MTA Capital Construction

CONTRACT #6240

DESIGN-BUILD SERVICES
FOR
LIRR EXPANSION PROJECT
FROM FLORAL PARK TO HICKSVILLE

CONFORMED DOCUMENTS

VOLUME 3
TECHNICAL PROVISIONS
DECEMBER 27, 2017

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Part 1 – Scope

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1.1 GENERAL

1.1.1 Section Includes

This section sets out a general introduction of the LIRR Mainline Expansion Project from Floral Park to Hicksville.

1.1.2 References

Refer to Appendix TPA1.1A ACRONYMS AND DEFINITIONS for acronyms and definitions used in the Volume 3, 4, and 6.

1.1.3 Introduction to Expansion Project

A. The LIRR's Main Line serves as the central artery of the commuter rail system in Nassau and Suffolk Counties. At various points east of Jamaica, five LIRR branches split off from the Main Line - the Hempstead, Oyster Bay, Port Jefferson, Ronkonkoma, and Montauk Branches. The number of tracks along the Main Line corridor varies: it primarily has four tracks west of Floral Park, but narrows to two tracks east of Floral Park through to Hicksville. The Main Line is also used by the New York & Atlantic Railway for freight service.

B. The existing LIRR Main Line segment between Floral Park and Hicksville comprises two tracks, and currently serves more than 220 trains on a typical weekday. Given the volume of train traffic along this Main Line segment, it frequently becomes congested during a normal rush hour. Moreover, in the event of a bottleneck caused by an emergency repair or disabled train, conditions can range from severely constrained to immobilized, creating significant delays. Due to the heavy train volumes and the two-track configuration, the LIRR has very few options to route service around a disabled train or track outage, compounding delays and affecting thousands of train riders.

C. The LIRR is projecting a substantial increase in service levels by the year 2040. This projected increase is due to a variety of factors, including: regional ridership growth; a desire to increase reverse peak and intra-island service opportunities; and planned future service growth to Manhattan terminals. If left unaddressed, this existing chokepoint will result in increasing congestion, delays, additional gate-down time, and passenger crowding in the future.

PEAK SERVICE

In addition to operational constraints, the two-track Main Line limits LIRR's ability to offer a broader range of services. The heavy demand for directional peak-period service (Manhattan bound service in the morning rush hours and Long Island-bound service in the evening rush hours) requires full use of both tracks and restricts other services such as intra-island service; and reverse direction travel (operating reverse from the peak direction). The result is no eastbound service for one and a half hours in the morning peak period and no westbound service for one hour in the evening peak period. LIRR anticipates increasing demand for intra-island travel and reverse peak travel—services that the current Main Line configuration cannot support during critical times of the day.

GRADE CROSSINGS

Grade crossings adversely impact traffic and train operations, neighborhood quality-of-life, as well as vehicle, pedestrian and bicyclist safety. Under normal conditions grade crossings add automobile traffic congestion due to gate-down time. When incidents occur at or near grade

crossings trains must approach the grade crossing at a reduced speed. In addition, train horns that must be blown at grade crossings, and bells that ring when gates are down create noise in the adjacent communities. They also increase risk to pedestrian, bicycle and automobile safety. Grade crossings also raise safety concerns related to response times for emergency vehicles that may need to cross the tracks. Accordingly, the desired option from a safety, quality-of-life, and traffic flow standpoint is to eliminate the grade crossings through grade-separation of the two modes of transportation (e.g., building a roadway underpass) or closure of the grade crossing.

PLANNING CONTEXT AND PROJECT HISTORY

A. Separate from the Project, LIRR is moving forward with the following regional transportation projects and plans:

    1. East Side Access.

    2. Double Track Project from Farmingdale to Ronkonkoma.

B. The Project will support current service plans as well as longer term post-ESA service plans. It will provide for a consistent three-track segment capability of the LIRR Main Line, substantial additional operational flexibility, improved safety, and a more resilient and reliable commuter rail network.

1.1.4 Scope Overview

A. The LIRR Expansion Project from Floral Park to Hicksville extends approximately 9.8 miles from the Village of Floral Park to the Hamlet of Hicksville. The Work includes but is not limited to the design and construction of the following major components:

    1. Installation of additional track to complete a continuous third Main Line track from Floral Park Station to Hicksville.

    2. Elimination of seven existing grade crossings to provide grade separated crossings or full closures to vehicular traffic.

    3. Construction of retaining walls and sound attenuation barriers along portions of the Project Corridor.

    4. Modifications to passenger rail stations including modified and improved platforms, station access, passenger shelters, Americans with Disabilities Act (ADA) enhancements, and parking modifications including new parking facilities.

    5. Modifications to railroad infrastructure including signal systems, substations, culverts, interlockings, crossovers, sidings, track bed, power systems, communications and signals.

    6. Utility relocations, including electric, signal, communications, gas, water, sewer, and storm sewer systems.

B. A more detailed description of the Project Scope is set out in the following sections of this Technical Provisions, Part 1, Scope.

Figure 2 – Project Area – Showing LIRR Stations

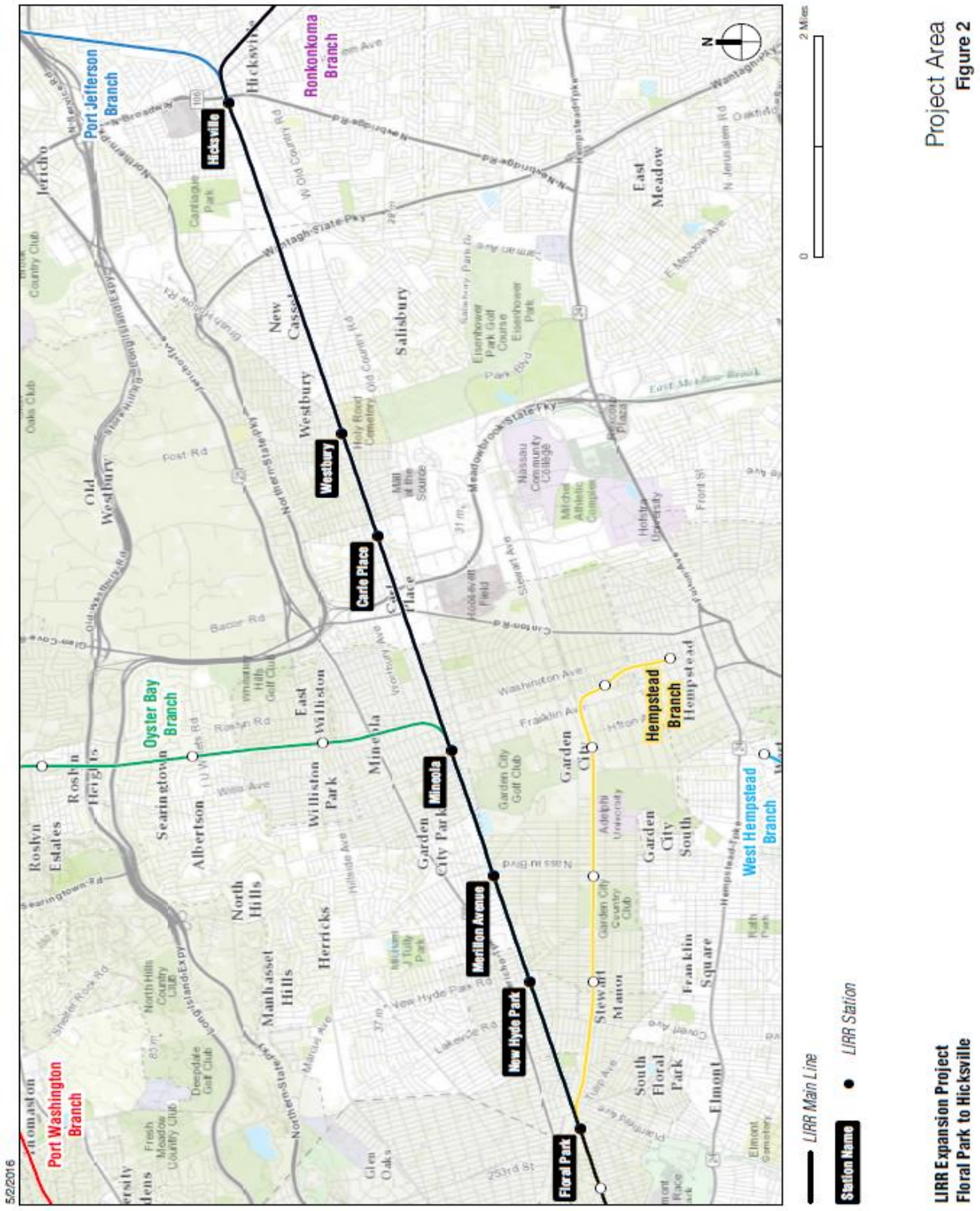
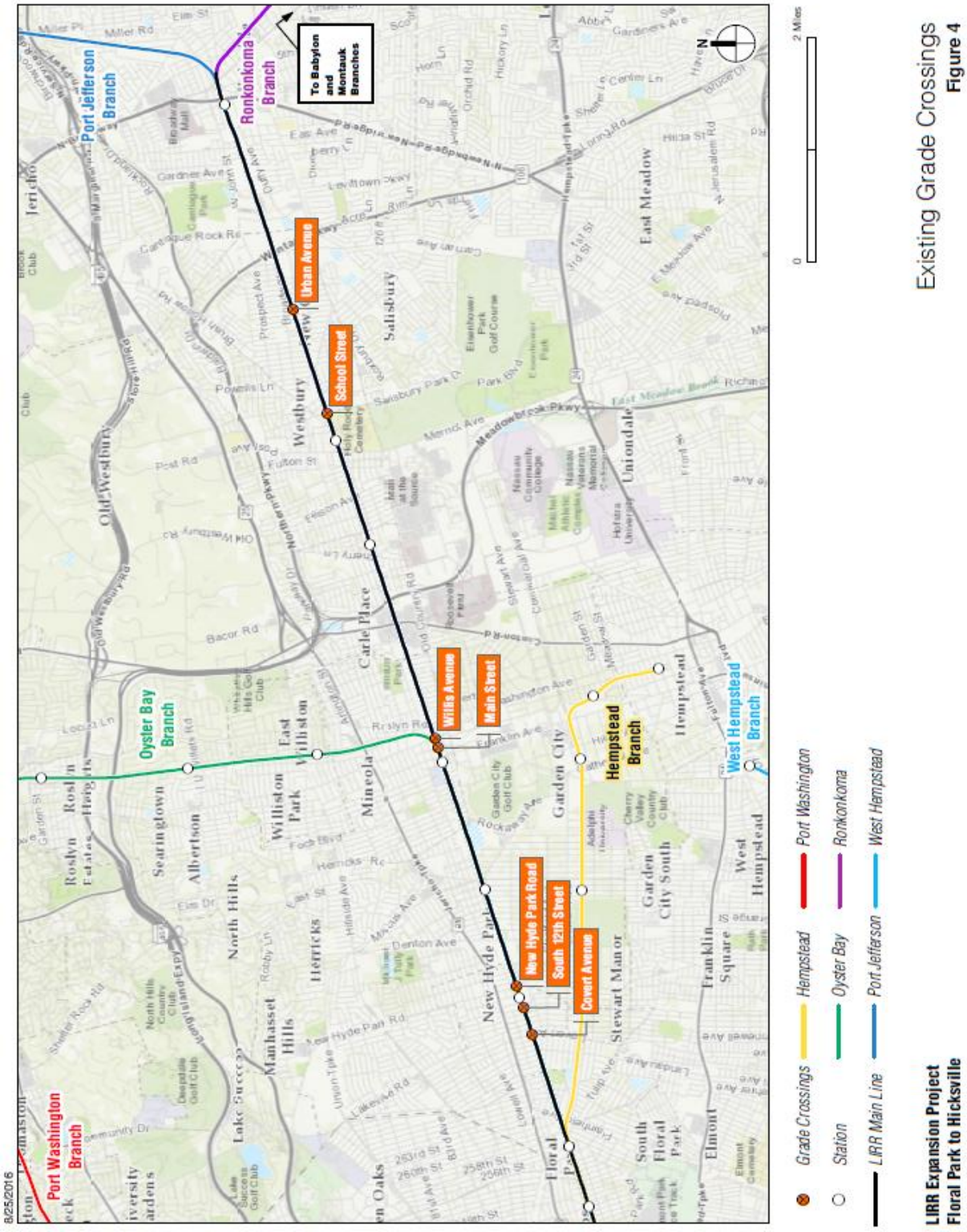


Figure 4 - Existing Grade Crossings



1.1.5 Division of Work

A. At the end of Scope sections included in the Technical Provisions Part 1 – Scope, there are “Division of Work” tables. The tables indicate which items of work shall be performed by the Design-Builder, and which items of work shall be performed by others. Unless work is specifically identified as ‘by others’, it shall be the responsibility of the Design-Builder.

B. Except as otherwise noted in the Scope sections or as specifically set out elsewhere in the Contract Documents, final connections between new systems and the existing operating system will be made by the Railroad, and all other work shall be performed by the Design-Builder.

END

1.2 UTILITIES

1.2.1 Section Includes

A. This section sets out design and construction scope related to utility relocation, replacement, and or abandonment of utilities owned by Third Parties, and public and private Utility Owners.

B. Utilities owned by the Railroad itself are addressed in TP1.3 RAILROAD UTILITIES.

1.2.2 References

A. Volume 4 Utility Requirements.

1.2.3 Utility Scope

Except as specifically excluded by the Contract Documents, the Design-Builder shall perform all design and construction work necessary to complete the Project including at a minimum, protection, adjustment, and relocation due to:

A. A physical conflict between the utility and the Project, including its construction, operation and maintenance, and maintenance of utility by the Utility Owner.

B. An incompatibility between the Utility and the Project based on the requirements of the Railroad or NYSDOT as set out in the Contract Documents, and the requirements of Utility Owners and Third Parties.

C. Temporary relocations necessary to perform the Work, including all stages of construction including those determined by the Design-Builder and Third Parties and Utility Owners.

1.2.4 Division of Work

All work shall be performed by the Design-Builder, or by others working for the Design Builder.

END

1.3 RAILROAD UTILITIES

1.3.1 Section Includes

A. This section sets out design and construction scope related to the relocation, modification, and or abandonment of Railroad Utilities. Railroad Utilities are those utilities that are owned by the Railroad and that are for use only by the Railroad. This includes but is not limited to the following:

1. Utility poles owned by the Railroad.
2. [redacted] power distribution lines.
3. Communications lines (fiber and copper) on utility poles owned by the Railroad.
4. Signal power lines underground and on signal towers owned by the Railroad.
5. Express signal cable.
6. Signal Power Distribution (Above and Below Ground).
7. Switch Heater Distribution and Control.
8. 3rd Rail Heaters.
9. Communication and Signals Wayside Distribution and Control.
10. Traction Power Distribution.

B. For requirements relating to Utility Poles, see TP1.2 UTILITIES and TP3.2 UTILITIES.

C. For requirements relating to the demolition of signal towers, see TP1.4 SITE PREPARATION AND DEMOLITION.

D. For requirements relating to Traction Power and 3rd Rail Heaters, see TP1.17 TRACTION POWER and TP3.17 TRACTION POWER.

E. For requirements relating to Signals and Train Protection, see TP1.19 SIGNALS AND TRAIN PROTECTION and TP3.19 SIGNALS AND TRAIN PROTECTION.

F. For requirements relating to Communications, see TP1.20 COMMUNICATIONS and TP3.20 COMMUNICATIONS.

1.3.2 References (Not Used)

1.3.3 Permanent Relocation, Replacement and Abandonment of Railroad Utilities

A. Existing utility poles carrying the Railroad's power distribution lines and communication lines shall be upgraded as indicated and relocated outside the footprint of the proposed construction within the Railroad ROW, if feasible. Where the availability of existing Railroad ROW is limited, these lines shall be relocated to PSEG-LI poles within the Railroad ROW.

B. Underground lines in conduit, or direct burials, and Utility equipment shall be relocated outside the footprint of the proposed construction within the ROW, if feasible. Where the availability of existing Railroad ROW is limited, underground lines shall be relocated to PSEG-LI poles within the Railroad ROW.

C. The existing signal system will be abandoned by the Railroad, and the Design-Builder shall remove all components of the signal system once the installation of the replacement Automatic Train Protection system has been installed and is fully operational.

D. The Design-Builder is responsible for supplying and installing all material and equipment required for permanent relocation and replacement of Railroad Utilities. However, all final ties to and activation in conjunction with existing systems to remain shall only be completed by the Railroad. The deactivation of existing Railroad Utilities designated for abandonment will be completed by the Railroad.

1.3.4 Temporary Relocations of Railroad Utilities

A. The construction of other Project-related work may also require the temporary relocation of the Railroad Utilities. The design and construction of all temporary relocations, including those that are identified during the course of design and construction, except for final tie-ins to existing systems and activation, are the responsibility of the Design-Builder. All ties to and activation in conjunction with existing systems will be completed by the Railroad.

1.3.5 Division of Work

The Division of Work between the Design-Builder and others, including the Railroad, Third Parties, and Utility Owners, is shown in the following table.

DIVISION OF WORK TABLE					
Disc.	**Work Element**	**Design-Builder**		**By Others**	
		Supply	**Install**	**Supply**	**Install**
Railroad Utilities	Utility Pole Relocations (Railroad)	X	X		
	Utility Pole Relocations and Hybrid Poles PSEG-LI	X	X		
	60 Hz Power Distribution Line Upgrade and Relocation, except for tie-ins to existing systems and activation	X	X		
	Tie-ins to existing power Distribution Systems and Activation			X	X
	Communication Line Upgrade and Relocation, except for tie-ins to existing systems and activation	X	X		
	Tie-ins Existing Communication Systems and			X	X

	Activation				
	Deactivation of Signal System to be Abandoned			X	X
	Removal of Abandoned Signal System after deactivation by the Railroad	X	X		
	Signal Power Distribution (above and below Ground)	X	X		
	Tie-ins to Signal Power Distribution (above and below Ground)and Activation			X	X
	Switch Heater Distribution and Control	X	X		
	Tie-ins to Switch Heater Distribution and Control and Activation			X	X
	3rd Rail Heater	X	X		
	Tie-ins to 3rd Rail Heater			X	X
	Communication and Signals Wayside Distribution and Control	X	X		
	Tie-ins to Communication and Signals Wayside Distribution and Control and Activation			X	X
	Traction Power Distribution	X	X		
	Tie-ins to Traction Power Distribution and Activation			X	X

END

1.4 SITE PREPARATION, DEMOLITION, AND SITE RESTORATION

1.4.1 Section Includes

This section sets out scope related to preparation of a work area before construction activities begin and site restoration once work is complete; and building and facility demolition and maintenance of the demolition areas before and after demolition occurs.

1.4.2 References (Not Used)

1.4.3 Site Preparation and Restoration

A. Prior to commencing construction at any location, the Design-Builder shall prepare the area in accordance with requirements set out in the Contract Documents.

B. Once work at a location is complete, the Design-Builder shall timely restore the area in accordance with requirements set out in the Contract Documents.

C. The Design-Builder shall restore all sidewalks and curbs impacted by construction. All sidewalks and curbs shall be repaired to match existing conditions.

1.4.4 Demolition of Buildings and Facilities

The Design-Builder shall demolish, dispose of all demolished and waste materials, and restore the work area for the following buildings and facilities:

A. [redacted] – Auto Repair Building (Building Located at Grade Crossing).

B. [redacted] – Self Storage Building (Building Located at Grade Crossing).

C. [redacted] – Industrial Property (Building Located at Grade Crossing).

D. [redacted] – Auto Repair Building (Building Located at Grade Crossing).

E. Two (2) LIRR facilities located at Southwest Quadrant of Main Street Crossing:

   1. Nassau Tower (White Building).
   2. Historic Substation Building (Brick Building).

F. Merillon Avenue Station Building.

G. Carle Place and Mineola Station Pedestrian Overpass.

H. LIRR Nassau Tower.

I. Bridges (Including Substructure, Superstructure and Appurtenances).

   1. Floral Park Viaduct – Viaduct demolition as needed.
   2. South Tyson Avenue Bridge – Superstructure and substructure demolition as needed.
   3. Plainfield Avenue Bridge – Substructure demolition as needed.
   4. Tanners Pond / Denton Avenue Bridge – Full superstructure demolition, and substructure demolition as needed.
   5. Nassau Blvd Bridge – Full superstructure demolition, and substructure demolition as needed.

6. Glen Cove Road Bridge - Full superstructure demolition, and substructure demolition as needed.
7. Meadowbrook Parkway Bridge - Substructure demolition as needed.
8. Cherry Lane Bridge - Full superstructure demolition, and substructure demolition as needed.

J. Retaining Walls as necessary to complete work.

K. Signal Bridges, huts, and equipment.

L. Depending on the Design-Builder's design, the Design-Builder may avoid affecting the parking structure behind Birchwood Court in Mineola. However, if it does affect the parking structure, it shall demolish the parking structure located behind Birchwood Court in Mineola, and replace it in kind, and provide temporary parking until parking in the new structure is available.

M. Full demolition of LIRR Building directly west of substation G13.

N. Removal of advertisement billboards along the LIRR ROW.

Prior to any demolition, the Design-Builder shall assess the site and prepare for demolition in accordance with the requirements of the Contract Drawings. The Design-Builder shall maintain the demolition sites before, during and after demolition in accordance with the requirements of the Contract Documents.

1.4.5 Vegetation Management

The Design-Builder shall provide all the necessary labor, material, transportation, permits, licenses and equipment to trim, and/or clear as specified, certain trees and other vegetation, including but not limited to bushes, brush, vines and weeds along the Railroad ROW from property line to property line. All cable, open wires and wayside signals shall be cleared of growth and debris shall properly and lawfully disposed by the Design-Builder.

1.4.6 Demolition of Track and Systems Elements

In addition to the demolition of buildings and facilities identified above, the Design-Builder shall demolish, dispose of all track and systems related demolished and waste materials, and restore work areas.

1.4.7 Clearing and Grubbing

The Design-Builder shall perform clearing and grubbing on all trees, brushes and stumps, fences, debris and miscellaneous structures not covered under other items above within the construction area in accordance with requirements set out in the Contract Documents.

1.4.8 Division of Work

All work shall be performed by the Design-Builder.

END

1.5 STRUCTURES

1.5.1 Section Includes

A. This section sets out design and construction scope related to structures, including the following:

1. Existing structures to remain.
2. Roadway bridges.
3. Undergrade crossings.
4. Railroad bridges.
5. Retaining walls.
6. Sound attenuation barriers.
7. Pedestrian bridges at stations.
8. Existing pedestrian underpasses.
9. Temporary Structures.

B. For scope relating to structural requirements at stations, refer to TP1.12 STATIONS AND ARCHITECTURE.

C. For scope relating to structural requirements for parking structures, refer to TP1.14 PARKING STRUCTURES.

1.5.2 References

A. Contract Drawings.

B. Directive Drawings.

1.5.3 Existing Structures to Remain

A. The Design-Builder shall assess existing structures to remain and provide a full assessment of the condition and load rating as applicable in accordance with the requirements set out in the Contract Documents.

B. The Design-Builder shall repair structures to a state of repair in accordance with the requirements set out in the Contract Documents. The structures shall last a minimum of 20 years with routine maintenance after construction is complete.

C. The Design-Builder shall analyze existing structures impacted by the Project as defined in the Contract Documents. As needed the Design-Builder shall retrofit structures in order to meet requirements set out in the Contract Documents.

1.5.4 Roadway Bridges

The Design-Builder shall construct roadway bridges in accordance with the requirements set out in the Directive Drawings and Contract Documents at the following locations:

A. 2nd Street over Covert Avenue.

B. 3rd Street over Covert Avenue.

C. Railroad Avenue over Urban Avenue.

D. LIRR Oyster Bay Line and Hinck Way over Willis Avenue.

E. Front Street over Willis Avenue.

1.5.5 Undergrade Crossings

The Design-Builder shall construct undergrade crossings in accordance with the requirements set out in the Directive Drawings and Contract Documents at the following locations:

A. LIRR Main Line over Covert Avenue.

B. LIRR Main Line over New Hyde Park Road.

C. LIRR Main Line over Willis Avenue.

D. LIRR Oyster Bay Line and Hinck Way over Willis Avenue.

E. LIRR Main Line over School Street.

F. LIRR Main Line over Urban Avenue.

1.5.6 Railroad Bridges

The Design-Builder shall construct or modify existing Railroad structures in accordance with the requirements set out in the Contract Documents at the following locations:

A. Floral Park Viaduct.

B. South Tyson Avenue.

C. Plainfield Avenue.

D. Denton Avenue.

E. Nassau Boulevard.

F. Glen Cove Road.

G. Meadowbrook Parkway.

H. Cherry Lane.

I. Hicksville Viaduct.

1.5.7 Retaining Walls

A. The Design-Builder shall construct retaining walls within the existing ROW in locations where the Project Corridor is either elevated or depressed compared to the surrounding land, taking into account transverse grading from the track clear area including the required drainage ditches to the edge of the ROW.

B. Retaining walls meeting required aesthetic criteria shall be constructed within the right-of-way limits to provide stable ground slopes for the new horizontal and vertical alignment.

1.5.8 Sound Attenuation Barriers

A. The Design-Builder shall construct sound attenuation barriers within the existing ROW at locations noted in TP3.5 STRUCTURES. Sound attenuation barriers shall be an extension of the retaining walls at locations that also require retaining walls. At all other locations sound attenuation barriers shall be standalone structures meeting required aesthetic criteria.

1.5.9 Pedestrian Bridges at Stations

The Design-Builder shall construct pedestrian bridges at stations in accordance with the requirements set out in the Contract Documents at the following locations:

A. Mineola Station.

B. Main Street.

C. Willis Avenue.

D. Carle Place Station.

E. Westbury Station # 1.

F. Westbury Station # 2.

1.5.10 Pedestrian Underpasses

The Design-Builder shall construct integral extensions of existing pedestrian underpasses at the following locations:

A. Westbury Station.

B. Adjacent to Floral Park Recreational Center.

The Design-Builder shall construct a new pedestrian underpass at the following location:

A. South 12th Street.

1.5.11 Temporary Structures

The Design-Builder shall construct temporary structures required for construction in accordance with the requirements set out in the Contract Documents.

1.5.12 Division of Work

All work shall be performed by the Design-Builder.

END

1.6 CIVIL, HIGHWAYS, AND PARKING

1.6.1 Section Includes

This section sets out design and construction scope related to roadworks, parking on the street and in parking lots, and pavement striping and signage.

For parking structures, refer to TP1.14 PARKING STRUCTURES.

1.6.2 References (Not Used)

1.6.3 Civil and Highways Scope

A. The Design-Builder shall be responsible for the design, materials, construction, and reconstruction of the temporary and permanent roadway(s) to be constructed within the Project Limits, including full depth reconstruction and milled and resurfaced roadways. Any other roads damaged by construction operations or necessary for permanent operations are included in this scope, all in accordance with the design requirements stated in the Contract Documents.

B. This Section's scope also includes the design, materials, and construction scope of all curbs, sidewalks, driveways, road appurtenances; and furnishing all safety protections, and safety devices not specifically cited in other Contract Documents. In addition, the Design-Builder shall be responsible for installing systems meeting current NYSDOT Standards when restoring areas impacted by Project work, unless specified otherwise in the Contract Documents.

C. Existing disturbed and damaged curbs, sidewalks, and driveways that are not included in the reconstruction work shall be replaced with corresponding elements having equal or better characteristics. The Design-Builder shall provide all tie-in work to avoid differential problems, accounting for such factors as total surfacing thickness, minimum structural requirements, and unequal base/subbase thickness.

D. All elements that will not be maintained by LIRR shall be provided in accordance with the requirements of the AHJ.

1.6.4 Parking Scope

A. Table 1-6-1 below illustrates the total number of surface parking lost due to station improvements & third track construction and grade crossing improvements. The Design-Builder shall coordinate with LIRR when performing station improvements & third track construction and grade crossing improvements to ensure no additional surface parking locations are lost other than the ones outlined in Table 1-6-1 below.

Table 1-6-1

Net Parking Lost Due to Station Improvements & Third Track Construction		
Location	**Surface Parking Lost**	**Details**
Floral Park Station	10	Approximately 10 parking spaces may be lost due to construction of the third track on the viaduct. It may be possible to relocate some of these spaces in the same general area.

New Hyde Park Station	109	North side: 177 head-on parking spaces removed along Third Avenue due to south station platform and pedestrian overpass and third track. 46 parallel parking spaces returned. South side: 25 Spaces removed due to new north station platform. 39 parallel parking spaces along 2nd Avenue between S 5th Street and S 12th Street replaced with 86 head-on or angled spaces.
Merillon Avenue Station	13	13 Spaces removed due to north platform ramps and stairs.
Mineola Station	0	35 head-on and angled parking spaces impacted by south station platform and third track, replaced along Station Road.
Carle Place Station	9	14 head-on spaces removed near Stonehinge Lane due to north station platform. 5 parallel parking spaces added.
Westbury Station	20	Spaces removed (including 7 handicap spaces) due to south station ramps and stairs.
Total Spaces removed for Station Improvements & 3rd Track Construction	**161**	
Net Parking Lost Due to Grade Crossing Improvements		
Location	**Surface Parking Lost**	**Details**
Covert Avenue	10	
South 12th Street	8	
Main Street	3	
Willis Avenue	31	
School Street	0	
Urban Avenue	7	
Total Spaces removed for Grade Crossing Improvements	**59**	

B. The following locations shall include parking lots as outlined in the Directive Drawings:
   1. New Hyde Park Road – Parking lot with 95 parking spaces with Kiss and Ride
   2. Main Street – Parking Lot with 11 parking spaces with Kiss and Ride

C. The Design-Builder shall provide temporary parking at locations in close proximity to the station to substitute any parking impacted during construction. Total number of temporary parking spaces shall, at a minimum, match the number of removed parking

spaces, including the parking lost due to the demolition of the Birchwood Garden Garages.

1.6.5 Signage/Striping

A. The Design-Builder shall provide all temporary and permanent fixed signage and pavement markings required for the Project. The Design-Builder shall be responsible for identifying, designing, detailing, fabricating, delivering and installing all signage and pavement marking materials and shall install all components necessary for a complete and functional system which, in addition to meeting the design and construction criteria specified above, meets the following requirements:

   1. Provides for the orderly and predictable movement of all traffic.
   2. Provides such regulation, guidance, warnings and advisories as are needed to ensure safe and informed operation.
   3. Is fully and seamlessly integrated into the existing signing elements beyond the Project Limits.

1.6.6 Division of Work

All work shall be performed by the Design-Builder.

END

1.7 LIGHTING, TRAFFIC SIGNALS, AND ITS

1.7.1 Section Includes

This Section sets out design and construction scope related to: street and parking lot lighting; lighting on structures; traffic signals; and Intelligent Transportation Systems (ITS).

For lighting at stations, refer to TP1.12 STATIONS AND ARCHITECTURE.

For security requirements, including issues relating to lighting levels, refer to TP2.10 SYSTEM SECURITY.

1.7.2 References (Not Used)

1.7.3 Lighting Scope

The Design-Builder shall perform all design and construction work necessary to provide lighting for all Project locations where it has performed Work. This includes:

A. Lighting on all roadways, sidewalks, parking structures, parking lots, and parking locations.

B. Lighting on all pedestrian walks, stairs, ramps, bridges, and waiting areas.

C. Lighting on Railroad bridges, structures, and ROW.

D. Under bridge lighting.

E. Any existing lighting impacted by the Project shall be replaced to meet the Project requirements.

F. Any existing lighting not impacted by the Project, but within the Project Limits, shall be verified to be operational. Non-operational existing lighting, within the Project Limits, shall be made operational.

G. All existing lighting shall remain operational throughout construction until the new lighting is operational.

H. Design of lighting system shall include elements to facilitate maintenance of all components of lighting system while minimizing disruptions to the travelling public.

1.7.4 Traffic Signals and ITS Scope

The Design-Builder shall perform all design and construction work necessary to provide traffic signals, ITS installations, and connections into existing controls for all Project locations where it has performed Work.

1.7.5 Traffic Signals

The Design-Builder shall furnish and install new traffic signal equipment in accordance with requirements set out in the Contract Documents for the following locations:

A. Intersection of New Hyde Park Road and Plaza Avenue.

B. Intersection of Willis Avenue and 1st Street.

C. Intersection of Willis Avenue and 3rd Street.

D. Intersection of School Street and Railroad Avenue.

E. Intersection of School Street and the [redacted] and [redacted] School Street driveways.

F. Intersection of Urban Avenue and Broadway.

G. Intersection of Urban Avenue and the new dead end street located between 99 Urban Avenue and 109 Urban Avenue.

H. Intersection of West Barclay Street and Marion Place.

I. Intersection of West John Street and Marion Place.

1.7.6 Intelligent Transportation Systems

The Design-Builder shall furnish and install all equipment required for Intelligent Transportation Systems (ITS) in accordance with requirements set out in the Contract Documents. ITS design shall incorporate lighting design in order to optimize nighttime video camera monitoring capabilities.

1.7.7 Division of Work

All work is to be performed by the Design-Builder, with the exception of traffic signal microcomputer programming and activation, to be done by signal owner.

END

1.8 PEDESTRIAN FACILITIES

1.8.1 Section Includes

A. This Section sets out design and construction scope related to pedestrian amenities including sidewalks, curb cuts, ramps, and railings.

B. For requirements relating to pedestrian overpasses, refer to TP1.5 STRUCTURES.

C. For requirements relating to elevators and stairs, refer to TP1.12 STATIONS AND ARCHITECTURE.

1.8.2 References

A. Directive Drawings.

1.8.3 Pedestrian Facilities Scope

A. The Design-Builder shall furnish and install all pedestrian amenities, including, but not limited to, sidewalks, curb ramps, and railings in accordance with requirements set out in the Contract Documents.

B. All sidewalks, curbs, and pedestrian ramps adjacent to station platforms shall be reconstructed. The limits of new sidewalks, curbs and pedestrian ramps are shown on the Directive Drawings.

1.8.4 Division of Work (Not Used)

All work shall be performed by the Design-Builder.

END

1.9 ALIGNMENT AND TRACK

1.9.1 Section Includes

This section sets out scope related to the defined track alignment of the third track, and design and construction related to:

A. Adjustment of in-service tracks.

B. Out of service track including third rail.

C. New crossovers and turnouts.

D. Fencing and barriers along the ROW.

E. Close Clearance Signs.

F. Direct Fixation Track.

G. Hi-Rail Access.

1.9.2 References

A. Contract Drawings.

B. Directive Drawings

1.9.3 Track Alignment

A. The Design-Builder shall design and construct track to match the horizontal alignment indicated on the Contract Drawings.

B. The profile of new track shall generally match that of the existing tracks, recognizing that track lifts and adjustments will be required at various locations.

C. The term “in-service tracks” as used in the Contract Documents shall mean tracks that are in service or shall be put back in service for the next Peak Period.

D. The term “out of service tracks” as used in the Contract Documents shall mean tracks that will not be put back in service for the next Peak Period.

E. The Design-Builder shall provide designs and plans for use by the Design-Builder and the Railroad for construction of both in-service and out of service tracks.

1.9.4 Construction of In-Service Tracks

A. The Design-Builder shall provide designs and plans for use by the Railroad that the Railroad may use in adjusting the alignment and elevation of existing track as required for installation of new track and crossovers.

B. At certain locations where the existing tracks must be shifted laterally, the Design-Builder shall excavate adjacent to the existing tracks and prepare the track formation up to the top of sub-ballast. The existing mainline track shifts are indicated in the Contract Drawings.

C. The Design-Builder shall design all tracks that are to be constructed in-service. The plans shall clearly indicate the limits of in-service track construction and out of service track construction. The LIRR will construct all in-service track modifications. Tie ins to in-service tracks will be done by LIRR force account. The Design-Builder shall develop a construction staging plan that has two mainline tracks in service at all times except for approved track outages.

1.9.5 Construction for Out of Service Tracks

A. The Design-Builder shall design and construct all out of service tracks that will become part of the operating Expansion Project System.

B. The Design-Builder shall complete construction of the Maintenance of Way (MOW) siding east of Urban Avenue and make it available for use before the Urban Avenue grade crossing is eliminated.

1.9.6 New Crossovers and Turnouts

1.9.6.1 Supply of Crossovers and Special Track

The Design-Builder shall procure turnouts and crossovers for installation at the following locations, and shall provide detailed shop drawings:

A. Connection to the Hempstead Branch ([redacted] turnouts).

B. New interlocking on the Hempstead Branch ([redacted] turnouts).

C. Relocated Nassau 1 interlocking ([redacted] turnouts).

D. Connection to the Oyster Bay Branch ([redacted] and No. [redacted] turnouts).

E. Relocated Nassau 3 interlocking (No. [redacted] turnouts).

F. Siding east of School Street (No. [redacted] turnouts).

G. Siding east of Urban Avenue (No. [redacted] turnouts).

H. Interlocking west of Wantagh Pkwy (No. [redacted] turnouts).

I. Jamaica Ash Siding (No. [redacted] turnout).

J. Added equilateral turnout in Divide 4 interlocking at Jerusalem Ave (Hicksville) (No. [redacted] and No. [redacted] turnouts).

1.9.6.2 Installation of Turnouts on Out of Service Track

The Design-Builder shall supply and install crossovers and turnouts on all out of service track construction.

1.9.6.3 Installation of Turnouts on In-Service Track

A. The Railroad will install crossovers and turnouts on all in-service tracks. All turnouts shall be supplied by the Design-Builder. All turnouts shall be panelized by the Design-Builder, as directed by the Railroad.

B. The Design-Builder shall support and assist the Railroad in preparing for the installation of turnouts for in-service tracks. The Design-Builder shall:

1. Store turnouts until needed by the Railroad.
2. Transport turnout panels to the site for installation by the Railroad.
3. Provide for the use of a crane to lift panels into place.
4. Perform grading for the new turnouts.

1.9.6.4 Waste Disposal

A. The Design-Builder shall dispose waste materials generated from its work on the ROW. In addition, where the Railroad or others are working in the same vicinity as the Design-Builder, the Design-Builder shall dispose of waste generated by others in order to keep the site clean and free of waste and debris.

1.9.7 Fencing and Barriers

A. High security fencing shall be installed along both sides of the right-of-way for the entire length of the corridor except for areas where there are retaining walls, sound attenuation walls, or existing decorative fencing (in the area of New Hyde Park). The Design-Builder shall supply and install any decorative fencing that needs to be replaced due to construction.

1.9.8 Close Clearance Signs

A. The Design-Builder shall install close clearance signs at all locations with a clear distance of less than 13' from the centerline of track to any obstruction above top of rail that would reduce the area to clear to (e.g. wall, fence, structure, or other barrier).

1.9.9 Replace Direct Fixation Track

A. Replace the existing direct fixation plates and fasteners on all three tracks for the length of direct fixation track at Herricks Road.

1.9.10 Hi-Rail Access

A. The Design-Builder shall construct hi-rail access to provide permanent access by LIRR to the tracks. Access will be provided at three general locations, between Queens 3 and Nassau 1, between Nassau 1 and Nassau 3, and between Nassau 3 and Divide 1. Hi-rail access at these three general locations will be provided from both the north side and the south side of the tracks. Access shall not be provided off residential streets.

B. Several possible hi-rail access locations are as follows::

1. Nassau 1 Access: Along Railroad Ave., west of Merillon Ave. Station, in the area of Old Broadway ([redacted]). This is [redacted]' west of relocated Nassau 1.
2. Nassau 3 Access: Along Hinck Way, between Willis Ave. and Roslyn Rd., around [redacted]. This is [redacted] west of relocated Nassau 3.
3. Divide 1 Access:
   a. At the end of Bond St. [redacted]), west of Wantagh Parkway. This is [redacted] west of Divide 1.

   OR

   b. At the end of New York Ave. ([redacted]). This is [redacted]' west of Divide 1.

C. Hi-rail access shall be provided to all mainline tracks.

D. In addition, the LIRR may select up to three additional locations for the Design-Builder to provide hi-rail access.

1.9.11 Survey Support During Construction

A. The Design-Builder shall provide survey support for the following activities:

1. Adjustment of existing tracks.
2. Installation of new track including third rail.
3. Installation of new crossovers and turnouts.

1.9.12 Division of Work

The Division of Work between the Design-Builder and the Railroad is shown in the following table.

Division of work boundaries shall be clearly shown, labeled, and stationed on the drawings produced by the Design-Builder.

DIVISION OF WORK TABLE						
Disc.	Work Element	Design-Builder			Railroad	
		Design	Supply	Install	Supply	Install
Track	Adjustment of in-service track	X	X			X
	Out of service track	X	X	X		
	Crossovers and turnouts for out of service track	X	X	X		
	Crossovers and turnouts for in-service track	X	X			X
	Fencing and barriers	X	X	X		
	Cutovers	X	X			X
	Hi-Rail Access	X	X	X		
	Direct Fixation Track	X	X	X		
	Stone (ballast) for track raises (Covert Avenue/School Street/Urban Avenue)				X	X

END

1.10 DRAINAGE

1.10.1 Section Includes

This section sets out design and construction scope related to drainage systems, and the handling of storm water runoff, both within and outside the Railroad ROW. This work may include the design and construction of retention basins and facilities on or outside the Railroad ROW.

1.10.2 References (Not Used)

1.10.3 Railroad ROW and Stations

For the length of the Project Railroad ROW the Design-Builder shall provide drainage and storm water management to meet Project requirements and Nassau County Department of Public Works (NCDPW) Drainage Criteria Requirements, AHJ, and/or Third Party Owner as appropriate.

1.10.4 Roadways and Streets

The Design Builder shall furnish and install an operating drainage system in accordance with the requirements set out in the Contract Documents at the following locations:

A. Covert Avenue.

B. South 12th Street.

C. New Hyde Park Road.

D. Main Street.

E. Willis Avenue.

F. School Street.

G. Urban Avenue.

1.10.5 Existing Facilities

A. Existing drainage elements within the Project shall be inspected and assessed for capacity, outfall stability, system condition, remaining service life and other parameters with respect to the requirements of the Contract Documents. The Design-Builder shall clean the existing drainage system at the beginning and completion of Work, where new drainage will (re)connect to existing drainage system, such as at Urban Avenue crossing (Rushmore Street).

1.10.6 Temporary Works

A. The Design-Builder shall provide all temporary works, including bypasses and other temporary drainage systems required to stage and complete the work and maintain the site in accordance with the requirements set out in the Contract Documents.

B. The construction of new drainage systems shall not adversely affect any drainage provision outside the construction site boundaries.

1.10.7 Connections to Existing Systems

A. The Design-Builder shall provide all temporary and permanent connections to existing systems required to complete and commission the work in accordance with the requirements set out in the Contract Documents.

B. The Design-Builder shall coordinate with NYSDOT and Nassau County and shall submit all required permitting documents to the AHJ.

C. The Design-Builder shall coordinate design requirements with NYSDOT, Nassau County Department of Public Works, AHJs, and Third Party Owners as appropriate.

1.10.8 Division of Work

All work shall be performed by the Design-Builder.

END

1.11 LANDSCAPING AND AESTHETICS

1.11.1 Section Includes

A. This section sets out design and construction scope related to:

1. Landscaping along streets and the ROW.
2. Aesthetic design and construction scope requirements relating to bridge and underpass structures, retaining walls, and sound attenuation barriers.
3. The replacement of landscaping damaged inside as well as outside of the Railroad ROW and along street corridors where off site stormwater conveyance systems are constructed.

B. For landscaping at stations and station aesthetics refer to TP1.12 STATIONS AND ARCHITECTURE.

1.11.2 References (Not Used)

1.11.3 Landscaping Along Streets and the ROW

The Design-Builder shall furnish and place all grass, groundcovers, shrubs, and trees in accordance with requirements set out in TP3.11 LANDSCAPING AND AESTHETICS at the following locations:

A. Covert Avenue – Wayne Avenue to First Avenue.

B. South 12th Street – Fourth Avenue to First Avenue.

C. New Hyde Park Road – Fourth Avenue to Plaza Avenue.

D. Main Street – Third Street to Second Street.

E. Willis Avenue – Front Street to Second Street.

F. School Street – Dryden Street to Union Avenue.

G. Urban Avenue – 400 feet South of Tracks to Broadway.

1.11.4 Landscaping at Stations

The Design-Builder shall furnish and place all groundcovers, shrubs, and trees in accordance with requirements set out in TP3.11 LANDSCAPING AND AESTHETICS at the following locations:

A. New Hyde Park Station.

B. Merillon Avenue Station.

C. Mineola Station.

D. Carle Place Station.

E. Westbury Station.

1.11.5 Landscaping along Railroad ROW Corridor

A. The Design-Builder shall furnish and replace all grass, groundcovers, shrubs, and trees in areas of properties adjacent to the Railroad ROW that are disturbed or removed due to retaining wall and sound attenuation barrier construction. Replacement shall be in accordance with requirements set out in TP3.11 LANDSCAPING AND AESTHETICS.

B. The Design-Builder shall furnish and replace all grass, groundcovers, shrubs, trees, and tree grates within the street ROW and in areas of properties outside the Railroad ROW

that are disturbed or removed due to stormwater conveyance system construction. Replacement shall be in accordance with requirements set out in TP3.11 LANDSCAPING AND AESTHETICS at the following locations:

1. Willis Avenue/ Main Street – Third Street along Front Street and Old Country Road to Nassau County SWB 123.
2. School Street – School Street along Old Country Road and Linden Avenue to Nassau County SWB 315.
3. Urban Avenue - Urban Avenue along Old Country Road, Grand Boulevard, and Lindy Road to Nassau County SWB 51.

1.11.6 Aesthetic Design and Construction

1.11.6.1 Undergrade Crossing Retaining Walls

The Design-Builder shall furnish and install aesthetic finishes at undergrade crossing retaining walls in accordance with requirements set out in TP3.11 LANDSCAPING AND AESTHETICS at the following locations:

A. Covert Avenue.
B. South 12th Street.
C. New Hyde Park Road.
D. Main Street.
E. Willis Avenue.
F. School Street.
G. Urban Avenue.

1.11.6.2 Retaining and Sound Attenuation Barriers along Railroad ROW Corridor

The Design-Builder shall furnish and install aesthetic finishes at retaining wall and sound attenuation barriers along the Railroad ROW in accordance with requirements set out in TP3.11 LANDSCAPE AND AESTHETICS.

1.11.7 Division of Work

All work shall be performed by the Design-Builder.

END

1.12 STATIONS AND ARCHITECTURE

1.12.1 Section Includes

This section sets out the design and construction scope related to the modification of existing permanent stations, the replacement and relocation of existing platforms, the addition of pedestrian overpasses, the addition of pedestrian underpasses, the addition of elevators, the installation and maintenance of temporary station platforms, and ancillary buildings and facilities.

1.12.2 References (Not Used)

1.12.3 Railroad Station Scope Including, Architectural and Structural

The Design Builder shall provide everything required as set out in TP3.12 STATIONS AND ARCHITECTURE.

1.12.3.1 Stations

A. Floral Park

B. New Hyde Park Station.

C. Merillon Station.

D. Mineola Station.

E. Carle Place Station.

F. Westbury Station.

1.12.3.2 General Scope

1.12.3.2.1 Station Buildings

A. Architectural Upgrades shall be provided as set out in TP3.12 STATIONS AND ARCHITECTURE to the existing station buildings at the following locations:

1. New Hyde Park Station.
2. Mineola Station.
3. Westbury Station.

B. Structural, electrical, and plumbing upgrades shall be provided, only when required to maintain a structurally sound structure and to provide a working electrical and plumbing system for new work associated with the Project.

1.12.3.2.2 Permanent Platforms

A. All existing westbound and eastbound station platform slabs shall be removed and replaced with permanent heated platforms (partial system as described in TP3.12 STATIONS AND ARCHITECTURE) with the exception of Floral Park Station. Platforms adjacent to the proposed third track shall be relocated to accommodate the new alignment. The existing structural foundations associated with the relocated platform shall be demolished and re-built to accommodate the new platform. Existing Structural foundations at platforms to remain in situ shall be brought to a state of good repair and shall be upgraded to accommodate all associated loads. Guard rails shall be provided the full length along the back edge of the boarding platform.

B. The Design-Builder shall provide stairs and ADA ramps with guardrails and handrails connected to the all boarding platforms within the station property.

C. The Design-Builder shall provide tactile warning, and platform edge rub board meeting current code requirements.

1.12.3.2.3 Canopies

A. The Design-Builder shall provide canopy/canopies at all westbound platforms for a total length of 6 train cars (510 ft.) with the exception of Floral Park Station, where no new canopies are required.

B. The Design-Builder shall provide canopy/canopies at all eastbound platforms for a total length of 3 train cars (255 ft.) except for Mineola Station, for which the Design-Builder shall provide canopy for total length of 6 train cars (510 ft.).

C. The Design-Builder shall provide canopy/canopies at all walkways directly adjacent to station boarding platforms that are utilized for egress and access purposes.

1.12.3.2.4 Temporary Platforms

A. The Design-Builder shall provide Temporary platforms as part of construction phasing to maintain train service and customer access, including stairs, ADA ramp access, guardrails, handrails, tactile warning, and platform edge rub board meeting current code requirements.

1.12.3.2.5 Pedestrian Underpass

A. The Design-Builder shall provide pedestrian underpasses for cross track access at stations indicated below. Pedestrian underpasses shall not be provided at stations unless they are listed below. See TP1.5 STRUCTURES for pedestrian overpass scope requirements.

B. New Hyde Park Station

1. Provide one (1) pedestrian underpass:

    a. Adjacent to South 12th Street.

1.12.3.2.6 Pedestrian Overpass

A. The Design-Builder shall provide pedestrian overpasses for cross track access at stations indicated below. Pedestrian overpasses shall not be provided at stations unless they are listed below. Elevators for ADA access at all overpasses shall be provided unless noted otherwise. See TP1.5 STRUCTURES for pedestrian overpass scope requirements.

B. Mineola station

1. Provide one (1) pedestrian overpass adjacent to the station building. Do not provide elevators.
2. Provide one (1) pedestrian overpass at Main Street.
3. Provide one (1) pedestrian overpass at Willis Avenue.

C. Carle Place Station.

1. Provide One (1) pedestrian overpass at Stonehinge Lane.

D. Westbury Station

1. Provide one (1) pedestrian overpass adjacent to the station building connected to the southern parking structure.

2. Provide one (1) pedestrian overpass at the east end of the Westbury Station platforms. Do not provide elevators.

1.12.3.2.7 Elevators

A. The Design-Builder shall provide ADA compliant elevators with weathertight enclosures and elevator machine rooms for cross track access at stations listed below.

1. Merillon station

a. Two (2) Elevators: One (1) on each side of the track within the LIRR ROW adjacent to and with a connection to the Nassau Boulevard pedestrian sidewalk.

1.12.3.2.8 Station Furnishings-and-Accouterments

A. The Design-Builder shall provide Furnishings and accouterments at all stations with the exception of Floral Park Station.

1.12.3.2.9 Station Signage

The Design-Builder shall provide signage, both static and electronic. See TP1.20 COMMUNICATIONS for electronic signage scope requirements, with the exception of Floral Park Station where no new signages are required.

1.12.3.2.10 Outdoor plaza / Park

A. The Design-Builder shall provide outdoor plaza/parks at the following stations.

1. New Hyde Park Station.
2. Westbury Station.

1.12.3.2.11 MTA Arts & Design

A. The Design-Builder shall work with MTA Arts & Design (A&D), LIRR, and the selected artist to determine the parameters and sites for the artwork to be installed at all stations, with the exception of Floral Park Station where no new artwork is required. The Design-Builder shall provide all means and methods as indicated in TP3.12 STATIONS AND ARCHITECTURE to install the artwork as provided by MTA arts & design.

Exhibit 4.1 Project Stations	Work to be Performed	Temporary Platform Needed	Platform Type
Floral Park	ADA compliant elevators (3) with enclosures.	No	Side & Island
New Hyde Park	Platform replacement, Pedestrian underpass, existing station building upgrades, Arts and Design, and outdoor plaza/park.	Yes	Side
Merillon Avenue	Platform replacement, Two (2) elevators, with enclosure, elevator machine rooms, and Arts & Design.	Yes	Side
Mineola	Platform replacement, construct (3) overpasses (see above for required elevators), existing station building upgrades, and Arts & Design.	Yes	Side
Carle Place	Platform replacement, construct overpass with elevator, and Arts & Design.	Yes	Side

Exhibit 4.1 Project	Stations	Work to be Performed	Temporary Platform Needed	Platform Type
Westbury		; Platform replacement, Extend pedestrian tunnel, Two (2) overpasses (1 with elevator), existing station building upgrades, Arts & Design, and outdoor plaza/park.	Yes	Side

1.12.4 Division of Work

The Division of Work between the Design-Builder and the Railroad is shown in the following table.

DIVISION OF WORK TABLE					
Disc.	**Work Element**	**Design-Builder**		**By Others**	
		Supply	**Install**	**Supply**	**Install**
Stations	Station Building Architectural Upgrades	X	X		
	Permanent Platforms (including stairs and ADA ramps, guardrails, handrails, tactile warning, and platform edge rub board)	X	X		
	Platform Canopies	X	X		
	Walkway Canopies	X	X		
	Temporary Platforms (including stairs, ADA ramps, guardrails, handrails, tactile warning, platform edge rub board)	X	X		
	Pedestrian Overpass	X	X		
	Station Furnishings-and-Accouterments	X	X		
	Station Signage	X	X		
	MTA Arts & Design		X	X	
	ADA compliant elevators	X	X		
	Pedestrian Underpass	X	X		

END

1.13 STATION MEP AND VERTICAL TRANSPORTATION

1.13.1 Section Includes

This section sets out design and construction scope related to Mechanical, Electrical, Plumbing, and Vertical Transportation at each station.

1.13.2 References (Not Used)

1.13.3 Railroad Station Scope Including, Mechanical, Electrical, Plumbing, Communications, and Vertical Transportation.

The Design-Builder shall provide the systems as set out in TP3.13 STATION MEP AND VERTICAL TRANSPORTATION.

1.13.3.1 Stations

A. Floral Park

B. New Hyde Park Station.

C. Merillon Station.

D. Mineola Station.

E. Carle Place Station.

F. Westbury Station.

1.13.4 General Scope

1.13.4.1 Mechanical

A. The Design-Builder shall provide HVAC and control systems to monitor and manage temperature, humidity, air velocity, air pressure, rate of air pressure change, dust, odors, smoke control, smoke movement and smoke direction during fire emergencies to protect and preserve life. Design builder shall provide an automatic snow melt system (partial system as described in TP3.12 STATIONS AND ARCHITECTURE) for all platforms, platform stairs, platform ADA ramps, and paver areas directly surrounding station buildings at New Hyde Park, Mineola, and Westbury.

1.13.4.2 Electrical

A. The Design-Builder shall provide normal and emergency electrical power for lighting and equipment where a unified design and standardized equipment selection is provided for Stations, buildings, tunnels, pedestrian bridges, and other electrically powered equipment and facilities.

B. The electrical system shall include at least 25% spare capacity for future upgrade. If the existing system does not have at least 25% spare capacity the Design-Builder shall upgrade the system to provide at least 25% spare capacity.

1.13.4.3 Electrical Low Voltage System

A. The Design-Builder shall provide power for low voltage systems which shall include: Audio Visual Paging System (AVPS), Public Address System, Customer Message Board, Telephone, Fire, Smoke Detection and Alarm System, Intrusion and Emergency Alarm, Closed Circuit Television (CCTV) System, Gate Signs, Platform Indicators, Designation Monitors, and advertising display boards.

1.13.4.4 Plumbing

A. The Design-Builder shall provide cold water supply, distribution piping, fixture and equipment selection Stations, and dry pipe system on station platforms.

1.13.4.5 Vertical Transportation

A. The Design Builder shall provide APTA Grade ADA compliant elevators at all pedestrian overpasses except as noted in TP1.12 STATIONS AND ARCHITECTURE.

B. The Design-Builder shall provide three (3) APTA Grade ADA compliant elevators with enclosures at Floral Park Station. No other upgrades shall be provided at this station unless associated with providing an enclosed complete and working vertical transportation system as specified in TP3.12 STATIONS AND ARCHITECTURE.

C. The Design-Builder shall provide two (2) Elevators at the Merillon Station, Nassau Boulevard sidewalk along the vehicular underpass.

1.13.5 Division of Work

All work shall be performed by the Design-Builder.

END

1.14 PARKING STRUCTURES AND PARKING LOTS

1.14.1 Section Includes

This section sets out the design and construction scope related to Parking Structures and Surface Lots.

1.14.2 References (Not Used)

1.14.3 Scope

The Design-Builder shall provide everything required as set out in TP3.14 PARKING STRUCTURES.

1.14.4 Parking Structures

The Design-Builder shall construct parking structures in accordance with the requirements set out in the Contract Documents at the following locations:

A. Harrison Ave.

B. Mineola South.

C. Westbury North.

D. Westbury South.

E. Hicksville.

1.14.4.1 Support Facilities

The Design-Builder shall provide the following support facilities at all parking facilities:

A. Manager's Office.

B. Counting / Server room.

C. Customer Service / waiting area.

D. General Office area.

E. Employee Restroom.

F. Communications room.

G. IT Room.

H. Elevator machine room (one per elevator).

I. Electrical Room.

J. Storage Room.

1.14.5 Vertical Transportation

The Design-Builder shall provide APTA grade ADA compliant elevators in accordance with the requirements set in TP3.14 PARKING STRUCTURES.

1.14.6 Division of Work Table

All work shall be performed by the Design-Builder.

END

1.15 PERMANENT FACILITIES

1.15.1 Section Includes

This section sets out the design and construction scope related to Permanent Staff Facilities at several locations for use by LIRR employees.

1.15.2 References (Not Used)

1.15.3 Scope

The Design-Builder shall provide everything required as set out in TP3.15 PERMANENT FACILITIES.

1.15.4 Permanent Facilities

The Design-Builder shall provide Permanent Facilities for the following LIRR departments in accordance with the requirements set out in TP3.15 PERMANENT FACILITIES:

A. Signals:
    A. Building type: Modular Building.
    B. Location: In close proximity to the Mineola Obay Turnout. Final location shall be approved by LIRR.

B. Substations:
    A. Building type: Pre-engineered “Butler” type building.
    B. Location: Floral park substation area, west of the existing substation on LIRR property. Final location shall be approved by LIRR.

C. Track:
    A. Building type: Modular Building.
    B. Location: Close proximity to Mineola Station. Final location shall be approved by LIRR.

D. Communications:
    A. Building type: Modular Building.
    B. Location: Close proximity to the Mineola Obay Turnout. Final location shall be approved by LIRR.

E. All permanent facilities shall be provided with the permanent items listed below:
    A. Toilet Facilities.
    B. Electrical connection.
    C. Climate control.
    D. Potable water connection.
    E. Sanitary connection.
    F. Stormwater connection.

1.15.5 Division of Work

All work shall be performed by the Design-Builder.

END

1.16 SYSTEMS – GENERAL

1.16.1 Section Includes

The scope elements identified in this Section apply to the all operational systems provided by the Design-Builder, and include, but are not limited to Reliability Availability and Maintainability Plan (RAM), Electromagnetic Interference, and Sectionalizing Plan. In addition, the Design-Builder is responsible for integration of all Systems elements with the existing Railroad system.

1.16.2 References (Not Use)

1.16.3 Systems Scope

A. The Design-Builder shall provide a fully integrated Reliability, Availability and Maintainability Plan and Sectionalizing Plan taking into account the existing Railroad operations, the necessary design and construction modifications required to complete the requirements of the Contract Documents, and performing the necessary testing, both by the Design-Builder and the Railroad.

B. See TP3.16 SYSTEMS GENERAL for detailed requirements.

1.16.3.1 Reliability, Availability, and Maintainability

C. The Design-Builder shall be responsible for the RAM requirements identified in TP3.16 SYSTEMS GENERAL. For compatibility reasons, the Railroad requires the use of materials and equipment that are identical to, or completely compatible with the existing systems configuration that are in service at the time of installation.

1.16.3.2 Electromagnetic Interference Analysis

A. The Design-Builder shall perform an analysis of its activities, and those activities performed by its subcontractors and suppliers, to ensure that all operational systems and equipment provided by, or used by the Design-Builder in execution of the Contract requirements are not negatively affected by Electromagnetic Interference.

1.16.4 Sectionalizing Plan Scope

A. The Design-Builder shall provide a Sectionalizing Plan that identifies the sequencing of installation, static testing, turning over to the Railroad, and cutovers (cutovers to be performed by the Railroad).

1.16.5 Division of Work

Except as noted otherwise in the Contract Documents:

A. On out of service track and facilities, all work shall be performed by the Design-Builder.

B. On in-service track and facilities, the Design-Builder shall provide for supply of materials and equipment to be installed by the Railroad.

C. Final terminations and connections for Railroad facilities will be by the Railroad.

.

END

1.17 TRACTION POWER AND SIGNAL POWER

1.17.1 Section Includes

This section sets out design and construction scope related to Traction Power Systems.

1.17.2 References (Not Used)

1.17.3 Traction Power System Scope

A. This Section identifies requirements for the overall Traction Power supply and distribution system, as well as ancillary systems, which represent the design and construction scope for this Project.

B. Construction and implementation of these traction power systems requires a staged approach to maintain existing LIRR train operations throughout the Project.

1.17.3.1 Traction Power Supply System

A. The Design-Builder shall design, furnish, and install a fully functional Traction Power supply system that consists of the incoming utility medium voltage (MV) feeders, utility metering and traction power substation (and associated components/systems) to convert the incoming AC power to DC power suitable for powering the LIRR trains along the mainline tracks.

B. The traction power substation includes but is not limited to the following components/systems:

1. Prefabricated/Modular Building Overtop of Cable Vault
2. AC Control Panel
3. Medium Voltage Switchgear
4. Rectifier Transformer with Surge Suppression on Primary Windings
5. Rectifier Unit
6. DC Switchgear
7. Protective Relay Network
8. Supervisory Control and Data Acquisition (SCADA System)
9. Transfer Trip Network
10. Dead Rail Indication System/Components
11. Auxiliary Power System
12. 125Vdc Station Battery System
13. Entry Alarm System
14. Fire Alarm System
15. Security Camera System
16. High Security Fencing
17. HVAC System
18. Ground Grid System

C. There are eight (8) substations located within project limits that require modification due to the additional mainline track construction. They are as follows:
    1. G-13, Floral Park (modifications to existing substation facility).
    2. G-14, New Hyde Park (complete substation replacement).
    3. G-15, Merillon Avenue (complete substation replacement).
    4. G-16, Mineola (complete substation replacement).
    5. G-17, Carle Place (complete substation replacement).
    6. G-18, Westbury (complete substation replacement).
    7. G-19, New Cassel (complete substation replacement).
    8. G-20, Hicksville (complete substation replacement).

D. There are three (3) motor-generator (mg) sets located within Project Limits that require modification / furnish and installation due to the additional mainline track construction. They are as follows:
    1. G-13, Floral Park (modifications to existing motor generator facility).
    2. G-16, Mineola (complete motor generator replacement; mg set to be installed with Traction Power Substation).
    3. G-20, Hicksville (new motor generator; mg set to be installed with Traction Power Substation).

E. All construction of the replacement substations shall be contained within the existing LIRR substation property site or existing LIRR ROW. The Design-Builder may evaluate alternate locations for substations at its own risk and cost.

F. Other work aspects for the substation design and construction includes:
    1. Duct banks for medium voltage service.
    2. Duct banks for low voltage auxiliary power service.
    3. Duct banks for positive and negative feeder cables to their respective termination points at the third rail, reactor units or trackside impedance bonds.
    4. Duct banks for incoming communications lines.
    5. Duct banks for control/indication cabling to sectionalizing switches.
    6. Duct banks for control/indication cabling to third rail heater system.
    7. Site construction of all traction power system components (substation vault structures, transformer oil containment and foundations, reactor foundations, manholes, switch foundations).
    8. Coordination with electrical utilities.
    9. Site design/construction for grading, access, fencing.
    10. Cathodic Protection.

1.17.3.2 Traction Power Load Flow Analysis

A. The Design-Builder shall conduct traction power system Load Flow Simulation studies including contingency operations with substation outages to determine the extent of substation outages to support construction staging for this project.

B. The Design-Builder shall conduct a final traction power system Load Flow Simulation to accurately reflect the traction power system as will be designed and installed by the Design-Builder.

C. The simulation shall be performed using industry recognized and proven software packages designed specifically for simulating railway DC Traction Power systems. The substation outage conditions considered shall be consistent with the specified levels of service reliability.

1.17.3.3 Traction Power Emergency Backup Mobile Substations

A. The Design-Builder shall design and furnish one 4MW emergency backup mobile traction power substation prior to the removal of any existing in-service substations. This unit shall be used only as an emergency back-up that can be transported/connected into the existing traction infrastructure in the event a substation failure occurs during the period when already in the substation outage condition. This mobile traction power substation cannot be used to remove additional substations from service above what is permitted per the load flow analysis.

B. This mobile substation shall be turned over to the Railroad prior to Final Completion.

1.17.3.4 Traction Power Distribution System

A. The Design-Builder shall design, furnish, and install a fully functional Traction Power distribution system that consists of 750Vdc positive and negative cabling, associated distribution manholes, wayside sectionalizing switches (with associated control cabling) and contact (3rd) rail components to provide power from the traction power substation to the mainline to power the LIRR trains.

B. The construction of the additional mainline track will require modifications/additions to the existing traction power distribution system, namely installation of new cables/raceways from the new traction power substations to the track area. Where existing in-service tracks are being modified/relocated, the Design-Builder shall furnish all associated material including third rail. If an in-service track is taken out of service, modified, and then put back into service for the next rush; LIRR will install associated material. If a track is taken out of service for an extended outage, an outage that extends into the next rush, then the Design-Builder shall install all associated material.

C. This work includes but is not limited to the following:

1. Manhole and Duct banks for traction power positive, negative and control/indication cables.
2. 3rd rail system (complete).
3. Sectionalizing switches.
4. Reactors.
5. A cross bonding study/report that addresses the need for negative return reactors, as well as addresses how to mitigate arcing across the insulated joints in crossovers.

1.17.3.5 3rd Rail Heater System

A. The Design-Builder shall design, furnish, and install a fully functional wirelessly controlled 3rd Rail Heater System within interlockings and at station platforms.

B. The 3rd rail heater system shall include, but not be limited to:

1. The installation of wayside control stations, fuses, distribution cabling and heater elements onto the 3rd rail.
2. 3rd rail heaters shall be within each interlocking and extend 1,500 feet in advance of the home signals for the interlocking.
3. 3rd rail heaters on each track within each station platform and extend 1,500 feet beyond the platforms' edge in both directions.
4. The 3rd rail heater system shall be controlled via 900MHz wireless radio system and connected to headend equipment located within Jamaica Control Center.

1.17.3.6 Signal Power System

A. The Design-Builder shall design, furnish, and install a new upgraded fully functional Signal Power distribution system that consists of the incoming medium voltage (MV) feeders, power transformers, motor-generator equipment, electrically operated oil switches, and outgoing signal power feeders. The new Signal Power system shall supply the LIRR signal equipment. The new Signal Power system shall provide the same level of sectionalizing, flexibility and redundancy, as is currently installed. The Design-Builder shall ensure that the new Signal Power system can sufficiently supply all operating conditions along the alignment and the new signal equipment.

1. The new signal power motor-generator sets shall be designed, furnished, and installed at the following traction power substation locations:
   i. Floral Park Substation.
   ii. Mineola Substation.
   iii. Hicksville Substation.
2. The locations listed above shall be replaced with new equipment sized to meet the signal power system loads between Hall and Hicksville, inclusive. Existing 60 Hz service equipment, switchgear, and cables may be reused if adequate for the new signal power motor-generator sets and if in good condition.
3. All of the new 100 Hz apparatus shall be capable of energizing dead lines over the maximum territory specified herein. The Design-Builder shall submit calculations for sizing of the equipment and demonstrating that the equipment can supply the magnetizing current required to perform the dead line pickup without tripping.

B. The Design-Builder shall work closely with LIRR to ensure the equipment installed meets all LIRR standards and requirements.
   1. The Design-Builder shall ensure that each signal power system at each of the three substations listed above, and its associated motor-generator equipment, is sufficiently sized to energize the entire signal power system from Floral Park Station to Hicksville Station with 2 out of the 3 MG sets down. Each MG set shall be able to support the new and existing loads.

2. The Design-Builder shall provide a Load Flow Study and transient analysis for all anticipated signal power loads between Floral Park to Hicksville. It is the Design-Builder's responsibility to evaluate the potential switching scenarios possible to ensure that all equipment is sufficiently sized and rated.

3. The Design-Builder shall provide a signal power system that adequately meets the requirements of the new signal system including, but not limited to the following:
   i. Voltage.
   ii. Voltage drop.
   iii. Frequency.
   iv. Transformer sizing.
   v. Distribution cable size and type.

4. The design and installation of the signal power system shall be closely coordinated with the design and installation of the signal system.

1.17.4 Division of Work

The Division of Work between the Design-Builder and others, including the Railroad, Third Parties, and Utility Owners, is shown in the following table.

DIVISION OF WORK TABLE					
Disc.	Work Element	Design-Builder		By Others	
		Supply	Install	Supply	Install
	De-energizing LIRR in-service equipment				X
	Connections to LIRR in-service equipment and systems	X			X
	Incoming Electrical Services and coordination with Utility	X	X		
	Prefabricated Traction Power Substations (complete) and new Motor-Generator Equipment	X	X		
	Traction Power Distribution System and Signal Power distribution System (with exception of any connections to in-service LIRR equipment)	X	X		
	Site work to support Traction Power and Signal Power Systems Installations	X	X		
	Traction Power and Signal Power Manhole and Duct Bank Systems	X	X		
	3rd Rail Heater System (in-service track)	X			X
	3rd Rail Heater System (new and/or out-of-service track)	X	X		
	Wireless 3rd Rail Heater Control System and all associated equipment	X	X		
	Testing and Commissioning of Equipment	X	X		

	Witnessing Testing and Commissioning				X
	SCADA – RTU Physical Equipment Installations	X	X		
	SCADA – RTU Programming				X
	SCADA – Control Center Modifications	X			X
	G-13 Floral Park (Equipment Installation) and MG installation	X			X
	G-13 Floral Park structural and HVAC modifications to support new mg set equipment	X	X		
	Decommissioning of existing LIRR equipment	X			X
	Demolish/Removal of existing LIRR equipment	X	X		
	Mobile Substation transport, connection and commissioning (LIRR to make final termination to existing equipment)	X	X		

END

1.18 CORROSION CONTROL AND GROUNDING

1.18.1 Section Includes

This section identifies requirements for facilities and systems including specialized construction materials and coatings to minimize corrosion and prevent premature corrosion failures on all Project and adjacent above ground and below ground facilities.

1.18.2 References (Not Used)

1.18.3 General

A. Project designs and construction methods shall control corrosion caused by contact with corrosive environments, soils, and water, and the effects of stray current. Mechanisms to be utilized for corrosion control shall include stray current control, materials selection, protective coating, and cathodic protection.

B. The mechanisms described in this Section of the Contract Documents are minimum requirements. If Design-Builder believes that additional measures are required to properly limit rates of deterioration, whether due to a corrosive environment, soils, water or the effects of stray current, then the Design-Builder shall include such additional measures in the design and construction of the Project.

1.18.4 Functional Requirements

A. The Design Builder shall include corrosion control systems, features and materials as described in TP3.18 CORROSION CONTROL, in all applicable elements of the Project Work. The design criteria for each of these categories, and their implementation, shall meet or exceed the following objectives:

1. Achieve the design life of system facilities by avoiding premature failure caused by corrosion.
2. Minimize aesthetic deterioration resulting from the failure of material coatings and the consequential onset of visible corrosion.
3. Minimize annual operating and maintenance costs associated with material deterioration and degradation.
4. Provide continuity of operations by reducing or eliminating corrosion-related failures of Project facilities, systems, and subsystems.
5. Mitigate detrimental effects of stray earth currents to a reasonably achievable level during normal Railroad operations.

END

1.19 SIGNALS AND TRAIN CONTROL

1.19.1 Section Includes

This section sets out design and construction scope related to Signals and Train Control.

1.19.2 References (Not Used)

1.19.3 Signals and Train Control Scope

The Design-Builder shall design, furnish, and install a fully functional Signals and Train Control System that complies with all the requirements of the Contract Documents. Work includes the following:

A. Pre-wired signal enclosures
    1. Interlocking (CIL, auxiliary and battery houses).
    2. Master location (houses).
    3. Electric lock cases.
    4. Switch heater cases and elements.
B. Straight Line (block plan).
C. Track and Signal Routing (control lines).
D. Express and local cables.
E. Positive Train Control.
F. Cable trough and tray.
G. Direct buried and aerial cables.
H. Conduits and vaults.
I. Impedance bonds.
J. Signals and Switch Machines.
K. [redacted] and [redacted] power.
L. Signal SCADA and Interface:
    1. Including primary control from JCC of all of existing Queens Interlockings, Bellrose, new and existing Hempstead, Nassau 1, 2, 3, 4, and Locust. The staging requirements are discussed in this Section.
M. Cross bonding and traction return study with broken rail analysis:
    1. Reactors and cross bonds.
N. Installation and Site preparation:
    1. Install hut and case legs, steps, cable trough, trays, conduits, cable vaults and pull boxes.

1.19.4 Site Preparation including -grading, screening, fill, trenching, leveling, retaining walls and stairs

1.19.5 Division of Work

A. The Design-Builder shall design, furnish, and install signal system and train control equipment as required for a fully functional signals and train control system.

B. The Design-Builder shall design, furnish, install and test all equipment to implement the Positive Train Control System as described in TP3.19 SIGNALS AND TRAIN CONTROL.

C. The Design-Builder shall prepare all factory test procedures and perform all factory tests. The Railroad's Force Account will review and approve all factory test procedures and witness all factory tests.

D. The Design-Builder shall prepare and perform all applicable FRA and Railroad specific tests of prewired signal enclosures, express and local cables as indicated in the Division of Work Table below.

E. The Railroad will perform final cut-over and commissioning of the signal and train control system. The Railroad will inspect all the equipment, systems and cables installed by the Design-Builder.

F. The Division of Work between the Design-Builder and others, including the Railroad, Third Parties, and Utility Owners, is shown in the following table.

DIVISION OF WORK TABLE

Disc.	Work Element	Design-Builder		By Others	
		Supply	Install	Supply	Install
Sig	Pre-wired and factory tested signal enclosures (including applicable PTC equipment)	X	X		
Sig	Signals, switch machines, transponders, radio cases, antennas, impedance bonds and switch heaters	X	X		
Sig	Design, Furnish and Install signal SCADA system	X	X		
Sig	Prepare pre-testing, cut-over and commissioning tests (signal system and SCADA), Perform pre-test and applicable FRA and LIRR tests.	X	X		
Sig	Final testing, cut-over and commissioning (signal system and SCADA).	X			LIRR
Sig	Site prep - retaining walls, grading, platforms, stair cases, etc. to support the signal system.	X	X		
Sig	Furnish cables, conduits, ladder racks, pull boxes, vaults, trough, and tray	X	X		
Sig	Install cables, conduits, pull boxes, vaults, trough, tray	X	X		
Sig	Terminate and test cables	X	X		LIRR
PWR	60Hz utility drops	X	X	PSEG	
PWR	100Hz drops	X	X		
PWR	Reactors and cross-bonding	X	X		
Comm	Communication Rack in CILS and ML	X	X		
Sig	Prepare and perform factory acceptance testing	X	X		

DIVISION OF WORK TABLE - TESTING

Disc.	Test Type	Design-Builder		LIRR Force Account		
		Prepare	Perform	Review	Witness	Perform
Sig	Prepare factory test procedures and perform factory acceptance testing	X	X	X		
Sig	Software simulation testing for VPLC and NVLCP logic	X	X	X		
Sig	Cross Bonding, Broken Rail LIRR test L43	X	X	X		
Sig	Timing relays and timing devices	X	X	X		
Sig	Ground reading LIRR test F3-107	X	X	X		
Sig	Megger testing of all new and temporary cables installed	X	X	X		
Sig	Relays testing LIRR test F5-107	X	X	X		
Sig	Approach locking per FRA Rule 236-377 and LIRR test F13-377	X	X	X		
Sig	Time locking per FRA Rule 236-378 and LIRR test F14-378	X	X	X		
Sig	Indication locking per FRA Rule 236-380 and LIRR test F20-380	X	X	X		
Sig	Route locking per FRA Rule 236-379 and LIRR test F16-379	X	X	X		
Sig	Shunt fouling circuit per FRA Rule 236.104 and per LIRR test F33-104	X	X	X		
Sig	Point Detector per FRA Rule 236.334 and per LIRR test F21-103	X	X	X		
Sig	Switch obstruction per FRA Rule 236.382 and per LIRR test F22-382	X	X	X		
Sig	CAB Sig code – TSRs cut-over	X			X	X
Sig	Aux bit installed on all approach locking giving end user ability to leave off.	X	X			
Sig	TSRs	X	X			
Sig	Traffic Fiber ON	X	X			
Sig	Traffic Fiber OFF	X	X			
Sig	AS Release less more 3 seconds	X	X			
Sig	AS Release less than 3 seconds	X	X			
Sig	Emergency Signal Release A/S	X	X			
Sig	Emergency Switch Release Track and Route Locked	X	X			
Sig	Emergency Switch Release Correspondence	X	X			
Sig	Switch Correspondence Verification	X	X			
Sig	Signal Light-Out	X	X			

Sig	Emergency Release Switch Correspondance Verification	X	X			
Sig	Switch NJP	X	X			
Sig	Signal Holds	X	X			
Sig	Switch Blocks	X	X			
Sig	Exit Blocking	X	X			
Sig	Test #4 Timers	X	X			
Sig	Test 12 Part 1 Switch Indication Locking	X	X			
Sig	Test 12 Part 2 Switch Indication Locking	X	X			
Sig	Test 14 Time Locking	X	X			
Sig	Conflicting Signal Trailing Point	X	X			
Sig	Test 16a Switch Detector Locking	X	X			
Sig	Test 16b Route Locking	X	X			
Sig	Test 17 Traffic	X	X			
Sig	Traffic Emergency Release	X	X			
Sig	Test 20 Indication Locking	X	X			
Sig	Microprocessor Input And Output Verifications	X	X			
Sig	Fra Jumper Box	X	X			
Sig	Non-Vital And VCOR	X	X			
Sig	Switch Circuit Input	X	X			
Sig	"V" Circuit Input	X	X			
Sig	VCOR Repeater	X	X			
Sig	Line Circuit	X	X			
Sig	Traffic Circuit	X	X			
The LIRR will provide sample tests and final list of tests for the Design-Builder to prepare.						

END

1.20 COMMUNICATIONS

1.20.1 Section Includes

This section sets out design and construction scope related to communications, including:

A. Design analysis of the existing communications system and elements.

B. Elements of the Backbone Communications system.

C. Elements of Facilities Communications at stations, substations, parking facilities, communications rooms, IT rooms and all other locations identified in the Contract Documents.

For additional design and installation requirements for communications, refer to the following Sections:

A. TP1.21 and TP3.21 SECURITY SYSTEMS for Security Systems scope of work and performance criteria.

B. TP2.9 SYSTEM SAFETY for safety policy and strategy.

C. TP2.10 SYSTEM SECURITY for security policy and strategy.

1.20.2 References (Not Used)

1.20.3 Design Analysis

The Design-Builder shall perform the following:

A. Identify and evaluate all elements of the existing LIRR communication systems at stations and along the ROW.

B. Coordinate the design of all communications elements with the security design and the work of all other disciplines.

C. Evaluate LIRR Design Guidelines and standards for adequacy to provide a fully functional and integrated communications system.

D. Incorporate signal, communications, and circuit cable systems into the design drawings identifying the existing and new work.

E. The new signal communication network shall interface with the existing communication network.

F. Determine necessary communications infrastructure for traction power substations DC breaker transfer-trip system.

G. It is the responsibility of the Design-Builder to coordinate the design and installation of the communications with the work of all other disciplines, including all systems work that may interface, integrate, support or otherwise be affected by the communications infrastructure.

H. Design a fully integrated communication system guaranteeing seamless system performance for the new track configuration, including all necessary materials, interfaces for each version and/or system, addition, modification, integration, testing and acceptance requirements.

1.20.4 Backbone Communications

The Design-Builder shall:

A. Maintain and protect existing fiber and copper cabling and communications (existing systems shall remain fully operational at all times).

B. Install new fiber optic communications cables along the entire Project ROW with demarcation points at Queens Communications Hut and Divide Communications Hut, including all supporting infrastructure, cable splicing, termination, patch panels and other items as required to support the development of a fully integrated and functional communications system.

C. All existing legacy systems on existing copper backbone cables shall be transferred to the new fiber backbone.

D. Relocate existing or install new cabling as required to temporarily maintain existing/legacy communications during construction before it is transferred to the new fiber optic cables.

E. Coordinate the installation communications cabling with relocation of utility poles and existing utility cables. See TP3.2 UTILITIES and TP3.3 RAILROAD UTILITIES for information.

F. Install fiber optic backbone communications cables to each parking facility.

G. The Mineola radio tower and radio equipment will require relocation to make way for the new track. Install a new radio pole and radio equipment in an alternate location and remove the existing radio tower and equipment.

H. Install aerial and underground cabling and infrastructure as required to provide connections to stations and wayside equipment, including:

1. Communications Rooms/Huts.
2. C-Cases.
3. Station Buildings.
4. Signal Huts/Cases.
5. Substations.
6. Platforms.
7. Interlockings.

I. Install communications networking equipment at infrastructure, including LAN/WAN switch gear, cabling, programming and ancillary items required for a complete and fully functioning communications system.

J. Software configuration of all LAN/WAN gear, including MPLS LDP's and OSPF VRF's, shall be performed by the Design-Builder. Specific configuration information about the existing system is security sensitive and proprietary. It shall be the responsibility of the Design-Builder to implement the network configuration as directed by the Railroad; and to obtain, coordinate, and schedule all network configuration and programming activities with the Railroad.

1.20.5 Facilities Communications

The Design-Builder shall:

A. Maintain and protect existing station systems and communications during all stages of construction (existing systems shall remain fully operational at all times).

B. Install Audio-Visual Paging System (AVPS), Public Address (PA) system and Access Nodes with Wi-Fi, including all cables, conduits, communications and supporting infrastructure.

C. Relocate and install communications cables, conduits and supporting infrastructure for all Ticket Vending Machines (TVMs); and coordinate the activities for relocation of existing TVMs.

D. Provide Digital Interactive Touchscreen Displays on station platforms and inside station buildings.

E. Provide parking payment systems, AVPS and Parking Guidance and Information system (PGI) at parking facilities.

F. Coordinate the environmental aspect to test all under platform cables and wire trays for hazardous materials and provide for abatement, then relocate into permanent protective enclosures.

G. Relocate existing Telephone “T” boxes to temporary locations during construction and install in permanent locations upon completion.

H. Identify all communications system related interferences and relocate as necessary, including troughs, conduit systems, poles, and communications shelters, huts, cabinets, and any other affected items.

I. Install communications networking equipment at facilities, including LAN/WAN switch gear, cabling, programming and ancillary items required for a complete and fully functioning communications system.

1.20.6 Training for Railroad staff

A. The Design-Builder shall develop and implement a comprehensive training program, which shall educate the Railroad staff about the working and functioning of the communication systems.

1.20.7 Testing and Acceptance

A. The Design-Builder shall coordinate all activities for testing, integration, and final acceptance with the Railroad for all system elements.

B. All installed cables; equipment and infrastructure shall be tested and documented by the Design-Builder.

C. A complete set of As-Built drawings, specifically for the communications elements, shall be developed by the Design-Builder and submitted to the Railroad for approval. As-Built drawings shall be submitted in 11”x17” PDF and electronic format (AutoCAD DWG per LIRR CAD standards) before final acceptance of any communications element.

1.20.8 Division of Work

DIVISION OF WORK TABLE			
Disc.	Work Element	Design-Builder	By Others

		Supply	Install	Supply	Install
	Backbone cables	x	x		
	Facilities cables	x	x		
	Utility Poles	x	x		
	Pathways	x	x		
	Messenger and cable support	x	x		
	Risers	x	x		
	Manholes, handholes, underground infrastructure	x	x		
	Conduit systems, backbone and station	x	x		
	Patch panels and TTBD's	x	x		
	Fiber optic and copper cable terminations	x	x		
	Snow-shoes	x	x		
	Splice closures	x	x		
	Pull cords in empty conduits	x	x		
	Cable ID and tagging	x	x		
	Cable splicing	x	x		
	Cabling and infrastructure for temporary communications	x	x		
	Final tie-ins for temporary communications			x	x
	Communications huts at stations	x	x		
	IT Rooms at Stations	x	x		
	PA System	x	x		
	AVPS	x	x		
	Digital Interactive Touchscreen Displays	x	x		
	Parking Guidance and Information Systems	x	x		
	Relocate Mineola Radio pole/equipment	x	x		
	Relocation and reconnection of TVM's			x	x
	Access Nodes with Wi-Fi	x	x		
	Network Equipment	x	x		
	IP Addressing		x	x	
	Software configuration of backbone network equipment		x	x	
	Software configuration of end devices		x	x	

END

1.21 Security Systems

1.21.1 Section Includes

This section sets out design and construction scope related to security, including:

A. Design analysis of the existing security system and elements at stations, substations, parking facilities, and all other locations identified in the Contract Documents.

B. Elements of the Security System at stations, substations, parking facilities and all other locations as specified in the Contract Documents.

For additional design and installation requirements for communications, refer to the following Sections:

A. TP1.20 and TP3.20 COMMMUNICATIONS for communications scope of work and performance criteria.

B. TP2.9 SYSTEM SAFETY for safety policy and strategy.

C. TP2.10 SYSTEM SECURITY for security policy and strategy.

1.21.2 References (Not Used)

1.21.3 Design Analysis

The Design-Builder shall perform the following:

A. Identify and evaluate all elements of the existing LIRR security system elements.

B. Coordinate the design of all security elements with the communications design and the work of all other disciplines.

C. Evaluate LIRR Design Guidelines and standards, as well as all applicable local and national codes and standards for safety and electrical work, for adherence and to provide a fully functional and integrated security system.

D. Incorporate existing and proposed security system elements into the design drawings identifying the existing and new work. The new security system shall interface with the existing security network using the communications system.

E. Design, furnish and install a fully integrated security system guaranteeing seamless system performance for the stations and the new track configuration, including all necessary materials, interfaces for each version and/or system, addition, modification, integration, testing and acceptance requirements.

1.21.4 Security Elements

The Design-Builder shall:

A. Maintain and protect existing station systems and communications during all stages of construction.

B. Install a CCTV system, Electronic Access Control and Help Points, including all cables, conduits, communications and supporting infrastructure. Coordinate CCTV and EAC design and installation activities inside station buildings with the existing LIRR security systems contractor. The Design-Builder shall coordinate all CCTV and EAC activities in adherence to the Project schedules.

C. Install a fire alarm and fire protection system at all facilities as required by LIRR design guidelines and NFPA 70.Coordinate with LIRR, AHJ and the LIRR fire alarm contractor and install pathways for the fire alarm and fire protection system end devices and Fire Alarm Control Panel (FACP). The Design-Builder shall be responsible for coordination of all the fire alarm and fire protection activities with the Project Schedule.

D. Coordinate the design of the CCTV system with lighting to prevent interference with CCTV imaging.

E. Coordinate the environmental aspect to test all under platform cables and wire trays for hazardous materials and provide for abatement, then relocate into permanent protective enclosures.

F. Identify all security system related interferences and relocate as necessary, including troughs, conduit systems, poles, locks, doors, gates and any other affected items.

1.21.5 Testing and Acceptance

A. The Design-Builder shall coordinate all activities for testing, integration and final acceptance with the Railroad for all installed system elements.

B. All installed cables, equipment and infrastructure shall be tested and documented by the Design-Builder.

C. A complete set of As-Built drawings, specifically for the security elements, shall be developed by the Design-Builder and submitted to the Railroad for approval. As-Built drawings shall be submitted in 11”x17” PDF and electronic format (AutoCAD DWG per LIRR CAD standards) before final acceptance of any security element.

1.21.6 Division of Work

The Division of Work between the Design-Builder and others, including the Railroad, Third Parties, and Utility Owners is shown in the following table.

Work elements where the “design” or “install” responsibility are not specifically identified are the responsibility of the Design-Builder.

DIVISION OF WORK TABLE

Disc.	Work Element	Design-Builder		By Others	
		Supply	Install	Supply	Install
	Cables	x	x		
	Pathways	x	x		
	Patch panels and TTBD’s, including cable terminations	x	x		
	Pull cords in empty pathways	x	x		
	Cable ID and tagging	x	x		
	Coordinate design and installation of CCTV, EAC, fire alarm and fire protection system end devices inside station buildings	x	x		

	Installation of CCTV, EAC, fire alarm and fire protection system end devices inside station buildings			x	x
	Design and install CCTV, EAC, fire alarm and fire protection system end devices at all locations other than inside station buildings, as required by the Contract Documents	x	x		
	Install FACP cabinet, conduits, and provide FACP power	x	x		
	Install CCTV, EAC, fire alarm and fire protection end devices and end device cabling inside station buildings			x	x
	Decommission, remove, store and reinstall CCTV, EAC, fire alarm and fire protection end devices inside station buildings			x	x
	Install CCTV, EAC, fire alarm and fire protection end devices and end device cabling at all locations other than inside station buildings, as required by the Contract Documents.	x	x		
	Integrate CCTV system (including devices by others)	x	x		
	Help Points	x	x		
	Integrate Electronic Access Control (including devices by others)	x	x		
	Device naming and network addressing		x	x	

END

1.22 RAILROAD OPERATIONS

1.22.1 Section Includes

This section describes regular operations of the LIRR System and requirements relating to any work that may or will affect Railroad operations.

1.22.2 References

A. Roadway Worker Protection Manual.

1.22.3 Railroad Operations

The Design-Builder shall comply with the following when Work is performed in the vicinity of Track.

A. Railroad Approval Required:

1. Prior approval of the Railroad is required for Track Outages and Fouling of Track. Unless provided for elsewhere in these Contract Documents, changes in the Railroad operating schedules will not be made to accommodate the Design-Builder's Work.

B. Work Affecting Operating Railroad:

1. The Design-Builder will be furnished access to, and shall comply with the Railroad Safety Rules and Regulations, the Operating Rules and Instructions of the Railroad, and LIRR Transportation Department Safety rules.
2. The Design-Builder shall conduct the Work to safeguard the ROW, tracks, embankments, structures, rolling stock, signal systems, and other equipment and appurtenances of the Railroad from being damaged in any manner. If during the progress of the work trains, track, or other facilities adjacent to the ROW of the Railroad are endangered, the Design-Builder shall immediately restore the operation to a safe condition.
3. The Railroad will maintain continuous operation during the performance of work. The work of this Project shall be performed without interruption of, or change in, the regular schedule of operations of trains on the Railroad, except as herein provided. No work shall be performed until the Design-Builder has received written permission to proceed from the Railroad.
4. The Design-Builder shall at all times adhere to the direction of the Railroad, and use all reasonable care and due diligence in the execution of the Work to avoid accidents, damage, and delay to, or interference with, trains and other property of the Railroad.
5. All construction operations within and over the limits of the Railroad's ROW shall be accomplished by means and methods which will in no way cause damage to the tracks, facilities, aerial or underground lines, embankments or drainage system. It shall be the Design-Builder's responsibility to provide for protection of the tracks and embankments in a safe and satisfactory manner, with proper engineering documentation; to install and maintain such shoring, sheeting, and bracing as may be required; and to remove and dispose of such protective facilities upon completion of the work. If, in the opinion of the Railroad, any of the foregoing is endangered in any manner or as a result of the performance of the Work; the Design-Builder shall immediately cease work and take immediate

action to restore operations to a safe condition. All damage Railroad property caused by Design-Builder's operations shall be repaired by Design-Builder at no cost to the Railroad, or repaired by the Railroad and charged to the Design-Builder. Work shall not continue until such damage is repaired as determined by the Railroad.

6. Means and Methods: If the Design-Builder's proposed means and methods have a direct impact on Railroad operations, at the request of the Railroad an alternate approach shall be considered. All equipment and crane movements and operations shall be planned in such a manner that will minimize the potential to foul tracks or other Railroad facilities. Cranes operating near the tracks or other Railroad facilities shall be equipped with lockouts on the swing mechanism, such as a stop block on the crane turntable, to prevent the crane from swinging toward and/or fouling the tracks or other Railroad facilities.
7. The Design-Builder shall not conduct any operation that fouls any track or causes other fouling without the prior permission of the Railroad and shall conform to the procedures specified in the Contract Documents. The fouling envelope is shown at the end of the Section as the sketch titled, "Fouling Envelope". Railroad Protective Labor will be required whenever the Design-Builder conducts an operation that fouls track or other items.
8. The Design-Builder shall order and obtain the approval of any necessary Railroad Protective Labor minimum of five (5) workdays in advance of such requirement, and shall provide advance notice in the Six Week Rolling Schedule. The Design-Builder shall not proceed until the necessary protective personnel are in position at the job site. The determination of the requirements for Protective Personnel, using the above criteria, shall be at the sole determination of the Railroad.
9. The Design-Builder shall request track outages by means of the Track Outage Schedule. The Design-Builder's Track Outage Schedule shall include request for the Single Track outage (weekday and weekend) 6 months prior to the actual outage and Double Track Outage (weekend) 16 weeks prior to the actual outage. Failure to provide advance notification by means of the Track Outage Schedule will result in rejection of the Design-Builder's request for track outages.
10. Subject to conditions, limitations and restrictions herein, the Design-Builder shall request track outages in the 90-Day Schedule and/or Detailed Contract Schedule and the Six Week Rolling Schedule. Track outages will be locked in at the Six Week Rolling Schedule. The Railroad will permit track outages as requested, provided they are not in conflict with other planned work and Railroad operations as described in items herein and in accordance with the conditions and limitations stated in provision 1.22.3 and 1.22.17 thru 20. If a conflict is identified by the Railroad, the Design-Builder shall schedule their work substituting a track outage that is not in conflict. To facilitate the Railroad's flexibility to provide track outages on a regular basis, the Design-Builder's means and methods shall be in a manner that optimizes the Railroad's ability to substitute track outages.
11. The Railroad may, at any time, withdraw its approval for a track outage. If Railroad approval is withdrawn after the Design-Builder has begun work, the Design-Builder shall fully cooperate to vacate the area in safe and rapid manner. The Design-Builder shall inform the Railroad as soon as possible (but within one-

hour) after requested to vacate the area(s), the extent of the Work that shall be performed in order to vacate the area(s), and the estimated time required to perform, such work. The Design-Builder shall furnish a written report to the Railroad, documenting the measures taken by the Design-Builder to resolve the prematurely terminated outage and mitigate the resulting effects on the construction schedule.

12. The Design-Builder shall have all material at the work site and shall work expeditiously, with adequate work force, during the track outage, to complete Work and allow service to be fully restored as scheduled, subsequent to the allotted track outage.
13. When track outages are scheduled for after sunset, the Design-Builder shall be responsible for all OSHA approved lighting during the entire outage. The Railroad will require the Design-Builder to demonstrate the working lighting arrangement forty-eight (48) hours in advance for each outage.
14. All necessary preparatory work shall be completed prior to the actual track outage.
15. If the Design-Builder cancels a planned operation for which Railroad Protective Labor has been arranged, it shall notify the Railroad no later than forty-eight (48) hours prior to the operation. Failure to provide such notification will result in the assessment of a labor charge for the requested Railroad Protective Labor, even though the Protective Labor may not be made available.
16. The Railroad will furnish protective personnel as required at no charge to the Design-Builder, except as otherwise noted herein. The furnishing of Railroad Protective Labor shall not relieve the Design-Builder from its responsibility of performing all operations in accordance with Railroad requirements, and shall not relieve the Design-Builder from any liability.

C. Emergency Operations

1. If during the progress of the Work, trains, track or other facilities adjacent to the ROW of the Railroad are endangered, and if directed by the Railroad, the Design-Builder shall immediately restore the operation to a safe (at the sole discretion of the Railroad) condition. Should the Design-Builder fail to respond to the Railroad's direction immediately, the Railroad, at the expense of the Design-Builder, may take whatever steps it determines necessary to restore the operation to a safe condition.
2. If there is an operational emergency on the tracks along the Project Corridor, the Railroad may withdraw its approval for a track outage.

D. Maintenance and Protection of Railroad Facilities

1. All components of the Design-Builder's equipment which could potentially contact the electrified structure shall be grounded. The Design-Builder shall furnish and install a grounding cable (4/0 copper or equivalent ASR) on each piece of equipment which could potentially contact the electrified structure. The grounding cable shall be equipped with the fittings necessary to install the cable. Rubber tired equipment shall be grounded from the frame of the equipment. All equipment used for grounding is subject to approval by the Railroad.

2. Operating tracks are equipped with 750 volt DC power (third rail). The Design-Builder shall exercise great care in working near any Railroad facilities. Railroad instructions and pertinent requirements shall be strictly observed whenever the ROW, tracks, structures, properties or operations of the Railroad are involved or affected. The Design-Builder shall provide the necessary electrical grounding to protect personnel and facilities.

E. Ingress and Egress

The Design-Builder's ingress to and egress from the work site shall be solely by means of public streets and public ROW. Use of the Railroad ROW will not be permitted without prior written approval from the Railroad.

F. Utility Interruption

When a Railroad system, line, power or other Railroad utility shut off is required, the Design-Builder shall so request the Railroad to do so. No Work shall commence until the Railroad approves the Design-Builder's request, in writing, and until the Railroad notifies the Design-Builder that the Work in that area may proceed.

1.22.4 Railroad Protection Requirements

A. General Railroad Protection (Flagging) Requirements: The Railroad will require Railroad protective personnel to be on duty to protect its operations when the Design-Builder is working on Railroad property, or when the Design-Builder's work is not completely contained behind Railroad approved barriers and is on, above or below, or immediately adjacent to Railroad property, or having the capability of obstructing, or fouling a track, as determined by the Railroad.

B. If by reason of Design-Builder's operations, it is necessary to provide additional Railroad support personnel such as third rail electricians, signal maintainers, equipment pilots or other personnel of the Railroad to protect employees of the Railroad, Design-Builder, or others engaged in work on or adjacent to the tracks and/or to ensure the safe movement of trains on the Railroad, the Design-Builder – shall submit a written request for review by the Railroad to allow the Railroad to schedule such arrangements as necessary for the stationing of such employees, in accordance to the guideline set forth in the contract documents.

1. All requests for such services shall be written and shall include Work Plans containing details of the work to be performed, locations, areas to be occupied, equipment to be used, labor force to be assigned, and the date, duration, and time of the proposed work. Any need for relief shifts, and overtime shall be detailed.
2. Provision of Flagging Resources: Following submission, review and acceptance of Design-Builder's Work Plan, the Railroad will coordinate the necessary Railroad support personnel needed by Design-Builder's proposed Work Plan.
3. The Railroad reserves the right to determine the number of flagmen or other employees necessary based on the details of Design-Builder's Work Plan submittal.
4. The furnishing of such Railroad personnel shall not relieve the Design-Builder of it responsibility for the performance of this Contract, nor shall it relieve the Design-Builder of its responsibility or liability for personal injuries including death

or property damages to any passenger, person, or employee of Design-Builder, subcontractor, or of any other parties.

5. The Design-Builder shall furnish clear and safe access for LIRR flagman to perform their duties.

C. Force Account Costs: Should Design-Builder's actual procedure or labor force vary from that accepted, thereby causing increased costs to the Railroad by the uneconomical use of its employees and services, Design-Builder shall be charged for all such increased costs as determined by the Railroad. All such costs will be in accordance with prices in effect at the time the services are performed.

1.22.5 Restrictions

A. The Railroad reserves the right to restrict the Design-Builder's operation when it may impact train operations.

B. The use of Railroad property will be restricted as follows, unless specifically authorized by the Railroad in writing;

1. Any tools or equipment being utilized by the Design-Builder, shall not foul or have the potential to foul active Railroad tracks.
2. No worker shall be permitted to foul and/or cross a track or tracks without appropriate flag protection, as determined by the Railroad.
3. No tools or working materials shall be permitted to be left unattended, or along the Railroad ROW without written permission by the LIRR.
4. In no event shall equipment or material be transported across a track or tracks without permission and inspection, as required by Railroad; and appropriate flagging protection.

C. In advance of any work scheduled on Railroad property, successful completion of a required Roadway Worker Protection (RWP) class is mandatory for all personnel that plan to work on Railroad property. Proof of completion of the RWP class is required at all time while on Railroad property. RWP refresher class is required on an annual basis.

D. Not all Railroad conduits, including third rail (except on the out of service track during track outages) power, communications and signal may be shut down for the Design-Builder, during the contract duration.

1.22.6 Submittals

A. Railroad Protective Labor: The Design-Builder shall order in writing, and obtain the approval for any necessary Railroad Protective Labor and each request shall appear in the 90-Day Schedule and/or Detailed Contract Schedule, and in the Six-Week Rolling Schedule. The request for Protective Labor will be locked in when the Six-Week Rolling Schedule is accepted by the Railroad. The determination of the requirements for Protective Personnel, using the above criteria, shall be at the sole determination of the Railroad. Railroad Protective Labor shall be reviewed weekly.

B. Track Outages: The Design-Builder shall make a separate formal written request to the Railroad for each track outage. Each requested track outage shall be approved by the Railroad in writing in advance and shall appear in the 90-Day Schedule and/or Detailed Contract Schedule, and in the Six-Week Rolling Schedule. The track outage will be locked in when the Six-Week Rolling schedule is accepted by the Railroad. Track outages that are submitted, reviewed and accepted by the Railroad will be supplied to

the Design-Builder without cost. Track outages are granted by the Railroad in accordance with TP2.11 SCHEDULES, and as otherwise restricted within the Contract Documents.

C. Working Drawings: Working drawings indicating locations of temporary fencing, temporary facilities, barricades and the Design-Builder lay down and staging areas shall be submitted to the Railroad for approval.

D. Work Plans: The Design-Builder Work Plans are required for all work to be performed on the Railroad property or work adjacent to the Railroad property that may potentially affect the Railroad operations and/or safety, as determined by the Railroad during the Weekly Schedule/Work Plan Review Meeting. The written Design-Builder Work Plan shall be submitted for review not less than 30 days before the commencement of said work. The detailed Work Plan shall include the dates and times of proposed work, methods of construction, a job hazard analysis, and an estimation of the duration of flagging, track outages, crane usage, and/or other related Railroad support personnel required, subject to the Railroad's approval. The Design-Builder shall submit a Work Plan to the Railroad before the use of Hi-Rail vehicles and/or Work Trains on the Railroad ROW.

E. Safety Work Plan: A Safety Work Plan or job hazard analysis is required prior to the start of work of any proposed activity within the limits of the Railroad property or for work that could potentially foul Railroad tracks.

1.22.7 Work Trains And Motive Power

A. The Design-Builder shall provide for its own work trains and rail bound equipment including motive power.

B. All equipment that operates on the Railroad system shall comply with the requirements of the Railroad.

C. The Design-Builder shall provide advance notice to the Railroad so that pilots and other Railroad Protection staff may be scheduled. The Railroad will assign qualified pilots and any necessary Railroad Protective Labor, for the operation of Design-Builder's Hi-Rail vehicle and Work Trains along the Railroad ROW, and to and from each work area.

D. The Design-Builder's work trains and Hi-Rail vehicles shall be in compliance with TPA1.22B MINIMUM RAILWAY CLEARANCE.

E. The Design-Builder's work trains and Hi-Rail vehicles shall comply with the safety requirements described in TPA1.22C VEHICLE OPERATION SAFETY PROGRAM.

1.22.8 Hi-Rail Vehicles & their Safety

A. Prior to piloting a Design-Builder hi-rail vehicle, the Track Car Pilot and hi-rail vehicle operator shall undertake a vehicle inspection to determine that the vehicle is safe to operate. The Design-Builder shall provide the following information to the Railroad before the use of Hi-Rail vehicles on LIRR tracks:

1. Hi-rail vehicle operator shall complete the TPA1.22A PRE-TRIP CHECKLIST form.
2. Hi-rail vehicles shall have their own current annual, FRA-required, rail-gear inspection. All inspection stickers shall display the EXPIRATION date of the rail-gear inspection, which is the last day of the month and year punched or cited. The stickers shall be mounted on or near the driver's door or fender.

3. The Railroad will inspect all of the Design-Builder's vehicles for general rail-bound safety. The Design-Builder shall keep a copy of this inspection in the vehicle's glove box. A Pilot should request to see it. The Railroad will perform a re-inspection every 12 months. If Design-Builder's vehicle is used for hi-rail operations on another railroad, it shall be re-inspected upon its return to LIRR.
4. Manual and remote-controlled rail-gear pins shall be properly engaged. Front over-center rail-gear shall not require pinning. Failure to utilize pins may lead to the rail-gear collapsing and the vehicle derailing.
5. Rear rail wheels shall be in contact with the rail. Ensure tire pressure is not too high, air bags are not inflated or rail-gear is not improperly adjusted preventing the rail wheels and flanges to fully interface the rail.
6. Rail-gear brakes shall be operational. Missing shoes or loose components shall be unacceptable.
7. Functional vehicle lighting shall include headlights, brake lights, 360° beacon and work lights, if required for night or tunnel work.
8. The Design-Builder shall inspect the Hi-Rail vehicles and submit the inspection form TPA1.22D TRUCK INSPECTIONS to the Railroad.

B. Subject to specified track outage requirements, Hi-Rail equipment, if utilized by the Design-Builder, shall conform to the limits of the "Allowable Equipment Envelope" illustrated in 1.22.19, titled "Fouling Envelope." Hi-rail equipment utilized for the completion of the work shall be provided by the Design-Builder, and be self-propelled. (Maximum length of 85 linear feet, extreme width not to exceed 10 linear feet) which shall conform to the limits of the "allowable equipment envelope" in addition to that specified above.

C. Hi-rail equipment is subject to and shall pass inspection by the Railroad prior to use on Railroad ROW. Such inspections will be provided by the Railroad at a Railroad specified location. The Design-Builder shall allocate sufficient time for the Railroad to inspect all such equipment. The Railroad will have no liability by virtue of the vehicle inspection, nor by the provision of pilots.

D. All Hi-Rail equipment, when in use on active yard, siding and main tracks shall be accompanied by a Railroad pilot. A pilot is responsible for the safe movement and operation of a piece of equipment in accordance with the Railroad Operation Rules. No movement of Hi-Rail vehicles within the out-of service track (encompassing the worksite) without Railroad pilot supervision shall be permitted. The number of pilots will be determined by the Railroad at the Six-Week Rolling Schedule. Railroad pilots will be available as necessary throughout the duration of the Project.

E. A written request for a Railroad pilot shall be submitted to the Railroad at the same time as the 90-Day Schedule and/or Detailed Contract Schedule, and Six-Week Rolling Schedules are submitted. If the Design-Builder subsequently postpones or cancels a planned operation for which a Railroad pilot has been arranged, the Design-Builder shall be assessed the full charge for pilot services.

1.22.9 Flagging

A. The Design-Builder may request that the Railroad provide flagging in order to provide the Design-Builder with improved flexibility to perform work along the ROW.

B. Flagging will be provided simultaneously at up to five locations at a time, each location extending approximately 1500 feet on tangent track sections. At locations that are not on tangent track the length of section where flagging will be provided will be shorter, as it needs to be adjusted to take into account lines of sight. Alternatively, and depending on flagging requirements at each location, work may be allowed at additional locations provided that the total number of flaggers to be provided by the Railroad does not exceed 40 per Calendar Day. The number of flaggers required at each location shall be at the sole discretion of the Railroad and will depend on the type of work being performed and the equipment being used.

C. The Design-Builder shall comply with all instructions and directions of the Railroad Protective Labor Personnel. No Design-Builder "lone workers", as defined in Appendix D to the "LIRR Transportation Department Rules and Procedures Governing Protection of Third Party Contractors and Roadway Worker Protection" shall be permitted to perform work under this Contract.

1. Upon warning of an approaching train work activities shall cease and materials, equipment, and tools shall be placed in an idle position clear of the fouling envelope, where they shall remain until receiving a signal from Railroad Protective personnel, that work may resume.

2. The Design-Builder is responsible for ensuring that their personnel are able to either audibly hear or otherwise be made aware of a signal from Railroad Protective personnel. For work around noisy equipment, the Design-Builder shall have one or more of its personnel, as required, dedicated solely to functioning as "tappers" (i.e., Design-Builder Watchmen) for this purpose.

1.22.10 Work Requiring A Track Outage Or Flagging

A. Work requiring Track Outages or Fouling of Track requires prior approval of the Railroad, and shall not proceed until the necessary protective personnel are in position.

B. The Design-Builder shall make a separate formal written request to the Railroad for each track outage. Each requested track outage must be approved by the Railroad in writing in advance and shall appear in the in the Six-Week Rolling Schedule. The track outage will be locked in when the Six-Week Rolling schedule is accepted by the Railroad. Track outages that are submitted, reviewed, and accepted by the Railroad will be supplied to the Design-Builder without cost. Track outages are granted by the Railroad in accordance with TP2.11 SCHEDULES, and as otherwise restricted within the Contract Documents.

C. All personnel provided by the Design-Builder shall be properly trained, qualified and/or licensed as required to perform their Work including Railroad Safety Training as specified in 49 Code of Federal Regulations (CFR) part 214. It is anticipated that this training will take one day. The Railroad shall reserve the right to remove any of the Design-Builder's personnel from the site at their sole discretion. The Design-Builder shall submit resumes of key personnel to the Railroad for approval.

D. Except as otherwise specified, track outages and fouling of track by the Design-Builder, shall be prohibited. If permitted, explicit written approval shall be obtained from the Railroad as a prerequisite for each track outage, and for each fouling of track.

E. If the Design-Builder fails to return the track affected by the outage by the end of their "available time" periods, the Design-Builder shall be subject to liquidated damages as specified in the Contract Documents.

1.22.11 Preparatory Work

A. The Design-Builder shall have all materials at the Worksite and shall have work expeditiously, with an adequate work force, during the track outage, to complete work and allow service to be fully restored as scheduled, subsequent to the allotted track outage.

B. All necessary preparatory work shall be completed prior to the actual track outage.

C. All cranes and hoisting equipment used in this application shall be properly grounded in accordance with the Railroad requirements. .

1.22.12 Right-Of-Way Restrictions:

A. The Design-Builder shall adhere to the requirements of NYCRR Subpart 753-3, Duties of Excavators, except as otherwise specified herein.

B. The Design-Builder shall take the necessary precautions to locate and identify existing public utilities and shall notify the local Call Before You Dig or One Call Center at least 10 Calendar Days prior to excavating, augering, drilling, pile driving, sheet piling, or other ground penetrating activities.

C. The Design-Builder shall take the necessary precautions to locate and identify existing Railroad utilities and shall notify the Railroad at least 10 Calendar Days prior to excavating, augering, drilling, pile driving, sheet piling, or other ground penetrating activities.

1.22.13 Cancellation by the Design-Builder

A. If the Design-Builder cancels a planned operation for which the Railroad Protective Labor has been arranged, it shall notify the Railroad no later than 48 hours prior to the operation. Failure to provide such notification will result in the assessment of the labor charge for the requested Railroad Protective Labor.

1.22.14 Railroad protective Labor

A. Except as otherwise specified, the Railroad will furnish protective personnel as required at no charge to the Design-Builder. The furnishing of Railroad Protective Labor shall not relieve the Design-Builder from the responsibility of performing all operations in accordance with the Railroad requirements, and shall not relieve the Design-Builder from any liability.

1.22.15 Roadway Worker Protection (RWP):

A. Each employee of the Design-Builder and its subcontractors, whose duties include working on or near the Right of Way, shall attend a Roadway Worker Protection training session prior to performing such duties for the first time and annually thereafter.

B. The RWP training session, which normally lasts 4 hours, shall be given by the Railroad as required during the term of the Contract, and will be conducted in the English language.

C. Each work shift that involves work activities on or near Right of Way shall begin with an RWP briefing of worksite personnel, delineating the RWP measures and procedures to be used. The Design-Builder shall set aside a 15-minute period for the RWP briefing. The RWP briefing shall be conducted by the Railroad's Roadway Worker in Charge (RWIC).

1.22.16 Work Requiring Lighting

A. When track outages are scheduled for after sunset, the Design-Builder shall provide all OSHA approved lighting during the entire outage. The Railroad will require the Design-Builder to demonstrate the working lighting arrangement 48 hours in advance of each outage.

1.22.17 Single Track Outages

A. Weekdays
   1. For work that does not affect the track or any system affecting operation of the Railroad, single track outages may be granted for the time period between 1000h and 1500h after the morning peak period, and from 2200h to 0330h after the evening peak period.
   2. For work that does affect the track or any system affecting operation of the Railroad, time will be required for the Railroad, at the initiation of the track outage, for Railroad forces to take the track out of service and perform track, third rail and ancillary effort necessary to turn the track over to the Design-Builder. At the completion of the track outage for Railroad forces to install the new track, third rail and perform ancillary tasks prior to placing the track back in service.

B. Weekends
   1. For work that does not affect the track or any system affecting operation of the Railroad, single track outages may be granted for the time period between Saturday at 0000h and Monday at 0000h.
   2. For work that does affect the track or any system affecting operation of the Railroad, time will be required for the Railroad, at the initiation of the track outage, for Railroad forces to take the track out of service and perform track, third rail and ancillary effort necessary to turn the track over to the Design-Builder. At the completion of the track outage for Railroad forces to install the new track, third rail and perform ancillary tasks prior to placing the track back in service.

   3. No outages will be granted on major holiday / long weekends.

C. Track Blocks Affected
   1. Regular outages will only be provided for within one track block at a time. Outages may be requested in the same block or in different blocks for each of the day, night, or weekend periods.

2. When a track outage is in effect, the Design-Builder shall coordinate with the Railroad to determine which track, Track 1 or Track 2, will be taken out of service.
3. Single track outages shall be provided in the following single blocks:
    a. Mainline branch:
        i. Queens interlocking to Nassau 1 interlocking.
        ii. Nassau 1 interlocking to Nassau 3 interlocking – For track 1 outages, Nassau 2 interlocking must remain operational.
        iii. Nassau 3 interlocking to Divide interlocking.
    b. Hempstead branch:
        i. Queens interlocking to Garden interlocking.
    c. Oyster Bay branch:
        i. Nassau 2 interlocking to Nassau 4 interlocking.
4. The Design-Builder's request for a single track outage in any of the above single blocks for weekdays, weeknights, or weekends shall be consistent throughout the prevailing timetable. For example, if the Design-Builder requests a single track outage in a block for weekends, that outage will be for all weekends in the specific single block for the entire timetable.
5. Where absolutely necessary to perform necessary work, a double block outage (in adjacent blocks) will be provided for during a night timeframe between 2200h to 0330h.

D. Cancellations of Outages by the Railroad

1. Unexpected problems and issues will arise during the regular operation of the Railroad. The Design-Builder shall take into account that while the Railroad will make best efforts to provide planned outages, up to 15% of outages in total may be cancelled by the Railroad at any time, including up to 10% of outages cancelled on short notice (less than 72 hours notice), and that no relief or adjustment will be made for such cancellations.

E. Track Time

1. It is recognized that on some days, some more track time may be provided than is indicated in this section, and on other days some less time may be provided. A delay of less than two hours will not be treated as a cancellation. In the event of continued track outage delays, consideration will be given to a pro-rata adjustment taking into account both the additional and reduced amounts of track times provided.

1.22.18 Timetables

A. The Railroad typically operates on four timetables per year.

B. The Design-Builder may request that the number of timetables per year be increased from 4 to 6. Such request must be made not less than six months in advance. Each timetable shall extend for a time not less than eight weeks.

1.22.19 Double Track Outages

A. Weekends

1. For work that does not affect the track or any system affecting operation of the Railroad, double track outages may be granted for the time period between Saturday at 0000h and Monday at 0000h.
2. For work that does affect the track or any system affecting operation of the Railroad, time will be required for the Railroad, at the initiation of the track outage, for Railroad forces to take the track out of service and perform track, third rail and ancillary effort necessary to turn the track over to the Design-Builder. At the completion of the track outage for Railroad forces to install the new track, third rail and perform ancillary tasks prior to placing the track back in service.
3. No outages will be granted on major holiday / long weekends.
4. A maximum number of Mainline double track outages, equal to the lesser of 48 or the number of outages provided for in the Design Builder's Proposal, will be provided for during the duration of this Project.
5. Main Line Double Track Outages shall only be allowed at one of the following locations at a time:
    i. Floral Park Station to Mineola Station.
    ii. Mineola Station to Hicksville Station.
6. The Design-Builder shall coordinate the outage parameters for each Main Line double track outage with LIRR. The stations at the limits of the track outage shall remain in service for the duration of the outages. For example, when a double track outage is between Floral Park and Mineola, both Floral Park and Mineola stations shall be operational.
7. Additional double track outages may be required on the Hempstead and Oyster Bay branches for work to be performed within the Project scope. A Maximum of 1 double track outage each for Hempstead and Oyster Bay branches may be provided. Double track outages on the Hempstead and Oyster Bay branches will not be counted towards the total number of Main Line double track outages for the Project. Outages on the Hempstead and Oyster Bay branches shall not be at the same time as any of the Main Line double track outages except as coordinated with the Railroad and approved at the sole discretion of the Railroad. Depending on the type of work being performed, and the locations of the work, some work may be allowed at the same time as for Mainline outages. The

Hempstead and Oyster Bay branch double track outages shall not be at the same time.

1.22.20 Obligations Of The Railroad

The Railroad will:

A. Provide flagmen as set out in provision 1.22.9.

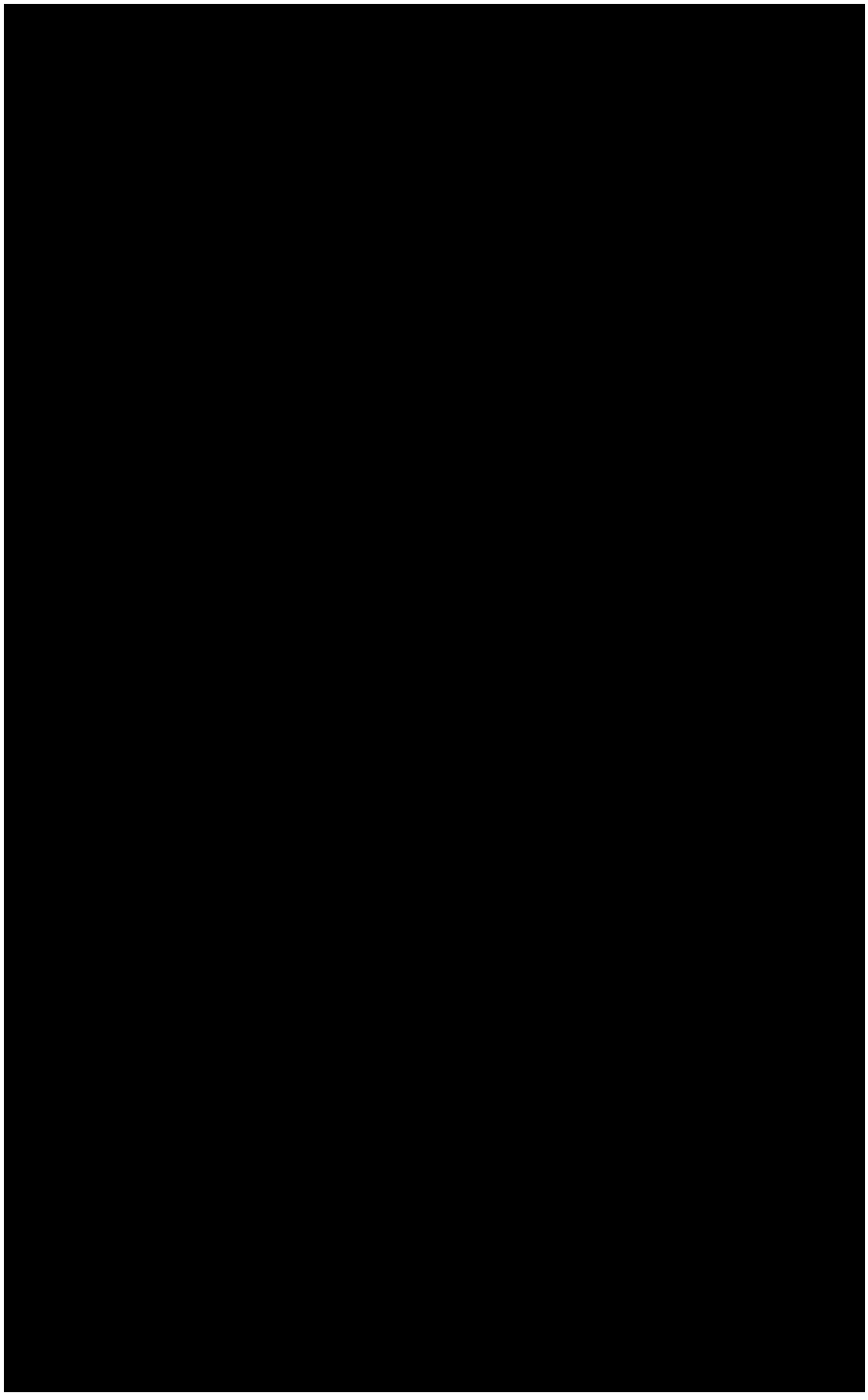
B. Schedule single track single block outage described in provision 1.22.17 subject to the requirements of this Section. Up to 15% of single track single block outages in total may be cancelled at any time, including up to 10% of outages cancelled on short notice (less than 72 hours notice).

C. Schedule single track double block outages as set out in provision 1.22.17 subject to the requirements of such provision.

D. Increase the number of Timetables in a year to a maximum of 6 as set out in provision 1.22.18 subject to the requirements of such provision.

E. Schedule double track outages as set out in provision 1.22.19 subject to the requirements of this Section. Up to 10% of double track outages may be cancelled at any time, including on short notice (less than five days).

1.22.21 Fouling Envelope



END

1.23 ACCESS TO THE SITE

1.23.1 Section Includes

This section sets out requirements regarding access of the various parts of the Site, and when the locations will be available to the Design-Builder so that it can perform its work. This includes: Property Availability; and utility relocation work performed by others.

1.23.2 References (Not Used)

1.23.3 Property Availability

Access to properties will be made available to the Design-Builder on the dates indicated in Appendices:

A. TPA1.23A PROPERTY TAKING.

B. TPA1.23B DRIVEWAY RELEASE AGREEMENTS.

C. TPA1.23C LIRR PROPERTIES.

D. TPA1.23D VILLAGE – MUNICIPAL OWNED.

E. TPA1.23E PARKING GARAGES.

1.23.4 Utility Relocation Work Performed by Others

A. The Design-Builder is responsible to achieve its schedule completion dates, and shall coordinate with and or manage work by Utility Owners as necessary in order to complete its work on time.

END

1.24 SEQUENCING AND MILESTONES

1.24.1 Section Includes

This section sets sequencing and milestones for: undergrade crossings; track and related work; traction power substations and related work; and stations.

1.24.2 References (Not Used)

1.24.3 Sequencing of Work at Undergrade Crossings

A. The Design Builder shall complete undergrade crossing work in the following order:

1. New undergrade crossings at Covert Avenue and at Urban Avenue.
    i. Work at the Covert Avenue and Urban Avenue undergrade crossings that require extended lane closures (more than 24 hours) shall not commence until January 02, 2019, or later.
    ii. While working on Covert Avenue, New Hyde Park Road and South 12th Street shall remain open. The new undergrade crossing at Covert Avenue shall be open to traffic prior to any road closures or lane restrictions at New Hyde Park Road and South 12th Street.
    iii. While working on Urban Avenue, School Street shall remain open. The new undergrade crossing at Urban Avenue shall be open to traffic prior to any road closures or lane restrictions at School Street.
2. New undergrade crossings at New Hyde Park Road, Willis Avenue, and at School Street.
    i. While working at New Hyde Park Road, Covert Avenue and South 12th Street shall remain open. The new undergrade crossing at New Hyde Park Road shall be open to traffic prior to any road closures or lane restrictions at South 12th Street, and Covert Avenue shall remain open.
    ii. While working on New Hyde Park Road, a pedestrian crossing of the tracks shall be maintained at all times.
    iii. While working at Willis Avenue, Main Street shall remain open. The new undergrade crossing at Willis Avenue shall be open to traffic prior to any road closures or lane restrictions at Main Street. The new undergrade crossing work at Willis Avenue may begin prior to opening the new undergrade crossings at Covert Avenue and Urban Avenue.
    iv. While working on School Street, Urban Avenue shall remain open.
3. Closures of the grade crossings at Main Street and at South 12th Street.
    i. While working at South 12th Street, Covert Avenue and New Hyde Park Road shall remain open.
    ii. While working on Main Street, Willis Avenue shall remain open.

B. Utility relocations at each grade crossing shall be started early in the Project.

C. The Design-Builder shall install temporary and / or permanent drainage solutions prior to commencement of excavation for road and structural work at each undergrade crossing.

D. The Design-Builder may temporarily open the undergrade crossing to traffic upon completion of the Binder Course pavement. Installation of Top Course pavement shall be completed within the seasonal limits and the temperature requirements as indicated in NYSDOT Standard Specifications Section 402.3.

1.24.4 Undergrade Crossings Completion Dates

A. Durations of road closures and completion dates for work at undergrade crossings are set out in VOLUME 1 DESIGN BUILD AGREEMENT.

1.24.5 Sequencing of Work on Track

A. The Design-Builder shall complete construction of the Maintenance of Way (MOW) siding east of Urban Avenue and make it available for use before the Urban Avenue grade crossing is eliminated.

B. The Design-Builder may sequence its work on the track so as to optimize its schedule, and may work in multiple locations provided that it does not affect Railroad operations.

C. When work by the Design-Builder will affect Railroad operations, such work shall require coordination and approval from the Railroad. Refer to TP1.22 RAILROAD OPERATIONS for requirements relating to flagging and track outages.

1.24.6 Sequencing of Work at Stations

A. The Design-Builder will be allowed to work on maximum of 2 Westbound platforms and 2 Eastbound platforms at the same time. Both the North and South Carle Place station platforms may be closed once, at the same time, for a duration of up to 12 consecutive months to provide for construction.

B. While working at stations the existing platforms and or the temporary platforms shall provide for 6 cars minimum at all times except:

1. 8 contiguous cars at Mineola station.

C. At all the stations, the Design-Builder shall construct the new platform while maintaining pedestrian access to the existing platform.

1.24.7 Sequencing of Work at Parking Structures

A. The Design-Builder may work at multiple station locations at the same time, but its work shall only proceed on one parking structure location at a time at each station. Work on parking in any area at a station shall be completed and that area shall be open to provide for customer parking prior to the closure of any other parking areas at that station. For example, work on both Mineola parking structures can not proceed at the same time.

B. At Westbury Station, the South Parking Structure shall be constructed and open to allow parking prior to the commencement of work on the North Parking structure. Note that prior to being allowed to be open to receive customers, the South Parking Structure shall be substantially completed, all systems including MEP, elevators, security systems, and pay systems shall be in place, and the Parking Structure will require acceptance from the Railroad.

C. The Design-Builder may only work at 1 parking structure in each village/town at the same time.

1.24.8 Sequencing of Work at Traction Power Substations

A. The sequencing of work and replacement of Traction Power Substations shall be as determined by the Design-Builder subject to requirements set out in TP3.17 TRACTION POWER.

1.24.9 Sequencing of Work on Signals and Train Control

A. The sequencing of work relating to Signals and Train Control shall be as determined by the Design-Builder subject to the requirements and Railroad approvals set out in the Contract Documents.

1.24.10 Coordination of Work by Multiple Disciplines

A. Work on and along the ROW will often affect Railroad Operations. The Design-Builder shall take into account restrictions and approvals required for each discipline in planning and performing its work. For example, work on the installation of a crossover will affect not only Track, but also Signals and other disciplines. And similarly, work on Stations will need to take into account and be coordinated with work on Communications and Security Systems.

END

1.25 WORK BY OTHERS

1.25.1 Section Includes

This section describes other work programs that the Railroad and the NYSDOT are currently aware of between Hicksville and Floral Park that may require some coordination with the Design-Builder. These are:

A. Contract 6234 Replacement of Post Avenue Bridge.

B. Contract 6202 Hicksville Station and North Track Siding Improvements.

C. Installation of concrete ties by the Railroad.

D. Implementation of Positive Train Control by the Railroad.

Note that new work programs are expected to arise, and that the Railroad will be performing ongoing maintenance and capital improvement work in addition to that noted above.

Information in this section is being provided “for information only”. The Design-Builder shall coordinate with the Railroad and others in accordance with all the requirements of the Contract Documents.

1.25.2 References (Not Used)

1.25.3 Contract 6234 Replacement of Post Avenue Bridge

1.25.3.1 Current Scope – Subject to Change without Notice

Under this Design/Build Contract, the existing two (2) track thru steel plate girder bridge carrying the LIRR Main Line at Mile Post 21 over Post Avenue in the Village of Westbury, Nassau County, New York will be replaced with a new bridge. The work includes but is not limited to the following:

A. Removal and disposal of the existing two (2) bay bridge.

B. Installation of a new three-bay bridge to accommodate the existing tracks and a future third track.

C. Abutment modifications, including tie-backs, risers, back-walls, and concrete repairs.

D. Replacement of concrete staircase at west end of Westbury Station with new structural aluminum staircase.

E. Replacement of timber retaining walls, northwest of Post Avenue Bridge, with concrete lagging retaining walls.

F. Modification of west end of Westbury Station platform to accommodate new bridge/track elevation.

G. Reconstruction of curbs, sidewalks, and fencing.

H. Relocation of overhead utilities on the south side of the bridge.

I. The elevation of approximately 1,500 lf of main line track will be raised by the LIRR during the track outage.

1.25.4 Contract 6202 Hicksville Station and North Track Siding Improvements

1.25.4.1 Current Scope – Subject to Change without Notice

A. The project consists of two parts, improvements to the Hicksville Station and improvements to the North Track, power and signal systems in the vicinity of the station. Station work includes new platforms, new platform waiting rooms, new lighting, new translucent canopy roof, new stairways, elevators and escalators, a new video security

system, audio and digital communications systems, new signage as well as artist-designed ceramic murals and laminated art glass.

B. North Track work includes the installation of over three thousand feet of new track, power and signal work. Track 1 at Hicksville will be connected to an existing track siding situated about one-half mile west of the station platform. In conjunction with this work the signal system at Divide Tower east of Hicksville Station will be modernized.

1.25.5 Tie Replacement by the Railroad

A. The Railroad is planning to replace wooden ties on the existing two tracks between Floral Park and Hicksville with concrete ties.

1.25.6 Installation of Positive Train Control by the Railroad

A. The Railroad is planning to implement a Positive Train Control system that will include track between Floral Park and Hicksville.

1.25.7 Digital Display Signs for Stations

A. At the time of writing, the MTA/Railroad is in the process of procuring a contractor to supply and install digital display signs for stations.

END

MTA Capital Construction

CONTRACT #6240

DESIGN-BUILD SERVICES
FOR
LIRR EXPANSION PROJECT
FROM FLORAL PARK TO HICKSVILLE

CONFORMED DOCUMENTS

VOLUME 3
TECHNICAL PROVISIONS
PART 2 – CONTRACT ADMINISTRATION

December 27, 2017

Part 2 – Contract Administration

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END

2.1 PROJECT MANAGEMENT

2.1.1 Section Includes

This section sets out requirements for the Design-Builder's Project Management Plan (PMP).

2.1.2 Codes and References (Not Used)

2.1.3 Project Management Plan (PMP)

A. The Design-Builder's PMP shall, at a minimum:

1. Comply with the requirements of the Contract Documents.
2. Clearly state, detail, and describe the approach and intended results to demonstrate compliance with the scope, goals, and objectives of the Project.
3. Identify and comply with all applicable codes, standards, specifications, regulatory requirements, and directives and/or requests from the Authorities Having Jurisdiction (AHJ).
4. Coordinate and incorporate all other Project plans
5. Identify by cross-reference all other plans.
6. Identify by signature page and date, the title of the qualified professionals who are responsible for planning, reviewing, approving, reporting, monitoring, controlling, implementing, revising, and issuing the PMP, including revisions.
7. Identify required resources and competencies for defined roles and activities for all aspects of the Project.
8. Identify training requirements by defined roles and activities.
9. Identify document and data control responsibilities for review and approval.
10. Identify the procedures for document review, submittal, revisions, and approvals.
11. Identify the procedures for schedule, budget, and finance management.
12. Indicate by statement and certification that the Design-Builder is responsible for Quality Assurance and Quality Control (QA and QC).
13. Identify the methods to identify and control non-conformances, and the corrective actions and the schedule to perform the corrective action.
14. Identify the recording and reporting procedures for non-conformance activities, the corrective actions, and the preventative actions to eliminate recurrences.
15. Identify the audit procedures, audit reporting process, and audit reporting schedule.
16. Develop and update the PMP to facilitate external audits, including those performed by Railroad.
17. Identify the management and integration plans of subcontractors and suppliers.
18. Identify documents to be prepared and procedures to be followed for cutover plans.

B. The Railroad will perform obligations under the Technical Provisions explicitly stated as Railroad's responsibility; all other obligations in the Technical Provisions not expressly assigned to the Railroad or others, or explicitly assigned to the Design-Builder are the Design-Builder's responsibility. The Design-Builder's PMP shall be structured to include the time periods during which the following Work is accomplished:

1. Design Work.
2. Construction Work.
3. Force Account Work.
4. Relocation of Utilities.
5. Testing, certification, and commissioning of Project Elements.

C. The Design-Builder shall submit the PMP to the Railroad for Review and Approval within 30 Calendar Days after LNTP. The PMP shall be approved before commencement of design and construction Work. The Design-Builder shall update and resubmit the PMP to the Railroad for Review and Approval annually, whenever there is a significant change to the PMP or if requested by the Railroad.

2.1.4 Summary of Submittals

Item	Section	Submittal	Action
1.	2.1.3	Project Management Plan (PMP)	Review and Approval

END

2.2 PROJECT TEAM

2.2.1 Section Includes

This section sets out requirements relating to the Design-Builder's Key Personnel and Other Personnel.

2.2.2 Codes and References (Not Used)

2.2.3 Project Team Requirements

A. The Design-Builder's Key Personnel and other management personnel for the Project require Railroad's approval. Key Personnel resumes and references accepted with the Design-Builder's SOQ or Proposal are considered as having been approved.

B. Key Personnel and other management personnel shall not be changed or replaced without Railroad's approval. The Design-Builder shall submit resumes and references for replacement of Key Personnel for Review and Approval a minimum of 21 Calendar Days prior to the planned replacement.

2.2.4 Resumes and References

A. Resumes and references shall be not more than two pages for each person. The Design-Builder shall provide three references for each person for work performed on projects within the past five years.

B. In cases where the person has worked on less than three projects during the past five years, the Design Builder shall:

   1. Affirmatively state that such person has worked on less than three projects during the past five years.
   2. Include references for each of such projects.
   3. Include references for projects worked beyond the past five years so that the number of references equals three in total.

C. References for each person shall be previous owners, clients, or employers and shall include the name, position, company, or agency, and current postal and email addresses and phone numbers.

2.2.5 Key Personnel

The positions listed below shall be the Design-Builder's key personnel for the Project. The Design-Builder shall provide personnel that meet these minimum requirements.

2.2.5.1 Project Executive

A. Responsibilities: The Project Executive shall be designated at the discretion of the Design-Builder and must have the authority to represent, make decisions for, and oversee the performance of, the Design-Builder.

B. Licenses: It is preferred, but not required, that the Project Executive be licensed as a Professional Engineer in the State of New York.

C. Education: The Project Executive shall have a bachelor's degree or equivalent.

D. Experience: It is preferred that the Project Executive has demonstrated a minimum of 20 years' experience in construction and management-of-construction for major rail

transportation and infrastructure projects that included work of a similar scope, nature, and complexity as included in this Proposed Project and has Design-Build experience..

E. Past Project Value: The Project Executive experience in construction and management-of construction shall include at least one (1) construction project having a construction value in excess of $200,000,000.

2.2.5.2 Design-Builder's Project Manager

The Design Builder shall provide a Design-Builder's Project manager with the following qualifications:

A. Responsibilities: The Design-Builder's Project Manager shall have full responsibility for the execution of the Work on behalf of the Design-Builder. The Design-Builder's Project Manager shall be the Design-Builder's representative and single point of contact. The Design Builder's Project Manager, can hold only this one Key Personnel position.

B. Licenses: It is preferred, but not required that the Design-Builder's Project Manager shall be a licensed Professional Engineer registered in the state of New York.

C. Education: The Design-Builder's Project Manager shall have a bachelor's degree or equivalent.

D. Experience: Shall have a minimum of 20 years demonstrated experience in construction and management-of-construction for major rail transportation and infrastructure projects with similar size, type of work, and complexity as this Proposed Project, including projects with compressed timelines, and community information requirements. Such experience in construction and management-of-construction shall include at least one on a commuter railroad construction project. The Project Manager shall have Design-Build and extensive project management experience,

E. Past Project Value: The Design-Builder's Project Manager's experience in construction and management-of construction shall include at least one (1) construction project having a construction value in excess of $200,000,000.

2.2.5.3 Design Manager

A. Responsibilities: The Design Manager shall have an understanding of developing a design and staging plans which will allow the Railroad to minimize operating impacts on a mainline commuter railroad..

B. Licenses: The Design Manager shall be licensed as a Professional Engineer in the State of New York.

C. Education: The Design Manager shall have a bachelor's degree or equivalent.

D. Experience: The Design Manager shall be an owner or employee of the Designer and shall have a minimum of 15 years demonstrated experience in managing design for multi-disciplinary infrastructure, rail and transportation projects of similar scope and complexity as this Proposed Project. The Design Manager, who shall have Design-Build experience, shall have specific experience with rail transportation design, including track and rail, bridges, signal, power and communications systems, earth retaining structures and drainage structures, on major projects of similar complexity and type.

E. Past Project Value: The Design Manager shall have experience on at least one transit, commuter rail, or highway project with a capital construction cost of no less than $250 million and have design build experience.

2.2.5.4 General Superintendent

A. Responsibilities. The General Superintendent shall be responsible for directing and coordinating the activities of the Design-Builder's workforce, including all subcontractors, ensuring that work progresses according to schedule, within budget and that material and equipment were delivered to the site on time.

B. Licenses: Preference is for a Licensed Professional Engineer in the State of New York.

C. Education: Not used.

D. Experience: The General Superintendent shall have a minimum of 15 years demonstrated construction experience in civil works projects with experience in managing the site work of large, complex rail and roadway construction projects including new track construction, . Experience shall include work of the nature anticipated in the Project, and shall include Design-Build contracts, public and community sensitivity, utility relocation, and maintenance of operations for rail, vehicular and pedestrian/commuter users.

E. Past Project Value: Experience shall include at least one (1) project having a construction value in excess of $100,000,000.

2.2.5.5 Quality Manager

A. Responsibilities: The Quality Manager is the individual retained by the Design-Builder with the authority and responsibility for quality management, quality system-related activities for all Work, including the establishment and maintenance of, and compliance with the quality management plan or equivalent report/Submittal. The Quality Manager shall have no Project responsibilities other than quality assurance and quality management and control of the Project, and shall be independent from staff and duties associated with the execution/production of the Work. The Quality Manager shall be working full time and exclusively for the Project.

B. Licenses: Not used.

C. Education: The Quality Manager shall have a bachelor's degree or equivalent.

D. Experience: The Quality Manager shall have a minimum of 10 years of QA/QC experience on commuter rail or transit, and Design-Build projects, and have undertaken training in the use and application of Quality Programs including the application of ISO 9001-:2008. Experience shall include projects of similar type and complexity.

E. Past Project Value: Experience shall include at least one (1) construction project having a construction value in excess of $100,000,000.

2.2.6 Other Personnel:

The Design-Builder shall provide Other Personnel that meet these minimum requirements.

2.2.6.1 Design-Builder's Deputy Project Manager

A. Responsibilities: The Design-Builder's Deputy Project Manager shall assist the Design-Builder's Project Manager in overseeing the execution of the Work on behalf of the Design-Builder.

B. Licenses: It is preferred, but not required, that this individual be licensed as a Professional Engineer in the State of New York.

C. Education: The Design-Builder's Deputy Project Manager shall have a bachelor's degree or equivalent.

D. Experience: The Design Builder's Deputy Project Manager shall have a minimum of fifteen (15) years demonstrated experience in construction and management of construction for major rail transportation and infrastructure projects with similar size, type of work, and complexity as this Project.

E. Past Project Value: The Design-Builder's Deputy Project Manager's experience in construction and management-of construction shall include at least one (1) construction project having a construction value in excess of $200,000,000.

2.2.6.2 Lead Construction Manager

A. Responsibilities: Lead Construction Manager shall be the individual responsible on a day-to-day basis for the activities of construction from the commencement of Construction Work to Final Completion of the Project. Lead Construction Manager shall be located at the Project Site from NTP until no less than 2 months after Final Completion and will be available until all Design Work and Construction Work-related disputes and claims are resolved.

B. Licenses: It is preferred, but not required, that this individual be licensed as a Professional Engineer in the State of New York.

C. Education: High school diploma or equivalent.

D. Experience: The Lead Construction Manager shall have a minimum of fifteen (15) years demonstrated construction experience in civil works projects with experience in managing the site work of large, complex rail and roadway construction projects including new track construction. Experience shall include work of the nature anticipated in the Project, and shall include design-build contracts, public and community sensitivity, utility relocation, and maintenance of operations for rail, vehicular and pedestrian/commuter users.

E. Past Project Value: Experience shall include at least one (1) transit, commuter rail, or highway design-build project with a capital construction cost of no less than $250 million.

2.2.6.3 Area Construction Manager

A. Responsibilities: The Area Construction Manager shall be available on site as required to fulfil the requirements of the Contract.

B. Licenses: It is preferred, but not required, that this individual be licensed as a Professional Engineer in the State of New York.

C. Education: The Area Construction Manager shall have a bachelor's degree or equivalent.

D. Experience: The Area Construction Manager shall have a minimum of seven (7) years demonstrated construction experience in civil works projects with experience in managing the site work of large, complex rail and roadway construction projects including new track construction. Experience shall include work of the nature anticipated in the Project, and shall include Design-Build contracts, public and community sensitivity, utility relocation, and maintenance of operations for rail, vehicular and pedestrian/commuter users.

E. Past Project Value: Experience shall include at least one (1) construction project having a construction value in excess of $50,000,000.

2.2.6.4 Lead Utility Coordinator

A. Responsibilities: The Lead Utility Coordinator shall oversee and manage utility work performed by the Design-Builder, and shall manage design and construction coordination with Utility Owners and the Railroad.

B. Licenses: It is preferred, but not required, that this individual be licensed as a Professional Engineer in the State of New York..

C. Education: The Lead Utility Coordinator shall have a bachelor's degree or equivalent.

D. Experience: The Lead Utility Coordinator shall have an equivalent of ten (10) years' experience in utility coordination including experience with work in close proximity to highly active electrified railroad tracks.

E. Past Project Value: Experience shall include at least one (1) project having a construction value in excess of $100,000,000.

2.2.6.5 Third Party Coordination Manager

A. Responsibilities: The Third Party Coordination Manager shall act as the primary contact between the Design-Builder and Third Parties.

B. Licenses: Not Used.

C. Education: High school diploma or equivalent.

D. Experience: The Third Party Coordination Manager shall have at least 10 years of relevant Third Party Coordination experience.

E. Past Project Value: The Third Party Coordination Manager shall have experience on at least one transit, commuter rail, or highway project with a capital construction cost of no less than $100,000,000.

2.2.6.6 Lead Structural Engineer

A. Responsibilities: The Lead Structural Engineer shall be responsible for design of structures.

B. Licenses: The Lead Structural Engineer shall be a licensed Professional Engineer registered in the state of New York.

C. Education: The Lead Structural Engineer shall have a bachelor's degree or equivalent.

D. Experience: The Lead Structural Engineer shall have a minimum of fifteen (15) years demonstrated experience in track and track structure design, retaining structures and drainage design including experience with work in close proximity to highly active electrified railroad tracks.

E. Past Project Value: Experience shall include at least one (1) construction project having a construction value in excess of $100,000,000.

2.2.6.7 Lead Geotechnical Engineer

A. Responsibilities: The Lead Geotechnical Engineer shall be responsible for developing and leading a subsurface investigation program and the development of geotechnical design parameters.

B. Licenses: The Lead Geotechnical Engineer shall be a licensed Professional Engineer registered in the state of New York.

C. Education: The Lead Geotechnical Engineer shall have a bachelor's degree or equivalent.

D. Experience: The Lead Geotechnical Engineer shall have a minimum of fifteen (15) years demonstrated experience in foundation design and retaining structures with emphasis on track and retaining structures.

E. Past Project Value: Experience shall include at least one (1) construction project having a construction value in excess of $100,000,000.

2.2.6.8 Geotechnical Instrumentation Engineer

A. Responsibilities:. The Geotechnical Instrumentation Engineer shall be responsible for all the geotechnical instrumentation and related data.

B. Licenses: Not used.

C. Education: The Geotechnical Instrumentation Engineer shall have a bachelor's degree in Civil Engineering or Geology.

D. Experience: The Geotechnical Instrumentation Engineer shall have an equivalent of ten (10) years of instrumentation and monitoring experience.

E. Past Project Value: Experience shall include at least one (1) construction project having a construction value in excess of $50,000,000.

2.2.6.9 Lead Highway Engineer

A. Responsibilities: The Lead Highway Engineer shall be responsible for highway design.

B. Licenses: The Lead Highway Engineer shall be a licensed Professional Engineer registered in the state of New York.

C. Education: The Lead Highway Engineer shall have a bachelor's degree or equivalent.

D. Experience: The Lead Highway Engineer shall have an equivalent of ten (10) years' experience in highway design including experience with work in close proximity to highly active electrified railroad tracks.

E. Past Project Value: Experience shall include at least one (1) construction project having a construction value in excess of $50,000,000.

2.2.6.10 Lead Track Engineer

A. Responsibilities: The Lead Track Engineer shall be responsible for track design.

B. Licenses: The Lead Track Engineer shall be a licensed Professional Engineer registered in the state of New York.

C. Education: The Lead Track Engineer shall have a bachelor's degree or equivalent.

D. Experience: The Lead Track Engineer shall have a minimum of fifteen (15) years demonstrated experience in track and track structure design with a sound understanding of the design interfaces with the signal design and of Railroad and AREMA track design standards.

E. Past Project Value: Experience shall include at least one (1) construction project having a construction value in excess of $100,000,000.

2.2.6.11 Lead Architect

A. Responsibilities: The Lead Architect shall be responsible for the design of all architectural components.

B. Licenses: The Lead Architect shall be a licensed Architect registered in the state of New York.

C. Education: The Lead Architect shall have a bachelor's degree or equivalent.

D. Experience: The Lead Architect shall have a minimum of fifteen (15) years demonstrated experience in transit or commuter rail based railroad architectural design, including a minimum of ten (10) years of experience in the design of railroad station structures including code compliance and NFPA 130.

E. Past Project Value: Experience shall include at least one (1) construction project having a construction value in excess of $100,000,000.

2.2.6.12 Lead Electrical Engineer

A. Responsibilities: The Lead Electrical Engineer shall be responsible in power design.

B. Licenses: The Lead Electrical Engineer shall be a licensed Professional Engineer registered in the state of New York.

C. Education: The Lead Electrical Engineer shall have a bachelor's degree or equivalent.

D. Experience. The Lead Electrical Engineer shall have a minimum of fifteen (15) years of demonstrated experience in designing traction power systems with emphasis on DC traction power distribution and third-rail layout with a sound understanding of the track/signal interface for new track/interlocking construction.

E. Past Project Value: Experience shall include at least one (1) construction project having a construction value in excess of $50,000,000.

2.2.6.13 Lead Signal Engineer

A. Responsibilities: The Lead Signal Engineer shall be responsible for signal design.

B. Licenses: The Lead Signal Engineer shall be a licensed Professional Engineer registered in the state of New York.

C. Education: The Lead Signal Engineer shall have a bachelor's degree or equivalent.

D. Experience: The Lead Signal Engineer shall have a minimum of at least fifteen (15) years demonstrated experience in designing for construction of railroad signaling systems which are similar in complexity and comparable in size with this Project. The emphasis of project experience shall involve AC track circuits, Vital Processor Logic Controller (VPLC), Color Light Signaling, Grade Crossings, Automatic Speed Control Testing, and switch machines and controls and PTC implementation. The Signal Engineer shall also have a full understanding of vital and non-vital hardware/software of railroad projects of comparable size and complexity and an understanding of railroad operations, block and aspect designs, software/hardware integration in testing, experience in cab signal design, and developing cutover schemes to allow the Railroad to maintain its operations during construction of the new track. The emphasis of project experience shall involve AC track circuits, Vital Processor Logic Controller (VPLC), Color Light Signaling, Grade Crossings, Automatic Speed Control Testing, and switch machines and controls.

E. Past Project Value: Experience shall include at least one (1) construction project having a construction value in excess of $50,000,000.

2.2.6.14 Systems Integration Engineer

A. Responsibilities: The Systems Integration Engineer shall be responsible for System Integrations design.

B. Licenses: The Systems Integration Engineer shall be a licensed Professional Engineer registered in the state of New York.

C. Education: The Systems Integration Engineer shall have a bachelor's degree or equivalent.

D. Experience: The Systems Integration Engineer shall have an equivalent of ten (10) years of design of system integrations on transit or commuter rail projects.

E. Past Project Value: Experience shall include at least one (1) construction project having a construction value in excess of $100,000,000.

2.2.6.15 Rail Operations Specialist

A. Responsibilities: The Rail Operations Specialist shall be responsible for coordination of flagging for Project related single track and double track outages..

B. Licenses: Not used.

C. Education: High school diploma or equivalent.

D. Experience: The Rail Operations Specialist Shall have a minimum of ten (10) years demonstrated experience in railroad scheduling and operations, and who shall be responsible for coordinating with the Railroad regarding flagging, use of Design-Builder's equipment on or near the ROW, and scheduling of work that affects Railroad operations including outages.

E. Past Project Value: The Rail Operations Specialist shall have experience on at least one transit or commuter rail project with a capital construction cost of no less than $50,000,000.

2.2.6.16 Designer of Record

A. Responsibilities: The Designer of Record shall be responsible for signing and sealing the design packages, and for certifying that work has been performed in accordance with the requirements of the Contract Documents and the Design-Builder's Released For Construction Documents.

B. Licenses: The Designer of Record shall be a licensed Professional Engineer or Architect in the State of New York.

C. Education: Designer of Record shall have a bachelor's degree or equivalent.

D. Experience: The Designer of Record shall have at least 10 years of relevant design experience.

E. Past Project Value: The Designer of Record shall have experience on at least one transit, commuter rail, or highway project with a capital construction cost of no less than $50,000,000.

2.2.6.17 Environmental Compliance Manager

A. Responsibilities: The Environmental Compliance Manager shall report directly to the Design-Builder's Project Manager and shall have the primary responsibility for ensuring that all of the Project's Environmental requirements are satisfied.

B. Licenses: Occupational Safety and Health Administration (OSHA) 40-Hour Hazardous Waste Site Operation (HAZWOPER) certification.

C. Education: The Environmental Compliance Manager shall have a Bachelor's degree or equivalent.

D. Experience: The Environmental Compliance Manager shall have a minimum of 10 years demonstrated experience in the environmental permitting process, environmental design, and construction management and compliance on large, complex transportation or Railroad projects with complex environmental permitting requirements and commitments. This experience shall be in relation to federal permitting requirements and environmental regulatory agencies and shall also include experience of New York State permitting requirements.

E. Past Project Value: Experience shall include at least one (1) construction project having a construction value in excess of $100,000,000.

2.2.6.18 Design-Builder's Chief Safety Officer

A. Responsibilities: The Chief Safety Officer shall be responsible for oversight of the Design-Builder's project system safety during all project phases including design, construction, start-up, commissioning, and testing. The Chief Safety Officer and the Design-Builder's safety organization shall be independent from the staff and duties associated with the execution/production of the Work

B. Licenses: Not used.

C. Education: The Chief Safety Officer shall have a bachelor's degree or equivalent.

D. Experience: The Chief Safety Officer shall have a minimum for 20 years' experience in transit or rail project in similar roles.

E. Past Project Value: The Design Builder's Chief Safety Officer shall have experience as a Chief Safety Officer on at least one transit, commuter rail, or highway design-build project with a capital construction cost of no less than $250,000,000.

2.2.6.19 Safety Manager

A. Responsibilities: The Safety Manager shall report directly to the Design-Builder's Chief Safety Officer and shall be available on the site for the duration of the Project. The Safety Manager shall be independent of the physical construction effort and shall be available full-time to fulfill the requirements of the Contract. The Safety Manager shall have the authority to stop Work when unsafe conditions are present.

B. Licenses: The Safety Manager shall at a minimum have successfully completed the 30-hour OSHA course on Construction Safety and Health (29 CFR 1926). The Railroad may accept other safety certifications or safety training in lieu of the foregoing.

C. Education: High school diploma or equivalent.

D. Experience: The Safety Manager shall have a minimum of fifteen (15) years demonstrated experience in the management of complex infrastructure projects, which

shall include at least five (5) years of major construction management of major bridges. Shall be familiar with FRA work zone safety regulations and shall have at least 10 years of experience working with OSHA regulations.

E. Past Project Value: The Safety Manager shall have experience on at least one transit or commuter rail project with a capital construction cost of no less than $100,000,000.

2.2.6.20 Lead Scheduler

A. Responsibilities: The Lead Scheduler shall be responsible for the Project Schedule.

B. Licenses: Not used.

C. Education: High school diploma or equivalent.

D. Experience: The Lead Scheduler shall have at least 10 years of relevant scheduling experience.

E. Past Project Value: The Lead Scheduler shall have experience on at least one transit or commuter rail project with a capital construction cost of no less than $100,000,000.

2.2.6.21 Outreach Program Manager

A. Responsibilities: The Outreach Program Manager shall be responsible for the preparation and development of material required for the ongoing public outreach program and notification during construction in conjunction with the Railroad.

B. Licenses: Not used.

C. Education: High school diploma or equivalent.

~~D.~~ Experience: The Outreach Program Manager Shall have demonstrated experience managing and implementing public outreach programs for complex transit or commuter rail projects in a community environment.

E. Past Project Value: $50,000,000.

2.2.6.22 M/WBE SDV Program Manager

A. Responsibilities: M/WBE SDV Program Manager shall be responsible for monitoring all Civil Rights Compliance requirements and achieving the DBE goals and EEO goals described in the Contract documents. The M/WBE SDV Program Manager shall organize, implement, and direct a DBE program for the Railroad; consult with and advise management on a wide variety of DBE and contract compliance issues; prepare and present concise, logical oral and written reports; interpret and apply applicable laws, policies, regulations and procedures; and establish and maintain cooperative working relationships with the prime Design Builder's community, M/WBE s and M/WBE associations, and local community based organizations.

B. Licenses: Not used.

C. Education: High school diploma or equivalent.

D. Experience: The M/WBE SDV Program Manager shall have demonstrated experience implementing M/WBE Programs for complex transit or commuter rail projects.

E. Past Project Value: $50,000,000.

2.2.7 Summary of Submittals

Item	Section	Submittal	Action
1	2.2.4	Resumes and References	Review and Approval

END

2.3 DESIGN

2.3.1 Section Includes

A. This section sets out requirements relating to the development of designs by the Design-Builder, and design review processes.

B. Designs will need to be developed for each of the following types of work:

1. Designs for Railroad related work to be constructed by the Design-Builder.
2. Designs for Railroad related work to be constructed by others, including Railroad forces.

C. For Commissioning, Acceptance, and Maintenance Plan (CAMP) requirements, see TP4.2 CAMP

2.3.2 Codes and References (Not Used)

2.3.3 Design Requirements

A. The Design-Builder shall provide design studies, reports, documents, plans, and specifications as required by the Contract Documents, and as required for the Design-Builder to provide a complete Project in accordance with the requirements of the Contract Documents. The Design-Builder shall:

1. Manage and perform the Design Work pursuant to the requirements of the Contract Documents.
2. Manage and perform the Quality Control and Quality Assurance for the Design Work.
3. Manage, coordinate, and obtain all necessary approvals and permits from Railroad, NYSDOT, Utility Owners, and AHJs.
4. Prepare all Design Documents under the direct supervision of the Design-Builder's Designer of Record.
5. Verify pertinent dimensions and other relevant existing conditions in the field prior to the Submittal of the design plans.

B. In addition to the Contract Documents, the Design-Builder shall comply with all other applicable engineering codes and standards, including those of the various Federal, State, and local jurisdictions. Codes, standards and/or manuals in effect on the proposal due date shall be applicable to the Project.

C. Design plans and specifications, together with all pertinent supporting documents and data, shall be subject to Review by Railroad, NYSDOT, Utility Owners, and or AHJs as appropriate.

D. Third Party, Utility, County or locality specific requirements, to the extent cited, apply only with respect to that portion of the Work performed for such Third Party, Utility Owners, County, or AHJ.

2.3.4 Integrated Design Process

A. The Design-Builder shall utilize an integrated design process to design all elements of the Project in a synchronized manner so that the Project is designed as an integrated whole and functions effectively and efficiently for the intended purpose.

B. The Design-Builder shall identify all requirements, including design, construction, operations, and maintenance that apply to the design of each element of the Project.

C. The Design-Builder shall address the highest-level performance requirements as matters of priority to determine the impact of these requirements on each element of the Project.

D. The Design-Builder's integrated design process shall identify, catalog, and track the status of all interfaces between different elements of the Project. Interface management shall include the assignment of design responsibilities, coordination requirements, the completion of the designs, the assignment of construction responsibilities, the assignment of inspection responsibilities, the assignment of test responsibilities, and the execution of inspections and tests to demonstrate the correct functionality of the interfaces.

E. The Design-Builder shall provide coordinated services inclusive of reviews and permitting by Railroad, Utility Owners, and Third Parties.

F. The Design-Builder’s design process shall demonstrate to Railroad through each design submission that individual elements have been designed to integrate with the Project as a whole and will support the intended purpose.

2.3.5 Design Units

A. A Design Unit is a distinct portion of the Project of which the design is performed as a contiguous, integrated unit.

B. The Design-Builder shall package all calculations, designs, and drawings for the Work into separate Design Units and, if necessary, sub-units. Design of each Design Unit or sub-unit shall be performed in a contiguous, integrated manner. Each Design Unit shall comprise similar and coherent parts of the Project that can be checked and reviewed as a self-contained package with due consideration for accommodating interfaces with other Project components. The following are examples of a design unit:

1. A bridge abutment.
2. An earth retaining structure.
3. A roof of a station.

C. Within 20 Calendar Days of LNTP, the Design-Builder shall provide a written report and schedule updating information submitted with the Design-Builder’s Proposal and identifying each Design Unit. The Design-Builder shall prepare and submit the Design Unit report to the Railroad for Review and Comment. The written report shall include the following:

1. Design Unit description, including scope of design Work within each Design Unit (including sub-units, if necessary), including limits and interface points.
2. Planned review stages and dates, including specific information to be reviewed, planned review dates (measured from NTP or LNTP date, as appropriate) and percent complete represented by each review.
3. Responsible Engineer for the Design Unit.
4. Locations where design Work will be performed.

2.3.6 Project Elements

A. Note that designs shall be organized into Project Elements as set out in TP4.1 PROJECT ELEMENTS AND ACCEPTANCE.

B. All Design Units shall be included in a Project Element. The Design-Builder shall coordinate its design work so that all design items are included in one, and only one, of the Project Elements.

2.3.7 Design Document Organization

The Design-Builder shall arrange Design Documents in a systematic order and identify them with alpha/numeric designations based on discipline designations, locations, and sequential numbering in accordance with the AHJ's CADD Standards.

2.3.8 Design Certification

The Design-Builder shall provide Design Certification by the Project Manager, and Designer of Record and the Quality Manager that each design Submittal is:

A. Consistent and compliant with all applicable requirements of the Contract Documents.

B. Consistent with all other elements of the Project.

C. Accurate, complete, and in a form and level of detail that is appropriate to the design stage to which it applies.

D. Coordinated among all requirements of the Contract Documents.

2.3.8.1 Supervision and Seals

A. Prior to delivering any Released for Construction Documents to Railroad or to any of the Design-Builder's construction teams:

1. The contents of the Release for Construction Documents shall be individually signed and sealed by the licensed Professional Engineer or Architect under the laws of the State of New York responsible for the specific content included in the documents.

2. The Designer of Record shall sign and seal the title sheet.

B. Prior to delivering any Permittable Items Package to Railroad or to any of the Design-Builder's construction teams, the contents of the Permittable Items Package shall be individually signed and sealed by the licensed Professional Engineer under the laws of the State of New York responsible for the specific content included in the documents.

2.3.9 Design Exceptions and Waivers

A. Requests for Design Exceptions or Design Waivers shall be considered a Deviation in accordance with the VOLUME 1 – DESIGN-BUILD AGREEMENT (DBA), and shall be submitted to Railroad, Utility Owners, and Third Parties as required, for Review and Approval.

B. The Design-Builder shall be solely responsible for acquiring approval from Railroad, Utility Owners, and Third Parties as may be required.

C. The Design-Builder shall obtain all necessary Deviation approvals before submission of Final Design Documents.

2.3.10 Existing Conditions

The Design-Builder shall ensure that the condition of existing buildings, structures, roadways, sidewalks, paths, trails, lighting, and signal equipment, or other property that is to remain in place or is to be modified is not adversely affected by the performance of the Work. The Design-Builder shall perform appropriate property pre-condition surveys and associated monitoring, and shall repair any damage determined to be caused by the Work.

2.3.11 Stages of Design Development

A. The Design-Builder shall generally classify design Submittals in accordance with the design stages set out below, taking into account that for permittable items and for some discipline specific work, different design stages may be required:

1. Conceptual (Fifteen Percent) Design / Preliminary (Thirty Percent) Design.
2. Intermediate (Sixty Percent) Design.
3. Final (Ninety Percent) Design.
4. Released For Construction Documents.
5. Conformed Release For Construction Documents.

B. Once all review comments have been addressed, the Final Design documents may be issued as “Released For Construction Documents”.

C. The Design-Builder shall determine the appropriate level of design completion for each stage using the requirements of the Contract Documents, Good Industry Practice, and the designated Submittal requirements for each stage in order to ensure all Project requirements are met. The Design-Builder may request that different levels of design approval be provided for, subject to approval by the Railroad.

2.3.11.1 Conceptual (Fifteen Percent) Design / Preliminary (Thirty Percent) Design

A. The Design-Builder shall provide a Conceptual (Fifteen Percent) Design Submittal unless a Preliminary (Thirty Percent) Design Submittal is required to be submitted in Technical Provisions.

B. Conceptual (Fifteen Percent) design submission shall represent conceptual design of the character and all features of the project and serve to validate project requirements and the construction cost. The Design-Builder shall prepare and submit the Conceptual Designs to Railroad for Review and Comment.

C. Preliminary (Thirty Percent) design submission shall represent preliminary design of the selected features and technical specifications of the project, if required by the specific disciplines, as specified in Technical Provisions. The Design-Builder shall prepare and submit the Preliminary Designs to Railroad for Review and Comment.

2.3.11.2 Intermediate (Sixty Percent) Design

The Intermediate design submission shall represent the overall size, character, and features of the project and serve to thoroughly convey the designer’s intentions, define elements such as major demolition, structural, track work, utilities, earth work, environmental considerations, shoring and temporary support and ancillary, work, operations, and materials. The Design-Builder shall prepare and submit the Intermediate Designs to Railroad for Review and Comment.

2.3.11.3 Final (Ninety Percent) Design

A. The 90 percent design submission shall further the Intermediate design, incorporate comments generated by the Intermediate Design Review and bring construction documents to a substantially complete level. The technical specifications shall be in sufficient detail to complement the ancillary ninety percent (90%) drawings.

B. The construction technical approach shall be refined based upon comments generated by the Intermediate Design Review and the ninety percent (90%) design.

C. The Design-Builder shall prepare and submit the Final Designs to Railroad for Review and Comment.

2.3.11.4 Release For Construction Documents

A. Release for Construction Documents (RFCD) shall be signed and sealed by the Design-Builder, and shall be used by the Design-Builder to construct the Project.

B. The RFCD shall include plan sheets, specifications, shop drawings, working drawings, and other pertinent information as applicable. The RFCD may only be issued by the Design-Builder after all previous comments related to the elements, whether in the subject Submittal or not, have been addressed and appropriately incorporated, non-conformances have been corrected, and appropriate approvals and permits have been obtained.

C. The Design-Builder shall submit Release for Construction Documents to the Railroad for Review and Approval before commencing the Construction Work contained in the RFCD.

2.3.11.5 Conformed Release For Construction Documents

A. The Design-Builder shall at all times maintain a conformed, electronic .dwg and .pdf format, set of all RFCD plans, specifications, and shop drawings. The conformed RFCD shall also include formally issued revisions made after release for construction, but are not construed as as-built records.

B. The conformed RFCD shall be electronically accessible to the Railroad from Project and remote locations at all times. The conformed RFCD shall contain master indexes such that relevant plans, specifications, or shop drawings can be easily located.

C. The Design-Builder shall prepare and submit the Conformed Release For Construction Documents to the Railroad for Information.

2.3.12 Interface Management

A. The Design-Builder shall implement an interface management process to ensure that all elements of the Project, systems, and facilities interface with each other and with outside systems, elements, and facilities throughout the design life.

B. The disciplines requiring interface monitoring include interfaces within a single discipline, interfaces between disciplines, interfaces with disciplines outside the Project but within the Railroad, and interfaces with Third Parties and Utility Owners. These interfaces are defined further as:

1. Project to Project within a single discipline or sub discipline. E.g. communications/CIB to communications/telephones.
2. Project discipline to other Project disciplines. E.g. communications cables with Station conduits.
3. Project disciplines to existing Railroad systems and equipment. E.g. Project LIRR CIB network with existing LIRR CIB network.
4. Project disciplines to non-Railroad external systems, if any.
5. Project disciplines to various Railroad departments (e.g. CCTV cameras to Security).

C. There are two classifications of interfaces:

1. Equipment to equipment Interfaces.

2. Equipment to human interfaces.

2.3.12.1 Systems and Facilities

The Project systems and facilities interface with each other and with outside systems and facilities. The Design-Builder shall include all elements of the Project in the interface control process.

2.3.12.2 Project External Interfaces

The Design-Builder shall provide interfaces with other systems and facilities that are external to the Project, including, at a minimum:

A. Existing Railroad systems and equipment.

B. Railroad systems to be constructed by others to support the Project.

C. Systems and facilities to be constructed by the Design-Builder for Third Parties and Utility Owners as part of the Project.

D. Existing and to be constructed by others systems and facilities owned and operated by Third Parties and Utility Owners. These include, but are not limited to, traffic signal systems, Utilities, PSE&G supply power, and existing municipal road and bridge infrastructure.

E. Physical locations of Railroad departments where Railroad employees are tasked with monitoring of Project systems.

2.3.12.3 Internal Equipment to Equipment Interfaces

The Project operational systems and facilities shall interface and operate with each other efficiently. These interfaces include three sub-categories of interface:

A. System to system interfaces are mostly communication-based interfaces that implement electronic hand shaking between two systems. This type of interface consists of physical and/or logical connections between two interfacing systems and information (voice/ video/ data) that is transmitted between them, and shall include a communication protocol (e.g. Transmission Control Protocol/Internet Protocol or other) that governs the nature of the information transmission.

B. System to facility interfaces include physical interfaces in which a facility may provide a physical support for a systems device or an electrical/electronic interface in which a system may control or monitor the status of a facility element.

C. Facility to facility interfaces are the physical coordination of different facilities elements and typically involve form, fit, and structural integrity (e.g. embedded conduit or equipment rooms).

2.3.12.4 Equipment to Human Interfaces

A. Systems shall interface with human operators through numerous conventional means which are established by building codes and also, for more complex functions, by Graphical User Interfaces (GUI) implemented on systems workstations. The workstations shall be provided, as a minimum, as elements of the Train Control, Traction Power, communications, control and monitoring, fire, and security, and MEP systems. These interfaces shall allow the operations and maintenance personnel to view the information presented in an ergonomic and logical format, and to interact with the systems for

changing views, issuing commands, and performing other related functions. These interfaces may include existing standard designs and custom designs based on functional requirements and ergonomic factors. The Design-Builder shall furnish, install, program, and configure these GUIs and workstations, including the updating of all GUI databases as required.

2.3.12.5 Interface Management

The Design-Builder shall develop and execute an interface management program to identify and develop all interfaces and integration needed to support the Project and including all necessary steps to be taken throughout the design, construction, and testing of the Project. This interface management program shall include, at a minimum, the following steps:

A. Identification and classification of all interfaces – a process initially conducted during Preliminary Design and then updated as necessary throughout the rest of the Project by which the Design-Builder shall review all Project requirements to identify and define the interfaces.

B. Assignment of responsibilities among the Design-Builder's organization for designing, constructing, and testing the interfaces.

C. Specification and deployment of tools required to manage and organize interfaces, present attributes clearly, and allow all stakeholders to coordinate interfaces.

D. Definition and design of interface attributes and functionality, including physical connection, data type, medium, and other interface details as appropriate.

E. Formal sign-off by the responsible designers and/or operators on all sides of the interface that the interface design is acceptable.

F. Means (inspection or test) to be used to verify the correct functionality interfaces.

G. Provision for continued peer review of identified and new interfaces, and revisiting the process before each.

2.3.12.6 Interface Control Manual (ICM)

A. The Design-Builder shall develop and maintain a comprehensive ICM. This manual shall include two key tools for managing interfaces:

   1. The Interface Control Matrix – a database to track all details and design, manufacture, construction, and testing responsibilities for each interface.
   2. The Interface Control Form – to collect input data for the Interface Control Matrix.

B. The Design-Builder shall define both of these documents.

C. For the 30% Design, the Design-Builder shall prepare and submit for Review and Comment the initial ICM, including the Interface Control Matrix, the database, and the Interface Control Form. The Design-Builder shall provide a means to confirm that the interface has been coordinated and accommodated in the associated systems and affected system, facility, or human counterpart.

D. For the 60% Design, the Design-Builder shall prepare and submit for Review and Comment the current version of the Interface Control Manual, including the Interface Control Matrix, the supporting database, and the Interface Control Form. The Design-Builder shall provide a means to confirm that the interface has been coordinated and

accommodated in the associated systems and affected system, facility, or human counterpart.

E. For the Final Design, the Design-Builder shall prepare and submit for Review and Approval the current version of the ICM, including the Interface Control Matrix, the supporting database, and the Interface Control Form. The Design-Builder shall provide a means to confirm that the interface has been coordinated and accommodated in the associated systems and affected system, facility, or human counterpart.

F. After the completion of Integration Testing, The Design-Builder shall update the ICM as a Record Document and submit for Information.

G. As an alternative to the above listed Interface Control Manual Submittals, the Design-Builder may provide personnel as designated by Railroad with continuous access to the Design-Builder's interface management system.

2.3.12.7 Interface Control Tools

A. Figure 2.3.1.7 identifies the documentation that shall be developed to support the Interface Control process:

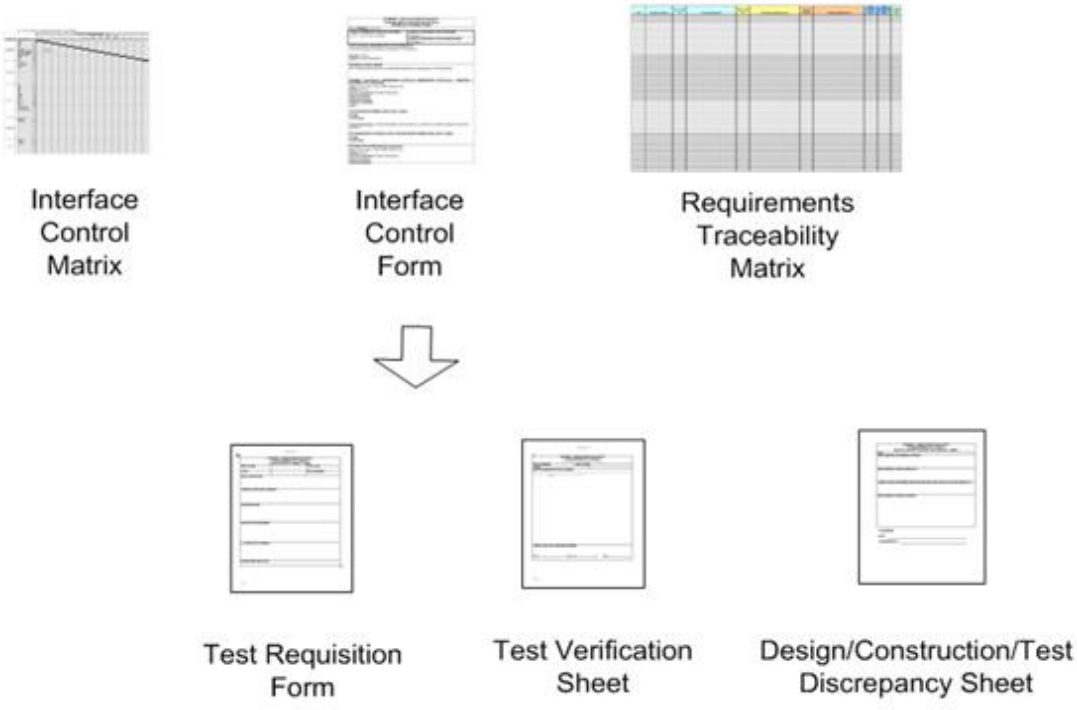


Figure 2.3.1.7 – Interface Management Document/Tool Structure

B. The Design-Builder shall use the following tools or alternate functional equivalents to identify and document interfaces: data flow diagrams and accompanying interface descriptions, the Interface Control Matrix, Interface Control Forms, and detailed system interface diagrams. The following sections describe these interface control tools.

2.3.12.8 Data Flow Diagram and Accompanying Interface Descriptions

A. The data flow diagram shall facilitate the identification of System and GUI between core systems and external systems. These are shown as bubble diagrams depicting which systems have interfaces and how that interface functions (one-way or two-way) via arrows. The Design-Builder shall submit the data flow diagram as part of the design documentation for each facility and system.

2.3.12.9 Interface Control Matrix

A. The Interface Control Matrix shall show all of the Project systems' and facilities' internal and external interfaces. Each interface shall be assigned a unique designation for tracking purposes. The details of each interface shall be captured in a separate Interface Control Form with a title and filename corresponding to this numbering scheme. Therefore the Interface Control Matrix shall indicate interface(s) between core and target systems, and point the reader to where the details of that interface can be found.

2.3.12.10 Interface Control Forms

A. Using the data flow diagram, Interface Control Matrix, and associated numbering scheme, a unique alphanumerical name shall be assigned to each interface shown in the initial data flow diagram. The interface control forms shall capture and be used to verify that all of the interface data is acknowledged, coordinated, and incorporated into the system and shall be tested.

B. The interface management process shall document several attributes for each interface. These attributes shall provide detailed characteristics of each interface such that further definition can be provided.

2.3.12.11 Detailed System Interface Diagrams

The detailed system interface diagrams shall include the following items at a minimum:

A. All equipment such as devices, control panels, patch panels, workstations, hardware firewalls, servers, clients.

B. Connectivity to all equipment in remote locations, including communications rooms and elevators, along with connections to other communication systems and external systems.

C. A legend that shows the physical type of connection (such as RS232, RS-422, RS-485, IP Ethernet (10BT/100BT/1000BT), contact closure) with appropriate notes such as RS-485 Full duplex connection allows up to 256 devices per system controller at up to 4000 foot distances.

D. A legend that shows the types of traffic (type of data e.g. IP (unicast, multicast) local/remote client/server connections and/or peering capability.

E. All point-to-point and/or point-to-multipoint site connectivity shall be included.

F. The interfaces to other communication systems and specific types of data interfaces (analog or data) such as RS-232,422, or 485; copper or fiber optics; data rate speeds required (kbps);, VLAN (IEEE 802.1q) capability; IEEE 802.1p MAC Quality of Service (QoS) prioritization capability; and Layer 3 Diffserv QoS capability.

G. All necessary equipment details and network connectivity specifics, including client/server connectivity, Layer 2 VLAN assignments, and Layer 3 routing between associated equipment (if applicable) between the OCC and remote sites.

H. Equipment redundancy and cable redundancy if applicable.

I. The head-end physical and software requirements (Open Architecture e.g. HP OpenView).

J. A recommended QoS assignment that ensures that the data flow is without significant packet congestion or packet delay.

K. The PSTN connectivity and its specific equipment and interface types to allow backup recovery.

L. Interface details to the existing Railroad equipment/locations if applicable.

2.3.13 Common Design Documents

A. Certain types of Design Documents are required for all elements and engineering disciplines. In addition to the Submittal requirements listed in each Section of the Technical Provisions, the Design-Builder shall prepare and submit the following Design Documents for every element and engineering discipline.

2.3.13.1 Design Criteria Report

A. The Contract Documents provide design criteria for some elements. The Design-Builder shall develop design criteria for the remaining elements. The Design Criteria Report shall identify how the requirements of the Contract Documents have been interpreted in terms of the configuration, performance, and all other requirements.

B. The first submittal related to an element shall include, or be preceded by, a Design Criteria Report. The Design-Builder shall prepare and submit the Design Criteria Report to the Railroad for Review and Comment.

2.3.13.2 Basis of Design Report

A. The Design-Builder shall create and maintain a comprehensive Basis of Design Report (BODR) for the Project.

B. The first submittal related to a element shall include a BODR. Each BODR submitted shall be a portion of the overall BODR.

C. The Design-Builder shall submit the Basis of Design Report Record Document for Review and Comment upon completion of all elements of the BODR.

D. The BODR Record Document shall be logically organized wherein each of the major Work elements are organized, including:

1. Table of Contents.
2. Executive Summary.
3. Project Controls.
4. Design Work.

E. The BODR shall address the following as applicable to each element:

1. Design methodology and approach.
2. Key assumptions:

i. Identify applicable design criteria, considerations, influences, and factors.

ii. Identify concurrent design activities.

iii. Identify construction approach, including sequence, phasing and staging (if applicable).

iv. Identify any deviations from the FEIS and any associated revisions to governmental approvals.

2.3.13.3 Specifications

A. Written specifications shall be provided that document the requirements for materials, equipment, systems, standards and workmanship for the Work and performance of related services. Every submittal starting with Intermediate Design shall include specifications.

2.3.13.4 Calculations

A. The Design-Builder shall prepare and submit calculations for Design Units including but not limited to structural elements, final geometry, pavement, hydraulics, hydrology, storm water management, mechanical, electrical, plumbing, track, and systems (systems includes traction power, signals and train control, communications, and security systems). The Design-Builder shall prepare and submit calculations necessary to support that the design meets all Contract requirements.

2.3.13.5 Revisions to Design

A. The Design-Builder shall deal with any changes to design initiated by the Design-Builder as an entirely new design. The Design-Builder shall not be entitled to any increase in the Contract Price or extension of time in such circumstances.

2.3.13.6 Design Changes Before Construction

A. Design changes may occur prior to construction or may occur after final design, and may be initiated by the Design-Builder or the Railroad. For all design changes requiring calculations, the Design-Builder and the Designer of Record shall conduct a documented check of all calculations. All design changes requiring alteration of design documents released for construction shall undergo all review and certification procedures included for original design documents in the Design-Builder's Quality Program.

2.3.13.7 Design Support During Construction

A. The Design-Builder shall verify during construction that the conditions actually encountered are consistent with the design and related Contract Documents. The Design-Builder shall prepare necessary adjustments in the Contract Documents, and the Design-Builder shall obtain required Railroad approval. The Design-Builder and the Designer of Record shall check any such changes in accordance with the requirements of the Contract Documents. The Designer of Record shall certify the change in writing as meeting the Contract requirements. The Design-Builder shall incorporate the adjustments in the As-Built Plans. The Design-Builder shall retain copies of the Designer of Record's written certifications and submit the certifications to the Railroad.

2.3.14 Design Coordination

2.3.14.1 Design Workshop

A. Within 21 Calendar Days of LNTP, the Design-Builder shall arrange a design workshop to familiarize the Design-Builder's personnel, Railroad staff, and others associated with design to review design concepts, issues, status, and review procedures. The Railroad and the Design-Builder shall jointly develop the agenda of the workshop and how it will be organized (e.g., by Design Unit and engineering discipline). The intent of the workshop is to make the subsequent Design Reviews more effective and efficient for all parties. The workshop will focus on a review of the critical design elements and criteria and on how the Designer plans to organize its design and conduct the reviews.

2.3.14.2 Over the Shoulder Reviews

The interaction between Designer and Railroad staff will be continuous throughout the design process through the "over-the shoulder" reviews that typically would consist of activities, such as:

A. Participating in design meetings.

B. Responding to design requests for information or clarification.

C. Auditing of design quality process and records.

2.3.15 DB Design For Construction To Be Done By The Railroad

2.3.15.1 Construction Documents for Work by Railroad

The Design-Builder shall provide Construction Documents for Work by Railroad of such a nature as to develop a finished product in accordance with the Design Plans and Contract Documents.

A. The Construction Documents for Work by Railroad include, but are not limited to, the following:

1. Material and product data from Manufacturers.
2. Calculations.
3. Working drawings, prepared by the Design-Builder to supplement the Final Design documents and specify additional details and procedures for construction of the Project, as applicable, including the following:

i. Construction details.
ii. Demolition Plans.
iii. Erection plans.
iv. Fabrication plans.
v. Transportation plans.
vi. Storage plans.
vii. Field design change plans.
viii. Shop drawings.
ix. Lift plans / staging drawings.

x. Bending diagrams for reinforcing steel.

xi. Falsework plans.

xii. Other Plans required to adequately describe the Work in accordance with the Contract.

xiii. Similar data required for the successful completion of the Work.

2.3.15.2 Certification of Construction Documents for Work by Railroad

Construction Documents for Work by Railroad shall be reviewed and signed by the Designer of Record.

2.3.15.3 Review of Construction Documents for Work by Railroad

The Design Builder shall arrange for the Railroad's review and comment of the Construction Documents for Work by Railroad for each phase of design development, including Conceptual/Preliminary, Intermediate, and Final Design, and other design stages if required in discipline specific areas or as required by governmental agencies or for permittable items.

2.3.16 Summary of Submittals

Item	Section	Submittal	Action
1	2.3.5	Design Units Report	Review and Comment
2	2.3.9	Request for Design Exceptions or Design Waivers	Review and Approval
3	2.3.11.1	Conceptual (Fifteen Percent) Design/Preliminary (Thirty Percent) Design	Review and Comment
4	2.3.11.2	Intermediate (Sixty Percent) Design	Review and Comment
5	2.3.11.3	Final (Ninety Percent) Design	Review and Comment
6	2.3.11.4	Release for Construction Documents	Review and Approval
7	2.3.11.5	Conformed Release for Construction Documents	Information
8	2.3.12.6	Interface Control Manual – Thirty Percent Design	Review and Comment
9	2.3.12.6	Interface Control Manual – Sixty Percent Design	Review and Comment
10	2.3.12.6	Interface Control Manual – Final Design	Review and Approval
11	2.3.12.6	Interface Control Manual – Record Document	Information

12	2.3.13.1	Design Criteria Report	Information
13	2.3.13.2	Basis of Design Report Record Document	Review and Comment
14	2.3.15.1	Construction Documents for Work by Railroad	Review and Approval

END

2.4 GEOTECHNICAL

2.4.1 Section Includes

This section sets out requirements for geotechnical work, including testing, the preparation of reports, blasting work, and the protection of existing structures and facilities.

2.4.2 Codes and References (Not Used)

2.4.3 Design Requirements

2.4.3.1 Geotechnical Work Plan

A. The Design-Builder shall prepare a geotechnical work plan for the Project. The plan shall identify the required geotechnical scope of work that the Design-Builder plans to complete for the design and construction of the Project. The geotechnical work plan shall include the following:

1. The Design-Builder's knowledge and understanding of the geotechnical, geologic, hydrogeology and seismic settings of the Project Site and how the nature and behavior of the soil, rock, groundwater and subsurface conditions will affect the investigation, design and methods of construction.
2. Anticipated methods of analysis and design for the structure foundations and a discussion of the foundation optimization process and rationale for selection of the foundation types.
3. Identify key Project constraints and describe how the geotechnical activities will be designed and constructed to meet these constraints.
4. Identification of all principal geotechnical deliverables and activities.
5. A narrative describing the approach to quality control during design and construction of the geotechnical Works.
6. A risk register identifying all major design and construction risks of the geotechnical activities, and describe how these risks are managed and mitigated.
7. Resumes of the Lead Geotechnical Engineer, Geotechnical Instrumentation Engineer, and Seismic Specialist.
8. Types of subsurface investigations to be carried out for the geotechnical design, including minimum number and depth of borings and other field testing with a narrative of the in-situ tests and laboratory tests to be carried out.
9. Minimum numbers, and types of axial load tests for each foundation type, size and subsurface condition.
10. Minimum numbers, and types of lateral load tests for each foundation type and subsurface condition.
11. Minimum percentage and/or numbers of driven piles as tested piles to be dynamically tested.

B. Crosshole sonic logging shall be done on all drilled shafts according to NYSDOT specifications. Thermal integrity profiling shall be done on all demonstration shafts, in addition to the first three production shaft of each diameter size. Thermal integrity data shall be collected continuously and remotely through embedded sensors.

2.4.3.2 Geotechnical Investigation Plan

A. The Design-Builder shall prepare a geotechnical investigation plan, including specifications for performing the Work. The geotechnical investigation plan shall include the criteria or rationale used in developing the plan, and shall identify the locations of all field investigation sites, and borings, together with their depths, sampling intervals, and a description of both the field and laboratory testing programs utilized. The geotechnical investigation plan shall be prepared and signed and sealed by the Design-Builder's Designer of Record. The geotechnical investigation plan shall include details of borehole abandonment procedures and a list of all permits required to perform the geotechnical investigation.

B. The Design-Builder shall plan and conduct subsurface investigations in accordance with the NYSDOT and AASHTO Standards for subsurface exploration programs, and as deemed necessary by the Design-Builder's Designer of Record to establish the geotechnical conditions and to perform all geotechnical and foundation design and analysis.

C. The Design-Builder shall determine the coordinate location and ground surface elevation for each boring and field investigation position, and shall show the coordinates, station and offset, and elevation for each individual boring log or investigation record in accordance with NYSDOT standards.

2.4.3.3 Minimum Number of Borings

Table 2.4.3.3 summarizes the minimum number of borings and minimum investigation depths required for various structures.

Table 2.4.3.3 – Minimum Requirements for Subsurface Investigations

Geotechnical Feature	Minimum Number of Borings	Minimum Investigation Depth
Bridge Foundations	1 boring per substructure.	In accordance with AASHTO LFRD Bridge Design Specifications, or greater if required by the Lead Geotechnical Engineer.
Gravity and Fill Type Retaining Walls	Minimum of 1 boring for each required wall. At least 1 boring every 500 feet.	In accordance with AASHTO LFRD Bridge Design Specifications, or greater if required by the Lead Geotechnical Engineer.
Anchored Retaining Walls	Minimum of 1 boring, location 1.5 times the retained height behind the proposed wall for wall length less than 100 ft. Borings spaced at 100-200 ft, located 1.5 times the retained height behind the proposed wall	In accordance with AASHTO LFRD Bridge Design Specifications, or greater if required by the Lead Geotechnical Engineer.

	for wall length of 100 ft or more.	
Sound Attenuation Barriers	Minimum of 1 boring per sound attenuation barrier and at least 1 boring every 500 feet.	As required by the Lead Geotechnical Engineer. However, for shallow foundations, borings shall extend a minimum of 2 times the estimated footing width below the bottom of footing. For deep foundations, borings shall extend a minimum of 20 ft below the pile/shaft tip elevation.
Platforms	Minimum of 3 borings per platform and at least 1 boring every 500 feet.	As required by the Lead Geotechnical Engineer. However, for shallow foundations, borings shall extend a minimum of 2 times the estimated footing width below the bottom of footing. For deep foundations, borings shall extend a minimum of 20 ft below the pile/shaft tip elevation.
Parking Garages	Minimum one boring per 2,500 square ft. or two borings per garage, whichever is greater.	As required by the Lead Geotechnical Engineer. However, for shallow foundations, borings shall extend a minimum of 2 times the estimated footing width below the bottom of footing. For deep foundations, borings shall extend a minimum of 20 ft below the pile/shaft tip elevation.
General Trenchless Pipe Installation	1 boring every 50-200 ft within the proposed area of trenchless pipe installation. Where conditions are diverse, additional borings may be warranted.	In accordance with AASHTO LFRD Bridge Design Specifications, or greater if required by the Lead Geotechnical Engineer.
Jacking and Receiving Pits Trenchless Pipe Installation	1 boring at the anticipated pit locations.	In accordance with AASHTO LFRD Bridge Design Specifications, or greater if required by the Lead Geotechnical Engineer.
Ancillary Structures	As required by Lead Geotechnical Engineer.	As required by the Lead Geotechnical Engineer. However, for shallow foundations, borings shall extend a minimum of 2 times the estimated footing width below the bottom of footing. For deep foundations, borings shall extend a minimum of 20 ft below the pile/shaft tip elevation.

Information from existing borings may be combined by the Design-Builder with the Design-Builder's subsurface investigations to comply with the requirements contained in Table 2.4.3.3.

2.4.3.4 Test Boring Procedures

A. A Geotechnical Inspector is required to be on-site full time during drilling to make a preliminary identification of soils according to the Unified Soil Classification System (USCS). Perform borings at locations shown on the boring location plan approved by the Railroad.

B. Test boring termination depth criteria shall be as indicated in Table 2.4.3.3 above.

C. Split Spoon Sampling in Overburden:

1. Obtain Standard 2-inch OD split-spoon samples in accordance with ASTM D1586, except as modified herein.
2. Test borings shall be performed in a continuous sampling manner to a depth of 15 ft and at 5-ft intervals thereafter. Continuous sampling is defined as the taking of 24-inch drive samples at continuous intervals between tops of succeeding samples. Support holes in the overburden by casing or drilling fluids.
3. Where soil is uniform retain that portion of the sample soil column between the points of 6 and 18 inches. Where soil type changes within the sampler, take samples of each soil type. Place soil samples in clean, new, 16 oz. glass jars with tightly fitting screw lids, and of sufficient opening to accept the 2-inch samples. Supply each jar with a water resistant label with the following information: project, date, boring number, sample number, SPT blow count, sample depth, and amount of recovery.
4. Keep complete records of all details of the split spoon sampling operation. This log shall include as a minimum: project name, boring number, driller's name, inspector's name, date/time begun, date/time completed, offset distance from locations shown on the approved boring location plan, sampling interval, description, moisture content and USCS classification of materials encountered in accordance with ASTM D2488, SPT blow counts in accordance with ASTM D1586, type of hammer used (e.g., donut, safety or automatic), sample recovery, water level at completion and at 24 hours after completion, and any unusual conditions encountered.
5. Jar samples shall be stored on the construction site or delivered to a location designated by the Railroad. One or more of these destinations may be designated by the Railroad.

D. Undisturbed Tube Samples:

1. These samples shall be taken if clay, organic silt/clay or peat soil (as defined in ASTM D2488) strata is encountered. A minimum of one (1) undisturbed tube sample shall be taken for every 10 ft of continuous cohesive soils. Follow the standard method described in ASTM D1587 for "Thin-Walled Tube Sampling of Soils" except as modified herein.
2. Collect undisturbed tube samples in offset test boring, by means of unsampled drilling, at a depth indicated by continuous sampling in original test boring.
3. Use stainless steel thin-wall tube samplers capable of obtaining a sample at least 2.8 inches in diameter and 24 inches in length. Driving of the thin wall tube sampler by means of a drop hammer shall not be permitted unless approved by the Railroad. After the sample has been obtained, and immediately upon dismantling

the sampler, clean out the ends of the tube for a depth of 1 inch and install a seal using a low-shrinkage wax that is microcrystalline in quality (Acker Part No. 120284 or equivalent) or mechanical device with O-ring (Acker Soilseal Part No. 120872 or equivalent). Cover the ends of the tube with a cap that is taped in place. The sample shall be stored and moved in a vertical position.

4. Obtain all undisturbed sampling by advancing the sampler a distance not in excess of the inside length of the sampler. Tube samples containing less than 6 inches of undisturbed material are unsuitable for laboratory testing procedures and shall be rejected. Place the material from a rejected sample in a glass jar and label as described below.
5. Indicate on the boring logs and the label on the sample tube, the drilling date, boring number, type of sampler used, sample number, and amount of recovery. Place in glass jars the material removed from the ends of each sample tube in preparation for the placement of the wax or mechanical seal. Label the jars with the same information placed on the tube. When different material is encountered at each end of a sample tube, furnish separate jars and descriptions for each material. When the material from each end is essentially the same, a single jar and description is sufficient. Take particular care to indicate the relative positions of the tops and bottoms of tube samples.
6. Undisturbed Tube samples shall be delivered by the Design-Builder to either the Independent Testing Laboratory or delivered to a location designated by the Railroad.

2.4.3.5 Laboratory Testing

A. The Design-Builder shall select laboratory testing to adequately characterize the soil and rock, support the design parameters, and provide information for evaluation of design alternatives. Testing and methods will be dependent upon the materials encountered and may include, but shall not be limited to the tests listed below:
    1. Particle-Size Analysis (ASTM D422).
    2. Atterberg Limits (ASTM D4318).
    3. Water Content (ASTM D2216).
    4. Consolidation Tests (ASTM D2435).
    5. Direct Shear Tests (ASTM D3080).
    6. Triaxial Tests (ASTM D2850/ASTM D4767/ASTM D7181).
    7. USCS Classification (ASTM D2487).
    8. Unconfined Compressive Strength (UCS) of Rock Test (ASTM D7012).
B. The Design-Builder shall implement corrosion testing, including such tests as sulfate and chloride concentration, organic content, pH, and resistivity, using the general criteria of FHWA NHI-01-031. Laboratory test methods shall be performed in accordance with the appropriate ASTM standards.

2.4.3.6 Subsurface Investigation Records

The Design-Builder shall be responsible for keeping a continuous and accurate log of the materials encountered and a complete record of the operation of progressing the casing. Where

driving is used, a record of the number of blows required to advance the sampling barrel, each 6 inches in the soil where each sample is taken, shall be kept. Records shall be kept using the NYSDOT Subsurface Exploration Log Form (US Units).

2.4.3.7 Software Requirements

The Design-Builder shall develop and maintain an electronic database of subsurface information including in-situ test and laboratory test results, and to produce boring records.

2.4.3.8 Geotechnical Data Report

The Design-Builder shall prepare a geotechnical data report, signed and sealed by the Designer of Record. The geotechnical data report shall serve as a factual depiction of the subsurface conditions and at a minimum it shall include:

A. A detailed description of the investigation methods.

B. Complete records (typed logs using NYSDOT log format) with summary tables of investigation.

C. Complete records with summary tables of laboratory test results.

D. Exploratory hole location plan, showing locations of any existing (pre-award) exploratory holes for which data was used by the Design-Builder plus locations of post-award exploratory hole locations undertaken by the Design-Builder.

E. Plots of laboratory test results versus elevations for separate areas and soil types.

2.4.3.9 Seismic Assessment Report

The Design-Builder shall prepare a seismic assessment report for the Project, including:

A. Evaluation of liquefaction potential. Should this show that liquefaction is a potential hazard at the Site, the risk potential on the Bridge shall be evaluated by the Design Builder, and any remediation solutions proposed by the Design-Builder shall be demonstrated by analytical and field methods.

B. Site-specific seismic response analysis shall be performed to develop design free-field response spectra in accordance with FHWA publication FHWA-NHI-11-032 (http://www.fhwa.dot.gov/engineering/geotech/pubs/nhi11032/nhi11032.pdf). The Design-Builder shall develop dynamic soil/rock properties for use in the seismic analysis based on PS-Logging data as well as widely-used empirical correlations. Spatial variation of ground motions shall be accounted for, as applicable.

C. Seismic soil structure interaction evaluation of deep foundations shall include determination of the maximum imposed curvatures and bending from earthquake ground motions and structure response, including free-field soil strains modified for soil-foundation-structure interaction coupled with deep foundation deformations associated with earthquake loads imparted to the foundation by the structure (i.e. inertial response).

2.4.3.10 Geotechnical Instrumentation & Construction Monitoring Plan

A. The Design-Builder shall develop, implement, and maintain a geotechnical instrumentation and construction monitoring plan to monitor vibrations, accelerations, vertical settlement, and lateral movement of temporary support structures and adjacent ground, and existing

structures and infrastructure during construction including existing bridges, ancillary structures and infrastructure within the zone of influence of construction.

B. Wherever vibration-producing activities could affect a structure, building, or utility, the Design-Builder shall prepare a Vibration Monitoring and Control Plan to address the potential impacts to nearby receptors due to construction or demolition activities associated with this Project. The term "receptor" includes buildings, structures, utilities, and sensitive operations/processes for which construction impacts or Work above recommended limits may be detrimental. The plan shall include ground and air-blast vibration threshold limits.

C. The monitoring plan shall address how the Design-Builder intends to complete vibration-related activities and meet the following minimum requirements:

    1. Develop a list of all anticipated vibration producing activities and where they are expected to occur.
    2. Develop a list of all potentially impacted receptors from these activities.
    3. Provide a vibration susceptibility analysis for each identified receptor, and establish a vibration control limit to preclude damage, including threshold damage, to each of the identified receptors.
    4. Provide a plan for notifying the public of potential vibration impacts, responsible Project personnel, receptors requiring precondition surveys, and vibration monitoring activities.
    5. Monitor construction related ground movement and vibrations at the nearest and most critical receptor(s), and notify appropriate project personnel immediately if established vibration limits are exceeded.
    6. Provide instrumentation locations, monitoring procedures, and a description of the monitoring devices and/or manufacturers' brochures in the submitted plan.
    7. Assess any sensitive community or business operations that may be affected by ground movements and vibrations.
    8. Provide recommendations for vibration-limiting methods to meet the established maximum safe vibration levels.

D. List of receptors shall include:

    1. Existing Bridge foundation elements.
    2. Utilities.
    3. Storage tanks.
    4. Buildings.
    5. Newly constructed elements.
    6. Existing structures within zone of influence of vibration producing activities.

E. The Design-Builder's construction monitoring plan shall include details of the proposed program of instrumentation and monitoring, monitoring frequency, assesses the impacts to existing structures and utilities, establishes threshold values of the monitored parameters, and describes the response plan that will be implemented when threshold parameters are exceeded. Construction monitoring of the existing structure and infrastructure shall include vertical, horizontal, and tilt movements and vibration in sufficient locations as to

determine adequate performance and safety of the existing structure and infrastructure and its foundations during construction.

F. The Design-Builder shall ensure that the instrumentation can be read remotely and that data shall be uploaded to a website provided by the Design-Builder, and which shall be accessible remotely by both the Design-Builder and the Railroad. Remote-access functionality shall include the ability to extract data and to isolate an individual monitoring point or multiple points. The presentation system shall include the functionality to modify the extents and scale of data plotting such that arbitrary views are available.

G. The Design-Builder shall provide weekly construction instrumentation monitoring reports to the Railroad. Monitoring reports shall be interpretive in nature, and shall enumerate any corrections applied to the data including, but not limited to any notification measures taken regarding data. The weekly reports shall include clear and explicit statements of exceedances of any pre-determined threshold values. The Design-Builder shall maintain the instrumentation and monitor the measurements during and after construction up to Final Completion.

2.4.3.11 Foundation Design Reports

A. The Design-Builder shall prepare a foundation design report for all structures included in the Project. The foundation design report shall detail the analysis and design of each foundation element, including any foundation optimization process such as foundation element pile spacing, and shall detail the anticipated total and differential settlements over time. The foundation design report shall be signed and sealed by the Lead Geotechnical Engineer.

B. The following information shall be included in the Foundation Design Report:

1. Subsurface Information**.**

   i. As drilled boring location plan and subsurface profiles along new bridge alignment, and cross-sections, as appropriate.

   ii. Description of geology and subsurface conditions within the Project site.

   iii. Summary of lab and field test results.

2. Recommended Geotechnical Design Parameters**.**

   i. Evaluation of the engineering properties of all soil and rock types, including the expected average and range of soil and rock strengths, index properties and mechanical properties.

3. Design Method and Foundation Recommendations**.**

   i. Design assumptions.

   ii. Design methods.

   iii. Software used.

   iv. Design criteria.

   v. Selection of foundation systems.

vi. Summary of loads.

vii. Summary of resistance.

viii. Foundation recommendations, including type, size, depth, arrangement of foundation elements.

4. Construction Considerations.

i. Obstructions.

ii. Planned field testing programs, including pile and drilled shaft integrity and load testing.

iii. Slope stability, support of excavation and groundwater control considerations.

iv. Time-related settlement and lateral deformation and determination of the resulting effects on adjacent structures.

v. Protection of existing structures and utilities.

2.4.3.12 Foundation Load Testing

A. The Design-Builder shall carry out sufficient axial load tests to verify the design nominal resistance for each production pile/shaft type, diameter and subsurface condition type. For each type and diameter of pile/shaft per subsurface condition type, a minimum of 1% of the total number of piles/shafts but no less than one static load test shall be performed.

B. The Design-Builder shall carry out lateral load tests to verify the lateral resistance for each production pile/shaft type and subsurface condition type. For each type and diameter of pile/shaft per subsurface condition type, a minimum of one static lateral load tests shall be performed. Lateral load tests will not be required for foundation using battered piles to resist applied lateral loads.

C. After completion of a pile/shaft load test, the Design-Builder shall be responsible for either fully removing the test pile from the ground or for cutting off the test pile at 2 feet below final grade.

D. Load Testing for Drilled Shafts:

1. Install demonstration shafts to demonstrate successful drilled shaft installation means and methods prior to installing load test shafts. Perform axial compression load test for each drilled shaft size on demonstration shaft to verify the design assumptions and construction procedures. Select test locations to represent different subsurface conditions and/or construction methods. Perform additional axial load tests based on site variability as specified in the AASHTO LRFD Specifications. If the Design-Builder chooses to alter construction methods, an additional axial load test shall be required on a test shaft constructed with the new method. Perform axial load tests using Osterberg Cell load equipment in accordance with ASTM D1143. Other test methods such as a Statnamic Test are not allowed.

2. Conduct a minimum of one lateral load test for each drilled shaft size and construction methodology. Lateral load testing requirements and details are provided in FHWA publication FHWA-NHI-10-016 (http://www.fhwa.dot.gov/engineering/geotech/foundations/nhi10016/nhi10016.pdf)
3. Perform integrity testing on all demonstration shafts and production drilled shafts. At a minimum, integrity testing requirements shall comprise crosshole sonic logging on all drilled shafts. In addition, the Design-Builder shall carry out thermal integrity profiling testing to investigate the integrity of the cover concrete and the shaft perimeter behavior on all demonstration shafts.

E. Load Testing for Driven Piles

1. Perform a minimum of two axial compression load tests for each pile size, each pile type and subsurface condition type as defined by AASHTO. The additional number of axial static load tests on piles shall be determined by the Lead Geotechnical Engineer, strictly adhering to the effect of their load testing program on the selection of pile design resistance factors given in Table 10.5.5.2.3-1 of the AASHTO LRFD Specifications. Perform a minimum of two axial tensile load tests when piles are designed with resultant uplift forces for each pile size, each pile type and subsurface condition type as defined by AASHTO. Complete load testing in accordance with the requirements and details provided in NYSDOT Static Pile Load Test Manual.
2. Perform a minimum of two lateral load tests for each pile size and for each pile type. Complete load testing in accordance with the requirements and details provided in FHWA Design and Construction of Driven Pile Foundations Reference Manual FHWA NHI-05-42 and FHWA NHI-05-043.
3. Complete all pile load testing for a given size and nominal resistance prior to driving production piles of that size and nominal resistance.
4. Develop production pile driving criteria from the static load test results, dynamic (PDA) test results, static calculations, and wave equation analysis in accordance with FHWA Reference Manual. Include the following in the pile driving criteria:
    i. Hammer type.
    ii. Hammer blow rate along with the stroke.
    iii. Hammer and pile cushion type, size and thickness.
    iv. Hammer blows at the end of initial drive and for restrike.
5. For each substructure supported with driven piles, a minimum of 5% but no less than two of all the piles to be installed within that substructure unit or pile group shall be driven and dynamically tested during the entire initial drive and all restrikes. A pile driving analysis using Pile Driving Analyzer (PDA) shall be used to measure the hammer energy and the dynamic testing with signal matching Case Pile Wave Analysis Program (CAPWAP) shall be used to analyze the data on these piles. Dynamic pile testing shall be performed in accordance with the FHWA Design and Construction of Driven Pile Foundations Reference Manual.

F. Load Testing for Micropiles

1. Install demonstration micropile to demonstrate micropile subcontractor's ability to successfully install micropiles. Perform axial compression load test for each micropile size on demonstration micropiles to verify the design assumptions and construction procedures. Select test locations to represent different subsurface conditions and/or construction methods. Perform additional axial load tests based on site variability as specified in the AASHTO LRFD Specifications. If the Design-Builder chooses to alter construction methods, an additional axial load test shall be required on a test micropile constructed with the new method.
2. For static compression load tests, use Davisson's failure criteria in accordance with FHWA Design and Construction of Pile Foundations, consider only friction component of elastic deformation of the micropile plus 0.15 inch. Ignore end bearing component. For elastic deformation calculations, consider the micropile total length minus half the bond length.

G. Reports

1. The Design-Builder shall prepare a Pile or Shaft Geotechnical Nominal Resistance Test Implementation Report containing test procedures, instrumentation plan including measurements along the piles or shafts, calibration procedures, test pile locations, pile sizes, and types being tested and equipment used. At a minimum, drilled shaft load test piles shall be instrumented along the length to establish load transfer (t-z) curves for each soil layer and (q-z) curve for the bearing layer(s). Include crosshole sonic logging and thermal integrity profiling results for drilled shafts.
2. The Design-Builder shall prepare a Pile Geotechnical Nominal Resistance Test Results Report containing test results per pile size and type tested; production pile/shaft installation and/or driving system, and production piling acceptance criteria. The Design-Builder shall interpret the load test results and use them in the Design of Foundation such that the axial and lateral deformations of the pile or shaft do not exceed the structural limit.

2.4.3.13 Embankments & Cuts

A. Settlement. The Design-Builder shall assess settlement induced by fill placements, including immediate settlement in granular soils, and both immediate and consolidation (time-dependent) settlements in cohesive soils in accordance with AASHTO LRFD Specifications.

B. Global Stability. The Design-Builder shall evaluate the stability of all existing slopes, new fill and cut slopes (permanent and temporary) within or effected by the Project, and ensure for the stability of these slopes.

C. The Design-Builder shall design new fill and cut slopes, and check existing slopes for the static case in accordance with FHWA NHI-05-123 - Soil Slope and Embankment Designs and for the seismic case in accordance with FHWA-NHI-11-032. The Design-Builder shall be responsible for ensuring that the following minimum requirements are satisfied:

1. The minimum factors of safety from limit equilibrium analysis for static load conditions for permanent slopes shall be 1.3 for non-critical slopes and 1.5 for critical slopes (at bridge abutments, wingwalls and existing structures).
2. The minimum factor of safety for seismic load cases shall be 1.0 for non-critical slopes and 1.1 for critical slopes and the Design-Builder shall be responsible for

establishing the acceptable deformations the slopes can accommodate for the design seismic events.

3. The minimum factor of safety for a rapid drawdown condition shall be 1.1.
4. For non-permanent slopes, the minimum safety factor shall be 1.3 under static load conditions.

2.4.4 Construction Requirements

2.4.4.1 Dewatering and Groundwater Control

The Design-Builder shall be responsible for evaluating the potential need for dewatering and groundwater control, and for implementing such measures as appropriate, and shall evaluate the effects on existing facilities resulting from any dewatering and draw down.

2.4.4.2 Condition Surveys

2.4.4.2.1 Pre-Construction Condition Survey

A. The Design-Builder shall conduct a pre-construction inspection and survey of the existing condition of all structures and properties for the purposes of generating photographic and video documentation of existing damage, leaks and cracks. The pre-construction condition survey shall form the basis against which all new cracks, existing progressive cracks, or damage will be measured. The spatial extent of the pre-construction survey shall encompass the Project Limits plus certain areas beyond the Project Limits, as detailed herein.

B. The full spatial extent of the Design-Builder's pre-construction condition survey necessarily depends upon the Design-Builder's design and proposed means and methods of construction. In its preparation for the pre-construction survey, the Design-Builder shall be responsible for predicting anticipated vibration and settlement effects at various offset distances from the Project Limits, and for ensuring that the pre-construction condition survey encompasses at a minimum all properties within areas that are identified by the Design-Builder to be potentially prone to: (i) ground vibration levels, expressed as resultant peak particle velocity, in excess of 0.50 inches per second; and (ii) predicted ground settlements of greater than ¼ inch.

C. In addition, the spatial extent of the pre-construction condition survey shall be integrated with the Design-Builder's implementation of its strategy for conformance with the Environmental Performance Commitments related to the protection of cultural resources. This strategy shall include properties within designated historic districts.

D. If the Design-Builder elects to use the latest inspection report as the pre-construction condition survey of an existing bridge, the Design-Builder shall there by agree and affirm that the latest survey report presents an accurate and comprehensive survey of the pre-construction condition of the existing bridge.

E. The Design-Builder shall submit to the Railroad the records and photographic and video documentation of the pre-construction condition survey, which shall be signed and stamped by a Professional Engineer registered in the State of New York.

2.4.4.2.2 Post-Construction Condition Survey

The Design-Builder shall conduct a post-construction condition survey of the zone and properties covered by the pre-construction conditions survey. The post-construction condition survey shall be performed by the Design-Builder after the construction is completed, and it shall compare the post-construction conditions with the conditions recorded in the pre-construction condition survey. The location and scope of the post-construction condition survey shall match those of the pre-construction condition survey. The complete documentation of the post-construction survey, describing the comparison with the preconstruction conditions and signed by a Professional Engineer registered in the State of New York, shall be submitted to the Railroad.

2.4.5 Summary of Submittals

Item	Section	Submittal	Action
1	2.4.3.1	Geotechnical Work Plan	Review and Approval
2	2.4.3.2	Geotechnical Investigation Plan	Review and Comment
3	2.4.3.6	Geotechnical Data Report	Review and Comment
4	2.4.3.7	Seismic Assessment Report	Review and Comment
5	2.4.3.8	Geotechnical Instrumentation & Construction Monitoring Plan	Review and Comment
6	2.4.3.9	Foundation Design Reports	Review and Comment

END

2.5 GEOTECHNICAL INSTRUMENTATION AND GROUNDWATER MONITORING

2.5.1 Section Includes

This Section describes the requirements for:

A. Furnishing, installing, maintaining, and protecting from damage the geotechnical and structural instrumentation.

B. Establishing baseline readings (with the Railroad).

C. Obtaining groundwater readings in groundwater monitoring wells installed by others, and interpreting monitoring data provided by the Railroad.

D. Additional instrumentation and data collection that the Design-Builder deems necessary to ensure the safety of personnel and the Work.

2.5.2 Codes and References

A. LIRR Track Safety Standards

B. Deutsches Institut für Normung (DIN).

1. DIN 18723 - Field Procedure for Precision Testing of Surveying Instruments.

C. National Geodetic Survey (NGS).

D. National Institute of Standards and Technology (NIST).

2.5.3 Purpose of the Geotechnical and Instrumentation Program

A. Purposes of the Geotechnical and Structural Instrumentation Program include, but are not limited to, providing:

1. Pre-construction baseline data (to be agreed upon by both the Design-Builder and the Railroad) for comparison with construction and post-construction data.

2. Monitoring of ground, groundwater, and facilities during and after construction, to determine whether they have been adversely affected by construction activities. At a minimum the Design-Builder shall:

3. Monitor the existing track alignment where temporary sheeting or excavation is within 15 feet of the centerline of the track or is within the influence line of the track.

4. Monitor existing structures which may potentially be impacted by construction on the Project.

5. A forewarning of unforeseen conditions that may require remedial or precautionary measures.

2.5.4 Monitoring Role of the Railroad

A. Monitoring Role of the Railroad: The Railroad will confirm baseline readings with the Design-Builder, and upon acceptance of the fully functional instrumentation, continue to monitor and take readings (except groundwater readings) from the instrumentation and immediately inform the Design-Builder if any response levels are exceeded. However, this shall not relieve the Design-Builder of responsibility for the safety of the works. The

Railroad is not responsible for the safety of the work based on geotechnical or structural instrumentation data.

2.5.5 Movement and Vibration Limits

The Design-Builder is responsible for review and evaluation of the monitoring levels set out in the table below and incorporating them in the Action Level Plan.

Parameters	Review Level	Alert Level	Units
Vertical & Horizontal Movement for Non-Historic Structures	0.5	0.75	Inches
Vibration PPV for non-building locations	1.0	2.0	Inches/second
Vibration PPV for Non-Historic and Non fragile buildings	0.5	1.0	Inches/second
Utilities	*	*	

* The Design-Builder shall follow vibration limits set out by utilities for each type of service in the vicinity of anticipated construction.

2.5.6 Design-Builder's Responsibilities

A. The Design-Builder shall:

1. Furnish components of instrumentation that are to be installed during construction.
2. Furnish two portable readout units for the Railroad's use.
3. Install instruments, verify their satisfactory operation, undertake acceptance testing with the Railroad, obtained baseline readings and confirm these readings with Railroad and hand over to the Railroad.
4. Perform regular groundwater level and quality monitoring, and provide these data to the Railroad.
5. Protect from damage and maintain instruments installed by the Design-Builder, and existing instruments installed by others. Undertake calibrations in accordance with the manufacturer's recommendations for the duration of the Contract and provide copies of calibration certificates. Repair or replace damaged or inoperative instruments.
6. Install, monitor, and interpret data from instrumentation in addition to that specified herein, and collect and interpret data from instrumentation specified herein in addition to the data collected by the Railroad, and that the Design-Builder deems necessary to ensure the safety of personnel, the Work, and existing structures, tracks, utilities and other facilities.
7. Provide safe access to the Railroad for data collection.
8. Implement response actions.

9. The installation of the instrumentation program shown on the RFCD Drawings will require closure of tracks, de-energization of adjacent third rail, and flag protection during installations. Coordinate all such actions through the Railroad.
10. Provide Review and Alert Levels to the Railroad for the adjacent facilities in the Design-Builder proposed Structure Monitoring Program as required herein.
11. Respond to notifications provided by the Railroad if review and alert threshold values are exceeded and implement changes in accordance with the Action Level Plan as agreed with the Railroad.
12. Survey the as-built location and elevation of each instrument or, in the case of an inclinometer or extensometer, the collar of each borehole instrument, and provide the coordinates and level to the Railroad in accordance with the Project grid.
13. Provide manual survey of the track baseline for all areas that instruments will be used and perform manual weekly survey of the track to verify accuracy of electronic monitoring system.

2.5.7 Quality Control

A. A factory calibration shall be conducted on all instruments before shipment. Certification shall be provided to indicate that the test equipment used for this purpose is calibrated and maintained in accordance with the test equipment manufacturer's calibration requirements and that, where applicable, calibrations are traceable to the NIST.

B. A final quality assurance inspection shall be made before shipment. During the inspection, a checklist shall be completed to indicate each inspection and test detail. A completed copy of the checklist shall be supplied with each instrument.

C. Provide the manufacturer's warranty for each portable readout unit.

D. All instruments shall be labeled with their reference number at the location where readings or measurements are taken. The labeling shall be permanent using a method or material to be agreed with the Railroad. The reference numbering scheme shall be in accordance with the system defined on the RFCD Drawings.

E. Qualifications of the Design-Builder’s Instrumentation Personnel:

1. Geotechnical and structural instrumentation work involves highly specialized tasks. The Design-Builder's instrumentation personnel who are responsible for furnishing and installing all geotechnical and structural instrumentation, maintaining instrumentation, as required and interpreting data shall have the qualifications specified herein. These personnel may be on the staff of the Design-Builder or may be on the staff of a specialist instrumentation subcontractor.
2. The Design-Builder's instrumentation personnel shall include a Professional Engineer licensed in the State of New York, who has a minimum of a Bachelor of Science degree in Civil Engineering, and who has at least four years (or as review by the Railroad) of experience in installation and monitoring of the types of instruments specified herein and in interpreting instrumentation data. A suitably qualified Engineering Geologist is also acceptable as the Geotechnical Instrumentation Engineer (GIE).

F. The Geotechnical Instrumentation Engineer shall:

1. Prepare detailed step-by-step procedures and bar chart for the installation of all instruments specified herein.
2. Be on-site, supervise, and conduct the pre-installation and post-installation acceptance tests of at least the first two installations of each type of instrument.
3. Be on-site until the completion and acceptance by the Railroad of the tasks identified elsewhere herein, and subsequently be available for consultation at all times for the duration of the Contract.
4. Supervise interpretations of geotechnical and structural instrumentation data.

G. The Design-Builder's instrumentation personnel shall include a Superintendent who shall be in responsible charge full-time on site during the geotechnical and structural instrumentation program. The Superintendent shall have at least four years (or as reviewed by the Railroad) of direct field experience in installation and monitoring of the types of instrumentation specified herein, and shall have supervised instrumentation programs of similar magnitude in similar subsurface conditions. The Superintendent shall be on site to supervise all instrument installations, and pre-installation and post-installation acceptance tests, after the Geotechnical Instrumentation Engineer has performed these three tasks for the first two of each instrument type. He shall also supervise the monitoring of groundwater levels and report the results to the Railroad.

H. The Design-Builder’s instrumentation personnel shall include Instrumentation Technicians who have at least one year of experience in the installation and monitoring of the types of instruments specified herein. At least one of the technicians with experience in the logging of boreholes and rock cores shall be available to execute the task whenever the advancement of instrumentation holes by drill rig is in progress and neither the GIE nor the Superintendent is available at the site.

I. AMTS Specialist: The Design-Builder’s personnel shall include a qualified Automated Motorized Total Station (AMTS) Specialist who is qualified to perform the tasks relevant to the AMTS as specified herein. The AMTS Specialist shall have previous experience in the installation, monitoring, and data interpretation of at least two AMTS systems in similar applications including previous experience in active railroad environments. The AMTS Specialist shall perform the following tasks:

1. Detail the overall configuration and appurtenant hardware and installation procedures for the entire AMTS system including final locations of the components.
2. Perform pre-installation and post-installation acceptance tests.
3. Supervise installation of the system in its entirety.
4. Collect, reduce, process, plot, and evaluate data to prove functionality before turning system over to the Railroad.
5. Oversee replacement and repair of damaged components until the system is no longer required for the collection of data for the Project.

J. The driller responsible for drilling instrumentation boreholes shall be on-site fulltime during the drilling program and shall have at least four years of direct field experience in drilling boreholes for the types of instruments specified herein.

K. Collection of baseline values and the Design-Builder's data, either from additional instruments or from specified instruments, the Design-Builder's personnel shall be as follows:

1. Installations shall be supervised by the Superintendent.
2. Data collection, reduction, plotting, and reporting, except for survey data, shall be supervised by the Superintendent.
3. The person in responsible charge of the surveyors shall be a Land Surveyor licensed in the State of New York with a minimum of three years (or as reviewed by the Railroad) of experience in measurements of the types and accuracies specified herein. The field survey party chief shall have a minimum of one year of experience in survey measurements of the types and accuracies specified herein.
4. Interpretations of data shall be supervised by the Geotechnical Instrumentation Engineer.

L. All personnel working within the Railroad vicinity will be required to take the appropriate training before they are permitted to enter the Railroad properties. For surveying work, the survey instrument manufacturer's stated accuracy and the field procedures shall be such that the resulting accuracies meet the specified accuracies at a 95-percent level of confidence.

2.5.7.1 Prior to Beginning of Instrumentation and Monitoring Activities

A. At least 30 Calendar Days before beginning any excavation support installation, submit to the Railroad for review Action Level Plans, providing generalized plans of action to be implemented in the event any Review Level or Alert Level is reached.

B. Within three weeks after the LNTP, submit to the Railroad for review:

1. Resumes of Geotechnical Instrumentation Engineer and Superintendent, sufficient to define details of relevant experience.
2. Resumes of other field and office geotechnical and structural instrumentation personnel to be assigned to the Project, other than clerical staff.

C. At least 45 Calendar Days before commencing installation of the first of each type of instrument, submit to the Railroad for review the following items pertaining to that instrument type:

1. Detailed step-by-step procedure for installation, together with a sample installation record sheet. The procedures shall be bound and indexed. The installation procedures shall include appropriate content from the following list:
    i. The method of forming boreholes, including the procedure for advancing casing.
    ii. The method to be used for cleaning the inside of casing or augers.
    iii. Specifications for proposed grout mixes, including commercial names, proportions of admixtures and water, mixing sequence, mixing methods and duration, pumping methods and tremie pipe type, size and quantity.
    iv. Drill casing or auger type and size.

v. Depth increments for backfilling boreholes with sand and granular bentonite.

vi. Method for overcoming buoyancy of instrumentation components during grouting.

vii. Method of sealing joints in pipes and inclinometer casing to prevent ingress of grout.

viii. Method for conducting post-installation acceptance test.

ix. Method for protecting instruments from damage.

x. Method for marking identification number for each installation.

2. If the Design-Builder collects the Design-Builder's data using survey methods, the detailed step by-step procedures for conducting all optical survey measurements to the specified accuracies and shall include types of surveying instruments, all as specified herein, and data reduction procedures. The manufacturer's stated accuracy and the field procedures shall be such that the resulting accuracies meet the specified accuracies at a 95 percent level of confidence. In addition, submit resumes of the Land Surveyor, field survey party chief, and surveyors. A bar chart and schedule indicating the proposed time sequence of instrument installation and baseline monitoring. Update schedule as construction progresses. Inform the Railroad a minimum of 24 hours in advance, as to when specific instruments or monitoring points will be installed or monitored.

3. Submit manufacturer’s product data describing all specified instruments including requests for consideration of substitutions, if any, together with product data and instruction manuals for requested substitutions.

4. Shop Drawings:

   a. Before any instrumentation installation, submit Shop Drawings showing the locations, tip elevation, and surface elevation of all deep cased benchmarks required to provide the survey control to be used by the Railroad. Actual locations are to be determined by the Design-Builder and reviewed by the Railroad.

   b. After instrumentation installation and baseline monitoring are agreed on by the Railroad and the Design-Builder, submit Shop Drawings summarizing the installation of each instrument and monitoring point. The information shown on these Shop Drawings shall include, but not be limited to, the following data:

      i. Instrument identification numbers and locations, with baseline elevations, station and offsets, and coordinates, as applicable for each instrument.

      ii. As-built installation details of each instrument, including locations, depths, lengths, elevations, materials used, and dimensions of key elements.

      iii. A separate statement describing the procedure used for the installation of each instrument.

5. Submit a Structure/Building Monitoring Program with the generalized Action Level Plan.

2.5.7.2 During Instrumentation and Monitoring Activities

A. Within five workdays of receipt of each instrument at the site, submit to the Railroad a copy of factory calibration, manufacturer's test equipment certification, completed copy of quality assurance checklist, and warranty for each portable readout unit.

B. Within two weeks of receipt of each instrument at the site, submit to the Railroad completed pre-installation acceptance test record form for that instrument.

C. Within five workdays of installing each instrument, submit to the Railroad the installation record sheet for that instrument, including the as-built instrument coordinates as specified.

D. Submit baseline readings as specified herein before any effects from construction. Such readings are to be agreed upon by both Railroad and the Design-Builder.

E. Submit soil samples as specified herein.

F. Every four weeks, submit to the Railroad updated as-built instrument location plans.

G. Groundwater Level Monitoring Data:

1. Submit groundwater level monitoring data to the Railroad in electronic form, and corresponding computer printouts of the data. The data format shall be as reviewed by the Railroad to be compatible with the requirements of the Railroad’s data analysis software. The monitoring data shall be in both table and graphical plot format as required by the Railroad. Each set of data shall clearly indicate the instrument identification numbers and locations, reference elevations and depths for readings as appropriate, the date and time that the readings were taken, and the names of individuals who performed the monitoring.

2. Submit the groundwater level monitoring data to the Railroad within eight hours after the readings are taken.

H. Detail Action Level Plan for specific locations where the Response Levels have been reached.

I. For each instrument type, provide an instruction manual that shall include the following:

A. A description of the purpose of the instrument.

B. Theory of operation.

C. Step-by-step procedures for:

1. Pre-installation acceptance test when instruments are received on the Work Site, to ensure the instruments are functioning correctly before installation.

2. Calibration of readout units.

D. A list of calibration equipment required, and recommended frequency of calibration.

E. Step-by-step instrument installation procedure including materials, tools, spare parts, and any borehole requirements, and post-installation acceptance tests.

F. Maintenance procedure.

G. Step-by-step data collection procedure.

H. Data reduction, processing, and plotting procedures.

J. Provide specified readout units, together with associated calibration devices and software, shall be furnished to the Railroad no later than one week before commencing installation of the first of each type of instrument. In addition to specified readout units for the Railroad's use when collecting data, provide the Design-Builder's own readout units as needed for making pre-installation and post-installation acceptance tests, and for taking any required readings during installation. Such readout units shall be identical to the specified readout units.

K. Provide updated as-built instrument location plans to the Railroad. The location plans shall be reproducible composite plans of all installed instruments plotted on 11-inch by 17-inch or 24-inch by 36-inch sheets at a scale of 1-inch equals 40-feet. The first plans shall be provided within one month after completion of the first instrument installation, regardless of instrument type. Updated plans shall be provided every subsequent four weeks. Updated plans need not be provided for periods during which no instruments have been installed.

2.5.8 Storage and Maintenance of Instruments

A. All instrumentation materials, after receipt at the site and before installation, shall be stored in an indoor, clean, dry, and secure storage space. Instruments shall not be exposed to temperatures outside the manufacturer's stated working temperature range.

B. Maintain and protect new and existing instrumentation from damage or deterioration because of construction operations, weather, traffic, and vandalism, including all survey references and control points, instruments and appurtenant fixtures, instrument leads, connections, and other components of the instrumentation systems.

C. Provide construction access for the Railroad to all monitoring points, instruments, and monitoring facilities.

2.5.9 Action Level Plan

A. The Action Level Plan shall be a live document continuously updated to reflect changes in contact details for all key members of the following organizations:

1. Railroad Senior Management.
2. Railroad.
3. Emergency Services.
4. Railroad Operators.
5. Utility Owners.
6. Adjacent Property Owners.

B. The Action Level Plan shall identify the actions to be taken at each response level/range for each element of the Work which may cause movement or member loads to exceed the response levels/ranges and shall include as a minimum, the names of the responsible person for the activity currently being undertaken and the measures to be taken. The Action Level Plan, as a minimum, shall also identify all key buildings/structures and utilities throughout the Site and define the party responsible for

each structure. The Action Level Plan shall also identify the resources required for each Alert Level including the notification required if action is taken at each level.

C. The general Action Level Plan shall form the basis of meetings with the Railroad to discuss response action(s) as specified elsewhere herein. This plan of action shall be positive measures by the Design-Builder to perform any or all of the followings as applicable:

   1. Limit further excavation-induced structure, Railroad facility, utility and ground movements.
   2. Limit further drop in groundwater and piezometric levels.
   3. Control vibrations.
   4. Maintain loads in structural members within design limits.
   5. Maintain the structural integrity of adjacent structures and utilities.
   6. Maintain Railroad operations and roadway traffic.

D. At a minimum, one copy of the Action Level Plan shall be held at each excavation face and at the Design-Builder's Office.

2.5.10 Monitoring of Structures and Buildings

A. The Design-Builder shall prepare a structure/building monitoring instrumentation program. Such program, in addition to the geotechnical instrumentation program shown on RFCD Drawings, shall be in accordance with the materials and installation requirements specified herein.

B. The structure/building monitoring program (schedule and proposed instruments to be used) shall be submitted by the Design-Builder for review by the Railroad.

C. The monitoring program shall be prepared, signed, and sealed by the Design-Builder's Professional Engineer licensed in the State of New York. The program shall include Review Level and Alert Level movement thresholds for the facilities where these values have not already been provided, and action plans as defined herein. Threshold values shall be established for vertical, horizontal, and differential movement as specified herein below.

D. Fixed reference points not subject to movement due to the work activities shall be established. The reference points shall be maintained and protected during the Project duration. The reference points may be used to reestablish the monitoring points if needed.

E. The monitoring program shall have sufficient number of measurement points for each structure/building in order to assess the full impact of the construction activities on the structure or building. The program shall have sufficient redundancies.

F. The Design-Builder shall protect all measurement points from construction operations, and from vandalism for the duration of the contract. In case of damage or disturbance, restore and reestablish the points.

G. The monitoring program, at a minimum, shall be capable of detecting horizontal and vertical movements and settlements on the order of 0.05-inch.

H. The monitoring program shall include thresholds for horizontal, vertical, and differential movements and for settlement for each structure. The thresholds shall be based on the type of the structure, its condition, and the type of the construction activities impacting the structure. The monitoring program shall include action plans to be implemented if the thresholds are reached.

I. After the installation of the reviewed monitoring program, transfer the fully functional system to the Railroad for monitoring.

J. The Design-Builder shall coordinate work schedules for excavation support wall construction and excavation with the Railroad's monitoring schedule. If at any time during the work the Railroad considers it necessary to stop work, terminate operations until the Railroad determines that operations can resume. To control ground losses and movement, and to maintain existing elevations, use accepted methods to maintain the building/structures at the elevations existing before commencement of the work. At all times maintenance, safety and protection of the structures shall be the responsibility of the Design-Builder. The Design-Builder shall provide and install instruments and, together with the Railroad, make measurements to record existing conditions and elevations (baseline conditions) of the structures listed herein below as a minimum, and to any additional structures affected by construction operations.

K. Based on the structure/building examinations, the Design-Builder and Railroad shall identify and select existing cracks to be monitored in accordance with requirements specified herein.

L. If a Response Level is reached, the Design-Builder will be notified by the Railroad. Have on site all materials and equipment needed to implement immediately the pre-accepted Action Plan(s) in the event of such plan(s) is needed.

2.5.11 Instrumentation and Monitoring Materials

2.5.11.1 General

A. All materials shall be new.

B. Whenever any product is specified by brand name and model number, such specifications shall be deemed to be used for establishing a standard of quality and facilitating the description of the product desired. The term "approved equal" shall be understood to indicate that the "approved equal" product is the same or better than the product named in the specifications in function, performance, reliability, quality, and general configuration. This procedure is not to be construed as eliminating from competition other suitable products of equal quality by other manufacturers. the Design-Builder may, in such cases, submit complete comparative data to the Railroad for consideration of another product. Substitute products shall not be ordered, delivered to the site, or used in the Work unless reviewed by the Railroad in writing. The Railroad will be reviewer of the suitability and equivalency of the proposed substitution.

C. Any request from the Design-Builder for consideration of a substitution shall clearly state the nature of the deviation from the product specified.

D. Specified readout units, together with associated calibration devices and software, shall be furnished to the Railroad no later than one week before commencing installation of the first of each type of instrument. In addition to specified readout units for the Railroad's use when collecting data, provide the Design-Builder's own readout units as

needed for making pre-installation and post-installation acceptance tests, and for taking any required readings during construction. Such readout units shall be identical to the specified readout units.

E. Furnish all installation tools, materials, and miscellaneous instrumentation components.

F. A factory calibration shall be conducted on all instruments at the place of manufacture before shipment. Each factory calibration shall include a calibration curve with data points clearly indicated, and a tabulation of the data. Each instrument shall be marked with a unique identification number. Quality assurance procedures during factory calibration shall be as specified. Factory calibration of seismograph vibration monitors shall be performed using a shake table and a reference sensor traceable to the NIST. Factory calibrations of overpressure sensors shall be performed using a calibrator traceable to the NIST.

G. Surface protection shall be flush with the ground surface in paved or other areas. For all instruments, unless specified separately, surface protection shall consist of a Tyler Pipe Model 26T-6855 LF Top Only Roadway Box, or approved equal, with a plain 5-1/4-inch lock-lid, Bresnahan Foundry Model 00068 Roadway Box, or approved equal, with latching lock lid, or approved equal. Roadway boxes for inclinometers shall have a diameter adequate to allow attachment of cable support assembly, or shall allow for attachment of an inclinometer casing extension while readings are being taken. The length of the inclinometer casing extension shall not vary by more than 0.05-inch.

H. All graduations shall be in U.S. Customary Units, for example, feet, inches, pounds.

I. The grout used for the installation of instrumentation shall be a bentonite-cement mixture with sufficient water to achieve a pumpable mix. The proportions of the mix shall be such as to imitate as closely as possible the strength or consistency of the natural soils or rock present. Conduct trials on different mixes of bentonite-cement (from 4:1 to 8:1) to ascertain the relationship with strength. Specimens shall be cured and stored, then tested in undrained triaxial compression after 1 day, 2 days, 7 days, 14 days, 1 month, and 3 months. Three specimens shall be tested on each occasion, and the sources of bentonite and cement shall be the same as used for eventual installation. Based on these trials, propose the bentonite-cement proportions to be used, which may be varied depending on the application.

2.5.11.2 Surveying Instruments for Vertical Movement Monitoring

A. The following requirements for vertical movement monitoring apply to baseline readings and the Design-Builder's Data as defined elsewhere herein. Instruments used for vertical movement monitoring shall have a minimum accuracy of plus or minus 0.06-inch (standard deviation for one kilometer of double run leveling) and a minimum setting accuracy of plus or minus 1.0-arc seconds. Leveling staffs shall be nontelescopic in design (i.e., 'Chicago' style leveling staff). A bull's eye bubble shall be used to plumb the leveling rod.

2.5.11.3 Surveying Instruments for Horizontal Movement Monitoring

A. The following specification for horizontal movement monitoring applies to baseline readings and the Design-Builder's Data as defined elsewhere herein. Instruments used for horizontal movement monitoring shall have a minimum accuracy of plus or minus 3.0-arc seconds (standard deviation according to DIN 18723), and a minimum display reading less than or equal to the accuracy. Distances less than 30-feet shall be

measured with a standardized steel tape used in conjunction with a tension handle. Distances greater than 30-feet shall be measured with an Electro-Optical Distance Measuring Instrument (EDM). Distances between 30 and 100-feet shall be verified with a standardized steel tape in conjunction with a tension handle. Electronic pointing shall be used to minimize error due to possible misalignment of the EDM axis and telescope. Centering shall be accomplished using high precision optical plummets or mechanical centering devices.

B. EDM equipment used for horizontal movement monitoring shall, after calibration, have a minimum accuracy of plus or minus 0.2-inch plus 5 parts per million.

2.5.11.4 Movement Monitoring Points (S1, SM, RP)

A. Movement monitoring points will be used to monitor vertical and horizontal deformation of various facilities at selected locations shown on the RFCD Drawings or as reviewed by the Railroad.

B. The following types of monitoring points shall be used to monitor deformation:

1. Surface Settlement (S1), including where used in Railroad Monitoring shall consist of a 5-foot long, 3/4-inch diameter steel rod, and a surface roadway box. Top of rod shall be rounded and punch-marked at its center.
2. Structure Monitoring (SM) Point shall be suitable for installation in vertical surfaces such as concrete, masonry, and mortar joints. It shall consist of an anchor sleeve, an anchor, and a bolt as shown on the Drawings. Anchor sleeves and anchors can be obtained from Hilti, ITW Ramset/ Red Head; or approved equal.
3. Settlement/Lateral Displacement Reference Point shall consist of an observable point punch-marked on the top horizontal surface of (temporary or permanent) wall, or other concrete/steel surface. The surface within 3-inches of the point shall be cleaned by wire brush to permit easy identification of the exact point. The point shall also be clearly identified.

2.5.11.5 Grid Crack Gauges (CG)

A. If the Design-Builder uses grid crack gauges in the building monitoring program, they shall be calibrated crack monitors as manufactured by Avongard Products (USA) Ltd.; or approved equal. Anchors, bolts, screws, and quick-setting epoxy shall be as provided by Avongard Products (USA) Ltd., or approved equal.

2.5.11.6 Vibrating Wire Crack Gauges (CW)

A. If the Design-Builder uses vibrating wire crack gauges in the structural monitoring program, they shall include vibrating wire transducers and shall be Geokon Inc., Model 4420; Roctest, Model JM-S; or Soil Instruments Ltd., Model 1.3; or approved equal. Ra ge shall be 2-inches.

B. Anchors shall be selected to suit the surface being monitored, as reviewed by the Railroad.

C. Cables, terminal panels and electrical readout units, shall be from the same manufacturer as the crack gauges.

D. Portable readout units shall be as recommended by the manufacturer.

2.5.11.7 Inclinometers in Soil (IS)

A. The Design-Builder shall provide inclinometer casing, probe, cable, readout unit, and accessories, as manufactured by Slope Indicator Company; or approved equal.

B. Inclinometer casing shall be 2.75-inch outside diameter ABS with broached internal keyways, and twist tolerance less than 1-degree per 10-foot length. Couplings shall be of the non-telescoping type. Probe shall be Slope Indicator Company, Model 50325-E; or approved equal. Probe shall be biaxial, consisting of two force balance accelerometers mounted at 90-degrees, with a 2-foot wheelbase. Probe shall be supplied in a carrying case.

C. Cable shall be 100-feet long, shall be sheathed with neoprene, and shall have vulcanized rubber markers, and an internal wire rope core. Minimum cable outside diameter shall be 0.4-inch.

D. Readout unit shall be Slope Indicator Company, Digitilt DataMate; or approved equal. The time interval between recordings 2-feet apart in the casing shall be such that the reading stabilizes to within plus or minus 1 unit of display within eight seconds. Readout unit shall include a battery charger.

E. The Design-Builder shall provide accessories, consisting of end caps, tools, and materials for attaching couplings and taking readings.

F. The Design-Builder shall provide inclinometer software, Slope Indicator Company, DigiPro for Windows, latest version, or approved equal.

G. Factory calibrations of inclinometers shall include comprehensive calibrations of the force balance accelerometers before assembly in the probe. A final calibration shall include measurements made at 10-degree intervals from minus 30- to plus 30-degrees with respect to vertical, and a comprehensive repeatability check over a smaller zone near vertical.

H. Cement grout shall be Type III Portland cement and water. Special grout Type B shall include cement, bentonite, and water, and shall have approximately the same shear strength and compressibility as the surrounding ground.

2.5.11.8 Seismographs

A. The Design-Builder shall provide portable seismographs for monitoring the velocities of ground vibrations resulting from construction activities. Provide Instantel Inc., Model DS-477 Blastmate; Thomas Instruments Inc., Model VMS-500; or approved equal. Provide tools and materials required to mount seismographs to various surfaces. The seismograph shall have the following minimum features:

1. Seismic Range: 0.01- to 4-inches per second with a accuracy of plus or minus 5-percent of the measured peak particle velocity or better at frequencies between 10- and 100-Hertz, and with a resolution of 0.01-inch per second or less.
2. Acoustic Range: 110- to 140-decibels (referenced to 20-micro-Pascals) with an accuracy and resolution of plus or minus 1-decibel.
3. Frequency Response (Plus or Minus 3-Decibel Points) 2- to 200-Hertz.
4. Three channels for vibration monitoring plus a fourth channel for overpressure

5. Two Power Sources: Internal rechargeable battery and charger and 115-volts AC. Battery shall be capable of supplying power to monitor vibrations continuously for up to 24 hours.
6. Capable of internal dynamic calibration.
7. Direct writing to printer and capability to transfer data from memory to 3-1/2-inch magnetic disk. Instruments shall be capable of producing strip chart recordings of readings on-site within one hour of obtaining the readings. Provide computer software to perform analysis, produce reports of continuous monitoring, and to perform zero-crossing frequency analyses of waveform data on magnetic disks.
8. Self-triggering waveform capture mode that provides the following information:
    i. Plot of waveforms, peak particle velocities, peak overpressure, and frequencies of peaks.
    ii. Continuous monitoring mode shall be capable of recording single-component peak particle velocities and frequency of peaks with an interval of one minute or less.

2.5.11.9 Automated Motorized Total Station (AMTS)

A. High quality precision optical monitoring targets in conjunction with fully automated motorized total stations under computer control shall be used to provide real-time remote settlement and movement monitoring of bridge piers. This system shall provide the means to remotely monitor the three components of movement of the precision targets mounted on the bridge piers.

B. Each system shall consist of:
    1. A robotic total station including mounting cages, brackets, and protective covers. The mounting system shall provide a fixed and stable support of the Total Station and provide protection against theft and vandalism.
    2. High quality precision optical monitoring targets shall be protected against accidental damage and located to minimize a tripping hazard.
    3. High quality precision optical reference targets similarly protected.
    4. On-site equipment to operate the total station and communicate with the Railroad's office comprising components such as combined power/signal boxes including AC to DC charger/transformer including necessary power supply connections, back-up battery, transceiver modem, and associated cabling. All cabling shall satisfy combustion and smoke regulations applicable to the actual site locations and all cables shall be protected against electromagnetic radiation and rodents and accidental damage.
    5. Site to designated office data transmission link comprising either radio modems including antennae and housing to provide wireless digital transmission of data between the total station controller and the Railroad's designated office or cable modems and cabling and/or dedicated telephone lines or cabling as required.
    6. Receiver equipment at the designated Railroad's office comprising of a signal box and transceiver modem and cabling to connect to a compatible computer in the Railroad's office. Appropriate network interface cards and cabling shall also

be supplied to permit connection of this computer to the Railroad's computer in the same office.

7. Existing dedicated system control software can be used for real-time monitoring comprising data acquisition, calculation, storage, recording of reference alarm levels, display of individual time plots and settlement profiles of selected prisms at selected dates and times and notification of alarm when threshold values are exceeded. The system shall take into account the need to check reference prisms outside the zone of influence to determine self-movement of the station(s) and adjust for temperature and pressure variations.
8. Any system software shall include the capability of performing least squares calculation of multiple arrays of such systems in order to provide coverage of the site, undertake statistical analysis at the end of each reading cycle to ensure the reliability of the data being presented, and shall include a data archiving interface compatible with the Railroad's monitoring database, permit display of the results on a computer screen, in real-time, indicating the latest observed movement of the monitored prisms. The display shall include three threshold levels of each prism and an alarm notification system to the Railroad.

2.5.11.10 Target Prisms (SP)

A. High precision 3D survey prisms, mounted on L-Bars, commonly used for all major optical survey purposes, will consist of a copper coated prism in a dust and water proof anodized aluminum housing, mounted with a 10-mm hex bolt to an anodized aluminum L-bar.

B. 3D survey prisms will be suitable for application to the types of buildings, structures and railroad tracks and ties being monitored.

C. L-Bar Survey Prisms shall have the following features: Prism Material H-K9L, Prism Diameter 25 mm, O.D. of Prism Housing: 2.5 inches, O.D. of Mounting Hole: 0.40 inches, Weight: 0.45 lb. (0.20 Kg).

2.5.11.11 Vibrating Wire Strain Gauges

A. Vibrating wire strain gauges shall be Geokon Inc. Model VSM-4000, Roctest, Inc. Model SM-5A, Geonor, Inc. Model P-200/P-220, or approved equal. Gauges shall have the following minimum requirements:

1. Nominal 3,000-microstrain range.
2. 1-microstrain resolution.
3. 0.1- to 0.5-percent laboratory calibrated accuracy.
4. Arc weldable mounting.
5. Integral temperature sensor.
6. Documented long-term stability over a five year period.

B. The Design-Builder shall furnish cable from the same commercial source as the strain gauges. Cable shall be either:

1. 4-conductor, [redacted]-gauge, with two shielded twisted pairs, a common drain wire, and a sheath of [redacted] thick pressure-extruded vinyl with an outside diameter of [redacted]; or

2. Geonor Model P-540-1 for the strain gauge together with 2-conductor, 22-gauge twisted and shielded cable with waterproof jacket for the thermistor.

C. The Design-Builder shall furnish datalogger systems from the same commercial source as the strain gauges. The dataloggers shall have the following minimum requirements:

1. Battery operated and housed in an environmental enclosure.
2. Minimum non-volatile data storage capability of [redacted]
3. Program storage of up to [redacted] active programs and 1[redacted] for alternate programs.
4. Programmable sample rates from continuous to once daily.
5. Minimum of [redacted] single-ended input channels, expandable with multiplexers to [redacted].
6. Compatible with vibrating wire sensors and thermistors.
7. Temperature range from minus [redacted] to plus [redacted] degrees Fahrenheit.
8. Accuracy (period mode) plus or minus [redacted]-percent of reading.
9. Clock accuracy of 1-minute per month.
10. ASCII communications protocol with baud rates of at least [redacted]
11. Include at least one portable laptop computer with the following minimum requirements:
    i. RS-232 or USB interface compatible with datalogger interface.
    ii. Battery operated.
    iii. Windows XP operating system.
    iv. 2.0-GHZ minimum processor speed.
    v. Minimum 256-mb memory.
    vi. Minimum 30-GB hard drive.

2.5.11.12 Execution of the Monitoring Activities

A. Except as specified herein, boreholes for instruments may be drilled by any method provided that it results in a clean and stable hole of the required diameter to the correct depth. Boreholes shall be cased to their full depth unless strata are sufficiently competent for the hole to stay open under dry conditions. Boreholes shall be drilled using clean water. Drilling mud or polymer additives shall only be used if accepted by the Railroad. In the case of installation of piezometers, drilling mud or polymer additives will not be permitted. Care shall be taken during drilling to ensure that a minimum of material is lost from outside the casing. Surging of casing will not be allowed, and flushing of drilling water up the outside of the casing shall be minimized.

B. The Design-Builder shall not disclose monitoring data and interpretive reports to third parties or publish without written Approval from the Railroad.

2.5.11.13 Pre-Installation Acceptance Tests

A. When instruments are received at the installation site, the Design-Builder's instrumentation personnel shall perform pre-installation acceptance tests to ensure that the instruments and readout units are functioning correctly before installation. Pre-installation acceptance tests shall include relevant items from the following list:

1. Examine factory calibration curve and tabulated data, to verify completeness.
2. Examine manufacturer's final quality assurance inspection checklist, to verify completeness.
3. Check cable length.
4. Check tag numbers on instrument and cable.
5. Check, by comparing with procurement document, that model, dimensions, and materials are correct.
6. Perform resistance and insulation testing, in accordance with criteria provided by the instrument manufacturer, using a gauge insulation or circuit tester that applies 2 volts or less for resistance testing and 15 volts or less for insulation testing.
7. Verify that all components fit together in the correct configuration.
8. Check all components for signs of damage in transit.
9. Check that quantities received correspond to quantities ordered.

B. During pre-installation acceptance testing of each instrument, the Design-Builder's instrumentation personnel shall complete a pre-installation acceptance test record form.

C. An instrument that fails the specified pre-installation acceptance test shall be repaired such that it passes a subsequent pre-installation acceptance test, or shall be replaced by an identical instrument.

2.5.12 General Installation Provisions

A. The Design-Builder's instrumentation personnel shall install instruments in accordance with the Design-Builder's detailed step-by-step procedures that were submitted and Reviewed by the Railroad.

B. Installation procedures for instruments in boreholes shall be such that all steps in the procedure can be quality assured. Granular bentonite shall be placed in depth increments not exceeding 2 feet. Volumes of each increment of backfilling with sand shall be small enough such that no bridging occurs. The depth to the top of each increment of sand or granular bentonite shall be checked after placement.

D. The Design-Builder shall place grout using a tremie method with side discharge ports on the tremie pipe.

C. Before installing any instrument through drill casing or augers, the Design-Builder shall thoroughly remove all material adhering to the inside of the casing or augers, and all cuttings.

D. Whenever withdrawing drill casing or augers during instrument installation in a borehole, take care to minimize the length of unsupported borehole and the rate of casing or auger withdrawal. The Design-Builder shall not allow collapse of the borehole to occur. The

Design-Builder shall not allow backfill material to build up inside the casing or auger such that the instrument is lifted as the casing or auger is withdrawn. Casings and augers shall be withdrawn without rotation. The use of casings or augers is mandatory.

E. The Design-Builder shall notify the Railroad at least 24 hours before installing each instrument.

F. The Design-Builder shall install instrumentation, in addition to that specified herein, that the Design-Builder deems necessary to ensure the safety of personnel and the Work. Notify the Railroad at least 24 hours before installing any such additional instrumentation. Data resulting from such instrumentation are referred to herein as the Design-Builder's Data, together with groundwater monitoring data specified. Such Design-Builder's data will be accepted by the Railroad only if the data are obtained from instrumentation furnished, calibrated, tested, installed, and maintained as specified herein, if the data are collected and plotted as specified herein, and if submitted to the Railroad within three days of data collection.

G. The Design-Builder shall extend installed instrumentation and reinstall roadway boxes as necessary as grade changes occur, and revise instrument reference elevations as necessary.

H. As each instrument is installed, the Design-Builder shall prepare an installation record sheet including appropriate items from the following list:

1. Project name.
2. Contract name and number.
3. Instrument type and number, including readout unit.
4. Planned location in horizontal position and elevation.
5. Planned orientation.
6. Planned lengths and volumes of backfill.
7. Personnel responsible for installation.
8. Plant and equipment used, including diameter and depth of any drill casing or augers used.
9. Date and time of start and completion.
10. Spaces on record sheet for necessary measurements or readings required at hold points during installation to ensure that all previous steps have been followed correctly, including instrument readings made during installation.
11. A GIE, superintendent or instrumentation technician log of subsurface data indicating the elevations of strata changes encountered in the borehole. Strata soil nomenclature shall be based on profiles and boring logs contained in the Geotechnical Data Report.
12. Type of backfill used.
13. As-built coordinates in horizontal position and elevation including:
    i. Elevation referenced to the North American Vertical Datum of 1988 (NAVD88), together with the location of the point used for the elevation measurement.

ii. Horizontal position referenced both to the New York State Plane and the Long Island Zone State Plane Grid Coordinates, as referenced to the North American Datum of 1983 (NAD 83) and to the Project Baseline Station and Offset, together with the location of the point used for horizontal position measurement.

iii. A location sketch showing the instrument number, taped horizontal distances to the instrument, measured to an accuracy of plus or minus 1-inch from permanent physical features in the field. A sufficient number of taped measurements shall be included on the sketch to establish a unique horizontal position for the instrument. If such features are removed, provide a new sketch, before removal, with taped measurements to other features.

14. As-built orientation.

15. As-built lengths and volumes of backfill.

16. Result of post-installation acceptance test.

17. Weather conditions at the time of installation.

18. A space on record sheet for notes, including problems encountered, delays, unusual features of the installation, and details of any events that may have a bearing on instrument behavior. An instrument that fails the specified post-installation acceptance test shall be replaced by an identical instrument.

I. After installation, roadway boxes shall be free draining. Roadway boxes that are not free draining shall be repaired or replaced.

J. The Design-Builder shall submit updated as-built instrument location plans to the Railroad. The location plans shall be reproducible composite plans of all installed instruments plotted on 11-inch by 17-inch or 24-inch by 36-inch sheets at a scale of 1-inch equals 40-feet. The first plans shall be submitted within one month after completion of the first instrument installation, regardless of instrument type. Updated plans shall be submitted to the Railroad every subsequent four weeks. Updated plans need not be submitted for periods during which no instruments have been installed.

2.5.12.1 Installation of Open Standpipe Piezometers (PO)

A. Open standpipe piezometers shall be installed, one per borehole, at the locations and depths shown on the RFCD Drawings.

B. Bentonitic drilling mud shall not be used.

C. Take three split spoon samples for each piezometer installed. One sample shall be taken within 5-feet above the planned installation depth, one at the planned installation depth, and a third at a depth submitted by the Design-Builder, subject to Review by the Railroad.

D. Depth to the top of each increment of granular bentonite shall be checked using a cylindrical sounding hammer. The granular bentonite shall not be tamped.

E. After completion of installation, a post-installation acceptance test shall be performed by conducting a falling head permeability test to verify seal integrity.

F. After completion of installation, the as-built location in horizontal position shall be determined to an accuracy of plus or minus 0.3-foot and the elevation of the top of the riser pipe to an accuracy of plus or minus 0.01-foot.

2.5.12.2 Movement Monitoring Points

A. The Design-Builder shall install movement monitoring points at the locations shown on the Released For Construction Documents or as requested by the Railroad. Structure monitoring points shall typically be installed into vertical surfaces of structures or into horizontal concrete and rock surfaces (e.g. sidewalks, granite curbstones). Drilled holes shall be located to avoid historically and architecturally significant design features of the structure. Holes for anchor sleeves shall be drilled into horizontal mortar joints, masonry units, or other surfaces as requested by the Railroad.

B. Where structure movement points are installed on surfaces that will be snow plowed, the points shall be recessed to avoid damage. The carriage bolt in structure monitoring points shall be kept permanently fixed in the anchor with thread-locking compound.

C. After completion of installation of a movement monitoring point, the as-built location in horizontal position shall be determined to an accuracy of plus or minus 1-foot, and the elevation to an accuracy of plus or minus 0.01-foot.

2.5.12.3 Installation of Grid Crack Gauges

A. Installation shall be in accordance with the manufacturer's recommendations.

B. After completion of installation, a post-installation acceptance test shall be performed to check that the two parts of the gauge are free to move over each other by passing a feeler gauge or thin plastic card between the two sections.

C. After completion of installation, the as-built location shall be recorded.

2.5.12.4 Installation of Vibrating Wire Crack Gauges

A. Vibrating wire crack gauges shall be installed in accordance with the manufacturer's recommendations. Initial settings shall be reviewed by the Railroad.

B. After completion of installation, perform post installation acceptance test by reading the meter to ensure correct functioning.

C. After completion of installation, the as-built location shall be recorded.

2.5.12.5 Installation of Inclinometers in Soil

A. Inclinometer casings in soil shall be installed at the locations and depths shown on the RFCD Drawings or as requested by the Railroad. After installation, the casing groove spiral shall not exceed one degree per 10-feet of length, the orientation of the grooves at the top of the casing shall be within 10-degrees of the planned orientation, and no part of the casing shall deviate from vertical by more than 4-percent of the depth to that part. The bottom of the casing shall be a minimum of 15-feet within a stratum suitable for providing base fixity, such as bedrock or glacial till at least 20 feet below the planned bottom level of any adjacent excavation.

B. Three samples shall be taken of the material assumed to provide base fixity, one at the bottom of the borehole, others at 5 and 15 feet above the bottom of the borehole, and submitted to the Railroad within 24 hours. If the material is bedrock, a core sample shall be taken throughout the bottom 15 feet.

C. Casing groove orientation shall be maintained throughout installation.

D. Fill the casing with non-toxic antifreeze with a propylene glycol base.

E. After completion of installation, a post-installation acceptance test shall be performed to verify that there is no grout in the inclinometer casing, that groove orientation and verticality are within specified tolerances, and that the inclinometer probe tracks correctly in all four orientations.

F. After completion of installation, the as-built location in horizontal position shall be determined to an accuracy of plus or minus 0.03-foot, and the elevation of the top of the inclinometer casing to an accuracy of plus or minus 0.01-foot. The point selected to determine horizontal position shall be indicated on the installation record sheet.

2.5.12.6 Installation of Seismographs

A. Seismograph vibration sensors shall be firmly mounted on the surface slab of concrete or asphalt, or firmly set in undisturbed soil. Vibration sensor locations shall include points on the ground surface between 3- and 6-feet from the faces of buildings.

2.5.12.7 Installation of Automated Motorized Total Station (AMTS)

A. The location and positioning of the targets and total station(s) shall be set out by experienced surveyors and experts in robotic optical monitoring systems after studying the site taking into account ambient conditions such as: sight distances and lines of sight, vibration of structures, train, traffic and pedestrian interference, temperature diffraction effects, etc. Additional real-time monitoring of other instrumentation may need to be combined with the robotic optical system in order to provide the necessary coverage where sight lines are obscured. These additional systems shall be identified and proposed as required.

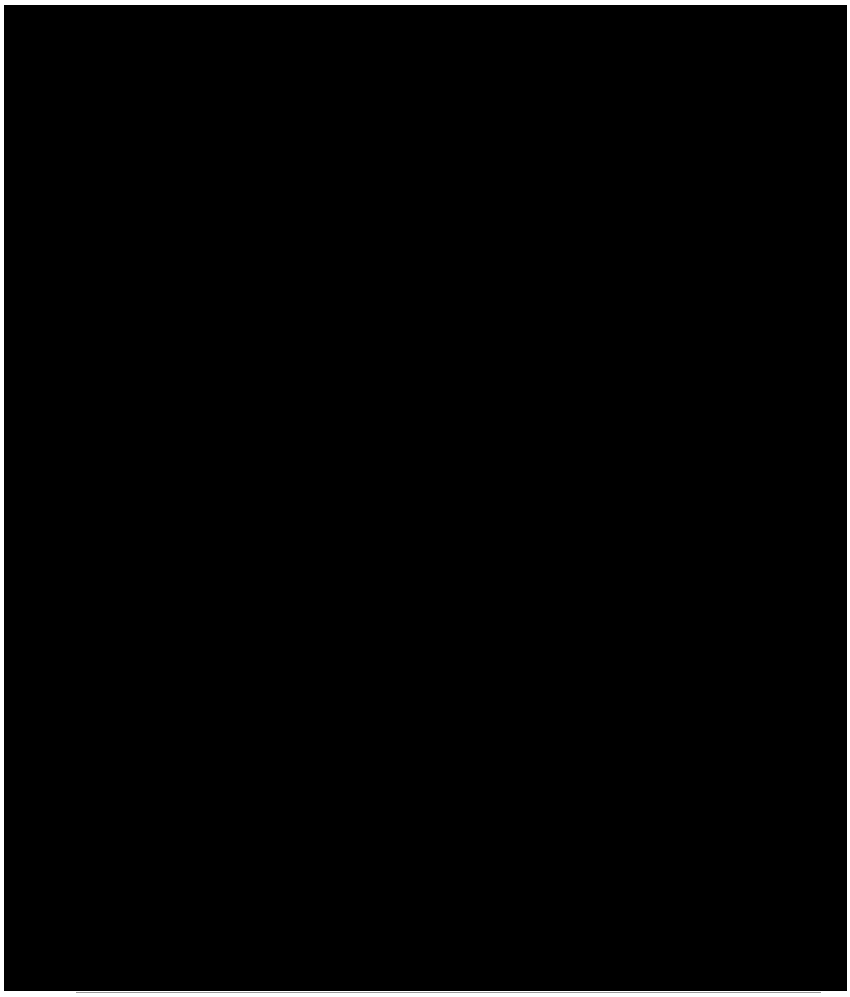
B. A baseline survey shall be carried out using a precise level and bar coded staff fitted with a spirit bubble to facilitate a manual check of the automatic system.

2.5.12.8 Installation of Target Prisms (SP)

A. Target Prisms (SP) will be installed on the Railroad ties, buildings and structures as required. Prisms on the Railroad ties will be spaced at 31 ft. center to center.

B. The L-Bar Survey Prism shall be mounted using the following method: Prism shall be installed using minimally invasive 3/8 inch concrete anchors and /or 3/8 inch lag bolts as required. Anchors and screws allow for the Survey targets (Prisms) to be taken down easily. They can also be attached to the surface of a structure using an epoxy based adhesive and removed easily once the monitoring period is over.

C. The exact location of the prisms and the AMTS shall be determined on-site based line of sight. See below for typical detail of prism mounted on the rail tie.



2.5.12.9 Installation of Vibrating Wire Strain Gauges

A. The Design-Builder shall install gauges at the locations agreed by the Railroad. The Design-Builder shall complete installation of vibrating wire strain gauges a minimum of two days before a gauged structural member is installed in the excavation.

B. If threaded posts are used for mounting the gauges, cover posts with a thread-locking compound, and attach a locknut to each post.

C. After end block attachment, the Design-Builder shall stress-relieve welded end blocks by lightly tapping with a hammer, and bolted end blocks by flexing with the fingers several times in all directions. Repeat this procedure after gauge attachment.

D. Initial vibrating wire tension settings shall be such that three-quarters of the gauge range is available for monitoring compressive strains and one-quarter for monitoring tensile strains.

E. After gauge installation, the Design-Builder shall perform post-installation acceptance test by reading the gauge to ensure correct functioning.

F. After member is installed, the Design-Builder shall record as-built location in relation to member number and gauge location on member.

G. The Design-Builder shall connect strain gauges to datalogger systems to be installed at the locations submitted by the Design-Builder for Railroad's Review.

2.5.12.10 Field Calibration and Maintenance

A. The Design-Builder shall conduct regular maintenance of field terminals and accessible instrument components. Maintenance shall include both instruments installed by the Design-Builder and existing instruments installed by others.

B. When using survey instruments, perform an EDM calibration to determine the zero error and scale error on a calibration baseline that meets NGS standards (example Georgetown, Marlboro, etc.). The length of the calibration baseline shall span a range of distances that will be encountered during the Work. Before performing the calibration, check the adjustment of the tribrachs. The calibration shall be performed every six months, and the results applied to each distance measurement. The Design-Builder shall obtain an access permit from the appropriate agency, and make the necessary arrangements before any visit to a calibration baseline. When used for collecting the Design-Builder's Data, the Design-Builder's level shall be peg-tested, and adjusted if necessary once a week to check for collimation error.

C. For inclinometer casings filled with antifreeze, as specified, maintain the concentration of the antifreeze, by replacing or adding as necessary, throughout the duration of the Project.

2.5.12.11 Data Collection

A. The Design-Builder shall take initial readings to establish a baseline in agreement with the Railroad. Subsequently, the Railroad will be taking regular readings and monitoring the instruments except groundwater levels. The Design-Builder shall continue to record groundwater level readings throughout the duration of the Project.

B. The Railroad anticipates collecting data at selected instruments in and adjacent to active construction sites, generally daily, but not less than once per week. At the Railroad's discretion, data collection may be carried out more frequently than once per day. Monitored instruments will include those installed by the Design-Builder and those installed by others. Data will be provided to the Design-Builder as specified herein after.

C. The Design-Builder shall check the validity of formal initial readings and sign agreement to such readings. No instrument will be accepted or paid for until formal initial readings are agreed upon as specified herein.

D. The Design-Builder shall record data on field data records including, but not limited to, the following list. The Design-Builder shall record data in U.S. customary units such as feet, inches, pounds, etc.

1. Project name.
2. Contract name and number.
3. Instrument type.
4. Date and time.
5. Observer.
6. Readout unit number.
7. Instrument number.

8. Readings.
9. Remarks.
10. Visual observations.
11. Other causal data including weather, temperature, and construction activities.

E. The Design-Builder shall collect data from instrumentation specified herein, in addition to the data collected by the Railroad that the Design-Builder believes are required to ensure the safety of personnel and the Work. Such data, together with groundwater and structure/building monitoring data are referred to herein as the Design-Builder's Data. Such Design-Builder's Data will be accepted for Review by the Railroad only if the data are collected and plotted as specified herein, if readout unit materials and calibrations are as specified herein, and if submitted to the Railroad within three days of data collection.

F. The Design-Builder shall provide and facilitate safe access to the Work at all times for the Railroad to collect data from specified instruments including existing instruments installed by others, and also from any additional instruments installed by the Design-Builder as specified. Safe access shall include, but not be limited to, cessation of work activities, temporary relocation of obstructing materials and equipment, provision of ladders, working platforms and hoisting services, and any other needs that, in the opinion of the Railroad, are necessary to ensure the safety of data collection personnel.

G. The following paragraphs define formal baseline readings that shall be agreed on by the Railroad and the Design-Builder. These definitions of formal baseline readings shall also apply to the Design-Builder’s data.

1. A formal baseline groundwater reading shall consist of the average of three readings with the water level indicator. The indicator will be removed from the riser pipe between these three readings. Each reading shall be a single reading with the water level indicator. Reading accuracy shall be plus or minus 0.05-foot. All baseline values are to be agreed upon by the Railroad.
2. Monitoring of grid crack gauges shall be in accordance with the manufacturer’s recommendations. A formal baseline reading and also each subsequent reading shall be a single reading.
3. A formal baseline reading of a vibrating wire strain/crack gauge and a subsequent reading shall be a single reading.
4. An inclinometer reading is defined as a set of readings at 2-foot intervals throughout the casing, and a second set at 180-degrees to the first set. A formal baseline inclinometer reading shall be selected from three readings as defined above, involving six complete traverses along the casing. Each reading shall be a single reading. Check-sums (sum of two readings at the same depth but 180-degrees apart) shall be examined in the field. Except where obvious imperfections in the casing have affected the check-sums, the standard deviation of A- and B-axis check-sums over a 2-foot interval shall not exceed 0.0005-foot and 0.0010-foot, respectively.
5. A formal baseline reading on the 3D Target Prism (SP)) shall consist of a determination of the northing, easting and elevation of the prism by surveying to an accuracy of plus/minus 0.01 foot.

H. Baseline movement monitoring by surveying methods shall conform to the following requirements:

1. For vertical movement monitoring, the Design-Builder shall perform runs by a single run beginning and ending on two different deep benchmarks. Use movement monitoring points as turning points or as intermediate foresights from two different turning points, allowing elevations to be adjusted and eliminating significant observational errors. The maximum length of line of sight shall be 230 feet, and the imbalance between backsight and foresight shall not exceed 30 feet. Allowable level loop misclosure shall not exceed plus or minus 0.033 times the square root of "M"-feet (where "M" is the distance of the level run in miles) for a single run between two deep benchmarks. A formal baseline reading on a movement monitoring point shall consist of the average of three elevations, from three independent level runs that meet the closure specified herein. The Design-Builder shall determine elevations established subsequent to a formal baseline reading by a single run as specified herein. The least count (without estimation) of the rod and level combination shall read to 0.003-foot or less, such that the accuracy of an elevation measurement shall be plus or minus 0.01-foot (at 95-percent level of confidence).

2. For horizontal movement monitoring, if a theodolite is used, the direction measurements shall be made in two sets of direct and reverse pointings, changing the circle setting by 90-degrees between sets. Reduced directions shall be rejected if they deviate from the mean by more than 5-arc-seconds. Plumb the theodolite over the occupied point by a high precision optical plummet or mechanical centering device. When distances are measured with a tape, each distance shall be measured independently two separate times and shall be corrected for the temperature and tension of the tape. A formal baseline reading on a movement monitoring point shall consist of the average of three readings, from three independent set-ups, each as specified herein. Each reading other than the formal baseline reading shall consist of a single set of readings, as specified herein. All readings shall be referenced to stable horizontal control points. Reading accuracy shall be plus or minus 0.03-foot. Horizontal control points will be installed by others.

3. For distance monitoring, make measurements of taped horizontal distance between adjacent movement monitoring points installed on the exterior walls of buildings. Measure each distance independently and correct for the temperature and tension of the tape. A formal baseline reading on a pair of movement monitoring points shall consist of the average of three measurements that meet a repeatability of plus or minus 0.01-foot. Each reading other than the formal baseline reading shall also consist of the average of three measurements that meet a repeatability of plus 0.01-foot.

I. The Railroad will collect seismograph data before any vibration producing construction activities to document background vibrations, and at the start of vibration-producing activities to establish the maximum energy that can be used without surpassing acceptable vibration and overpressure levels at nearby facilities. The Railroad will also monitor vibration during construction. Notify the Railroad at least 24 hours before starting a new vibration-producing task. If the Design-Builder installs additional seismographs to collect the Design-Builder's data during construction, monitoring shall be as follows:

1. Monitoring during pavement breaking, excavation, and other vibration-producing construction activity shall consist of recording single-component peak waveform

velocities that shall be printed on a strip chart. Continuous monitoring and full waveform data shall be recorded and submitted as specified.

2. When submitting the monitoring data to the Railroad, use the same record format as that used by the Railroad.

2.5.12.12 Data Reduction, Processing, Plotting and Reporting

A. The Design-Builder shall provide groundwater readings with plots of observation well data showing groundwater table elevation versus time.

B. The Design-Builder shall have access to the electronic data that the Railroad will place on the Project Limited Access Website for viewing and printing reports only. The Railroad will provide the Design-Builder with two - one-day long training periods at the beginning of the Project and one day of supplemental training per month as requested by the Design-Builder on the production of instrumentation reports from the data.

C. If the Design-Builder chooses to access and download data from the Website, the following data retrieval system is recommended, as a minimum:

1. Intel-based PC with Microsoft Windows XP operating system, 2.0-Ghz processor, 256-MB SDRAM, 30-GB hard disk, and a CD drive.

2. DSL modem and a dedicated telephone line.

D. The Design-Builder may access data from the Intranet according to the following schedule:

1. For instruments monitored by datalogger, within four hours of data collection.

2. For manually read, non-surveyed instruments, within six hours of data collection.

3. For optically surveyed instruments, by 8:00 AM on the day following data collection.

4. When the periods specified are interrupted by weekends or holidays, the periods will be increased by up to 24 hours for each weekend day or each holiday day.

E. The Railroad does not warrant that electronic data will be available on the schedules described herein above, and it shall be understood that the Railroad is not responsible for any delays or interruptions to the Design-Builder's access to such data.

F. The Railroad will use its best efforts to provide hard copy data to the Design-Builder in accordance with the following schedules:

1. All data provided no later than 4:00 PM on the day following the day on which data are collected.

2. When the periods specified are interrupted by weekends or holidays, the periods will be increased by up to 24 hours for each weekend day or each holiday day.

3. Weekly hard copy summary reports, generally within one week of data collection for data that the Railroad anticipates are affected by construction activities.

G. When the Railroad determines from the data that a change has occurred that, while not exceeding the response levels specified may provide indication of an accelerating trend, and the change or trend may require remedial or precautionary measures, the Railroad will notify the Design-Builder so that the Design-Builder can verify the change and take appropriate action in accordance with the submitted action plan. The Railroad will

endeavor to provide advice of such change or trend to the Design-Builder within a shorter time period than that specified above.

H. When data indicate that a change has occurred as specified, the Design-Builder shall initiate the response action(s) specified elsewhere herein.

I. When the Design-Builder submits the Design-Builder's data to the Railroad, the data shall be reported as follows:

1. All raw and reduced data shall be presented in the same format used by the Railroad.
2. In addition to hard copy data as specified herein, provide data on CD-R disks. Provide electronic data files for all instrument data in format reviewed by the Railroad.

J. The following definitions of plot types shall apply to the Design-Builder's data.

1. Plots of movement data at movement monitoring points shall show absolute vertical deformation versus time or absolute horizontal deformation versus time. In addition, angular distortion between adjacent movement monitoring points shall be plotted. Plots of distance monitoring data at adjacent movement monitoring points shall show change with respect to the initial reading, versus time. At the Design-Builder's option, horizontal strain between adjacent movement monitoring points can also be plotted.
2. Plots of crack gauge data shall show displacement versus time.
3. Plots of inclinometer data shall be "cumulative change" data, showing absolute horizontal deformation versus depth, and "change" data showing incremental deflection versus depth. The top of the inclinometer casing (excluding any extension length added during data collection) shall be used as a datum for depth measurement. Multiple plots shall be on the same sheet to provide a time history, each labeled with the date. Each plot shall include the instrument numbers, station, and offset.
4. If the Design-Builder collects the Design-Builder's Data from an instrument that has been installed to replace a damaged instrument, the last reliable reading for the damaged instrument shall be used as the initial reading for the replacement instrument so that data are plotted continuously, without an offset at the time of damage. The time of damage and replacement shall be noted on the plot.
5. If the Design-Builder collects the Design-Builder’s own seismograph data during construction, plots of data shall be strip charts and full waveform plots.
    i. For seismic data collected in continuous monitoring (strip chart) mode, provide a permanent record of single-component peak particle velocity. The strip chart shall also indicate the time and magnitude of maximum single-component peak particle velocity measured during each one-hour interval of the monitoring point.
    ii. For seismograph full waveform data, provide plots consisting of a graphical display of the three component particle velocities and overpressure levels during the entire course of the vibration-producing construction activity.
    iii. For the Design-Builder's strain gauge data, provide plot of load versus time for individual strain gauges, and average load versus time for pair of strain

gauges. Data plots shall not show excavation level versus time at the location of the strain gauge, and the date of installation of struts below the strain gauge location.

2.5.12.13 Loss of Damage to Instrumentation

A. The Design-Builder shall protect all instruments and appurtenant fixtures, leads, connections, and other components of instrumentation systems from damage due to construction operations, weather, traffic, and vandalism.

B. If an instrument, including an existing instrument installed by others, is damaged or inoperative, the Design-Builder's instrumentation personnel shall repair or replace the damaged or inoperative instrument within 72 hours. Notify the Railroad at least 24 hours before repairing or replacing a damaged or inoperative instrument. The Railroad will be the sole judge of whether repair or replacement is required.

C. If a readout unit or seismograph provided by the Design-Builder for the Railroad’s use is lost or becomes inoperable for any reason, replace it with an operable unit within 72 hours.

2.5.12.14 Interpretation of Data and Implementation of Plans of Action

A. The Design-Builder shall interpret the data collected and provided by the Railroad as well as any additional data the Design-Builder elects to collect. Interpretation shall include making correlations between instrumentation data and specific construction activities. Instrumentation data shall be evaluated to determine whether the response to construction activities is reasonable.

B. The actions associated with the response levels are defined below. Plans for such actions are referred to herein as plans of action, and actual actions to be implemented are referred to herein as response actions. Review and Alert Levels are subject to adjustment by the Railroad as indicated by prevailing conditions or circumstances.

C. If a Review Level or Yellow Range is reached:

1. The Design-Builder shall meet with the Railroad to discuss the need for response action(s) within 24 hours of receiving instrumentation data from the Railroad indicating that a Review Level has been reached and submit a detailed specific plan of action, based as appropriate on the generalized plan of action submitted previously.
2. The Design-Builder shall implement response action(s) within 24 hours of submitting a detailed specific plan of action, so that the Alert Level is not reached.
3. Install additional instruments if required by the Railroad.

D. The Design-Builder shall take all necessary steps so that the Alert Level or Red Range is not reached.

E. The Design-Builder may be directed to suspend activities in the affected area with the exception of those actions necessary to avoid reaching the Alert Level.

F. If an Alert Level or Red Range is reached:

1. The Design-Builder shall stop work, meet with the Railroad within 24 hours of receiving instrumentation data from the Railroad indicating that an Alert Level has been reached and submit a detailed specific plan of action, based as appropriate on

the generalized plan of action submitted previously. The Design-Builder shall implement response action(s) within 24 hours of submitting a detailed specific plan of action, so that the Alert Level or the upper bound Red Range is not exceeded.

2.5.13 Disposition of Instruments

A. The Design-Builder shall remove salvageable instruments only when directed by the Railroad.

B. Portable readout units furnished to the Railroad for data collection shall become the property of the Railroad. Portable readout units used by the Design-Builder during installation, during pre- and post-installation acceptance testing, and for collecting the Design-Builder's Data shall become the property of the Design-Builder.

C. All salvaged instruments shall become the property of the Design-Builder.

D. It is the responsibility of the Design-Builder to ensure that all instruments installed by the Design-Builder and existing instruments installed by others shall be operational upon completion of the Work, for possible later monitoring by others. If requested by the Railroad, remove and dispose of those portions of instruments constituting an obstruction. The Railroad will be the sole judge of whether or not removal is required. For instruments installed in boreholes, the upper 2 feet of the instrument shall be removed, together with the ground surface protection. The remaining open portions of the instrument and casing shall be backfilled with cement grout up to a level 2 feet below the ground surface, and with lean concrete in the upper 2 feet. New pavement patches shall be constructed, in paved areas, of the same material and to the same thickness as existing adjacent pavement. Disturbed or damaged surfaces shall be restored to the condition existing before install.

2.5.14 Summary of Submittals

Item	Section	Submittal	Action
1	2.5.7.1	Action Level Plan	Review and Approval
2	2.5.7.1	Resumes	Review and Approval
3	2.5.7.1	Installation Procedures and Record Sheets	Review and Comment
4	2.5.7.1	Shop Drawings	Review and Comment
5	2.5.7.2	Factory Calibration & Manufacturers Test Certification	Information
6	2.5.7.2	Quality Assurance Checklist	Review and Comment
7	2.5.7.2	Pre-Installation acceptance test record	Information
8	2.5.7.2	As-built Location Plans	Information
9	2.5.7.1	Structure/Building monitoring program	Review and Approval
10	2.5.7.2	Comparative product data	Review and Comment
11	2.5.12	Open Standpipe Piezometer Installation Depth	Review and Comment
12	2.5.11	Material Samples	Information

13	2.5.12	Monitoring Data	Information
14	2.5.12	Detailed specific Plan of Action	Review and Approval

END

2.6 DEWATERING

2.6.1 Section Includes

A. This section sets out the requirements for dewatering.

2.6.2 Codes and References

A. American Water Works Association (AWWA)

   1. C704 - Flow Meters.

B. NYSDEC

   1. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, Division of Water Technical and Operational Guidance Series (TOGS).

2.6.3 General

A. The Design-Builder shall furnish all labor, materials, tools and equipment, and performing all operations and design necessary to temporarily lower groundwater table and remove seepage, storm runoff, and other inflows during construction as specified herein and in addition, such other locations required by the Design-Builder to progress the work.

B. Dewatering system instrumentation includes furnishing, installing and monitoring observation wells and piezometers.

C. The Work shall include controlling, handling, treating, and disposing of dewatering effluent. Dewatering effluent is defined as water from seepage, initial and maintenance dewatering, and the portion of the storm water runoff and all other water that may be encountered as required for performance of the Work as well as work necessary to repair or replace property damaged because of dewatering disturbance. Work shall also include removal of temporary dewatering system(s), if utilized.

D. Piezometers and observation wells, including covers, shall conform to the requirements of the Technical Provisions.

E. For open cut excavations, the Design-Builder shall take readings of the piezometers at frequencies specified in the Contract Documents.

F. The Design Builder shall verify proper operation of piezometers and observation wells by means of recharge test or equivalent procedure reviewed by the Railroad.

G. The Design-Builder shall furnish to the Railroad a Rossum Sand Content Tester as manufactured by Roscoe Moss Company, or approved equal.

2.6.4 Design-Builder's Restrictions

A. The Design-Builder shall construct pit shoring and conduct dewatering operations so that the aggregate contract dewatering effluent does not exceed the 45 gpm (gallons per minute) or 64,800 gallons per day threshold or as required by New York State Department of Environmental Conservation (NYSDEC) or Nassau County. If dewatering effluent exceeds this rate, then a Long Island well permit (LIWP) may be necessary.

B. The Design-Builder shall install, operate, and maintain dewatering systems to not impact train, pedestrian, and vehicular traffic.

C. Drainage trenches, berms, and dikes can be used to channel flow within the Work Site only.

D. The Design-Builder shall obtain local municipality sewer discharge permit before start of dewatering, if utilizing on-site discharge.

E. The Design-Builder is responsible for controlling the pH of the water from the excavation, which may be high due to Design-Builder's grouting, other activities involving cement, or use of soil conditioners.

2.6.5 Design Builder's Responsibilities

A. The Design-Builder is responsible for treatment of dewatering effluent before discharge to the local municipal sewers. The Design-Builder may elect to provide a suitable and permitted on-site dewatering treatment system or may collect and transport dewatering effluent to an off-site facility for treatment.

B. The Design-Builder shall design a dewatering system to conform to the following design criteria:

1. The Design-Builder shall design dewatering systems that shall:

   i. Develop a substantially dry and stable subgrade for the prosecution of subsequent operations.

   ii. Not result in damage to adjacent facilities, Railroad infrastructure and other work.

   iii. After 12 hours of initial pumping, maximum soil particles in the discharge not exceeding value specified herein.

2. Methods for primary dewatering systems may include educator and ejector type systems, deep wells, or combinations thereof. Methods for secondary dewatering systems may include educator and ejector type systems, well point systems, sump pumping, or combinations thereof.

3. The Design-Builder shall modify dewatering procedures that cause, or threaten to cause, damage to new or existing facilities, so as to prevent further damage.

4. If utilized, the Design-Builder shall provide the dewatering treatment system, with a system handling capacity appropriate for, or exceeding, the maximum dewatering quantities expected.

2.6.5.1 Before Construction

A. At least 60 days before installation of dewatering control systems, the Design-Builder shall submit Shop Drawings and design data showing the following:

1. The proposed type(s) of dewatering system(s), including system for maintenance of the excavation in a dewatered and in a hydrostatically relieved condition.

2. Arrangement, locations, and depths of components of dewatering system(s).

3. Complete description of equipment and materials to be used, with installation, operation, and maintenance procedures. Submit operation and maintenance manuals for all equipment furnished in accordance with TP2.29 OM MANUALS AND TRAINING.

4. Standby equipment and power supply.

5. Locations and sizes of drainage trenches, pipes, berms, dikes, sediment removal ponds, piezometers, observation wells, sumps and discharge lines, including their configurations relative to discharge locations (manhole connecting to municipal sewer system).
6. Procedures for cleaning and disposal of sediment to be removed from sediment removal ponds and settling basins, and floating matter and grit or other settled matter from oil/water separators in accordance with the Contract Documents.
7. Types and sizes of dewatering treatment system components.
8. Location and staging routes for effluent storage tanks, if off-site disposal is to be utilized.
9. Instrumentation and monitoring program, including flow meters and water and soil content sampling outlets to be installed on the dewatering system(s).
10. Locations, depths, and types of materials and construction details of well points, piezometers, and observation wells.
11. Type and grading of filter material for piezometers and observation wells.
12. Procedure to be used periodically to verify proper functioning of piezometers and observation wells as specified herein.
13. Submit product data including manufacturer's catalogs, material specifications, installation instructions, performance characteristics, and other pertinent data for all manufactured components used in the dewatering and groundwater treatment system.
14. Design calculations demonstrating adequacy of the selected dewatering treatment systems and equipment to achieve dewatering treatment requirements, including estimated pumping rates of individual deep wells or discharge rates of well-point or ejector systems, and anticipated distance-drawdown relationships. The design calculations shall be signed and sealed by a Professional Engineer licensed in the State of New York.
15. Copies of all necessary permits obtained by the Design-Builder to conduct dewatering and the data required to obtain such permits.
16. Obtain approvals from regulatory agencies having jurisdiction and submit documentation of those approvals to the Railroad before activation of dewatering systems.

B. The Design-Builder shall submit calculated duration of dewatering interval to commence each stage of excavation.

2.6.5.2 Construction

A. The Design-Builder shall provide the following:

1. All permits obtained by the Design-Builder for the Railroad necessary to conduct dewatering operations.
2. Well logs showing configuration of all installed observation wells and piezometers.
3. Average daily flow rate and the time of operation of each pump used in the system. Data shall be provided in a format acceptable to the Railroad.

4. Daily groundwater level records in the observation wells and piezometers during initial dewatering period. Weekly groundwater level records when dewatering operations have stabilized, if concurred by the Railroad. Monthly observation well bottom elevations. Records shall be provided within 24 hours of reading, in a format acceptable to the Railroad.
5. Discharge water soil particle content measurements.

2.6.6 Execution

2.6.6.1 General

A. The Design-Builder shall comply with the requirements of Federal, State, and local requirements, regulations, ordinances governing the discharge of construction water.

B. The Work shall consist of the removal of dewatering effluent from open cut excavations, treatment of the collected dewatering effluent to meet requirements for discharge, and discharge of the treated dewatering effluent in accordance with requirements specified herein. The dewatering of open cut excavations shall be strictly controlled because of nearby zones of contamination.

C. The dewatering treatment/control and/or storage systems shall be operational at all times, and shall have adequate backup systems to accomplish control of dewatering effluent.

D. Existing observation wells to be maintained and new piezometers to be installed under this Contract shall be closely monitored to evaluate the performance of all dewatering systems and measure the resulting drawdowns.

E. Sump pumps if used shall be in constantly attended on a 24 hour basis until their operation can be safely halted. When dewatering, close observation shall be maintained to detect removal of fines from the surrounding soil mass on the sides and base of the excavation and any settlement or displacement of road surface, railroad embankment, tracks, and facilities.

F. The Design-Builder shall comply with the requirements of Federal, State, and local requirements, regulations, ordinances governing the discharge of construction water.

G. Monitor the discharge of the system with totalizing type water flow meters conforming to AWWA C704 and meeting the requirements specified herein. Instantaneous flow rate type meters are not acceptable. The flow meters shall read in cubic feet or gallons and shall be protected from damage and vandalism. Flow meters shall be installed as follows:

1. At each individual pumping well for deep well systems.
2. If a well point system is used, at the discharge point of each well point system.
3. If an ejector system is used, at the discharge point from each ejector system tank.

H. The Design-Builder shall provide dewatering systems that include on each discharge line, a valve controlled bypass that shall permit samples to be taken for soil particle content determinations and chemical analyses of treated dewatering effluent.

2.6.6.2 Preparation

A. The Design-Builder shall determine the existing groundwater elevations, patterns, permeability rates characteristic of the local geologic conditions, and potential

groundwater level fluctuations in order to satisfactorily plan and provide materials and equipment for an adequate dewatering system. The Design-Builder shall evaluate the geology and design a system that effectively lowers the groundwater levels as required.

B. The Design-Builder shall install observation wells not less than one week in advance of beginning of nearest excavation, and record observation well readings daily before lowering the water table by means of the dewatering system. Existing observation wells within the excavation area to be abandoned may be used.

C. The Design-Builder shall make arrangements with the governing agency for permission to discharge pumped water into the existing drainage systems after the flow has passed through the dewatering treatment system.

2.6.6.3 Monitoring

A. The Design-Builder shall monitor the quantity of soil particles (suspended sediment) daily in the water discharged from dewatering systems during construction using testing equipment specified herein. The Design-Builder shall submit data obtained from soil particle content measurements to the Railroad. The maximum allowable total suspended particle content is 0.5 ppm by volume to avoid piping. If the quantity of soil particles in the discharge water from a particular well is determined to exceed this limit, the Design-Builder shall modify or replace that well.

B. The Design-Builder shall monitor the groundwater quality before and during dewatering operations. Groundwater samples shall be collected for chemical analysis as specified in the Contract Documents and in conformance with all applicable Federal, State, and local permit requirements.

C. The Design-Builder shall monitor the levels at all observation wells and piezometers, and reporting such data to the Railroad conforming to requirements set forth in Technical Provisions.

D. The Design-Builder shall observe the dewatering system in operation and record the discharge volume, average flow rate calculated from readings of the totalizing flow meters, and the time of operation of each pump used in the system.

E. The Design-Builder shall dispose of all dewatering effluent collected by dewatering operations in accordance with Federal, State, and local agency permits.

F. The Design-Builder shall check the calibration of all flow meters at least once a month and record the results of these calibration tests. The Design-Builder shall replace or repair within 48 hours any flow meter that is found to be working improperly.

G. Using an approved form, the Design-Builder shall observe and record the time periods during which individual dewatering system pumps or other components are not operating and the reasons for non-operation.

H. After installation of each observation well and piezometer, the Design-Builder shall observe and record groundwater levels in the observation wells on a daily basis when the dewatering system(s) are in operation. The Design-Builder shall sound each piezometer and observation well bottom on a monthly basis to ensure that soil particles are not entering the screen and accumulating in the riser pipe.

I. The Design-Builder shall provide access for the Railroad to all flow meters installed and maintained for the dewatering system(s). The Railroad will take frequent and random

readings independent of Design-Builder's readings. The Railroad's data will be available upon request.

2.6.6.4 System Preparation

A. The Design-Builder shall select and install, or upgrade existing, dewatering systems designed to accomplish dewatering effluent control and treatment required to successfully execute all excavations under this Contract. The Design-Builder shall install in accordance with submittals reviewed by the Railroad. Dewatering system(s) shall control amount of soil particles to minimize soil piping.

B. Piezometers and observation wells shall conform to the requirements of TP2.5 GEOTECHNICAL INSTRUMENTATION AND GROUNDWATER MONITORING and TP2.6 DEWATERING.

C. Sump Pumps:

1. The Design-Builder shall remove loose earth particles and other debris after the hole has been excavated to the required depth.
2. The Design-Builder shall provide pump base of ¾-inch coarse aggregate 3-inch minimum thickness.
3. The Design-Builder shall clean and maintain pump base on a regular basis.

2.6.6.5 Operation

A. The Design-Builder shall maintain continuous and complete effectiveness of dewatering system installations.

B. The Design-Builder shall operate the dewatering systems to lower groundwater levels and maintain groundwater elevations as follows:

1. A minimum of 2-feet below lowest point of each open excavation throughout the entire base area of the excavation.
2. 2-feet below the surface of compacted backfill.

C. Piezometers and observation wells shall be used to control and assess the dewatering effort on a continuous basis during excavation. It is Design-Builder's responsibility to locate, install, and maintain new piezometers. The Design-Builder shall notify Railroad of any existing observation wells identified during construction, and rehabilitate and maintain existing observation wells, as long as the construction work is not affected. The Design-Builder shall install additional piezometers and observation wells as necessary to monitor the effectiveness of the dewatering system.

D. The Design-Builder shall modify dewatering systems and procedures if, after installation and while in operation, they cause or threaten to cause damage to existing or new facilities. The Design-Builder shall determine and make the modifications necessary.

E. The Design-Builder shall modify dewatering treatment systems and operating procedures in the event that the systems do not perform as required. The Design-Builder shall determine and make the modifications necessary.

F. The Design-Builder shall dispose of pumped water from the excavations and dewatering systems in accordance with the following requirements:

1. The Design-Builder shall control discharge of dewatering effluent so that quantity is not greater than the limits set in permits from governing agencies.

2. Quality of discharge water shall comply with permit conditions. The Design-Builder shall use settling tanks, filtration, activated carbon absorbers, pH adjustment system, and/or other approved treatment processes to obtain quality required by permits and as specified in the Contract Documents.
3. The Design-Builder shall clean the sediment removal ponds to maintain sedimentation capability and dispose of sediment legally and satisfactorily.
4. The Design-Builder shall dispose of precipitation and subsurface water away and clear of the Work Site. Keep open cut excavations dry.
5. The Design-Builder shall provide water to flush sewers and drains.
6. The Design-Builder shall promptly remove deposits from sewer, drain, catch basin, or gutter receiving pumped water from the Work Site, partially or entirely filled with sediment.
7. All dewatering effluent removed from the Work Site shall be discharged through pipes. The conveying of dewatering effluent in open ditches or trenches shall not be allowed. Dewatering effluent shall be discharged in a manner that shall not cause soil erosion at the discharge point.
8. The Design-Builder shall ensure that dewatering effluent discharge meets the requirements of Nassau County.

G. The Design-Builder shall take measures to prevent damage to properties, railroad facilities, buildings, structures, sewers and other utility installations, pavements, sidewalks, and Work resulting from drawdown.

H. The Design-Builder shall provide to the Railroad any schedule or information concerning any proposed changes in the status of the pumping wells, especially the deactivation or throttling back of any deep wells, well-points, or ejectors that are essential to the Railroad to schedule the necessary instrumentation readings and interpret the data obtained.

I. The Design-Builder shall repair any damage, disruption, or interference resulting directly or indirectly from dewatering operations to the satisfaction of the Railroad and property owners.

J. In the event that dewatering system wells become clogged or their performance is decreased due to microbial induced mineralization to the degree that the system does not produce the required groundwater drawdown, implement measures to remediate the problem in accordance with the equipment, materials, and procedures submitted as specified herein and reviewed by the Railroad. The Design-Builder shall implement remedial measures.

K. Oily dewatering effluent shall be collected and provided adequate treatment through an oil/water separation device before discharge to public waters or storm sewers leading to public waters or water treatment. Floating matter and settled matter shall be removed as necessary from oil/water separation devices to assure their efficient operation at all times. All floating matter and grit or other settled matter removed from the oil/water separator or otherwise collected at the Work Site shall be disposed of in accordance with Design-Builder's reviewed submittal.

L. If storage, transportation and off-site treatment and disposal of dewatering effluent is utilized, the Design-Builder shall maintain records documenting the satisfactory disposal of such effluent.

2.6.6.6 Field Quality Control

A. Piezometer and observation well readings shall be used to monitor the performance of the dewatering systems.

1. The Design-Builder shall prove proper functioning of each piezometer and observation well in accordance with submitted procedures that have been reviewed by the Railroad before commencing dewatering.
2. While dewatering systems are in full construction service operation, the Design-Builder shall periodically prove continued proper functioning of each piezometer and observation well in accordance with submitted procedures that have been reviewed by the Railroad.
3. The Design-Builder shall keep each piezometer and observation well in good condition and observe and record the elevation of the water levels in observation wells daily, as long as the dewatering system is in operation and weekly thereafter until the Work is completed or the piezometer or observation well is turned over to the Railroad.
4. The Design-Builder shall review daily the water levels in the observation wells.
5. The Design-Builder shall replace damaged and destroyed piezometers and observation wells with new piezometers and observation wells within 72 hours.
6. The Design-Builder shall cut down the riser pipes of observation wells in excavation areas as they become exposed with the progress of the excavation and continue to maintain the wells and make observations as specified.

2.6.6.7 Dewatering System Removal

A. Upon completion of the Project, the Design-Builder shall demolish well casings, unless otherwise agreed by the Railroad, to a depth of eight feet minimum below the ground surface. The Design-Builder shall remove observation wells inside excavation areas to the subgrade.

B. The Design-Builder shall backfill voids with cement grout.

C. Backfill remaining space with compacted earth and cap as necessary to restore the surface to its original condition.

2.6.7 Summary of Submittals

Item No.	Section No.	Submittal	Action
1.	2.6.5.1	Shop Drawings & Design Data	Review and Comment
2.	2.6.5.2	Permits	Information
3.	2.6.5.2	Average Daily Flow Rate	Information
4.	2.6.5.2	Daily Groundwater Level Records	Information
5.	2.6.5.2	Daily Groundwater Level Records	Information
6.	2.6.5.2	Particle Content Measurements	Information

END

2.7 ENVIRONMENTAL REQUIREMENTS

2.7.1 Section Includes

This Section describes the environmental requirements and mitigation measures relating to:

A. Air quality and monitoring.
B. Erosion and sediment control.
C. Stormwater pollution prevention.
D. Historic and archaeological resources.
E. Sustainability.
F. Toxic substances.
G. Contaminated and hazardous materials.

2.7.2 Codes and References

A. American Society for Testing and Materials (ASTM).
    1. ASTM D 5116: Guide for Small Scale Environmental Chamber Determination of Organic Emissions from Indoor Materials/Products.
    2. ASTM C 150: Standard Specification for Portland Cement
    3. ASTM C 1157: Standard Performance Specification for Hydraulic Cement
B. U.S. Environmental Protection Agency (USEPA).
    1. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) 42 U.S.C. s/s 9601 et seq.
    2. Resource Conservation and Recovery Act (RCRA) 42 U.S.C. s/s 321 et seq.
    3. Best Stormwater Management Practices.
    4. 40 CFR 122 – National Pollutant Discharge Elimination System.
    5. US EPA Programs
        i. Energy Star.
        ii. Green Lights.
        iii. WasteWise.
C. Green Seal.
    1. GS-5: Environmental Standard for Compact Fluorescent Lamps.
    2. GS-6: Environmental Standard for Water-Efficient Fixtures.
    3. GS-11: Standard for Paints, Coatings, Stains and Sealers.
D. National Ambient Air Quality Standards (NAAQS).
E. U.S. Green Building Council.
    1. Leadership in Energy and Environmental Design (LEED) Green Building Standard Rating System.

F. Code of Federal Regulations.

1. 29 CFR 1910 - Occupational Safety and Health Standards (OSHA).
    i. 29 CFR 1910.120 - Hazardous Waste Operations and Emergency Response.
    ii. 29 CFR 1910.1001 – Asbestos.
2. 29 CFR 1926 – OSHA Construction Standard.
    i. 29 CFR 1926.62 – Lead Exposure in Construction.
    ii. 40 CFR Part 61, Subpart M – National Emissions Standard for Hazardous Air Pollutants (NESHAP).
3. 36 CFR 68- The Secretary of the Interior's Standards for the Treatment of Historic Properties.
4. 36 CFR 60 - National Register of Historic Places.
5. 36 CFR 800 - Advisory Council on Historic Resources.
6. 40 CFR 260 – Hazardous Waste Management System: General.
7. 40 CFR 261 - Identification and Listing of Hazardous Waste.
8. 40 CFR 262 – Standards Applicable to Generators of Hazardous Waste.
9. 40 CFR 263 – Standards Applicable to Transporters of Hazardous Waste.
10. 40 CFR 264 – Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.
11. 40 CFR 273 – Universal Waste Regulations.
12. 49 CFR 107, 110, 130, 171, 172, 173, 177, 178, 180 – Research and Special Programs Administration, US Department of Transportation (USDOT) (Hazardous Materials Regulations).
13. 49 CFR 397 – Federal Motor Carrier Safety Administration, USDOT (Transportation of Hazardous Materials).
14. 40 CFR 761 – Polychlorinated biphenyls (PCBs) - Toxic Substances Control Act (TSCA).
15. 40 CFR 763 - Asbestos Hazard Emergency Response Act (AHERA).

G. NYSDEC.

1. NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-15-002).
2. New York Standards and Specifications for Erosion and Sediment Control (Blue Book).
3. New York State Stormwater Management Design Manual.
4. NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation.

5. NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.
6. NYSDEC Commissioner Policy (CP) on Soil Cleanup Guidance (CP-51) Soil Cleanup Levels (SCLs).

H. New York Code of Rules and Regulations (NYCRR).
   1. 6 NYCRR 360 – Solid Waste Management Facilities.
   2. 6 NYCRR 364 – Waste Transporter Permits Program.
   3. 6 NYCRR Part 371 - Identification and Listing of Hazardous Waste.
   4. 6 NYCRR 372 – Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities.
   5. 6 NYCRR 373 and 374 – Hazardous Waste Management Facilities and Management of Specific Hazardous Waste.
   6. 6 NYCRR Part 375 – Environmental Remediation Programs
      i. Part 375- 6.8: Soil Cleanup Objectives.
   7. 6 NYCRR 376 – Land Disposal Restrictions.
   8. 12 NYCRR Part 56 - Asbestos (Industrial Code Rule 56).

I. New York State Department of Health (NYSDOH).
   1. Environmental Laboratory Accreditation Program (ELAP).

J. U.S. Department of Housing and Urban Development, HUD Guidelines.
   1. Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing.

K. The Design-Builder shall perform all work in accordance with the Uniform Fire Prevention and Building Code, Title 19, of the New York Codes, Rules, and Regulations (Building Codes of New York State).

2.7.3 Related Documents

VOLUME 6 - Environmental Compliance Plan.

2.7.4 Responsibilities and Qualifications

A. The Design-Builder shall be responsible for compliance with all environmental regulatory requirements applicable to their specific activities.

B. The Design-Builder shall implement Project-specific procedures and guidelines developed with regard to environmental compliance.

2.7.5 Air Quality

2.7.5.1 Air Quality Control Plan

A. The Design-Builder shall prepare and implement an Air Quality Control Plan. The Air Quality Control Plan shall be submitted to the Railroad for review and approval prior to construction. The Air Quality Control Plan shall include:

1. Clean Fuel—Ultra-low sulfur diesel fuel (ULSD) with a maximum sulfur content of no more than 15 parts per million (ppm) sulfur by weight shall be used for all non-road and on-road diesel engines utilized during construction. Any diesel-powered equipment found to be using diesel fuel that does not meet the ULSD requirement shall be removed from the construction site(s).
2. Idling Restrictions—In addition to adhering to local laws restricting unnecessary idling on roadways, on-site vehicle idle time shall be restricted to five minutes for all equipment and vehicles that are not using their engines to operate a loading, unloading, or processing device (e.g., concrete mixing trucks) or are otherwise required for the proper operation of the engine. The operators of the equipment and vehicles subject to the idling prohibition shall shut down their engines within the five (5) consecutive minutes limit with the following exceptions:
    i. To ensure the safe and proper operation of the equipment that is located in or on the vehicle in order to accomplish the intended use of the vehicle or equipment, but only to the extent so necessary (for example concrete mixer trucks with load or truck-mounted concrete pumps).
    ii. To bring the vehicle to the manufacturer's recommended operating temperature, but only to the extent necessary.
    iii. A vehicle is being actively worked on for repairs or maintenance and engine idling is necessary to effectuate such repairs or maintenance.
    iv. When the equipment or vehicle is operating in an ambient air temperature below twenty-five (25) degrees Fahrenheit for more than two (2) hours.
3. Best Available Tailpipe Reduction Technologies—non-road diesel engines with a power rating of 50 horsepower (hp) or greater and controlled truck fleets (i.e., truck fleets under long-term contract with the project), including but not limited to concrete mixing and pumping trucks, shall utilize the best available technology (BAT) for reducing diesel particulate matter (PM) emissions. Diesel particulate filters (DPF) are the tailpipe technology currently proven to have the highest PM reduction capability. The Design-Builder shall use DPFs for all diesel non-road engines rated at 50 hp or greater, either installed by the original equipment manufacturer or retrofitted. Retrofitted DPFs must be verified by USEPA or the California Air Resources Board. Active diesel particulate filters or other technologies proven to achieve an equivalent reduction may also be used.
4. Utilization of newer equipment—USEPA's Tier 1 through 4 standards for non-road diesel engines regulate the emission of criteria pollutants from new engines, including PM, CO, NOx, and hydrocarbons. All diesel-powered non-road construction equipment with a power rating of 50 hp or greater shall meet at least the Tier 3 emissions standard.
5. Diesel equipment reduction—The Design-Builder shall give preference to electrically powered equipment over diesel-powered and gasoline-powered versions of that equipment to the extent practicable. Electric power from the grid shall be used in lieu of diesel powered generators to the extent practicable.

B. The Design-Builder shall ensure the following during the implementation of the Air Quality Control Plan:

1. All on-road vehicles and non-road construction equipment shall comply with all pertinent State and Federal regulations relative to exhaust emission controls and safety.
2. The Design-Builder shall establish truck-staging zones for vehicles waiting to load or unload material at the Work Site. Such zones shall be located where diesel emissions have the least impact on abutters and the general public, and shall be located in an area approved by the Railroad.
3. The Design-Builder shall ensure that diesel emissions do not cause harmful effects to adjacent sensitive receptors. Sensitive receptors include but are not limited to hospitals, schools, daycare facilities, elderly housing, and convalescent facilities.
4. The Design-Builder shall ensure that diesel powered engines are located away from fresh air intakes, air-conditioners, and windows.
5. Equipment shall prominently display a clean exhaust message such as: “Machine is equipped with an air pollution control device and uses Ultra-Low Sulfur Diesel fuel”.
6. The Design-Builder shall ensure that the Design-Builder and subcontractors maintain their equipment properly.
7. Proper training shall be provided to the Design-Builder and any subcontractors responsible for construction activities. Topics to be covered during the air quality training sessions shall include but not limited to: environmental performance commitments and methods to implement these commitments properly.
8. In the event that any non-compliance with the Air Quality Control Plan is identified, corrective action shall be taken immediately to address the non-compliance.

C. Before any construction equipment is brought on-site and used in project construction activities, the Design-Builder shall submit in writing to the Railroad documentation that the engine meets the retrofit and certification requirements outlined in this section of Technical Provisions. The documentation shall include:

1. The Design-Builder/subcontractor name/address/contact person.
2. Equipment type, model, serial number.
3. Engine serial number, family number, make, model, year of manufacture, horsepower.
4. Retrofit serial number, type, make, model, manufacturer, USEPA/California Air Resources Board (CARB) verification number, and installation date.
5. Equipment date on site, date off site and fuel usage.
6. Digital pictures of equipment showing complete equipment as well as engine and retrofit data plates.
7. Maintain copies of fuel deliveries identifying source of supply and quantity of fuel. These copies shall be available for review by the Railroad.
8. Non-compliant equipment shall not be brought on-site. The Design-Builder will be issued an Environmental Deficiency Report when any on-site engine is determined to be in non-compliance with the specifications outlined in the Contract Documents.

Non-compliance shall be corrected within 24-hours of discovery or notification. Non-compliant equipment shall be removed immediately from the job site.

9. The Design-Builder's listing of all heavy duty diesel engine-powered on-road and off-road vehicles and equipment shall be submitted to the Railroad a minimum of two weeks in advance of commencing construction activities. Once construction is underway, a minimum of one week's advance notice is required for the Railroad to review and approve all additional equipment to be used by the Design-Builder and/or any sub-contractor.

2.7.5.2 Community Air Monitoring

A. The Design-Builder shall minimize the impact on the downwind community (i.e. off-site receptors including residences and businesses and on-side workers not directly involved with the subject work activities) from dust and potential airborne contaminants generated during construction activities. The Design-Builder is responsible for dust control at all times during the Project duration.

B. The Design-Builder shall prepare, submit for approval, and implement a Community Air Monitoring Plan in accordance with NYSDEC DER-10 Appendix 1A.

C. The Community Air Monitoring Plan shall establish action levels for worker respiratory protection, which shall be given in the SHECP, provided under separate cover and developed in accordance with 29 CFR 1910 and 1926.

D. The Design-Builder shall perform real-time air monitoring for volatile organic compounds (VOCs) and particulate levels at the perimeter or the Work zone.

E. The Design-Builder shall monitor continuously during all ground-intrusive activities, railroad-intrusive work, and demolition of contaminated or potentially-contaminated structures. Ground intrusive activities include, but are not limited to, spoils excavation and handling, soil grading, test pitting or trenching, and the installation of soil borings or monitoring wells. During placement of clean fill, the Design-Builder shall monitor for particulate levels.

F. The Design-Builder shall monitor periodically for VOCs during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. Periodic monitoring during sample collection shall consist of, at a minimum, taking readings upon arrival at sample locations, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location.

G. VOC Monitoring, Response Levels and Actions

1. VOCs shall be monitored at the downwind perimeter of the immediate work area on a continuous basis unless otherwise specified by the Railroad using a photo-ionization detector (PID). Upwind concentrations shall be measured at the start of each workday, midday, and towards the end of the workday to establish background conditions. Upwind concentrations also shall be measured whenever intrusive work locations change or there is a substantial change in wind direction.

2. The PID shall be calibrated at least daily, or more often if needed. The equipment shall be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

i. If the ambient air concentration of total organic vapors at the downwind perimeter or the work area exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities shall be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, Work activities can resume with continued monitoring.

ii. If total organic vapor levels at the downwind perimeter or the Work area persist at levels in excess of 5 ppm over background but less than 25 ppm, Work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, Work activities shall resume provided that the total organic vapor level 200 feet downwind of the Work zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less, but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

iii. If the organic vapor level is above 25 ppm at the perimeter or the Work area, activities shall be shutdown.

3. All 15-minute readings shall be recorded and made available upon request by the Railroad. Instantaneous readings, if any, used for decision purposes shall also be recorded in a dedicated field book maintained for the purpose of recording air and particulate monitoring results.

H. Particulate Monitoring, Response Levels, and Actions

1. Particulate concentrations shall be monitored at the upwind and downwind perimeters of the Work zone at temporary particulate monitoring stations.

2. The particulate monitoring shall be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment shall be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all Work activities.

i. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the Work area then dust suppression techniques shall be employed. Work shall continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the Work area.

ii. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, Work shall be stopped and a re-evaluation of activities initiated. Work shall resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings shall be recorded in a dedicated field book maintained for the purpose of recording air and particulate monitoring results and made available upon request by the Railroad to review.

2.7.6 Erosion and Sediment Control

A. The Design-Builder shall not commence work until the Design-Builder secures a New York State Department of Environmental Conservation (NYSDEC) State Pollutant Discharge Elimination System (SPDES) General Permit GP-0-15-002 and until the Design-Builder prepares and obtains approval of a Stormwater Pollution Prevention Plan (SWPPP).

B. A qualified Design-Builder's Safety Supervisor/Representative shall be present at the Work Site during all Work times.

C. The Design-Builder shall display or have available at the Work Site at all times a copy of the approved Safety, Health, and Environmental Control Plan (SHECP).

D. Ensure compliance with all regulatory requirements and NYSDOT Standard Specifications to all construction areas, as applicable.

E. Submittals:

1. Submit proposed method of erosion and sediment control to LIRR.
2. Submit SWPPP, including Erosion and Sediment Control Plan (ESCP), in accordance with NYSDEC, NYSDOT, and USEPA regulatory requirements to LIRR.

F. Deliverables:

1. Provide Notice of Intent (NOI) for SPDES General Permit for Stormwater Discharges from Construction Activities.
2. The Design-Builder shall prepare a Notice of Termination (NOT), for Railroad Review and Approval, when all construction activity identified in the SWPPP has been completed; all areas of disturbance have achieved final stabilization; all temporary erosion and sediment controls have been removed; all post-construction stormwater management practices have been constructed in accordance with the SWPPP and are operational; and a qualified inspector performs a final inspection just prior to the submittal of the NOT to NYSDEC.

G. Criteria:

1. Conform to NYSDOT Standard Specifications including Section 209-2.
2. Conform to New York State Standards and Specifications for Erosion and Sediment Control and NYSDEC, NYSDOT and USEPA regulatory requirements.

H. Silt Fence: A Mirafi Silt Fence, or approved equal.

I. Stockpile Covers:

1. 4-mil polyethylene sheeting shall be used to cover all soil and debris stockpiles.
2. Sandbags or other non-puncture weighted materials to keep cover in place.

J. General:

1. Install and maintain all necessary products to conform to the requirements of this Section and the NYSDEC SPDES Permit. Such products may include, but are not

limited to, hay bales at storm drain inlets and catch basins; dewatering pump inlet bags or sediment traps; temporary slope stabilization materials such as stone riprap, fabric filters, geo-textiles, degradable blankets, seeding, planting, or mulching; and sedimentation tanks to treat run-off where Work Site space is limited.

2. All erosion and sediment control measures shall be performed within the LIRR ROW, station platforms, parking garages, and grade crossings without impacting adjacent properties.

K. Installation:

1. Initiate all erosion controls required during construction to prevent siltation of any affected collection basins, inlets, manholes, channels, combined sewers, or storm sewer systems as shown on the Contract Drawings and Directive Drawings, in accordance with New York State Standards and Specifications for Erosion and Sediment Control, subject to Review by the Railroad. Prevent sediment from flowing onto public right-of-way, private property, wetlands, etc.

2. Installation of the temporary soil erosion and water pollution controls shall be in accordance with NYSDOT Standard Specifications, Section 209-3, Construction Details in addition to USEPA's Best Stormwater Management Practices, New York State Standards and Specifications for Erosion and Sediment Control and NYSDEC, NYSDOT, and USEPA regulatory requirements.

2.7.6.1 Operation, Maintenance, and Repair

A. Subject to review by the Railroad, inspect all erosion and sediment controls, especially before, during, and after storm events, for indications of failure, malfunction, or sediment buildup in accordance with New York State Standards and Specifications.

B. Remove sediment buildup from all controls to maintain functional capacity. All sediment shall be properly handled and managed in accordance with the NYSDEC SPDES Permit. Any contaminated sediment shall be handled and managed according to the applicable sections of these Specifications and subject to review by the Railroad.

C. Repair and replace any malfunctioning or failing erosion and water pollution controls in accordance with New York State Standards, the NYSDEC SPDES permit, and as reviewed by the Railroad.

D. Keep and maintain a stockpile of materials at the Site to supplement, replace, or repair all erosion and sedimentation controls. Typical materials to be utilized include silt fence, straw bales, mulch, mesh/blanket matting, and crushed stone/rip-rap.

2.7.6.2 Dust Control

A. The Design-Builder shall use wet suppression to provide temporary control of dust. Several applications per day may be necessary to control dust depending upon meteorological conditions and work activity. The Design-Builder shall apply wet suppression on a routine basis as necessary or directed by the Railroad to control dust.

1. Wet suppression consists of the application of water or a wetting agent in solution with water. The Design-Builder shall ensure wetting agent is not used on plantable soils.

2. Wet suppression equipment shall consist of sprinkler pipelines, tanks, tank trucks, or other devices capable of providing regulated flow, uniform spray, and positive shut-off.

B. The Design-Builder shall provide wind-screens and wind barriers in locations where they would be effective in minimizing wind erosion and spread of dust. The locations shall be submitted as part of the Design-Builder's Dust Control Plan. The Design-Builder shall keep wind-screens and barriers in good repair for the duration of the Project.

C. The Design-Builder shall use the following measures to control dust on public roadways:

1. Vehicles leaving the construction site shall have no mud or dirt on the vehicle body or wheels. Gravel cover shall be applied to soil (unpaved) surfaces where they will be regularly traveled at egress and ingress routes from/to work sites. Wheels shall be cleaned as necessary before leaving sites to control tracking.
2. Vehicle mud and dirt carryout, material spills, and soil washout onto public roadways and walkways and other paved areas shall be cleaned up immediately.
3. The Design-Builder is responsible for daily clean-up of public roadways and walkways affected by the Work. A wet spray power vacuum sweeper or similar equipment shall be used on paved roadways. Dry power sweeping is prohibited.

D. The Design-Builder shall use the following methods to control dust and wind erosion of active and inactive stockpiles:

1. Wet suppression without wetting agent during active stockpile load-in, load-out, and maintenance activities.
2. Soil stabilizers applied to the surface of inactive stockpiles.
3. Plastic tarps on stockpiles, secured with sandbags or an equivalent method to prevent the cover from being dislodged by the wind. The Design-Builder shall repair or replace covers whenever damaged or dislodged.

E. The Design-Builder shall use the following measures to minimize dust during demolition:

1. Closed chutes shall be used for the handling or debris. Dropping or throwing of debris is prohibited.
2. Debris shall not be stockpiled. Debris shall be stored temporarily and removed promptly from the site.
3. During transport of debris, the truck cargo area shall be securely covered.
4. Water sprays shall be used as necessary for all demolition activities to avoid the suspension of dust into the air.

F. The Design-Builder shall use the following measures to minimize dust from earthwork activities:

1. During batch drop operations (i.e., earthwork with front-end loader, clamshell bucket, or backhoe) the free drop height of excavated or aggregate material shall be reduced as practical to minimize the generation of dust.
2. To prevent spills during transport, freeboard space shall be maintained between the material load and the top of the truck cargo bed rail.

3. Water sprays shall be used as necessary for all earthwork activities to avoid the suspension of dust into the air.
4. Privacy screens shall be required on all fencing adjacent to non-LIRR property Owners.

2.7.7 Stormwater Pollution Prevention

A. The Design-Builder shall prepare a Stormwater Pollution Prevention Plan (SWPPP) and Post-Construction Stormwater Management Plan for the Project site for Railroad's Review and Approval. SWPPP must be completed in accordance with NYSDEC SPDES General Permit GP-0-15-002 for Stormwater Discharges from Construction Activities and applicable standards, the New York State Stormwater Management Design Manual and erosion and sediment controls in accordance with the New York State Standards and Specifications for Erosion and Sediment Control.

Construction sites shall be covered by the NYSDEC SPDES General Permit GP-0-15-002 for Stormwater Discharges from Construction Activity.

B. The Design-Builder shall carry out the SWPPP according to the Contract Documents and must submit the required certification to the NYSDEC.

C. The Design-Builder shall prepare and submit a NOI for Railroad Review and Approval. After Approval by the Railroad, the NOI must be submitted to the NYSDEC.

D. The Design-Builder shall prepare and submit all drainage calculations of the pre-construction and post-construction conditions as part of the NOI and SWPPP General Permit.

E. The Design-Builder shall select appropriate construction stormwater Best Management Practices (BMPs) for the SWPPP to ensure the reduction of all pollutants of concern in stormwater discharges to the Maximum Extent Practicable (MEP).

F. For the Post Construction Stormwater Management Plan, the Design-Builder shall include a combination of structural management practices (including, but not limited to, practices from the NYS Stormwater Management Design Manual or equivalent) and / or non-structural management practices (including, but not limited to, comprehensive plans, Low Impact Development (LID), Better Site Design (BSD) and other Green Infrastructure practices) appropriate for the Railroad that will reduce the discharge of POCs to the MEP. This includes the preparation of a NOI for Railroad Review and Approval.

G. The Post Construction Stormwater Management Plan shall include an inventory of post-construction stormwater management practices; type of practice; location of practice (street address or coordinates); and maintenance needed per the NYS Stormwater Management Design Manual, SWPPP or other provided documentation.

H. The Design-Builder shall prepare a Notice of Termination (NOT), for Railroad Review and Approval, upon Substantial Completion of the Project.

I. The Design-Builder shall ensure that the SWPPP is carried out during Construction. The Design-Builder shall ensure that all erosion and sediment control practices and all post-construction stormwater management practices identified in the SWPPP are maintained in effective operating conditions at all times.

J. Each subcontractor shall comply with the SWPPP as approved by the Railroad, and shall provide written notification of its intent to adopt and comply with the SWPPP. The Design-

Builder and each subcontractor shall identify at least one person from their company who will be responsible for implementation of the SWPPP. This person shall be known as the trained Design-Builder. The Design-Builder shall ensure that each subcontractor sign a copy of the certification statement shown in Appendix A2.7A CONTRACTOR - SUBCONTRACTOR SWPPP CERTIFICATION STATEMENT.

K. The Design-Builder shall ensure that a Qualified Inspector conducts site inspections where soil disturbance activities are on-going at least once every (7) seven calendar days. A Qualified Inspector is a person that is knowledgeable in the principles and practices of erosion and sediment control, such as a licensed Professional Engineer (PE), Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect (RLA) or other NYSDEC endorsed individual. It can also be a person working under the direct supervision of, and at the same company as, the licensed PE or RLA, provided that the person has completed training in the principles and practices of erosion and sediment control, as provided by the NYSDEC (4) four-hour "Protecting New York's Natural Resources with Better Construction Site Management" training class. A trained Design-Builder cannot conduct the Qualified Inspector site inspections unless they meet the Qualified Inspection Qualifications.

L. The Qualified Inspector shall prepare an inspection report for each and every inspection. At a minimum, the inspection report shall include the following:

1. Date and time of inspection.
2. Name and title of person performing the inspection.
3. Description of the weather and soil conditions at the time of the inspection.
4. Description of the condition of the runoff at all points of discharge from the construction site including discharges of sediment from the construction site, including discharges from conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow.
5. Description of the condition of all natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the construction site which receive runoff from disturbed areas, including identification of any discharges of sediment to the surface waterbody.
6. Identification of all erosion and sediment control practices that need repair or maintenance.
7. Identification of all erosion and sediment control practices that were not installed properly or are not functioning as designed and need to be reinstalled or replaced.
8. Description and sketch of areas that are disturbed at the time of the inspection and areas that have been stabilized (temporary and/or final) since the last inspection.
9. Current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with the SWPPP and technical standards.
10. Corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practices; and to correct deficiencies identified with the construction of the post-construction stormwater management practice(s).

11. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions. The Qualified Inspector shall attach paper color photographs of these digital photographs to the inspection report within (7) seven calendar days of the inspection date. The Qualified Inspector shall also take digital photographs, with a date stamp, that clearly show the condition of the practice after the corrective action has been completed and attach paper color copies of the photographs to the inspection report that documents the completion of the corrective action within (7) seven Calendar Days of that corrective action inspection.
12. Within one business day of the completion of an inspection, the Qualified Inspector shall notify the owner or operator and appropriate Design-Builder of any corrective actions that need to be taken. The Design-Builder shall begin implementing the corrective actions within one business day of this notification and shall complete the corrective actions in a reasonable length of time.
13. The Qualified Inspector shall sign all inspection reports and the reports shall be maintained on site with the SWPPP and available to regulatory oversight authorities for review.
14. All SWPPP inspection reports shall be sent electronically to:

    Long Island Rail Road—Corporate Safety Department.
    Attention: Gloria Russo, Director of Environmental Planning and Compliance
    ggrusso@lirr.org

2.7.8 Historic Resources

A. The demolition of two known historic architectural resources in Mineola—the Nassau Tower and the former Mineola LIRR Electrical Substation—would constitute an Adverse Impact to historic resources under the New York State Environmental Quality Review Act and Article 14 of the Parks, Recreation and Historic Preservation Law.

B. To ensure that construction activities associated with the Project that would be undertaken within 100 feet of architectural resources would not cause inadvertent physical impacts to historic architectural resources, the Design-Builder shall prepare and implement a construction protection plan (CPP) in consultation with OPRHP and the Railroad for architectural resources located within 100 feet of the Project construction.

C. The Design-Builder shall prepare and submit the CPP to OPRHP and the Railroad. The CPP shall set forth the specific measures to be implemented to protect historic architectural resources during construction of the Project, specifically:

    1. Meet all requirements for such plans in the Secretary of the Interior's Standards for the Treatment of Historic Properties 36 CFR 68, National Register of Historic Places 36 CFR 60, and Protection of Historic Resources 36 CFR 800. The CPP would also be prepared in accordance with the National Park Service's *Preservation Tech Notes, Temporary Protection Number 3: Protecting a Historic Structure During Adjacent Construction.*
    2. Prior to the commencement of the Work, and to the extent permitted by the owners of the historic buildings within 100 feet of the Project, a preconstruction inspection of the historic buildings shall be undertaken by an engineering firm licensed to practice in the State of New York (the "Inspecting Engineer") to document any noticeable pre-existing damage where possible.

3. Detail the actions the Design-Builder shall employ to assure the protection and preservation of historic structures located within 100 feet of the Project.
4. Based on the preconstruction inspection and as deemed necessary by the Inspecting Engineer, for any areas of a historic building that are identified as problematic (i.e. cracks, damage, instability), the Design-Builder, as directed by the Inspecting Engineer, shall include in the CPP appropriate protective measures to be implemented during construction to prevent damage to the historic buildings. The Design-Builder shall also include in the CPP a list of potential measures to be implemented should additional specific problem areas be identified during construction. The justification of the adequacy of each measure, planned or potential, identified as a means of protection shall be described.
5. Should the Inspecting Engineer determine that any damage to a historic building was caused by the Design-Builder, the Design-Builder shall repair that damage in accordance with a specific written plan for that repair submitted by the Design-Builder to OPRHP and the Engineer and approved by the OPRHP and the Engineer. Any repairs would also be undertaken in consultation with OPRHP. All such plans shall to be consistent with acceptable and customary historic preservation means and methods, as determined by the Engineer.

2.7.9 Archaeological Resources

A. If additional Project components are proposed (e.g., additional parking facilities) or if Project components are relocated, to avoid adverse impacts to archaeological resources the Design-Builder shall contract with a registered professional Archaeologist who will:
   1. Conduct additional background research to document land use history and prior subsurface disturbance to assess the archaeological potential of the subject parking structure locations.
   2. Based on the research results for the subject locations, a Phase 1B archaeological subsurface testing survey may be recommended to determine the presence or absence of archaeological resources. OPRHP would then be consulted for their concurrence with the Phase 1B Survey recommendation(s). Should OPHRP concur, the Design-Builder's Archaeologist shall submit to OPRHP and the Railroad a Phase 1B archaeological field investigation plan, in accordance with the Standards for Cultural Resource Investigations and the Curation of Archaeological Collections in New York State. Upon approval by OPRHP, the Design-Builder's Archaeologist shall commence the Phase 1B investigation and submit a summary technical report to OPRHP.
   3. The Design-Builder's Archaeologist shall perform any such archaeological investigations in consultation with OPRHP and the Railroad.

B. Discovery of Archaeological Resources Including Unanticipated Discoveries:
   1. Upon uncovering a potential item of archaeological interest (e.g. portions of foundation walls or other features, artifact concentrations) during the progress of the Work, the Design-Builder shall cease excavation in the immediate vicinity of the discovery and shall immediately report the discovery to the Railroad.
   2. When the Design-Builder's Archaeologist determines that a potentially significant resource may be compromised, the Design-Builder shall cease excavation in the

immediate vicinity of the discovery and shall immediately report the discovery to the Railroad.

3. Upon receipt of a report of the conditions described above, the Railroad shall promptly provide directions on when and where excavation may continue. Excavation in the immediate vicinity may be ceased to allow time for photography, drawing of profiles, screening of removed soil for artifacts, removal of soil samples, hand excavation, and other actions deemed necessary to determine the nature, extent, and potential significance of the discovery. However, excavations may continue in other parts of the site concurrent with the recovery, provided that such operations have no harmful effects on the archaeological evaluation and documentation efforts.
4. The Design-Builder shall make reasonable efforts to mobilize and work in other areas, and to mitigate all costs and delays, if Work in the current area is limited, stopped or delayed due to the archaeological investigation.
5. The Design-Builder shall assist the Archaeologist, as directed by the Railroad, in conducting investigative Work requiring heavy machinery, pumping water from excavation areas, shoring trenches, establishing barricades and related Work. If required, the Design-Builder shall provide assistance to the Archaeologist, as above (e.g., machine excavating) in areas that were not identified as sensitive to further reveal the resource(s).
6. If the resources encountered do not appear significant and do not appear to meet criteria for listing on the National Register of Historic Places (NR), the Archaeologist will notify the Railroad, and the Railroad will notify the Design-Builder that construction may immediately resume in the area of the discovery.
7. If the resources encountered are determined to be potentially significant, e.g. appearing to meet the National Register-eligibility criteria, then a pre-established chain of notification will include the Design-Builder's Superintendent, Railroad, Archaeologist, and OPRHP. As required, OPRHP will be consulted regarding the potential significance of the discovery, i.e., whether OPRHP determines it meets or does not meet National Register-eligibility criteria.
8. After these parties have been consulted regarding the presence of potentially significant resources, and if OPRHP determines that the resource(s) are National Register-eligible, the Archaeologist will be given an agreed-upon amount of time to conduct data recovery excavation of the resource(s). The period of time for these actions will be dependent on the size and location of the resource(s).

C. The Design-Builder shall plan, schedule and execute the excavation operations, as well as any Work in the vicinity of archaeological discoveries and excavation operations, in a manner such that archaeological-related Work can be accomplished in accordance with these requirements while mitigating any impacts on the progress and cost of the Work and avoiding any total shutdown of excavation Work.

2.7.10 Sustainability, Materials Use, and Recycling

A. Except as otherwise specified, the Design-Builder shall:

1. Comply with the Energy Star Program.
2. Be resource and energy efficient and environmentally sensitive.

3. Be responsive to the needs for clean air, water, land, and ecosystems quality.
    i. Protect the environment, both on-site and off-site, during demolition and construction operations.
    ii. Minimize pollution and damage to the environment.
    iii. Effect optimum control over, and documentation of, solid wastes created.

B. Except as otherwise specified, the Design-Builder shall:
1. Use fossil fuels with care, efficiency, and best practices.
2. Select materials with recycled contents. To the greatest extent practicable, preference shall be given to product manufacturers that exhibit the highest quantities of certifiable post-consumer and post-industrial recycled contents, including recycled steel. The Design-Builder shall provide the Railroad with documentation of which materials contain recycled content.
3. Select woods from select certified sources. Provide products from sustainable harvested wood / sustainable managed forest as certified under the Rain Forest Alliance Smart Woods Program.
4. Provide equipment that minimizes potable water usage.
    i. Water Closets, Lavatory Faucets, and Faucet Aerators shall meet the water usage requirements of the Energy Policy Act of 1992. For example, fixtures shall be certified under Green Seal GS6.
    ii. Hoses shall be fitted with trigger-operated spray nozzle.
    iii. Irrigation needs, if any, shall be met through the use of drip irrigation systems.
5. Reusability/Recyclability: To the greatest extent practicable, provide products for which secondary markets, take back programs, or leasing programs exist. The Design-Builder shall divert materials from landfills to the extent practicable by separating out materials for reuse and recycling (including but not limited to wooden pallets, scrap steel, and crushed concrete. The Design-Builder shall strive to recycle 75 percent of construction waste.
6. To the maximum extent practicable, select products and materials with the following characteristics:
    i. Water-based; water-soluble; water-cleanup; non-flammable; biodegradable.
    ii. Lowest volatile organic compound (VOC) content available.
    iii. Manufactured without compounds that contribute to ozone depletion in the upper atmosphere.
    iv. Manufactured without compounds that contribute to smog in the lower atmosphere.
    v. Contains no urea formaldehyde and the lowest level of phenol formaldehyde available.
    vi. Contains recycled content: greatest amount of post-consumer or post industrial waste used.

7. Minimize the selection of products and materials with the following characteristics
    i. Contain chlorinated hydrocarbons.
    ii. Contains inorganic arsenic and chromium.
    iii. Contains hexavalent chromium plating.

C. To reduce greenhouse gas emissions to the extent practicable, the Design-Builder shall:

1. Use LED lighting and signals, and automated and motion-sensor controlled lighting where appropriate. Where LED is not reasonably available or practicable (including lifetime cost considerations) for a particular application, the Design-Builder shall select another highlight efficient technology.
2. The Design-Builder shall select energy-efficient pumps and other powered equipment where reasonably available and practicable (including cost-benefit considerations), with a preference for Energy Star certified equipment where available.
3. The Design-Builder shall explore the use of B20 biodiesel for construction engines.
4. Cement used in the U.S. in accordance with ASTM C-150 allows for a maximum of 5 percent interground limestone. The ASTM C1157 standard allows for greater interground limestone content. The Design-Builder shall explore the use of cement with higher interground limestone content.
5. The Design-Builder shall use best efforts to incorporate innovative measures to reduce the Project's carbon footprint.

2.7.11 Toxic Substances

A. Toxic/Hazardous Contents: Products containing carcinogens listed by any of the following shall not be permitted on Railroad property:

1. EPA-CAG list of carcinogens.
2. Clean Air Act – Sections 109, 111, 112.
3. The National Toxicology Program's latest published Annual Report on Carcinogens.
4. IARC – Human Carcinogens (Groups 1, 2A, and 2B).

B. Products that require toxic or hazardous materials for maintenance shall not be permitted.

C. Out Gassing/Reactivity.

1. Formaldehyde: Products containing urea-formaldehyde shall not be permitted on Railroad property.
2. Chlorofluorocarbons (CFC): Products and equipment requiring or using CFC during the manufacturing process or during normal operation shall not be permitted on Railroad property.
3. Volatile Organic Compounds (VOC): Paints, Coatings, and Sealers shall comply with NYSDEC and EPA Regulations.

2.7.12 Contaminated Materials - Subsurface Investigations

A. The Design-Builder shall prepare a site-specific SHECP to minimize the potential for impacts to the community and construction workers. All demolition, excavation, and construction work involving soil disturbance shall be performed in accordance with the SHECP.

   1. The SHECP shall be based on the results of the soil investigations conducted by the Railroad and the Design-Builder and specify appropriate testing and/or monitoring, and detail appropriate measures to be implemented (including notification of regulatory agencies, dust suppression techniques, appropriate air monitoring action levels and responses, etc.) if underground storage tanks, soil and groundwater contamination, or other unforeseen environmental conditions are encountered.

   2. The SHECP shall include an explanation and layout of the Exclusion, Contamination Reduction, and Support Zones.

B. If dewatering is required for construction, the Design-Builder shall perform testing to ensure compliance with applicable discharge regulatory requirements. If necessary, the Design-Builder shall conduct pre-treatment prior to discharge.

C. Unless there is labeling or test data that indicated that electrical equipment, including transformers, is not mercury- and/or PCB-containing, the Design-Builder shall perform removal and disposal in accordance with applicable federal, state and local regulations.

D. Prior to any activities required as part of the Project that could disturb identified and/or assumed ACM, the Design-Builder shall perform a comprehensive asbestos survey of areas (including underground utility vaults) to be disturbed by the Project (except where such surveys have already been completed by the Railroad).

   1. This survey shall include the sampling of all suspect materials to confirm the presence or absence of asbestos and shall be performed by appropriately licensed individuals.

   2. The Design-Builder shall remove and dispose of all identified ACM prior to construction in accordance with all federal, state, and local regulations and requirements of the Technical Provisions.

   3. Asbestos abatement removal procedures and containment engineering controls will be based on the type and quantities of ACM to be removed.

E. The Design-Builder shall perform any demolition activities with the potential to disturb lead based paint (LBP) in accordance with requirements of Technical Provisions and applicable Occupational Safety and Health Administration regulations including OSHA 29 CFR 1926.62 - Lead Exposure in Construction. Methods for lead abatement will comply with the Railroad abatement procedures and containment requirements.

F. For all material that needs to be disposed of (e.g., miscellaneous debris, tires, contaminated soil and any excess fill), the Design-Builder shall characterize and dispose of such material off-site in accordance with applicable federal, state, and local requirements.

2.7.13 Chemical Sampling and Analysis

A. This sub-section includes requirements for furnishing all labor, materials, tools, and equipment and performing all operations necessary for sampling and analysis of the Site materials listed below:

1. Soil, concrete, ballast, timber ties, and sewer sediment.
2. Groundwater and any wastewater as required by the NYSDEC.
3. Potential asbestos containing materials (ACM) as required by 40 CFR Part 763 and 12 NYCRR Part 56 that may be impacted or disturbed by the Work.
4. Potential lead-containing materials in conformance with HUD Guidelines as well as the Society for Protective Coatings (SSPC) *Project Design Industrial Lead Paint Removal Handbook, Volume II (SSPC 95-06). Guidelines for Field Sampling of Coating Films* that may be impacted or disturbed by the Work.

B. This sub-section also includes requirements for characterization and classification of soil and other applicable Site materials.

C. The Design-Builder shall verify that soil, other applicable Work Site materials inclusive of sewer sediment, groundwater, and any wastewater analytical results are consistent with applicable regulatory standards and permit restrictions.

D. The Design-Builder shall ensure that a qualified Safety Supervisor / Representative shall be present at the Work Site at all times.

E. The Design-Builder shall display or have available at the Work Site at all times a copy of the approved Safety, Health and Environmental Control Plan (SHECP).

F. All sampling activities shall be performed in accordance with applicable protocols and cited standards and regulations specified herein, including CERCLA, RCRA, 6 NYCRR Part 375 and 12 NYCRR Part 56.

G. Soil and other Site material analytical results shall be consistent with applicable regulatory limits specified herein including 40 CFR 261, 40 CFR 761, 6 NYCRR 371, 6 NYCRR Part 375.

H. The Design-Builder shall verify that the Railroad has Reviewed and Approved all proposed treatment or disposal facilities and verify the facilities have approved the sampling and analytical methods and procedures specified herein.

I. Laboratory provided results and documents shall include all requested analytical parameters prior to submission to the Railroad.

J. The Design-Builder is responsible for assuring compliance with all applicable Federal and State regulations and policies in place at the time of construction. This includes, but is not limited to, any Federal or State modifications to sampling or analytical methods, standards, or policies specified herein.

K. The Design-Builder shall submit the following for Railroad's Review:

1. Laboratory Qualifications: Analytical laboratory shall provide certification under the NYSDOH ELAP for all chemical analyses conducted.
2. Sampling Plan: Provide a sampling and analysis plan at least 21 days before implementing sampling activities in accordance with the cited standards and

regulatory requirements specified herein. Sampling plan shall be Reviewed by the Railroad before sampling activities can commence on-site.

2.7.13.1 Deliverables

The Design-Builder shall submit the following deliverables:

A. Laboratory Analytical Data Packages: Provide to the Railroad, laboratory analytical data packages and documents within 21 Calendar Days (unless otherwise specified) of the sampling event as specified herein for the exclusive use of the Railroad. The laboratory results shall accompany a drawing that depicts the sampling locations, which corresponds to the appropriate laboratory data.

B. Where the Design-Builder identifies suspect asbestos containing materials (ACM), the Design-Builder shall furnish asbestos survey reports including laboratory analytical results and copies of chain-of-custody forms to the Railroad within 21 Calendar Days of the sampling event (unless otherwise specified). The report shall include drawings that depict the sampling locations that correspond to the appropriate laboratory data.

C. The Design-Builder shall use the following materials:

1. All re-usable sample collection devices such as scoopulas, shovels or hand trowels shall be stainless steel. All devices shall be decontaminated before and after collection of each sample. All methods necessary to decontaminate the sampling equipment shall be used including steam cleaning and methanol solutions as necessary. The Design-Builder shall be responsible for proper handling and disposal of all decontamination materials and fluids.

2. All disposable sampling devices such as bailers or tubing shall be constructed of inert materials such as polyethylene, silicon, or Teflon. All disposable sampling devices shall be used only once and properly disposed.

D. The Design-Builder shall adhere to the following stockpiling guidelines:

1. Sample and classify all excavated Site materials including sewer sediment as follows:

i. Hazardous Material - Material from areas where analytical results exceed RCRA and/or TSCA hazardous waste regulatory levels for at least one target compound, as defined by 40 CFR Part 261, 40 CFR Part 761, and 6 NYCRR Part 371.

ii. Non-Hazardous, Non-Petroleum Contaminated Material - Material from areas where analytical results exceed Soil Cleanup Objectives (SCO) of 6 NYCRR Part 375-6.8 (Track 1) but are below hazardous waste regulatory levels established by the NYSDEC and do not exhibit petroleum contamination or exceed the SCLs for petroleum contaminated soil as per NYSDEC's CP-51.

iii. Petroleum-Contaminated Material - Material from areas where field observations suggest petroleum contamination and exceed SCLs for petroleum contaminated soil as per NYSDEC's CP-51.

iv. Non-Contaminated Material - Material from areas where environmental investigations do not indicate the presence of contamination as identified in the above three categories.

v. Rock/Construction Debris – Rocks which are greater than or equal to 4-inches in diameter and/or other miscellaneous construction demolition debris as defined in 6 NYCRR Part 360.

2. In-situ sampling for Work Site material classification prior to excavation is the preferred characterization method.

E. The Design-Builder shall adhere to the following sampling protocols for soils, concrete, ballast, and timber ties:

1. Collect soil, concrete, ballast, and timber ties samples for waste characterization purposes in accordance with the regulatory requirements specified herein and as required by the disposal facility.

2. NYSDEC's DER-10 provides guidance for sampling of soil imported to or exported from the Work Site. The recommended number and type of samples is included in the tables below. The actual number and type of samples per stockpile will depend on the regulatory requirements specified herein and as required by the disposal facility.

3. Submit samples to the Laboratory for analysis by the analytical parameters required in the tables above and by the disposal facility. Samples shall be submitted on ice in Laboratory-provided containers and within prescribed holding times and conditions.

3. Endpoint samples for petroleum-contaminated materials shall require the following analyses: Toxicity Characteristic Leachate Procedure (TCLP) including ignitibility and reactivity; RCRA characteristics; USEPA Target Compound List (TCL) volatile organic compounds (VOCs); TCL semi-volatile organic compounds (SVOCs); TCL polychlorinated biphenyls (PCBs); Target Analyte List (TAL) metals; TCL Pesticides; TCL herbicides; and dioxin based on the anticipated contaminants to determine if they were released into the environment.

4. Furnish laboratory analytical data package and copies of chain-of-custody forms to the Railroad within 21 Calendar Days (unless otherwise specified) of the sampling event.

Contaminant	**VOCs**	**SVOCs, Inorganics, & PCBs/Pesticides**	
Soil Quantity (cubic yards)	**Discrete Samples**	**Composite**	**Discrete Samples/Composite**
0-50	1	1	3-5 discrete sample from different locations in the fill being provided will comprise a composite sample for analysis
50-100	2	1	
100-200	3	1	
200-300	4	1	
300-400	4	2	
400-500	5	2	
500-800	6	2	
800-1000	7	2	
>1000			

5. Option to collect soil samples for VOC analysis using special collection devices (e.g., En Core, Terra Core, etc.) as per NYSDOH recommendations.

F. The Design-Builder shall adhere to the following sampling protocol for sewer sediment:

1. Accumulated sediments, greases, oils and grits removed from the sewer shall be sampled for waste characterization in accordance with the regulatory requirements and as required by the disposal facility.
2. Samples for waste characterization shall be screened in the field for the presence of VOCs with a photo-ionization detector (PID) and observed for discoloration, staining, odors, and products.
3. Solids, fats, greases, oils and other petroleum products captured during the sewer cleaning shall be separated from the liquids prior to waste characterization.
4. Wash water used for sewer cleaning operations will be considered contaminated and shall be either containerized for off-site disposal or properly treated as per local and state regulations prior to ultimate discharge to the sewers.
5. The Design-Builder shall have an option to collect sediment samples for VOC analysis using special collection devices (e.g., En Core, Terra Core, etc.) as per NYSDEC recommendations.

G. The Design-Builder shall adhere to the following sampling protocol for groundwater/wastewater:

1. Collect groundwater samples from monitoring wells, piezometers and discharge location(s) in accordance with the conditions set forth in all applicable permits and relevant regulations including NYSDEC DER-10 and TOGS.
2. Submit samples to laboratory and analyze for parameters as specified in all applicable permits and relevant regulations including NYSDEC TOGS.
3. Furnish laboratory analytical data packages and copies of chain-of-custody forms to the Railroad within 21 Calendar Days of the sampling event (unless otherwise specified).
4. Samples shall be collected for laboratory analysis and shall include a minimum of the following parameters: Toxicity Characteristic Leachate Procedure (TCLP) including ignitibility and reactivity; RCRA characteristics; USEPA Target Compound List (TCL) volatile organic compounds (VOCs); TCL semi-volatile organic compounds (SVOCs); TCL polychlorinated biphenyls (PCBs); Target Analyte List (TAL) metals; TCL Pesticides; TCL herbicides; and dioxin based on the anticipated contaminants to determine if they were released into the environment.

H. The Design-Builder shall adhere to the following sampling protocol for potential asbestos-containing materials:

1. Conduct a comprehensive asbestos survey, if required, and collect the required number of bulk samples in all work areas in accordance with 40 CFR 763, 12

NYCRR Part 56 (Code Rule 56), all Federal, State and local regulations, and those specific sampling requirements of the Railroad.

2. Analyze bulk samples of suspect asbestos containing materials for asbestos content by Polarized Light Microscopy (PLM) by ELAP Method 198.1 for friable materials and Method 198.6 for Non-Organically Bound (NOB) samples. NOB materials found to be negative by PLM shall be further analyzed by Transmission Electron Microscopy (TEM) by ELAP Method 198.4.

    i. Samples of spray-on fireproofing (SOF) (as needed) that are determined to contain vermiculite are to be analyzed ELAP method 198.8. Samples of other materials containing greater than 10% vermiculite will be analyzed by ELAP method 198.6.

3. All asbestos containing materials shall be handled in accordance with the requirements of the Contract Documents.

4. All samples are to be analyzed by an independent laboratory certified by the American Industrial Hygiene Association (AIHA), the National Voluntary Laboratory Accreditation Program (NVLAP) and NYSDOH ELAP.

I. The Design-Builder shall adhere to the following sampling protocol for potential lead-containing materials:

1. A lead-containing materials survey, if required, shall be conducted in conformance with the HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing. The survey, if required, shall consist of a visual inspection of each work area as well as the performance of X-Ray Fluorescence (XRF) testing to detect the presence of lead in the painted surfaces.

2. When an XRF reading is determined to be inconclusive, the sampling and subsequent analysis of the suspect surface shall be done by lead paint chip sample method (SW846-7420, Flame Atomic Absorption), by a New York State ELAP certified laboratory.

3. Lead-containing materials shall be properly managed in accordance with requirements of the Contract Documents.

2.7.14 Excavation, Staging, Handling, Transportation and Disposal of Hazardous Materials

This sub-section presents the requirements for furnishing all labor, materials, tools and equipment, and performing all operations necessary for excavation, staging, handling, transportation and disposal of hazardous material encountered during execution of the Contract.

A. The Design-Builder shall remove all hazardous soil and other hazardous material from the Work Site and delivered to a Hazardous Waste Treatment, Storage and Disposal (TSD) facility within 90 Calendar Days of the generation start date.

B. The Design-Builder shall not move any hazardous soil and other hazardous materials from their original Work Site to any other site without prior Review by the Railroad.

C. Classification of Site materials shall be undertaken in accordance with applicable regulatory standards specified herein and Chemical Sampling and Analysis.

D. All sampling activities and analytical methods shall be performed in accordance with applicable regulatory protocols, referenced standards, and regulations referenced herein and Chemical Sampling and Analysis in addition to NYSDEC's Sampling Guidelines and Protocols, CERCLA, and RCRA.

E. All employees handling hazardous material, including subcontractors, shall be qualified and experienced in the work of sampling, preparing, removing, handling, and disposing of the hazardous waste materials to be performed under this Contract. All employees shall be properly trained, certified in the pertinent environmental regulations and in personal protection, and other safety procedures.

F. The Design-Builder's Safety Supervisor/Representative shall be present at the Work Site during all Work times.

G. Provide in accordance with the SHECP and RAP, location and design of the on-site staging areas for holding hazardous/contaminated materials, including an explanation and layout of the exclusion, contamination reduction, and support zones, separate locations where hazardous soil and other hazardous materials shall be stockpiled and stored for sampling and characterization before disposal. All hazardous soil and other hazardous materials shall be protected from precipitation, stormwater runoff, and erosion. Storage location(s) shall be secured with access restricted to authorized personnel only.

H. All TSD Facilities and transporters which the Design-Builder intends to use to treat and/or dispose and transport hazardous soils and other hazardous materials shall be Reviewed by the Railroad before any removal under this Project. The Design-Builder shall verify compliance with 40 CFR 262, 263, and 264.

I. Should any problem arise regarding the TSD Facility selected to accept the hazardous soils and other hazardous materials that would require the return of hazardous materials to the Design-Builder or should such TSD Facility have violated any environmental regulation which would result in any regulatory enforcement action, immediately notify the Railroad in writing of such situations. Make provisions for the lawful storage of the hazardous soils and other hazardous materials, until an alternate approved TSD Facility can be located by the Design-Builder and Reviewed by the Railroad.

J. Comply with all of the requirements of the Building Code of New York State, except where more stringent requirements are specified.

K. The Design-Builder shall prepare and submit the following submittals to Railroad:

1. At least 60 Days before undertaking the excavation or handling of materials specified herein the following shall be submitted to the Railroad for Review:
    i. Remedial Action Plan: This shall include but not be limited to the following:
        a. Details of the proposed methods, including details of and activities planned at the disposal facility, for the excavation, removal, storage, stockpiling, testing, classification, transportation and disposal or reuse of all materials as specified herein. The Work Plan shall include information on material handling, waste transportation and off-site management, pollution prevention and spill contingency. The Railroad will Review, provide a notice to proceed, or request revision and resubmission of these plans. The Design-Builder shall not implement the RAP until the notice to proceed is received from the Railroad.
        b. Details of any temporary bracing and any other protection measures for utilities, services, structures, as well as survey and geotechnical instrumentation.
        c. Statement of qualifications for Hazardous Waste Materials Management including names, addresses and telephone numbers of responsible individuals.
    ii. Evidence of current valid permits, licenses, and certifications including as a minimum the following:
        a. Training certificates (current Hazardous Waste Operations and Emergency Response [HAZWOPER] 40-hour or 8-hour Refresher) of all workers, to be engaged in Work under this Section, including the Safety Supervisor/Representative, in accordance with 29 CFR 1910.120(e).
        b. Valid off-site transportation and disposal permits and licenses from the waste hauler and an approved TSD Facility, and a copy of the Petroleum Spill Response Plan for the Work Site. The Petroleum Spill Response Plan shall be submitted to the Railroad for Review and Approval.
        c. Name, location, telephone number, and all applicable permits of all TSD Facilities.
2. Prior to off-site management disposal of hazardous material, provide an approved waste shipment package (Waste Manifest) to the Railroad, showing acceptance of the waste shipment by the signature of an authorized representative of the permitted disposal facility.
3. The completed shipping documents for all hazardous waste removed shall contain the information required under 6 NYCRR Part 372 (manifest form) in addition to all certificates of disposal.
4. Submit executed waste manifests and final Certificates of Destruction or Disposal for each load of hazardous material removed from the Work Site.
5. Within 90 Calendar Days of completion, provide final closure report and documentation including as a minimum, the following:

i. Final weight tickets within seven days of shipment as specified herein.

ii. Copies of all shipping documents within two days of shipment as specified herein.

iii. Summary of sampling efforts and results of laboratory analysis for material disposal and end-point sampling results.

iv. Executed hazardous waste manifests for each load of respective material removed and transported from the Work Site, and manifests for material associated with decontamination.

v. Executed hazardous waste manifest form signed by a responsible party of the TSD Facility.

vi. Certificate of final disposal (or destruction) for each manifest.

vii. Location and volume of contaminated and/or hazardous water generated and the disposal management methods used.

viii. Status of all unanticipated conditions and/or findings and spills.

6. Provide any other documentation requested for Review by the Railroad to conform or comply with all applicable laws, codes, ordinances, and regulations.

A. The Design-Builder shall use the following materials:

1. 4-mil thick polyethylene sheeting shall be used as soil or other material stockpile liner and covers.

2. A partial containment berm typically made up of hay bales, silt-fence, or 12-inch by 12-inch timbers shall be utilized around stockpiled soils to direct runoff and minimize erosion, in accordance with the Erosion and Sediment Control procedures described in this Section.

B. The Design-Builder shall prepare the site as follows:

1. Before construction activities commence, identify areas of potentially hazardous materials that will be disturbed by construction.

2. Locate, identify, and protect all utilities within the Work Site from damage.

3. Protect all benchmarks, survey control points, boring locations, monitoring wells, and piezometers from damage or displacement during excavation, removal, handling, and disposal activities at the Work Site.

4. Construct staging areas for storage of hazardous materials within the approved storage area prior to off-site transportation and disposal, as specified herein.

C. The Design-Builder shall make requests for waste disposal clearances, and permits through the Railroad and the following contact:

Mr. Paul Manske MTA/LIRR
Deputy Chief Safety Officer- Occupational & Environmental Safety
Corporate Safety Department
144-41 94th Avenue- Mail Code 1944
Jamaica, New York 11435

[redacted]

1. Notification of NYSDEC Region 1 representative shall be notified five working days prior to removing hazardous materials.

2. Representatives of NYSDEC may arrive at the work site unannounced to perform SWPPP inspections and verify that all erosion and sediment controls are in place and working. The Design-Builder shall cooperate with and assist NYSDEC representatives and allow them on-site to perform an inspection. A hard copy of the SWPPP and all inspection reports must be maintained on the Work Site.

D. The Design-Builder's Safety Supervisor/Representative shall be present at the Work Site at all Work times.

E. The Design-Builder shall display or have available at all times at the Work Site a copy of the approved Safety, Health, and Environmental Control Plan (SHECP).

F. The Design-Builder shall clear areas required for access to the Work Site and execution of the Work.

G. The Design-Builder shall follow the following requirements with respect to the excavation, handling, and storage of hazardous materials:

1. Do not excavate wet hazardous materials.
2. Stockpile hazardous soil and other hazardous materials in a designated storage location and protect from precipitation, erosion, and stormwater runoff using 4mil thick plastic polyethylene sheeting and a containment berm. All hazardous soil and other hazardous material shall be removed from the Work Site and delivered to the TSD Facility within 90 Calendar Days of the generation start date. Do not move any hazardous soil and other hazardous materials from their original Work Site to any other site without prior Review by the Railroad.
3. Stockpiles shall be of manageable size and designed to protect the soil from precipitation, runoff, and erosion. Restrict access to the area to authorized personnel only.
4. Design storage areas to prevent leakage from the stockpiled materials from entering surrounding surface soils or waters. Line and cover stockpiled areas with 4-mil thick impervious, polyethylene sheeting.
5. Provide appropriate berms, sumps, or ditches around the storage area to prevent surface water runoff from contacting the stockpiles and to prevent infiltrating water from discharging off the stockpile area.
6. Provide a drainage system to collect accumulated liquids from all stockpiled areas and divert the liquids to an appropriate water collection, storage, and/or treatment system.
7. Store potentially hazardous soil separately from all other material in accordance with 6 NYCRR 372.

8. Collect soil samples from the stockpiles for waste characterization purposes, as directed by the TSD facility.
9. All hazardous soil and Site materials shall be removed from the Work Site for disposal following the Railroad's receipt and Review of sampling, analysis, and characterization.
10. Confirm all analytical parameters that may be required by the TSD Facilities before their acceptance of disposed materials.
11. Stockpiled soil and materials classified as hazardous shall be disposed as hazardous waste as specified in herein, in addition to 40 CFR 260.
12. Universal waste shall be recycled, treated or disposed of in accordance with regulations set forth in 40 CFR 273 and 6 NYCRR 374-3.

H. The Design-Builder shall adhere to the following dust control and monitoring requirements:

1. Ensure that dust generated during all work is controlled in accordance with Federal, State and local regulations. Implement OSHA and NYSDEC requirements for suppression of contaminated dust.
2. Conduct monitoring of worker exposures in a manner to comply with the monitoring requirements of 29 CFR 1910 and 29 CFR 1926.
3. If OSHA permissible exposure limits (PELs) are exceeded either engineering controls shall be implemented by the Design-Builder to reduce the contaminant levels, or PPE shall be worn. If monitoring reveals elevated levels of air-borne contaminants, stop work until safe working conditions are established.

I. The Design-Builder shall adhere to the following requirements regarding transportation and final disposition of hazardous materials:

1. All stockpiled material classified as hazardous (in accordance with Chemical Sampling and Analysis and 40 CFR 261) shall be transported off-site to the TSD Facility in accordance with 40 CFR 264 and 761 within 90 Calendar Days.
2. Applicable USDOT and New York State hazardous materials transporter regulations referenced herein shall be followed during the transportation and handling of all hazardous material.
3. Do not remove any excavated materials from the Work Site unless authorized by the Railroad. On the day of off-site shipment, the Railroad will sign the hazardous waste manifest and retain one copy.
4. A hazardous waste manifest label must be affixed to containers used to transport hazardous material removed from the Work Site. The manifest label shall be properly filled out with the USEPA hazardous waste ID number, the name of the waste, the date and the generator's site address. Please see Appendix TPA2.7B HAZARDOUS WASTE LABEL for an approved hazardous waste label.

5. Obtain the appropriate RCRA hazardous waste generator number from the Railroad to be provided on the waste manifest.

6. Upon delivery of the waste to the TSD Facility, the TSD Facility representative shall sign and date the manifest. A copy of this manifest shall be sent to the Railroad.

7. Provide copies of all paperwork (shipping documents) that accompany a waste shipment, including a description of the material and the on-site source, to the Railroad within two days of the shipment. Hard copies of shipping documents must also be sent to:

   Long Island Rail Road—Corporate Safety Department
   Attention: Kathy Green
   146-01 Archer Avenue, MC 1428
   Jamaica, NY 11435

8. Provide final weight tickets and waste/shipping documents for hazardous waste from the receiving facility and transporter within seven days of shipment from the Work Site.

9. The Railroad shall receive a copy of the manifest signed and dated by the operator of the TSD Facility within 45 Days of the date the hazardous material was shipped from the Work Site.

J. The Design-Builder shall remove all waste materials and restore all temporary storage and stockpile areas and corridors. At the completion of the Work, temporary storage and stockpile areas shall have a neat appearance and shall be graded to drain to accepted drainages to prevent erosion.

2.7.15 Excavation, Staging, Handling, Transportation and Disposal of Non-Hazardous Materials

A. This sub-section presents the requirements for furnishing all labor, materials, tools and equipment, and performing all operations necessary for excavation, staging, handling and disposal of non-hazardous contaminated (including petroleum-contaminated) soil, concrete, ballast, sewer sediment or other Site materials as specified in this Section.

B. Work under this sub-section shall also include requirements for the excavation, staging, handling, transportation, and disposal of non-contaminated materials, rock/construction debris, and unidentified impacted materials associated with earthwork in areas that have not been previously identified, as Reviewed by the Railroad.

C. The Design-Builder shall not move any contaminated soil and other materials from their original Work Site to any other site without prior Review by the Railroad.

D. Classification of soil, concrete, ballast, sewer sediment, and other Work Site materials shall be undertaken in accordance with applicable regulatory standards specified herein

and requirements of 6 NYCRR Part 375, in addition to NYSDEC DER-10 and CP-51 Sampling Guidelines and Protocols, CERCLA and RCRA.

E. Sampling activities and analytical methods shall be performed in accordance with applicable regulatory protocols, referenced standards and regulations specified herein in addition to NYSDEC's Sampling Guidelines and Protocols, CERCLA and RCRA.

F. If at any time during the course of construction, the Design-Builder deems any soil, concrete, ballast, sewer sediment or other Work Site material to be contaminated other than what has been identified, immediately notify the Railroad.

G. The Design-Builder shall comply with all requirements of the Building Codes of New York State, except where more stringent requirements are specified.

H. All off-site solid waste management methods, facilities and transporters, which the Design-Builder intends to use to treat, dispose or transport soils, concrete, ballast, sewer sediment and other Site materials shall be Reviewed by the Railroad before any materials excavation under this Project. The Design-Builder shall verify that off-site management facilities and transporters are approved by the Railroad. Comply with 6 NYCRR Parts 360 and 364.

I. Should any problem arise regarding an approved facility or transporter that would require the return of materials to the Design-Builder or should such facility or transporter have violated any regulation which would result in any regulatory enforcement action, immediately notify the Railroad in writing of such situations. Make provisions for the lawful storage of the soils and other Site materials, until an alternate facility or transporter can be arranged by the Design-Builder and Reviewed by the Railroad.

J. All on-site solid waste management methods which the Design-Builder intends to use to handle or treat soils and other Site materials shall be Reviewed by the Railroad before any materials excavation under this Project. All applicable requirements of all governing bodies having jurisdiction shall be followed. Verify compliance with 6 NYCRR Part 360.

K. Should any problem arise regarding an approved treatment method, immediately notify the Railroad in writing of such situations. Make provisions for the lawful storage of the soils and other Site materials, until an alternate method, facility and/or transporter can be arranged by the Design-Builder and Reviewed by the Railroad.

L. The Design-Builder shall prepare and submit the following submittals to Railroad:

1. A minimum of 60 Calendar Days before undertaking the excavation or handling of materials specified herein, submit a Non-hazardous Materials Work Plan including, but not limited to, the following:

    i. Details of the proposed methods, including details of any activities planned at the disposal facility, for the excavation, removal, storage, stockpiling,

testing, classification, transportation and disposal or re-use of all materials as specified herein.

ii. Petroleum Spill Response Plan.

iii. Statement of qualifications for Non-Hazardous Waste Materials Management including names, addresses, and telephone numbers of responsible individuals.

2. Submit evidence of current valid permits, licenses, and certifications including, as a minimum, the following:

   i. Off-site transportation entity permits and licenses including a copy of the Petroleum Spill Response Plan.

   ii. Written verification by a Certified Industrial Hygienist (CIH) of approval of the Safety, Health, and Environmental Control Plan (SHECP) and a copy of the report

   iii. Name, location, telephone number, and all required permits of all handling facilities.

3. Material-specific safety documents including the SHECP. Documents shall conform to the requirements of 29 CFR 1910 including, but not limited to, the following:

   i. The SHECP shall be read and signed by all affected personnel.

   ii. Identify key personnel responsible for Work Site safety, including the name and qualifications of the Design-Builder's Safety Supervisor/Representative.

   iii. Address levels of personal protection equipment (PPE) to be employed during Work, establishing specific criteria for choices of protective clothing and equipment.

   iv. Designate Work exclusion zone(s) and decontamination zone(s) as defined by OSHA. Describe how zone(s) will be marked / barricaded and made known to all persons at the Work Site.

   v. Establish Work Site emergency procedures including escape routes, signals for evacuating work parties, emergency communications, and procedures for response to fire and explosions. Describe emergency equipment to be made available on-site, such as portable extinguishers and first aid kit.

   vi. Identify, provide location of, and list arrangements with the nearest Medical Facility.

   vii. Establish a program for air monitoring in the Work Area (exclusion zone) in accordance with the Community Air Monitoring Plan. List and describe equipment to be used. Program shall include a description of provisions to monitor and control direct contact and inhalation exposures to construction workers, Railroad employees, and the general public.

   viii. Provide action levels based on air monitoring results to upgrade PPE against airborne particulates and contaminants.

ix. Set forth procedures for decontamination of personnel, materials and equipment.

M. The Design-Builder shall prepare and submit the following deliverables to Railroad:

1. Within 90 days of completion, provide documentation including as a minimum, the following:

i. Copies of all shipping documents within two days of shipment as specified herein.
ii. Final weight tickets within seven days of shipment as specified herein.
iii. Summary of sampling efforts and results of laboratory analysis for all soils and materials sampled.
iv. Documentation related to on-site activities including recycling, re-use and treatment, under approved Beneficial Use Determination (BUDs).
v. Executed waste manifests or bills of lading for each load of respective material removed and transported from the Work Site.
vi. Executed waste manifest forms or bills of lading (signed by a responsible party of the solid waste management facility) for each load of respective material removed and transported from the Work Site.
vii. Certificate of final disposition for each manifest.

2. Provide any other documentation requested for Review by the Railroad to conform or comply with all applicable laws, codes, ordinances, and regulations.
3. Provide manifests, bill of ladings, scale tickets and laboratory analytical results.

N. The Design-Builder shall use the following products:

1. 4-mil thick polyethylene sheeting shall be used as soil stockpile liner and covers.
2. A partial containment berm typically made up of hay bales, silt-fences, or 12-inch by 12-inch timbers shall be used around stockpiled soils to direct runoff and minimize erosion.

O. Before construction activities, the Design-Builder shall identify areas of non-hazardous contaminated soil, or other Site materials that will be disturbed by construction.
P. Representatives of NYSDEC may be at the Work Site. The Design-Builder shall cooperate with and give assistance to such representatives, upon Review by the Railroad.
Q. The Design-Builder's Safety Supervisor/Representative shall be present at the Work Site during all Work times.
R. The Design-Builder shall display or have available at all times at the Work Site a copy of the approved SHECP and SWP documents.
S. The Design-Builder shall locate, identify, and protect all utilities within the area from damage.
T. The Design-Builder shall protect all benchmarks, survey control points, boring locations and monitoring wells from damage or displacement during excavation and handling activities at the Work Site.

U. The Design-Builder shall clear areas required for access to the Work Site and execution of the Work.

V. The Design-Builder shall adhere to the following procedures with respect to the excavation, staging, and handling of non-hazardous contaminated materials:

1. Non-hazardous contaminated material (including petroleum-contaminated material) shall not be mixed with foreign materials.
2. Materials may be pre-classified by in-situ sampling.
3. If not pre-characterized, excavated non-hazardous contaminated material shall be stored in designated storage area until waste characterization is completed.
4. Accumulated sediments removed from the sewer system during cleaning operation shall be separated from the liquids and containerized.
5. Stockpiles shall be of manageable size and designed to protect the soil from precipitation, runoff, and erosion. Access to the area shall be restricted to authorized personnel only.
6. Storage areas shall be designed to prevent leakage from the stockpiled materials from entering surrounding surface soils or waters. Line and cover stockpiled areas with 4-mil thick impervious, polyethylene sheeting.
7. Provide appropriate berms, sumps, or ditches around the storage area to prevent surface water runoff from contacting the stockpiles and to prevent infiltrating water from discharging off the stockpile area.
8. Provide a drainage system to collect accumulated liquids from all stockpiled areas and divert the liquids to an appropriate water collection, storage and/or treatment system.
9. If not pre-characterized, collect samples (soil and other material) from the stockpiles for waste characterization purposes and as required by the disposal facility.
10. Sewer sediment shall be sampled for waste characterization as required by the disposal facility.
11. Confirm all analytical parameters that may be required by solid waste management facilities prior to their acceptance of materials.

W. The Design-Builder shall adhere to the following procedures with respect to the disposal of non-hazardous contaminated materials:

1. Disposition options for non-hazardous contaminated soil and other material include the following:

    i. Material classified as non-hazardous, non-petroleum contaminated material shall be:

        a. Reused on-site under specific NYSDEC BUDs according to 6 NYCRR Part 360. The preferred disposition option is reuse as onsite fill material if the fill material meets all other requirements including gradation.
        b. Treated on-site by an approved method.
        c. Disposed at an approved off-site solid waste management facility.

ii. Material classified as petroleum-contaminated shall be:
    a. Disposed at an off-site authorized solid waste management facility or landfill according to 6 NYCRR Part 360 and 364; or
    b. Processed off-site and re-used under specific NYSDEC BUDs according to 6 NYCRR Part 360.

X. The Design-Builder shall adhere to the following procedures with respect to the transportation of non-hazardous contaminated materials:

1. All non-hazardous contaminated soil and other Work Site material shall be properly transported following the Railroad's receipt and written notice of sampling, analysis, and characterization.
2. No excavated Site materials shall be removed from the Work Site unless Reviewed by the Railroad. Transportation shall comply with 6 NYCRR Part 364. On the day of off-site shipment, the Railroad shall sign the waste manifest or bill of lading and retain one copy.
3. All vehicles used to transport Site material to off-site facilities shall be covered to prevent loss of soil during transport to the disposal facility.
4. Vehicles shall utilize maximum legal load limits for transport from the Work Site to the disposal facility.
5. Disposition of contaminated soil at an off-site facility shall include all time incurred for queuing, weighing, and tipping at the facility.
6. Deliver all scale tickets to the Railroad for confirmation of quantities.
7. Submit executed waste manifests and/or bill-of-lading for each load of Site material removed from the Work Site.
8. The Design-Builder shall provide copies of all paperwork (shipping documents) that accompany a waste shipment, including a description of the material and the onsite source, to the Railroad within two Working Days of the shipment.
9. Provide final weight tickets and waste/shipping documents from the receiving facility and transporter within seven days of shipment from the Work Site.

Y. The Design-Builder shall adhere to the following procedures with respect to the management of contaminated water:

1. Manage all contaminated water encountered or produced in accordance with all relevant Federal, State, and local regulations.
2. When contaminated water, such as liquids generated during construction operations, cannot be properly treated, such water shall be pumped into temporary storage containers (or other appropriate methods), sampled, and analyzed by the Design-Builder in accordance with the requirements of the disposal facility (for containerization and off-site disposal) or for discharge to the sewers. Provide the test results to the Railroad.

Z. The Design-Builder shall adhere to the following procedures with respect to the handling of non- contaminated materials:

1. Non-contaminated Site materials shall be staged and handled in the same manner as non-hazardous contaminated materials. Non-contaminated Site materials may be reused on site.

AA. The Design-Builder shall adhere to the following procedures with respect to the control of dust:

1. Ensure that the dust generated during all Work is controlled in accordance with Federal, State and local regulations. Implement OSHA requirements for suppression of contaminated dust.
2. Conduct monitoring of worker exposures in a manner to comply with the monitoring requirements of 29 CFR 1910 and 29 CFR 1926.
3. If OSHA permissible exposure limits (PELs) are exceeded, subject to the Review of the Railroad, either engineering controls shall be implemented by the Design-Builder to reduce the contaminant levels, or PPE shall be worn. If monitoring reveals elevated levels of air-borne contaminants, stop Work until safe working conditions are established.

BB. The Design-Builder shall remove all waste materials and restore all temporary storage and stockpile areas.

CC. At the completion of the Work, temporary storage and stockpile areas shall have a neat appearance and shall be graded to drain to accepted drainages to prevent erosion.

2.7.16 Hazardous Materials Management

A. The Design-Builder shall prepare a Hazardous Materials Management Plan (HMMP). The HMMP shall include safe handling, storage, treatment and/or disposal of Hazardous Materials whether encountered at or brought onto the Project by Design-Builder, or by a Third Party. The HMMP shall include procedures compliant with all applicable Codes and Standards and include, at a minimum:

1. For all chemicals to be used on the Project, Safety Data Sheets (SDS), per OSHA requirements.
2. Designated individuals responsible for implementation of the plan.
3. Procedures for ensuring that all applicable certifications, licenses, authorizations, and Governmental Approvals for personnel handling Hazardous Materials are current and valid through the duration of the Work.
4. Procedures for identifying and documenting potential contaminated sites which might impact Project development.
5. Assessment of the risk of release of Hazardous Materials into the ground, groundwater, or surface water of the property as a result of Design-Builder Work.
6. Procedures for Hazardous Materials Management of known contaminated sites anticipated to impact construction.
7. Procedures for Hazardous Materials Management of unanticipated contaminated sites encountered during Construction Work.
8. Procedures for Hazardous Materials Management of contamination during the operations of the Project.

9. Provisions for appropriate storage and management or remediation of Hazardous Materials on Site.
10. Procedures for preparing an investigative work plan and site investigative report in the event that Hazardous Materials are discovered during Construction Work, operations, or maintenance activities, including Railroad's Review and Comment on such plans and reports.
11. Identification and contact information for designated responsible individuals.
12. The HMMP shall require that all non-administrative personnel of Design-Builder handling Hazardous Materials be trained and certified at least to the minimum requirements established under the current guidelines of OSHA 1910.120 (HAZWOPER Training).
13. The Railroad shall have the right to direct alternative approaches or to undertake Hazardous Materials Management itself.

B. The Design-Builder shall prepare, implement, manage, operate, and, as required, update a Hazardous Materials Operations, Safety, and Health Plan (HMOSHP) that complies with all applicable Law and Good Industry Practice, including at a minimum:
    1. Procedures and contingency plans to meet the Resource Conservation and Recovery Act requirements in 40 CFR 262 for waste operations.
    2. Risk identification and assessment, decontamination procedures, Emergency response procedures, training procedures for employees, personnel roles; lines of authority, training and communications; Emergency recognition and prevention; site security; evacuation routes and procedures; decontamination procedures; emergency medical treatment; and emergency alerting procedures.
    3. Details of the training to be provided by Design-Builder for Railroad staff required by their duties to visit the Project or facilities to be used in connection with the Project including, at a minimum, facilities for the production of materials or equipment.
    4. Provisions for making all on-site workers aware of the potential Hazardous Materials to which they may be exposed, limiting Design-Builder and other Site workers' exposure to Hazardous Materials and providing all necessary personal protection equipment to protect workers from exposure.
    5. Requirement that the Design-Builder to provide any non-Design-Builder personnel who visit the Project with the appropriate personal protection equipment, full descriptions of Design-Builder's policies, plans, training programs, work site controls, and incident response plans to ensure the health and safety of personnel involved in the Project and the general public affected by the Project.
    6. Address procedures for immediately notifying Railroad of all Incidents involving Hazardous Materials arising out of or in connection with the performance of the Work, whether on or adjacent to the Project.

2.7.17 Summary of Submittals

Item	Section	Submittal	Action
1	2.7.5	Air Quality Control Plan	Review and Approval

2	2.7.5	Documentation that engine meets certification & retrofit requirements	Information
3	2.7.6	Erosion and Sediment Control Plan (ESCP)	Review and Approval
4	2.7.6	Notice of Termination (NOT)	Review and Approval
5	2.7.6	Notice of Intent (NOI)	Review and Approval
6	2.7.6.2	Dust Control Plan	Review and Approval
7	2.7.7	Stormwater Pollution Prevention Plan (SWPPP)	Review and Approval
8	2.7.7	Post-Construction Stormwater Management Plan	Review and Approval
9	2.7.7	Notice of Termination (NOT)	Review and Approval
10	2.7.8	Community Air Monitoring Plan	Review and Approval
11	2.7.9	Construction Protection Plan (CPP) for Historic Resources	Review and Approval
12	2.7.10	Phase 1B Archaeological Field Investigation Plan	Review and Approval
13	2.7.10	Phase 1B Summary Report	Review and Approval
14	2.7.11	Recycled Materials Documentation	Information
15	2.7.13	Environmental Site Investigation Report	Review and Comment
16	2.7.13	Phase II Subsurface Investigation Work Plan	Review and Approval
17	2.7.13	Remedial Action Plan (RAP)	Review and Approval
18	2.7.13	Safety, Health and Environmental Control Plan (SHECP)	Review and Approval
19	2.7.14	Lab analytical data package	Information
20	2.7.14	Asbestos survey reports	Information
21	2.7.14	Sampling location drawings	Information
22	2.7.15	Sampling and Analysis Plan (SAP)	Review and Approval
23	2.7.15	Petroleum Spill Response Plan	Review and Approval
24	2.7.15	Approved Waste Manifest	Information
25	2.7.15	Complete Shipping Documents	Information
26	2.7.15	Final closure report and documentation	Information
27	2.7.15	Final weight tickets	Information
28	2.7.16	Non-hazardous Materials Work Plan	Review and Approval
29	2.7.16	Evidence of current valid permits, licenses, certifications	Information
30	2.7.16	Copies of shipping documents	Information
31	2.7.16	Final Weight Tickets	Information
32	2.7.16	Summary of Sampling efforts	Information
33	2.7.16	Recycling, reuse and treatment documentation	Information
34	2.7.16	Executed waste manifests or bills of landing	Information
35	2.7.17	Hazardous Materials Management Plan (HMMP)	Review and Approval
36	2.7.17	Hazardous Materials Operations, Safety and Health Plan (HMOSHP)	Review and Approval

END

2.8 LEAD AND ASBESTOS REMEDIATION

2.8.1 Section Includes

This Section describes the environmental requirements and mitigation measures relating to:

A. Lead paint management.

B. Asbestos-containing materials (ACMs).

2.8.2 Codes and References

A. American Board of Industrial Hygiene (ABIH).

B. Associated General Contractors of America, Inc. (AGCA):

1. Manual of Accident Prevention in Construction.

C. National Institute for Occupational Safety and Health (NIOSH):

D. American National Standards Institute (ANSI):

1. Z87.1 - Eye Protection.
2. Z88.2-80 - Practices for Respiratory Protection.

E. Steel Structures Painting Council (SSPC):

1. Guide 6 - Guide for Containing Debris Generated During Paint Removal Operations.
2. SSPC 93-02 - Industrial Lead Paint Removal Handbook, 2nd Edition, Volume I.
3. SSPC 98-06 - Project Design, Industrial Lead Paint Removal Handbook, Volume II.

F. 29 CFR 1926 – OSHA Construction Standard.

G. 12 NYCRR Part 56 - Asbestos (Industrial Code Rule 56).

H. 40 CFR 61 - National Emission Standards for Hazardous Air Pollutants (USEPA NESHAPS).

I. 49 CFR 171-180 - Hazardous Material Transportation Regulations (USDOT).

J. Steel Structures Painting Council (SSPC)

1. Guide 6 - Guide for Containing Debris Generated During Paint Removal Operations.
2. SSPC 93-02 - Industrial Lead Paint Removal Handbook, 2nd Edition, Volume I.
3. SSPC 98-06 - Project Design, Industrial Lead Paint Removal Handbook, Volume II.
4. Code of Federal Regulations (CFR):
   i. 29 CFR 1910 - Occupational Safety and Health Standards (OSHA).
   ii. 29 CFR 1926 - Safety and Health Regulations for Construction (OSHA).
   iii. 40 CFR 260-263 - Hazardous Waste Regulations (USEPA).
   iv. 49 CFR 171-180 - Hazardous Material Transportation Regulations (USDOT).

5. New York State Department of Environmental Conservation (NYSDEC):
    i. 6 NYCRR Part 360 - Solid Waste Regulations.
    ii. 6 NYCRR Part 364 - Waste Transportation Regulations.
    iii. 6 NYCRR Part 370-374 and 376 - Hazardous Waste Regulation.
6. New York State Department of Health (NYSDOH):
    i. 173.14 - Safety Standards for Lead Based Paint Abatement.
7. New York State (NYS)
    i. Article 30 of New York State Labor Law, Products Containing Asbestos; Licensing.

2.8.3 Lead Paint Management

A. This provision provides for utilization of management methods and containment systems, as required, that shall eliminate or minimize the risk of worker and community exposure to lead dust/debris generated during LBP disturbance, as well as disposal requirements which conform to all applicable federal, state and local laws and regulations. LBP management work shall include the disturbance, removal, and off-site management of LBP associated with the construction work described herein above. The LBP shall be removed intact on the components, with a minimal disruption to the painted surface or shall be removed from the components expected to be disturbed during construction.

B. Those activities which will require management of LBP include, but are not limited to:
    1. Surface preparation to remove loose, flaking, peeling paint.
    2. Drilling, cutting, bolt and rivet removing, etc.
    3. Scarification.
    4. Other required paint removals.

C. The Design-Builder shall use the requirements of this subsection for furnishing all tools, personnel, equipment, safety devices, and spill prevention and cleanup materials as required for the Work to be performed and for the management, removal, disturbance, and disposal of lead-containing waste. This shall include, but is not limited to, industrial vacuum cleaning equipment, equipped with high efficiency particulate air (HEPA) filters capable of removing paint waste and providing personal protective equipment (PPE) to all personnel who will enter the work area or who will be in contact with hazardous waste. The Design-Builder is also required to provide protective equipment to persons outside of their employment who may be required to visit the Work Site.

2.8.3.1 Design-Builder's Use of Subcontractors

A. If the Design-Builder uses Subcontractor(s) to perform any of the work under this Specification including laboratory work and waste disposal, this Specification shall apply to all such Subcontractor(s) as if specifically referred to herein.

B. The Design-Builder or its Subcontractor(s) shall perform all work necessary to carry out the proper management, identification, removal, collection, handling, storage, classification, testing, transportation and disposal of LBP in accordance with all

applicable laws, codes, rules and regulations and the requirements of Technical Provisions.

C. The Subcontractor(s) performing paint removal or other lead management work shall be considered Lead Abatement Subcontractor(s).

2.8.3.2 Certificate of Removal

A. The Railroad will be provided an original signed Certificate for Removal of all LBP. No removal and disposal activities shall take place without this signed Certificate for Removal prominently posted at the work site. All activities involving the removal of LBP must cease upon expiration of the Certificate for Removal; work cannot resume until a request for a certificate renewal has been submitted to the Railroad for Review.

2.8.3.3 Accreditations, Qualifications, and Training Requirements

A. The laboratory used for testing shall be Environmental Laboratory Accreditation Program (ELAP) certified for all parameters required.

B. The Design-Builder shall employ a certified USEPA/NYS Lead Supervisor on-site at all times during the Work and ensure that all employees, including Subcontractors, are qualified and experienced in the work of preparing and removing and disposing of the LBP which they shall perform under this Contract. All employees shall be knowledgeable in the pertinent environmental regulations and in personal protection and other safety procedures. All lead abatement workers shall have valid USEPA/NYS Lead Worker certifications.

C. The Design-Builder and/or its Subcontractors involved in any activity which may impact LBP (i.e., LBP sampling, lead removal, and lead removal design) shall have demonstrated a minimum three (3) years of experience in lead hazard assessment and management, environmental and personal air monitoring, worker protection and training, and lead remediation specification writing.

D. Before using any Subcontractor(s) to perform any of the other lead management work under this provision, including laboratory work, the Design-Builder shall submit an executed “Statement of Qualifications of Lead Subcontractor” for each such Subcontractor to the Railroad for Review.

E. All employees shall be trained in accordance with 29 CFR 1926.62 before initial assignment to areas where there is a possibility of exposure to lead over the Action Level (AL) of 30 micrograms per cubic meter. This training shall include a description of the OSHA lead standard, the sources of lead exposure, the uses and limitations of respirators, the purpose of getting a blood lead test, the purpose of the initial exposure assessment, their rights to the results of blood tests air monitoring, and the methods of controlling the level of lead exposure to a minimum.

2.8.3.4 Equipment and Materials

A. The Design-Builder shall furnish all labor, materials, services, permits, and equipment necessary to carry out the LBP management work (which includes removal, clean up, handling, storing, transporting, and off-site disposal of LBP contaminated components).

B. The following equipment and material shall be used, at a minimum, for proper execution of the LBP management work. Additional equipment and materials shall be used, as

required, for activities to be conducted in accordance with applicable regulations. The use of additional or alternate materials and equipment shall be included in the LBPMP, and shall be subject to the Review of the Railroad. All equipment and materials shall be in new or "like new" condition and in good working order:

1. Respiratory Protection in accordance with the approved Respiratory Protection Program contained in the LBPMP.
2. High Efficiency Particulate Air (HEPA) Vacuum Filtration Systems: All vacuum equipment employed in the work area shall utilize HEPA filtration systems that are 99.97 percent efficient to 0.3 microns particulate size. Vacuums shall be equipped with appropriate size brushes, crevice tools and other angular tools necessary for proper cleaning of all surfaces.
3. Decontaminated Wastewater Filtration System: The system shall, at a minimum, contain a three-stage filtering system with a final filter not greater than 0.5-microns. The filtration system shall be adequate to meet applicable regulations and permits.
4. At a minimum, two layers of securely attached 6-mil PVC sheeting shall be used to cover the Work Area. The sheeting shall extend 20-feet from the edge of the work area and 20-feet from the base of the container used for off-site disposal, where space is available and secured to the ground. Additional containment requirements are outlined herein.
5. Off-site waste transportation containers shall be USEPA and USDOT approved solid enclosed containers, lined with two layers of 6-mil PVC sheeting and locked and secured at all times.
6. Temporary electrical cords and outlets shall be Underwriters Laboratory (U.L.) listed, connected to a source of power outside of the work area, and protected by a ground fault circuit interrupter (GFCI) as reviewed by the Railroad.

2.8.3.5 Design-Builder's Responsibilities

2.8.3.5.1 Prior to beginning of LBP Management Activities

A. The Design-Builder shall prepare a detailed LBP Management Plan (LBPMP) outlining the specific methods and controls to be used during the performance of this work. Submit the LBPMP to the Railroad within 30 Calendar Days after LNTP. The Railroad will review, provide notice to proceed or request revision and resubmission of the LBPMP. Do not implement this LBPMP until notice to proceed is received from the Railroad. The Railroad's notice to proceed shall not be considered an approval, but an indication that the LBPMP is consistent with the requirements specified in this Section of Technical Provisions.

B. Information to be included in the LBPMP regarding overall conduct and work practices to be employed on this Project is required and shall include, at a minimum:

1. Employee information and training - This shall include copies of all licenses, training certification, permits, and notifications that are required by 29 CFR Part 1926.62, including laboratory certifications.
2. Medical Surveillance and Medical Removal Protection: Provide a written program describing frequency and type of blood testing, medical removal, and physical

examinations. Certifications for the laboratory conducting blood work, certifications of occupational physician, and copies of blood lead testing for all crew members and competent persons shall be provided, including a description of the medical surveillance program and plan that includes the items required by OSHA 29 CFR Part 1926.62.

3. Exposure Assessments: Provide program site exposure assessments documenting compliance with OSHA Permissible Exposure Limits (PELs) and Action Levels, and provide certifications for the laboratory conducting air sampling analysis.
4. Personal protective equipment - including respiratory protection and protective clothing.
5. Signs and Restricted Zones: Provide a written program for establishing restricted zones and use of Lead Work signs.
6. Written Compliance Program: Provide in accordance with OSHA 29 CFR Part 1926.62, including a Respiratory Protection Program and documentation of fit testing.
7. Work Area preparation - including site access and security plans.
8. Personal Hygiene Facilities and Equipment/Decontamination Zone: Describe the decontamination procedures of personnel, and equipment including procedures for showers, break areas, and change areas. Include catalog cuts for the decontamination unit and hand wash station.
9. The location and quantities of LBP to be removed.
10. Engineering and Work Practice Controls – This shall include a written program describing the methods of lead management, air monitoring, containment/collection systems, equipment and safety procedures. Include catalog cuts for power tools/hand tools with HEPA attachments.
11. Housekeeping: Provide a written program describing cleaning frequency, cleaning with HEPA vacuums, cleaning with biodegradable lead detergents, containerizing, storing and disposing of lead dust and paint chips.
12. Material Safety Data Sheets (MSDS): Provide documentation for all chemicals to be used as part of the LBP management.
13. Visible Assessments: Provide a written program for assessment of visible emissions.
14. Pre- and Post-management sampling protocols and action levels.
15. Procedures for handling and disposing of waste materials.
16. Procedures for final decontamination, clean up, and clearance.
17. Detailed work and performance schedule.

C. A Waste Handing Plan shall be included within the LBPMP that addresses the proper handling and disposal of all waste, which includes:

1. Transporter Qualifications, Experience, and Permits including the names, addresses, qualifications, and contact persons for the proposed transporter(s) of

hazardous waste, non-hazardous waste, and wastewater. Provide evidence that each transporter has current registration and permits, as required.

2. Disposal Facility Qualifications, Experience and Permits that include the name, address, telephone number, and contact person for each waste disposal facility proposed for use in the Contract. Provide evidence that each disposal facility has current registrations and permits for the operation of such facilities, or written approval from the state (and by the USEPA or other local agency, if applicable) in which it operates.

D. A Contingency Plan and Emergency Procedures shall be included in the LBPMP as follows:

1. Submit a Contingency Plan and Emergency Procedures to respond to fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water at the construction site.
2. The plan shall describe arrangements agreed to by local police departments, fire departments, hospitals, and state and local emergency response teams.
3. The plan shall list names, addresses, and phone numbers of all persons qualified to act as emergency coordinators; and include a list of all emergency equipment at the construction site (fire extinguishers, spill control equipment, communications and alarm systems and decontamination equipment).
4. The plan shall include an evacuation plan for workers to describe signals to be used to begin evacuation routes, and alternate evacuation routes.

B. Furnish a lead-containing material survey report including X-ray Fluorescence (XRF) and laboratory analytical results and copies of chain-of-custody forms to the Railroad within 21 Calendar Days of the sampling event (unless otherwise specified). The report shall include drawings that depict the sampling locations, which corresponds to the appropriate XRF and laboratory data.

C. For all lead abatement activity under this project, the Design-Builder shall provide the following submittals for Review by the Railroad a minimum of 15 Work Days prior to abatement.

1. A copy of the abatement Design-Builder master list of workers showing proof (submit copy of “blue card”) of receiving Railroad Roadway Worker Protection training.
2. Copy of Valid Hazardous Waste Hauler Permit.
3. A letter indicating whether the lead waste will be transported directly to a landfill or a transfer station will be utilized (and if so please identify).
4. The name, address and permit of the landfill that will accept the lead waste.
5. A copy of laboratory ELAP accreditation for OSHA sampling analysis.
6. A detailed work schedule for each day of work, including number of laborers per day.
7. A detailed drawing identifying the regulated area, decontamination units, waste storage area and material storage area.
8. Safety Data Sheets for applicable materials used in lead removal.

9. Any other documents deemed necessary by the Railroad.

2.8.3.5.2 Construction Phase

A. The Design-Builder shall provide a complete analytical package of Toxic Characteristic Leaching Procedure (TCLP) test results of waste samples within 4 weeks after sample collection.

B. If contaminated waste is generated during LBP management, provide a complete analytical package of wastewater test results of waste sample collection within four weeks after sample collection.

C. Waste Manifests: The Design-Builder shall submit to the Railroad one copy of:

1. Executed and signed manifest for each load of waste material transported from the construction site. Provide the manifest within one day of shipment.
2. Executed waste manifest form signed by a responsible party of the disposal facility. Provide the form within one Calendar Day of receipt. If the copy is not received within 35 Calendar Days from the date of shipment, contact the Railroad, and assist as directed, in efforts to locate the shipment, and in the completion of the EPA Exception Reports (if the signed manifest is not received within 45 Calendar Days of the date of shipment).
3. Certificate of final disposal for each manifest or certificate of recycling for recycled material. Provide the certification within one Calendar Day of receipt.

D. Bills of Lading: Provide bills of lading for the disposal of all nonhazardous municipal/construction waste within one week of the date of shipment.

E. Wastewater: Provide written documentation of the receipt of disposal of all wastewater within one week of the date of shipment.

F. Cleanup: Before issuance of Certificate of Final Completion, provide the Railroad with a letter report presenting the results of the inspections conducted to verify the final clearance of the construction site, surrounding property, waterways, equipment, buildings, and structures.

2.8.3.5.3 Post Completion of Construction Activities

A. Within five Working Days of completion of field activities associated with the LBP management portion of the Project, submit to the Railroad all Project documentation. These documents shall consist of the following:

1. Daily Project Logs/Reports.
2. Waste disposal manifests.
3. Analytical results from all samples collected.
4. Clearance certificate(s).

B. Material removal locations shall be surveyed and presented by the Design-Builder on Drawings in a format according to the Railroad's review, as defined in Technical Provisions.

G. Submit for information and records, copies of all records indicating that the renovation work has been performed in compliance with lead paint management requirements.

H. A summary of the techniques used to comply with these regulations shall be submitted by the Design-Builder.

I. Maintain a daily Project log documenting each day's activities. This will be submitted to the Railroad after Final Completion.

J. The starting and completion dates of the LBP management work shall be documented by the Design-Builder.

K. Maintain a log of worker training certifications; medical surveillance and blood lead level records. These records shall be available for inspection at the site at all times.

2.8.3.6 Execution of Lead Paint Management

2.8.3.6.1 General

A. The Design-Builder is required to field verify all job conditions, quantities, and locations of LBP which will be impacted as part of the renovation before the submittal of their bid.

B. The Design-Builder shall employ, a Certified Industrial Hygienist (CIH) to prepare the Design-Builder's site-specific Construction Safety and Health Plan (CSHP) and Safe Work Plan (SWP), and to develop a personal air-monitoring program in accordance with Occupational Safety and Health Administration (OSHA) 29 CFR1926.62, good industrial hygiene practices, and the requirements stated herein.

C. The Design-Builder shall submit certification that all documents and permits required will be submitted before the start of work.

D. The Design-Builder shall comply with the OSHA Lead Construction Standard (29 CFR Part 1926.62) for their personnel and Subcontractors.

E. All treatment, storage and disposal (TSD) and recycling facilities and transporters which the Design-Builder intends to use to treat and/or transport and dispose of LBP hereunder shall be submitted to Approval for use by Railroad before any removal from the Work Site. The Railroad reserves the right to inspect the Design-Builder's transporters, equipment storage facility and TSD Facility at any time.

F. Should any problems arise regarding the TSD or recycling facility chosen to accept the LBP for treatment and disposal that would require the return of such LBP to The Design-Builder or Railroad, or should such TSD or recycling facility have violated any environmental regulation which would result in any regulatory enforcement action, Immediately notify Railroad in writing of such situation, and make provisions for the lawful storage of the LBP, until an alternate TSD or recycling facility can be located by the Design-Builder and Approved by the Railroad.

G. Hazardous Waste: The Design-Builder and/or its subcontractors involved in any activity that relates to the handling, storage or disposal of hazardous waste shall demonstrate a minimum two years of experience in hazardous waste management.

H. The subcontractor(s) transporting hazardous waste shall be considered Hazardous Waste subcontractor(s).

I. Before using any subcontractor(s) to conduct any hazardous waste management including laboratory work, the Design-Builder shall submit an executed "Statement of Qualifications of Hazardous Waste Subcontractor" for each such Subcontractor to the Railroad for Review.

J. Provide documentation that the minimum insurance criteria have been met.

K. Identify all legal or administrative actions or proceedings in which the Design-Builder (or any proposed subconsultant(s) or subcontractor(s) and testing laboratory) has been involved within the last five years which were brought by the USEPA, the NYSDEC, OSHA or any other agency having safety, health or environmental responsibilities or functions.

L. Disturbance to the sheathing of the LBP components shall be kept to a minimum.

M. The LBP components shall be placed together in 6-mil PVC lined, steel, and containers. LBP-contaminated materials shall be kept separated from other contaminated materials removed from the work area.

N. Crushing of the LBP components to facilitate transportation shall be conducted only after the component has been placed into the container.

O. All systems components are assumed to be energized until confirmed to be de-energized by the Railroad.

P. It is not necessary to remove all LBP from impacted components. Materials to be removed and disposed of with LBP still attached, shall be subject to the required testing procedures for waste classification and disposal.

Q. All materials associated with LBP management, including LBP chips and spent sand blast media containing lead shall be considered contaminated and must be managed properly. The materials associated with LBP management shall be managed in accordance with United States Environmental Protection Agency (USEPA) and New York State Department of Environmental Conservation (NYSDEC) regulations. The Design-Builder shall be responsible for obtaining all required permits and/or approvals for their selected LBP management method(s).

2.8.3.6.2 Containment

A. Activities requiring removal of LBP shall be performed using methods and containment, which will minimize production and dispersion of airborne particulates and paint chips. Such activities and corresponding containment include, but are not limited to:

1. Removal of loose, flaking, peeling paint by misting and scraping with hand tools.
2. Drilling or cutting operations using tools equipped with HEPA vacuum attachment.
3. Removal of paint by use of power tools (needle scalers, close abrasive blasting, etc.) equipped with HEPA vacuum attachment.
4. Removal of paint by use of approved chemical strippers.
5. Removal of paint by use of power tools not equipped with vacuum attachments.
6. Removal of paint by use of abrasive blasting.
7. A combination of the above methods.

B. The Design-Builder shall ensure that the required containment prevents LBP from contaminating adjacent areas, buildings, waterways or the environment in any fashion. This shall include any water runoff from wet removal methods.

C. The Design-Builder shall supply all equipment and materials needed to contain Project emissions, releases, waste and/or debris in accordance with the requirements set out in the Contract Documents.

1. When Chemical Stripping is used as a paint removal method, use SSPC Class 3C containment, in accordance with Table 2.8.1.
2. When Hand Tool Cleaning is used as a paint removal method, use SSPC Class 3P containment, in accordance with Table 2.8.1 . When Power-Assisted Hand Tool Cleaning is used as a paint removal method, use power tools equipped with HEPA-filtered vacuum shrouds within SSPC Class 3P containment, in accordance with Table 2.8.1 . When Solvent Cleaning is performed in connection with paint removal or painting, use a containment class equivalent to the associated cleaning and/or painting operation being performed (e.g. for chemical stripping, power-assisted hand tools etc.), in accordance with Table 2.8.1 .
3. Thoroughly examine the structure to verify its ability to support a containment system including wind loads that can be impaired on it. The containment design should also be constructed to keep bridge drains open and maintaining traffic throughout the Project.
4. Prohibit the release of lead or into any storm sewers and all work shall be halted if spills or emissions are observed entering any storm sewers.

2.8.3.6.3 Site Access and Security

A. The Design-Builder shall provide security for all work and storage areas. All storage areas containing hazardous materials including LBP waste shall be fully enclosed and secured at all times when personnel are not present to oversee the material. All storage areas containing hazardous materials shall be clearly labeled as containing hazardous materials with signs in both English and Spanish, or other primary language used by occupants. Storage of waste containers shall be coordinated with the Railroad.

B. The LBP management work area is to be restricted to authorized, trained and protected personnel. A list of authorized personnel shall be established before job start and posted in the Design-Builder's site office. The Design-Builder is responsible for updating their list.

1. Post appropriate warning signs at each entrance of the work area. Signs shall be conspicuous; at least 20-inches by 14-inches with lettering at least two inches in height and read:

WARNING

LEAD PAINT REMOVAL HAZARD

UNAUTHORIZED ENTRY PROHIBITED

NO SMOKING, EATING OR DRINKING ALLOWED IN WORK AREA

2. The Railroad will notify the Design-Builder of any other authorized visitor before his/her entry to the Project site. The Railroad shall be responsible for providing documentation of training and certification.
3. Entry into the work area by unauthorized individuals shall be reported immediately to the Railroad by the Design-Builder.

4. A logbook shall be maintained in the Design-Builder's site office. Anyone who enters the LBP management work area shall record their name, affiliation, time in, and time out for each entry.

C. The Design-Builder shall maintain control of site security during operations in order to protect work efforts, equipment and property. If site security is deemed insufficient by the Railroad, they reserve the right to provide additional security, at the Design-Builder's expense.

D. The Design-Builder shall employ a qualified, accredited Lead Abatement Supervisor, as per 40 CFR Part 745, on site during all phases of lead management work. The Design-Builder shall maintain proper security at all times.

2.8.3.6.4 Worker Protection

A. All worker protection requirements apply to the Design-Builder and/or subcontractor personnel on the Work Site who are exposed to lead or have potential to disturb lead. The Design-Builder is responsible for maintaining a program in accordance with 29 CFR 1926.62, at a minimum, and shall be responsible for protecting and training his employees on worker safety, health hazards, etc. relating to lead.

B. Personal Hygiene Practices/Facilities: The Design-Builder shall provide for shower/washroom and lavatory facilities, and hygiene practices in accordance with OSHA 29 CFR 1926.62. Water from the shower shall be managed in accordance with the approved LBPMP. The Design-Builder shall enforce and follow good personal hygiene practices during LBP management activities.

C. The Design-Builder shall provide portable eyewash stations and first aid equipment, as required by the Design-Builder's site-specific CSHP and SWP, inside all work areas.

2.8.3.6.5 Exposure Monitoring

A. An exposure assessment is the primary means of determining the airborne concentration of lead that workers are being exposed to. Ensure that workers are not exposed to lead at concentrations greater than the Permissible Exposure Limit (PEL) of 50 micrograms per cubic meter (mg/m3) over an eight-hour time weighted average (TWA).

B. If available, the Design-Builder may use exposure assessment data obtained within the last 12 months from previous jobs conducted under similar work conditions, control methods, work practices, and environmental conditions as a basis for an exposure assessment. The use of historical or objective data in this manner is subject to prior Review by the Railroad.

C. Respiratory Protection Equipment. All workers inside the LBP Management work area will wear the proper respirator for the airborne lead concentration generated, as per OSHA 29 CFR 1926.62. A formal respiratory protection program shall be prepared and implemented in accordance with OSHA 29 CFR 1926.62.

2.8.3.6.6 Respiratory Protection

A. The Design-Builder is responsible for maintaining adequate controls to insure worker safety for the duration of this work. After feasible Engineering controls and work practices have been implemented, Use respiratory protection to maintain workers' exposures to lead to below the PEL.

B. The use of respirators is required for all workers, inspectors, observers, or other personnel who enter areas where airborne exposures exceed or are expected to exceed the PEL, or when entering regulated areas.

2.8.3.6.7 Protective Clothing and Equipment

A. The Design-Builder shall provide protective clothing and equipment and ensure they are worn by all employees whose exposures exceed the PEL, or enter regulated areas.

B. The Design-Builder shall not remove or clean the clothing by any means that reintroduces lead in the ambient air such as brushing, shaking, or blowing. The use of vacuums equipped with HEPA filters for cleaning is considered an acceptable method to remove dust from clothing and limit exposure to ambient dust.

C. The Design-Builder shall furnish all containers, specialty items, and labels required for the disposal of LBP.

D. All materials, equipment, and tools shall be properly cleaned at the end of the work shift to remove LBP dust and prevent contamination of personnel and/or clean areas. Proper cleaning shall be accomplished using HEPA vacuum equipment to remove loose dust followed by cleaning with washing agent (power tools shall be wet wiped).

E. Respiratory Protection shall be provided in accordance with the Approved Respiratory Protection Plan and the accepted Project Health and Safety Plan.

F. Temporary electrical cords and outlets shall be of an approved type and connected to a source of power outside of the work area and protected by a GFCI as Reviewed by the Railroad.

G. HEPA Vacuum Filtration Systems: All vacuum equipment employed in the work area shall utilize HEPA filtration systems that are 99.97-percent efficient to 0.3- microns particulate size. Vacuums shall be equipped with appropriate size brushes, crevice tools and other angular tools necessary for proper cleaning of all surfaces.

H. Water Filtration System: Water used for showering in the decontamination area and any other lead-contaminated water shall be filtered before containerization for off-site disposal or disposal into the existing sewer system with local authority approval. The system shall, at a minimum, contain a three-stage filtering system with a final filter not greater than 0.5 microns. The filtration system shall be adequate to meet lead discharge limitations of the local publicly owned treatment works and any other applicable regulations and permits. Testing and approval of any water discharge shall be provided to the Railroad.

2.8.3.6.8 Paint Removal

A. At no time will the Design-Builder be permitted to perform any Work which may impact upon LBP, until review by the Railroad.

B. Acceptable LBP abatement methods for this project include the use of chemical strippers, hand tools, and power-assisted hand tools.

1. Chemical Strippers: The chemical stripping solvent shall not be a hazardous material or result in a hazardous waste under EPA regulations. Provide all product instructions and Safety Data Sheets (SDS) from the manufacturer.

2. Hand Tools: Hand tools such as wire brushes and manual sanding shall be implemented where LBP removal utilizing chemical strippers is not completely effective.
3. Hand Held Power Tools: All hand held power tools shall be equipped with HEPA filtered vacuum attachments. Specifically, flanged units such as "needle guns" can be utilized for abating joints, bolts and surfaces.

C. Torch cutting, open flame burning, rivet/bolt busting, power tool use and/or any other work which shall disturb LBP shall be permitted only after all visible paint has been removed from the substrate surface for a minimum distance of six (6) inches on all sides of the area.

D. During all clean-up procedures and at the end of each Work Day on which LBP removal has taken place, the Work Site will be HEPA vacuumed and swept clean of all dust and debris. The dust and debris will be cleaned using the "wet-sweeping" technique, or a light spray/mist of water will be used to dampen the dust/debris before sweeping. Dry sweeping is prohibited.

E. The Railroad may conduct visual inspections, air sampling and/or wipe tests to determine compliance with specified procedures and clearance standards, in accordance with all applicable regulations.

F. The Railroad will inspect the facilities daily, as necessary, to monitor compliance with these specifications and may be on site at all times during the performance of LBP management.

G. The Railroad is not limited by the inspection requirements as noted above; additional safety and health inspections may occur randomly.

H. Fully cooperate with all monitoring efforts, including periodic observation of work practices, and shall provide for personal air monitoring, clearance inspections and clearance sampling, and any other sampling as necessary to document that the Project LBP management activities are being performed safely and in conformance with the approved LBPMP and all applicable federal, state and local regulations.

2.8.3.6.9 Project Monitoring and Testing

A. The Design-Builder shall conduct monitoring of worker lead exposure in a manner to comply with the monitoring requirements of 29 CFR 1926.62.

B. The Design-Builder shall fully cooperate with all monitoring efforts conducted by the Railroad, including periodic observations of work practices.

C. The Design-Builder shall provide for clearance inspections and clearance sampling, and any other sampling as necessary to document that the LBP Management activities are being performed safely and in conformance with these specifications, the LBPMP, and all applicable Federal, state, and local regulations.

D. The Design-Builder shall ensure that dust generated during all work is controlled in accordance with Federal, state, and local regulations. Implement OSHA requirements for the suppression of dust.

2.8.3.6.10 Waste Handling, Packaging, and Storage

A. General: The Design-Builder shall perform sampling and analysis as may be required to assure the proper and legal handling of the waste. Samples may be composited for analysis with the consent of Railroad. If any chemical analysis or sampling is performed by or on behalf of the Design-Builder, it's Transporter, or its Treatment Storage and Disposal facility (TSD), the Design-Builder, shall provide a copy of such analysis to the Railroad. (Note: Painted metal may be designated as recyclable and disposed of at a scrap metal facility for reuse or resale, if accepted by that facility.)

B. The Design-Builder shall ensure that its waste disposal Subcontractor warrants and represents possession of all permits and/or licenses required under the Resource Conservation and Recovery Act (RCRA), as well as any state or local permits or licenses required for removal, repackaging, transportation and disposal of hazardous waste.

C. The Design-Builder shall verify that all waste is transported to the appropriate recycling or disposal facility within 60 Calendar Days after waste is generated. With the Railroad's written Approval, waste may be stored at the Work Site for an additional 30 Calendar Days, but in no event shall waste be stored at the Work Site for more than 90 Calendar Days. If the signed manifest is not received from the disposal facility within 45 Calendar Days of shipment, the Design-Builder shall initiate the EPA Exception Report in accordance with 40 CFR 262.42, and take all steps necessary to locate the manifest or waste. The Design-Builder shall ensure that the waste disposal subcontractor will provide completed shipping documents for all hazardous wastes removed, which contain the information required under 40 CFR Part 262 Subpart B (hereinafter the "Manifest Form") and 6 NYCRR Part 372, as well as all Certificates of Disposal which specify where each component of waste removed from the Railroad property is ultimately treated or disposed, and copies of weight receipts for the waste, to insure the accurate compliance with regulatory fees by Railroad.

D. The Design-Builder shall ensure that the waste disposal subcontractor will provide completed shipping documents, hereinafter referred to as "Bills of Lading", for all non-hazardous "industrial" waste removed from Railroad property.

E. Transportation Requirements: The Design-Builder shall ensure that the waste disposal subcontractor providing waste transportation services possesses a valid Waste Hauler's permit issued pursuant to the New York State Department of Environmental Conservation (NYSDEC) regulations, 6 NYCRR Part 364. In addition, if the waste is to be transported and disposed of out of New York State, permits for those states through which the waste will be transported and for where it will be disposed shall be required. It is the Design-Builder's responsibility to insure that the waste disposal subcontractor correctly determines which permits are required and to provide such permits for review and approval of Railroad.

Table 2.8.1

Containment Criteria for the Method of Cleaning Painted Surfaces (Washing and Paint Removal) [1]

Methods of Cleaning [10]	Containment SSPC Class[2]	Containment Flexibility	Containment Material Permeability [3]	Support Structure	Material Joints	Containment Entryway	Ventilation System Required	Negative Pressure Required	Exhaust Filtration Required
Hand Tool Cleaning[4]	3P	Rigid or Flexible	Permeable or Impermeable	Minimal	Partially Sealed	Overlapping or Open Seam	Natural	Not Required	Not Required
Power Tool Cleaning with Vacuum [4]	3P	Rigid or Flexible	Permeable or Impermeable	Minimal	Partially Sealed	Overlapping or Open Seam	Natural	Not Required	Not Required
Power Tool Cleaning w/o Vacuum[3]	2P	Rigid or Flexible	Permeable or Impermeable	Rigid or Flexible	Fully Sealed	Overlapping or Open Seam	Natural[5]	Not Required	Not Required[5]
Chemical Stripping[6]	3C	Rigid or Flexible	Permeable or Impermeable	Minimal	Partially Sealed	Open Seam	Natural[6]	Not Required	Not Required[6]
Wet Methods[7]	2W	Rigid or Flexible	Impermeable	Rigid or Flexible	Fully Sealed	Overlapping	Natural[7]	Mot Required	Not Required[7]
Pressure Washing	NA	Flexible	Mesh (25 Mil Openings)	Rigid, Flexible or Minimal	Partially Sealed	Open Seam	Natural	Not Required	Not Required
Abrasive Blast Cleaning (Sp 5, 6, 10)[8,9]	1A	Rigid or Flexible	Impermeable	Rigid or Flexible	Fully Sealed	Airlock or Resealable	Mechanical	Required	Required
Abrasive Blast Cleaning (SP 7) [8,9]	2A	Rigid or Flexible	Impermeable	Rigid or Flexible	Fully Sealed	Airlock or Re-sealable	Mechanical	Required	Required

1. This Table provides general design criteria only. It does not guarantee that specific controls over emissions will occur because unique site conditions shall be considered in the design.
2. This SSPC Classification is based is on SPCC Guide 6. Note that for the work over water, water booms or boats with skimmers shall be employed, where feasible, to contain spills or releases. Debris shall be removed daily at a minimum.
3. Permeability addresses both air and water as appropriate. In the case of water or chemical removal methods, the containment materials shall be resistant to both chemicals and water. Ground covers or base of containment floor should always be impermeable, and of sufficient strength to withstand the impact and weight of the debris and the equipment used for collection and clean-up.
4. Do not use ground covers and/or free hanging tarpaulins as the sole means of providing controls over releases without the prior written Approval of the Railroad.
5. Ventilation is not required provided the emissions are controlled as specified in the Contract Documents, and provided worker exposures are properly controlled. If unacceptable worker exposures to lead or other heavy metals occur (per 29 CFR 1926.62), incorporate a ventilation system into the containment.
6. Ground covers or base of containment floor shall always be impermeable and of sufficient strength to withstand the weight and impact of the debris and the equipment used for cleaning. If debris escape through the seams or permeable containment materials, then additional sealing of seams and joints is required and/or replacement of permeable materials with impermeable. All containment materials and materials used for sealing shall be resistant to both chemicals water. If unacceptable worker exposures to lead or other heavy metals occur (per 29 CFR 1926.62), incorporate a ventilation system.
7. This method includes high pressure water jetting with and without abrasive, and wet abrasive blast cleaning. Although both permeable and impermeable containment materials are included, ground covers and the lower portions of the containment shall be water impermeable with fully sealed joints, and of sufficient strength and integrity to facilitate the collection and holding of the water and debris for proper disposal. Ventilation is not required provided the emissions are controlled as specified in the Contract Documents, and provided worker exposures are properly controlled. If unacceptable worker exposures to lead or other heavy metals occur (per 29 CFR 1926.62), incorporate a ventilation system into the containment.
8. Containment materials shall be sufficient strength to withstand the impact and weight of the abrasive and the equipment used for cleaning. Ground covers shall also extend beyond the containment boundary to capture escaping debris.
9. Vacuum-blast cleaning shall not be employed using ground covers and/or free hanging tarpaulin as a means of containment unless The Design-Builder has demonstrated that such containment is the equal of a SSPC Class 1A containment and has obtained the Railroad's prior written Approval therefore.
10. When using wet methods to achieve an SP 5, 6, 7 or 10 level of surface preparation, the Containment shall be in accordance with SSPC Class 2W as shown above for the Wet Methods. When using abrasive blast cleaning for coating repairs or for miscellaneous structural steel repairs, the Containment shall be in accordance with SSPC Class 2A as shown for SSPC-SP 7.
11. For all SP 1: Solvent cleaning surface preparation, use a containment class equivalent to the associated cleaning and/or painting operation being performed (e.g., power assisted hand tools, abrasive blast cleaning, painting, etc.)

2.8.4 Asbestos Removal

A. All ACM shall be abated in the areas that will be impacted by the Work. All asbestos material is to be disposed of as ACM waste. The Design-Builder shall provide all labor, equipment and materials complete for performance of the work in accordance with the Contract Documents.

B. The Design-Builder shall field verify the amount of ACM and familiarize himself with all variable field conditions in the work area prior to bid submission. Proper removal of ACM located in areas that were inaccessible or hidden during previous surveys will be the responsibility of the Design-Builder.

C. ACM shall be properly handled, packaged, and transported for disposal in an asbestos-only landfill. The proposed waste disposal facility and waste transporter shall be Approved by the Railroad.

D. All work shall be accomplished in strict adherence to requirements of the Contract Documents, and applicable Federal, State, and local regulations.

2.8.4.1 Accreditations, Qualifications, and Training Requirements

A. The laboratory used for testing certification under the NYSDOH Environmental Laboratory Accreditation Program (ELAP) for all analyses required.

B. Qualifications:

1. Minimum Experience: The Design-Builder shall have experience with asbestos abatement work, as evidenced through participation in at least two asbestos abatement projects of complexity comparable to this Project.

2. Experience and Training: The Design-Builder's job supervisors, supervisors, and workers shall be adequately trained and knowledgeable in the field of asbestos abatement. All Design-Builder's personnel engaged in asbestos abatement or related activities shall have NYSDOL certifications. Skilled workers experienced in each respective trade shall execute all phases of the work. Proof of such experience shall be submitted upon request. Improperly trained, untrained, or inexperienced personnel shall not be allowed in the work area(s). The Design-Builder's personnel shall meet minimum training and experience requirements as specified in the Contract Documents.

   i. The Design-Builder's on-site job supervisor shall have successfully completed, within the last twelve months, the New York State Department of Health (NYSDOH) approved course "Supervision of Asbestos Abatement Projects." A NYSDOH-approved training provider shall provide the course. The supervisor shall have experience with abatement work, as evidenced through participation in at least two asbestos abatement projects of complexity comparable to this Project.

   ii. The job supervisors shall be thoroughly familiar with, and experienced in asbestos abatement, related work, and shall meet the requirements of a competent person set down in 29 CFR 1926.1101.

   iii. All asbestos abatement workers shall be knowledgeable, qualified, and trained in the abatement, handling, and disposal of asbestos material and in subsequent cleaning of the affected environment. All asbestos abatement workers shall be certified as having attended and satisfactorily completed asbestos worker training in accordance with 29 CFR 1926.1101. A NYSDOH-approved training provider shall provide the course.

   iv. The Design-Builder's job supervisors and asbestos abatement workers shall be certified and licensed as required by the NYSDOL.

   v. Before commencement of work, all personnel who are to enter the work area shall be instructed in and shall be knowledgeable of the appropriate procedures for personnel protection and asbestos abatement. On-site training in the use of equipment and facilities unique to this job site shall be performed. Emergency evacuation procedures from the work area shall also be included in worker training.

2.8.4.2 Equipment and Materials

A. Materials provided in accordance with the requirements set out in this Section shall be standard products of manufacturers regularly engaged in the production of the items and shall conform to 29 CFR 1926.1101; 40 CFR 61, Subpart M; 49 CFR 171, 172, and 173; applicable State regulations; and requirements specified herein. Materials listed under this Section "or Approved Equal" shall be provided for work for the Project.

B. Plastic: The Design-Builder shall provide fire retardant plastic of 6-mil thickness shall be provided in rolls of sizes that will minimize the frequency of joints. Fire retardant plastic sheet shall be used for plasticizing the enclosed work area, for preparation of the decontamination enclosure system, and for waste packaging.

C. Reinforced Fire Retardant Plastic: The Design-Builder shall provide reinforced polyethylene sheet for the floor area of the decontamination enclosure system. Reinforced plastic sheet provided for this Project shall be a 19-mil, 3-ply, high-density flame resistant reinforced-polyethylene sheet. Color of plastic shall be opaque.

D. Duct Tape: The Design-Builder duct tape shall be capable of sealing joints of adjacent sheets of plastic and of attaching plastic sheeting to finished surfaces without damage to existing finish and shall be capable of adhering under both dry and wet conditions, including use of amended water. When used on windows the tape shall be ultra violet light stable and shall not leave residue when removed. Nashua 357 Black Duct Tape or approved equal shall be used for all window applications. This tape can be used for all applications relative to this Project.

E. Surfactant: Surfactant (Wetting Agent) shall consist of resin materials in a water base that has been tested to ensure materials are non-toxic and non-hazardous. Surfactants shall be installed according to the manufacturer's written instructions.

F. Lockdown Encapsulants: Encapsulants used after asbestos abatement to lockdown fugitive fibers shall carry a Class "A" fire resistance rating and shall have an ASTM E-162 flame spread index of 15 or less. A tint shall be given to the encapsulant by means of the addition of non-toxic, nonflammable colorings before application. The encapsulant shall be installed according to the manufacturer's written instructions.

G. Caulking Sealant: Caulking sealant shall be single component, non-sag elastomer with 1,600-percent elongation capacity. Sealant shall meet the requirements of FS TT-S-00230C, Class A Type II. Sealant shall be used to form an airtight seal around plywood barriers or temporary partitions, to seal along the seams of the decontamination enclosure system's plywood sheathing, and to seal around piping or other small penetrations of the work area. Sealant application shall be according to the manufacturer’s written instructions.

H. Foam Sealant: Foam Sealant shall be expanding urethane Class 1 foam sealant with a UL 723 flame spread index of 25 or less, smoke developed index of 0, and a minimum operating temperature range between minus 30 and plus 250 degrees Fahrenheit.

I. Plywood: Plywood used for temporary partitions, decontamination enclosure systems, and tunnels shall be an exterior grade, a minimum 3/8-inch thick and fire-retardant.

J. Spray Adhesive: Spray Aerosol Adhesive shall be specially formulated to stick to sheet polyethylene (3M 76, 3M 77, or approved equal).

K. Other Materials: All other materials, such as lumber, plywood, tools, scrapers, brushes, cleaning materials, adhesive, nails, hardware, etc., which are required to perform the work described in this Section shall be provided. Materials and equipment shall be new or used, uncontaminated by asbestos, in serviceable condition, and appropriate for the intended purpose.

L. Disposal Bags: Plastic Disposal Bags shall be a minimum of 6-mils in thickness. Bags shall be labeled in accordance with this Section.

M. Shipping Containers: Impermeable Containers shall be suitable to receive and retain any asbestos-containing or asbestos-contaminated materials until they are disposed of at an acceptable landfill. The containers shall be labeled in accordance with this Section. Containers shall be both airtight and watertight and conform to 49 CFR 178. Each container shall be constructed of fiber, hard plastic, or metal, with locking, airtight lids.

N. Markings and Labels: Disposal bags and shipping containers shall bear danger labels, transportation packaging labels, and generator identification information. Labels shall be permanently affixed to all bags and shipping containers containing ACM, in accordance with 29 CFR 1926.1101(k)(8), 49 CFR Part 171 and 172, and 40 CFR Part 61.150(a)(1)(v).

O. HEPA Filter: High efficiency particular air filter capable of trapping and retaining 99.97-percent of particles (including asbestos fibers) greater than 0.3-micrometers or larger in mass median aerodynamic equivalent diameter.

P. Mastic Remover: Mastic removing solvent shall be non-flammable and shall not contain methylene chloride, glycol ether, or halogenated hydrocarbons. Solvents used on site shall have a flashpoint greater than 140 degrees Fahrenheit.

Q. The worker and waste decontamination facilities shall have weighted door flaps constructed of at least three layers of 6-mil fire-retardant plastic sheeting and with alternating openings. A minimum of two layers of 6-mil fire-retardant plastic sheeting shall be required for floors, walls and the ceiling, reinforced with at least two layers of 6-mil reinforced plastic sheeting installed on the floor. All decontamination facilities shall be constructed of 3/8-inch thick fire retardant plywood faced with fire-resistant gypsum board. Structural studs shall be 2 inches by 4 inches, and be spaced 16 inches on center on the outer part of the wall. The decontamination unit shall be lockable, sturdy, and able to withstand all environmental conditions.

R. Tent Enclosure (when required): A commercially available or constructed tent shall be utilized. The tent shall be constructed of a minimum of one layer of 6- mil fire retardant plastic sheeting with double folded seams on a rigid frame. The seams shall be taped airtight and flush with the adjacent tent wall. A single chambered airlock shall be constructed at the entrance to the tent. The airlock shall be constructed of a minimum of one layer of fire retardant plastic sheeting with three flap entrances. The airlock shall be large enough for a single worker, waste bags, and clean suits. The tent shall be exhausted utilizing a HEPA vacuum in use continuously throughout the removal project. Should a HEPA vacuum not provide sufficient negative air pressure to the tent, utilize a negative air unit to exhaust the tent.

S. Communication Equipment: Devices suitable for inter-room communications, such as “walkie-talkies” or “radio band” communicators shall be provided by the Design-Builder.

T. Spraying Equipment: Equipment used to apply amended water or abatement encapsulant shall be of a low-pressure type to prevent disturbance of the asbestos before physical controlled abatement. Airless spray equipment shall be provided for the application of asbestos encapsulant.

U. Vehicles: Trucks or vans used for asbestos waste transportation shall be enclosed and suitable for loading, temporary storage, transit, and unloading of asbestos contaminated waste without exposure to persons or property.

V. Fall Protection Equipment: Certified equipment to be used by trained personnel when working at elevation to protect against falling from an elevated work area.

W. Fire Extinguisher: Type “ABC” dry chemical extinguisher or a combination of several extinguisher of NFPA recommended types for the fire hazard exposures in each extinguisher location shall be provided. Minimum size of extinguisher shall be 4-A, and 40-B:C. Supply a minimum of one extinguisher for every 1,000- square feet of floor area, with a maximum travel distance to an extinguisher of 75- feet. Supply at least one extinguisher in each decontamination enclosure equipment room, and clean room.

X. Smoke Detectors: Smoke detectors of the battery powered ionization type will be required at a rate of one per 5,000-square feet, with a minimum of one smoke detector in the decontamination enclosure clean room, and one in the work area.

Y. Water Filtration System: A system capable of filtering and retaining particles larger than 5.0 microns in size shall be provided.

Z. Carts: The Design-Builder shall provide water tight wheeled carts with tight fitting lids suitable for movement of non-contaminated waste or bagged asbestos waste from the decontamination enclosure system to the waste storage container or transport vehicle.

AA. Power Tools: The Design-Builder shall provide power tools necessary to complete the work. Power tools used directly for asbestos abatement shall be equipped with a dust collection system. The Design-Builder shall attach a shroud connected to a HEPA vacuum system for capture of dust.

BB. Ladders and Scaffolding: The Design-Builder shall provide ladders and/or scaffolding as required and of sufficient dimensions and quantities so that all surfaces can be safely and easily reached. All scaffolding joints and ends shall be sealed with duct tape. Scaffolds and ladders shall comply with all Federal, State, and local codes. For all scaffolding construction. The Design-Builder shall supply shop drawings signed by a Professional Engineer licensed in the State of New York.

CC. Protective clothing and equipment shall conform to 29 CFR 1926.1101. Workers shall be provided with sufficient sets of properly fitting, full-body, disposable coveralls, head covers, gloves, and 18-inch high boot-type foot covers. Disposable coveralls, head covers, and 18-inch high boot type foot covers shall be constructed of DuPont "TYVEK-Type 14" or KimberlyClark "Kleenguard", or approved equal, as a minimum requirement. The Design-Builder shall provide the Railroad, the Railroad or their authorized visitors and authorized representatives of agencies having jurisdiction, suitable properly fitting protective disposable clothing, headgear, hard hats, eye protection, respiratory protection, and footwear (up to four sets per 8-hour shift) whenever they are required to enter the Work area.

DD. Equipment: Eye protection and hard hats required for job conditions or by applicable safety regulations shall be provided.

EE. Respiratory Protection: The Design-Builder shall be solely responsible for providing adequate respiratory protection at all times for all individuals in the work area. Types of respirators used shall be approved by National Institute for Occupational Safety and Health, NIOSH, for asbestos in accordance with 29 CFR 1926.1101 and 29 CFR 1910.134. Provide a level of respiratory protection that provides for an airborne fiber level inside the respirator below 0.01-f/cc, as the minimum level of protection allowed.

2.8.4.3 Design-Builder's Responsibilities

A. The Design-Builder shall place the waste containers or disposal receptacles at the work site only for the period required to complete the ACM abatement work.

B. Labeled ACM waste containers or bags shall not be used for non-ACM debris or trash. Any materials placed in labeled containers or bags, whether turned inside out or not, shall be handled and disposed off-site as ACM waste.

C. Waste removal through decontamination units shall not occur during worker shift changes or when workers are showering or changing.

D. The Design-Builder shall supervise, inspect, and direct the work competently and efficiently, devoting such skills and expertise as may be necessary to perform the work in accordance with the Project requirements. The Design-Builder shall be responsible to see that work complies accurately with the Project requirements and is of good quality and workmanship.

E. Supervision Requirements: Provide adequate job supervision for all phases of the asbestos abatement work.

   1. Asbestos Abatement Supervisor: From the start of work through to the completion of ACM abatement, employ on-site a responsible and competent supervisor who possess valid NYSDOL Supervisor certifications. At a minimum, the Design-Builder's Asbestos Supervisor shall meet the qualifications specified herein, for a job supervisor. The Supervisor shall be on-site during all working hours. When the Supervisor must leave site during work, a temporary Supervisor shall be appointed. Employ a NYSDOL job supervisor present on site whenever work described in this Section is in progress. If the job supervisor leaves the site for any reason, a qualified and certified supervisor shall be designated who meets the requirements of the Contract Documents and is familiar with the status of the work. The Railroad shall be informed of the substitution. The Supervisor shall be familiar and experienced with asbestos abatement and its related work, safety procedures, and equipment.

F. Worker Medical Examinations: Provide medical examinations for all employees engaged in asbestos abatement and disposal operations, in accordance with 29 CFR 1910.134(b), 1926.1101, and applicable state regulations. Ensure that all employee examination results are on file in his office and available for review and are maintained in accordance with 29 CFR 1926.1101n (3).

G. The Design-Builder's industrial hygiene practices during asbestos abatement may be monitored by the Railroad. The Design-Builder shall be responsible for monitoring his own construction safety work practices for compliance with the OSHA regulations.

H. The Design-Builder shall provide the best available technology, and state-of-the-art procedures and methods of execution, clean up, disposal, and safety.

2.8.4.3.1 Prior to Beginning of Asbestos Removal

A. Project Monitor – The Design-Builder shall hire an independent asbestos Project monitor in accordance with 12 NYCRR Part 56. The Project monitor will be vetted through the Placard review process, and shall also submit proof or valid pertinent asbestos licenses, as well as the Railroad Roadway Worker Protection training.

B. For all asbestos abatement activity under this Project, the Design-Builder shall provide the following submittals to the Railroad a minimum of 15 Working Days prior to abatement.

1. A copy of the Design-Builder's abatement master list of worker certifications (NYSDOL Asbestos Handling Certificates). All Design-Builder abatement workers shall have valid certificates.
2. A copy of the Design-Builder's abatement master list of workers showing proof (submit copy of "blue card") of attending Railroad Roadway Worker Protection training.
3. Copy of Project Notification (NYSDOL asbestos filing and EPA if applicable).
4. Copy of Valid Hazardous Waste Hauler Permit.
5. A copy of laboratory ELAP accreditation for OSHA sampling analysis.
6. A detailed work schedule for each day of work, including number of laborers per day.
7. Safety Data Sheets (SDS) for encapsulants or abatement aids.
8. Any other documents deemed necessary by the Railroad.
9. Certificates of Insurance naming Railroad as additional insured.
10. All required bonds. All bonds shall be underwritten by a United States based, preferably New York State, A or B rated bonding company.
11. List of subcontractors.
12. Training Certificates (current Hazardous Waste Operations and Emergency Response [HAZWOPER] 40-hour or 8-hour Refresher) and asbestos licenses for all workers to be engaged in work described in this Section.
13. The Design-Builder's Site-specific Construction Safety and Health Plan (CSHP) and Safe Work Plan (SWP): Provide written CSHP and SWP addressing procedures for work place safety. As a minimum, the following topics shall be addressed in the plan:
    i. Site description and history.
    ii. Project activities, including coordination with subcontractors.
    iii. Hazard Assessment, including physical, chemical and biological hazards.
    iv. Chain-of-Command
    v. Designation of responsibilities.
    vi. Site Control and Work Zones.
    vii. Personnel Training.

viii. Medical Surveillance.

ix. Personal Protective Equipment (PPE).

x. Atmospheric and Personnel Monitoring.

xi. Establishment of organic vapor and particulate action levels requiring PPE upgrade and/or mitigation.

xii. Decontamination procedures.

xiii. Storage and disposal of expended PPE.

xiv. Emergency Response Procedures, equipment and First Aid requirements.

xv. Contingency Planning.

xvi. Provisions for Sanitation and Drinking Water.

xvii. Recordkeeping/audit program and daily safety logs.

xviii. Fire Prevention and Protection.

xix. Dust minimization and mitigation techniques.

xx. Safe work practices: Standard Operating Procedures for activities including, but not limited to, confined space entry and working in trenches and excavations.

xxi. Hospital route maps.

xxii. Communication and posting of regulations.

xxiii. Hazard Communication: Procedure on how physical and health hazards associated with the work are identified and communicated to employees, and name of the person responsible for implementation of the Hazard Communication Program.

xxiv. Guidelines for assessment and prevention of heat stress.

xxv. Procedures for using ladders safely.

xxvi. Electrical safety procedures.

14. Emergency Action Plan: The Design-Builder shall submit to the Railroad for Review a written Emergency Action Plan. This Plan shall outline the contingency actions to be performed for emergencies including fire, accident, power failure, supplied air system failure, breach of work area containment, unexpected asbestos contamination in the site area and on the adjoining grounds, or spilling of asbestos material being hauled to storage and/or disposal. This Plan shall identify the manner in which emergencies are announced, emergency escape procedures and routes, and procedures to account for all employees after evacuation. The Plan shall identify those persons responsible for fire/life safety duties including the Safety Manager, persons responsible for fire prevention equipment and the control of fuel source hazards, and the members of the Emergency Response Team. The Plan shall also include a field chain-of command for the Design-Builder, listing the field personnel names, beeper and telephone numbers. In addition, provide emergency notification numbers such as

fire, police, etc., relevant to the Project location. This Plan shall be readily available for review by all workers.

15. Fall Protection Plan: The Design-Builder shall submit to the Railroad for Review a written Fall Protection Plan. This plan shall outline the actions to protect personnel when they are working at an elevation of 6 feet or more above lower levels. The plan shall detail specific fall protection devices (i.e., guardrail systems, safety net systems, or personal fall arrest systems, etc.) to be utilized, training provided to personnel for same, and training of designated competent person in charge of, and responsible for the elevated work site.
16. The Design-Builder shall provide a proof of written notifications required by Site Security and Control subsection of this Section.
17. The Design-Builder shall provide proof that all required permits and variances have been obtained.
18. Proof of written notification to the local police department and fire department that asbestos abatement work is being conducted. As a minimum, the notification letter shall include the address of the Facility, dates work is to be performed, and drawings indicating the areas to undergo abatement.
19. The Design-Builder shall provide documentation of compliance with all requirements of this Section. Submittal shall include:
    i. Proof that the job supervisors and asbestos abatement workers meet State certification and license requirements.
    ii. Proof of a current medical surveillance program for all the Design-Builders' personnel to work on this Project.
20. Proof of a respiratory protection program. Submit level of respiratory protection intended for each operation required by the Project.
21. Proof of historic airborne fiber data. Submit airborne asbestos fiber monitoring data from an independent air-monitoring firm to substantiate selection of respiratory protection proposed. Data shall include the following for each procedure required by the work: date of measurement; type of work task monitored; methods used for sample collection and analysis, and; number, duration and results of samples taken.
22. Proof that a landfill site has been located, and arrangements for transport and disposal of ACMs have been made. Provide the name and location of the landfill, and waste transport company, if applicable. Landfill shall be an asbestos-only receptor. The waste disposal facility and waste transporter shall be Approved by the Railroad.
23. Manufacturer's literature on all proposed job related equipment and products to be used on this Project. Include Safety Data Sheets (SDS) for encapsulant, fire retardant plastics, and other chemicals to be used on this Project.
24. A detailed Asbestos Abatement and Disposal Work Plan (AADWP) that describes all aspects of the work to be performed for this Project. Provide an AADWP to the Railroad for review within 30 Calendar Days after LNTP. The Railroad will Review, Approve, or request a revision and resubmission of the

requested submittals. No work shall be permitted until Railroad's Approval. The Plan shall include the following:

i. A detailed description of the work area enclosure: Provide shop drawings (with dimensions and locations) of proposed decontamination facilities and work areas. These drawings shall be sealed by a Professional Engineer licensed in New York State and shall indicate the following: 1) areas to be sealed off and work area boundaries. 2) proposed layout and location of the decontamination enclosure systems. Include a detailed description of any modifications or changes to be made to the specified negative pressure work area enclosure.

ii. Specimen of the daily log proposed for use: Minimally, the log should include the date(s) and time(s) when all personnel enter and leave the work area(s).

iii. Asbestos abatement techniques to be used: The Design-Builder may propose alternative removal methods in the AADWP, which will require review by the Railroad.

iv. Location, capacity and number negative air filtration units.

v. Additional engineering controls to be used.

vi. All Applicable Variances and Site-Specific Variances to be utilized.

vii. A copy of the Design-Builder's valid NYSDOL Asbestos Handling License.

viii. An ACM abatement activities schedule shall include locations, dates, and times for work to be completed, and identify any coordination activities needed with other trades.

ix. Copies of USEPA and NYSDOL notifications, and approved variance documentation.

x. Negative Exposure Assessment to determine the proper level of PPE to be used including the level of respiratory protection.

xi. License for the proposed waste transporter and list of principal owners. All transporters shall be approved by the USEPA and NYSDEC or relevant state agency, subject to the Railroad's review.

xii. The location (name, address, and telephone number) of proposed Asbestos Waste Landfills to be utilized for the project. All disposal facilities shall be approved by the USEPA and NYSDEC or relevant state agency, subject to the Railroad's Review.

xiii. List and Certifications of any Waste Transfer Stations to be utilized during the off-site disposal of ACM waste.

C. Project shop drawings of scaffolding and enclosure required to isolate the Work Area designed and sealed by a NYS licensed Professional Engineer.

2.8.4.3.2 During Asbestos Removal Process

A. During the Asbestos Removal Process the Design-Builder shall submit:

1. A “Request for Services” form shall be submitted at least 24 hours in advance of required air monitoring tests and inspections to be performed by the Railroad.
2. Results of all air monitoring performed by the Design-Builder shall be posted for all workers to see within 24 hours for regular asbestos abatement project after collection. A copy of the results shall be provided to the Railroad at the same time.
3. A certified, signed, and completed copy of each “Waste Shipment Record” form used, and receipts from the landfill operator which acknowledge the Design-Builder's delivery(s) of material, shall be submitted to the Railroad within 30 Calendar Days following disposal.
4. A copy of the bound logbook.
5. Obtain appropriate variances from regulatory agencies as required to complete the safe abatement of ACM.

2.8.4.3.3 After Completion of Asbestos Removal Process

A. Within five Working Days of completion of field activities associated with the asbestos abatement portion of the Project, submit the following Project documentation to the Railroad.

1. Daily Project Logs/Reports.
2. Waste disposal manifests.
3. Analytical results from all samples collected.
4. Clearance certificate(s).

B. Material removal locations shall be surveyed and presented by the Design-Builder on as built drawings in a format reviewed by the Railroad.

C. Upon completion of the Project, the Design-Builder shall submit:

1. Notarized copies of a daily log showing the date(s) and time(s) of entrance to and exit from the work area(s) for all persons.
2. Compilation, in chronological order, of all air monitoring records pertaining to this Project.
3. Compilation of all completed and signed Waste Shipment Record forms, waste manifests, bills of lading, or disposal receipts pertaining to this Project.
4. Copies of notifications and checks to applicable agencies that the asbestos abatement has been completed.

2.8.4.4 Execution of Asbestos Removal

A. Phasing: The Design-Builder shall perform and complete the asbestos abatement activities during times scheduled by the Railroad. It is the Design-Builder's responsibility to ensure that all Work including successful air clearance testing and analysis as required is completed.

2.8.4.4.1 Limits of Work

A. The abatement of ACM shall occur within the work limits, as shown on the RFCD Drawings.

2.8.4.4.2 Decontamination Enclosure Systems

A. The Design-Builder shall set up personal and waste decontamination facilities outside of the work areas in accordance with 12 NYCRR 56 and SSVs.

B. The location of the decontamination facilities shall be in an area that is subject to the review of the Railroad.

C. The personal decontamination unit shall consist of a serial arrangement of rooms adjacent to the work area, including a clean room, shower room and equipment room. Each space shall be clearly identified and separated from the others and the work area by air locks with weighted door flaps. Specifications for materials to be used are specified in the Contract Documents.

D. The waste decontamination unit shall consist of a serial arrangement of rooms adjacent to the work area, including a washroom/clean-up room and holding area. Each space shall be clearly identified and separated from the others and the work area by air locks with weighted door flaps.

E. The Design-Builder (with assistance from the Railroad) shall apply to NYSDOL for a SSV applicable for the use of a mobile/remote personal and waste decontamination units, if required.

F. Provide lockers for storage of street clothes of workers in the clean room. Provide in the same room uncontaminated disposable protective clothing and equipment. This room shall be used by workers and visitors to change from street clothes to disposable protective clothing, respirators and other personal protective equipment prior to entering into the contaminated area. This room shall also be used to dress into street clothing after they have showered and dried in the shower room as they exit from the contaminated area.

G. Provide pass-through shower facilities with hot and cold water arranged so as to provide complete showering of workers and visitors as they exit from the contaminated area. Each shower head shall be supplied with hot and cold water adjustable at the tap. Workers shall be able to have available hot water adjustable at the tap immediately. Supply a liquid soap and shampoo in the shower room at all times. Make provisions to prevent contaminated water run-off from the shower room.

H. There shall be one shower per six full-shift ACM handlers and/or Supervisors calculated on the basis of the largest shift.

I. Provide an equipment room with storage for contaminated clothing and equipment. In this area, workers and visitors dispose of their disposable protective clothing, except the respirator, as they prepare to enter the shower room after leaving the work area.

J. The wash room/cleanup room shall be equipped with the facilities to wash and wipe the outside of the bags prior to removing them from the work area for offsite disposal at the approved permitted disposal facility. Make provisions to prevent any contaminated water run-off.

K. Provide heating and ventilation in the entire decontamination system so that air flow shall be from the outside towards the work space.

L. All workers shall utilize the personal and waste decontamination units in accordance with the requirements of 12 NYCRR 56, AVs or SSVs, as required.

M. Workers shall not eat, drink, smoke, chew gum, or chew tobacco, in the work area. To eat, drink, or smoke, workers shall leave the work area in accordance with the following instructions: Remove disposable work clothes and footwear in the equipment room. Still wearing their respirators, workers shall proceed to the showers and remove their respirators while showering with soap and water. Workers shall then dress into a new, clean disposable coverall. The new coveralls can be worn to reenter the work area.

N. All persons entering the work area shall wear an approved respirator and disposable coverall, head cover, gloves and footwear. The Design-Builder is responsible for controlling access at the work site and shall maintain a daily log of personnel entering the work area. A list of names of workers shall be posted with their start and stop times for each day. NYSDOL asbestos certification number and social security number shall be recorded for each worker.

O. Waste Decontamination Enclosure System: may be remote from tents for roofing removal operations in accordance with 12 NYCRR 56-11.6.

2.8.4.4.3 Health and Safety

A. Toxic Effects: The Design-Builder shall assume all responsibility for any toxic effects to workers from the air supplied to respirators, or from toxic or damaging vapors or residues resulting from the use of encapsulant and/or wetting agents or other substances used by the Design-Builder during construction.

B. Chemical/Biological Hazards: The known chemical and or biological hazards on site include ACM and debris. The Design-Builder shall provide materials, equipment, and training to its workers to ensure their protection from these and any other chemical/biological hazards that may be identified during the course of this Project work.

C. Physical Hazards: The Design-Builder shall provide safety equipment and training to his workers to ensure their protection from any physical hazards including but not limited to trip/fall hazards, working at elevation, heat stress, contact with energized (hot) active equipment, noise, overhead bump hazards, and electrical shock that may be present during the work.

D. Safety Act: As amended, OSHA shall be strictly complied with during the course of this project. This Act shall govern the conduct of the Design-Builder's workers, tradesmen, material persons, and visitors to the Project site.

E. Accident Prevention: In order to protect the lives and health of employees, comply with all pertinent provisions AGCA Manual of Accident Prevention in Construction and maintain an accurate record of all accidents which occur during the project. Immediately report an injury or loss of life to the Railroad, and a copy of the Design-Builder's report to its insurer of an accident shall be provided to the Railroad.

F. Emergency Response: The Design-Builder shall establish an Emergency Response Team made up of members of work force. Team members shall be trained, organized, and capable of responding in case of an accident, fire, or other emergency. The Design-

Builder shall designate a site Safety Coordinator to train team members regarding the location and use of site specific fire/life safety equipment.

G. Workmen Protection: The Design-Builder shall provide and maintain all safety measures necessary to properly protect workers.

H. Emergency Actions: In an emergency affecting the safety of life, the work, or adjoining property, the Design-Builder, to prevent such threatened loss or injury without review from the Railroad or the Safety Manager, is hereby permitted to act at it's discretion.

I. Hazard Communication Act: The Design-Builder shall comply with the Hazard Communication Standard promulgated by 29 CFR 1910.1200. This program ensures that all employers provide the information they need to inform and train employees properly and to design and put in place employee protection program. It also provides necessary hazard information to employees so they can participate in, and support, the protective measures needed at their work place. The Design-Builder shall ensure that labels or other forms of warning are legible in English. The Design–Builder's employees who speak other languages may add the information in their languages. See 29 CFR 1910.1200 for more details.

J. Lighting: Adequate lighting, as reviewed by the Railroad, shall be provided in the Work area and decontamination units at all times during the work.

2.8.4.4.4 Codes, Permits, and Standards

A. The Design-Builder shall be solely responsible for compliance with all Federal, State, and local laws, ordinances, codes, rules and regulations that govern asbestos abatement work or hauling and disposal of ACM waste material. The current issue of each document shall govern. All work installed shall comply with applicable codes and regulations as amended.

B. Before starting the work, the Design-Builder shall examine the Contract Documents for compliance with codes and regulations applicable to the work and immediately report any discrepancy to the Railroad.

C. Where conflict among requirements, the more stringent requirements shall apply.

D. Permits, State Licenses, and Notifications: The Design-Builder shall be responsible for obtaining all necessary permits, variances, state licenses, and certifications of personnel in conjunction with asbestos abatement, hauling, and disposition and shall provide timely notification of such actions as may be required by Federal and state authorities. The Design-Builder shall pay all fees and/or charges for these licenses, permits, and notifications. Use all notification forms where applicable.

    1. Agency Notification: At least ten Calendar Days before commencement of any asbestos abatement, the Design-Builder shall prepare written notification to USEPA Region 2, to the NYSDOL, and all other applicable agencies having jurisdiction.

2.8.4.4.5 Work Area Preparation

A. At a minimum, the Design-Builder shall adhere to the work area preparation procedures included in 12 NYCRR 56, Article 3.06, AV and SSVs.

B. Unless otherwise specified in a SSV, at a minimum, the Design-Builder shall construct a tent enclosure before asbestos abatement activities.

C. The Design-Builder shall coordinate with the Railroad to test and verify that electrical equipment is de-energized in work areas and to lockout and tag-out electric power to all Work areas.

D. The Design-Builder shall provide and ensure safe installation of temporary power sources and equipment, giving special attention to areas of high humidity and/or sprayed water. Installation shall comply with all applicable codes.

E. All power to work areas shall be brought into the area through ground-fault circuit interrupters (GFCI) positioned at the source.

F. All temporary wiring for light and power shall be effectively grounded in accordance with the National Electric Code (NEC).

G. All temporary lighting shall be equipped with heavy-duty electric cords with connections and insulation maintained in safe condition.

H. As work progresses and as reviewed by the Railroad, remove all or part of the temporary electrical connections installed for the work.

I. The Design-Builder shall furnish all energy for temporary power and lighting required for performance and inspection of work under this Project.

J. All generators used during abatement activities shall use carbon monoxide scrubbers.

K. The Design-Builder will not be permitted to proceed with any portion of the Work if, in the opinion of the Railroad, adequate lighting levels and power facilities are not provided.

L. The Design-Builder shall provide for and maintain required water supply.

2.8.4.4.6 Site Security and Control

A. The Design-Builder shall provide warning tape to delineate the work area and post caution signs indicating that asbestos work is being conducted. Copies of 12 NYCRR 56, any AV, and SSV obtained for the Project, and workers licenses shall be posted. All postings shall be in a conspicuous place, subject to the Railroad's Review.

B. The Design-Builder shall display caution signs at all approaches, entrance ways to the work area and barriers separating the work area from adjacent non-work areas. Signage shall be at least 20 inches by 14 inches, yellow background and with black lettering at least two inches in height. Lettering requirements and sign language shall be in accordance with 29 CFR 1926.1101.

C. The Design-Builder shall post a Notice of Asbestos Abatement conspicuously in the vicinity of the work area and by any entrances or passageways to the work area, ten (10) Calendar Days before commencement of work on any asbestos related activity on the Project. This shall include the name of the Design-Builder and air monitoring firm, location, amount of ACM, and work dates. This information shall be posted in both English and Spanish.

D. The Design-Builder shall provide or post the following information outside the Clean Room:

1. Copies of 40 CFR 61; 29 CFR 1926.1101; and 12 NYCRR 56.
2. A copy of Worker's, Air Sampling Technician's, and Project Monitor's NYSDOL Asbestos Certificates.
3. A copy of all applicable USEPA and NYSDOL Notifications, AVs and SSVs.

4. A list of telephone numbers for local hospital, location of hospital and/or emergency squad, local fire department, the Railroad and authorized representatives, and the NYSDOL Asbestos Control Program.
5. A copy of all MSDS for hazardous chemicals used during the ACM abatement project.

E. The Design-Builder shall provide disposable coveralls, head cover, gloves and footwear to the Railroad personnel and any other authorized representative who inspects the job site.

F. The Design-Builder shall provide all personnel throughout the ACM abatement process with the specified PPE.

G. All movable items that can be removed from the work area with no disturbance to the ACM shall be either wet washed or HEPA vacuumed and removed before isolation of the work area.

H. The Design-Builder shall establish and maintain emergency and fire exits from the work area.

I. Entry into the work area and surrounding area shall be restricted to the Design-Builder, its employees, and authorized visitors. The Design-Builder shall post a list of worker names including their starting and ending times for each day. In addition, record social security numbers and NYSDOL asbestos certification numbers.

J. Surface Barrier Installation:

1. Plastic shall be sized to minimize seams. Seams shall be staggered and separated by at least a distance of six feet.
2. Wall sheeting shall overlap floor sheeting by at least 12 inches beyond the wall/floor joint.
3. Wall sheeting shall be secured to prevent it from falling away from walls. This may require additional support/attachments when negative pressure ventilation systems are turned on.
4. Caulk or seal edges of sheeting at floor, ceiling, walls, and fixtures to form an airtight seal.

K. Engineering Controls:

1. The Design-Builder shall install engineering controls as per 12 NYCRR 56 before any ACM is disturbed or removed. For procedures using tent enclosures, use HEPA vacuums or negative air units to exhaust tent enclosures.
2. The estimated number of HEPA filtration units or HEPA vacuums to be employed for each applicable phase shall be determined by the Design-Builder and described in the AADWP, and shall provide a minimum of four air changes per hour.

L. Critical Barrier Installation:

1. Isolate the work area for the duration of the work in accordance with 12 NYCRR 56. Seal all openings from the work area to occupied areas of the building as per the following, if applicable.

2. Fire Exits: Since they shall be accessible at all times, equip each exit with an emergency egress light - battery powered to illuminate the exit path.
3. Fill any holes, cracks, or inlets into the work area with caulking, foam, or approved equal.

2.8.4.4.7 Asbestos Abatement Control Procedures

A. The ACM shall be managed in sections by two-person teams, the size of which shall be subject to the Review of the Railroad.

B. The ACM shall be managed using manual methods whenever possible. If mechanical means are required, tools and procedures shall be subject to the Review of the Railroad and described in the AADWP.

C. Unless otherwise approved in a SSV, the asbestos shall be sprayed with water containing a wetting agent, to enhance penetration. A fine spray of the amended water shall be applied to reduce fiber release preceding and as required during the abatement of the asbestos. The material shall be sufficiently saturated to prevent emission of airborne fibers, and to maintain airborne fiber concentrations below the exposure limits prescribed in OSHA regulations.

D. Encapsulation of ACM may be applicable to some areas of the work. Approved sealants specific to each of the different intended uses and material requirements shall be utilized in accordance with manufacturer's instructions.

E. All tools shall be HEPA vacuumed, wet washed/wiped and removed from work area upon completion of work.

F. Before beginning asbestos abatement of the next section in sequence, the material shall be double-bagged while still wet into two different color bags of 6-mil thickness. The outside bag shall be clear and the inside bag shall be of a dark color.

G. The ACM waste, the clean-up materials, and protective clothing shall be wetted sufficiently, double-bagged minimizing air content, sealed separately, and disposed off-site.

2.8.4.4.8 Asbestos Abatement Procedures

A. General: The Design-Builder is responsible for the proper removal of ACM from the work area using standard abatement removal techniques. Specific asbestos abatement procedures for types of ACM expected to be encountered during the project are described in this Part. The Design-Builder may choose alternative asbestos abatement methods not described in this Part; however, all means and methods shall be described in full detail in the AADWP, and reviewed by the Railroad prior to commencement of work. The Design-Builder is responsible for any and all procedures, conditions, and restrictions included in any AV or SSV to be implemented during the work whether specifically described or not in the Contract Documents.

B. Built-up Roofing, Roof Caulking and Flashing, and Roof Cap Flashing Caulking:

1. Removal of asbestos-containing materials from the roof areas utilizing 12 NYCRR 56-11.6.
    i. The Design-Builder shall perform all work in accordance with the Contract Documents as well as all applicable laws, codes, rules, regulations, and applicable variances. The Design-Builder shall notify the

Railroad of any discrepancies, and an interpretation of the item(s) in question will be provided.

ii. Where applicable, the Design-Builder shall install and utilize fixed scaffolding or approved equivalent, where required, to facilitate removal of the asbestos containing materials. All scaffolding shall be approved by a Professional Engineer.

iii. Removal procedures are as per 12 NYCRR 56-11.6, and as specified in this section.

iv. All asbestos handlers shall wear two disposable suits, including gloves, hood and footwear, and appropriate respiratory equipment, after removing street clothes in the clean room.

v. Each worker, before leaving the work area, shall clean the outside of the respirators and outer protective clothing by wet cleaning and/or HEPA vacuuming. The outer disposable suit shall be removed in the work area and the workers shall then proceed directly to the shower room. The inner disposable suit and respirator shall be washed thoroughly before removing and prior to aggressive shower.

vi. The worker decontamination unit shall be constructed at an entry/exit from each work area with at least a shower room and a clean room. In addition to the shower head(s), the shower room shall be equipped with a flexible hose for waste decontamination for small projects. For large decontaminations, a separate waste decontamination facility shall be constructed.

vii. Located within each airlock, there shall be extra clean and uncontaminated disposable protective suits and one such clean suit shall be worn by each worker in the airlock immediately after removal of the other suit and before each worker exits any airlock.

viii. After the ACM removal and bagging, the bagged waste shall be HEPA vacuumed then wet cleaned and transferred into either the waste decontamination unit or the personal decontamination unit in accordance with AV 119 and 12 NYCRR 56. Double bagged waste shall be washed and transferred through the decontamination unit for its final storage in an enclosed waste container.

ix. A plan outlining the location of the waste container shall be furnished to the Railroad for Review. The waste container shall not be placed on the Railroad's property prior to written Approval from the Railroad.

x. Preliminary examination shall be conducted and precautions shall be taken to prevent damage to the interior of the building and to ensure no adverse effect on the structural stability of the roof due to the abatement activity.

xi. Abatement shall not be carried out during adverse weather conditions (e.g., precipitation, heavy winds, etc.).

xii. The work area on the roof shall be cordoned off, and only authorized persons shall have access to the "designated" work area.

xiii. Movable objects shall be removed from the work area, or kept in place and wrapped in two sheets of 6-mil plastic sheeting. Fixed objects including perimeter walls, bulkheads, cooling towers, ducts and other rooftop appurtenances shall be covered in one sheet of plastic (minimum height equals 6-feet).

xiv. Provisions shall be made to ensure a safe and adequate air supply to affected building(s). All vents, skylights, air intakes, windows and doors opening onto the roof, and all other openings are to be sealed with two layers of 6-mil plastic or fitted with HEPA filters where appropriate. In lieu of sealing vents, air intakes, etc., with 2 layers of plastic or HEPA filters, temporary extensions may be installed to a height of 10 feet to ensure adequate air exchange. Drains may be equipped with 5-micron filtering systems in lieu of being sealed.

xv. Manual methods of removal are recommended; however, if handheld power tools are used to drill, cut into, or otherwise disturb the asbestos-containing roofing, flashing and caulking material, the power tools shall be equipped with HEPA-filtered local exhaust ventilation and operated to prevent potential fiber release.

xvi. Portable abatement HEPA-vacuum machines shall be available during abatement.

xvii. After the ACM removal and bagging, the bagged waste shall be HEPA-vacuumed then wet cleaned and transferred into the shower room for double bagging. The double-bagged waste shall be transferred outside the clean room for its final transfer for storage in an enclosed waste container.

xviii. Upon completion of the abatement in the work area, clean-up procedures shall involve removal and bagging of asbestos containing roofing, flashing and caulking material.

xix. The work area shall be allowed to dry completely before the visual inspection is conducted. The inspection shall confirm the absence in the work area of ACM or debris.

xx. If the work area fails visual inspection, it shall undergo another wet cleaning and/or HEPA vacuuming until it passes the visual inspection.

xxi. When the visual inspection and clearance testing is successful, all plastic may be removed.

2.8.4.4.9 Personnel Protection and Decontamination Procedures

A. The Design-Builder shall take all safety measures and precautions necessary to protect his employees and building occupants in accordance with 29 CFR 1926, 40 CFR, Part 61, Subpart M, and applicable state regulations. Be solely responsible for enforcing personnel protection requirements.

B. The Design-Builder shall be solely responsible for enforcing personnel protection requirements.

C. The Design-Builder shall instruct employees and ensure that they have been properly trained in respirator use and provide documentation of fit testing with appropriate

(NIOSH-approved) respirators for all employees. The size and type of respirator and HEPA filter cartridges shall be determined by the concentration of fibers encountered during mandated air sampling. Respirators shall be worn in accordance with OSHA regulations.

D. In the work area, workers shall always wear disposable full-body coveralls, head covers, gloves, and footwear. Non-disposable footwear may be used but must be left in the work area until completion of the job.

2.8.4.4.10 Testing and Inspection

A. Visual inspections and air monitoring will be performed before, during, and after asbestos abatement to document airborne asbestos fiber concentrations as defined in this Specification.

B. The Design-Builder's shall be responsible for:

1. Payment for PCM and TEM air samples that fail to meet the re-occupancy clearance standard. Should a delay occur due to failure(s) of clearance air testing, all associated expenses such as PCM and TEM analysis and air testing, shall be the responsibility of the Design-Builder.
2. Provision of OSHA monitoring and all other all tests required by specified applicable regulations, codes, and standards and any other tests for his use. The use of a testing laboratory by the Railroad does not relieve the Design-Builder from providing tests required for the protection and safety of his employees.
3. Employment of an independent Industrial Hygiene (IH) testing laboratory for collection and analysis of OSHA personal air monitoring samples. The laboratory used for air sample analysis shall be successfully participating in the "Proficiency Analytical Testing (PAT) Program for Laboratory Quality Control for Asbestos." The monitoring shall be supervised by a CIH certified by the ABIH. Each testing laboratory shall be ELAP and NVLAP certified.
4. From each work area, collection and analysis of OSHA personal air monitoring samples. Sampling shall be repeated during each different work activity. Sample collection and analysis shall be performed using the OSHA Reference Method as outlined in 29 CFR 1926.1101, Appendix A.
5. Posting results of all air monitoring performed by the Design-Builder within 24 hours for regular asbestos abatement project after collection for all workers to see. A copy of the results shall be submitted to the Railroad.
6. Being advised whenever questions arise concerning compliance with standards of quality and completeness of the work, and shall use its best efforts to resolve any such questions, subject to the Review of the Railroad.
7. Where air monitoring tests and/or inspections are specified, notifying the Railroad, in writing, in advance of the required test and/or inspection.
8. Ensuring the work is complete to the level that meets the criteria of the inspection. Perform an inspection of the work to evaluate completeness before requesting an inspection by the Railroad.

C. Time Requirements for the Railroad's Inspections and Testing: Where visual inspections or air testing is required to be performed by the Railroad, allow for the following response/analytical time for completion of the inspection/test.

1. Where visual inspections are required, allow 24 hours beginning from the time the Design-Builder's written request is received by the Railroad, for the performance of the inspection.
2. Where PCM and TEM clearance air monitoring tests are required, allow 24 hours beginning from the time the Design-Builder's written request is received by the Railroad to the beginning of the air test.

2.8.4.4.11 Marking and Labeling

A. Disposal bags and shipping containers shall bear danger labels, transportation packaging labels, and generator identification information. Labels shall be permanently affixed to all bags and shipping containers containing ACM, in accordance with 29 CFR 1926, 49 CFR Part 171 172, and 173, and 40 CFR Part 61.

1. Danger label format and color shall conform to 29 CFR 1926.
2. USDOT Marking and Labels: Markings and labels shall be permanently affixed to all bags and containers containing ACM, in accordance with 49 CFR 172.
    i. Markings shall display the following text:

    RQ, ASBESTOS, NA 2212

    ii. Labels shall be in accordance with 49 CFR 172.
3. Generator identification information shall be affixed to each USDOT label format and color shall conform to 49 CFR 172. Generator identification information labels shall display the following legend/information:

    GENERATOR'S NAME: LIRR

    GENERATOR'S 24-HOUR PHONE NUMBER

    GENERATOR'S FACILITY ADDRESS
4. Reuse of Containers: If impermeable containers used to transport bagged ACM waste to the approved permitted disposal facility are to be reused, the empty containers shall display the following label:

    RESIDUE

    LAST CONTAINED ASBESTOS RQ

1. Labeled ACM waste containers or bags shall not be used for non-ACM debris or trash. Any materials placed in labeled containers or bags, whether turned inside out or not, shall be handled and disposed off-site as ACM waste.

2.8.4.4.12 Waste Handling and Disposal

A. All waste disposal and transportation shall meet the requirements of the NYSDEC regulations.

B. The preferred ACM waste management shall incorporate the use of container or disposal receptacles of suitable size for the loading and transportation.

C. ACM waste, once properly wrapped and secured, shall be carried or transported to the waste haulers vehicle.

D. ACM waste shall then be transported directly to a permitted off-site disposal facility.

E. It is the responsibility of the Asbestos Abatement the Design-Builder to determine current waste handling, transportation and off-site disposal regulations for the work site and for each approved permitted disposal facility. Comply fully with these regulations and all appropriate USDOT, USEPA, NYSDEC, and other Federal, State and local regulations.

F. Pre-Abatement Inspections: Before abatement of any ACM, the Design-Builder shall notify the Railroad and request a pre-abatement inspection.

G. ACM waste shall be placed in a wet condition into properly labeled disposal bags or sealed in two layers of plastic sheeting wrapped airtight and properly labeled. Materials to be transported through a non-work area building space shall be placed in hard walled shipping containers for handling.

H. All bagged ACM shall be transported by a permitted waste hauler.

I. Waste Load Out Through Remote Decontamination Units.

1. After filling of disposal bags or sheeting, clean outer covering of ACM waste package by wet cleaning and/or HEPA vacuuming in the work area before transferring such items into the remote decontamination enclosure system.
2. Waste disposal bags shall be washed in the remote decontamination unit and be placed into another 6-mil thick plastic bag and labeled. The top of the outer bag shall be twisted and secured with duct tape.
3. The disposal bags shall be transported directly to an ACM waste dumpster or an approved disposal vehicle. Waste bags shall not be stored in the remote waste decontamination unit.
4. Thoroughly clean the remote decontamination enclosure system immediately upon completion of the waste load-out activities, and at the completion of each work shift.

J. Waste Load Out Through Full Waste Decontamination Units.

1. Place ACM waste in disposal bags. Large items not able to fit into disposal bags shall be wrapped in one layer of 6-mil thick plastic sheeting. Clean outer covering of ACM waste package by wet cleaning and/or HEPA vacuuming in a designated part of the work area. Move wrapped ACM waste to the equipment washroom, wet clean each bag or object and place it inside a second disposal bag, or a second layer of 6-mil plastic sheeting, as the item's physical characteristics demand. Air volume shall be minimized, and the bags or sheeting shall be sealed airtight with tape.
2. The clean containerized items shall be moved to the waste decontamination enclosure holding area pending load-out for off-site disposal.
3. Load-out of containers from the decontamination enclosure holding area shall be performed by workers who have entered the waste decontamination enclosure system from the uncontaminated non-work area. Dress workers moving ACM waste to storage or off-site disposal facilities in clean overalls of a color different

than from that of coveralls used in the work area. Ensure that workers do not enter from uncontaminated areas into the equipment washroom or the work area. Ensure that contaminated workers do not exit the work area through the waste decontamination enclosure system.

4. Thoroughly clean the waste decontamination enclosure system immediately upon completion of the ACM waste load-out activities, and at the completion of each work shift.

2.8.4.4.13 Wastewater Management

A. All water utilized during this project and contaminated by asbestos shall be filtered. The final filter should be of a 5-micron size. A system containing a series of several filters with progressively smaller pore size shall be used to avoid rapid clogging of the filtration system by large particles. The filtration system shall be adequate to meet the discharge limitations of all applicable regulations and permits.

B. Filtered wastewater shall be containerized for off-site disposal or discharged into the existing sewer system with the Railroad's Approval.

C. Test results of any water proposed for off-site disposal or discharge to the sewers shall be submitted to the Railroad.

D. The Design-Builder shall provide proof of an approved discharge permit (if discharged to the sewers) to the Railroad.

E. Used filters shall be disposed of as ACM waste.

2.8.4.4.14 Final Clean-up Procedures

A. The final cleanup procedures performed by the Design-Builder shall, at a minimum, comply with the requirements of 12 NYCRR 56, AVs, or SSVs, as required.

B. Additional final clean-up procedures include, but are not limited to the following:

1. After abatement of all visible accumulations of ACM, the Design-Builder shall decontaminate the work area in accordance with this Section.
2. The Design-Builder shall request and pass a visual inspection performed by the Railroad at the completion of each cleaning phase. Documentation of passing this inspection shall be recorded in a daily logbook.
3. The Design-Builder shall ensure the following:

iii. All surfaces in the work area shall be cleaned using a fine spray of amended water followed by wet-wiping with disposable cloths.

iv. Cleaning material, clothing, and all other disposable material or items used in the work area are double-bagged for disposal and removed from the work area for off-site disposal as ACM waste.

v. After inspection by the Railroad, all containerized ACM waste shall be removed from the work area and the holding area.

vi. All ACM waste shall be staged in a designated area until it is removed for off-site disposal. This designated area shall be maintained such that the sealed materials shall be protected from any potential damage.

vii. All tools and equipment shall be decontaminated, before removal from the work area.

viii. Following cleaning, all non-abated surfaces shall be sprayed with a mist of encapsulant.

ix. Following a prescribed waiting period, clearance air monitoring will be conducted by the Railroad.

x. Waiting periods shall be in accordance with 12 NYCRR 56 or the time specified in an AV or SSV.

xi. Critical barriers shall remain up until air monitoring is completed and satisfactory results have been obtained.

xii. If air monitoring results are acceptable, according to the Railroad's review, encapsulate all work area surfaces before any breakdown. All critical barriers shall then be removed.

xiii. Following cleanings and satisfactory clearance air monitoring, a final visual inspection shall be conducted by the Railroad.

xiv. Waste disposal procedures shall be performed according to 12 NYCRR 56.

4. The Railroad will provide notice to proceed with breakdown of decontamination facilities. The last item removed from the site shall be the decontamination units.

2.8.4.4.15 Air Monitoring

A. Clearance air monitoring shall be conducted by the Design-Builder.

B. The Design-Builder shall conduct monitoring of worker asbestos exposures in a manner to comply with the monitoring requirements of 29 CFR 1926.1101.

C. The Design-Builder shall conduct pre-clearance inspections.

D. The Design-Builder shall conduct clearance sampling and inspections in accordance with 12 NYCRR 56, AV, or SSV, and any other sampling as necessary to document that the ACM management activities are being performed safely and in conformance with the AADWP and all applicable Federal, state and local regulations.

2.8.4.4.16 Fire Protection and Emergency Egress

A. The Design-Builder shall be responsible for the security and safeguarding of all areas turned over by the Railroad to the Design-Builder. Designate to workers and other building occupants the means of egress in case of emergency.

B. The Design-Builder shall establish emergency and fire exits from the work area. First aid kit, two full sets of protective clothing and respirators shall be provided for use by qualified emergency personnel in the clean room of the decontamination facility.

C. The Design-Builder shall provide fire watch and logbook throughout the entire term of the project, to protect against fire and unauthorized entry into and around the work area. Any intrusion or incident shall be documented in the logbook. The Design-Builder shall fire watch personnel shall be present during off-hours shift such as night shift, weekends and holidays when asbestos abatement work is not in progress. The fire watch shall be a NYSDOL certified asbestos handler.

2.8.4.4.17 Clean-up

A. Asbestos Related Clean-up: All clean-up work related to asbestos abatement work shall be in strict accordance with general technical requirements.

B. Final Site Cleaning: Upon completion of the work, remove all temporary construction, decontamination facilities, and unused materials placed on site by the Design-Builder. Leave the premises in a neat and clean condition by sweeping, cleaning, and washing as required to restore the site to its original condition.

2.8.5 Summary of Submittals

Item	Section	Submittal	Action
1	2.8.3.2	Certificate of Removal of LBP	Information
2	2.8.3.2	Executed “Statement of Qualifications of Lead Subcontractors”	Review and Approval
3	2.8.3.5.1	LBP Management Plan	Review and Approval
4	2.8.3.5.1	Lead-containing material survey report	Information
5	2.8.3.5.1	Hazardous Waste Hauler Permit	Information
6	2.8.3.5.1	Landfill letter, name address and permit	Information
7	2.8.3.5.1	Detailed work schedule	Review and Comment
8	2.8.3.5.1	ELAP accreditation	Information
9	2.8.3.5.1	Detailed site drawing	Review and Comment
10	2.8.3.5.1	Safety Data Sheets	Information
11	2.8.3.5.2	Toxic Characteristic Leaching Procedure	Review and Comment
12	2.8.3.5.2	Wastewater Test Results	Information
13	2.8.3.5.2	Waste Load Manifests	Information
14	2.8.3.5.2	Certificate of Final Disposal	Information
15	2.8.3.5.2	Bills of Landing	Information
16	2.8.3.5.2	Disposal of Wastewater Receipts	Information
17	2.8.3.5.2	Inspections Letter Report	Information
18	2.8.3.5.3	Daily Projects/Logs	Information
19	2.8.3.5.3	Waste Disposal Manifests	Information
20	2.8.3.5.3	Analytical Results from Collected Samples	Information
21	2.8.3.5.3	Clearance Certificate	Information
22	2.8.3.5.3	As Built Drawings	Information

23	2.8.3.5.3	Copies of all LBP Management Records	Information
24	2.8.3.5.3	Summary of Techniques of LBP Management	Review and Comment
25	2.8.3.6.1	Certification that all documents and permits will be submitted before the start of the work	Information
26	2.8.3.6.1	Documentation that minimum insurance criteria have been met	Information
27	2.8.3.2	Certificate of Removal	Information
28	2.8.3.3	Statement of Qualifications of Lead Subcontractors	Information
29	2.8.4	Worker Medical Examinations	Information
30	2.8.4.3.1	NYSDOL Asbestos Handling Certificates	Information
31	2.8.4.3.1	Blue Cards	Information
32	2.8.4.3.1	NYSDOL Asbestos Filing with EPA	Information
33	2.8.4.3.1	Waste Hauler Permit	Information
34	2.8.4.3.1	ELAP accreditation	Information
35	2.8.4.3.1	SDS for encapsulants	Information
36	2.8.4.3.1	Certificates of Insurance	Information
37	2.8.4.3.1	Bonds	Information
38	2.8.4.3.1	List of Subcontractors	Review and Comment
39	2.8.4.3.1	Training Certificates	Information
40	2.8.4.3.1	Site-Specific Construction Safety and Health Plan	Review and Comment
41	2.8.4.3.1	Safe Work Plan	Review and Comment
42	2.8.4.3.1	Emergency Action Plan	Review and Comment
43	2.8.4.3.1	Fall Protection Plan	Review and Comment
44	2.8.4.3.1	Proof of Written Notification	Information
45	2.8.4.3.1	State Certification and Licenses	Information
46	2.8.4.3.1	Proof that all required permits & variances have been obtained	Information
47	2.8.4.3.1	Proof of written notification to the local police & fire departments	Information
48	2.8.4.3.1	Proof Supervisors & workers meet state certifications & license requirements	Information

49	2.8.4.3.1	Show drawings of scaffolding	Review and Comment
50	2.8.4.3.1	Proof of Medical Surveillance Program	Information
51	2.8.4.3.1	Proof of a Respiratory Protection Program	Information
52	2.8.4.3.1	Proof of Historic Airborne Fiber Data	Information
53	2.8.4.3.1	Proof that a Landfill Site has been Located	Information
54	2.8.4.3.1	Manufacturer's Literature	Information
55	2.8.4.3.1	Asbestos Abatement and Disposal Work Plan	Review and Approval
56	2.8.4.3.2	Request for Services Form	Information
57	2.8.4.3.2	Results of air monitoring	Information
58	2.8.4.3.2	Daily project logs/Reports	Information
59	2.8.4.3.2	Waste Disposal Manifests	Information
60	2.8.4.3.2	Analytical Results from all samples collected	Information
61	2.8.4.3.2	Clearance certificates	Information
62	2.8.4.3.2	As built drawings	Information
63	2.8.4.3.2	Notarized copies of daily logs	Information
64	2.8.4.3.2	Air monitoring records	Information
65	2.8.4.3.2	Waste shipment record forms	Information
66	2.8.4.3.2	Waste manifests	Information
67	2.8.4.3.2	Bills of landing	Information
68	2.8.4.3.2	Disposal receipts	Information
69	2.8.4.3.2	Copies of notifications & checks to applicable agencies	Information

END

2.9 SYSTEM SAFETY

2.9.1 Section Includes

This section sets out requirements relating to the program that the Design-Builder shall use to identify and manage vulnerable design solutions, and unsafe conditions arising from systems elements, subsystems interfaces, or overlapping design elements.

2.9.2 Codes and References

The Project Work shall comply with all statutory requirements, and shall comply with the following codes, where applicable:

A. MIL STD 882E.

B. New York State Uniform Fire and Building Code.

C. LIRR System Safety Program Plan (SSPP).

D. Train Control System shall comply with 49 CFR Part 236 subpart I-H.

E. System Safety Program 49 CFR Part 270.

F. NFPA 130, Standard for Fixed Guideway Transit and Passenger Rail Systems.

The Design Builder shall monitor for any update, change or new regulation, standard or industry practice and comply where it is required.

2.9.3 System Safety

A. This section provides system safety design criteria for the entire Project. This Section establishes minimum system safety requirements for each identified facility and subsystem according to the Railroad, local, and national codes, and/or standards as determined by the AHJ. The Design criteria are specified uniformly and generically at a functional level for system elements and subsystems to achieve a high level of system safety. The Design-Builder shall prepare and submit the Safety Design Criteria to the Railroad for Review and Approval.

B. System safety design criteria are specified as qualitative, functional requirements to be implemented and further specified in greater detail by the various design disciplines. System safety shall be achieved through a composite of operating equipment, hardware, procedures, and software subsystems that are integrated to provide protection of life and systems from the effects of hazards.

C. The LIRR System Safety Program Plan (SSPP), mandated by FRA through 49 CFR Part 270, shall be the governing document for requirements, methodology, and implementation of system safety. The validation of safety elements of the Project are governed by the Project System Safety Certification Plan. The System Safety Certification Plan shall describe the procedures and methods that document attainment of safety-related elements of these design criteria.

2.9.4 General Requirements and Responsibilities

A. The Design-Builder shall design a safe system in accordance with Federal, State, County, and local applicable Codes and Standards, and detect and avoid unsafe or vulnerable design solutions. The Design-Builder shall identify unsafe conditions where systems and subsystems interface, and where overlapping design elements occur.

B. The Design-Builder's system safety program shall eliminate or control critical and catastrophic safety hazards, and reduce Unacceptable Hazards/Risks through the application of Railroad's risk criteria as defined in LIRR's System Safety Program Plan (SSPP), and MIL STD 882E.

C. The Design-Builder shall take corrective action to eliminate or control Unacceptable Hazards/Risks as defined by LIRR's SSPP using the following approach to system safety, in the following order of precedence. Note that a combination or all of the following approaches may be used to mitigate or control hazards:

   1. Design for minimum risk – Design to eliminate hazards through design selection. Design-Builder shall use fail-safe devices and principles of design, and incorporate high-reliability systems and components, and use of redundancy in hardware and software design.

   2. Safety devices – Hazards that cannot be eliminated or controlled by design selection shall be controlled to an acceptable level of risk through the use of fixed, automatic, or other protective safety design features or devices. Safety devices shall be designed to permit limited and controlled operation. The Design-Builder shall inspect and perform periodic functional checks of each safety device.

   3. Warning devices – When neither design nor safety devices can effectively eliminate or control an identified hazard, the Design-Builder shall provide a device to detect the hazardous condition and generate a warning signal to the operators and personnel for subsequent corrective action.

   4. Procedures and training – When design selection, safety devices, and warning devices cannot effectively eliminate or control an identified hazard, Design-Builder shall use procedures and training to control the hazard. The Design-Builder shall implement training, equipment, and procedures to reduce the probability of a hazardous event. System safety critical tasks, duties, and activities require training and certification of operations and maintenance personnel by nationally recognized certifying agencies acceptable to the Railroad.

D. System safety process shall address requirements under four integrated and overlapping functions:

   1. LIRR Safety & Training - elimination, minimization, or control of potential hazards and the protection of property from damage against injury and/or property damage.

   2. Fire/Life Safety - elimination, minimization, or control of potential hazards to customers, employees, emergency response personnel and the general public caused by fire, smoke, explosion or resulting panic; and the protection of property from fire, explosion or chemical exposures.

   3. Occupational Safety - elimination, minimization or control of potential hazards to employees and emergency response personnel.

   4. Public Safety - elimination, minimization or control of potential hazards to the general public and customers that result from the operation of the system.

2.9.5 System Safety Program Plan (SSPP)

The Railroad's System Safety Program Plan is mandated by the Federal Railroad Administration (FRA) through 49 CFR Part 270, and shall be the governing document for requirements, methodology, and implementation of system safety program.

2.9.6 System Safety Plan

A. The Design-Builder shall submit the System Safety Plan for Review and Approval that documents the requirements, methodology, and implementation of system safety for the Project in accordance with the Railroad SSPP. The Design-Builder shall update the System Safety Plan as required for significant issues and not less than annually. The initial submittal of the System Safety Plan shall be no later than 30 Calendar Days after LNTP.

B. The Design-Builder's System Safety Plan shall include, but not be limited to the following:

1. Task listing and time phasing of each task.
2. Organization and responsibilities of key personnel.
3. Procedures to accomplish system safety tasks, including, at a minimum:
    i. Hazard management program.
    ii. Correct system safety deficiencies noted within Design Work.
    iii. Evaluate system design and design changes.
    iv. Conduct system safety analyses of Project systems, subsystems, and interfaces.
    v. Corrective action to address Unacceptable Hazards/Risks.
    vi. Actions to reduce risks from Unacceptable Hazards/Risks.
    vii. Cost-benefit analysis for elimination or acceptance of risk.
    viii. Internal safety audits.
4. Description of a data collection and feedback system to be used to establish requirements for redesign, design changes, and corrective actions.
5. Description of training program for operations and maintenance personnel to provide information on system safety methods and procedures, protective devices, and emergency equipment, and provide input from safety analyses in the form of warnings and caution statements into the training program and into the operating and maintenance/service manuals, for systems, subsystems, equipment hardware, software, and firmware provided in the Contract Documents.

C. The validation of safety elements of the Project is governed by the Project-specific Safety Certification Plan. The Project Safety Certification Plan shall describe the procedures and methods used for attainment of safety-related elements required by the Contract Documents.

2.9.7 Design-Builder's Chief Safety Officer

A. The Design-Builder shall provide a Chief Safety Officer having the primary responsibility for implementing and monitoring the goals and objectives established by the System Safety Plan and to meet the criteria for safety management systems. Responsibilities include oversight of the system safety during all Project phases. The Design-Builder's Chief Safety Officer Responsibilities shall include, at a minimum:

1. Implementation and oversight of the Design-Builder's hazard management process.

2. Overseeing the Design-Builder's interface with local jurisdiction emergency responders, including emergency responder training and drills.
3. Ensuring that the Design-Builder personnel are trained in safety plans, procedures, and operations.

B. The Design-Builder's Chief Safety Officer shall also be responsible for the Design-Builder safety audits, accident investigation and reporting, as well as reporting of safety and accident statistics to the Railroad. The Chief Safety Officer and the Design-Builder's safety organization shall be independent from the staff and duties associated with the execution/production of the Work.

2.9.8 Hazard Management Program

The Design-Builder shall maintain a Hazard Management Program throughout the Project. The Hazard Management Program shall document Design-Builder's effort to eliminate, mitigate and control hazards that Design-Builder identifies during design, construction, testing, operations and maintenance of the Project. The Hazard Management Program shall be described in the Design-Builder's System Safety Plan.

2.9.9 Safety Analysis

A. The Design-Builder shall perform system safety analyses to identify safety hazards, assess their risk as a function of hazard severity and probability of occurrence, and apply the Railroad risk criteria for hazard mitigation and resolution given in the Railroad's SSPP.

B. Hazard severity and probability definitions shall be based on LIRR's SSPP.

C. The Design-Builder shall perform and document system safety analyses to identify potentially hazardous conditions as required to ensure that safety has been adequately considered. The Design-Builder shall apply system safety analyses to:

1. Evaluate alternatives.
2. Evaluate and verify safety requirements of the systems, subsystems and assemblies for the systems under the scope of this Project.
3. Evaluate the operation/emergency procedures and training requirements.
4. Provide visibility of relative safety and risk within system components.

D. The Design-Builder shall perform safety analyses of systems, subsystems and functions to identify potential system safety hazards in System Elements, subsystems and assemblies, hardware and software and interfaces including at a minimum:

1. System Elements and subsystems to be analyzed include but are not limited to those specified in the Certified Items List (CIL).
2. Perform analyses of interfaces between each system and operating and maintenance personnel.
3. Perform analyses of interfaces between each system and other systems that directly interface with it.
4. Perform analyses of potential human errors and fault conditions arising from operations and maintenance manuals.

E. Existing analyses and data that are properly documented and verifiable, and that present the material in a neat, concise and logical manner may be submitted for equipment and applications that are identical or manifestly similar.

F. The system safety analyses shall be an on-going function of the Design-Builder. Therefore, during the Design-Build Period, there will be multiple Submittals based on these analyses and the Design-Builder's schedule, including the Submittal Schedule, should reflect the time required to complete these analyses and include them as necessary for the Final Design.

2.9.9.1 Types of System Safety Analyses

A. In performing the required analyses, the depth of detail shall be dictated by hardware and software components, functions and modules called for in the Final Design, identified critical items, and unresolved potential failures of Unacceptable Hazards/Risks. The Design-Builder shall perform the following analyses, including, at a minimum:

B. Preliminary Hazard Analysis – The Design-Builder shall determine, evaluate and assess the hazards during Design Work. The PHA process shall include a workshop for each PHA including the Design-Builder and Railroad subject matter experts. A consensus shall be reached regarding the rating of hazard probability and severity, and risk. The Design-Builder's Preliminary Hazard Analysis shall demonstrate that the Certifiable Elements and operational systems conform to the requirements of the Contract Documents and identified hazards have been either eliminated, or reduced to levels of risk acceptable to the Railroad in accordance with Railroad's SSPP. Design mitigation measures for hazards shall be verified as being included in the design at the end of Final Design. The PHA shall be initiated and updated throughout the Design Work and shall be submitted to the Railroad for Review and Approval for Final Design and be included in the Initial Baseline Schedule.

C. Failure Modes and Effects Analysis – The Design-Builder shall identify weaknesses in safety critical system hardware and software design, and to provide analysis of the modes and effects of failures whenever details are not established by historical records of equipment operation. The Failure Modes and Effects Analysis shall indicate circuit behavior, random component failures, electrical interference, and systematic component failures. The Failure Modes and Effects Analysis and reliability prediction shall be updated throughout Design Work and include the Operating System design. The FMEA shall be detailed in the Testing Program Plan as described in this Section. The Design-Builder shall prepare and submit the Failure Modes and Effects Analysis to the Railroad for Review and Comment.

D. Software Failure Modes and Effects Analysis - Design-Builder shall determine and document the software failure modes and software errors in software-based logic that are likely to cause failure events. These events are classified according to their severity and criticality.

E. Fault Tree Analysis – The Design-Builder shall perform Fault Tree Analysis to investigate unresolved potential failures with Unacceptable Hazards/Risks. The Fault Tree Analysis shall evaluate the probability of item failure and combination of several item failures that result in a higher-level system failure. Fault Tree Analysis shall be updated throughout Design Work and shall include operating system design. The Design-Builder shall prepare and submit the Fault Tree Analysis to the Railroad for Review and Comment.

F. Event Tree Analysis – The Design-Builder shall perform Event Tree Analysis to investigate any unresolved potential failures with Unacceptable Hazards/Risks. The purpose of Event Tree Analysis is to identify and quantify possible event outcomes following an initiating event. Event Tree Analysis shall be updated throughout Design Work and shall include operating system design. The Design-Builder shall prepare and submit the Event Tree Analysis to the Railroad for Review and Comment.

2.9.9.2 Evaluating Hazards

A. For each identified hazard, the Design-Builder shall establish hazard severity category, hazard probability ranking, and a combined hazard risk index reflecting the severity and probability ranking based on the hazard risk indices defined in Railroad's SSPP.

B. The Design-Builder shall apply risk assessment criteria to identified hazards based on the identified severity and probability of occurrence, to determine acceptance of the risk or the need for corrective action to further reduce the risk. The risk acceptance criteria shall conform to that defined in Railroad's SSPP.

C. The Design-Builder shall analyze hazards that are identified as having an Unacceptable Hazards/Risks, using logic network analyses (such as fault tree) to determine effectiveness of corrective actions. Unacceptable Hazards/Risks shall be reduced to an acceptable level before design acceptance. Hazards or risks that are not Unacceptable Hazards/Risks shall be mitigated on a priority basis using cost-benefit considerations and shall be approved by the Railroad.

D. Hazards identified as "acceptable with review" may be accepted by Railroad in an "as-is" condition with no further corrective action. Alternatively, the Railroad may require the Design-Builder to create operating and maintenance procedures for periodic tests and inspections of the subject item to ensure an acceptable level of safety is maintained over the life of the system.

2.9.9.3 Safety Verification Tracking Log

A. The Design-Builder shall maintain and update a Safety Verification Tracking Log (SVTL) throughout the duration of the Project to track safety-critical items identified during the system safety analyses as defined by Railroad's SSPP. The SVTL shall track and document the verification process and outcome, and include, at a minimum:

1. List of all certifiable items.
2. Hazard analysis items.
3. System safety requirements.
4. Criteria references.
5. Verification methods.
6. Compliance/noncompliance documentation.
7. Work around procedures.
8. Closure status.

B. The Design-Builder shall document any rationale in lieu of corrective action to mitigate a hazard. Design-Builder shall conduct special reviews of unresolved critical items on the SVTL with Railroad to determine disposition of the items.

C. The Design-Builder shall submit the SVTL for Review and Comment every 90 Calendar Days from LNTP until Final Completion.

2.9.9.4 Safety Principles

The following safety principles, as modified from FTA's Hazard Analysis Guidelines for Transit Projects, shall be implemented by the Design-Builder in the design and operational concepts of the systems, subsystems, functions, assemblies and interfaces, to the extent covered under the Design-Builder's scope in the Contract Documents for the Project:

A. When the systems are operating normally there shall be no Unacceptable Hazard/Risks.

B. Systems design shall ensure successful operation under abnormal (failure recovery) and Emergency (e.g., derailment, fire/ smoke) conditions on the Track, and all safety analyses shall evaluate and ensure acceptable hazard risk under normal, abnormal (failure recovery), and Emergency conditions.

C. Safety of the systems in the normal automatic operating mode (if applicable) shall not depend on the correctness of actions or procedures used by operating personnel.

D. There shall be no single-point failures or fault conditions in the system that can result in an Unacceptable Hazard/Risk, under normal, abnormal (failure recovery) or Emergency condition.

E. If one failure combined with a second failure can cause an Unacceptable Hazard/Risk, the first failure shall be detected and the system shall achieve a known safe state before the second failure can occur.

F. Software faults shall not cause an Unacceptable Hazard/Risk under normal, abnormal (failure recovery), or Emergency conditions.

G. Unacceptable Hazard/Risks shall be mitigated or eliminated by design.

H. Maintenance activities required to preserve or achieve risk levels shall be performed. Personnel qualifications required to adequately implement these activities shall also be identified and tracked.

2.9.10 Fire/Life Safety Committee (FLSC)

A. The FLSC will serve as a liaison between the Railroad and the external emergency response agencies. The FLSC includes Railroad and local emergency response agency representatives, Design Builder and other local, State and Federal officials, as necessary. The FLSC reviews, analyzes and directs activities related to the fire/life safety and security aspects of the Project and identifies the emergency response needs (such as training and drills) that are required to adequately respond to accidents/incidents that may occur during the Project. The FLSC also provides expertise to facilitate the development and implementation of emergency responder training programs and activities, and Emergency operating procedures and plans if requires.

B. The Design-Builder shall lead and coordinate all required tasks and actions between stakeholders.

2.9.11 Emergency Drills and Exercises

The Design-Builder shall participate, lead and coordinate in the planning, co-ordination, and execution of tabletops, emergency drills and exercises with the Railroad and Emergency Services to demonstrate Project response to emergencies. The Design-Builder shall participate in these

drills and exercises during the pre-operational testing phases and through the Project at least twice per year during the operations phase and as determined by the Railroad and the local emergency response agencies.

2.9.12 System Safety Criteria

A. System safety criteria shall be incorporated into design and construction of the Work. Safety criteria are dispersed throughout the technical provisions with respect to Structures, Track, Stations, and etc.

B. Implement the approved criteria throughout all aspects of final design development, test, delivery, installation and maintenance. The criteria shall include requirements for the following:

1. Design safety: Employment of system safety techniques that optimize the design to minimize or control hazards identified by failure analyses. Coordination with reliability, maintainability and design engineers to avoid potential hazards resulting from complexity of design. Maintenance of standardization of design by use of proven standards of the railroad/ transit industry and applicable regulatory codes.
2. Potential failures: Ensure a single-point failure in a dynamic system will not result in an Unacceptable Hazard/Risk. Ensure elimination or minimization of the hazards by design, except in specific cases where high reliability, failsafe items may be used, based upon a properly documented past history of low failure rate, if approved by Railroad after submission of the history of these items. Control of potential failures with hazards or risks that are not an Unacceptable Hazard/Risk through use of safety devices and approved operating or maintenance procedures.
3. Redundancy: Incorporation of redundant circuits and components in a coordinated system safety, reliability and maintainability engineering review to ascertain mutual agreement of system enhancement.
4. Human factors: Prevent/minimize human error(s) when responding to field and operational conditions by eliminating the following: conflicting or ambiguous alarms and status indications; conflicting or ambiguous instructions; lengthy or complicated instructions; inherent design errors/problems; and unclear or incomplete supporting hardware and software documentation.

2.9.13 SAfety Management Plan (SAMP)

The Design-Builder shall submit the Safety Management Plan to the Railroad for Review and Approval. The Design-Builder shall address safety management for the Project from LNTP to Final Completion. The SAMP shall be submitted 90 Calendar Days after LNTP.

2.9.14 Safety Certification Support

A. The Design Builder shall support LIRR Safety Certification processes and procedures. The Design Builder shall develop, perform and provide all necessary documentation, analysis, reports and testing to support LIRR Safety Certification, including the development of a Safety Certification Support Plan (SCSP).

B. The SCSP shall describe the process for the Project to support Safety Certification. The Project will identify safety elements using various methods, including, at a minimum, previous experience, system safety analyses. The purpose of the SCSP is to ensure that Project safety requirements are implemented by tracking them for application through all Project phases from Design through commencement of operations.

C. The Design-Builder shall develop an SCSP in accordance with the FRA guidelines (such as 49 CFR 236 sub part H and I), the Contract Documents, LIRR's SSPP and LIRR's Safety Certification processes and that documents how the Design-Builder will achieve the following:

1. The Design-Builder shall prepare and submit to the Railroad for Review and Comment the Certifiable Items List (CIL) composed of the numerous items that make up the whole of the certifiable elements and require individual safety verification.
2. Safety design criteria are developed to identify concerns appropriate for the Project.
3. The Design-Builder shall submit the Design Criteria Conformance Checklist for Review and Approval and be shown in the Submittal Register for final designs. The Design-Builder shall identify and record the requirements generated from safety design criteria on such checklist. The format of the Checklist shall provide verification and compliance with the identified safety requirements.
4. The Design-Builder shall develop a Construction Specification Conformance Checklist to be used in coordination with the safety test plans. The Design-Builder shall verify that the built facilities and systems incorporate the safety related requirements of the Project. The Design-Builder shall submit the Construction Specification Conformance Checklist for Review and Comment and be shown on the Submittal Schedule for construction/installation.
5. Hazard and vulnerability identification and resolution are performed with tracking for resolution and/or acceptance throughout the Project.

2.9.15 Safety Test Plans and Verification

The Design-Builder shall verify that system safety requirements are met. A combination of analytical and test methods shall be utilized. The Design-Builder shall integrate safety tests and verifications into the appropriate test plans developed in accordance with Contract Documents for system elements, subsystems and assemblies, hardware and software, and interfaces. Detailed test plans shall ensure:

A. Safety is adequately demonstrated.

B. Testing will be carried out in a safe manner.

C. Any additional hazard introduced by testing procedures, instrumentation and test hardware is properly identified and minimized.

D. A detailed description of all testing activities to be performed shall be captured and documented via a Testing Program Plan (TPP). The TPP will include the processes for conducting, monitoring and coordinating the test program. Testing activities shall include the following:

1. Conformance reviews for all system and sub system level components.
2. Design qualification for compliance to the technical specification.
3. Production verification and construction inspection tests both in production and in the field for design performance compliance.
4. Installation verification to ensure proper installation is performed.

5. Site acceptance test to verify that all delivered and installed equipment preforms as specified.
6. A Failure Mode & Effects Analysis (FMEA) shall be performed to identify failures and root causes.
7. Demonstration testing where applicable.

2.9.16 Summary of Submittals

Item No.	Section No.	Submittal	Action
1.	2.9.3	Safety Design Criteria	Review and Approval
2.	2.9.6	System Safety Plan	Review and Approval
3.	2.9.9.1	Preliminary Hazard Analysis	Review and Approval
4.	2.9.9.1	Failure Modes and Effects Analysis	Review and Comment
5.	2.9.9.1	Software Failure Modes and Effects Analysis	Review and Comment
6.	2.9.9.1	Fault Tree Analysis	Review and Comment
7.	2.9.9.1	Event Tree Analysis	Review and Comment
8.	2.9.9.1	Operating Hazard Analysis	Review and Approval
9.	2.9.9.3	Safety Verification Tracking Log (Hazard Log)	Review and Comment
10.	2.9.9.14	Safety Certifiable Items List	Review and Comment
11.	2.9.14	Documentation, Analysis, Reports and Testing to support LIRR Safety Certification	Review and Comment
12.	2.19.14	Safety Certification Support Plan (SCSP)	Review and Comment
13.	2.9.14	Design Criteria Safety Conformance Checklist	Review and Approval
14.	2.9.14	Construction Specification Safety Conformance Checklist	Review and Comment
15.	2.9.15	Safety Certification Verification Report	Review and Approval

END

2.10 SYSTEM SECURITY

2.10.1 Section Includes

This section: Sets out requirements to maintain a security risk management process to eliminate, mitigate and/or control system and operational vulnerabilities that are identified during design and construction that might increase LIRR risk of an adverse security related event.

For requirements relating to Security Sensitive Information (SSI), refer to TP2.33 SECURITY SENSITIVE INFORMATION.

2.10.2 Codes and References

The Project shall comply with the requirements of the documents listed below, requirements of the LIRR Office of the Security related to security requirements set out in its System Security and Emergency Preparedness Plan:

A. LIRR Design Guidelines document.

B. Federal Transit Administration (FTA) Transit Agency Security and Emergency Management Protective Measures.

C. FTA, FTA-TRI-MA-26-7085-05, Transit Security Design Considerations.

D. FTA, DOT-FTA-MA-26-5019-03-01, Public Transportation System Security and Emergency Preparedness Planning Guide.

E. TSA/FTA, Security and Emergency Management Action Items for Transit Agencies.

F. Transit Security Working Group (TSWG), Contract Number N4175-05-R-4828, Final Report, Bridge and Tunnel Report.

G. FTA Circular C 5800.1, Safety and Security Management Guidance for Major Capital Projects.

H. DOT-FTA-MA-26-5005-00-01/DOT-VNTSC-FTA-00-01, Hazard Analysis Guidelines for Transit Projects.

I. 49 CFR Part 659, Rail Fixed Guideway Systems, State Safety Oversight.

J. 49 CFR Parts 12 and 1520, Protection of Sensitive Security Information.

K. Crime Prevention Through Environmental Design (CPTED) for Transit Facilities. APTA SS-SIS-RP-007-10.

L. APTA, Guidelines for Design of Rapid Transit Facilities.

M. IESNA, IESNA G-1-03, Guideline on Security Lighting for People, Property, and Public Spaces; and

N. IESNA, Recommended Practice IESNA RP-20, Lighting for Parking Facilities.

2.10.3 Purpose

A. The Railroad is committed to providing a secure travel and work environment. Security is a priority in the planning and execution of all work activities on the Railroad.

B. It is the policy of the Railroad that the Design-Builder shall perform work on the Project in a manner that ensures the security of its employees, subcontractors, emergency

responders, and the public. The application of security risk management processes to the project comprise a fundamental threat management and mitigation process that incorporates the characteristics of planning, design, construction, testing, operational readiness, and subsequent operation of the Project elements.

C. All Project elements shall be designed, constructed, and implemented in a manner that promotes the security of persons and property. The Program Management Team, and all Design-Builder personnel and subcontractors are charged with the responsibility for ensuring the security of employees, subcontractors, emergency responders, and the public who come in contact with the LIRR system.

D. The Design-Builder shall provide for safe and secure employee access to the ROW and equipment locations (both temporary and permanent) during the duration of the Project. This includes all access paths, stairs, walkways, gates, fencing/barriers, etc.

E. The Design-Builder shall create and maintain a recognized and approved security risk management process throughout the duration of the Project. The Design-Builder shall document security risk management process efforts to eliminate, mitigate and/or control vulnerabilities that are identified during design, construction, and testing of the Project.

2.10.4 General Requirements and Responsibilities

A. The Design-Builder shall be responsible for designing a secure system per applicable codes, standards, industry best practices, and security related guidelines for detecting and/or avoiding risk conditions that may be inherent in the Design-Builder's design solution and/or determined in a Threat Vulnerability and Risk Assessment (TVRA). Special attention to vulnerable conditions to identified threats shall be given in areas where systems or subsystems interface, or where overlapping areas of design responsibility exist.

B. The Design-Builder's system security program shall eliminate and/or control critical vulnerabilities or reduce security related risk through application of LIRR's security risk acceptance criteria.

C. During consideration of precedence in the control of security related risks, Design-Builder shall consider human factors and limitations as a design constraint. Design-Builder shall take corrective action to eliminate or control security related risk using the following approach to system security:

1. MTA Unified Methodology (TVRA) Document.
2. The Design-Builder shall prepare and implement security strategies in accordance with the USDOT document, The Public Transportation System Security and Emergency Preparedness Planning Guide.
3. General application of security measures shall be supplemented by TVRAs.
4. Results of the TVRAs shall be used to help determine risk mitigation and implementation priorities.
5. The Design-Builder shall prioritize security risks through TVRAs and select sets of countermeasures for the Project that provides the best overall risk reduction.
6. The Design-Builder shall incorporate TVRA results as the design and threat assessments evolve.

2.10.5 SEcurity Management Plan (SEMP)

A. The Design-Builder shall submit a Security Management Plan for Review and Approval. Design-Builder shall address safety and security management for the Project from Financial Close to Revenue Service in accordance with FTA Circular C 5800.1, *Safety and Security Management Guidance for Major Capital Projects*. The SSMP shall be submitted at the same time as the Project Management Plan.

2.10.6 Security Analysis

A. Mitigating the security risks from criminal activity, insider threats, terrorist acts, or other security incidents is essential to providing LIRR passengers, employees, subcontractors, the public, and Railroad property is essential to providing a secure environment. A breach in security may result in serious injuries or death, destruction of property and facilities, and/or the inability to continue Railroad operations. To evaluate the susceptibility to potential threats, and to develop risk mitigation strategies that can reduce or mitigate the risk of serious consequences from a security incident, the TVRA shall be initiated during the preliminary phases of the Project. The assessment shall be reviewed and updated at each subsequent phase. The TVRA process consists of four primary activities:
   1. Identification of critical Project assets.
   2. Analysis of the threats against these assets.
   3. Identification of potential vulnerabilities to the identified threats.
   4. Analysis of the consequences of a realized threat.

B. The Design-Builder's security analysis shall be conducted in accordance with the process outlined in LIRR's SSEPP.

C. The SSEPP shall be the governing document for requirements, methodology and implementation of the security analysis document itself. The Design-Builder's security-cleared personnel shall contact LIRR to obtain informational regarding the requirements of the SSEPP.

D. The Design-Builder shall perform a TVRA for each Project critical asset, including element and subsystem interfaces. Design-Builder shall initiate their security analysis on the LIRR-provided baseline TVRA. Design-Builder's TVRA shall be conducted early during Design Work to identify security threats and vulnerabilities (weaknesses) in the Project System Elements and subsystems, assess their risk as a function of severity and probability of occurrence, and apply LIRR risk acceptance criteria for security risk mitigation and resolution. The TVRA shall be conducted in accordance with the FTA guide documents on security, except as modified herein. The TVRA shall be updated by Design-Builder throughout Design Work, Construction Work, and certification of the Project. Design-Builder shall review the TVRA and perform additional analyses in the event design elements change.

E. Categorization of severity, probability and risk acceptance of security threats and vulnerabilities shall be as follows:
   1. Severity of a security vulnerability and the magnitude of the impact should a threat successfully exploit the vulnerability are rated in terms of their effects on people or property, similar to safety hazard severity.

2. Ease of a given threat to exploit a given vulnerability provides the probability of occurrence.
3. Combination of severity and probability ratings results in a risk rating (risk index) for a security vulnerability.
4. Severity Categories I though IV used to categorize security vulnerability consequences shall be used for severity categorization in TVRA per LIRR's SSEPP.
5. Probability ratings A through E used for vulnerability probabilities will be qualitatively used to rank the likelihood of each security vulnerability.
6. LIRR's Hazard Risk Assessment Matrix and Acceptance Criteria shall be used in TVRA to provide an LIRR approved measure for acceptance of risk and security risk resolution.

F. The Design-Builder shall submit a TVRA for Review and Approval that identifies security threats and vulnerabilities in the Project System Elements and subsystems, assesses their risks as a function of severity and probability of occurrence, and applies LIRR's risk acceptance criteria for security risk mitigation and resolution. The TVRA shall be initiated and updated throughout the Design Work and be included in the Initial Baseline Schedule. The Design-Builder shall update the TVRA throughout the design process and into construction, installation and testing of the Project.

G. The Design-Builder shall maintain a compilation of security critical items identified during the TVRA, in the Security Verification Tracking Log (SVTL). The SVTL shall be maintained and updated by Design-Builder throughout the Term. Security critical items shall consist of vulnerabilities with Unacceptable Hazards/Risks. The SVTL is also used to track safety critical items and is described in TP4.5 SECURITY CERTIFICATION SUPPORT.

2.10.6.1 Security - Threat Vulnerability Risk Assessment (TVRA)

A. Threats are defined as specific intentional acts that will damage the system, its facilities, or its patrons. Threats include any intentional actions which detract from overall security. They range from terrorist related threats, to active shooter incidents to assault, vandalism, loitering, or sabotage. Vulnerability is defined as the susceptibility to a specific threat.

B. A formal process for the management of security threats and their associated vulnerabilities shall be used for the Project. The purpose of the process is as follows:
   1. Identify and evaluate the effects of security threats and vulnerabilities on Railroad system personnel, Railroad system infrastructure and equipment, passengers, employees, subcontractors, or the public.
   2. Define and evaluate countermeasures to eliminate, reduce, or control identified security threats and vulnerabilities.
   3. Provide timely notification of the identified threats and vulnerabilities to design personnel to resolve them through the design process.
   4. Design security risk mitigation strategies into the Project.

C. Managing security threats and vulnerabilities through identification, assessment, resolution, and tracking shall be an essential function of the Design-Builder from preliminary engineering through system start up. This process shall be initiated during the preliminary engineering (PE) phase of the Project. The Design-Builder shall perform a Threat, Vulnerability, and Risk Assessment (TVRA) in the earliest stages of the design process. The Design-Builder shall complete a TVRA of the Project construction site(s), prepare findings, and include mitigation recommendations.

D. The Design-Builder's TVRA shall be based on the MTA Unified Methodology 2013 and LIRR's Security Emergency Preparedness Plan (SEPP) wherein the report identifies threats, vulnerabilities and mitigations. The SEPP shall include the requirements of this Section, Federal, State, and local laws, regulations, and requirements of the Contract Documents.

E. The development of the security risk assessments shall be coordinated with the LIRR Office of Security along with the appropriate engineering disciplines for the identification of applicable security risk issues and recommended control measures. Upon completion of the TVRAs a report shall be prepared and submitted to LIRR for review.

F. In the Project's Final Design stage, the Design-Builder shall review and update the TVRA and perform other analyses as warranted by site-specific conditions or designs. Any deviations to the design as initially analyzed by the TVRA shall require a vulnerability and risk assessment for each deviation to ensure that the same level of risk reduction is achieved as initially anticipated during the initial analysis. Additional vulnerabilities or new threats may be identified during the normal course of work on the Project. New risks shall require a new TVRA be performed.

G. The Design-Builder's Site areas include, but are not limited to: stations; Railroad ROW; under-grade crossings and bridges; roadways, LIRR parking areas, and supporting power and communication infrastructure. Each of these environments presents a serious security risk and the Design-Builder shall take proactive measures to preclude unauthorized access to these areas at all times. The Design-Builder's SEPP shall identify and include security risk mitigation for these areas.

H. In instances where a waiver of this requirement is requested, include the request in the "Acknowledgement and Compliance Form".

I. Because of the sensitive nature of the security risk assessment, only those with a "need-to-know" shall have access to the TVRA, and the document shall be considered Sensitive Security Information (SSI).

2.10.7 Design-Builder's Security Plan

A. The Design-Builder's Security Plan (DBSP) shall include but not be limited to the following elements:

1. Task listing and time phasing of each task.
2. Organization and responsibility of key personnel.
3. Procedures to accomplish the system security tasks, including provisions to:

i. Correct system security deficiencies, including at a minimum vulnerabilities and security breaches noted during the Design Work, but not later than system design acceptance.

ii. Evaluate system design and design changes from the aspects of security threats and vulnerabilities.

iii. Conduct security TVRAs of each critical asset of Design-Builder's scope of work, and their interfaces. Update the TVRA during the construction, installation, testing and certification of the Project.

iv. Take immediate corrective actions to prevent personal injury or system damage when an Unacceptable Hazard/Risk is identified, and take action to reduce identified risk (defined as the combination of vulnerability severity and probability).

v. While unacceptable risk shall be immediately eliminated, designed-out and controlled to an acceptable level before design acceptance, undesirable risk shall be prioritized for corrective action based on cost-benefit considerations giving precedence to those vulnerabilities with the highest risk reduction potential with the most cost-effective mitigation measures.

vi. Implement security protections, system "hardening" changes, which are Design-Builder initiated and approved by the Railroad, and those initiated by the LIRR, per Design-Builder's scope of Work and responsibility in accordance with the Contract Documents.

vii. Coordinate the activities of Design-Builder's system security plan and comply with the overall LIRR SSMP and LIRR Safety and Security Certification Plan (SSCP).

viii. Internal security audits.

B. The Design-Builder shall submit the Design-Builder's Security Plan for Review and Approval within 30 Calendar Days after LNTP.

C. The Design-Builder's Security Plan shall show how their Threat/Vulnerability/Risk Analysis (TVRA) is addressed within the context of the Project to reduce relative risk to LIRR and how the Design-Builder's mitigation strategies to reduce security risk will do the following:

1. Ensure that the system initiated into revenue service is secure for passengers, employees, emergency response personnel, and the general public through a formal program of security certification of security related facilities and systems.
2. Protect property.
3. Control and minimize the effects of identified security related incidents.
4. Eliminate/mitigate security related risk and reduce vulnerability to security threats.
5. Create a secure connected rail network infrastructure.
6. Create secure operating conditions.

7. Ensure that the design, acquisition, construction, fabrication, installation, and testing of critical elements of the system will be verified for conformance with the established LIRR security requirements and validated for effectiveness in achieving an effective level of security.
8. Ensure that a mechanism is provided to follow to completion the identified and agreed upon security related mitigation strategies through a security certification process.
9. Ensure verification of all security related LIRR facilities, systems, and equipment have been designed, built, procured, installed, inspected, and tested in accordance with the design and specifications.

D. The Design-Builder shall be prepared to perform additional security related analysis as required.

2.10.8 System Security Criteria (SSC)

A. The Design-Builder's SSC shall be integrated into Project elements, including operations, maintenance and training. SSC are dispersed throughout the Contract Documents. These criteria are based on DHS and FTA security guidance documents and industry practice, including FTA's Transit Agency Security and Emergency Management Protective Measures. Design-Builder shall identify and implement the SSC throughout the Term including at a minimum: design, delivery, installation, testing, certification, operations and maintenance.

B. The Design-Builder shall prepare and submit a Design Criteria Conformance Checklist.

C. The Design-Builder shall prepare and submit a Construction Specification Conformance Checklist.

2.10.9 Physical Protection System Guidance

2.10.9.1 Barrier Selection

A. Principles of Operation

The following principles shall be considered when designing, constructing, or upgrading physical barriers:

1. Barrier selection shall be based on the threat they are intended to protect against and the relative likelihood that there would be an attempt to attack people, assets, or facilities. They shall be employed as part of this project as directed by the Railroad and as determined by the TVRA. An assessment of reasonable threats shall be based on an examination of the capabilities, intentions, and histories of actions demonstrated by specific threats relevant to the LIRR facility and operating environment. Barrier selection shall consider an adversary's most likely objective, as determined by the TVRA.
2. Layered security or "delay-in-depth" principles shall be applied to the risk mitigation design. According to this principle, different types of multi- layered barriers employed along all potential adversarial paths of access will compound the adversary's challenges and further extend the length of time required to overcome obstacles. This principle implies a careful and well-considered analysis

of likely access routes to the most likely targets. If the barrier device or system is to achieve a prescribed measure of facility standoff or set-back, the barrier devices shall be sited an appropriate distance from the facility and/or will need to be integrated with other possible measures, such as adjacent road closures and restricted parking. Delay barriers shall be located close to detection devices and integrated with them. Where possible, barriers shall be integrated with terrain or landscaping to leverage the natural protection offered by trees, ditches, natural rock outcroppings, and berms.

3. Barriers shall be under observation, whether directly by security personnel or remotely by electronic surveillance.
4. Any barrier systems that are motorized or require electronic access control shall interface with existing Railroad systems.

2.10.9.2 Access Control

A. Principles of Operation:

Access Control Systems are used to grant or deny access into an area, asset, or facility based on a credential. They shall be employed as part of this project as directed by the Railroad and as determined by the TVRA. The use of a physical credential can be combined with information known only to the person attempting entry, such as a personal identification code (PIN) and/or a biometric. Every entry control system performs at minimum three processes:

1. Identification - Determining the identity of the person requesting access.
2. Authentication – Determine a credential's legitimacy as one produced and issued by the organization controlling the facility and that the person presenting the credential is indeed the person to whom the organization issued that credential.
3. Authorization - The process of determining if the person presenting an authenticated credential is allowed to enter a particular area and what privileges that person may be assigned.

B. All Access Control Systems shall interface with existing Railroad systems.

2.10.9.3 Intrusion Detection

A. Principles of Operation

1. Intrusion detection systems (IDS) provide the capability to monitor facilities and assets to detect unauthorized attempts to access, compromise, or remove them. They shall be employed as part of this project as directed by the Railroad and as determined by the TVRA.
2. An essential feature in an IDS is the ability to arm and disarm the sensor. In interior applications, authorized persons can disarm an alarm when entering or opening an asset (e.g., communications cabinet, traction power substation) or facility (e.g., station, closet). Exterior IDS sensors are usually continuously enabled (armed) as they commonly monitor areas where human presence is not expected. Zoning is an important concept in an effective IDS design. This term refers to the ability to precisely identify the location of an activated sensor so that

law enforcement personnel can rapidly respond to the correct location. In external perimeter IDS applications, sensor activations are connected to CCTV systems so that a camera observing the sensor location can be automatically displayed to monitoring staff.

3. All Intrusion Detection Systems shall interface with existing Railroad systems.

2.10.9.4 Duress Alarms (aka "Help Point")

A. Principles of Operation:

1. Duress alarms are device used to trigger a silent alarm at a remote monitoring station when the user cannot dial 9-1-1 or otherwise call for assistance. They shall be employed as part of this project as directed by the Railroad and as determined by the TVRA. Duress alarms shall be within a close field of view of a surveillance camera.
2. Activating this alarm signifies that a security incident is occurring at the triggering location that requires immediate assessment and intervention by law enforcement. Alarms can be triggered to an internal response force or to an external law enforcement agency.
3. All duress alarm systems shall interface with existing Railroad systems.

2.10.9.5 Video Surveillance Systems

2.10.9.5.1 Principles of Operation

A. Video Surveillance Systems shall be employed as part of this project as directed by the Railroad and as determined by the TVRA. Several general objectives shall be considered when selecting camera types and video recording devices.

B. Objectives for camera types utilized in this project shall be:

1. Identification.
2. Operational Assessment and Situational Awareness.

C. Operational assessment is used when active monitoring is available. Assessments may include but are not limited to incident/threat response, mitigation, augmentation of access control and/or intrusion detection, and general public safety.

D. Objectives for video recording devices have many options but all essentially resort to:

E. Number of video streams to be recorded. Recording is 24hrs per day, 7 days per week and may be monitored during specific hours or not actively monitored but recorded for evidentiary data only.

1. Objective video quality as defined by ITU-TJ.246 and J.247.
2. Available system bandwidth and storage requirements.
3. Primary target of video capture.

2.10.9.5.2 Camera Placement Objectives

A. The ability of surveillance cameras to capture images that will be of greatest assistance to the Railroad, the LIRR Office of Security, and the LIRR Police Department, as well as other local law enforcement and local agency first-responders depends on a number of factors including the choice and placement of cameras and lenses, recording devices, storage/archival space, and compression schemes, and each factor shall be coordinated with one another. These factors shall be coordinated by the Design-Builder.

B. A careful assessment of the asset or facility where the camera(s) will be deployed shall be performed and utilized as an integral part of the total surveillance camera design process. A site plan documenting the location, primary target and field-of-view of each camera in the facility shall be provided as a part of this detailed survey and incorporated into the design.

C. The final camera surveillance system design shall be approved by LIRR.

D. Camera quantity and location will vary from site to site. Generally, fewer cameras expertly placed will be more effective than a large number of cameras placed poorly. Fewer cameras reduce the workload of monitoring agencies and analytics (when implemented). The Design-Builder shall ensure that the camera(s) is/are not located in places where they may be subject to tampering, consistently high contrast lighting, backlighting or unintentional adjustments. Camera disabling and tampering shall be minimized by using components that feature concealed wiring and protection of the camera and lens assembly from weather and/or physical damage.

E. The camera Field-Of-View (FOV) shall not be obstructed or pointed directly at high-contrast light sources, such as picture windows, spotlights, and sunrise/sunset. If brightly lighted areas cannot be avoided in the FOV, cameras with a wide dynamic range (WDR) or backlight compensation adjustments shall be required to optimize the resulting image.

F. Some important considerations for camera surveillance applications as part of securing Railroad facilities and assets include:

    1. Increasing patron confidence in LIRR security.
    2. Facilitating emergency/incidence response and management activities.
    3. Monitoring LIRR assets.
    4. Assisting with timely response to security related actions against the public, asset, or facility.
    5. Providing archival video for forensic and evidentiary purposes.
    6. Background detection:
        i. Erratic or atypical behavior.
        ii. Crowds (atypical formation or size).
        iii. Unauthorized entry into protected or non-public spaces.

G. Camera specifications are derived from the principles of detection, classification, recognition and identification. Each one defines the nature the perceived threat from the

broadest to the narrowest. The scenarios below illustrate how each principle works in practice.

1. Detection: Something is seen moving in an area where movement is not typically seen but the object is unknown.
2. Classification: The object identified is a person (not object, vehicle or animal) moving through a secured open space.
3. Recognition: The person is a white female with a tan jacket carrying a suitcase.
4. Identification: The person is a known Railroad employee carrying a toolkit.

2.10.9.5.3 Specific Direction

A. For the Project, all cameras shall provide recognition and/or identification based upon the TVRA and overall system design requirements.

B. All cameras shall be physically capable of Panning, Tilting, and Zooming (PTZ).

C. All cameras shall interface with existing Railroad systems.

D. The Railroad video analytic system is BRS and the video camera surveillance system shall interface with this system.

E. Areas of coverage at a minimum shall be as follows:

1. 100% coverage of station platforms.
2. 100% coverage of elevators and stairs.
3. 100% coverage of track areas entering and leaving the station.
4. 100% coverage of Fire Alarm locations.
5. 100% coverage of Duress Alarm (Help Point) locations.
6. All LIRR owned or controlled parking areas.
7. All sidewalks and approaches to the station platform to include Project related grade crossings.
8. All Project related bridges, overpasses, and underpasses.
9. 100% coverage of all Project related critical infrastructure assets related to the Railroad to include at a minimum TPSS, Communications Cabinets and Bungalows, Signaling Cabinets, etc.

2.10.9.6 Security Lighting

A. The design of security related lighting is an essential component of the Railroad's physical security program. The purpose behind a security lighting system is to deter criminal activity by reducing stealth approach opportunities.

B. Security lighting is primarily used in two ways, to light approaches to specific areas and property boundaries, and to light facilities, assets, ROW, and other critical areas and structures within a defined perimeter. Regardless of the specific location, these general principles apply:

1. The optimum use of security lighting generally involves the use of even illumination around perimeter areas and station or facility entryways. Fixtures shall be positioned so that glaring light is directed on likely intruders, with lower levels of illumination directed on law enforcement or observation areas to reduce glare and increase contrast in the direction of potential threats.
2. The light fixture positioning shall maximize the contrast between intruders and the background. Extremely dark backgrounds require more illumination to produce the contrast necessary to identify intruder activity.
3. Intruders wearing darker clothing than their background can result in law enforcement only observing movement of a silhouette or outline instead of clearly observing the details of an individual(s). Applying lighter colored finishes or striped patterns to the lower facilities or assets may aid in distinguishing the movement of intruders or unauthorized entry.
4. Light Sources shall be full spectrum and evenly diffuse and reflect all colors. During darkness contrast is created with high color rendering by full spectrum light sources that provide color discrimination. Increased illumination and higher contrast and can reduce camera system bandwidth and storage requirements. When visible light spectrum illumination is not desirable or feasible, the use of Infrared (IR) Illuminators shall be considered to improve video recording quality.
5. Project lighting design shall account for obstructions. Objects that obstruct the uniform distribution of light will limit the effectiveness of security lighting. To reduce shadowing, obstructed views shall be lit with more than one light fixture from more than one direction.
6. The relationship of light fixtures to each other, to other elements on the site, to security cameras, and to law enforcement patrol routes shall be carefully considered. In addition, the perimeter location of pole mounted, wall mounted, and building mounted fixtures shall be carefully planned to ensure their placement does not inadvertently assist intruder access.
7. The Design-Builder shall provide vandal resistant housings, lenses, and hardware.
8. Project lighting design shall take into consideration CCTV lighting requirements, including: camera field-of-view (FOV), minimum light intensity levels, reflectance, and daylight-to-darkness transitions. Avoid direct lighting or hot-spot glare into CCTV end devices.
9. Security related lighting requirements shall be coordinated with the general lighting design effort.

2.10.9.7 Public Address System (PA)

A. The primary objective of the public address system is delivery to Railroad passengers' adequate levels of intelligibility of LIRR PA announcements. The Design-Builder shall ensure that the PA system is designed in such a way as to deliver clear and intelligible information in all conditions and to all persons in the station area.

B. All Public Address Systems shall interface with existing Railroad systems.

2.10.9.8 Fire Alarm

A. Fire Alarm systems shall be installed as determined by the Railroad, the TVRA, and NFPA.

B. All Fire Alarm Systems shall interface with existing Railroad systems.

2.10.9.9 Crime Prevention Through Environmental Design (CPTED)

A. Crime prevention through environmental design (CPTED) is the application of designing security into the built environment. CPTED concepts and strategies use three interrelated principles of natural surveillance, natural access control, and territoriality. This design approach emphasizes using structures, spaces, lighting and people in design in order to create a more welcoming environment to Railroad patrons, and to reduce the propensity for crime. It is used in conjunction with the other design elements in this section to create a more secure environment and to reduce relative risk to the Railroad.

2.10.9.10 Parking Lots and Parking Structures

In general, the designers shall:

A. Ensure access to elevators, stairwells and pedestrian pathways is clearly visible from an adjacent parking area.
B. Avoid hidden recesses are and dark shadows that can conceal aggressors.
C. Avoid reduced visibility for pedestrians and vehicles, an inadequate color rendering.
D. Ensure the parking area is segregated from transit vehicles and fuel storage.
E. Define the perimeter and control access to deter unwanted pedestrian-level access to the facility.
F. At the garage ground level controls in the form of fencing, level changes, ground floor protection, and other architectural and environmental barriers, provide a channel for people to designated entry points and discourage others from hiding outside and inside the property or buildings.
G. To prevent or deter unauthorized access at ground-level use metal screening, while upper floors shall be open with cable strung to prevent cars from overshooting the parking spaces and toppling off.
H. To create natural surveillance use screened, rather than walled, ground levels and open upper levels will make it likely that calls for assistance will be heard.

2.10.9.10.1 Parking Security Lighting Applications

A. Structure lighting selected shall be coordinated to reduce glare at the camera lens.
B. Utilize at minimum, a horizontal illuminance level of [redacted] with a uniformity ratio of [redacted] in order to provide an adequate level of security.
C. For open parking it is recommended light levels range from a minimum of [redacted] in low-activity general parking and pedestrian areas to [redacted] in high-activity vehicle areas.

Cash collection and vehicular access control areas shall be maintained at a minimum of 5 fc. (Source: ASIS POA, Section: 6.5 - Security Lighting Applications).

2.10.9.11 Protection of Sensitive Security Information (SSI)

A. The MTA/LIRR Agency Document Control Officer shall coordinate review and approval of Design-Builder Security Sensitive Information Management Plan submittals. If the Railroad determines, in its sole discretion, that plan submittals are deficient or otherwise unsatisfactory, the Design-Builder shall be required to resubmit revised plans within seven (7) Calendar Days of notification by the Railroad. If necessary, the Design-Builder's Chief Executive Officer shall be required to attend a meeting within five (5) Calendar Days of notification by the Railroad to discuss the plan and reach agreement of the necessary changes to be made. Failure to secure Railroad approval for SSI Management Plan, attend the required meeting or reach agreement with the Railroad may result in termination of this Contract.

2.10.10 Summary of Submittals

Item	Section	Submittal	Action
1.	2.10.5	Design-Builder's Security Management Plan	Review and Approval
2.	2.10.6	Design-Builder's Security Verification Tracking Log (SVTL)	Review and Approval
3.	2.10.6.1	Design-Builder's Threat, Vulnerability, and Risk Assessment (TVRA)	Review and Approval
4.	2.10.7	Design-Builder's Security Plan (DBSP)	Review and Approval
5.	2.10.8	Design-Builder's System Security Criteria (SSC)	Review and Approval

END

2.11 SCHEDULE

2.11.1 Section Includes

This Section describes the schedule requirements for the Project.

2.11.2 Codes and References (Not Used)

2.11.3 Project Schedule

A. The purpose of the Project Schedule is to ensure that adequate planning, scheduling, and resource allocations occur to provide a reasonable and executable baseline work plan.

B. The types of Project Schedules are further described below and shall include:

1. 90-Day Schedule.
2. Detailed Contract Schedule.
3. Revised Detailed Contract Schedule.
4. Six-Week Rolling Schedule.
5. Weekend Time-Line Detail Schedule.
6. Weekend Time-Line Summary Schedule.
7. Weekend Time-Line As-Built Summary Schedule.
8. Project Schedule Updates.
9. Project Recovery Schedule.

C. The Project Schedule shall be used for coordinating the Work, monitoring the progress of Work performed, identifying Work to be performed, and evaluating changes.

D. The Design-Builder shall include in Project Schedules all required Railroad, Third Party, and Utility activities and/or milestones. These shall include at a minimum ROW availability, review of submissions, and special inspections as detailed in the Technical Provisions and DB Agreement.

E. The Design-Builder shall archive all approved Project Schedules.

F. Within 15 Calendar Days of LNTP, the Design-Builder shall submit to the Railroad a list of activities, Work Breakdown Structure, and sample formats of all tabular reports.

2.11.3.1 90-Day Schedule

A. The Design-Builder shall provide the first update to the Initial Baseline Schedule submitted with its Proposal within 30 Days of LNTP, updated and submitted weekly until the Detailed Contract Schedule is accepted by the Railroad.

B. Until the 90 Day or Detailed Construction Schedule is approved by the Railroad, the Initial Baseline Schedule will be used to monitor progress of the Design-Builder.

2.11.3.2 Detailed Contract Schedule

A. The Design Builder's Detailed Contract Schedule shall be a price loaded Critical Path Method schedule and shall expand upon the Initial Baseline Schedule submitted in the Design-Builder's Proposal.

B. The Detailed Contract Schedule shall encompass the complete scope of work, including subcontractor activities and material deliveries. The Work Breakdown Structure (WBS)

shall be established with work scope broken down to the level of manageable activities. The Detailed Contract Schedule shall show each activity, including interface and Railroad Force Account support activities, for completion of the Work, properly ordered and sequenced.

C. A Detailed Submittal Schedule shall be prepared and incorporated into the Detailed Contract Schedule identifying the scheduled submittal date of the required submittals/deliverables, which include but are not limited to: Design submittals, shop drawing submittals, and various project plans.

D. The Design-Builder shall submit the Detailed Contract Schedule to the Railroad for Review and Approval no later than 45 Calendar Days after LNTP. The Detailed Contract Schedule shall be approved by the Railroad before commencement of the construction Work.

E. The Detailed Contract Schedule, upon approval by the Railroad, will be designated as the Performance Measurement Baseline (PMB). This shall be used to generate comparative reports to analyze progress.

2.11.3.3 Six Week Rolling Schedule

A. The Design-Builder shall submit a Six Week Rolling Schedule to the Railroad for Review and Approval on a weekly basis starting no later than 7 Calendar Days after approval of the Detailed Contract Schedule.

B. The Six-Week Rolling Schedule shall contain two weeks of historical information and four weeks of planned activities in support of and consistent with the Detailed Contract Schedule.

2.11.3.4 Weekend Time Line Detail Schedule

A. The Weekend Time Line Detail schedule shall identify all activity being performed in the weekend outage divided into 15 minute blocks.

B. The Design Builder shall submit the Weekend Time Line Detail Schedule to the Railroad for Review and Approval no later than 72 hours prior to the commencement of Work included in the schedule.

2.11.3.5 Weekend Time Line Summary Schedule

A. The Weekend Time Line Summary schedule shall identify all activity being performed in the weekend outage divided into hourly blocks.

B. The Design Builder shall submit the Weekend Time Line Summary Schedule to the Railroad for Review and Approval no later than 72 hours prior to the commencement of Work included in the schedule.

2.11.3.6 Weekend Time Line As-Built Schedule

A. The Weekend Time Line As-Built schedule shall identify all major activities performed in the weekend outage.

B. The Design Builder shall submit the Weekend Time Line Summary Schedule for Information no later than 48 hours after the completion of Work included in the schedule.

2.11.3.7 Revised Detailed Contract Schedule

A. The Design-Builder shall revise the Detailed Contract Schedule within Seven Calendar Days for the following:
    1. Revisions specifically previously approved by the Railroad.
    2. Revisions requested in writing by the Railroad.

B. The Design-Builder shall submit the revised Detailed Contract Schedule for Review and Approval. After approval the revised Detailed Contract Schedules will become the Detailed Contract Schedule.

2.11.3.8 Project Recovery Schedule

A. Whenever the Detailed Contract Schedule shows any scheduled completion date having 30 Calendar Days or more of negative float, the Design-Builder shall prepare a Project Recovery Schedule. The Project Recovery Schedule submittals shall include a list of all activity changes and an accompanying narrative explaining the nature of the changes.

B. The Design-Builder shall submit the Project Recovery Schedule for Review and Approval.

C. After an Approval is granted the Project Recovery Schedule shall become the Detailed Project Schedule.

2.11.4 Schedule Requirements

A. All Project Schedules shall comply with the Contract Documents, good planning and scheduling practices, and at a minimum:
    1. Include all major activities of the Work in sufficient detail to enable Railroad to monitor and evaluate design and construction progress from LNTP to the Final Acceptance by the Railroad.
    2. Provide standalone schedules as required by Third Parties and Utility Owners.
    3. Apply the critical path method of network calculation to generate the Detailed Contract Schedule (the critical path shall be based on the longest network path through the Project) and prepare the Detailed Contract Schedule using the precedence diagram method to establish relationships and interdependencies between the individual activities required to complete the Project. Total float criteria are not acceptable for identifying or representing the Critical Path. The scheduling software shall be configured to show the longest path in any schedule calculation and its graphical representation. The Design-Builder shall take care to distinguish between the Critical Path and near Critical Paths.
    4. Identify and discuss the Project overhead costs and the Project-wide costs not applicable to a specific activity in the Detailed Contract Schedule narrative.
    5. Be resource-loaded.
    6. Ensure that activity identification numbers, textual descriptions, and codes are consistently applied in the Detailed Contract Schedule and are unique for each activity.
    7. Divide all Work through the Final Completion into activities with appropriate logic ties to show the Design-Builder's overall approach to sequencing, include logical relationships between activities reflecting the Design-Builder's actual intended sequence of Work, avoid open ends, and not use imposed constraint dates to

begin or complete any activity unless such dates are specifically required in the Contract Documents or are mutually agreeable to the parties. The Project Schedule shall have a single start and a single completion point. Activities shall be used in lieu of lags where an activity is appropriate, i.e. use a concrete curing activity in lieu of a 7 or 28 day lag to achieve strength prior to a subsequent activity.

8. Avoid the use of non-typical relationships that cannot be shown to demonstrate a true dependency. Use of relationships and lags to position an activity at certain dates is not permitted.
9. Depict the required coordination with and work to be performed by the Utility Owners.
10. Depict the required coordination with and work to be performed by the Railroad including flagging, providing pilots and support for the movement of Design-Builder provided equipment, and all Force Account Work.
11. Show phasing of the Work as detailed in the plans, work to be performed by the Design-Builder, subcontractors, procurement, fabrication, delivery, installation, testing of materials and equipment, commissioning of systems, and any long-lead time orders for major or significant materials and equipment.
12. Be cost-loaded to an activity-level consistent with the Schedule of Values, including the direct costs used in the Schedule of Values, with the total cost loaded into the Project Schedule equal to the total of the Design-Build Contract Price. The Level of effort cost loading shall not be used by the Design-Builder.
13. Identify regulatory Approvals required and the dates by which such Approvals are necessary.
14. Incorporate the availability of Project ROW.

B. Project Schedules shall show the Project milestones for significant components of work that are critical to the start of key subsequent activities and will assist with managing the Project Schedule including at a minimum:
    1. Commencement of Design Work.
    2. Commencement of Construction Work.
    3. Other milestones identified by The Design-Builder and Railroad, Third Party or Utility Owner reviews, approvals, and permits that may include key design submissions required prior to the start of fabrication, key permitting required for start of construction activities, completion of tunnel, major traffic changes, and other high priority items required for public relations needs.
    4. Commencement of Integration Testing.
C. Project Schedules shall use a Work Breakdown Structure that is well organized and based on a deliverable oriented methodology that:
    1. Allocates all activities with an estimated cost/planned value.
    2. Is organized and cost distributed to address 100 percent of the Project scope at all levels of the WBS.

2.11.4.1 90-Day Schedule Requirements

A. The 90-Day Schedule shall be a Critical Path Method schedule prepared using the Precedence Diagram Method and show each activity and operation from the LNTP to 90 Calendar Days into the future.

B. The 90-Day Schedule shall be sufficiently detailed to preclude the use of activity durations greater than 10 Work Days. Activity durations shall include allowances for the lost time and inefficiencies.

C. The 90-Day Schedule shall indicate the planned work periods, shifts and planned track outages.

2.11.4.2 Detailed Contract Schedule Requirements

A. The Detailed Contract Schedule shall be sufficiently detailed to preclude the use of construction activity durations greater than 20 Work Days. Activity durations shall include allowances for lost time and inefficiencies.

B. Each activity designation shall delineate the phase or stage of the Work, and the component of the Work such as design, submittal, submittal review, procurement, fabrication, delivery, construction, testing, and inspection, and shall include:

1. A clear description of the activity, including its location.
2. The duration expressed in full Work Days.
3. A responsibility code denoting the entity (the Railroad, the NYSDOT, the Design-Builder, subcontractor, government agency, County/Villages/Town or Utility Owner) performing the activity.
4. The dollar amount associated with each installation activity, in hundreds of dollars. The sum total of installation activities, plus allowances for bond and insurance premiums, and mobilization, shall equal the Contract amount.
5. The quantity of material in units, if not included as part of the description.
6. The integer percent complete representing the physical progress.
7. The actual start and finish dates.
8. Identification of required track outages and flag protection.
9. Planned resource hours associated with each activity by craft/discipline.

C. Activities that will count toward the fulfillment of the Contract's M/WBE goals shall be readily identifiable through the responsibility code.

D. The Design-Builder shall not artificially constrain activity dates using Constraints/Lags. If used, where necessary, they are to be identified, explained, and approved by the Railroad.

E. The Detailed Contract Schedule shall show a clear and definable critical path(s) for the Work and each specified milestone, including Quality Check Points, tests, and inspections as identified in the Project Quality Plan and contract documents. The requirements and events which impose limitations, and dates and milestones which constrain the time, shall be clearly identified.

F. The Detailed Contract Schedule activities shall be organized by WBS / Activity Codes as directed by the Railroad.

2.11.4.3 Six Week Rolling Schedule Requirements

A. The Six-Week Rolling Schedule level of detail shall be greater than that included in the Detailed Contract Schedule. Each activity requiring a track outage or flag protection shall be clearly shown and scheduled utilizing an hourly time scale. Each activity required to be performed by the Railroad Force Account shall be clearly shown and scheduled utilizing an hourly time scale.

B. Work performed during a track outage shall be scheduled utilizing an hourly time scale.

C. The Six-Week Rolling Schedule shall include a work force projection delineating the number of on-site personnel allocated to each activity.

2.11.4.4 Weekend Time Line Detail Schedule Requirements

A. The Time-Line detail schedule shall identify all activities from the initiation of the track outage to when the track is accepted by the Railroad, and put back into service. The schedule shall be divided into a maximum of 15-minute time blocks, and shall show work by the Design-Builder and all others participating in performing the work including any Utility Owners, Third Parties, and Railroad forces including Force Account.

B. The schedule shall identify and include:

1. Five (5) hours (11:00 PM Friday to 4:00 AM Saturday) at the initiation of the track outage including time for Railroad forces to take the track out of service and perform track, third rail and ancillary effort necessary to turn the track over to the Design-Builder.
2. Twelve (12) hours (4:00 PM Sunday to 4:00 AM Monday) at the completion of the track outage including time for Railroad forces to install the new track, third rail and perform ancillary tasks prior to placing the track back in service.
3. Meal breaks and safety briefings for each shift.
4. Elements of the work, including critical stops where the effort must be completed to assure the track is placed in service at the end of the outage.
5. Manpower listing for craft and supervision.

2.11.4.5 Weekend Time Line Summary Schedule

A. The Time-Line summary schedule shall identify major activities from the initiation of the track outage to when the track is accepted by the Railroad, and put back into service. The schedule shall be divided onto hourly blocks, and shall show work by the Design-Builder and all others participating in performing the work including any Utility Owners, Third Parties, and Railroad forces including Force Account.

B. The schedule shall identify and include

1. Five (5) hours (11:00 PM Friday to 4:00 AM Saturday) at the initiation of the track outage including time for Railroad forces to take the track out of service and perform track, third rail and ancillary effort necessary to turn the track over to the Design-Builder.
2. Twelve (12) hours (4:00 PM Sunday to 4:00 AM Monday) at the completion of the track outage including time for Railroad forces to install the new track, third rail and perform ancillary tasks prior to placing the track back in service.

3. A summary of manpower and supervision.

2.11.4.6 Weekend Time Line As-Built Schedule

A. The weekend time-line as-built summary schedule shall identify actual durations of work for the major activities identified in the summary schedule based upon the time recording during the weekend outage. The actual durations shall be plotted next to the planned durations.

2.11.4.7 Revised Detailed Contract Schedule Requirements

A. The Revised Detailed Contract Schedule shall be prepared in the same manner and at a minimum to the same level of detail as the Detailed Contract Schedule. The requirements for the Revised Detailed Contract Schedule shall be similar to those used to prepare the Detailed Contract Schedule, unless requested otherwise by the Railroad.

2.11.4.8 Project Recovery Schedule

A. The Project Recovery Schedule shall be prepared in the same manner and at a minimum to the same level of detail as the Detailed Contract Schedule. The requirements for the Project Recovery Schedule shall be similar to those used to prepare the Detailed Contract Schedule, unless requested otherwise by the Railroad.

2.11.5 Project Schedule Updates

A. The Design-Builder shall produce the Project Schedule Updates as summarized in Table 1 below to reflect the actual progress to date and to define future activities. The last day of the reporting period shall be the date used to calculate the schedule.

B. Schedules found deficient by the Railroad shall be corrected within 5 Calendar Days, with the exception of Six Week Rolling Schedule required to be corrected within 24 hours.

C. The Detailed Contract Schedule shall be the basis for the Project Schedule updates.

D. At no time shall the Design-Builder continue to reflect an item of non-concurrence from the Railroad in the updates to the Project Schedule.

E. The Project Schedule updates shall, at a minimum:

1. Depict activities that have started, are on-going, or have completed during the reporting period.
2. Show the actual start and finish dates for all activities.
3. Include value of work completed per the Work Breakdown Structure.
4. Depict the remaining duration for on-going activities, with the remaining duration based on the amount of time required to complete the work.
5. Modify activity relationships as necessary to correct out-of-sequence progress for on-going activities or to reflect The Design-Builder’s plan for completing remaining Work.
6. Include all approved change orders.
7. Be accompanied by a narrative report, which shall:
    i. Identify the Detailed Contract Schedule version.
    ii. Provide a summary of and reasons for revisions.

iii. Identify milestones.
iv. Include started activities this period.
v. Include completed activities this period.
vi. Include activities not started this period.
vii. Include activities not completed this period.
viii. Discuss critical resources.
ix. Describe the critical path.
x. Identify near critical activities.
xi. Describe any pending Time Impact Analyses (TIA).
xii. Describe Project issues encountered.
xiii. Identify potential changes to the Detailed Contract Schedule.

F. Include the following as tables:
1. Critical path.
2. Added activities.
3. Deleted activities.
4. Added predecessors.
5. Revised relationship lags.
6. Deleted predecessors.
7. Revised original durations.
8. Revised activity names.
9. Changed calendars.
10. Activities started this period.
11. Activities completed this period.
12. Near critical activities.
13. Activities not started this period.
14. Activities not completed this period.
15. Activities started or completed in previous period.

G. The Design-Builder shall submit monthly Project Schedule Updates for Review and Approval in coordination with the Progress Report.

2.11.6 Project Schedule Submission Requirements

A. Each submission of a Project Schedule shall include, at a minimum, the following:
1. A Time-scaled logic diagram indicating the critical path, early start and early finish dates, total float, grouped by WBS, and sorted by early start and then total float.
2. An electronic file of the Project Schedule in Primavera proprietary exchange format (XER) file format. Each submission shall have a unique file name to indicate the type and order of submission.

3. A narrative progress report of the Project Schedule. The narrative shall indicate, at a minimum:
    i. The Detailed Contract Schedule in effect at the data date of the current update and the preceding Detailed Contract Schedule Update for that period.
    ii. The Design-Builder's plan of operation for meeting the interim milestones and the required completion dates.
    iii. An evaluation of the critical path.
    iv. A discussion of Project-specific issues encountered since the last submission as such issues relate to the schedule, and proposed solutions thereof.
    v. Work calendars.
    vi. Constraints.
    vii. Delays experienced.
    viii. Status of any submitted or pending Time Impact Analyses.
    ix. Float consumption.
    x. Documentation of any logic changes, duration changes.
    xi. Resource changes or other relevant changes.
    xii. Cost/Resource Histograms.
    xiii. Planned vs. Actual Percent Complete Curves.

B. Primavera backup .XER and .PDF Report files. The number of copies required for each submission item are summarized in Table 1 below:

Submission Type	Compact Disk	Number of Paper Copies					
		Activity Bar Chart	Time Scaled Logic Diagram	Activity Listing Report	Total Float Report	Early Start Report	Pure Logic Diagram
90 Day Schedule	1	5	-	-	-	-	-
Detailed Contract Schedule	1	5	5	5	5	5	5
Six Week Rolling Schedule	1	10	10	10	10	10	10
Weekend Time Line Detailed Schedule	1	5	5	5	5	5	5
Weekend Time Line Summary Schedule	1	5	5	5	5	5	5
Weekend Time Line As-Built Summary	1	5	5	5	5	5	5

Table 1. Project Schedule Submission Requirement Summary

C. The logic diagrams and bar charts shall be as follows:
    1. Pure Logic Diagrams on 11"x 17" paper, showing all codes and dates grouped by work area.

2. Activity Bar Charts on 11"x 17" paper, with activities grouped by Work Breakdown Structure (WBS) as approved by the Railroad (typically representing Type of Work, Location, Responsibility) and sorted by early start.
3. Time Scaled Logic Diagrams on 11"x 17" paper, with all major scope elements (not activities), with relationships, expected start and completion date to provide a snapshot of contract execution plan.

D. All tabular reports shall include the activity identifier, description, code, original duration, remaining duration, physical percent complete, early start and finish dates, late start and finish dates, actual dates, and total float for each activity.

1. Each Activity Listing Report shall be sorted by activity identifier and shall include predecessor activities, successor activities, resources, and allocated dollars of the Contract amount.
2. Each Total Float Report shall be sorted by total float with a secondary sort by early start, and shall include predecessor activities and successor activities.
3. Each Early Start Report shall be sorted by early start with a secondary sort by total float.

2.11.7 Time Impact Analysis for Proposed Extensions of Time

A. The following shall apply if a Time Impact Analysis (TIA) is required:

B. The TIA shall be based on the date on which the alleged Force Majeure Events or Relief Event is determined to have occurred, or, in the event of a proposed Change Order, the proposed date on which the implementation of such Change Order is to commence.

C. The TIA shall show the current status of the Work using the most recent Project Schedule Update prior to the initiation of the events in question. The time computation of all affected activities shall be shown in the TIA along with a demonstration of steps used to mitigate impacts.

D. Each TIA shall include a fragmentary network (fragnet) demonstrating how The Design-Builder proposes to incorporate the impact into the most recent Project Schedule Update prior to the initiation of the events in question. A fragnet is defined as the sequence of new activities and/or activity revisions, and logic relationships that are proposed to be added to the existing schedule to demonstrate the influence of impacts to the schedule. The fragnet is subject to the same requirements for activities including resource information for added scope and assignment of activity codes and assignment to the appropriate WBS structure, existing or amended. The fragnet shall identify the predecessors to the new activities and demonstrate the impacts to successor activities. The Design-Builder shall include a narrative report describing the effects of new activities, resources and relationships to Contract Document milestones and the Substantial Completion Date with each TIA.

E. The Design-Builder shall submit the Time Impact Analysis for Review and Approval. The TIA shall include an electronic file (in .XER file format) of the Project Schedule impact analysis.

F. Upon Approval, the Design-Builder shall incorporate the TIA into the next Detailed Contract Schedule update. Any TIA related to a change shall be incorporated into, and attached to the applicable Change Order.

2.11.8 Software

The scheduling software employed by the Design-Builder shall be Primavera P6 and utilize the coding structure compatible with Railroad's scheduling software. Any changes in scheduling software shall be mutually agreed upon by all parties.

2.11.9 Summary of Submittals

Item	Section	Submittal	Action
1	2.11.3	List of activities and Work Breakdown Structure	Review and Approval
2	2.11.3	Sample formats of all tabular reports	Review and Approval
3	2.11.3.1	90-Day Schedule	Review and Comment
4	2.11.3.2	Detailed Contract Schedule	Review and Approval
5	2.11.3.3	Six Week Rolling Schedule	Review and Approval
6	2.11.3.4	Weekend Time Line Detail Schedule	Review and Approval
7	2.11.3.5	Weekend Time Line Summary Schedule	Review and Approval
8	2.11.3.6	Weekend Time Line As-Built Schedule	Information
9	2.11.3.7	Revised Detailed Contract Schedule	Review and Approval
10	2.11.3.8	Project Recovery Schedule	Review and Approval
11	2.11.7	Time Impact Analysis for Proposed Extensions of Time	Review and Approval

END

2.12 SUBMITTALS

2.12.1 Section Includes

This Section describes the Submittal process and review procedures for all Design-Builder Submittals to Railroad, Third Parties, and Utility Owners for Shop and Working Drawings, Calculations, Product Data, Samples, Colors and Patterns, Test and Inspection Procedures, and Installation Instructions.

For coordination between Technical Provisions and Technical Specifications submittal requirements, see TP2.32 SUPPLEMENTARY INSTRUCTIONS.

2.12.2 Codes and References

A. Railroad CADD Manual.

B. NYSDOT Project Development Manual.

2.12.3 General

A. The Railroad and Design-Builder may modify and refine the Submittals, Submittal content, and review process required by the Contract Drawings to provide for further efficiencies by mutual agreement, evidenced by a “no cost, no schedule change” Change Order.

B. The Railroad and Design-Builder may modify and refine the Submittals, Submittal content, and review process required by the Contract Documents to provide for further efficiencies by mutual agreement, evidenced by a “no cost, no schedule change” Change Order.

C. The Contract and/or design documents developed by the Design-Builder may require submittals other than those listed in the Contract Documents. The Design-Builder shall include all such submittals in its Submittal Register, and shall provide all Submittals required in the Project or otherwise necessary to perform the Work.

2.12.4 Submittal Content

2.12.4.1 Technical Content

A. Some Technical Provisions may include descriptions of what information shall be included with each Submittal (e.g., what is to be included in preliminary or intermediate submittals). The Design-Builder may propose that different information be shifted into an earlier or later Submittal.

B. The Summary of Submittals table within sections of the Technical Provisions is for the Design-Builder’s convenience only, and does not supersede any requirements pertaining to Submittals in the Contract Documents or imposed by the Third Parties, Utility Owners, or AHJs. The Design-Builder shall comply with all requirements pertaining to Submittals specified in the Technical Provisions.

2.12.4.2 Submittal Certification

A. With each Submittal, the Design-Builder shall certify in writing that the Submittal meets the requirements of the Contract Documents and has been coordinated among all requirements of the Contract Documents including at a minimum Design Work, Construction Work, and Special Inspections.

B. For the Final Design submittals (except for test results) the certification shall include signature of the Design-Builder’s Project Manager, and signatures recommending certification from authorized personnel of Design-Builder including at a minimum:

1. Design Manager.
2. Designer of Record.
3. Quality Manager.

C. For all other Submittals (including test results), the certification shall include the signature of the Design-Builder's Project Manager.

D. Shop Drawings shall be checked by the Design-Builder, subcontractor, supplier, and Design-Builder's Quality Manager.

2.12.4.3 Quality Assurance Certification

A. The Design-Builder shall control through the DBQP a technical approval and certification system for every Submittal to the Railroad, Utility Owner, and Third Party. Each Submittal shall contain a Quality Control certification attesting that the requirements of the Quality Control identified in the DBQP have been performed.

2.12.4.4 Other Certifications

A. All Submittals shall contain any other certifications required by AHJ, Codes and Standards, Law, Third Parties, and Utility Owners.

B. RFCD Drawings shall indicate the types of certifications are required for each submittal.

2.12.5 Submittal Format

A. All Submittals shall be in the English language using U.S. customary units.

B. Each submittal shall consist of one reproducible and ten legible copies, or three sample sets, as applicable. These submittals shall be delivered by the Design-Builder simultaneously to entities at locations and to individuals in quantities to be designated by the Railroad. CADD drawing submittals shall include one electronic copy of the submittal on CD-ROM.

C. The Design-Builder shall make available user licenses and provide training to the Railroad's project team for an electronic document control system (Electronic submittal system as proposed by the Design-Builder and accepted by the Railroad).

2.12.5.1 Submittal Format Requirements

The required format for hard copies of submittal items is summarized in Table 1 below:

Submittal Item	Submittal Format Requirement
Full Size Drawings	Standard "D" size with outside cut dimensions 22-inches by 34-inches submitted on 20-pound vellum
Half Size Drawings	Standard "B" size with outside cut dimensions 11 inches by 17 inches, submitted on 20-pound bond paper
Calculations	Standard "letter" size with outside cut dimensions of 8 1/2 inches by 11 inches
Specifications	Standard "letter" size with outside cut dimensions of 8 1/2 inches by 11 inches, submitted on 20-pound plain bond paper

Table 1. Submittal Requirements.

2.12.5.2 Identification of submittals

A. A signed transmittal letter shall be included with each Submittal. The transmittal letter shall indicate the date of the transmittal, the type, stage where applicable, review type, entities to perform review, and review period for each entity.

B. In addition to the above, each submittal shall contain:

1. Submittal Number, which shall be shown on at least the first page of each copy of each Submittal or distinct portion of each submittal and elsewhere as required for positive identification.
2. Contract Number and Title.
3. Design-Builder's Name.
4. Contract name.
5. Identification of material, equipment, or work represented, referenced to.
6. Specification section(s), and location of the Work.
7. Name of manufacturer including model number or brand.
8. In a drawing, drawing number, title, date, and revision number.
9. Where required, the name, registration number and seal of the licensed architect or Professional Engineer registered in the State of New York who prepared the submittal.
10. For electronic drawings submitted on a CD-ROM, CADD format.

C. Record drawing submittal shall include five (5) full sets of full size prints, five (5) full sets of half size prints, one (1) full set of reproducible mylars, as well as five (5) full sets on CD-ROM.

2.12.5.3 CADD Drawings:

The following requirements shall apply to any submittal that includes CADD drawings:

A. CADD drawings shall be prepared using Autocad 2016, or later version.

B. Submitted drawings shall not be the product of a conversation or translation from another CADD software package.

C. Within 30 Calendar Days of the date of LNTP, the Design-Builder shall submit a test sample of Autocad CADD drawing files prepared by the Design-Builder to assure compatibility with the Railroad's CADD system.

D. Each submittal shall include the Railroad's Standard Cell and Font Libraries and reference files used to generate the CADD drawing files.

E. Each submittal shall be provided on CD-ROM. Each CD-ROM shall be properly labeled and shall include the Design-Builders' name, date, Project name, Contract Number, description of contents, and CADD format.

F. CADD drawings shall meet all requirements of the Railroad CADD Manual. These requirements include but are not limited to:

1. File naming conventions.
2. Leveling schemes.

3. Scales.
4. Appearance.
5. Line styles and weights.
6. Fonts.
7. Cell libraries.
8. Drawing content.
9. Reference file variables and paths.

G. No deviations from the Railroad CADD Manual will be permitted unless otherwise approved in writing by the Railroad.

2.12.6 Submittal Register

A. The Technical Provisions specify the minimum required Submittals, types and content required by the Railroad. The Design-Builder shall identify any additional Submittals required by Design-Builder's Project Management Plan, Third Parties, Utility Owners, and any other Plans.

B. The Design-Builder shall be responsible for identifying, scheduling and managing the Submittals necessary to meet the Project requirements.

C. The Design-Builder shall keep and maintain a Submittal Register of all anticipated Submittals to the Railroad, Third Parties, and Utility Owners. For each submittal, the Register shall include:

1. A submittal number.
2. A descriptive title.
3. A brief description of the Submittal.
4. "Information only" designation, if applicable.
5. The reviewing entity or entities (Railroad, Third Parties, Utility Owners).
6. Date the submittal had received the "Proceed" notation.
7. Forecast submission date.
8. Actual submission date.
9. Status of response(s) to the Submittal.

D. "Exception" notation highlighting each submittal which will be late, or has been in the possession of the Railroad for more than 21 Calendar Days, or has a revised forecast submittal date.

E. The Design-Builder shall submit the Initial Submittal Register for Review and Comment no more than 30 Calendar Days after LNTP.

F. The Design-Builder shall submit an updated Submittal Register within 5 Calendar Days after the end of each month until each submittal has received a "Proceed" notation.

G. Each month the Design-Builder shall submit an Updated Submittal Register for Information in coordination with the Progress Report. The Updates Submittal Register shall include revised scheduled submission dates, actual submission dates, status of response(s) to the Submittal, and a narrative comparing the submittal log to the Submittal Schedule.

2.12.7 Submittal Process

2.12.7.1 Transmittal

A. Submittals shall be made electronically via the Railroad's project document control system. In the case of sample or mock up Submittals, the electronic Submittal shall contain information describing the location at which the sample or mock up Submittal can be examined. Sample locations shall be provided in locations close to the Project.

2.12.7.2 Review Period

A. The Design-Builder shall allow a 21 Calendar Day review period for all submittals. The 21 Calendar Day review period will be for all initial submittals, and re-submittals, as required. Submittals to the Railroad, including each revision shall be made at least 21 Calendar Days prior to performing the Work indicated by the submittal. In cases when the purpose of a submittal, in part or entirely is an "Equal" or "Equivalent" substitution approval by the Railroad, the submittal shall be transmitted at least 60 Calendar Days prior to performing the Work as indicated by the submittal.

2.12.7.3 Simultaneous Reviews

A. The Railroad may extend the review period of simultaneous Submittals a reasonable period of time under any one or more of the following circumstances:
    1. Railroad is in receipt of more than 20 simultaneous Submittals.
    2. Railroad is in receipt of more than 5 simultaneous Submittals requiring review by a single design discipline.

2.12.7.4 Review Types

A. This Section describes the review types that the Railroad may perform. The submittal shall identify the type of review that the Railroad is to perform. The comments from the Railroad will be based on Contract requirements only.

B. Under any review type, the Railroad may also provide remarks, in addition to comments. Remarks provided to the Design-Builder are for information only, and do not need to be tracked or responded to by the Design-Builder.

C. Review and Approval
    1. Railroad will return the Submittal in one of the following manners:
        i. "Proceed." The Design-Builder may proceed to implementation of the Submittal or further development of the Design.
        ii. "Proceed, except as noted. Revise and Resubmit." The Design-Builder shall document all comments received and the corresponding resolutions. The Design-Builder shall incorporate comments into the next planned Submittal, or resubmit if no future Submittals are required.
        iii. "Revise and Resubmit. Work may not proceed" The Design-Builder shall document all comments received and the corresponding resolutions. The Design-Builder shall amend the Submittal in accordance with the comment resolutions and resubmit to the Railroad.

iv. “Reject.” The Design-Builder shall not proceed with the development of the Design or implementation of the Submittal (for example, in the case of proposed new work items that are not approved).

D. Review and Comment

1. Railroad will return the Submittal in one of the following manners:

i. "Reviewed with No Comments." The Design-Builder may proceed to implementation of the Submittal or further development of the Design.

ii. "Reviewed with Comments, Resubmittal Not Required." The Design-Builder shall be responsible for documenting all comments received and the corresponding resolutions. Design-Builder shall incorporate comments into the next planned Submittal or resubmit if no future Submittals are required.

iii. "Reviewed with Comments, Resubmit." The Design-Builder shall be responsible for documenting all comments received and the corresponding resolutions. Design-Builder shall amend the Submittal in accordance with the comment resolutions and resubmit.

iv. “Reviewed with Comments, Resubmit before Release For Construction Documents (RFCD) Submittal.” The Design-Builder shall be responsible for resolving all comments before the Release For Construction Documents (RFCD) Submittal.

E. “Equal” or “Equivalent” Substitution Approval

1. Each submittal that proposes the use of "equal" or "equivalent" materials or products shall contain sufficient data to permit the Railroad to determine if such item is equal to that specified.

2. Within 21 Calendar Days, the Railroad will notify the Design-Builder in writing if the submitted item meets the specified requirements.

F. Information

1. Railroad will acknowledge receipt of the Submittal via the document control system. There shall be no review period.

2.12.7.5 Submittal Response

A. The Railroad will provide Railroad’s written response through Railroad’s document control system in accordance with the defined review types and review periods.

2.12.8 Design-Builder’s Obligation to Coordinate

A. The Design-Builder shall transmit to Railroad any response or other correspondence received from any Third Party or Utility Owner with respect to Submittals.

B. The Design-Builder shall identify and resolve any conflicting comments and work with all parties to achieve resolution.

2.12.9 Amended Submittals

A. If the Design-Builder determines that any Submittal previously provided to Railroad, Third Party or Utility Owner is required to be amended or is identified to be outdated, incomplete, contain errors, or is no longer sufficient to cover Design-Builder’s Work, the Design-Builder shall revise the Submittal and submit for the same type of review as

specified for the initial Submittal. The resubmittal shall identify specific changes made since the previous Submittal.

B. When material is resubmitted for any reason, the Design-Builder shall forward such re-submittal with a new letter of transmittal, clearly indicating the status of the re-submittal with applicable reference to previous Submittals.

C. In an event of, and as a part of, an authorized change, the Design-Builder shall revise each affected submittal to reflect the change and submit such submittals in the same manner as the initial submittal.

2.12.9.1 Drawing Revisions

A. Drawing revisions shall be described and dated in a revision block format. The revision block shall be a permanent part of the drawing. The latest revisions shall be highlighted by means of “clouds” or “bubbles” and shall be tagged with the corresponding revision number.

B. The Design-Builder shall direct specific attention, in writing, to revisions made for reasons other than as a direct result of Railroad comments.

2.12.10 Summary of Submittals

Item	Section	Submittal	Action
1.	2.12.4	Initial Submittal Register	Review and Comment
2.	2.12.4	Updated Submittal Register	Information

END

2.13 PROGRESS REPORTS

2.13.1 Section Includes

This Section identifies the progress reports that the Design-Builder shall provide during the Project to document the progress of the Work.

2.13.2 Monthly Progress Report

The Design-Builder shall submit a monthly progress report with each payment request and shall summarize progress over the past month, including, at a minimum:

A. Monthly baseline progress schedule update.

B. Stoppages and delays.

C. Issues adversely impacting the progress of the Work.

D. Updated Submittal Register.

E. List of subcontractors, count of personnel and equipment at Project site.

F. Design and Engineering progress.

G. Summary of activities including non-conforming design and construction Work and corrective Work.

H. Services connected and disconnected.

I. Summary of liquidated damages occurrences.

J. Design-Builder report of contract payments, for each subcontractor.

K. Monthly subcontract report, including MBE/WBE/SDV participation percentage achieved vs. Project goals.

L. Quantity calculations for any unit priced items.

M. Order-on-contract status report.

N. Change orders received and implemented.

O. Orders and requests of Authorities Having Jurisdiction (AHJ).

P. Quality certifications.

Q. Prime contractor's certification.

R. Equipment or system tests and startups.

S. Systems certification activities.

T. Meetings and significant decisions.

U. Safety report.

V. Security report, if required.

W. Summary of hazardous and contaminated substance activities.

X. Summary of noise monitoring results.

Y. Summary of air quality and groundwater monitoring results.

Z. Occurrence report.

AA. Special reports.

BB. High and low temperatures, general weather conditions, rain or snow amounts, and severe weather events.

CC. Material location report.

DD. Monthly progress photographs.

2.13.3 Format

The monthly progress report shall:

A. Summarize the Work accomplished during the report period and shall include a narrative description, in bullet format, of each problem area identified, along with the actions taken and planned to resolve the problem.

B. Be in 8½" x 11" format and shall be bound. The cover sheet shall include the Contract number and title, Design-Builder's name, reporting period and date of issue.

2.13.4 Schedule Information

The monthly progress report shall:

A. Address each action item on Critical Path. At a minimum, each Critical Path item noted shall include a statement of its impact on the Work as well as actions taken and planned to eliminate or mitigate its impact.

B. Contain schedule information, including an activity-by-activity listing of each duration change with the reason, each logic change with the reason, and each activity actual date achieved during the reporting period.

2.13.5 Submittal Register

A. Within 30 Calendar Days of LNTP, the Design-Builder shall prepare and submit to the Project Manager a Submittal Register, covering all submittals required during the first six months of the Contract. Thereafter, the Design-Builder shall submit monthly updates to the Submittal Register with the monthly progress report. The updated Submittal Register shall show the record of submittals made to date and shall show the submittals due over the next three month period.

2.13.6 Subcontract Report

A. As part of the monthly progress report, the Design-Builder shall submit a subcontract report providing the Railroad with an updated list of subcontractors (design and construction, at all tiers, including labor only). The Design-Builder shall specifically identify MBEs, WBEs, and SDVs in the report. The location where the subcontractors worked shall also be shown.

B. The Design-Builder shall also report the results of all procurements completed in the previous month, including those procured competitively and by other means. The Design-Builder shall indicate the type of Work or product procured and size of the procurement (in dollars), and the name of the successful subcontractor.

C. The report shall indicate the total number of subcontractors and the total dollar value of all subcontracts awarded to date. The report shall show the total number of subcontracts and the total value of subcontracts awarded to MBE, WBE, and SDV firms to date.

D. The report shall indicate, for each subcontract, the following:

1. The original subcontract amount.
2. The value of any modifications to date.
3. Payments made to date.

E. The monthly progress report shall also include a separate report relating to utilization of certified MBE/WBE/SDV firms and other small businesses, on a form approved by the Railroad. The report shall identify each small business subcontractor and supplier (at all tiers) by name and function, state whether such person is an MBE or WBE or SDV, state the original subcontract amount and value of modifications to date, and state the payments made to each such Person for the current period and total cumulative payments to date.

2.13.7 Order on Contract Status Report

The Design-Builder shall provide a report of outstanding order-on-contract requests containing the following:

A. The Design-Builder's and Railroad's order-on-contract identification numbers and/or coding.

B. The issue title.

C. A brief description of the change.

D. Any outstanding issues to be resolved.

E. The estimated cost and time implications.

F. The projected resolution date.

2.13.8 Quality Certifications

The Design-Builder shall submit a certificate every month signed by the Quality Manager certifying the following for the previous month:

A. That all Work, including that of the Designer and all other designers, Subcontractors at all tiers, and vendors has been checked and/or inspected by the Design-Builder's QC staff, that all documentation regarding this QC effort is in place, and that all Work, except as specifically noted in the certification, conforms to the Contract Documents.

B. That the Design-Builder's Quality Program and all measures and procedures provided therein are functioning properly and are being followed, except as specifically noted in the certification.

2.13.9 Summary of Hazardous and Contaminated Substances Activity

A. The Design-Builder shall submit a monthly summary of activities related to hazardous and contaminated substances. If there is no activity, the report shall indicate such.

2.13.10 Occurrence Reports

A. The Design-Builder shall submit an occurrence report for information upon discovery of an occurrence including at a minimum emergency, criminal activity, accident, injury, fire, infrastructure damage, safety and hazardous conditions, and negative public relations incidents. The Design-Builder shall provide an immediate verbal notification to the Railroad and shall submit a written report no later than 72 hours after discovery of the incident unless requested earlier by Railroad. The report shall be a form prepared by the

Design-Builder and shall include a detailed description of the incident including name(s) of affected individual(s) and witnesses.

2.13.11 Special Reports

A. The Design-Builder shall submit a special report for information within one Calendar Day after an event of an unusual and significant nature occurring at the site, whether or not related directly to the Project. The report shall list the chain of events, persons participating, response by the Design-Builder's personnel, evaluation of results or effects, and similar pertinent information. The Design-Builder shall advise Railroad in advance when these events are known or predictable.

2.13.12 Material Location Report

A. The Design-Builder shall submit a material location report for information on a monthly basis. The report shall list major materials delivered to and stored at the site. The list shall be cumulative, showing materials previously reported plus items recently delivered. The list shall include a statement of progress and delivery dates for materials or items of equipment fabricated or stored away from the site. The report shall indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage.
3. Material stored following previous report and remaining in storage.

2.13.13 Monthly Progress Photographs

A. The Design-Builder shall photograph the progress of the Work. The photographs will be digitally taken, and each month, the Design-Builder shall furnish one set of at least thirty (30) photographs in 8” x 10” size, on double weight glossy paper mounted on linen with a flap for binding and also in digital format stored on a CD-ROM. The photographs shall be clear and sharp in detail; free of light streaks other blemishes that may render them unsuitable, in the discretion of the Railroad, for use in progress reports and similar documents. Each photograph shall contain, in the lower right-hand corner, a small title block showing the name of the Project, the name of the Design-Builder, the name of the photographer and the date and the location (including direction of camera) of the photograph. Copies of the photographs shall be submitted to the Railroad monthly as part of the support documentation for the progress payment. At completion of the Project, the negatives and/or the CD-ROM shall be provided to the Railroad.

2.13.14 Summary of Submittals

Item No.	Section No.	Submittal	Action
1.	2.13.2	Monthly Progress Report	Information
2.	2.13.4	Schedule Information	Information
3.	2.13.5	Submittal Register	Information
4.	2.13.6	Subcontract Report	Information
5.	2.13.7	Order on Contract Status Report	Information
6.	2.13.8	Quality Certifications	Information
7.	2.13.9	Summary of Hazardous and Contaminated Substances Activity	Information
8.	2.13.10	Occurrence Reports	Information
9.	2.13.11	Special Reports	Information
10.	2.13.12	Material Location Report	Information
11.	2.13.13	Monthly Progress Photographs	Information

END

2.14 PROJECT MEETINGS

2.14.1 Section Includes

This section sets out requirements for Project meetings.

2.14.2 Codes and References (Not Used)

2.14.3 Project Meetings

2.14.3.1 Required Attendees

Required attendees at Project meetings shall include the following at a minimum:

A. The Design-Builder's Project Manager or designee as permitted by the Railroad.

B. The Design-Builder's Scheduler or designee as permitted by the Railroad.

C. The Design-Builder's Designer or designee as permitted by the Railroad.

D. The Design-Builder's Safety Manager.

E. The Design-Builder's Quality Manager.

2.14.3.2 Meeting Minutes

A. The party leading the meeting shall record minutes of all meetings and distribute them within five days of the meeting. Meeting minutes shall clearly identify the following:

1. Action items and issues.
2. The party responsible for the action item.
3. The status of issues.
4. Due dates for identified action items.

B. Action items and issues shall be retained on the minutes until the required action is completed and/or the issue is resolved.

2.14.3.3 Decision Authority

A. The Design-Builder’s personnel that attend and participate in Project meetings shall have all required authority to commit the Design-Builder to decisions agreed upon at the Project meetings.

2.14.3.4 General Procedures

Project meetings shall be held at locations set by the Project Manager, in consultation with the Design-Builder.

A. Meeting calendar, notifications and invitations shall be managed electronically by the Design-Builder on a real-time basis.

B. The Design-Builder shall:

1. Provide agendas and meeting materials in advance of the meeting.
2. Lead and facilitate meetings.
3. Distribute meeting minutes to all attendees within 72 hours of the meeting conclusion.

C. The meetings described in this section do not represent all meetings necessary or required by the Contract Documents. The Railroad may, with reasonable notice, require additional Project meetings at any time at no additional cost to the Railroad.

2.14.3.5 Pre-Work Conference

A. The Project Manager will consult with the Design-Builder and arrange and lead a meeting promptly after issuance of LNTP.

B. The Design-Builder shall be represented by all appointed Key Personnel.

C. The meeting will take place at a location determined by the Project Manager in the Project vicinity.

D. The agenda of the meeting shall include the following items:

1. Submission of executed bonds, guarantees, warranties, and insurance policies and certificates, if not already provided.
2. Planned activity for the first 90 days after LNTP.
3. A Submission of the list of intended subcontractors.
4. A Submission of the plans required under the Project.
5. The Project Manager or the Design-Builder may add other items to this agenda.
6. A Schedule development and submissions.

2.14.3.6 Site Mobilization Meeting

A. The Design-Builder's Project Manager will consult with the Project Manager and arrange and lead a meeting at the Design-Builder's office prior to the Design-Builder's occupying any part of the site. The Design-Builder's Key Personnel who will be responsible for activities on the agenda shall attend the meeting.

B. The agenda shall be developed in consultation between the Project Manager and the Design-Builder and prepared by the Design-Builder and shall include the following items:

1. Use of premises by the Railroad and Design-Builder.
2. Railroad's requirements.
3. Temporary utilities and facilities.
4. Security and "housekeeping".
5. ROW and construction survey.
6. Schedule for establishing Work areas, temporary facilities, and facilities and equipment for Railroad's staff.
7. Temporary works.
8. Plans for early construction, if any.

2.14.3.7 Work Initiation Meetings

2.14.3.7.1 Project Work Initiation Meeting

A. The Design-Builder shall hold the Project Work initiation meeting within 10 Work Days of the LNTP. At a minimum, the Design-Builder's Key Personnel shall attend the meeting.

B. The Project Work initiation meeting shall address, at a minimum, the following:

1. Project management plan including the key personnel and organizational chart.
2. Project schedule.
3. The Design-Builder's approach to design and construction.
4. The Design-Builder's approach to Maintenance and Protection of Traffic (MPT).
5. The Design-Builder's approach to Third Party and Utility Owner coordination and approvals.
6. The Design-Builder's approach to systems design and procurement.
7. The Design-Builder's Quality Program.
8. Project ROW availability.
9. Submittal procedures and document control and record documents.
10. Safety and emergency procedures.
11. WBE, MBE, SDV, EEO, Insurance, and other requirements.
12. Payment and financial controls.
13. Other topics as deemed necessary by the Design-Builder or the Railroad.

2.14.3.7.2 Design Initiation Meeting

The Design-Builder shall hold the Design Initiation Meeting within 60 Calendar Days of LNTP. At a minimum, the design initiation meeting shall address the following:

A. Design management plan and organization chart.
B. The Design-Builder's design Work locations and logistics.
C. The Design-Builder's submittals list, reviews, and schedule.
D. The Design-Builder's Design Quality portions of the Quality Program.
E. Railroad plan for review.
F. The Design-Builder's plan for Third Party or Utility Owner approvals and permits.
G. Other topics as deemed necessary by Design-Builder or Railroad.

2.14.3.7.3 Construction Initiation Meeting

A. The Design-Builder shall hold the construction initiation meeting a minimum of 90 Calendar Days before initiation of construction. At a minimum, the Project Work initiation meeting shall address the following:
    1. Major construction and field activities.
    2. Construction management and organization chart.
    3. The Design-Builder's construction management plan.
    4. The Design-Builder's construction offices and logistics.
    5. The Design-Builder's schedule, staged construction plan and staging areas.
    6. The Design-Builder's Construction Quality portions of the Quality Program.
    7. Railroad plan for Quality Oversight.

8. The Design-Builder's plan to demarcate ROW.
9. The Design-Builder's CEPP.
10. The Design-Builder's Safety Plan and Emergency Plans.
11. The Design-Builder's Construction Security Plan.
12. Process for Record Documents.
13. Payment and financial controls.

B. The Design-Builder shall also hold Project Work initiation meetings with Third Parties, Utility Owners, and AHJs as appropriate.

2.14.3.7.4 Quality Work Initiation Meeting

A. The Design-Builder shall hold a quality initiation meeting within 15 Work Days following the Project Work initiation meeting. The meeting shall include discussion of all aspects of the Design-Builder's Quality Program, with a focus on implementation of the required processes.

2.14.3.7.5 Safety & Security Work Initiation Meeting

A. The Design-Builder shall hold a safety and security initiation meeting within 45 Calendar Days following the Project Work Initiation Meeting and prior to commencing any construction Work. The meeting shall include discussion of all aspects of the safety and security requirements, with a focus on implementation of the required processes and the SHECP.

2.14.3.7.6 Environmental Work Initiation Meeting

A. The Design-Builder shall hold an environmental Work initiation meeting within 15 Work Days following the Project Work initiation meeting. The meeting shall include discussion of all aspects of the Comprehensive Environmental Protection Program and processes required for design, permitting and construction of the Project.

2.14.3.7.7 Schedule Work Initiation Meeting

A. The Design-Builder shall hold a Schedule Work initiation meeting within 15 Work Days following the Project Work initiation meeting. The meeting shall include discussion of the schedule requirements for the Project.

2.14.3.8 Regular Meetings

2.14.3.8.1 Progress Meetings

The Design-Builder shall hold monthly progress meetings, including, at a minimum, the Design-Builder's Project Manager, the Design-Builder's Design Manager, Lead Construction Manager, the Design-Builder's Quality Manager, and Railroad attendees. Monthly progress meetings shall be held one week after submittal of the monthly progress report. Discussion items shall include, as appropriate:

A. Project Schedule, including progress for the past 14 days and 28-day look-ahead.
B. Quality update and issues.
C. Safety and security update and issues.
D. Submittal and review process updates and issues.

E. Project ROW availability updates and access issues.

F. Environmental reporting and issues.

G. Status of submitted and potential change orders, relief events, force majeure, request for changes, railroad change and directive letters.

H. Any other issues.

2.14.3.8.2 Design Progress Review Meeting

A. The Railroad will conduct on-board review meetings to discuss comments on design submittals at a location designated by the Railroad.

B. The Design-Builder shall have all design disciplines represented at these meetings.

C. The Design-Builder shall prepare minutes of each meeting, and submit to the Railroad within three (3) Calendar Days.

D. The Design-Builder shall address all comments and take the appropriate action to the next submittal relating to that Work.

2.14.3.8.3 Schedule Review Meetings

A. The Railroad shall conduct semi-monthly schedule review meetings at a location designated by the Railroad. The Design-Builder and each affected subcontractor shall attend. Should the Design-Builder fail to progress the Work in accordance with the established schedule, additional meetings may be conducted by the Railroad.

B. The Schedule Review Meeting attendees shall:

1. Review the minutes from the previous meeting.
2. Review the progress of the Work since the last meeting.
3. Review the Detailed Contract Schedule.
4. Address schedule slippages.
5. Address new issues and unresolved issues.

2.14.3.8.4 Payment Request Review Meeting

The Design-Builder shall hold payment request review meetings to review each of Design-Builder's payment requests. The meeting shall be held no later than the week following the end of each billing period. Design-Builder shall provide the following information at the end of the billing period and prior to payment request review meetings:

A. Pencil-copy invoice.

B. Pencil-copy review checklist to document distribution of invoiced amounts to appropriate funding vehicles.

C. Updated Schedule of values with updated values for current quantities or current percentage and current amount Invoiced.

D. Project schedules update narrative.

E. Documentation confirming the percentage of earned value of Work completed during the billing period.

2.14.3.8.5 Railroad Coordination Meetings

A. The Design-Builder shall hold a weekly look-ahead meeting and daily morning plan meeting in order to coordinate resource allocation with the Railroad.

2.14.3.9 Special Meetings

2.14.3.9.1 Change Order Meetings

A. As required, the Design-Builder shall hold change order meetings to discuss and resolve change orders, relief events, force majeure, request for changes, railroad change and directive letters.

2.14.3.9.2 Functional Testing and Commissioning Meeting

The Design-Builder shall hold a functional testing and commissioning meeting three months prior to the start of function testing. The meeting agenda shall include, at a minimum:

A. Detailed testing and commissioning plans and schedules.

B. Requirements and schedules for training of staff.

C. Coordination and shutdown requirements.

D. On-site witness testing by approval/regulatory agencies.

E. Protocol for certifications.

F. Sampling and analytical requirements and responsibilities.

G. SCADA integration and control.

2.14.4 Summary of Submittals

Item No.	Section No.	Submittal	Action
1	2.14.3.4	Meeting Agenda and Materials	Information
2	2.14.3.4	Meeting Schedule	Information

END

2.15 MOBILIZATION AND PAYMENT

2.15.1 Section Includes

This Section sets out requirements for mobilization and payment.

2.15.2 Codes and References

A. National Fire Protection Association (NFPA):

   70 National Electric Code.

B. Underwriter's Laboratories, Incorporated (UL).

C. Occupational Safety and Health Administration Standards (OSHA).

2.15.3 Mobilization

2.15.3.1 Scope

The Design-Builder shall, subsequent to receipt of LNTP, establish the required construction plant at the Work site, complete in place, and ready for commencement of the Work.

A. Erect fencing and barricades, as required.

B. Set up field offices and temporary utilities.

C. Make arrangements for site personnel services, including security and janitorial.

D. Deliver required construction equipment, tools, and appurtenances for commencement of the Work. Construction equipment shall be of the appropriate type, capacity, quality, and function for the performance of the Work.

E. See additional requirements on the scope of LNTP work set out in VOLUME 1 DESIGN BUILD AGREEMENT and VOLUME 2 GENERAL PROVISIONS.

2.15.3.2 Noted Restrictions

A. Unless otherwise specified, existing Railroad utilities shall not be used by the Design-Builder.

2.15.3.3 Submittals

The Design-Builder shall provide the following submittals:

A. Layout of construction plant, showing locations of fences, roadways, buildings or sheds, field offices, temporary utility services, and storage and laydown areas.

B. Maintenance and inspection records, covering the previous 12 months, for each crane utilized.

C. Copy of license for each crane operator.

D. The Design-Builder’s daily employee sign-in log prior to the end of the shift.

E. List of foreign national employees assigned to the Project.

F. Copy of Foreign National Registration Document (including I-94 cards and I-797 notices or Permanent Resident Cards) for each foreign national employee.

G. Signed consent forms from all employees to allow the Railroad to verify employee identification.

2.15.3.4 Execution of Mobilization

A. The Design-Builder shall transmit submittals and deliverables required by this Section.

B. The Design-Builder shall notify the Railroad immediately if objects of historical or archeological interest are encountered during the performance of the Work. Pending direction from the Railroad, the Design-Builder shall not remove or destroy such objects.

C. The Design-Builder shall erect barricades or fencing at the direction of the Railroad to separate Work areas from active track. The Design-Builder shall remove barricades or fencing as directed by the Railroad when Work is completed and access is required for Railroad operations.

2.15.4 Payment

2.15.4.1 Payment for Mobilization

A. Mobilization will be 5.5% of the Proposal price for the items of physical construction only. Physical construction does not include items such as: allowances; design and engineering services; quality management and testing, safety and security management; and etc.

B. Mobilization payment will be payable to the Design-Builder distributed equally between first three invoices.

2.15.4.2 Progress Payments

A. Progress payments will be made as set out in VOLUME 2 GENERAL PROVISIONS.

2.15.4.3 Payments to Utility Companies

A. The Contract Documents identify the elements of work that are to be performed by utility companies, not by the Design-Builder.

B. The Design-Builder shall make payments directly to utility companies for all Project related work performed by the utility companies.

2.15.5 Summary of Submittals

Item No.	Section No.	Submittal	Action
1.	2.15.3.3	Construction Plan Layout	Information
2.	2.15.3.3	Crane Maintenance and Inspection Records	Information
3.	2.15.3.3	Crane operator License Copy	Information
4.	2.15.3.3	Daily Employee Sign-in Log	Information
5.	2.15.3.3	Foreign National Employee List	Information
6.	2.15.3.3	Foreign National Registration Document	Information
7.	2.15.3.3	Employee Signed Consent Forms	Information

END

2.16 PUBLIC INFORMATION AND COMMUNICATIONS

2.16.1 Section Includes

This Section sets out the responsibilities of the Design-Builder for public information and communications.

2.16.2 Codes and References (Not Used)

2.16.3 General

A. The Design-Builder shall support the Railroad in providing communications to the adjacent communities. Such support may include attending meetings, advising of the Design-Builder's progress and performance, and demonstrating conformance to permits and obligations.

B. The Design-Builder shall ensure that all public information and communications materials, including the website, meet ADA requirements.

C. All public information and communications materials shall be provided in English; however, the Design-Builder shall translate materials into Spanish if requested.

D. As the project-related activities begin (including engineering, design, environmental, property acquisition, utility relocation, and construction activities), the Design-Builder will need to proactively interface with the affected communities on a daily basis. The Design-Builder will be required to implement and manage a robust community relations program so that the Railroad can provide the public with project status, alerts and information, improve public image and support, establish advocates and supporters from within the community, communicate with the local communities and government officials, and solicit and incorporate feedback when possible to minimize impacts to the neighborhood.

2.16.4 Railroad Responsibilities

A. The Railroad will oversee the public information and communications program from LNTP to Final Completion. The Railroad's program activities will be designed to build upon previous communications and acknowledge the progression of the Work. The Railroad will:

1. Review and approve the Communications and Public Outreach Plan, and support and oversee the implementation of this plan.
2. Manage community and public relations using community outreach staff (provided by the Design-Builder) assigned to specific areas in the Project area.
3. Serve as the official spokesperson for the Project, except for notifications regarding Construction Work (including road closures and detours).
4. Serve as the lead liaison with the Press and government officials.
5. Establish media protocols jointly with the Design-Builder to provide clarity of responsibility for media comment on specific Project activities.

2.16.5 Design-Builder Responsibilities

A. The Design-Builder shall provide daily, on-going support to the Railroad in the implementation of the Communications and Public Outreach Plan from LNTP to Final Completion. Such support may require work hours and work days to vary depending on Project requirements.

B. The Design-Builder shall:

1. Provide a LIRR Expansion Project Community Information Center as set out in TP2.26 TEMPORARY FACILITIES. The center shall be in place and functional prior to the commencement of any pre-construction work, and shall remain in place until Final Completion.
2. Provide and staff a 24/7 construction hotline to receive and respond to input and complaints in accordance with the Communications and Public Outreach Plan. Maintain a log of all calls received, and track the following at a minimum:
    a. Time, date, name of caller, contact information. (e.g., email and/or phone number, street address and/or neighborhood)
    b. Nature of call. (e.g., noise complaint, emergency, inquiry unrelated to project, etc.)
    c. Whether the inquiry requires follow-up by the Railroad.
    d. Resolution of the call. (e.g. caller directed to 911, caller referred to Railroad's Project liaison, caller directed to general LIRR information phone number, no additional action required, etc.)
3. Lead preparation and implementation of the Communications and Public Outreach Plan, which will provide the framework for the program and materials described in this Section.
4. Provide a dedicated liaison for the Project who will also serve as the Outreach Program Manager for the Design-Builder's public information and communications tasks.
5. Develop and maintain the Project website and social media using content provided by the Design-Builder (such content shall be approved by the Railroad).
6. Maintain the Project contact database and distribution list for mailings and electronic mailings.
7. Maintain and staff the Project office, as the Railroad determines is necessary and useful.
8. In coordination with the Railroad, inform local media and the public of scheduled Construction Work and its impacts including traffic congestion, road closures and detours, including:
    i Provide advance notification of any disruptive work or work-related closures to the affected residents, municipalities, and school districts.
    ii Ensure coordination between emergency services providers, including all first responders, to ensure continuity of access to the community.
9. Prepare responses for media inquiries in accordance with the Communications and Public Outreach Plan and provide support to the Railroad in responding to media inquiries.
10. Distribute Project newsletters and press releases using content provided by the Design-Builder and approved by the Railroad. This shall include:
    i Printing and distributing hard copies of newsletters and brochures (unless it is jointly determined that "e-newsletters" are preferable to hard copies).

ii Updating the public with email blasts and online postings.

11. Design, prepare, format, print, and distribute Project newsletters regarding project construction work updates and scheduling. The frequency of such newsletters, email blasts, and online postings shall be proposed in the Communications and Public Outreach Plan.
12. Support the Railroad's outreach and marketing activities by providing necessary materials and information for use in outreach efforts. Such materials shall include a graphical Project overview, plan of Work for the coming month, overall Project Schedule (on a quarterly basis), and updated Project photos and videos. The Design-Builder shall support the Railroad in preparation of graphic designs, digital materials, animations, audio-visual technology, and time-lapse photography.
13. Provide periodic content (including graphics) for the Project website and social media.
14. Provide high-resolution construction progress photographs and videos in electronic format. Baseline photographs of the entire construction area shall be obtained prior to construction activities. New photographs shall be obtained at periodic intervals (to be defined in the Communications and Public Outreach Plan) or at any time that a new significant activity commences. In addition, the Design-Builder shall facilitate requests by the Railroad to take additional photos on an as-requested basis. Distinct from progress documentation photos, the purpose of photos is to facilitate public information via Project website(s), newsletters, and other such materials.
15. Prioritize community needs and concerns and ensuring they are effectively integrated into engineering and construction planning and execution as required.
16. Participate in Railroad-organized public forums, providing outreach and technical staff as necessary.
17. Provide graphic design support for Project office exhibits, promotional materials, public workshop materials, store vacancy reports, and other requests pertaining to the Project's public outreach.
18. Create and update signage, business cards, detour and construction zone maps, bus stop / road closure information, and other print materials as needed.

2.16.6 Innovative Outreach Strategies

A. The Design-Builder shall include in the Communications and Public Outreach Plan ideas and suggestions for innovative outreach strategies, including opportunities to implement community-focused mitigation measures during the construction period.

2.16.7 Education Programs

A. The Design-Builder shall include in the Communications and Public Outreach Plan ideas and suggestions for developing educational programs, potentially including "safe routes to schools" materials, and or interactive exhibits to be displayed at the Project office. Railroad intends to develop age-appropriate lessons plan(s) regarding construction activities and the overall Project, with a focus on science, technology, engineering, and mathematics (STEM). The Design-Builder shall provide support in preparation of these lesson plan(s), associated internship program, and any associated group site visits.

2.16.8 Community Outreach

A. Business Communication:

1. The Design-Builder shall seek to limit and mitigate business impacts during the Work, including protecting access to businesses. In development of content for the Project website, Project newsletters and other activities specified by the Communications and Public Outreach Plan, the Design-Builder shall include construction impact information specific to businesses and promotion of local businesses. The Design-Builder shall also provide signage regarding access and parking changes, and address reduced visibility of businesses by providing “Open for Business” signage or similar efforts.

B. School/Institutional Communication:

1. The Design-Builder shall seek to limit and mitigate impacts to school impacts during the Work, particularly during the affected schools’ hours of operations. The Design-Builder shall identify potentially affected schools and coordinate with the Railroad to work as unobtrusively as practically feasible.
2. The Design-Builder shall coordinate with the Railroad and local school districts to provide alternative transportation to schools that are affected by temporary or short-term road closures to the extent that such closures would either increase walking distance to schools or make on-foot travel to school problematic.

C. Residential Outreach

1. The Railroad will be responsible for door-to-door communication in areas directly affected by the Project.

D. Community-Wide Communication

1. The Design-Builder shall support the Railroad at regular meetings with community representatives to discuss construction activities and community concerns.
2. The Design-Builder shall implement a protocol for addressing community complaints.

2.16.9 Communication Materials

A. All communications materials developed by the Design-Builder for consumption by the public shall be quality reviewed by the Design-Builder. The Design-Builder shall submit communications materials to the Railroad for review and approval no less than five business days prior to their use. Where such material is in response to an incident or emergency, the Design-Builder shall coordinate with the Railroad to enable the Railroad to review and approve the communication within the time available.

B. The Design-Builder shall not use the Railroad’s logos, images, and brands (including those of the Railroad, State, NYSDOT, and local municipalities) on any communication without the prior written Approval of the Railroad.

2.16.10 Public Notifications

A The Design-Builder shall perform public notifications as required by the Communications and Public Outreach Plan, for those activities shown below, and for other activities identified as necessary by the Design-Builder and Railroad.

B As appropriate for the situation, public notifications may include, but are not limited to, email notifications, phone calls, personal visits, dynamic message signs, static signs, flyer postings, and door-to-door delivery of written notices or door hangers.

C The Design-Builder shall also notify Third Parties and Utility Owners as required for these entities to implement their own notification processes.

D The Design-Builder shall submit public notifications to the Railroad for Review and Approval. After receiving approval from the Railroad, the Design-Builder shall print public notifications. The Railroad and the Design-Builder shall work jointly to distribute.

E In the Communications and Public Outreach Plan, the Design-Builder shall propose appropriate community notification timeframes for various activities, including but not limited to: lane closures, utility shut-offs/diversions, roadway/driveway closures, commencement of work, night and weekend work, pile driving, and other potentially intrusive or disruptive activities.

2.16.11 Project Tours

A From time to time, representatives of peer transit agencies, community-based organizations, government officials, and others may wish to tour the Site. The Design-Builder shall accommodate Project tours when feasible, bearing in mind both the need for positive community engagement and the safe and timely prosecution of the Work.

2.16.12 Summary of Submittals

Item	Section	Submittal	Action
1	2.16.4	Communications and Public Outreach Plan	Review and Approval
2	2.16.7	Public Education Program	Review and Approval
3	2.16.9	Communications Material	Review and Approval
4	2.16.10	Public Notifications	Review and Approval

END

2.17 DESIGN-BUILDER'S QUALITY PROGRAM

2.17.1 Section Includes

This Section sets the Quality related responsibilities of the Design-Builder during design and construction, including the activities of any subcontractors and suppliers.

2.17.2 Codes and References

A. American Society for Testing and Materials (ASTM):

E 329	Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.

B. American National Standards Institute/International Standard Organization/ American Society for Quality (ANSI/ISO/ASQ):

9001:2015	Quality Management Systems – Requirements.
9001:2008	Quality Management Systems – Requirements.
10012:2003	Measurement Management Systems – Requirements for measurement processes and measuring equipment.
17025:2005	General requirements for the competence of testing and calibration laboratories.

C. Institute of Electrical and Electronics Engineers (IEEE):

1558:2004 Standard for Software Documentation for Rail Equipment and Systems.

2.17.3 Design-Builder's Quality Program (DBQP) Requirements

A. The Design-Builder shall implement and maintain an effective quality program to manage, control, document, and ensure that the Work complies with the requirements of the Contract Documents.

B. The Design-Builder shall submit the Design-Builder's Quality Program for Review and Approval within 30 Calendar Days after LNTP. DBQP shall be approved by the Railroad before commencement of construction Work.

C. The DBQP shall contain all processes and procedures necessary to ensure complete quality assurance and quality control for all major activity categories: design; materials; equipment; testing; construction; start-up; coordination; workmanship; fabrication; and, document control for both on-Site and off-Site Work by the Design-Builder (including subcontractors, suppliers, laboratories and consultants). Separate volumes addressing design and construction shall be produced which shall comprise the DBQP.

D. The processes and procedures established in the DBQP shall comply with an ISO 9001 standard.

E. The DBQP shall include an organization chart showing names, titles, responsibilities, authority, and the interrelationship between those involved in managing and directing the Quality Program, including all subcontractors, vendors, suppliers and consultants.

F. The Design-Builder's Quality Manager (QM) shall be responsible for overseeing the overall quality program and the preparation, implementation and update of the DBQP for Design-Builder, including management, design and construction. The DBQP shall establish a "Quality Program Team" which shall be distinct and separate from the design and

construction production organization. The quality program team shall report directly to the QM.

G. As work progresses, the Design-Builder shall update the DBQP to reflect current conditions.

H. The Design-Builder and/or the Railroad may identify the need for revisions to the DBQP. The Design-Builder shall submit any revisions or updates to the DBQP to the Railroad for Review and Approval. Changes to the revisions shall be documented on a table describing what changes were made to each revision. Revisions to the DBQP shall be approved by the Design-Builder's QM prior to Submittal for approval to the Railroad.

I. Software Quality

1. If the Scope of Work includes products or systems that contain software, the vendor shall have in place a documented system that conforms to IEEE Standard 1558-2004 including the additional IEEE Standards as cited in Section 5 of IEEE STD 1558-2004. Comments, procedures, plans and other specified documentation associated with software design, coding, and maintenance shall be available to LIRR upon request.

2. The Vendor shall submit a written description of software related processes in place, demonstrating the organizations capabilities for similar work for all phases of software life cycle including concept, design, development, test, system integration and maintenance. The Vendors system shall demonstrate implementation such as Capability Maturity Model Integration (CMMI) - Level 2 minimum, or other industry criteria acceptable to the Railroad prior to the award of the contract. These requirements apply to the Consultant as well as its sub-consultants who perform such activities for the Design Builder.

3. If there is a discrepancy between the individual projects specifications and standards or other specifications, the more stringent requirements shall apply unless otherwise agreed in writing by the Railroad.

2.17.4 Design-Builder's Quality Program (DBQP) Contents

The following subsections are elements of the DBQP and should be specifically addressed therein

2.17.4.1 Management Responsibility

A. The Design-Builder shall define and document a quality policy that includes objectives for each specific project and shall communicate, implement, and maintain that policy at all levels of its organization. The Design-Builder shall have a published statement of its commitment to quality and the organization's quality objectives. It shall explain the Design-Builder's commitment to quality relative to the Project, shall be made known to all staff, and shall be included in the DBQP. The policy statement within the DBQP shall be signed by the Design Builder's Project Manager.

2.17.4.2 Documented Quality Management System (QMS)

A. The Design-Builder shall establish and maintain a documented QMS to ensure Project quality objectives are satisfied. The QMS requirements shall extend to the Design-Builder's entire organization.

B. The QMS shall either contain or reference the procedures and documentation critical to quality and shall define policies, goals and objectives of the organization and organizational interfaces. The Design-Builder shall prepare documented procedures

consistent with the requirements of the Contract Documents and the Design-Builder's stated quality policy. These procedures may include both standard procedures and those developed specifically for use on this Project. The procedures shall define the interface between the quality organization and the design and construction groups of the Design-Builder's organization and shall be written with the intent of gaining employee understanding of the system.

C. The procedures and instructions shall contain a statement of their purpose and scope, and shall contain any references to appropriate codes, standards, or specifications. In developing the quality procedures and instructions, consideration shall be given to identifying and acquiring any inspection equipment, skills, or special quality processes needed to ensure quality performance.

D. Where new techniques are being proposed for construction or manufacturing, adequate time shall be allowed to develop appropriate quality procedures and instruction for the new techniques and to train the personnel who will be using these new techniques. The procedures and instructions shall contain formats for the quality records needed to ensure that the procedures and instructions are followed and documentation requirements are understood.

2.17.4.3 Design Control

A. It shall be the Design-Builder's sole responsibility to provide Design Documents in accordance with the Contract Documents and the Design-Builder's Design Quality Plan (DBDQP). Review of the Design-Builder's Design Documents by the Railroad shall not relieve the Design-Builder of the responsibility to meet all requirements of the Contract Documents.

B. During the development of the Design-Builder's design criteria and DBDQP, the designer shall insert quality control provisions and references to the Project's DBQP. Furthermore, the Design-Builder shall establish and maintain procedures in the DBQP to control and verify the design of the Project in order to ensure that the design criteria, other specified requirements, and requirements of the applicable Governmental Entities, Third Parties, and Utilities are met.

C. The Design Control includes ensuring that the design requirements are understood, planning and scheduling the design interfaces and the design verification activities, executing the design verification activities, and controlling design changes through Final Completion.

D. The Design control shall be applied to computer programs, design tables and all other products that provide analytical results which are used to develop or check designs.

E. The Design-Builder shall establish and include in the DBDQP procedures on how design changes are to be initiated, reviewed, approved, implemented and recorded in accordance with the Contract Documents.

F. Provisions in order to control configuration management, and shall include the identification of persons authorized to approve design changes. An approved DBDQP is required before submittal of any Design Documents can be made.

2.17.4.4 Document Control

A. Procedures for control of Project documents shall be established and maintained. The document control measures shall ensure that all relevant documents are current and readily available.

B. Electronic document distribution and management shall be managed in the same manner as hard copy distribution and management.

C. The Project documents shall include, at a minimum: contracts, plans, specifications, permits, master drawing lists or equivalent documents, critical procedures and work instructions, quality system manuals, Quality plans and data (e.g., computer databases, computer files).

D. The Design-Builder shall establish and maintain documented procedures to control the Project documents and implement procedures to ensure that the Work is fit for its intended functions and uses. Use of a master list or equivalent document control procedure identifying the current revision status of Project documents shall be established and be readily available to preclude the use of invalid and/or obsolete documents.

E. The Design-Builder shall establish and maintain documented procedures to control the process for Project document review, resolution of comments and establishment of approval authority.

F. This control shall ensure that:

1. Pertinent issues of appropriate Project documents are available at all locations where operations essential to the effective functioning of the quality system are performed.

2. Invalid and/or obsolete Project documents are promptly protected against unintended use.

G. Changes to the Project documents and data shall be reviewed and approved by the same internal authority that performed the original review and approval, unless specifically designated otherwise. If this is not possible then the designated approval authority shall have adequate background and experience upon which to base the decision. The designated functions/organizations shall have access to relevant Project documents upon which to base their review and approval.

2.17.4.5 Purchasing

A. The Design-Builder shall ensure that purchased services or products conform to the Design-Builder's specified requirements. The Design-Builder shall require suppliers to have quality programs consistent with the Design-Builder's use of such products of service in the Work meeting the requirements of the Contract Documents.

B. Procurement shall be controlled through processes established in the DBQP covering such activities as procurement document control, supplier/sub-supplier selection/qualification, supplier quality survey, pre-award quality surveys, supplier quality approval, source/vendor surveillance, source/vendor inspection, release for shipment, and receiving inspection.

2.17.4.6 Control of Railroad Supplied Items

A. The Design-Builder shall establish and maintain documented procedures for the control of verification, storage and maintenance of Railroad-supplied items provided for incorporation into the Project or for related activities. When such items are encountered, documented procedures shall be submitted as part of the DBQP which detail the receipt/acceptance, storage, maintenance and preservation of these items.

2.17.4.7 Product Identification and Traceability

A. Measures shall be established and maintained for identifying and controlling items of production (batch, materials, parts, and components) to prevent the use of incorrect or defective items and to ensure that only correct and acceptable items are used or installed. To ensure the controls of product and materials subject to expiration, the Design-Builder shall establish and maintain documented procedures for identifying product from receipt and during all stages of production, delivery and installation for all products incorporated as part of the Project.

B. The filing and retrieval of operating manuals, certificates of compliance and/or analysis, inspection status and nonconforming product shall be traceable to the items. Records shall be kept that identify the installed location of the product.

2.17.4.8 Process Control

A. The Design-Builder shall identify and plan the production and installation processes that directly affect quality and shall ensure these processes are performed under controlled conditions. Special processes, including at a minimum welding, nondestructive testing, and heat treatment, the results of which cannot be directly verified by subsequent inspection and testing of the product, shall be continuously monitored to ensure the quality of the final product. The Design-Builder shall also ensure that any activities related to the requirements are monitored and controlled by identifying any relevant provisions of the Contract Documents and determining a method to verify that they are met.

B. Documentation of the processes may be in the form of a narrative, flow chart or control points.

2.17.4.9 Inspection and Testing

A. Inspection and testing procedures shall be planned and executed as necessary to verify quality. Procedures shall be specified, implemented, with the results documented for receiving incoming products for final inspection, verification and testing. Testing shall be included, in the DBQP, including references to required certifications, testing procedures, frequency and location, requirements for witnessing of tests, and where factory inspection and/or testing is recommended prior to shipping.

B. The Design-Builder shall be responsible to perform all quality control and quality assurance related inspection and testing under the Contract Documents. The required certifications, inspections and testing, and the records to be established shall be detailed in the DBQP.

2.17.4.10 Inspection, Measuring, and Test Equipment

A. Inspection, measuring, and test equipment (including test software) necessary to carry out inspection and testing shall be identified, controlled, calibrated, and maintained in order to demonstrate the conformance of work to the specified requirements. Provisions shall be made for recalibration of such equipment in a timely manner and these provisions shall be documented in the DBQP. The Design-Builder shall provide a Schedule of Testing Equipment as part of the DBQP identifying all equipment that needs periodic and regularly scheduled recalibration including date of initial calibration, schedule for recalibrations, and current calibration status. This schedule shall be audited by the Design-Builder's Quality Assurance personnel on an appropriate frequency.

B. The Design-Builder's testing equipment shall be calibrated prior to its use on the Project. Inspection, measuring, and test equipment shall be used in a manner that ensures that the measurement uncertainty is known and is consistent with the required measurement capability. Records of calibrations shall be maintained as a Quality Record.

C. When an out-of-tolerance (OOT) condition shall exist on equipment, a systemic approach shall be taken to identify what the OOT values were, when, where, and how the OOT equipment was used to identify what areas contain potential risk.

2.17.4.11 Inspection and Test Status

A. A means shall be provided as part of the DBQP for identifying the inspection and test status of work during production and installation. The purpose of this is to ensure that only work that has passed the DBQP-required inspections and tests are accepted.

B. The inspection and test status shall be identified by suitable means, which indicate the conformance or nonconformance of the work with regard to the inspections and tests performed.

C. The identification of inspection and test status shall be maintained, as defined in the DBQP, throughout production, installation, and servicing to ensure that all work has passed the required inspections and tests.

2.17.4.12 Nonconformance

A. Procedures shall be established and maintained as part of the DBQP to ensure that nonconforming Work is not inadvertently used, installed or allowed to remain in place. Nonconforming Work shall be identified, documented, and evaluated to determine appropriate disposition. Dispositions such as use-as-is, rework, repair shall be subject to the Railroad's approval.

B. Nonconformances shall be remediated as soon as possible based on the criticality of the condition when discovered, but shall not extend no later than 30 Calendar Days of issuance unless otherwise accepted by the Railroad.

2.17.4.13 Corrective Action

Corrective action procedures shall be established, documented, and maintained as part of the DBQP. These include procedures for investigation of the root cause of nonconforming work and the corrective action needed to correct the nonconformance, prevent recurrence, and procedures for analysis to detect and eliminate potential causes of nonconforming work. The Design-Builder's QA personnel shall verify that the corrective action has been accomplished to the satisfaction of the Railroad. The Design-Builder shall also determine preventive action to eliminate the causes of potential nonconformances in order to prevent their occurrence. This also includes implementing and recording changes in procedures resulting from preventive action, corrective action, and continual improvement initiatives.

2.17.4.14 Quality Records

A. Procedures shall be established and maintained as part of the DBQP by the Design-Builder for Quality Records, both hard copy and electronic. These procedures shall identify which records shall be kept, responsibility for production and collection, and responsibility for indexing, filing, storage, maintenance, and disposition of Quality Records.

B. Quality Records shall be maintained to demonstrate conformance to specified requirements and the effective operation of the quality system. The Design-Builder shall

provide records necessary to provide objective evidence of contract review, procedure compliance, design review (when applicable), training, and completion and acceptance of inspection and testing, and to provide traceability of equipment or items to document.

C. All Quality Records shall be legible and shall be stored and retained in such a way that they are readily retrievable in facilities that provide a suitable environment to prevent damage or deterioration and to prevent loss. .

D. Quality Records shall be made available to the Railroad in accordance with the requirements of the Contract Documents. Retention periods and the storage medium of such records shall be established in accordance with the requirements of the Contract Documents.

2.17.4.15 Quality Audits

A. A Quality Audit program shall be established by the Design-Builder and documented in the DBQP to ensure that the elements of the QMS are functioning as intended. The Design-Builder shall establish and maintain documented procedures for planning and implementing a comprehensive program of scheduled and unscheduled Quality Audits to verify whether quality activities and related results comply with planned outcomes and to determine the effectiveness of the quality system. The audit program shall be revised as needed to keep current throughout the term of the Contract.

B. Quality Audits shall be conducted on a planned and scheduled basis, consistent with the importance of the activities being performed, no less frequently than every 12 months.

C. Quality Audits shall be initiated early enough in the life of the activity to assure effective Quality Control during all phases. The Quality Audits shall include Project management, testing, and technical work activities.

D. Format and content of the Design-Builder's Quality Audit checklists, audit finding reports, and audit schedule shall be reviewed by Railroad. A quarterly report shall be provided to Railroad for Information.

E. The results of the Quality Audits shall be recorded and brought to the attention of the personnel having responsibility in the area audited. The management personnel responsible for the area shall take timely corrective action on deficiencies found during the Quality Audit.

F. The personnel conducting a Quality Audit shall be independent of those having direct responsibility for the activity being audited. The Auditor qualifications shall be established and documented by the Design-Builder, with qualification records maintained as quality records.

G. Records of audits shall be maintained by the Design-Builder. The Design-Builder must make available all quality records such that the Railroad can conduct an audit of the Design-Builder's quality practices and adherence to the DBQP. If desired, the Railroad may witness such audits performed by the Design-Builder.

2.17.4.16 Training

A. The Design-Builder shall establish and maintain procedures as part of the DBQP for identifying the training needs of and provide for the training of all personnel performing activities affecting quality on the DBQP and on the project's quality assurance and quality control strategies. The DBQP shall also detail criteria for determining which aspects of the Work affect quality.

B. Personnel performing specific assigned tasks shall be certified on the basis of appropriate education, training and/or experience, as required. Appropriate records of training and certifications shall be maintained.

C. The Design-Builder shall establish documented procedures and records to ensure that the tasks are performed only by qualified persons. These shall be developed through training and/or the recorded accumulation of experience, with systematic reviews of their competence at determined levels, and before any deployment of new roles. The Training shall focus on improving competency and skill for those performing activities that impact quality.

2.17.5 General Requirements for Design-Builder's Design Quality Plan (DBDQP)

The Design-Builder shall submit the Design-Builder's Design Quality Plan for Review and Approval. No design shall commence until the DBDQP is approved.

2.17.5.1 Design Documentation

2.17.5.1.1 Progress Tracking

The Design-Builder shall include engineering and design progress and changes in its Project Schedule, including work on any design changes.

2.17.5.1.2 Monthly DBDQP Report

The Design QA Manager shall submit a monthly DBDQP Report for Information at the same time as the monthly Progress Report that includes the following:

A. Summary of reviews conducted and planned reviews for the following 4 weeks to come.

B. Nonconforming Work and current status and/or disposition (based on design nonconformance log).

C. List of design Submittals(s) from the Design-Builder and status.

2.17.5.1.3 DBDQP Final Design Report

Upon completion of the final design for each design package (as determined by the Design-Builder), the Design QA Manager shall notify the Design-Builder, with a copy to the Railroad, of any outstanding monitoring report issues or unresolved review comments in the DBDQP Final Design Report. The DBDQP Final Design Report shall be submitted with the relevant Final Design Submittal.

2.17.5.1.4 Quantity Estimates

A. To facilitate the determination of QO sampling and testing requirements, the Design-Builder shall provide quantity estimates for the Work. The quantity estimates shall be in units that facilitate sampling and testing, i.e. United States customary units unless otherwise specified by Railroad.

B. The Design-Builder shall submit Quantity Estimates for Information 15 Work Days prior to commencement of the construction activity.

2.17.5.1.5 CADD Standards

The CADD formatting for Design and As-Built Plans shall conform to the Railroad CADD Manual except that when work is being done for others, it shall comply with the requirements of the AHJ.

2.17.5.2 Quality Records

A. The Design QA Manager shall prepare and submit monitoring reports to the Railroad of all design issues and review comments resulting from the scheduled and additional checks and reviews.

B. The Design-Builder shall maintain an auditable record of all DBDQP procedures, reviews and checks.

C. An independent auditor shall be able to determine and verify by reviewing documentation if all procedures included in the DBDQP have been followed.

D. The Design-Builder shall develop, implement, and maintain a log of design Nonconformance Reports and/or notices indicating the dates issued, the reasons for the nonconformance, the status of the item, and ultimately the manner of resolution and the date of resolution.

2.17.5.3 Design Quality Assurance Manager

A. The Design-Builder shall provide a Design QA Manager. The Design-Builder's Design QA Manager shall assess and evaluate the Design-Builder's design QC activities in order to certify to the QM and to the Railroad that the design QC activities comply with the DBDQP and Contract Requirements.

B. The Design-Builder shall ensure that the Design QA Manager carries out all of their duties expressed and implied in the Contract Documents.

C. The Design QA Manager shall have QA responsibilities related to the following:

1. Design of permanent and major temporary elements.
2. Changes in design of permanent elements.
3. As-Built Plans.

D. The Design QA Manager shall also perform the following activities:

1. Identify and report non-conformities/noncompliance.
2. Track, monitor, and report on status of outstanding Design Nonconformance Reports and resolution of design review comments.
3. Supply DQCP Monthly Report.
4. Submit specified certificates (permanent elements and major temporary elements).
5. Monitoring QA/QC activities of design sub-consultants.

2.17.6 General Requirements for Design-Builder's Construction Quality Plan (DBCQP)

2.17.6.1 General

A. The Design-Builder shall submit the Design-Builder's Construction Quality Plan (DBCQP) to the Railroad for Review and Approval. No construction shall commence until DBCQP is approved by the Railroad.

B. The DBCQP shall certify that procurement, shipping, handling, fabrication, installation, cleaning, inspection, construction, testing, storage, examination, repair, maintenance, and required modifications of all materials, equipment, and elements of the work will comply with the requirements of the Contract Documents and that all materials incorporated in the

work and all equipment and all elements of the work will perform satisfactorily for the purpose intended.

C. The Design-Builder shall submit planned construction activity reports bi-weekly for Information. The planned construction activities shall include all planned construction activities, including fabrication, for the previous two weeks and the following four weeks. The first two weeks of look ahead will be detailed and the second two weeks may be more general. For activities occurring a distance greater than 100 miles from the Project area, such as fabrication, the Design-Builder shall give the Railroad at least 21 Calendar Days of notice of planned Work.

D. The Design-Builder's Quality staff shall be responsible for management and scheduling all quality inspection, Special Inspections, sampling, and testing of all items of Construction Work.

2.17.6.2 Construction Control

The DBCQP shall contain procedures and policies to detect and prevent the reoccurrence of nonconforming Work.

2.17.6.3 Material Certifications

A. The Design-Builder shall submit a Sources of Supply and Item Material Types Report for Information according to the follow schedule:

1. Within 30 Calendar Days after LNTP, to the extent information is known.
2. For materials not initially identified or changes to the initial source provided, the source of supply shall be provided as soon as known and no less than 30 Calendar Days prior to delivery to the Project.

B. Documentary evidence that materials and equipment conform to the requirements of the Contract Documents shall be available at the Site prior to installation or use of such materials and equipment. This documentary evidence shall be retained at the site and shall be sufficient to identify the specific requirements, such as, Working Plans, codes, standards, are fulfilled by the purchased materials and equipment. Substitution of specified materials shall not occur without prior approval by the Design-Builder's Designer of Record. Failure to acquire prior substitution approval will result in the issuance of a Nonconformance Report.

C. Additionally, a copy of all documentary evidence that materials and equipment conform to the requirements of the Contract Documents shall be provided to the Railroad, or its representative, at the same time Design-Builder receives such documentary evidence. The effectiveness of the QC by Design-Builder's own forces and subcontractors shall be assessed by Design-Builder at intervals consistent with the importance, complexity, and quantity of the product or services. The Railroad reserves the right to audit and review these documents at any time.

D. The Design-Builder shall submit for each certifiable element, a Source of Supply Certificate of Compliance signed by the Design-Builder's Project Manager and Quality Manager indicating that all material incorporated into the Project conforms to the requirements of the Contract Documents. Note that this requirement shall apply to each Project Element that will be turned over for acceptance by the Railroad, not at Substantial Completion for the Project as a whole.

2.17.6.4 Process Control

The Design-Builder shall establish and maintain documented procedures in the DBCQP to control all key processes associated with construction.

2.17.6.4.1 Quality Check Points

A. The Design-Builder shall establish Quality Check Points (QCPs) at reasonable stages of the construction progress that ensures work is performed in accordance with the approved designs, the DBQP including the DBCQP, and within the requirements of the Contract Documents. As work is accomplished, Design-Builder's Construction Manager, representative from the QC staff, and appropriate engineer shall meet with the Railroad to review documentation and procedures for quality control including, at a minimum: material certifications, daily inspection records, material testing results, survey results, permits, and material placement records.

B. The Design-Builder's QC staff shall coordinate with Railroad to ensure that QCPs are accomplished timely so the work is not delayed. Notification to the Railroad that a QCP has been reached while work is still being performed or not allowing adequate time to complete the QCP review and opportunity for adjustments will result in the issuance of a Nonconformance Report.

C. At minimum QCPs shall be established at the initiation of construction for each Certifiable Element. Design-Builder will identify all QCPs prior to commencing construction.

2.17.7 Design-Builder's Independent Construction QC Firm

A. The Design-Builder shall appoint an Independent Construction QC Firm, which shall perform separate Quality Control for construction of the Project. The Firm shall oversee, manage, certify, and perform construction quality related activities and Special Inspections. The independent firm shall be able to understand the concept of Project Element and thereby certify various Project Elements in order to be accepted by the Railroad.

B. The Independent Construction QC Firm performing Construction Quality Control shall perform construction quality control of the Design-Builder for conformance to the Design-Build plans, specifications, the Quality Program, and the Contract requirements. The Independent Construction QC Firm's inspection, measurement, and testing activities must adhere to, and be in accordance with, all of the requirements set forth in the Contract Documents, referenced policies, manuals, engineering bulletins, and engineering instructions, and the DBQP.

C. The Independent Construction QC Firm shall report to the Design-Builder's Quality Manager and shall coordinate with the Railroad's Quality Manager.

D. The Independent Construction QC Firm providing construction QC shall enforce the specifications and identify in a timely manner local conditions, methods of construction, errors on the plans, or defects in the work or materials which would conflict with the quality of work required, or compromise the successful completion of the Project.

E. All records shall be kept in accordance with the Manual of Uniform Record Keeping (MURK) and the Contract requirements. The Independent Construction QC Firm must take all measurements and collect all other pertinent quality information necessary to prepare a project diary describing the progress of the work, specific problems encountered, daily

inspection reports, and other pertinent data, records and reports which may be required by MURK or the Contract.

2.17.7.1 Construction QC Manager (CQCM)

A. The Independent Construction QC Firm shall assign an on-site CQCM, who shall report to the Design-Builder's QM. Additional resources shall be provided for multiple site coverage as needed.

B. The CQCM shall be responsible for overall management and supervision of the construction QC staff.

C. The CQCM shall be responsible for coordinating the schedules of the QC inspectors, testers and samplers with the Design-Builder's construction activities.

2.17.7.2 Staffing Levels

A. The actual size of the field/site staff shall reflect the complexity, needs, shifts, and composition of Quality activities consistent with the Work in progress.

B. The Independent Construction QC Firm 's quality staff shall consist of experienced; Quality Control Inspectors, Quality Control (QC) Engineers, and others in sufficient numbers to adequately perform the duties required by the DBCQP. The Design-Builder's quality personnel shall report to the CQCM. The DBQP shall include a training procedure for the quality staff that clearly defines the education, previous experience and training requirements for this Project. The training procedure shall include the evaluation of each candidate's knowledge of the DBQP, including the DBCQP. All staff shall be evaluated for conformance to the training requirements and shall be certified to perform the necessary quality activities. The quality staff shall be independent from those responsible for performing the work.

C. The DBCQP shall identify administrative and clerical support for the maintenance and management of records and documents pertinent to the Design-Builder's quality activities. The Design-Builder's quality staffing schedule shall be updated as necessary throughout Construction Work to reflect staffing requirements to perform the work set forth in the DBCQP.

2.17.8 Laboratories and Testing

A. The Design-Builder shall retain an Independent Testing Agency (ITA) or Agencies (materials testing firms or laboratories) to perform the specified ITA tests, sampling and material testing, and inspections, conforming to the requirements specified in this section..

B. The ITAs shall not be an equity participant on the Design-Build Team.

C. Material testing shall be conducted by ITAs in accredited laboratories or locations. The test laboratories shall comply with the minimum industry requirements related to the items being tested, and shall be approved by the Railroad. Compliant satellite locations (field laboratories) of these laboratories conforming to the specifications described below may be used. The equipment in the satellite laboratories shall be certified at the start of work and annually thereafter, and subject to Railroad audit. Certification shall be performed by an independent accredited laboratory inspector. Qualifications shall be provided to the Railroad within 45 Calendar Days after NTP.

D. The test laboratory shall have written policies and procedures to assure portable and satellite laboratories performing testing activities on the Project are capable of providing testing services in compliance with the test methods described by the laboratories. The

policy and procedures shall address inspection and calibration of testing equipment as well as a correlation-testing program between the accredited laboratory and portable or satellite facilities.

E. The Railroad reserves the right to verify laboratory testing procedures and techniques and to check testing equipment for compliance with specified standards.

F. The Railroad also reserves the right to witness any testing and to verify compliance of the testing procedures, techniques and results.

G. Minimum qualifications of test laboratories:

The test laboratory shall have the accreditation from any of the following accrediting bodies and any relevant industry-specific standards:

1. ASTM E329.
2. ISO 10012, ISO 17025.
3. A2LA (American Association of Laboratory Accreditation).
4. AASHTO Accreditation Program (AAP) American Association of State Highway and Transportation officials.
5. NVLAP (National Voluntary Laboratory Accreditation Program.
6. IAS (International Accreditation Service).
7. ANSI ASQ (National Accreditation Board/ACLASS).

2.17.8.1 Inspection Testing Plan (ITP)

A. An individual ITP shall be developed for each site/location Project Element (i.e. Floral Park Station, Covert Ave. Undergrade Crossing, etc.) to be managed. Offsite related Quality Control i.e. precast fabrication, Factory Acceptance Test, etc. shall also be included within the applicable ITP.

B. The Design-Builder shall develop a documented plan to identify what inspections and test will be performed to control quality on the project. The ITP shall specify at a minimum:
   1. Required verification, validation, monitoring, inspection and test activities specific to the Work, including their identification, sequencing, and scheduling; as well as the criteria for product acceptance at appropriate stages of the Work, including:
      i. Responsible parties, key activities, documentation, and the manner of control over these activities.
      ii. Responsibilities, authority, and interrelations for each person who performs verification activities.

2.17.9 Quality Oversight

2.17.9.1 Railroad Quality Oversight

A. The Quality Oversight (QO) will be performed by the Railroad, or consultants of the Railroad. The QO does not relieve the Design-Builder from complying with all the requirements of the Contract, and does not in any way diminish the Design-Builder's responsibilities.

B. The Railroad will periodically audit aspects of the Design-Builder's Work. The audits and subsequent feedback to the Design-Builder's Quality Manager are intended to assess the adequacy of the Design-Builder's QC and QA plans, including frequency of testing and adherence to the requirements of the Contract Documents.

C. Nonconformances will be presented to the Design-Builder. Observations and conformances may be presented to the Design-Builder through QO Assessment Reports. The Design-Builder shall be required to respond to all nonconformances within the timeframe as specified by the Railroad. A Railroad-reported nonconformance will be closed by the Railroad upon verification of a resolution of the issue acceptable to the Railroad in accordance with the requirements of the Contract Documents.

2.17.9.2 Independent Assurance

A. Verification sampling and testing may be performed by the Railroad on samples that are taken independently of the Design-Builder's quality control and/or quality assurance samples.

B. Additionally, the Railroad may periodically provide independent assurance to evaluate the quality sampling and testing.

2.17.9.3 Competence

A. If a concern arises as to the performance of any of the organization's individuals, Railroad will give notice to the Design-Builder. The Railroad reserves the right to investigate any such concern. If this investigation substantiates the concern, a corrective action shall be implemented by the Design-Builder in accordance with DBQP or procedures established by the Railroad, as part of the Work.

2.17.10 Performance

A. Perform the Work in accordance with the Contract Documents and the DBQP.

B. Revise, amend, or clarify the Design-Builder's Quality Program, to keep current throughout the term of the Project.

2.17.11 Restrictions

A. The Design-Builder's Personnel shall not engage in the performance of the Work until qualified to perform assigned tasks based on appropriate education, training, and experience.

B. The Design-Builder invoices will not be deemed proper and therefore not payable until the Design-Builder's Quality Program (DBQP) is approved by the Railroad.

2.17.12 Use of Quality Forms

A. The Design-Builder can use the Appendix TP2.17A QUALITY PROGRAM – NYSDOT FORMS as a guide for development of the Quality Program, as a minimum level of Quality Control (QC) activities to be performed for the Grade crossings related work on the Project. The frequency of QC activities shall be at least equal to the current NYSDOT practices.

B. The Design Builder shall develop similar forms for its use in performing QC work for all other elements of the Project.

C. The Quality Program shall specifically and clearly define all QC activities to be performed by the Design-Builder, documentation and records to be managed, including forms that will be used, and frequencies of sampling and testing.

D. The Design-Builder shall provide in the Quality Program all the various materials planned for use and the specific certifications and/or sampling and testing to be progressed for QC purposes to assure durability of the material.

2.17.13 Summary of Submittals

Item	Section	Submittal	Action
1	2.17.4	Design-Builder Quality Program (DBQP)	Review and Approval
2	2.17.4.12	Nonconformance Reports	Review and Approval
3	2.17.4.15	Quality Audit Reports	Information
4	2.17.5	Design-Builder's Design Quality Plan (DBDQP)	Review and Approval
5	2.17.5.1.2	Monthly DBDQP Report	Information
6	2.17.5.1.4	Quantity Estimates	Information
7	2.17.6	Design-Builder's Construction Quality Plan (DBCQP)	Review and Approval
8	2.17.6.1	Planned Construction Activities	Information
9	2.17.6.3	Sources of Supply and Item Material Types Report	Information

END

2.18 SPECIAL INSPECTIONS

2.18.1 Section Includes

This section defines the responsibilities of the Railroad and the Design-Builder related to the performance of Special Inspections.

2.18.2 Codes and References

The Building Code of New York State (BCNYS).

2.18.3 Quality Control

All proposed inspectors, testing and inspection agencies shall meet the requirements of BCNYS, Chapter 17, and the Contract Documents.

2.18.4 Inspections and Testing Policy

A. Wherever the Contract Documents require inspections and tests that are also required by Chapter 17 of BCNYS, it is not intended that such inspections and tests be repeated, provided the persons or testing agency performing the inspections and tests meet the qualification requirements of Chapter 17 of BCNYS and all documentation of satisfactory completion of the inspections and tests is submitted to the Designer of Record and the Railroad.

B. Where the Contract Documents have more stringent requirements than BCNYS, the more stringent requirements shall apply.

2.18.4.1 Design-Builder's Responsibility

A. The Design-Builder shall be responsible for paying Special Inspectors and Testing Agencies.

B. The Design-Builder shall be responsible for coordinating, supervising, and directing all day-to-day activities of the Special Inspectors as required by Chapter 17 of BCNYS. The Design-Builder shall allow for and coordinate the presence of Special Inspectors and employees of the Testing Agencies at the Work Site during the progress of the work at times as required by Chapter 17 of BCNYS.

C. The Design-Builder shall ensure that it proposes to the Railroad only Special Inspectors and Testing Agencies who are competent and duly qualified as required in Chapter 17 of BCNYS.

2.18.4.2 Design-Builder's Responsibility

The Railroad will retain control over the Special Inspectors and Testing Agencies to be hired by approving their qualifications, including any replacements and all submittals requiring approval of the Designer of Record.

2.18.5 Execution of Special Inspections

2.18.5.1 General Requirements

The Design-Builder's Quality Manager shall act as the Design-Builder's main coordinator/liaison for all Special Inspection and test activities, which shall include:

A. Coordinating Special Inspection and Test activities between Design-Builder's construction supervision, and the Designer of Record.

B. Ensuring that Special Inspections and Tests are performed in accordance with the Design-Builder's Inspection and Test plan, Quality Program, and schedule of Special Inspections and Tests as described in this chapter of Technical Provisions.

C. Monitoring and controlling Special Inspection and Test activities.

2.18.5.2 Preliminary and Final Lists of Special Inspections

The Design-Builder shall submit a Preliminary List of Special Inspections and Tests and a minimum of three sets that will be required for the Project no later than the Intermediate Design Submittal and a final list of Special Inspections and Tests no later than the Final Design Submittal.

2.18.5.3 Schedule of Special Inspections and Tests

The Design-Builder shall submit a Schedule of Special Inspections and Tests no later than 30 Calendar Days before beginning of construction of each Project Element.

2.18.5.4 Qualifications of Special Inspectors and Testing Agencies

The Design-Builder shall submit resumes and qualifications for three sets of candidates of Special Inspections and Testing Agencies to the Railroad no later than 60 Calendar Days before beginning of construction of each Project Element. The candidates shall at a minimum, meet the qualifications outlined below:

A. The Design-Builder's Quality Staff Performing as Special Inspectors:

   1. The Design-Builder's Staff shall not be performing as Special Inspectors.

B. Subcontractor's Personnel Performing as Special Inspectors:

   1. Special Inspector(s) shall be a qualified person(s) or firm who shall provide training certifications and demonstrate competence, to the satisfaction of the Railroad for inspection of the particular type of construction or operation requiring a special inspection.

   2. The minimum qualifications for Special Inspectors for various categories of work are outlined in Chapter 17 of BCNYS.

   3. The identity and qualification of proposed Special Inspectors shall be submitted to the Railroad for approval.

C. If for any reason, and at any time, a candidate for Special Inspector or a Testing Agency submitted by the Design-Builder is not acceptable to the Railroad, or becomes unacceptable, the Design-Builder shall propose additional candidates or Testing Agencies for the acceptance of the Railroad. Within ten days of any such submission, the Railroad will advise the Design-Builder of whether such proposed replacement is approved and, if not, the basis for disapproval.

D. If the Design-Builder wishes to replace any of the Special Inspectors or Testing Agencies approved by the Railroad at any time during the performance of this Work, it shall first submit a request to the Railroad for the Railroad's acceptance and shall not make a substitution without the Railroad's acceptance. Within ten days of any such submission, the Railroad will advise the Design-Builder of whether a request to replace is approved and, if not, the basis for disapproval. All final decisions in respect to hiring and/or replacement of Special Inspectors or Testing Agencies shall be at the sole discretion of the Railroad. In no event shall any Special Inspector or Testing Agency be replaced without Railroad's approval.

E. Within 60 Calendar Days after LNTP, submit for the Railroad's approval the resumes and Qualifications of Special Inspectors and Testing Agencies.

2.18.5.5 Documentation of Special Inspections and Tests

A. The Design-Builder shall document, retain, and provide to the Railroad, records of Special Inspections and tests.

B. Forms to be used for Special Inspection and testing may be provided to the Design-Builder at the construction kick-off meeting.

C. The Design-Builder shall identify and process Nonconformances in accordance with the Design-Builder's Quality Program.

D. The Design-Builder shall furnish the following to the Project Manager for information every month:

1. Documentation of satisfactory completion of required Special Inspection and Tests.
2. Status report of Nonconforming Special Inspections and Tests including documentation that all Nonconformances have been satisfactorily resolved.

2.18.6 Special Inspections Nonconformance Reporting Procedure

The following procedure shall be implemented for each item that does not pass it's designated special inspection:

A. A Special Inspections Nonconformance Reporting Procedure shall be implemented to ensure that items that do not confirm to the NYSBC are identified, segregated, and removed from work operations to prevent use until adequate disposition is made.

B. The Design-Builder's Quality Manager shall have a Special Inspections Nonconformance Report (SINCR) Forms and a SINCR Log for use when identifying, correcting, documenting, and controlling any non-conformances.

C. Special Inspections Nonconformance Reports are to be generated for any items that did not pass special inspections as required by Chapter 17 of BCNYS.

D. The Designer of Record shall be furnished a copy of all SINCRs within one (1) Working Day upon initial generation and upon "close out". Additionally, the Designer of Record and the Railroad shall be furnished with an updated SINCR log on a weekly basis.

E. The SINCR form and SINCR Log format and content shall be approved by the Designer of Record.

F. SINCRs shall be numbered; at a minimum consisting of the Contract Number, year, and sequential number (e.g., XXXXX-20YY-n+1).

G. The Design-Builder shall investigate the root cause of the nonconformance, and take appropriate corrective actions to prevent recurrence. Responses with preventive measures from suppliers, subcontractors, and others shall be recorded on or attached to the SINCR.

H. Any member of the Design-Builder's staff can initiate a SINCR. Each initiated SINCR is to be logged by the Design-Builder's Quality Manager. The Design-Builder's Quality Manager is to validate each SINCR prior to subsequent processing.

I. Any SINCRs determined to be invalid shall be marked "VOID", with the explanation and VOID status being clearly indicated in the SINCR Log.

2.18.7 Final Report

A final report certified by the Design-Builder's Quality Manager shall be submitted by the Design-Builder stating that all items requiring Special Inspections and/or tests were done in accordance with the Contract Documents. Items not in conformance, unresolved items, or any discrepancies in inspection coverage (e.g., missed inspections, periodic inspection when continuous inspection was required, etc.) shall be specifically itemized in this report.

2.18.8 Summary of Submittals

Item	Section	Submittal	Action
1.	2.18.5.1	Preliminary List of Special Inspections	Information
2.	2.18.5.1	Final List of Special Inspections	Information
3.	2.18.5.3	Schedule of Special Inspections and Tests	Review and Approval
4.	2.18.5.4	Resumes with Qualifications of Special Inspectors and Testing Agencies	Review and Approval
5.	2.18.5.5	Monthly Documentation of satisfactory completion of required Special Inspections and Tests	Information
6.	2.18.5.5	Monthly status reports of Nonconforming Special Inspections and Tests.	Information
7.	2.18.7	Final Special Inspection and Test Report with all required documentation	Review and Approval

END

2.19 CONSTRUCTION SAFETY REQUIREMENTS

2.19.1 Section Includes

This Section defines the requirements the Design-Builder shall follow to create and maintain a safe work environment. The Design-Builder's safe work environment is applicable to all Design-Builder and non-Design-Builder personnel.

2.19.2 Codes and Standards

A. OSHA.

B. NYSDOL.

C. New York State D.O.T. Manual of Uniform Traffic Control Devices.

D. New York State Uniform Fire Prevention and Building Code.

E. LIRR Vehicle Operation Safety Policy and General Safety Rules.

F. ANSI Z49.1 Standard- Safety in Welding and Cutting.

G. Compressed Gas Association guidelines.

H. NFPA (National Fire Protection Association) Standards.

I. OSHA 29 CFR 1910.146 – Confined Spaces.

J. 29 CFR 1910.268- .269- Enclosed Spaces.

K. ADA Accessibility Guidelines for Buildings and Facilities (Appendix A to 36 CFR Part 1911).

L. Mine Safety and Health Regulations.

M. American National Standards Institute (ANSI).

N. American Conference of Governmental Industrial Hygienists (ACGIH).

O. USDOL.

P. NYSDOT.

Q. NYCRR.

R. CFR.

S. New York State Public Service Law.

T. Federal Railroad Administration.

U. Environmental Protection Administration (Federal).

V. Department of Environmental Conservation (State).

W. Department of Environmental Protection (City).

X. National Electrical Code, the New York State Industrial Code.

Y. NFPA 704 Hazard Warning System.

Z. NYCRR Subpart 753-3, Duties of Excavators.

2.19.3 Safety – General Requirements and Responsibilities

A. The Design-Builder shall issue and implement a Safety Plan for this Project. The Design-Builder shall submit a detailed Safety Plan, which addresses each of the applicable safety items set forth in "Safety, Health and Environmental Control Plan", to LIRR within thirty (30) days of LNTP and prior to the Design-Builder's start of Work. LIRR will review the Safety Plan and designate the Design-Builder's Safety Plan approved, not approved or approved as noted. In the event LIRR determines that the Design-Builder's Safety Plan is not approved or approved as noted, the Design-Builder shall revise its Safety Plan to address any deficiencies and/or concerns identified by LIRR and resubmit the revised Safety Plan to LIRR no later than two (2) weeks after the Design-Builder is notified by LIRR that its Safety Plan requires revision. The approved and accepted Safety Plan, including copies of Safety Data Sheets (SDSs), shall be carried by the Safety Plan for emergency reference during the course of the Work.

B. The Design-Builder shall comply with the most stringent provisions of the applicable statutes and regulations of the City and State of New York, and the United States, including without limitation, the provisions of the United States Department of Labor Occupational Safety and Health Administration (OSHA) and the New York State Department of Labor (NYSDOL), are observed and further that the methods of performing the work do not involve undue danger to the personnel employed thereon, the public and public or private property. Should charges of violation of any of the above be issued to the Design-Builder in the course of work; a copy of each charge and resolution thereof, shall immediately be forwarded to LIRR.

C. Safety of passengers and other persons, Railroad employees, employees of the Design-Builder and its subcontractors, as well as protection of property and the environment, shall be a primary concern of the Design-Builder. The Design-Builder shall assume the full responsibility and obligation to provide a safe working environment at all times and shall maintain a safe, clean, and healthy worksite.

D. The Design-Builder shall comply with all the applicable federal, State, and local laws, rules, regulations, statutes, ordinances, and provisions including but not limited to the Federal Railroad Administration, the Environmental Protection Administration (Federal), Department of Environmental Conservation (State), Department of Environmental Protection (City), the National Fire Protection Association (NFPA) including National Electrical Code, the New York State Industrial Code, and the New York State Uniform Fire Prevention and Building Code.

2.19.3.1 Additional Safety Requirements

A. All products and materials used in connection with this Project shall remain asbestos and lead free.

B. The Design-Builder shall immediately notify LIRR if during the course of the Project there should be a discovery of any underdetermined substances, including suspected asbestos containing materials (ACM), and/or lead containing materials (LCM) without the prior authorization of LIRR.

C. If hazardous waste materials are detected or generated at any time, LIRR shall be immediately notified of each and every occurrence. No Work shall be performed in any area with suspected hazardous materials without the prior authorization of LIRR.

D. In accordance with OSHA and New York State Labor Law, the Design-Builder shall be responsible for the compliance with applicable laws, codes, rules, regulations and

standards with respect to safety and health regulations in accordance with the approved Safety Plan, and that requirements regarding safety and health are being fully implemented. The Design-Builder shall monitor/provide the Project with the adequate safeguards, including but not limited to the proper shoring, trenching, safe rigging, safety nets, fencing, barricades, scaffolding, and ladders, that are necessary for the protection of its employees, as well as the public and Authority employees. All rigging and scaffolding must be of good sound materials, of adequate dimensions for its intended use, and substantially braced, tied, or secured to insure absolute safety for those required to use it, as well as those within its vicinity. All riggings, scaffolding, and ladders shall be OSHA approved.

E. If any Emergency condition should develop during the entire Project, the Design-Builder shall immediately notify LIRR of each and every occurrence. The Design-Builder should also recommend any appropriate courses of action to LIRR.

F. Any review, acceptance, or approval of the Design-Builder's Safety Plan shall be construed merely to mean that LIRR is unaware of any reasons at the time to object thereto. Approval by an Agency of the Safety Plan shall not impose any liability upon LIRR's Project Manager, and/or LIRR itself, nor shall any such approval relieve the Design-Builder of any responsibilities under the Project.

G. The Design-Builder shall provide the maintenance of traffic and the protection of the public from damage to person or property, within the limits of and for the duration of the Project, through completion. This requirement shall include furnishing, installing, and maintaining temporary construction signs, sign supports, cones, arrow board trailers or arrow panels, truck mounted and other safety equipment, and maintenance of traffic control devices or methods as required per the NYSDOT's Manual of Uniform Traffic Control Devices.

H. All projects with respect to any LIRR's buildings shall conform to the New York State Uniform Fire Prevention and Building Code, and respective LIRR obligations under the Americans with Disabilities Act.

I. Prior to the start of any demolition work, relocation, repairing or re-routing of existing ducts, cables, conduits, raceways, junction boxes, plumbing lines, or roof structures, the Design-Builder shall notify LIRR in advance and obtain full clearance of any ACM and/or LCM within this work area. At no time should the Design-Builder be permitted to perform any work in an area presumed to be of ACM and/or LCM without the prior authorization of LIRR.

2.19.4 Design-Builder's Safety Manager

A. Each Safety Supervisor shall be familiar with the work being performed, shall be competent to instruct others, and shall be familiar with the SHECP.

B. The primary responsibility of the Safety Manager and Safety Supervisors shall be the management of all safety matters.

C. In the event of an Unsafe Condition, the Safety Manager and each Safety Supervisor shall have the authority to order the work to be stopped in the affected area until the Unsafe Condition is corrected.

D. A Safety Supervisor, or the Safety Manager, shall be present for each work shift at each work area. Failure to have the Safety Supervisor, or the Safety Manager, at a work area shall result in stoppage of work at that work area.

E. Safety Manager:

1. The Safety Manager, and each Safety Supervisor, shall have the authority and responsibility to direct and control the safe performance of the Work.
2. The Safety Manager shall be responsible for the development of the SHECP, shall continually monitor the Design-Builder's and each subcontractor's implementation of, and adherence to, the SHECP, and shall revise the SHECP when required.
3. At a minimum, the Safety Manager shall attend all Progress Meetings, Schedule Review Meetings, and Management Safety Meetings, as well as all meetings at which issues of safety are to be discussed.
4. The Design-Builder shall not change the approved Safety Manager without prior written consent of the Railroad.

2.19.5 Design-Builder Safety and Health Plan

The Design-Builder shall submit a Safety Plan to the Railroad. The Plan shall include the following:

A. Policy of Design-Builder concerning safety.

B. Scope of Safety Policy as it applies to the Project. If a generic plan is submitted, site specific information must be included to address additional needs.

C. Safety Organization: The Design-Builder shall designate an individual in its organization who is responsible for safety and has the background, authority and knowledge to understand what constitutes safe practices and to direct their implementation at the site.

D. Special Provisions for Project Safety and Health Programs, if applicable. Example:
   1. Scaffolding.
   2. Trenching.
   3. Blasting.
   4. Welding.
   5. Hoists.
   6. Cranes.
   7. Maintenance and
   8. Protection of traffic, confined space of entry, etc.

E. Safety and Health Training including the Consultant and/or Design-Builder's plan for regular scheduled safety meetings and other training to ensure safe practices. All on-site personnel will be required to attend LIRR Contractor Safety Course / Roadway Worker Protection Training in advance of any activity on the premises (See Training Procedures in Appendix TPA2.19A TRAINING PROCEDURES).

F. Reporting and Records Requirements including posting of emergency numbers and information and liaison with the Authority Project Manager, Facility Engineer, and/or General Manager of Facility Operations.

G. First Aid and Medical Emergencies including equipment available at site and it accessibility for use. Plan for replacement for expended First Aid materials.

H. Sanitation and Drinking Water.

I. Personal Protective Equipment including hard hats, safety shoes, harnesses, gloves, goggles, safety belts, etc.

J. Housekeeping

K. Fire Protection and Prevention including providing fire extinguishers at Authority job sites, fire drills, and training.

L. Electrical Safe Practices including light, temporary circuits, insulated tools, ground fault interruption (GFL), lockout/tagout practices.

M. Industrial Hygiene including Right-To-Know, SDS, etc.

N. Environmental Protection including Consultant and/or Design-Builder personnel protection, Authority personnel protection, prevention of air, water and solid contamination.

O. Cold Weather/Hot Weather Safety Practices.

P. Use of Power Actuated Tools methods of complying with Local Fire Department Regulations by using person holding a Certificate of Fitness.

2.19.5.1 Safety Orientation Program

A. The Safety Orientation Program is Design-Builder's written detailed plan and training program for the safety orientation of employees. Design-Builder's Safety Orientation Program shall include, at a minimum:

1. The Design-Builder Safety and Health Plan.
2. Applicable safety rules and regulations.
3. Responsibility of each employee to formally acknowledge receipt of safety rules, safety orientation and training prior to performing or being assigned duties on the Project.

B. The Safety Orientation Program shall cover the applicable construction hazards addressed by OSHA safety regulations and training described in 29CFR Part 1910, Occupational Safety and Health Standards and 29CFR Part 1926, Safety and Health Regulations for Construction.

C. Topics for the Safety Orientation Program include, at a minimum:

1. Emergency preparedness and response plan and drill.
2. Specific site hazards and safe working methods.
3. Review of hazardous materials communication program (SDS).
4. Track safety training for work on or adjacent to tracks or energized rails (initial two-year certification and subsequent two-year recertification required).
5. Personal protective equipment and safety procedures.
6. Fire prevention.
7. Location of first aid and medical facilities; and.
8. Operating track / energized OCS.

2.19.5.2 Management of Safety Documents

The Design-Builder shall maintain the following Safety Records for a period of not less than 6 years after Final Completion:

A. Safety, Health, and Environmental Control Plan.

B. Safe Work Plans.

C. Daily Safety Reports.

D. Worker Safety Meeting records.

E. Training records and Certification Cards including, Safety Orientation, Roadway Worker and all other training provided to employees.

F. Competent Person Designations.

G. Safety Data Sheet (SDS).

H. Accident/Incident reports including; Report of Injury, Accident Investigation Report, LIRR Form Accident Report Non-Employee (ARNE) and OSHA Form 200.

I. Written notice of Citations, Suits, or Complaints.

J. Other compliance records as required by City, State, and Federal Agencies.

2.19.5.3 Daily Safety Audit Checklist

A. The Design-Builder shall prepare a Daily Safety Audit Checklist, identified in the LIRR CSHP as Form 110 (see Appendix TPA2.19B DAILY SAFETY AUDIT CHECKLIST), including at a minimum:

   1. Header stating:
      i. Title of Contract and Contract Number.
      ii. Date.
      iii. Time of shift.
      iv. Work area(s) inspected, and
      v. Weather conditions.

B. An entry for each safety deficiency that includes:

   1. Location and nature of deficiency.
   2. Time noted, Names of persons and firms that were notified* of the deficiency including time notified; and
      *Notification shall include at a minimum the parties exposed to the safety hazard, the parties responsible for creating the deficiency, and the parties responsible for correcting the deficiency.
   3. Time and nature of corrective action(s).

C. An entry for each deficiency that was not corrected on the prior shift's Daily Safety Report until the deficiency is corrected.

D. A notation of each accident, incident, or injury reported (including name of injured party or affected property owner, time of accident, incident, or injury), and description of accident, incident, or injury.

E. Notation of Safety Meetings conducted and attended including type of meeting and the name of each person in attendance.

F. A notation of visits by safety representatives of the Railroad, City, State or Federal Authorities, including name and phone number of representative, time of visit, and department or authority represented.

G. Printed name and signature of person completing the report.

2.19.5.4 Safety, Health and Environmental Control Plan

A. The Design-Builder shall develop and maintain a Safety, Health, and Environmental Control Plan (SHECP) to:

1. Protect the lives and health of all persons.
2. Prevent damage to the property of others.
3. Prevent damage to the environment.

B. Each subcontractor shall comply with the SHECP as approved by the Railroad, and shall provide written notification of its intent to adopt and comply with the SHECP. If a subcontractor elects to submit its own Plan, it shall meet the requirements of this Section, be approved by the Design-Builder, and be incorporated into the SHECP.

C. The SHECP including each subcontractor's notice of intent to comply with the SHECP shall be readily available for review by the Railroad.

D. The Design-Builder shall take immediate action to prevent the recurrence of each accident or incident. In addition, the Design-Builder shall review the SHECP based on such an occurrence and revise as necessary. Upon any changes in work conditions, the Safety Manager shall also revise the SHECP. The Design-Builder shall submit each revision of the SHECP to the Railroad for review.

E. The SHECP shall be organized as follows:

1. Cover page with name of Design-Builder, Title of Contract, and Contract number. Include plan revision number, date of revision, name and signature of Safety Manager.
2. Table of contents listing each section and exhibit that clearly identifies the revision number and date of each section and exhibit.
3. Safety Policy Statement signed by an Officer of the Design-Builder.
4. Organization chart of Design-Builder and subcontractor personnel responsible for implementing the SHECP and their duties and responsibilities. The chart shall show the reporting relationship and integration of the Safety Manager with all personnel, including top-level managers, responsible for implementing the SHECP.
5. Detailed description of Safety Supervisor's duties and responsibilities.
6. A Site inspection procedure to ensure that a walk-through of the Site is conducted daily for each work shift and recorded in a Daily Safety Report. Include copy of Report form.

7. An accident investigation procedure including a decision chart for identifying root causes. Include accident investigation form(s).
8. A plan for the safe and effective response to medical emergencies for Design-Builder and subcontractor personnel. Emergency medical services shall include first-aid treatment (including all necessary first aid supplies), and ambulance service (or other standing arrangement) for the immediate transport of injured workers to medical treatment. Include a map of local routes to medical treatment facilities.
9. An evacuation plan that designates one or more assembly areas for personnel and ensures that each person is accounted for in the event of fire or other such emergency.
10. A list of emergency phone numbers which shall identify the proper numbers to call for all emergencies including fire, police, medical (hospital, clinic, ambulance), disruptions of train service (LIRR Train Movement Bureau), and the release of contaminants into the environment. Identify the location of phones to be used for emergency notification.
11. Disciplinary procedures for violations of safety rules.
12. A detailed safety orientation plan for Design-Builder and subcontractor personnel, including:
    i. Description of the Work.
    ii. Review of Safety Policy Statement.
    iii. Discussion of general safety rules with a copy of the rules distributed to each employee.
    iv. Procedure for notification of accidents, injuries and incidents.
    v. Location of First Aid and nearest Medical facilities.
    vi. Evacuation and emergency escape routes.
    vii. Specific Site hazards and safe work practices.
    viii. Review of public safety concerns.
    ix. Attendance requirements at Worker Safety Meetings.
    x. Personal Protective Equipment requirements.
        a. For the duration of the Project and in accordance with OSHA and New York State Labor Law, the Design-Builder shall take responsibility to ensure that all employees of this Project are provided with the necessary personal protective equipment (PPE), including any required personnel traffic safety equipment. Personal protective equipment as required shall include, but not be limited to, hard hats, safety shoes, gloves, goggles, eye/face shield protection, safety belts, harnesses, respirators, hearing protection, traffic safety vests, etc.
        b. All Design-Builder employees walking on or along LIRR roadways and Right-of-Way, and other areas of LIRR facilities designated by any of LIRR during the course of the Project, shall at all times wear

safety equipment designed to provide high visibility under all lighting and weather conditions. The safety equipment shall be worn on all occasions, no matter how brief. Furthermore, the safety equipment shall be worn whenever so directed by LIRR.

c. The safety equipment shall be for outermost wear and shall consist of fluorescent orange, and safety reflective material, or equipment with both properties combined, consistent with ANSI Class II Safety Apparel. The exact nature of the equipment required (generally safety vests) will be determined solely by LIRR, and may be modified by LIRR during the course of the Project as it deems fit. All safety equipment provided and worn shall be subject to approval by LIRR.

d. The Design-Builder shall have the responsibility for monitoring and enforcing compliance by all employees and subcontractors with these provisions regarding the wearing of safety equipment. Any Design-Builder employees not in compliance will be forbidden to work on LIRR's premises.

e. No separate rate of measurement and payment will be made for any compliance within this section.

xi. Substance abuse policy.

xii. Fire prevention requirements.

xiii. Review of hazardous communication program.

xiv. Housekeeping requirements.

xv. Construction equipment safety.

xvi. Vehicle safety.

xvii. Warning devices and safety postings.

xviii. Disciplinary procedures.

13. Outline of general safety rules and procedures for the performance of the Work. The Design-Builder shall ensure that all applicable safety regulations are addressed and included in this section. Examples for inclusion in this section are as follows:

    1. Hazcom Program.
    2. Hearing Conservation Program.
    3. Respiratory Protection Program.
    4. Confined Space Program.
    5. Use and storage of compressed gases.
    6. Use and storage of flammable liquids and toxic materials.

14. Outline of site-specific safety rules and procedures for the performance of the Work. Examples for inclusion in this section are as follows:

    1. Plans for safe ingress and egress.

2. Traffic control plans.
3. Public protection.
4. Plans for fire protection and emergency response.
5. Plans for Lead and Asbestos Abatement.

15. A plan for site security including prevention of unauthorized entry onto the Site and prevention of vandalism.

2.19.5.5 Environmental and Hazardous Material Response Plan

A. The Design-Builder shall develop an Environmental and Hazardous Material Response Plan in accordance with OSHA Parts 1910 and 1926. The Environmental and Hazardous Material Response Plan shall include at a minimum:

1. Identification of potential environmental accidents and emergencies associated with site-specific construction activities.
2. Response procedures to construction site environmental accidents and emergencies and for the prevention and mitigation of the environmental impacts that may be associated with them.
3. Annual reviews and revisions of the Emergency Preparedness and Response Plan, in particular after the occurrence of environmental accident and emergency.

B. The Design-Builder shall ensure that each hazardous material is clearly marked or labeled in accordance with either the NFPA 704 Hazard Warning System (NFR Diamond) or the new color bar format (HMIG labels) as specified in the OSHA Federal Hazard Communication Standard (29 CFR 1900.1200). Each Hazardous material shall be stored in accordance with the manufacturer's recommendations, NFPA Standards, OSHA Standards, and all other storage provisions of the Contract Documents.

2.19.5.6 Blasting

Blasting is prohibited on Railroad property.

2.19.5.7 Electrical

Ground Fault Circuit Interrupters (GCFI) designed for personnel protection shall be used on all electrical services used by workers. Assured grounding may only be used for temporary light circuits. All other power sources, including portable generators (regardless of wattage), as well as extension cords plugged into permanent power sources, shall be protected by GFCI.

2.19.5.8 Power Actuated Tools

All operators of powder-actuated tools (e.g., Hilti, Ramset) shall be trained in the use of the specific tool by the manufacturer. In addition, a NYC Fire Department Certificate of Fitness shall be required for work within the New York City limits.

2.19.5.9 Rigging and Lifting Operations Safety Compliance

A. In addition to complying with the requirements of the referenced sections, the cited standards, OSHA, and other specified safety provisions, the Design-Builder shall:

1. Ensure that personnel, who direct, rig, and handle the loads have received proper training.

2. Ensure hoisting equipment is only operated by a trained, experienced, competent, and licensed operator.
3. Comply with 29 CFR 1926.550 for work over water.
4. Station a signal person at all times within view of the operator when operating cranes or hoisting loads that are within close proximity of a power line to warn when any part of the equipment or its load is approaching the minimum safe distance from the power line.
5. Maintain at least the minimum clearances of crane and its load from energized electrical equipment and lines: less than 69 KV = 10 feet, 69 KV= 11 feet, 138 KV = 13 feet, 345 KV = 20 feet. If the operation infringes upon the required clearances, the Design-Builder shall coordinate such lifting operations with the appropriate utility company and shall be responsible for the required protection of such including, but not limited to, de-energizing and grounding, temporarily altering electric lines, insulating lines, and dropping existing wires.
6. Station a competent signal person during the lifting operation whenever the operator's view of the path of travel of the equipment, load, or components is obstructed. The signal person shall be:
    i. Fully qualified by experience with the operation.
    ii. In full view of the operator and intended path of travel of equipment, load, and component.
    iii. In constant communication with the crane operator either visually with hand signals or audibly by radio throughout the operation.
    iv. Only the Design-Builder designated signal persons shall give signals to the operator, however, the operator shall obey a stop signal at all times, no matter who gives the signal.
7. Designate 1 qualified person when 2 or more cranes or hoists are used to lift a load.

2.19.5.10 Welding and Cutting

Welding and cutting equipment and operations shall meet the requirements of the ANSI Z49.1 Standard, and the requirements of this section as followed:

A. Gas welding and cutting equipment shall be listed by Underwriters Laboratories, (UL) or by Factory Mutual, (FM).
B. Prior to any welding, cutting or burning in work areas designated by the Railroad, the Design-Builder shall obtain an LIRR Hot Work permit.
C. Welding apparatus and equipment shall be inspected daily, prior to use. Defective apparatus and equipment shall not be used and shall be removed from service until repaired or replaced.
D. Whenever the operator leaves the work area, the cylinder valves shall be closed.
E. Torch valves shall be checked for leaks at the start of each shift.
F. Only friction lighters or other approved devices shall be used to light torches.

G. Splices or repaired insulation on arc welding cables shall not be permitted within 10 feet of the electrode holder. Cables shall be positioned so as not to interfere or create obstructions on walkways, scaffolds, stairs or ladders. Splices shall be equal to or greater than the original insulation on the cable.

H. Portable welding screens or shields shall be used to protect other workers and/or the public in the immediate area.

I. Fire extinguishers rated at 10 ABC or larger shall be in the immediate area whenever welding or cutting is being carried out.

J. When welding, cutting or heating is such that normal fire prevention precautions are not considered adequate, Fire Watchers shall be assigned and maintained for a minimum of 30 minutes following the completion of the last cutting or welding operation.

2.19.5.11 Roadway Worker Protection (RWP)

A. Each employee of the Design-Builder and its subcontractors, whose duties include working on or near the Right of Way, shall attend a Roadway Worker Protection training session prior to performing such duties for the first time and annually thereafter.

B. The RWP training session, which normally lasts 4 hours, shall be given by the Railroad as required during the Project, and will be conducted in the English language.

C. Each work shift that involves work activities on or near ROW shall begin with an RWP briefing of worksite personnel, delineating the RWP measures and procedures to be used. The Design-Builder shall set aside a 15-minute period for the RWP briefing. The RWP briefing shall be conducted by the Railroad's Roadway Worker in Charge (RWIC).

2.19.5.12 Fires on Construction Sites

A. Upon observation of a fire at any Project site, the Design-Builder shall immediately notify the appropriate Fire Department then the appropriate site personnel. This notification shall be made by the fastest possible means. Where a radio transmitting on a LIRR's frequency is available, that radio shall be used to contact the appropriate site personnel, using the Facility's name. If a suitable radio is not available, a facility phone, cellular phone or outside phone line shall be used to call the appropriate person(s). This individual shall be advised of all the relevant information, which must include a description of the exact location of the fire. If the fire is located on or adjacent to the roadway, the location description shall include bridge lamppost or tunnel marker number, lane direction and lane number.

2.19.6 Safe Work Plan (SWP)

A. The SWP Document shall be structured to correlate with the Six-Week Rolling Schedule. By maintaining parallelism in document formats, a consistent, cohesive effort will effectively merge safety into the construction management process.

B. Each primary construction task on the Six-Week Rolling Schedule shall be identified and described in the SWP with corresponding sub-tasks as appropriate. The following headings should be used for the SWP:

1. Primary Task: (Six-Week Rolling Schedule) Describe scope of work.
2. Work Element(s) Describe sub-tasks and activities of the Primary Task, as appropriate. Identify the equipment and methods of construction for the Work Element.

3. Hazard Description Describe each foreseeable hazard for the Work Element.
4. Accident Prevention Methods
    i. Describe controls and procedures that will be implemented to reduce or eliminate each foreseeable hazard described above; reference attachments as necessary. When controls are compliance based, such as for confined space entry, all applicable compliance information shall be included or appropriately referenced. Of particular concern are training items that will be required to educate the employees about exposures such as Tool box meetings held to discuss the hazard and accident prevention methods. More formal training (offsite, confined space, trenching, competent person, etc.) should be listed and documentation referenced or provided.
    ii. Priority should be given as follows in controlling hazards:
        - Elimination of the hazard.
        - Engineering controls.
        - Provision of Personal Protective Equipment (PPE).
        - Management controls / training, such as a safety monitor for falls exposures.
5. Accident prevention procedures shall be based on industry standards including but not limited to:
    i. OSHA Standards.
    ii. Mine Safety and Health Regulations.
    iii. American National Standards Institute (ANSI).
    iv. National Fire Protection Association (NFPA).
    v. American Conference of Governmental Industrial Hygienists (ACGIH).
    vi. Absence of an applicable standard or regulation does not preclude the Design-Builder from providing appropriate controls within an SWP. Specific references in the SWP to codes, standards, and regulations are not necessary.

2.19.7 Accident Reporting and Investigation

A. The Designer-Builder shall provide such equipment and facilities as necessary or required in case of accident and/or personal injury, for first aid service to anyone who may be injured during the progress of work, within the limits of and for the duration of the Project. In addition, the Design-Builder shall have standing arrangements for the removal and hospital treatment of any person who may be injured or who may become ill.

B. The Design-Builder shall report immediately to the Railroad, any accident and/or personal injury resulting in lost time to employees, vehicle accidents, or any accident resulting in damage to Authority property or the public, and shall furnish in writing, full information including testimony of witnesses regarding any and all, accidents and injuries.

C. The Design-Builder must, within forty-eight (48) hours, report in to the Railroad all accidents whatsoever, occurring upon the site of the Work, or arising out of or in connection with the performance of the Work (whether or not on or adjacent to the site)

which cause death, personal injury, or property damage, giving full details and statements of witnesses.

D. In addition, if death or serious injuries or serious damages are caused, the accident shall be reported immediately to the Railroad orally and filed in writing within forty-eight (48) hours. The original NYS Employers Report of Injury Form C-2 must be sent to the Workers Compensation Board in accordance with the Board's instructions. In addition, LIRR ARC form entitled Design-Builder Accident/Incident Report must be filled out for every accident occurring upon the site of the Work, or arising out of or in connection with the performance of the Work. The completed form shall be mailed to:

System Safety Department
Long Island Rail Road
144-41 94th Avenue – 4th Floor
Jamaica, NY 11435

E. A copy of the ARC form must also be provided to the Railroad. If any claim is made by any third person against the Design-Builder on account of any accident, the Design-Builder shall, within forty-eight (48) hours, report the fact in writing to the Railroad, giving full details of the claim. All notices given to the Railroad in accordance with the notice must be copied to:

Ms. Kristin Woodhouse

Director—Claims & Investigations

Law Department

Long Island Railroad

93-02 Sutphin Boulevard, 4th Floor

Jamaica, New York 11435

[redacted]@lirr.org

F. A Serious Accident shall be defined as an accident or incident that reflects more than $5,000 in property damage, causes death, or causes Serious Injury, which shall include but not be limited to:

1. Spinal cord injuries.
2. Burns to 10% of more of the body.
3. Amputations or crushing injuries.
4. Eye injuries causing partial or full loss of sight.
5. Injuries causing loss of hearing.
6. Severe head injuries.
7. Any occupational disease.
8. Any occurrence resulting in hospitalization. In the event of a spill (or release) of a reportable quantity of a hazardous material, the Design-Builder shall immediately notify the appropriate authorities having jurisdiction and the Railroad. The Design-

Builder shall be responsible for statutory reporting and shall bear all costs for immediate clean up and disposal of spilled materials or liquids.

2.19.8 Construction Safety Report

The Design-Builder shall submit a Construction Safety Report for Information on a monthly basis. The Construction Safety Report shall contain summary data for the previous month and Project total data including, at a minimum:

A. Number of first aid cases.

B. Number of recordable cases.

C. Number of lost time cases.

D. Number of days lost.

E. Total man-hours worked.

2.19.9 Unsafe Conditions

A. An Unsafe Condition is a condition that gives rise to the imminent possibility of Serious Injury to workers or the public, of serious damage to property or the environment, or of affecting the safe movement of trains. When an Unsafe Condition exists at the Site, work shall be stopped in the affected area until the condition is corrected.

B. If the Design-Builder does not take corrective action immediately, or within the time period specified by the Railroad, the Railroad reserves the right to take whatever action is required to correct the Unsafe Condition.

2.19.10 Fitness for Duty

A. The Design-Builder shall not permit a worker whose ability or alertness is impaired because of drugs, fatigue, illness, intoxication, or other conditions to work at the Site. The Design-Builder is encouraged to have a substance abuse program, pre-employment drug testing, and testing for cause.

B. The Design-Builder shall not permit the possession or consumption of illegal drugs or alcohol on the Site.

C. The Design-Builder personnel performing "Safety Sensitive Functions" shall be subject to drug and alcohol testing, which Design-Builder shall perform in accordance with applicable provisions of the Contract Documents and U.S. 49 CFR Parts 40, Procedures for Transportation Workplace Drug and Alcohol Testing Programs, and 655, Prevention of Alcohol Misuse and Prohibited Drug Use in Transit Operations.

2.19.11 Control of Drug and Alcohol use

A. On June 10, 2016, the FRA published a final rule expanding the scope of its drug and alcohol testing regulations to provide that “each railroad must ensure that a regulated employee is subjected to being selected for random testing…whenever the employee performs regulated service on the Railroad’s behalf.” (Reference 49 CFR 219.601). A regulated employee includes a contractor to the Railroad or any individual who is performing activities for the Railroad and includes those Contractors or individuals who are deemed “maintenance of way” (MOW) employees under 49 CFR 219.5.

B. The Design-Builder shall submit a Part 219 Railroad Contractor Drug and Alcohol Compliance Plan to LIRR and FRA prior to the Notice of Award.

C. The Design-Builder shall establish a random testing pool to ensure an initial minimum annual testing rate of 50% for drugs and 25% for alcohol for its MOW employees.

D. Each Design-Builder employee hired after June 11, 2017 shall have a negative DOT pre-employment drug test on file with his or her employer.

E. Pursuant to 49 CFR 40.25, the Design-Builder shall check the drug and alcohol testing record of any employee it intends to use for regulated service before the employee performs such service for the first time for LIRR. The Design-Builder shall maintain such records or any future records; and provides such records upon request by either the FRA or LIRR.

F. The Design-Builder shall have an in-house employee whose function it is to act as the Designated Employer Representative (DER).

G. The Design-Builder shall, on an annual basis, perform at least 2 Drug and Alcohol observations per each of its MOW employees. E.g. if the Design-Builder has 1000 MOW employees, it must do 2 observations/per year X 1000 employees, or 2000 observations.

H. LIRR contractors are subject to bi-annual audits of their Drug and Alcohol Programs for compliance by LIRR and whenever requested by the FRA pursuant to 49 CFR 219.263(b). LIRR contractors who do not comply with this federal regulation and provide documentation of such will not be permitted to work on LIRR property and may be subjected to termination of their contracts. For more information related to the requirements of this regulation, please refer to

https://www.gpo.gov/fdsys/pkg/FR-2016-06-10/pdf/2016-13058.pdf

I. A model Part 219 Railroad Contractor Drug and Alcohol Compliance Plan has been prepared by the FRA for contractors to use in preparation of their plans. A copy of the model plan can be found at the following:

https://www.fra.dot.gov/eLib/details/L02815

J. LIRR contractors are required to submit a copy of their Part 219 Railroad Contractor Compliance Drug and Alcohol Plans to the FRA and the LIRR :

FRA Drug and Alcohol Program Manager

U.S. Department of Transportation

Federal Railroad Administration, Office of Railroad Safety – RRS-19

1200 New Jersey Avenue SE

Washington DC 20590

Christopher M. Yodice – DER

LIRR Medical Office

300 Old Country Road

Suite GL-71

Mineola, NY 11501

K. Questions regarding the plans and/or the federal regulation shall be directed to Mr. Gerald Powers, Drug and Alcohol Program Manager, Office of Safety Enforcement, Federal

Railroad Administration, 1200 New Jersey Avenue SE, Mail Stop 25, Washington, DC 20590 or via telephone [redacted]

2.19.12 Employee Conduct

The Railroad reserves the right to refuse access to the Site or require immediate removal from the Site any individual violating site safety or security regulations.

2.19.13 Design-Builder Vehicle Operation Safety

A. The Design-Builder shall operate its vehicles in compliance with applicable laws, as well as, in accordance with the LIRR Vehicle Operation Safety Policy and General Safety Rules. The Design-Builder shall be subject to periodic audits.

B. The Design-Builder shall require its drivers to inspect vehicles before and after each tour of duty and file daily vehicle status reports with their supervisors. The daily vehicle status reports shall be maintained by the Design-Builders as a business record.

C. The Design-Builder shall require its drivers to report vehicle defects directly to their supervisors. Unsafe vehicles shall not be brought on to LIRR property.

D. The Design-Builder shall ensure that only authorized alterations be permitted on its vehicles and equipment and that if alteration are made, they do not compromise safety.

E. The Design-Builder shall warrant that its policy is to ensure that each of its drivers shall:

1. Have a valid driver's license specific to their job activities and to the class of motor vehicle they operate.
2. Comply with the LIRR Vehicle Operations Safety Policy and General Safety Rules.
3. Operate vehicles on LIRR property for business-related purposes only. Utilize appropriate safety equipment (e.g., seat belts, shoulder harnesses, etc.).
4. Allow only authorized personnel as passengers of vehicles.
5. Perform pre-trip and post-trip vehicle inspections to ensure that the vehicle and associates safety features are in good working order. Provide a copy of the vehicle status report to their supervisors, and if necessary, initiate repairs.
6. Make certain vehicle contains all required documentation (e.g. vehicle inspection report, registration, insurance documentation, etc.).
7. Observe traffic laws and, when applicable, hazardous material regulations.
8. Vehicle and equipment operators shall inspect and test essential controls, safety equipment, and safety devices before placing the vehicle or equipment in use. Construction equipment, whether owned, leased, or rented, shall be removed from service if unsafe.
9. Modification of construction equipment affecting its safety shall not be performed unless approved in writing by the manufacturer.
10. All motor vehicle and equipment operators shall be trained for the type of equipment they operate.
11. Self-propelled equipment shall be equipped with backup lights and a reverse signal alarm. The alarm shall produce a 0.2 to 0.5 second audible warning within the initial 3 feet of backward movement of the vehicle on which it is mounted and at regular intervals thereafter of not more than 3 seconds, throughout the backward

movement. The alarm shall automatically cut out when backward movement ceases. Sound intensity shall range from 90 to 100 dbs. at a distance of 5 feet from the alarm. Actuation shall be automatic by direct connection to any part of the equipment that moves or acts in a manner distinctive only of rearward movement of the vehicle, with no manual controls between the source of actuation and the alarm.

12. Vehicle and equipment operators shall inspect and test essential controls, safety equipment, and safety devices before placing the vehicle or equipment in use. Construction equipment, whether owned, leased, or rented, shall be removed from service if unsafe.
13. Modification of construction equipment affecting its safety shall not be performed unless approved in writing by the manufacturer.
14. All motor vehicle and equipment operators shall be trained for the type of equipment they operate.
15. Self-propelled equipment shall be equipped with backup lights and a reverse signal alarm. The alarm shall produce a 0.2 to 0.5 second audible warning within the initial 3 feet of backward movement of the vehicle on which it is mounted and at regular intervals thereafter of not more than 3 seconds, throughout the backward movement. The alarm shall automatically cut out when backward movement ceases. Sound intensity shall range from 90 to 100 dbs. at a distance of 5 feet from the alarm. Actuation shall be automatic by direct connection to any part of the equipment that moves or acts in a manner distinctive only of rearward movement of the vehicle, with no manual controls between the source of actuation and the alarm.
16. Except for deliveries and other essential functions related to the Work, vehicles shall be prohibited from entering the Site.
17. Personal vehicles shall be prohibited from entering the Site.
18. Vehicles shall not block access for emergency equipment.
19. Company identification shall be clearly displayed on each vehicle.
20. Pedestrians shall have the right of way at all times. The speed limit on Railroad property is 5 MPH unless otherwise posted.
21. Any other related safety information.

2.19.14 Right-of-Way Restrictions

A. Measuring Tapes: Only cloth or fiberglass measuring tapes shall be used on or near the LIRR ROW.

B. Ladders: Only ladders made of fiberglass shall be used in manholes, near power lines, and on or near the Railroad Right-of-Way.

C. Orange Paint: The use of orange paint on or near the tracks is prohibited.

2.19.15 Utility Mark-Out

A. The Design-Builder shall adhere to the requirements of NYCRR Subpart 753-3, Duties of Excavators, except as otherwise specified herein.

B. The Design-Builder shall take the necessary precautions to locate and identify existing public utilities and shall notify the local Call Before You Dig or One Call Center at least 1 week prior to excavating, augering, drilling, pile driving, sheet piling, or other ground penetrating activities.

C. The Design-Builder shall take the necessary precautions to locate and identify existing Railroad utilities and shall notify the Railroad at least 10 Calendar Days prior to excavating, augering, drilling, pile driving, sheet piling, or other ground penetrating activities. The Design-Builder shall request a mark-out from the Railroad and contact the local Call Before You Dig or One Call Center, as required. The Design-Builder shall exercise good judgment whenever using mechanized equipment or hand digging on LIRR property. Mechanized equipment and equipment used for hand digging shall be in good working order and shall meet LIRR requirements for the application.

D. The Design Builder shall initiate a mark-out request by completing the required sections of the form in Appendix TPA2.19C REQUEST FOR MARK-OUT, providing at a minimum:

1. The location of the required mark-out.
2. A description of the work to be performed.
3. Applicable diagrams and/or photos.

F. The Design-Builder shall submit the completed form to the Railroad for approval and processing. The request shall be submitted a minimum of 10 Calendar Days prior to the start of any excavation. The Design-Builder shall use the One Call system for any non-railroad utilities or utilities outside the ROW.

E. The completed mark-out request is valid for only 10 Calendar Days from the approval date on the request.

F. Should any problems occur while the Design-Builder is performing its excavation work, all work shall cease until LIRR and all other affected parties are so notified and the problem(s) resolved.

G. When the work has been completed, the Design-Builder shall notify LIRR that all workers are clear and the work area is secure.

2.19.16 Rigging and Lifting Operations

2.19.16.1 Pre-Rigging and Lifting Operations

A. The Design-Builder shall inspect and test each crane assembled on site. An inspection report shall be transmitted to the Railroad prior to the lifting operation.

B. The Competent Person shall be present during the lifting operation and shall inspect the machinery and equipment prior to each use to ensure its safe operating condition. Identified deficiencies shall be repaired before continued use.

C. Comply with manufacturer's specifications and limitations and with requirements of the American National Standards Institute (ANSI) for crane operations. Rated load capacities, recommended operating speeds, special hazard warnings, and instructions shall be posted on the equipment.

D. Rigging shall be capable of safely handling 150% of the actual load. Wire ropes, chains, and fiber slings shall have the manufacturer's safe working load identified and attached to each item. Each sling and fitting shall be inspected daily for signs of wear and abrasion,

broken wires, worn or cracked fittings, loose seizing and splices, kinking, crushing, flattening, and corrosion. Damaged rigging shall be immediately removed from service.

E. The Railroad will conduct a job briefing prior to each shift identifying hazards that the Design-Builder's personnel will be working near, including active tracks, third rail power, and high-tension power cables. Each Design-Builder personnel shall be required to attend and shall sign the roster verifying such attendance.

2.19.16.2 Readiness Review Meeting

A. The Design-Builder and its lifting and rigging operator shall attend a Readiness Review Meeting with the Railroad at least 15 days prior to the lifting operation to review all aspects of the Plan.

2.19.16.3 Standby Crane

A. When required by the Project, the Design-Builder shall have a standby crane and associated parts readily available. In addition:
    1. Standby crane shall be available such that the Design-Builder's critical work can resume within 3 hours.
    2. Location and source of the standby crane shall be identified in the Design-Builder's work plan.
    3. A minimum of 3 hours shall be reserved in the Design-Builder's work plan as contingency for such lifting operations.

2.19.16.4 Rigging and Lifting Operations Requirements

A. The Design-Builder shall:
    1. Cart away debris at the end of each shift.
    2. Restore property damaged from lifting operation.
    3. Adequately and securely ground cranes and hoisting equipment.
    4. Provide Competent Person to observe clearances of equipment when difficult for the operator to maintain proper clearance by visual means.
    5. Select multi-legged slings based on most heavily loaded leg.
    6. Call for mark-outs in the work area and for areas in which the crane will be positioned.
    7. Ensure that all loads are properly rigged and secured to prevent the dislodgement of any part.
    8. Securely sling and properly balance loads before set in motion.
    9. Ensure loads are kept under control at all times. Use tag lines unless doing so would create an unsafe condition.
    10. Ensure loads are safely landed and properly secured before being unhooked and unslung.
    11. Ensure each lifting beam is plainly marked with its weight and designed working load.

12. Avoid impact loading caused by sudden jerking.
13. Ensure loads are never carried or suspended over any person.
14. Secure loose pieces of load before it is moved.
15. Ensure load is free before lifting and all sling legs are taking the load.
16. Ensure slings are made from the same materials when using two or more slings on a load.
17. Lower loads onto adequate blocking to prevent damage to slings and load.
18. Ensure crane is on firm foundation that is uniformly level to within 1%.
19. Lower boom faced away from track at end of work shift.
20. Secure crane when on Railroad property and not in use.
21. Perform trial lift immediately prior to the actual lift to ensure crane's rigging is properly secured. Record actual weight of each lift and provide such to the Railroad.

2.19.16.5 Quality Control

A. Personnel shall be properly trained, qualified, and licensed as required to perform the work.

2.19.16.6 Restrictions

A. Rigging and lifting operations shall not commence unless the Railroad has approved the required submittals. Such submittals shall include acknowledgement that the rigging and lifting operations will conform to the Contract Documents. Additionally, such submittals shall specifically state that the rigging and lifting operator shall comply with this Section.

B. No lift shall be made over property owned by others without written permission from the property owner.

C. Only crane equipment as originally manufactured will be approved by the Railroad for operations on or near the Railroad property.

2.19.16.7 Submittals

A. Rigging and lifting plan 6 weeks prior to scheduled lift, reviewed and stamped by a Licensed Professional Engineer registered in the State of New York, including:

1. Plans and details showing locations of crane(s), operating radii, delivery locations, placement locations, and disposal locations. Show overhead and underground obstructions and potential hazards including, but not limited to, overhead wires, aerial structures, curbs, basins, outline of buildings, manholes, fences, and other physical features. Show weight of picks, load transferred to soil, soil bearing capacity, lateral earth pressure distribution, and mat details. Show hitch and rigging details indicating geometry and capacity of bridles, shackles, equalizers, slings, hitches, lifting inserts, eyes, and the like.
2. Ground support (or grillage design) details with calculated shear and bending moment of cribbing and/or mat utilized. Actual timber dimensions (not nominal dimensions) shall be used for cribbing calculations.

3. Calculations shall substantiate information shown with generally accepted industry assumptions and reference documents. Soil bearing capacity shall be as a result of field-testing or utilize generally accepted industry presumptive soil bearing capacity.
4. Crane manufacturer's load and rating charts demonstrating that for each pick, swing, and radius, the crane has the capacity to safely lift a load that is 150% of the actual load. The actual load shall include the object being picked plus the hook blocks, hooks, slings, equalizer beams, material handling equipment, and other elements of lifting tackle.
5. Catalog data specific to the crane to be utilized.
6. Rigging manufacturer's catalog cut for each hook block, hook, sling, equalizer beam, and element of lifting tackle demonstrating that each such item has the capacity to safely lift a load that is 150% of the actual load or portion thereof.
7. Procedure(s) indicating the sequence of operations, including the order of lifts and any repositioning or re-hitching for the crane or temporary support of any components. Clearly identify staging sequences and lay-down areas.
8. Detailed schedule of the various stages of operation and the overall time for the entire lifting operation.
9. Haul routes for transporting crane and/or load to the site, including permits.
10. Documentation, including street closure permits, required by the municipality in which the work is being performed.
11. Crane Operator's License (submit again 1 week prior to lifting operation)
12. Certificate of Inspection (submit again 1 week prior to lifting operation)
13. Copy of Maintenance Records (submit again 1 week prior to lifting operation)
14. Name and resume of Competent Person responsible for crane inspection, testing, rigging, and lifting operation.
15. Contingency plan in the event of an equipment failure or inability to transport load to site as planned.

B. Modifications or additions to Railroad approved plans, lifting operations, and crane equipment shall be submitted to the Railroad in accordance with the preceding requirements.

2.19.17 Underground Utilities

A. Prior to excavating, augering, drilling, pile driving, sheet piling, or other ground penetrating activities, the Design-Builder shall review the plans and site mark-outs for existing underground utilities.

B. The Design-Builder shall source and verify each utility location and, if its removal or relocation is required, shall liaison with the utility owner.

C. The Design-Builder shall consider each mark-out as approximate and shall, unless otherwise approved by the utility owner, hand dig test pits if the edge of the planned ground penetrating activities will be within 5 feet of a mark-out. Test pits shall be a minimum of 5 feet deep with no more than 10 feet between test pits.

D. Unless an alternate method is approved by the Railroad, the Design-Builder shall hand dig to a minimum depth of 5 feet below grade in areas indicated as “hand digging required”.

E. The Design-Builder shall protect each utility, shall schedule all connections, disconnections, and reconnections with the utility owner, and shall ensure continuity of services at all required times as determined by utility owner. If the condition of a utility is determined to be unsafe, the Design-Builder shall immediately notify the utility owner and proceed in accordance with the utility owner’s directions.

F. Whenever a utility is encountered during the performance of the Work, the Design-Builder shall stop the associated work, notify the Railroad, and proceed in accordance with the Railroad directions.

G. In the event of contact with a utility, the Design-Builder shall immediately call the Railroad’s Engineering System Operators at (718) 558-8285.

H. The Design-Builder shall act immediately to restore to the prior level, each utility damaged during construction. Each utility cut, interfered with, or damaged, including insulation, shall be fully restored.

I. The Design-Builder shall permit reasonable access to each utility for the purpose of inspection and maintenance.

2.19.18 Influence Zones

Excavations shall not be permitted within the influence zone of any track or bridge structure including poles or signal foundations. If a required excavation will encroach on any line of influence, the excavation support system shall be designed to carry a Cooper E-80 live load.

2.19.19 Demolition

The Design-Builder shall perform all necessary explorations and probes to determine the protection required prior to performing any demolition.

2.19.20 Cleanup and Disposal

The Design-Builder shall maintain the work site in a clean and orderly manner. All debris shall become the property of the Design-Builder and shall be removed promptly from the work site and lawfully dumped.

2.19.21 Compressed Gas Cylinder Storage

A. All compressed gas cylinders shall be stored, used, and handled in accordance with the Compressed Gas Association guidelines, NFPA Standards, and the requirements of this section.

B. Each compressed gas cylinder shall be considered to be either in transport, storage, or use.

C. Compressed gas cylinders shall be transported and used in portable welding carts with the cylinders securely chained to the cart.

D. An operable dry chemical fire extinguisher, rated not less than 2 pounds of chemical shall be mounted on each portable welding cart in use.

E. Valve protector caps shall be in place except when the cylinders are in use.

F. Compressed gas cylinders in storage (full or empty) shall; be chained or secured in an upright position to a firm base, have the proper protective cap in place, and be protected from sources of heat.

G. Mixed gases shall not be stored together.

H. Improperly stored cylinders shall be immediately removed from the work area.

I. Excessive or unreasonable storage of cylinders on the Site is prohibited.

2.19.22 Fire Protection and Prevention

A. Open flames and smoking shall be prohibited within 100 feet of flammable materials. In addition to notifying the Railroad, the written permission of the water utility shall be obtained before shutting off water servicing a fire hydrant.

B. Prior written permission of the Railroad shall be obtained before blocking roadways, hydrants, post indicator valves, or access to firefighting equipment.

C. The Safety Manager shall designate, as required, appropriately trained personnel to act as Fire Watchers. Fire Watchers shall be familiar with hazards that exist in the work area, and be trained in the operation of each type of fire extinguisher on the worksite.

D. Flammable Liquids shall be stored in Factory Mutual (FM) approved safety cans equipped with self-closing lids and flame arrestors.

E. Storage of flammable materials in or near Railroad structures shall be prohibited.

F. Work stoppage and shutdown of equipment shall be mandatory upon alarm of fire. Personnel shall report to the designated assembly area(s).

G. Each temporary structure shall be constructed of fire rated material.

2.19.23 Fall Protection

A. The Design-Builder shall provide fall protection for all persons exposed to an unprotected fall greater than 6 feet. Excavations 6 feet or greater in depth with slopes steeper than 45 degrees shall also be provided with fall protection. In the event that providing this protection is not feasible or creates a greater hazard, the Railroad may at its discretion allow for a task specific variance from this policy. Requests for a task specific variance shall be transmitted in writing with justification for relief. The Railroad's acceptance must be received in writing prior to starting the specific task under the variance.

B. For work on railroad bridges the fall protection requirements of 49 CFR 214.101 shall be followed.

2.19.24 Confined or Enclosed Spaces

A. The Design-Builder shall adhere to all the requirements for entering a Confined Space as listed in OSHA 29 CFR 1910.146. Enclosed Spaces as defined in 29 CFR 1910.268- .269 shall be treated as Confined Spaces.

2.19.25 Spill Prevention and Leakage Containment

A. The Design-Builder shall inspect all equipment for leak free operation on a daily basis. Any spillage shall be cleaned up promptly to prevent any release into the environment. Spill kits shall be maintained on site. The Design-Builder shall report all spills of Hazardous Materials including petroleum products to the authority having jurisdiction and the Railroad.

2.19.26 Storage and Office Trailers

A. Trailers shall be fully chocked and tied down to prevent overturning in high wind conditions. Storage and office trailers shall be equipped with auxiliary supports at each corner.

2.19.27 Protection of the Public

A. The Design-Builder shall provide and maintain substantial, durable, and effective protective devices including, but not limited to, guardrails, barricades, fences, bridging, ramps, floor coverings, road plates, sidewalks, guide rails, lights, traffic control devices, warning signs and signals, and other warning and safeguard devices as required to prevent accidents, injuries, or damages to any persons or property, during the performance of the Work.

B. Protective devices shall be designed to protect the public and others on or adjacent to the Site from potential exposures created by the Work. Such protective devices shall include, but not be limited to, the use of welding screens to protect against welding flash, the use of solid barricades or tarps to protect against flying objects created by cutting, chipping or grinding, or the use of fully sealed enclosures to protect against exposures to hazardous vapors, fumes, or dusts.

C. Protective devices shall be designed to withstand the reasonably anticipated forces in or around the work area including but not limited to wind, vibration, runoff, and other natural or man-made conditions.

D. Protective devices shall be maintained in a clean and smooth condition so as not to cause cuts, nicks, splinters, or snag clothing.

E. The Design-Build shall remove each protective device when the device is no longer required.

F. Each protective device shall be constructed of properly identified fire rated materials.

G. Barricades and fences shall be a minimum of 4 feet in height and be maintained in a continuous unbroken line along the work area. Barricades or fences eight feet or higher shall be provided along work areas with moderate to heavy pedestrian traffic or along work areas where site security is required.

H. Barricades and fences shall be rigid and capable of preventing unauthorized entry into the work area. Caution tape or unsupported fencing shall not be considered a rigid barricade.

I. Covers, plates, bridging, and temporary walkways shall be constructed so as to minimize potential slip and trip hazards; secured against movement; and installed in accordance with ADA Accessibility Guidelines for Buildings and Facilities (Appendix A to 36 CFR Part 1911). All such covers, plates and bridging shall be solid and coated with slip resistant materials so that the surface is at least as slip resistant as the surrounding walking surfaces. The perimeter of floor covers and plates shall be painted yellow or another contrasting color approved by the Railroad.

2.19.28 Safety Training

All Design-Builder personnel on the Project site shall have attended the Safety Orientation Program per the CSHP.

2.19.28.1 Safety Orientation

Prior to working on Railroad property, each employee shall undergo the safety orientation program as outlined in this Section.

2.19.28.2 Safety Toolbox Meetings

A. Worker Safety Meetings

1. Worker Safety Meetings shall be held no less than once each week. Each employee of the Design-Builder and each subcontractor working at the Site shall attend these meetings.
2. An employee failing to attend a Worker Safety Meeting shall not be permitted to perform any work that requires safety precautions that were discussed in the Worker Safety Meeting, until the employee has received the same instruction.
3. The Design-Builder shall notify the Railroad at least 1 week in advance of each scheduled Worker Safety Meeting. A record of each Worker Safety Meeting, including the topics covered, and a signed list of attendees, shall be prepared by the Safety Manager and transmitted to the Railroad within 3 working days after the Worker Safety Meeting.
4. Each Worker Safety Meeting shall include instruction and discussion of safe working methods and applicable rules required for the safe performance of the work scheduled during the 2-week period following the Worker Safety Meeting. The Railroad reserves the right to direct the Design-Builder to cover additional information.
5. The Safety Manager shall conduct the Worker Safety Meetings.

B. Safety Briefing

1. A Safety Briefing, conducted by the Safety Manager or a Safety Supervisor, shall be held at the start of each workday to discuss the safety precautions applicable to that day's hazardous work.

C. Management Safety Meeting

1. The Railroad will conduct a Management Safety Meeting in conjunction with the Progress Meeting. The Project Superintendent and Safety Manager shall attend.

2.19.28.3 Safety Walk-Thru

A. The Design-Builder shall hold a monthly Safety Walk-Thru attended by Design-Builder and Railroad. The CSE shall bring all active (look-back and look-ahead Schedules) SWP, AHAs (Activity Hazard Analysis), and SDS on the walk-through, for reference. The walk-thru shall include a visit to the PMO where the CSE shall have available for review the daily safety log and other safety related records. Railroad shall record the activities and observations that were noted during the walk-thru, including listing all those in attendance.

B. During the walk-through, the effective implementation of all appropriate SWP and AHAs will be reviewed with safety issues and findings identified, including review of the Railroad’s Safety deficiencies affecting the Site safety; and

C. During the meeting immediately after the walkthrough, the observations will be reviewed and corrective actions identified. Also, outstanding findings identified in the interim between walk-throughs will be addressed.

2.19.29 Summary of Submittals

Item	Section	Submittal	Action
1.	2.19.3	Design-Builder's Safety Plan	Review and Approval
2.	2.19.5	Design-Builder's Safety & Health Plan	Review and Approval
3.	2.19.6	SWP, AHA and SWP Summary	Review and Comment
4.	2.19.7	Incident Investigation Reports	Information
5.	2.19.8	Construction Safety Report	Information
6.	2.19.16	Crane Inspection Report	Information
7.	2.19.16	Rigging and Lifting Plan	Review and Approval

END

2.20 CONSTRUCTION SECURITY

2.20.1 Section Includes

This Section sets out the security requirements for construction including:

A. Site Security Control Plan.

B. Background Verification.

C. Design-Builder Identification Card.

D. Non-working Visitor Identification.

E. Daily Site Security Report.

2.20.2 Codes and References (Not Used)

2.20.3 General

The Design-Builder shall secure and maintain the Site in a secure manner at all times. The Design-Builder shall be solely responsible for all damage and the restoration of damaged property resulting from illegal trespassing.

2.20.4 Noted Restrictions

A. LNTP will not be granted until the Site Security Control Plan (SSCP) has been approved by the Railroad.

B. No personnel shall work on Railroad property until they have Railroad Approved identification and have attended the required Railroad Worker Protection Safety Orientation.

C. No Design-Builder employees shall be permitted access to MTA/LIRR property without prior notification to and initial authorization from the Railroad.

D. The Design-Builder shall not limit job site access to Railroad, NYSDOT, State, County, Village and municipalities, or Utility Owner personnel.

E. Visitors (i.e., salesmen, service agents, and business agents) shall register and obtain permission from the Railroad. No visitor shall be left unescorted at any time on the site.

F. Other than officially issued Identification Cards, no Design-Builder, subcontractor, vendor, supplier, or service personnel shall be permitted to wear or display any item on their person that would identify them as Railroad personnel.

G. Any person failing to comply with site security requirements will be subject to immediate removal from the Site and may be permanently barred from re-entering the Site.

H. Background verifications performed prior to the Proposal submission date are not valid for this Project.

2.20.5 Quality Control

A. Unless otherwise approved by the Railroad, the Design-Builder's on-site Superintendent shall be responsible for Site security.

B. The Design-Builder's approved SSCP shall be applicable to all Design-Builder personnel, including, but not limited to, personnel of any tier subcontractor, consultant, vendor, and supplier.

C. All aspects of the Design-Builder's security process and procedures will be subject to audit by the MTA/LIRR or its representatives at any time and without prior notice at any location(s) identified in the course of the audit process.

2.20.6 Site Security Control Plan (SSCP)

A. The Design-Builder shall develop and maintain a Project specific Site Security Control Plan (SSCP). The SSCP Document shall define the management, organization and strategy to provide Site security during the duration of the Project. The SSCP shall define the personnel responsible for developing and delivering security related Work practices. The SSCP shall be in accordance with the Railroad's System Security Emergency Preparedness Plan (SSEPP).

B. The SSCP shall be organized and include the following:

1. Table of contents.
2. Intent and purpose policy statement with approving official's name and signature.
3. Sensitive security information.
4. Project security organizational chart.
5. Approval of security plan.
6. Statement of Acknowledgement and Compliance (refer to Appendix TPA2.20 STATEMENT OF ACKNOWLEDGEMENT AND COMPLIANCE).
7. Disciplinary procedures for violations of site security control protocols.
8. Any other related site security information.

C. Each subcontractor shall comply with the SSCP as approved by the Railroad, and shall provide written notification of its intent to adopt and comply with the SSCP. If a subcontractor elects to submit its own Plan, it shall meet the requirements of Contract Documents, be approved by the Design-Builder, and be incorporated into the SSCP following Railroad approval.

2.20.7 SSCP Content

A. The Design-Builder shall use the template provided in Appendix TPA2.20 STATEMENT OF ACKNOWLEDGEMENT AND COMPLIANCE unless otherwise permitted by the Railroad.

B. In addition the Design-Builder and its subcontractors at all tiers shall comply with the following additional requirements:

1. Field offices shall be locked at the end of each day.
2. Security window guards shall be installed on all windows.
3. Site gates/fences shall be locked at the end of each day.
4. Keys to locks shall be limited in distribution to Design-Builder's management staff and the Railroad's project staff as directed by the Railroad.
5. Enforce disciplinary procedures for violations of site security control protocols.
6. Comply with all other related site security information specific to the project.

2.20.8 Submittals

2.20.8.1 Site Security Control Plan

A. The Design-Builder shall submit a contract-specific Site Security Control Plan within 15 Calendar Days of LNTP, including the duties and responsibilities of specific personnel to ensure Site security clearly detailing the actions and activities as required by the Contract and the Design-Builder's Site Security Policy and Procedures.

B. If the Railroad determines, in its sole discretion, that the Site Security Control Plan is deficient or otherwise unsatisfactory, the Design-Builder will be required to resubmit a revised Security Plan within seven (7) Calendar Days of notification by the Railroad. If necessary, the Design-Builder's Project Executive will be required to attend a meeting within five (5) Calendar Days of notification by the Railroad to discuss the plan and reach agreement of the necessary changes to be made. Failure to resubmit a revised Site Security Control Plan, attend the required meeting or reach agreement with the Railroad may result in termination of this Contract.

C. Procedure for verifying personnel identification and performing certified background checks including, but not limited to, checking for prior criminal infractions, employment, residences, and verification of American Citizenship or Visa for Foreign National status.

D. The Design-Builder shall provide security documents for each personnel a minimum of 15 Calendar Days prior to attending the Roadway Worker Protection Safety Orientation and entering the Site including:

1. Verified identification and certified background check documentation.
2. Railroad-required ID card.
3. Fully executed consent form to permit the Railroad to perform further investigation.

2.20.8.2 Additional Submittals

The Design-Builder shall submit the following documentation:

A. Copy of Foreign National Registration Document (including I-94 cards and I-797 notices or Permanent Resident Cards) for each foreign national employee assigned to the Contract.

B. Design-Builder's Employee Sign-in Log at the end of each shift.

C. All logs at the end of each shift, i.e. vehicle, visitor, etc.

D. Expired or no longer needed Design-Builder-issued Identification Cards.

E. Expired or no longer needed Railroad-issued Identification Cards.

F. Sample I.D. Card.

G. Statement of Acknowledgement and Compliance (refer to Appendix TPA2.20 STATEMENT OF ACKNOWLEDGEMENT AND COMPLIANCE).

2.20.9 SSCP Security Risk Analysis

A. The Design-Builder shall complete a security risk analysis of the Project construction site(s), prepare findings, and include risk mitigation recommendations.

B. The Design-Builder's SSCP security risk analysis shall be based on the Railroad's System Security Emergency Preparedness Plan (SSEPP) wherein the report identifies threats,

vulnerabilities and mitigations. The SSCP shall include the requirements of this Section, Federal, State, and local laws, regulations, and requirements of the Contract Documents.

C. The Design-Builder's Site areas include, but are not limited to: stations; Railroad ROW; undergrade crossings and bridges; roadways, and utility work areas. Each of these environments presents a serious security risk and the Design-Builder shall take preemptive measures to preclude unauthorized access to these areas at all times. The Design-Builder's SSCP shall identify and include security risk mitigation for these areas.

2.20.10 Daily Site Security Report

The Daily Site Security Report shall include:

A. Attendance Log(s) that shall include the printed name of each individual on the Site, sign-in signature, time and sign-out signature and time.

B. Vehicle Log(s) that shall list each vehicle used by the Design-Builder with the Driver's/Operator's name and start and finish time of Site activities.

C. An entry for each security deficiency that includes:

1. Location and nature of deficiency.
2. Time noted.
3. Names of persons and firms that were notified of the deficiency including time notified.
4. Time and nature of corrective action(s) taken.

D. An entry for each deficiency that was not corrected on the prior shift's Daily Site Security Report until the deficiency is corrected.

E. Printed name and signature of person completing the report.

2.20.11 Security Requirements

A. The Design-Builder shall manage and secure the construction site(s) and temporary office facilities in accordance with the SSCP.

B. The Railroad shall have 24-hour, seven-day per week access to be exercised at the Railroad's discretion.

C. The Design-Builder shall provide and maintain substantial, durable, and effective security devices including, but not limited to, barricades, fences, lights, warning signs, and other devices as required to ensure security during the performance of the work.

D. Security devices shall be designed to withstand the reasonably anticipated forces in or around the work area including but not limited to wind, vibration, runoff, and other natural or man-made conditions.

E. Security devices shall be maintained in a clean and smooth condition so as not to cause cuts, nicks, splinters, or snag clothing.

F. The Design-Builder shall remove each security device when it is no longer required.

G. Each security device shall be constructed of properly identified fire rated materials.

H. Barricades and fences shall be provided and maintained in a continuous unbroken line along work areas where site security is required. Barricades and fences shall be a minimum of 8 feet in height, rigid, and capable of preventing unauthorized entry into the work area. Caution tape or unsupported fencing shall not be considered a barricade.

2.20.12 Additional Requirements

The Design-Builder shall also comply with the following site security requirements:

A. Attendance Log: Ensure that each employee signs in at the start of each shift, and verify the identity of each employee at the time of sign-in. A sign-in or check-in point will be established for each large Project location. [Location subject to Review and Approval by LIRR].

B. Parking: Construction vehicles and equipment shall be parked in designated areas, located away from critical areas, as permitted by the Railroad.

C. Deliveries and Pickups: Ensure that deliveries and pickups are made to a controlled area, as permitted by the Railroad.

D. Storage Containers: Containers shall be clearly labeled, stating contents and stored away from critical areas or structures, subject to Railroad approval. Emergency phone numbers shall be visibly posted wherever containers are stored. Containers are subject to inspection by authorized Railroad personnel upon demand.

E. Schedules: A schedule including all pre-dawn/post-sunset work, locations, hours of pick-up/delivery and site supervisor must be forwarded to the MTA/LIRR Regional Security Command Center with a copy to the Railroad.

F. Critical Areas: The Railroad will designate some areas as critical. Workers, assigned to a critical area for more than 20 Calendar Days, will be required to display a Railroad supplied identification card. The Design-Builder shall ensure the return of all Railroad provided identification cards not later than the expiration date printed on the card.

G. Security Signs: Erect security signs as requested and provided by the Railroad.

H. The Design-Builder shall provide adequate lighting and guarding at main security areas, work areas, and storage yards.

I. Vehicle Logs: The Design-Builder shall provide a vehicle log identifying those vehicles which will be used in performing any portion of the Work within 10 Calendar Days after Notice of Award is issued and prior to commencement of work. Vehicles must be conspicuously marked with Design-Builder's name or logo. Vehicle logs shall be kept current throughout the shift and shall identify those vehicles used in performing the Work.

2.20.13 Coordination Requirements

A. The Design-Builder shall coordinate law enforcement emergency protocols and provide emergency contact information. The Design-Builder shall provide and maintain similar information with all appropriate agencies and Utility Owners to ensure:

1. Provisions for documented procedures in response to emergencies, incident reports, and assistance calls.
2. Appropriate patrol of the environment external to the construction site(s), including storage and laydown yards.
3. Provision of criminal investigative support.

B. In the event of a security incident, the Design-Builder shall contact law enforcement for immediate response and then inform the Railroad.

2.20.14 Identification

A. Design-Builder-issued Identification Cards: Personnel shall be required to wear the Design-Builder Identification Card at all times while on Railroad property. The ID card shall be displayed outward on the outermost garment / safety vest.

B. The Design-Builder-issued Identification Card shall be laminated plastic, nominally 3.5 inch square, and shall conform to LIRR-ID-001 as indicated. At a minimum, the ID Card shall contain the name and full-face passport-style color picture of the person, the Project Number, the Contract Number, the name of the Design-Builder, the name of the firm employing the person, and an expiration date not to exceed the date of construction completion. A sample ID card must be submitted with the Site Security Control Plan.

C. Railroad-issued Identification Cards: Personnel assigned to work in sensitive/critical Railroad facilities or areas, as determined by the Railroad, shall be required to wear the Railroad-issued Identification Card at all times while in that facility or area in addition to the Design-Builder-issued ID Card. The ID card shall be displayed outward on the outermost garment / safety vest.

D. Design-Builder/Visitor Identification:

   1. American Citizens: a current passport, valid driver's license, union card, employer's identification card, or other Railroad approved officially issued, photo identification.
   2. Foreign Nationals: a Railroad-approved officially issued photo identification, which establishes the identity of the bearer, and appropriate foreign national registration document(s) including I-94 cards and I-797 notices or permanent resident cards.

2.20.15 Background Verification

A. At a minimum each background verification shall be undertaken by a licensed and bonded investigative service in accordance with the applicable laws, and include:

   1. Residence check.
   2. Verification of American Citizenship or Visa for Foreign National status.
   3. Professional license verification and check for sanctions.
   4. Civil Records check for gross negligence incidents.
   5. Driver's license verification and check for serious infractions.
   6. Criminal records check.

B. All Design-Builder's employees' authenticity of their identification documents may be verified by the MTA/LIRR. Any employees not consenting to such verification will not be permitted access to MTA/LIRR property. Where advisable, any aspect of the verification process may be referred by the MTA/LIRR to the MTA Police Department or other appropriate authority including, but not limited to, the Federal Bureau of Investigation.

2.20.16 Employee Conduct

A. The Railroad reserves the right to deny Site access for any individual violating site safety or site security requirements.

B. All employees of the Design-Builder, subcontractor or sub-subcontractor are required to agree to random search of their persons, vehicles, equipment, materials, containers, by MTA Police or other law enforcement official within jurisdiction, while on or about MTA/LIRR Property.

2.20.17 Design-Builder Vehicles

A. Except for deliveries, pickups, and other essential functions related to the Work, vehicles shall be prohibited from entering the Site.

B. Personal vehicles shall be prohibited from entering the Site.

C. Vehicles shall not block access for emergency equipment.

D. Company identification shall be clearly displayed on each vehicle.

E. Pedestrians shall have the right of way at all times. The speed limit on Railroad property is 5 MPH unless otherwise posted.

2.20.18 Security Incident Management Requirements

A. The Design-Builder shall prepare and provide emergency protocols to include emergency contact information. The Design-Builder shall provide this information to LIRR Office of Security's 24x7 Regional Security Command Center, all appropriate Agencies and Utility operators in order to ensure information is coordinated in the National Incident Management System (NIMS) regarding:

1. Provisions for documented procedures in response to emergencies, incident reports, and assistance calls.
2. Appropriate patrol of the environment external to the Construction site(s), including storage and laydown yards; and
3. Provision of criminal investigative support.

B. In the event of a security incident, the Design-Builder shall contact MTA or Local law enforcement for immediate response and then immediately inform the LIRR Office of Security's 24x7 Regional Security Command Center (RSCC) at 718-558-8200.

2.20.19 Summary of Submittals

Item	Section	Submittal	Action
1	2.20.8.1	Site Security Plan (SSP)	Review and Approval
2	2.20.8.1	Verified identification and certified background check documentation	Information
3	2.20.8.2	Employee Sign-in Log	Information
4	2.20.8.2	Copy of Foreign National Registration Documents	Information
5	2.20.8.2	Employee Sign-in Log for each shift	Information
6	2.20.8.2	Expired Design-Builder-issued Identification Cards	Information
7	2.20.8.2	Expired Railroad-issued Identification Cards	Information
8	2.20.8.2	Sample I.D. Card	Information
9	2.20.10	Daily Site Security Report	Information

END

2.21 WORK RESTRICTIONS

2.21.1 Section Includes

This Section specifies work restrictions that the Design-Builder shall comply with in the prosecution of the Work. Third Parties and Utility Owners may have additional restrictions that apply to work by the Design-Builder.

2.21.2 Codes and References

A. The Project shall comply with the requirements of the Codes and Standards listed in Contract Documents including, at a minimum, the following:

1. ANSI S1.4; Specification for Sound Level Meters.
2. FTA Transit Noise and Vibration Impact Assessment; FTA-VA-90-1003-06 May 2006.
3. NYSDOT Engineering Instructions EI 05-044 – Special Specification for Building Condition Survey(s) and Vibration Monitoring (Nonblasting).
4. OSHA 29CFR.
5. ISO 9533.
6. SAE J994.

2.21.3 Construction Work Hours

A. For work directly related to construction of items that will be an integral part of the Railroad, including Undergrade crossings, work may proceed at all times except as prohibited elsewhere in the Contract Documents, and provided that in performing the work, noise restrictions are not exceeded.

B. For any work that is included in Project scope that is not on the LIRR ROW or is in the immediate vicinity of an undergrade crossing, but that will be performed for acceptance and ownership by others (e.g., new drainage pipes to recharge basins that will become part of the Nassau County infrastructure, and new parking structures) the work hour restrictions of the AHJ shall apply.

2.21.4 Holiday Restrictions and Holiday Embargo

A. Activities that interfere with the operation of trains or the flow of passengers, or that require oversight, inspection, or support of any kind by the Railroad, shall not be performed on the following holidays:

TABLE 1 SCHEDULE OF HOLIDAYS	
New Years Day	Martin Luther King's Day
Presidents Day	Christmas Day
Good Friday	Mother's Day
Memorial Day	Independence Day
Labor day	Columbus Day

Election Day	Veteran's Day
Thanksgiving Day	Day After Thanksgiving

B. The holiday period shall be from 1300 hours of the holiday eve through 1201 hours of the day after the holiday.

C. The eve of holidays observed on Monday shall be the preceding Friday.

D. Activities that interfere with the operation of trains or the flow of passengers shall not be performed from 1300 through 1700 hours of the eve of Rosh Hashanah, the eve of Yom Kippur, the eve of Passover, the first day of Passover, December 23rd, and the "getaway" days preceding Memorial Day, Independence Day, and Labor Day.

E. Dates for the foregoing shall be as established by the Railroad.

F. Each holiday shall be reflected in the Detailed Contract Schedule.

G. The Design-Builder shall comply with NYSDOT, , NCDPW Holiday Embargo regulations, as applicable.

2.21.5 Construction Noise Control Strategy

A. To minimize the potential disruption of daily human activity from construction related noise the Design-Builder shall implement a construction noise control strategy.

B. Noncompliance with the maximum construction noise levels as specified in the Contract Documents shall require immediate modification of the Design-Builder's work methods and/or additional mitigation to bring the operation into full compliance.

C. For work related to the new parking structures the noise limits of the AHJ shall apply.

2.21.5.1 Construction Noise Control Plan

A. Within 60 days of LNTP and not less than 21 Calendar Days prior to any construction related activity, the Design-Builder shall submit to the Railroad a Construction Noise Control Plan that outlines in detail the measures to be implemented by the Design-Builder to minimize adverse impacts to the nearby communities. This shall include, but not be limited to:

1. Daily noise measurement plan.
2. Description of the anticipated construction activities including construction equipment locations.
3. Inventory of construction equipment and associated noise levels.
4. Construction noise commitments.
5. Noise sensitive locations/receptors.
6. Noise monitoring locations.
7. Type of noise measurement devices.
8. Noise monitoring methods, frequency, and procedures that shall be used, including both stationary and hand held noise/portable meter measurements in accordance with the Contract Documents.

9. Maximum noise levels for various areas and activities in accordance with the Contract Documents.
10. Planned and potential construction noise waiver requests in accordance with the Contract Documents.
11. Description of noise reduction measures to be used in accordance with the Contract Documents.
12. Data reporting method that shall be used.
13. Complaint response procedures.
14. Noise mitigation training program for all field-worker supervisory personnel. Supervisors shall field-train all field workers to minimize construction noise.

2.21.5.2 Construction Noise Limits

A. The Design-Builder shall measure sound levels for public exposure to noise and comply with the following noise level restrictions in all areas:

1. In no case expose the public to construction noise levels exceeding 90-dBA on "slow" response or to impulsive noise levels exceeding 125-dBA maximum transient level "fast" response as measured on a general purpose sound level meter.
2. Conduct construction activities in such a manner that the noise levels at the nearest edge of the nearest affected building, or where there are no buildings, 200-feet from construction limits, do not exceed the levels listed in Table 2.
3. In areas outside of construction limits and not designated as a special construction site or special zone, prevent stationary noise sources, parked mobile sources or any other source or combination of sources from producing repetitively scheduled or long-term noise lasting more than 10-percent of the construction duration (L_{10}) from exceeding the limits of Table 2.

B. The Design-Builder shall test its equipment and demonstrate compliance with noise limits specified in Table 4, at a minimum every six months, and periodically whenever evidence of non-compliance is apparent. Testing procedures shall conform to Project guidelines. Equipment without a currently valid noise certification on file, or equipment that fails its random noise compliance test will be required to cease operation until adequate mitigation measures can be implemented.

D. The Design-Builder shall prepare a Construction Noise Restrictions Summary summarizing the Railroad restrictions and those of all others including AHJs and submit a copy of the review summarizing all Construction Noise Restrictions to the Railroad for Review.

TABLE 2 CONSTRUCTION NOISE LOT LINE LIMITS & ADJUSTMENTS FOR EQUIPMENT NOISE MEASUREMENTS		
Noise Monitoring Location Land Use	**L_{10} Level (dBA, slow) whichever is greater**	**L_{max} Level (dBA, slow)**
DAYTIME (0700 TO 1800 HOURS)		
Noise Sensitive Locations – Residential Areas	75 or Background + 5 *	85 * 90 (impact equipment)
Commercial Areas	Areas 80 or Background + 5 *	None
Industrial Areas	85 or Background + 5 *	None
EVENING (1800 TO 2200 HOURS)		
Noise Sensitive Locations – Residential Areas	Background + 5	85
Commercial Areas	None	None
Industrial Areas	None	None
NIGHT-TIME (2200 TO 0700 HOURS)		
Noise-Sensitive Locations– Residential Areas • If Background < 70 dBA • If Background ≥ 70 dBA	 Background + 5 Background + 3	 80 80
Commercial Areas	None	None
Industrial Areas	None	None
* Noise from impact equipment is exempt from the L_{10} requirement, however is subject to a L_{max} limit of 90 dBA noise levels at the nearest edge of the nearest affected building, or where there are no buildings, 200-feet from construction limits, do not exceed the		

TABLE 2 CONSTRUCTION NOISE LOT LINE LIMITS & ADJUSTMENTS FOR EQUIPMENT NOISE MEASUREMENTS		
Noise Monitoring Location Land Use	**L_{10} Level (dBA, slow) whichever is greater**	**L_{max} Level (dBA, slow)**
levels listed in Table 2		
Note: All measurements will be taken at the nearest edge of the nearest affected building, or where there are no buildings, 200-feet from construction limits, whichever is closer. L_{10} noise readings are averaged over 20-minute intervals. Lmax noise readings occur instantaneously		

TABLE-3 ADJUSTMENTS FOR EQUIPMENT NOISE MEASUREMENTS AT LESS THAN 50-FEET	
Measurement Distance (Feet)	**Values to be Subtracted from Measured Noise Level to Estimate Noise Level at 50 Feet (dBA)**
19-21	8
22-23	7
24-26	6
27-29	5
30-33	4
34-37	3
38-42	2
43-47	1
48-50	0

TABLE 4

CONSTRUCTION EQUIPMENT 50-FOOT NOISE EMISSION LIMITS

Equipment Category	L_{max} Level (dBA/slow)	Impact/Continuous
Arc Welder	73	Continuous
Auger Drill Rig	85	Continuous
Backhoe	80	Continuous
Ballast Equalizer	82	
Ballast Tamper	83	
Bar Bender	80	Continuous
Boring Jack Power Unit	80	Continuous
Chain Saw	85	Continuous
Compactor	82	
Compressor	70	Continuous
Compressor (other)	80	Continuous
Concrete Mixer	85	Continuous
Concrete Pump	82	Continuous
Concrete Saw	90	Continuous
Concrete Vibrator	80	Continuous
Crane	85	Continuous
Dozer	85	Continuous
Excavator	85	Continuous
Front End Loader	80	Continuous
Generator	82	Continuous
Generator (25 KVA or Less)	70	Continuous
Gradall	85	Continuous
Grader	85	Continuous
Grinder Saw	85	Continuous
Horizontal Boring Hydro Jack	80	Continuous
Hydra Break Ram	90	Impact
Impact Pile Driver	95	Impact
In situ Soil Sampling Rig	84	Continuous
Jackhammer	85	Impact
Mounted Impact Hammer (hoe ram)	90	Impact
Paver	85	Continuous
Pneumatic Tools	85	Continuous
Pumps	77	Continuous
Rail Saw	90	
Rock Drill	85	Continuous

TABLE 4 CONSTRUCTION EQUIPMENT 50-FOOT NOISE EMISSION LIMITS		
Equipment Category	**L_{max} Level (dBA/slow)**	**Impact/Continuous**
Scraper	85	Continuous
Slurry Trenching Machine	82	Continuous
Soil Mix Drill Rig	80	Continuous
Spike Driver	77	
Street Sweeper	80	Continuous
Tie Cutter	84	
Tie Handler	80	
Tie Inserter	85	
Tractor	84	Continuous
Truck (dump delivery)	84	Continuous
Vacuum Excavator Truck (vac-truck)	85	Continuous
Vibratory Compactor	80	Continuous
Vibratory Pile Driver	95	Continuous
All other equipment with engines larger than 5 hp	85	Continuous

2.21.5.3 Construction Noise Reduction Measures

A. The Design-Builder shall perform the work in a manner to prevent nuisance conditions such as unnecessary noise that exhibits a specific audible frequency or tone (e.g. back-up alarms, unmaintained equipment, brake squeal) or impact noise (e.g jack hammer, hoe rams).

B. The Design-Builder shall schedule and conduct operations in a manner that will minimize, to the greatest extent feasible, the disturbance to the public areas adjacent to the work and to occupants of buildings in the vicinity of the construction sites.

C. All construction equipment shall have sound deadening/noise suppression devices and/or materials and shall incorporate noise attenuation features and as listed below:

1. Comply with NYSDEC Regulations for idling vehicles.
2. Back-up alarms shall be either audible self-adjusting back-up alarms or manual adjustable alarms. Backup alarms required for all vehicles entering the construction site shall be in compliance with OSHA approved Regulations, 29CFR Part 1926, Subpart “O”, 1926.601.b.4 and 1926.602.a.9. Installation and use of alarms shall be consistent with the performance requirements of the current revisions of SAE J994, J1446 and OSHA regulations.
3. Impact and drilling equipment such as pile drivers, jackhammers, hoe rams, core drills, direct push soil probes (e.g. Geoprobe), and rock drills shall be equipped with a muffler.

4. Use of electrically operated hoists and compressor plants unless otherwise permitted by the Railroad.
5. Maximum sized intake and exhaust mufflers on internal combustion engines.
6. Gears on machinery designed to reduce noise to a minimum.
7. Concrete crushers or pavement saws for concrete deck removal, demolitions, or similar construction activity.
8. Line hoppers and storage bins with sound-deadening material.
9. Pre-auguring equipment to reduce the duration of impact or vibratory pile driving.
10. The prohibition of the use of air or gasoline driven saws unless otherwise permitted by the Railroad.
11. Conducting the operation of dumping rock or other material and carrying it away in trucks so that noise is kept to a minimum.
12. Routing of construction equipment and vehicles carrying rock, concrete, or other materials over streets that will cause the least disturbance to noise-sensitive locations.
13. Slamming of dump truck tail gates shall be prohibited.
14. Earthmoving and stationary equipment shall be noise attenuated.
15. Silencers on air intakes and air exhaust of equipment.
16. Mitigate noise from construction devices with internal combustion engines by ensuring that the engine doors are kept closed, and by using noise-insulating material mounted on the engine housing that does not interfere with the manufacturer guidelines and by operating the device at lower engine speeds to the maximum extent possible.
17. Operate equipment to minimize banging, clattering, buzzing, and other annoying types of noises.
18. Provide shields, acoustic fabric, soundproof housings or other physical barriers to restrict the transmission of noise.
19. Jackhammers shall be equipped with elongated effective muffler casing or bellows.
20. Alternative methods to hoe ramming concrete, including hydraulic jacks or chemical splitting, shall be considered.
21. Hoe rams shall be the smallest and quietest necessary. A noise shroud enclosure shall be wrapped around the head (i.e. chisel) of the hoe ram.
22. Auger drill rigs shall be equipped with well-maintained and effective mufflers. All moving parts shall be well lubricated to avoid unnecessary noise squeaking parts. Debris from the drill bit shall be removed without quick twisting, jerking, or hammering the bit.
23. Street plates shall be properly installed minimize vehicular tire impact on the plate and minimize noise.

24. Use the local power grid to reduce the use of generators.

2.21.5.4 Construction Noise Monitoring

A. The Design-Builder shall at a minimum perform daily measurements for above ground noise generating activities. In addition, the Design-Builder shall conduct measurements upon request by Railroad and upon receipt of a noise complaint.

B. The time period for each noise measurement shall be as defined in Table 2 of this Section. All measurements shall be performed using the A-weighting network and the "RMS fast" setting of the sound level meter.

C. The measurement microphone shall be fitted with an appropriate windscreen, shall be located 5 feet above the ground, and shall be at least 5 feet away from the nearest acoustically-reflective surface. Monitoring shall measure sound levels at the nearest edge of the nearest affected building, or where there are no buildings, 200-feet from construction limits, whichever is closer.

D. Noise monitoring performed during precipitation or when wind speeds are greater than 15 mph shall be conducted in such a manner as to negate the acoustic effects of rain and high winds.

2.21.5.5 Construction Noise Monitoring Equipment

A. All noise measurements shall be performed with an instrument that is in compliance with the criteria for a Type 1 (Precision) or Type 2 (General Purpose) Sound Level Meter as defined in the current revision of ANSI Standard S1.4. The sound level meter shall be capable of measuring compliant dBA noise levels and displaying Leq and Lmax over 20-minute intervals in the field without the need for post-processing of data.

B. The sound level meter and the acoustic calibrator shall be calibrated and certified prior to commencing construction and every two years thereafter by the manufacturer or other independent certified acoustical laboratory. The sound level meter shall be field calibrated using an acoustic calibrator, according to the manufacturer's specifications, prior to and after each measurement.

C. The Design-Builder shall submit a Noise Meter Laboratory Calibration Certificate for Information prior to performing any noise level monitoring, following subsequent calibrations, and upon completion of any repairs to the Noise Meter.

2.21.5.6 Construction Noise Report

The Design-Builder shall submit a Construction Noise Report for Information on a monthly basis. Reports shall include, but not be limited to:

A. Location plan of the construction area, operating equipment, and receptors.

B. Construction and other noise generating activities occurring while performing the noise measurements shall be noted.

C. Daily field logs, site, noise measurement summary tables, and complaint responses.

D. Noise reduction measures implemented, the effectiveness of implemented reduction measures, and additional measures to be implemented.

2.21.5.7 Construction Noise Waivers

A. The Design-Builder may submit Noise Waiver requests for specific construction activities for Review and Approval. Noise Waivers shall be reserved for those Construction Work activities that cannot meet maximum construction noise levels despite making all reasonable efforts. Noise Waiver requests shall contain, at a minimum, the following information:

1. Type of construction activity.
2. Location of construction activity and impacted receptors.
3. Existing and proposed noise contour maps.
4. Work hours and calendar days for proposed noise waiver.
5. Noise mitigation measures to be used.
6. Exhibit showing the proposed noise levels as they relate to the contractually required noise levels.
7. Any other information justifying issuance of a waiver.

B. Noise waivers, if approved, shall be specific to construction activities listed in the waiver.

2.21.6 Utility Restrictions

A. The Design-Builder shall take suitable precaution to prevent damage to underground or overhead public utility structures.

B. Utility Owners may impose seasonal or other restrictions on Utility Work. The Design-Builder shall coordinate with the Utility Owners to determine restrictions and incorporate the restrictions into the Project Schedule.

2.21.7 Load Restrictions

A. The Design-Builder shall identify and comply with all State and local requirements pertaining to speed, size and weight of motor vehicles. The Design-Builder shall take into account any and all posted bridges, the crossing of which might be contemplated by work on the Project. No loads in excess of posted limits will be allowed unless the required permits are obtained from the appropriate State and local governmental agencies.

B. The Design-Builder shall consider possible detrimental effects of construction activities on retaining walls, pipe culverts, arches, forms for concrete work as well as construction existing prior to this Project.

C. Railroad shall have the right to limit passage of heavy equipment (plus loads) when such passage or usage is causing apparent or visible damage to embankments, paving, structures or any other property.

2.21.8 Public Convenience and Safety

A. Equipment and/or materials stored upon the Site shall be placed so as to cause a minimum of obstruction to the public.

B. Existing facilities planned to be removed, but which might be of service to the public during construction Work are not to be disturbed until other and adequate provisions are made. Existing mailboxes shall be maintained or reset in positions accessible to the

public and to mail deliveries during construction Work and subsequent to construction in their final locations in a satisfactory condition.

C. Fire hydrants on or adjacent to the Site shall be kept accessible to fire apparatus at all times, and no material or obstruction shall be placed within 15 feet of any such hydrant. All footways, gutters, sewer inlets and portions of the Project adjoining the work under construction shall not be obstructed more than is absolutely necessary.

2.21.9 Preservation and Restoration of Property

A. The Design-Builder shall not enter upon public or private property outside of the Project ROW for any purpose without obtaining permission. The Design-Builder shall be responsible for the preservation of all public and private property, trees, monuments, signs and markers and fences thereon, and shall use every precaution necessary to prevent damage or injury thereto.

B. The Design-Builder shall be responsible for all damage or injury to property of any character during the prosecution of the Work, resulting from any act, omission, neglect or misconduct in his manner or method of executing said Work, or at any time due to defective Work or materials, and said responsibility shall not be released until the Work shall have been completed and accepted. When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect or misconduct in the execution of the Work or in consequence of the non-execution thereof on the part of the Design-Builder, he shall restore, at his own expense, such property to a condition similar to, or equal to, that existing before such damage or injury, in an acceptable manner. In case of the failure on the part of the Design-Builder to restore such property or make good such damage or injury, Railroad may, upon 48 hours' notice, proceed to repair, rebuild or otherwise restore such property as may be deemed necessary and the cost thereof will be deducted from any monies due or which may become due the Design-Builder under this Agreement.

2.21.10 Air and Water Pollution

A. Construction equipment shall be equipped with operating air pollution control devices.

B. Prevent spills of oil or other hazardous substances from entering the ground, sewers, storm drainage areas, and piping systems. In the event of a spill, take appropriate containment and remediation actions, notify the Railroad, and make notifications required by law.

2.21.11 Toxic Substances

A. Toxic chemicals, agents, mixtures, sealants, or coatings discovered during performance of the Work shall be immediately reported to the Railroad.

2.21.12 Surface Water

A. Do not allow water to collect on the worksite. Where required, provide positive means of water removal, such as trenching or pumping.

2.21.13 Summary of Submittals

Item	Section	Submittal	Action
1	2.21.5.1	Construction Noise Control Plan	Review and Comment
2	2.21.5.5	Noise Meter Laboratory Calibration Certificate	Information
3	2.21.5.6	Construction Noise Report	Information
4	2.21.5.6	Noise Waiver	Review and Approval

END

2.22 THIRD PARTY COORDINATION

2.22.1 Section Includes

This section sets out requirements for the Design-Builder to coordinate with Third Parties including Nassau County and Villages affected by the Project.

2.22.2 Codes and References (Not Used)

2.22.3 General Requirements

A. Except as otherwise required by the Contract Documents, the Design-Builder shall coordinate directly with each Third Party entity to identify, collaborate and resolve all items and issues that impact the Project in a timely manner. The Design-Builder shall invite the Railroad to participate in Third Party coordination.

B. The Design-Builder shall coordinate and resolve all third party items and issues throughout the term, whether or not:

1. The Railroad has had previous discussion with a Third Party.
2. The Railroad has executed an agreement and/or a memorandum of understanding with a Third Party.
3. The Railroad has or has not identified a Third Party.

C. Third Party entities include but are not limited to the following:

1. Local Authorities having jurisdiction (i.e. Village, Town, County, State).
2. Public and Private Utilities affected by the Work.
3. Commercial entities affected by the Work.
4. Permitting Agencies and AHJs.
5. All other stakeholders having an interest with, or who are impacted by the Project.

D. The Design-Builder is responsible to enter into arrangements with and develop agreements with Third Parties and others, if and as required, in order to timely complete all work.

2.22.4 Third Party Coordination Work Plan

A. The Design-Builder's Third Party Coordination Work Plan shall include, but not be limited to, the following:

1. A Third Party Coordination Manager is assigned exclusively to the Project and functioning as the primary contact between Design-Builder and Third Parties.
2. The Third Party Coordination Manager role and responsibility shall remain active and in force until Final Completion of the Project.
3. Identification of each Third Party, by contact, type, schedule to closure, and resolution status.
4. Identification of the party responsible for the design, construction, inspection, acceptance and cost of the Work in accordance with the Contract Documents.
5. Notification to Railroad of requested betterments.
6. Third Party-specific coordination meetings from LNTP to Final Completion including Railroad and the Third Parties.

7. Creation, maintenance and update on a monthly basis of a report of Third Party coordination activities.
8. Establishment of Design-Builder's design and construction procedures, processes and schedule for Third Party Work and methodology for ensuring that all the Third Party Work is completed in accordance with the Third Party Coordination Work Plan.

B. The Design-Builder shall submit the Third Party Coordination Work Plan to the Railroad for Review and Comment within 30 Calendar Days of LNTP.

2.22.5 Coordination with Third Parties

A. The Design-Builder shall coordinate all design and construction, including that of any subcontractors, with other designers, subcontractors, Utility Owners, governmental agencies, Railroad's personnel, and operating personnel concerning Site access, establishment and use of temporary facilities, work schedules, and all other elements of the specified Work, which require interfacing with others. The Design-Builder shall coordinate with the Railroad in carrying out any Railroad Force Account Work. When the Work of the Design-Builder or its subcontractor dovetails with the Railroad Force Account Work, the material shall be delivered and the operations conducted so as to carry on the Work continuously in an efficient and skillful order.

B. The Railroad shall have the right, at any time, to contract for and perform other work on, adjacent to, near, over or under the Work covered by this Project. In addition, other work may be performed under the jurisdiction of another Railroad or State agency. In such cases, when a dispute arises among contractors, the Railroad will decide which agency will have jurisdiction over said dispute. The Design-Builder shall cooperate fully with such other contractors and carefully fit its own work to such other work as may be directed by the Railroad.

C. Any delays in performance of the Work or the need to oversee and coordinate with work performed by others, including removal and replacement of Work already in place if needed, will not be the basis for a claim for extra compensation. Such Work shall be done at the cost and expense of the Design-Builder.

D. The Design-Builder shall protect and save the Railroad harmless from any and all damages or claims that may arise because of inconvenience, delay, or loss experienced by the Design-Builder or other contractors because of the presence and operations of other contractors working within the limits of this Project.

2.22.6 Summary of Submittals

Item	Section	Submittal	Action
1	2.22.4	Third Party Coordination Work Plan	Review and Comment

END

2.23 UTILITY COORDINATION

2.23.1 Section Includes

This section sets out the requirements for the Design-Builder to coordinate with Utility Owners and the Railroad regarding Utility Work on the Project.

2.23.2 Codes and References (Not Used)

2.23.3 General Requirements

A. The Design-Builder shall coordinate directly with all the Utility Owners to identify and confirm Utility locations, potential conflicts, and relocations necessary for the Project.

B. The Utility Owners include:

1. LIPA/PSEG-LI (electric transmission and distribution).
2. National Grid (gas).
3. Verizon (telephone).
4. Verizon Business Systems (formerly MCI) (fiber optic).
5. AT&T (fiber optic).
6. Lightower (fiber optic).
7. Crown Castle (fiber optic).
8. Altice (formerly Cablevision) (cable television).
9. Nassau County Department of Public Works (sanitary sewer).
10. Village of Garden City (sanitary sewer).
11. Village of Mineola (sanitary sewer).
12. Nassau County Department of Public Works (water).
13. Hicksville Water District (water).
14. Village of Garden City (water).
15. Village of Mineola (water).
16. Water Authority of Western Nassau County (water).
17. Westbury Water District (water).

C. The Design-Builder shall confirm that the above list of Utility Owners are affected, and in addition, shall identify any Utility Owner not included in the list.

D. The Design-Builder shall coordinate with all Utility Owners whether they are impacted by the Project, and whether or not the Railroad has:

1. Had previous discussion with a Utility Owner.
2. Entered into a Utility Agreement with an affected Utility Owner.
3. Identified the existing Utility on a Utility composite map.

E. The Design-Builder may enter into agreements with Utility Owners in accordance with the requirements of the Contract Documents. The Design-Builder shall submit any Design-Builder Utility Agreements to the Railroad for Review and Comment before execution.

F. The Design-Builder shall coordinate directly with the Railroad to identify and confirm Railroad Utility locations, potential conflicts, abandonments, and relocations necessary for the Project.

2.23.4 Utility Coordination Work Plan

A. The Design-Builder shall develop a Utility Coordination Work Plan that includes, at a minimum:

1. A Lead Utility Coordinator assigned exclusively to the Project as the main point of contact for all public and private Utility Owners, Third Parties, and the Railroad until the Final Completion of the Project; the position requires overseeing all the Utility Work so that is it coordinated with each Utility Owner, and the Railroad.
2. Preliminary identification of Utility Work necessary for the Project.
3. Identification of the party(ies) responsible for the design, construction, inspection, acceptance, and cost of the Utility Work in accordance with the Contract Documents.
4. Verification that all post-construction Utilities are capable of providing service at least equal to that offered by the pre-construction Utility unless the Utility Owner (Public, Private, Railroad), or Third Party has specified a lesser replacement.
5. Submittal processes to the Railroad as required by the Contract Documents.
6. Notification and a process for obtaining the Railroad's Approval of Betterments requested by a Utility Owner, or Third Party.
7. Utility-specific coordination meetings beginning 30 Calendar Days after LNTP and continuing until the Final Completion of the Project. Meetings shall include the Design-Builder, Utility Owners, Third Parties, and the Railroad. The Design-Builder shall prepare and distribute meeting agendas, minutes, and attendance records.
8. Creation, maintenance, and update, on a monthly basis, of a Project Utility composite map showing all the existing and proposed Utility alignments.
9. Development of Project Execution Plans defining the Design-Builder's Design and Construction procedures, processes, and schedule for protecting, adjusting, and relocating the facilities of each Utility Owner (Public, Private, Railroad) to accommodate the Project Work. The Project Execution Plans shall also include processes for emergency utility work.
10. A methodology for ensuring that all Utility Work is completed in accordance with the individual Project Execution Plans.
11. Creation, maintenance, and update, on a monthly basis, a Utility Relocation Schedule.

B. The Design-Builder shall submit the Utility Coordination Work Plan to the Railroad for Review and Comment within 30 Calendar Days after LNTP.

2.23.5 Project Execution Plans

A. The Design-Builder shall prepare a Project Execution Plan for each Utility Owner, Third Party, and the Railroad relating to affected utilities. “Utility Work” may include the performance of any Betterments sought by a Utility Owner or Third Party.

B. The Design-Builder shall submit each Preliminary Project Execution Plan to the Utility Owner or Third Party for Review and Comment and to the Railroad for Information in accordance with the following schedule:

1. LIPA/PSEG-LI (electric) – no later than 60 Calendar Days after LNTP.
2. National Grid (gas) – no later than 60 Calendar Days after LNTP.
3. Verizon Telephone (telephone) – no later than 60 Calendar Days after LNTP.
4. Verizon Business Systems (fiber optic) – no later than 60 Calendar Days after LNTP.
5. AT&T (fiber optic) – no later than 60 Calendar Days after LNTP.
6. Lightower (fiber optic) – no later than 60 Calendar Days after LNTP.
7. Crown Castle (fiber optic) - no later than 60 Calendar Days after LNTP.
8. Altice (cable television) - no later than 60 Calendar Days after LNTP.
9. Nassau County DPW (sanitary sewer) – no later than 60 Calendar Days after LNTP.
10. Garden City Village (sanitary sewer) – no later than 60 Calendar Days after LNTP.
11. Village of Mineola (sanitary sewer) – no later than 60 Calendar Days after LNTP.
12. Nassau County DPW (water) – no later than 60 Calendar Days after LNTP.
13. Hicksville Water District (water) - no later than 60 Calendar Days after LNTP.
14. Village of Garden City (water) – no later than 60 Calendar Days after LNTP.
15. Village of Mineola (water) – no later than 60 Calendar Days after LNTP.
16. Water Authority of Western Nassau County (water) – no later than 60 Calendar Days after LNTP.
17. Westbury Water District (water) – no later than 60 Calendar Days after LNTP.

C. The Design Builder shall submit a Preliminary Project Execution Plan for Railroad Utilities to the Railroad for Review and Comment no later than 15 Calendar Days after LNTP.

D. The Design-Builder shall incorporate comments and submit the Final Project Execution Plan for Non-Railroad Utility Work to the applicable Public or Private Utility, or Third Party no later than 15 Calendar Days after receipt of comments with copies to the Railroad for information.

E. The Design-Builder shall incorporate comments and submit the Final Project Execution Plan for Railroad Utility Work to the Railroad no later than 15 Calendar Days after receipt of comments.

2.23.6 Project Execution Plan Content

C. The primary purpose of the Project Execution Plan shall be to give greater detail to the work to be performed by the Design-Builder. The Project Execution Plan shall contain, at a minimum:

A. Detailed procedures for the Utility Work including inspection and acceptance of facilities or other work to be owned by the Utility Owner or the Railroad upon completion.

B. Detailed procedures for submittals.

C. The Submittal list as related to the Third Party or Utility Owner, which shall be coordinated and updated from time-to-time as may be necessary.

D. The Design-Builder's approved schedule for completing the utility work

E. Standards, responsibilities and procedures for design and review of the Utility Work or Third Party Work.

F. Standards, responsibilities, and procedures for performance of work.

G. Standards, responsibilities and procedures for any inspection, testing, and acceptance of utility facilities or other related work required prior to acceptance (including, with respect to Utility Owners, Third Parties, and the Railroad).

H. Standards, responsibilities and procedures for quality assurance and quality control of the Utility Owner's utility work , Third Party utility work, and Railroad utility work.

I. Processes for emergency utility work that include timely status updates, expected completion schedule for the emergency utility work, and coordination with the Utility Owners, Third Parties, and the Railroad for issue resolution.

J. Any information, plan, or procedure specifically called for by Utility Owners, Third Parties, and the Railroad, as applicable.

K. The Project Execution Plan shall not expand the responsibilities nor diminish the rights of the Design-Builder as set out in the Contract Documents.

2.23.7 Summary of Submittals

Item	Section	Submittal	Action
1.	2.23.3	Design-Builder Utility Agreements	Review and Comment
2.	2.23.4	Utility Coordination Work Plan	Review and Comment
3.	2.23.5	Initial Project Execution Plans	Review and Comment
4.	2.23.5	Draft Project Execution Plans	Review and Comment
5.	2.23.6	Project Execution Plans	Review and Approval

END

2.24 MAINTENANCE AND PROTECTION OF TRAFFIC

2.24.1 Section Includes

This Section sets out the requirements for developing and implementing a comprehensive Transportation Management Plan (TMP). Construction access and mobility, lane closure restrictions and permitting requirements are also included.

2.24.2 Codes and References

A. NYSDOT Highway Design Manual (HDM).

B. 23 CFR 630.

C. National Manual of Uniform Traffic Control Devices (MUTCD) and New York State Supplement to MUTCD.

D. NYSDOT Standard Specifications.

E. US Access Board's Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Rights of Way, 2011, a.k.a Public Right of Way Accessibility Guidelines (PROWAG).

F. ADA Accessibility Guidelines (ADAAG) for Buildings and Facilities in 28 CFR, 1991.

G. New York State Building Code for Commercial Buildings (BCNYS).

H. United States Access Board.

2.24.3 Requirements

A. The Design-Builder shall be responsible for the planning and provision of Work Zone Traffic Control (WZTC), required to perform the Project Work until Final Completion. This Project Requirement applies to any roads, ramps, cross roads, local streets, maintenance roads, driveways, and active paths within and/or affected by the Project.

B. The Design-Builder shall be responsible for the planning and provision of Work Zone Traffic Control (WZTC) meeting the requirements of Chapter 16 of the current version of the NYSDOT HDM, Section 619 of the Specifications, and 23 CFR 630 Subpart J, MUTCD Part VI Section 16.3.1 (J) – Public information and outreach considerations until Final Completion.

C. The Design-Builder shall provide WZTC for the safe and efficient movement of vehicular and pedestrian traffic, people, goods, and services through the Project area while maintaining access and minimizing negative impacts to residents, commuters, businesses, and any maintenance operations by the County, Town or the Village.

D. Note that, as used in this section, "Work Zone Traffic Control plan" or "WZTC plan" is the equivalent of "Maintenance and Protection of Traffic plan" or "MPT plan" as described in Chapter 16 of the NYSDOT Highway Design Manual.

2.24.3.1 Work Zone Traffic Control (WZTC) Plan

A. The WZTC Plan shall be submitted to the Railroad a minimum of two weeks prior to initiation of any work in proximity to traffic or the implementation of any change in traffic patterns.

B. The Design-Builder shall prepare and submit a WZTC scheme for managing traffic operations and controlling access, until physical completion of work, meeting the requirements of Chapter 21 of the NYSDOT HDM for final WZTC Plans. The work Zone traffic Control scheme shall be in accordance with the NYSDOT Standard Sheets, National Manual of Uniform Traffic Control Devices (MUTCD) and New York State Supplement to MUTCD. In addition, the plan shall include contingency plans for weather, utility issues, and other unforeseen interruptions.

C. The Design-Builder shall coordinate development and submissions of WZTC Plans with Design Submittals. At a minimum, appropriately developed WZTC plans shall be submitted with the Conceptual / Preliminary Design, Intermediate Design, Final Design, and RFCD Submittals, as defined in the Technical Provisions.

D. The Design-Builder shall maintain the following features, including but not limited to, the roadway, curb, pavement, shoulder, drainage, barrier, guide rail pavements markings, traffic signal and loops, all signs (existing and WZTC) within the WZTC and within the ROW and work limits during construction, including existing roadway features.

E. The Design-Builder shall be responsible for maintenance of all new construction until the Project Element has been accepted by the Railroad. The Design-Builder shall be responsible for snow removal only within single lane cattle chutes or other areas not accessible to the Department of Sanitation.

F. The Design-Builder shall confirm acceptability of the proposed WZTC Plan with local officials (County, Town and Village), residents, and affected police and emergency response jurisdictions to facilitate safe and effective enforcement. The WZTC Plan shall recognize the need for approval of the use of local public roads.

G. The Design-Builder shall produce a clear graphical representation of each WZTC Plan stage, with associated traffic clearly delineated, in chronological order. Each significant change in traffic patterns shall be presented as a separate stage.

H. Following the RFCD Submittal, the Design-Builder shall be responsible for updating and resubmitting the WZTC Plan every 3 months or for every major traffic shift if within 3 months throughout the duration of the Project, so that at all times the current version reflects the planned current and future construction staging activities. The Design-Builder shall coordinate any proposed changes to the WZTC scheme with the AHJ.

I. The Design-Builder shall coordinate with any municipality or agency affected by any detours, lane closures or road closures that are part of the WZTC. The Design-Builder shall incorporate any comments from those municipalities or agencies into the WZTC Plan as directed by the Railroad.

J. The Design-Builder shall inform the Railroad one week in advance of any proposed WZTC lane closure or staging.

K. The construction staging plan shall indicate the location and treatment of all traffic streams (motorized vehicles, bicycles, pedestrians) and shall include details of:

1. Contingency plans for weather, utility issues, and other unforeseen interruptions.
2. Duration of construction, sequencing of construction and detouring/alternate routing required for each construction stage.
3. Identification of lane(s) to be closed and duration of closure(s), if any.
4. Location and scheduled dates of use for all traffic control and safety devices, including but not limited to traffic channelization devices, barriers, impact attenuators, signs, pavement markings and variable message signs.
5. Location and schedule of flaggers (where such use is permitted and required).
6. Location and type of regulatory, guidance and warning devices.
7. The anticipated impact on local businesses.
8. The means of delivery, work zone access points, and deployment of construction equipment, trailers, supplies, materials and other items for the Project.
9. Time of construction.
10. Public information considerations.

L. The WZTC plan shall be coordinated with affected emergency responders and police jurisdictions to facilitate safe and effective enforcement. The plan shall recognize the need for local approval of the use of public roads.

M. The desirable lane width during construction is 12'-0". In areas where 12 feet cannot be provided, the minimum lane width shall not be less than 11'-0". All local streets and access to buildings must be maintained unless otherwise noted in the permit.

N. Coordination with emergency services such as the local Fire Department will also be required. This coordination will require that traffic data be collected, a traffic study and analysis be performed and that the Design-Builder demonstrate that proposed lane closures will not have an adverse effect on traffic.

O. The Design-Builder shall produce a clear graphical representation of the staging with each stage, with associated traffic clearly delineated, in linear chronological order. Each significant change in traffic patterns shall be presented separately.

P. The Design-Builder shall provide portable variable message signs for the posting of appropriate warnings and advisories at strategic locations where opportunities are available for directing traffic to alternative routes in response to prevailing circumstances.

It is anticipated that portable variable message signs will be required at major highway interchanges, local streets and any detour routes.

Q. The Design-Builder shall be responsible for maintaining access to all businesses, residences, and properties within and abutting the Project, including essential services such as trash pickup and mail delivery.

R. The Design-Builder shall coordinate with any municipality or agency affected by any detours or road closures that are part of the WZTC.

2.24.3.2 Maintenance During Construction

A. The Design-Builder shall maintain the Work area during and after construction until Final Completion, except as may be provided elsewhere in the Contract Documents. The maintenance shall constitute continuous and effective Work prosecuted day by day, with adequate equipment and forces such that the roadway or structures are kept in satisfactory condition at all times. In the case of a contract for the placing of a pavement course upon a course or subgrade previously constructed, the Design-Builder shall maintain the previous course or subgrade during all construction operations, including when the plan calls for placing traffic on the unfinished roadway.

B. All costs of maintenance Work during and after construction, up until the Project Element has been accepted by the Railroad, shall be included in the Proposal Price and the Design-Builder will not be paid an additional amount for such Work. Maintenance includes snow and ice control.

C. The Design-Builder shall provide temporary and interim pavement markings during all construction phases conforming to the requirements of the NYSDOT Standard Specifications.

2.24.3.3 Opening of New Lanes

A. Any new travel lanes, turn lanes or other feature shall not be open to traffic prior to complete installation of all associated overhead and ground mounted permanent signs and striping.

2.24.4 Maintenance of Traffic Restrictions

A. Except in cases of Long Term Closures or with the approval of the AHJ, lane or shoulder closures are not permitted on the days indicated below, or on the work day preceding and following these days:

1. New Year's Day, January 1.
2. Presidential Inauguration Day.
3. Good Friday.
4. Easter weekend.
5. Memorial Day, the last Monday in May.
6. Independence Day, July 4.
7. Labor Day, the first Monday in September.

8. Thanksgiving Day, the fourth Thursday in November.
9. Christmas Day, December 25.

2.24.4.1 Closures

A. The following are provisions for full the lane closures:

1. While working on NHP Rd: Covert Ave and South 12th St shall be open.
2. While working on Covert Ave: NHP Rd and South 12th St shall be open.
3. While working on South 12th St: Covert Ave and NHP Rd shall be open.
4. While working on Willis Ave: Main St shall be open. Conversely, while working on Main St, Willis Ave shall be open.
5. While working on Urban Ave: School St shall be open. Conversely, while working on School St, Urban Ave shall be open.
6. Nothing in this section shall restrict the Design-Builder from requesting from Railroad and AHJ differing Short Term Lane and Shoulder Closures, Long Term Lane and Shoulder Closures, and alternate work hours. Any such request shall be subject to the approval of the AHJ.
7. While working on Meadowbrook parkway:
    a. Northbound:
        i. One lane closure will be allowed between 1100h and 1400h as well as between 2200h and 0500h.
        ii. Two lane or full road closure will be allowed between 2200h and 0500h.
    b. Southbound:
        i. One lane closure will be allowed between 1000h and 1400h as well as between 2200h and 0500h.
        ii. Two lane or full road closure will be allowed between 2300h and 0500h.

B. Short Term Lane and Shoulder Closures: Short Term Lane and Shoulder closures are those temporary closures which do not extend beyond a single continuous work session, such as a work day, an overnight period or a weekend and are easily removed in the case of an emergency

1. Shoulders directly adjacent to a closed lane shall also be closed.
2. The Design-Builder shall restore full traffic capacity in accordance with the lane and shoulder closure restriction or liquidated damages may be assessed appropriately by the Railroad.
3. Long Term Lane and Shoulder Closures: Long Term Lane and Shoulder Closures are defined as those closures extending across multiple work sessions longer than a work day, overnight period or a weekend. Long Term Lane and Shoulder Closures shall only be used when work is actively taking place or is reasonably planned to take place. Shoulders directly adjacent to a closed lane shall also be closed.

2.24.5 Emergency Response and Transportation Management Plans

A. The Design-Builder shall notify the Railroad immediately following any impacts to motorists due to construction activities and/or unforeseen circumstances. The Design-Builder shall disseminate such information to the appropriate personnel/entities for appropriate response to mitigate impacts to motorists.

B. The Design-Builder shall prepare an Emergency Response Plan to be implemented in the event any roadway within the project limit is shut down for unforeseen or unplanned circumstances. The Plan shall be implemented when the anticipated duration of closure exceeds twenty (20) minutes. The Plan shall be submitted to the Railroad for review and comment a minimum of two weeks prior to the beginning of Work. Work on this Project shall not begin until the Design-Builder receives written notification from the Railroad that the Emergency Response Plan has been reviewed by the Railroad and all Railroad comments have been resolved.

C. The Emergency Response Plan shall include a notification and communication plan that describes how the Design-Builder shall promptly inform the appropriate personnel/entities of an unforeseen or unplanned circumstance. The Railroad will provide a list of personnel and entities that need to be contacted in this section of the Emergency Response Plan.

D. The Design-Builder shall also provide the Railroad with a Transportation Management Plan (TMP) per FHWA's Final Rule on Work Zone Safety and Mobility, 23 CFR 630 Subpart J. The Emergency Response Plan shall be a component of the TMP and shall be located in the contingency section of the TMP.

2.24.6 Summary of Submittals

Item	Section	Submittal	Action
1	2.24.3.1	WZTC Plans (Intermediate, Final, RFCD and Updates)	Review and Comment
2	2.24.5	Emergency Response Plan	Review and Comment
3	2.24.5	Transportation Management Plan	Review and Comment

END

2.25 TEMPORARY UTILITIES

2.25.1 Section Includes

This Section identifies the requirements for temporary utilities that will be used by the Design-Builder.

2.25.2 Codes and References

A. National Electric Code.

B. Standards of the American Water Works Association.

C. The New York Department of Health Code.

D. The Nassau County Department of Health Code.

E. The Plumbing code of New York State.

F. The Occupational Safety and Health Administration (29 CFR1926).

G. The requirements of individual Utility Owners.

2.25.3 Scope

A. General: Provide and maintain temporary utility services and lighting as necessary for the performance of the Work.

1. Secure permits from the local municipality and/or Nassau County, as applicable, for temporary utility services, including connection and disconnection.

B. Electric Power:

1. Equipment and wiring for temporary power and lighting shall be UL listed. Installation shall conform to applicable requirements of the National Electric Code and OSHA.

2. Equipment and wiring shall be maintained in a safe condition and utilized in a manner which does not constitute a hazard to persons or property.

C. Lighting: Provide temporary lighting for Work areas in accordance with the requirements of 29 CFR 1926.56, modified as follows:

1. Provide a minimum uniform illumination level of 10 footcandles in general construction areas.

2. Lighting equipment shall be positioned and aimed in a manner which will not shine directly on passing trains, vehicular traffic, or any commercial or residential premises adjoining Railroad property.

D. Non-Potable Water: Provide non-potable water for construction purposes in accordance with the requirements of 29 CFR 1926.51 for industrial water supplies.

E. Potable Water: Provide potable water in accordance with the requirements of 29 CFR 1926.51.

F. Sanitary Facilities: Provide sanitary facilities in accordance with the requirements of 29 CFR 1926.51.

2.25.4 Functional Requirements

A. The Design-Builder shall submit Temporary Utility Designs to the Railroad for Review and Comment at least 10 Calendar Days prior to performing the Work.

B. The Design-Builder shall coordinate with all parties as necessary to provide temporary utilities.

C. The Design-Builder shall disconnect and remove all unnecessary temporary connections as the Work progresses.

D. Upon disconnection of the temporary services, the Design-Builder shall remove the temporary utilities and restore to original condition all disturbed areas and facilities not otherwise being improved as part of the Project.

2.25.5 Summary of Submittals

Item No.	Section No.	Submittal	Action
1.	2.25.4	Temporary Utility Designs	Review and Comment

END

2.26 TEMPORARY FACILITIES

2.26.1 Section Includes

This section defines the requirements for temporary Project office facilities that will be used by the Design-Builder as well as by the Railroad staff.

2.26.2 Construction Signage:

A. General: Provide construction signage in accordance with the following:

1. Signs shall be constructed from single sheets of ¾" thick exterior type, A-B grade plywood, securely bolt-mounted in locations as directed by the Railroad. Posts, where used, shall be of 4" x 4" pressure treated construction grade lumber, set to a minimum depth of 4' below grade.
2. Signs shall be painted with 1 coat of primer-sealer on both sides and with 2 finish coats of white semi-gloss enamel.
3. Unless otherwise specified, lettering styles, colors and proportions shall be as directed by the Railroad.

B. Field Office Signs: Provide 2 field office signs, 4' wide by 2' high. Text shall read as follows:

LONG ISLAND RAIL ROAD
FIELD OFFICE

[NAME OF DESIGN-BUILDER]
FIELD OFFICE

C. Temporary Construction Signs: Provide temporary construction signs, 4' wide by 2' high. The Design-Builder shall provide separate signs for each element of work to include specific Project Element details of improvements where appropriate and show final renderings of how area will look after construction is completed at each work site. Text for Temporary Construction Signs shall read as follows:

This work is part of the LIRR Expansion Project, to improve service and safety by adding a third track, eliminating grade crossings, and other local improvements. Please bear with us and forgive any inconvenience while work is in progress [Insert hotline number].

D. Maintenance: Maintain all signs, keeping them clean, in good repair, and free of obstructions. Remove signs upon completion of the Work.

2.26.3 Project Identification Signs:

A. The Railroad shall furnish to the Design-Builder Project Identification Signs, nominally 3' wide by 4' high by 1/16" thick aluminum.

B. Install each Sign, securely mounted to 1/2" minimum plywood substrate in a manner resistant to vandalism and theft, in the locations directed by the Railroad. Sign posts, where used, shall be of 4" x 4" pressure-treated construction grade lumber, set to a minimum depth of 4' below grade.

C. Maintain each Sign in good condition, free of markings and dirt, and free of obstructions.

D. Upon completion of the Work, return all Signs to the Railroad and repair damage to substrate resulting from sign installation or removal.

2.26.4 Temporary Railroad Facilities:

A. The Design-Builder shall establish temporary field office spaces for exclusive use of Railroad's project management employees and Railroad employees displaced by this project at locations as directed by the Railroad. Railroad PM/CM employee offices shall be complete in place and ready for commencement of the work, and displaced employee offices shall be complete in place prior to their displacement.

B. The Design-Builder shall provide the temporary facilities for the Railroad PM/CM staff in accordance with the following requirements:

1. LIRR Expansion Project Community Information Center:
    a. Location Preferably located within the same building as the PM/CM space.
    b. Requirements:
        i. If the PM/CM office is not located in proximity to Mineola Station, the location shall be in a separate building in walking distance to Mineola station.
        ii. Separate entrance area from reception area.
        iii. A minimum of 3 outlets.
        iv. Small storage space to place extra documents, iPad, and flat screen TV.
        v. 12 person conference room.
        vi. One (1) 12 person conference table.
        vii. Twelve (12) padded ergonomic office chair with 360 degree swivel, adjustable arms, seat height, and seat angle for the conference room.
        viii. The conference room shall have a projector and a 65" TV with HDMI connect capability.
2. LIRR Reception Area:
    a. No. of Personnel – 2.
    b. Location - Located within the same building as the PM/CM space.

c. Requirements:
    i. Separate entrance from Public Information Office.
    ii. Separate area from Public Information Office.
    iii. Space shall be 64 sq. ft. (min).
    iv. Space for waiting room seating.
    v. Four (4) chairs for waiting area.

3. Conference Rooms:
    a. No. of Personnel – 100.
    b. Location - Located within the same building as the PM/CM space.
    c. Requirements:
        i. 2 conference rooms with 50 person capacity each.
        ii. Conference rooms shall be connected with a removable wall in between.
        iii. One (1) conference phone per room with two (2) connected mics.
        iv. One (1) 48”x72”white board per room.
        v. One (1) 80" LED flat screen TV with HDMI connections per room.
        vi. Wi-Fi access.
        vii. Multiple outlets throughout each conference room.
        viii. One (1) padded ergonomic office chair per person with 360 degree swivel, adjustable arms, seat height, and seat angle for each conference room.
4. Break Out Rooms
    a. Three (3) Break Out Rooms
    b. Each room shall be 220 sq.ft.
    c. Allowable space for 6-10 people.
    d. Each room shall have a conference table, a phone, one (1) chair per person, One (1) 55" LED flat screen TV with HDMI connections, one (1) projector, and computer access with connection to the projector.
5. Railroad PM/CM Office Space:
    a. The Railroad PM/CM office space shall be equipped with, a minimum of 3 copiers (color & BW), printers (color & BW) with capability of scanning, faxing, printing 11x17 printing capability, and 1 color plotter/ scanner to handle full size drawings. The designated Railroad office area shall have adequate lighting, security lighting during non-working hours, fire protection systems, heating and cooling, lavatory and toilet facilities with hot and cold running water, coffee service, fire extinguishers, OSHA Standard first-aid cabinets, and daily cleaning and servicing. All offices

shall be equipped with Wi-Fi and network connectivity to support all employee activities.

b. No. of Personnel – 70.

c. Parking Accommodations – 40 cars.

d. Location - Preference for close proximity to Mineola Station, however other locations that are close to Project Corridor would be considered

e. Requirements -

i. 47 cube spaces (8'x8') for each employee and a minimum of two (2) outlets per cube.

ii. 12 Office spaces (10'x10') for senior management and above and a minimum of three (3) outlets per cube.

iii. Swing space for 6 desks with one (1) chair per desk.

iv. Three (3) offices (14x14) for executives and above and a minimum of three (3) outlets per cube.

v. One (1) office phone for each cube and office

6. Features for Railroad PM/CM Office:

a. Restrooms - Women's and Men's restrooms.

b. Drafting table - two (2) tables.

c. File cabinet (36'x63') - fifteen (15) cabinets.

d. Wardrobe – two (2).

e. Refrigerator - two (2) (minimum $27ft^3$).

f. Microwave oven - two (2) (1 ft^3, 1000 Watts).

g. Storage room - One (1) large Storage room.

h. Supply room - One (1).

7. Cubicle Furniture:

a. Floor Standing Pedestal, 2 box drawers & 1 file cabinet, 15Wx24Dx26-7/8H, with standard lock.

b. Calibre Bookcase, 3-high, 30Wx14-7/8Dx39H, two shelves.

c. Reuter Overhead Cabinet, one door, 42Wx14-1/4Dx14-3/4H.

d. Calibre Lateral File, 2-12" drawers with rails, 30Wx27H, with lock.

e. Work Surface, Straight with grommets.

i. 72Wx23-5/8Dx1-1/4H.

ii. 96Wx23-5/8Dx1-1/4H.

f. Padded ergonomic office chair with 360 degree swivel, adjustable arms, seat height, and seat angle.

g. One (1) white board and two (2) chairs per cubicle.

h. One (1) trash can per cubicle.

8. Office Furniture

a. Senior Management office

i. Office desk: L-Shape

ii. Book Shelf

iii. Whiteboard- 48”Lx 36”H.

iv. One (1) trash can

v. Three (3) padded ergonomic office chair per office with 360 degree swivel, adjustable arms, seat height, and seat angle for each office

b. Executive office

i. Office desk: L-Shape

ii. Book shelf

iii. Whiteboard- 48”Lx 36”H

iv. One (1) trash can

v. Separate round table with and additional three (3) chairs

vi. Three (3) chairs per office.

vii. Three (3) padded ergonomic office chair per office with 360 degree swivel, adjustable arms, seat height, and seat angle for each office

9. Optional Accessories:

a. Adjustable Keyboard Support, 27" Integrated Platform, Advanced Easy Lift Arm, 22" Track Length.

b. Sapper XYZ Monitor Arm Kit, table clamp mount, cable management clips.

C. The Design-Builder shall provide temporary facilities for employees of the following LIRR departments in accordance with the design requirements stated below:

1. Temporary facility for LIRR Signal Staff:

a. No of Personnel – 7.

b. Parking accommodations – 2 trucks.

c. Location - Close proximity to Mineola Station/ Obay turnout.

d. Requirements:

i. One (1) 60'-0" Construction trailer.

ii. Space for nine (9) lockers (6'x2' lockers).

iii. One (1) Office for the Foreman.

2. Temporary facility for LIRR Substations Staff:
    a. No of Personnel – 8.
    b. Parking accommodations – 4 trucks.
    c. Location - Close proximity to Mineola Station.
    d. Requirements:
        i. One (1) 60'-0" Construction trailer.
        ii. Space for thirteen (13) lockers (6'x2' lockers).
        iii. One (1) Office for the Foreman.
            a. One (1) desk
            b. One (1) chair
            c. One (1) Trash Can
3. Temporary facility for LIRR Transportation Staff:
    a. No of Personnel –15 per location.
    b. Parking accommodations – 2 cars.
    c. Location - Throughout the Project Corridor.
    d. Requirements:
        i. Three (3) 20'-0" Construction trailers distributed evenly throughout the Project Corridor, so that there is one trailer at the West end of the Project Corridor, one at the East end of the Project Corridor, and one in the center of the Project Corridor.
        ii. One (1) Conference table in the main area of the trailer.
        iii. One (1) chair per employee.
        iv. One (1) Copier/printer/scanner.
        v. One (1) microwave oven (1 ft^3, 1000 Watts).
        vi. One (1) refrigerator (minimum 27ft^3).
        vii. One (1) Cork Bulletin Board per trailer.
4. Temporary facility for LIRR Communications Staff:
    a. No of Personnel – 6.
    b. Parking accommodations – 2 vans.
    c. Location - Mineola.
    d. Requirements:
        i. One (1) 60'-0" Construction trailer.
        ii. Space for four (4) lockers.
        iii. Wall shelving.

iv. Two (2) 19” equipment racks used for demonstrations.

v. One (1) Office for the Foreman.

a. One (1) desk

b. One (1) chair

c. One (1) Trash Can

5. Temporary facility for LIRR Track Staff:

a. No of Personnel – 8.

b. Parking accommodations – 2 trucks.

c. Location - Close proximity to Mineola Station.

d. Requirements:

i. One (1) 60'-0" Construction trailer.

ii. Space for sixteen (16) lockers (6'x2' lockers).

iii. One (1) Office for the Foreman.

a. One (1) desk

b. One (1) chair

c. One (1) Trash Can

D. All temporary facilities shall be provided and maintained by the Design-Builder. All temporary facilities shall have working bathrooms with running water and call-ahead services. All temporary facilities shall be required to have electricity supply.

E. Internet Requirements - The Design-Builder shall provide Verizon 1Gbps EPL point to point transparent connection supporting jumbo frames MTU 1950 or better. EPL shall be from built from temporary facilities to the Hillside Support Facility.

2.26.5 Design-Builder's Office

A. The Design-Builder shall maintain its Central Management and Design Office (co-located facility) in the same building as the Railroad PM/CM office, but separate from the Railroad Offices.

B. In addition, the Design-Builder may establish and maintain separate Design-Builder’s Field offices at locations permitted by the Railroad.

2.26.6 Temporary Facilities for Communities

A. The Design-Builder shall provide a temporary facility for ensuring emergency services can operate on the south side of the New Hyde Park Village, during construction of the grade crossings at Covert Avenue, South 12th Street, and New Hyde Park Road. The temporary facility shall be in place till the construction at Covert Avenue, South 12th Street and New Hyde Park Road grade crossings is complete.

B. The temporary facility shall be provided in accordance with the following requirements:

1. A modular structure to house one 26 feet fire engine and 1 ambulance:

a. Double wide bay.

b. 28 feet wide, 14 feet tall and 30 feet deep.

c. Outfitted with heat and A/C.

2. A trailer for staff which shall include:

   a. Electricity, heating and cooling system, running water, lavatory and toilet facilities.

   b. A bathroom.

   c. Space for desk/chair.

   d. Small kitchenette area.

2.26.7 Temporary Facilities Site and Floor Plans

A. Prior to the beginning of construction, the Design-Builder shall submit Temporary Facilities Site and Floor Plans for Railroad's Review and Comment.

2.26.8 Summary of Submittals

Item No.	Section No.	Submittal	Action
1.	2.26.4	Temporary facility final location for PM/CM office	Review and Approval
2.	2.26.4	Temporary facility final location for Railroad Staff	Review and Approval
3.	2.26.7	Temporary Facilities Site and Floor Plans	Review and Comment

END

2.27 SURVEY AND LAYOUT

2.27.1 Section Includes

This Section includes requirements for land survey units, datum, controls, and monuments.

2.27.2 Codes and References

The Project shall comply with the following:

A. Federal Geodetic Control Committee, Geometric Geodetic Accuracy Standards and Specifications for Using GPS and Relative Positioning Techniques, August 1989.

B. Federal Geodetic Control Committee, Standards and Specifications for Geodetic Control Networks, August 1, 1984.

C. Federal Geographic Data Committee – Federal Geodetic Control Subcommittee, *Geospatial Positioning Accuracy Standards, Part 1: Reporting Methodology*, document FGDC-STD-007.1-1998.

D. Federal Geographic Data Committee – Federal Geodetic Control Subcommittee, *Geospatial Positioning Accuracy Standards, Part 2: Standards for Geodetic Networks*, document FGDC-STD-007.2-1998.

E. Federal Geographic Data Committee – Federal Geodetic Control Subcommittee, *Geospatial Positioning Accuracy Standards, Part 3: National Standard for Spatial Data Accuracy*, document FGDC-STD-007.3-1998.

F. Federal Geodetic Control Subcommittee, Specifications and Procedures to Incorporate Electronic Digital / Bar-Code Leveling Systems, FGCSVERT (ver. 4.1 5/27/2004).

G. National Geodetic Survey (NGS), User Guidelines for Single Base Real Time GNSS Positioning, Version 3.1, April 2014.

H. New York State DOT, Land Surveying Standards and Procedures Manual, February 2009

I. Federal Geographic Data Committee, GIS Standards.

2.27.3 Overview

A. The Design-Builder shall perform all land surveying and mapping under the direction of a Professional Land Surveyor registered in the State of New York.

B. The Design-Builder shall be responsible for preparing and securing all applications, permits, access rights, permissions, approvals or otherwise necessary for property access prior to carrying out any survey work. The Design-Builder shall submit copies of property access permissions for Information before performing the survey work.

C. The Design-Builder shall protect carefully from disturbances or damages all land monuments and property marks until the Design-Builder has recorded their location. The Design-Builder shall replace such monuments and marks upon completion of construction.

D. If construction is anticipated 10 feet a monument, the applicable governmental office (e.g. New York City Department of Transportation or National Geodetic Survey (NGS)) must be notified at least 48 hours in advance.

E. Each monument or bench mark, which must be removed or disturbed, shall be protected until properly referenced for relocation. The Design-Builder shall provide the new monument or bench mark prior to removing or disturbing the existing monument or bench mark.

2.27.4 Datum and Units

Except where specified otherwise by Third Party standards, the Design-Builder shall perform all land survey and mapping in accordance with the following:

A. Units: 1 US. Survey Feet = 0.3048m (1200/3936m).

B. Horizontal datum North American Datum of 1983 (NAD 83) (2011), referenced both to the New York State Plane and the Long Island Zone State Plane Grid Coordinates.

C. Vertical Datum: North American Vertical Datum (NAVD88) 1988 adjustment.

2.27.5 Control Requirements

2.27.5.1 Horizontal Accuracy Requirements

2.27.5.1.1 Primary Control

A. The Design-Builder shall tie its lines, elevations, and grades into the Railroad's primary control system. The Design-Builder shall validate its horizontal and vertical control points with the Railroad prior to continuing with the work.

B. The Design-Builder shall establish primary control by either Global Navigation Satellite System (GNSS) methods or conventional traversing methods. The Design-Builder shall tie primary control to NAD 83 (2011) static monuments, published either by the National Geodetic Survey (NGS) or NYSDOT.

C. The Design-Builder shall survey the primary control network to an accuracy standard of 1 centimeter of positional tolerance as described in the Federal Geodetic Control Subcommittee – Federal Geographic Data Committee's *Geospatial Positioning Accuracy Standards, Parts, 1, 2, and 3*, document FGDC-STD-007.1, .2, and .3-1998.

D. The Design-Builder shall not use real time kinematic or real time network surveys for establishment of primary control. The Design-Builder shall not use the NGS's Online Positioning User System as a means for determining GNSS positions.

2.27.5.1.2 Secondary Control

A. The Design-Builder shall establish secondary control to control the mapping of the Project Corridors from Hicksville to Floral Park. Secondary control shall be tied to and connect the primary control. Secondary control shall be established using GNSS or conventional traversing methods.

B. The secondary control shall be surveyed to an accuracy standard of 2 centimeters of positional tolerance as described in the Federal Geographic Data Committee – Federal Geodetic Control Subcommittee's *Geospatial Positioning Accuracy Standards, Part 1: Reporting Methodology*, document FGDC-STD-007.1-1998, and *Part 2: Standards for Geodetic Networks*, document FGDC-STD-007.2-1998.

C. Real time kinematic surveys meeting the Class RT1 specifications as detailed in the NGS *User Guidelines for Single Base Real Time GNSS Positioning, Version 2.1* (August 2011) are acceptable for the establishment of secondary control. Real time network surveys shall not be used for the establishment of secondary control. The Design-Builder shall not use the NGS's Online Positioning User System as a means for determining GNSS positions.

2.27.5.1.3 Supplemental Control

A. The Design-Builder shall establish supplemental control for the purpose of gathering design-related data, and metes and bounds surveys.

B. The supplemental control shall be tied to either the secondary control networks or the primary control networks, or a combination of both, and shall be surveyed to an accuracy standard of 2 centimeters plus 50 parts per million of positional tolerance.

C. Real time kinematic surveys meeting the Class RT1 specifications as detailed in the NGS *User Guidelines for Single Base Real Time GNSS Positioning, Version 3.1* (August 2014) are acceptable for the establishment of secondary control. Real time network surveys shall not be used for the establishment of secondary control. The Design-Builder shall not use the NGS's Online Positioning User System as a means for determining GNSS positions.

2.27.5.2 Vertical Accuracy Requirements

A. The Design-Builder shall establish vertical control as defined by the Federal Geodetic Control Committee's report *Standards and Specifications for Geodetic Control Networks (*August 1, 1984), as supplemented by *Federal Geodetic Control Subcommittee Specifications and Procedures to Incorporate Electronic Digital/Bar-Code Leveling Systems* (FGCSVERT, ver. 4.1, May 27, 2004).

B. The Design-Builder shall establish Primary control and secondary control networks by digital leveling with the use of an invar rod. Primary and secondary control shall be established to an accuracy of Second Order, Class 1 (1:50,000).

C. Supplemental Control networks shall be established to an accuracy of Third Order (1:20,000).

D. GNSS survey shall not be used for the establishment of vertical control.

2.27.5.3 Permanent Control Monuments

The Design-Builder shall place permanent control monuments in accordance with the following:

A. Monuments shall be brass monument discs permanently anchored in concrete.

B. The Design-Builder shall place a minimum of three monuments within each one-mile increment along the Project Corridor.

C. The Design-Builder shall set monuments in a way so as to minimize the chances of being disturbed or destroyed during Construction Work. Disturbed or destroyed monuments shall be replaced within 7 calendar days. Each monument must be visible to the next monument before and after construction. The Design-Builder shall not set monuments in roadways.

2.27.5.4 Control Survey Field Books and Records

A. The Design-Builder shall submit to the Railroad, all information listed under the '*Documentation*' sub-section of each chapter of the NYSDOT *Land Surveying Standards and Procedures Manual* that is applicable to its survey work. The Design-Builder shall index and submit all calculations, notes, computer files, raw data, project reports, meeting notes, correspondence, digital images, maps, corner records, records of survey, aerial photogrammetric products, centerline alignment maps, and other maps and related items.

B. The Design-Builder shall be responsible for ensuring that information submitted is consistent with the applicable Railroad CADD standards, software and operating systems and formats.

C. All survey reports and maps, including bathymetric survey plans, shall be signed-and-sealed by a New York State licensed professional land surveyor.

D. The Design-Builder shall reference each monument to at least three permanent, physical features to remain during Construction Work. The Design-Builder shall prepare detailed sketches showing the monument and reference ties, as well as the general physical location.

E. The Design-Builder shall record all horizontal and vertical control work, including angles, distances, adjusted coordinates, levels, elevations, and references, in a survey field book. The Design-Builder shall catalog copies of their horizontal and vertical control adjustment files and final adjusted coordinates and elevations.

F. The Design-Builder shall submit Control Survey and reports in standard NYSDOT format within 14 Calendar Days of completion of the controls establishment.

2.27.6 ROW and Permanent Easement Surveys

A. The Design-Builder shall perform right of way and easement surveys and stakeout as necessary to execute the work.

B. Upon the request from the Railroad or a property owner abutting the Project ROW, the Design-Builder shall stake out the Project ROW and easements at the abutting property within 14 Calendar Days.

2.27.7 ROW and Permanent Easement Monuments

The Design-Builder shall place permanent monuments to define the Project ROW and permanent easement in accordance with the following:

A. The Design-Builder shall place brass discs stamped with “LIRR ROW” permanently anchored in concrete at 2,000-foot intervals along the Project Corridor. Where the monument falls near a control station (P.C., P.T., P.R.C., P.C.C), that monument shall be placed at that station.

B. The Design-Builder shall place rebar and caps in between the brass disc concrete monuments in such a way that there is an approximate 1,000-foot interval between monumentation. Rebar shall be a minimum of ½ in diameter and 18” long. Cap shall be 2 ½” in diameter, made of a metal material and stamped with “MTA ROW”.

C. The Design-Builder shall set monuments in a way so as to minimize the chances of being disturbed or destroyed during Construction Work. Disturbed or destroyed monuments shall be replaced within seven Calendar Days.

2.27.7.1 ROW and Permanent Easement Field Books and Records

A. The Design-Builder shall record all ROW and permanent easement monument stakeout, including traverse used, stakeout computations with angles and distances, and references sketches.

B. The Design-Builder shall submit ROW and Permanent Easement Field Books and Records for Information within 30 Calendar Days of the monument stakeout.

2.27.8 3-D GIS

A. The Design-Builder shall provide a 3-D GIS spatial model of the Site that includes base mapping layers such as aerial photography, topography, infrastructure, and buildings. The 3-D GIS spatial model shall include all the design elements, buildings, and staging areas. The 3-D GIS spatial model shall incorporate and host a geospatial digital photographic documentation record by the Design-Builder of the construction, including for all photographic images the date, time, location, orientation, and descriptor. The 3-D GIS spatial model shall allow for interactive simulation in a virtual reality system, including visualization of the staging, sequence of the Work. The 3-D GIS spatial model shall include interactivity to enable the Railroad to review sequence of construction, and shall provide 3-D interactive viewing capability to a functional level typical of commercial proprietary software.

2.27.9 Summary of Submittals

Item	Section	Submittal	Action
1	2.27.3	Property Access Permission	Information
2	2.27.5.4	Control Survey Field Books and Records	Information
3	2.27.7.1	ROW and Permanent Easement Field Books and Records	Information
4	2.27.8	3-D GIS	Review and Approval

END

2.28 CLEANING AND DUST CONTROL

2.28.1 Section Includes

This Section describes the requirements to keep a clean and orderly Site free of waste, trash, rubbish, debris, dirt, dust and spilled, surplus and discarded materials.

2.28.2 Codes and References

The Design-Builder shall comply with the requirements of the relevant Codes and Standards listed in Contract Documents including, at a minimum, the following:

A. 29 CFR 1910 - Occupational Safety and Health Administration (OSHA).

B. 29 CFR 1926 - Safety and Health Regulations for Construction (OSHA).

2.28.3 Site Housekeeping and Final Cleanup

2.28.3.1 Site Housekeeping

A. The Site shall be cleaned up at the close of each work day, and be left in an orderly condition. Waste and debris shall be removed from the Site and surrounding areas cleaned of debris or waste generated from the Site.

B. Containers shall be provided for the collection, and separation of waste and recyclable materials in accordance with applicable governmental rules, and garbage and other waste shall be disposed of lawfully at frequent and regular intervals. Any salvaged material not specified to be disposed of otherwise shall become the property of the Design-Builder and shall be removed from the Site.

C. No material removed from the work site can be disposed of, either temporarily or permanently, on property owned or leased by the Railroad, MTA (including all subsidiaries) or the State.

2.28.3.2 Final Cleanup

A. Before the project is completed, the construction area and all other adjoining areas, other than those owned by the Design-Builder, occupied by the Design-Builder in connection with the construction Work shall be cleaned of all surplus and discarded materials, spilled materials, excess materials left deposited on the permanent Work as a result of the Design-Builder's operations, falsework, and rubbish and temporary structures and buildings, that were placed thereon by the Design-Builder.

B. The adjoining areas mentioned above, outside the normal limits for seeding, will be reshaped, seeded and mulched, or otherwise restored as directed by the Project Manager at the Design-Builder's expense.

2.28.4 Cleaning

2.28.4.1 Cleaning inside the ROW

A. The Design-Builder shall clean the areas directly impacted by its work inside the ROW. In addition, it shall also clean the areas remove debris and waste generated by the Railroad when the Railroad is performing Work inside the ROW in the same location as the Design-Builder.

2.28.4.2 Waste Material

A. The Design-Builder shall maintain the Site in a clean and neat condition, clear and free of waste, trash, rubbish, and debris.

B. Waste material shall not remain on the Site or adjoining streets, and shall immediately be removed by the Design-Builder. The Design-Builder shall clean and keep clean all roadways, sidewalks, paths, trails, and other public areas in which the Work is to be done. Protect such areas against unauthorized dumping of waste material by others and remove such material promptly.

C. Concrete mixing trucks shall not be washed on local streets, nor shall the waste material from the washing out of concrete mixing trucks and grouting operations be discharged to any sewer manhole, catch basin, sewer, or street.

D. Rubbish (such as bottles, cans, paper, and wrappers) shall be placed into rodent-proof, tightly covered, plastic-lined trashcans located in each work area.

E. All work areas shall be protected against unauthorized dumping of waste material by others. Refuse or debris that spills or blows from any container shall be cleaned up as soon as possible and not more than 2 hours after the occurrence. The Design-Builder shall prevent waste from entering into storm or sanitary sewers.

2.28.4.3 Public Roadway Cleaning

A. The Design-Builder shall prevent dirt and debris from leaving the Site and from spilling onto public roadways, sidewalk, paths, and trails within the Site. Dirt and debris transferred to paved surfaces shall be cleaned up immediately.

B. All public roadways and walkways adjacent to the Work of the Project, including those within the Site, shall be cleaned daily. Dry sweeping is prohibited.

2.28.4.4 Dust Control

The Design-Builder shall prevent dust particles from leaving the Site and from entering onto public roadways, sidewalks, and private properties.

A. Wet suppression shall be used to provide temporary control of dust. Several applications per day may be necessary to control dust depending upon meteorological conditions and work activity. The Design-Builder shall apply wet suppression on a routine basis as necessary or directed by the Project Manager to control dust.

   1. Wet suppression consists of the application of water or a wetting agent in solution with water. Ensure wetting agent is not used on plantable soils.

   2. Wet suppression equipment shall consist of sprinkler pipelines, tanks, tank trucks, or other devices capable of providing regulated flow, uniform spray, and positive shut-off.

B. Provide wind-screens and wind barriers in locations where they would be effective in minimizing wind erosion and spread of dust. Locations shall be submitted as part of the Design-Builder's dust control plan. The Design-Builder shall keep wind-screens and barriers in good repair for the duration of the Project.

C. The Design-Builder shall use the following measures to control dust on public roadways:

1. Vehicles leaving the construction site shall have no mud or dirt on the vehicle body or wheels. Gravel cover shall be applied to soil (unpaved) surfaces where they will be regularly traveled at egress and ingress routes from/to work sites. Wheels shall be cleaned as necessary before leaving sites to control tracking.
2. Vehicle mud and dirt carryout, material spills, and soil washout onto public roadways and walkways and other paved areas shall be cleaned up immediately.
3. The Design-Builder is responsible for daily cleanup of public roadways and walkways affected by work of this Project. A wet spray power vacuum sweeper or similar equipment shall be used on paved roadways. Dry power sweeping is prohibited.

D. The Design-Builder shall use the following methods to control dust and wind erosion of active and inactive stockpiles:
   1. Wet suppression without wetting agent during active stockpile load-in, load-out, and maintenance activities.
   2. Soil stabilizers applied to the surface of inactive stockpiles.
   3. Plastic tarps on stockpiles, secured with sandbags or an equivalent method to prevent the cover from being dislodged by the wind. The Design-Builder shall repair or replace covers whenever damaged or dislodged.

E. The Design-Builder shall use the following measures to minimize dust during demolition:
   1. Closed chutes shall be used for the handling or debris. Dropping or throwing of debris is prohibited.

END

2.29 OM MANUALS AND TRAINING

2.29.1 Section Includes

This Section outlines:

A. Requirements for Operation and Maintenance Manuals.

B. Requirements for Instruction of Railroad Personnel.

C. Requirements relating to the training required by the Contract Documents.

2.29.2 Codes and References (Not Used)

2.29.3 OM Manuals

2.29.3.1 Quality Control

The Design-Builder shall ensure that:

A. Manuals shall be prepared by a skilled technical writer familiar with the operation and maintenance of the products and systems described.

B. Operating procedures and maintenance requirements shall be as developed by the respective manufacturers of the equipment or components of systems, and integrated by the Design-Builder's technical writer.

2.29.3.2 Submittals

The Design-Builder shall submit following submittals:

A. Preliminary Draft.

B. Complete manuals, in final form, for each type of equipment and each system.

C. Documentation that each manufacturer and supplier has committed to furnish updated operation and maintenance data, service bulletins, and other information pertinent to installed materials, products, equipment, and systems for the duration of the warranty period.

2.29.3.3 Format

A. The Design-Builder shall compile the OM Manuals in the following format:

1. Manuals shall be written in clear, grammatically correct English. Information shall be preprinted or typewritten. No handwritten data shall be permitted.
2. Use of pertinent manufacturer's printed product data is acceptable. Product data sheets shall be marked to clearly identify applicable materials, products components and systems, and data applicable to their installation. Extraneous information shall be deleted.
3. Drawings shall be utilized as required to supplement product data, to illustrate relationships of components, equipment, and systems, as well as control logic and flow.
4. Typed text shall be utilized as required to supplement product data, to incorporate maintenance instructions from individual manufacturers, and to ensure a logical sequence of instructions for each procedure.
5. Measurements shall include both the U.S. measurements and SI equivalents.

B. Text shall be printed in standard 8½" x 11" in size, and shall be bound in with the text Drawings and sketches 11" x 17" or 22"x 34" in size are acceptable, but shall be folded and placed in a drawing pocket inside the rear cover. Drawings and sketches of other sizes shall be reduced to or mounted on one of the foregoing sizes.

C. Manuals shall be enclosed in standard 3-ring loose leaf binders of appropriate thickness for the contents. Binders shall have heavy-duty plastic covers. Binder covers and spines shall be clearly labeled with the following information:

THE LONG ISLAND RAIL ROAD COMPANY

JAMAICA, NEW YORK

(CONTRACT TITLE)

(MANUAL TITLE)

Prepared by: (name of Contractor)

(space for Railroad approval stamp on cover)

D. A Table of Contents shall be provided, listing each material, product, equipment, and system, indexed to the contents of the manual.

E. Flysheets shall separate each portion of the manual and shall briefly describe the contents of the ensuing portion. Flysheets shall be blue in color.

F. Manuals shall be printed on minimum 20 pound paper.

2.29.3.4 Content

A. The Design-Builder shall ensure that OM manuals, at a minimum cover the following content:

1. For each material, product, and system, the name, address, and telephone number of the original supplier shall be listed. Where applicable, a local source of supplies and replacement parts shall be included.

B. For building products, materials, and finishes, the following information shall be included:

1. Manufacturer's product data, including catalog number, size, composition, and color and texture designations; and information for re-ordering custom manufactured products.

2. Instructions for care and maintenance, including the manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

C. For equipment and systems, the following information, as applicable, shall be included:

1. Description of each item or system, including component parts; manufacturer's published literature describing capacity, function, normal operating conditions and limits; performance curves, with engineering data and tests; and complete nomenclature of each replaceable part.
2. Operating procedures, including start-up, break-in, and routine normal operating instructions; regulation, control, starting, stopping, shutdown, and emergency instructions; and special operating instructions.
3. Maintenance procedures, including guides for routine procedures and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
4. For each system, the following shall be included, as applicable:
    i. As-installed color-coded wiring diagrams.
    ii. Sequence of operation by controls manufacturer.
    iii. As-installed control diagrams by controls manufacturer.
    iv. Charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
    v. Airflow and water flow balancing reports.
5. For each item of equipment, the following shall be included, as applicable:
    i. Servicing and lubrication schedule, including a list of lubricants required.
    ii. Manufacturer's printed operation and maintenance instructions.
    iii. Original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
    iv. Lists of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

2.29.3.5 Execution

A. The Design-Builder shall prepare manuals in accordance with the requirements of this Section and other requirements of the Contract Documents.

B. The Design-Builder shall transmit manuals to ensure their receipt by the Railroad prior to the specified time. The Design-Builder shall transmit 3 copies of each manual unless otherwise specified. All copies shall be bound in hard cover, three ring binders with titles on both the cover and the spline. All individual sections should be separated with tabbed dividers. In addition, a copy of all the content shall be furnished on CD-ROM in either Microsoft Word or Adobe Acrobat Format.

2.29.3.6 Instruction to Railroad Personnel

A. The Design-Builder shall provide instructions to the Railroad Personnel as follows:

1. Prior to Construction Completion, the Design-Builder shall instruct designated Railroad personnel in the operation, adjustment, and maintenance of materials, products, equipment, and systems. For work on Project Elements that the Design-Builder wishes to turn over to the Railroad, this requirement shall apply to each Project Element, and completion of training will be required prior to acceptance of the Project Element by the Railroad.

2. For equipment subject to seasonal operation, perform such instruction "in season". Complete deferred instruction for seasonally operated equipment at the beginning of the appropriate season.
3. The OM Manuals shall be used as the basis for instruction. Review the contents of the manuals with Railroad personnel to verify that each aspect of operation and maintenance is explained in detail, for each material, product, equipment, and system.
4. Prepare and insert additional data in OM Manuals, should the need for such data become apparent during instruction.

2.29.4 Training

2.29.4.1 Requirements

The Design-Builder shall provide training as follows:

A. The Design-Builder shall establish and maintain documented procedures for identifying training needs and provide for the training of all personnel performing activities affecting safety or quality. Personnel performing specific assigned tasks shall be qualified on the basis of appropriate education, training and/or experience, as required. Appropriate records of training shall be maintained. All training shall take into account and comply with prevailing codes and standards applicable to the work.

B. The Design-Builder shall establish documented procedures and records to ensure that the skills and professional judgment of their personnel are developed appropriately for their intended roles, through training and/or the recorded accumulation of experience; with systematic reviews of their competence at determined levels, and before any deployment of new roles.

C. Training shall focus on improving competency and skill for those performing activities that materially impact safety or quality.

D. All qualification and training records shall be considered quality records and shall be maintained accordingly.

E. Project personnel shall be trained in all the special Project procedures applicable to their work.

F. Craft journeymen with special skills need not be trained for activities affecting quality but their competency shall be verified and a record maintained of the verification. They shall be trained for Project safety.

G. The Design-Builder shall provide Project specific training for Railroad personnel as required for Railroad personnel to perform their designated work functions. Railroad will designate all Railroad personnel who need to receive training no less than 15 Calendar Days prior to the scheduled training, including training required for full access to the site.

2.29.5 Summary of Submittals

Item	Section	Submittal	Action
1	2.29.3.2	Draft OM Manual	Information
2	2.29.3.2	Complete OM Manuals	Review and Approval
3	2.29.3.2	Manufacturer & Supplier Documentation	Information

END

2.30 RECORD DOCUMENTS

2.30.1 Section Includes

This Section describes the requirements for Record Documents including document control, data control and record retention.

2.30.2 Document and Data Control

2.30.2.1 General

The Design-Builder shall establish record documents in according with the following:

A. The Design-Builder shall establish and maintain documented procedures to control all documents and data that relate to the requirements of this Section including, to the extent applicable, documents of external origin such as Standards and the Railroad Plans.

B. The Design-Builder shall be responsible for the establishment and implementation of documented procedures for ensuring all documents essential to the quality of the delivered product or service are properly controlled. This shall include, but is not limited to, contracts, plans, specifications, master drawing lists or equivalent documents, critical procedures and work instructions, Quality Program manuals, Quality Program plans and data (e.g., computer data bases, computer files).

C. The procedures should recognize that there is a finite life to electronic storage media. Consideration should be made for those documents which only exist in the electronic media.

D. This control shall ensure that:

1. The pertinent issues of appropriate documents are available at all locations where operations essential to the effective functioning of the quality system are performed.

2. Invalid and/or obsolete documents are promptly removed from all points of issue or use, or otherwise assured against unintended use:

   i. Superseded, revised and voided documents shall be removed from all work areas and the employees whose work is governed by those documents shall be informed of the changes to ensure compliance to the new or revised requirements.

   ii. A master document list, or equivalent, shall be maintained to identify the status and current revision of all controlled documents. The master list shall be controlled and be available to all holders of controlled documents.

   iii. Any obsolete documents retained for legal and/or knowledge-preservation purposes are suitably identified. Superseded, revised and voided documents can be maintained for legal and/or historic information. However, the documented procedure must describe the method of identifying and storing these documents in a manner that ensures they are not inadvertently used by an unknowing individual. There shall also be a record retention plan for the Design-Builder.

2.30.2.2 Document and Data Approval and Issue

A. The Design-Builder shall be responsible to see that the documents and data are reviewed and approved for adequacy by authorized personnel prior to issue. A master list or equivalent document-control procedure identifying the current revision status of documents shall be established and be readily available to preclude the use of invalid and/or obsolete documents.

B. The Design-Builder shall be responsible for establishing, documenting, maintaining, and, implementing a procedure which clearly defines the process for document review, resolution of comments and approval authority.

C. Quality Program documentation shall also be controlled to ensure its proper authorization and distribution.

D. No construction work activities shall be accomplished using unreleased, unauthorized or outdated design documents.

2.30.2.3 Document and Data Changes

A. The Design-Builder shall identify and include in the Quality Program, the process for the initiation, review, and approval of all document changes prior to issuance of those changes.

B. Changes to documents and data shall be reviewed and approved by the same functions/organizations that performed the original review and approval, unless specifically designated otherwise. If this is not possible then the designated approval authority shall have adequate background and experience upon which to base the decision. The designated functions/organizations shall have access to pertinent background information upon which to base their review and approval.

C. Where practical, the nature of the change shall be identified in the document or the appropriate attachments.

2.30.2.4 Record Documents

A. Record Documents shall reflect the actual conditions and location of Work as constructed and installed, including drawings, specifications, and related documentation such as reports.

B. Drawings that are part of the Record Documents shall be produced in the same manner, scale and size as the original drawings. The Design-Builder shall electronically modify all drawings to record actual construction where it varies from the RFCD Drawings and Shop Drawings.

C. Record Documents shall be produced in format that is acceptable to the AHJ.

2.30.2.5 Record Drawings

A. The Design-Builder shall keep an accurate record of all deviations from the approved Design Drawings and the performance requirements which may occur in the Work as actually constructed. Any such deviation must be approved by the Railroad.

B. Prior to acceptance of each Project Element, the Design-Builder shall promptly submit the final Record Drawings to the Railroad, including, five (5) full sets of full size prints, one (1) full set of reproducible mylars, as well as five (5) full sets on CD-ROM. The final Record Drawings shall include a final Project Drawings List. The Design-Builder shall submit with the acceptance of each Project Element, the hand-marked hard copy record

drawings set maintained in the Design-Builder's field office, as well as any surveyor's notes and other mark-ups. All such mark-up and notes shall be clearly identified on the submittal. If revisions or updates to the Work occur prior to Final Completion of the Work, the Design-Builder shall submit the updated final Record Drawings.

C. Record Drawings are a record of the completed Project depicting as-built facilities as actually installed or constructed because of field conditions, clarifications drawings issues by the Railroad, or by modifications issued by Railroad during construction.

   They shall include, but not limited to, the following:

   1. Updated Design Drawings.
   2. All requirements for Record Drawings (As-built Drawings) as contained elsewhere in the Contract and in the Design Drawings and Specifications.
   3. The location of underground or embedded pipelines, electrical, communication and instrumentation conduits, utilities, etc. not readily discernible from the surface, and indicate actual depths or invert elevations.
   4. Marked-up Shop Drawings where they are used as the base for Record Drawings purposes.

D. The Design-Builder shall prepare, update, and maintain the Record Drawings throughout the progress of the work.

   1. CADD drawing files of RFCD Drawings shall be used by the Design-Builder to prepare Record (As-Build) Drawings. Record Drawing Submittals shall be CADD generated drawings. Record Drawing issues of CADD files will be marked electronically as such to differentiate them from the Design Drawings or other drawing issues. (Where the Design Drawings are generally schematic and are not intended to portray the precise physical layout making it impractical to mark-up, the "PROCEED" or PROCEED AS NOTED" Shop Drawings shall be considered as Design Drawings for this purpose and marked-up to show the actual as-built installation.
   2. A full-size hard copy set of CADD-generated Design Drawings shall be kept at the Design-Builder's field office. All changes to these drawings resulting from the actual installation or construction shall be entered by-hand as soon as practicable after the changes have occurred. All entries shall be dated and attention called to each entry by a "cloud" drawn around the area affected. This set shall be clearly identified and maintained separately from other drawings and documents.
   3. Electronic entries to the Record CADD drawing files shall be made as soon as practicable after changes have occurred. Updating of the CADD drawings files for as-build conditions shall be done as soon as practicable after the work is installed or constructed.
   4. Clouding of updates shall only appear for updates made since the last Record Drawing monthly update was submitted to the Railroad. Clouding shall be done so that it can be turned off and on, in the electronic file.

E. The Design-Builder shall maintain an updated Project Drawings List in the same format as the Project Drawings List included in the Design Documents. It shall indicate Record

Drawings by notation “REC,” shall show any additional records added to the list since the previous submittal and shall show the current revision date for each drawing.

F. Record Drawings, both the hard copy set and the CADD files set, along with the updated Project Drawings List, will be subject to review by the Railroad at any time to assure that entries are being made as changes occur. The Design-Builder is responsible for accuracy of all entries.

2.30.3 Retention of Records

A. The Design-Builder shall retain all records for nine years after final payment is made under the Contract. Required records shall include all payrolls, accounts, correspondence, maps, photographs, or other documentary materials, regardless of physical form or characteristics, made or received by the Design-Builder in connection with the Project. The Design-Builder shall establish a document-control system whose records are so arranged, identified, and indexed that any individual document, or component of the records, can be located with reasonable facility.

B. The Design-Builder shall maintain records of all required payrolls and of the details that comprise the total Contract Price including records maintained pursuant to allowances, change orders, and claims, if any. These records shall be available at any time within nine years following the date of final payment of the Project at the request of the Railroad for review and audit, if deemed necessary by the Railroad. In case all or part of such records are not made so available, any items not supported by reason of such unavailability of the records shall be disallowed, or if payment has already been made, the Design-Builder shall, upon demand in writing by the Railroad, refund to the Railroad the amount so disallowed.

2.30.4 Summary of Submittals

Item	Section	Submittal	Action
1.	2.30.2.4	Record Documents	Information

END

2.31 RIGHT OF WAY AND PROPERTY

2.31.1 Section Includes

This Section describes the process for Design-Builder to manage and maintain the Right of Way (ROW) and how to request revisions to the Project ROW.

2.31.2 Codes and References (Not Used)

2.31.3 Right of Way Management, Maintenance and Demolition

The Design-Builder shall manage and maintain all property, whether occupied or not, within the Project ROW upon acquisition of the property by Railroad. The Design-Builder shall protect the property from vandalism, theft and unauthorized use. The Design-Builder shall be responsible for demolition and disposal of existing structures including at a minimum pre-demolition hazardous materials inspections, removal and disposal of foundations, footings, slabs, buildings, above and below grade utilities, and utility structures. Utility connections shall be abandoned at the property boundary and in accordance with the applicable Utility company standard.

2.31.4 Request for Additional Properties or Other Temporary Interests

If the Design-Builder requires additional property because there is no possible way to construct the Work without additional property then it may request that the Railroad acquire Additional Property or other interests in real property for the Project. In that event, the Design-Builder shall submit a Request for Additional Property for Review and Approval including, at a minimum, the following elements:

A. The Design-Builder's justification for acquisition.

B. Proposed use for the property.

C. New or revised surveys, legal descriptions, Project ROW maps, and proposed Project ROW plat revisions.

D. Estimated property cost of each acquisition.

2.31.5 Replacement of Private Property Features

The Design-Builder shall replace in kind existing sidewalks, fences, handrails, and structural retaining walls (where a nominal slope 2:1 or flatter will not adequately support finished grade) on private property when such features are displaced by Construction.

2.31.6 Summary of Submittals

Item	Section	Submittal	Action
1	2.31.4	Request for Additional Properties	Review and Approval

END

2.32 SUPPLEMENTARY INSTRUCTIONS

2.32.1 Section Includes

The Contract Documents are comprised of various documents from different sources, including standard and prescriptive Railroad documents, standard and prescriptive NYSDOT documents, and documents from other sources. The documents provide requirements, standards, guidelines, instructions, bulletins, inspection forms, and templates to be used during design and construction. This Section provides instructions regarding how the documents shall be used together to complement each other.

2.32.2 Codes and Standards

A. In all Sections of Technical Provisions, it shall be understood that the Applicable Standards, Design Codes and Manuals identified in Appendix TPA3.1A CODES AND INDUSTRY STANDARDS shall apply whether listed in each individual section or not.

B. The most current version of each Code and Standard, in effect on the date that Proposals are due, shall be used unless noted otherwise in the individual section.

C. The Design-Builder shall notify the Railroad if at any point during the Project the Design-Builder becomes aware of a new version of any relevant Code or Standard comes into effect.

2.32.3 Coordination of Technical Specification Requirements with other Contract Documents

A. Submittals:

1. In the event that submittals are identified in VOLUME 5 TECHNICAL SPECIFICATIONS, the processes for these submittals shall follow the requirements outlined in VOLUME 3 TECHNICAL PROVISIONS.
2. Submittals identified VOLUME 5 TECHNICAL SPECIFICATIONS shall be subsumed, or where applicable be incorporated into submittals outlined in VOLUME 3 TECHNICAL PROVISIONS as follows:
    a. Civil Works, Drainage, Alignment and Track:
        i. Submittals identified in VOLUME 5 TECHNICAL SPECIFICATIONS that are additional to submittals identified in VOLUME 3 TECHNICAL PROVISIONS shall be reviewed and approved by the Design-Builder prior to submitting for Review and Comment by the Railroad.
        ii. All material sample related submittals set out in VOLUME 5 TECHNICAL SPECIFICATIONS shall be included in the preliminary design submittals as defined in respective sections of VOLUME 3 TECHNICAL PROVISIONS.
        iii. Whenever similar submittal requirements are identified in VOLUME 3 TECHNICAL PROVISIONS and VOLUME 5 TECHNICAL SPECIFICATIONS, VOLUME 3 TECHNICAL PROVISIONS shall control.
    b. Stations and Architecture
        i. For Stations and Architecture related Technical Specifications Number 055100, 071113, 072500, 072823, 078400, 079005,

083100, 102900, 102900, 131290, and 02761, the submittals identified in the Technical Specifications shall be submitted no later than the respective intermediate design submittal for Stations Design and shall follow the respective review criteria outlined in TP3.12 STATIONS AND ARCHITECTURE.

ii. For Stations and Architecture related Technical Specifications Number 076200, 081113, 084313, 085113, 087100, 088000, 089100, 089700, 092116, 099000, and 102900, the submittals identified in the Technical Specifications shall have an intermediate progress submittal submitted together with the intermediate design submittal for Stations Design, followed by a final submittal that shall be included as part of the final design submittal for Stations Design. All submittals shall follow the respective review criteria outlined in TP3.12 STATIONS AND ARCHITECTURE;

iii. For all Stations and Architecture related Technical Specifications Number 104250, 142100, and 142423, the submittals identified in the Technical Specifications shall be submitted together with the final design submittal for Stations Design and shall follow the respective review criteria outlined in TP3.12 STATIONS AND ARCHITECTURE.

iv. All items identified as “deliverables” shall be submitted for Review and Comment by the Railroad within the following timeframes:

1) All items related to personnel qualifications shall be submitted no later than 30 days prior the beginning of work.

2) All items related to manufacturer’s certificates, test and inspection procedures, and warranties shall be submitted no later than 30 days prior the beginning of work.

3) All other items shall be submitted within the time frames specified in the Technical Specifications or no later than 30 days after completion of work, whichever is sooner, unless a different submittal requirement is specified in TP3.12 STATIONS AND ARCHITECTURE, in which case TP3.12 STATIONS AND ARCHITECTURE shall control.

c. Traction Power

i. For all Traction Power related Technical Specifications, the submittals outlined in Technical Specifications shall follow the requirements outlined in TP 3.17 TRACTION POWER as follows:

1) All items identified as “informational submittals” shall be submitted no later than the intermediate design submittal.

2) All items identified as “action submittals” or “submittals” shall be submitted with intermediate and final design submittals accordingly and follow respective review requirements outlined for each design submittal in TP 3.17 TRACTION POWER.

3) All items identified as “deliverables” shall be submitted for Review and Comment by the Railroad within the following timeframes:

a) All items related to personnel qualifications shall be submitted no later than 30 days prior the beginning of work.

b) All items related to manufacturer’s certificates, test and inspection procedures, and warranties shall be submitted no later than 30 days prior the beginning of work.

c) All other items shall be submitted within the time frames specified in the Technical Specifications or no later than 30 days after completion of work, whichever is sooner, unless a different submittal requirement is specified in TP3.17 TRACTION POWER, in which case TP3.17 TRACTION POWER shall control.

d. Signals and Train Control

i. For Signals and Train Control Related Technical Specifications Number 01500, 01510, 01730, 13570, 13571, 13572, 13574, 13576, 16750, 16751, 16752, and all SCADA-related Technical Specifications, the submittals outlined in Technical Specifications shall follow the Pre-wired Signal and Train Control submittal requirements outlined in TP 3.19 SIGNALS AND TRAIN CONTROL as follows:

1) All items identified as “informational submittals” shall be submitted to the Railroad no later than the Pre-wired Signal and Train Control Intermediate Design submittal as outlined in TP 3.19 SIGNALS AND TRAIN CONTROL. In cases when the aforementioned Technical Specifications call for earlier submission times, than the anticipated time of the Pre-wired Signal and Train Control Intermediate Design Submittal, the earliest submission time requirements shall control.

2) All items identified as “action submittals” or “submittals” shall be submitted to the Railroad with the Pre-wired Signal and Train Control Intermediate and Final Design submittals and follow respective review requirements outlined in TP 3.19 SIGNALS AND TRAIN CONTROL.

3) All items identified as “deliverables” shall be submitted to the Railroad for Review and Comment within the timelines outlined in the Technical Specifications.

ii. For Signals and Train Control Related Technical Specifications Number 16110, 16120, 16121, 16122, 16123, 16124, 16125, and 16126, the submittals outlined in Technical Specifications shall

follow Installation Signal and Train Control submittal requirements outlined in TP 3.19 SIGNALS AND TRAIN CONTROL as follows:

1) All items identified as “informational submittals” shall be submitted to the Railroad no later than the Installation Signal and Train Control Intermediate Design submittal as outlined in TP 3.19 SIGNALS AND TRAIN CONTROL. In cases when the aforementioned Technical Specifications call for earlier submission times, than the anticipated time of the Pre-wired Signal and Train Control Intermediate Design Submittal, the earliest submission time requirements shall control.
2) All items identified as “action submittals” or “submittals” shall be submitted to the Railroad with the Installation Signal and Train Control Intermediate and Final Design submittals and follow respective review requirements outlined in TP 3.19 SIGNALS AND TRAIN CONTROL.
3) All items identified as “deliverables” shall be submitted to the Railroad for Review and Comment within the timelines outlined in the Technical Specifications.

B. Shop drawings:

1. All shop drawing submittals outlined in VOLUME 5 TECHNICAL SPECIFICATIONS shall go through Design-Builder’s review and comment resolution process by Design-Builder’s Design Professionals prior to submitting to the Railroad.
2. The Submittal and Review of Shop Drawings related to Traction Power and Signals and Train Control shall follow requirements set out in Section 2.32.3.A of this TP 2.32. SUPPLEMENTARY PROVISIONS and VOLUME 3 TECHNICAL PROVISIONS. All other shop drawings shall be submitted to the Railroad for information.
3. The Design Builder may identify additional items, for which shop drawings shall undergo the Review and Approval process by the Railroad. The Design-Builder shall submit a list of such additional items for Review and Approval by the Railroad together with the Submittal Register as identified TP 2.12 SUBMITTALS.

C. Warranties:

1. For warranty requirements, the more stringent requirements of VOLUME 5 TECHNICAL SPECIFICATIONS, VOLUME 3 TECHNICAL PROVISIONS, and VOLUME 1 GENERAL PROVISIONS shall control.

D. Division of Work:

1. Division of work shall be in accordance with requirements outlined in VOLUME 3 TECHNICAL PROVISIONS.
2. All references to “work by others”, “by vendor”, or “by contractor” in VOLUME 5 TECHNICAL SPECIFICATIONS shall be performed by the Design-Builder except as specifically noted otherwise in VOLUME 3 TECHNICAL PROVISIONS.

E. Drawings:

1. All working drawings for work to be performed by the Railroad specified in VOLUME 5 TECHNICAL SPECIFICATIONS shall also confirm with the requirements of TP 2.12 SUBMITTALS.
2. Any references to “Contract Drawings” and/or “drawings” in VOLUME 5 TECHNICAL SPECIFICATIONS shall be ignored, unless noted with a prefix “shop” or noted as indicated in line 3. below. TO BE CONFIRMED.
3. Any references to “approved drawings” or “approved plans” in VOLUME 5 TECHNICAL SPECIFICATIONS shall be substituted with “Released For Construction Documents”.

F. Alll references to “as required” without a tie to a specific document shall mean “as required by Released For Construction Documents”.

G. Codes, manuals and standards:

1. In the event that there is conflicting guidance when referencing the applicable standards from VOLUME 3 TECHNICAL PROVISIONS, VOLUME 5 TECHNICAL SPECIFICATIONS, and as specified by AHJ, the following shall be the order of precedence of applicable standards:
    a. Codes and Standards cited in VOLUME 3 TECHNICAL PROVISIONS
    b. Codes and Standards cited in VOLUME 5 TECHNICAL SPECIFICATIONS
    c. Codes and Standards cited by local AHJ.

H. Referenced Technical Specifications:

1. In the event that there are references to Technical Specifications that were not included in VOLUME 5 TECHNICAL SPECIFICATIONS, such references shall be ignored.

END

2.33 SECURITY SENSITIVE INFORMATION

2.33.1 Section Includes

This Section sets out the process that the Design-Builder shall follow in handling Security Sensitive Information.

See Appendices TPA2.33A to E for additional information and forms related to Security Sensitive Information.

2.33.2 Codes and References

A. MTA Sensitive Security Information Handbook, latest version.

2.33.3 Program Requirements

A. LNTP will not be granted until the NON-DISCLOSURE AND CONFIDENTIALITY AGREEMENTS have been received by the Railroad.

B. LIRR shall designate an Agency Document Control Officer for the coordination of Security Sensitive Information management among all parties throughout the life of the project.

C. The Design-Builder shall designate a Document Control Officer for the handling and management of Sensitive Security Information and submit appropriate MTA employment and resume verification documentation to verify resume, education background, and past history employment for the past two years.

D. The Design-Builder shall provide an overview of existing protocols to ensure security in the procurement process and in the handling of Security Sensitive Information. Such protocols shall be reviewed and certified by an Agency Document Control Officer for compliance with MTA handbook.

E. The Design-Builder shall inform the Agency Document Control Officer of the location where Security Sensitive Information will be kept during the duration of work.

F. The Design-Builder shall provide appropriate and reasonable physical and logistical security for all date files and programs containing Security Sensitive Information. The Design-Builder shall ensure that similar and equally adequate procedures are employed by any party that will store handle use or examine any Security Sensitive Information.

G. The Design-Builder shall ensure that Security Education and Awareness is administered for each employee, consultant or sub-contractor prior to receiving access to Security Sensitive Information and upon request of the MTA provide employee resume verification as to an individual's suitability to have access.

H. The Design-Builder shall provide control and accountability of documents containing Security Sensitive Information by tracking the location and number of copies. A document control system in terms of logging documents shall be developed to track, identify and protect all documents related to contracts involved with MTA Security Sensitive Information.

I. In order to retain necessary access control, a listing of authorized individuals must be maintained by the Vendor for all employees who have been provided access to MTA Security Sensitive Information.

J. The Design-Builder shall ensure that all employees provided access to Security Sensitive Information have executed an appropriate MTA Non-Disclosure Agreement. The Design-Builder must also impose the above requirements in any subcontract agreement that will require access to MTA Security Sensitive Information.

K. The Design-Builder shall develop and submit to the MTA an IT system management plan for Approval. At a minimum, the plan must include measures developed and implemented by the vendor to address the objectives outlined above. The management plan shall also describe both hardware and software components of the IT system proposed.

L. The Design-Builder shall take steps reasonably necessary to provide adequate physical security for computer system components storing off line records, data files and programs of the MTA. Procedures for protecting Information Technology systems shall include the use of user ID's and passwords to prevent unauthorized access to networked computers utilized in the day to day operations related to projects containing MTA Security Sensitive Information.

M. The Design-Builder shall ensure that Security Sensitive Information is stored in a minimum number of office locations, in a secure environment (password protected or in a secure container such as locked file cabinet, locked desk, or safe type file container) and that a list is maintained as to which individuals have access to which

N. The Design-Builder shall ensure that document control systems facilitate easy retrieval of Security Sensitive Information from individuals when the information is no longer required by those individuals.

O. The Design-Builder shall fully relinquish to the MTA at the end of the project all original documents containing Security Sensitive Information and shall destroy all copies of such materials after completion of the project. The vendor agrees to include similar procedures in each sub contract under any awarded contract.

2.33.4 Quality Control

A. Unless otherwise approved by the Railroad, the Design-Builder's Document Control Officer shall be responsible for Security Sensitive Information security.

B. The Design-Builder's approved Security Sensitive Information Management Plan shall be applicable to all Design-Builder personnel, including, but not limited to, personnel of any tier subcontractor, consultant, vendor, and supplier.

C. All aspects of the Design-Builder security process and procedures will be subject to audit by the MTA/LIRR or its representatives at any time and without prior notice at any location(s) identified in the course of the audit process.

2.33.5 Security Sensitive Information Management Plan Submittals

A. The LIRR Department of Program Management is responsible for the management of capital improvement projects within the Capital Program. As such, the LIRR Department of Program Management will coordinate review and approval of Vendor Security Sensitive Information Management Plan submittals. The SSI Handbook Bidder Extract included in this RFP package specified specific Vendor program and submittal requirements. If the

Railroad determines, in its sole discretion, that plan submittals are deficient or otherwise unsatisfactory, the Design-Builder will be required to resubmit a revised plan within seven (7) Calendar Days of notification by the Railroad. If necessary, the Design-Builder's Chief Executive Officer will be required to attend a meeting within five (5) Calendar Days of notification by the Railroad to discuss the plan and reach agreement of the necessary changes to be made. Failure to secure plan approval, attend the required meeting or reach agreement with the Railroad may result in termination of this Contract.

2.33.6 Summary of Submittals

Item	Section	Submittal	Action
1.	2.33.4	Security Sensitive Information Management Plan	Review and Comment
2.	2.33.3	IT System Management Plan	Review and Approval

END

2.34 BUS OPERATIONS

2.34.1 Section Includes

The Section includes requirements for providing bus service for LIRR customers between Carle Place and Westbury stations while Carle Place station is closed.

2.34.2 Codes and References

A. Comply with all codes and standards set out in a standard LIRR emergency and scheduled bus service contract.

2.34.3 Bussing Requirements

Provide for bus service between Carle Place Station and Westbury Station during the time period when Carle Place Station is closed.

A. The service provider shall provide for insurance and indemnification to the Railroad, consistent with standard LIRR emergency and scheduled bus service contract.

B. Bus service capacity shall be sufficient to handle passenger demand. As information, weekday peak ridership in 2014 was approximately 300 passengers in each direction.

C. All passengers shall be provided with seats: no standees.

2.34.4 Hours of Service

Provide bus service as follows:

A. During weekday Peak Periods (as indicated on LIRR timetables) provide service at intervals not to exceed 30 minutes.

B. During weekday Off - Peak Periods, between the morning and afternoon Peak Periods only, provide service at intervals not to exceed 60 minutes.

C. Weekday service shall be provided commencing at Carle Place Station so as to allow for passengers to meet the first Peak Period train at Westbury Station.

D. Weekday service shall be provided ending at Carle Place Station so as to allow for passengers to take the bus from the last Peak Period train arriving at Westbury Station. Provide for trains to be delayed not more than 30 minutes from the posted schedule.

E. No bus service is required on weekends or on holidays (as indicated on LIRR timetables).

F. Service shall be to a regular schedule, posted conspicuously for the benefit of the Railroad and passengers. It is not required that the schedule be timed to meet train arrivals or departures other than for the first and last bus departures.

G. Submit a schedule for review and approval not less than 30 Calendar Days prior to the scheduled commencement of service.

H. The service shall be in place and ready to operate prior to the closing of the Carle Place Station.

2.34.5 Summary of Submittals

Item	Section	Submittal	Action
1.	2.34.4.F	Bus operation Schedule	Review and Approval

END

MTA Capital Construction

CONTRACT #6240

DESIGN-BUILD SERVICES
FOR
LIRR EXPANSION PROJECT
FROM FLORAL PARK TO HICKSVILLE

CONFORMED DOCUMENTS

VOLUME 3
TECHNICAL PROVISIONS
PART 3 – DB REQUIREMENTS

December 27, 2017

Part 3 – Design Build Requirements

Table of Contents

END

3.1 GENERAL

3.1.1 Section Includes

This Section sets out requirements that apply to all aspects of the Design-Build Work.

3.1.2 Codes and Standards

Work performed shall comply with all applicable standards required by statute, comply with good industry practice, and comply with the version of standard in place at the time the proposal was submitted. Relevant codes and industry standards can be found in Appendix TPA3.1A CODES AND INDUSTRY STANDARDS, or in the provision marked “Codes and Standards” in each section.

3.1.3 Related Documents

Related documents identified in the Design-Build documents are provided for convenience only. The Design-Builder shall be responsible for complying with all the requirements of all of the Contract Documents.

3.1.4 Certifications by the Designer of Record

A. The Designer of Record shall provide certification that work has been constructed in accordance with the requirements of the Contract Documents, and in accordance with the Released For Construction Documents.

B. The certification by the Designer of Record shall be without limitation. For avoidance of doubt, language such as the certification is “based on information provided by others” is not acceptable.

3.1.5 Preconstruction Surveys

A. The Design-Builder shall perform a preconstruction survey consisting of a physical examination of a property located within the limits identified below prior to the commencement of the construction or demolition operations and at reasonable periods during the progress of the work. Observed conditions shall be recorded by a Professional Engineer or a Registered Architect licensed in the State of New York, and such records shall be made available to the Railroad. The following properties shall be subject to a preconstruction survey:

   1. Any property immediately adjacent to the construction or demolition site.
   2. Any property located within 10 feet of any excavation depth between 5 feet and 10 feet.
   3. For excavations over 10 feet deep, any property located within the 1vertical:2horizontal influence line extended from the bottom of the final excavation subgrade to the lowest point of a load bearing element of the property.
   4. For installation of excavation support systems, any property located within the 1vertical:1horizontal influence line extended from the lowest elevation of the excavation support system to the lowest point of a load bearing element of the property.
   5. Any property located within 100 feet of any pile, caisson, or deep foundation element installation activity.

3.1.6 Notice for LIRR Force Account Work

A. For work to be performed by LIRR Force Account, the Design-Builder shall submit the request in advance of such requirement, and shall provide advance notice prior to the starting of such work as follows:

1. 6 Weeks for LIRR Track Force Account.
2. 4 Weeks for all other.

3.1.7 Summary of Submittals (Not Used)

END

3.2 UTILITIES

3.2.1 Section Includes

A. This section sets out general design and construction requirements related to utility relocation, replacement, and or abandonment of public and private utilities owned and/or operated by the respective Utility Owners within the project area, and/or Third Parties.

B. Also refer to VOLUME 4 UTILITY REQUIREMENTS for additional requirements.

C. For utilities that are owned by the Railroad itself, see TP3.3 RAILROAD UTILITIES.

3.2.2 Codes and Standards

Project Work shall comply with all statutory requirements, and shall comply with the codes and standards identified in Appendix TPA3.1A CODES AND INDUSTRY STANDARDS, codes and standards identified by Utility Owners, and the codes and standards listed below:

A. The National Electrical Code.

B. The Standards of the American Water Works Association.

C. The Occupational Safety and Health Administration.

D. The New York State Department of Health Code.

E. The Nassau County Department of Health Code

F. The Plumbing Code of New York State.

G. The New York State Fuel and Gas Code.

H. Bellcore Blue Book – Communication Construction Standards.

I. The requirements of the individual Utility Owners.

3.2.3 Related Documents

A. Chapter 8 of the NYSDOT Highway Design Manual.

B. NYSDOT Standard Sheets.

C. NYSDOT 2008 Standard Specifications including Special Specifications, Updates, and Addenda.

D. Altice Project Requirements (Specifications).

3.2.4 General Requirements

A. The Design-Builder shall design, permit, furnish, install, inspect and coordinate the construction of the Utility facility in accordance with requirements of the Contract Documents and in accordance with requirements of Utility Owners. Any costs incurred by the Utility Owners in connection with providing these services shall be the sole responsibility of the Design-Builder.

B. The Design-Builder shall be responsible for any interruptions of service including coordinating all Utility service interruptions with the appropriate Utility and be responsible for ensuring that such interruptions are minimized as per the requirements of the Utility Owners. The Design-Builder shall notify affected Utility customers of such shutdowns, and provide temporary service if the interruptions surpass Utility timeframes.

C. The Design-Builder shall ensure that Utility Work is conducted in accordance with all the relevant requirements and all permits.

D. If the Design-Builder has reasonable cause to believe that a Utility Owner does not have necessary approvals, or is in violation of any approvals, the Design-Builder shall notify the Railroad immediately.

E. The Design-Builder is responsible for ensuring the designated abandonment or removal of Utilities within the Project ROW.

F. The Design-Builder is responsible for timely performance of all utility work, whether the work is performed by the Design-Builder, the Utility Owner, or others.

G. The Design-Builder shall pay for any work performed by the Utility Owners on the Project.

3.2.5 Design Requirements

A. The Design-Builder shall examine the record plans of the work site, make a field survey of the work site and examine all other available documents to determine the type and location of all utilities that may be affected by the Design-Builder's Work. Before any work begins the Design-Builder shall inform the Railroad what utilities are present and how they may be affected by the work.

B. Hybrid Poles – Approximately 200 existing poles carrying PSEG-LI's [redacted] Electric Transmission lines inside the LIRR ROW will require relocation to new Hybrid Concrete-Steel poles to be designed and installed by the Design-Builder. The Design-Builder shall install the new hybrid poles in new locations within the ROW to carry LIRR facilities and private carrier fiber optic and cable television facilities. The Design-Builder shall design the hybrid poles considering the applicable loadings at each pole location.

C. For each relocation and installation the Design-Builder, in coordination with any affected Utility Owner, shall be responsible to verify that the relocated utility as designed and constructed is compatible with and interfaces properly with the Project. The Design-Builder shall be responsible for protecting any and all utilities that require protection during the construction of the Project.

3.2.5.1 Utility Loading

A. All Utilities, including PSEG-LI Hybrid Poles, within the Project ROW and crossing it shall be analyzed and designed to support all dead and live loads, including, at a minimum, that imposed by earth, sub-base, ballast, pavement, track, structures, and vehicles when the Utility is operating under internal pressure ranges varying from zero to maximum.

3.2.5.2 Utility Clearances

A. Utility clearances shall be as specified in the Contract Documents, the requirements of the Utility, Third Parties, Utility Owners, and the requirements below. In the case of conflict the most stringent criteria shall govern.

B. Minimum horizontal clearances from tracks, measured in the horizontal plane and from the nearest outside edge of the Utility or Utility casing:

1. For water mains longitudinal to the tracks, the minimum horizontal clearance is 12'-4¼" from the centerline of the adjacent track.

2. For ballasted track, the minimum horizontal clearance for all other underground Utilities longitudinal to the tracks is 12'-4¼" from the centerline of the adjacent track.
3. For ballasted track, the minimum horizontal clearance for all poles carrying overhead Utilities longitudinal to the tracks is 8'-6" from the centerline of the adjacent track.
4. For new or existing manholes, roadway boxes, meter vaults, and any other surface features which may require future entry or access (excluding inlets and drainage grates), the minimum horizontal clearance distance from the nearest edge of cover to the centerline of track shall be 12'-4¼" from the centerline of track.

C. Minimum vertical clearances from the tracks, measured in the vertical plane, and from the nearest outside edge of the Utility or Utility casing:
1. The minimum vertical clearance for existing communications and power utilities to remain in place shall be 2'6" below bottom of rail.
2. The minimum vertical clearance for all other existing utilities to remain in place shall be 4 feet below bottom of rail.
3. The minimum vertical clearance for relocated and new utilities shall be 5'6" below bottom of rail.

D. For horizontal and vertical clearances between Utilities, measured in the horizontal or vertical plane, as applicable, and between the nearest outside edges of the Utilities or Utility casings:
1. Minimum horizontal clearance shall be 5 feet, except 10 feet between water mains and sanitary sewers.
2. Minimum vertical clearance shall be 1 foot and sanitary sewers shall be below water mains.
3. Minimum horizontal and vertical clearance from overhead electrical Utility lines shall be 10 feet from other Utilities and structures.

E. Existing Utilities to remain in place shall meet all horizontal, vertical and clearance between Utility requirements unless otherwise approved by the Railroad.

3.2.5.3 Utility Encasement

A. Encasement pipes shall be provided for new and relocated pipelines carrying gas, water, sanitary effluent, or storm water discharge across the tracks in accordance with the following:
1. Encasements shall be provided based on AREMA, Part 5, Chapter 1; however, the length of casing pipe required will vary. At a minimum, the casing pipe shall extend 5 feet beyond the most outside rail at the crossing.
2. Ferrous metal casing pipes shall be protectively coated against corrosion and have suitable cathodic protection and corrosion monitoring features.
3. Encasement pipes shall be of a suitable diameter and length to permit removal and replacement of the carrier pipe without impacting Railroad operations.

B. New or relocated electric and telephone conduits, fiber optic duct banks, crossing beneath the tracks shall not require encasement provided that the strength of the Utility line is capable of withstanding the Railroad system loading.

3.2.5.4 Design-Builder Utility Design Plans

A. The Design-Builder shall submit Design-Builder Furnished Utility Design Plans for Review and Comment at Preliminary and Final Design. All plans for sewer and water shall be reviewed and approved by both the Utility Owner and the Nassau County Department of Health prior to construction.

3.2.5.5 Utility Owner Design Plans

A. For all Utility Relocation Plans to be furnished by a Utility Owner, Design-Builder shall coordinate the Utility Adjustments with the Utility Owner as well as with other elements of the Project, including other Utility Work. The Design-Builder shall submit Utility Owner Design Plans for Review and Comment at Preliminary and Final Design.

3.2.6 Construction Requirements

A. The Design-Builder shall meet with all the affected Utility Owners and Third Parties for the purpose of discussing the effect of the Project on the utility facilities and to agree on a plan to maintain, protect, relocate, reinstall, or other action that may be necessary for the work to progress.

B. For any work undertaken by the Design-Builder that will be turned over to a Utility Owner or Third Party, or that is being performed on behalf of a Utility Owner and or Third Party including any work to complete repairs to utility facilities damaged by the Design-Builder, the Design-Builder shall engage the services of a sub-contractor certified by the Utility Owner and or Third Party. In the event the Utility Owner and or Third Party does not have a list of certified sub-contractors for utility work, then the Design-Builder shall engage the services of a sub-contractor qualified and experienced in the required utility work, subject to approval of the Utility Owner and or Third Party.

C. For all water main work including connections, the Design-Builder shall be responsible for all hydrostatic testing, disinfection, and sample testing and must receive approval of sample testing from both the Water Utility Owner and the Nassau County Department of Health, prior to putting new water mains and connections into service .

D. All utilities must be maintained, supported and protected during construction, unless otherwise directed by the Utility Owner and or Third Party.

E. Any utility conduit, conductor, splice box, pull box or other utility facility that is part of a utility system or street light system that is embedded in a concrete deck, sidewalk or other concrete element that is being removed and replaced as part of this Project shall be replaced and its location coordinated with the Utility Owner unless the Utility Owner indicates that replacement is not required. The design and construction of the replaced utility shall be in conformance with the current standards of the Utility Owner.

F. The Design-Builder shall be responsible for repair to any damage and consequential damages to those utilities caused by his operations at the Design-Builder's expense. If the nature of the damage is such as to endanger the satisfactory operations of the utilities and the necessary repairs are not immediately made by the Design-Builder, the work may be done by the respective Utility Owner and or Third Party, and the cost thereof charged against the Design-Builder.

G. The Design-Builder shall provide notice to the Railroad at least two weeks before construction begins on any portion of the Project.

H. The Design-Builder shall provide notice to the Utility Owners and or Third Parties in accordance with the time frame requirements of the Utility Owners and or Third Parties, and in any event, not less than two weeks before construction begins on any portion of the Project.

3.2.7 Utility Relocations

3.2.7.1 General

Provide and maintain temporary utility services during the performance of the Work.

3.2.7.2 Electric Power and Street Lighting

A. Poles, Hybrid Poles, conduit, wiring, and equipment for relocated electric power and lighting shall be UL listed.

B. Installation of new facilities and protection of existing facilities shall conform to applicable requirements of the National Electric Code, OSHA, LIPA/PSEG-LI, and the New York Power Authority.

C. Equipment and wiring shall be maintained in a safe condition and utilized in a manner that does not constitute a hazard to persons or property.

D. Street lighting equipment shall be positioned and aimed in a manner that will not shine light directly on passing trains, vehicular traffic, or any commercial or residential premises adjoining Railroad property.

3.2.7.3 Gas

A. Materials and installation of relocated gas mains and service connections, and protection of existing facilities shall conform to the requirements of OSHA, the NYS Fuel and Gas Code, and National Grid.

B. Telephone.

C. Poles, conduit, wiring, equipment, and installation of relocated telephone services and customer connections, and protection of existing facilities shall conform to the requirements of OSHA, the National Electrical Code, and Verizon.

3.2.7.4 Fiber Optic

A. Conduit, wiring, equipment, and installation of relocated fiber optic services and customer connections, and protection of existing facilities shall conform to the requirements of OSHA, the National Electric Code, and Verizon Business Systems, Verizon, AT&T, Lightower, and Crown Castle, as applicable.

3.2.7.5 Cable Television

A. Conduit, if required, fiber optic cable, wiring, equipment, and installation of relocated cable television services and customer connections, and protection of existing facilities shall conform to the requirements of OSHA, the National Electrical Code, Bellcore Blue Book communications construction standards, and Altice Project Requirements (Specifications) for aerial fiber optic cable placement.

B. Provide and install Armored Gel-Free Loose-Tube Ribbon Fiber – 432 Fiber Count – AccuTube, or approved equal.

3.2.7.6 Water

A. Materials, equipment, appurtenances, and installation of relocated water mains and service connections, and protection of existing facilities shall conform to the requirements of OSHA, the AWWA, the New York State Health Code, the Plumbing Code of New York State, and Nassau County DPW, the Water Authority of Western Nassau County, the Village of Garden City, the Carle Place Water District, the Village of Mineola, and the Westbury Water District, as applicable.

3.2.7.7 Sanitary Sewer

A. Materials, equipment, appurtenances, and installation of relocated sanitary sewer mains and service connections, and protection of existing facilities shall conform to the requirements of OSHA, AWWA, New York State Health Code, Plumbing Code of New York State, Nassau County Department of Public Works, Nassau County Department of Health, Village of Garden City, and Village of Mineola as applicable.

3.2.8 Utility Service Connections

A. The Design-Builder shall maintain all existing service connections and provide for new service connections as may be required for temporary or permanent aspects of the Project.

B. Prior to establishing the location for new Utility service connections, the Design-Builder shall coordinate with Utility Owners and Third Parties concerning accessibility of the service connection, safety, and maintenance of the service connection.

C. The Design-Builder is responsible for all coordination activities with other elements of the Project and as required by Utility Owners and Third Parties to provide utility service connections.

D. The Design-Builder shall include Utility Service Connection Plans for Information as part of the Project Execution Plans prior to commencing utility work.

END

3.3 RAILROAD UTILITIES

3.3.1 Section Includes

This section sets out design and construction requirements related to the relocation, modification, and or abandonment of utilities and utility structures owned by the Railroad.

For utilities owned by public or private Utility Owners and or Third Parties, see TP3.2 UTILITIES.

3.3.2 Codes and Standards

A. Project Work shall comply with all statutory requirements, and shall comply with the codes and standards identified in Appendix TPA3.1A CODES AND INDUSTRY STANDARDS.

3.3.3 Related Documents (Not Used)

3.3.4 General Requirements

A. The Design-Builder shall design, obtain required permits for, furnish, install, inspect and coordinate the construction of the Railroad Utility facility in accordance with requirements of the Contract Documents.

B. The Design-Builder shall be responsible for coordinating all Railroad service interruptions ensure that such interruptions are minimized as per the requirements of the Railroad, and provide temporary Railroad Utility service as at all times.

C. The Design-Builder shall ensure that the Railroad Utility Work is conducted in accordance with all the relevant requirements of the Railroad and all permits.

D. Following de-activation by the Railroad, the Design-Builder shall be responsible for ensuring the removal of Railroad Utilities designated for abandonment within the Project ROW.

E. The Design-Builder shall be responsible for timely performance of all Railroad Utility Work according to the Contract Documents.

F. Confined Space Entry:

1. The Design-Builder shall coordinate with the Railroad regarding Confined Space Entry requirements for all manholes and other underground structures carrying Railroad utilities.
2. All Confined Space Entry shall be conducted only by LIRR authorized personnel and follow the Railroad's established procedures.
3. The Design-Builder shall review the list of Confined Spaces provided by the Railroad and identify those locations within the work area designated as Confined Spaces. The Railroad shall determine whether these locations are Non-Permit-Required Confined Spaces or Permit-Required Confined Spaces. The Design-Builder shall complete the Entry Permit Application provided by the Railroad for all Permit-Required Confined Spaces and submit it to the Railroad.
4. All required Confined Space Entries will be completed by authorized LIRR personnel and the Railroad will identify methods of hazard control and/or mitigative measures to be implemented by the Design-Builder before the Design-Builder begins any demolition, removal, and/or construction work involving Railroad utilities.

3.3.5 Design Requirements

A. The Design-Builder shall examine the record plans of the work site, make a field survey of the work site and examine all other available documents to determine the type and location of all utilities that may be affected by the Design-Builder's Work. Before any work begins the Design-Builder shall inform the Railroad regarding which Railroad Utilities are present and how they may be affected by the work.

3.3.5.1 Utility Loading

A. All Railroad Utilities, including PSEG-LI Hybrid Poles, within the Project ROW shall be analyzed and/or designed to support all dead and live loads, including, at a minimum, those imposed by earth, sub-base, ballast, pavement, track, structures, and vehicles when the Railroad Utility is operating under internal pressure ranges varying from zero to maximum.

3.3.5.2 Utility Clearances

A. Utility clearances shall be as specified in the Contract Documents, the requirements of the Railroad, and the requirements below. In the case of a conflict the most stringent criteria shall govern.

B. Minimum horizontal clearances from tracks are measured in the horizontal plane and from the nearest outside edge of the Railroad Utility or Railroad Utility casing:

1. For ballasted track, the minimum horizontal clearance for all underground Railroad Utilities longitudinal to the tracks is 12'-4¼" from the centerline of the adjacent track.
2. For ballasted track, the minimum horizontal clearance for all poles carrying overhead Railroad Utilities longitudinal to the tracks is 8'-6" from the centerline of the adjacent track.
3. For new or existing manholes, utility boxes, utility vaults, and any other surface features which may require future entry or access, the minimum horizontal clearance distance from the nearest edge of cover to the centerline of track shall be 12'-4¼".

C. Minimum vertical clearances from the tracks, measured in the vertical plane, and from the nearest outside edge of the Railroad Utility or Railroad Utility casing:

1. The minimum vertical clearance for existing communications and power utilities to remain in place shall be 2'-6" below bottom of rail.
2. The minimum vertical clearance for all other existing utilities to remain in place shall be 4 feet below bottom of rail.
3. The minimum vertical clearance for relocated and new utilities shall be 5'-6" below bottom of rail.

D. For horizontal and vertical clearances between Railroad Utilities, measured in the horizontal or vertical plane, as applicable, and between the nearest outside edges of the Railroad Utilities or Railroad Utility casings the minimum horizontal and vertical clearance from overhead electrical Railroad Utility lines shall be 10 feet from other Utilities and structures.

E. Existing Railroad Utilities to remain in place shall meet all horizontal and vertical clearance requirements unless otherwise directed by the Railroad.

3.3.5.3 Utility Encasement

A. New or relocated electric conduits, and communications conduits crossing beneath the tracks with less than or equal to 30 inches of cover shall be covered with a minimum of 3 inches of concrete over the width of the excavated trench. Concrete cover is not required if the cover over the conduits exceeds 30 inches.

3.3.5.4 Design-Builder Utility Design Plans

A. The Design-Builder shall submit the Design-Builder Furnished Railroad Utility Design Plans to the Railroad for Review and Comment at Preliminary and Final Design.

3.3.6 Construction Requirements

A. The Design-Builder shall develop a plan to maintain, protect, relocate, reinstall, or other action that may be necessary for the work to progress.

B. All Railroad Utilities shall be maintained, supported and protected during construction, unless otherwise directed by the Railroad.

C. The Design Builder shall follow the Railroad mark-out procedures defined in TP2.19 CONSTRUCTION SAFETY for any work affecting underground Railroad Utilities (Power, Signals, and Communications) as well as for structural or other excavations.

D. The Design-Builder shall furnish and install required conduits as well as cables for new or relocated Railroad Utilities under existing and new in-service tracks.

E. Any utility conduit, conductor, splice box, pull box or other utility facility that is part of a Railroad Utility system that is embedded in a concrete element that is being removed and replaced in its current or new location as part of this Project shall be replaced and its location coordinated with the Railroad unless the Railroad indicates that replacement is not required. The design and construction of the replaced Railroad Utility shall be in conformance with the current standards of the Railroad.

F. The Design-Builder shall be responsible for repair to any damage and consequential damages to those Railroad Utilities caused by its operations at the Design-Builder's expense. If the nature of the damage is such as to endanger the satisfactory operations of the Railroad Utilities and the necessary repairs are not immediately made by the Design-Builder, the work may be done by the Railroad at its own discretion, and the cost thereof charged against the Design-Builder.

3.3.7 Utility Relocations

3.3.7.1 General

A. The Design-Builder shall maintain all Railroad Utility services affected by the work until new services have been installed, tested and accepted by the Railroad.

3.3.7.2 Utility Poles Owned by the Railroad, 60Hz Power Distribution Lines, and Traction Power Distribution

A. Poles, Hybrid Poles, conduit, wiring, and equipment for relocated electric power and distribution shall be UL listed, as applicable.

B. Installation on Utility Poles owned by the Railroad and underground shall conform to applicable requirements of the National Electric Code, OSHA, AREMA, and the Railroad.

C. Installation on Utility Poles owned by LIPA/PSEG-LI shall conform to applicable requirements of the National Electric Code, OSHA, AREMA, the Railroad, and LIPA/PSEG-LI.

D. Equipment and wiring shall be maintained in a safe condition and utilized in a manner that does not constitute a hazard to persons or property.

3.3.7.3 Communication Lines on Utility Poles Owned by the Railroad and Underground

A. Conduit, copper and fiber optic wiring, equipment, and installation of relocated communication services on utility poles owned by the Railroad and/or underground shall conform to the requirements of the National Electrical Code, OSHA, AREMA, and the Railroad.

3.3.7.4 Express Signal Cable and Signals Wayside Distribution and Control

A. Conduit, copper and fiber optic wiring, equipment, and installation of relocated signal services on utility poles owned by the Railroad and/or underground shall conform to the requirements of the National Electrical Code, OSHA, AREMA, and the Railroad.

3.3.7.5 Signal Power Lines Underground and on Signal Towers Owned by the Railroad and Signal Power Distribution (Above and Below Ground)

A. Conduit, wiring, equipment, and installation of relocated signal power and distribution services shall conform to the requirements of the National Electric Code, OSHA, AREMA, and the Railroad.

3.3.7.6 Switch Heater Distribution and Control and 3rd Rail Heaters

A. Conduit, wiring, equipment, and installation of relocated switch heater distribution and control systems, and 3rd rail heaters shall conform to the requirements of the National Electrical Code, OSHA, AREMA, and Railroad requirements.

3.3.8 Summary of Submittals

Item	Section	Submittal	Action
1	3.3.7	Power and Distribution Systems Relocation – Preliminary Design	Review and Comment
2	3.3.7	Power and Distribution Systems Relocation – Final Design	Review and Approval
3	3.3.7	Communication Lines – Preliminary Design	Review and Comment

4	3.3.7	Communication Lines – Final Design	Review and Approval
5	3.3.7	Express Signal Cable and Signals Wayside Distribution and Control – Preliminary Design	Review and Comment
6	3.3.7	Express Signal Cable and Signals Wayside Distribution and Control – Final Design	Review and Approval
7	3.3.7	Signal Power Lines and Distribution – Preliminary Design	Review and Comment
8	3.3.7	Signal Power Lines and Distribution –Final Design	Review and Approval
9	3.3.7	Switch Heater Distribution and Control and 3rd Rail Heaters – Preliminary Design	Review and Comment
10	3.3.7	Switch Heater Distribution and Control and 3rd Rail Heaters – Final Design	Review and Approval

END

3.4 SITE PREPARATION, DEMOLITION, AND SITE RESTORATION

3.4.1 Section Includes

A. This section sets out requirements for preparation of a work area before construction activities begin, site restoration once work is complete, and for building and facility demolition and maintenance of the demolition site before and after demolition occurs.

B. The Section also includes requirements for the demolition of the buildings and facilities identified in TP1.4 SITE PREPARATION, DEMOLITION, AND SITE RESTORATION.

3.4.2 Codes and Standards

Project Work shall comply with all statutory requirements, and shall comply with the codes and standards identified in Appendix TPA3.1A CODES AND INDUSTRY STANDARDS.

3.4.3 Related Documents

NYSDOT Standard Specifications.

3.4.4 Design Requirements

3.4.4.1 Site Preparation

A. The Design-Builder shall survey the project limits to verify the existing surface facilities and underground utilities. The Design-Builder shall create site plans indicating at a minimum the project limits, loading areas and demolished buildings and facilities.

3.4.4.2 Hazardous Material

A. The Design-Builder shall provide hazardous material disposal plans that shall include the removal, disposal, remediation of asbestos, hazardous chemicals, gases, flammable materials, or similarly dangerous materials on the site prior to any demolition.

B. Additionally, the Design-Builder shall meet the following hazardous waste requirements as set forth by the NYSDOT Standard Specifications:

1. Waste shall be properly packaged, with a written description and labeled as hazardous.
2. Waste shall be inspected at least weekly while stored on site.
3. Waste shall be shipped by a permitted waste transporter with a hazardous waste manifest and required documentation.
4. Waste shall be disposed of at a permitted hazardous waste treatment storage and disposal facility.
5. Waste shall be removed within 10 days after generation.
6. Hazardous waste shall be stored on the site of generation until manifested and shipped for disposal.
7. Personal must be trained in hazardous waste management procedures.
8. Appropriate security shall be provided for hazardous wastes while on site.

3.4.4.3 Clearing and Grubbing

A. The Design-Builder shall perform clearing and grubbing as necessary to remove vegetation and deleterious material from the site. Brush and other vegetation in areas to be cleared shall be cut-off flush with or below the original ground surface. Clearing shall also include the removal and disposal of impediments and obstructions that obtrude, encroach upon, or otherwise interfere with the work. Additional items for removal include the removal and disposal of trees, brush, stumps, fences, debris and miscellaneous structures not covered under other contract items within the construction area. The Design-Builder shall clear all areas within the limits of the ROW and easement lines as specified or directed. No trees, tree trunks, stumps, or other debris shall be felled, sidecast or placed outside the limits of the contract area. All wood including grubbed stumps shall be removed from the contract site or otherwise disposed of. In the interest of conservation, the Design-Builder shall make every effort possible to salvage marketable timber produced as a result of clearing operations, provided the amount of timber is great enough to make the hauling practical. The Design-Builder shall submit a design package indicating the limits of clearing and grubbing.

3.4.4.4 Demolition of Buildings and Facilities

A. This work shall include the demolition, removal, and disposal of existing buildings. The Design-Builder shall conduct all demolition and removal operations in accordance with the indicative plans and local building codes. Prior to any demolition, the Design-Builder shall conduct an engineering survey of the building to determine its existing condition and prepare a Demolition Plan for each building and facility to be demolished. The Design-Builder is responsible for protecting all existing utility facilities during demolition, or if necessary, utilities shall be temporarily relocated prior to the start of demolition.

B. The Design-Builder shall submit a demolition plan prior to any construction that must contain the following at a minimum:

1. Demolition of buildings.
2. Demolition of bridges.
3. Demolition of grade crossings.
4. Demolition of station platforms.
5. Limits of clearing and grubbing.
6. Removal and disposal of hazardous materials (pending results of borings).
7. Removal and disposal of signal bridges, signal huts and train signals.
8. Removal and disposal of existing rail.
9. Demolition of sidewalks and curbs to accommodate station upgrades.
10. Removal of advertisement billboards within the LIRR ROW. (Coordinate removal with LIRR)

C. The Design-Builder shall submit design plans to include the design, construction, maintenance and removal of temporary structures and their approaches, or the removal of existing structures to provide temporary structures along with their temporary approaches prior to any demolition of existing buildings or facilities.

D. The Design-Builder's Demolition Plan shall be prepared by a Professional Engineer and include the following:

1. A plan of the work area including roadways, sidewalks, curbs, support structures, railroad tracks, both underground utilities and overhead utility lines, and any other information pertinent to demolition.
2. A description and catalog cuts of the type, size, and weight of cranes, heavy equipment, and trucks to be used.
3. A plan of the location of cranes, heavy equipment, and trucks.
4. Identification of components analyzed, with reference to controlling specifications or codes.
5. Identification of strength of materials (or allowable stresses related to means and methods, within calculations and drawings.
6. Girder stability analysis, including non-composite girder analysis with dead load and equipment loads.
7. Current condition of superstructure and substructure. Indicate whether it is based on site visit and date, or latest inspection report and date.
8. Section loss of all components (including components in the load path), where applicable, both within calculations and on demolition drawings. State whether section loss is assumed percentage based on inspection report and date, or measured section loss based upon field inspection and date.
9. Demolition sequences, with a narrative description. Calculations associated with the Demolition Plan shall be included for each stage. Include saw cut locations.
10. Clear statement of critical assumptions, with guidance on contingency steps if conditions do not match assumptions.
11. The locations and details of supporting members, framing and foundations, etc., necessary to accomplish the partial demolition of a building.
12. Measures necessary to prevent a partial building demolition from affecting adjacent property.

E. The following shall be identified in the Demolition Plan, but need not be prepared by a Professional Engineer:

1. The locations and details of signs, barricades, curbing, and decking used to cover over holes in the flooring of a building.
2. Details of water diversion plans necessary for the proposed means and methods. Identify environmental ground and environmental water protection requirements, including location specific information.
3. Description of plans to contain and collect paint waste generated from subsequent cutting operations, or reference to other submittals.
4. Sequence of operations, including Work Zone Traffic Control requirements such as lane closures required to perform the work.
5. Means and methods to control dust from being objectionable to nearby residents or potentially hazardous to workers.

6. Description of plans for abatement of all identified and impacted asbestos-containing materials.

F. The Design-Builder shall submit the design of any temporary support structures required to demolish buildings and facilities for the review and approval by the railroad.

G. Submittals to be followed are stated elsewhere in the RFP. Safety plans, security plans, and environmental compliance submittals shall be referred to where necessary.

3.4.4.5 Maintenance of Site Demolition

A. The Design-Builder shall institute and maintain safety measures and provide all equipment or temporary construction necessary to safeguard all persons and property affected by construction operations. The Design Builder shall remove and dispose of any equipment devices that are unsafe or malfunctioning.

3.4.4.6 Salvage

A. The Design Builder shall salvage materials and make them available to the Railroad at a location specified by the Railroad. Items that the Railroad does not wish to accept will become the property of the Design-Builder, and shall be removed from the site. Items to be salvaged include the following:

1. Gates.
2. Frames.
3. Metal castings.
4. Miscellaneous parts of inlets and manholes.
5. Hydrants.
6. Fire alarm posts and boxes.
7. Metal light poles.
8. Pipe and valves.
9. Metal fencing.
10. Guide rail.
11. Highway street signs and posts.
12. Timber.
13. Ties.
14. Running rail, third rail.
15. Other items specified elsewhere in the Technical Provisions.

B. Salvaged material damaged or destroyed due to the Design-Builder's negligence shall be repaired or replaced as directed by the Railroad.

3.4.5 Construction Requirements

A. The site work shall be surveyed to verify all existing site features and underground utilities. The Design-Builder shall verify that no hazardous features are present within the site work.

If there is hazardous material, the Design-Builder shall dispose of them as specified in the Contract Documents.

B. The site work may include but not be limited to: clearing and grubbing; excavation and embankment; removal of pavement and pavement markings, road barriers, soil, drainage facilities, fencing, signs, and miscellaneous structures; subgrade preparation and stabilization; dust control; removal of abandoned above-ground and shallow piping and wiring, valves, meters, and other waste materials; and aggregate surfacing. The removal and disposal of items along the LIRR ROW shall be the responsibility of the Design-Builder, at the discretion of the Railroad.

C. The Design-Builder shall grade and restore all disturbed areas to match the existing surrounding ground elevation unless otherwise specified elsewhere in the Contract Documents. The Design-Builder shall cut pavement or sidewalk to full depth with straight lines at removal terminations.

D. The Design-Builder shall over-excavate as necessary to remove unsuitable material from under the footprint of pavements and structures and backfill with properly compacted suitable material. Topsoil may be stripped, stockpiled, and reused within the Project Limits.

E. The Design-Builder may only reuse materials on the Project that meet the requirements for grading and backfill materials. Disposal of obsolete, unsuitable, and surplus material is not allowed within the Right-of-Way and shall be removed.

F. Unless specified otherwise in the Contract Documents, the Design-Builder shall remove all obstructions down to a minimum of 2 feet below the existing or proposed surrounding ground elevation or to the elevation necessary to properly construct the Work, whichever is lower.

G. The Design Builder shall terminate any existing utilities servicing demolished building in accordance with local authorizes regulations and codes. The Design-Builder shall coordinate with authorities as required to terminate existing services.

H. The maintenance of the site during demolition includes providing safety measures during demolition and after demolition is completed. The Design-Builder is responsible for implanting a Health and Safety Plan during construction to eliminate any construction related work incidents.

3.4.6 Vegetation Management

The Design-Builder shall follow the following tree cutting requirements:

A. All trees, brush, woody growth and other vegetation, including bushes, vines and weeds growing along the various Railroad right-of-ways, shall be cleared from a maximum height of four (4) inches above ground level to the sky along a swath starting at the track and going outward to the property line. All overhanging limbs, regardless of height, within this swath shall be removed. All dead fall, including piles of or scattered branches, logs, limbs or any parts of live or dead trees located in the work area shall be cleaned up and disposed of by the Design-Builder.

B. All trees, brush, woody growth and other vegetation, including bushes, vines and weeds growing along the Railroad ROW for one thousand (1,000) feet preceding wayside signals; and five hundred (500) feet preceding each side of signal case, flasher and road crossing equaling one thousand (1,000) feet per signal case, flasher and road crossing, shall be cleared from a maximum height of four (4) inches above ground level to the sky along a swath starting at the track and going outward to the property line on the field side of the wayside signal. All overhanging limbs within this swath shall be removed, regardless of height.

C. The Design-Builder is required to use hand tools (i.e. chain saws and bow saws, etc). Mechanized equipment shall be inspected and approved by LIRR to be permitted along ROW. Wood chippers are approved along the ROW. A minimum of one (1) motorized wood chipper shall accompany each work crew daily when chipping is permitted by LIRR. In areas where chipping is not permitted by LIRR, all debris shall be removed from the site daily. For locations that are quarantined due to Asian Long horn bettle infestation, proper disposal of logs/tree stumps shall be arranged by the Design-Builder. Log loaders (grapple truck) shall be available and provided by the Design-Builder as necessary. Any type of mechanical equipment that knocks down growth thru blunt force shall not be approved for use on the Project.

D. All tree removal work shall be conducted so as not to interfere with the operation of the Railroad.

E. In case of interference with the Railroad operations, the Railroad shall be sole and final judge as to the sequence of the work necessary to expedite completion of the tree removal.

F. All debris resulting from the trimming shall be removed from the Railroad's property each day with no exceptions and shall be legally disposed of.

G. The Design-Builder shall provide safety devices for the protection of their employees, the employees of the subcontractor(s), the Railroad, the public and any/all other persons as shall be necessary and as shall be required by the Railroad.

H. The Railroad will be in continuous operation. The Design-Builder shall conduct their work in such a manner and at such times and with such precautions and safeguards as the Railroad may require for the purpose of minimizing interference with the safe and continuous operation of the Railroad and of avoiding interference with or injury to employees or other persons or damage to property. The Design-Builder shall at all times comply with the requirements of the Railroad as to the disposal and handling of materials, equipment, tools and facilities and with all other requirements to the end that interference with the safe and continuous operation of the Railroad and interference with or injury to employees and other persons shall be avoided.

I. The Design-Builder and all of its employees and subcontractors assigned to this Contract shall attend an LIRR Roadway Worker Protection Safety course (approximately one half-day duration) before beginning work along the LIRR ROW. See Appendix TP2.19A TRAINING PROCEDURES.

J. The Design-Builder shall clean the entire ROW from property line to property line immediately following cutting operations. The cutting operation and the cleaning operation shall follow one another closely to make use of the same LIRR flagging crew. A separate flagging crew shall not be provided for cleaning only. All trash and debris of any kind along

the ROW shall be picked up and legally disposed of by the Design-Builder. This includes all adjacent homeowner generated trash and debris. The manpower provided for cleanup operations shall be in addition to the cutting crew size specified elsewhere in the Contract Documents. The Design-Builder shall make use of heavy thickness black plastic trash bags to collect trash. All partially or fully filled trash bags shall be removed from the ROW at the end of each Workday. Dumpsters, if required, shall be placed at Railroad grade crossings if needed, but shall not remain in place longer than five (5) Calendar Days. Fully loaded dumpsters shall be removed from Railroad property immediately upon filling. All Railroad materials encountered along the ROW shall remain on the property. However, they shall be picked up and placed in piles a distance of ten (10) feet from the edge of running rail. Chipping, when allowed, shall never be aimed in such a way that the wood chips expelled by the chipper are deposited in an area that has not been cleaned beforehand. Any type of suspected hazardous material or container shall be reported immediately to the LIRR Safety Department at: (347) 494-6027 for inspection, evaluation, testing and removal.

K. The Design-Builder shall provide all necessary labor, equipment, permits, notifications, (including but not limited to, those required by various state and local Environmental Control Agencies), and material, to successfully chemically treat the stumps along LIRR ROW after being cut. It is intended to prevent the re-sprouting of woody vegetation in the treated area. The chemicals shall be applied by a backpack sprayer. The liquid shall be dyed to allow LIRR to verify afterwards that the treatment has been applied. At least one (1) individual shall be currently certified New York State applicator.

L. The Design-Builder shall be fully experienced in industrial weed control. The Design-Builder shall be currently registered with the Commissioner of the Department of Environmental Conservation, and shall be a currently certified applicator with a valid applicator certificate as required by Article 33 of the New York State Environmental Conservation Law.

3.4.7 Demolition of Track and System Elements

A. Whenever a track or system element is encountered during the performance of the work that is not shown on the Contract Drawings, the Design-Builder shall stop the associated work, notify LIRR in writing, and proceed in accordance with LIRR's written directions.

B. The Design-Builder shall verify all track and system elements to be removed per the Contract Documents and coordinate with LIRR prior to any demolition.

C. The Design-Builder shall coordinate with LIRR and protect all tracks and system elements encountered, shall schedule all connections, disconnections and reconnections with the Railroad, and shall ensure continuity of service at all required times as determined by LIRR.

D. The Design-Builder shall permit free and clear access to all areas of the work site at all times to LIRR for the purpose of inspection, maintaining and providing services to the track and system elements.

E. The Design-Builder shall act immediately to restore to the prior level of service tracks and systems not scheduled for replacement but damaged during construction. All such tracks or systems cut, interfered with, or damaged, including installation, shall be fully restored immediately.

3.4.8 Site Restoration

A. The Design-Builder shall protect and preserve all public and private property, including all existing vegetation and existing landscape features. The Design-Builder shall use every precaution necessary to prevent damage, pollution and destruction to all existing trees and plants that are to remain. Prior to any construction, the Design-Builder shall submit site restoration for approval to insure that the site will be properly maintained and restored. Site restoration plans must be undertaken in accordance with the Contract Drawings and local building codes.

B. Site restoration must be undertaken in accordance with local building codes. All necessary gas, electrical sanitary, water supply and other service connections at new building locations shall be at least equivalent in construction to the existing connections, so as to cause the least possible disruption in accordance with the requirements of the utilities and local building codes, and will be paid separately.

C. Restoration of the work site by the Design-Builder shall include at a minimum:

1. The removal of all equipment and parts, junk, rubbish, excess material and debris of all kinds.
2. Clean up as required.
3. Grading as shown on the grading plans.
4. Removal of pavement or granular surfacing from, and regrading of roads or areas.
5. The repair and or removal of damaged trees.
6. Fertilizing, seeding and mulching of disturbed areas.
7. Grading the slopes of excavated areas to a stable condition.
8. Site restoration for new, removed, and relocated underground lines and trenches, utility poles and their foundations, signal systems, traction power substations, communication lines, and all other utilities that impacted the existing Site.

3.4.9 Summary of Submittals

Requirements for Submittals and as-built documents are listed in the table below.

Item	Section	Submittal	Action
1	3.4.4.1	Survey Plans	Review and Comment
2	3.4.4.2 & 3.4.4.3	Disposal Plans (Hazardous Material & Clearing & Grubbing)	Review and Comment
3	3.4.4.5	Demolition plans	Review and Comment
4	3.4.4.5	Temporary Support Structure Design	Review and Comment

5	3.4.6	Site restoration plans	Review and Comment

END

3.5 STRUCTURES

3.5.1 Section Contents

A. This section establishes design and construction requirements related to structures, including the following:
    1. Existing structures to remain.
    2. Roadway bridges.
    3. Undergrade crossings.
    4. Railroad bridges.
    5. Retaining walls.
    6. Sound attenuation barriers.
    7. Pedestrian bridges.
    8. Existing pedestrian underpasses.
    9. Temporary Structures.

B. For geotechnical and foundation requirements, refer to TP2.4 GEOTECHNICAL.

C. For structural requirements at stations, refer to TP3.12 STATIONS AND ARCHITECTURE.

D. For structural requirements at parking structures, refer to TP3.14 PARKING STRUCTURES.

3.5.2 Codes and Standards

Project Work shall comply with all statutory requirements, and shall comply with the codes and standards identified in Appendix TPA3.1A CODES AND INDUSTRY STANDARDS and the codes and standards listed below:

A. American Association of State Highway and Transportation Officials (AASHTO), specifications, guidelines and policy including but not limited to:
    1. AASHTO, Policy on Geometric Design of Highways and Streets.
    2. AASHTO, AASHTO Guide Specifications for Seismic Isolation Design, Second Edition.
    3. AASHTO, LRFD Bridge Construction Specifications.
    4. AASHTO, LRFD Bridge Design Specifications.
    5. AASHTO, LRFD Guide Specification for Design of Pedestrian Bridges.
    6. AASHTO, Manual for Bridge Evaluation.
    7. AASHTO, R 8-96, Standard Recommended Practice for Evaluation of Transportation-Related Earthborne Vibrations.
    8. AASHTO, Guide Design Specifications for Bridge Temporary Works.
    9. AASHTO, Standard Specification for Highway Bridges.

B. American Concrete Institute (ACI) Manual of Concrete Practice including but not limited to:

1. ACI 117, Specification for Tolerances for Concrete Construction and Materials, unless otherwise specified in the NYS Standard Specifications.
2. ACI 207, Guide to Mass Concrete.
3. ACI 305, Guide to Hot Weather Concreting.
4. ACI 306, Guide to Cold Weather Concreting.
5. ACI 318, Building Code Requirements for Reinforced Concrete.
6. ACI 358.1R-92, Analysis and Design of Reinforced Concrete Guideway Structures.
7. ACI 506R - Guide to Shotcrete.
8. ACI 530, Building Code Requirements and Specification for Masonry Structures and Related Commentaries.

C. American Institute of Steel Construction (AISC) Manuals including but not limited to:
   1. AISC Steel Construction Manual, Specification for Structural Steel Buildings.
   2. AISC, Seismic Design Manual.
   3. AISC, Steel Construction Manual.

D. American Railway Engineering and Maintenance-of-Way Association (AREMA), Manual for Railway Engineering.

E. ASTM International (ASTM) Standards.

F. American Welding Society (AWS) Standards.

G. Applied Technology Council, ATC-32, Improved Seismic Design Criteria for California Bridges: Provisional Recommendations, 1996.

H. ASCE/SEI Standard 7, Minimum Design Loads for Buildings and Other Structures.

I. Code of Federal Regulations, 23 CFR Part 650.2, National Bridge Inspection Standards.

J. Federal Highway Administration (FHWA) Manuals, Guidelines and Circulars including but not limited to:
   1. FHWA-IF-03-017, Geotechnical Engineering Circular No. 7 – Soil Nail Walls.
   2. FHWA-IF-99-015, Geotechnical Engineering Circular No. 4 – Ground Anchors and Anchored Systems.
   3. FHWA, Geotechnical Engineering Circular No. 5 - Evaluation of Soil and Rock Properties, FHWA-IF-02-034.
   4. FHWA RD-82-046, Tiebacks, Executive Summary.
   5. FHWA RD-82-047, Tiebacks.
   6. FHWA-RD-89-93, Soil Nailing for Stabilization of Highway Slopes and Excavations.
   7. FHWA-SA-93-068, Soil Nailing Field Inspectors Manual.
   8. FHWA-SA-96-069, Manual for Design and Construction Monitoring of Soil Nail Walls, 1997.
   9. FHWA-SA-96-071, Mechanically Stabilized Earth Walls and Reinforced Soil Slopes – Design and Construction Guidelines, 1996.

10. FHWA-HRT-11-022, Field-Cast UHPC Connections for Modular Bridge Deck Elements.
11. FHWA NHI-05-123, Soil Slope and Embankment Design.

K. Multidisciplinary Center for Earthquake Engineering Research (MCEER), MCEER-98-0005, Screening Guide for Rapid Assessment of Liquefaction Hazard to Highway Bridges.

L. National Center for Earthquake Engineering Research (NCEER), NCEER-97-0022, Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils.

M. National Cooperative Highway Research Program (NCHRP), Report 350, Devices in Work Zones.

N. National Forest Products Association (NFPA), National Design Specification for Wood Construction.

O. National Fire and Protection Association (NFPA) including but not limited to:

1. NFPA 130, Standard for Fixed Guideway Transit and Passenger Rail Systems.
2. NFPA 502 Standard for Road Tunnels, Bridges, and Other Limited Access Highways.

P. New York State Department of Transportation (NYSDOT) Engineering Manuals and Guidelines including but not limited to:

1. Access Management Requirements.
2. Annual Report titled "Axle Factor Update".
3. Approved Materials List.
4. Bridge Detail Sheets US Customary (BD Sheets).
5. Bridge Inspection Manual.
6. Bridge Inventory Manual.
7. Bridge Manual.
8. Bridge Safety Assurance Seismic Vulnerability Manual.
9. CADD Standards and Procedure Manual.
10. Comprehensive Pavement Design Manual.
11. Consultant Instructions.
12. Design Consultant Manual.
13. Engineering Bulletins.
14. Engineering Instructions and Directives.
15. Environmental Procedures Manual (EPM) / The Environmental Manual (TEM).
16. General Design and Construction Requirements for Occupancies.
17. Geotechnical Engineering Bureau Manuals and Publications.
18. Guidelines For Design and Construction of Expanded Polystyrene Fill as a Lightweight Soil Replacement GEM-24.
19. GCP-17, Procedure for the Control of Granular Materials.
20. Highway Design Manual.

21. Land Surveying Standards and Procedures Manual.
22. LRFD Bridge Design Specifications (LRFD Blue Pages).
23. Standard Specifications for Highway Bridges (NYSDOT Blue Pages).
24. Manual for Uniform Record Keeping.
25. Materials Bureau - Applicable Sampling and Testing Manuals, Inspection Manuals, and Materials Methods.
26. New York State Supplement to the Manual on Uniform Traffic Control Devices.
27. Overhead Sign Structure Design Manual.
28. Policy on Highway Lighting.
29. Prestressed Concrete Construction Manual.
30. Project Development Manual.
31. Reference Marker Manual.
32. Rules and Regulations Governing the Accommodation of Utilities within the State Highway Right of Way.
33. Special Specifications.
34. Standard Sheets.
35. Standard Specifications for Construction and Materials.
36. Steel Construction Manual (SCM).
37. Structures Design Advisories.
38. Structures Technical Advisories.
39. Supplement to the Manual on Uniform Traffic Control Devices for Streets and Highways.
40. U.S. Customary Standard Sheets.
41. Work Zone Traffic Control Manual.

Q. Occupational Safety and Health Administration (OSHA) Standards.

R. Portland Cement Association (PCA), Engineering Mass Concrete Structures.

S. PCA, PCA Thickness Design for Concrete Highway and Street Pavement.

T. Post Tensioning Institute, Recommendations for Prestressed Soil and Rock Anchors.

U. Precast Concrete Institute (PCI), PCI Design Handbook: Precast and Prestressed Concrete.

V. U.S. Access Board, Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines.

W. U.S. Army Corps of Engineers, EM 1110-2-2901, Tunnels and Shafts in Rock.

X. U.S. Department of Transportation (DOT), Americans with Disabilities Act (ADA) Accessible Transportation Facilities.

Y. U.S. DOT, Americans with Disabilities Act (ADA) Standards for Transportation Facilities.

Z. U.S. DOT, Americans with Disabilities Act (ADA) Guidelines for Buildings and Facilities.

AA. U.S. DOT, FHWA, Lateral Support Systems & Underpinning, Vols. I, II, III, FHWARD 75-128, -129, and -130.

BB. Youd, T. L., Screening Guide for Rapid Assessment of Liquefaction Hazard to Highway Bridges, MCEER-98-0005, MCEER, 1998; and

CC. Youd, T. L., and Idriss, I. M., Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils, NCEER-97-0022, NCEER, 1997.

3.5.3 Related Documents

A. Directive Drawings.

B. Contract Drawings.

C. Technical Specifications.

3.5.4 Requirements

Structures designed as part of the Project and existing structures impacted by the Project shall comply with these structural design provisions. Impacts to the existing structures shall mean any increase in temporary or permanent loading on existing structures to remain. If the Design-Builder's design requires special conditions that are outside the parameters identified in the Contract Documents, the Design-Builder shall determine the applicable technical sources for the design to be used and obtain Railroad approval. The Design-Builder's Design Work shall comply with applicable local, State, and Federal regulations and codes. It shall be the Design-Builder's responsibility to obtain clarification for any unresolved or perceived ambiguity prior to proceeding with Design Work or Construction Work.

The following structures shall be excluded from the requirements of 3.5.4:

A. Floral Park – North Viaduct.

B. Floral Park – South Viaduct Spans 1-25.

C. Tulip Avenue Bridges.

D. South Tyson Ave. – North Bridge.

E. Plainfield Ave. – South Bridge (Superstructure only).

F. Herricks Road.

G. Winthrop Hospital Pedestrian Bridge.

H. Mineola Intermodal Pedestrian Bridge.

I. Mineola Blvd.

J. Roslyn Road.

K. Culvert 880' West of Carle Place Station.

L. Ellison Ave.

M. Post Ave.

N. Grand Blvd.

O. Wantagh State Parkway.

P. Charlotte Ave.

Q. Existing retaining walls not impacted by Project work.

R. Hicksville Viaducts, except as otherwise noted.

3.5.4.1 Existing Structures to Remain

The components of existing structures to remain shall be analyzed as a system in accordance with the following:

A. Components of existing structures, including bridges, and earth retaining structures impacted by the project shall be analyzed to determine their capacities using the same design methodology for which they were designed. If the original design methodology is unknown, bridge and earth retaining structures shall be checked for their capacities in accordance with AREMA's Manual for Railway Engineering. Structures that do not have sufficient capacity to support the required loading shall be retrofitted so that they do provide sufficient capacity.

B. Substructure deficiencies outlined in inspection reports and encountered in the field shall be repaired by the Design-Builder. Existing abutments and walls shall be remediated or repaired to a state of good repair. The structures shall last a minimum of 20 years with routine maintenance after construction is complete.

C. All concrete repairs shall contain epoxy coated reinforcement or stainless steel reinforcement or as directed otherwise.

D. Abutment modifications shall be designed to include new precast concrete bearing seats with galvanized reinforcing unless directed otherwise.

E. The Design-Builder shall clean out existing weep holes in all walls and abutments. If there are no weep holes, core drill weep holes in abutments as required to improve drainage. Avoid coring through existing reinforcement. Submit locations and repair details to Railroad for approval. See NYSDOT Bridge Manual for spacing requirements.

F. Existing abutments and wingwalls shall be retrofit as required to accommodate lateral surcharge from Cooper E80 as well as traction and braking forces. Existing abutments shall be retrofitted as required to accommodate vertical effects from Copper E60 loading at bearing locations.

G. Underground structures shall be modeled and analyzed, taking into account the stiffness of the surrounding soil.

H. Load ratings shall be performed for bridge superstructures and substructures, for both inventory and operating conditions, using all applicable train consists and work trains. The controlling load rating values shall be provided on the plans.

I. Repairs and strengthening, shall also be designed in accordance with the same design methodology for which the structure was designed. If the original method of design is unknown, repairs and strengthening design shall be completed in accordance with the same methodology as outlined in provision 3.5.4.1.A.

J. The Design-Builder shall analyze the existing bridge structures for seismic loading in accordance with AREMA's Manual for Railway Engineering and retrofit as needed, unless noted otherwise.

K. The Design-Builder shall retrofit existing retaining walls impacted by the Project in order to support the proposed project elements and ensure the stability of these walls. Retrofitting shall be required to accommodate lateral surcharge from Cooper E60.

3.5.4.2 Roadway Bridges, Undergrade Crossings, and Railroad Bridges

3.5.4.2.1 General Requirements for All Bridges

The following requirements shall apply to all roadway bridges, undergrade crossings, and railroad bridges. The Design-Builder shall design new bridge structure(s), including but not limited to the following: primary and secondary structural elements, reinforced concrete deck, deck joints, sidewalk(s), curb(s), pier structure(s), pier foundation(s), abutment structures, abutment foundations, retaining structures, bridge railings, bearings and drainage systems. The design shall meet the following requirements:

A. Geometric Requirements:

1. All bridge designs shall accommodate Plate F clearances. At a minimum designs shall meet LIRR CE-1 clearances, except as indicated otherwise on the Track Alignment Contract Drawings.
2. Adjacent structures shall have at least 3'-0" clear gap between primary members to allow access for maintenance and inspection, unless noted otherwise.

B. Analysis Requirements:

1. The Design-Builder shall use commercially-available computer bridge analysis programs to complete the bridge analysis and design, including seismic modeling. Programs shall be accepted throughout the industry, with a proven track record of use on projects of this nature. Unless otherwise specified, the Design-Builder shall ensure the most current version of the relevant software is used.
2. Bridge superstructures and substructures shall be designed for a minimum 100 year life cycle by providing the following:
    i. An additional 1/8" (i.e. 1/16" on each side) of sacrificial steel thickness shall be added to flanges and webs of primary members of steel superstructures over that which is required by design.
    ii. All prestressing steel shall have an additional one inch of minimum cover over the cover shown in NYSDOT's Standard bridge detail sheets.
    iii. A corrosion protection plan that includes additional cover for mild reinforcement, low permeability concrete mixes, concrete penetrating sealers.
    iv. A service life plan for reinforced concrete. A numerical solution for the long term behavior using commercially available software.
3. Design shall account for fatigue as required to meet service life requirements and shall be detailed accordingly to limit future maintenance and maximize bridge asset reliability.
4. The controlling load rating values shall be provided on the plans. Ratings shall be provided for structures based on the method of design used.
5. The Design-Builder shall develop erection procedures for the bridges that include complete detailed erection sequence drawings; erection stresses in permanent and temporary members; bent and falsework reactions determined for each construction stage and a detailed work plan.

C. Material Requirements:

1. The use of timber shall be prohibited in the design of structures that support or retain LIRR loading. Timber shall only be used for temporary structures. For timber structures other than structures subjected to LIRR or highway loading, the National Design Specification for Wood Construction, by the National Forest Products Association (NFPA), shall be followed. Timber structures with spans over 20 feet in length shall not be allowed for permanent structures.
2. Prestressed concrete bridges and elements shall meet the requirements of NYSDOT's Prestressed Concrete Construction Manual and AREMA.
3. Concrete exposure shall be considered severe.

D. Component Requirements:

1. Bearings:
   i. Bridges shall be supported by reinforced elastomeric bearings. The use of multi rotational disk and multi rotational spherical bearings may be deemed acceptable upon request for approval from LIRR.
   ii. Design and location of bearings shall provide for maintenance, accessibility and future replacement. Jacking points with sufficient capacity (full dead load and live load) to allow the superstructure to be lifted for bearing replacement under live load shall be provided. The plans shall include the location of the jacking points and the jacking loads.
2. BIN Plates:

   All bridges shall receive new Identification Plates that display both NYSDOT BIN Numbers and LIRR asset numbers and meet the following requirements:

   i. As part of the Final Design, Bridge Inventory Forms shall be completed and submitted for each bridge and ramp structure as per the NYSDOT Bridge Inventory Manual. NYSDOT will provide new Bridge Identification Numbers (B.I.N. numbers) for each bridge and ramp structure.
   ii. Panel with reflective background: The aluminum panel shall conform to the requirements of the NYSDOT Standard Specifications. The background material shall be green reflective sheeting conforming to the requirements of the NYSDOT Standard Specifications for Class A Sheeting. The size of the panels shall be 1/8 inch thick by 6 inches by 12 inches. A thin rubber or plastic gasket or sheeting matching the plate size shall be placed behind the plate prior to installation.
   iii. Numbers: The numbers shall be reflective sheeting conforming to the requirements of the NYSDOT Standard Specifications for Class A Sheeting, except that the adhesive shall be pressure-sensitive such that the numbers can be applied to the background in the field. The numbers shall be 2 inches high and silver-white in color conforming to FHWA series C dimensions.
   iv. Prior to placing the numbers on the panel, the reflective background shall be clean and free of dirt and oil which may adversely affect proper adhesion. The numbers shall be placed on the reflective background, perpendicular to the longitudinal axis of the panel and vertically centered.

The reflective background and numbers shall be coated and/or edge sealed in accordance with the recommendations of the sheeting manufacturer.

v. The Identification plate shall be attached to the beginning abutment, right side of the bridge using expansion anchors. The plate shall be placed high on the abutment, near the fascia of the bridge so that it cannot be painted over via a spray paint can or easily removed or damaged.

3. Bird Control:

   i. A bird repellant system (i.e. bird repellant spikes, rigid bird screen, etc.) shall be attached to structural steel and concrete surfaces through the use of adhesive compounds recommended by the manufacturer or approved system. The bird repellant system shall not decrease the vertical clearance of the bridge. Bird netting systems shall not be allowed.

4. Coating Systems:

   i. See requirements for roadway bridges and requirements for bridges that support LIRR loading, for structural steel coating system requirements.

   ii. All paint components shall be compatible and supplied by a single manufacturer.

   iii. Paint system shall meet the requirements of NYSDOT Standard Specifications, Construction Materials 2008, including all addendums.

   iv. All bridges shall be marked with the paint coating type, along with the month and year painted on the exterior most girders with a stencil.

   v. All bridges shall be coated with a sealer and anti-graffiti coating, in accordance with New York State Codes, Rules and Regulations (NYCRR): 6 NYCRR 205 Architectural Coatings and shall be a single manufacturer. Coating materials shall comply with the requirements of Article 19 of 6 NYCRR 205 of volatile organic compound (VOC) content.

   vi. Sealer and anti-graffiti coating shall be compatible with the paint coat system.

   vii. All exposed faces of concrete elements and all faces of precast elements shall be coated with a penetrating sealer. All exposed faces of all concrete elements shall be coated with an anti-graffiti coating.

5. Deck Joints:

   i. Deck joints shall not be allowed.

   ii. Any closure pour or cold joint connecting superstructure members shall be made watertight.

6. Drainage:

   i. Deck drainage system shall be designed and constructed to minimize maintenance needs. Cleanouts shall be provided at appropriate locations.

7. Prefabricated Elements:

i. The compressive strength of concrete shall be a minimum of 5,000 psi for prestressed or precast applications. All prestressed concrete elements shall meet the requirements of Material Specification 718-06.

ii. The joints between prefabricated elements shall not exhibit visible cracks and shall not leak. The joints design and construction shall meet one of the following:

The guidance provided in FHWA-HRT-11-022, Field-Cast UHPC Connections for Modular Bridge Deck Elements.

OR

Shall be fully reinforced moment carrying connection using NYSDOT High Performance Internal Curing (HPIC) Concrete with Calcium Nitrate corrosion inhibitor at a dosage rate equal to the dosage rate used in the concrete for the prefabricated element.

E. Abutment and Wingwall Requirements:

1. Bridges shall be designed to be lifted off the new or existing abutment/bridge seats to allow future maintenance and replacement of bearings.
2. Provide cementitious waterproofing on the backside of all abutments and wingwalls (Thoroseal Foundation Coating or equal).
3. Provide perforated vertical and horizontal drainage piping wrapped in filter fabric with graded granular material behind abutments to allow for connection to bridge deck drainage, connect drainage to seepage basin if required.
4. Provide clean soil drainage materials (i.e. sand, stone, etc.) to allow water dissipation.
5. Reinforcement coating shall be as specified in the NYSDOT Bridge Manual and AREMA.

F. Foundation Requirements:

1. The Design-Builder may propose various types of foundations and substructures to replace the existing bridges unless otherwise noted in site specific requirements.
2. The Design-Builder shall design and construct permanent foundations based on the requirements of AREMA and NYSDOT LRFD Bridge Design Specifications, AASHTO LRFD Bridge Design Specifications and AASHTO LRFD Bridge Construction Specifications.
3. The Design-Builder shall not use auger cast piles, screw piles, timber piles, or buoyant foundations.
4. The Design-Builder shall evaluate the effects of ground movement around, or movement of, existing foundations due to proposed structures and consider downdrag loads on deep foundations, where applicable.
5. Seismic design of foundations shall be in accordance with AREMA and Section 3.10 of the NYSDOT LRFD Specifications, considering the effects of inertial loading from the superstructure and kinematic effects due to loading from the soil (soil-structure interaction).

6. The Design-Builder shall calculate settlements for the different founding conditions along the bridges. Settlements likely to occur during construction shall be calculated separately from long term settlements. The effects of settlements, differential settlements, and down-drag shall be fully accounted for in the design and construction.

G. Construction Requirements:

1. The Design-Builder is prohibited from running equipment that does not operate on rubber tires (milling machines, rollers, etc.) across bridge decks unless proper precautions (mats, etc.) are provided to prevent damage to the deck.

3.5.4.2.2 Requirements for Roadway Bridges

In addition to the requirements outlined above for all bridges, the following requirements shall apply to roadway bridges:

A. Structure Type:

1. Fracture-critical members are not permitted.

B. Geometric Requirements:

1. A minimum 1'-0" gap shall be provided between roadway bridges and adjacent railroad bridges.
2. Barriers shall be detailed to not allow salt splash to impact any portion of adjacent railroad structures or stations.

C. Analysis Requirements:

1. The limit states described in NYSDOT, LRFD Bridge Design Specifications shall be investigated for the design and analysis of bridge components. At a minimum,permanent deformations under overloads, live load deflections, and fatigue characteristics under service loadings shall be investigated. The Design-Builder shall also complete constructability checks in accordance with AASHTO.
2. The Design-Builder shall perform Load Ratings based on NYSDOT EI 05-034. The minimum LRFR inventory load rating shall be 1.2. A rating shall be provided for Load Factor Design (LFD) in addition to the rating based on the method of design - Load and Resistance Factored Rating (LRFR).

D. Material Requirements:

1. The superstructure may be constructed using concrete or structural steel.
2. All structural steel shall be either conventionally metalized or galvanized.

E. Loading Requirements:

1. [redacted]

F. Site Specific Requirements:

1. 2nd Street over Covert Avenue.
    i. In accordance with the Directive Drawings.
2. 3rd Street over Covert Avenue.

i. In accordance with the Directive Drawings.

3. Railroad Avenue over Urban Avenue.
    i. In accordance with the Directive Drawings.
4. Front Street over Willis Avenue.
    i. In accordance with the Directive Drawings.

3.5.4.2.3 Requirements for Bridges that Support LIRR Loading

In addition to the requirements outlined above for all bridges, the following requirements shall apply to all structures that support LIRR loading. The Design-Builder shall design new bridge structure(s), including but not limited to the following: primary and secondary structural elements, reinforced concrete deck, deck joints, sidewalk(s), curb(s), pier structure(s), pier foundation(s), abutment structures, abutment foundations, retaining structures, bridge railings, bearings and drainage systems shall meet the following requirements:

A. Structure Types:
    1. Bridge replacements shall be steel ballasted-deck girder bridge structures or steel ballasted deck through girder bridge structures unless noted otherwise in the site specific requirements, or as set out in provision 3.5.4.2.3.A.2.
    2. Concrete superstructures may be used for crossings less than 36’-0” as long as the Design-Builder can demonstrate the advantages of the proposed structure compared to the steel options noted above. Multi-span structures of this structure type shall not be permitted. The comparison shall demonstrate advantages in terms of economy, constructability, and general site improvements.

B. Trackway configuration:
    1. Direct fixation of trackway to bridges is not permitted, except the track over Herricks Road. All other bridges shall support track on ballast.

C. Geometric Requirements:
    1. Two (2) walkways (one on each side of bridge) shall be provided, unless noted otherwise. At undergrade crossings, a walkway shall not be provided when access can be gained from the roadway bridge.
    2. Walkway width shall be a minimum of [redacted]. Walkway supports shall be galvanized. Walkway shall have a minimum of [redacted] thick fiberglass grating. Walkway handrails shall either be galvanized or stainless steel.
    3. A minimum 1’-0” clear gap shall be provided between the LIRR Main Line over Willis Avenue bridge and the LIRR Oyster Bay Line and Hinck Way over Willis Avenue bridge.
    4. A minimum [redacted] of ballast is required between the bottom of tie and top of asphalt protection board.
    5. Top flanges of through plate girders shall have the ends rounded.

D. Loading Requirements:

1. For bridges that support LIRR loading, the design shall be conducted in accordance with the AREMA Manual for Railway Engineering and include Cooper [redacted], and [redacted] Freight Car loading.
2. Bridges shall be designed to account for the dead weight from a minimum of 30" ballast, concrete ties and [redacted] rail.
3. For the bridge carrying Oyster Bay Line and Hinck Way over Willis Avenue the Loading Requirements of Section 3.5.4.2.2 E shall be required in addition to the requirements of Section 3.5.4.2.3.

E. Analysis Requirements:

1. The limit states described in AREMA shall be used for the design and analysis of bridge components. Permanent deformations under overloads, live load deflections, and fatigue characteristics under service loadings shall be qualified under AREMA. The Design-Builder shall also complete constructability checks in accordance with AREMA.
2. For the bridge carrying Oyster Bay Line and Hinck Way over Willis Avenue the Analysis requirements of Section 3.5.4.2.2 C shall be required in addition to the requirements of Section 3.5.4.2.3.
3. Load ratings shall be performed for bridge superstructures and substructures, for both inventory and operating conditions, using all applicable train consists and work trains. The controlling load rating values shall be provided on the plans. Normal and maximum ratings for shear and bending for Cooper E80 loading and all LIRR consists shall be provided.

F. Material Requirements

1. Structural steel shall be ASTM A709 Grade [redacted], except Meadowbrook Parkway which shall match the existing bridge to remain.

G. Component Requirements:

1. Deck Waterproofing:
   i. Deck surface shall receive a minimum of [redacted] acrylic-based, cold liquid-applied, two (2) coat elastomeric waterproofing membrane systems to protect against corrosion and shall meet the requirements of AREMA Chapter 8, Section 29.9.10.
   ii. Alternative waterproofing shall be either rubberized asphalt or butyl rubber type, and shall meet all of the requirements of AREMA Chapter 8, Section 29.9.9 or Section 29.9.5.
   iii. Waterproofing system shall be UV stabilized;
   iv. Waterproofing shall be protected with two layers of asphalt protection board with a minimum thickness of one-half (1/2) inch per board conforming to ASTM D517 and AREMA Chapter 8, Section 29.10.
   v. Protection board shall be topped with a geocomposite subdrainage system (CCW MiraDRAIN 9900 or equal).
2. Coating Requirements for ASTM A709 steel:

a. All exposed bearing elements/surface are required to be painted according to NYSDOT Specification 565-2.04 and 708-05.

b. The exterior face of fascia girders shall be painted. At the discretion of LIRR this requirement may be eliminated during the Review process.

3. Coating Requirements for Meadowbrook Parkway:

i. Paint shall match appearance of adjacent existing bridges and shall receive a three (3) coat shop applied structural steel paint system. The three (3) coat system shall consist of the following components:

a. Epoxy Primer Coat.

b. Epoxy Intermediate Coat.

c. Polyurethane Top Coat.

4. Drainage

i. Bridges shall have a minimum of two (2) longitudinal perforated drain pipes. Through girder deck plate bridges shall have a minimum of one (1) drainage pipe per track.

ii. Bridge drainage pipe shall be [redacted] diameter half round perforated steel on top of the waterproofing membrane.

iii. Drainage pipe shall be ASTM A572 and galvanized in accordance with the requirements of NYS Standard Specifications Material Section 719-01, galvanized coatings and repair methods – Type 1.

iv. Decks shall be sloped to drain.

v. For ASTM A709 bridges drip bars shall be installed at each end of girders per NYSDOT BD-SG15E, except as modified by the following. Distance to drip bar shall be 3” beyond the proposed curb line rather than 6’-0” to the centerline of bearings.

H. Approach Requirements:

1. Bridges with new or replaced structures / superstructures shall have new approach slabs at each abutment for each track. The approach slabs shall be a minimum of [redacted] thick, reinforced with galvanized rebar.

3.5.4.2.4 Requirements for Undergrade Crossings

In addition to the requirements outlined above for all bridges, roadway bridges, and bridges that support LIRR loading, the following requirements shall apply to undergrade crossings:

A. Geometric Requirements:

1. The new structure(s) shall be designed and constructed to achieve the following requirements as detailed on the directive plans:

i. Minimum bridge width.

ii. Minimum bridge length.

2. The new structure(s) shall be designed and constructed to achieve a minimum vertical clearance of 14 ft.

B. Lighting Requirements:

1. The Design-Builder shall comply with the lighting requirements set out in TP3.7 LIGHTING, TRAFFIC SIGNALS AND ITS and Contract Documents.

C. Site Specific Requirements

1. Covert Avenue
   i. In accordance with the Directive Drawings.
2. New Hyde Park Road
   i. In accordance with the Directive Drawings.
3. Willis Avenue
   i. In accordance with the Directive Drawings.
   ii. The Design-Builder shall perform an engineering analysis per NFPA 502 clause 4.3.1 to establish the overall life safety approach and specific criteria for the structure and systems, for the projected traffic using the underpass and the overall enclosed length of the underpass. This shall include, as a minimum, provisions for structural fire protection and a traffic control system. The results of the engineering analysis, the proposed life safety approach and the proposed criteria shall be submitted.
4. School Street
   i. In accordance with the Directive Drawings.
5. Urban Avenue
   i. In accordance with the Directive Drawings.

D. Analysis Requirements

1. Abutments shall be designed to be stable for soil and surcharge loads, independent of the presence of the bridge deck to allow for future maintenance, removal or replacement of the deck.

3.5.4.2.5 Requirements at Existing Railroad Bridges

In addition to the requirements outlined above for all bridges, and bridges that support LIRR loading, the following requirements shall apply to existing railroad bridges:

A. Geometric Requirements:

1. The Design-Builder shall provide or modify existing structures in order to support the proposed horizontal track alignment within the existing Railroad ROW.

2. The new structures shall be designed and constructed to achieve the requirements outlined in the site specific requirements outlined in this Section.

3. The Design-Builder shall not re-profile roadways underneath in order to achieve desired clearances.

B. Component Requirements:

i. Maintenance access to the tracks shall be provided on one quadrant of the structure via steps that meet the following requirements:

a. OSHA requirements.

b. Open grate galvanized steel or fiberglass.

c. Gate access in security fence.

d. Landings shall be located outside of RWP zone.

C. Site Specific Requirements:

1. Floral Park Viaduct:

i. Existing structures consist of two separate viaducts; one for the Main Line and Hempstead Line. The Design-Builder shall modify the existing Hempstead Line structure while maintaining or increasing the existing vertical clearance of 15'-4" over parking area. New superstructure and substructures shall provide a similar appearance as the existing structure to remain. Concept drawings shall be submitted to the Railroad for review prior to the development of the Conceptual Design Report. This viaduct does not require seismic analysis and retrofit.

2. South Tyson Avenue – Hempstead Branch:

i. Existing structure consists of two-track ballasted concrete deck through-girders with a shared middle girder. The Design-Builder shall reconfigure existing structure or provide new structure while maintaining or increasing the existing vertical clearance of [redacted] over South Tyson Avenue. The requirement of a [redacted] gap between primary members is not applicable to this location if separate structures are provided.

ii. If it is impracticable to meet all the requirements of TP3.5 STRUCTURES at this location and to maintain a [redacted]" vertical clearance from the roadway, then the minimum thickness of ballast measured from the bottom of tie to the top of the asphalt protection board may be reduced to an absolute minimum of [redacted]".

3. Plainfield Avenue:

i. Existing structure consists of a two-track ballasted concrete deck through-girders with a shared middle girder. The Design-Builder shall provide a separate single track bridge to the South of the existing structure. New structure shall increase the existing vertical clearance of [redacted] to at least [redacted] over Plainfield Avenue.

4. Denton Avenue:

i. Existing structure consists of four stringers supported by masonry abutments. Timber ties support the trackway directly on the stringers. The Design-Builder shall provide a new structure in order to increase the vertical clearance of [redacted] to at least [redacted] over Denton Avenue and provide for the required horizontal track alignment. Existing masonry abutments and

existing roadway width on Denton Avenue are to remain. Any masonry abutment modifications or new abutments shall be of the same material, size, construction and appearance as the existing abutments.

5. Nassau Boulevard:

    i. Existing structure consists of ballasted concrete deck through-girders with separate girders for each track. The Design-Builder shall provide a new superstructure in order to support the existing horizontal track alignment and a new superstructure and substructure to support the new third track. New structure shall increase the existing vertical clearance from [redacted] to at least [redacted] over Nassau Boulevard.

6. Glen Cove Road

    i. Existing structure consists of a three through girder, two-track ballasted superstructure supported on concrete abutments. The Design-Builder shall provide a new structure which maintains or increases the existing vertical clearance of [redacted] over Glen Cove Road and provide for the required horizontal track alignment.

7. Meadowbrook Parkway:

    i. Existing structure consists of a two span two-track ballasted concrete deck supported on multi-girders. The Design-Builder shall provide a new structure north of the existing structure. The new structure shall maintain or increase the existing vertical clearance of [redacted] over Meadowbrook Parkway. The new structure shall provide a similar appearance, girder depth and the same structure type as the existing structure to remain. A walkway is only required on the North side of this structure.

8. Cherry Lane:

    i. Existing structure consists of two-track ballasted concrete deck on through-girders with a shared middle girder. The Design-Builder shall provide a new structure in order to support the proposed horizontal track alignment within the existing Railroad ROW. The new structure shall increase the existing vertical clearance of [redacted] to at least [redacted] over Cherry Lane. The existing sight distance from Atlantic Avenue to Cherry Lane shall be improved to the greatest extent possible. Refer to TP3.6 CIVIL, HIGHWAYS, AND PARKING for requirements related to sight distance.

9. Hicksville Viaduct:

    i. The Design-Builder shall remove the existing concrete walls around the opening and roof structure previously installed to cover an opening in the viaduct left by the abandoned south east platform stair (approximately [redacted]). The closure deck shall be minimum [redacted] thick and shall be designed for a minimum live load of [redacted]. Waterproofing on top of the deck shall be included as part of this work. This viaduct shall not require seismic analysis and retrofit.

3.5.4.3 Retaining Walls

A. The Design-Builder shall provide retaining walls within the existing ROW in locations where the Project Corridor is either elevated or depressed compared to the surrounding topography and fill and cut slopes do not meet the following criteria:

B. The Design-Builder shall evaluate the stability of existing slopes impacted by the Project, new fill and cut slopes (permanent and temporary) within or affected by the Project, and ensure for the stability of these slopes. Impacted by shall mean any condition which reduce the factor of safety of an existing slope relative to the existing condition. The Design-Builder shall design new fill and cut slopes, and check existing slopes for the static case in accordance with FHWA NHI-05-123 - Soil Slope and Embankment Designs and for the seismic case in accordance with FHWA-NHI-11-032. The Design-Builder shall be responsible for ensuring that the following minimum requirements are satisfied:

   1. Toe of slope is within existing ROW.
   2. The minimum factors of safety from limit equilibrium analysis for static load conditions for permanent slopes shall be [redacted] for non-critical slopes and [redacted] for critical slopes (at bridge abutments, wingwalls and existing structures).
   3. The minimum factor of safety for seismic load cases shall be [redacted] for non-critical slopes and [redacted] for critical slopes and the Design-Builder shall be responsible for establishing the acceptable deformations the slopes can accommodate for the design seismic events.
   4. For non-permanent slopes, the minimum safety factor shall be [redacted] under static load conditions.

C. TABLE 3.5.1 outlines anticipated retaining wall locations, cut or fill, approximate length, approximate average height, approximate maximum wall height. Walls in TABLE 3.5.1 with an average height over 6 feet shall be built.

TABLE 3.5.1 – Retaining Walls

[redacted]

* Height of wall is measured from top of subgrade to existing ground for walls in cut and from existing ground to top of ballast for walls in fill. The height of wall does not include sound attenuation barrier.

3.5.4.4 Retaining Wall Requirements

The Design-Builder shall design and construct retaining walls in accordance with the following requirements**:**

A. General Requirements:

1. Retaining wall surfaces shall have architecturally treated concrete that meets the requirements outlined in TP3.11 LANDSCAPING AND AESTHETICS.
2. New retaining walls shall be designed and detailed as separate structures when adjacent to existing elements to remain.

B. Type Allowed:

1. When supporting track, gravity retaining walls are required when there is enough room to construct them.
2. When supporting adjacent property, cantilevered retaining walls are permitted when there is enough room to construct them.
3. Permanent tiebacks underneath railroad subgrade are not acceptable.
4. Gabion and crib walls are not acceptable.
5. Bin type walls are acceptable.

C. Geometry Requirements:

1. Retaining walls shall be located within the ROW.
2. Retaining walls shall be located as close to the ROW as possible. Where feasible, the front face of the wall shall be set back [redacted] from the ROW for maintenance access, unless noted otherwise.

3. The front face of the retaining wall along Atlantic Avenue ([redacted] shall be set back [redacted]" from the ROW.
4. Retaining wall layouts and details shall avoid existing utilities as much as possible. In the event utilities cannot be avoided or relocated, utility protection measures shall be part of the design.

D. Loading Requirements

1. All new retaining walls supporting track shall be designed for Cooper [redacted] loading per track.
2. Earth retention structures that retain roadway loads and are not subjected to LIRR loading shall be designed in accordance with AASHTO, LRFD Bridge Design Specifications, as applicable.
3. When proposed structures are within influence zones of property owned by agencies other than the Railroad, including buildings, the Design-Builder shall adhere to the property owner's requirements for adjacent work. The Design-Builder shall coordinate with the owners and their representative when designing and constructing work that affects their property.

E. Material Requirements

1. Walls shall not have any exposed steel surfaces once completed. This may be accomplished through the use of H-Piles with precast panels or composite concrete and sheet pile/soldier pile walls.
2. Precast concrete H-Piles shall have galvanized reinforcement and concrete lagging panels shall be reinforced with epoxy coated reinforcement.
3. For composite concrete and sheet pile/soldier pile walls, the steel sheeting shall be ASTM A572 Grade 50 and soldier piles shall be ASTM A572 Grade 50 or A992. Design shall account for section loss due to corrosion by the addition of [redacted]" minimum sacrificial steel beyond design requirements. Design may also utilize corrosion resistant steel grades for sheeting (ASTM A588) and soldier piles (ASTM A709 Grade [redacted]). Concrete shall be reinforced with epoxy coated reinforcement.

F. Analysis Requirements

1. Retaining walls shall be designed for a minimum 75 year life cycle by providing the following:
    i. Develop corrosion protection plan that includes additional cover for mild reinforcement, low permeability concrete mixes, concrete penetrating sealers.
    ii. Develop service life plan for reinforced concrete. Develop a numerical solution for the long term behavior using software.
2. Retaining walls that are railroad-owned or which retain railroad tracks shall be designed in accordance with criteria prescribed in AREMA Chapter 8, Part 5, as supplemented by criteria of the Railroad.
3. Retaining walls that retain building loads and are not subjected to LIRR loading or traffic loading shall be designed in accordance with ICC's IBC or International Residential Code (IRC), as applicable.

4. The Design-Builder shall provide retaining wall designs to address internal, external, and global (overall) stability and settlements (total and differential) of the walls in accordance with the AASHTO LRFD Bridge Design Specifications.
5. All retaining walls supporting bridge approaches shall be designed for seismic events.
6. The Design-Builder shall assess settlement induced by fill placements, including immediate settlement in granular soils, and both immediate and consolidation (time-dependent) settlements in cohesive soils in accordance with AASHTO LRFD Specifications.
7. Underground structures shall be modeled and shall take into account the stiffness of the surrounding material.

G. Component Requirements

1. Drainage
    i. Drainage shall be handled using ditches wherever possible. See TP3.10 DRAINAGE for additional requirements.
    ii. See NYSDOT Bridge Manual for weephole spacing requirements.
2. Security Fence
    i. All retaining walls along ROW with an exposed height of less than four feet shall have an [redacted] High Security Fence on top of the wall when sound attenuation barriers are not an extension of the retaining wall, unless noted otherwise.
    ii. All retaining walls along ROW with an exposed height greater than four feet shall have a [redacted] High Security Fence on top of the wall when sound attenuation barriers are not on extension of the retaining wall.
    iii. Retaining walls at grade crossing shall have a [redacted] fence on top of the wall. The Design-Builder shall submit the design to LIRR for Approval.
3. Protective Coatings
    i. See General Requirements for all Bridges.

H. Construction Requirements

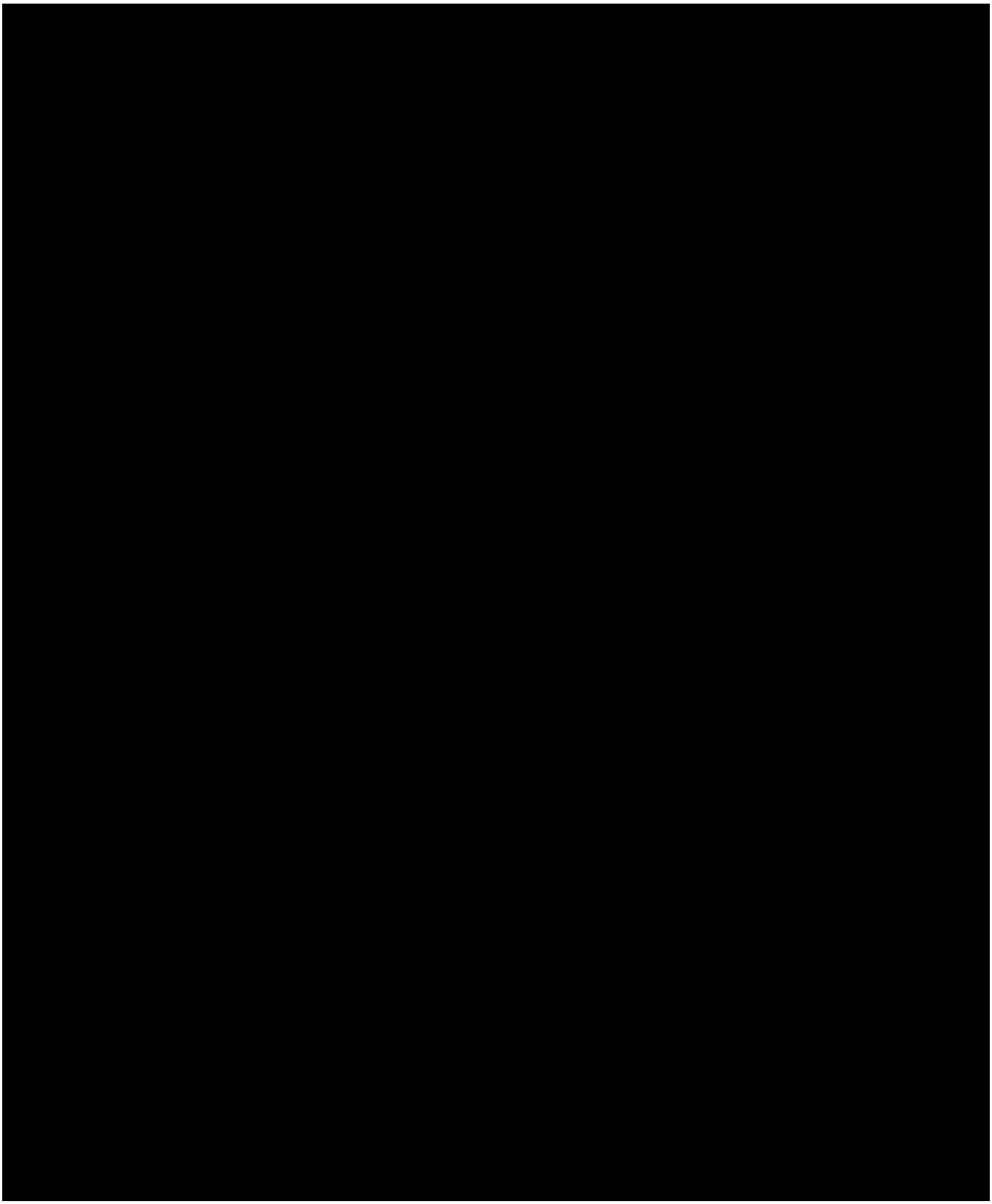
1. The Design-Builder is fully responsible for monitoring and maintaining retaining wall position and plumbness throughout permanent retaining wall installation, excavation, and backfilling operations adjacent to the wall, and for monitoring as frequently as necessary during construction operations to maintain wall position and plumbness.

3.5.4.5 Sound Attenuation Barriers

The Design-Builder shall provide sound attenuation barriers within the existing Right-of-Way in locations outlined in TABLE 3.5.2.

TABLE 3.5.2– Location of Required Sound Attenuation Barriers

Location	Track Side	From	To	Approximate Length



The Design-Builder shall design and construct sound attenuation barriers in accordance with the following requirements:

A. General

1. Sound attenuation barrier surfaces shall have architecturally treated concrete that meets the requirements outlined in TP3.11 LANDSCAPING AND AESTHETICS.
2. The top of barriers shall be sloped as required to avoid sudden transitions of wall height, unless noted otherwise.

B. Type allowed

1. Sound attenuation barriers shall be an extension of retaining walls at locations where retaining walls are needed.
2. Sound attenuation barriers may be stand-alone structures at locations where new retaining walls are not needed.
3. Sound attenuation barriers may be extensions of existing retaining walls provided the existing retaining walls meet the requirements of 3.5.4.1 in the proposed condition.
4. Sound attenuation barriers surfaces shall have architecturally treated concrete that meets the requirements outlined in TP3.11 LANDSCAPING AND AESTHETICS.

C. Geometry requirements

1. Top of sound attenuation barriers in fill sections shall be at least [redacted] above the lower proposed ground line adjacent to the barrier or [redacted] above top of rail, whichever is greater.
2. Top of sound attenuation barriers in cut sections shall be at least [redacted] above the higher proposed ground line adjacent to the barrier, unless noted otherwise.
3. Sound attenuation barriers shall be located as close as possible to the ROW, unless noted otherwise. Where feasible, the front face of the wall shall be set back [redacted] from the ROW for maintenance access.
4. Sound attenuation barriers shall provide access to railroad ROW for maintenance and to allow access and egress in case of an emergency. Access shall be provided at all railroad equipment locations, at all streets that dead end at the Right-of-Way and at least every [redacted]. Wherever possible this shall be accomplished via staggered and overlapped barriers. [redacted] foot wide high security fences / gates shall be provided between staggered barriers. When staggering is not possible due to site constraints, [redacted] feet wide by [redacted] feet tall steel doorways shall be provided. The color of doorway shall be similar to that of the sound attenuation barrier.
5. The overlap length for staggered sound barriers shall be a minimum of four times the opening width.
6. Sound attenuation barriers shall provide enough horizontal clearance for drainage, utilities, and maintenance access.
7. Sound attenuation barrier layouts and details shall avoid existing utilities as much as possible. In the event utilities cannot be avoided, utilities shall be relocated or protection measures for the utilities shall be added as part of the design.

8. Where Hi-Rail vehicle access and a stand-alone sound attenuation barrier are required, a solid sliding or rolling gate shall be provided which maintains the continuity and height of the sound attenuation barrier. Gate color shall be similar to that of the sound attenuation barrier.

D. Site Specific Requirements

Lateral clearances described below may be adjusted [redacted] as needed to accommodate the final design details.

1. Floral Park/New Hyde Park – North - Sta. [redacted]
    i. For this segment of the sound attenuation barrier, the track side face of the barrier shall be located 13’ from the centerline of the northernmost track.
2. Floral Park/New Hyde Park – North - Sta. [redacted]
    i. These barriers shall either be an extension of or located behind the existing retaining wall that is offset from LIRR ROW.
3. Floral Park/New Hyde Park – South – Sta. [redacted]
    i. The top of this barrier segment shall transition with a continuous slope from the height required per 3.5.4.5C at Station [redacted] down to [redacted]” above top of rail at the start of Covert Avenue Bridge. Beyond that point it shall remain at [redacted] above top of rail.
    ii. Along this segment a decorative fence similar in height and appearance to the existing fence shall be provided on top of the wall. Along the transition height, the top of the decorative fence shall remain level until it terminates into the sound attenuation barrier.
4. Floral Park/New Hyde Park – North – Sta. [redacted]
    i. The top of this barrier segment shall be [redacted]” above top of rail with a decorative fence similar in height and appearance to the existing fence.
5. Garden City – South – [redacted]
    i. The track side face of this barrier shall be located [redacted] from the centerline of the southernmost track.
6. Garden City/Garden City Park – South – [redacted]
    i. The track side face of this barrier shall be located [redacted] from the centerline of the southernmost track.
7. Carle Place – South - Sta. [redacted]
    i. The track side face of this barrier shall be located [redacted] from the centerline of the southernmost track.

E. Loading requirements

1. See TP3.5.4.3 Retaining Walls.

F. Material requirements

1. See TP3.5.4.3 Retaining Walls.
2. Timber shall not be permitted for standalone sound attenuation barriers.

G. Analysis requirements.

1. If the sound attenuation barrier is structure-mounted, the service load reactions obtained at the base of the sound attenuation barrier shall be factored in accordance with AASHTO LRFD load combinations and shall be applied to the structure.

H. Component requirements.

1. Protective Coating.

i. See TP3.5.4.3 Retaining Walls.

3.5.4.6 Pedestrian Bridges

Pedestrian Bridges shall be connected to Stations and the AHJ is LIRR.

3.5.4.6.1 Pedestrian Bridges

A. General Requirements for all Pedestrian Bridges:

1. General requirements:

i. Pedestrian bridges shall be fully enclosed and weathertight.

ii. Pedestrian bridges shall be fire and vandal resistant.

iii. Pedestrian bridges shall include support / utility spaces, and stairs.

iv. The Design-Builder shall provide elevators at both ends of the bridge unless noted otherwise. See TP3.13 STATION MEP AND VERTICAL TRANSPORTATION for elevator requirements.

v. Appearance shall be as required in TP3.12 STATIONS AND ARCHITECTURE.

2. Geometry requirements:

i. Bridges over the railroad shall be designed and constructed to achieve a minimum vertical clearance of [redacted] over top of rail.

ii. Clear walkway width shall be [redacted] minimum.

iii. Clear height shall be [redacted]" minimum.

iv. Location shall be as required in TP3.12 STATIONS AND ARCHITECTURE.

3. Loading requirements:

i. Live Load for Pedestrian Bridges as defined in AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges.

4. Material requirements:

i. The superstructure may be constructed of concrete or structural steel. Structural steel, if used, shall be either conventionally metalized or galvanized.

5. Analysis requirements:

i. See General Requirements for all Bridges.

6. Component requirements:

i. Protective Coatings.

1. See General Requirements for all Bridges.

B. Summary of locations:

1. Mineola Station
2. Main Street.
3. Willis Avenue.
4. Carle Place Station.
5. Westbury Station #1.
6. Westbury Station #2.

3.5.4.7 Existing Pedestrian Underpasses

A. Existing pedestrian tunnel structures at Westbury Station and Floral Park Recreational Center shall be extended. The extensions shall be integral with the existing tunnels and be similar in appearance to the existing structure to remain. Interface between extension and existing tunnel shall be waterproof. The joints between elements shall not exhibit visible cracks and shall not leak after extension has been completed.

B. Lighting in the pedestrian tunnel structures shall be in accordance with LIRR Station Design Guidelines, Chapter 8.

3.5.4.8 Temporary Structures

A. All temporary works shall be in accordance with AREMA and AASHTO Guide Design Specifications for Bridge Temporary Works.

B. Temporary traffic barriers shall meet, as a minimum, the testing requirements of TL 2 and permanent traffic barriers shall meet, as a minimum, the testing requirements of TL 4.

3.5.5 Structural Submittals

A. The Conceptual Design Submittal shall include, among other things:

1. Conceptual design report.
2. Proposed structure types and components for approval.
3. Required coordination with respective AHJs other than LIRR and NYSDOT.

B. The Intermediate Design Submittal shall include, among other things:

1. Intermediate structures design submittal.
2. Concrete control plan.
3. Erection procedure report
4. Work plans.
5. Analysis/Calculations for existing structures to remain.

C. The Final Design Submittal shall include, among other things:

1. Inspection and maintenance manual.

2. Bridge loading rating.
3. Structures design submittal.
4. Bridge inventory forms.
5. Final structures computations report.

D. Released for Construction Documents.

3.5.5 Summary of Submittals

Item	Section	Submittal	Action
1	3.5.4.4	Corrosion Protection Plan	Review and Comment
2	3.5.5	Conceptual Design Submittal	Review and Comment
3	3.5.5	Conceptual Design Report	Review and Comment
4	3.5.5	Proposed Structure Types and Components	Review and Approval
5	3.5.5	Required Coordination with respective AHJs other than LIRR and NYSDOT	Review and Comment
6	3.5.5	Concrete Control Plan	Review and Approval
7	3.5.5	Erection Procedure Report	Review and Comment
8	3.5.5	Work Plans	Review and Comment
9	3.5.5	Analysis/Calculations for Existing Structures to Remain	Review and Comment
10	3.5.5	Intermediate Design Submittal	Review and Comment
11	3.5.5	Inspection and Maintenance Manual	Review and Comment
12	3.5.5	Bridge Load Rating	Review and Comment
13	3.5.5	Final Design Submittal	Review and Approval
14	3.5.5	Final Structures Computations Report	Information
15	3.5.5	Bridge Inventory Forms	Information
16	3.5.5	Release for Construction Documents	Review and Approval
17	3.5.5	Conformed Release for Construction Documents	Information
18	3.5.5	As-Built Drawings	Information

END

3.6 CIVIL, HIGHWAYS, AND PARKING

3.6.1 Section Includes

This section sets out design and construction requirements related to roadworks, parking on the street and in parking lots, and pavement striping and signage.

3.6.2 Codes and Standards

A. Project Work shall comply with all statutory requirements, and shall comply with the codes and standards identified in Appendix TPA3.1A CODES AND INDUSTRY STANDARDS and the codes and standards listed below.

1. AASHTO, A Policy on Geometric Design of Highways and Streets.
2. AASHTO, Roadside Design Guide.
3. AASHTO, Guide for the Development of Bicycle Facilities.
4. AASHTO, Guide for the Planning, Design, and Operation of Pedestrian Facilities.
5. AASHTO, Guide for Park-and-Ride Facilities.
6. AASHTO, Guide for Design of Pavement Structures.
7. ADA, ADA Standards for Accessible Design.
8. FHWA, Manual on Uniform Traffic Control Devices (MUTCD) and New York State Supplement for MUTCD.
9. NYSDOT Standard Sheets.
10. NYSDOT Standard Specifications.
11. NYSDOT Highway Design Manual.
12. NYSDOT Comprehensive Pavement Design Manual.

B. The Design-Builder shall use the most current version of each listed Code or Standard.

C. In the even that there is conflicting guidance when the Design-Builder is referencing the applicable standards, design codes and manuals the NYSDOT manuals should be followed.

D. The Design-Builder shall ensure that all parking facilities are ADA compliant.

E. The Design-Builder shall design all sign panels and pavement striping to comply with the MUTCD and NYSDOT Standard Sheets.

3.6.3 Related Documents

A. Directive Drawings.

3.6.4 Design Requirements

3.6.4.1 Roadway

A. The Design-Builder shall be responsible for the design, construction and reconstruction of the permanent roadway(s) to be constructed within the Project Limits, and any other roads damaged by construction operations, or necessary for permanent operations, all in accordance with the design requirements stated in the Contract Documents.

B. The reconstruction of Covert Avenue, Main Street, Willis Avenue, New Hyde Park Road, South 12th Street, Urban Avenue and School street shall follow the design criteria specified below:

C. Design Speed:

1. [redacted] for underpass.
2. [redacted] for surface streets.

D. Lane Widths:

1. [redacted] minimum for travel lanes and turn lanes.
2. [redacted] minimum for parking lanes.

E. Shoulder Widths:

1. [redacted] minimum offset for two-way operation to allow for emergency vehicles and snow plans.
2. [redacted] minimum offset for one-way underpasses to allow for a [redacted] clear width for snow plows.

F. Sidewalk:

1. [redacted] no streetscaping or pedestrian facility appurtenances (as described in NYSDOT HDM Section 18.6.8).
2. [redacted] with streetscaping (trees, planters, signs, parking meters, hydrants, benches).

G. Grade:

1. [redacted] max for Collectors and Streets.
2. [redacted] max for Minor Arterials.
3. [redacted] proposed for underpasses to minimize impacts.

H. Stopping Sight Distance:

1. [redacted] minimum vertical stopping sight distance ([redacted] mph). [redacted] mph) proposed for underpasses to minimize impacts.
2. [redacted] minimum intersection and driveway sight distance ([redacted] mph).

3.6.4.2 Roadway Typical Section

A. Travel lanes, shoulders, bicycle lanes, parking lanes, and other typical section elements shall be provided in accordance with the following:

1. Requirements of the NYSDOT HDM.
2. Requirements shown in this Section.
3. As required to meet the level of service requirements.

B. The width of travel lanes, shoulders, bicycle lanes, and parking lanes shall meet the standards of the NYSDOT HDM or AASHTO.

C. Curbs along the streets shall be VF150 vertical faced concrete curb.

3.6.4.3 Roadway Superelevation and Cross Slopes

A. Vehicular travel lane normal cross slopes and superelevation shall be provided in accordance with the requirements of the NYSDOT HDM.

B. Vehicular travel lanes cross slopes shall:

1. Meet the requirements of NYSDOT HDM when feasible.
2. Meet a minimum of [redacted] cross slope.
3. Shall not exceed the maximum [redacted] superelevation.

C. The Design-Builder shall correct deficient cross slopes or superelevation on existing roadways being reconstructed. The maximum rollover shall be [redacted] between travel lanes and [redacted] at edge of traveled way.

3.6.4.4 Pavement Design and Construction

A. All asphalt and concrete pavement materials and construction methods shall meet the requirements of NYSDOT Standard Specifications.

B. Where installed, the Design-Builder shall provide a pavement system that meets the designated aggregate specifications; with the exception that limestone and/or dolomite, regardless of the acid insoluble residue content, shall not be allowed.

C. The Design-Builder shall design, furnish all materials, construct and undertake all Work necessary to provide all pavements needed for the following elements as shown in the Directive Drawings:

1. Milled Surface Overlays.

a. The Design-Builder shall mill and resurface roadways as shown in the Directive Drawings. The Design-Builder shall also mill and resurface additional pavement areas as necessary to provide for smooth transition between the existing and fully reconstructed pavement surfaces in accordance with the applicable Standard Sheets. The Design-Builder shall mill a minimum of [redacted] beyond the limits of any fully reconstructed pavement sections.

b. Milling shall involve the removal of the top [redacted] of the existing pavement surface as indicated in the Directive Drawings. Once milling operations have been completed, the Design-Builder shall inspect the underlying pavement and make repairs as necessary. Repair procedures for the following depth ranges [redacted] and [redacted] to full depth shall be designed and submitted to the Railroad for Review. Pavement repairs shall not be required for pavement defects less than [redacted] in depth. The Design-Builder shall assume that [redacted] of the total pavement area to be milled will require additional pavement repairs, with an average repair depth of [redacted]. Prior to beginning pavement repairs, the Design-Builder shall review the locations and depths of all pavement repairs with the Railroad.

c. All pavement surfaces which have been milled shall receive new asphalt within 14 Calendar Days. The new asphalt course shall meet the requirements of Top Course listed in this Section. Prior to the placement of asphalt, the Design-Builder shall place a tack coat complying with the

requirements of Section 407 of the NYSDOT Standard Specifications. Should it be necessary to reset any valves, inlets, manholes or other hardware, the Design-Builder shall submit a plan for this work to the Railroad for Review.

2. Full Depth Reconstruction
    a. Full depth reconstructed roadway sections shall meet the following pavement requirement:
        i. Top course shall be [redacted] or finer aggregate mix.
        ii. Prior to temporary opening of the undergrade crossings, the Design-Builder shall provide temporary pavement transition of [redacted] inch vertical per 1 foot horizontal where drainage inlets, manholes and other utility features within the roadway are set higher than the Binder Course surface grade. All temporary pavement transition shall be removed prior to placement of Top Course pavement.
3. Temporary Pavements
    a. The Design-Builder shall design, construct and maintain all temporary pavements within the Project Limits. All temporary pavements shall be removed and the area restored to the pre-construction condition prior to completion of the Project.
4. Isolated resurfaced/repaired or damaged pavement locations.
5. Surface Parking Lot Pavement
    a. Top course shall have a minimum thickness of [redacted].
    b. Binder Course shall have a minimum thickness of [redacted]
    c. Base course shall have a minimum thickness of [redacted]
    d. Subbase course shall have a minimum thickness of [redacted].

3.6.4.5 Barrier Systems and Impact Attenuators

A. The Design-Builder shall remove and dispose of all existing barrier systems within the Project limits, and replace with new barrier systems to current NYSDOT Standards.

B. The limits of work for new roadside barrier and new median barrier shall be the lesser of the following:
    1. The point where the barrier is no longer warranted.
    2. A point where the proposed barrier can be transitioned to an existing barrier system which conforms to current standards.

C. All existing barrier systems that are removed shall become property of the Design-Builder.

3.6.4.6 Clear zone

The Design–Builder shall document clear zone on the final record plans. The clear zone shall comply with NYSDOT HDM Section 10.2.1. See provision TP3.6.4.1 for stopping sight distance requirements. If the stopping sight distance requirements set forth by the NYSDOT HDM cannot

be met, the Design-Builder shall submit a justification of nonstandard features form per provisions in TP3.6.5.

3.6.4.7 Signage and Marking Plans

A. The Design-Builder shall provide all permanent fixed signing, permanent pavement markings and signal work required for the Project.

B. The Design-Builder shall develop a signing and pavement marking plan for the Project that shall:

1. Provide for all components as called for in this Section TP3.6 CIVIL, HIGHWAYS, AND PARKING.

2. Locate all signs in accordance with the MUTCD and the NYS supplement.

3. Provide signing plans that include the removal of existing signs and proposal of new sings. All overhead sign panels shall be high reflective signs with Type IX sheeting such as to not warrant sign lighting.

4. Provide pavement markings plans for new travel lanes and parking facilities.

5. Provide new pavement marking plans and signage plans for bicycle and pedestrian facilities within the Project Limits, where applicable.

3.6.4.8 On Street Parking

All on street parking dedicated to LIRR customers adjacent to the stations and parking lots impacted by the station upgrades shall be reconfigured to allow for the maximum allowable parking spaces. All reconfigured on-street parking and parking lot spaces shall meet ADA and NYSDOT requirements and shall include new thermoplastic pavement markings. The Design-Builder shall provide temporary parking at locations in close proximity to the station to substitute any parking impacted during construction. Total number of spaces of reconfigured and temporary parking shall, at a minimum, match the number of the existing spaces.

3.6.4.9 Cut and Fill

The Design-Builder shall manage the excavation, relocation, removal and/or re-use, and temporary stockpiling of all earthwork materials. The Design-Builder shall place slope protection to protect the grade from erosion and sloughing from runoff and groundwater seepage.

3.6.4.10 Roadway Design Submittal

The Design-Builder shall submit preliminary and final roadway plans for review and comment, including, at a minimum, the following elements:

A. Geometry control and data sheets for roadway and separate pedestrian paths.

B. Roadway plan sheets.

C. Vertical alignment sheets for streets and roadways.

D. Intersection detail sheets.

E. Typical section sheets including roadway and pedestrian elements.

F. Pavement detail sheets.

G. Superelevation data sheets.

H. Miscellaneous detail sheets to show non-standard details or additional details required.

I. Cross sections.

J. Design calculations for all proposed and temporary alignments.

K. Bus stop relocation plans.

L. Signage and Pavement Marking plan sheets.

3.6.5 Construction Requirements

3.6.5.1 Signs

A. The Design-Builder shall not reuse any existing NYSDOT sign materials as part of the permanent signing installation and shall be responsible for the disposal of all signing materials and structures that are removed from the Project. Standard signs owned by municipalities other than NYSDOT, and non-standard signs owned by private entities but placed within NYSDOT right-of-way, with the acceptance of the Railroad, shall be removed, stored and reinstalled as required.

B. The Design-Builder shall be responsible for the provision of all signs, posts, frames and other structural components required for the installation and support of the sign panels.

3.6.6 Requirements for Justification of Nonstandard Features

A nonstandard feature exists when the established design criteria outlined by the NYSDOT HDM is not met. All nonstandard features to be retained or created must be listed and justified by the Design-Builder and Approved by the Railroad in accordance with the NYSDOT HDM Chapter 2.

3.6.7 Summary of Submittals

Item	Section	Submittal	Action
1	3.6.3.9	Proposed Roadway Design Data	Review and Comment
2	3.6.3.9	Bus Stop Relocation Plans	Review and Comment
3	3.6.3.9	Roadway Plans – Preliminary	Review and Comment
4	3.6.3.9	Roadway Plans - Final	Review and Approval

END

3.7 LIGHTING, TRAFFIC SIGNALS, AND ITS

3.7.1 Section Includes

This section sets out design and construction scope related to: street and parking lot lighting; lighting on structures; traffic signals; and Intelligent Transportation Systems (ITS).

For security requirements, including issues relating to lighting levels, refer to TP2.10 SYSTEM SECURITY.

For lighting at stations, refer to TP 3.12 STATIONS AND ARCHITECTURE.

For lighting at parking structures, refer to TP3.14 PARKING STRUCTURES.

3.7.2 Codes and Standards

Project Work shall comply with all statutory requirements, and shall comply with the codes and standards identified in Appendix TPA3.1A CODES AND INDUSTRY STANDARDS and the codes and standards listed below:

3.7.2.1 Lighting Standards

A. ANSI/IES Approved Recommended Practice for Roadway Lighting, RP-8-00.
B. ANSI/IES Approved Recommended Practice for Roadway Sign Lighting, RP-19-01.
C. FAA Advisory Circular 70/7460-1K, Obstruction Marking and Lighting.
D. IES Recommended Lighting for Walkways and Class 1 Bikeways, DG-5-94.
E. NFPA 70 – National Electrical Code (NEC).
F. NYSDOT Policy on Highway Lighting.
G. NYSDOT Standard Sheets.
H. NYSDOT Standard Specifications.
I. USCG 33 CFR 118 – Bridge Lighting and Other Signals.

3.7.2.2 Lighting References

A. IES Guideline for the Application of General Illumination (“White”) Light-Emitting Diode (LED) Technologies G-2-10.
B. NFPA 70E Standard for Electrical Safety in the Workplace.
C. NFPA 780 Standard for the Installation of Lightning Protection Systems.

3.7.2.3 ITS Standards

NFPA:

A. 1101 NTCIP Simple Transportation Management Framework.
B. 1102 NTCIP Octet Encoding Rules (OER).
C. 1201 NTCIP Global Object (GO) Definitions.
D. 1203 NTCIP Object Definitions for Dynamic Message Signs.

E. NFPA 502 Recommended Practice on Fire Protection for Limited Access Highways, Tunnels, Bridges, Elevated Roadways and Air Right Structures.

NYCRR:

Part 56 of Title 12 of the Official Compilation of Codes, Rules; and Regulations of the State (12NYCRR, Part 56).

3.7.3 Related Documents (Not Used)

3.7.4 Design Requirements

3.7.4.1 General Lighting Requirements

A. Lighting on all roadways, sidewalks, parking structures, parking lots, and parking locations shall meet code requirements, security requirements, and requirements of the AHJs, and NYSDOT.

B. Lighting on all pedestrian walks, stairs, ramps, bridges, and waiting areas to meet code requirements, security requirements, and requirements of the AHJs and NYSDOT.

C. Lighting on Railroad bridges, structures, and ROW shall match existing.

D. Under bridge lighting to meet code requirements and requirements of the AHJs and NYSDOT

E. The Design-Builder shall be responsible for designing, furnishing and installing all components required for the implementation of the lighting system for the Project including new luminaires, controls, poles, mounting, wiring, conduits, and support hardware, as necessary for delivering a complete and functional lighting system.

F. Existing lighting impacted by the Project shall be replaced to meet the Project requirements.

G. Lighting System within the Project limits shall be fully maintained by the Design-Builder until acceptance of the Project Element that the lighting is associated with.

3.7.4.1.1 Power Supply Requirements

For reference, the lighting installation shall comply with the following:

A. Meet all requirements of NFPA 70 – National Electrical Code (NEC).

B. All outdoor electrical enclosures shall be type 316 stainless steel, rated NEMA 4X or a higher degree of protection; and

C. Meet all requirements of applicable IEEE and ANSI power engineering standards.

3.7.4.1.2 Removal of Existing Equipment

All disconnected luminaires, light poles, and associated equipment shall be removed and disposed of by the Design-Builder. All wiring, switches, panels, cabinets, enclosures, and other electrical equipment shall be removed and disposed of by the Design-Builder.

3.7.4.2 Permanent Lighting System

The Design-Builder shall be responsible for ensuring that the permanent lighting system meets the following requirements:

A. Provides illumination such that the road surface illumination meets or exceeds the uniformity and the illuminance and/or luminance criteria during darkness.

B. Utilizes energy efficient and long-life, low maintenance lighting technologies that are found on the NYSDOT's approved lists.

C. Can be fully and seamlessly integrated into the existing permanent lighting elements adjacent to the Project limits.

D. Utilizes a photo-control switch system that automatically activates lighting before dusk and deactivates the system past dawn.

E. Contains surge suppression devices for protection against damage by lightning strikes and complying with NFPA-780 and UL 96.

F. Provides fixtures that are water tight and intended for a marine/industrial environment; and

G. Utilizes lighting components that are readily available and not proprietary equipment.

H. Utilizes a new, or existing, locking cabinet containing manual and automatic switches and circuit breakers to control new lighting fixtures.

3.7.5 Construction Requirements

3.7.5.1 Permanent Lighting System

A. The Design-Builder shall use materials listed on the NYSDOT approved list of materials and consistent with the details shown on the NYSDOT's Standard Sheets.

B. The Design-Builder shall provide permanent lighting materials that satisfy the Project Requirements and applicable codes. In addition, the Design-Builder shall:

1. Ensure that all exposed raceways/conduits are made of PVC coated rigid galvanized steel (RGS). Short runs (maximum length per NEC) of liquid-tight flexible metal conduit may only be used to make a final connection between the main power feeder and a light pole or fixture.

2. Ensure that all outdoor electrical enclosures and attached parts (e.g. breather drain) shall be type 316 stainless steel, rated NEMA 4X or a higher degree of protection.

3. Ensure that any new electrical enclosures shall have a key lock.

4. Ensure all lighting shall include breakaway devices, unless protected by concrete barrier. Light poles shall feature a breakaway base, except where located behind bridge rails.

3.7.5.2 Temporary Lighting System

The Design-Builder shall ensure that the existing lighting levels within the Project limits are maintained at all times. A temporary lighting system shall be installed as necessary to meet this

requirement. The temporary system shall be energized either separately or though connection to the existing lighting system.

3.7.5.3 Traffic Signals

A. There are new signalized intersections within the limits of the Project that include traffic signals as well as pedestrian crossing signals, locations of which are listed below:

1. The intersection of New Hyde Park Road and Plaza Avenue.
2. The intersection of Willis Avenue and 1st Street.
3. The intersection of Willis Avenue and 3rd Street.
4. The intersection of School Street and Railroad Avenue.
5. The intersection of School Street and the [redacted] and [redacted] driveways.
6. The intersection of Urban Avenue and Broadway.
7. The intersection of Urban Avenue and the new dead end street located between [redacted] and [redacted].
8. The intersection of West Barclay Street and Marion Place.
9. The intersection of West John Street and Marion Place.

B. The Design-Builder shall replace the existing traffic and pedestrian crossing signals with the latest current standard of traffic signal pole and cable supports, and also the latest standard for the push button control systems with count-down timers at the pedestrian safety walks. Pedestrian pushbutton control systems shall be APS per TSMI 15-01.

C. At each intersection, the Design-Builder shall design and install new traffic signal infrastructure. The traffic signal infrastructure shall include installation of a new cabinet and controller, span poles and foundations, signal heads including backplates with retro-reflective tape in all directions, pedestrian signal poles, audible pedestrian signals and push buttons, cable and conduits, interconnect cable or fiber optic cable drop to adjacent signalized intersections, and loop detectors. Appropriate infrastructure (pullboxes, conduit, etc) shall be installed to accommodate the possible future installation of the traffic signals. The work shall include all equipment, hardware mountings, cabling, software modifications and labor necessary to install and integrate a fully operational signalized intersection.

D. New LED Pedestrian signal and Countdown Timer displays along with ADA compliant latching pushbuttons shall be installed at the intersection. Pedestrian pushbutton control systems shall be APS per TSMI 15-01. Unless otherwise directed by the Railroad, the Design-Builder shall maintain the existing signal phasing for the new system.

E. The Design-Builder will be responsible for maintaining the existing signal until the new signal is activated. The Design-Builder shall be responsible for maintaining new traffic signals until all final inspections are completed and all comments addressed.

F. Two weeks prior to beginning any construction work on traffic signals associated with the project, the Design-Builder shall notify the regional traffic signal section to perform an inspection of the existing traffic signal equipment. After the inspection, the Design-Builder shall submit to the Railroad a written notification of the date they will assume responsibility for traffic signal maintenance. No construction work shall proceed until traffic signal maintenance is assumed by the Design-Builder. The existing traffic signal shall be maintained by the Design-Builder under the requirements of Section 619 of the Standard Specifications, except for the controller, programming, and timing which shall be maintained by the NYSDOT.

G. Traffic signal activation shall be done by NYSDOT Traffic Signal personnel only. The Design-Builder shall notify the NYS traffic Signal Group two weeks prior to the requested date of activation.

H. The Design-Builder shall integrate the signals into the existing AHJs and/or NYSDOT ITS system.

3.7.5.4 Loop Detectors

A. The Design-Builder shall replace all existing loops at each signalized intersection and provide detection zones on all side streets. All loops shall have two sets of [redacted] loop spaced [redacted] apart installed at the stop bar, centered in the respective lane, with three turns wired in parallel. The Design-Builder shall splice the loop wire to a twisted pair lead cable, which shall in turn be wired to the cabinet. In addition shielded lead-in cable shall be run from the new cabinet to the pullbox by any service road point loop detector. A separate lead-in shall be run for each loop. These lead-in cables are to be terminated inside their respective controller cabinets.

3.7.5.5 Conduit/Cabling Requirements

A. The following cables shall be utilized during the installation of new signal heads, pedestrian/countdown timers, interconnect and pushbutton signs:

1. Pedestrian/Countdown Timer and pushbutton sign: furnish and install 5C#14 awg cable for each set display.

2. One way signal heads: furnish and install a minimum of [redacted].

3. Two way signal heads: furnish and install a minimum of [redacted] awg cable.

4. Three way signal heads: furnish and install a minimum of [redacted] awg cable.

B. The Design-Builder shall furnish and install fiber optic cable for any underground interconnect installation. A drop cable meeting the requirements of the NYSDOT's Special Specification 683.07250010 shall be connected to the cabinet. The interconnect shall be coordinated with ITS plans.

C. The Design-Builder shall furnish and install the following conduit as a minimum:

1. Detection loop conduits shall be [redacted] Flex between the first junction box and loop.
2. Conduits under roadway shall be [redacted] RGS.
3. Conduits between Span or Mast Arm poles and nearest junction box shall include a [redacted] and [redacted]
4. Conduits between Pedestrian poles and nearest junction box shall use a [redacted].
5. All other underground conduit installations shall be [redacted].

3.7.5.6 Signal Heads/Signal Poles

A. All signal faces to be installed as part of this Project shall be [redacted]. Mainline approaches require one through head for every through lane for multilane approaches. All traffic signal heads shall have [redacted] back plates with [redacted] yellow reflective tape.

B. All pedestrian signals shall be 16" LED and shall consist of combination "Walking Man"/"Hand" symbols with countdown timers. Pedestrian signal installations shall also include audible signals, countdown timers and ADA compliant pedestrian pushbuttons for all marked, signalized crosswalks. Pedestrian pushbutton control systems shall be APS per TSMI 15-01. Pedestrian countdown timers shall meet the requirements of NYSDOT Special Specification 680.81500010 – Pedestrian Count-Down Timer Module.

C. Span Pole Analysis shall be carried out using the latest version of the NYSDOT's Span Wire Analysis Program to determine the signal pole sizes and foundations needed. Span pole sizes identified by the Span Wire Analysis Program shall be increased by a minimum of [redacted] loading rounded up to the nearest [redacted] increment. Footing size shall be increased to accommodate the maximum loading of the pole.

3.7.5.7 Cabinet/Disconnect Switch

The Design-Builder shall install one state supplied microcomputer cabinet at each of the signalized intersections. The Design-Builder shall also install a disconnect generator transfer switch on the span pole to which the cabinet has been mounted, at a minimum of 8' above ground level. The cabinet and disconnect switch shall meet the requirements of Special Specifications 680.80324515 and 680.94997008, respectively.

3.7.5.8 Pullbox

Where a fiber optic interconnect exists, a [redacted] square fiber optic pullbox shall be installed adjacent to the cabinet. All other pullboxes required shall be standard [redacted] pullboxes. Pullboxes may be either reinforced concrete or reinforced concrete/bituminous fiber.

3.7.5.9 Power Supply

Power shall be supplied to the microcomputer cabinet from the nearest available utility pole. The power supply cable shall be a 2 conductor, 6awg cable conforming to the requirements of NYSDOT Special Specification 680.95020615 – Service Cable 2 Conductor, No. 06 Awg.

3.7.5.10 Fiber Optic Backbone

3.7.5.10.1 Fiber Optic Cable

A. The Fiber Optic cable drop cable installed from the ITS equipment to the fiber optic backbone shall meet or exceed the requirements of NYSDOT Specifications.

B. The Design-Builder shall also provide fiber optic cable connectors, splices, splice trays, splice cases, and breakout kits as necessary to perform the work.

3.7.5.10.2 Fiber Optic Pullboxes

A. Concrete Fiber Optic Pullboxes installed at the base of the traffic signal poles where the traffic signal control cabinets are located shall meet or exceed the requirements of NYSDOT Specifications.

B. Standard Traffic Signal Pullboxes to be installed between the concrete fiber optic pullboxes shall meet or exceed the requirements of NYSDOT Specifications.

3.7.5.11 Electrical Work

A. The Design-Builder shall provide all [redacted] power necessary for the construction and System installation and shall include the furnishing and installation of all labor and equipment. All power, video and data circuits entering or exiting the cabinets shall be furnished with surge lightning protection. The Design-Builder shall maintain the integrity of all circuits in service that may be affected by the work.

B. The Design-Builder shall furnish and install cabling and conduit between the controller cabinet and the ITS equipment cabinet, the ITS cabinet and the fiber optic pullbox, the fiber and communication manholes and the power source. It shall be the responsibility of the Design-Builder to verify that the cabling and its routing are sufficient for their needs.

3.7.5.12 Cabling Requirements

A. The minimum size cable used for power circuits and ground wires shall be #12 AWG. Alternate cable sizes that can be utilized for power and ground are #6AWG and #2AWG. Voltage Drop calculations for the electrical service drop to the ITS cabinet shall be provided.

B. Power cabling and wires installed outdoors and underground shall be rated for 600V, rated for wet locations and gasoline and oil resistant.

C. All cables provided shall be provided with terminations, connectors and splices as needed and shall be installed within the existing or proposed conduits. All termination cables provided shall be provided with terminations, connectors and splices as needed.

D. All cables shall be clearly labeled with identifying label or tags clearly indicating the circuit # and/or VMS #.

E. All electrical enclosures and boxes provided by the Design-Builder shall be stainless steel NEMA 4X.

F. All conduits shall be hot-dipped Rigid Galvanized Steel (RGS). All fittings and conduit bodies shall be hot-dipped galvanized.

3.7.6 Summary of Submittals

Item	Section	Submittal	Action
1	3.7	Final Signal Plan and Report	Review and Approval

END

3.8 PEDESTRIAN FACILITIES

3.8.1 Section Includes

A. This section sets out design and construction requirements related to pedestrian facilities including sidewalks, curb ramps, pedestrian street crossings, pedestrian ramps, and railings in the public right-of-way.

B. For requirements relating to elevators and stairs, refer to TP3.12 STATIONS AND ARCHITECTURE.

3.8.2 Codes and Standards

Project Work shall comply with all statutory requirements, and shall comply with the codes and standards identified in Appendix TPA3.1A CODES AND INDUSTRY STANDARDS and the codes and standards listed below:

A. Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG).

B. NYSDOT Highway Design Manual – Chapter 18: Pedestrian Facility Design.

3.8.3 Related Documents

A. Directive Drawings.

3.8.4 Design Requirements

A. The Design-Builder shall take into consideration the circulation, balance, connectivity, safety, accessibility, traffic engineering elements, and landscape development when implementing pedestrian facility design.

B. The Design Builder shall construct, maintain, monitor, and update, any facility it owns or maintains to meet the most current ADA standards. All pedestrian facilities designed, constructed, or altered, must meet or exceed the minimum accessibility requirements for design, construction, and alteration. However, if full compliance is technically infeasible, the facility shall provide accessibility to the maximum extent possible.

3.8.4.1 Sidewalks

A. The Design-Builder shall design sidewalks as part of the project wherever they are determined to be necessary and consistent with the needs identified in the Project Scoping Report, Final Design Report, and the guidelines of NYSDOT HDM Chapter 18. Generally, the Design-Builder shall place sidewalks along streets or highways in developed or developing areas, even where pedestrian activity may appear light. Existing, deteriorated, or non-accessible sidewalks should be rehabilitated or replaced.

B. The NYSDOT preferred minimum clear width for pedestrian access routes is [redacted] exclusive of the curb. On structures, the preferred minimum dimension from the face of the bridge rails or barriers to the face of the curb is [redacted]. These widths best accommodate continuous, two-way pedestrian traffic and are particularly desirable along state highways and in urban areas. The cross slope on the Pedestrian Access Route within a walkway shall not exceed [redacted], even after application of construction tolerances.

3.8.4.2 Pedestrian Facility Appurtenances

A. Pedestrian Facility Appurtenances will refer to signs, signal poles, lighting, telephones, litter containers, parking meters, fire hydrants, mailboxes, newspaper vending machines, utility poles, planters, etc. that may be located adjacent to the pedestrian access route.

The Design-Builder shall choose appurtenances for their appropriateness, size and scale, locations, and the needs and requirements of users.

3.8.4.3 Curb Ramps/Blended Transitions

The Design-Builder shall use the following design criteria for curb ramps:

A. The minimum width for a sidewalk curb ramp and or blended transition is 4 feet.

B. Curb ramps and blended transitions should be constructed with least possible running slope. The maximum slope on curb ramps, in the direction of pedestrian travel, is not to exceed [redacted].

C. Curb ramps and or blended transitions must be provided wherever accessible routes cross curbs.

D. Curb ramps and or blended transitions must be installed at all corners of intersections containing sidewalks.

E. Perpendicular curb ramps must have a turning space at the top.

F. Grates, access covers and similar surfaces shall not be located on curb ramps, blended transitions or turning spaces, unless they meet all surface requirements for accessibility.

G. Curb ramps and or blended transitions require the use of detectable warnings.

H. Utilities, signs, and other fixed objects may not be placed in a curb ramp and or blended transition, or in a manner that interferes with the use of the curb ramp and or blended transition.

I. Single diagonal or depressed corner curb ramps and or blended transitions serving two street crossing directions should be avoided in new construction and should only be considered where conditions specifically require their use.

3.8.4.4 Pedestrian and Vehicular Traffic Signals

A. The Design-Builder shall ensure that pedestrian signals are designed to direct and protect the pedestrian at street crossings. Pushbuttons that activate pedestrian signals must be reachable from sidewalk and be located as close as practicable to the sidewalk curb ramp.

3.8.4.5 Pedestrian Intelligent Transportation Systems (ITS)

A. The Design-Builder shall implement ITS technologies to facilitate access, safety, mobility, and way-finding during street crossings. Accessible/audible pedestrian signals, calming green wave, count-down signal, illuminated pushbutton, in-roadway lighting systems at crossings, leading pedestrian interval signal phasing, exclusive pedestrian phasing, scramble pedestrian phasing, and split phasing may be used in the implementation of ITS technologies.

3.8.5 Construction Requirements

3.8.5.1 Sidewalks

A. Provisions for safe accommodation of bicyclists and pedestrians must be given full consideration during construction. If safe passage for pedestrians cannot be maintained continuously through the work site, a safe continuous detour must be furnished. Alternate pedestrian access routes furnished during construction must comply with Sections 6D.01,

6D.02, and 6G.05 of the MUTCD. Where there are existing sidewalks on both sides of the road or bridge, work should be staged so that one sidewalk remains open to pedestrians at all times. If one sidewalk is closed, pedestrians should be directed to the other sidewalk by crosswalks, SIDEWALK CLOSED signs, and signals, as appropriate.

3.8.5.2 Pedestrian Railings

A. Pedestrian railings shall be required on both sides of stairs. Pedestrian railings shall be required on both sides of ramps (excluding curb ramps) with a rise over [redacted].

B. Handrail height shall be between [redacted] and [redacted] measured from the top of the walking surface or stair nosing to the top of the handrail gripping surface.

C. Handrail clearance, between the gripping surface and a wall or other vertical element, shall be at least [redacted].

D. Handrails shall extend a minimum of [redacted] beyond the top and bottom of a pedestrian ramp run. On stairs, handrails shall extend [redacted]. past the top riser nosing, and at least one tread depth past the bottom riser. Handrail ends shall return to a wall, guard, or the landing surface.

3.8.6 Summary of Submittals

Item	Section	Submittal	Action
1	3.8.5.2	Roadway Plans (Railing Details) – Preliminary	Review and Comment
2	3.8.5.2	Roadway Plans (Railing Details) - Final	Review and Approval

END

3.9 ALIGNMENT AND TRACK

3.9.1 Section Includes

This section sets out requirements related to the defined track alignment, and design and construction related to:

A. Horizontal and vertical alignment of the third track and other new tracks.

B. Horizontal and vertical adjustment of existing tracks.

C. New track construction including third rail.

D. Earthwork.

E. Design and construction of special trackwork.

F. Fencing and barriers along the ROW.

G. Close Clearance signs.

H. Direct Fixation Track.

I. Hi-Rail Access.

3.9.2 Codes and Standards

Project Work shall comply with all statutory requirements, and shall comply with the codes and standards identified in Appendix TPA3.1A CODES AND INDUSTRY STANDARDS and the codes and standards listed below:

A. LIRR: MW-2000 Part III, Recommended Practice for the Construction of Track, Special Trackwork and Miter Rails.

B. LIRR: CE-1 Specifications.

C. LIRR: Standard Drawings.

D. AREMA Manual of Railway Engineering.

E. AREMA Portfolio of Trackwork Plans.

F. New York Railroad Law 51-a: Clearances.

G. NYSDOT Standards. See list of applicable standards.

3.9.3 Related Documents

A. Technical Specifications.

B. Contract Drawings.

3.9.4 Design Requirements

3.9.4.1 General

A. The Design-Builder shall prepare a comprehensive Track Alignment and Trackwork Design Criteria Report document fully addressing and explaining how the Design-Builder proposes to design the system to meet the requirements of the Contract Documents. The report shall include the division of work between the Design-Builder and LIRR. The report shall be supplemented by figures, tables, standard detail drawings, and typical sections.

3.9.4.2 Alignment of Out of Service Track

A. The Design-Builder shall use the horizontal alignment shown in the Contract Drawings. These Contract Drawings show the proposed alignment for both the Third Track as well as necessary realignment of existing tracks. The track alignments shall conform to the codes and standards listed above. The alignment shown in the Contract Drawings required design exceptions which have been approved by the LIRR. These are shown in Appendix TPA3.9A ALIGNMENT AND TRACK DESIGN EXCEPTIONS.

   As shown in the Contract Drawings, the alignment shall be shown with both "Proposed Track Station" and with "Proposed LIRR Station." The "Proposed Track Station" is stationing established for this Project and was used to develop the track alignments. The "Proposed LIRR Station" is stationing that closely follows the stationing being used for the PTC project.

B. The Design-Builder shall design all new tracks as indicated on the Contract Drawings. All tracks shall be conventional ballasted track on sub-ballast and subgrade, except the track over Herricks Road shall be direct fixation similar to existing. Track installation includes:

   1. Any necessary excavation/fill and preparation of the site to provide for track at the new location.
   2. Subbase.
   3. Sub-ballast.
   4. Ballast.
   5. Concrete Ties.
   6. Running rails.
   7. Special trackwork
   8. Third rail.
   9. Direct Fixation Track (at Herricks Road only).

C. The Design-Builder shall establish the vertical profile of track to accommodate proper cross drainage of the of existing track, and shall make any minor adjustments necessary to take into account horizontal alignment, the placement of crossovers, and other features along the ROW. The profile of existing mainline tracks shall not be lowered. The profile at Herricks Road shall not be changed from its current alignment. The maximum allowable grade is [redacted]. If a maximum [redacted] grade cannot be met due to physical restrictions or barriers, the Design-Builder shall submit a variance request to the LIRR for approval.

D. In locations where the elevation of the existing tracks shall be raised to accommodate the configuration of the new structures over Covert Avenue, School Street, and Urban Avenue, the final track profiles of all tracks shall accommodate proper cross drainage under the tracks. The track profile design shall take into account existing platform heights, adjacent platforms, overhead and wayside clearances, and horizontal lateral clearances from the centerline of adjacent tracks. The maximum allowable raises for existing mainline tracks are 5 feet at Covert Avenue, 3 feet at School Street, and 3 feet at Urban Avenue. The Design-Builder shall prepare and obtain all required additional track waivers in accordance with LIRR and NYSDOT requirements. The track raises for the two existing tracks at Covert Avenue, School Street and Urban Avenue will be performed by Railroad

forces. The Design-Builder shall perform all preparatory work including but not limited to temporary and permanent retaining walls.

E. The Design-Builder shall prepare general plans identifying the track centerlines of Main Line tracks and connecting sidings, top of rail elevations, track layout plan and configuration (showing location and details of switches: point of switch, frog number/angle, degree of curve and radius, point of switch/frog, cross sections (every 100 feet) with profile elevations of the new track and existing tracks, identification of existing and proposed horizontal and vertical track alignment, critical information, and utility subsurface facilities. Track plans shall contain all pertinent survey data and be tied into survey controls that shall be used for the design and subsequent construction. The plan and profiles shall be identified on the same drawing.

F. The track design layout for all tracks shall be a continuous stationing starting with the lower valuation station as the beginning section starting west and moving east. The profile grade and horizontal alignment of the new track configuration shall be “best fitted’ with the existing profile when considering other structure elevations and overhead clearances.

3.9.4.3 Adjustment of In-Service Tracks

The Design-Builder shall prepare working drawings showing each track’s horizontal and vertical alignment and any other information necessary to perform the work. These shall include the locations of proposed turnouts and crossovers. Any necessary preparation of the track subbase and sub-ballast shall be shown on the drawings. The profile of existing mainline tracks shall not be lowered.

3.9.4.4 Special Trackwork

A. The Design-Builder shall provide detailed shop drawings for all turnouts and crossovers.

B. The Design-Builder shall procure all new turnouts and crossovers shown on the Contract Drawings. New turnouts and crossovers on in-service tracks will be installed by the Railroad. Turnouts and crossovers on out of service track shall be installed by the Design-Builder.

C. The Design-Builder shall provide shop drawings, and working drawings for use by the Railroad for the installation of all turnouts and crossovers.

D. The Design-Builder shall install the switch machine on the existing viaduct structure for the turnout at the east end of Hicksville Station.

3.9.4.5 Fencing and Barriers along the ROW

A. High security fencing shall be installed along both sides of the ROW for the entire length of the Project Corridor, except for: any existing decorative fencing (e.g. - in the area of New Hyde Park); and at locations where fencing is not required on top of retaining walls. For requirements regarding high security fencing on retaining walls and sound attenuation walls, see design requirements in TP3.5 STRUCTURES. Gate access shall be provided at all LIRR equipment locations. Steps for maintenance access shall be provided in accordance with TP 3.5 STRUCTURES along steep slopes.

B. Fence-barrier drawings shall indicate the location of all access gates. These gates shall be installed for admittance to vital areas such as interlockings, signal cases, and switches as well as a means of egress to/from the ROW in the event of an emergency.

C. All existing access points for LIRR workers and equipment that currently exist along the Project corridor shall stay open and accessible during the course of the Design-Builder's work. Approval to close any existing access point during the course of the work shall be requested by the Design-Builder before any access is made impassable. In some cases an alternate access point may be required by the LIRR at the Design-Builder's cost, to ensure LIRR can continue ongoing maintenance to the existing tracks.

D. Fall protection shall be installed and shall be in compliance with regulatory standards in areas where a 6' or higher potential fall hazard from the ROW exists or if it is created as a result of newly constructed retaining walls or sound walls.

E. Special attention shall be paid to potential access points to the ROW from/to high safety priority areas such as schools, churches, and parks/recreation locations.

F. The Design-Builder shall provide proposed fence-barrier drawings for LIRR Corporate Safety review and approval prior to making any changes to fence-barriers affected by construction activities.

3.9.5 Construction Requirements

3.9.5.1 General

The construction implementation of the existing track modifications and the new third track necessary for this project shall be staged so as minimize impact to LIRR train service. Trains shall be able to operate under scheduled peak train service unless there are track outages coordinated with and approved by the Railroad. Construction staging shall be submitted to the Railroad for approval.

3.9.5.2 Alignment of Out of Service Track

A. All out of service track construction shall be performed by the Design-Builder. The Design-Builder shall construct all out of service tracks to the tolerances given in the LIRR MW-2000. The Design-Builder shall construct out of service track including preparing the subgrade and constructing the sub-ballast, ballast, ties, rail, third rail, and all turnouts. Subgrade, sub-ballast, and ballast shall be prepared to NYSDOT standards.

B. The Design-Builder shall provide field layout of all track modifications to be constructed by the Design-Builder. This includes the track geometry as well as the location of turnouts and crossovers. The Design-Builder shall provide as-built drawings for the track geometry.

3.9.5.3 Adjustment of In-Service Tracks

A. The Railroad will relocate all in-service tracks requiring realignment in accordance with the Contract Drawings. Where a crossover is between an in-service track and an out of service track, the Railroad forces will construct the turnout in the in-service track and the Design-Builder shall construct the turnout in the out of service track. The Railroad will make the rail connection between the two turnouts in order to complete the crossover.

B. Where the existing track is shifted to the extent it is on a new track bed, the Design-Builder shall prepare the subgrade and construct the sub-ballast, ballast, ties, rail, and third rail. The Design-Builder shall construct all new tracks to the tolerances given in the LIRR MW-2000.

C. The Design-Builder shall provide field layout of all track modifications to be constructed by the LIRR. The Design-Builder shall provide as-built drawings for the track geometry.

D. The Design-Builder shall excavate to 7 feet from centerline of existing tracks and prepare the track bed up to the top of sub-ballast.

3.9.5.4 New Crossovers and Turnouts

A. The Design-Builder shall procure all turnouts and crossovers for the third track as shown on the Contract Drawings. Turnouts and crossovers in out of service track shall be installed by the Design-Builder. Turnouts and crossovers in the in-service tracks will be installed by the Railroad. The Railroad will make the track connection between the two turnouts in order to complete a crossover. The Design-Builder shall provide working drawings for approval by the LIRR and for use by the Design-Builder and the LIRR for the installation of all turnouts and crossovers.

B. The Design-Builder shall provide field layout of all proposed special trackwork, including those in the in-service tracks.

C. The Design-Builder shall provide complete real time survey support during the installation of turnouts and crossovers, including those that are installed by the Railroad.

D. The Design-Builder shall provide all cranes and other equipment (including operators) necessary to install the special track work for the installation of its own work, and to support installations and work by the Railroad.

3.9.5.5 Construction / Temporary Fencing and Barriers along the ROW

A. All required fencing and barriers along the ROW shall be constructed in accordance with the approved design plans.

B. Temporary Barriers shall be installed during the construction phase when access protection of the ROW is impaired. If the location is within the confines of a secured work site, no barrier is needed.

3.9.5.6 Close Clearance Signs

A. The Design-Builder shall install close clearance signs at all locations with a clear distance above top of rail of less than [redacted] from the centerline of track to any obstruction that would reduce the area to clear to (e.g., wall, fence, structure, or other barrier).

B. The close clearance zones shall be labeled as a “Close Clearance Zone” for each section. The Design-Builder shall provide signage and or field indicators at the entrance and exit of the zone. Within the zone, there shall be “Close Clearance” signs and or field indicators every [redacted] on the adjacent obstruction. Where there are utility poles, there shall signs and or field indicators on those as well. In addition, these zones shall be included in all job briefings/job briefing cards when working in the areas.

C. The Design-Builder shall submit plans showing the location of all proposed Close Clearance Signs and field indicators.

3.9.5.7 Direct Fixation Track

A. The direct fixation plates and fasteners on all three tracks at Herrick’s Road shall be a 6” rail base bonded system that is compatible with the existing system.

B. The direct fixation system shall be designed for [redacted] freight.

C. The Design-Builder shall prepare the design and submit for approval by the LIRR.

3.9.5.8 Hi-Rail Access

A. The Design-Builder shall submit a design for hi-rail access to LIRR for Review and Approval.

B. The locations shall include staggered pads on all three tracks. Gate access with locks shall be provided at all locations. The pads shall accommodate LIRR's maintenance equipment.

C. Several possible hi-rail access locations are as follows:

1. Nassau 1 Access: Along Railroad Avenue, west of Merillon Avenue Station, in the area of Old Broadway ([redacted]). This is [redacted] west of relocated Nassau 1.
   i. Security fence proposed in this area, gate would be needed.
2. Nassau 3 Access: Along Hinck Way, between Willis Avenue and Roslyn Road, around [redacted]. This is [redacted]' west of relocated Nassau 3.
   i. Entrance would be needed in barrier between Hinck Way and Railroad ROW.
3. Divide 1 Access:
   i. At the end of Bond St. ([redacted]), west of Wantagh Parkway. This is [redacted]' west of Divide 1.

   OR

   ii. Using the end of New York Avenue ([redacted]) would allow hi-rail access to the proposed MOW track east of Urban Street. This is [redacted] west of Divide 1.

3.9.5.9 Survey Support During Construction

A. The Design-Builder shall provide real-time surveying support during installation of new track, adjustment of existing track and installation of new crossovers and turnouts.

B. The Design-Builder shall coordinate all survey support during construction with the Railroad and provide the Railroad a Real-Time Surveying Support Procedure at least 15 Calendar Days prior to any Alignment and Track related construction activities.

C. The Real-Time Surveying Support Procedure shall comply with provisions of Section TP2.27 SURVEY AND LAYOUT.

3.9.6 Summary of Submittals

Item	Section	Submittal	Action
1	3.9.4.2	Alignment of out of service tracks	Review and Approval
2	3.9.4.3	Alignment of in-service Tracks	Review and Approval
3	3.9.4.4	Special Trackwork Drawings	Review and Approval

4	3.9.4.5	Fencing and Barriers	Review and Comment
5	3.9.5.2	As-Built Drawings	Review and Comment
6	3.9.5.3	As-Built Drawings	Review and Comment
7	3.9.5.6	Close Clearance Signs and Field Indicators	Review and Comment
8	3.9.5.7	Direct Fixation Design	Review and Approval
9	3.9.5.8	Hi-Rail Access Design	Review and Approval
10	3.9.5.9	Real-Time Surveying Support Procedure	Review and Comment

END

3.10 DRAINAGE

3.10.1 Section Includes

A. This Section sets out design and construction requirements related to drainage systems, and the handling of storm water runoff, both within and outside the Railroad ROW.

3.10.2 Codes and Standards

A. Project Work shall comply with all statutory requirements, and shall comply with the codes and standards identified in Appendix TPA3.1A CODES AND INDUSTRY STANDARDS and the codes and standards listed below:

1. AREMA Manual for Railway Engineering.
2. Nassau County Department of Public Works (NCDPW) Drainage Criteria Requirements and Recharge Basin Design Guidance.
3. New York State Storm Water Management Design Manual.
4. New York State Pollutant Discharge Elimination System (SPDES) Permit.
5. New York State Standards and Specifications for Erosion and Sediment Control.
6. New York State Highway Design Manual.
7. FHWA – Manual for Highway Stormwater Pumping Stations.
8. AASHTO Drainage Design Manual.

3.10.3 Related Documents

A. Technical Specifications.

B. Directive Drawings.

3.10.4 Design Requirements

A. The Design-Builder's drainage design shall comply with the requirements of the Contract Documents.

B. The Design-Builder shall obtain any required AHJ approvals if and as necessary.

C. The Design-Builder's design shall provide for adequate drainage and stormwater run-off provision throughout the execution of the work, including any temporary systems as required.

3.10.4.1 Storm Frequencies and Runoff Volume Requirements

A. The storm water drainage systems shall be designed to meet the following:

1. Track (Reference provision 3.10.4.2.G) — 100 year storm frequency
2. Roadway storm drainage system — 10 year storm frequency
3. Underpass storm drainage system (sag curve) — 10 year storm frequency

B. The Design-Builder must demonstrate that storage for 8 inches of runoff from the immediate tributary area at the low-point is provided for.

C. New drainage for each underpass crossing shall be required to accommodate only the stormwater runoff volume for the immediate tributary area that drains into the underpass crossing. Approach roadways leading to the underpass crossings and adjacent cross

street grades may be profiled to prevent runoff from draining to the underpass crossings from surrounding areas. The Design-Builder shall document that there will be no adverse impact to existing upland properties as determined by Nassau County DPW.

3.10.4.2 Storm Water On the LIRR ROW

A. Stormwater runoff shall be conveyed either by trapezoidal side ditches or channels,

B. French drains, under drain perforated pipes, and perforated storage pipes may be used to supplement surface side-ditches and channels, but only if surface gravity conveyance and storage system solutions cannot accommodate run-off volume requirements.

C. If perforated pipes are installed, cleanouts shall be provided at certain intervals for maintenance purposes.

D. All drainage systems shall be designed so that run-off will percolate into the soil sub-layers and be stored permanently in the groundwater table

E. All side ditches and channels shall be provided with grass to intercept any oil and other contaminants to address the water quality requirements.

F. The Design-Builder's design shall take into account that, in some areas, adjacent properties drainage runoff could flow into the LIRR ROW storm drainage system. This shall be considered in developing solutions to prevent flooding.

G. The storm water drainage and retention systems shall be designed so that, with a 100 year storm frequency condition, the free surface of water shall be below top of rail elevation at all locations

3.10.4.3 Storm Water Outside the LIRR ROW (On Nassau County or Local Municipalities right of way)

A. All stormwater systems shall be designed for a minimum 70 year service life.

B. The Design-Builder to provide spread calculations to backup the proposed number of basins in the Design Report. The allowable spread shall follow recommendations of the NYSDOT Highway Design Manual, Chapter 8.

C. New recharge basins may be constructed to collect and retain runoff, rather than discharging runoff to existing recharge basins. The Design-Builder shall obtain NYSDEC SPDES permit.

D. All new recharge basins shall be provided with access ramps leading from top of grade to the bottom of the recharge basin to provide for maintenance of the basin.

E. All new recharge basins shall be protected by high security walls or fence installations. Walls and fences shall receive aesthetic treatment consistent with the treatment used on adjacent project structures and facilities.

F. Existing Nassau County recharge basin SWB 123 shall be cleaned and all sediment removed to the satisfaction of Nassau County DPW.

G. Underground pipe infiltration galleries , including corrugated metal pipe infiltration galleries and concrete arch infiltration systems for drainage/storm management purposes will NOT be allowed.

H. Stormwater pumping systems are allowed.

I. Maintenance of pump systems will be by others (not the Design-Builder).

J. The Design-Builder may utilize on-site pumping to existing recharge basins using existing gravity flow sewer systems. A combination of pumping/wet wells, dry wells (leaching basins), and cistern/detention systems may be utilized, subject to requirements and approval by Nassau County DPW.

K. Pump stations may include catch basins with open bottoms within the underpass that will connect to a wet well. The pump station can pump from the wet well and discharge into a cistern/detention facility that serves as an equalization basin. The discharge from the equalization basin will be sized so as not to overwhelm the local existing gravity system.

L. Pumping stations including pump control shall be in accordance with AASHTO Drainage Design Manual, FHWA – Manual for Highway Stormwater Pumping Stations, and subject to Nassau County DPW requirements and approval.

M. The Design-Builder will submit basis of design and station components with recommended maintenance requirements with his proposal for evaluation and approval by Nassau County DPW.

N. Pump stations shall include multiple pump arrays for low-flow (5 year design storm frequency) and peak-flow (10 year design storm frequency). Constant or variable-speed motors will be allowed. The Design-Builder's design should provide for 100% pump standby capacity.

O. Pump stations shall be sited within existing or proposed LIRR or Nassau County right-of-way. Pumps shall be powered from the local power grid. Backup emergency generators and fuel supply for the pump stations should be adequate to operate the larger, peak-flow pumps for a minimum of 24 hours in the event of power failure. Emergency generators shall be portable and with a plug/receptacle connection and with a manual transfer switch for each pump station and which could be trailer mounted. Electrical components required to automate the pump system shall be housed within an above ground CMU block pump house.

P. Pump station materials of construction including architectural, foundation design, valve pit equipment, pre-treatment requirements and trash/debris handling shall be in accordance with AASHTO Drainage Design Manual, FHWA – Manual for Highway Stormwater Pumping Stations, and subject to Nassau County DPW requirements and approval.

Q. A winch or trolley/monorail system shall be designed to raise pumps for maintenance and removal from the site.

R. Station shall provide for debris removal / screening of stormwater.

S. Force main piping shall be class [redacted] ductile iron pipe with restrained joints.

T. The Design-Builder may utilize a force main system from the underpass discharging directly to the recharge basin, subject to Nassau County DPW requirements and approval. An energy dissipater is required at the point of discharge of the recharge basin.

U. Open cut trench installation methods for gravity drainage systems (except for manholes) will be allowed on any residential Nassau County or local streets if trenches are less than 15 feet in depth (to bottom of trench). Trenches greater than 15 feet deep shall require a trenchless solution. Acceptable methods of trenchless technologies include micro-tunneling and pipe jacking. The following streets shall be considered for utilizing open-cut trench and trenchless technologies:

1. 5th Avenue from Covert Avenue to Premier Boulevard.

2. Premier Boulevard from 5th Avenue to Stewart Avenue.
3. Stewart Avenue from Premier Boulevard to Recharge Basin #121.
4. 5th Avenue from New Hyde Park Road to Covert Avenue.
5. 1st Street from 3rd Avenue to Herricks Boulevard.
6. Herricks Boulevard from 1st Street, beneath tracks to Recharge Basin #123.
7. School Street from the underpass to Old Country Road.
8. Salisbury Park Drive from Old Country Road to Oak Street.
9. Oak Street from Salisbury Park Drive to Linden Avenue.
10. Linden Avenue from Oak Street to Recharge Basin #315.
11. Grand Boulevard from Old Country Road to Recharge Basin #51.
12. Kinkel Street from Railroad Avenue to Broadway.
13. Broadway from Kinkel Street to Rushmore Street.

V. The Design-Builder shall install a gravity drainage system on 1st Street in Mineola that will allow for the connection of an overflow pipe from Nassau County recharge basin SWB 125. This work shall be subject to Nassau County DPW approval.

W. Catch Basin and all appurtenances shall be adjusted as required to meet the proposed layout and grades at the permanent road closure locations at South 12th Street and Main Street.

X. The construction of the Urban Avenue underpass will require the removal of an existing [redacted] diameter drainage system within Railroad Avenue where it crosses Urban Avenue. This system drains east to west into a [redacted] drainage system within Rushmore Street. The Design-Builder shall reconstruct this portion of the 36-inch drainage system and reconnect to the existing drainage system on Rushmore Street. The Design-Builder may consider realigning via Kinkel Street (from Railroad Avenue to Broadway) and Broadway (from Kinkel Street and connecting to existing 60-inch drainage system at Rushmore Street) or as approved by Nassau County DPW.

Y. The ramps and stairway leading to the pedestrian tunnel at South 12th Street shall include provisions to prevent storm water runoff from entering into and collecting in the tunnel.

3.10.4.4 Storm water Design Criteria

A. The Design-Builder shall design a storm water piping system on roadways and at underpasses to meet the 10-yr design flood frequency event.

B. The Design-Builder shall provide preliminary, ADP and Final Design documents signed by NYSPE in accordance with NYSDOT Highway Design Manual and Nassau County Department of Public Works.

C. The existing drainage systems are designed to a 3-yr return frequency, but new designs are for a 10-yr storm event. The capacity of any existing system shall be verified as part of the final design.

D. Soil borings to assess groundwater table and percolation rates shall be provided at each existing or new recharge basin to be utilized as part of drainage design.

E. The minimum required depth of cover over pipe drainage systems is 2 feet. Drainage pipe shall be Reinforced Concrete Pipe; see NYSDOT Highway Design Manual Chapter 8 for pipe class.

F. The absolute maximum spacing for manholes shall be 300 feet for sewer pipes up to [redacted]-inches in diameter and [redacted] for sewer pipes greater than [redacted] in diameter. Manholes shall be used at all junctions of 2 or more sewers, at all changes of alignment for all sizes of sewers, and at all changes in grade or elevation for all sizes of sewer.

G. New recharge basins must be designed to provide for 8 inches of runoff from the tributary area. The Design-Builder shall maintain minimum five (5) foot clearance above Seasonal High Groundwater Table elevation.

H. Any new gravity drainage systems shall follow the standards of the NYSDOT Highway Design Manual, Chapter 8.

3.10.4.5 Catch Basins

A. The Design-Builder shall install catch basins to intercept the concentrated flow of storm water only at the underpass area, and shall follow requirements of Chapter 8 of the NYSDOT Highway Design Manual for spread and sag locations. Basin type shall be curb-opening inlet, gutter inlet, or a combination inlet in accordance with the NYSDOT Highway Design Manual.

3.10.4.6 Spill Management & Soil Erosion and Sedimentation Control

A. The Design-Builder's spill prevention and response measures shall be set out in the Design-Builder's SWPPP and Soil Erosion and Sedimentation Control (SESC) plans.

3.10.4.7 Storm Water Management

Stormwater management provided by the Design-Builder shall meet, at a minimum, provision 3.10.2 and the following requirements:

A. The Design-Builder shall address groundwater recharge (Re_v), water quality volume (WQ_v), channel protection volume (Cp_v) and overbank flood protection volume (Q_p) as required.

B. The Design-Builder shall provide safe, stable, long term maintenance access to each stormwater management facility from roadways.

C. Stormwater management structural elements, including pipes shall have a minimum service life of 70 years.

3.10.4.8 Existing Systems

A. The Design-Builder shall evaluate the existing drainage system elements that are to remain. They shall also evaluate the existing Nassau County recharge basins for capacity to receive runoff flows and runoff volumes from the proposed drainage system under the design storm conditions. The Design-Builder shall confirm that all inflows (surface runoff from adjacent parking lots and lawns and underground pipes from parking lots, private properties, etc.) into the Project area drainage systems are accounted for. The evaluation shall be submitted, and included as part of the Drainage Report to The Nassau County Department of Public Works for approval.

3.10.5 Construction Requirements

3.10.5.1 Drainage Report

A. The Design-Builder shall provide a Drainage Report for each underpass location to the Railroad, NYSDOT, Nassau County, and any other entities whose facilities will be impacted by the Project in accordance with NYSDOT HDM Chapter 8: Highway Drainage. The Design Report shall be signed by a Professional Engineer licensed in the State of New York.

B. The Drainage Report shall document the design criteria used, final design basis, and all supporting calculations and computer model output. Design computations including schematics, inlet drainage area maps, spacing, capacity, hydraulic gradients, and structural design for non-standard drainage structures shall be included. The results of the evaluation of the Existing Systems shall also be included.

3.10.6 Summary of Submittals

Item	Section	Submittal	Action
1.	3.10.4	Drainage Design - Preliminary	Review and Comment
2.	3.10.4	Drainage Design – ADP	Review and Comment
3.	3.10.4	Drainage Design - Final	Review and Approval
4.	3.10.4	Stormwater Management Reports	Review and Approval
5.	3.10.5.1	Drainage Reports	Review and Approval

END

3.11 LANDSCAPING AND AESTHETICS

3.11.1 Section Includes

A. This section sets out design and construction requirements related to landscaping along Streets, at Stations, and adjacent to the Railroad ROW. In addition, the section includes aesthetic requirements relating to bridge and underpass structures, retaining walls, and sound attenuation barriers.

B. For aesthetics of stations, refer to TP3.12 STATIONS AND ARCHITECTURE.

C. For Outdoor plaza/Parks, refer to TP3.12 STATIONS AND ARCHITECTURE.

3.11.2 Codes and Standards

A. Project Work shall comply with all statutory requirements, and shall comply with the codes and standards identified in Appendix TPA3.1A CODES AND INDUSTRY STANDARDS.

B. Project Work shall comply with all statutory requirements, and shall also comply with the following codes and standards:

1. Village of New Hyde Park – Village Code Book.
2. Village of Mineola – Mineola Code Book.
3. Village of Westbury – Code of the Village of Westbury.
4. Village of Garden City – Village Code Book.
5. ANSI Z60.1, American Standard for nursery Stock.
6. ANSI Z133.1, Safety Requirements for Pruning, Trimming, Repair, Maintaining, and Removing Trees and for Cutting Brush.
7. APTA SS-SIS-RP-007-10, Crime Prevention through Environmental Design (CPTED) for Transit Facilities.
8. LIRR Station Design Guidelines.
9. NYSDOT Highway Design Manual – Chapter 28: Landscape Architecture and Community Design for Transportation.

3.11.3 Related Documents

A. Contract Drawings.

3.11.4 Design Requirements

The Design-Builder shall use a Certified Arborist for cataloging existing trees and bushes, and for gauging their health and shall also hire a Registered Landscape Architect (RLA) for all landscape design issues.

The Design-Builder shall provide landscaping complying with the following design requirements:

3.11.4.1 Street ROW Landscaping

A. Trees planted within a street ROW in sidewalk areas shall be installed in a minimum 5’ by 5’ planting pit. The planting pit shall be covered with a cast iron tree grate.

B. Any existing trees, within or outside street ROWs, removed due to construction operations shall be replaced with similar total caliper of new trees. (E.g.: one (1) 6 inch caliper tree removed may be replaced with either one (1) 6 inch caliper tree, or two (2) three inch caliper trees, or three (3) two inch caliper trees).

C. Minimum size for new street trees shall be two (2 1/2) inch caliper measured at breast height.

D. The Design-Builder shall provide 2 1/2" caliper shade trees as a first priority and flowering/understory trees as a second priority where vertical and horizontal restrictions limit the use of shade trees.

E. New tree spacing along street rights-of-way shall not exceed 50' separation.

F. All areas in street rights-of-way not covered in hardscape or tree planting areas shall be seeded with grass seed and maintained until final acceptance.

G. Low maintenance shrubs at a minimum of 3' on center spacing shall be located in plant beds. Low maintenance groundcovers shall be located in plant beds at a minimum of 1' on center spacing.

3.11.4.2 Station Landscaping

A. All areas within the station limits not stabilized with pavements shall be covered with a minimum 5 inch thick layer of Decorative River Stone. Decorative River Stone shall be approximately 1" to 2" in size and have natural earth tone colors (browns, tans, grays).

1. Colors shall come from manufacturer standard color template for review and selection by the Railroad. All stone groundcover areas within station areas shall have a heavy-duty plastic weed barrier placed between the decorative stone and stone base Trees shall be planted no less than 1 tree every twenty (20) parking spaces within station areas.

B. Tree planting beds in parking areas shall be the equivalent size of one (1) parking stall for each tree.

C. Minimum size for station trees shall be two (2) inch caliper measured at breast height.

D. The Design-Builder shall provide 2" caliper shade trees as a first priority and flowering/understory trees as a second priority where vertical and horizontal restrictions limit the use of shade trees.

E. The Design-Builder shall provide grass at Merillon Station on the south side embankment adjacent to Nassau Blvd.

3.11.4.3 Railroad ROW Corridor Landscaping

A. Any existing trees adjacent to the Railroad ROW removed due to construction operations shall be replaced with similar total caliper of new trees. (E.g.: one (1), 6 inch caliper tree removed may be replaced with either one (1), 6 inch caliper tree, or two (2), three inch caliper trees, or three (3), two inch caliper trees).

1. Minimum size for new trees shall be two (2) inch caliper measured at breast height.

B. Existing shrubs adjacent to the Railroad ROW removed due to construction operations shall be replaced one-for-one with new plants. Replacement plants shall be of the same species and shall have a minimum size of 3' height; unless existing plant removed is smaller, then replacement plant shall be of same size.

C. Existing lawn areas outside the Railroad ROW disturbed due to construction operations shall be repaired and reseeded to previous condition.

D. Screening type planting shall be comprised of vegetation that maximizes visual screening throughout the year. Evergreen trees shall be planted at appropriate spacing to provide screening.

3.11.5 Plant Selection Requirements

A. The Design-Builder shall utilize the Codes and Standards in developing plant palettes.

B. The Design-Builder shall provide plant selections based on the intended plant function in the landscape and site conditions. Plant selection shall utilize native, hardy, drought-tolerant, and low maintenance materials capable of surviving in the harsh urban conditions in which they will be planted.

C. The Design-Builder shall provide arborvitae plantings on the north side of the Atlantic Avenue retaining wall from Cherry Lane to Glen Cove Road.

1. Arborvitaes shall be spaced no more than [redacted]" from center to center and located no more than [redacted] from the retaining wall.

D. Plants shall be selected that can survive on local rainfall after an initial one year establishment period.

1. Plant material selections shall emphasize native species and shall not include invasive species.

E. Other considerations for plant selections shall include:

1. Suitable size and form for the proposed location.
2. Resistance to disease and pests.
3. Tolerance to drought.
4. Tolerance of harsh urban conditions including heat, pollutants, and salt spray.
5. Requirements for soil and drainage conditions.
6. Trees proposed for Station areas shall have an upright habit and be fruitless and high-branching.
7. Trees proposed along public walk areas shall have a minimum branching height of seven (7) feet.

3.11.6 Construction Requirements

3.11.6.1 Existing Vegetation

A. The Design-Builder shall minimize existing vegetation removal and disturbance to the cut/fill limits and any removals, whether within the cut/fill limits or beyond those areas, shall be replaced in kind with native species appropriate for USDA NY Plant Hardiness Planting Zone 7, as described in NYSDOT HDM Section 11.3.2.

B. The Design-Builder shall preserve the row of pine trees located north of Main Avenue between the curb and the south limit of the LIRR ROW from Denton Avenue to Nassau Boulevard. The trees located within this area shall not be removed or damaged.

C. Prior to the removal of any trees or shrubs, an inventory of existing trees and shrubs shall be prepared by the Design-Builder and submitted to the Railroad. The inventory shall include major deciduous trees over 6 inches in diameter at breast height (DBH), coniferous trees over 6 feet in height, and deciduous or evergreen shrubs between 3 feet and 6 feet in height. The inventory shall include the size, location and species of each tree or shrub. Only living trees and shrubs shall be included in the existing tree inventory.

1. Exception: Existing trees located within the LIRR ROW are not required to be inventoried.

D. The Design-Builder shall protect vegetation outside the limits of disturbance with temporary plastic barrier fence along the limit of disturbance line.

E. The Design-Builder shall provide disturbed areas with topsoil and turf establishment. The type of topsoil and turf establishment, either roadside or lawn, will vary based on location.

F. See provision 3.11.4 for locations to replace landscaping adjacent to the ROW.

3.11.6.2 Tree Replacement Factors

A. The Design-Builder shall replace every live, deciduous tree greater than six inches diameter at breast height ("DBH") which is removed with a total quantity of deciduous trees a minimum of 2 inch caliper (size measured 6 inches above the base of the tree) equal to the total DBH size of the tree removed. For example, a 10 inch DBH tree removed shall be replaced with (5) two inch caliper trees or (2) three inch and (1) four inch caliper trees; however the replacement quantity will go down if larger caliper trees are used for replacement.

B. The Design-Builder shall replace every live, coniferous tree removed with a total quantity of coniferous trees equal to the height and width of the tree removed. For example, a 20 feet high x 10 feet wide coniferous tree shall be replaced by two (2) 10 feet high x 5 feet wide coniferous trees.

C. The Design-Builder shall replace every live shrub, between 3 foot height and 6 foot height, removed with a total quantity of shrubs equal to the quantity of shrubs removed.

D. Each replacement tree shall be the same genus and species of the tree removed, unless the tree being removed was identified by the Design-Builder as an invasive plant species.

E. The minimum replacement sizes shall be as follows: 2-inch caliper for major deciduous trees, 1.5-inch caliper for minor deciduous trees, 6-foot height for coniferous trees, 3-foot height for deciduous shrubs, and 2-foot height for evergreen shrubs.

3.11.6.3 Replacement Locations

A. The Design-Builder is not required to replace trees or shrubs located within the LIRR ROW, unless noted otherwise.

B. The Design-Builder shall provide replacement planting near the right-of-way line or on private property. Planting on private property may only be conducted if private property owners provide written permission to the Design-Builder and agree to take over the long term care and maintenance of the plant material, and the appropriate release is obtained by the Design-Builder and in consultation with the adjoining property owner in accordance with NYSDOT EI 11-010.

C. The Design-Builder shall provide trees outside and within the LIRR ROW at the locations noted below. Track Stationing points are indicated for location purposes. This list is in addition to all existing plantings damaged and/or removed during construction, located outside the LIRR ROW, which are replaced.

1. Trees shall be arborvitae unless noted otherwise.

    a. Arborvitaes shall be spaced [redacted] from center to center and located no more than [redacted] from sound walls (where applicable).

2. Floral Park

    a. [redacted] to [redacted], (Terrace Ave) South side of the LIRR ROW (Floral

Park Property).

3. New Hyde Park
    a. [redacted], (6th Ave) South side of the tracks, located on the LIRR ROW/property line.
    b. [redacted], (5th Ave) South side of the tracks, located on the LIRR ROW/property line.
4. Garden City
    a. [redacted] (Green Ridge) South side of the LIRR ROW (Garden City Property).
    b. [redacted], (Baseball Field) South side of the LIRR ROW (Garden City Property).
    c. [redacted], (Main Ave) South side of the tracks within the LIRR ROW South of the sound wall.
    d. [redacted], (Merillon Station) South side of the eastbound platform on the LIRR ROW. Small shrubs shall be provided, not trees (similar to Stewart Manor).
    e. [redacted] (Main Ave - Brixton Rd. to Kensington Rd.) South side of the tracks within the LIRR ROW South of the sound wall.
    f. [redacted], (Whitehall Rd.) South side of the tracks within the LIRR ROW South of the sound wall.
5. Mineola
    a. [redacted], (Mineola Kiss-n-Ride) South side of the tracks within the LIRR ROW.
6. Carle Place / Town of North Hempstead
    a. [redacted] and [redacted], (Atlantic Ave) North side of the tracks within the LIRR ROW north of the sound wall.
7. New Cassel / Town of North Hempstead
    a. [redacted], (Railroad Ave – Wright St. to Garden St.) North of the LIRR ROW north of the sound wall.
    b. [redacted], (Railroad Ave – Urban Ave to State St.) North of the LIRR ROW north of the sound wall.

3.11.6.4 Proposed Planting

A. The Design-Builder shall not use invasive plant species for any of the proposed planting as required by the New York State 2012 Invasive Species Prevention Act, or a monoculture of plant species, to reduce the potential for disease or invasive insect species to eradicate the proposed plantings.

B. Planting shall be located in a manner that does not interfere with the safe use of travel ways.

C. Planting shall be designed in a manner that provides a mix of plant material species to create seasonal interest for the traveling public.

D. Post planting care and replacement plantings shall be as per the requirements of NYSDOT Special Specification 611.190X0024, Post Planting Care with Replacement.

3.11.7 Content of Landscape Plans

The Design-Builder shall submit Landscape and Streetscape Plans for Review and Comment at Preliminary Design and Intermediate Design stages and Review and Approval for Final Design stage. The content of each Submittal shall be, at a minimum, as follows:

A. Preliminary Design.

B. Station Planting Plans, Scale 1”=20’.

C. Street ROW Planting Plans, Scale 1”=20’.

D. Railroad ROW Corridor Planting Plans, Scale 1”=40’.

E. Preliminary Plant Lists.

F. Intermediate Design.

G. Plant Lists with Plant Quantities and Sizes

H. Outline Specifications.

I. Final Design.

J. Planting Details.

K. Specifications.

3.11.8 Landscape Establishment Period

A. All plant materials and turf that have been identified in the design shall be planted in accordance with the Contract Documents as soon as portions of work area are completed. When growing season or construction conditions do not permit planting upon completion, the Design-Builder may wait until the next growing season but in no case shall plantings occur later than six months after Construction Completion.

B. Between planting and end of 1-year Warranty Period, the Design-Builder shall replace any plant materials and turf that are not in healthy and thriving condition, such that all such plant materials and turf identified in the design have achieved Vegetative Success. Vegetative Success means:

1. A minimum of 90% ground cover and adequate establishment to control erosion.
2. All plant materials in a healthy, thriving condition.
3. All plant materials are reflective of the species and requirements of the Contract Documents.
4. The Design-Builder shall conduct a Vegetative Success Survey within 30 Calendar Days of end of Warranty Period. The Design-Builder shall submit the Vegetative Success Survey to the Railroad for Review and Approval.

3.11.9 Aesthetic Treatment for Retaining Walls and Sound Attenuation Barriers

A. The Design-Builder shall provide a stone pattern design on the visible face of all concrete retaining and sound attenuation barriers.

B. The Stone pattern design may differ at select locations and shall be coordinated with LIRR and local community representatives.

   1. Stone pattern within the village of New Hyde Park shall be similar to the stone pattern on the existing bridges located along the N/S Parkway.

C. Precast units shall have the pattern applied during fabrication.

D. Cast in place concrete walls shall use a patterned form liner in the field.

E. Color – The Design-Builder shall provide pigmented concrete at select locations which shall be coordinated with LIRR and local community representatives.

   1. The Design-Builder shall assume a minimum of three different colors.

F. The Design Builder shall apply a breathable water repellent / anti-graffiti sealer to all exposed wall surfaces; including face, top, and back. Sacrificial anti-graffiti products are not acceptable. Sealer shall be clear and not alter the natural appearance of the wall.

   1. Cathedral Stone - R97.
   2. Prosoco – Blok-Guard & Graffiti Control II.
   3. Conspec – PWS-15.

3.11.10 Summary of Submittals

Item	Section	Submittal	Action
1.	3.11.6.1	Existing Vegetation Survey	Information
2.	3.11.7	Nutrient Management Plan	Review and Comment
3.	3.11.7	Soil Test Results	Information
4.	3.11.7	Landscape and Streetscape Plans – Preliminary	Review and Comment
5.	3.11.7	Landscape and Streetscape Plans – Intermediate	Review and Comment
6.	3.11.7	Landscape and Streetscape Plans - Final	Review and Approval
7.	3.11.8	Vegetative Success Survey	Review and Approval
8.	3.11.9	Retaining and Sound Wall Stone pattern	Review and Approval
9.	3.11.9	Water repellent / Anti-graffiti sealer	Review and Approval

END

3.12 STATIONS AND ARCHITECTURE

3.12.1 Section Includes

A. This section sets out design and construction requirements related to the modification of existing permanent stations, the replacement and relocation of existing platforms, the addition of pedestrian overpasses, the addition of pedestrian underpasses, the installation and maintenance of temporary station platforms, rehabilitation of existing station buildings, and ancillary buildings and facilities. The Design-Builder shall provide everything set out in this section including all accessories and appurtenances required to provide a complete and working station.

B. See TP3.13 STATION MEP AND VERTICAL TRANSPORTATION for electrical and plumbing upgrades required within the existing station buildings to provide a working electrical and plumbing system for new work associated with the Project. Upgrades specifically for the station building, electrical and plumbing system, shall not be provided unless required to complete the new work associated with the Project.

C. For structural requirements relating to pedestrian overpasses at Mineola Station, Mineola Main Street, Mineola Willis Avenue, Carle Place, and Westbury Stations, refer to TP3.5 STRUCTURES.

3.12.2 Codes and Standards

3.12.2.1 General

Project Work shall comply with all statutory requirements, and shall comply with the codes and standards identified in Appendix TPA3.1A CODES AND INDUSTRY STANDARDS and the codes and standards listed below:

Codes	
International Building Code (NY Edition)	2015
International Existing Building Code (NY Edition)	2015
International Fire Code (NY Edition)	2015
International Plumbing Code (NY Edition)	2015
International Mechanical Code (NY Edition)	2015
International Fuel Gas Code (NY Edition)	2015
International Property Maintenance Code (NY Edition)	2015
Uniform Code Supplement	2016
ASHRAE 90.1	2013
NFPA 70, National Electric Code (NEC)	2014
International Energy Conservation Code (NY Edition)	2015
Energy Code Supplement	2016
Executive order 88	2013
FTA ADA Regulations, Title 49, Subtitle A, Part 37 Transportation Services for Individuals with Disabilities	Current
Parts 27 and 37--Transportation for Individuals with Disabilities; Reasonable Modification of Policies and Practices (3/13/2015)	2015

DOT ADA 10/19/2011 Final Rule - Summary of Major points	2011
ADA standards for Transportation Facilities	2006
ADA standards for Accessible Design	2010
ASME A17.1	2013
Standards	
NFPA 130, Fixed Guideway Transit and Passenger rail Systems	2014
MTA Long Island Rail Road Station Design Guidelines (LIRR SDG)	Current
MTA sign Manual	Current
Occupational Safety and Health Administration (OSHA)	Current
The secretary of the Interior's Standards for the Treatment of Historic Properties	Current
Landmarks Preservation Commission Guidelines for Archaeological Work in New York City	2002

3.12.2.2 Structural

Project Work shall comply with all statutory requirements, and shall comply with the codes and standards identified in Appendix TPA3.1A CODES AND INDUSTRY STANDARDS and the codes and standards listed below. In case of conflicts between codes, the more stringent requirements shall apply.

A. 2015 International Building Code of New York State.

B. ASCE 7-10, American Society of Civil Engineers, Minimum Design Loads for Buildings and other structures.

C. AISC 360-10, American Institute of Steel Construction Specification for Structural Steel Buildings.

D. AISC 341-10, American Institute of Steel Construction Seismic Provisions for Structural Steel Buildings.

E. ACI 318-14, American Concrete Institute Building Code Requirements for Structural Concrete.

F. ACI 530-13, American Concrete Institute Building Code Requirements and Specifications for Masonry Structures.

G. AISI S100-12, American Iron and Steel Institute North American Specification for Design of Cold-formed Steel Structural Members.

H. Aluminum Design Manual 2010.

I. AWS D1.4/D1.4M-2011, American Welding Society Structures Welding Code- Steel.

J. PCI MNL 120-11, Precast Concrete Institute Design Handbook, Precast and Prestressed Concrete, 7th Edition.

K. 2016 American Railway Engineering and Maintenance-of-Way (AREMA), Manual of Railway Engineering.

3.12.2.3 LIRR Standard Drawings

The following LIRR standard reference drawings apply:

LIRR Standard Reference Drawings	
Drawing	Title
A321A	Detectable warning surface tile
A-109	Employee Ladder & gate Details
CE-1	Minimum railway clearances
S-1 – S-3	FRP temporary platform / gangway (permanent)

3.12.3 Related Documents

A. Technical Specifications

1. The requirements set out in the Technical Specifications shall supersede duplicative requirements set out in the LIRR Standard Specifications and LIRR station design guidelines.

B. Station renderings located in TPA3.12A RENDERINGS shall be used as the basis of design for all stations indicated in 3.12.4.1. The basis of design shall serve as the starting point and the demarcation of the Design-Builder changes. The final design of the stations is not required to look exactly as depicted in TPA3.12A RENDERINGS.

3.12.4 Station Design Requirements

3.12.4.1 Stations

The Design-Builder shall provide Stations that conform to the configurations and functional characteristics defined by the Contract Documents and subject to applicable codes and regulations at the following locations.

A. Floral Park Station.

B. New Hyde Park Station.

C. Merillon Station.

D. Mineola Station (Hub station).

E. Carle Place Station.

F. Westbury Station.

3.12.4.2 Service Life

The Design-Builder shall provide a final durable product that has been designed with the intent to last minimum service life of 75 years.

A. Service life timeline:

1. The final durable product can be up-kept with general maintenance for the first 50 years of service.

2. The final durable product can be maintained for an additional 25 years, by means

of full rehabilitation after the 50 year milestone.

3.12.4.3 Permanent Station Boarding Platforms

The Design-Builder shall locate station side boarding platforms conforming to the following design requirements:

3.12.4.3.1 Locations

Existing side boarding platforms shall be removed and replaced, removed and relocated, or upgraded according to the following design requirements

Table 3.12.4 - Station Boarding Platforms

Station	Westbound platform		Eastbound Platform	
	Platform slab	Substructure/ Foundation	Platform slab	Substructure/ Foundation
New Hyde Park	Remove / replace	*upgrade	Remove / relocate / replace	Remove / relocate
Merillon	Remove / replace	*upgrade	Remove / relocate / replace	Remove / relocate
Mineola	Remove / replace	*upgrade	Remove / relocate / replace	Remove / relocate
Carle Place	Remove / relocate / replace	Remove / relocate	Remove / replace	*upgrade
Westbury	Remove / replace	*upgrade	Remove / relocate / replace	Remove / relocate

*Upgrade shall include improvements to the existing platform structure, including foundations, footing, or piles for platform extension (width and length) and additional loads.

3.12.4.3.2 Existing Substructure / Foundation Condition

The Design-Builder shall investigate all substructures and foundations to determine the full extent of repair and replacement to accommodate heated pre-cast platform panels.

3.12.4.3.3 Vehicle Interface

The Design-Builder shall configure boarding Platforms for level boarding with an ADA-compliant gap between vehicle and Platform.

3.12.4.3.4 Platform Dimensions

A. Length – The Design-Builder shall design Platforms to not less than 1,020’ in length available for boarding and alighting of a 12 train car consist.

   1. The Design-Builder shall provide (1) one additional pre-cast concrete panel (approximately 16’-0” long) at each end of the all platforms for LIRR operations overrun, in addition to the above minimum length requirements.

B. Width – Design-Builder shall design platforms to not less than 8’ in width, and provide 10’ width where feasible. The following platforms shall be designed to 10’ width unless determined not to be feasible.

   1. Mineola station – Westbound platform.
   2. Westbury Station – Westbound platform.

C. Height – New high level platforms shall be [redacted] from the top of finished platform surface to the top of the nearest rail.

D. Horizontal Clearances.

1. Train - See LIRR SDG, section 5.2 / CE-1, Minimum Railway Clearances and NY State RRD law 51A clearances.

i. Curved track – Platform shall be designed with horizontal clearances to accommodate curvature and superelevation for non-tangent tracks.

2. Obstructions on platform - All platforms shall maintain a 6'-0" clearance from platform edge to any permanent platform obstruction, per FTA ADA, section 37.42

E. Platform extensions – Design Builder shall provide extensions off the rear (non-track side) of the platform as indicated for, but not limited to; platform shelters, gangway storage, stair landings, ADA ramp landings, elevator lobbies, and any connection required for customer or LIRR employee access.

1. Design-builder shall provide guardrails at all platform extensions when required to meet code requirements.

2. Guardrails shall be maintained continuous with the back of platform guardrail.

3.12.4.3.5 Platform Surface

The Design-Builder shall provide surface of all Platforms to be non-skid and of durable, weather-resistant materials. The platform surface shall be uniform in appearance and vandal resistant.

A. Where Platforms are contiguous with sidewalks, the Platform shall be differentiated from the sidewalk by the use of material, color, or texture.

B. Platform surfaces shall drain adequately to prevent hazardous ponding and ice conditions.

C. Transverse Platform slope – Minimum transverse slope of the platform deck shall be 1/8 inch per foot of width. Side platforms shall pitch away from the track structure.

D. Longitudinal Platform Slope - Longitudinal slope of platforms shall match that of the track. In addition, platform geometry shall match the track profile.

E. The Design Builder shall apply a breathable Silane based water repellent sealer to all surfaces. Sealer shall be clear and not alter the natural appearance of the platform.

F. At Mineola Station, provide sufficient drainage to prevent runoff towards the existing station building. At Mineola Station, where the Platform is contiguous with sidewalks, the Platform shall be differentiated from the sidewalk by the use of material, color, or texture.

3.12.4.3.6 Boarding Platform Joints

The Design-Builder shall provide platform joint sealant / filler resistant to weather, deicing chemicals, severe environmental conditions, UV degradation, and heavy duty traffic conditions conforming to the following design requirements.

A. General platform joints (less than [redacted] wide) – One part polyurethane Elastomeric sealant

1. The Design-Builder shall provide closed cell backer rod at all applications.

2. Depth of sealant - [redacted].

B. Expansion Joints (greater than [redacted] wide) – Heavy duty, pre-molded, adhered, bridge and highway joint seal

1. Mechanical fastening is not acceptable.

3.12.4.3.7 Automated Snow Melt System

A. The Design-Builder shall provide piping within station platforms for a hydronic heated snow and ice melting system cast monolithically into the top of the platform slab conforming to the following design requirements (partial system).

1. The Design-Builder shall provide full length coverage for all station boarding platforms.
2. The Design-Builder shall provide a clear area at the rear (non-track) edge of the platform, without hydronic heating system elements that is designated for future installation / anchoring of platform furnishings, and accouterments.
3. The installation /anchoring of platform furnishings and accouterments shall not be permitted in non-designated areas to avoid damage of the heating system. Field drilling and or fastening is prohibited.
4. See TP3.13 STATION MEP AND VERTICAL TRANSPORTATION for system requirements.
5. The Design-Builder shall provide a continuous chase for the snow melt system main feeds mounted to the underside of both the eastbound and westbound boarding platforms directly adjacent to the under platform conduit chase for the full length of the platform. Heating feeds shall be fully supported by the under platform unistrut system.

3.12.4.3.8 Detectable Warning Surface Tiles

A. The Design-Builder shall provide a [redacted] wide detectable warning system at the platform edge running the full length of the public use area of the platform conforming to the following design requirements.

B. The Design-Builder shall provide a [redacted] gap between the platform edge (track side) and the start of the detectable system. See LIRR SDG figure 5.2 for reference.

C. Detectable warning system shall meet ADA requirements. The field between the domes and the tops of the domes shall meet the coefficient of friction requirements for walking surfaces.

D. Detectable waring tiles shall be properly attached to the deck; cast in place or adhered to fully cured concrete. Final installation shall be designed to prevent infiltration of water. Drilled Mechanical anchor systems are not acceptable.

1. Adhesive: As recommended by tile manufacturer.
2. Sealant: As recommended by tile manufacture.

E. Detectable tiles shall be replaceable.

F. Detectable tiles shall be tamper resistant.

G. Tactile strips shall not span expansion joints.

H. Manufacturer Basis of design – ADA solutions Inc.

1. Material – Heavy duty Composite homogeneous glass and carbon reinforced polyester base sheet molding compound.
2. Color – [redacted]
3. Tile Size - [redacted]

3.12.4.3.8.1 Watch the Gap

A. The Design-Builder shall provide thermoplastic sign stating “WATCH THE GAP” affixed to the concrete boarding platform.
   1. Type – Thermoplastic, heated to affix
   2. Height – [redacted].
   3. Color
      i. Font Color – Black.
      ii. Field - Yellow
   4. Font – Helvetica Medium.
   5. Location
      i. Locate lettering at all train door locations when train is parked at the station for loading and unloading of customers.
      ii. Provide a [redacted] gap between the detectable warning surface tiles and the nearest edge of the sign.
      iii. Sign shall not span platform expansion joints.

3.12.4.3.9 Platform edge rub board

The Design-Builder shall provide platform edge rub board the full length of each boarding platform conforming to the following design requirements.

A. Top edge of rub board shall be flush with the finished platform surface.
B. The face edge of the rub board shall be cross hatched.
C. Stainless steel threaded inserts shall be cast monolithically into the platform slab for fastening of the edge board to the platform edge.
   1. The Design-Builder shall provide an additional 10% spare threaded inserts monolithically into the platform slab for future use by LIRR.
D. Material – high density flame retardant polyethylene.
   1. Basis of design - Ultra Poly AR819-FR UHMW-PE.
E. Color – Red.
F. Size – [redacted]
G. Hardware – Per LIRR standard drawing.
H. Boards shall never span across platform joints.
I. At platform ends edge rub boards shall taper for a running length of 1 foot from a dimension of [redacted] to a dimension of [redacted]” to the platform edge.

3.12.4.3.10 Under Platform Areas

All under platform areas shall be graded, cleared of debris, covered with ballast and a heavy duty protective weed barrier, and fenced or closed with precast panels conforming to the following design requirements:

A. The Design-Builder shall provide under platform fencing along the rear (non-track) edge of all boarding platforms where open areas occur that would permit a person to gain access beneath the platform with the exception of New Hyde Park and Carle Place station platforms.
    1. New Hyde Park and Carle Place station shall have lightweight removable panels.

B. Fencing is not required for open areas with a vertical distance of less than [redacted]" from the bottom of the platform edge to grade.
    1. Fencing shall be expanded rigid metal panel.
        a. Fence framing – galvanized steel, with powder coated finish.
            i. Color Black.
        b. Fence fabric – galvanized steel expanded rigid metal panel, with powder coated finish.
            i. Color – Black.
            ii. Pattern – [redacted] SWD, flattened.
    2. Fencing shall be securely fastened and tamper resistant.
    3. Fencing shall be able to withstand wind, snow and live loads as required by code.
    4. Fencing shall be designed to be located within the limits below the platform anchored to the platform structure. Fencing shall not be located outside the limits of the platform.
    5. Fencing shall not be fastened to the platform slab.

C. Weed protection shall be provided from under platform to the limits of the ROW, See TP3.11 LANDSCAPING AND AESTHETICS for weed protection requirements.

D. Platform slabs to have galvanized Unistrut cast into bottom of slabs for utility attachments.
    1. Unistrut system shall be designed to accommodate the weight and size of all utility loads including, but not limited to; electrical chase and snow melt system chase.

E. Removable panels:
    1. Panels shall be made from durable abuse resistant materials meeting the fire rating requirements of LIRR.
    2. Panels shall be provided from grade to the underside of the station platform for the entire length of the platform with the exception of areas with a vertical distance of less than [redacted]" from the bottom of the platform edge to grade.
    3. Panels shall be fastened to a structural framing system that is integral with the station platforms.
        i. All fasteners shall be stainless steel and tamper resistant, but easily accessible for removal by LIRR from both sides of the panel.

3.12.4.3.11 Employee Access Ladder

The Design-Builder shall provide an employee access ladder at each end of station boarding platforms (two per platform) complying with building code and OSHA requirements and conforming to the following design requirements.

A. Boarding platforms that are provided with end of platform stair or ramp access, to comply with means of egress requirements, do not require an employee access ladder.

B. The Design-Builder shall provide a self-closing lockable swing gate at platform level with warning signage as indicated in the MTA Sign Manual. See LIRR SDG figure 6.10.

C. Construction.

1. Clear Width – [redacted]".
2. Treads –
   i. [redacted] maximum.
   ii. Evenly spaced flat treads with slip resistant surface.
3. Riser height – [redacted] maximum.
4. Handrail – Continuous from bottom riser to [redacted]" above the top of platform.
5. Material – Clear anodized aluminum.
6. Hardware – Stainless steel.

D. Stainless steel threaded inserts shall be cast monolithically into the platform slab for fastening.

E. See LIRR standard reference drawings.

3.12.4.4 Temporary Boarding Platforms

The Design-Builder shall provide temporary removable boarding platforms and accessory items to maintain continued station operation throughout construction, conforming to the following design requirements:

A. Temporary platforms shall be constructed in place of demolished existing platforms while the permanent platforms are constructed.

B. Temporary platforms shall be designed, assembled, and erected for their eventual removal.

C. The decking shall be panelized to allow for access during construction.

D. Temporary platform dimensions and clearances shall match that of permanent platforms. See permanent boarding platform for requirements.

E. All temporary platforms shall contain "WATCH THE GAP" signs along the track-side edge and a continuous tactile warning strip. See permanent boarding platform section for accessory item requirements.

F. All temporary platforms shall be provided with a platform edge rub board. See permanent boarding platform section for accessory item requirements.

G. All temporary platforms shall be skid resistant.

H. The grade and cross-slope (peaked at center) of the platform shall match the demolished platform at each specific location.

I. Material.

1. Timber framing and marine grade plywood decking. All timber for joists and beams shall be Douglas fir-larch select structural grade or an approved equal.
2. All lumber and wood products shall be fire retardant for exterior use. Plywood deck shall be treated with fire retardant.
3. The in-place deck shall be provided with a non-skid surface equivalent to Ultra Tuff [redacted] Non-Skid Flexible Rubberized Coating, or approved equal.

J. All temporary platforms shall be provided with stair and ADA ramps access constructed of materials similar to the temporary platform.

K. All temporary platforms shall be provided with temporary lighting to meet the same requirements as for permanent platforms.

L. All temporary platforms shall be provided with temporary signage including wayfinding and informational.

3.12.4.4.1 Temporary Guardrails and Handrails

The Design-Builder shall provide temporary guardrails and handrails complying with state code and ADA code requirements at all temporary boarding platforms, stairs and ADA ramps.

A. Guardrail material – wood, fire retardant.

B. Handrail - clear anodized aluminum.

3.12.4.4.2 Temporary Platform Shelters

The Design-Builder shall provide temporary pre-fabricated platform shelters at all temporary boarding platforms.

A. Temporary platform shelters shall meet all clearance requirements set forth in this document.

B. Temporary pre-fabricated platform shelter sheds shall be fastened to the temporary platform.

C. Temporary shelters are permitted to be re-used during construction phase for multiple stations. Temporary shelters are not permitted to be used as a final installed element at the stations.

D. Quantity

1. (1) One on the eastbound platform.
2. (2) Two on the westbound platform.
3. Size

[redacted]

[redacted]

[redacted]”.

4. Material

i. Framing - Clear anodized aluminum.

ii. Solid panels – [redacted] thick Composite panel with smooth clear anodized aluminum on each face of panel.

iii. Glazing – [redacted] thick (minimum) clear, tempered safety glazing.

iv. Roof – Aluminum standing seam.

v. Gutter – aluminum.

vi. Downspout – aluminum, drain to ballast.

3.12.4.5 Platform Canopy

The Design-Builder shall provide platform canopies in the locations, configurations, and quantities at all stations conforming to the following design requirements.

A. The Design-Builder shall provide Shed type canopies at all side platforms.

B. Length – Design-Builder shall design canopies to not less than 510 ft. in length for westbound platforms and 255 ft. in length for eastbound platforms.

1. Mineola station is designated as a hub station, which requires both the eastbound and westbound canopies to be 510 ft. in length.

C. Height – The bottom of roof structure shall not be lower than 9’-0” from the top of platform.

D. Width – the canopy shall extend from the rear face of the canopy column to the track edge horizontal clearance.

E. Horizontal Clearance

1. Canopy - See CE-1 Minimum Railway Clearances and NY State RRD law 51A clearances.

2. Maintain a minimum of 8’-6” clear from the centerline of track.

3.12.4.5.1 Canopy Structure

The Design-Builder shall provide canopies constructed from galvanized steel conforming to the following design requirements:

A. Canopy shall comply with all NYS building code requirements for structural loading.

B. Canopy Columns shall be located at the rear (non-track) side of the boarding platform.

1. Columns shall be mounted on independent concrete piers with sloped tops to allow for water runoff.

2. Column bases shall be covered to protect anchor bolts.

C. Canopy shall support guardrails, signage, windscreens, advertising, lighting, roof drainage, CCTV cameras, public address systems, and communications systems.

D. Canopy structure shall be “T” shaped; tube steel and WF are not permitted.

E. Canopy columns shall be enclosed with a brick surround from grade to the canopy structure above, in accordance with TPA3.12A RENDERINGS.

1. Brick color – In accordance with TPA3.12A RENDERINGS.

F. Color – In accordance with TPA3.12A RENDERINGS.

3.12.4.5.2 Conduit installation / Conduit Chases

The Design-Builder shall conceal all conduits within the canopy structure and provided chases both above and below the boarding platforms.

A. The Design-Builder shall provide a continuous conduit chase spanning column to column, mounted to the canopy structure columns and platform light posts, see conduit locations figure below
    1. Material – Aluminum.
    2. Minimum Size – [redacted]
    3. Color – Clear anodized.
B. The Design-Builder shall provide sloped bird deterrent on the top portion of the Chase
    1. Material – aluminum.
    2. Minimum slope - [redacted].
    3. Color – prefinished, NYS Royal Blue.
C. The Design-Builder shall provide an enclosure on both sides of the rear facing portion of the structural "T" canopy column, see conduit locations figure below.
    1. Enclosure shall be removable for future access.
        i. The Design-Builder shall provide tamper resistant fasteners.
    2. Material – match canopy structure.
    3. Color – unfinished, clear coat.
D. The Design-Builder shall provide a continuous conduit chase mounted to the underside of both the eastbound and westbound boarding platforms directly adjacent to the snow melt system piping for the full length of the platform. Conduit chase shall provide sufficient space below the platform for the installation of the snow melt system chase.
E. See structural section for limitation on drilling of the structural components for installation of concealed conduit.

3.12.4.5.3 Platform Signage band

The Design-Builder shall provide a signage mounting band on the front (track side) face of the conduit chase for installation of static signage, wayfinding signage, advertising, accent lighting, AVPS, digital displays, and MTA / LIRR logo branding.

A. Material – Brushed aluminum.
B. Size – [redacted]
C. Signage band shall be welded to the conduit chase or mechanically fastened with a concealed fastening system. Welds shall be ground smooth. Fastening system shall not impeded the installation of conduit within the conduit chase behind the signage band.

3.12.4.5.4 Canopy Roof

The Design-Builder shall provide a weathertight structural roofing system covering the entire length of canopy structure conforming to the following design requirements:

A. Roofing system shall include; structural standing seam metal panels, flashing, gutters, and downspouts.
B. Roofing Panels –
    1. Material – Prefinished aluminum standing seam panels.
    2. Color

a. Top – as selected by LIRR.

b. Underside – as selected by LIRR.

C. Slope - Roofing shall be sloped a minimum of 1/8" per foot, or recommended by roofing system manufacturer towards the rear (non-track) edge of the platform terminating at the gutter system.

D. Flashing – Flashing shall be constructed of prefinished durable materials designed to be compatible with the selected roofing system.

1. Material - Prefinished aluminum.
2. Color – In accordance with TPA3.12A RENDERINGS.

E. Gutters – Gutters shall be constructed of prefinished durable commercial grade materials designed to meet plumbing code requirements for storm water collection.

1. Material - Prefinished aluminum.
2. Minimum Size - [redacted]".
3. Style – A or D.
4. Color - In accordance with TPA3.12A RENDERINGS.

F. Downspouts – shall be constructed of prefinished durable commercial grade materials designed to meet plumbing code requirements for storm water collection and distribution.

1. Downspouts shall be located only where a canopy column occurs and at intervals that maintain a low gutter pitch per plumbing code requirements.
2. Minimum Size – [redacted]" diameter.
3. Downspouts higher than [redacted]" above grade shall be fabricated from clear anodized aluminum.
4. Downspouts within [redacted] of grade in areas accessible to the public shall be heavy duty and designed to withstand damaged from customers. Acceptable materials include Cast iron and schedule 80 PVC which shall be painted to match the prefinished downspouts.
5. Downspouts shall drain to ballast.
6. Color - In accordance with TPA3.12A RENDERINGS.

3.12.4.5.5 Bird deterrent

The Design-Builder shall provide a canopy design which is "bird unfriendly". Areas within the canopy that cannot be designed to prevent bird roosting shall be provided with a bird deterrent system. See dedicated section within this chapter for bird deterrent system requirements.

3.12.4.6 Elevator Towers

The Design-Builder shall provide elevators with enclosures at the following locations conforming to the following design requirements:

A. Floral Park Station

1. (3) Three elevator towers with APTA grade ADA compliant elevators and enclosures; one at the existing island platform and the remaining each at the two side platforms.

2. The existing freight elevator and enclosure shall be removed at the island platform and the existing opening in the platform utilized for the replacement elevator.
3. Elevator towers provided at the side platforms shall be located directly north and south of the island platform elevator.
4. Elevator towers shall be constructed with the maximum extent of glazing.

B. Merillon Station

1. (2) Two elevator towers with APTA grade ADA compliant elevators and enclosures providing access from Nassau Boulevard to grade elevation, adjacent to the eastbound and westbound platforms.
2. See TPA3.12A RENDERINGS, for aesthetics.

C. See TP3.13 STATION MEP AND VERTICAL TRANSPORTATION for elevator requirements.

1. See provision 3.12.4.22.3 for elevator machine room requirements.
2. Elevator machine rooms shall be provided directly adjacent to the elevators and located as follows:
    a. Floral Park – At grade.
    b. Merillon - Access from the Nassau Boulevard sidewalk.
3. See provision 3.12.4.7.3 for glazing requirements.
4. The Design-Builder shall provide CCTV and Help Point Stations in accordance with the requirements set in TP3.20 COMMUNICATIONS and TP3.21 SECURITY SYSTEMS.
5. Hoistway enclosures and machine rooms shall be fully enclosed and weathertight.
6. Hoistway enclosures and machine rooms shall be fire and vandal resistant.
7. The Design-Builder shall provide (2) two sets of stairs from grade at platform to Nassau Boulevard adjacent to the elevator towers on both the north and south sides of the track.

3.12.4.7 Pedestrian Overpass

The Design-Builder shall provide pedestrian overpasses spanning three tracks and platforms at the following locations conforming to the following design requirements:

A. Mineola Station:

1. (1) One pedestrian bridge located adjacent to the existing station building to replace the existing overpass in place. For coordination purposes with TP3.13 STATION MEP AND VERTICAL TRANSPORTATION this overpass shall be designated as “Station Plaza”.
2. (1) One pedestrian bridge located on the west side of Main Street. For coordination purposes with TP3.13 STATION MEP AND VERTICAL TRANSPORTATION this overpass shall be designated as “Main Street”.

3. (1) One pedestrian bridge located at Willis Avenue. For coordination purposes with TP3.13 STATION MEP AND VERTICAL TRANSPORTATION this overpass shall be designated as “Willis Street”.

B. Carle Place Station:

1. (1) One pedestrian bridge aligned with the center of Stonehinge Street. For coordination purposes with TP3.13 STATION MEP AND VERTICAL TRANSPORTATION this overpass shall be designated as “Stonehinge”.

C. Westbury Station

1. (1) One pedestrian bridge located at the parking structure located in the parking lot on the south side of the station. For coordination purposes with TP3.13 STATION MEP AND VERTICAL TRANSPORTATION this overpass shall be designated as “Parking Structure”.

a. The overpass shall provide access to grade, all levels within the parking garage, the passenger platforms, and overpass levels.

2. (1) One pedestrian bridge located at the east end of the platform to provide emergency egress from the eastbound platform. For coordination purposes with TP3.13 STATION MEP AND VERTICAL TRANSPORTATION this overpass shall be designated as “East End”.

3.12.4.7.1 General requirements

A. Overpass shall include; overpass, elevator hoistway, support / utility spaces, and stairs.

B. The Design-Builder shall provide a minimum of (2) two elevators one at each end of the overpass unless noted otherwise. See TP3.13 STATION MEP AND VERTICAL TRANSPORTATION for which overpasses receive and do not receive elevators, elevator quantities, and elevator requirements.

C. The Design-Builder shall provide CCTV and Help Point Stations in accordance with the requirements set in TP3.20 COMMUNICATIONS and TP3.21 SECURITY SYSTEMS.

D. Overpass shall be fully enclosed and weathertight.

1. Provide doors at all stair tower entries.

E. Overpass shall be fire and vandal resistant.

F. Overpass tower shall connect to the back (non-track side) of all station platforms, unless noted otherwise.

G. The Design-Builder shall provide CCTV cameras in accordance with the requirements set out in TP3.21 SECURITY SYSTEMS.

H. Overpass stair and elevator towers at all stations shall be comprised of the following materials that match the aesthetic representation in accordance with the requirements shown in TPA3.12A RENDERINGS, and as approved by LIRR.

1. Standing Seam Roof:

a. Color: Gray.

2. Windows:

a. Glazing – clear

b. Frame and mullions - NYS Royal Blue.

3.12.4.7.2 Overpass dimensions

A. Vertical Clearance – [redacted]" from the top of rail to bottom of overpass, See CE-1, Minimum Railway Clearances and NY State RRD law 51A clearances.

B. Minimum interior dimensions

1. Width – [redacted]" clear.
2. Height – [redacted]" clear.

C. Minimum length – as required to provide uninterrupted eastbound and westbound station access while adhering to all Railroad clearance requirements. Span over three tracks and (2) two platforms.

3.12.4.7.3 Glazing

The Design-Builder shall provide glazing to the maximum extent possible to provide customer visibility and security conforming to the following design requirements:

A. Glazing shall be provided at the overpass, elevator hoistways, and stairs.

1. Glazing shall not be installed at utility / support spaces.

B. Glazing shall be [redacted]" (minimum) tempered, laminated safety glazing, Low-E complying with NYS building codes.

C. Glazing framing shall be clear anodized aluminum.

D. Glazing at the overpass shall be operable to permit LIRR staff to clean the exterior.

E. Gasket shall be Black PVC Dry-set.

F. Fasteners shall be tamper proof.

3.12.4.7.4 Exterior Insulated wall panels

The Design-Builder shall provide a weathertight exterior wall panel system where glazing is not provided conforming to the following design requirements:

A. Panels shall be designed to be durable and require low maintenance.

B. Exterior skin

1. Material - Steel.
2. Color – gray. As selected from manufacturer's standard selection as approved by LIRR.
3. Coating system – 3 coat (primer, color, and clear) polyvinylidene fluoride (PVDF) system.

C. All panels shall have a minimum R-value of 14.

D. All Fasteners shall be concealed.

E. Raised batten type molding covers at seams are not permitted.

F. Caulked and recessed reveal moldings are permitted.

G. Manufacturers.

1. Centria.

2. Or approved equal.

3.12.4.7.5 Louvers

The Design-Builder shall provide louvers at the exterior wall of the overpass conforming to the following design requirements:

A. Louvers shall prevent wind driven rain.

B. Louver blades shall be extruded, stationary, and drainable.

C. Louvers shall provide free flow of air through the overpass space.

D. Design Builder shall provide insect screens on all louvers.

E. Material.

1. Prefinished Aluminum.
2. Color – In accordance with TPA3.12A RENDERINGS.

3.12.4.7.6 Roof Access

The Design-Builder shall provide roof access from the interior of the overpass to the roof above conforming to the following design requirements:

A. Size – minimum [redacted]

B. Vandal resistant and lockable from the interior.

C. Fall protection system shall be initiated before full roof access is gained through the access hatch. Personnel shall not be permitted to access the roof area until the fall protection system is active.

3.12.4.7.7 Roof

The Design-Builder shall provide a weathertight roofing system covering the entire length of the pedestrian overpass, access stairs, and utility support spaces conforming to the following design requirements:

A. Roofing system shall include; roofing panels, flashing, gutters, and downspouts.

B. Design-Builder shall provide flat roofs over the main overpass structure, elevator hoistway. Utility spaces and access stairs.

1. Covered stairs shall maintain a minimum vertical clearance of 7’-6” from the top of tread to the lowest portion of the roof structure.

C. Flat Roof

1. Material – Fiberglass reinforced translucent panels.
2. Minimum Slope - Roofing shall be sloped a minimum of 1/8” per foot, or recommended by roofing system manufacturer sloped towards the roof edge.

D. Flashing –shall be constructed of prefinished durable materials designed to be compatible with the selected roofing system.

G. Gutters –shall be constructed of prefinished durable commercial grade materials designed to meet plumbing code requirements for storm water collection.

1. Material - Clear anodized aluminum.
2. Minimum Size – [redacted].

3. Provide gutters over the full width of the boarding platform as following:
    a. Do not provide gutters over track areas between platforms, water is permitted to drain directly to ballast.

H. Downspouts – shall be constructed of prefinished durable commercial grade materials designed to meet plumbing code requirements for storm water collection and distribution.
    1. Downspouts shall be located in corners or hidden within structural steel.
    2. Minimum Size – [redacted] diameter.
    3. Downspouts higher than [redacted]" above grade shall be fabricated from clear anodized aluminum.
    4. Downspouts within [redacted]" of grade in areas accessible to the public shall be heavy duty and designed to withstand damaged from customers. Acceptable materials include Cast iron and schedule 80 PVC which shall be painted to match the prefinished downspouts.
    5. Color - In accordance with TPA3.12A RENDERINGS.

3.12.4.7.8 Overpass Stairs

A. Design-builder shall provide (2) two stairs per pedestrian overpass conforming to the following design requirements.

B. Stair Width.
    1. Overpass stairs shall be a minimum of 68" clear to any element, with the exception of handrails which are permitted overhang the stair clearance per NYSBC.

C. Cast aluminum tread and risers - Stair tread, nose and riser shall be constructed as one piece structural units.
    1. Material – cast aluminum.
    2. Tread depth – minimum [redacted]" including nosing (NYS Building Code).
    3. Tread surface – cross hatched abrasive surface.
    4. Riser height – maximum [redacted]" (NYS Building Code).

D. Stair stringers shall be constructed with anodized aluminum.
    1. Color – NYS Royal Blue.

E. Mounting Hardware shall be stainless steel, vandal resistant and tamper proof.

F. Open spaces below stairs shall be enclosed to prevent vagrancy, code issues, and eliminate security concerns.

3.12.4.7.9 Bird deterrent

The Design-Builder shall provide an overpass design which is "bird unfriendly". Areas within the canopy that cannot be designed to prevent bird roosting shall be provided with a bird deterrent system. See dedicated section within this chapter for bird deterrent system requirements

3.12.4.8 Pedestrian Underpass

The Design-Builder shall provide pedestrian underpasses spanning three tracks and platforms with ramps and staircases as identified in the Directive Drawings, which shall follow guidelines of

NYSDOT HDM Chapter 18 at the following locations conforming to the following design requirements:

A. New Hyde Park Station

   1. (1) One pedestrian underpass located west of the S. 12th street grade crossing closure.

B. The minimum width of the underpass shall be [redacted] feet.

C. The minimum height of the underpass shall be [redacted] feet.

D. The longitudinal grade of the underpass shall be flat.

E. The minimum cover of the underpass from the ground surface to the top of the roof slab shall be [redacted]

F. The minimum width of the pedestrian ramps shall be [redacted].

G. The cross slope of the underpass shall not exceed [redacted]%.

H. Stairs shall be 8 feet wide on the north side of the tracks and [redacted] wide on the south side of the tracks.

I. Pedestrian ramps and stairs shall be covered with a canopy. Style shall match rail station platform and canopy.

J. Pedestrian underpasses shall allow clear and direct travel between the platforms and station site in an environment that is as pleasant.

K. Pedestrian underpasses shall be well lit.

2. Light fixtures shall use LED bulbs, be vandal resistant to prevent tampering, have a [redacted]-candle minimum, and comply with the security lighting requirements.

3. Emergency lighting shall be provided as per the Building and Fire Codes of New York State.

L. Pedestrian Underpasses shall contain security surveillance and emergency communications including a minimum of (2) two Help Point Stations.

M. Mirrors shall be provided at corners and access points.

N. Floors shall be equipped with an appropriate drainage and pump system to prevent flooding.

O. Underpasses shall have a positive drainage system to floor drains.

P. Pedestrian underpasses shall be designed and constructed as per the latest state codes, AREMA, ADAAG, ACI and all applicable industry standards.

Q. The floor surface shall be a concrete slab.

1. The surface shall be slip resistant and water resistant.

R. All light fixtures, Mirrors, signage, and any other furnishings shall be vandal resistant.

S. Provide CCTV cameras in accordance with the requirements set out in TP3.21 SECURITY SYSTEMS.

T. When an underpass is closed, access may be necessary for maintenance purposes.

1. A high security doorway with institutional grade hardware should be provided.

2. Walls that seal the underpass should be reinforced to deter vandalism and unauthorized entry.

3.12.4.9 Platform stairs

A. The Design-Builder shall provide a minimum of (4) four stairs per platform per NYS code conforming to the following design requirements:

1. The maximum travel distance to a point of egress (NYSBC, section 10, table 1017.2) is 200 ft.

2. Platform stairs shall be a minimum of 60” clear to any element, with the exception of handrails which are permitted overhang the stair clearance per NYSBC.

3. Material – stairs shall be constructed from pre-cast reinforced or cast in place concrete. In addition, they shall utilize high quality, low maintenance materials and ensure life cycle optimization through the selection of new and innovative technologies and products.

4. Tread depth – minimum 12” including nosing (NYS Building Code).

5. Tread surface – cast aluminum cross hatched abrasive surface cast into the concrete surface.

6. Riser height – maximum 7” (NYS Building Code).

B. Mounting Hardware shall be stainless steel, vandal resistant and tamper proof.

C. Open spaces below stairs shall be enclosed to prevent vagrancy, code issues, and eliminate security concerns.

    1. Platform stairs shall be fenced per under platform fencing requirements unless not feasible due to stair location and construction.

D. Stairs shall be provided with guardrails and handrails as required by code. Guardrails and handrails shall maintain continuity and design of the platform guardrails and handrails.

E. Stainless steel threaded inserts shall be cast monolithically into the stair for fastening of guardrails and handrails

3.12.4.9.1 (Not Used)

3.12.4.10 Platform Ramps

The Design-Builder shall provide a minimum of (2) two ADA compliant ramps at each platform, per NYS Building code accessibility requirements.

A. Ramp locations shall be coordinated with accessible parking spaces, other transit links (e.g., bus stops), TVMs, and at-grade crossings to form part of the station's accessible route to the platforms.

B. Ramps shall be constructed from pre-cast reinforced or cast in place concrete slabs. In addition, they shall utilize high quality, low maintenance materials and ensure life cycle optimization through the selection of new and innovative technologies and products.

C. Ramps shall comply with all ADA requirements.

D. Ramps shall be provided with guardrails and handrails as required by code. Guardrails and handrails shall maintain continuity and design of the platform guardrails and handrails.

E. Stainless steel threaded inserts shall be cast monolithically into the ramp for fastening of guardrails and handrails

3.12.4.10.1 (Not Used)

3.12.4.11 Pedestrian Walkways

The Design-Builder shall provide pedestrian walkways conforming to the following design requirements:

A. All walkways shall be a minimum of 4 feet wide.

B. All walkway surfaces shall be slip resistant meeting code requirements.

C. All walkways shall be designed to meet ADA requirements for slope.

D. All walkways shall be cast in place concrete.

    1. Pavers are not an acceptable walkway material.

3.12.4.11.1 Pedestrian Walkway Canopy

The Design-Builder shall provide walkway canopies in the locations, configurations, and quantities at all stations conforming to the following design requirements.

A. The Design-Builder shall provide flat type canopies at all walkways, unless indicated otherwise.

B. Length – Design-Builder shall design canopies for the full length of walkways that provide an emergency egress path from the boarding platform.

C. Height – The bottom of roof structure shall not be lower than 9’-0” from the top of the walkway.

D. Width – the canopy shall extend a minimum of the full width of the walkway below.

E. Structure.

1. Material – Galvanized steel.
2. Type – Tube steel.
3. Color – Clear coat.

F. Horizontal Clearance

1. Maintain a minimum of 8’-6” clear from the centerline of track.

G. Roof Material – Fiberglass reinforced translucent panels.

1. Minimum Slope - Roofing shall be sloped a minimum of 1/8” per foot, or recommended by roofing system manufacturer sloped towards the roof edge.

H. Flashing –shall be constructed of prefinished durable materials designed to be compatible with the selected roofing system.

I. Gutters –shall be constructed of prefinished durable commercial grade materials designed to meet plumbing code requirements for storm water collection.

1. Material - Clear anodized aluminum.
2. Minimum Size – [redacted]”.
3. Do not provide gutters over track areas, water is permitted to drain directly to ballast.

I. Downspouts – shall be constructed of prefinished durable commercial grade materials designed to meet plumbing code requirements for storm water collection and distribution.

1. Downspouts shall be located in corners or hidden within structural steel
2. Minimum Size – [redacted]” diameter.
3. Downspouts higher than [redacted] above grade shall be fabricated from clear anodized aluminum.
4. Downspouts within [redacted]” of grade in areas accessible to the public shall be heavy duty and designed to withstand damaged from customers. Acceptable materials include Cast iron and schedule 80 PVC which shall be painted to match the prefinished downspouts.

3.12.4.12 Fall protection

The Design-Builder shall provide OSHA compliant fall protection on all platform canopies, platform shelters, and pedestrian overpass roofs meeting the following design requirements.

A. Personal fall arrest systems are permitted, guardrails and safety net systems are not permitted.

B. The Design-Builder shall provide fall protection system at roof all access points.

C. Fall protection system shall extend the full length of all canopies and roofs.

D. Fall protection system shall be anchored to the canopy and/or roof structure. The fall protection system shall not be anchored to the roofing system.

E. Fall protection system shall adherer to OSHA requirements for pounds of force at anchor points.

3.12.4.13 Guardrails and Handrails

The Design-Builder shall provide guardrails at rear platform edges, platform ends, ADA ramps, stairs and any location required per height requirements of the building code. Design-Builder shall provide handrails at all stairs, ADA ramps, pedestrian overpass interiors, and pedestrian underpass interiors.

A. General

1. Guardrails and handrails shall be corrosion resistant.
2. Components shall be standardized and prefabricated where possible.
3. All rigid connections shall be sleeveless, welded, and ground smooth.
4. Tamper resistant hardware shall be used.
5. All railing assemblies in electrical territory shall be grounded to prevent electrocution.

B. Guardrail Design

1. Railings shall be a minimum of 42 inches above surfaces.
2. The railing design shall be uniform along the entire platform length.
3. Guardrails shall securely anchored to the canopy structure and span between columns. No portion of the guardrail shall be affixed to the station platform
4. Guardrails shall meet NYS code or the following loading requirements, whichever is more stringent.

i. Top Rails of Guards:

a. Uniform continuous load of 100 pounds per foot applied horizontally.
b. Uniform continuous load of 60 pounds per foot applied horizontally and concurrently with uniform continuous load of 100 pounds per foot applied vertically.
c. Concentrated load of 365 pounds applied in any direction.
d. Uniform and concentrated loads need not be assumed to act concurrently, unless noted.

ii. Infill of Guards:

a. Concentrated load of 365 pounds applied horizontally on an area of 1 square foot.
b. Uniform continuous load of 60 pounds per square foot applied horizontally.
c. Concentrated and uniform loads need not be assumed to act concurrently.

iii. Vertical Post:

a. Concentrated load of 365 pounds applied in any direction.

b. Uniform continuous load of 60 pounds per square foot applied horizontally on infill panel and concurrently with uniform continuous load of 100 pounds per foot applied vertically on top railing.

5. Balusters (infill) shall be oriented horizontally.
6. Guardrail finishes.
    i. All components shall be
        a. Material – Hot dipped galvanized Steel
        b. Finish – Kynar 500 finish
        c. Color – As selected by LIRR

C. Handrail Design

1. Minimum of 34 inches, and a maximum of 38 inches, measured from top of handrail to stair tread or ramp surface, in accordance with ADA requirements.
2. Handrails shall meet NYS code or the following loading requirements, whichever is more stringent.
    i. Uniform continuous load of 100 pounds per foot applied in any direction.
    ii. Concentrated load of 365 pounds applied in any direction.
    iii. Uniform and concentrated loads need not be assumed to act concurrently.
3. Handrails shall be continuous on stairways, ramps or at other locations as required by ADA.
4. Handrail ends shall be either rounded or returned smoothly to floor, wall or post leaving no open ends.
5. Handrail design shall not interfere with glass replacements in stairways or overpasses.
6. Handrails shall be corrosion resistant Stainless steel.
    i. Type – 316.
    ii. Finish – No. 7.

3.12.4.14 Bird Deterrent system

The Design-Builder shall provide a bird deterrent system in all locations where birds will have sufficient space to roost, conforming to the following design requirements:

A. Electrified netting.

B. Electrified wire.

C. Anchorage hardware shall be stainless steel and tamper resistant.

D. Manufacturer – Bird-B-Gone.

1. Bird Wire 2000a- modular post and wire system.
2. Bird Net 2000.
3. Electrification – Bird Jolt FlatTrack – electric bird abatement system.
4. Or approved equal.

3.12.4.15 Station furnishings and accoutrements

3.12.4.15.1 Platform Shelters

The Design-Builder shall provide platform shelters conforming to the following design requirements:

A. Quantity - The Design-Builder shall provide all station platforms with shelters indicated as below, with separate requirements for Mineola Station:
   1. (1) One on the eastbound platform.
   2. (2) Two on the westbound platform.
   3. Mineola Station
      a. (2) Two on the eastbound platform.
      b. (2) Two on the westbound platform.

B. Design – The Design-Builder shall provide a (3) three sided fully glazed platform shelter.
   1. The platform canopy roof shall be utilized as the platform shelter roof. No platform shelters shall be free standing.
   2. The platform canopy columns shall be utilized as the primary structural support system for the platform shelter. Secondary support shall be aluminum glazing framing.
   3. No portion of the platform shelter shall be affixed to the station platform, with the exception of the canopy structural columns which are affixed to independent concrete piers.
   4. The Design-Builder shall provide a [redacted] gap at the bottom of the glazing to permit airflow and platform surface drainage.

C. Minimum Interior Dimensions – [redacted]0” H.

D. Location – The front edge of the platform shelter shall not be placed an closer than 6’-0” from the track side platform edge.

E. Heat – All shelters shall be provided with infrared heating units.
   1. Heating shall be provided throughout the entire shelter area.
   2. Units shall be exterior and industrial grade.
   3. Units shall be mounted to the underside of the roof canopy above the shelter.
   4. Heating shall be initiated by customers pressing a button within the shelter. The heat shall remain on for (5) five minutes before automatically shutting off. Button shall be designed with the function of being depressed before it can be reactivated to prevent vagrancy.

J. Materials
   1. Glazing – clear, [redacted] (minimum) tempered laminated safety glazing complying with NYS building codes.
   2. Framing – Clear anodized aluminum.
   3. Gasket – Black PVC Dry-set.
   4. Fasteners – tamper proof.

3.12.4.15.2 Seated Benches

The Design-Builder shall provide seated benches on platforms and within platform shelters conforming to the following design requirements:

A. Quantity.

1. All station platforms except Carle Place Station and Mineola Station shall receive the following:

   (2) Two benches on the eastbound platform;

   (4) Four benches on the westbound platform; and

   (2) Two benches per platform shelter.

2. Carle Place platforms shall receive the following:

   (2) Two benches on the westbound platform;

   (2) Two benches on the eastbound platform; and

   (2) Two benches per platform shelter.

3. Mineola Station shall not receive seat benches

B. Open platform locations – See LIRR SDG, Section 6.7.

C. The Design-Builder shall provide benches following the basis of design manufacturer and model:

1. Basis of Design – Street Furniture, Concourse 4-seater w/ armrests.
2. Material – aluminum.
3. Color – two tone color palette.
   i. Panel – Sable Brilliance (textured), or color selected and approved from manufacturer standard chart by LIRR.
   ii. Frame - Palladium Silver, or color selected and approved from manufacturer standard chart by LIRR.
   iii. Anti-graffiti clear coat.

D. Benches shall be securely anchored to the canopy structure. No portion of the bench shall be affixed to the station platform.

E. Benches shall be designed to prevent vagrancy by providing armrests at each seat.

3.12.4.15.3 Standing Benches

The Design-Builder shall provide standing benches on platforms conforming to the following design requirements:

A. Quantity.

1. All station platforms except Mineola Station shall receive the following:

   (2) Two benches on the eastbound platform; and

   (4) Four benches on the westbound platform.

2. Mineola Station platform shelters shall receive:

(2) Two per platform shelter;

(4) Four benches on the eastbound platform; and

(8) Eight benches on the westbound platform.

B. The Design-Builder shall provide standing benches following the basis of design manufacturer and model:

1. Basis of the design– Street Furniture, Aero Leaning Rail.
2. Material – aluminum, clear anodized.
   a. Anti-graffiti clear coat.

C. Standing benches shall be securely anchored to the canopy structure. No portion of the standing bench shall be affixed to the station platform.

3.12.4.16 Customer Information Centers

The Design-Builder shall provide a minimum of (1) one customer information center (CIC) and timetable rack located at the primary entrance to the station/platform conforming to the following design requirements:

A. CIC boards and information racks shall be located in open areas easily located by customers and mounted as a freestanding element, unless conditions permit surface mounting to a structure.

B. CIC shall meet standard LIRR design, see figure below for examples.

C. CICs shall be constructed of clear anodized aluminum frames and posts.

D. All fasteners shall be flush, tamper proof and concealed to the greatest extent possible.

E. Map cases shall use mar-resistant polycarbonate glazing and clear anodized aluminum frames.

F. Hinges shall be continuous piano hinges. Locks shall be keyed to a common key as designated by LIRR.

G. The backing board shall be exterior grade plywood.

H. The design-builder is not responsible for Informational LIRR material contained within the CIC

I. Stainless steel threaded inserts shall be cast monolithically into the platform slab for fastening CIC's to the platform.

J. CIC shall be covered for protection from the elements.

3.12.4.16.1 Help Point communication Stations

The Design-Builder shall provide help point station conforming to the following design requirements:

A. See TP3.20 COMMUNICATIONS and TP3.21 SECURITY SYSTEMS for technical requirements.

B. The Design-Builder shall provide a minimum of (4) four Help Point Stations on each platform, eastbound and westbound, at all stations.

    A. There shall not be a distance greater than 300 feet between any device and end of station platform.

C. Manufacturer – Boyce Technologies or approved equal.

D. Help Point Station shall be securely anchored to the canopy structure. No portion of the Help Point Station shall be affixed to the station platform.

E. Help Point shall have network connectivity to the communications room.

3.12.4.16.2 Bicycle Storage

The Design-Builder shall provide bicycle racks at all stations located in close proximity to the station building and main access points conforming to the following design requirements:

A. Quantity of bicycle storage:

    1. The Design-Builder shall provide bicycle racks for a minimum of (10) ten bicycles at each station except Mineola Station.

    2. Mineola station shall be provided with bicycle racks that can store a minimum of (16) sixteen bicycles.

B. The Design-Builder shall construct bicycle storage facilities on level, hard, and well-drained surfaces adjacent to one or more Station entrances, and shall site them so as to not impede Station access, pedestrian flow, access to fare vending, or other travel modes.

C. Bicycle racks shall be standard double or single racks that allow cyclists to lock both the frame and wheels to the rack. The height of the rack shall be low enough to allow the frame and the wheel to be secured to the rack without excessive cable or chain lengths.

D. Bike racks are prohibited on Station Boarding Platforms.

E. Bike racks shall be individual post type design.

    1. Bike racks shall not serve more than (2) two bicycles.

    2. Bike racks shall be provided with an integrated light fixture.

    3. Bike racks shall be surface mounted.

F. The Design-Builder shall provide cast aluminum bike racks from the following manufacturers and models:

    1. Reeder illuminated bike rack or LIRR approved equal.

3.12.4.16.3 USB Charging station

The Design-Builder shall provide USB Charging stations on all boarding platforms conforming to the following design requirements:

A. Charging stations shall be weathertight, vandal proof, and tamper proof.

B. All station platforms except Carle Place Station shall receive the following:

   1. (6) Six charge stations on the eastbound platform.
   2. (12) Twelve charge stations on the westbound platform.

C. Carle Place Station platform shelters shall receive:

   1. (4) Four charge stations on the eastbound platform.
   2. (10) Ten charge stations on the westbound platform.

D. Charging stations shall be mounted directly to face (track side) of the canopy structure columns and platform light posts with tamper resistant fasteners.

E. The Design-Builder shall provide a minimum of (2) two charging stations at each platform shelter; eastbound and westbound platforms.

F. Quantity - Each USB charging station shall contain a minimum of (2) two USB charging ports.

G. Basis of design – Legrand outdoor charging station.

3.12.4.16.4 Station WIFI

The Design-Builder shall provide free WIFI connection for all customers on all boarding platforms and pedestrian overpasses conforming to the requirements set out in TP3.20 COMMUNICATIONS.

3.12.4.16.5 Interactive Digital Displays

The Design-Builder shall provide interactive digital displays on all boarding platforms and pedestrian overpasses conforming to the requirements set out in TP3.20 COMMUNICATIONS.

3.12.4.16.6 Trash Receptacles

The Design-Builder shall provide durable and vandal resistant trash receptacles at station sites and all boarding platforms conforming to the following design requirements:

A. Receptacles shall meet current safety and security requirements.

B. Receptacles shall not impede customer flow, customer egress, or obstruct station signage.

C. Trash receptacles shall be provided at all station sites to collect litter and enhance cleanliness.

   1. For customer convenience, a minimum of one receptacle shall be provided along the heaviest used routes to platforms.

D. Platform locations.

   1. The Design-Builder shall provide trash receptacles no farther apart than 250 feet on platforms.
   2. Receptacles shall be located near all major entrances, staircases, ramps, and shelters. Receptacles shall not be placed any closer than 10’-0” from these access points.

E. Materials

   1. Aluminum – powder coated gray.

2. Heavy duty plastic – clear.

F. Capacity – [redacted] gallons.

G. Quantity per Station to be equally distributed on the station platforms:

1. New Hyde Park – ([redacted]) sixteen trash receptacles.
2. Merillon – [redacted] twelve trash receptacles.
3. Mineola – [redacted] eighteen trash receptacles.
4. Carle Place – [redacted] twelve trash receptacles.
5. Westbury – [redacted]sixteen trash receptacles.

H. Trash receptacles shall be securely anchored to the canopy structure columns. No portion of the trash receptacle shall be affixed to the station platform.

1. The method of anchorage provided by the design-builder cannot be un-installed by anyone other than LIRR employees.

I. Trash receptacles shall permit LIRR employees unimpeded access to remove full trash bags and re-install new empty trash bags.

3.12.4.17 Station Fencing

The Design-Builder shall replace all decorative fencing in kind at areas impacted by construction that will not receive a retaining or sound wall as part of this Project.

3.12.4.18 Signage

3.12.4.18.1 Standard Signage

The Design-Builder shall furnish and install a complete station signage package for each station conforming to the following design requirements. The Design requirements and the specifications shall override conflicting requirements as indicated in the MTA sign manual. The following types of signage shall be furnished and installed:

A. Station markers.

B. Station identification

1. Station Identification signs (indicating station name) shall span column to column, and be mounted to the canopy structure columns and platform light posts
2. Station Identification signs shall occur every [redacted] or [redacted] for the length of the platform.
    i. Station Names
        a. New Hyde Park.
        b. Merillon Avenue.
        c. Mineola.
        d. Carle Place.
        e. Westbury.
3. Color
    i. Background – White.

ii. Text – Black.

iii. Top band – Blue.

C. Site signs.

D. Platform Signs.

E. ADA signs

1. This includes station, site, and platform signs that provide disabled customers with information that is critical to navigate the station per ADA requirements.

2. Signs shall have raised characters and braille per ADA requirements

D. All Platform signage shall be securely anchored to the signage band provided on the canopy structure, unless noted otherwise in this section. No signage shall be affixed to the station platform.

3.12.4.18.2 Temporary Signage

The Design-Builder shall furnish and install temporary signage for each station to be used during construction conforming to the following design requirements.

A. Station markers.

B. Station identification

1. Station Identification signs (indicating station name) shall span column to column, and be mounted to the canopy structure columns and platform light posts.

2. Station Identification signs shall occur every [redacted] or [redacted] lengths for the length of the platform.

i. Station Names

a. New Hyde Park.

b. Merillon Avenue.

c. Mineola.

d. Carle Place.

e. Westbury.

3. Color

i. Background – Black.

ii. Text – White.

C. Site signs.

D. Platform Signs.

E. ADA signs.

1. This includes station, site, and platform signs that provide disabled customers with information that is critical to navigate the station per ADA requirements.

2. Signs shall have raised characters and braille per ADA requirements

F. All temporary signage shall be securely anchored.

G. Existing signage removed to accommodate construction that is found to be in acceptable shape shall be permitted to be used as temporary signage during construction.

H. Temporary signage used during construction shall not be permitted as final installed signage.

3.12.4.18.3 Specialty Signage

The Design-Builder shall furnish and install specialty signage for each station conforming to the following design requirements.

A. Pedestrian Bridge – Station Name

1. Station name signs shall be provided, centered on the lower portion of both sides of all pedestrian overpasses, which are indicated in the pedestrian overpass section of this document.
2. Station name signs shall be individual letters indicating the name of the station in which the sign would be installed.
    i. Station Names.
        a. New Hyde Park.
        b. Merillon Avenue.
        c. Mineola.
        d. Carle Place.
        e. Westbury.
    ii. Material – Brushed aluminum.
    iii. Size – [redacted].
    iv. Mounting hardware shall be concealed.

B. Station access point – Station Name

1. Station name signs shall be provided at all main/primary and secondary station access points.
2. Access points that are provided with a canopy shall have the signage mounted to the roof.
    i. Signs shall be up-lit with LED lighting from the side visible to customers.
3. Access points that are not provided with a canopy shall have the signage mounted to an adjacent wall or structure as directed by LIRR.
4. Station name signs shall be freestanding individual letters indicating the name of the station in which the sign would be installed.
    i. Station Names.
        a. New Hyde Park.
        b. Merillon Avenue.
        c. Mineola.
        d. Carle Place.
        e. Westbury.

ii. Material – Brushed aluminum.

iii. Size.

a. Main Primary Entry - [redacted] deep.

b. Secondary entry – [redacted] deep.

iv. Mounting hardware shall be concealed to the greatest extent possible.

C. WIFI

1. The Design-Builder shall provide WIFI emblems on the face (track side) of the canopy structure columns and platform light posts.

i. Minimum Height above platform – [redacted]"

2. The Design-Builder shall provide a minimum of (4) four WIFI emblems at all platform shelters.

3. WIFI emblems not located at the platform shelters shall be provided every 100 ft.

4. Color – Black.

5. Size – [redacted]" height.

D. USB Charging Station

1. The Design-Builder shall provide USB Charging emblems on the face (track side) of the canopy structure columns and platform light posts.

2. The Design-Builder shall provide USB Charging emblems directly above all USB Charging stations.

3. Color – Black.

4. Size – [redacted]" height.

E. MTA LIRR Branding logo.

1. The Design Builder shall provide the MTA LIRR branding logo at the following locations.

i. Pedestrian overpass tower.

a. Minimum of (1) per tower, eastbound and westbound.

ii. All entry canopy fascia.

iii. Platform signage band.

a. Minimum of (10) ten per platform (eastbound and westbound) at all stations.

iv. All parking garages located on LIRR property.

v. All TVM shelters.

2. Material – Brushed Aluminum

3. Design

i. Text "Long Island Rail Road".

a. Size – [redacted] height.

ii. Graphic – MTA Logo

b. Size – [redacted]" height.

3.12.4.19 TVM Shelter

The Design-Builder shall provide TVM shelters, for all stations, located at all TVM's not contained within existing buildings, or beneath proposed canopies conforming to the following design requirements:

A. TVM shelters are prohibited on Station Boarding Platforms.

B. TVM shelters shall protect TVM's from weather.

C. The Design-Builder shall construct TVM Shelters on level, hard, and well-drained surfaces adjacent to one or more Station entrances, and shall site them so as to not impede Station access, pedestrian flow, access to fare vending, or other travel modes.

D. The Design-Builder shall provide a level queuing space in front of the shelter complying with ADA requirements.

E. Design

1. TVM shelters shall be designed to match the aesthetic of the overall station design.

F. Material

1. Glazing – clear, tempered laminated safety glazing.
2. Framing – Clear anodized aluminum.
3. Structure.

i. Material – Galvanized steel.

ii. Type – Tube steel.

iii. Color – Clear coat.

G. Roof Material – Fiberglass reinforced translucent panels.

1. Minimum Slope - Roofing shall be sloped a minimum of 1/8" per foot, or recommended by roofing system manufacturer sloped towards the roof edge.

H. Flashing –shall be constructed of prefinished durable materials designed to be compatible with the selected roofing system.

3.12.4.20 Permanent Temporary Boarding Access

The Design-Builder shall provide permanent temporary boarding access with storage from both side platforms to the center track at all stations. This is a final deliverable element furnished and installed by the Design-Builder that shall be used by LIRR after the completion of the Project for future track outages. The boarding access shall conform to the following design requirements:

A. Design.

1. All station platforms with the exception of Mineola Station, shall receive Boarding access at the each platform to accommodate (6) six train cars with (2) two doors per car. Mineola Station shall receive Boarding access to accommodate (8) eight train cars (2) two doors per car.

B. Final storage locations shall be coordinated with and will be directed by LIRR.

C. Boarding access shall have the ability to be erected, broken down, and stored by LIRR operations staff within a timeframe determined acceptable by LIRR. The Design-Builder shall submit the Permanent Temporary Boarding access installation design to the Railroad for Approval.

3.12.4.21 Advertising

The Design-Builder shall not include advertising or provisions for advertising, with the exceptions noted in this Section and unless approved in advance by LIRR.

A. The Design-Builder shall provide all power and conduit to all locations that shall receive digital advertising.

B. All advertising shall be securely anchored to the signage band provided on the canopy structure. No advertising shall be affixed to the station platform.

3.12.4.22 Support / Utility Rooms

The Design-Builder shall provide the following support/utility spaces at each station conforming to the following design requirements:

A. Rooms shall be integrated as part of a proposed structure, such as the pedestrian overpass. A standalone structure is only permitted in the event that there is not sufficient space within a structure being provided, such as the overpass.

B. A minimum of two (2) standalone structures shall be provided at the following stations where no overpasses are being provided, within the limits of the ROW.

1. New Hyde Park – Standalone structures shall be provided in these two locations:
    a. Westbound – located on the east side of the proposed underpass
    b. Eastbound – located at the east end of the plaza park
2. Merillon Station - Standalone structures shall be provided in two locations
    a. Westbound – located at the southwest corner of the existing parking lot
    b. Eastbound – located north of Euston Road.

C. Rooms shall be sized to accommodate all equipment necessary to provide a complete and working system, while still maintaining code requirements for clearances, egress, and interior environment.

D. Separation from adjacent spaces shall meet all applicable code requirements for construction and fire-ratings.

1. Any space utilized below an egress stair is required by code to be separated by a fire barrier meeting code requirements.

E. Spaces shall be conditioned and/or ventilated to meet loading requirements of the equipment housed within and complying with all code requirements.

F. Spaces that cannot be integrated as part of a proposed structure and shall become standalone structures, shall be designed as follows:

1. The Design-Builder shall provide weathertight, insulated, abuse resistant, low maintenance construction.
2. Exterior aesthetics shall conform to the overall station aesthetic.

3.12.4.22.1 Communications Room

A. The Design-Builder shall provide one communications room per station designed to accommodate all equipment required to provide a working communications system. See Section 3.18 for equipment requirements. The LIRR communication room shall meet the minimum requirements set forth in Technical Specification C-448 Communications Room.

1. Minimum interior size – [redacted]' high.
2. Minimum Quantity – (1) one per station.

B. The room shall be free of water pipes. Windows shall not be permitted in the room. Whenever possible TELCO demarcation shall occur outside location and required TELCO lines shall be brought into Communications Room via duct system. TELCO shall have access to their demarcation point independent of communication personnel availability.

C. In addition to the requirements set out in TP3.20 COMMUNICATIONS AND VOLUME 5 TECHNICAL SPECIFICATIONS, the Communications room shall be equipped with:

1. A thermostatically controlled, LIRR approved, heat and air conditioner (HVAC) system.
2. A fire and intrusion alarm subsystem shall monitor Communications Room and equipment and provide remote alarm indications.
3. Floors shall be concrete wherever possible. Waterproof sealants shall be applied to the floor surface.
4. The lighting shall be LED fixtures.
5. The doors shall accessed from the exterior and locked with Communications high security locks, and accessed with a yellow high security key which is restricted to Communications personnel.
6. Walls shall be fire rated plywood and cement board or concrete block and shall extend to the underside of the roof construction.
7. Where applicable, exposed ceiling structure shall remain
8. Rated floor, wall, ceiling and door assemblies shall comply with applicable codes.
9. A minimum of ([redacted]) four [redacted] convenience receptacles.

3.12.4.22.2 Information Technology (IT) Room

A. The Design-Builder shall provide one IT room per station.

1. Minimum interior Size – [redacted] high.
2. Location – Adjacent to the communications room.
3. Minimum quantity – (1) one per station

B. The IT room shall be a clean, secured and well ventilated space for the installation of [redacted] cables, Network Routers/Switches/Servers and Fiber Optics to the ticket selling machines, message boards, and Communication Rooms.

C. A minimum of 2 dedicated [redacted] circuits shall be provided. If available, these circuits are required to be tied to the electrical backup systems (generator and UPS).

D. The space shall be equipped with a thermostatically controlled HVAC system.

E. In addition, there shall be a clear path to the Communications Room with either a cable tray or (2) two [redacted] conduits.

F. Two dedicated [redacted] conduits shall be provided at all new or refurbished structures where underground access is preferred from circuit provider (internal/External Carrier) i.e. Verizon, Lightpath, Cable Co., etc. These conduits shall not follow the same path within the facility and leaving the facility.

G. No water, waste, or HVAC pipes shall be installed over the equipment space.

H. Location:

1. The IT room shall be located adjacent to the communications room.
2. The IT room shall not be located near equipment that can cause electromagnetic interference (EMI).

I. In addition to the requirements set out in TP3.20 COMMUNICATIONS, the IT room shall be equipped with:

1. The floor shall be static resistant with access to the building ground.
2. Walls shall be fire rated plywood and cement board or concrete block and shall extend to the underside of the roof construction.
3. Three-fourths inch [redacted]) plywood shall be provided on the walls for mounted equipment.
4. Fire retardant plywood and finishes shall be used.
5. Provisions shall be made for the termination of LIRR access cables.
6. Doors:
    a. Doors shall be accessed from the exterior and locked with restricted card access key system, restricted to IT personnel.
    b. Doors shall be solid and shall comply with the Code requirements.
7. Where applicable, exposed ceiling structure shall remain.
8. Rated floor, wall, ceiling and door assemblies shall comply with applicable codes.
9. Lighting:
    a. The lighting shall be LED fixtures.
    b. Fixture layout shall be coordinated with the equipment rack location and the overhead cable trays to ensure the fixtures are not obstructed.
    c. Lighting shall meet the OSHA minimum illumination for mechanical and electrical equipment rooms as set forth in 1926.56(a) (10 foot-candles). A switch to control the lighting should be located close to the entrance door.
10. A minimum of (4) four [redacted] convenience receptacle.
11. A minimum of one (1) smoke detector shall be installed in each IT room.

3.12.4.22.3 Elevator Machine Room

A. The Design-Builder shall provide one elevator machine room per elevator at all stations designed to accommodate all equipment required to provide working elevators.

1. Elevator equipment for only one elevator shall be provided in each space.

a. Exception: if multiple elevators are operating in a group a single machine room is acceptable for the group equipment.

2. Hydraulic Elevator machine room shall be located directly adjacent to the elevator hoistway.
3. Traction elevator machine rooms shall be located above the hoistway.

B. An elevator machine room is not required for stations that are not provided with an elevator (Mineola).

C. See Section 3.13 for equipment requirements.

D. The elevator machine room shall be equipped with:

1. Floors shall be concrete with waterproof sealants applied to the floor surface.
2. Walls shall be fire rated plywood and cement board or concrete block and shall extend to the underside of the roof construction.
3. Where applicable, exposed ceiling structure shall remain.
4. Rated floor, wall, ceiling and door assemblies shall comply with the following codes.
   a. Floor – 2 Hour
   b. Wall – 2 Hour
   c. Ceiling - 2 Hour
   d. Door - 1 1/2 Hour
5. The doors shall accessed from the exterior and locked with security locks, and accessed with a security key which is restricted to appropriate personnel.
   a. Door shall be self-closing, self-locking, open from the interior without a key, and keyed at the exterior for [redacted].
6. The lighting shall be LED fixtures, minimum [redacted].
7. A minimum of ([redacted] [redacted] convenience receptacle.
8. Ambient temperature shall be maintained per the requirements of the elevator controller manufacturer. See TP3.13 STATION MEP AND VERTICAL TRANSPORTATION for additional requirements.

3.12.4.22.4 Electrical Room

A. The Design-Builder shall provide one electrical room per station designed to accommodate all equipment required to provide a working electrical system. The space shall be clean, secured and well-ventilated space for the installation of electrical equipment and wiring.

B. Minimum Size – [redacted]

C. Minimum Quantity – (1) one per station

D. See Section 3.13 STATION MEP AND VERTICAL TRANSPORTATION for equipment requirements.

E. The space shall satisfy all requirements of the NEC, NESC, LIRR CE-1, Electric Utilities and applicable state and local building codes.

F. There shall be no water or sanitary pipes crossing the room over electrical equipment

G. The Boiler room shall be equipped with:

1. Floors shall be concrete with waterproof sealants applied to the floor surface.
2. Walls shall be fire rated plywood and cement board or concrete block and shall extend to the underside of the roof construction.
3. Where applicable, exposed ceiling structure shall remain.
4. Rated floor, wall, ceiling and door assemblies shall comply with applicable codes.
5. The doors shall accessed from the exterior and locked with security locks, and accessed with a security key which is restricted to appropriate personnel
6. The lighting shall be LED fixtures.
7. A minimum of ([redacted] convenience receptacle.

3.12.4.22.5 Boiler Room

A. The Design-Builder shall provide boiler rooms at each station designed to accommodate all equipment required to providing a working snow melt system.

B. Minimum Size – [redacted] Boiler Room shall be sized for the future installation of boilers for a complete system.

C. Minimum Quantity – As required to provide a complete system.

D. Locations:

1. Where feasible, each boiler room shall be located level with the top of platform.
2. Each boiler room shall be located directly adjacent to the platform.

E. Rooms shall be located to match and blend into existing infrastructure and aesthetics.

F. See TP3.13 STATION MEP AND VERTICAL TRANSPORTATION for additional requirements.

G. The Boiler room shall be equipped with:

1. Floors shall be concrete with waterproof sealants applied to the floor surface.
2. Walls shall be fire rated plywood and cement board or concrete block and shall extend to the underside of the roof construction.
3. Where applicable, exposed ceiling structure shall remain.
4. Rated floor, wall, ceiling and door assemblies shall comply with applicable codes.
5. The doors shall accessed from the exterior and locked with security locks, and accessed with a security key which is restricted to appropriate personnel.
6. The lighting shall be LED fixtures.
7. A minimum of [redacted] convenience receptacle.
8. The Design-Builder shall provide combustion air ventilation.
    i. Louvers in exterior walls shall be minimized.
    ii. Louvers shall be located in walls not doors.

iii. Louvers shall be located a minimum of 8 feet above the adjacent grade and backed by a woven rod security screen to prevent unauthorized access.

3.12.4.22.6 Storage Room

A. The Design-Builder shall provide one storage room per station. The space shall be clean, secured and well-ventilated.

B. Storage.

C. Minimum Size – [redacted] high.

D. Minimum Quantity – (1) one per station.

E. The Storage room shall be equipped with:

1. Floors shall be concrete with waterproof sealants applied to the floor surface.
2. Walls shall be fire rated plywood and cement board or concrete block and shall extend to the underside of the roof construction.
3. Where applicable, exposed ceiling structure shall remain.
4. Rated floor, wall, ceiling and door assemblies shall comply with applicable codes.
5. The doors shall accessed from the exterior and locked with security locks, and accessed with a security key which is restricted to appropriate personnel.
6. The lighting shall be LED fixtures.
7. A minimum of [redacted] convenience receptacle.

F. Storage room shall be provided with the following accessories:

1. Storage shelves.
2. Mop Rack.

3.12.4.23 Outdoor Station Plaza/Park

The Design-Builder shall provide outdoor station plaza/ park areas conforming to the following design requirements:

A. All materials shall be low maintenance and vandal resistant.

B. Selected landscaping shall be of native specifies that shall not require irrigation.

C. Plaza areas shall be provided with low maintenance large format pavers throughout

1. Grass areas are not permitted

3.12.4.23.1 Westbury Station

A. Location/Limits - North of the LIRR Main Line along Union Avenue from Post Avenue to the Westbury Station building.

B. Eliminate the existing embankment and provide a retaining wall at the limits of the station platform and limitations stated above.

1. Retaining wall shall match the aesthetics of the station retaining wall located on the south side of the station with the exception to not include vertical gray piers as provided on the south wall, in accordance with TPA3.12A RENDERINGS. The retaining wall shall be of one material,

C. Provide the following amenities within the plaza area:

1. Benches.
2. Bike storage racks.
3. Large tree plantings.

3.12.4.23.2 Mineola Station

A. Location/Limits – Replacement of the existing paver area (full length) between the eastbound platform and intermodal parking facility.

B. Provide the following amenities within the plaza area:

1. Large tree plantings
2. Benches.
3. Bike storage racks.
4. Snow melt system.

3.12.4.23.3 New Hyde Park Station

A. Location/Limits – South of the LIRR Main Line on 3rd Avenue from Baer Place to the dead end.

B. Provide the following amenities within the plaza area:

1. Large tree plantings.
2. Benches.
3. Bike storage racks.

3.12.4.23.4 Pavers

A. Pavers shall be in gray tones, as approved by LIRR.

B. Pavers shall consist of alternating sizes and colors creating a random pattern.

3.12.4.24 Finishes

The Design-Builder shall provide finishes to all materials indicated below conforming to the following design requirements unless indicated otherwise:

A. The Design-Builder shall provide the following “NYS Royal Blue” as a finish color as shown in TPA3.12A RENDERINGS.

1. Pantone – 288C.
2. CMYK – 100/80/6/32.
3. RGB – 0/45/114.
4. Hex - #002D72.

3.12.4.25 MTA Arts & Design

A. The MTA Arts & Design (MTA A&D) program uses a portion of Capital Program funds to install permanent works of art throughout the MTA system including LIRR stations. MTA A&D projects create links to neighborhoods with art that echoes the architectural history and design context of the individual stations.

B. The Design-Builder shall work with MTA Arts & Design, LIRR, and the selected artist to determine the parameters and sites for glass artwork, guardrails, fencing, sculptures,

terrazzo flooring, and ceramic tile/mosaic artwork integral with the station to be installed at the following locations:

1. New Hyde Park Station:
2. Merillon Avenue Station:
3. Mineola Station:
4. Carle Place Station:
5. Westbury Station**:**

C. Coordinate artwork final location and installation with MTA A&D.

3.12.4.25.1 General requirements

A. Submittals:

1. The Design-Builder shall coordinate with LIRR and MTA A&D regarding artwork requirements prior to construction at the site where artwork shall be located (e.g. window opening sizes, depth of channel etc.). Work shall be coordinated with LIRR.
2. The Design-Builder shall verify with LIRR and MTA A&D the dimensions, specific locations and the number of artwork installations.
3. The Design-Builder shall provide product data for sealants and anchoring devices or other products relating to the artwork.
4. The Design-Builder shall prepare and submit shop drawings, structural support and framing system, catalog cuts, mock-ups, and other related submittals as indicated in this section, for obtaining approvals from the LIRR prior to art glass fabrication and installation. The Design-Builder shall show all elevations and connection details for attachment to adjacent structures.
5. The Design-Builder shall provide field verified measurements for artwork locations. Fabrication shall not begin until measurements have been verified.
6. The Design-Builder shall provide a full-scale, on-site mockup off the mounting frame securing the artwork within the openings. This shall be provided at least six months prior to the scheduled installation of the artwork. Mockup shall be approved by MTA A&D and LIRR prior to proceeding with Artwork frames. If accepted, mock-up may be incorporated as a part of the work.
7. The Design-Builder shall deliver base glass sheets of the required material and size(s) to the Artist or to a location designated by the fabricator, if appropriate.

B. Meetings:

1. Prior to receiving delivery of the artwork, the Design-Builder shall schedule meeting(s) that are to be attended by: LIRR, Design-Builder, Installer, Artwork Fabricator, MTA A&D and the Artist.
2. The Design-Builder shall inform LIRR and MTA A&D of all foreseeable issues,

problems or changes that may affect the artwork throughout the Contract.

3. During meeting(s), LIRR and MTA A&D will review procedures and requirements for transporting, delivery, storage and installation of the artwork. LIRR, MTA A&D and Artist will designate the orientation, location and sequence of the art.
4. The Design-Builder shall obtain instructions and methods to install the artwork from Fabricator, as approved by LIRR and MTA A&D.
5. The Design-Builder shall prepare minutes of the meeting(s) and shall describe all issues discussed, decisions made and actions taken. Meeting minutes shall be distributed to all attendees.

C. Quality Assurance:

1. Installer Qualifications: For MTA A&D approval, the Design-Builder shall engage a professional installer with acceptable and approved experience in completing comparable art or custom projects requiring special care and handling.
    a. All Artwork will be provided by MTA A&D.
    b. The Artist or Artist's fabricator will designate the Artwork sites throughout the station with approval from LIRR and MTA A&D.

D. Examples:

1. The examples for art glass and mosaic wall tile described in 3.12.4.25.2 below are representative of the standard practice and requirements associated with the installation of MTA A&D projects. Requirements for final MTA A&D installations, types and locations will be selected by LIRR, may differ from the examples as provided herein.

3.12.4.25.2 Art Glass

A. Scope

1. The Design-Builder shall be responsible for transporting, handling, storage, installation and acceptance of laminated art glass at station locations including New Hyde Park, Merillon Avenue, Mineola, Carle Place, and Westbury. MTA A&D commissions the artists and coordinates the fabrication process, delivery and is present at installation by the Design-Builder. Glass specifications shall match Glazing Specifications by window type. The Design-Builder shall provide confirmed and approved glass dimensions to MTA A&D.
2. Locations and Panels may change within the glass façades/curtain walls and window systems in elevator towers, pedestrian overpasses, etc. as determined by MTA A&D.
3. The Design-Builder shall furnish all materials, tools and equipment necessary for transporting within the station, handling, storage, installation and acceptance of artwork as specified in this Section, as directed by LIRR and MTA A&D. Such materials for glass will be all standard glass installation tools, setting materials, blocks, stops etc.

4. The Design-Builder shall match each Laminated Art Glass panel within the facade and window module to ensure that the panels fit securely within each frame such that the artwork does not shift or become loose.
5. Installer:
    a. Thomas Manufacturing; Tom Lukowiak, 630 Ramsey Ave, Hillside NJ 07205, Office. [redacted]0.
    b. Or approved equal.

B. Related Work
1. Fillers, Gaskets, Sealants and Caulking shall be as specified by LIRR and MTA A&D.
2. Glass and Glazing shall be as specified by LIRR and MTA A&D.

C. Design-Builder's Responsibility
1. The Design-Builder shall install the laminated art glass in the glass facade systems and windows, in conjunction with all the other glazing systems included in the Project and in conformance with the performance requirements.
2. The Design-Builder shall design the glazing and mounting system for the glazed walls, incorporating all necessary allowances for wind load and other loads to the assembly, thermal movement, structural vibrations of the subway structure, glazing installation methods, and allowing for future maintenance and repair of the wall and glazing assembly.
3. The Design-Builder shall coordinate with LIRR and MTA A&D on all aspects of the artwork including:
    a. Initial phases of planning and scheduling of artwork.
    b. All aspects of structural design and dimensions/thickness for glass facade framing and mounting, reviewing, approving and coordination throughout the duration of art glass fabrication.
    c. Final stages of receipt, protection, handling, storage and installation of the artwork.
4. The Design-Builder shall provide detailed drawings and sectional details to the artist and art glass fabricator specifying all requirements and specifications for the art glass fabrication. The information should include the precise dimensions of the glass panel, thickness, glass type, and framing system, etc.
5. The Design-Builder shall contact LIRR and A&D regarding foreseeable issues, problems or changes that may affect the artwork throughout the Contract.
6. Upon receipt of the art glass from the fabricator, the Design-Builder shall be responsible for:
    a. Handling, transporting and storage of artwork to the project site.
    b. Preparing station site for the artwork.

c. Installing the artwork into the facade and windows frames and other designated artwork locations.

d. Providing all necessary materials including equipment and resources to complete such work.

7. Providing and Installing glass panels or other panel replacement which do not receive artwork as determined by MTA A&D.

8. The Design-Builder shall be responsible for insurance of artwork once in Design-Builder's possession.

9. The Design-Builder shall be fully responsible for the replacement of any artwork that is marred or otherwise damaged at no additional cost to LIRR.

a. Replacement of artwork units shall be fabricated in accordance with the Artist's designated fabricator.

b. The Design-Builder shall be responsible for all costs for replacement of artwork units including but not limited to: mobilization, materials, manufacturing, handling, transporting and installation.

10. The Design-Builder shall be fully responsible for the cost of replacement of any art glass panels, which are chipped or cracked or otherwise damaged until Substantial Completion and/or Final Acceptance of the artwork by LIRR and MTA A&D.

11. Replacement of artwork shall be fabricated in accordance with the Artist's design by the Artist and/or the Artist's designated Artwork Fabricator. The Artwork Fabricator will be responsible for determining all costs for replacement units.

12. The Design-Builder shall schedule work dates with LIRR and MTA A&D. LIRR and MTA A&D, the Artist and the Artist's Fabricator will oversee all aspects of the artwork including receipt, inspection and installation of the artwork as determined by LIRR and MTA A&D.

D. Materials

1. The artwork shall be as follows:

a. Laminated Art Glass. The glass panels may range in thickness from [redacted], which is dependent upon the specific artist proposal and the method of interpreting the design into laminated glass.

b. The laminated art glass shall interpret artist design using techniques that may include, but is not limited to, hand-painting, screen-printing, etching, fritting, and printed interlayers.

E. Fabrication

1. The art glass fabricator shall fabricate glass panels to the specifications provided by the Design-Builder.

2. The Design-Builder shall Inform LIRR and MTA A&D of all foreseeable issues, problems or changes that may affect the artwork throughout the Contract.

F. Delivery, Inspection & Storage

1. The art glass shall be delivered to the Project site by the glass fabricator and installed by the Design-Builder. The Design-Builder shall be responsible for the artwork until Final Completion.
2. The Design-Builder shall be solely responsible for the artwork upon it's delivery to the curb of the Station, storage facility or upon handling (if prior to delivery to station curb).
3. Upon delivery, the Design-Builder shall be required to unload and uncrate each of the artworks for inspection by LIRR, MTA A&D and Artist.
4. Upon approval, the Design-Builder shall repackage, carry or transport the artwork to the storage site.
5. The artwork shall remain secured in a locked storage facility until the scheduled date of installation.

G. Pre-Installation

1. The Design-Builder shall confirm with LIRR and MTA A&D, the conformity and dimensions of the designated artwork station location with the fabricated artwork sizes. This shall include horizontal and vertical dimensions as well as square and plumb of surfaces and adjacent materials. LIRR and MTA A&D's pre-approval required for delivery of artwork to station.
2. Prepare the station and provide all required supplies and tools including but not limited to scaffolding, ladders, lift, glazing etc., as determined by LIRR and MTA A&D and/or the Artwork Fabricator.
3. Purchase necessary supplies for the artwork installation.
4. Obtain rolls of mylar protective coating to cover the face of all Artworks, per requirements of LIRR and A&D. The mylar should be safely packages and shipped to Artwork Fabricator or other location designated by A&D and/or Design-Builder shall install mylar on the Artwork surfaces.
5. Prepare the frames - including drilling and tapping and/or other work as specified by MTA A&D and/or Artwork Fabricator for the installation.

H. Installation

1. Prepare the station and provide all required supplies and tools including but not limited to scaffolding, ladders, glazing etc., as determined by LIRR, MTA A&D and/or the Artwork Fabricator.
2. Provide temporary boards as required to place within the frames until the artwork arrives, in appropriate. Fill frames not receiving artwork with appropriate materials.
3. Coordinating with LIRR and MTA A&D, the Design-Builder shall arrange for large equipment, such as a crane, or other requirement to move the artwork to the platform site for installation.

4. The Design-Builder shall confirm all artwork locations with LIRR and MTA A&D.
5. The Design-Builder shall install the artwork per LIRR, MTA A&D and/or the Artwork Fabricator's installation instructions.
6. The Design-Builder shall install the artwork under the supervision of LIRR, MTA A&D, the Artist, and the Artwork Fabricator.

I. Cleaning

1. The Design-Builder shall clean the site and artwork promptly after installation per LIRR, MTA A&D and/or the Artwork Fabricator's recommendations. Exercise care to avoid damages to artwork. Remove dirt and other substances from the artwork. All artwork maintenance and cleaning solutions shall be standard LIRR materials. Deviations shall be approved by the LIRR prior to artwork installation and acceptance.

J. Inspection & Acceptance

1. Artwork shall be installed under the inspection and supervision of LIRR and MTA A&D. LIRR and MTA A&D will review to ensure proper practices and completion of installation.

3.12.4.25.3 Ceramic Tile / Mosaic Artwork

A. Scope:

1. The artwork medium shall be glass or ceramic mosaic and referred herein as "the artwork".
2. MTA A&D will contract with artist(s) and provide the artwork. The artist fabricators will install the artwork.
3. The artist's fabricator will furnish all labor, materials, tools and equipment necessary for transportation, and installation of artwork at the locations specified in this Section.
4. The Design-Builder shall accept delivery of artwork at curb or nearby storage area, provide safe and secure storage, and assist with installation of artwork.

B. Preparations for Installation:

1. The Design-Builder shall coordinate with the LIRR and MTA A&D on all aspects of the artwork installation including:
    a. Planning and design, including confirmation of artwork location dimensions within 60 Calendar Days of Notice of Award.
    b. Scheduling of the installation of the artwork.
    c. Extent of tile removal in areas set aside for artwork.
    d. Preparations of wall surfaces to receive the artwork, following determination of the actual wall surface material and condition.
    e. Protection, handling, and storage of the artwork.

f. Assistance to the artist's fabricator, who is responsible for the installation of the artwork, including scaffolding and/or ladder access; provision of power and water; and minimal labor and materials (not including wall surface preparation) unless it is determined that art shall be provided in panels that are mounted to substrate anchored to the wall surfaces.

2. Prior to receiving delivery of artwork, the Design-Builder shall arrange meeting(s) to be attended by: the Design-Builder, the LIRR, representatives(s) of MTA A&D the artist and the artist's fabricator

3. At the meeting(s) review procedures for Design-Builder to accept delivery of artwork at the curb, or appropriate storage area, provide a safe and secure storage site within the Package Station, to prepare wall surfaces, and to assist with installation procedures and requirements.

4. The Design-Builder shall prepare minutes of the meeting(s) and distribute to all attendees, describing the issues discussed and decisions made.

C. Delivery and Storage.

1. The artwork shall be delivered to the Package Stations by the Authority on the dates agreed in advance with the Design-Builder.

2. Upon delivery, the Authority designated personnel shall be present as the Design-Builder move crate to storage location and opens crate(s) of artwork for joint inspection by Design-Builder and LIRR.

3. Upon acceptance of the artwork at the curb, or storage area, the Design-Builder shall transport the artwork to a safe and secure storage site within the Package Stations.

4. Following acceptance of the artwork the Design-Builder shall be fully responsible for the replacement of any artwork, which, is marred or otherwise damaged, at no additional cost to the Authority. Replacement of artwork units shall be fabricated in accordance with the artist's designated fabricator. The Design-Builder shall be responsible for all costs for replacement of artwork, including mobilization, materials, manufacturing, handling, transportation, and installation that falls within its responsibility of providing a secure place for storage purposes.

5. The Design-Builder shall be responsible for insurance of artwork once in possession thereof, in the amount of four hundred thousand dollars ($400,000).

D. Surface Preparation and Installation:

6. The Design-Builder shall cooperate and assist, where needed, with the artist's fabricator during the artwork installation. This shall include but not limited to: scaffolding, ladders, locked storage, and access to power and water, as well as minimal labor and other materials, as determined by MTA A&D or artist's fabricator.

7. Artwork shall be installed by artist's fabricator within limit lines as developed by artist, artist fabricator, and the LIRR, and agreed in advance with the Design-Builder.

8. The artist's fabricator will mark-out the artwork limit lines on the walls in advance of existing tile removal and/or surface preparation work.
9. The Design-Builder shall prepare the wall surfaces to receive the artwork in accordance with agreed requirements. Artist fabricator will inspect the wall surface work after completion to ensure it meets agreed requirements.
10. When completed, prepared walls should be covered with 1/2" foam panel and plastic sheeting to protect any metal trim and flat surface from dents and dust until the mosaic can be installed. Foam panels and plastic sheet should be re-used to cover mosaic once installed.
11. The Design-Builder shall provide stainless steel edge strips (schlutter strips or similar approved) to be used to finish edge between artwork and tile walls as determined by artist's fabricator. Final surface shall be plumb, true and square.
12. The Design-Builder shall provide a tile profile to smooth transition from perimeter edges of artwork to the surrounding existing field tile, in a matching tile approved by MTA A&D.
13. All hardware shall be stainless steel.
14. If LIRR and MTA A&D determine it is more efficient for the artwork to be mounted by the Design-Builder, the frame and substrate system shall be developed and installed by Design-Builder so that it can receive the artwork, which would be received in sections that can be mounted/anchored to Substrate.

E. Cleaning.

15. Cleaning of the artwork will be performed by the artist's fabricator. Should artwork require cleaning after the artist's fabricator has completed work, the Design-Builder shall contact the representative of MTA A&D for specific instructions before proceeding with any cleaning.

3.12.4.26 Existing Station Buildings

A. The Design-Builder shall rehabilitate existing station buildings that conform to the configurations and functional characteristics defined by the Contract Documents and subject to applicable Codes and Regulations at the following locations.

1. New Hyde Park.
2. Mineola.
3. Westbury.

B. The scope of rehabilitation design consists of the following:

A. Complete interior renovation including demolition of some existing partitions, reconfiguration of spaces, upgraded bathrooms, and accessible waiting areas.

B. Rehabilitation of the station building exterior including restoration of deteriorated portions of the roof soffit, wall surface concrete patching, wall surface stucco patching, repointing brick facades, and painting.

C. Provide new heavy duty doors and fixed windows, LED lighting, finishes, incorporation of heritage art and digital interactive signage.

D. Rehabilitate the pedestrian underpass at Westbury station to provide new wall and ceiling finishes, and lighting.

E. Replace existing exterior plaza pavers with radiant snow melt system and large format pavers.

   a. Mineola station – Limits include the existing area surrounding the station building.

   b. New Hyde Park - Limits include the existing area surrounding the station building including within the limits of the roadway in front of the station.

C. Interior – The Design-Builder shall provide interior station building rehabilitation and upgrades conforming to the following design requirements unless specified otherwise:

1. Provide new Terrazzo flooring.
   a. Provide pattern approved by the Railroad in each station waiting room.
2. Provide a new Acoustical Ceiling Tile (ACT) ceiling system in back of house spaces.
3. Provide a new luminous ceiling in waiting area spaces.
4. Replace all operable windows with fixed heavy duty windows.
5. Replace existing doors with heavy duty tamper resistant doors.
6. Replace existing wooden wainscoting with tile.
7. Provide new benches and trash receptacles.
8. Refurbish decorative wood beams.
9. Provide new LED lighting.
10. Provide new kick plates where needed.
11. Provide upgraded customer bathrooms.
12. Provide updates to station ticket offices, except New Hyde Park Station.
    a. Patch and paint GWB walls and replace ACT ceiling.
13. Provide new digital interactive display.
14. Declutter the interiors.
15. Provide WIFI.
16. Provide USB charging stations integrated with all seated benches.
17. Provide framed historic black and white photos displaying community history.
18. Mineola Station:
    a. Upgrade ticket office bathroom.
    b. Replace ticket office floor with terrazzo.
    c. Radiant heated floors.
    d. Railroad clock.
19. New Hyde Park Station:
    a. Remove a portion of the existing ticket office and add more space to the current waiting room and retain sufficient space at the back of the east half for station storage and employee access to the existing employee toilet.

D. Exterior – The Design-Builder shall provide exterior station building rehabilitation and upgrades conforming to the following design requirements unless specified otherwise:

1. Provide new station name and way finding signages.
2. Provide new LIRR logo.
3. Replace deteriorated roof soffit around station perimeter.
4. Scrape, patch and paint all exterior surfaces of station building.

5. Replace existing gutters and leaders.
6. Provide new LED lighting.
7. Repoint bricks.
8. Provide new shutters.
9. Provide new heated pavers around station area.
10. New Hyde Park Station:
    a. Provide new siding (brick, shake, etc.) and wood corner trim.
    b. Provide larger fixed windows.
    c. Replace bollards.
11. Mineola Station:
    a. Fix leaks.
    b. Provide new shingle roof.
    c. Relocate vendor space.
    d. Provide heat in the waiting porticos flanking the station building.
    e. Provide bird deterrent on the roof.
    f. Repair and/or replace columns
12. Westbury Station:
    a. Replace the two stairs flanking the station building with heated concrete stairs.
    b. Replace the existing face brick.

3.12.4.27 Other Station Scope

3.12.4.27.1 Landscape

A. The Design-Builder shall provide landscaping at all stations.

B. See TP3.11 LANDSCAPING AND AESTHETICS for landscape requirements.

3.12.4.27.2 Mechanical, Electrical, and Plumbing

A. The Design-Builder shall provide station mechanical, electrical, and plumbing systems.

B. See TP3.13 STATION MEP AND VERTICAL TRANSPORTATION for mechanical requirements.

3.12.4.27.3 Communications and Security

A. The Design-Builder shall provide station communications and security systems.

B. See TP3.20 COMMUNICATIONS and TP3.21 SECUITY SYSTEMS for communications and security requirements.

3.12.4.27.4 Vertical Transportation

A. The Design-Builder shall provide APTA grade elevators.

B. See TP3.13 STATION MEP AND VERTICAL TRANSPORTATION for elevator requirements.

3.12.4.28 Station Construction Requirements

3.12.4.28.1 Boarding Platform Staging

The Design-Builder shall stage the removal and replacement of station boarding platforms in a manner to ensure that the existing boarding platform capacity is not diminished by more than half at any point during the duration of construction. Temporary platforms meeting the requirements as set forth within this document shall be used to maintain continued station operation throughout construction.

3.12.4.29 Commissioning, Acceptance, and Maintenance Plan (CAMP)

For CAMP requirements, refer to TP4.2 CAMP.

3.12.5 SUMMARY OF STATION SUBMITTALS

Item	Section	Submittal	Action
1	3.12.4	Station Plans – Preliminary	Review and Comment
2	3.12.4	Station Plans – Intermediate	Review and Comment
3	3.12.4	Station Plans - Final	Review and Approval
4	3.12.4	Station Design – Preliminary	Review and Comment
5	3.12.4	Station Design – Intermediate	Review and Comment
6	3.12.4	Station Design - Final	Review and Approval
7	3.12.4	Boarding platform joints	Review and Comment
8	3.12.4	Detectable Warning surface tiles	Review and Comment
9	3.12.4	Platform edge rub board	Review and Comment
10	3.12.4	Fencing (Under Platform)	Review and Comment
11	3.12.4	Employee access ladder	Review and Comment
12	3.12.4	Bird Deterrent	Review and Comment
13	3.12.4	Platform stairs	Review and Comment
14	3.12.4	Fall protection system	Review and Comment
15	3.12.4	Guardrails and Handrails	Review and Comment

Item	Section	Submittal	Action
16	3.12.4	Station Signage	Review and Comment
17	3.12.4	Unistrut System	Review and Comment
18	3.12.4	Weed Protection	Review and Comment
19	3.12.4	Temporary boarding platform materials	Review and Comment
20	3.12.4	Temporary Guardrails	Review and Comment
21	3.12.4	Temporary handrails	Review and Comment
22	3.12.4	Temporary Platform Shelters	Review and Comment
23	3.12.4	Temporary Signage	Review and Comment
24	3.12.4	Canopy Structure	Review and Comment
25	3.12.4	Conduit installation / Conduit Chases	Review and Comment
26	3.12.4	Platform Signage band	Review and Comment
27	3.12.4	Canopy Roofing (platform)	Review and Comment
28	3.12.4	Bird deterrent system	Review and Comment
29	3.12.4	Platform stairs	Review and Comment
30	3.12.4	Glazing	Review and Comment
31	3.12.4	Exterior insulated wall panels	Review and Comment
32	3.12.4	Roofing (Overpass)	Review and Comment

Item	Section	Submittal	Action
33	3.12.4	Roof Access (hatch)	Review and Comment
34	3.12.4	Guardrails and Handrails	Review and Comment
35	3.12.4	Automatic Snow Melt System	Review and Comment
36	3.12.4	Overpass Stairs	Review and Comment
37	3.12.4	Canopy roofing (walkway)	Review and Comment
38	3.12.4	Fall protection	Review and Comment
39	3.12.4	Cast aluminum stair tread & risers	Review and Comment
40	3.12.4	Platform Shelters	Review and Comment
41	3.12.4	Seated Benches	Review and Comment
42	3.12.4	Standing Benches	Review and Comment
43	3.12.4	Customer Information Centers	Review and Approval
44	3.12.4	Bicycle Storage	Review and Approval
45	3.12.4	USB Charging station	Review and Comment
46	3.12.4	WIFI	Review and Comment
47	3.12.4	Interactive Digital Display	Review and Comment
48	3.12.4	Trash Receptacles	Review and Comment
49	3.12.4	Standard Signage	Review and Approval

Item	Section	Submittal	Action
50	3.12.4	Temporary Signage	Review and Approval
51	3.12.4	TVM Shelter	Review and Approval
52	3.12.4	Permanent Temporary Boarding access	Review and Comment
53	3.12.2	NFPA 130 Calculations for stairs, travel distance, and evacuation time.	Review and Comment
54	3.12.4	Storage room accessories	Review and Comment
55	3.12.4	Finishes and materials	Review and Comment
56	3.12.4	Temporary platform Staging plan	Review and Comment
57	3.12.4	CAMP	Review and Approval
58	3.12.4	Platform ramps	Review and Approval
59	3.12.4	Specialty Signage	Review and Approval
60	3.12.4	Station Aesthetic Design	Review and Approval

3.12.6 STRUCTURAL DESIGN REQUIREMENTS

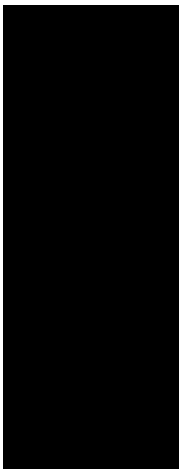
3.12.6.1 Dead Loads

Dead loads acting on a structure consist of the weight of all permanent construction, steel framing, and all fixed service equipment (including stationary storage equipment). The structure shall be designed to support all Mechanical, HVAC, and Electrical loads. This fixed service equipment design load shall be the larger of 1.) The actual weight, 2.) The code required loading allowance, or 3.) 10 psf.

3.12.6.2 Live Loads

Live loads consist of loading not permanently fixed to the structure and occurring over areas not occupied by fixed equipment. Live loads shall be determined in accordance with applicable codes or design standards unless listed in the design criteria section. Live loads greater than 100 pounds per square foot are not permitted to be reduced. Minimum uniform live loads shall be as follows:

A. Permanent Platforms
B. Temporary Platforms
C. Pedestrian Overpass
D. Stairs, Corridors & Ramps
E. Permanent Stairs
F. Elevator Machine Room
G. Mechanical Room
H. Electrical Room
I. Computer/ IT Rooms

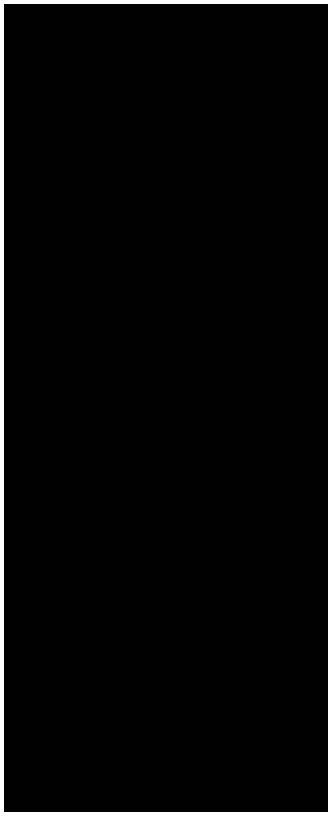


3.12.6.3 Roof Live Loads

Roof live load shall be determined as per the New York State Building Code. The minimum roof live load shall not be less than 20 pounds per square foot on ordinary flat or pitched roofs. Roof live loads may not be reduced. Roof elements shall be designed per the minimum roof live load or snow load, whichever governs.

3.12.6.4 Snow Loads

A. Ground Snow Load
B. Snow Importance Factor
C. Thermal Factor
D. Exposure Factor
E. Terrain Category



3.12.6.5 Wind Loads

A. Basic Wind Speed (3 Second gust)
B. Wind Impotence Factor
C. Wind Exposure Category

3.12.6.6 Seismic Loads

A. Site Class
B. Importance Factor(Category II)
C. 0.2 Sec. Mapped Spectral Acceleration
D. 1.0 Sec. MAPPED Spectral Acceleration
E. 0.2 Sec. Design Spectral Response
F. 1.0 Sec. Design Spectral Response

3.12.6.7 Structural System

A. **Platform Construction:** Stations platform shall consist of cast-in-place or precast reinforced concrete slabs. Platform shall be designed with a minimum thickness of 10” and minimum compressive strength of f’c=5000 psi.

1. All platform slabs shall contain piping for a hot water radiant heating Automated Snow Melt System cast monolithically into the top of the slab. The thickness of the slab or concrete topping shall accommodate the installation of a radiant heat system within the thickness.
2. The platform slab shall be supported on beams on concrete columns. All platform slabs to have galvanized unistrut cast into bottom of the slabs for utility attachments.

B. **Overpasses**: See TP3.5 STRUCTURES for overpass structural requirements.

C. **Canopy and Heated Shelters:** Station canopies and heated shelters shall consist of architecturally exposed steel or aluminum framing member. Canopy and heated shelters shall comply with all NYS building code requirements for structural loading. In addition, canopy shall be designed to support guardrails, signage, windscreens, advertising, lighting, roof drainage, CCTV cameras, public address systems, and communications systems.

D. **Stairs:** Provide a minimum of (4) four stairs per platform per NYS code. Stair framing members including stringers shall be constructed with anodized aluminum. All mounting hardware including bolts shall be stainless steel, vandal resistant and temper proof.

3.12.6.8 Foundation System

A. **Elevator Tower Foundation:** Foundation types (e.g., driven piles) whose installation may negatively impact the existing rail embankments, rail tracks, and other structures within the vicinity of the proposed elevator due to vibrations and/or ground loss are not permitted.

B. **Platform Foundation:** The foundations for the platforms shall consist of drilled shafts that can extend above grade, as concrete columns, to support the platform slab and beams. Alternative permissible foundation types may consist of drilled foundations (e.g., augured cast-in-place piles, micropiles) and spread footings where subsurface conditions are proven adequate to support such foundation types. Foundation types (e.g., driven piles) whose installation may negatively impact the existing rail embankments, rail tracks, and other structures within the vicinity of the proposed platforms due to vibrations and/or ground loss are not permitted.

3.12.6.9 Materials

A. Structural Steel

1. Steel for building structures (beams, columns and miscellaneous framing members) shall conform to ASTM A572 or A992, Grade [redacted], [redacted] unless noted otherwise.

W-Shapes	ASTM A992
HSS Shapes	ASTM A500 Grade B

2. Steel for base plates and connection Materials shall conform to ASTM A36.
3. All anchor Bolts shall conform to ASTM A307, High Strength Bolts shall conform to ASTM A325.
4. Unless noted otherwise, shop connections shall be made with [redacted] diameter high-strength bolts or welding - E70xx. Field connections shall be made with [redacted] diameter, [redacted]
5. Non-shrink, non-metallic grout below base plates shall be used.

B. Concrete

1. Design Strengths: (28 days)

   Platform slab

   Foundation (Caissons)

   Slab on Grade

   Structural Precast concrete

2. Concrete mix design for platform slab shall contain a corrosion inhibitor admixture.
3. Concrete mix design for platform slab shall contain synthetic micro fiber reinforcing.
4. Concrete exposed to weather shall contain air-entraining agent. Air entraining admixtures shall be in accordance with ASTM 260 and ASTM C138.
5. Accelerating admixtures shall be in accordance with ASTM C494.
6. Concrete shall contain DCI Corrosion Inhibitor.
7. Concrete shall be designed with resistance to deicing chemicals.
8. Precast concrete shall meet the requirements of the Precast Concrete Institute.
9. Concrete shall be designed for severe exposure per ACI 318.

C. Reinforcing Steel

1. All foundation structural elements shall be reinforced with epoxy coated reinforcing.
2. Concrete shall be reinforced in accordance with ASTM A615, A616 or A617. All reinforcing bars shall be deformed bars with [redacted] minimum yield strength, ASTM A615, Grade [redacted]
3. All stirrups and column ties shall be deformed bars with [redacted] minimum yield strength, ASTM A615, Grade[redacted]
4. Welded wire fabric shall conform to ASTM A185 and A82.

D. Aluminum

1. Use high strength and high corrosion resistance aluminum alloys for all aluminum structural and framing members.
2. Alloy 6061 shall be used for all structural, canopy and stair framing members.
3. Alloy 6063 shall be used for all plates, pipe railing, furniture and architectural extrusions.

3.12.6.10 Summary of Structural Design Submittals

Item	Section	Submittal	Action
1	3.12.6.7	Structural Systems – Preliminary	Review and Comment
2	3.12.6.7	Structural Systems– Intermediate	Review and Comment
3	3.12.6.7	Structural Systems– Final	Review and Approval

Item	Section	Submittal	Action
4	3.12.6.8	Foundation Systems – Preliminary	Review and Comment
5	3.12.6.8	Foundation Systems – Intermediate	Review and Comment
6	3.12.6.8	Foundation System – Final	Review and Approval
7	3.12.6.9	Concrete Mix Design	Review and Comment

END

3.13 STATION MEP AND VERTICAL TRANSPORTATION

3.13.1 Section Includes

This section sets out design and construction requirements related to Mechanical, Electrical, Plumbing, and vertical transportation work at each station.

A. Floral Park.

B. New Hyde Park Station.

C. Merillon Station.

D. Mineola Station.

E. Carle Place Station.

F. Westbury Station.

3.13.2 Codes and Standards

Project Work shall comply with all statutory requirements, and shall comply with the codes and standards identified in Appendix TPA3.1A CODES AND INDUSTRY STANDARDS and the codes and standards listed below.

3.13.2.1 Electrical Codes and Standards

A. American National Standards Institute (ANSI), ANSI/IES RP-8, American National Standard Practice for Roadway Lighting.

B. American National Standards Institute (ANSI), ANSI/IES RP-8, American National Standard Practice for Roadway Lighting.

C. APTA SS-SIS-RP-001-10, APTA Security Lighting for Transit Passenger Facilities.

D. APTA SS-SIS-RP-002-10, APTA Security Lighting for Nonrevenue Transit Facilities.

E. ASHRAE - Standard 90.1, Energy Standard for Buildings.

F. IESNA - The Lighting Handbook.

G. IESNA G-1-03, Guideline on Security Lighting for People, Property, and Public Spaces.

H. IESNA LM-80, Approved Method for Measuring Lumen Maintenance of LED Light Sources.

I. IESNA RP-8, Roadway Lighting.

J. IESNA RP-20-98, Lighting for Parking Facilities.

K. IEEE C2, National Electrical Safety Code (NESC).

L. IEEE C62.11, IEEE Standard for Metal-Oxide Surge Arresters for AC Power Circuits (>1 kV).

M. IEEE 80, IEEE Guide for Safety in AC Substation Grounding.

N. IEEE 242, Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.

O. Insulated Cable Engineers Association requirements.

P. International Code Council (ICC), International Building Code (IBC).

Q. International Electrical Testing Association (NETA), Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems.

R. NECA 1, Good Workmanship.

S. NECA 90, Commissioning Building Electrical Systems.

T. NECA 101, Installing Steel Conduits.

U. NECA 111, Installing Nonmetallic Raceways.

V. NECA 200, Temporary Electrical Power at Construction Sites.

W. NECA 230, Installing Electrical Motors and Controllers.

X. NECA 400, Installing Switchboards.

Y. NECA 406, Installing Panelboards.

Z. NECA 409, Installing Dry-Type Transformers.

AA. NECA 420, Standards for Fuse Applications.

BB. NECA 500, Installing Indoor Lighting.

CC. NECA 501, Installing Exterior Lighting.

DD. NECA 600 – Installing Medium Voltage Cable.

EE. NEMA ICS 18, Motor Control Centers.

FF. NEMA LA 1, Surge Arresters.

GG. NEMA SSL-3, High-Power White LED Binning for General Illumination.

HH. NEMA 250, Enclosures for Electrical Equipment (1000 Volts Maximum).

II. NFPA 30, Flammable and Combustible Liquids Code.

JJ. NFPA 70, National Electrical Code (NEC).

KK. NFPA 70E, Standard for Electrical Safety in Work Place.

LL. NFPA 70B, Recommended Practice for Electrical Equipment Maintenance.

MM. NFPA 72, National Fire Alarm and Signaling Code.

NN. NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems.

OO. NFPA 1, Fire Code.

PP. NFPA 101, Life Safety Code.

QQ. NFPA 110, Standard for Emergency and Standby Power Systems.

RR. NFPA 130, Standard for Fixed Guideway Transit and Passengers Rail Systems.

SS. NFPA 780, Standard for the Installation of Lightning Protection Systems.

TT. UL 845, Motor Control Centers.

UU. UL 1449, UL Standard for Safety for Surge Protective Devices.

VV. UL 2196, Tests for Fire Resistive Cables.

3.13.2.2 Mechanical Codes and Standards (current edition if not dated or referenced by code)

A. Air Conditioning and Refrigeration Institute standards.

B. Air Diffusion Counsel standards.

C. Air Movement and Control Association standards.

D. American Boiler Manufacturers Association standards.

E. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), ASHRAE Handbook – HVAC Applications.

F. ASHRAE, ASHRAE Handbook – Fundamentals.

G. ASHRAE, Commissioning Process for Buildings and Systems.

H. ASHRAE 62, Ventilation for Acceptable Indoor Air Quality.

I. 2015 International Mechanical Code.

J. 2015 International Energy Conservation Code

K. American National Standards Institute (ANSI)/ASHRAE 62.1, Ventilation for Acceptable Indoor Air Quality.

L. ASHRAE 90.1, Energy Standard for Buildings.

M. American Society of Mechanical Engineers (ASME), ASME B31, Standards of Pressure Piping.

N. ASME B16.10, Face-to-Face and End-to-End Dimensions of Valves.

O. American Society for Testing and Materials (ASTM), Standard E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

P. National Fire Protection Association (NFPA), NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems.

Q. NFPA 1, Fire Code.

R. NFPA 101, Life Safety Code.

S. NFPA 111, Standard on Stored Electrical Energy Emergency and Standby Power Systems.

T. NFPA 130, Standard for Fixed Guideway Transit and Passengers Rail Systems.

U. NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials.

V. Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA), HVAC Air Duct Leakage Test Manual.

W. SMACNA, HVAC Duct Construction Standards – Metal and Flexible.

X. SMACNA, HVAC Systems Duct Design.

Y. SMACNA, Rectangular Industrial Duct Construction Standards.

Z. Underwriters Laboratories, Inc., UL 723 (ASTM E84), Test for Surface Burning Characteristics of Building Materials.

AA. UL 555, Standard for Fire Dampers.

BB. UL 555S, Standard for Smoke Dampers.

CC. U.S. Army Corps of Engineers, Unified Facilities Criteria 3-450-01, Noise and Vibration Control.

DD. U.S. Department of Justice and U.S. Department of Transportation (DOT), Americans with Disabilities Act Accessibility Guidelines (ADAAG); and

EE. U.S. DOT, Urban Mass Transportation Administration, Subway Environmental Design Handbook. Volume I. Principles and Applications. Second Edition.

3.13.2.3 Plumbing Codes and Standards (current edition if not dated or referenced by code)

A. ASME/ANSI B16, Fittings and Valves package of standards.

B. ASME B31, Pressure Piping package of standards.

C. American Society of Testing and Materials (ASTM), ASTM B88, Standard Specification for Seamless Copper Water Tube.

D. 2015 International Plumbing Code.

E. 2015 International Fire Code.

F. 2015 International Fuel Gas Code.

G. NFPA 101, Life Safety Code.

H. NFPA 130, Fixed Guideway Transit and Passenger Rail Systems.

I. The Plumbing and Drainage Institute, PDI-G 101 Testing and Rating Procedure for Hydro Mechanical Grease Interceptors with Appendix of Installation and Maintenance.

J. Plumbing-Heating-Cooling Contractors Association, National Standard Plumbing Code.

K. Underwriters' Laboratory, Inc. (UL) standards.

L. U.S. Access Board, Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines (ADAAG).

M. Local sanitary authority having jurisdiction.

3.13.2.4 Vertical Transportation Codes and Standards

A. American Society of Mechanical Engineers (ASME):

1. A17.1 Safety Code for Elevators and Escalators, current version.
2. A17.2 Guide for Inspection of Elevators, Escalators and Moving Walks, current version.
3. A17.5 Elevator and Escalator Electrical Equipment, current version.
4. QEI-1 Standard for the Qualification of Elevator Inspectors, current version.

B. American Society for Testing and Materials (ASTM):

1. A36 Specification for Carbon Structural Steel.
2. A53 Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

3. A123 Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
4. A153 Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
5. A240 Specification for Chromium & Chromium-Nickel Stainless Steel Plate, Sheet & Strip for Pressure Vessels & for General Applications.
6. A276 Specification for Stainless Steel Bars and Shapes.
7. A385 Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
8. A554 Specification for Welded Stainless Steel Mechanical Tubing Alloy-Coated (Galvannealed) by the Hot-Dip Process.
9. A865 Specification for Threaded Couplings, Steel, Black or Zinc-Coated (Galvanized) Welded or Seamless, for Use in Steel Pipe Joints.
10. B108 Specification for Aluminum-Alloy Permanent Mold Castings.
11. B209 Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
12. B211 Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod and Wire.
13. B221 Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
14. E136 Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 C.

C. American National Standards Institute (ANSI):
   1. C80.1 Electrical Rigid Steel Conduit, Zinc-Coated.
   2. Z97.1 Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.

D. American Public Transportation Association (APTA):
   1. RT-RP-FS-008-03 Heavy Duty Transportation System Elevator Design Guidelines.

E. Americans with Disabilities Act Accessibility Guidelines (ADAAG)

F. American Welding Society (AWS):
   1. D1.1 Structural Welding Code – Steel.

G. National Fire Protection Association (NFPA):
   1. 70 National Electrical Code.

H. New York State Uniform Fire Prevention & Building Code (NYSBC)

I. IEC (International Electrotechnical Commission):
   1. 60529 Degrees of Protection Provided by Enclosures (IP Code).

J. Underwriters Laboratories (UL):
   1. 360 Liquid-Tight Flexible Steel Conduit.
   2. 1581 Reference Standard for Electrical Wires, Cables, and Flexible Cords Style.
   3. 1015 Hookup Wire.

3.13.3 Related Documents

3.13.3.1 Drawings

The following LIRR standard reference drawings shall apply

LIRR Standard Reference Drawings	
Drawing	Title
Sheets 1 - 6	Boarding Platform lighting - WP9SE-LED

3.13.3.2 Specifications

The following specifications shall apply:

Technical Specifications		
Section	Title	LIRR Standard
14 24 23	Standard Hydraulic Elevator	Yes
14 21 00	Traction Gearless Elevators	Yes

3.13.4 Electrical Design Requirements

3.13.4.1 Electrical Power System

The Design-Builder shall provide an electrical power system conforming to the following design requirements:

A. The electrical service(s) shall be evaluated to determine if it is sized adequately to supply current station needs and a projected 25 percent increase. If it is not properly size then a new service shall be brought to the station.

B. The power distribution system shall be a [redacted], [redacted] phase, [redacted]wire system which complies with the NFPA 70 requirements.

C. Conductors and cable shall be UL listed. Cable shall be low smoke LSZH XHHW-2 or RHW-2 cable. Conductors No. 8 and larger shall be stranded. Branch circuit feeders and motor circuit feeders shall be sized to limit voltage drop to 3 percent. As per NFPA 70 maximum voltage drop for feeders plus branch circuit shall not exceed 5 percent.

D. Emergency power conduits shall be run in a separate raceway than normal power. Emergency related system conductors shall be protected from physical damage by embedment or concrete encasement.

E. Mineola Station: The power distribution system shall be designed to include provisions for a portable emergency generator to be connected into the emergency power system through a manual transfer switch (MTS). Upon loss of normal power the system shall be ready to accept the integration of the emergency generator without any modification. The system shall be designed in compliance with NFPA 130 and NFPA 101 (Chapters 7 & 9). The temporary generator shall supply loads to the following::

1. Station building lighting, Platform lighting.
2. Ticket office outlets.
3. Communications room.

4. Electrical/mechanical room lighting.

F. The emergency system shall be designed to accept an 80Kw generator.

3.13.4.2 Lighting

A. The Design-Builder shall provide a lighting system designed to comply with requirements from current local regulations, standards and codes, including: APTA Security Lighting for Transit Passenger Facilities, APTA SS-SIS-RP-001-10, APTA Security Lighting for Nonrevenue Transit Facilities, APTA SS-SIS-RP-002-10, Illuminating Engineering Society of North America (IESNA), IESNA G-1-03, Guideline on Security Lighting for People, Property, and Public Spaces.

B. The illumination levels shall be as set in this document and as per LIRR requirements. Illuminations levels as provided by the Design-Builder shall be backed up by point-to-point calculations, include average maintained illumination, and max-to-min ratios.

C. All lighting conductors, wires and cable shall be run in raceway and comply with the National Electrical Code (NFPA 70), NFPA 130 and LIRR requirements.

3.13.4.2.1 Station Site

The Design-Builder shall provide station site lighting designed to create a sense of security for people around the area, this is the first impression that railway stations leave on travelers and influence passenger view of the entire rail network. It is very important to deliver a safe and pleasant passenger experience, not just in the station itself but in its site and vicinity.

3.13.4.2.2 Platform and track area

The Design-Builder shall provide platform and track area lighting which is one of the most important safety and security concerns in a station. The platform lighting must extend the entire length of the platform while emphasizing the platform edges and track area. It is crucial to avoid dark spots and to avoid blinding train engineers with inappropriate lighting level. It shall also be a priority to make sure that lighting does not infringe with adjacent buildings and/or residences.

3.13.4.2.3 Platform access

The Design-Builder shall provide Entrances, elevators lobby, ramps, stairs, underpasses and overpasses with special consideration during the design stage to assure that access areas are properly illuminated and make passengers safe and comfortable accessing the station.

3.13.4.2.4 Lighting Fixtures

The Design-Builder shall provide energy efficient LED type lighting fixtures, mounting heights and mounting methods shall be based on the station configuration and shall be coordinated with the architect and station management Fixtures shall be vandal resistant, tamper proof design to withstand rough abuse. Vandal-resistant lighting fixtures increased resistance to prying and weather-resistant seals as well as impact resistant and shatter-resistant lenses.

A. Basis of design lighting fixtures shall be rated for outdoor application:

1. Canopy LED strip lighting (warm white) – Acuity Brands winline 300 series anodized aluminum, or approved equal
2. Sign band LED strip lighting (Blue)
3. Non canopy platform LED lighting (warm white) - Kim Lighting model WP9SE-LED, anodized aluminum or approved equal.

a. Light shall be mounted to the top of the “T” section structural column matching the structural canopy columns.

4. Site LED lighting (warm white) - Kim Lighting model WP9SE-LED pole mounted or approved equal.

3.13.4.2.5 Exit Lights

The Design-Builder shall provide Egress Exit Lighting to facilitate the station exiting process. Exit lighting fixtures shall be LED type. The station exit lighting system shall comply with the International Building Code (IBC), NFPA 1, NFPA 101, OSHA regulations and local codes and regulations.

3.13.4.2.6 Ramps, Stairs and Escalator – Emergency Lighting

A. The station lighting system shall include emergency lighting on ramps, stairs and escalators. Provide emergency lighting to ensure that passengers can find the exit under a loss of power to the electrical system. This is typically accomplished with battery power lights and in station provided with an emergency generator by connecting emergency lighting fixture to the emergency system.

B. The system shall maintain 3 foot-candles (fc) illumination level, the system shall follow NFPA 1, NFPA 101, NFPA 130 and the National Electric Code (NFPA 70) article 700.

C. The illumination level shall be as measured at the horizontal plane of the walking surface.

3.13.4.2.7 (Not Used)

3.13.4.2.8 Illumination Levels

The Design-Builder shall provide average illumination levels as per Exhibit E1 and Exhibit E2 below.

Note: If the Max/Min ratios recommended in the current IES handbook for Exhibit E1 areas are more restrictive, then IES handbook ratios prevail. Otherwise, Exhibit E1applies.

Note: FC values are measured at the grade/Platform horizontal plane for Stations and 30 inches above the finished floor for OMF.

Note: If the Max/Min ratios recommended in the current IES handbook for Exhibit E2 areas are more restrictive, then IES handbook ratios prevail.

Note: FC values are measured at the grade/Platform horizontal plane for Stations and 30 inches above the finished floor for OMF.

3.13.4.3 Public Address System

The Design-Builder shall provide all stations with public address system to make announcements and address safety and security issues and to guide the public on the most effective way to proceed on any situation. Stations are generally located on densely populated area the daytime announcement need to be loud to be understood, however, the system shall minimize sound interference with the surrounding community. See TP3.20 COMMUNICATIONS for additional requirements.

3.13.4.4 TVM

Ticket Vending Machine's (TVM's) relocations shall be properly coordinated with the Railroad to follow the station passenger traffic, to provide a sense security to passenger purchasing tickets and to avoid riders' congestion. The areas shall be properly illuminated. Electric power and communication shall be provided to all TVMs. See TP3.20 COMMUNICATIONS for additional requirements.

3.13.4.5 AVPS

The Design-Builder shall provide the station with an Audio Visual Public Address System (AVPS) to help passengers navigate the station. This system shall help customers to know which platform their train arrive on or will depart from.

A. The AVPS shall include audio and visual information and comply with LIRR ADA requirements. System consoles shall be distributed throughout the station.

B. See TP3.20 COMMUNICATIONS for additional requirements.

3.13.4.6 Station Power

The Design-Builder shall provide incoming electric service(s) located in dedicated rooms. If required secondary electrical rooms shall be provided to house lighting panelboards and receptacles panelboards.

A. Where new electrical service is required the service equipment and associated metering shall be sized to properly supply all station power needs, including lighting, power, maintenance equipment, elevators, escalators and retail vendors' spaces.

3.13.4.7 Boiler Building Power

The Design-Builder shall provide boiler and HVAC equipment power derived from a station power system independent from the lighting and low voltage systems power.

3.13.4.8 Overpass Power

The Design-Builder shall provide overpass power designed to provide a degree of safety such as that the loss of a power circuit would disconnect all equipment installed on the overpass and/or lose the lighting in the space.

3.13.4.9 Elevator Power

The Design-Builder shall power for the elevator controller through a lockable fused disconnect switch or circuit breaker to be located in the vicinity of the equipment room door. The elevator cab lights shall be circuited to a separate circuit and shall be provided with emergency power which shall be accomplished with batteries. The elevator power system shall have separate grounding conductor.

3.13.4.10 Station Grounding

The Design-Builder shall provide a station power system including a grounding system which complies with the National Electrical Code (NFPA 70), IEEE standards and local codes and regulations. Grounding electrode system of buried interconnected conductors and electrodes shall form a grid for the station.

A. All major equipment, as well as canopies, fences, railings, handrails, shelters and other metal items on platforms and station building must be grounded.

3.13.4.11 Lightning Protection System

The Design-Builder shall provide a lightning protection system in accordance to NFPA 780, Standard for the Installation of Lightning Protection System and UL 96A shall be provided.

3.13.4.12 Heat trace

Mechanical piping which is exposed to outdoor temperatures shall be provided with heat tracing to prevent freezing.

3.13.4.13 Fire, Smoke Detection and Alarm Systems

A. To protect life and property at stations it is very important to be able to detect and locate fires. Smoke detectors, horns, strobes shall be provided in offices, waiting rooms, restrooms, storage rooms, overpasses, and mechanical and electrical spaces. Elevator shafts and machine rooms shall be provided with smoke detectors.

B. The Design-Builder shall design the fire alarm system; however, he shall only be responsible for providing an empty conduit system. LIRR Fire Alarm contractor, ILS shall run all cabling, installation of devices, programming and final connections.

C. The system shall be designed to comply with NFA 72.

3.13.4.14 Temporary Power

The Design-Builder shall provide temporary power supply to maintain station operations and to supply temporary construction activities throughout the duration of construction until permanent

power supplies are commissioned and determined to be complete. The Design-Builder shall provide temporary power panels and all other power accessories as required to provide a code compliant system during construction.

3.13.4.15 Temporary Lighting

The Design-Builder shall provide temporary lighting during construction to maintain code required lighting levels at all stations. Temporary lighting equipment shall not be used as final installation equipment.

3.13.4.16 Electrical Design Submittals

The Design-Builder shall submit Electrical Design for Review and Comment at the following stages and including the following minimum content:

A. Preliminary Design
    1. Design Criteria and Basis of Design Report.

B. Intermediate Design
    1. HVAC Calculations, Single Line Drawings, Equipment Schedule, Power Load Schedules, Standard Project Specific Details.
    2. Updated information from Preliminary Design.

C. Final Design
    1. Product Data Sheets for all materials, products and components.
    2. Material Safety Data Sheets.
    3. Samples of products exposed to view in public areas; and
    4. Updated information and samples from Intermediate Design.

3.13.5 Mechanical Design Requirements

3.13.5.1 Ventilation Design Criteria

The Outdoor Design Conditions shall be as follows:

A. Summer dry bulb temperature
B. Summer wet bulb temperatur
C. Winter dry bulb temperature:

3.13.5.2 Ventilation Rates

The Design-Builder shall provide all HVAC systems and equipment complying with ASHRAE 62.1 and ICC *International Mechanical Code (adopted by NY State)* requirements for ventilation rates for occupied spaces being heated, ventilated, and/or air conditioned.

A. The Design-Builder shall provide ventilation for all elevator hoistways.

3.13.5.3 Snow Melt Systems

A. The Design-Builder shall design a complete hydronic ice/snow melting system to heat all station platforms. Design Conditions for ice/snow melting shall be an outside air temperature of 0 deg. F. with a 10 mile per hour wind, and 85% relative humidity. The system shall be designed to the following requirements:

1. Boilers shall be sized so that one boiler per boiler room is for standby.
2. Boiler rooms shall be designed to work with future utility supplied natural gas where utility service is available. Where natural gas service from utility is not available, boilers shall be designed to work with oil supplied from oil storage tank(s) at locations that shall be approved by LIRR. Boiler rooms shall be designed and constructed to receive utility service, but actual utility service connections are not in the scope of this Contract.

B. The Design-Builder shall provide piping within station platforms for hydronic snow melt system for each platform at all stations (two platforms per station). Each platform snow melt system will include, but not be limited to the following:

1. Snow melt piping consisting of Polyethylene Random (PPR) pipe, PEX plastic pipe, or approved equal. Piping system shall be pressure tested to verify no leaks are present and all open ends capped for future installation of the boilers to provide a complete system.

3.13.5.4 Heating and Air Conditioning Equipment Rooms.

The Design-Builder shall provide ductless mini-split heat pumps in the electrical room, IT room, communications room, and the elevator machine room. Outdoor units shall be in a secured enclosure in a location approved by LIRR. Provide indoor evaporating units with condensate pumps and pipe to acceptable location.

A. All customer and/or ticket agent spaces will include appropriate HVAC capability and shall be designed in accordance with the LIRR Station Guidelines and any aforementioned codes or standards.

B. Ductless mini-split AC system with heat pump option and BAC-Net/BMS capability.

C. In accordance with LIRR Fire Marshal requirements, all HVAC systems shall be interlocked with the fire alarm system at each location.

3.13.5.5 Mechanical Design Submittals

The Design-Builder shall submit Mechanical Design for Review and Comment at the following stages and including the following minimum content:

A. Preliminary Design

1. Design Criteria and Basis of Design Report.

B. Intermediate Design

1. HVAC Calculations, Single Line Drawings, Equipment Schedule, Power Load Schedules, Standard Project Specific Details.
2. Updated information from Preliminary Design.

C. Final Design

1. Product Data Sheets for all materials, products and components.
2. Material Safety Data Sheets.
3. Samples of products exposed to view in public areas.
4. Updated information and samples from Intermediate Design.

3.13.6 Plumbing Design Requirements

3.13.6.1 Drainage

3.13.6.1.1 Above-Grade Stations

The Design-Builder shall provide deck drains and/or trench drains with epoxy-coated, cast iron, heel-proof grates to collect surface drainage from Platforms and open concession areas.

3.13.6.1.2 Subsurface

The Design-Builder shall provide gravity flow drainage. Where collection points are level or below the elevation of gravity outfalls. Station entries, ventilation shafts and similar openings shall not be conveyed to the Guideway drainage systems (Exception: Drainage from Station Platforms). Subsurface drainage shall be intercepted before it enters into the track drainage system and diverted to a public stormwater system.

3.13.6.1.3 Location

A. The Design-Builder shall provide drainage slot inlets or sumps in Stations at an interval of 100 feet along each Guideway. Provide gravity drainage from the low point under Platforms and connect to storm or track drainage system. Provide under Platform wall sleeves to ensure continuous gravity flow.

B. The Design-Builder shall provide a drain or sump pump at elevator pit per ASME A17.1, Safety Code for Elevators and Escalators. Sump pump discharge shall be per the AHJ. Provide an automatic sump pump oil sensor as part of the elevator control system.

3.13.6.1.4 Piping

Provide piping per the requirements in Exhibit 9.5.

Exhibit 9.5 – Drainage - Pipe Sizes

Diameter (inches)	Material	Use
4	Extra-Heavy-Weight Cast Iron	Drain Connections in Structural Walls and Floor
6	Extra-Heavy-Weight Cast Iron	Drain Connections in Structural Walls and Floor
6	Extra-Heavy-Weight Cast Iron	Branch Connections in Structures and Underground
8	Polyvinyl Chloride (PVC) Sewer Pipe Schedule 80	Station Track Drain and Subsurface Line Track Drainage
10	PVC Sewer Pipe Schedule 80	Station Track Drain and Subsurface Line Drainage

Note: Drainage piping to provide a minimum velocity of 2.5 feet per second with the pipe flowing 50 percent full.

3.13.6.2 Platform dry water line service

A. The Design-Builder shall provide a dry water line at each platform with one hose bibb (two per station) located at the mid-point of each platform.

1. Pitch pipe and add drain valves so all water can be drained from the system.
2. The dry system shall allow a powerwasher to be connected to the system at street level
3. The dry waterline system shall be comprised of the following materials:

3.13.6.3 Natural Gas System

The Design-Builder shall provide incoming main, service meter and service regulator coordinated with natural gas supplier. When meter and regulator are supplied by the local natural gas company, install these items per their written requirements of the local natural gas company.

3.13.6.4 Area Drains

The Design-Builder shall provide area drains at emergency exits, exterior elevators, and where trench drains are unsuitable or unacceptable to Railroad.

3.13.6.5 Piping and Valves

3.13.6.5.1 Piping

A. The Design-Builder shall provide pressure piping systems per ASME B31, *Pressure Piping.* Provide pipe fittings, flanges, valves, accessories and comply with the requirements of AMSE B16, *Fittings and Valves*.

B. Piping in public areas of Stations shall be concealed from view.

3.13.6.5.2 Pipe and Fittings

The Design-Builder shall provide pipe and fittings conforming to the following design requirements:

A. Embedded cold water piping hard-drawn copper type K tubing.

B. Non-embedded hot and cold water piping shall be hard-drawn type L copper tubing with wrought brass or copper fittings.

C. Type L and K copper shall be per ASTM B88, Standard Specification for Seamless Copper Water Tube.

D. Water service pipe two (2) inches and larger shall be ductile iron with dual mechanical-joints for pipe, and type K copper with wrought fittings for pipe sizes less than two (2) inches in diameter.

E. The minimum diameter of waste pipe installed underground or embedded in structural slabs shall be four (4) inches.

F. Connect pipes of dissimilar metals and metallic pipe entering a building with dielectric couplings.

G. Force mains shall be of ductile iron pipe with joints per AHJ.

3.13.6.5.3 Plumbing Design Submittals

The Design-Builder shall submit Plumbing Design for Review and Comment at the following stages and including the following minimum content:

A. Preliminary Design:

1. Plumbing Design Criteria and Basis of Design Report.

B. Intermediate Design:

1. Plumbing diagrams and equipment schedules.
2. Updated information from Preliminary Design.

C. Final Design:

1. Product Data Sheets for all materials, products and components.
2. Samples of products exposed to view in public areas.
3. Safety Data Sheets.
4. Updated information and samples from Intermediate Design.

3.13.6.6 Vertical Transportation

The Design-Builder shall provide Hydraulic APTA Grade ADA compliant elevators at pedestrian overpasses, stations, and/or parking structure, except where indicated that elevators will not be provided. Elevators shall conform to the following design requirements:

A. Quantity – Each overpass, stations, and/or parking structure, shall be provided with elevators to provide access to the westbound and eastbound platforms. See table below for quantity of elevators and overpasses that do and do not receive elevators. See TP3.12 STATIONS AND ARCHITECTURE for details on overpass designation as listed below :

Station	Designation	Elevators provided	Quantity
Floral Park	Existing station viaduct	Yes	3
Merillon	N parking	Yes	2
Mineola	Station Plaza	No	0

Mineola	Main Street	Yes	2
Mineola	Willis Avenue	Yes	2
Carle Place	Stonehinge	Yes	2
Westbury	Parking Structure	Yes	2
Westbury	East End	No	0

B. Elevator machine rooms shall be climate controlled with air-conditioning and heat.

C. 5WL pattern stainless steel shall be used on all surfaces except fixtures and ceilings.

D. Cab bottom section panels shall be 5WL pattern stainless steel.

3.13.6.6.1 Hydraulic Elevators

The Design-Builder shall provide Hydraulic APTA Grade ADA compliant elevators with a travel distance no greater than 40 feet. Elevators shall conform to the following design requirements:

A. Design – Refer Technical Specification 14 24 23 – standard hydraulic elevator, for all elevator requirements not stipulated herein.

B. Elevators shall be non-proprietary

C. Elevators shall be direct acting single stage piston, unless technically not feasible.

1. Telescopic pistons are not permitted

D. Elevator Cabs and entrances shall be stainless steel.

E. Elevator Cabs shall be glazed to the fullest extent possible.

1. Glazing shall be [redacted] (minimum) tempered, laminated safety glazing, Low-E complying with NYS building codes.

F. All elevators shall conform to the following:

1. Elevator Use: Passenger service.

2. Capacity in pounds: Rated capacity: [redacted] APTA capacity: [redacted]

3. Travel Speed: [redacted] (feet per minute), [redacted], regardless of load or operating direction

4. Travel Distance: Specific to each station location, maximum [redacted]

5. Number of Stops:

a. Overpasses - Three (3) at Street, Platform, and overpass levels.

b. Merillon Ave – Two (2) at Nassau Blvd and grade adjacent to the station platforms.

c. Floral Park - Two (2) at grade and the boarding platforms on the viaduct level.

6. Machine Locations: At grade.

7. Car and Hoistway Doors:
   a. Type: Single Speed Side opening doors
   b. Operation: Power, closed loop VVVF
   c. Opening Speed:
   d. Operating Times:
   e. Door Dwell Times:
   f. Reversal Device:

8. Car Operating Panel: Stainless steel, vandal resistant and NEMA 4X rated.
9. Hall Fixtures: Stainless steel, vandal resistant and NEMA 4X rated.
10. Leveling: Automatic; [redacted] under any loading condition.
11. Communication System: Two-way, hands-free.

3.13.6.6.2 Traction Elevators

The Design-Builder shall provide APTA Grade ADA compliant traction elevators where travel distance greater than 40 feet is required. Elevators shall conform to the following design requirements:

A. Elevators shall be non-proprietary.

B. Minimum capacity of elevators shall be [redacted]. Elevators shall be traction type elevators with a machine room above the elevator shafts. Machine room shall have HVAC.

C. Elevator Cabs and entrances shall be stainless steel.

D. Elevator Cabs shall be glazed to the fullest extent possible.
   1. Glazing shall be [redacted](minimum) tempered, laminated safety glazing, Low-E complying with NYS building codes.

E. MRL type elevators shall not be permitted.

F. All equipment shall be non-proprietary.

G. Design - Refer to Technical Specification 14 21 00 - Traction Gearless Elevator for all elevator requirements not stipulated in this Section.

H. All elevators shall conform to the following:
   1. Elevator Use: Passenger service.
   2. Capacity in pounds: Rated capacity; [redacted]
   3. Travel Speed: [redacted] regardless of load or operating direction.
   4. Travel Distance: Specific to each station, minimum [redacted] feet.

5. Number of Stops: Specific to each station.
6. Machine Room Locations: Above the hoist way.
7. Car and Hoist way Doors:
   a. Type:
   b. Operation:
   c. Opening Speed:
   d. Operating Times:
   e. Door Dwell Times:
   f. Reversal Device:

8. Car Operating Panel: Stainless steel, vandal resistant and NEMA 4X rated.
9. Hall Fixtures: Stainless steel, vandal resistant and NEMA 4X rated.
10. Leveling: Automatic; [redacted] under any loading condition.
11. Communication System: Two-way, hands-free.

3.13.7 Construction Requirements

A. The Design-Builder shall provide attic stock of the following items:
   1. Thermostats – 10% of the total quantity installed.
   2. Registers / grills – 10% of the total quantity installed

B. Attic Stock shall be handed over to LIRR for storage at the completion of the Project.

3.13.8 Summary of Submittals

Item	Section	Submittal	Action
1	3.13.4.2	Mechanical Design - Preliminary	Review and Comment
2	3.13.4.2	Mechanical Design – Intermediate	Review and Comment
3	3.13.4.2	Mechanical Design - Final	Review and Approval
4	3.13.4.1	Electrical Design - Preliminary	Review and Comment
5	3.13.4.1	Electrical Design - Intermediate	Review and Comment
6	3.13.4.1	Electrical Design - Final	Review and Approval
7	3.13.4.3	Plumbing Design - Preliminary	Review and Comment
8	3.13.4.3	Plumbing Design - Intermediate	Review and Comment
9	3.13.4.3	Plumbing Design - Final	Review and Approval
10	3.13.4.4	Elevator Design - Preliminary	Review and Comment
11	3.13.4.3	Elevator Design - Intermediate	Review and Comment
12	3.13.4.3	Elevator Design - Final	Review and Approval

END

3.14 PARKING STRUCTURES AND PARKING LOTS

3.14.1 Section Includes

This section sets out design and construction requirements related to parking structures and surface lots.

3.14.2 Codes and Standards

Project Work shall comply with all statutory requirements, and shall comply with the codes and standards identified in Appendix TPA3.1A CODES AND INDUSTRY STANDARDS and the codes and standards listed in this section.

3.14.2.1 General Codes and Standards

Codes	
International Building Code (NY Edition)	2015
International Existing Building Code (NY Edition)	2015
International Fire Code (NY Edition)	2015
International Plumbing Code (NY Edition)	2015
International Mechanical Code (NY Edition)	2015
International Fuel Gas Code (NY Edition)	2015
International Property Maintenance Code (NY Edition)	2015
Uniform Code Supplement	2016
ASHRAE 90.1	2013
NFPA 70, National Electric Code (NEC)	2014
International Energy Conservation Code (NY Edition)	2015
Energy Code Supplement	2016
Executive order 88	2013
ADA standards for Accessible Design	2010
ASME A17.1	Current
Standards	
Occupational Safety and Health Administration (OSHA)	Current
U.S. Green building Council - LEED	Current

3.14.2.2 Electrical Codes and Standards

A. American National Standards Institute (ANSI), ANSI/IES RP-8, American National Standard Practice for Roadway Lighting.

B. American National Standards Institute (ANSI), ANSI/IES RP-8, American National Standard Practice for Roadway Lighting.

C. APTA SS-SIS-RP-001-10, APTA Security Lighting for Transit Passenger Facilities.

D. APTA SS-SIS-RP-002-10, APTA Security Lighting for Nonrevenue Transit Facilities.

E. ASHRAE - Standard 90.1, Energy Standard for Buildings.

F. IESNA - The Lighting Handbook.

G. IESNA G-1-03, Guideline on Security Lighting for People, Property, and Public Spaces.

H. IESNA LM-80, Approved Method for Measuring Lumen Maintenance of LED Light Sources.

I. IESNA RP-8, Roadway Lighting.

J. IESNA RP-20-98, Lighting for Parking Facilities.

K. IEEE C2, National Electrical Safety Code (NESC).

L. IEEE C62.11, IEEE Standard for Metal-Oxide Surge Arresters for AC Power Circuits (>1 kV).

M. IEEE 80, IEEE Guide for Safety in AC Substation Grounding.

N. IEEE 242, Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.

O. Insulated Cable Engineers Association requirements.

P. International Code Council (ICC), International Building Code (IBC).

Q. International Electrical Testing Association (NETA), Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems.

R. NECA 1, Good Workmanship.

S. NECA 90, Commissioning Building Electrical Systems.

T. NECA 101, Installing Steel Conduits.

U. NECA 111, Installing Nonmetallic Raceways.

V. NECA 200, Temporary Electrical Power at Construction Sites.

W. NECA 230, Installing Electrical Motors and Controllers.

X. NECA 400, Installing Switchboards.

Y. NECA 406, Installing Panelboards.

Z. NECA 409, Installing Dry-Type Transformers.

AA. NECA 420, Standards for Fuse Applications.

BB. NECA 500, Installing Indoor Lighting.

CC. NECA 501, Installing Exterior Lighting.

DD. NECA 600 – Installing Medium Voltage Cable.

EE. NEMA ICS 18, Motor Control Centers.

FF. NEMA LA 1, Surge Arresters.

GG. NEMA SSL-3, High-Power White LED Binning for General Illumination.

HH. NEMA 250, Enclosures for Electrical Equipment (1000 Volts Maximum).

II. NFPA 30, Flammable and Combustible Liquids Code.

JJ. NFPA 70, National Electrical Code (NEC).

KK. NFPA 70E, Standard for Electrical Safety in Work Place.

LL. NFPA 70B, Recommended Practice for Electrical Equipment Maintenance.

MM. NFPA 72, National Fire Alarm and Signaling Code.

NN. NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems.

OO. NFPA 1, Fire Code.

PP. NFPA 101, Life Safety Code.

QQ. NFPA 110, Standard for Emergency and Standby Power Systems.

RR. NFPA 130, Standard for Fixed Guideway Transit and Passengers Rail Systems.

SS. NFPA 780, Standard for the Installation of Lightning Protection Systems.

TT. UL 845, Motor Control Centers.

UU. UL 1449, UL Standard for Safety for Surge Protective Devices.

VV. UL 2196, Tests for Fire Resistive Cables.

3.14.2.3 Mechanical Codes and Standards (current edition if not dated or referenced by code)

A. Air Conditioning and Refrigeration Institute standards.

B. Air Diffusion Counsel standards.

C. Air Movement and Control Association standards.

D. American Boiler Manufacturers Association standards.

E. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), ASHRAE Handbook – HVAC Applications.

F. ASHRAE, ASHRAE Handbook – Fundamentals.

G. ASHRAE, Commissioning Process for Buildings and Systems.

H. ASHRAE 62, Ventilation for Acceptable Indoor Air Quality.

I. 2015 International Mechanical Code.

J. 2015 International Energy Conservation Code

K. American National Standards Institute (ANSI)/ASHRAE 62.1, Ventilation for Acceptable Indoor Air Quality.

L. ASHRAE 90.1, Energy Standard for Buildings.

M. American Society of Mechanical Engineers (ASME), ASME B31, Standards of Pressure Piping.

N. ASME B16.10, Face-to-Face and End-to-End Dimensions of Valves.

O. American Society for Testing and Materials (ASTM), Standard E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

P. National Fire Protection Association (NFPA), NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems.

Q. NFPA 1, Fire Code.

R. NFPA 101, Life Safety Code.

S. NFPA 111, Standard on Stored Electrical Energy Emergency and Standby Power Systems.

T. NFPA 130, Standard for Fixed Guideway Transit and Passengers Rail Systems.

U. NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials.

V. Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA), HVAC Air Duct Leakage Test Manual.

W. SMACNA, HVAC Duct Construction Standards – Metal and Flexible.

X. SMACNA, HVAC Systems Duct Design.

Y. SMACNA, Rectangular Industrial Duct Construction Standards.

Z. Underwriters Laboratories, Inc., UL 723 (ASTM E84), Test for Surface Burning Characteristics of Building Materials.

AA. UL 555, Standard for Fire Dampers.

BB. UL 555S, Standard for Smoke Dampers.

CC. U.S. Army Corps of Engineers, Unified Facilities Criteria 3-450-01, Noise and Vibration Control.

DD. U.S. Department of Justice and U.S. Department of Transportation (DOT), Americans with Disabilities Act Accessibility Guidelines (ADAAG).

EE. U.S. DOT, Urban Mass Transportation Administration, Subway Environmental Design Handbook. Volume I. Principles and Applications. Second Edition.

3.14.2.4 Plumbing Codes and Standards (current edition if not dated or referenced by code)

A. ASME/ANSI B16, Fittings and Valves package of standards.

B. ASME B31, Pressure Piping package of standards.

C. American Society of Testing and Materials (ASTM), ASTM B88, Standard Specification for Seamless Copper Water Tube.

D. 2015 International Plumbing Code.

E. 2015 International Fire Code.

F. 2015 International Fuel Gas Code.

G. NFPA 101, Life Safety Code.

H. NFPA 130, Fixed Guideway Transit and Passenger Rail Systems.

I. The Plumbing and Drainage Institute, PDI-G 101 Testing and Rating Procedure for Hydro Mechanical Grease Interceptors with Appendix of Installation and Maintenance.

J. Plumbing-Heating-Cooling Contractors Association, National Standard Plumbing Code.

K. Underwriters' Laboratory, Inc. (UL) standards.

L. U.S. Access Board, Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines (ADAAG); and

M. Local sanitary authority having jurisdiction.

3.14.2.5 Vertical Transportation Codes and Standards

A. American Society of Mechanical Engineers (ASME):

1. A17.1 Safety Code for Elevators and Escalators, current version.
2. A17.2 Guide for Inspection of Elevators, Escalators and Moving Walks, current version.
3. A17.5 Elevator and Escalator Electrical Equipment, current version.
4. QEI-1 Standard for the Qualification of Elevator Inspectors, current version.

B. American Society for Testing and Materials (ASTM):

1. A36 Specification for Carbon Structural Steel.
2. A53 Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. A123 Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
4. A153 Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
5. A240 Specification for Chromium & Chromium-Nickel Stainless Steel Plate, Sheet & Strip for Pressure Vessels & for General Applications.
6. A276 Specification for Stainless Steel Bars and Shapes.
7. A385 Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
8. A554 Specification for Welded Stainless Steel Mechanical Tubing Alloy-Coated (Galvannealed) by the Hot-Dip Process.
9. A865 Specification for Threaded Couplings, Steel, Black or Zinc-Coated (Galvanized) Welded or Seamless, for Use in Steel Pipe Joints.
10. B108 Specification for Aluminum-Alloy Permanent Mold Castings.
11. B209 Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
12. B211 Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod and Wire.
13. B221 Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
14. E136 Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 C.

C. American National Standards Institute (ANSI):

1. C80.1 Electrical Rigid Steel Conduit, Zinc-Coated.
2. Z97.1 Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.

D. American Public Transportation Association (APTA):

1. RT-RP-FS-008-03 Heavy Duty Transportation System Elevator Design Guidelines.

E. Americans with Disabilities Act Accessibility Guidelines (ADAAG)

F. American Welding Society (AWS):

1. D1.1 Structural Welding Code – Steel.

G. National Fire Protection Association (NFPA):

1. 70 National Electrical Code.

H. New York State Uniform Fire Prevention & Building Code (NYSBC)

I. IEC (International Electrotechnical Commission):

1. 60529 Degrees of Protection Provided by Enclosures (IP Code).

J. Underwriters Laboratories (UL):

1. 360 Liquid-Tight Flexible Steel Conduit.
2. 1581 Reference Standard for Electrical Wires, Cables, and Flexible Cords Style.
3. 1015 Hookup Wire.

3.14.3 Related Documents

A. Technical Specifications.

B. Directive Drawings.

3.14.4 Service Life

The Design-Builder shall provide a final durable product that has been designed with a minimum service life of 75 years.

A. Service life timeline:

1. The final durable product can be up-kept with general maintenance for the first 50 years of service.
2. The final product can be maintained for an additional 25 years by means of full rehabilitation after the 50 year milestone.

3.14.5 General Design Requirements

The Design-Builder shall provide parking structures

A. General Requirements:

1. Structures to be located in accordance with the Directive Drawings.
2. The Design-Builder shall design parking structures in compliance with ASCE 7 Minimum Design Loads for Buildings and Other Structures as well as ACI 318 Building Code Requirements for Structural Concrete.
3. Standard practice for selecting proportions for normal, heavyweight, and mass concrete will be used. Concrete exposure shall be considered severe and resistant to deicing chemicals.

4. The Design-Builder shall coordinate with AHJs regarding additional site specific criteria, except that stall sizes may be [redacted] and aisle widths may be [redacted], and maximum structure heights shall be as set out in this Section.

5. The Design-Builder shall provide temporary parking for commuters to replace any parking spaces that will not be available during construction so that the total number of available spaces is not reduced.

B. Loading Requirements:

1. When applying loading, the Design-Builder shall use an equivalent uniformly distributed load (EUDL) that would produce the lifetime maximum column axial force and midspan beam bending moment. The load is estimated at 35 psf.

C. Material Requirements:

1. Parking garages shall be precast concrete.

D. Component Requirements:

1. Barriers:

i. Cable barriers are not acceptable.

E. Site Specific Requirements:

1. Harrison Ave Parking Garage:

i. Maximum height of the parking garage top deck surface shall be no higher than [redacted] from grade.
ii. The minimum number of spaces shall be [redacted].
iii. Stair wells at First Street.
iv. One sub-surface level of parking.
v. Structure shall be built exclusively within the municipal lot.
vi. The Architectural finish shall be consistent with the Mineola Intermodal Center (MIC).

2. Mineola –South Parking Garage:

i. Maximum height of the parking garage top deck surface shall be no higher than [redacted] feet from grade.
ii. The minimum number of spaces shall be [redacted].
iii. One sub-surface level of parking.
iv. The Architectural finish shall be consistent with the Mineola Intermodal Center (MIC).
v. Locate stairwell on the south side of the garage.
vi. The design shall accommodate three additional levels for future expansion.

3. Westbury North Parking Garage:

i. The southern exterior wall of the garage must be a maximum of [redacted] from the Scally Place eastbound face of the curb, in accordance with the Directive Drawings.

ii. Maximum height of the parking garage top deck surface shall be no higher than [redacted] feet from grade.
iii. Structure shall be built exclusively within the Municipal owned property
iv. The minimum number of spaces shall be [redacted].
v. Provide [redacted] spots of surface parking spaces adjacent to the Parking Structure.
vi. Provide a Kiss and Ride between Westbury North Parking Garage and Union Avenue.
vii. One sub-surface level of parking.
viii. Stair case at the south side of the structure with direct access to the southern surface lot and Union Ave.
ix. Provide [redacted] setback to the northern exterior wall from the back of the existing sidewalk on the south side of Scally Place for future development.
x. Vehicle access to the parking garage shall be through the existing surface lot and utilize the existing eastern entrance from Scally Place. Access from Union Avenue shall also be provided.
xi. The Architectural finish shall be consistent with the new LIRR Westbury Train Station.

4. Westbury South Parking Garage:

i. The western exterior wall of the garage must be a minimum of 335 feet from Post Avenue and Railroad Avenue intersection northbound face of curb as shown in the Directive Drawings.
ii. Maximum height of the parking garage top deck surface shall be no higher than [redacted]
iii. To be built exclusively within the MTA owned property.
iv. Maintain 123 spots of surface parking spaces on the western portion of the lot with access to Railroad Avenue.
v. The minimum number of parking garage spaces shall be [redacted].
vi. The Architectural finish shall be consistent with the new LIRR Westbury Train Station.
vii. An elevator and stairs shall be provided giving access to a pedestrian overpass connecting the parking garage to the north side of the train tracks and also provides access to the rail station platform. .
viii. Access to the station underpass shall be maintained from the first level of the parking garage.

5. Hicksville Parking Garage

i. Maximum height of the parking garage top deck surface shall be no higher than [redacted].
ii. Structure shall be built exclusively within the municipal owned property.
iii. The minimum number of spaces shall be [redacted].
iv. Two (2) sub-surface levels of parking.
v. The Architectural finish shall match the basis of design examples below.

vi. The existing access to the LIRR sub-Station shall be maintained.

3.14.6 Electrical Design Requirements

The Design-Builder shall provide Electrical equipment at each parking structure conforming to the following design requirements:

A. An emergency generator is required. Emergency Generator shall be sized to provide emergency power for the following systems as a minimum:

3. Elevators (one at a time).

a. Special Code required provisions shall be installed for elevator emergency power operation.
4. Parking Access and Revenue Control System computers and pay stations.
5. Emergency lighting.
6. Exit lighting.
7. All equipment and lighting in communications room.

B. No ice melting systems shall be required.

C. Electrical service, adequate to meet the parking structure requirements after construction of all phases, including future expansion, with all elevator shafts occupied and revenue control system, shall be connected to the appropriate Electric Power Company source.

D. Utilize exposed conduits wherever possible. Only rigid galvanized steel (RGS) conduits shall be used. For rigid conduits, utilize threaded connectors only. Except where otherwise required by code or approved, conduit shall be run exposed and attached to the surface of the underside of slabs or the surface of beams, columns, and walls. Where exposed conduits encounter obstructions, the obstructions shall be sleeved to accept the conduit. Ferrous sleeves shall be hot-dipped galvanized. Sheet metal sleeves shall not be permitted.

E. Central lighting control panels, secure from unauthorized use or tampering, shall be provided. Circuit outside lights separate from interior lights. Outer row of lights on covered tiers adjacent to exterior spandrels, and roof lights shall be controlled by photocell programmed to turn these lights off during daylight.

F. Any switches, controls, or thermostats not in the central panel shall not be easily accessible to the public and shall be protected from unauthorized use.

G. No aluminum wire shall be used.

H. Electrical outlets [redacted] shall be provided at each stairwell on each level.

I. The lighting system design shall address the following:

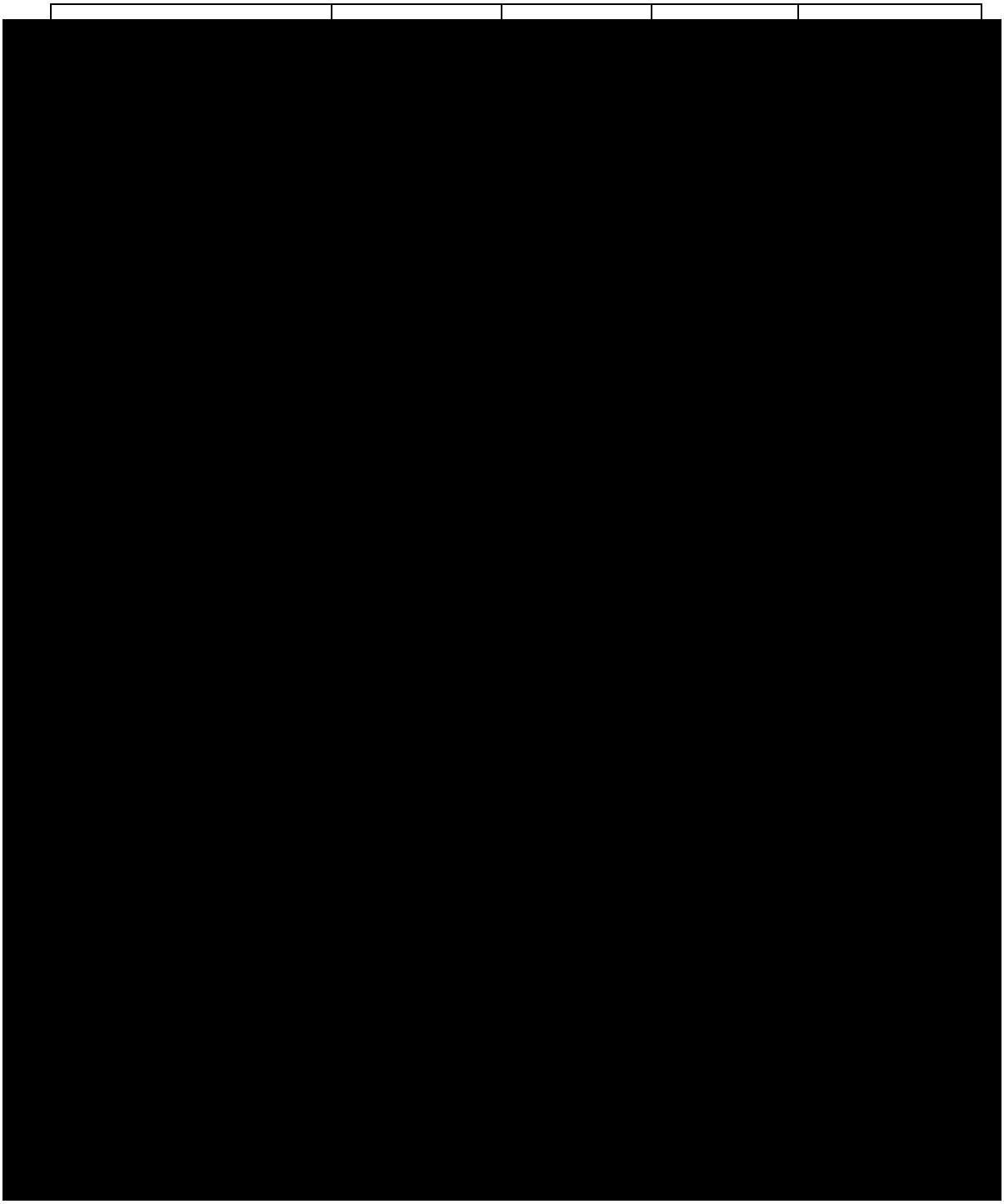
1. Lighting intensity study shall consider the intensity of natural light at various points in the parking structure.
2. Visibility shall be optimized with respect to the vertical and horizontal planes and uniformity of illumination.

J. The lighting system shall be economical, efficient, and provide for minimum maintenance:

1. It shall be energy efficient LED type.
2. Fixtures shall use tamperproof fasteners, be vandal resistant and be weather resistant wherever such fixtures are readily available.
3. Fixture locations shall be easily accessible for maintenance.
4. Fixtures shall have a shroud or shall be otherwise designed to prevent bird roosting and perching.

K. Minimum illumination levels measured at floor level shall be determined through photometric analysis and established based upon structural system, method of operation and user groups to be served.

L. Illumination levels and uniformity ratios shall meet IES and National Parking Association (NPA) recommendations for average maintained lighting of parking structures as well as the following requirements:



M. Point-by-point computer printouts are required to verify lighting performance. Proposed location of lighting shall be coordinated with architectural and structural configuration of the structure.

N. Security lighting shall be provided throughout the parking and pedestrian areas at quantity of 25% of the total minimum general parking area lighting levels.

O. Lighting design shall control spill of light outside of parking structure. A spill light study is required as part of the design process. It is anticipated that some masking of light fixtures will be required to adequately control spill light between parking structure and adjoining buildings.

P. Lighting shall be controlled by a combination of manual on-off switches, 7 day electronic time switches provided with reserve power, and photo controls. Astronomic type time clocks shall not be used. The control system shall permit various patterns of light activations during different times of the day on an area basis:

1. Dusk to one hour after closing: all lights on, except added daylight lighting at vehicular entry/exits.
2. One hour after closing to Dawn: every other fixture off, except at stairwells, elevators and corners of the garage.
3. Dawn to Dusk: All lights on, except photocell controlled lights in outer row of fixtures adjacent exterior spandrels. At vehicular entry/exits photo cells shall turn on fixtures as required to provide added light at vehicular entrances to allow drivers eyes to adjust to lower light levels.
4. Furnish 10% spare lamps of each type and wattage used in the Project.

Q. Fixture Types:

R. Light fixtures shall be beta LED (PKG-304-5M-DM) or approved equivalent. The Design-Builder shall provide a deduct alternate for fluorescent light fixtures. The selected light fixture will contain an uplight feature.

S. Parking Areas - [redacted] depending on a lighting analysis, plastic, aluminum or stainless steel housings, tamperproof fasteners, vandal resistant, ceiling mounted luminaires.

T. Stairwells and Lobby/Landing Areas – Fluorescent, PSMH, or LED, vandal resistant wall packs.

U. Roofs - Pole mounted, anodized aluminum, [redacted] LED luminaire, medium cutoff, high impact lens, enclosed and gasketed, with integral ballast and adjustable knuckle shall be specified. Square anodized hinged aluminum poles shall be provided. Poles located on the perimeter are to hinge inward. Other poles must hinge so as not to meet obstructions.

V. Exit Signs - Self-luminous, vandal resistant exit signs may be used.

W. Driveways (exterior of the structure) - Pole mounted, anodized aluminum, 250 or 400 watt LED or high pressure sodium luminaire, medium cutoff, high impact lens, enclosed and gasketed, with integral ballast shall be specified. Square, anodized aluminum poles hinged at the base shall be provided.

X. An emergency lighting system, in accordance with code requirements, shall be provided. Sealed, maintenance-free, lead-calcium batteries may be used. There shall be no appreciable interruption of illumination during changeovers between power systems.

Y. Circuits to serve elevator motors shall be sized in accordance with the needs of the specific elevator equipment.

Z. The Design-Builder shall provide a parking guidance system at all parking garages in accordance with the requirements set out in TP3.20 COMMUNICATIONS.

3.14.7 Mechanical & Plumbing Design Requirements

The Design-Builder shall provide mechanical at each parking structure conforming to the following design requirements:

A. Piping shall be located and installed so that it does not reduce minimum vertical clearances. Sleeving through beams, when provided, shall be protected from rusting. Ferrous sleeves shall be hot-dipped galvanized. Sheet metal sleeves are not permitted.

B. Water shall be supplied at convenient locations on each floor, with adequate pressure for cleaning the facility using [redacted]. Water lines shall be sized to allow use of either conventional[redacted] hose or [redacted] fire hose for wash down of the parking structure. The water system shall be designed draining to prevent freezing without interrupting water to other portions of the mall. Piping is to be exposed, neatly and securely fastened to the surface of the structure, and located so it is not damaged by vehicles or subject to vandalism. Hose connections and valves shall not protrude in such a way as to present a safety hazard to pedestrians.

C. Sprinkler and fire alarm systems shall be provided as required by the Code. Sprinkler systems, if required, shall be air supervised dry systems.

D. Standpipe systems shall be dry systems. Hose connections and valves shall not protrude in such a way as to present a safety hazard to pedestrians.

E. Pipe guards shall be provided to protect drain lines, plumbing lines, fire protection lines and standpipes from vehicle impact. Pipe guards shall be hot-dipped galvanized or stainless steel. Pipe guards shall not obstruct cleanouts. Pipe guards shall provide a minimum of 1 inch clearance for all pipes but shall be designed to minimize intrusion into parking stalls.

F. Drains shall be provided at the bottom of stairwells. They shall either be located outside of the main pedestrian traffic area or be fitted with covers that do not pose a tripping hazard.

G. Floor drains shall be of adequate size and located frequently enough to effectively capture runoff. Floor drains in driving aisles shall be avoided. Floors shall be sloped

to drains. No floor slope shall be less than [redacted] in./ft (1%). Preferred slope is [redacted]

H. Heavy duty, vandal-resistant drains with strainers shall be used. Set drains below the finished floor elevations and finish slab down to the drains to insure that low points do not occur immediately adjacent to the drains.

I. Storm water drain lines, including leaders from the roof of elevator banks and stairwells, shall be protected from damage by vehicles. Exposed roof leaders shall be fabricated of a non-rusting material.

J. Provide a subgrade-drainage system behind all walls retaining earth. Waterproof wall areas below grade.

K. All Parking Structure drainage shall discharge through an oil/grit separator(s) prior to entering the Third Party Owners' drainage system.

L. Provide HVAC for offices, storage, electrical, motor and water service rooms.

M. The Design-Builder shall provide ventilation for all elevator hoistways.

3.14.8 Vertical Transportation Design Requirements

The Design-Builder shall provide elevators at each parking structure conforming to the following design requirements:

A. Elevators shall be located where convenient for pedestrian circulation paths, while compatible with parking structure architecture and structural design.

B. Elevators shall comply with codes, including ADA requirements. Elevator cabs shall accommodate ambulance stretchers per IBC size requirements.

C. Provide weather protected enclosed lobby areas at the roof level of elevator and stairway accesses.

D. Elevators shall be provided with automatic leveling devices and infrared electric eyes to prevent car and hoistway doors from closing when obstructed.

E. Vandal resistant call buttons constructed of stainless steel and flush mounted shall be provided.

F. Vandal resistant car position indicators shall be placed in each elevator lobby and in each car.

G. A sign prohibiting smoking in elevator shall be engraved in the wall in each car.

H. Each car shall be provided with a separate telephone line and flush mounted ADA compliant speakerphone with built-in auto dialer and ringer to permit two-way conversations. The device is to have a stainless steel faceplate and be vandal resistant.

I. Signs warning against use of elevators during fires shall be Installed adjacent each elevator entrance door.

3.14.8.1 Hydraulic Elevators

The Design-Builder shall provide Hydraulic APTA Grade ADA compliant elevators at parking structures with a travel distance not more than 40 feet. Elevators shall conform to the following design requirements:

A. Design – see Technical Specification 14 24 23 – Standard Hydraulic Elevator, for all elevator requirements not stipulated herein.

B. Elevators shall be non-proprietary.

C. Elevators shall be direct acting single stage piston, unless technically not feasible and approved by the Railroad.

D. Elevator Cabs and entrances shall be stainless steel.

E. Elevator Cabs shall be glazed to the fullest extent possible.

1. Glazing shall be [redacted] (minimum) tempered, laminated safety glazing, Low-E complying with NYS building codes.

F. All elevators shall conform to the following:

1. Elevator Use: Passenger service.

2. Capacity in pounds: Rated capacity: [redacted]., APTA capacity: [redacted].

3. Travel Speed: [redacted] (feet per minute), [redacted], regardless of load or operating direction.

4. Travel Distance: Specific to each station location, maximum [redacted]

5. Number of Stops: maximum of [redacted]

6. Machine Locations: At grade.

7. Car and Hoistway Doors:
   a. Type:
   b. Operation:
   c. Opening Speed:
   d. Operating Times:
   e. Door Dwell Times:
   f. Reversal Device:

[redacted]

8. Car Operating Panel: Stainless steel, vandal resistant and NEMA 4X rated
9. Hall Fixtures: Stainless steel, vandal resistant and NEMA 4X rated
10. Leveling: Automatic; [redacted] under any loading condition
11. Communication System: Two-way, hands-free

3.14.8.2 Traction Elevators

The Design-Builder shall provide APTA Grade ADA compliant traction elevators at parking structures where travel distance more than 40 feet is required. Elevators shall conform to the following design requirements:

A. Elevators shall be non-proprietary.

B. Minimum capacity of elevators shall be [redacted]. Elevators shall be traction type elevators with a machine room above the elevator shafts. Machine room shall have HVAC.

C. Elevator Cabs and entrances shall be stainless steel.

D. Elevator Cabs shall be glazed to the fullest extent possible.

   a. Glazing shall be [redacted] minimum) tempered, laminated safety glazing, Low-E complying with NYS building codes.

E. MRL type elevators shall not be permitted.

F. All equipment shall be non-proprietary.

G. Design - Refer to Technical Specification 14 21 00 Traction Gearless Elevators for all elevator requirements not stipulated herein.

H. All elevators shall conform to the following:

   1. Elevator Use: Passenger service.

   2. Capacity in pounds: Rated capacity: [redacted].

   3. Travel Speed: [redacted]), [redacted], regardless of load or operating direction.

   4. Travel Distance: Specific to each parking structure.

   5. Number of Stops: Specific to each parking structure.

   6. Machine Room Locations: Above hoistway.

   7. Car and Hoistway Doors:
      a. Type:
      b. Operation:
      c. Opening Speed:
      d. Operating Times:
      e. Door Dwell Times:
      f. Reversal Device:

   [redacted]

   8. Car Operating Panel: Stainless steel, vandal resistant and NEMA 4X rated.

   9. Hall Fixtures: Stainless steel, vandal resistant and NEMA 4X rated.

   10. Leveling: Automatic; [redacted] under any loading condition.

11. Communication System: Two-way, hands-free.

3.14.9 Paints and Coatings

A. Painting of any elements of the structure shall be compatible with the substrate. All areas accessible to the public should have anti-graffiti coating applied.

B. Elevator shafts for glass-backed elevators, if any, shall be painted black.

C. Do not paint stainless steel, galvanized and non-ferrous metal surfaces.

D. Provide a dust proof concrete sealer on floors in machine rooms, storage room, water and electrical rooms and elevator pits.

E. Provide primer, intermediate and finish coats on surface as defined below from Tnemec or approved equal:

1. Drain lines-color: black, Tnemec Gloss Series.
2. Fire lines-color: red, Tnemec Gloss Series.
3. Waterlines-color: blue, Tnemec Gloss Series.
4. Structural Steel: blast clean.
    a. Primer Tnemec Series 90-97-Zinc.
    b. Intermediate Tnemec Series 69 Hi-Build Epoxoline 11.
    c. Finish Tnemec Series 75 Endurance Shield.
5. Concrete: Stairwells, ceilings, etc.
    a. Primer Tnemec Series 130.
    b. Intermediate Tnemec Series 83.
    c. Finish Tnemec Series 75 Endurance Shield.

F. All CMU shall be painted.

G. Work performed shall be guaranteed in writing free of defects relating to workmanship or material deficiency for one (1) year from date of Final Acceptance.

3.14.10 Support / Utility Spaces

The Design-Builder shall provide the following support/utility spaces at each parking structure conforming to the following design requirements:

A. Spaces shall be sized to accommodate all equipment necessary to provide a complete and working system, while still maintaining code requirements for clearances, egress, and interior environment.

B. Separation from adjacent spaces shall meet all applicable code requirements for construction and fire-ratings.

1. Any space utilized below an egress stair is required by code to be separated by a fire barrier meeting code requirements.

C. Spaces shall be conditioned and/or ventilated to meet loading requirements of the equipment housed within and complying with all code requirements.

3.14.10.1 Office Spaces

The Design-Builder shall provide the following office spaces grouped together at each parking structure conforming to the following design requirements:

A. The parking structure design shall include an office for the Parking Operations Vendor. The office area shall contain as a minimum, the following spaces:

1. Manager's office: [redacted]
2. Counting/server room: [redacted]
3. Customer Service counter/waiting area: [redacted]
4. General Office Area: [redacted]
5. Employee Restroom: Per ADA.

B. Office Area Finishes:

1. Doors - Hollow metal door with [redacted] minimum vision panel and frame.
2. Door Hardware - Closers, keyed cylindrical locksets, panic hardware, thresholds and weather stripping.
3. Ceiling - Suspended [redacted] architectural acoustic ceiling tile system.
4. Flooring - Vinyl composition tile.
5. Glazing - Insulated, laminated glass.
6. HVAC - A split system heating and cooling unit shall for utilized for the office area.
7. Lighting - Recessed LED fixtures controlled by surface mount wall switch.
8. Plastic laminated counter, [redacted] deep.
9. Telephone jacks.
10. Horizontal metal mini-blinds for all windows and doors.
11. Duplex outlets.
12. Walls – Integral color CMU with fixed windows set in aluminum frames with thermal break in accordance with the Contract Drawings. Fixed window sill height to be 36" above finished floor. Top of window framing to match top of door framing.

3.14.10.2 Communications Room

A. The Design-Builder shall provide one communications room per parking structure designed to accommodate all equipment required to provide a working communications system. See TP3.20 COMMUNICATIONS for equipment requirements. The communication room shall meet the minimum requirements set forth in Technical Specification Communications Room C-448.

1. Minimum interior size – [redacted]

B. The room shall be free of water pipes. Windows shall not be permitted in the room. Whenever possible TELCO demarcation shall occur outside location and required TELCO lines shall be brought into Communications Room via duct system. TELCO shall have access to their demarcation point independent of communication personnel availability.

C. In addition to the requirements set out in TP3.20 COMMUNICATIONS and VOLUME 5 – TECHNICAL SPECIFICATIONS, the Communications room shall be equipped with:

1. A thermostatically controlled, LIRR approved, heat and air conditioner (HVAC) system.

2. A fire and intrusion alarm subsystem shall monitor Communications Room and equipment and provide remote alarm indications.
3. Floors shall be concrete wherever possible. Waterproof sealants shall be applied to the floor surface.
4. The lighting shall be LED fixtures.
5. The doors shall be locked with Communications high security locks, and accessed with a yellow high security key which is restricted to Communications personnel.
6. Walls shall be fire rated plywood and cement board or concrete block and shall extend to the underside of the roof construction.
7. Where applicable, exposed ceiling structure shall remain
8. Rated floor, wall, ceiling and door assemblies shall comply with applicable codes.
9. (1) One [redacted] convenience receptacle.

3.14.10.3 Information Technology (IT) Room

A. The Design-Builder shall provide one IT room per parking structure.
   1. Minimum interior Size – [redacted].
   2. Location – Adjacent to the communications room.

B. The IT room shall be a clean, secured and well ventilated space for the installation of CAT5E cables, Network Routers/Switches/Servers and Fiber Optics to the ticket selling machines, message boards, and Communication Rooms. Power provided to these rooms shall be provided on dedicated circuits. In addition, there shall be a path to the Communications Room for both conduits/cables

C. A minimum of 2 dedicated [redacted] circuits shall be provided. If available, these circuits shall be tied to the electrical backup systems (generator and UPS).

D. The space shall be equipped with a thermostatically controlled HVAC system.

E. In addition, there shall be a clear path to the Communications Room with either a cable tray or [redacted] conduits.

F. [redacted] dedicated [redacted] conduits shall be provided at all new or refurbished structures where underground access is preferred from circuit provider (internal/External Carrier) i.e. Verizon, Lightpath, Cable Co., etc. These conduits shall not follow the same path within the facility and leaving the facility.

G. No water, waste, or HVAC pipes shall be installed over the equipment space.

H. Location:
   1. The IT room shall be located adjacent to the communications room.
   2. The IT room shall not be located near equipment that can cause electromagnetic interference (EMI).

I. In addition to the requirements set out in TP3.20 COMMUNICATIONS and VOLUME 5 – TECHNICAL SPECIFICATIONS, the IT room shall be equipped with:
   1. The floor shall be static resistant with access to the building ground.

2. Walls shall be fire rated plywood and cement board or concrete block and shall extend to the underside of the roof construction.
3. Three-fourths inch [redacted]) plywood shall be provided on the walls for mounted equipment.
4. Fire retardant plywood and finishes shall be used.
5. Provisions shall be made for the termination of LIRR access cables.
6. The doors shall be locked with security locks, and accessed with a security key which is restricted to IT personnel.
7. Where applicable, exposed ceiling structure shall remain.
8. Rated floor, wall, ceiling and door assemblies shall comply with applicable codes.
9. The lighting shall be LED fixtures.
10. [redacted] convenience receptacle.

3.14.10.4 Elevator Machine Room

A. The Design-Builder shall provide one elevator machine room per elevator at all parking structure designed to accommodate all equipment required to provide working elevators.
   1. Elevator equipment for only one elevator shall be provided in each space.
      a. Exception: if multiple elevators are operating in a group a single machine room is acceptable for the group equipment.
   2. Hydraulic Elevator machine room shall be located directly adjacent to the elevator hoistway
   3. Traction elevator machine rooms shall be located above the hoistway

B. The elevator machine room shall be equipped with:
   1. Floors shall be concrete with waterproof sealants applied to the floor surface.
   2. Walls shall be fire rated plywood and cement board or concrete block and shall extend to the underside of the roof construction.
   3. Where applicable, exposed ceiling structure shall remain.
   4. Rated floor, wall, ceiling and door assemblies shall comply with the following codes:
      a. Floor [redacted]
      b. Wall
      c. Ceilin
      d. Door
   5. The doors shall be locked with security locks, and accessed with a security key which is restricted to appropriate personnel.
      a. Door shall be self-closing, self-locking, open from the interior without a key, and keyed at the exterior for C64 key.
   6. The lighting shall be LED fixtures.

7. ([redacted] convenience receptacle.
8. Ambient temperature shall be maintained per the requirements of the elevator controller manufacturer. See TP3.13 STATION MEP AND VERTICAL TRANSPORTATION for additional requirements.

3.14.10.5 Electrical Room

A. The Design-Builder shall provide one electrical room per parking structure designed to accommodate all equipment required to provide a working electrical system. The space shall be clean, secured and well-ventilated space for the installation of electrical equipment and wiring.

B. Minimum Size – [redacted] high.

C. The space shall satisfy all requirements of the NEC, NESC, LIRR CE-1, Electric Utilities and applicable state and local building codes.

D. There shall be no water or sanitary pipes crossing the room over electrical equipment

E. The Boiler room shall be equipped with:

1. Floors shall be concrete with waterproof sealants applied to the floor surface.
2. Walls shall be fire rated plywood and cement board or concrete block and shall extend to the underside of the roof construction.
3. Where applicable, exposed ceiling structure shall remain.
4. Rated floor, wall, ceiling and door assemblies shall comply with applicable codes.
5. The doors shall be locked with security locks, and accessed with a security key which is restricted to appropriate personnel
6. The lighting shall be LED fixtures.
7. [redacted] convenience receptacle.

3.14.10.6 Storage Room

A. The Design-Builder shall provide one storage room per parking structure. The space shall be clean, secured and well-ventilated.

B. Minimum Size – [redacted] high.

C. The Storage room shall be equipped with:

1. Floors shall be concrete with waterproof sealants applied to the floor surface.
2. Walls shall be fire rated plywood and cement board or concrete block and shall extend to the underside of the roof construction.
3. Where applicable, exposed ceiling structure shall remain.
4. Rated floor, wall, ceiling and door assemblies shall comply with applicable codes.
5. The doors shall be locked with security locks, and accessed with a security key which is restricted to appropriate personnel.
6. The lighting shall be LED fixtures.
7. [redacted] convenience receptacle.

D. Storage room shall be provided with the following accessories:

1. Janitor's mop sink.
2. Storage shelves.
3. Mop Rack.

3.14.11 Signage

A. Signage for parking structure shall consist of a system of signs and graphics which shall provide parking structure users with essential directional information, safety/security, provide for proper traffic flow and use of parking spaces, and present a coordinated appearance. All signage shall conform to MTA Sign Manual, 2004 requirements.

B. Provide Audio Visual Public Address System per LIRR/MTA requirements.

C. The following is a partial list of signs to be considered:

1. Exterior:
    a. Entrance.
    b. Operation rules & regulation signs.
    c. Clearance.
    d. Exit - Do Not Enter.
2. Interior:
    a. Park.
    b. Each parking space shall be signed with a parking space number as assigned by the LIRR based upon final striping plan.
    c. Handicapped Parking.
    d. Van Accessible Parking.
    e. Elevator.
    f. Stair.
    g. Exit (and directions to) - (When vehicle exits lead to different streets, signs should provide this information).
    h. No Parking (International symbol).
    i. No Exit (for dead ends).
    j. Parking Level Number.
    k. Stop.
    l. Do Not Enter.
    m. No Right Turn - No Left Turn.
    n. Yield.
    o. In Case of Fire (pictograph).
    p. Elevator Car Number.
    q. No Smoking.
    r. Room Designations.
    s. Other direction signs as needed.
3. Traffic control signs at driving lanes to and from the parking structure, and any associated exterior surface parking, shall conform to the Manual on Uniform Traffic Control Devices for Streets and Highways, U.S. Department of Transportation, FHWA.

4. The background color of similar sign types in the parking structure shall be uniform and not vary by level (except tier designations). Different sign types such as driver and pedestrian oriented signs may have different background colors.
5. Vehicular signs shall have reflective numbers, letters and symbols. Pedestrian signs may be painted. Backs of signs shall be painted.
6. Parking level indicators are required.
7. Parking stalls shall be separated by striping painted on concrete floors. Striping shall be a [redacted] wide white line painted on a [redacted]" wide black background. Pavement markings shall consist of epoxy paint, chlorinated rubber paint or water-borne 100% acrylic paint applied in a [redacted] system. Floor arrows and centerlines shall be provided where beneficial.

D. Signs shall be aluminum alloy, minimum sheet thickness [redacted], complying with strength and durability properties specified in ASTM B-209 for 5005-H15. Background color for signs shall be silk screened onto scotchlite reflective sheets bonded to aluminum.

3.14.12 Additional Requirements

The Design-Builder shall provide the following which shall conform to the following design requirements:

A. Access Help Point telephones:

1. Access Help Point Telephones for the Transport Sector per LIRR standard as manufactured by Boyce Technologies, or approved Equal. The units shall be brushed stainless steel and labeled “Assistance” with graphic text. The faceplate shall include an “INFO” button.

2. The Design-Builder shall provide units on each floor of each parking structure located not more than 300 feet between any devices.

3.14.13 Summary of Submittals

Item	Section	Submittal	Action
1.	3.14.6	Electrical Design - Preliminary	Review and Comment
2.	3.14.6	Electrical Design - Intermediate	Review and Comment
3.	3.14.6	Electrical Design - Final	Review and Approval
4.	3.14.7	Mechanical Design - Preliminary	Review and Comment
5.	3.14.7	Mechanical Design – Intermediate	Review and Comment
6.	3.14.7	Mechanical Design - Final	Review and Approval
7.	3.14.7	Plumbing Design - Preliminary	Review and Comment
8.	3.14.7	Plumbing Design - Intermediate	Review and Comment
9.	3.14.7	Plumbing Design - Final	Review and Approval
10.	3.14.8	Elevator Design - Preliminary	Review and Comment
11.	3.14.8	Elevator Design - Intermediate	Review and Comment
12.	3.14.8	Elevator Design - Final	Review and Approval

13.	3.14.10	Support space Design - Preliminary	Review and Comment
14.	3.14.10	Support space Design - Intermediate	Review and Comment
15.	3.14.10	Support space Design - Final	Review and Approval
16.	3.14.11	Signage	Review and Comment

END

3.15 PERMANENT FACILITIES

3.15.1 Section Includes

This section sets out design and construction requirements related to permanent facilities for LIRR staff.

3.15.2 Codes and Standards

Project Work shall comply with all statutory requirements, and shall comply with the codes and standards identified in Appendix TPA3.1A CODES AND INDUSTRY STANDARDS and the codes and standards listed below:

Codes	
International Building Code (NY Edition)	2015
NY State Division of Code enforcement & administration - Modular Third Party Review Document Submission Standards	Current
International Fire Code (NY Edition)	2015
International Plumbing Code (NY Edition)	2015
International Mechanical Code (NY Edition)	2015
International Fuel Gas Code (NY Edition)	2015
International Property Maintenance Code (NY Edition)	2015
Uniform Code Supplement	2016
ASHRAE 90.1	2013
NFPA 70, National Electric Code (NEC)	2014
International Energy Conservation Code (NY Edition)	2015
Energy Code Supplement	2016
Executive order 88	2013
ADA standards for Accessible Design	2010
ASME A17.1	2013
ASCE 7-10, American Society of Civil Engineers, Minimum Design Loads for Buildings and other structures.	Current
AISC 360-10, American Institute of Steel Construction Specification for Structural Steel Buildings.	Current
AISC 341-10, American Institute of Steel Construction Seismic Provisions for Structural Steel Buildings.	Current
ACI 318-14, American Concrete Institute Building Code Requirements for Structural Concrete.	Current
ACI 530-13, American Concrete Institute Building Code Requirements and Specifications for Masonry Structures.	Current
AISI S100-12, American Iron and Steel Institute North American Specification for Design of Cold-formed Steel Structural Members	Current
Aluminum Design Manual 2010.	Current
AWS D1.4/D1.4M-2011, American Welding Society Structures Welding Code- Steel.	Current

Codes	
Standards	
Occupational Safety and Health Administration (OSHA)	Current
Underwriter's Laboratories, Incorporated (UL)	Current

3.15.3 Related Documents (Not Used)

3.15.4 Design Requirements

This section sets out design and construction requirements related to the installation and/or construction of permanent facilities for LIRR staff. The Design-Builder shall provide everything set out in this Section including all accessories and appurtenances required to provide a complete and working facility.

A. The Design-Builder shall provide the following at all permanent facility locations:
   1. Toilet rooms – All toilet rooms shall be provided with the following:
      a. Low flow water closet and lavatory fixtures.
      b. Accessories: Paper towel dispenser, toilet paper dispenser, soap dispenser, mirror, and one GFI receptacle.
   2. Electricity:
      a. Receptacle quantities shall be provided to accommodate all equipment specified within this section for each department and meet code requirements, with the exception of toilet rooms. Each space within each facility shall be provided with a minimum of 3 receptacles.
      b. Lighting – Overhead LED lighting shall be provided to produce a uniform minimum 100 foot candles of illumination at desktop height throughout, unless stated otherwise.
   3. Climate Control (conditioned spaces, heated and air conditioned). All interior spaces shall be conditioned with the exception of the following:
      a. Spaces shall be designed to maintain an interior temperature of 70 degrees F under ambient temperature conditions ranging from 0 degrees F to = 95 degrees F.
      b. Substation Material Storage – Heated and mechanical ventilation shall not provide air conditioning.
   4. Utility Connections:
      a. Electrical.
      b. Potable water supply.
      c. Storm water connection.
      d. Sanitary/Sewer Connection.
      e. All connections to surrounding utilities shall be permanent.
   5. Hot water Heater – Capacity to provide hot water for toilet room lavatory.

3.15.5 Building Types

3.15.5.1 Modular Building

A. Building Materials

The Design-Builder shall provide weathertight construction at all permanent facility modular buildings, conforming to the following design requirements:

1. Exterior Siding:
    a. Wood – [redacted]painted horizontal lap, [redacted] painted corner trim,[redacted] painted window & door trim.
    b. Color – as selected by LIRR.
2. Flooring:
    a. Vinyl composite tile.
    b. Color – as selected by LIRR.
3. Roof:
    a. Roof shall be gabled with a minimum pitch of 4:12.
    b. Roofing Material – Asphalt Shingles.
    c. Color – As selected by LIRR.
4. Soffit:
    a. Vented prefinished aluminum.
    b. Color – White.
5. Gutters & downspouts:
    a. Material – Heavy duty prefinished aluminum.
    b. Color – As selected by LIRR.
    c. Gutter Shape – Minimum [redacted] or approved equal, sized to meet plumbing code requirements.
    d. Leader Shape – Minimum [redacted] sized to meet plumbing code requirements.
6. Exposed foundation:
    a. Parge Coat - Type N, smooth finish.
    b. Color – As selected by LIRR.
7. Insulation:
    a. Provide in all exterior walls.
    b. R-Value – Meet code requirements, minimum R15.
    c. Insulation shall be formaldehyde free.

3.15.5.2 Prefabricated Building

A. Manufacturer:
    1. Butler manufacturing.

2. Or approved Equal.

B. Building Materials:

The Design-Builder shall provide weather tight construction at all permanent facility prefabricated buildings, conforming to the following design requirements.

1. Exterior:
    a. Steel wall panels with concealed fasteners
    b. Coating - “Kynar 500” or “Hylar 5000” fluoropolymer (PVDF) coating both sides.
    c. Color – as selected by LIRR.
2. Flooring:
    a. Concrete.
    b. Finish – slip resistant epoxy coating.
3. Roof:
    a. Roof shall be gabled with a minimum pitch of 4:12.
    b. Steel panels with concealed fasteners.
    c. Coating - “Kynar 500” or “Hylar 5000” fluoropolymer (PVDF) coating both sides.
    d. Color – As selected by LIRR.
4. Soffit:
    a. Vented prefinished aluminum.
    b. Color – White.
5. Gutters & downspouts:
    a. Material – Heavy duty prefinished aluminum.
    b. Color – As selected by LIRR.
    c. Gutter Shape – Minimum [redacted]” K or approved equal, sized to meet plumbing code requirements.
    d. Leader Shape – Minimum [redacted] sized to meet plumbing code requirements.
6. Exposed foundation:
    a. Parge Coat - Type N, smooth finish.
    b. Color – As selected by LIRR.
7. Insulation:
    a. Provide in all exterior walls.
    b. R-Value – Meet code requirements, minimum R15.
    c. Insulation shall be formaldehyde free.

3.15.6 Permanent Facilities

3.15.6.1 Permanent facility for Signal staff

The Design-Builder shall provide a permanent facility conforming to the following design requirements:

A. Location

1. The final location of the signal facility shall be in close proximity to the Mineola Obay Turnout. The final locations shall be approved by LIRR.

B. The facility shall be provided with the following:

1. [redacted] modular building on a permanent foundation:
   a. Building shall be provided with a minimum of two (2) code compliant stairs for access.
   b. Building shall be provided with a minimum of two (2) exterior lockable insulated steel doors for access.
   c. Building shall be provided with a minimum of five (5) insulated windows. Windows shall comply with code requirements for natural light, ventilation, and energy code.
   d. The building shall be divided into the following spaces:
      i. Foreman office – single occupant –minimum size 10'x10'.
      ii. Main staff area.
      iii. Toilet Room – single occupant.
2. Outdoor yard Space:
   a. [redacted] yard area for vehicle storage.
   b. Yard area shall be designed to accommodate 3 trucks.
   c. (3) Three 8 ft. x 30 ft. storage containers.

C. The modular building shall be designed with the following requirements.

Signal Staff Modular Building (7 Employees)	
Foreman Office	
Description	**Quantity**
Desk	1
Chair - Padded ergonomic office chair with 360 degree swivel, adjustable arms, seat height, and seat angle.	1
File Cabinet -4 drawer (letter-size), with lock & key	1
Main Staff Area	
Description	**Quantity**

[redacted]	7
	3
	1
	1
	1
	1
	12
	1
	1
	1
	2
	1
	3
	2

3.15.6.2 Permanent facility for Substation staff

The Design-Builder shall provide a permanent facility on LIRR property conforming to the following design requirements:

A. Location:

1. Floral Park substation area, west of the existing substation on LIRR property. The final location of the substation facility shall be approved by LIRR.

B. Modular building on a permanent foundation:

1. Building shall be provided with a minimum of two (2) code compliant stairs for access.
2. Building shall be provided with a minimum of two (2) exterior lockable insulated steel doors for access.
3. Building shall be provided with a minimum of five (5) insulated windows. Windows shall comply with code requirements for natural light, ventilation, and energy code.
4. The Building shall divided into the following spaces
   a. Headquarters – [redacted] (office):
      i. Foreman office – single occupant.
      ii. Main staff area – Designed to accommodate 14 persons.
      iii. Toilet Room – single occupant.

b. Training Room – [redacted].
    i. Designed to accommodate 10 persons.
c. Shop Area – [redacted]
    i. Shop area shall have direct access at grade.
d. One space for 10 employees, furniture, and a whiteboard.

C. Pre-engineered “Butler” type Building:
1. 5,000 sq. ft. for material storage.
    a. One (1) story to fit within the LIRR ROW.

D. Outdoor Yard Space:
1. 1,500 square foot yard area.
2. Yard area shall be designed to accommodate 4 trucks.

3.15.6.2.1 Headquarters and Training Room

The Design-Builder shall provide the substation headquarters and training room with the following:

Substation Staff	
Headquarters - Foreman Office	
Description	**Quantity**
Desk	1
Chair - Padded ergonomic office chair with 360 degree swivel, adjustable arms, seat height, and seat angle.	1
File Cabinet -4 drawer (letter-size), with lock & key	1
Headquarters – Main Staff Area	
Description	**Quantity**
[redacted]	14
	3
	1
	1
	1
	1
	13
	1
	1
	1

[redacted]	2
	1
	3
	2
	1
	10
	10

3.15.6.2.2 Shop Area

The Design-Builder shall provide the shop area conforming to the following design requirements.

A. Floors:
   1. Material - Concrete.
   2. Finish – slip resistant epoxy coating.

B. Automatic Roll up Door:
   1. Size – [redacted]
   2. Quantity - 1.

3.15.6.2.3 Material Storage

3.15.6.2.3.1 General

The Design-Builder shall provide the material storage space with the following design requirements:

A. Floors:
   1. Material - Concrete.
   2. Finish – slip resistant epoxy coating.

B. Automatic Roll up Door:
   1. Size – [redacted]
   2. Quantity - 1.

3.15.6.2.3.2 Space Shelving

The Design-Builder shall provide the material storage space with shelving conforming to the following design requirements:

A. The shelving/storage solution shall be constructed to form two levels. All shelving components shall be part of an overall system that shall include, but may not be limited to: Shelves, supports, walkways, stairways, security fencing/barriers, gates and locking mechanisms.

B. All components shall be fabricated from high quality steel, and be of sufficient strength for the application

C. The shelving system shall be configured to occupy the following dimensions:

[redacted]

D. Except as otherwise stated, all steel components shall be cleaned, de-burred and finished in a matching gray power coat finish.

E. All shelves shall be bolted to upright supports. In no case shall shelves utilize clips or hanger brackets.

3.15.6.2.4 Large shelving unit

A. The Design-Builder shall provide a minimum of sixteen (16) large shelving units measuring [redacted]

B. The large shelving unit shall be equipped with 4 Shelves on each level.

C. The large shelving unit shall be designed to hold a minimum of [redacted] per shelf.

D. The large shelving unit shall be designed to adjustment of intermediate shelves.

E. Shelves shall be designed to prevent bowing or deformation when fully loaded.

F. No support shall be permitted in the middle of shelving units that will interfere with storage space.

3.15.6.2.5 Small shelving unit

A. Provide a minimum of eighty [redacted] small shelving units measuring [redacted]

B. The small shelving unit shall be equipped with [redacted] Shelves on each level.

C. The small shelving unit shall be designed to hold a minimum of [redacted] per shelf.

D. The small shelving unit shall be designed to adjustment of intermediate shelves.

E. Shelves shall be designed to prevent bowing or deformation when fully loaded.

F. No support shall be permitted in the middle of shelving units that will interfere with storage space.

3.15.6.2.6 Security fencing

A. The Design-Builder shall provide a minimum of [redacted] of high-security, wire mesh fencing to secure both levels of the storage solution.

B. Install one (1) double gate and (1) single gate in the security fencing. The gates shall be equipped with cut resistant padlock hasps.

C. The security fencing shall be supported by the existing concrete slab and shelving system

3.15.6.3 Permanent facility for Track staff

The Design-Builder shall provide a permanent facility conforming to the following design requirements:

A. Location:

1. Close proximity to Mineola Station, the final location of the track facility shall be approved by LIRR.

B. The facility shall be provided with the following:

1. [redacted] modular building on a permanent foundation.
    a. Building shall be provided with a minimum of two (2) code compliant stairs for access.
    b. Building shall be provided with a minimum of two (2) exterior lockable insulated steel doors for access.
    c. Building shall be provided with a minimum of five (5) insulated windows. Windows shall comply with code requirements for natural light, ventilation, and energy code.
    d. The Building shall divided into the following spaces:
        i. Foreman office – single occupant –minimum size 10'x10'.
        ii. Main staff area.
        iii. Toilet Room – single occupant.
2. [redacted] yard area.
    a. Yard area shall be designed to accommodate 2 trucks.

C. The modular building shall be designed with the following requirements.

Track Staff Modular Building (12 Employees)	
Foreman Office	
Description	**Quantity**
Desk	1
Chair - Padded ergonomic office chair with 360 degree swivel, adjustable arms, seat height, and seat angle.	1
File Cabinet -4 drawer (letter-size), with lock & key	1
Main Staff Area	
Description	**Quantity**
[redacted]	12
	3
	1
	1
	1
	1
	16
	1
	1

[redacted]	1
	2
	1
	3
	2

3.15.6.4 Permanent facility for Communications staff

The Design-Builder shall provide a permanent facility conforming to the following design requirements.

A. Location

1. The final location of the signal facility shall be in close proximity to the Mineola Obay Turnout, final locations shall be approved by LIRR.

B. The facility shall be provided with the following:

1. [redacted] modular building on a permanent foundation.
   a. Building shall be provided with a minimum of two (2) code compliant stairs for access.
   b. Building shall be provided with a minimum of two (2) exterior lockable insulated steel doors for access.
   c. Building shall be provided with a minimum of five (5) insulated windows. Windows shall comply with code requirements for natural light, ventilation, and energy code.
   d. The Building shall divided into the following spaces:
      i. Foreman office – single occupant –minimum size 10'x10'.
      ii. Main staff area.
      iii. (2) Two Toilet Rooms – single occupant.
2. [redacted] yard area for vehicle storage.
   a. Yard area shall be designed to accommodate 2 trucks.

C. The modular building shall be designed with the following requirements.

Communications Staff Modular Building (6 Employees)	
Foreman Office	
Description	**Quantity**
Desk	1
Chair - Padded ergonomic office chair with 360 degree swivel, adjustable arms, seat height, and seat angle.	1
File Cabinet -4 drawer (letter-size), with lock & key.	1
Main Staff Area	

[redacted]	4
	8
	1
	3
	4
	6
	2
	1
	1
	1
	1
	1
	1
	2
	1
	3
	2

3.15.7 Structural Design Requirements

3.15.7.1 Dead Loads

A. Dead loads acting on a structure consist of the weight of all permanent construction, steel framing, and all fixed service equipment (including stationary storage equipment). The structure shall be designed to support all Mechanical, HVAC, and Electrical loads. This fixed service equipment design load shall be the larger of:

1. The actual weight.
2. The code required loading allowance.
3. [redacted]

3.15.7.2 Live Loads

A. Live loads consist of loading not permanently fixed to the structure and occurring over areas not occupied by fixed equipment. Live loads shall be determined in accordance with applicable codes or design standards unless listed in the design criteria section. Live loads greater than [redacted] are not permitted to be reduced. Minimum uniform live loads shall be as follows:

1. Permanent stairs [redacted]

2. Stairs, Corridors & Ramps
3. Mechanical Room
4. Electrical Room
5. Computer/ IT Rooms

[redacted]

3.15.7.3 Roof Live Loads

A. Roof live load shall be determined as per the New York State Building Code. The minimum roof live load shall not be less than [redacted] on ordinary flat or pitched roofs. Roof live loads may not be reduced. Roof elements shall be designed per the minimum roof live load or snow load, whichever governs.

3.15.7.4 Snow Loads

A. Ground Snow Load
B. Snow Importance Factor
C. Thermal Factor
D. Exposure Factor
E. Terrain Category

[redacted]

3.15.7.5 Wind Loads

A. Basic Wind Speed (3 Second gust)
B. Wind Impotence Factor
C. Wind Exposure Category

3.15.7.6 Seismic Loads

A. Site Class
B. Importance Factor(Category II)
C. 0.2 Sec. Mapped Spectral Acceleration
D. 1.0 Sec. MAPPED Spectral Acceleration
E. 0.2 Sec. Design Spectral Response
F. 1.0 Sec. Design Spectral Response

3.15.7.7 Materials

A. Structural Steel:

1. Steel for building structures (beams, columns and miscellaneous framing members) shall conform to ASTM A572 or A992, [redacted] unless stated otherwise.

a. W-Shapes	ASTM A992
b. HSS Shapes	ASTM A500 Grade B

2. Steel for base plates and connection Materials shall conform to ASTM A36.
3. All anchor Bolts shall conform to ASTM A307, High Strength Bolts shall conform to ASTM A325.

4. Unless noted otherwise, shop connections shall be made with [redacted] diameter high-strength bolts or welding - E70xx. Field connections shall be made with [redacted] diameter, A325 high-strength bolts or welds (E70xx).
5. Non-shrink, non-metallic grout below base plates shall be used.

B. Concrete

1. Design Strengths: (28 days)
   a. Platform slab
   b. Foundation (Caissons)
   c. Slab on Grade
   d. Structural Precast concrete

[redacted]

2. Concrete mix design for platform slab shall contain a corrosion inhibitor admixture.
3. Concrete mix design for platform slab shall contain synthetic micro fiber reinforcing.
4. Concrete exposed to weather shall contain air-entraining agent. Air entraining admixtures shall be in accordance with ASTM 260 and ASTM C138.
5. Accelerating admixtures shall be in accordance with ASTM C494.
6. Concrete shall contain DCI Corrosion Inhibitor.

C. Reinforcing Steel

1. All foundation structural elements shall be reinforced with epoxy coated reinforcing.
2. Concrete shall be reinforced in accordance with ASTM A615, A616 or A617. All reinforcing bars shall be deformed bars with [redacted] minimum yield strength, ASTM A615, [redacted].
3. All stirrups and column ties shall be deformed bars with [redacted] minimum yield strength, ASTM A615, [redacted]
4. Welded wire fabric shall conform to ASTM A185 and A82.

D. Aluminum

1. Use high strength and high corrosion resistance aluminum alloys for all aluminum structural and framing members.
2. Alloy 6061 shall be used for all structural, canopy and stair framing members.
3. Alloy 6063 shall be used for all plates, pipe railing, furniture and architectural extrusions.

3.15.8 Summary of Submittals

Item	Section	Submittal	Action
1	3.15.6	Modular building - Preliminary	Review and Comment
2	3.15.6	Modular building – Intermediate	Review and Comment
3	3.15.6	Modular building - Final	Review and Approval

4	3.15.6	Foundations - Preliminary	Review and Comment
5	3.15.6	Foundations - Intermediate	Review and Comment
6	3.15.6	Foundations - Final	Review and Approval
7	3.15.6	Prefabricated Building - Preliminary	Review and Comment
8	3.15.6	Prefabricated Building - Intermediate	Review and Comment
9	3.15.6	Prefabricated Building - Final	Review and Approval
10	3.15.6	Shelving	Review and Approval
11	3.15.6	Fencing	Review and Approval
12	3.15.6	Furniture, accessories, and appliances	Review and Approval

END

3.16 SYSTEMS - GENERAL

3.16.1 Section Includes

The requirements described in this Section apply to all systems related to the operation of the Railroad.

3.16.2 Codes and Standards

Project Work shall comply with all statutory requirements, and shall comply with the codes and standards identified in Appendix TPA3.1A CODES AND INDUSTRY STANDARDS and the codes and standards listed below.

A. 47 CFR 15 / FCC Part 15 Radio Frequency Devices.

B. 47 CFR 2. Subpart B, Subsection 106, Table of Frequency Allocations.

C. IEEE C95.1.

D. IEEE C95.6.

E. ANSI C 63.4.

3.16.3 Related Documents (Not Used)

3.16.4 Reliability, Availability and Maintainability (RAM)

This section presents the minimum RAM program specification required to be implemented by Design-Builder in order to guarantee that the dependability level of the systems related to the operation of the Railroad and supporting equipment provided within the Design-Builder scope of work is compliant with the Contract Documents.

3.16.5 Documents

3.16.5.1 RAM Program Plan

The Design-Builder shall develop a Reliability, Availability and Maintainability (RAM) Plan in accordance with the provisions specified herein:

A. Task listing and time phasing for each task.

B. Organization and responsibilities of key personnel.

C. Techniques for allocation of quantitative requirements to lower level functional elements.

D. Analytical methods to be used during design and development for demonstrating compliance with reliability/availability requirements and goals.

E. Procedures and controls, including piece part selection and screening, manufacturing process controls, procurement controls and test procedures to be utilized during production to ensure achievement of reliability/availability requirements.

F. Provisions to evaluate design changes for possible effects upon subsystem and functional level requirements and goals.

3.16.5.2 RAM Prediction

The Design-Builder shall submit preliminary reliability/availability predictions within 120 days of LNTP. The Design-Builder shall then refine these predictions in its reliability/availability analyses. These numbers shall not deviate more than +/-5% with final numbers.

3.16.5.3 RAM Analyses

A. The Design-Builder shall perform reliability/availability analyses for items identified in Certifiable Item List up to the point of interface with other Project elements/subsystems or assemblies.

B. The accepted reliability/availability values in the reliability/availability analyses shall not differ from those in the preliminary predictions by more than +/-5%. The accepted availability/MTBF/MTTR values shall be used as the requirements for the reliability/availability testing. The subsystems may be composed of a number of components, some of which will not be supplied by the Design-Builder. For reliability/availability calculations and actual performance measurements the equipment not furnished by the Design-Builder shall have an assumed reliability/availability of 100%.

3.16.5.4 Quantitative Requirements

The availability requirements for each subsystem/equipment are listed at the installation level and represent each subsystem for the entire alignment in Table 1 below:

TABLE 1

Item	Availability	Unit
TPSS	99.99	Percent
UPS	99.99	Percent
Fire Alarm System	99.99	Percent
Intrusion Detection System	99.99	Percent
SCADA RTU	99.99	Percent
Radio System	99.99	Percent
Gas Detection System	99.99	Percent
CCTV	99.99	Percent
Communication System	99.99	Percent

3.14.1.1 RAM Demonstration Test Plan

The Design-Builder shall perform demonstration testing for verification of compliance with specified reliability/availability requirements. A reliability/availability demonstration test plan shall be prepared before the start of the test. This Plan shall identified steps, methodology and strategy to perform RAM demonstrations for identified equipment in RAM plan.

3.14.1.2 RAM Demonstration Report

The Design-Builder shall submit the test results in a report format for LIRR Approval.

3.16.5.5 Maintainability Program

The Design-Builder shall establish and maintain a maintainability program in support of the specified Project requirements. Features shall be incorporated into the design of equipment to minimize the Mean Time to Repair (MTTR) and preventive maintenance time. The subsystems and components shall incorporate the following design features:

A. Accessibility: All routinely serviced subsystems and components shall be readily accessible for service and inspection. Accessibility of components shall be proportional to frequency of maintenance and repair. No active electrical or mechanical components that

can foreseeably require maintenance shall be structurally embedded to preclude convenient access for repair or replacement.

B. Modular Design: Modular design principles shall be employed to the greatest extent practicable. Components shall be packaged together in replaceable subassemblies according to the logical function that they perform. Components or subassemblies requiring occasional removal shall preferably be plug-in units.

C. Interchangeability: Assemblies or components that are functionally interchangeable shall be physically interchangeable. Assemblies or components that are not functionally interchangeable shall not be physically interchangeable.

D. Adjustments: The need for adjustments shall be avoided. Where adjustment points cannot be avoided, they shall be readily accessible, adequately identified, and self-locking to prevent inadvertent adjustment or drift.

E. Special Tools: The number of special tools required for maintenance and repair shall be minimized. However, if they are required, they shall be defined and furnished in a quantity determined as part of the Work of this Project.

F. Panels and Openings: Panels and openings shall be of sufficient quantity, size, and placement to permit ready access from normal work areas and positions. Adjustment controls, fittings, and such, shall be directly accessible through panels and openings. Self-retaining fasteners shall be used wherever possible. Special access opening tools shall not be used unless considered necessary to prevent vandalism.

G. Cable Connections: Cable connectors shall be spaced far enough apart so that they can be grasped firmly for connecting and disconnecting. Connectors shall be properly labeled and keyed so that they cannot be interchanged or improperly installed. Signal and power pins shall not be adjacent.

H. Visual Inspection: Visual inspection of equipment shall be unobstructed.

I. Test Points: Built-in test points shall be provided and marked. Major components having test panels or test points shall be located for easy accessibility and shall permit external monitoring of critical functions. Test points shall be protected against environmental damage and human error.

J. Fault Isolation: Failure indicators shall be provided and identified. Systematic fault isolation procedures shall be developed and included in the maintenance manuals.

K. Labeling: All test points, fault indicators, modules, wire junctions, pipes, tubes, wires, etc., shall be identified by name plates, color coding, number coding, or other means to assist maintenance personnel. All ROMs, PROMs, and EPROMs shall be labeled with the version and date of stored software.

L. Hardware: Standard, commercially available industrial components and hardware shall be used wherever possible.

M. Vandalism: The use of vandal and damage resistant materials shall be used whenever possible.

3.16.5.5.1 Maintainability Program Plan

The Design-Builder shall prepare a detailed Maintainability Program Plan including the following:

A. Task listing and time phasing for each task.

B. Organization and responsibilities of key personnel.

C. Interfaces and input from maintainability to efforts such as:

1. Logistic support and maintenance planning.
2. Design.
3. Standardization.
4. Systems engineering.
5. Personnel subsystem program (human engineering, training, and manuals).
6. Methods for ensuring that subcontractors' and suppliers' maintainability efforts are consistent with overall plan.
7. Provisions for early fault detection and rapid fault isolation to the proper service level to minimize costs and MTTR.
8. Provisions for simplification of fault detection, isolation, and repair to minimize the skill levels and training requirements for maintenance personnel.
9. Provisions for accessibility for maintenance tasks.
10. Provisions for reduction of the following: complexity of maintenance, design dictated maintenance activities and related costs, maintenance down-time and effects on system operation, maintenance costs, potential for maintenance error, and man/machine interface problems.
11. Provisions to evaluate operational and design changes for possible effects upon maintainability requirements.
12. Provisions for use of components and/or assemblies that can be easily replaced in form, fit and function for a period of not less than 10 years from Proposal Due date to avoid issues that come from obsolescence.

3.16.5.5.2 Preventive Maintenance Plan

A. The Design Builder shall develop and submit for Review and Approval at least two months prior to requesting that the Railroad accept a Project Element, a detailed Preventive Maintenance (PM) plan based upon the maintenance concepts and established maintainability requirements for that Project Element. The PM plan shall provide all preventive maintenance tasks needed to maintain each subsystem/equipment, supplied under this Project, as close as possible to new condition. The PM task analysis shall include all servicing, inspections, scheduled overhaul, or any task required on a scheduled basis. The elapsed time to perform specific tasks shall be defined in the analysis, and in maintenance and servicing manuals. All tasks will be sorted and grouped by time interval (ex. daily, weekly, monthly, etc.), as well as by subsystem.

B. In addition to PM tasks recommended by equipment manufacturers to enhance the reliability/availability of their equipment, many Safety-Critical Preventive Maintenance (SCPM) tasks will be required as a means of detecting safety-significant latent failures, which would otherwise remain latent until another subsequent failure resulted in a potentially hazardous event. The SCPM tasks are a direct result of performing safety analyses on all required subsystems. The Design-Builder shall use a clear and deliberate method to identify all SCPM tasks in the PM plan.

3.16.6 Electromagnetic Interference Analysis

A. The Design-Builder is responsible to ensure that all operational systems and equipment provided by, or used by Design-Builder in execution of the Project requirements, shall be compatible with the existing system and the new system being provided. Should any portion of the existing or new system be harmfully affected by the Design-Builder's part, Design-Builder shall be responsible to correct the error, and is responsible for any delay as a result of such occurrence. Should any portion of rail operations be negatively affected by Design–Builder's activity or actions, the Design-Builder shall be responsible to correct the error, and is responsible for any delay as a result of such occurrence.

B. These requirements include, but are not limited to the use of electrical tools, equipment, and any other devices or items that Design-Builder, or its subcontractors and suppliers may choose to use in carrying out their work.

C. Although this analysis is required, submittal of the analysis in report form is not required.

3.16.7 Sectionalizing Plan

LIRR requires that the Design-Builder's scope of work shall be performed while maintaining normal service operations, and without any delay or disruption to Normal Service operations, except as otherwise identified within the Contract Documents. The Design-Builder shall prepare and submit to the Railroad for Review and Approval, a Sectionalizing Plan. This Sectionalizing Plan shall be prepared in accordance with TP1.24 SEQUENCING AND MILESTONES. Sectionalizing Plan shall provide a detailed breakdown of the sequencing and progression of installation, static testing, and Cutover Testing (to be performed by LIRR). The Sectionalizing Plan details shall include, at a minimum, details listed below:

A. How many, and which sections the Design-Builder shall demolish and construct.

B. Names for each of the sections being demolished and constructed (i.e. names of locations along with specific stationing marks).

C. Durations of time for each of demolition, construction, static testing, and Cutover testing (Cutover testing to be performed by LIRR).

D. Crew sizes for each item mentioned in provision 3.16.7.C above that is being demolished and reconstructed, then static tested, plus expected crew size for LIRR to perform Cutover testing.

3.16.8 Spatial Separation

In order to provide for redundancy in systems, some of the provisions require that spatial separation be provided for fiber, cable, and etc. In order to provide for spatial separation between routes, routes shall be located so that one route is on each side of the ROW, or so that one route is placed on poles while the other route is underground,

3.16.9 Summary of Submittals

Item	Section	Submittal	Action
1	3.16.5.1	Reliability, Availability and Maintainability Plan (including Certifiable Item List)	Review and Approval
2	3.16.5.6	RAM Demonstration Report	Review and Approval

3	3.16.5.7.2	Preventive Maintenance (PM)	Review and Approval
4	3.16.6	Sectionalizing Plan	Review and Approval

END

3.17 TRACTION POWER AND SIGNAL POWER

3.17.1 Section Includes

This section sets out design and construction requirements related to modification and upgrading of existing Traction Power Substations, new Substation Construction, traction power distribution, connections to the Third Rail, and new Signal Power System.

For security system related requirements, refer to TP3.21 SECURITY SYSTEMS.

3.17.2 Codes and Standards

Project Work shall comply with all statutory requirements, and shall comply with the following codes and standards.

A. Institute Of Electrical and Electronic Engineers (IEEE).
    1. Various Standards – See Technical Equipment Specifications.
B. American National Standards Institute (ANSI)
C. The National Electrical Code (NEC).
D. The National Electric Safety Code (NESC).
E. LIRR Standards CE-1 (Drawings and Specifications).
F. International Electrotechnical Commission (IEC) 61850, Communications Networks and Systems in Substations.
G. IEC 62128-1:2003, Railway Applications – Fixed Installations – Part 1: Protective Provisions relating to electrical safety and earthing.
H. NFPA 130, Standard for Fixed Guideway Transit and Passenger Rail Systems and
I. NFPA 780, Standard for the Installation of Lightning Protection Systems.

3.17.3 Related Documents

A. Technical Specifications
B. Contract Drawings

3.17.4 Design Requirements

A. The Design-Builder shall design a new traction power system and signal power generation and distribution system in the area of construction limits that encompasses Floral Park Substation (G13) through Hicksville Substation (G20).
B. The Design-Builder shall design the new traction power substations, modifications to the existing traction power substation at Floral Park, new signal power generation and distribution system, new third rail and new traction power positive and negative return distribution system in accordance with LIRR design, electrical utility and installation standards to accommodate the proposed additional mainline track.
C. The design documents shall be signed and sealed by a professional engineer licensed in the state of New York. Design submissions, as outlined here in, shall be provided to the Railroad for their review, comment and approval. Technical Specifications are provided that outline the LIRR's requirements for the substation related equipment and signal power system, including a specification for new [redacted] motor-generator equipment. The

motor-generator shall be a [redacted] unit with associated equipment such as medium-voltage switchgear, distribution transformers, cabling, and all other associated equipment.

1. Signal Power: [redacted] motor-generator (mg) sets shall be sized to power the new and existing signal system over the maximum territory defined in TP1.17 TRACTION POWER. This equipment shall have sufficient excitation and reactive power capacity to energize the worst-case dead line, including the stepdown transformers on the line, without tripping.

D. The LIRR CE-1 standards are provided that outline the LIRR's material/installation requirements for traction power and signal distribution components.

E. The design shall support the staged construction/implementation required to completely replace the signal power generation and distribution system. This includes seven (7) traction power substations, two (2) motor-generator sets (and all associated equipment) and modifications to the traction power and motor-generator equipment at Floral Park, including all appurtenances and traction and signal power distribution/controls related to its power block.

F. The Design-Builder shall provide all substations furnished and installed on this Project by a single substation manufacturer using the same equipment and components. All [redacted] motor-generator equipment furnished and installed on this Project shall be the product of a single manufacturer.

G. The design of the traction power substation and related equipment and signal power MG set and related signal power equipment includes, but not limited to:

1. Replacement substations shall be the prefabricated/modular type, with its building structure conforming to the NY State Building Code and LIRR requirements. A single prefabricated/modular unit substation is required to house the traction power equipment per provided contract drawings.

2. At the existing Floral Park motor-generator building, the building may be expanded to accommodate new or larger apparatus. Such expansion shall maintain vehicle and pedestrian access to other facilities on the site. The expansion shall maintain the structural integrity of the original building, be fully water- and weather tight and all modifications shall be designed and approved by a Professional Structural Engineer registered in the state of New York.

    i. If the existing building is expanded, the Design-Builder shall evaluate the existing heating, ventilation and air conditioning (HVAC) equipment for suitability for the larger equipment. If additional HVAC is required, the Design-Builder shall replace the existing HVAC with new HVAC system, rated for the new requirements and meeting current energy conservation codes.

3. The existing Variable Frequency Drive (VFD) installed at Floral Park shall be replaced to accommodate the new loading and functionality requirements from Floral Park to Hicksville.

4. Traction power substations shall accommodate two incoming utility feeders with required utility metering per local utility (PSE&G) and LIRR requirements. Medium Voltage switchgear shall be indoor rated [redacted] class (except for New Hyde Park which is outdoor [redacted]). Control Circuitry shall meet Utility and LIRR standards.

The Design-Builder shall provide a 4ft exterior working platform behind entire AC Switchgear line-up. AC Switchgear shall have a minimum of 3ft physical separation between switchgear line-ups.

5. Rectifier Transformers shall be outdoor rated, FR3 type oil-filled units, and affixed with snubber circuits to protect its primary windings. Rectifier Transformers are also to have tertiary winding to support substation auxiliary loading.
6. Rectifier units shall be indoor type and coordinated with the design of the rectifier transformers. The rectifier transformer units shall be ANSI 31 circuit, extra heavy duty service, rated for a [redacted]. Control Circuitry shall be per LIRR standards.
7. Dc switchgear shall be high-speed dc circuit breakers in accordance with IEEE C37.14 and LIRR standards. Cathode Breakers shall be uni-directional trip rated [redacted] Tie Breakers shall be bi-directional trip rated [redacted]. Feeder breakers shall be bi-directional trip rated 8kA. Control Circuitry shall be per LIRR standards. A DC Switchgear line-up shall consist of the following:
    i. (1) Cathode breaker.
    ii. (3) Feeder breakers.
    iii. (1) Tie breaker.
    iv. (1) Spare feeder breaker shall be installed in either switchgear line-up.
8. Rectifier and dc switchgear shall be high resistance grounded, in accordance with LIRR standards.
9. Ground Grid Design for Substation in compliance with IEEE 80.
10. Ballast stone grading design at each substation compound. Ballast stone grading shall be designed in coordination with step-and-touch potential evaluation at each substation location.
11. The SCADA system equipment/materials shall be per LIRR standards. Technical specifications contain the requirements for this equipment.
12. The [redacted] station battery system shall follow LIRR standards. Technical specifications contain the requirements for this equipment.
13. Auxiliary power for the substation compound shall be serviced by a site specific three phase utility drop. This service shall be the primary source of “house power” for the substation site. The tertiary windings in each rectifier transformer shall serve as redundant sources in the event the utility service is lost.
    i. Substations G14, G15, G17, G18, and G19 shall each receive a new [redacted], 3-phase service. The Design-Builder shall verify voltage and service capacity with the local utility and include these requirements in the new substation auxiliary power design.
    ii. Substation G16 and G20 shall receive a [redacted] service. The Design-Builder shall verify voltage and service capacity with the local utility and include these requirements in the new substation auxiliary power design.

iii. In addition to the [redacted] utility service, locations servicing signal power distribution equipment shall be equipped with a redundant [redacted] phase source supplied from the medium voltage equipment with the traction power substation. This redundant source shall be supplied by a medium-voltage fused disconnect switch located within the medium-voltage switchgear line-up. The fused disconnect switch shall be key-interlocked with the signal power transformers to ensure all loads are disconnected prior to accessing the fuses within the disconnect switch medium-voltage power.

a. The existing feeds supplying the signal power equipment at Floral Park shall be maintained unless they are not sufficiently sized to support the new equipment. If additional capacity is required, the Design-Builder shall upgrade the existing utility service and install a fully redundant second service.

14. Other substation internal equipment (entry alarm, fire alarm) to meet LIRR requirements.

15. Substation shall have an HVAC system for the control room and ventilation fans/damper for the main substation equipment area.

16. The design of the Traction Power system shall include any details necessary to properly stage the installations, including any temporary cable routing, installations, connections for traction return, 3rd rail sectionalizing, or other temporary system interconnections, and split-duct for surface routed temporary traction power cables. In-service breakers shall remain closed and connected throughout construction unless its associated substation is being taken offline. The Design-Builder shall supply all material for temporary work and installations.

H. The design of the traction power facility and signal power system shall include all necessary civil/structural elements, including, but not limited to:

1. Prefabricated substation buildings shall be situated on a full concrete vault structure to accommodate cable installations. Substation building, outdoor substation equipment, MG sets and at grade mounted signal power equipment shall be set 1 foot above the 100 year flood plain level.

2. The Design-Builder shall provide LIRR with a spill response plan for each substation location.

3. The substation design and signal power design shall include a civil/site design for vehicular access for large maintenance vehicles, grading, storm water and high security fencing.

4. Ductbank and manholes designs for all systems associated with the signal power distribution system, traction power substation including, but not limited to, traction power positive, negative, control, fiber/communication, and low-voltage conduits.

5. Foundation design for wayside equipment (reactors, sectionalizing switches, transformers, prefabricated building(s), and MG sets.

6. Foundations for signal power motor-generator sets shall be designed to absorb the vibrations from the single-phase generator without damage either to the machines (particularly bearings) or the structure.

7. Security camera coverage.
8. Each substation location shall have a 4ft wide access gate to access LIRR ROW. Concrete stairs shall be provided for access when required.

I. The design of the traction power distribution system shall include, but not be limited to:

1. The installation of [redacted], [redacted] cables for dc positive feeder from the substation breaker to its third rail section.
2. The installation of [redacted] [redacted] cable for Dead Rail Indication (DRI) from each substation breaker to its third rail section.
3. The installation of [redacted], [redacted] cables for dc negative returns from the substation to the negative bus of the impedance bond in each track.
4. The installation of [redacted], [redacted] cables for 3rd rail continuity jumpers.
5. The installation of LIRR stainless steel capped aluminum contact rail based upon LIRR CE-1 requirements. This includes coordination with running rail sizes to select proper insulators and associated components.
    i. Contact rail design shall meet LIRR requirements.Particular attention shall be given to coordinating 3rd rail gap locations to ensure correct operation of the system to prevent stranding trains.
    ii. The Design-Builder shall locate third rail gaps to minimize the chance of stranding a married pair. All third rail gaps shall be bridgeable except where directed by the Railroad.
    iii. Where new stainless steel capped aluminum third rail is installed on existing tracks; the aluminum third rail shall be installed continuous up to an existing gap. Splicing stainless steel capped aluminum third rail to existing steel and/or composite third rail will NOT be accepted.
6. A cross bonding study/report that addresses the need for negative return reactors, as well as addresses how to mitigate arcing across the insulated joints in crossovers.
7. The installation of [redacted] cables for negative cross-bonding connections at the mid-span between each substation.
8. The installation of negative equalizing bus, reactors and cable at each interlocking sized sufficiently to minimize arcing across insulated joints. Installation of equalizing locations must be coordinated with the signal system and cannot affect the signal system or compromise broken-rail protection.
9. Reactor equipment and installations to comply with LIRR standards.
10. Third rail disconnect, sectionalizing and tie switches shall comply with LIRR standards.

J. The design of the third rail heater system shall include, but not be limited to:

1. The Design-Builder shall design, furnish, and install a 3rd rail heater system that can be wirelessly controlled via [redacted] radio equipment. The heaters shall be controlled via power contactors installed along the ROW and protected using 30 amp (maximum) [redacted] rated fuses. Fuses shall be installed adjacent to the third

rail and all heater equipment shall follow LIRR standard 3rd rail heater requirements.

2. The Design-Builder shall design, furnish and install all components needed to safely energize third rail heaters at locations required by the Contract Documents. Equipment shall include, but not be limited to, radio towers, communication equipment, [redacted] wayside control stations, fuses, distribution cabling and 3rd rail heater elements. The Design-Builder shall supply all new rail heater power cables and equipment at adjacent in-service tracks, for LIRR Force Account to install.
3. The Design-Builder shall work with a LIRR approved vendor of this equipment. The vendor shall have a minimum of ten (10) years of experience in designing, programming, building, testing and commissioning SCADA systems used for the purpose of controlling rail road equipment and communicating seamlessly over a wireless communication system.
4. The 3rd rail heaters shall be designed and installed within each interlocking modified and installed within the Project Limits. The 3rd rail heater elements shall be installed [redacted] in advance of the interlocking home signals.
5. 3rd rail heaters shall be installed on each track where vehicles are required to stop at a station platform. The 3rd rail heaters shall be designed and installed at the station platform tracks and shall extend [redacted] beyond the end of the platforms in both directions.
6. The Design-Builder shall design, furnish and install the stand-alone, wireless control system to remotely operate the third rail heaters. The system shall have an independent SCADA system separate from both the signal and traction power substation SCADA systems. The SCADA and control equipment shall communicate wirelessly with the headend SCADA system. The Design-Builder shall design, furnish and install the headend SCADA equipment at Jamaica Central Control controlled by the ESO; the 3rd rail heater equipment shall use dedicated fiber-strands to communicate between equipment and back to Jamaica. The SCADA equipment shall be able to communicate with LIRR's existing SCADA system. In addition, the Design-Builder shall submit to the Railroad for review all material required for installation of the 3rd rail heaters on aluminum 3rd rail. The 3rd rail heater network shall consist of:
    i. Master Terminal
        a. The SCADA Master main terminal shall be the main operator station as well as a radio transmitter/receiver location and a network gateway. The main terminal shall have two (2) rack mounted redundant servers.
    ii. Remote Terminal(s)
        a. Each terminal shall be an operator station as well as a radio transmitter/receiver and a network gateway location for either remote or local servers. Server(s) and PC Human Machine Interfaces (HMI) shall be as required by Contract Documents. Each terminal shall have an outdoor temperature probe.
    iii. Cell Master/Radio Tower(s)

a. These locations/equipment shall supply all equipment required to receive continuous data from the Master Terminal and further communicate to downstream repeaters and control points. Each cell master shall be designed to communicate simultaneously on both the wireless and local networks. Communications in both directions shall be via two [redacted] radio networks. All enclosure components shall be hardened for the rail road environment and rested/rated for long term use.

iv. Control Points (Nodes)

a. Control points shall supply all equipment required to control and monitor heat trace elements. Each note shall be designed to control land monitor four (4) heat trace elements (maximum). Communication to the nodes shall be via a [redacted] radio network. All enclosure components shall be hardened for the Railroad environment and rested/rated for long term use.

v. Trackside Repeaters (as required per Path Propagation Study)

a. Same equipment and requirements as cell master/radio tower(s) locations.

7. The Design-Builder shall perform a comprehensive Path Propagation Study (PPS) that can predict (theoretically) propagation patterns along the Project alignment. The PPS shall use industry recognized modeling software capable of creating an accurate propagation model for wireless networks ranging from [redacted]. Project specific equipment shall be modelled within the PPS and the results of the report shall be submitted to the Railroad for review and comment. Using the PPS the Design-Builder shall create a final design of the radio network. The design shall include a complete system Bill of Materials and an in depth site analysis of the network and its architecture.

8. The network shall be designed a single sequential failure, self-healing network with two paths of communication. The two paths of communication are defined as one radio communication network (primary mode of communication) and one backup wired network (secondary on failure).

K. The Design-Builder shall conduct traction power system Load Flow Simulation studies including contingency operations with substation outages to determine the extent of substation outages to support construction staging for this project. The simulation shall be performed using industry recognized and proven software packages designed specifically for simulating railway DC Traction Power systems. The substation outage conditions considered shall be consistent with the specified levels of service reliability. The load flow simulations shall, as a minimum:

1. Simultaneously model interconnected positive and negative return electrical networks.

2. Model 3rd rail using electrical branches which are distinct from those used to model running rails.

3. Calculate current flows in rectifiers, 3rd rails, positive feeder and negative return cables.

4. Calculate TPSS bus voltages and 3rd rail voltages at all trains as they move along the alignment.
5. Calculate rail-to-remote-earth voltages at any location under peak normal and recovery service conditions, with multiple trains in operation on the ROW.
6. Calculate rms energy demand for the electric utility supply demand interval.
7. Calculate energy consumption.

L. The load flow studies shall incorporate the following criteria for equipment representation and modeling:

1. The model shall incorporate all traction power substation equipment ratings, source locations, negative return network with running rail impedances, positive distribution with 3rd rail impedances and other pertinent data.
2. Model shall include train operational requirements and performance characteristics.
3. Incorporation of the LIRR Peak train schedule into the simulation to determine required load flow in the traction system to support train operations under Normal Operation (the base case of all substations in service) and under the Contingency Operation of substation(s) out of service.
4. The Design-Builder shall provide LIRR with a Load Flow Analysis in the event a proposed substation is relocated greater than 500ft from the existing substation's footprint.

M. LIRR will allow full substation outages as defined below to facilitate construction on this Project.

1. A minimum of three substations shall remain is service between any substations taken out of service.
2. All 6MW substations (G14 New Hyde Park & G19 New Cassel) shall be the first substations replaced. All other substations shall be staged to comply with the requirements above.
3. Substation G16 Mineola shall not be taken offline until a temporary mobile substation is installed and commissioned.G16 feeds the "dead end" electrified section of the Oyster Bay branch and this branch cannot be supported by sectionalizing power from the mainline only.
4. Signal Power shall be staged to provide additional capacity to the system prior to requesting a full motor generator outage. If modifications to the existing system are required to facilitate a motor generator outage, the Design-Builder shall provide LIRR with staging plans and all associated material. Only one motor generator shall be allowed to be out of operation at a given time.
5. Prior to a substation being taken out of service the following work will be performed by LIRR and all material shall be furnished by the Design-Builder. LIRR will install temporary cables at grade. The Design-Builder shall supply all split-duct needed to protect these cables.
    a. Installation of a third [redacted] positive feeder cable per track installed at each adjacent substation.

b. Installation of a third [redacted] negative return cable per track installed at each adjacent substation.

c. Installation of negative equalization with reactors at substation taken out of service.

d. Installation of negative equalization with reactors at mid-span between adjacent substations and substation taken out of service.

6. It is not anticipated that a full substation outage will be necessary for Substation G13 on this Project. If outages are required, outages shall only be allowed during off-peak weekend hours with it returning to service in the on-peak hours. Note that much of the work within the Substation must be performed by LIRR Force Account.

7. To advance schedule, the Design-Builder may elect to provide additional adequate sources of temporary traction supply; such as, a temporary mobile substation. Such temporary facilities, in conjunction with the Design-Builder's work approach, shall be subject to review and approval by the Railroad.

a. The Design-Builder shall submit a traction power load flow study/simulation verifying that the connection of additional temporary sources of traction supply shall not negatively affect system performance and/or operational redundancy.

N. To mitigate any potential long term outage situation, a complete emergency backup mobile substation shall be provided. The basis of design for the mobile substation follows:

1. The emergency backup mobile traction power substation shall be designed and provided. The substation shall be used as an emergency back-up that can be transported and connected, in "plug and play" fashion, into the existing traction infrastructure in the event a substation failure occurs, during the period when already in the substation outage condition. The emergency backup mobile traction power substation shall be on-site with 48 hours in the event a substation failure occurs.

2. The Design-Builder shall provide LIRR with an emergency response plan any time an existing substation is taken offline for a duration greater than 2 weeks. The emergency response plan shall consist of the following criteria:

a. Stored location of emergency backup mobile traction power substation

b. Temporary location along ROW or construction area.

c. List of potential local permits that may be required.

d. Emergency Response Organization with contact information in the event of an emergency.

e. Required work to be performed by the Railroad.

O. All mobile substations shall be based upon a single [redacted] transformer rectifier unit with dc switchgear that consists of one dc main and six feeder breakers. The Design-Builder shall design the substation on appropriately sized flatbed trailer(s), registered with NYSDOT, suitable for outdoor use, and suitable for access and set up at the substation site. The mobile substations shall match the control/indication circuitry standards of the LIRR and the final equipment. The ac switchgear shall accommodate a single incoming line with

provisions for metering and comply with the utility requirements to allow it to be connected to its incoming feeder. Mobile traction power substations shall have a full SCADA system with the capabilities of being controlled and monitored from the ESO in Jamaica. The Design-Builder shall determine the arrangement of the mobile equipment trailer(s).

1. The Design-Builder shall protect and store all mobile substations throughout the duration of the Project. If a mobile substation is to be connected to the LIRR traction power system, the Design-Builder shall transport the mobile substation to its connection location and coordinate with all parties involved (LIRR, PSEG, etc.) to energize the substation. The Design-Builder shall provide all required material associated with installation, connection and commissioning of the mobile substation.
2. Prior to connecting a mobile substation to the existing system, the Design-Builder shall submit a traction power load flow study/simulation to the Railroad for Review and Comment.
3. The Design-Builder shall transfer ownership of the required temporary and emergency backup mobile substation to the Railroad once traction power work is complete, and in any event, prior to Final Completion.

P. A further breakdown of design requirements per site includes, but not be limited to, the following items:

1. Modifications of Traction Power Substation Facility at Floral Park (G13)
    i. Inspection of existing breaker cells and breakers that have been fully furnished in advance of this project. Inspection shall identify any corrective action to make fully operational for the Project. The Design-Builder is responsible for all design related tasks associated with the modifications of G13.
    ii. The Design-Builder shall protect & avoid reactors, utilities, positive and negative feeders during construction. The reactors shall maintain a minimum clearance of 4 feet from the retaining wall per NEC requirements.
    iii. The Design-Builder shall coordinate all construction activities exterior to G13 with the Railroad. The Design-Builder shall determine the minimum clearances for construction activities and the existing building.
2. New Prefabricated Substation Facilities – Total of 6 Locations [Merillon Avenue (G15), Mineola (G16), Carle Place (G17), Westbury (G18), New Cassell (G19), Hicksville (G20)]
3. The traction power substation at Mineola (G16) shall have an additional (2) feeder breakers and associated equipment (positive and negative ductbank, power cable, DRI cable, switches, etc.) installed to feed the dead end section of the Oyster Bay Branch.
4. Replacement of New Hyde Park (G14) substation. This location is unique, as it has an incoming primary voltage of [redacted]. Replace all equipment with new. The existing incoming utility service is comprised of two [redacted] feeders that terminate on an outdoor gantry structure at their respective load break switch. This shall be replaced with an “H-configuration” with [redacted] breakers. All other rectifier transformer equipment shall meet LIRR’s dc output requirements. All other

components/operation in the substation shall be similar to that as the existing substations being replaced under this project.

5. Engineering drawings shall be provided for all substation components as described here in. Design drawings shall show the physical substation layout on the site, as well as design drawings that indicate the prefabricated substation's internal equipment arrangements.
    i. The substation compound shall maximize area for the substation facility, rectifier transformers, and equipment installation & removal. The Design-Builder shall work closely with LIRR throughout the design to develop each substation compound layout.
    ii. Where additional space is available for additional traction power equipment (reactors and sectionalizing switches), the Design-Builder shall install equipment within the substation compound. Installation of this equipment shall not prohibit access to the site and shall not restrict the installation and removal of major electrical equipment.
    iii. Where additional traction power equipment cannot be installed within the substation compound, the Design-Builder shall reserve and coordinate adequate space for all equipment adjacent to the Right of Way.
6. In addition to replacing the Traction Power Substations at Mineola (G16) and Hicksville (G20) the Design-Builder shall install new motor generator equipment at these substations. The Design-Builder shall ensure that the replacement equipment is sufficiently sized to support this Project.
7. Design drawings shall identify the physical characteristics of each piece of equipment and details of the following internal systems:
    i. New Medium Voltage AC Switchgear.
    ii. Utility Metering.
    iii. AC Control Panel and Relaying.
    iv. Rectifier Transformers with Surge Suppression on Primary Windings.
    v. Rectifier Units.
    vi. DC Switchgear.
    vii. Protective Relay Network.
    viii. Supervisory Control and Data Acquisition (SCADA System).
    ix. Transfer Trip Network.
    x. Dead Rail Indication System/Components.
    xi. Auxiliary Power System.
    xii. [redacted] Station Battery System.
    xiii. Entry Alarm System.
    xiv. HVAC System.
8. Design and installation of new ground grid system at substation.

9. Design and installation of a top layer of ballast stone on top of finished grade at each substation compound. The ballast stone shall be processed Trap Rock, AREMA size 4, [redacted] LIRR small stone. The Design-Builder shall coordinate depth/quantity of stone required with the step-and-touch potential evaluation at each location.
10. Design and installation of cable vaults below entire substation. Access to the cable vaults shall be via stairs and access hatches. Access to the vault shall be from within the substation.
11. Design and installation of high-security fencing and security cameras.
12. Design and installation of any and all cathodic protection requirements in and around the substation. The Design-Builder shall coordinate cathodic protection with utilities located within the substation's influence.
13. Blast walls between rectifier transformer units.
14. Oil spill containment response plan at rectifier transformer units
15. Modifications/additions to third rail distribution (contact rail, insulators, cover board, cover board brackets, anchors, fasteners, etc,).
16. New 3rd Rail Disconnect Switches (motor operated, hand operated, load break and non-load break).
17. New Negative Return Reactors.
18. New control/indication cables (complete with terminations) for motor operated dc disconnect switches.
19. New 3rd Rail Continuity Jumpers - complete with [redacted] cables, conduits, concrete pedestals and pothead assemblies.
20. New Traction Power Positive Feeder Distribution - complete with [redacted] cables, [redacted] Dead Rail Indication (DRI) cable, conduits, concrete pedestals and pothead assemblies, copper lug terminals for connection at dc breaker and all 3rd rail connection materials (including [redacted]).
21. New Traction Power Negative Return Distribution - complete with [redacted] cables, [redacted], negative return reactors, conduits and all termination hardware and copper busses to perform all impedance bond connections and connections at the substation negative bus.
22. New third rail heater system to be installed in each interlocking and at station platforms per LIRR standards.
23. The Design-Builder shall be responsible to salvage, transport and unload (3) three of the existing traction transformers to an LIRR specified location. The Design-Builder shall coordinate with the Railroad prior to transport of existing traction transformers.
    i. The Design-Builder shall be responsible to salvage, transport and unload [redacted] transformers from New Hyde Park Substation (G14) to West Hempstead Substation (W03) yard.

ii. The Design-Builder shall be responsible to salvage, transport and unload one [redacted] transformer to a location to be determined by LIRR.

24. Electrically Operated Disconnect Switches

i. Electrically operated disconnect switches shall be controlled from the main substation PLC. The Design-Builder shall design, furnish and install all required copper control and indication cable from the electrically operated disconnect switch to the main substation PLC.

ii. In rare cases (when the electrically operated disconnect switches are not in close proximity to the substation; minimum of [redacted] from the substation) the Design-Builder shall, with approval from the Railroad, provide control power via an adjacent signal facility and route fiber-optic cabling back to the nearest substation. The Design-Builder shall use a PLC based remote control panel for the control and indication of these remote switches.

iii. The remote control panel shall be an outdoor rated enclosure on the right-of-way equipped with a PLC, battery backup, control relays, and local operators, space heater, light and GFCI outlet. The remote control panel shall communicate back to the nearest substation via a fiber-optic cable.

3.17.5 Design Submittals

A. The Design-Builder shall submit the Traction Power Load Flow Simulation Study and shall include, at a minimum, the following items:

1. A Traction Power Load Flow Simulation for Normal, Interim (staged) and Contingency Service configurations. Submittal shall include all input data, output results and a written analysis of the results with an interpretation of expected system performance relative to all performance requirements.
2. Simulation runs to confirm which traction power system elements could be removed to support the Design-Builder's staged construction approach.

B. The Design-Builder shall submit the Traction Power Substation Preliminary Design submittal for Review and Comment. The Traction Power Substation Preliminary Design submittal shall include, at a minimum, the following items:

1. TPSS Technical Specification for all TPSS equipment and systems.
2. TPSS Typical Drawing Set. Drawing sets shall include, but not be limited to, 1) Anticipated drawing list of the final TPSS design package, 2) Single Line Diagram, 3) TPSS physical layout showing all dimensioning and internal equipment layout, 4) Preliminary control circuit diagrams for traction power equipment; 5) TPSS Layout and other ancillary equipment on substation site plan with preliminary routes for all incoming/outgoing ducts and underground utility drawings.

C. The Design-Builder shall submit the Traction Power Substation Intermediate Design submittal for Review and Comment. The Traction Power Substation Intermediate Design submittal shall include, at a minimum, the following items:

1. Any Updates to TPSS Technical Specification for all TPSS equipment and systems.

2. TPSS Typical Drawing Set. Drawing sets shall include, but not be limited to, 1) updated dwgs from the previous submission with comments incorporated, 2) emergency trip and transfer trip circuit diagrams, 3) internal and external plans and elevations showing all TPSS, lighting, communications, control and monitoring and fire and security equipment, 4) interface control documents describing the method of interface to other required systems, 5) typical installation details for all components, 6) ground grid design including resistance and step and touch potential calculations, 7) conduit and cable schedules, 8) SCADA System block diagram and point count, 9) other internal system schematics and details (HVAC, ventilation, fire alarm, entry alarm, lighting controls), 10) Utility Metering Details.

D. The Design-Builder shall submit the Traction Power Substation Final Design submittal for Review and Approval. The Traction Power Substation Final Design submittal shall include, at a minimum, the following items:

1. Completed TPSS Technical Specifications – All TPSS Equipment and Systems related specifications.
2. Completed TPSS Dwg Set – All TPSS Equipment and Systems with all Site Layout Plans.

E. The Design-Builder shall submit the Traction Power Mobile Substation Design submittal for Review and Comment. The Traction Power Mobile Substation Intermediate Design submittal shall be complete and include, at a minimum, the following items:

1. Traction Power Mobile Substation Typical Drawing Set. Drawing sets shall include, but not be limited to, 1) Drawing list, 2) Single Line Diagram, 3) Mobile Trailer(s) physical layout showing all dimensioning and internal equipment layout, 4) Control circuit diagrams for traction power equipment; 5) incoming/outgoing cable entrance locations, 6) emergency trip and transfer trip circuit diagrams, 7) internal and external plans and elevations showing all lighting, communications, control and monitoring and fire and security equipment, 8) details of equipment interconnections (power circuits, control circuits and physical connections), 9) equipment ground connection locations 7) conduit and cable schedules, 8) SCADA System block diagram and point count, 10) Utility Metering Details.

F. The Design-Builder shall submit the Traction Power Distribution Design and 3rd Rail Sectionalizing submittals for Review and Approval. These design submittals shall include, at a minimum, the following items:

1. 3rd Rail Sectionalizing Plans for existing, interim configuration(s), final conditions. Third rail plans shall meet the minimum requirements specified in these contract documents and as is required per LIRR CE-1 Standards and Requirements.
    i. Sectionalizing Switches - [redacted] electrically operated non-load break disconnect switches shall be equipped with [redacted] power connections to each section of third rail (incoming and outgoing).
        a. The Design-Builder shall furnish and install sectionalizing switches at each third rail gap installed around a switch point.
    ii. Feeder Switch - [redacted] manually operated load-break disconnect switches shall be equipped with three [redacted] l power connections to third rail.

a. The Design-Builder shall furnish and install a feeder switch connecting the substation feeder breaker to the third rail.

iii. Tie Switch – [redacted] electrically operated load break disconnect switches shall be equipped with three [redacted]l power connections to each section of third rail.

. The Design-Builder shall furnish and install a normally-opened tie switch connecting around a gap located at a substation location.

2. In addition to substation locations, the Design-Builder shall install switches at the following locations:

   i. [redacted] [redacted]electrical operated load break switch between power section 71 & 81 west of Floral Park Station and associated equipment.

   ii. [redacted] [redacted] electrical operated load break switches between mainline track 3 to the Oyster Bay branch and associated equipment.

   iii. [redacted] electrical operated load break switches for new crossover on Hempstead line west of Stewart Manor Station.

3. Plan views showing duct bank routing out of each substation to track area for traction power Positive and Negative cablings (including DRI ducts/cables). Drawings to include manholes and final conduit stub up locations.

4. Details of duct bank sections and its contents, manhole details, conduit stub-up location/details.

5. 3rd rail plan view set that shows gaps, end approaches, anchors, continuity jumpers, sectionalizing switch locations.

6. All 3rd rail details, pothead details, conduit installation details for all arrangements (feeder stub ups, continuity jumpers, sectionalizing switches, reactors, impedance bonds).

   i. All third rail sectionalizing tie switches installed at substation gap locations shall be electrically operated load break switches.

   ii. The Design-Builder shall coordinate all 3rd rail details and equipment locations with LIRR through final design. Certain locations along the alignment may allow for the installation of electrically-operated, non-load break (coffin style) disconnect switches. Typically these are locations where the disconnect switch is along the alignment and normally-closed during normal revenue service.

   iii. The Design-Builder shall coordinate the indication and control of all electrically-operated disconnect switches with LIRR. In general, control cables are routed from the substation to the disconnect switch.

   iv. The Design-Builder shall submit complete design package for Remote Operation Control Panel for Electrically Operated Disconnect Switches. This design shall follow LIRR standards and requirements and shall be submitted for each location where control panels are used.

G. The Design-Builder shall submit the 3rd Rail Heater System Design submittals for Review and Comment. This design submittals shall be complete and include, at a minimum, the following items:

1. Plan view showing extent of heater layout.
2. Physical layout drawing of each proposed location to be installed.
3. Component cut sheets and equipment details.
4. Technical specification of equipment.
5. Final System Study.
6. Heater Control/distribution case details (complete with physical equipment details, electrical control details and installation/foundation details).
7. Heater element details and heater system connection details (positive, negative and control interconnection details).

H. The Design-Builder shall submit any/all interim staging plans that denote major traction power system modifications for review and comment. This may include but not be limited to:

1. Substation modification Plans.
2. Interim 3rd Rail Sectionalizing.
3. Interim Positive, Negative or control duct bank and cable distribution modifications to support construction activities.

I. The Design-Builder shall submit all manufacturer shop drawings and catalog cuts of the all materials and systems being furnished under this contract for Review and Comment.

J. The Design-Builder shall submit to the Railroad all test plans and test results for Review and Approval.

K. Signal Power Generation and Distribution System: The Design-Builder shall submit to the Railroad, design documents similar to those required for the Traction Power Substation as described in this Section. In addition to these submittals, the Design-Builder shall submit to the Railroad, the following submittals regarding the [redacted] signal power system:

a. Signal Power Sectionalizing drawings depicting all changed cut sections, new or relocated switches, etc.
b. Plans and elevations of equipment installations or modifications.
c. Control wiring drawings for new or modified installations, including switchgear elementary drawings.
d. Power wiring showing the flow of power from the incoming [redacted] service to the [redacted] signal power lines.
e. [redacted] generator PQ curves (generator capability curves).
f. Relay coordination for the signal power motor-generator sets.
g. Factory test plans.
h. Field test and commissioning plans.

3.17.6 Construction Requirements

A. The construction implementation of the Traction Power System modifications/additions necessary for this project shall be staged so as not to impact LIRR train service. Trains shall be able to operate under scheduled peak train service.

B. One or more substations may be taken out of service provided that the requirements set out in 3.17.4 Design Requirements have been met, and subject to Railroad Review and Approval.

C. The Design-Builder shall furnish and install equipment for the new Traction Power System in accordance with LIRR installation standards and includes but not limited to:

1. Furnish and install all incoming medium voltage cabling infrastructure, including conduits, cables and termination hardware.
2. Furnish and install all prefabricated substations and all internal equipment traction power equipment (complete). This includes ac switchgear, transformer rectifier units, dc switchgear, SCADA equipment, pilot wire system, protective/control relays, HVAC, auxiliary power systems, station battery equipment, lighting and HVAC.
3. Furnish all material and equipment necessary to modify the existing substation and motor generator at Floral Park (G13). This includes dc switchgear, motor-generator set, signal power transformers, SCADA modifications, control circuitry interconnects, and positive, negative and DRI duct banks and cabling.
    i. LIRR Force Account will install all equipment within the substation building.
    ii. The Design-Builder shall install all material and equipment outside the building and anything routed from outside the substation to the interior; e.g., positive, negative and DRI duct banks and cabling.
4. Furnish and install all 3rd rail positive distribution system equipment which includes positive cabling from substations to tracks, 3rd rail sectionalizing switches, connection materials for all cables to third rail and section switches, new stainless steel capped aluminum third rail with all its components (insulators, anchors, brackets, coverboard, etc.), 3rd rail continuity jumpers and all pothead connection materials. Where existing continuity jumpers and switches are required to be re-labeled, the Design-Builder shall provide LIRR with all required labels for installation.
5. Furnish and install all negative distribution system equipment which includes negative cabling from substation to reactors and/or tracks, impedance bond interconnections and all power cable termination hardware.
6. Furnish and install a new ground grid system at each substation including all ballast stone grading at each substation compound.
7. Furnish and install all manhole, pull boxes, conduits, raceways for traction power system cables (medium voltage, auxiliary power, positive, negative and control cables).
8. Furnish and install all arc-proof tape protection of positive and negative traction power cabling in manholes and vaults.

9. Furnish and install all 3rd rail heater system components (control cases, fuses, cables, raceways and heater elements).
10. Furnish and install mobile substation equipment to facilitate existing substation replacements along the project limits.
11. LIRR Force Account will be responsible for de-energizing existing equipment/systems that the Design-Builder is to modify and/or replace.
12. After each substation has been properly decommissioned and prior to demolition, LIRR reserves the right to salvage any and all equipment it deems necessary. The Design-Builder shall NOT demolish or remove any equipment prior to receiving written consent from the Railroad. Once the Railroad has provided consent, then that the Design-Builder shall correctly demolish and dispose of all remaining substation material

3.17.7 Traction Power Equipment Testing

A. The Design-Builder shall Test (Factory and/or Field testing for specific component/system) all equipment Traction Power related components that they have been tasked to modify and/or replace under this project. LIRR Force Account (or their designated representative) will witness these test.

B. The Design-Builder shall submit test plans and anticipated pass/fail results for each component/system being furnished and/or modified under this project to show compliance with the Contract Documents.

C. This includes, but not limited to:

1. Traction Power Substations.
    i. Ground resistance (Field Test).
    ii. AC switchgear (Factory and Field Testing).
    iii. DC switchgear (Factory and Field Testing).
    iv. Transformer rectifier units (Factory and Field Testing).
        a. At a minimum, each TR Unit design (15kV & 69kV designs) shall be sent to an independent laboratory for comprehensive unit testing.
    v. SCADA System (Factory and Field Testing).
    vi. All Substation Operational Testing (Factory to extent possible and Field Testing). This includes protective relaying, control circuitry, transfer trip, train start up and remote dc short circuit testing.
    vii. Auxiliary Power Supply Systems (Field Testing).
    viii. Station Battery System (Field Testing).
2. Traction Power Distribution System.
    i. Cable Testing (Factory Certification Testing and Field Testing).
    ii. Sectional Switches (Field/Operational Testing).
    iii. Third Rail System testing (Field/Operational Testing).
3. Contact Rail Heating System (Field/Operational Testing).

D. All substations shall be subjected to a 60 Day burn-in period before adjacent/additional substations can be removed from operation. See Contract Documents for additional information on traction power equipment testing.

3.17.8 Signal Power Equipment Testing

A. Signal Power System Cable testing.

B. AC switchgear (factory and field testing).

C. Motor-generator set testing, including temperature rise tests for both the motor and the generator at the limits of their capability curves.

D. Dead line pickup: The Design-Builder shall demonstrate on site that each new or modified motor-generator set can reliably energize the dead line that it is intended to pick up, without exceeding the time-rated capability of the machine, and without voltage drop beyond that tolerated by the signal system.

E. SCADA control of the signal power motor-generator set and related switchgear.

F. All motor generators shall be subjected to a 60 Day burn-in period before next generator can be removed from operation.

3.17.9 Pre-approved Equipment Manufacturers

The Design-Builder may submit alternate manufacturers than those listed below to the Railroad for Review and Approval. Alternate manufacturers shall meet all the Contract requirements.

A. Traction Power Substations Prefabricated Buildings

1. Myers.
2. Powell.

B. DC Traction Rectifiers

1. Myers.
2. Powell.

C. DC Traction Switchgear (Note that the only approved 10kA cathode & bus tie breaker for 4MW rectifiers is Meyer's HSN)

1. Myers.
2. Powell.

D. SCADA

1. Siemens PLC.

E. AC & DC MFR (Multi-Function) Relays

1. Siemens.

F. Signal Power Motor Generator

1. KATO.
2. Power System (Motor Generator Single Shaft System).

G. Aluminum 3rd Rail with Stainless Steel Cap

1. TransTech.

H. 3rd Rail Insulators
   1. PolyPly.
   2. Quality Industries.

I. 3rd Rail Brackets
   1. B-Tech Solutions.

J. 3rd Rail Tie Extension Brackets
   1. LB-Foster.
   2. SELCO.

K. DC Electrically Operated Load Break Switches
   1. NDC Power Switch.

L. DC Electrically Operated Non-Load Break Switches
   1. NMC Power Switch.
   2. SELCO.
   3. MAC Products.

M. DC Manual Disconnect Switches
   1. NMC Switches.
   2. SELCO.
   3. MAC Products.

N. [redacted]Traction Cables [redacted]
   1. Okonite.
   2. DRAKA.
   3. Southwire.

O. [redacted] Traction Cables [redacted]l
   1. Okonite.
   2. DRAKA.

P. Type-II Negative Reactors
   1. Schaffner MTC Transformers.

Q. Wireless 3rd Rail Heater System and Equipment
   1. Radio Equipment & SCADA – Kapsch & Phoenix Contact.
   2. 3rd Rail Heaters – Rails Company.
   3. 3rd Rail Distribution Equipment – Phoenix Contact & Rails.

3.17.10 Construction Submittals

A. The Design-Builder shall submit to the Railroad all manufacturer shop drawings and catalog cuts of the all materials and systems being furnished under this Project for Review and Comment.

B. The Design-Builder shall submit all test plans and test results for Review and Comment.

3.17.11 Summary of Submittals

Item	Section	Submittal	Action
1	3.17.4	Calculations showing the ability of the proposed motor-generator sets to power the signal power line, and to successfully pick up that line from dead without tripping.	Review and Comment
2	3.17.5	Traction Power Load Flow Study	Review and Comment
3	3.17.5	Traction Power Substation Preliminary Design (each site)	Review and Comment
4	3.17.5	Traction Power Substation Intermediate Design (each site)	Review and Comment
5	3.17.5	Traction Power Substation Final Design (each site)	Review and Approval
6	3.17.5	Traction Power Substation Manufacturer Shop Drawings	Review and Approval
7	3.17.7	Traction Power Substation Test Program Plan	Review and Approval
8	3.17.7	Traction Power Substation Factory Test Procedures	Review and Approval
9	3.17.7	Traction Power Substation On-Site Test Procedures	Review and Approval
10	3.17.5	Traction Power Mobile Substation Design	Review and Approval
11	3.17.5	Traction Power Mobile Substation Manufacturer Shop Drawings	Review and Approval
12	3.17.7	Traction Power Mobile Substation Factory Test Procedures	Review and Approval
13	3.17.7	Traction Power Mobile Substation Field Test Procedures	Review and Approval
14	3.17.7	Traction Power Mobile Substation Test Results	Review and Comment
15	3.17.8	Signal Power Generation and Distribution Study	Review and Comment
16	3.17.8	Signal Power Generation and Distribution System – Preliminary	Review and Comment
17	3.17.8	Signal Power Generation and Distribution System – Intermediate	Review and Comment

Item	Section	Submittal	Action
18	3.17.8	Signal Power Generation and Distribution System – Final	Review and Approval
19	3.17.7	Signal Power apparatus factory and field tests	Review and Comment
20	3.17.5	Traction Power Distribution System Preliminary Design	Review and Comment
21	3.17.5	Traction Power Distribution System Intermediate Design	Review and Comment
22	3.17.5	Traction Power Distribution System Final Design	Review and Approval
23	3.17.5	Traction Power Distribution System Equipment Shop Drawings	Review and Comment
24	3.17.7	Traction Power Distribution System – Testing Procedures	Review and Approval
25	3.17.7	Traction Power Distribution System – Test Results	Review and Comment
26	3.17.5	3rd Rail Sectionalizing – Intermediate Design	Review and Comment
27	3.17.7	3rd Rail Sectionalizing – Final Design	Review and Approval
28	3.17.7	3rd Rail Sectionalizing Switches – Shop Drawings	Review and Comment
29	3.17.4	Remote Operation Control Panel for Electrically Operated Disconnect Switches – Intermediate Design	Review and Comment
30	3.17.4	Remote Operation Control Panel for Electrically Operated Disconnect Switches – Final Design	Review and Approval
31	3.17.4	Remote Operation Control Panel for Electrically Operated Disconnect Switches – Shop Drawings	Review and Comment
32	3.17.4	3rd Rail Heater System Design - Preliminary	Review and Comment
33	3.17.4	3rd Rail Heater System Design - Intermediate	Review and Comment
34	3.17.4	3rd Rail Heater System Design - Final	Review and Approval
27	3.17.4	3rd Rail Heater System Equipment – Shop Drawings	Review and Comment
28	3.17.4	3rd Rail Heater System – Test Procedures	Review and Approval
29	3.17.4	3rd Rail Heater System – Test Results	Review and Comment
30	3.17.6	Traction Power System Related Construction Staging/Implementation Plans	Review and Comment

END

3.18 CORROSION CONTROL

3.18.1 Section Includes

This Section sets out the criteria for corrosion control measures to be incorporated into the design and construction of the Project. The criteria are separated into three areas:

A. Stray Current Corrosion Control.

B. Soil Corrosion Control.

C. Atmospheric Corrosion Control.

3.18.2 Codes and Standards

A. Project Work shall comply with all statutory requirements, and shall comply with the codes and standards identified in Appendix TPA3.1A CODES AND INDUSTRY STANDARDS and the codes and standards listed below and to the requirements of the latest versions of standards issued by the following organizations:

1. American Concrete Institute (ACI).
2. American National Standards Institute (ANSI).
3. American Society for Testing and Materials (ASTM).
4. American Welding Society (AWS).
5. Institute of Electrical and Electronics Engineers (IEEE).
6. Insulated Cable Engineers Association (ICEA).
7. NACE International.
8. National electrical Code (NEC).
9. National Electrical Manufacturers Association (NEMA).
10. National Fire Protection Association (NFPA).
11. Occupational Safety and Health Administration (OSHA).
12. The Society for Protective Coatings (SSPC).
13. 49 CFR parts 192 and 195.

B. The following standards shall be reviewed by the Design-Builder to identify possible corrosion control design conflicts. The order of precedence in the event of conflicting requirements shall be determined by direct communications between the designer and the agencies involved.

1. National Grid.
2. PSE&G
3. Long Island Railroad Standards

3.18.3 Related Documents (Not Used)

3.18.4 Systems Interfaces

A. The Design-Builder shall coordinate, as required, the corrosion control designs with other disciplines and Project Element designs, including mechanical, utilities, electrical, civil, structures, trackwork, traction power, environmental, geotechnical, architecture,

grounding, signaling, communications, safety, and security in order to produce a fully comprehensive and integrated design.

3.18.5 Pre-Design Corrosion Control Surveys

A. The Design-Builder shall conduct a pre-design investigation to determine the chemical make-up of existing soil and atmospheric conditions as they may impact the development of corrosive effects on the Project. The Design-Builder shall use the results of this investigation to confirm or enhance the soil and atmospheric corrosion control requirements of this Section of the Technical Provisions.

B. At a minimum, the Design-Builder shall analyze soil samples for resistivity, moisture content, pH, chloride, and sulfate ion concentrations, oxidation-reduction potential, and for presence of sulfides.

C. The Design-Builder shall conduct a pre-design stray current survey to determine the existing levels of stray current at intervals along the alignment not to exceed one half mile apart. The Design-Builder shall use the results of this survey to confirm or enhance the stray current corrosion control requirements of this Section of the Technical Provisions.

3.18.6 Expansion Capability

A. The corrosion control system shall be easily expandable to future line expansions and or additional structures along the existing alignment without major reconfiguration, reconstruction, redundancy, or duplication of equipment. Experimental designs, equipment, and prototypes of a research nature shall not be used.

3.18.7 Special Design Provisions

A. Preliminary Design and Final Design phases of the Project, shall identify unique and special corrosion control design cases such as existing building foundations, abandoned foundations, paralleling power lines, stray currents, unusual soil conditions, and other conditions, revealed during the baseline soil surveys, boring program, and stray current surveys.

B. For each unique and special design case, the Design-Builder shall evaluate and recommend appropriate special design measures.

3.18.8 Design Requirements and Documents

3.18.8.1 Corrosion Control Design

A. These corrosion control requirements are separated into three areas: stray current corrosion control, soil and water corrosion control, and atmospheric corrosion control.

3.18.8.2 Stray Current Corrosion Control

A. The Design-Builder shall apply stray current corrosion control requirements to mitigate the corrosive effects to a reasonably achievable level of Direct Current (DC) stray currents on Project and other adjacent structures, primarily by providing and maintaining high levels of electrical isolation from ground for the traction power substations, positive distribution systems, and negative return systems, and maintaining acceptable levels of rail-to-earth potential.

B. The requirements of this Section shall also apply to measures installed with fixed facilities, and to facilities belonging to others. They are based on anticipated stray earth traction current levels and the characteristics of fixed facilities and other structures. Protection

measures shall be applied to assure that stray currents are eliminated or maintained within acceptable ranges to avoid deterioration of metallic structures.

3.18.8.3 Soil and Water Corrosion Control

A. The Design-Builder shall apply soil and water corrosion control requirements to mitigate corrosion of Project facilities and facilities installed for Utility Owners, caused by contact with soil, rock, and groundwater. Structures and systems shall be protected against environmental conditions by the use of non-metallic materials, coatings, electrical isolation, electrical continuity provisions, cathodic protection, or a combination of these measures, as appropriate.

3.18.8.4 Atmospheric Corrosion Control

A. The Design-Builder shall apply atmospheric corrosion control requirements to systems and measures installed to mitigate corrosion caused by local climatological conditions, air pollutants and applied ice melting chemicals. Structures and systems shall be protected against atmospheric conditions, meteorological conditions, air pollutants, and ice melting chemicals by the use of materials selection, coatings, sealants, and design details that provide for proper drainage in order to maintain necessary function and appearance of railroad structures exposed to the environment. Design Builder shall conduct corrosion surveys to determine and document the corrosive characteristics of the atmosphere and ice melting chemicals which may be used as a basis of the atmospheric corrosion control system designs. Atmospheric corrosion control requirements shall be coordinated with Structural and Architectural design disciplines.

3.18.9 Stray Current Corrosion Control Systems

A. This Section provides requirements for designs to minimize, within reasonable levels, stray earth traction currents from transit operations, and to control and monitor potential stray current activity on transit structures and adjacent structures owned by others. Stray current corrosion control systems shall reduce or limit the level of stray earth currents at the source, under normal operating conditions, rather than mitigating the corresponding effects (possibly detrimental) which may otherwise occur.

B. The structures which may be affected by stray current shall be identified and designed to limit the impact of stray currents. Stray current control designs shall provide a means to mitigate and monitor stray current activity on Project and adjacent buried or embedded metallic structures.

3.18.9.1 Traction Power System

3.18.9.1.1 Mainline Negative Return System

A. The Design-Builder shall design the mainline and yard running rails, including special trackwork and ancillary system connections to have a minimum, uniformly distributed, in-service rail-to-earth resistance of [redacted] normalized to [redacted] (two rails).

B. The Design-Builder shall meet or exceed this criterion through the use of appropriately designed isolating track fastening devices, such as isolated tie plates, isolated rail clips, plastic ties, isolated direct-fixation fasteners, rail fastener coating, or other approved methods. The Design-Builder shall include test facilities to determine rail-to-earth resistance levels during Construction Work and operations.

C. The Design-Builder shall design and furnish ballasted track to meet the following minimum provisions:

1. Well-drained ballast material free of dirt or debris.
2. A minimum 1-inch clearance between the ballast material and metallic surfaces of the rail and metallic track components in electrical contact with the rail.

D. The Design-Builder shall design and furnish track at grade crossings and hi-rail vehicle access locations with suitable electrical isolation provisions to accommodate periodic maintenance and comply with the minimum track-to-earth resistance criterion.

E. Direct fixation fasteners utilized on the Project shall have a minimum resistance of [redacted] dry and [redacted] within 2 hours of wetting.

F. The running rails shall be constructed as an electrically continuous power distribution circuit through the use of rail joint bonds, impedance bonds, cross bonds, continuously welded rail, or a combination of these methods.

3.18.9.1.2 Water Drainage

A. Grade, tunnels, under passes, or other below grade sections shall be designed to prevent water from dripping or running onto the running rails and appurtenances and to prevent accumulation of freestanding water under normal operating conditions. Water drainage systems shall be designed to prevent water accumulation from contacting the running rails and rail appurtenances.

3.18.9.1.3 Barrier Coating

A. Metallic components, with the exception of grounding materials, that will be partially embedded or come into contact with concrete or soil shall be coated with sacrificial or barrier coatings. Sacrificial coatings shall be applied to the entire components. Barrier coatings shall extend a minimum of 3 inches into the concrete or 18 inches into the soil and a minimum of 6 inches above the surface of the concrete or soil.

3.18.9.1.4 Ancillary Systems

A. Switch machines, bumping posts, signaling devices, train communication systems, and other devices or systems, which may contact the rails, shall be electrically isolated from earth/ground. Devices or systems that are grounded by design shall be electrically isolated from the running rails using appropriately designed dielectric fastening systems.

3.18.9.2 Railroad Facilities

3.18.9.2.1 Direct Fixation Track Slabs

A. The Design-Builder shall meet or exceed the following provisions for direct fixation track slabs:

1. Epoxy coated reinforcement steel shall not be used for track slabs or other reinforced concrete structures that may be subject to detrimental levels of stray current from the railroad.
2. Electrical continuity of top and bottom layer reinforcing steel in the slab shall be provided by welding longitudinal lap splices, except where a second pour concrete slab containing an electrically isolated reinforcing mat will be located directly under the trackway, only the reinforcing steel in the second pour concrete shall be made electrically continuous.

3. Top and bottom layer longitudinal reinforcing steel shall be electrically interconnected by welding to transverse collector bars installed at breaks in longitudinal reinforcing steel and welding a minimum of two steel straps between the top and bottom collector bars, such as at expansion joints, contraction joints and at the end of each slab, hinges, and abutments. . Collector bars, installed on each side of a break, shall be connected by exothermically welding multiple (minimum of 2 per track) insulated copper bonding cables to the collector bars on adjoining track slabs. The bonding cables shall be extended to a test station where the location of the bonding coincides with a test station location. Where the track slab crosses bridges or other structures and the track slab continues on the other side, copper bonding cables shall be exothermically welded between the two separate track slabs so the slabs are electrically continuous. The bonding cables shall be installed in PVC conduit. The number and size of cables required shall be determined during final design but, in no case shall less than 2 cables be utilized for bonding.
4. Additional transverse collector bars shall be provided at intermediate locations to maintain a maximum spacing of [redacted] between collector bars.
5. A test station shall be provided approximately every [redacted] at collector bar locations and at each end of the slab. Test stations installed at expansion joints/bonding locations shall be located within the system ROW, preferably on sidewalks or platforms, to allow testing with minimum impact to train and vehicular traffic. The test box shall contain equipment and wiring to enable electrical bonding and separation of adjacent track slabs. Test stations installed in accordance with the two previous bullets shall be taken into consideration during the design, when scheduling the breaks between adjacent track slabs.
6. Insulated copper bond cables shall be connected to each collector bar. A minimum of 6 feet shall separate bond cable connections to the collector bar wherever possible. The bond cables shall be installed in block-outs or sand pockets with sufficient slack in the cables to accommodate slab movement. Bond cables shall be routed to a test station when the location of the bonding coincides with the location of a test station. Wire tags with numbers shall be provided on both ends of the wire and the wires shall be color-coded.
7. Copper-to-steel weld locations (bond cables) shall be coated with a cold applied, fast drying mastic consisting of bituminous resins and solvents or an approved epoxy. The coating shall be cured prior to placement of concrete.
8. Prior to and after the pouring of the concrete, the rebar system shall be tested for continuity. The rebar system resistance shall not exceed 120 percent of the theoretical resistance of the system.

3.18.9.2.1.1. Aerial Trackway Structures Column and Bearing Assemblies, Direct-Fixation

A. The Design-Builder shall apply the requirements of this Section to aerial structures and bridges that use a column and bearing assembly that can be electrically isolated from deck or girder reinforcing steel. Such structures and bridges shall have isolated trackwork construction.

B. Epoxy coated reinforcement steel shall not be used for track slabs or other reinforced concrete structures that may be subject to detrimental levels of stray current from the railroad system.

C. Provide electrical continuity of top and bottom layer reinforcing steel in the deck/girder by welding all longitudinal lap splices.

D. Electrically interconnect all top and bottom layer longitudinal reinforcing steel by welding to transverse collector bars installed at breaks in longitudinal reinforcing steel, such as at expansion joints, hinges and at abutments. Weld a minimum of two steel straps between the top and bottom collector bars. Connect collector bars installed on each side of a break (except at abutments) by exothermically welding a minimum of two 1/0 AWG insulated copper jumper bonding cables per track.

E. Provide additional transverse collector bars at intermediate locations to maintain a maximum spacing of [redacted] feet between collector bars.

F. Provide a ground electrode system at each end of the structure and at intermediate locations to maintain a maximum spacing between ground electrode systems of [redacted] feet. The number, location and resistance-to-earth of the ground electrode system shall be determined on an individual structure basis.

G. Provide test facilities at each end of the structure and at intermediate locations to maintain a maximum spacing of [redacted] feet between test points. The test facilities shall be located within system ROW to allow testing with minimum impact to Train and vehicular traffic.

H. Color-coded wires with wire tags shall be run from the collector bars and ground electrode system, if present, to the nearest test facility.

I. Provide electrical isolation of reinforcing steel in deck/girders from columns, abutments, and other grounded elements. Isolation can be established through the use of isolating elastomeric bearing pads, dielectric sleeves, and washers for anchor bolts, and dielectric coatings on selected components.

J. Copper-to-steel weld locations (bond cables) shall require coating with a cold-applied, fast-drying mastic consisting of bituminous resins and solvents or an approved epoxy. The coating shall be cured prior to placement of concrete.

3.18.9.2.1.2. Column and Bearing Assemblies, Tie-and-Ballast

A. This Section covers the aerial trackway structures of tie-and-ballast track construction. Welding of reinforcing steel in the deck is not required for this configuration.

1. The Design-Builder shall provide a waterproofing, high volume resistivity membrane over the entire surface of the deck that shall be in contact with the ballast. The membrane may be fiberglass mesh/poured asphalt system, rolled membrane, polyurea or other coating with a demonstrated transit history. The membrane system shall have a minimum volume resistivity of [redacted], as measured in accordance with ASTM D257. Membranes shall be protected with an asphaltic protection board immediately after the membrane is installed and cured.

2. Where determined necessary by the Design Builder's Corrosion Engineer, the Design-Builder shall provide an electrically continuous collector grid, such as welded wire fabric, directly on top of the protection board over the waterproofing membrane and beneath the ballast. The collector grid shall extend the full width of the tracks on the Guideway. Extend test leads to test facilities at each end of the grid and intervals not exceeding [redacted].

3. The Design-Builder shall provide ground electrodes, test facilities, electrical isolation and coatings as described in this Section of Technical Provisions.

3.18.9.2.1.3. Bents and Girders, Direct-Fixation

A. The Design-Builder shall apply the requirements of this Section to structures that use bent type supports with reinforcing steel extending into the deck/girders. Girders may be pre- or post-tensioned. This type of construction precludes the electrical isolation of deck/girder steel from bent/column steel. Ground electrode systems are not required for these types of structures.

1. Epoxy coated reinforcement steel shall not be used for track slabs or other reinforced concrete structures that may be subject to detrimental levels of stray current from the railroad.
2. The Design-Builder shall provide the applicable features as described in this Section of Technical Provisions.
3. The Design-Builder shall provide electrical continuity of column/bent steel by welding appropriate reinforcing in the bent cap and bent foundation to at least two vertical bars in each column. Make these connections to each of the two vertical bars at top and bottom of column/bent. Weld lap splices, if any, in the vertical bars of the columns to ensure electrical continuity.
4. Electrically interconnect column/bent steel to deck/girder steel by welding at least two vertical column bars to collector bars installed at bents.
5. Electrically interconnect column/bent steel to footing steel when column/bent steel penetrates the footing. Weld at least two vertical column/bent bars to footing reinforcing steel.
6. Electrically interconnect pre- or post-tensioned cables to continuous longitudinal reinforcing steel by welding a cable between each anchor plate and the longitudinal reinforcing steel.
7. The Design-Builder shall provide test facilities at each abutment, hinge and expansion joint and at every column/bent. Test facilities at hinges and expansion joints shall house bonding cables from adjacent collector bars on each side of the hinge/joint. Facilities at columns/bents shall house two wires from vertical column/bent steel and from collector bar at top of bent. Test facilities shall be located within system ROW to allow testing with minimum impact to Train and vehicular traffic.

3.18.9.2.1.4. Bents and Girders, Tie-and-Ballast

A. This Section covers structures with tie-and-ballast track construction:

1. The Design-Builder shall provide the same features as for structures with Direct Fixation, as specified in this Section of Technical Provisions.

3.18.9.2.2 Abutments

A. The Design-Builder shall provide a traverse collector bar in the top and bottom of the abutment backwall in seat-type abutments.

B. Weld all backwall exterior face vertical rebars to the collector bars for the full width of the bridge backwall for electrical continuity.

C. Provide a traverse collector bar at the top of the abutment diaphragm.

D. Exothermically weld a minimum of two insulated copper bonding cables to each of the collector bars.

E. Apply an insulating membrane on the abutment diaphragm end surface.

F. Use epoxy coated rebar for approach slab tie rods for the full length of the bridge. The epoxy coated tie rods shall not contact the electrically continuous reinforcing in the abutment.

3.18.9.2.3 Concrete Deck/Exposed Steel, Direct-Fixation

A. The Design-Builder shall apply the requirements of this Section to bridge structures using reinforced concrete deck with exposed steel superstructure and having isolated trackwork construction. This type of construction precludes the electrical isolation of deck reinforcing steel from superstructure steel.

1. Provide the applicable features as specified for Bents and Girders with Direct Fixation.
2. If electrical isolation of reinforcing steel in the deck and superstructure steel from columns, abutments, and other grounded elements cannot be obtained, then electrical continuity of metallic components within these elements must be established by appropriate welding and bonding procedures.

3.18.9.2.4 Concrete Deck/Exposed Steel, Tie-and-Ballast

A. This Section covers bridge structures with tie-and-ballast track construction. Welding of reinforcing steel in the deck is not required for this configuration. Provide the applicable features as specified for Column and Bearing Assemblies with Tie-and-Ballast track construction.

3.18.9.2.5 Existing Concrete Deck Structures, Tie-and-Ballast

A. The Design-Builder shall apply the requirements of this Section to existing reinforced concrete deck structures for tie and ballast track construction. Stray current corrosion control for existing type structures shall be addressed by limiting stray current levels at the source (running rails). Meeting the criteria established shall provide primary stray current control for these facilities. .An insulating waterproofing membrane and stray current collection grid may be installed where practical or determined necessary by the Corrosion Engineerto enhance stray current mitigation.

3.18.9.2.6 Cast In-Place Reinforced Concrete Retaining Walls

A. The Design-Builder shall weld longitudinal bar overlaps in both faces of cast-in-place retaining walls, including the top and bottom bars of the footing to ensure electrical continuity. Longitudinal bars in the footing shall be made electrically continuous to the longitudinal bars of the walls. Collector bars and bonding cables shall be installed at intervals not exceeding 250 feet and at electrical (physical) breaks in the longitudinal reinforcing steel such as at expansion joints. A minimum of two steel straps shall be welded between the collector bars of the reinforcement courses to ensure electrical continuity. Test facilities shall be installed at each end of the retaining wall and at every other collector bar such that the maximum spacing between test stations does not exceed 500 feet.

3.18.9.2.7 Utility Structures

A. The Design-Builder shall provide non-metallic piping and conduit unless metallic facilities are required for specific engineering purposes. There are no special provisions required if nonmetallic materials are used.

B. Aluminum and aluminum alloys shall not be utilized in concrete or direct burial applications.

3.18.9.2.8 Metallic Facilities (System wide)

A. Pressure or non-pressure piping exposed within tunnel structures or crawl spaces, supported by aerial structures, or embedded in concrete inverts, shall not require special provisions, except for those specified in provision 3.18.10.17 and 3.18.8.4.

B. The Design-Builder shall electrically isolate pressure piping that penetrates a surface from the external piping to which it connects, surface reinforcing steel, and from watertight sleeves. Electrical isolation of interior piping from external piping shall be made on the inside of the structure for underground penetrations, as close as practical to the location of the penetration. Electrical isolation of interior piping from external piping shall be made on the outside of the structure for aboveground penetrations, as close as practical to the location of the penetration. Testing facilities shall be provided if the isolation fitting is not readily accessible for testing. The need for surge/lightning arrestors shall be determined on a case-by-case basis during the final design process.

C. Buried pressure piping outside the Station structures shall meet or exceed the criteria of provision 3.18.10.9, 3.18.10.10 and 3.18.10.11.

3.18.9.3 Facilities Owned by Others

3.18.9.3.1 Replacement/Relocated Facilities

A. Corrosion control requirements for buried utilities installed and/or relocated or modified by a Utility Owner as part of Project construction shall be the responsibility of the individual Utility Owner. Minimum stray current and corrosion control criteria, when guidance is requested by the Utility Owner, shall be in accordance with provision 3.18.10.

B. Relocated or replaced ferrous and reinforced concrete pressure piping, installed by the Design-Builder on behalf of a Utility Owner, shall be installed in accordance with Utility Owner specifications, , and include the following minimum provisions:

1. Electrical continuity through the installation of insulated copper bond cables across mechanical joints for which electrical continuity cannot be assured.
2. The requirement for electrical access to the Utility structure via test facilities shall be evaluated on a case-by-case basis based on the Utility Owner's requirements.
3. The need for additional measures, such as electrical isolation, application of a protective coating system, installation of cathodic protection, or any combination of these measures, shall be based on the characteristics of the specific structure and the Utility Owner's requirements.

C. Other materials and structures shall require individual review.

3.18.9.3.2 Existing Utility Structures

A. The Design-Builder shall provide stray current corrosion test and control facilities for existing below ground utility lines and structures that may be subject to degradation due to stray currents from the Project as determined by the Design-Builder or in accordance with the Utility Owners' standards. The following minimum provisions shall be suggested:

1. Test facilities may be installed at select locations for the purpose of evaluating stray earth current effects during start-up and revenue operations. Suggested guidelines for location of test facilities are as follows:

i. At Utility crossings within the railroad and on structures proximal and parallel to Project ROW.

ii. At locations on specific Utility structures proximal to Project traction power substations.

B. If existing protective measures are in place, the Design-Builder shall inspect the condition and capabilities of those existing measures, determine the nature of any changes or replacements needed. The following minimum provisions shall be inspected for existing test and protection systems:

1. Test facilities for the purpose of evaluating stray earth current effects during start-up and revenue service operations.
2. Cathodic protection facilities.

3.18.9.3.3 Existing Bridge Structures

A. Stray current corrosion control for existing bridge-type structures that will be utilized by the Project, including supporting substructures (e.g. steel pilings), shall be addressed by limiting stray current levels at the source as specified in provision 3.18.9. Existing structures that will be utilized by the Project shall be reviewed on an individual basis to determine compatibility with the methods of controlling stray current as described in this Section of the Contract Documents. If there are no compatibility issues, the methods described herein shall be applied. If the methods described herein are incompatible with the nature of the structure, the Design-Builder shall propose alternate methods to achieve the equivalent level of stray current control.

3.18.9.3.4 Other Existing Structures

A. The Design-Builder shall provide stray current corrosion test and control facilities for other privately or publicly owned existing above or below ground structures that may be subject to degradation due to stray currents from the Project. If existing protective measures are in place, the Design-Builder shall inspect the condition and capabilities of those existing measures, determine the nature of any changes or replacements needed. The following minimum provisions shall be inspected for existing test and protection systems:

1. Test facilities for the purpose of evaluating stray earth current effects during start-up and revenue service operations.
2. Cathodic protection facilities.

B. When determining the stray current corrosion protection and test facilities required for other existing structures, the Design-Builder shall apply the same evaluation and design criteria as used for the Project structures with appropriate consideration of the location of the structures relative to the alignment and other adjacent conductive structures.

3.18.9.3.5 Stray Current Corrosion Control Design Submittals

A. The Design-Builder shall submit the Stray Current Corrosion Control Preliminary Design submittal for Review and Approval. The Stray Current Corrosion Control Preliminary Design submittal shall include, at a minimum, the following items:

1. The results, conclusions and recommendations based on all stray current corrosion control surveys conducted.
2. A Stray Current Corrosion Control Basis of Design Report for all stray current corrosion control equipment and systems to identify how the requirements of the

Contract Documents have been interpreted in terms of the system configuration, performance and equipment requirements.

3. Written design proposals describing how each specified stray current corrosion control requirement will be implemented accompanied by typical design drawings. Typical design drawings may utilize appropriate drawings from the traction power, trackwork and structural designs to avoid duplication.

B. The Design-Builder shall submit the Stray Current Corrosion Control Final Design submittal for Review and Approval. The Stray Current Corrosion Control Final Design submittal shall include, at a minimum, the following items:

1. A Technical Specification for all stray current corrosion control equipment and systems.
2. Product catalog cuts and component shop drawings for all components, wire and cable used in the cathodic protection and stray current corrosion control systems.
3. The completed typical stray current corrosion control design drawings and a tabulation of specific locations where each stray current corrosion control measure shown on the typical drawings is being implemented to include specific drawing references for each discipline at each location. All final drawings depicting stray current corrosion control measures shall be included in the final design Submittals for the facilities and systems to which they relate.

3.18.10 Soil Corrosion Control

A. The purpose of this Section is to provide criteria for the design of systems and measures to prevent corrosion of buried or submerged Project structures due to soil and water conditions. The Design-Builder shall protect structures and systems from environmental conditions by the use of materials selection, coatings, electrical isolation, electrical continuity provisions, cathodic protection, or combination of these measures, as appropriate.

B. Corrosion control design for buried or submerged structures owned by others shall be the responsibility of the individual structure Owner. The Project designs shall be coordinated with stray current corrosion control design in order to allow for proper placement of test facilities so that proper evaluation of soil and stray current corrosion control is provided, while minimizing the number of test facilities required.

C. All corrosion control designs for structures owned by others shall be coordinated among all cognizant disciplines to minimize stray current interference resulting from cathodic protection installations and minimize other undesirable conflicts.

3.18.10.1 Soil Corrosivity Analysis

A. The Design-Builder shall perform an analysis of area soils to determine the corrosive tendencies of the soil and groundwater along the ROW. Soil analysis shall include in-situ resistivity measurements, in accordance with ASTM G57 where practical, at an approximate spacing of 1,000 feet between measurement locations and to a general depth of 15 feet. Soil layer resistivity shall be analyzed at 2.5, 5.0, 7.5, 10.0, and 15.0-foot depths where practical. When possible to coordinate with geotechnical boring activities, soil box resistivity measurements at similar depths shall be taken.

B. Soils shall be measured in depths which allow for a Barnes Layer Analysis, where practical, to correlate the corrosivity specifically to the depth of buried structures. In addition, soil samples shall be obtained for laboratory testing (ASTM D1452 and ASTM

D4220) at locations identified by corrosion engineering, based on the location of the geotechnical soil boring schedule. Soil and water chemical analysis at the locations identified shall include: pH (ASTM D1293 and ASTM G51), reduction-oxidation potential (ASTM D1498 and ASTM G200), saturated resistivities (ASTM G57), chloride concentration (ASTM D512 and ASTM D4327), sulfate concentration (ASTM D516 and ASTM D4327), and presence of sulfides (ASTM D4658). For groundwater samples dissolved oxygen (ASTM D888) and carbon dioxide concentration (ASTM D513) shall be measured in addition to the tests performed on soil samples. These parameters shall be used to further classify the soil and groundwater corrosivity to construction materials.

3.18.10.2 Safety and Continuity of Operations

A. The Design-Builder shall provide corrosion control provisions for facilities where failure of such facilities caused by corrosion may affect safety or interrupt continuity of operations, regardless of location and material or construction.

3.18.10.3 Accessibility of Installations

A. Permanent test facilities installed with certain corrosion control provisions shall be accessible after installation, allowing for periodic maintenance and monitoring without the need for special equipment or traffic control.

3.18.10.4 Special Considerations

A. Design and installation of corrosion control measures for facilities owned by others, but designed as part of the Project, shall be coordinated with the AHJ.

3.18.10.5 Electrical Isolation of Piping

A. The Design-Builder shall provide electrical isolating devices for corrosion control that include nonmetallic inserts, isolating flanges, couplings, unions, and/or concentric support spacers. Devices shall meet or exceed the following criteria:

1. Minimum resistance of 10 megohms prior to installation.
2. Following insertion of an isolating device into the operating piping system, the insulation shall have sufficient electrical resistance so that no more than 2 percent of a test current applied across the device shall flow through the isolator and through any conductive fluids, if present.
3. Mechanical and temperature ratings equivalent to the structure in which they are installed.
4. Where isolating devices are used in metallic pipelines, internal polyamide epoxy coating shall be applied on each side of the isolating device for a distance equal to two times the pipe diameter on which they are used. Where conductive fluids with a resistivity of less than 2,000 Ω-cm are present, internal coating requirements shall be based on a separate evaluation determining the need for additional coating. Coatings that will be in contact with potable water shall be compliant with ANSI/NSF 60 and 61.
5. Isolating devices for metallic pipelines buried in soils or accessible in a hand hole, vault, or chamber shall be provided with an external protective coating.
6. Non-metallic, concentric support spacers and watertight end seals shall be used where piping is routed through a metallic casing.

7. An electrically isolated connection shall be provided at tie-ins to non-protected facilities.
8. Design shall specify the need for, and location of, isolating devices. Inaccessible isolating devices, such as buried or elevated isolators, shall be equipped with accessible permanent test facilities. Test facilities shall include, at a minimum, two insulated, tagged wire test leads connected to each side of the isolating device and terminated at a test station.
9. A minimum clearance of 12 inches shall be provided between new and existing metallic structures. When conditions do not allow 12-inch clearance, the design shall include the following additional provisions to prevent electrical contact between existing structures:
    i. Installation of a non-metallic (PVC or similar material) block or sheet between the structures.
    ii. Installation of a pre-formed, correctly sized, reinforced fiberglass pipe saddle around the appropriate pipe where it crosses those structures.
    iii. Installation of a test station containing at a minimum two insulated, tagged wire test leads to each structure.

3.18.10.6 Electrical Continuity of Piping

A. The Design-Builder shall provide electrical continuity bonding for non-welded metallic pipe joints that meets or exceeds the following criteria:
    1. Electrical continuity shall be achieved by directly buried, isolated, stranded copper cable with the minimum length necessary to span the joint being bonded. Cables shall be rated at [redacted] with High Molecular Weight Polyethylene (HMWPE) isolation.
    2. To minimize current attenuation in cathodic protection installations, wire size shall be based on the electrical characteristics of the structure and resulting electrical network.
    3. A minimum of two cables shall be used per joint for redundancy. Wire resistance shall be such that the total of the bond resistance and pipeline resistance for a span is a maximum of 110 percent of the theoretical calculated pipe resistance. Bonding cables shall be installed using the thermite welding method.
    4. Exothermic welds and adjacent bared piping shall be coated with a cold-applied, fast-drying mastic consisting of bituminous resins and solvents, or an approved epoxy.

3.18.10.7 Cathodic Protection

A. The Design-Builder shall use bonded external protective coatings and cathodic protection systems for buried metallic structures where soil conditions indicate that soil corrosion may reduce the service life of the facility below the design requirements consistent with the structure life objectives. The presence of stray currents may also require design and installation of cathodic protection for underground metallic structures. Design of cathodic protection shall be performed by a licensed professional engineer, a NACE International Corrosion Specialist, or a NACE International Cathodic Protection Specialist. Cathodic protection shall be provided by galvanic or impressed current protection systems. Testing of cathodic protection systems shall be performed in accordance with NACE TM0497.

B. Galvanic cathodic protection shall be used wherever feasible to minimize interference with other underground Utilities. When galvanic cathodic protection is used for new facilities, the facilities shall be provided with a compatible coating system. All galvanic anodes shall be connected to the structure via test stations. Anodes shall not be directly connected to the structure, with the exception of metallic fittings in a non-metallic piping system.

C. The Design-Builder shall only use impressed current systems when the use of galvanic systems is not technically feasible. The systems shall utilize separate and isolated anode ground beds. Cathodic protection schemes requiring connection to the railroad's negative return system, in lieu of using a separate isolated anode ground bed, shall not be permitted.

D. Cathodic protection design shall incorporate consideration of the following:

1. Presence of anaerobic bacteria.
2. Need for mutual protection schemes.
3. Limitation of structure-to-electrolyte potential.
4. Accessibility after construction is completed.
5. Optimum location of anodes for ease of replacement and avoidance of interference with other structures.
6. Need for monitoring facilities.
7. Power availability, space available for installation, structure geometry.

E. Cathodic protection system design shall be based on theoretical calculations, including the following parameters at a minimum:

1. Cathodic protection current density, minimum of [redacted]
2. Estimated/anticipated current output per anode.
3. Estimated/assumed percentage bare surface area (minimum 1 percent).
4. Estimated/indicated total number of anodes, size, orientation, depth, and spacing.
5. Estimated/anticipated anode bed resistance.
6. Minimum anode life of 25 years (maximum 50 percent current efficiency for magnesium anodes and an 85 percent utilization factor).

F. The Design-Builder shall design impressed current rectifier systems using constant output voltage rectifiers or automatic potentially controlled rectifier units, with permanent reference electrode facilities. Rectifiers shall be rated a minimum of 50 percent above calculated operating levels to overcome higher-than-anticipated anode ground bed resistance, lower-than-anticipated coating resistance, or the presence of interference mitigation bonds. Other conditions which may result in increased voltage and current requirements shall be considered.

G. The design shall include test facilities which permit initial and periodic testing of cathodic protection levels, structure-to-electrolyte potentials, interference currents, and system components (such as anodes, isolating devices, and continuity bonds). At a minimum, the test facilities shall contain the following:

1. Two structure connections for each structure.

2. One reference electrode test wire connection.
3. Conduits and terminal (test) boxes.

H. The design shall specify the locations and types of test facilities for each cathodic protection system and coordinate approval and/or permits as necessary for the facilities to be installed. The number, type, and spacing of the test facilities shall be sufficient to determine the adequacy of cathodic protection, electrical continuity, and electrical isolation.

3.18.10.8 Structures and Facilities

A. The following sections establish the protective measures to be considered for underground metallic Utilities and structures.

3.18.10.9 Ferrous Pressure Piping

A. The Design-Builder shall cathodically protect new buried cast iron, ductile iron, and steel pressure piping on an individual structure basis, in accordance with provision 3.18.10.7. In addition to cathodic protection, the piping system design shall include the following minimum features:

1. Conformance with existing Railroad and the local AHJ's standards and specifications.
2. Conformance with Federal, State, and local codes for regulated piping.
3. Application of a bonded protective coating to the external surface of the pipe in accordance with the requirements of provision 3.18.10.30.2. All coatings shall be electrically tested to ensure they are holiday-free prior to backfilling. Holiday detector voltage shall depend on coating thickness in accordance with manufacturer recommendations and in accordance with NACE RP0274 and SP0188. All coating holidays located shall be repaired and retested prior to backfilling.
4. Electrical isolation of pipe from interconnecting pipe, casings, and other structures, and segregation into discrete electrically isolated sections depending upon the configuration and total length of piping. Electrical isolation fittings shall be provided with surge suppression devices where appropriate.
5. For pressure piping entering Owner facilities below grade, pipe shall be electrically isolated immediately inside of the wall penetration. For pressure piping entering Owner facilities above grade, pipe shall be electrically isolated immediately outside of the wall penetration. Pipe penetrations through walls and floors shall be electrically isolated from building structural elements.
6. Piping encased in concrete, including thrust blocks, shall be provided with a coating material extending minimum of 6 inches beyond the concrete to soil interface.
7. Electrical continuity through the installation of insulated copper cables across mechanical pipe joints or fittings other than intended isolating device. (See provision 3.18.10.6)
8. Permanent test/access facilities shall be installed at all isolating connections to allow for verification of electrical continuity, electrical effectiveness of isolating devices and coating, and evaluation of cathodic protection levels. Additional test/access facilities shall be installed at intervals not to exceed [redacted].

3.18.10.10 Copper Piping

A. The Design-Builder shall electrically isolate buried copper pipe from piping of differing material (i.e. ductile iron) and from non-buried piping, such as that contained in a Station structure, through use of accessible isolating unions.

B. Pipe penetrations through walls and floors shall be electrically isolated from building structural elements. The isolating device shall be located inside the structure and not buried.

C. New installations of underground copper piping shall be coated and cathodically protected in accordance with the requirements of provision 3.18.10.7.

3.18.10.11 Pre-Stressed/Post Tensioned & Reinforced Concrete Cylinder Pipe (Pressure)

A. Pre-stressed/post-tensioned concrete cylinder pressure pipe shall not be used in the vicinity of Project tracks or substations.

3.18.10.12 Gravity Flow Piping (Non-Pressure)

A. The Design-Builder shall coat corrugated steel piping internally and externally with a sacrificial metallic coating and a protective organic coating.

B. Cast or ductile iron piping shall be designed and fabricated to include the following provisions:

1. An internal mortar lining with a bituminous coating on ductile iron pipe only (not required for cast iron soil pipes).
2. A bituminous mastic coating on the external surfaces of pipe 6 inches on each side of a concrete/soil interface.

C. The Design-Builder shall evaluate the need for electrical continuity, electrical isolation, external coatings and cathodic protection on an individual basis.

D. Reinforced concrete non-pressure piping shall include the following provisions:

1. Water/cement ratios meeting the minimum provisions of AWWA.
2. Chloride concentration shall not exceed 250 ppm in the total concrete mix of mixing water, cement, admixture, and aggregates.
3. Pipe design shall be in accordance with ASTM C76.
4. Concrete used in the manufacture of this pipe shall be in accordance with ACI 201.2R and ASTM C150.

3.18.10.13 Buried Concrete/Reinforced Concrete Structures

A. The Design-Builder shall base the design of cast-in-place concrete structures, precast Utility structures, and precast tunnel liner segments on the structural requirements of the Contract Documents and the following criteria:

1. The type of cement utilized shall be based on the anticipated exposure conditions in accordance with ACI 201.2R and ASTM C150. Use of a concrete mix with a cement type not specifically listed in ACI 201.2R shall be reviewed and must be approved by the Railroad. ASTM C452 shall be used as criteria for evaluation of the sulfate resistance of concrete mixes with non-standard cement types.
2. Concrete to be in contact with soil or groundwater shall have a water/cement ratio not greater than [redacted]. Concrete subject to chloride exposure shall have a

water/cement ratio not greater than [redacted]. Refer to applicable sections of ACI 201.2R, Guide to Durable Concrete.

3. The concrete mix shall be such that water soluble and acid soluble chloride concentrations, at the concrete/reinforcing steel interface, do not exceed the values stated in ACI 222R, Protection of Metals in Concrete against Corrosion, for reinforced concrete in wet conditions.
4. Concrete cover over reinforcing steel shall comply with ACI codes. Provide a minimum cover of [redacted] on the soil/rock side of reinforcement when pouring within form and minimum cover of [redacted] when pouring directly against soil/rock or excavation support systems.
5. The need for additional measures, as a result of localized special conditions, shall be determined on an individual basis. Additional measures may include increased cover, application of sealers, corrosion inhibitors, and protective coating to concrete and reinforcing steel.

B. Precast standardized facilities, such as segmented concrete ring construction, vaults, and pull boxes, shall meet or exceed the requirements specified in this Section or must be reviewed on an individual basis to determine alternative criteria when these facilities cannot be practically modified to meet or exceed some or all of the provisions specified.

C. Below grade shotcrete used for permanent support shall be in accordance with ACI 506.2 and applicable provisions specified in this Section. In the case of conflicting specifications, the more rigid or conservative specification shall be applicable. No special corrosion control measures are required for shotcrete applications, which are not used for permanent support.

3.18.10.14 Reinforced Concrete Retaining Walls

A. The Design-Builder shall provide cast-in-place concrete retaining walls in accordance with the requirements in provision 3.18.9.2.6.

B. Mechanically Stabilized Earth (MSE) retaining walls with metallic restraining devices or reinforcing strips placed beneath tracks or walls less than 200 feet from the nearest rail shall meet or exceed the requirements in provision 3.18.10.13, FHWA Publication No. FHWA-NHI-09-087, and shall require special consideration for stray current mitigation and monitoring due to the location of critical structural components. The Design-Builder shall provide for stray current and soil corrosion control for MSE retaining walls with metallic structural support components beneath Project tracks. Stray current control for cast-in-place concrete cap beams that will be in contact with ballast or soil shall be in accordance with provision 3.18.9.2.6.

C. MSE retaining walls that do not place critical metallic structural components beneath Project tracks and are in excess of 200 feet from the nearest rail shall meet or exceed the requirements in provision 3.18.10.13, FHWA Publication No. FHWA-NHI-09-087, and the following provisions:

1. Steel reinforcement and embedded tie strip anchors of the modules shall be constructed without special provisions for establishing electrical continuity.
2. Steel reinforcement of adjacent modules shall not be electrically interconnected. Reinforcing strips shall be galvanized or coated with a fluidized-bed epoxy resin system or liquid 100 percent epoxy system.

3. Tie-strips shall be coated with a fluidized-bed epoxy resin system or liquid 100 percent epoxy system prior to module construction.
4. Longitudinal reinforcing steel within precast concrete parapets and cast-in-place junction slabs shall not be made electrically continuous.
5. Modular block walls that utilize a non-metallic reinforcement grid do not require special considerations for stray current control.

3.18.10.15 Support Pilings

A. The following is applicable only to support piling systems providing permanent support. Pilings used for temporary support do not require corrosion control provisions.

B. The Design-Builder shall design metallic supports exposed to the environment to meet or exceed the following minimum criteria. The minimum requirements listed shall be coordinated with the structural design discipline. The minimum corrosion control specification may not be appropriate in all conditions.

1. Application of a barrier coating to the pile from the surface to a minimum of 10 feet below expected low groundwater level. Where groundwater is not encountered, the coating shall extend a minimum of 10 feet below grade level. Barrier coating shall conform to the requirements in provision 3.19.10.30.2 and include exposed surfaces, including splices.
2. Inclusion of additional wall thickness to the structural requirements for the pile. A minimum of [redacted] corrosion allowance shall be included for each face or surface contacting the soil from grade level to a minimum of 10 feet below the expected low groundwater level. Where groundwater is not encountered, the additional wall thickness shall extend a minimum of 10 feet below grade level.
3. The interior of open-ended pipe piles shall be considered exposed to soil and provided with a corrosion allowance of a minimum 0.125 in. The interior of closed-end pipe piles shall be considered as a surface contacting soils unless filled with a cementitious mortar.
4. The need for special measures, such as electrical isolation measures, electrical continuity, monitoring devices, and cathodic protection, shall be determined on an individual basis, based on type of structure, exposure to stray currents, analysis of soil borings for corrosive characteristics, and degree of anticipated structural deterioration caused by corrosion.

C. Reinforced concrete piling, including fabrications with pre-stressed members, shall be designed to meet or exceed the requirements in provision 3.18.9.2.6, with the exception that fabrications with pre-stressed members shall have a minimum concrete cover of 3 inches and utilize a concrete mix with water soluble and acid soluble chloride concentrations at the pre-stressed wires/concrete interface not exceeding 0.06 and 0.08 percent by weight of concrete, respectively, over the life of the structure.

D. Concrete-filled steel cylinder columns, where the steel is an integral part of the load bearing characteristics of the support structure, shall be designed considering the need for special measures, such as increased cylinder wall thickness, external coating system, stray current mitigation, and/or cathodic protection. Design shall be determined on an individual basis, based on type of structure, analysis of soil borings for corrosive characteristics, and degree of anticipated structural deterioration caused by corrosion.

Chloride restrictions for the concrete fill shall be in accordance with ACI 222R, Protection of Metals in Concrete against Corrosion.

3.18.10.16 Electrical Conduits

A. The Design-Builder shall provide galvanized steel conduits with the following minimum provisions:

1. Direct burial conduit shall be externally coated with PVC and internally coated with urethane or other accepted coating system regularly in use for direct burial.
2. Galvanized conduit within duct banks shall have a minimum of 3-inch concrete cover on soil sides. Internal coating only may be provided when conduits are installed in concrete.
3. Internal and external coating shall be provided for conduits installed above grade, in corrosive atmosphere, and in wet atmosphere. Coating shall be of a type suitable for exposure to wet and corrosive atmosphere.
4. Couplings and fittings shall be coated with the identical coating materials used for the conduit lengths.

B. The Design-Builder shall establish electrical continuity throughout each conduit as follows:

1. Use of standard threaded joints.
2. Installation of bond wires across non-threaded joints. Bond wires shall be installed using the thermite weld method. Bond wire sizing shall depend on the conduit diameter, as follows:
   i. [redacted] diameter conduit, [redacted] bond wires.
   ii. [redacted] diameter conduit, [redacted] bond wires.

C. The Design-Builder shall encase buried non-metallic conduits in concrete, including couplings and fittings, except at transitions where metallic materials are required (such as stub-ups and penetrations).

3.18.10.17 Piping and Conduits in Tunnel

A. The Design-Builder shall route metallic piping and conduits installed in tunnels through vent shafts, inside the tunnel structure, or embedded in the concrete structure as much as possible. Routing of conduits in vent shafts shall meet or exceed NFPA 130 requirements for concrete encasement.

B. Piping and conduit routing in earth shall be avoided. Where this is not practical, the Design-Builder shall coat buried metallic pressure piping and include provisions for cathodic protection. Non-pressure piping shall include corrosion control provisions as required on a site-specific basis.

3.18.10.18 Casings

A. If required, the Design-Builder shall install pipeline casings bare, unless coating and cathodic protection are required by AHJ. Casing isolators and spacers shall be installed on the carrier pipe to avoid electrical contact between the casing and the carrier pipe. Casing end seals shall be installed at each end of the casing to prevent soil and groundwater accumulation inside the casing. Test facilities shall be provided at each end of the casings to allow testing of the status of electrical isolation between the casing and the carrier pipe. The test stations shall have as a minimum:

1. Two test wires connected to the carrier pipe.
2. Two test wires connected to the casing.
3. A reference electrode located adjacent to the surface of the carrier pipe as close as practical to the end of the casing.
4. A terminal (test) box located as close as practical to the pipeline and in an accessible location.

3.18.10.19 Hydraulic Elevator and Lift Cylinders

A. The Design-Builder shall design, fabricate and install underground steel hydraulic elevator and lift cylinders to meet or exceed the following minimum provisions:

1. Application of an external protective coating (see provision 3.18.10.30.2) resistant to deterioration by petroleum products (hydraulic fluid).
2. An outer concentric Fiberglass Reinforced Plastic or PVC casing in accordance with ASME A17.1. Casing thickness diameter and resistivity shall be designed to prevent moisture intrusion, including the bottom, to maximize electrical isolation between cylinder and earth and to withstand physical conditions. The casing diameter shall provide a minimum 1-inch clearance between the cylinder and casing.
3. Silica sand fill between the cylinder and casing with a minimum resistivity of 25,000 Ω-cm, a pH of between 6 and 8, and a maximum chloride concentration of 100 ppm.
4. Cathodic protection through the use of sacrificial anodes installed in the sand fill or galvanic ribbon anode wrapped around cylinder. Cathodic protection systems sacrificial anodes shall have a useful life consistent with the Project design life.
5. Permanent test facilities installed on the cylinder, anodes, and reference electrode to permit evaluation, activation, and periodic retesting of the protection system.
6. A removable moisture-proof sealing lid shall be installed on the top of the casing prior to installation of the cylinder. The top of the casing shall be permanently sealed against moisture intrusion after installation of the cylinder.
7. As an alternative to the sand fill and cathodic protection for protecting the hydraulic cylinder from corrosion, the Design-Builder may install a gel or wax-based inhibited dielectric material in the interstitial space between the cylinder and casing. Corrosion monitoring equipment (e.g. corrosion rate probes) shall be installed in the interstitial space and leads shall be routed to a test station to allow evaluation of the protection system.

B. Hydraulic piping to elevator cylinders shall be placed in pipe chases or constructed of double wall pipe with provisions for leak detection. Connections to the cylinder and to the hydraulic fluid reserve tank shall use a dielectric isolator suitable for use with the hydraulic fluid and the design pressure of the cylinder if cathodic protection is installed on the cylinder. Where hydraulic piping must be placed in direct contact with soil or concrete, a barrier coating, dielectric isolation, and cathodic protection shall be included in the design.

3.18.10.20 Non-Metallic Materials

A. Plastics, fiberglass, and other non-metallic materials for pressure piping may be appropriate to aid in corrosion control. The following shall be considered:

1. Manufacturer recommendations.
2. Mechanical strength and internal pressure limitations.
3. Elasticity/expansion characteristics.
4. Expected life.
5. Failure modes.
6. Local codes.
7. Prior experiences with the proposed non-metallic material in similar applications.

3.18.10.21 Soil Corrosion Control Design Submittals

A. The Design-Builder shall submit the Soil Corrosion Preliminary Design submittal for review and approval. The Soil Corrosion Preliminary Design submittal shall include, at a minimum, the following items:

1. Results, conclusions and recommendations based on all soil corrosion control surveys conducted.
2. A Soil Corrosion Control Basis of Design Report for all soil corrosion control equipment and systems to identify how the requirements of the Contract Documents have been interpreted in terms of the system configuration, performance and equipment requirements.
3. Written design proposals describing how each specified soil corrosion control requirement will be implemented accompanied by typical design drawings. Typical design drawings may utilize appropriate drawings from other disciplines to avoid duplication.

B. The Design-Builder shall submit the Soil Corrosion Final Design submittal for review and approval. The Soil Corrosion Final Design submittal shall include, at a minimum, the following items:

1. Product catalog cuts and component shop drawings for all components, wire and cable used in the soil corrosion control system.
2. Typical design drawings and a tabulation of specific locations where each soil corrosion control measure shown on the typical drawings is being implemented. Site specific soil corrosion control drawings shall be submitted with the final design drawings for the system or facility to which they apply.
3. Technical Specifications for each type of soil corrosion control materials, coatings, equipment and systems to be utilized.
4. An updated tabulation of specific locations where each soil corrosion control measure is being implemented to include specific drawing references for each discipline at each location. All final drawings depicting soil corrosion control measures shall be included in the final design Submittals for the facilities and systems to which they relate.

3.18.10.22 Graffiti-Resistant Coatings

A. The Design-Builder shall protect surfaces which are susceptible to graffiti with graffiti-resistant coating. This includes concrete and painted steel surfaces within Stations, such as walls, columns, and equipment enclosures. Such areas shall be protected up to a height of 10 feet. The coating shall be a urethane-type coating, applied in accordance with

the latest-published manufacturer instructions. All graffiti-resistant coating applications shall be coordinated with the Architectural design discipline.

3.18.10.23 Coordination of Safety and Electrical Grounding Systems

A. The purpose of this Section is to ensure that safety grounding and corrosion control requirements do not conflict so as to render either system ineffective. The key to accomplishing complementary systems is proper location of isolation points and proper means of grounding systems.

3.18.10.24 General Grounding Criteria

A. The Design-Builder shall provide grounding in conformance with applicable sections of the IEEE C2, NFPA 70, NFPA 130 and the National Electric Safety Code. The codes are to be considered as the minimum requirements for the protection of life and property and shall be carefully reviewed during the course of system design.

B. Grounding shall extend around the alignment to all metallic objects, structures and cases that could become energized by an inadvertent contact with the Third Rail.

3.18.10.25 Lightning Protection

A. The Design-Builder shall provide lightning protection systems for all buildings, structures, Station canopies, substations, signal enclosures, and other walk-in equipment enclosures.

3.18.10.26 Connection to Utilities

A. The Design-Builder shall not make connection between any Project grounding system and any utility, including water, outside the dielectric coupling, used to isolate facilities from utilities outside the building.

3.18.10.27 Coordination Requirements

A. The Design-Builder shall incorporate the following considerations to provide compatible grounding systems for aerial structures and corrosion control systems:

1. Ground electrode component materials.
2. Ground electrode locations.
3. Aerial component electrical continuity details.
4. Pier support/isolation details.
5. Electrical interconnection of the stray current control and personnel safety grounding systems shall be considered on an individual basis. Grounding systems for stray current control shall not be interconnected with power neutral grounds.

3.18.10.28 Grounding System Design Submittals

A. For the Preliminary Design, the Design-Builder shall submit for review and approval written design proposals describing how each specified grounding requirement will be implemented accompanied by design criteria and typical design drawings. Typical design drawings may utilize appropriate drawings from other disciplines to avoid duplication.

B. For the Final Design, the Design-Builder's submittal shall include the completed typical design drawings and a tabulation of specific locations where each grounding measure shown on the typical drawings is being implemented. Site specific grounding drawings shall be submitted with the final design drawings for the system or facility to which they apply.

C. The Final Design shall also include at a minimum Technical Specifications for each type of grounding material to be utilized.

D. For the Final Design, the Design-Builder shall submit for Review and Approval an updated tabulation of specific locations where each grounding measure is being implemented to include specific drawing references for each discipline at each location. All final drawings depicting grounding measures shall be included in the final design Submittals for the facilities and systems to which they relate.

3.18.10.29 Material and Equipment Requirements

The Design-Builder shall utilize materials and equipment for corrosion control purposes that conform to the requirements and referenced Codes and Standards of this Section of the Technical Provisions.

3.18.10.30 Soil Corrosion Control Materials

3.18.10.30.1 Materials and Methods

A. The Design-Builder shall provide non-metallic piping (pressure and non-pressure) unless metallic materials are required for specific engineering purposes. Use of metallic materials shall be supported by engineering calculations when used in lieu of non-metallic materials.

B. Aluminum and aluminum alloys shall not be used for direct burial purposes.

C. If non-native fill is to be used for backfilling concrete or ferrous structures, then it shall meet or exceed the following criteria:

1. pH value of 6 to 8 (ASTM G51).
2. Maximum chloride ion concentration of 150 ppm (ASTM D512 and ASTM D4327).
3. Maximum sulfate ion concentration of 150 ppm (ASTM D516 and ASTM D4327).
4. Minimum resistivity of 10,000 Ω-cm (ASTM G57).
5. Free of angular rock (>3/4 inches), clay lumps, un-decayed organic matter or other deleterious material.

D. Protection of metal structures shall include corrosion control techniques such as coating, electrical isolation, electrical continuity, and cathodic protection. The corrosion control design shall identify concrete structures subject to attack, and shall coordinate with the Civil and Structural design disciplines to specify cement types in accordance with ASTM C150. For severe environments, supplemental coatings may be specified.

E. The following sections establish the materials and methods to be used for soil corrosion control.

3.18.10.30.2 Coatings

A. The Design-Builder shall use coatings for corrosion control of buried metallic or concrete facilities that satisfy the following criteria:

1. Minimum volume resistivity of [redacted] as measured in accordance with ASTM D257.
2. Minimum thickness as recommended for the specific system, but not less than [redacted].

3. Bonded systems shall be used on metal or concrete surfaces. Non-bonding or pressure sensitive (i.e., cold-applied tape) systems may be used in special instances, after review and approval by the Railroad.
4. Surface preparation of the structure to be coated shall be required in accordance with the coating manufacturer's recommendations and applicable industry standards.
5. Factory coated materials shall be used wherever possible. Field application shall be performed using a compatible coating system only.
6. Minimum 5-year satisfactory performance record shall be required for the intended service.
7. Coatings shall have mechanical characteristics capable of withstanding reasonable abuse during handling and earth pressure after installation for the design life of the Project element.
8. Generic coating systems include, but are not limited to, the following:
    i. Fusion-bonded epoxy.
    ii. Extruded polyethylene/butyl based system.
    iii. 100% solids polyurethane (two-component system).
    iv. Coal-tar epoxies (two-component systems).
    v. Bituminous mastics (airless spray).
    vi. Polyamide epoxy for internal coating of pipe at isolating fittings.
    vii. Wax tape systems.

3.18.11 Atmospheric Corrosion Control Materials and Coatings

3.18.11.1 Materials

The Design-Builder shall select and provide metals exposed to the atmospheric environment as follows:

3.18.11.2 Steels and Ferrous Alloys

A. The Design-Builder shall provide carbon steel, ductile, and cast iron exposed to the atmosphere, except for track and track fasteners, such as spring clips, spikes, and rail plates, with a barrier or sacrificial coating applied to external surfaces. Barrier coatings may be appropriate for track fastening hardware inside tunnels. High strength, low alloy steels shall be protected similarly to carbon steels except where used as a weathering steel exposed to the outside environment. The design shall incorporate complete drainage of surfaces, the coating of metal-to-metal contacting surfaces, and the sealing of crevices. The potential staining of adjacent structures shall be considered.

B. The Design-Builder shall provide stainless steel surfaces that have been cleaned and passivated after fabrication. Series [redacted] stainless steels are suitable for use in most exposed situations without further protection, with [redacted] being preferred for superior corrosion resistance. Series [redacted] stainless steel may also be used, if staining over time is not detrimental. A barrier coating shall be used on stainless steel exposed to roadway deicing salts and certain marine environments. Hardware used to couple or connect stainless steel components shall be the same stainless series, or as approved by corrosion control engineering.

3.18.11.3 Aluminum Alloys

A. Aluminum alloys shall receive a sealed, hard anodized finish to provide the best weather-resistant surface. A barrier coating shall be used on aluminum exposed to roadway deicing salts or atmospheric corrosive pollutants.

3.18.11.4 Copper Alloys

A. Copper and copper alloys can be used where equipment is exposed to weather without additional protection. A coating shall be utilized only where a natural patina is not desired. Bimetallic couplings shall be prohibited.

3.18.11.5 Magnesium Alloys

A. Magnesium alloys shall have a barrier coating applied when long-term appearance is critical. Bimetallic coupling shall be prohibited.

3.18.11.6 Zinc Alloys

A. Zinc alloys can be used without additional protection. A shop-applied barrier coating may be utilized to extend the design life of components or to enhance the component appearance. Bimetallic coupling shall be prohibited, unless the intent is for sacrificial protection by the zinc alloy.

3.18.11.7 Metals Exposed to Below-Grade Atmospheric Environments

A. The Design-Builder shall minimize water seepage into below-grade (tunnel) portions of the Project and any water that might enter shall be drained in the most efficient manner. Below-grade (tunnel) metals and protective coatings shall be selected to be suitable for the corrosiveness of the environment.

3.18.11.8 Miscellaneous Electrical Equipment

A. The Design-Builder shall provide non-metallic electrical equipment enclosures, such as, switch boxes, transformers, and connection cabinets where practical. Where metallic equipment is required, it shall include the following minimum provisions:

1. Enclosures shall be placed in an air-conditioned environment, if possible. Otherwise, metallic surfaces shall be coated with a barrier coating.
2. Vapor phase inhibitors shall be used in sealed cabinets.
3. Compressor mounting hardware shall be a corrosion-resistant material, such as a stainless steel.

3.18.11.9 Coatings

A. The Design-Builder shall provide coatings for atmospheric exposure that have established performance records for the intended service and be compatible with the base metal to which they are applied. Coatings shall be able to demonstrate satisfactory gloss retention, color retention, and resistance to chalking over their minimum life expectancies. Coatings shall have minimum life expectancies, defined as the time prior to major maintenance or reapplication, of 15 to 20 years.

3.18.11.10 Metallic-Sacrificial Coatings

A. Acceptable coatings for carbon and alloy steels for use in atmospheric exposure are as follows:

1. Zinc, hot-dip galvanizing [redacted] or flame sprayed.

2. Aluminum, hot-dip galvanizing [redacted] or flame sprayed.
3. Flame sprayed aluminum-zinc alloy.
4. Cadmium and electroplated zinc, for fastening hardware located in sheltered areas only.
5. Inorganic zinc (used as primer).

3.18.11.11 Organic Coatings

A. Organic coating systems typically consist of a wash primer (for galvanized and aluminum substrates only), a primer, intermediate coat(s), and a finish coat. Acceptable organic coatings, for exposure to the atmosphere, include, but may not be limited to:

1. Aliphatic polyurethanes.
2. Aromatic polyurethanes.
3. Vinyl copolymers(where compliant with VOC requirements).
4. Fusion-bonded epoxy polyesters, polyethylenes, and nylons.
5. Acrylics.
6. Alkyds.
7. Epoxy as a primer where exposed to the atmosphere or as the complete system where sheltered from sunlight or where appearance is not a primary concern.
8. Organic zinc, used as a primer.

3.18.11.12 Conversion Coatings

A. The Design-Builder shall use conversion coatings, such as phosphate and chromate coatings as pretreatment only for further application of organic coatings.

3.18.11.13 Ceramic-Metallic Coatings

A. Ceramic-metallic coatings are acceptable for use on metal panels and fastening hardware.

3.18.11.14 Sealants

A. The Design-Builder shall seal crevices with a polysulfide, polyurethane, or silicone sealant as appropriate for the application and exposure conditions.

3.18.11.15 Barrier Coating Systems

A. The Design-Builder shall use the following generic barrier coating systems where corrosion protection is needed but appearance is not a primary concern:

1. Near white blast cleaning according to NACE No. 2/SSPC-SP 10, followed with a three-coat epoxy system.
2. Near white blast cleaning according to NACE No. 2/SSPC-SP 10, followed with a two-coat inorganic zinc and high build epoxy system.
3. Near white blast cleaning according to NACE No. 2/SSPC-SP 10, followed with a three-coat epoxy zinc, high build epoxy system.
4. Coatings shall be applied and inspected according to manufacturer specifications. All coating system components shall be from the same manufacturer.

B. The Design-Builder shall use the following generic barrier coating systems where corrosion protection and good appearance are needed:

1. Near white blast cleaning according to NACE No. 2/SSPC-SP 10, followed with a three-coat inorganic zinc, high build epoxy, polyester urethane system.
2. Near white blast cleaning according to NACE No. 2/SSPC-SP 10, followed with a three-coat vinyl system. Volatile Organic Compounds (VOC) limits must be satisfied for approved coatings.
3. Commercial blast cleaning according to NACE No. 3/SSPC-SP 6 or NACE No. 2/SSPC-SP 10 is required for immersion, followed with a three-coat epoxy zinc, high build epoxy and polyester urethane system.
4. Commercial blast cleaning according to NACE No. 3/SSPC-SP 6 or NACE No. 2/SSPC-SP 10, followed with a three-coat epoxy zinc, high build epoxy and acrylic urethane system.
5. Coatings shall be applied and inspected according to manufacturer specifications. All coating system components shall be from the same manufacturer.

3.18.12 Construction Requirements

A. The Design-Builder shall incorporate all corrosion control materials and coatings identified in the Released for Construction Design Documents into the all applicable aspects of the construction. Where materials will be buried or otherwise inaccessible after the completion of construction, the correct use of all materials and coatings shall be verified and documented by inspection prior to placement of covering material or structure.

B. The Design-Builder shall furnish, install and test all cathodic protection systems and other corrosion control features and systems shown in the Released for Construction Design Documents.

C. The Design-Builder shall construct and test all ground mats, ground rods and any other grounding schemes shown in the Released for Construction Design Documents.

D. Following completion of Third Rail construction, the Design-Builder shall test each section to confirm that it meets or exceeds the specified leakage current requirement. All measured values shall be recorded for comparison with subsequent readings.

E. Following completion of track construction, the Design-Builder shall test each section track to confirm that is meets or exceeds the requirements in provision 3.18.9.1.1. All measured values shall be recorded for comparison with subsequent readings.

F. No later than 30 calendar days after completion of on-site testing at each location, the Design-Builder shall prepare and submit for Information all mechanical, electrical and software configuration settings.

G. Following completion of construction and prior to the energization of any section of Third Rail, the Design-Builder shall repeat the stray current survey conducted prior to the start of construction. The survey shall be coordinated with local utilities and owners of structures adjacent to the Project. In addition to all the test locations used in previous stray current surveys, this survey shall include all stray current test facilities installed on the Project.

H. Upon commencement of revenue service, the Design-Builder shall repeat the stray current survey conducted prior to energization utilizing all the test points from the previous survey. All measured values shall be less than 20mV time-weighted fluctuation from the previous

survey values. All measured values shall be recorded for comparison with subsequent readings.

I. The Design-Builder shall record all measured values from corrosion control systems on all structures and Utilities for comparison with subsequent tests performed throughout the Term.

3.18.13 Corrosion Control Submittals

A. Immediately following release of the Issued for Construction Drawings, the Design-Builder shall prepare and submit for review and approval a Test Program Plan describing all corrosion control and grounding tests that will be performed to confirm the correct application and performance of all corrosion control materials, coatings and systems.

B. Following acceptance of the corrosion control Test Program Plan and before any testing is performed, the Design-Builder shall prepare and submit for review and approval a Test Procedure for each corrosion control and grounding test type identified in the corrosion control Test Plan.

C. Within 30 Calendar Days of completion of each test, the Design-Builder shall submit for review and approval a Test Report detailing the results of the test. Test Reports may be grouped by system and/or location for the purpose of these Submittals.

3.18.14 Summary of Submittals

Item	Section	Submittal	Action
1	3.18.9.3.5	Stray Current Corrosion Control Preliminary Design	Review and Comment
2	3.18.9.3.5	Stray Current Corrosion Control Final Design	Review and Approval
3	3.18.10.21	Soil Corrosion Control Preliminary Design	Review and Comment
4	3.18.10.21	Soil Corrosion Control Final Design	Review and Approval
5	3.18.10.28	Grounding System Preliminary Design	Review and Comment
6	3.18.10.28	Grounding System Final Design	Review and Approval
7	3.18.13	Test Program Plan	Review and Approval
8	3.18.13	Test Procedures	Review and Approval
9	3.18.13	Test Reports	Review and Approval

END

3.19 SIGNALS AND TRAIN CONTROL

3.19.1 Section Includes

This section sets out design and construction requirements related to Signals and Train Control.

3.19.2 Codes and Standards

Project Work shall comply with all statutory requirements, and shall comply with the following codes and standards:

A. Codes of Federal Regulations – Title 49 Part 236 (49 CFR 236).

B. Recommendations of the American Railway Engineering and Maintenance of Way Association (AREMA).

C. Recommendations of the National Transportation Safety Board (NTSB).

D. National Fire Protection Association (NFPA) 70, National Electrical Code.

E. Underwriters Laboratory, Inc. (UL) standards.

F. Institute of Electrical and Electronic Engineers (IEEE).

1. 730 - Software Quality Assurance.
2. 828 - Software Configuration Management.
3. 1012 - Software Verification and Validation.
4. C63.14 – EMC, EMP and ESD.

G. Electronics Industries Association (EIA).

H. The National Electrical Code (NEC).

I. LIRR Signal Engineering Operations Manual (SEOM).

J. LIRR Standard Drawings:

Section No.	Section Title
LS-170	Plug Connector Assemblies
LS-513	Terminal Blocks
LS-528	Vital Cable Terminations
LS-529	Tags for Vital & Non-Vital Applications
LS-530A	Standard Aluminum Instrument Case
TY-531	Instrument Case Layout
TY-534	Typical Transmitter Case Layout
TY-542Y	Typical Instrument Hut Layout
TY-532B	Battery Case Layout
LS-539	Vital Terminal Detail
TY-548	Battery Hut Layout
TY-549	Hut Layout with Office Extension
LS-550A	Case Grounding Plan
LS-551A	Hut Grounding Plan
TY-900	Battery Tray
TYTTBX	Title Box
STD 01	Emergency Traffic Jumper Box Standard

STD 01	Emergency Traffic Jumper Box Standard
TY-CT	Signal Location Cable Sheet
ISO Signal Engineering Operational Quality System Procedure	
Long Island Rail Road Rules of the Operating Department	

K. LIRR Standard Specifications.

Section No.	Section Title
16121	PC-101 SINGLE CONDUCTOR POWER CABLE
16122	PC-102&102A MULTI-CONDUCTOR POWER CABLE
16123	TRACK WIRE
16124	SW-104A SIGNAL WIRE SPECIFICATION
16125	SHIELDED TWISTED PAIR SIGNAL CABLE
16126	SC-106&106a SIGNAL CABLE
CSI-ULM	NICD BATTERY - ULTRA-LOW MAINTENANCE NICKEL–CADMIUM ALKALINE STORAGE BATTERY
ELP-100	60HZ & 100HZ ELECTRIC SERVICE
16110	UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS
16120	ABOVE-GROUND RACEWAYS and boxes
SEQWI 1.1.A	SIGNAL EQUIPMENT QUALITY WORK INSTRUCTION
VSA-101	VITAL SYSTEM ASSURANCE
The Design-Builder shall provide cables and equipment in accordance with the LIRR specifications and drawings listed here-in.	

3.19.3 Related Documents

A. Technical Specifications.

B. Contract Drawings.

3.19.4 Design Requirements

A. The Design-Builder shall design, furnish and install the new Signal and Train Control System in accordance with the Railroad's design and installation standards and include but not limited to pre-wired signal enclosures and installation requirements.

B. The Design-Builder shall provide a pre-wired signal enclosure design including but not limited to:

1. Bi-directional Automatic Speed Command (ASC) cab signaling (Rule 261/410) with ACSES II. The ASC plus ACSES II are the components of the Railroad's Positive Train Control System planned throughout the entire rail network.
2. Pre-wired signal enclosures (huts and cases) for interlockings, master and electric lock locations, transmitter and switch heater cases. This design shall include detailed circuit plans including track and cable plans, hut, rack, wall board and

cases layouts, interface and local control panels. Track and cable plans indicating the local cable required at each location.

3. The design and construction of pre-wired enclosures shall be consistent throughout the Project regardless of which vendor or sub-vendor is manufacturing the specific locations. For example equipment and cable labeling, power busses, surge protection, wall board layouts, relays and track relays, etc. shall be the same in each type of enclosure.
4. Straight line plans with stationing for all equipment for the section between Floral Park and Hicksville indicating the locations of signal equipment and enclosures, insulated joint locations, reactors (if required), switch heater enclosures, stations, substations, and other pertinent information.
5. Provide detailed staging and tie-in plans between the new and existing signal systems. The Railroad shall provide the existing circuit, straight line and TSR plans to be revised by the Design-Builder. The revisions to the existing plans shall be in 'X' and 'O' format in accordance with the Railroad's signal design practices. This shall include:
    i. All proposed track swings to support the construction staging.
    ii. Changes both permanent and temporary to elevations of out of service and in-service tracks.
6. Provide power calculations for the [redacted] and DC requirements of each signal enclosure. This design shall include the [redacted] drop design including load letters and coordination with the utility.
7. Provide a crossing bonding and broken rail analysis in accordance with the Railroad's crossing bonding and broken rail standards.
8. Provide factory test plans and procedures in accordance with the Technical Specification 01500 Product and System Testing. This shall include but not limited to software simulation test, factory test plan, on site integrated acceptance test plan, and all specific FRA and Railroad tests listed in the Contract Documents. Software simulations of the system as well as test plans and procedures shall be provided for each staged cut-over. That is:
    i. `The Design-Builder shall submit the software simulation files and Vital Sim program (including vital sim key) to the Railroad; the Railroad's Force Account will verify software simulation and perform their own software simulation'.
9. The Design-Builder shall develop and submit all tie-in, FRA, and LIRR specific tests to the LIRR for Approval. The Design-Builder shall perform LIRR specific tests related to pre-testing prior to final cut-over and commissioning. The LIRR Force Account will perform all applicable FRA, and LIRR specific tests for final cut-over and commissioning.
10. The Design-Builder shall design and furnish a new Supervisory and Data Acquisition System (SCADA), including non-vital networks. The SCADA system shall also interface with existing communications infrastructure. The purpose of this interface shall be to provide SCADA and diagnostic communications between the field signal locations included in this Project and the new office system at JCC.

11. The new SCADA system shall be in accordance with the Technical Specification 16572 SCADA System and include a new office system at JCC with redundant network connections at the interlockings described here in.
12. The new SCADA systems shall control the existing and new interlockings being procured or modified under this Project that include but is not limited to:
    i. Existing Queens (1, 2, 3, and 4 - Floral Park and Garden) Interlockings.
    ii. New Floral Park (east end of Floral Park Station) and Hempstead (East of Floral Park Station) Interlocking.
    iii. New Nassau - 1 Interlocking east of Merillon Ave Station.
    iv. New Nassau-2 that's replacing the existing Nassau - 2 Interlocking.
        a. Existing Nassau - 4 and Locust interlockings currently controlled from Nassau Tower.
    v. New Nassau - 3 that's replacing the existing Nassau-3 Interlocking west of the existing Nassau - 3.
    vi. The new SCADA system shall be cut-over in stages to support the new signal system. The new SCADA system shall be procured, installed, tested and commissioned at JCC to control existing Queens - 1, 2, 3, 4 - Floral Park, and Garden as well as existing Nassau - 1, 2 , 3, 4, and Locust prior to construction of the new third track.
    vii. The Design-Builder shall design and furnish the revisions to the recently procured SCADA system at Divide Tower to accommodate new Divide-1 and the modifications at Divide - 2, 3, and 4.
13. The new SCADA system shall include the track and location indication of each master location and electric locks between Queens and Divide-1 being procured under this Project.
    i. Indications shall be transmitted west to east over fiber optic cables via contact mapping devices. For example:
        a. From the first location east of Queens and Floral Park to Nassau - 1 shall transmit east to Nassau - 1.
        b. All electric lock cases shall have vital line cable to the nearest signal location and the electric lock information shall be inputted to the contact mapping system.
14. The Design-Builder shall design and furnish the testing, cut-over and staging procedures for the SCADA system.
15. The Design-Builder shall design and furnish all equipment to implement the Positive Train Control System currently under contract. This shall include but not limited to Wayside Interface Units in the CILs, transponders at the wayside locations and radio equipment, radio cases, and antennas. The Design-Builder shall design, furnish, install and test all PTC equipment on the new out of service 3rd track. The Design-Builder shall design and furnish all PTC equipment to be installed by LIRR Force Account on the existing in-service tracks.
    i. The Railroad currently has a System Integrator implementing PTC on the entire LIRR system. This includes PTC equipment, configuration,

programming and testing procedures. The Design-Builder shall utilize the equipment, configuration, programming, and testing procedures developed by the PTC System Integrator.

a. This includes but not limited all the components required for a complete working PTC system (amount required, locations, installations including brackets, programming, testing and verification) of:

- Transponders and brackets.
- Wayside interface units.
- Radio cases and antennas.
- Ground based network.
- Interface to the ground based network.

b. This includes but not limited to addressing signals close to the end of platforms with a signal at stop related to station berthing issues.

c. The Design-Builder shall perform radio spectrum analysis to verify the existing radio system being procured under the current PTC project will provide the required coverage.

d. The Design-Builder shall revise the existing PTC system including all temporary and permanent track elevations to support the new third track construction.

ii. The Design-Builder shall design, furnish and install all PTC equipment on new out of service tracks. Force account will install and test PTC equipment on in service tracks design and furnished by the Design-Builder.

C. The Design-Builder shall provide a detailed installation design including but not limited to:

1. Pre-wired signal enclosure installation plans for hut and case including foundations, grading, grounding, applicable berms and/or retaining walls, stairs and railings and platforms as required, conduit riser, pull boxes and trough details.
2. Cable trough, tray, conduits and pull box/cable vault layout installation plans at signal enclosure including the transition from the express cable pole line and to/from local equipment. This design shall include fill calculations compliant with the requirements outlined in the NEC.
3. Switch machine layouts including the junction box, machine location and amount.
4. Switch heater layout including case installation, point and crib heaters.
5. Signal and signal foundations layout.
6. Signal express and local cables installation details; the express and fiber cables shall be installed on utility poles and in trough/conduit system. The local cables shall be installed in cable trough, tray, conduits and pull boxes.

i. The Design-Builder shall design and install fiber optic cables in diverse paths between pre-wire signal enclosures to eliminate copper cables. The diverse paths shall be achieved by using both the utility pole and cc system. Where utility poles are not available then a trough/conduit system shall be used.

7. Support the existing grade crossing locations during the grade crossing elimination. This includes the equipment and cables during construction.
    i. The gates may need to remain in-service during construction.
    ii. The existing cables may need to be relocated aerially prior to elimination.

D. The Design-Builder shall design and furnish track circuit cases at each of the existing grade crossings. These track circuit cases shall be designed to replicate the existing track circuit logic at the crossing today and will be tested and placed in service by LIRR Force Account prior to track construction and decommissioning of the grade crossing function as well as the entire grade crossing.
    1. The Design-Builder's design of the temporary track circuit case shall include if possible the elimination of the one set of the insulated joints defining the hard island circuits on each track and include that section in the adjacent track circuit.

E. The Design-Builder shall provide master location, electric lock and AFO cases at each existing location house or case that needs to be relocated for new track construction. These location cases shall be designed to replicate the existing logic and will be tested and placed in service by LIRR Force Account prior to track construction and decommissioning of the existing location.
    1. At some grade crossing, master, AFO and electric lock locations the AFO equipment used for code change points is no longer available. In these instances the Design-Builder shall propose design alternatives including but not limited to track circuit equipment and/or timed code change points.

3.19.5 Construction Requirements

The Design-Builder shall furnish and install equipment for the new Signal and Train Control System in accordance with the Railroad's installation standards and includes but not limited to:

A. Furnish and install trough, tray, conduits, brackets, messenger cable, ladder racks, clamps, clips and vaults and pull boxes for routing local and express cables from the signal enclosure to the signal equipment (signals, switches, track circuits, switch heaters, and etc.) and utility poles.
    1. Fill calculations shall be in accordance with the NEC and submitted to LIRR for review prior to installation.

B. Furnish and install the new signal express and local cables along the entire Railroad ROW of the Project Limits; the express cables and fiber cables shall be installed on utility poles and in trough/conduit system. The local cables shall be installed in cable trough, tray, conduits and pull boxes.
    1. The Design-Builder shall design and install fiber optic cables in diverse paths between pre-wire signal enclosures to eliminate copper cables. The diverse paths shall be achieved by using both the utility pole and trough/conduit system.

C. Furnish and install the transition of signal express and local cables from the utility poles to the signal enclosures.

D. Furnish and install pre-wired signal enclosures, signals, signal foundations, switches, switch junction boxes, switch heaters, impedance bonds, track connections and reactors in accordance with the design requirements and the Railroad's standards. This includes the foundations for huts, cases and signals, stairs, platforms and railings for maintenance, junction boxes for switches and track connections and point and crib heaters.

E. Furnish, install and rout cables to existing signal locations and leave a coil in a pull box for installation and termination by the Railroad Force Account.

F. Furnish and install the materials and equipment to complete the revisions for tie-ins and staging at existing locations for interface to the new system. These materials and equipment includes but not limited to relays, contacts, wire, surge protection, terminals and plug couplers.

G. The Railroad's Force Account will test and commission all cables installed by the Design-Builder.

H. The Railroad's Force Account will install all equipment furnished by the Design-Builder for installation on in-service tracks including but not limited to switches, signals impedance bonds and track connections.

I. The Design-Builder shall design and furnish a new Supervisory and Data Acquisition System (SCADA), The Design-Builder shall install the SCADA equipment at JCC. LIRR Force Account will perform final cut-over and commissioning. Force Account will install, test and cutover the new SCADA equipment designed and furnished by the Design-Builder at Queens Tower and Nassau interlocking.

J. The Design-Builder shall remove all existing signal equipment not required for the new system including but not limited to cables, conduits, trough, ductbanks, foundations, signal, signal bridges, equipment cases, and houses. Equipment such as relays, transformers, AFO, event recorders, power supplies, battery charges, and batteries shall be returned to LIRR. LIRR will provide the locations and packing requirements. The removed equipment and not returned the the LIRR shall be salvaged as per the LIRR's discretion. The Design-Builder shall perform all excavation required to remove items noted above.

3.19.6 Staging and Tie-ins

A. The Design-Builder shall provide detailed staging plans that will be determined by the construction requirements of the new 3rd track.

B. These staging plans shall be developed to minimize risk of cutover related train delays during the major segment cutovers by placing portions of the final signal equipment or new configuration in service in advance, and as otherwise necessitated by the requirement to support train operation as some elements of the new signal equipment are placed in service to facilitate the new construction.

C. The staging plan and construction shall avoid the relocation of existing signal locations (including master, transmitter and electric lock locations) and cables where possible. It is understood that locations like Nassau - 1, 2, 3, and Nassau Tower shall require demolition and relocation to support the new third track construction. These staging plans shall identify all the signal locations and cables that require relocation.

   A. The Design-Builder shall furnish and install temporary pre-wired signal location cases to replace the existing master, transmitter and electric lock locations that require relocation..

   B. The following list depicts logical sections of the Project and is not intended as an outline for the Design-Builder's staging plans:

      i. Divide-1 and all work at Divide included under this Project. The work at Divide included new and revised signal revision including revisions to the existing SCADA system located in Divide Tower.

ii. Divide 1 to Nassau - 3.

iii. Nassau - 3 to Nassau - 2 (SCADA control of Nassau - 4 and Locust).

iv. Nassau - 2 to Queens - 3 (including the Hempstead).

v. The new master and electric lock locations Divide to Queens.

vi. New SCADA system at JCC to control Queens - 1, 2, 3, and 4 - Floral Park and Garden as well as the control of existing Nassau - 1, 2, 3, 4, and Locust.

D. The Design-Builders staging plans shall include but not be limited to tie-in circuit revisions required when interfacing new signal equipment to the existing system as well as revised straight line and TSR drawings depicting stage of construction and temporary operation.

A. The Design-Builder's TSRs revisions shall include all temporary and permanent track elevations to support the new third track construction,

E. These tie-ins revisions may remain in service for extended periods of time awaiting completion of a subsequent construction stage. The revisions to the existing circuit, Straight Line and TSR drawings shall be provided on the existing signal drawings, marked-up with black and white Xs and Os in accordance with the Railroad's standard practice, for each location that requires circuit changes. The Design-Builder shall provide Tie-In designs that are fully compliant with the Railroad's standard signal design practice. Existing drawings that have been revised or redrawn will have proper update notation added, clearly indicating the revision number, revision date, and the revision symbols used, in accordance with the requirements of the Railroad's SEOM.

F. The Design-Builder shall furnish all signal equipment required at new and existing locations to complete the revisions required for each stage. The Design-Builder shall modify and update vital and non-vital application logic at existing locations. The modifications to the application logic for each stage shall be designed such that each stage can be separated from one another. For the final configurations of application logic all interim staging modifications application logic shall be removed and final stage will be placed in service by LIRR. The Design-Builder's application logic modifications will require Approval of the LIRR.

G. The Design-Builder shall provide all applicable FRA and Railroad testing plans depicted elsewhere in the Contract Documents for each stage.

H. The Railroad's Force Account will install and test, cut-over and commission all equipment required at existing locations and connections to in-service tracks required for each stage.

3.19.7 Materials

A. The Design-Builder shall furnish and install the following construction materials in accordance with the Railroad's installation and construction standards. The materials listed here are not contained in the pre-wired signal enclosure documents. References to fiber optic cables, inner ducts and pole line materials are described in the Contract Documents.

B. The quantities of material required for the work of this Project shall be determined by the Design-Builder from the Contract Documents, site inspections and from Project requirements as determined by the Design-Builder. The Design-Builder shall furnish and install all material necessary to make a complete installation.

C. All products and installation work shall comply with governing codes and regulations. The Design-Builder shall provide products of acceptable manufacturers that have been in satisfactory use in similar service for five years at minimum. The Design-Builder shall use experienced installers in the execution of the Work.

D. The Design-Builder shall provide products that are free from defects impairing performance, durability, or appearance, and of the commercial quality best suited for the purpose shown specified herein.

E. The Design-Builder shall deliver, handle, and store materials in accordance with manufacturer's instructions. The Design-Builder shall submit to LIRR for approval the methods by which the Design-Builder shall bundle and deliver the material before any delivery is made.

F. Conduits stored on unpaved surfaces outdoors shall be supported at least one foot above grade, or shall be provided with end closures to that height.

G. Conduits shall be sealed with end closures during the course of construction, to protect threads and to prevent the entry of foreign material.

H. The Design-Builder shall verify the quantities of material required to provide a complete Project by examining the Contract Documents and by the performance of a thorough field investigation prior to commencing the Work. Quantities implied or otherwise shown in these Contract Documents shall not relieve the Design-Builder from responsibility to supply any and all quantities of material as may be required to provide a complete system installation.

I. The Design-Builder shall furnish installation material in conformance with these Contract Documents, or as approved by the Railroad.

J. The Design-Builder shall comply with the following requirements regarding submittals:

1. The Design-Builder shall submit product data for all material installed as part of the work of this Project, indicating product standards, physical and chemical characteristics, Technical Provisions, limitations, and general recommendations regarding the material.
2. The Design-Builder shall submit manufacturers' certificates that document that products meet or exceed specified requirements.
3. The Design-Builder shall submit manufacturers' installation instructions.
4. Submittal requirements are listed in this Section.

K. The Design-Builder shall comply with the following requirements for substitute materials and apparatus:

1. Specification RMS-201 lists preferred LIRR-approved materials and equipment to be provided. Substitutes may be considered and shall be subject to Approval by LIRR. The Design-Builder proposing alternate apparatus shall submit prices for both the provision of the proposed alternate apparatus and for the provision of the originally specified apparatus. The Design-Builder shall ensure that items proposed for substitution are of equal quality and have been used in similar applications of proven service in Class-1 Railroad or Transit for not less than five years. The Design-Builder shall provide substantiating data, related FMEA and FRACAS reports, and names, e-mail addresses, and current phone numbers of contacts able to certify satisfactory performance.

2. The Design-Builder shall provide alternate products for acceptance testing by LIRR 1 year prior to the pre-wired construction.

3.19.8 Signaling and Train Control System General

This Section identifies the base requirements for the Signaling and Train Control System that includes but is not limited to train detection, automatic speed control, train routing, vital and non-vital processor logic controllers (including software), positive train control (using ACSESII), local control panels, [redacted] and DC power, switches, switch heater and signals. A detailed description of the Signaling and Train Control System requirements is contained in the Technical Specifications, Contract Drawings, Standard Drawings, SEOM, and RMS-201.

3.19.9 System Overview

A. The Design-Builder shall provide a commercially available train control technology that meets or exceeds all specified functional, safety, reliability, availability and maintainability requirements and has a service proven record for 5 year in a similar railroad environment with an equivalent EMI environment. The new system shall be compatible with the existing signal equipment to minimize the revisions at the existing locations for required to tie-ins and staging.

B. Functions of the system that are safety critical shall be implemented with vital hardware and software.

C. The Design-Builder shall design a bi-directional signal system (Rule 261/410) with ACSES that maximizes throughput. Track and Signal Routing plans (TSR) including signal aspects, Automatic Speed Command (ASC) Codes, and equated distances based on the latest LIRR Signal braking criteria. The design shall include the newly adapted Reduced Aspect Signaling (RAS). Currently the Railroad uses the follow cab signal codes:

D. The Design-Builder shall provide Computer Aided Signal Code Change Point Locator (CASCOL) report or approved equal verifying the code rates.

E. The Design-Builder shall provide double rail [redacted] AC Vane track circuits for train detection and cab signaling with [redacted] impedance bonds. The track circuit shall be configured to eliminate any problems or issues resetting AC track circuits over 270 and/or 420 code rates. At a minimum, the AC track circuit shall not be de-energized more than 1 minute and 30 seconds before an interrupt of code is provided of [redacted]. This shall be handled either by external timers or in the case of processor designs,

incorporated in the vital software. The [redacted] track circuit provided under this Project shall be compatible with the existing systems track circuits.

F. The Design-Builder shall provide the pre-wired signal enclosures in accordance with the Railroad's standards. The final size of the huts and cases shall be determined by the Design-Builder and submitted to LIRR for approval.

G. The interlocking central instrument location (CIL) shall include an office area separated by a wire mesh wall system with a lockable sliding door and contain the local control panel and communications rack. The vital train control equipment shall be installed in the non-office portion of the CIL including but not limited to VPLC, NVPLC, signal lighting units, Wayside interface units (WIU)s, relays, isolation modules, terminal boards, transformers, track circuit equipment, FRA Test Panel, power supplies, grounding and surge equipment, racks and wall equipment. The interlocking shall include a separate battery hut to house the batteries and power equipment.

    1. The FRA test panel is a locked jumper box containing jumper points to permit FRA testing of the interlocking and to permit release of switch and traffic locking in an emergency. The indications for the FRA testing shall be located on the Local Control Panel.

H. The interlocking central instrument location (CIL) shall include the current Railroad vital processor logic controller (VPLC) System. The Design-Builder shall provide zoned interlockings as described here-in:

    1. The VPLC System at Nassau - 1, Nassau - 3 and Divide - 1 shall be configured in three separate zones, designated as Zone 3, Zone 1 and Zone 2, with Zone 3 controlling Track 3, Zone 1 controlling Track 1 and Zone 2 controlling Track 2.

    2. The VPLC System at Hempstead shall be configured in two separate zones, designated as Zone 1 controlling track Hemp - 1 and Zone 2 track Hemp - 2.

    3. The VPLC System at Floral Park East and Nassau - 2 shall be configured in two separate zones designated as Zone 1 and Zone 2.

        i. The primary control and indication of the crossover switches connecting the adjacent zones shall be assigned to a Zone 1 which controls track 1 at (Nassau - 1, Nassau - 3 and Divide - 1) and track 2 at (Hempstead) and Floral Park.

        ii. Indications of normal switch position for these switches, and the status of the detector track circuit in the normally controlling zone, shall also be provided to the vital processor controlling the adjacent zones.

        iii. Upon a failure of the adjacent zones processor with the crossover switches normal, these vital inputs shall be utilized in the signal control logic to provide for uninhibited train moves over the switch in the healthy zones.

        iv. Control shall be provided for these shared crossover switches from both of the adjacent zones processors (primary and alternate), such that if the adjacent zone processor fails with the crossover reverse, a vital time delay equal to at least the longest time locking for any signal that can be routed over the switch in the other zones, shall be run. Appropriate logic and external vital I/O shall be provided to insure that the affected signals in the adjacent zones have been held at stop for the entire time duration. Once this release time is satisfied, the crossover may then be controlled back to

normal position by the remaining healthy processors, subject to full route locking in the active zone, but in accordance only with detector locking of the switch by the appropriate track circuit or circuits from the failing zones. Once the crossover is normal, it shall not be able to reverse the switch, and uninhibited train moves shall be possible over the switch in normal position through the healthy zone.

a. Due to the power requirements of the switch machines the vital logic shall be designed to sequence the switch moments. The logic for the sequencing shall be designed to limit one crossover be thrown at a time followed by subsequent crossovers.

b. DC power back-up for the interlockings is 8 hours and shall be included in the Design-Builder's power calculations.

v. Interface to the signals shall be via external signal lighting unit (direct connection between the VPLC and signal is not permitted).

a. Light out detection is required for each signal aspect.

vi. Control of the switches shall be via a solid state switch controller and position indications shall be provided utilizing external vital switch repeater ("NWP" and "RWP") relays, in order to provide isolation between the external line circuits and the separate vital processors.

I. The VPLC zones shall contain the vital logic for interlocking control and include but not limited to route check, signal control, route locking, switch locking, switch request and indications and traffic. The traffic logic shall have provisions for emergency release in the event of perturbed situations from either interlocking (allowing for one individual to manually reverse traffic for the block from one end only).

1. Wherever possible, the Design-Builder shall use fiber optic cables run in a diverse path between pre-wire signal enclosures to eliminate copper cables configure as normal and standby.

2. The Design-Builder shall design a redundant vital network via the fiber optic cables ran in a diverse path between pre-wire signal enclosures.

3. The Design-Builder shall design non-vital network via the fiber optic cables run in a diverse path. The non-vital network shall include redundant connections to the SCADA system. The non-vital network shall include indications from the adjacent locations to the west.

J. The interlocking central instrument location (CIL) shall include the current Railroad non-vital processor logic controller (NVPLC) standard:

1. The NVPLC system shall have redundant connections to the communications network for interface to the SCADA system for control from JCC.

2. The NVPLC system shall contain the non-vital logic for interface to the local control panel (primary local control), remote indications from the master and electric lock locations and local indications.

3. The Local control panel shall have alternate connections to each VPLC zone for back-up local control..

K. The interlocking central instrument location (CIL) shall include redundant 100Hz power feeds connected to an automatic transfer panel in the CIL feed from redundant 25kVA

transformers supplied under this Project. Locally the 100Hz will feed the interlocking houses to the east and west via local cables.

L. The interlocking central instrument location (CIL) shall include commercial 200A 60Hz feeds supplied under this Project. Locally the 60Hz will feed the interlocking houses to the east and west via local cables.

M. The interlocking signals shall be low homes (The Railroad's newly adapted Reduced Aspect Signaling – RAS) with three color LED aspects depicting:

1. Absolute Proceed – Flashing Green over Flashing Lunar.
2. Proceed Cab Signal – Solid Green over Lunar.
3. Slow Proceed Cab Signal – Solid Red over Green over Lunar.
4. Restricted Proceed Cab Signal - Solid Red over Lunar.
5. Restricting – Flashing Red.
6. Stop – Solid Red.
    i. Light out detection is required for each color and any failure will result in an aspect downgrade.
    ii. The Design-Builder shall provide color light low home signal units, Model CLS-10D as manufactured by Siemens (formally Safetran) or approved equal at the interlockings.

N. The interlocking DC switch heater cases shall be fed from the 3rd rail power in accordance with the Railroad's standards.

O. The Design-Builder's pre-wired design shall include the hardware and software components for ACSES II which is currently being implemented on the Railroad. This includes but not limited to Wayside Interface Units (WIU)s and interface equipment for communications to the ground network located in the CILs and transponders. The Design-Builder's pre-wired design shall include all hardware and software for the ACSES II system for the reconfigured 3rd Track alignment.

P. The master location shall include a hut for the signal equipment and a separate battery case for the batteries and power equipment. The master locations shall include the same equipment (i.e. VPLC, relays, isolation mods, terminals, network switches, fiber distribution panels, etc.) that is used in the CILs.

1. For applicable sections of the Project, the master locations shall include VPLCs zoned per track designated as Zone 3 (Track 3), Zone 1 (Track 1), and Zone 2 (Track 2) and communicate via redundant fiber optic cables (normal and standby). The VPLCs at master location shall be sized to accommodate each zone.
    a. For master locations with VPLC, the non-vital indications shall be fed to a non-vital card on the main/middle zone (Zone 1/Track 1) and transmitted east via fiber to the next adjacent interlocking.
    b. For all relay master locations the indication shall be fed to a contact mapping device and transmitted east via fiber to the next adjacent interlocking.

Q. The master location shall include a 100Hz power feed connected to the panel in the ML hut fed from 10kVA transformer supplied under this Project.

R. The master location hut shall include commercial [redacted] feed supplied under this Project.

    1. DC power back-up for the master locations is 8 hours and shall be included in the design-builders power calculations.

S. The electric lock locations shall include:

    1. Pre-wired case, switch interface, circuity and series overlay for release.

T. The electric lock locations shall include power feeds from the adjacent locations.

U. The Design–Builder's pre-wired signal enclosure design shall include fully detailed circuit plans including but not limited to vital and non-vital hardware, processor layout and architecture, relay contacts assignments, cable terminal assignments, terminal board layout, cable line-ups, case layouts, vital and non-vital login in Boolean format. The Design-Builder shall provide tie-in revisions to existing locations to accommodate staging for both interim and final configurations.

    1. The Design-Builder shall provide new relays, terminals and all equipment required for the tie-in revisions. Re-use and re-tagging of existing relays and equipment shall not be permitted.

V. All pre-wire signal enclosure shall include the latest surge and grounding standards.

W. The Design-Builder shall provide cross-bonding and broken rail analysis including reactor placement.

X. The Design-Builder Signal design process shall include verification that the components selected are completely compatible with existing systems and infrastructure.

Y. The Design-Builder shall prepare the FRA application and documentation for the new signal system (if applicable under 49 CFR Part 236 Subpart H) subject to approval by LIRR. The Design-Builder shall work with LIRR to develop FRA testing requirements required for the cutovers of new signal equipment installation.

Z. The Design-Builder Signal design shall include power calculations for the 60Hz, 100Hz and DC power and include:

    1. The Design-Builder's 60Hz design shall include load letters, single line diagrams, conduit, and cable routing and power demarcation. The Design-Builder shall coordinate with the utility to procure the power drop and meter location.

    2. The Design-Builder's 100Hz design shall include power calculations for the new locations and analysis of the existing 100Hz power system. The analysis of the existing 100Hz power system shall be used to ensure the existing signal can remain powered while the new system is being tested.

The Design-Builder shall provide new locations at:

Location	Type	Description
Floral Park	Interlocking	New Floral Park Interlocking shall control signals 2E, 2W and H2E and switch 21, interface to the Main Line east to Nassau-1 and to the Hempstead Branch and the new universal interlocking at Plainfield Avenue, interface to the west at existing Queens-3 – Floral Park
Hempstead	Interlocking on the west end of the Hempstead	New Hempstead Interlocking shall control signals H1W and H2W and switches 21 and 12, interface to the west at new Floral Park

	Branch	interlocking and the east to existing Garden Interlocking.
ML-156	Master Location	New master location at [redacted] north side of track 3.
ML-162	Master Location	New master location at [redacted] north side of track 3 across of sub-station G14.
ML-166	Master Location	New master location at [redacted] north side of track 3 east of New Hyde Park (interface to electric lock switch).
ML-170	Master Location	New master location at [redacted] north side of track 3 east of Denton Ave at existing Nassau-1 interlocking (interface to electric lock switch).
ML-174	Master Location	New master location at [redacted] north side of track 3 west of Merillon Avenue Station.
EL	Electric Lock	New Electric Lock Location [redacted]
Nassau-1	Interlocking	New Nassau-1 Interlocking
ML-182	Master Location	New master location at [redacted] north side of track 3 west of Mineola Station.
Nassau-2	Interlocking	New Nassau-2 Interlocking (SCADA and vital circuit interface to Nassau-4 and SCADA interface to Locust)
Nassau-3	Interlocking	New Nassau-3 Interlocking (main CIL, track circuit case, battery hut, and 2 Auxiliary houses)
ML-196	Master Location	New master location at [redacted] south side of track 2 east of Nassau-2
ML-200	Master Location	New master location at [redacted] south side of track 2 at sub-station G17.
ML-204	Master Location	New master location at [redacted] south side of track 2 west of Carle Place Station.
ML-206	Master Location	New master location at [redacted] south side of track 2 east of Carle Place Station.
ML-212	Master Location	New master location at [redacted] north side of track 3 west of Westbury Station.
ML-216	Master Location	New master location at [redacted] north side of track 3 east of Westbury Station at sub-station G18.
EL	Electric Lock	New Electric Lock Location [redacted]
EL	Electric Lock	New Electric Lock Location [redacted]
ML-222	Master Location	New master location at [redacted] north side of track 3 at Grand Blvd.
ML-226	Master Location	New master location at [redacted] south side of track 2 east of Urban Avenue.
EL	Electric Lock	New Electric Lock Location [redacted]
EL	Electric Lock	New Electric Lock Location [redacted]
Divide-1	Interlocking	New Divide-1 Interlocking
JCC		New SCADA system described here-in to replace the existing SCADA systems at Queens and Nassau Towers.
The master locations listed are preliminary and shall be finalized during the Design-Builders TSR design.		

Note the Design-Builders TSR design shall provide master locations at sub-station to avoid drain bonds.

The Design-Builder shall provide tie-in revisions at the following locations at:

Location	Type	Description
Queens-3 – Floral Park	Interlocking	The revisions at existing Queens-3 Floral Park Interlocking shall include interface to the new Floral Park Interlocking at the east end of Floral Park Station.
Divide-2	Interlocking	The revisions at existing Divide-2 Interlocking shall interface to the new Divide-1 interlocking to the west. The removal of crossovers 2-12 and 2-31 as well as signal reconfiguration.
Divide-4	Interlocking	The revisions at existing Divide-4 Interlocking includes a new crossover and modifications to the existing relay signal logic.
Divide Tower	SCADA System	The revisions at existing Divide Tower include modifications to the SCADA system for the switch and signal revisions at Divide-4, interface revisions at Divide-2 and interface to new Divide-1.

AA. Training

1. The Design-Builder shall provide comprehensive training for LIRR Maintenance and Design personnel, and furnish professional pre-printed material and other training aids to ensure a thorough understanding of the subject material.
2. The Design-Builder shall develop a detailed training plan to submit to the LIRR for approval, which provides the training methodology, training schedule, name and quantity of each training course, training course outlines, training course durations, prerequisite knowledge of training participants and expected outcomes of each module of training. The training plan shall also include requirements for training facilities, including requirements for sound, slide projectors, marker boards, video monitors, media players and electrical power requirements. The training plan shall also describe the physical size of training simulators to be constructed and delivered to LIRR and the requirements for moving the simulators into LIRR facilities, including height, width and depth of the equipment, as well as the need to use elevators versus stairs to move the equipment into place.
    i. A total of 50 LIRR Maintenance and Design personnel shall be trained; three sessions with The comprehensive training program shall cover the service, maintenance, operation and programming of:
        a. The proposed microprocessor interlocking control system (VPLC) and all related equipment as provided in Technical Specification 16750.
        b. Non-vital programmable logic controller (NVPLC) and all related equipment as further specified in Technical Specification 16751.
        c. The proposed AFO system and all related equipment as further specified in this Section.
        d. Event Recording System as provided in Technical Specification 13572.

e. Fire Suppression System as provided in Technical Specification 13571.

f. Any "Equal" equipment not included in the RMS-201.

ii. In preparation for the training program, the Design-Builder shall design the program to ensure the level of knowledge is adequate for engineering, maintenance, repair, and troubleshooting of all equipment supplied. The program shall include both classroom instruction and field exercises, and shall incorporate the use of training aids such as videotape, mock-ups, schematics, manuals, and test equipment.

iii. All training sessions shall conform to the following requirements:

a. The Design-Builder's instructors shall have a thorough knowledge of, and experience with, the systems included in the program.

b. The lesson plans and course materials shall be available to the LIRR for review.

c. All instruction shall be conducted on LIRR property with class duration not less than seven hours per normal working day. At the LIRR's option, the LIRR may videotape all classroom and field instruction.

d. Instruction shall include system functionality of each component, troubleshooting, and the essentials of their routine maintenance.

iv. This instruction shall in no way be considered as superseding the conventional functions of the Design-Builder's and/or sub-contractor's personnel.

v. All training materials and instruction shall be in English.

vi. All classroom and field instructors shall be approved by LIRR. The Design-Builder shall submit the resume of all instructors to LIRR for Approval, 60 Calendar Days prior to the start of training.

3.19.10 Functional Requirements

A. The overall safety of the Signaling and Train Control System shall be consistent with the requirements for service, vehicle and passenger safety. The signal system shall maintain safe train separation and prevent over-speed derailments, movement of trains through improperly aligned switches, enforce civil speed restriction and incursions into established work zones. Elements of the Signaling and Train Control System intended to maintain the safety of Trains and other rail mounted vehicles shall be designed to be Vital. Any malfunction affecting safety shall cause these System Elements to revert to a state that is known to be safe.

B. The Design-Builder shall install Train control equipment in accordance with Project clearance criteria. Sites for the installation of Train control equipment shall be selected to avoid interference with other systems and civil elements.

3.19.11 Pre-wired Design Related Submittals

A. The Design-Builder shall submit the Signal and Train Control Preliminary Design submittal for Review and Comment for each type of location. Signal and The Train Control Preliminary Design submittal shall include, at a minimum, the following items:

1. Preliminary track and signal routing plans (TSRs), including signal aspects, Automatic Speed Command (ASC) Codes, PTC System, and equated distances based on the latest LIRR Signal braking criteria.
2. Preliminary double line track and cable plans showing the preliminary locations of the signals, track circuits, track circuit polarity, cases, huts and other signal apparatus.
3. Preliminary cable layout showing the cable make up and line up, express and local cables and track circuit polarity.
4. Preliminary system block diagram depicting the current Railroad's VPLC and NVPLC standard configuration for interlocking control, SCADA interface, local control and FRA test mode.
5. Preliminary bill of materials showing long lead items.
6. Preliminary control and indication code chart.
7. Preliminary factory test and acceptance plan.
8. Preliminary pre-test, FRA Tests, LIRR specific tests, and cut-over plan.
9. Preliminary staging plan.
10. Preliminary CAMP.

B. The Design-Builder shall submit the Signals and Train Control Intermediate Design submittal for Review and Comment for each type of location. The Signals and Train Control Intermediate Design submittal shall include, at a minimum:

1. Refinement of all drawings submitted for Preliminary Design.
2. Development of typical detailed plans for each type of application.
3. Development of vital application logic for one interlocking and logic for a master location.
4. Development of non-vital application logic for one interlocking and logic for a master location (indications).
5. Development of local control panel and FRA Test panel.
6. Development of track and signal routing plans (TSRs), including signal aspects, Automatic Speed Command (ASC) Codes, PTC System, and equated distances based on the latest LIRR Signal braking criteria.
7. Development of double line track and cable plans showing the preliminary locations of the signals, track circuits, track circuit polarity, cases, huts and other signal apparatus.

a. In addition to individual track and cable plans a complete double line track plan for the Project Limits depicting the signals, switches, track circuits with polarities, crossbonds, reactors, huts and cases shall be provided.

8. Development of cable layout showing the cable make up and line up, express and local cables and track circuit polarity.
9. Development of system block diagram depicting the current Railroad VPLC and NVPLC standard configuration for interlocking control, SCADA interface, local control and FRA test mode.
10. Power calculations (60Hz, 100Hz and DC) for and interlocking, master and electric lock locations; including a sample load letter application.
11. Development of bill of materials showing long lead items.
12. Development of control and indication code chart.
13. Development of factory test and acceptance plan.
14. Development of pre-test, FRA Tests, LIRR specific test, and cut-over plan.
15. Development of staging plan.
16. Development of CAMP.

C. The Design-Builder shall submit the Signal and Train Control Final Design submittal for Review and Approval for each type of location. The Signal and Train Control Final Design submittal shall include, at a minimum:

1. Refinement of all drawings submitted for Intermediate Design.
2. Final detailed plans for each location.
3. Final vital application logic for each interlocking and logic for each master location.
4. Final non-vital application logic for each interlocking and logic for each master location (indications).
5. Final local control panels and FRA Test panels.
6. Final track and signal routing plans (TSRs), including signal aspects, Automatic Speed Command (ASC) Codes, PTC System, and equated distances based on the latest LIRR Signal braking criteria.
7. Final double line track and cable plans showing the final locations of the signals, track circuits, track circuit polarity, cases, huts and other signal apparatus.
8. Final cable layout showing the cable make up and line up, express and local cables and track circuit polarity.
9. Final system block diagram depicting the current Railroad's VPLC and NVPLC standard configuration for interlocking control, SCADA interface, local control and FRA test mode. The final system block diagram shall include both vital and non-vital communications diagram for each location as well as an overall diagram depicting each location within the Project Limits. The system block diagrams shall include all communications connectivity including vital and non-vital IP addresses.
10. Final Power calculations (60Hz, 100Hz and DC) for and interlocking, master and electric lock locations; including a sample load letter application.

11. Final bill of materials showing long lead items.
12. Final control and indication code chart.
13. Final factory test and acceptance plan.
14. Final pre-test, FRA Tests, LIRR specific test, and cut-over plan.
15. Final staging plans and detailed tie-ins.
16. Final CAMP plan.

3.19.12 Installation Related Submittals

A. The Design-Builder shall submit the Signal and Train Control Preliminary Installation Design submittal for Review and Comment, at a minimum, the following items:
   1. Preliminary hut and case layout (including foundations), one of each type of location.
   2. Preliminary express cable installation.
   3. Preliminary trough, conduit, pull box layout and local cable installation details.
   4. Preliminary switch and switch heater layout.
   5. Preliminary signal and foundations installation.
   6. Preliminary power drops and meter pans.
   7. Preliminary staging, cutover and test procedures.
   8. Catalog cuts for the above mentioned equipment.
   9. Preliminary conduit, tray and trough fill calculations.

B. The Design-Builder shall submit the Signal and Train Control Intermediate Installation Design submittal for Review and Comment, at a minimum, the following items:
   1. Intermediate hut and case layout (including foundations), for each type of location.
   2. Intermediate express cable installation.
   3. Intermediate trough, conduit, pull box layout and local cable installation details.
   4. Intermediate switch and switch heater layout.
   5. Intermediate signal and foundations installation.
   6. Intermediate power drops and meter pans.
   7. Intermediate staging, cutover and test procedures.
   8. Intermediate conduit, tray and trough fill calculations.

C. The Design-Builder shall submit the Signal and Train Control Final Installation Design submittal for Review and Approval, at a minimum, the following items:
   1. Final hut and case layout (including foundations), for each type of location.
   2. Final express cable installation.
   3. Final trough, conduit, pull box layout and local cable installation details.
   4. Final switch and switch heater layout.
   5. Final signal and foundations installation.

6. Final power drops and meter pans.
7. Final staging, cutover and test procedures.
8. Final conduit, tray and trough fill calculations.

3.19.13 Additional Submittals

A. Double line track plans shall be drawn to scale and drawing Match Line when used to connect multiple pages will allow a roll plan to be created without offsetting the paper.

B. NX tables and Route and Aspect charts shall be submitted to the Railroad in both excel and PDF formats. Excel files shall be submitted to the Railroad in accordance to the Railroad's current software requirements.

C. Route release tables in excel and PDF shall be provided by the Design-Builder.

D. Any revised charts shall be submitted in full with all pages both revised and current any deleted pages shall be represented.

E. Any notes shall be listed on bottom of every page they are associated with.

F. Complete TSRs shall be submitted to the Railroad for all stages.

G. Roll Plans shall be produced for all stages and submitted to the Railroad.

H. Double line track plans shall show switches that are blocked and spike in that stage. If the switch is released a new double line and roll plan shall be submitted by the Design-Builder.

3.19.14 Summary of Submittals

Item	Section	Submittal	Action
1	3.19.11	Pre-wired Signal and Train Control Preliminary Design	Review and Comment
2	3.19.11	Pre-wired Signal and Train Control Intermediate Design	Review and Comment
3	3.19.11	Pre-wired Signal and Train Control Final Design	Review and Approval
4	3.19.12	Installation Signal and Train Control Preliminary Design	Review and Comment
5	3.19.12	Installation Signal and Train Control Intermediate Design	Review and Comment
6	3.19.12	Installation Signal and Train Control Final Design	Review and Approval

END

3.20 COMMUNICATIONS

3.20.1 Section Includes

This section sets out design and construction requirements related to Backbone Communications, Information Technology (IT), and Facilities Communications at Stations, Buildings, Substations, Parking Structures, and all locations specified in the Contract Documents. For additional design and installation requirements for communications, refer to the following Sections:

A. TP1.21 and TP3.21 SECURITY SYSTEMS for Security Systems scope of work and performance criteria.

B. TP2.9 SYSTEM SAFETY for safety policy and strategy.

C. TP2.10 SYSTEM SECURITY for security policy and strategy.

3.20.2 Codes and Standards

Project Work shall comply with all statutory requirements, and shall comply with the following codes in addition to any such documents referenced throughout the document, where applicable:

A. 2016 New York State Uniform Building Code.

B. Electrical Code of the City of New York.

C. Building Code of the City of New York (BCCNY).

D. National Electrical Code (NEC).

And the relevant standards published by:

E. American Railway Engineering and Maintenance-of-way Association (AREMA) 1997.

F. Alliance for Telecommunication Industry Solutions (ATIS).

G. American National Standards Institute (ANSI) S-56-434.

H. American Society for Testing and Materials (ASTM).

I. Electronics Industry Association (EIA).

J. Institute of Electrical and Electronic Engineers (IEEE).

K. National Committee for Information Technology Standards (NCITS).

L. National Electrical Contractors Association (NECA).

M. National Electrical Manufacturers Association (NEMA).

N. Occupational Safety and Health Administration (OSHA).

O. Underwriters Laboratories (UL) 2024.

P. TIA-569C for the installation of conduits and pathways.

Q. The Railroad conforms to the following Telecommunications Industry Association (TIA) standards relevant to TIA-455 - General requirements for standard test procedures for optical fibers, cables, connecting and terminating devices, and other fiber optic components:

1. TIA-455-B.
2. TIA-455-8.
3. TIA-455-25C.

4. TIA-455-31C.
5. TIA-455-33B.
6. TIA-455-37A.
7. TIA-455-41A.
8. TIA-455-78A.
9. TIA-455-81B.
10. TIA-455-82B.
11. TIA-455-85A.
12. TIA-455-104B.
13. TIA-455-168A.
14. TIA-455-175B.
15. TIA-455-176A.
16. TIA-455-178B.
17. TIA-455-181.
18. TIA-455-598A.

3.20.3 Related Documents

The design and construction shall adhere to the most recent versions and revisions of following design guidelines and specifications, in addition to any such documents referenced throughout the document:

A. American Public Transit Association (APTA) Design Guidelines and Recommended Practices.
B. Motorola R56 Specifications.
C. Telcordia Generic Requirements for Outside Plant Bonding and Grounding.
D. LIRR Station Design Guidelines.
E. LIRR Specification C-612 – AVPS.
F. LIRR Specification C-448 – Communications Rooms.
G. LIRR C-304 – Copper Communications Cable.
H. LIRR C-445 – Single Mode Fiber Optic Cable (SMFO).
I. LIRR C-445 – SMFO Appendices.
J. LIRR C-447 – 10’ x 12’ Communications Hut.
K. LIRR C-448 – Communications Room.
L. LIRR C-449 – 8’ x 10’ Communications Hut.
M. LIRR C-457 – Communication C-Case.
N. LIRR C-501-02 – Messenger Cable.

O. LIRR C-502-98 – Wood Poles.

P. LIRR C-502-98 – Wood Pole Appendices.

Q. LIRR C-465 VHF Radio Base Station.

R. LIRR C-466 VHF Radio Receiver.

S. LIRR Standard Drawing STD-002 Typical Radio Pole Installation.

T. GR-1275 Central Office/Network Environment Equipment Installation/Removal Generic Requirements.

U. GR-295 Mesh and Isolated Bonding Networks: Definition and Application to Telephone Central Offices.

V. GR-326 Generic Requirements for Single-Mode Optical Connectors and Jumper Assemblies.

W. GR-356 Generic Requirements for Optical Cable Innerduct, Associated Conduit, and Accessories.

X. GR-765 Generic Requirements for Single Fiber Single Mode Optical Splices and Splicing Systems.

Y. GR-1502 Central Office/Network Environment Detail Engineering Generic Requirements.

3.20.4 Design Requirements

The Design-Builder shall:

A. Design, provide, construct or install (provide) all Backbone Communications, IT and Facilities Communications (collectively referred to as “Communications”) in accordance with the Contract Documents, including but not limited to the elements listed herein. The Design-Builder is responsible for all materials and activities required for a complete and fully operational communications system furnished, installed and tested except where explicitly stated otherwise.

B. Take due account of the planned and ongoing third party contracts detailed in the Special Conditions. Coordinate the design and implementation of the communications work with the Railroad and third party contractors.

C. For all activities requiring work to be performed by LIRR Force Account, the Design-Builder shall provide advance notice in accordance with TP3.1 GENERAL for review and mobilization, and shall be accounted for specifically as such within the Design-Builder’s Schedule.

D. Before starting any communications-related scheduling or physical work, perform detailed and comprehensive walk-through including inspection and survey of the existing pathways, cables and equipment to determine the location and extent of removals, installation and protection of existing elements.

E. The Design-Builder shall coordinate all work and materials for activities specifically designated to be performed “by others”, for a fully functioning system, tested and accepted by LIRR. For work by others, see Division of Work table in TP1.20 COMMUNICATIONS.

F. All designs, materials means and methods shall be approved by LIRR with no exceptions. Submit for Approval by LIRR all preliminary design drawings and material cut sheets prior to the start of work for respective items. Preliminary design drawings shall indicate all equipment locations, pathway and cable routings and conduit and cable type and size.

G. The cables owned by Third Party Owners located in the Project Limits (even cables which LIRR is leasing the use of pairs or strands) shall not be considered LIRR communications cables for the cabling scope under this Contract. Third Party cables shall be identified by the Design-Builder, and any work required to relocate, adjust, reconfigure or otherwise affect those cables in any way, shall be coordinated with the Third Party Owner of that cable and shall be the sole responsibility of the Design-Builder.

H. The LIRR "Obsolescence Clause" shall apply for all materials furnished and installed. The designs shall take into account technology obsolescence practices of the Railroad and other public entities at the time of installation of the new systems. All equipment installed by the Design-Builder shall be the most recently available technology.

I. Label all equipment, cabinets and cables. All labels shall be adhesive type, using materials and ink rated for outdoor use and resistant to smudging, fading or wear due to UV light, moisture, heat/cold or humidity. All labelling conventions shall be approved by LIRR.

J. All materials and equipment used in the communications work shall be furnished and installed new and Commercial Off-the-Shelf (COTS).

K. The design and implementation of the communications work shall be planned and configured to protect existing equipment, cables and/or conduits that are not directly part of the Work.

L. Should conflicts arise between these criteria, codes, standards and guidelines, the more stringent shall apply. Final decision shall be at the discretion of LIRR.

M. Attention is drawn to the importance of integrating the communications work at with other disciplines undertaking parts of the Work, including in relation to the visual quality of the completed Work.

N. Plan cutover of all existing services at each location to minimize downtime and interruption to LIRR operations. The Design-Builder shall submit a detailed cut-over scheduling/phasing plan, including any required downtime of existing systems, for Approval by LIRR before the decommissioning of any systems.

O. Construct separate rooms for Communications and IT Data Networks. Install all racks, patch panels and other head-end equipment in both the Communication Room and the IT Data Network Room. Follow LIRR standards for communications rooms and IT Data Network Rooms and the requirements provided in the Contract Documents. Coordinate requirements with other disciplines.

P. Network connectivity between Railroad locations for all systems and services at train stations and parking garages, LIRR facilities, substations, signal huts, towers and other wayside locations shall be provided over the Communications Backbone. Dark fiber shall not be utilized to support network connectivity. Virtual private LAN service or virtual routing and forwarding technology over the Communications Backbone shall be utilized to maintain security and separation of the various applications and groups. Configuration of all network shall be performed by the Design-Builder as directed by the Railroad.

3.20.5 Backbone Communications

The Design-Builder's requirements for the elements of the Backbone Communications work are listed in Table 3.20-1.

Table 3.20-1 – Backbone Communications Elements

Element	Requirements
A. Utility Poles	1. Coordinate with track design and identify existing utility poles in conflict with track related work. 2. Relocate all utility poles and communications cables in conflict. 3. Install new utility poles where required to facilitate the installation of communications infrastructure, including huts, C-cases, station buildings, signal huts, signal cases substations, buildings and radio sites. 4. Before the start of any work to relocate any poles, cables or cable infrastructure, prepare a detailed pathway and cable relocation plan and submit to the Railroad for approval. Include all calculations for loading of poles and cables, attachments, messenger strand, and down guys. 5. Furnish and install new utility poles per the 2016 Manual for Railway Engineering published by The American Railway Engineering and Maintenance-of-way Association (AREMA) 1997 and LIRR 290 for clearances from electrical cables. 6. Each pole shall be tagged with owners name and an ID number provided by LIRR. Utility pole tags shall be industry standard outdoor rated aluminium ID plates using 1" black on yellow characters. 7. The poles and attachment hardware shall be designed such that the load carrying capability can facilitate 100% future expansion of cables. 8. Install deadends and down guys at end runs and on other poles as required by the RFCD design.
B. Messenger Strand	1. Along the utility pole line, install messenger strand for fiber optic communications cables. 2. Install a 1/4" messenger strand for all fiber optic communications cables. Install all pole attachment hardware. *Note: Signal cables and communications shall never be installed on the same messenger or through the same pathway.* 3. Install a messenger ground at all poles and ground all messenger and messenger hardware. 4. Provide calculations for all pole attachment hardware, and provide sag and tension calculations for each messenger strand between poles, including weight of all installed cables. Include the calculations in the detailed pathway and cable relocation plan and submit to the Railroad for approval.
C. Fiber Optic Backbone	1. Install spatially diverse 144 strand single mode fiber optic (SMFO) backbone cables, one on each side of the tracks, along the entire right

Table 3.20-1 – Backbone Communications Elements	
Element	**Requirements**
Cabling	of way between Queens Communications Hut and Divide Communications Hut, and as required to facilitate the installation of cabling to all stations, facilities, and communications infrastructure as required herein. 2. At Queens Communications Hut and Divide Communications Hut, the cable shall terminate on patch panels in the communications rooms at each station. 3. Install 36 strand SMFO "drop" cable: a. The fiber optic backbone cables shall only be pulled into and terminated at communications huts. For all other facilities, spatially diverse drop cables shall be used. b. Between the backbone and all C-cases, station buildings, parking facilities, signal huts, signal cases and substations, install spatially diverse drop cables and terminate on patch panels. c. At 3rd rail heater locations at platforms and interlockings, coordinate with LIRR and install 12 strand SMFO drop cable as required to facilitate the design of the 3rd rail heater system, including at tower locations if a wireless 3rd rail heater system is installed. The 3rd rail heater system shall have dedicated strands allocated within the backbone cable. 4. Demarcation Points – The demarcation points between the new fiber optic cables and the existing fiber optic cables where the new and old communications systems interface shall be at Queens Communications Hut, Mineola Communications Hut and Divide Communications Hut. The new fiber optic cables shall be installed into the communications huts and terminated on patch panels. 5. Except at communications huts where all strands of the backbone cable shall be terminated on patch panels, the Design-Builder shall ring cut for the splicing of all drop cables and only cut fibers that are needed for the drop (including spares). No other cutting re splicing of the backbone cable shall be permitted. All fiber allocations shall be approved by the Railroad. 6. For parking facilities, where a communications room is required in accordance with TP3.14 PARKING STRUCTURES, provide drop cable and terminate cables in communications room. Where no communications room is required, extend drop cable from ROW backbone cable to a fiber distribution panel (FDP) mounted inside a lockable NEMA 4 cabinet with IAC. Field devices shall terminate and connect to the drop cables at the communications room (where applicable) or at the FDP. FDP cabinets shall be located to not interfere with vehicle or pedestrian traffic through any position of the door swing, and shall be protected with bollards. 7. The design of the fiber optic cable plant shall be such that "dual feeds" are provided to each communications facility by installing two distinct

Table 3.20-1 – Backbone Communications Elements	
Element	**Requirements**
	drop cables from one of the backbone cables (either the new cable or the relocated existing cable) to each of the communications rooms at the stations. 8. Each drop shall be from different spatially diverse backbone cable. Spatial diversity of the backbone or drop cables may be achieved by using both utility pole messenger and a trough/conduit system. 9. Maintain and protect existing copper communications cables and fiber cables and communications at all times. In addition to installing new spatially diverse backbone cable, the existing copper and fiber optic cables shall remain operational throughout and after construction of the Project. Should the existing copper and fiber optic cable require relocation due to the design and construction of the new cable, the Design-Builder shall be responsible for any and all work required for the relocation, and shall submit a written and detailed plan to LIRR for temporarily maintaining and/or relocating existing cables. All criteria for the design and installation of new fiber optic cable work shall apply. The existing copper backbone cable shall be removed. 10. Existing fiber cable that requires relocation shall require the installation of a new fiber cable node-to-node. Intermediate cable splices are permitted for temporary cables. No intermediate cable splices shall be permitted. 11. No fiber optic cable shall be installed on the same messenger or through the same conduit as a copper cable. 12. Tag each fiber optic cable within 3’ of cable ends or where cable enters/exits a manhole, splice case, snow-shoe pair, conduit or wall penetration, with an ID number and color as directed by LIRR. 13. Provide an aerial snow-shoe pair at all locations where additional cable is required for a “fold back”. 14. Provide a 200’ fold back of backbone cable for maintenance for every 2000’ of installed backbone cable. 15. Provide 200’ fold back of backbone cable at all drops. 16. Provide 200’ fold back of drop cable at all locations where the drop cable will splice into the backbone cable. 17. Provide 80’ additional cable at all communications huts, C-cases, station buildings, parking facilities, signal huts, signal cases and substations. 18. Provide 200’ additional cable at the communications rooms at Floral Park and Hicksville stations. 19. Provide 200’ additional cable at all current and future PTC locations along the ROW. Coordinate with LIRR for the location of all PTC locations. 20. Install an aerial splice case at all drop locations. 21. All cabling shall be installed, tested and terminated at patch panels installed in equipment racks. Any utilized buffer tube shall have all of its

Table 3.20-1 – Backbone Communications Elements	
Element	**Requirements**
	fibers terminated. 22. Splice and terminate and all fiber cables. All buffer/strand assignments will be provided by LIRR. Unused fibers/buffer tubes shall be sealed and capped. 23. Test and provide test results (OTDR and OLTS) for cables, pre and post installation, and after termination. Submit to the Railroad for approval all test procedures (prior to testing) and all cable test results for cable acceptance.
D. Backbone Pathways	1. Provide pathways to transition fiber optic and copper cables from aerial messenger to huts, stations, and other wayside equipment as shown in the plans. 2. All underground pathways parallel to the track shall provide 100% spare capacity. 3. Underground conduits shall be [redacted] schedule 80 PVC, unless otherwise noted. 4. All communication cross track ducts shall be a minimum quantity of four [redacted] schedule 80 PVC, installed [redacted] under bottom side of track ties. 5. All fiber optic cables installed through underground ducts shall be installed in 1-1/4" innerduct. 6. Track crossings: install four [redacted] ducts parallel to the tracks, and provide a manhole on both ends of the crossing. All ducts shall extend 6" inside the manhole and be in the same logical order as the adjacent manhole. Provide a crossing at each the following facilities regardless of utilization: a. Communications Huts, Rooms, and Closets. b. Substations. c. Signal Huts. d. Mineola Radio Tower. e. PTC Radio Sites. f. Grade Crossings, Overpasses and Underpasses. 7. Manholes: a. Provide separate copper cable and fiber cable manholes at all transitions from above ground to underground cable, bridge or grade crossings and at the entrance to all wayside cabinets, huts, cases and station communications rooms. b. Manholes shall be [redacted] rectangular, with street grade design load. c. Pulling eyes shall be embedded into all walls of the manholes. d. All manhole covers shall have a cast-in logo "LIRR COMMUNICATIONS". e. Manhole spacing shall be no greater than [redacted] f. Install a manhole at all conduit transitions and at all conduit angles greater than [redacted] degrees.

Table 3.20-1 – Backbone Communications Elements	
Element	**Requirements**
	g. Install a manhole at the base of all poles where a cable drop is located, and at the base of all communications facilities. h. Provide watertight bushings on all ducts inside manholes. 8. The number of ducts feeding from a communications manhole to any facility shall be 200% greater than the duct that the design shows being utilized. 9. Use separate pathways for fiber optic communications and copper communications cables. No AC power shall be mixed with communications through any pathway. 10. Use cable ladders and vertical cable trays for all cables installed vertically on poles. 11. Fiber cables and copper cables(including signal cables) shall never be mixed in the same pathway or attached to the same messenger.. 12. For all fiber cables, provide 200' additional cable slack coiled in all manholes through which the cable passes through.
E. Radio System	1. Install a new radio pole, radio equipment, cabinet, conduits and cables to replace the radio tower and equipment at Mineola. 2. Survey existing radio system to identify coverage area and signal strength. Submit results to LIRR for review and approval/agreement of existing radio coverage. 3. Survey Project area for an alternate location in which to relocate the radio system. New location shall meet or exceed existing coverage area and signal strength. 4. Provide detailed radio system plans, including coverage area, pole location, equipment specifications for approval by LIRR. 5. Existing radio service shall remain operational at all times. Existing radio system shall not be removed until replacement system is installed, tested and approved by LIRR. 6. Remove the existing radio system and infrastructure after LIRR approval of the replacement system. Return to LIRR the existing radio system antenna, cabinet and all radio equipment at the sole discretion of LIRR.
F. Backbone Commun-ications Equipmen t	1. Backbone communications equipment shall be installed at signal huts, substations and stations. 2. Signal Huts i. Design, install, test and document with LIRR approval, Cisco ASR 903 network nodes and services over the fiber optic communications backbone. The ASR 903s will utilize [redacted] links. The nodes shall be configured to support secure L2 and L3 services using MPLS VPLS's and OSPF VRF's. ii. The Cisco ASR 903s shall be configured in multiple [redacted] string topologies that terminate into [redacted]

Table 3.20-1 – Backbone Communications Elements	
Element	**Requirements**
	nodes at Hillside, Mineola and Hicksville communication facilities. [redacted] nodes shall be supplied by the design-builder to form part of the core of the network, shall have 100G WAN links and shall be connected in a mesh configuration to adjacent FON nodes in communication facilities. iii. All nodes shall be configured to be redundant for power, WAN and LAN service modules. iv. Communications equipment at Signal huts shall be mounted in 19" racks. v. HVAC facilities in all locations shall be provided to ensure environmental conditions meet the ASR specifications. vi. A VOIP phone extended from the LIRR Communications PBXs shall be provided in the huts. vii. At Signal Huts only, design, install, test and document OTN XTRAN nodes to support all non-vital supervisory network connectivity in redundant and parallel MPLS-TP rings. Redundant power sources in common with Signal Supervisory equipment shall power the OTN nodes. viii. All electronics shall be powered from redundant [redacted] sources from Signals primary and backup non-vital DC distribution bus with backup power for at least 12 hours. ix. Plan cutover of existing services at each location to minimize downtime and interruption to LIRR operations. Provide downtime within procedures and schedules submitted to LIRR for Approval. 3. Substations i. Design, install, test and document with LIRR approval, Cisco ASR 903 network nodes and services over the fiber optic communications backbone. The ASR 903s shall utilize [redacted] WAN links. The nodes shall be configured to support secure L2 and L3 services using MPLS VPLS's and OSPF VRF's. ii. The Cisco ASR 903s shall be configured in multiple [redacted] linear string topologies that terminate into [redacted] network nodes at Hillside, Mineola and Hicksville communication facilities. [redacted] nodes shall be supplied by the design-builder to form part of the core of the network, shall have [redacted] WAN links and shall be connected in a mesh configuration to adjacent FON nodes in communication facilities. iii. All nodes shall be configured to be redundant for power, WAN and LAN service modules. iv. Communications equipment at Substations shall be mounted in fan

Table 3.20-1 – Backbone Communications Elements	
Element	**Requirements**
	ventilated Hoffman Cabinets. DC power for the electronics shall be conditioned through a [redacted] converter. The [redacted] shall be fed from Substation 130VDC distribution center. v. HVAC facilities in all locations shall be provided to ensure environmental conditions meet the ASR specifications. vi. A VOIP phone extended from the LIRR Communications PBXs shall be provided in the subs. 4. Stations i. Design, install, test and document with LIRR approval, Cisco ONS 15454 M6 network nodes and services over the fiber optic communications backbone. The ONS 15454 M6 shall utilize 10G WAN links. ii. HVAC facilities in all locations shall be provided to ensure environmental conditions meet the ASR specifications. iii. A VOIP phone extended from the LIRR Communications PBXs shall be provided at each station and parking facility. 5. Install all conduits and cabling for communications and power required for all communications equipment. 6. Install power cords, patch cables, fiber distribution equipment, punch blocks, connectors and all other ancillary items for a complete and fully installed system. 7. Connect the communications backbone equipment through the communications backbone fiber optic cable system pursuant to the requirements of related elements. 8. Coordinate with LIRR and submit for approval a bill of materials (BOM) listing the number of chassis, cards, ports, power supplies and other ancillary items required for a complete and fully operational system approved by LIRR.
G. Power for Backbone Communications Equipment	1. All backbone communications equipment shall be powered through a battery back-up (UPS) system providing 8 hours of run-time, in addition to any requirements for power panels that connect to gas fired generators.
H. Testing and Acceptance	1. Pursuant to Section 3.20.7, develop and submit test plans to LIRR for review and approval, including Factory Acceptance Test (FAT), On-Site Stand-Alone Installed Test (SAT) and System Integration Test (SIT).

Table 3.20-1 – Backbone Communications Elements	
Element	**Requirements**
	For individual systems: i. FAT shall be completed and approved for a system element before any field installation of that system element. ii. All components of a system element shall be field installed before SAT for that system element, including cabling installation and testing. iii. All system elements shall be SAT approved before SIT. 2. All testing shall include a full set of procedures documenting all materials and a complete step-by-step set of procedures that demonstrate all aspects of all elements the equipment under test throughout each stage of FAT, SAT and SIT, including all operational functionality of the all elements throughout each stage of testing. 3. All documentation and procedures shall be approved by LIRR before the start of any testing. 4. Coordinate installation of materials and witness of testing with LIRR, and submit all test results for approval before final acceptance by LIRR.

3.20.6 Facilities Communications

The Design-Builder's requirements for the elements of the Facilities Communications at stations, parking structures, huts, cases and other locations as specified in the Contract Documents are listed in Table 3.20-2.

Table 3-20-2 Facilities Communications Elements	
Element	**Requirements**
A. Pathways	1. Provide pathways between all communications and IT end devices and equipment cabinets, communications rooms, IT rooms, closets, and other locations as specified in the Contract Documents. 2. Submit drawings showing pathway routings in the preliminary, intermediate and final communications design submittals for approval by LIRR. 3. Pathways shall consist of conduits, conduit bodies, conduit sweeps, pull boxes, junction boxes, handholes and manholes. 4. All exposed conduits, conduit bodies and sweeps shall be RGS. Flexible liquid-tight conduit shall be permitted for final connections to end devices and shall not exceed 18" in length. 5. All pathways shall be installed using LIRR approved materials

Table 3-20-2 Facilities Communications Elements	
Element	**Requirements**
	and fittings that prevent the penetration of liquids into the pathway system. 6. All pathways shall have 200% spare cable capacity. 7. Test all under platform cables and wires for hazardous materials. Abate all hazardous materials and relocate all cables to permanent protective enclosures (see Environmental section(s) of the Technical Provisions for additional information). 8. All communication cross track ducts shall be a minimum quantity of [redacted] schedule 80 PVC, installed [redacted] under bottom side of track ties. 9. All new conduits and pathways left unused shall have a pull tape installed. 10. All pathways shall be designed, arranged and installed so as to be as visually inconspicuous as possible, and follow installation routes that are parallel and/or perpendicular to the platform edge. 11. Conduit supports shall allow for 200% conduit expansion in the future. Access to these conduit supports shall be from the field side of platform, not track side.
B. Communications Rooms	1. Install/construct a communications room and associated equipment at each station or parking structure per Technical Specification C-448. 2. Communications rooms and IT Data Network Rooms shall be separate. The communications and security equipment shall be installed at a location specified by LIRR. 3. Install rooms minimum 13' from outside edge of rail. The location of all communications rooms shall be approved by LIRR. 4. Location of communications room shall allow direct, unobstructed access by a LIRR utility body pickup truck. 5. Power distribution panels for communications equipment shall be provided in the communications room and shall meet the following requirements: i. If the station requires a connection for a portable emergency power, connect the communications room power panels to receive emergency power. ii. Install all cabling, conduit, connections and all other ancillary equipment for a complete installation. iii. Install UPS to allow for clean uninterrupted generator transfer and protect against line surges 6. Ground communications rooms and equipment per Telcordia and

Table 3-20-2 Facilities Communications Elements	
Element	**Requirements**
	Motorola R56 Specifications. 7. Conduits into communications rooms shall consist of four 4" Schedule 80 PVC conduit, with long-bend sweeps, and minimum [redacted] stub-up through communications room floor. 8. Where multiple communications rooms or communications closets exist, provide pathways between each room and closet. Cabling required to facilitate the design shall be the responsibility of the Design-Builder. Pathways between rooms/closets shall be minimum two [redacted] conduits and adhere to the criteria for station pathways. 9. Install a fiber distribution panel (FDP) in the communications room with a lockable door. Provide a patch panel inside the FDP with 100% spare capacity.
C. IT Data Network Room	1. Construct an IT room at each station and parking structure. 2. Communications Rooms and IT Data Network Rooms shall be separate. The communications and security equipment shall be installed at a location specified by LIRR. 3. Location shall not be located near to equipment that can cause electromagnetic interference (EMI). Examples include door openers and elevator systems. 4. The maximum cable distance between the IT Data Networks room and an end device shall not exceed [redacted] meters [redacted] feet). 5. The required size for an IT Data Network Room is [redacted] with a minimum ceiling height of 8'. 6. The IT Data Network Room shall be adjacent to the communications room and telephone room. 7. A cable tray shall be provided between the IT Data Network Room and the communications room and the telephone room or two 4" conduits between rooms (if not directly adjacent). 8. Provide two [redacted] two post vertical equipment racks with horizontal and vertical wire management equipment. Locate racks with recommended clearances in front, back and sides. 9. Provide ladder style overhead cable tray wire management system. Position along all walls and extend over the top of both equipment racks. 10. Two dedicated [redacted] conduits shall be provided where underground access is from circuit provider (internal/External Carrier) i.e. Verizon, Lightpath, Cable Co., etc. These conduits shall not

Table 3-20-2 Facilities Communications Elements	
Element	**Requirements**
	follow the same path within the facility and leaving the facility. 11. The secured space shall be accessible at all times. The door shall be secured by EAC and available only to IT personnel. Doors shall be solid without glass openings and shall swing outwards. 12. No water, waste, or HVAC pipes shall be installed over the equipment space. 13. The space shall be equipped with a thermostatically controlled HVAC system. 14. A minimum of two dedicated [redacted] circuits shall be provided. If available, these circuits are required to be tied to the electrical backup systems (generator and UPS). 15. The space shall have uniform lighting and coordinate fixture layout with the equipment rack location and the overhead cable trays to ensure the fixtures are not obstructed. 16. The space shall have adequate lighting to meet the OSHA minimum illumination for mechanical and electrical equipment rooms as set forth in 1926.56(a) (10 foot-candles). A switch to control the lighting shall be located close to the entrance door. 17. The floor shall be static resistant with access to the building ground. 18. Three-fourths inch (¾") type-x plywood shall be provided on the walls for mounted equipment. Fire retardant plywood and finishes shall be used. Provisions shall be made for the termination of Telephone Company and Railroad access cables. 19. All installed and terminated copper (CAT 6 or better) or fiber cabling shall be CERTIFIED to meet or exceed EIA/TIA standards for the cable under test. 20. Where the IT Data Networks room is more than 90 meters (295 feet) from the communications room or outside the building, single mode fiber of OS2 or better shall be required (networks shall require fiber for riser/uplink to be 10G or better). In lieu of Dark fiber we would require a transparent, point to point Ethernet circuit, Jumbo Frames enabled, at least dedicated 10GBPS, (Preferred 40GBPS), from the head end to Hillside Data Centre and Jamaica Data Centre. 21. Coordinate with LIRR for the selection and installation of IT

Table 3-20-2 Facilities Communications Elements	
Element	**Requirements**
	network/switch gear.
D. Station Communications Cabling	1. Install all cabling required to facilitate the installation of all elements and end-devices for communications and IT equipment. 2. All cabling shall be installed, tested and terminated at end devices or patch panels installed in equipment racks. 3. All cabling shall be as required by the design and per LIRR design guidelines (where applicable) and per manufacturer's recommendations for each station element. 4. All network shielded copper cabling shall be Cat6.
E. Ticket Vending Machines (TVM)	1. Existing TVM's will be relocated to new platforms. Disconnecting, moving, storing and relocating the TVM's will be performed by others. 2. Existing TVM's shall remain operational and unobstructed at all times while station buildings and platforms are in service. 3. Submit an equipment location plan, showing all device locations, equipment, and pathway and cable routings for approval by LIRR. 4. Install pathways and cables for power and communications between the TVM's and the IT room. Terminate and test all cabling. 5. TVM integration in the communications room to be performed by others. 6. Coordinate with the Railroad for integration, testing and acceptance, and provide a fully functioning TVM System at all locations specified in the Contract Documents.
F. Parking Payment Systems	1. At parking facilities, including parking lots at stations and parking structures, install a real-time Parking Payment System from MacKay Systems and as described in the Contract Documents. 2. The system shall include MacKay Guardian MultiElite Pay-on-foot stations capable of Pay-by-Space and Pay-by-Cellphone. 3. Install all conduits and cabling required for a complete system, including power and communications, and coordinate with the design and construction of the parking facilities. 4. Install all pathways and cabling. Terminate and test all cabling. 5. Terminate and test all cabling. 6. Integrate the parking payment system to the LIRR MacKay Sentinal Central Management System (CMS). The existing

Table 3-20-2 Facilities Communications Elements	
Element	**Requirements**
	parking payment systems shall remain fully operational at all times. Coordinate and schedule with a minimum 2-week advance notice for all integration activities with LIRR.
G. Parking Guidance and Information System (PGI)	1. Provide a Parking Guidance and Information System (PGI) at all parking facilities specified in the Contract Documents. 2. The PGI shall consist of technology to count vehicles entering/exiting the facility or actively detect the number of occupied parking spots, and actively display to customers in real time if the lot is full or not. 3. Displays shall be visible from outside the entrance(s) to the facilities. Each vehicle entrance to the facility shall have a sign. 4. PGI systems shall be stand-alone at each facility with no central management system integrating all facilities, but shall have that capability of being integrated into a central PGI system. 5. Install all pathways and cabling. Terminate and test all cabling. 6. Provide all hardware, software and components for a fully functioning PGI system at each facility.
H. Audio Visual Paging System (AVPS)	1. Install AVPS at stations and parking facilities in accordance with LIRR Station Design Guidelines Chapter 7 - Communications, LIRR C-612 AVPS Back End Components and Installation Guidelines, and as detailed in the Contract Documents. 2. Existing AVPS Signs, PA, and other AVPS devices shall remain fully operational and unobstructed at all times while the station is in service. If a platform is taken out of service, the AVPS devices for that platform may be taken out of operation so as long as it does not impact service on any part of the station that remains in service. 3. Existing AVPS signs at each station will be replaced by LIRR. 4. Platform AVPS signs shall be double sided. 5. Provide single sided AVPS signs at TVM's and inside the station building. 6. At parking facilities, provide a single sided AVPS sign at all pedestrian throughways where customers exit the facility and walk to the station. PA component is not required at parking facilities 7. Install signs, brackets, hangers, pathways and cables for power and communications. AVPS inside the communications room to be furnished and installed by others. All cabling and pathways shall be installed with minimum 4' lengths of additional cable to allow installation by others. Conduits shall be terminated at locations of end devices to facilitate direct connections.

Table 3-20-2 Facilities Communications Elements	
Element	**Requirements**
	8. For the AVPS PA Component, the following shall apply: i. Install PA speakers on each platform. Existing PA speakers inside the station buildings are to remain and shall be integrated into the existing PA system. ii. Relocate existing PA system head-end into new communications rooms at each station. iii. Existing PA system shall remain operational at all times while station buildings and platforms are in service. Coordinate relocation of head-end and testing with LIRR. Relocate existing head-end equipment to communications room. iv. Install pathways and cables for power and communications between the end-devices and the communications room. v. Speaker locations, materials and installation shall adhere to the Station Design Guidelines, Chapter 7 – Communications, and as follows: a. Open platforms - every 30ft. b. Under Canopy - every 15ft. c. Two speaker zones per platform, alternating from speaker to speaker. d. Separate zone for waiting room. e. Speakers shall not be installed on light poles. f. For relocated or removed PA system devices, remove pathways and cabling that is no longer needed. g. For PA system devices being reused or relocated, store for future use. Dispose of conduit and cable at the direction of the Railroad. Devices not being reused or relocated shall be turned over to LIRR at the direction of the Railroad. 9. Install all pathways and cabling. Terminate and test all cabling. 10. Coordinate with Penta Corporation to integrate the station elements with the LIRR AVPS head-end through the backbone communications system. 11. Coordinate with the Railroad for integration, testing and acceptance, and provide a fully functioning AVPS at all locations

Table 3-20-2 Facilities Communications Elements

Element	Requirements
	specified in the Contract Documents.
I. Digital Interactive Signage	1. Provide digital interactive touchscreen displays (displays) at Carle Place, Merillon, Mineola, New Hyde Park and Westbury. 2. Displays shall be installed inside platform shelters, one inside each station building interior and one on each station building exterior as follows:

	Shelters	Interior	Exterior
Carle Place	3	0	0
Merillon	3	0	0
Mineola	4	1	2
New Hyde Park	3	1	1
Westbury	3	1	2

3. Touchscreen functionality may be integrated into the display panel, by overlay panel or other means.
4. [redacted]
5. Provide all conduits and cables for [redacted] power and communications for the displays. Power shall be from a panel in the communications room. Communications shall be from the communications room or closest access node or application access node, and shall interface into the station LAN. The Contractor is responsible for all conduits, cabling and interfaces (if necessary) to control the displays through the LAN. If interface hardware is necessary, it shall be installed inside the station communications room.
6. Displays shall be integrated into the shelter walls and building walls and coordinated with other signage and the architectural details of the stations.

Table 3-20-2 Facilities Communications Elements	
Element	**Requirements**
	7. Develop a test plan, configure and demonstrate all functionality of the displays through the station LAN. Integration of the displays with LIRR head-end shall be by others.
J. Telephone Boxes (T-Boxes)	1. Relocate existing T-Boxes at stations. 2. Install pathways and cabling. 3. Terminate and test all cabling. 4. Coordinate with the Railroad for integration, testing and acceptance, and provide fully functioning T-box system.
K. Access Nodes (AN), Application Nodes (AAN) and associated equipment	1. Install Access Nodes (ANs) and Application Access Nodes (AANs) on all platforms to create a platform/station LAN with PoE capability for connection of station CCTV and other station devices as applicable. Install a Back-Box (BB) for each AN and AAN. 2. Install an Access Node(s) as required to accommodate all communications and security equipment at parking facilities that do not have communications rooms. 3. Install an Access Node(s) as required to accommodate all communications and security equipment at parking facilities that do not have communications rooms. 4. All ANs and AANs shall include a wireless access point to provide free public wireless internet access for customers, and private wireless network access for railroad employees. 5. ANs, AANs, BBs and all other equipment required for a complete installation shall be from Boyce Technologies. All components, including power supplies, switches and wireless access points shall be integrated into the AN/AAN. 6. AN and AAN shall be structure or column mounted; no free standing or pedestal installation shall be permitted. 7. Install an AAN at the center of each platform. 8. Install two AN's per platform, one at each end of the platform, each being approximately 300' from the center AAN. 9. Install all pathways and cabling. Terminate and test all cabling. 10. Provide power to the ANs and AANs from a power distribution panel in the communications room. 11. Locate ANs and AANs to facilitate PoE communications and WiFi access to any point along the platforms. 12. Connect all ANs and AANs at the station in a ring configuration using a 36-strand single mode fiber (SMFO) cable, and terminate in the communications room FDP.

Table 3-20-2 Facilities Communications Elements	
Element	**Requirements**
	13. Configure the AN/AAN LAN to communication with the communications backbone as required to integrate station services and equipment utilizing the AN/AAN LAN. 14. Coordinate with the design of the communications network equipment in communications room to ensure the necessary fiber ports are available for integration. 15. Coordinate with the Railroad for integration, testing and acceptance, and provide fully functioning AN/AAN LAN.
L. Power for Facilities Communications	1. All communications elements at stations shall be powered through panels located in the communications room or IT room, consistent with the room in which the end devices or local control cabinet, panel, access node, etc. are terminated. 2. All communications elements at parking facilities shall be powered through the facilities power system. Where a communications room is provided, the power for communications elements shall adhere to the criteria of the communications room equipment as set out in the Contract Documents.

Table 3-20-2 Facilities Communications Elements	
Element	**Requirements**
M. Testing and Acceptance	1. Pursuant to this provision and provision 3.20.7, develop and submit test plans to LIRR for review and approval, including Factory Acceptance Test (FAT), On-Site Stand-Alone Installed Test (SAT) and System Integration Test (SIT). For individual systems: i. FAT shall be completed and approved for a system element before any field installation of that system element. ii. All components of a system element shall be field installed before SAT for that system element, including caballing installation and testing. iii. All system elements shall be SAT approved before SIT. 2. All testing shall include a full set of procedures documenting all materials and a complete step-by-step set of procedures that demonstrate all aspects of all elements the equipment under test throughout each stage of FAT, SAT and SIT, including all operational functionality of the all elements throughout each stage of testing. 3. All documentation and procedures shall be approved by LIRR before the start of any testing. 4. Coordinate installation of materials and witness of testing with LIRR, and submit all test results for approval before final acceptance by LIRR.
N. Digital Display Signs, WiFi and Interactive Signage	1. Field survey platforms and station building for the locations, quantities, communications and power, and coordinate with LIRR on the maintenance and protection of digital and interactive signage and Wi-Fi antennas if in existence on the platforms and inside the station buildings. . 2. Coordinate with LIRR on the requirements to install or relocate devices. 3. Maintain or install communications and power conduits cabling for all devices. 4. All devices shall remain fully operation on platforms and in the station building while in service.

3.20.7 Training

A. Develop and implement a comprehensive training program for Owner's personnel.

B. Design the curriculum so that each group is trained in the full repertoire of system functions and maintenance activities.

C. Schedule training no more than two weeks prior to use of equipment.

D. Include lectures, visual presentations, hands-on operation of equipment and any materials necessary to perform job. Provide each trainee with a complete set of training materials and operating manuals during training session, to be kept for use on job at completion of training.

E. Training categories:

1. Operation.
2. Configuration.
3. Maintenance.

3.20.8 Testing and Acceptance

A. Prepare and submit to the Railroad for Approval detailed testing procedures of all functions, including wires and cables, for all elements and systems installed under the Project.

B. In addition to FAT, SAT and SIT requirements, submit for approval a Test Program Plan detailing the overall approach, documentation, coordination and scheduling for completing the testing requirements.

C. All cables shall be tested as follows:

i. Fiber optic cables shall be tested using an OLTS and OTDR and include a reel test, installed segment test, and end-to-end test after all splices and terminations.

ii. Copper cables shall be tested end-to-end after all terminations.

D. Undertake testing using the approved test procedures. Provide the test results to the Railroad for approval.

E. Systems and devices to be relocated or turned over to LIRR shall be pre-tested by LIRR prior to the removal of the relevant equipment, conduits and cables. The Design-Builder shall coordinate activities and provide in the construction schedule minimum 2-week notice to the Railroad for the work required to remove equipment.

F. After the re-installation of any removed equipment that is to be re-used and after test results of relevant wires and cables have been approved by the Railroad, coordinate with the Railroad for testing and acceptance to ensure the systems are operational. Equipment or materials shall not be reused unless specifically directed by LIRR and with written authorization from LIRR.

3.20.9 Communications Design Submittals

A. Submittals to the Railroad pertaining to communications work shall, as applicable for the submittal, include details of the following items in addition to any other requirements for submittals specified elsewhere in the Contract Documents: voltage drop calculations for all cables; conduit fill calculations for all pathways; written installation plans; specifications of materials with product data sheets. Submitted drawings shall include: key plans; riser diagrams; interconnecting wiring details; grounding details; layout drawings (to scale)

showing all devices and equipment, pathway routings and components, junction box locations, communications and power cabling and cable terminations.

B. The Design-Builder shall submit the Communications Preliminary Design submittal for Review and Comment, at a minimum, the following items:

1. Preliminary facilities location plans (including foundations), one of each type of location.
2. Preliminary pathways plan, including poles, trough, messenger, conduit, pull box layout and cable installation details.
3. Preliminary calculations including voltage drop, messenger cable sag and tension calculations, pole loading, and conduit, tray and trough fill calculations.
4. Preliminary block and schematic diagrams for all communications elements
5. Preliminary staging, cutover and test procedures.
6. Catalog cuts for materials.

C. The Design-Builder shall submit the Signal and Train Control Intermediate Installation Design submittal for Review and Comment, at a minimum, the following items:

1. Intermediate facilities location plans (including foundations), one of each type of location.
2. Intermediate pathways plan, including poles, trough, messenger, conduit, pull box layout and cable installation details.
3. Intermediate calculations including voltage drop, messenger cable sag and tension calculations, pole loading, and conduit, tray and trough fill calculations.
4. Intermediate block and schematic diagrams for all communications elements.
5. Intermediate staging, cutover and test procedures.
6. Preliminary/Intermediate fiber strand allocation and splicing diagrams.

D. The Design-Builder shall submit the Signal and Train Control Final Installation Design submittal for Review and Approval, at a minimum, the following items:

1. Final facilities location plans (including foundations), one of each type of location.
2. Final pathways plan, including poles, trough, messenger, conduit, pull box layout and cable installation details.
3. Final calculations including voltage drop, messenger cable sag and tension calculations, pole loading, and conduit, tray and trough fill calculations.
4. Final block and schematic diagrams for all communications elements.
5. Final staging, cutover and test procedures.
6. Final fiber strand allocation and splicing diagrams.

3.20.10 Summary of Submittals

Item	Section	Submittal	Action
1.	3.20.9	Communications Preliminary Design	Review and Comment

Item	Section	Submittal	Action
2.	3.20.9	Communications Intermediate Design	Review and Comment
3.	3.20.9	Communications Final Design	Review and Approval
4.	3.20.4	Materials Cut Sheets	Review and Comment
5.	3.20.5	Plans for Temporary/Relocated Cables	Review and Comment
6.	3.20.6	Application Software Listings	Review and Comment
7.	3.20.6	Software Configuration Settings	Review and Comment
8.	3.20.6	Test Program Plan	Review and Approval
9.	3.20.6	On-Site Stand-Alone Test (SAT) Procedures	Review and Comment
10.	3.20.6	On-Site Stand-Alone Test SAT Results	Review and Comment
11.	3.20.6	System Integration Test (SIT) Procedures	Review and Comment
12.	3.20.6	System Integration Test SIT Results	Review and Approval
13.	3.20.7	Factory Acceptance Test (FAT) Procedures	Review and Approval
14.	3.20.7	Factory Acceptance Test (FAT) Results	Review and Comment
15.	3.20.7	Cable Reel Test Procedures	Review and Comment
16.	3.20.7	Cable Reel Test Results	Review and Comment
17.	3.20.7	Installed Cable Test Procedures	Review and Comment
18.	3.20.7	Installed Cable Test Results	Review and Comment
19.	3.20.7	Terminated Cable Test Procedures	Review and Comment
20.	3.20.7	Terminated Cable Test Results	Review and Comment

END

3.21 SECURITY SYSTEMS

3.21.1 Section Includes

This section sets out design and construction requirements related to security elements at locations specified in the Contract Documents. For additional design and installation requirements for security systems, refer to the following Sections:

A. TP1.20 and TP3.20 COMMUNICATIONS for Communications scope of work and performance criteria.

B. TP2.9 SYSTEM SAFETY for safety policy and strategy.

C. TP2.10 SYSTEM SECURITY for security policy and strategy.

3.21.2 Codes and Standards

Project Work shall comply with all statutory requirements, and shall comply with the following codes in addition to any such documents referenced throughout the document, where applicable:

A. 2016 New York State Uniform Building Code.

B. Electrical Code of the City of New York.

C. Building Code of the City of New York (BCCNY).

D. National Electrical Code (NEC).

And the relevant standards published by:

E. American Railway Engineering and Maintenance-of-way Association (AREMA) 1997.

F. National Fire Protection Association (NFPA) 72.

G. Alliance for Telecommunication Industry Solutions (ATIS).

H. American National Standards Institute (ANSI) S-56-434.

I. American Society for Testing and Materials (ASTM).

J. Electronics Industry Association (EIA).

K. Institute of Electrical and Electronic Engineers (IEEE).

L. National Committee for Information Technology Standards (NCITS).

M. National Electrical Contractors Association (NECA).

N. National Electrical Manufacturers Association (NEMA).

O. Occupational Safety and Health Administration (OSHA).

P. Underwriters Laboratories (UL) 2024.

3.21.3 Related Documents

The design and construction shall adhere to the following design guidelines and specifications, in addition to any such documents referenced throughout the document:

A. American Public Transit Association (APTA) Design Guidelines and Recommended Practices.

B. LIRR Station Design Guidelines.

C. Technical Specifications.

3.21.4 Design Requirements

A. The Design-Builder shall design, provide, construct or install (provide) all security system elements in accordance with the Contract Documents, including but not limited to the elements listed herein. The Design-Builder is responsible for all materials and activities required for a complete and fully operational security system furnished, installed and tested except where explicitly stated otherwise.

B. Take due account of the planned and ongoing third party contractors. Coordinate the design and implementation of the security work with the Railroad and the work of third party contractors.

C. For all activities requiring work to be performed by LIRR Force Account, the Design-Builder shall provide advance notice in accordance with TP3.1 GENERAL for review and mobilization, and shall be accounted for specifically as such within the Design-Builder's Schedule.

D. Before starting any security-related scheduling or physical work, perform detailed and comprehensive walk-through including inspection and survey of the existing pathways, cables and equipment to determine the location and extent of removals, installation and protection of existing elements.

E. It is the responsibility of the Design-Builder to furnish and install all components, equipment and materials, and perform all work and coordination (for work and materials specifically designated "by others") required for a fully functioning system, tested and accepted by LIRR.

F. All cabling shall be installed, tested and terminated at patch panels installed in equipment racks.

G. Security related elements shall be installed in either the Communication Room or IT Data Network Room. See TP3.20 COMMUNICATIONS for additional requirements pertaining to the Communications Room and IT Data Network Room. The communications and security equipment shall be installed at a location specified by LIRR.

H. All designs, materials means and methods shall be approved by LIRR. Submit for approval by LIRR all preliminary design drawings and material cut sheets prior to the start of work for respective items. Preliminary design drawings shall indicate all equipment locations, pathway and cable routings and conduit and cable type and size.

I. The LIRR "Obsolescence Clause" shall apply for all materials furnished and installed. The designs shall take into account technology obsolescence practices of the Railroad and other public entities at the time of installation of the new systems. All equipment installed by the Design-Builder shall be the most recently available technology

J. Label all equipment, cabinets and cables. All labels shall be adhesive type, using materials and ink rated for outdoor use and resistant to smudging, fading or wear due to UV light, moisture, heat/cold or humidity. All labelling conventions shall be approved by LIRR.

K. All materials and equipment used in the security work shall be furnished and installed new and Commercial Off-the-Shelf (COTS).

L. The design and implementation of the security work shall be planned and configured to protect existing equipment, cables and/or conduits that are not directly part of the Work.

M. Should conflicts arise between these criteria, codes, standards and guidelines, the more stringent shall apply. Final decision shall be at the discretion of LIRR.

N. Attention is drawn to the importance of integrating the security work with other disciplines undertaking parts of the Work, including in relation to the visual quality of the completed Work.

O. Submittals to the Railroad pertaining to security systems work shall, as applicable for the submittal, include details of the following items in addition any other requirements for submittals specified elsewhere in the Contract Documents: voltage drop calculations for all cables; conduit fill calculations for all pathways; written installation plans; specifications of materials with product data sheets. Submitted drawings shall include: key plans; riser diagrams; interconnecting wiring details; grounding details; layout drawings (to scale) showing all devices and equipment; pathway routings and components; junction box locations; communications and power cabling for security devices; and cable terminations.

3.21.5 Security Elements

The Design-Builder's scope of work for the elements of the security system is listed in Table 3-21-1.

Table 3-21-1 Performance Criteria for Security Elements

Element	Requirements
A. Pathways for security elements	1. Provide pathways between end devices and equipment cabinets, communications rooms, IT rooms and closets. 2. Submit drawings showing pathway routings in the preliminary, intermediate and final design submittals for approval by LIRR. 3. Pathways shall consist of conduits, conduit bodies, conduit sweeps, pull boxes, junction boxes, handholes and manholes. 4. All exposed conduits, conduit bodies and sweeps shall be RGS. Flexible liquid-tight conduit shall be permitted for final connections to end devices and shall not exceed 18" in length. 5. All pathways shall be installed using LIRR approved materials and fittings that prevent the penetration of liquids into the pathway system. 6. All pathways shall have 200% spare cable capacity. 7. Test all under platform cables and wires for hazardous materials. Abate all hazardous materials and relocate all cables to permanent protective enclosures (see Environmental section(s) of the Technical Provisions for additional information). 8. All cross track ducts shall be a minimum quantity of four 6" schedule 80 PVC, installed [redacted]" under bottom side of track ties. 9. All new conduits and pathways left unused shall have a pull tape installed. 10. All pathways shall be designed, arranged and installed so as to be as visually inconspicuous as possible, and follow installation routes that are parallel and/or perpendicular to the platform edge.

Table 3-21-1 Performance Criteria for Security Elements

Element	Requirements
	11. Conduit supports shall allow for 200% conduit expansion in the future. Access to these conduit supports shall be from the field side of platform, not track side.
B. Security Cabling	1. Install all cabling required to facilitate the installation of elements and end-devices as stated here-in. 2. All cabling shall be installed, tested and terminated at end devices, patch panels installed in equipment racks or terminal boards (TTBDs). 3. All cabling shall be as required by the design and per LIRR design guidelines (where applicable) and per manufacturer's recommendations for each station element.
C. CCTV System	1. Install a complete CCTV system at each station building and at platforms, parking lots, substations, parking structures and at grade crossings/underpasses/overpasses, consisting of fixed and PTZ cameras, domes and mounts, network video recorders (NVRs), pathways and cabling. Note: The existing LIRR security systems contractor is currently installing CCTV cameras and equipment at station buildings. The removal or decommissioning of any in-service CCTV systems that are incorporated into the station building communications room or IT room racks/panels must be done so by the current LIRR security systems contractor. They shall be given a two (2) week notice to remove or decommission their current systems. Additionally, they will need to be given (2) weeks to re-install if needed. This work shall be coordinated through LIRR and shall be accounted for in the Design-Builder's Schedule. 2. Follow Station Design Guidelines, Chapter 7 – Communications and Station Security for CCTV camera placement, field of views, survey, materials and camera specifications and system requirements, and as required herein. 3. Coordinate the design of the CCTV system with lighting design, and provide the locations of lighting with CCTV design. Provide a detailed analysis demonstrating that the CCTV locations have been coordinated with the lighting design. 4. Perform a detailed CCTV survey and provide results to LIRR for evaluation and approval. i. The survey shall include a video capture for all CCTV, with a still image for fixed cameras and a video through the range of motion for each PTZ CCTV. ii. All CCTV cameras shall be surveyed at the proposed height and angle of installation, with the correct lens type for each location. iii. No CCTV shall be installed without prior approval from

Table 3-21-1 Performance Criteria for Security Elements

Element	Requirements
	LIRR for location, camera type, housing and mounting. iv. Demonstrate that the intended CCTV views shall not be impacted (i.e. "washed out") by lighting levels. 5. As a basis for design, all CCTV shall be IP, high-definition (HD), pan-tilt-zoom (PTZ) with IP66 vandal proof domes. Coordinate with the Railroad for CCTV specifications and installation requirements to provide most current technologies at the time of procurement. 6. Terminate and test all cabling. 7. CCTV shall be PoE and be connected to the nearest platform Access Node or Application Access Node (See TP3.20 COMMUNICATIONS). 8. Coordinate with the Railroad for integration, testing and acceptance, and provide a fully functioning CCTV System. 9. The following criteria shall be met: i. Edge of platform rail side – 100% coverage with PTZ. ii. End of platform – 100% coverage in both directions with PTZ. iii. Edge of platform CCTV shall be spaced 300' max between ends of platform (150' max for each camera view). iv. Escalator – PTZ at top and bottom of each escalator. v. Stairwells – PTZ at top and bottom of each stairwell. vi. Elevators – Fixed 180^0 view inside elevator, and PTZ camera facing the elevator door. vii. Waiting Rooms – 360^0 camera in center with max view diameter of 40' (20' max spacing between 360^0), Minimum of two PTZ in opposite corners, or as needed for 100% coverage inside the waiting room. viii. Covered Stairwells/Pedestrian Ramps a. Back-to-back PTZ's at corners. b. 150' max spacing through long runs up to LIRR property. ix. At TVM's a. One 360^0 CCTV centered above machines. b. One PTZ behind. c. No CCTV shall be positioned to allow PIN capture. 10. Video Management System i. Install a Video Management System from Intralogic Solutions (ILS). ii. Install network video recorders (NVR's) from ILS at all stations and substations. iii. Install, configure and integrate all servers, iv. Coordinate all VMS requirements with LIRR at the time of

Table 3-21-1 Performance Criteria for Security Elements

Element	Requirements
	procurement. v. At stations, install all servers and hardware inside equipment racks inside the stations communications room. vi. At substations, install all servers and hardware in new racks inside the substation. vii. For parking lot and parking garage CCTV, integrate all CCTV with the VMS at the nearest station or substation. viii. All CCTV names and IP addresses to be furnished by LIRR and configured by the Design-Builder. ix. The VMS shall provide 150% server capacity for the following: a) 24-hour high res loop. b) 30-day low res loop. x. Install BRS Labs analytic software and integrate with the ILS VMS. 11. Grade Crossing/Overpass/Underpass CCTV i. Install CCTV cameras to provide surveillance at all grade crossings and overpasses/underpass bridges. ii. Minimum one PTZ camera on each side of the underpass/overpass, each providing 100% coverage of the overpass and supporting structure. iii. Install CCTV cameras to provide surveillance and license plate recognition (LPR) at all grade crossings to provide LPR of front and rear plate of all vehicles. iv. Grade crossing and overpass/underpass cameras shall be installed on a CCTV pole and at a height (minimum 15') and angle (< 40^0) in which to clearly obtain both the front and rear license plate of all vehicles and provide 100% of the grade crossing. 12. Parking Facility CCTV i. LIRR Owned Parking facilities: a) Provide 100% coverage with PTZ. b) Install cameras on CCTV poles or LIRR light poles. c) Maximum spacing between cameras shall be 100'. d) Install PTZ CCTV at each end of walkways. ii. Non-LIRR Owned Parking facilities: a) Install cameras at edges of LIRR property. b) Install cameras on CCTV poles or LIRR light poles. c) Maximum spacing between cameras shall be 100'. d) PTZ and each end of walkways on LIRR property. 13. Substation CCTV

Table 3-21-1 Performance Criteria for Security Elements

Element	Requirements
	i. Install one PTZ CCTV on each corner of all substations, one PTZ CCTV for viewing along the ROW, and one PTZ CCTV at each entry gate if applicable. ii. Install all pathways and cabling. iii. Integrate all substation CCTV with the VMS. 14. Coordinate with the Railroad for integration, testing and acceptance, and provide a fully functioning and fully integrated CCTV system.
D. Fire Alarm and Fire Protection System	1. Install conduits and cabling for all fire alarm and protection systems at substations, station buildings, rooms, closets and other areas as required by applicable codes and standards, LIRR guidelines and NFPA 70. 2. Fire Alarm System at Station Buildings shall be coordinated with the LIRR Fire Alarm Contractor. The Fire Alarms at all other facilities shall have to be provided by the Design-Builder. Note: The removal or decommissioning of any in-service fire alarm or protection devices that are incorporated into the station building fire alarm and protection system, including any end devices, fire alarm panels, conduit, cables, etc. that must be altered or removed, the existing LIRR security contractor must be informed (2) weeks in advance to make necessary alterations or removals. Additionally, they will need to be given (2) weeks to re-install if needed. This work shall be coordinated through LIRR and shall be accounted for in the Design-Builder's Schedule. 3. Coordinate the design of the fire alarm and protection system devices with the LIRR on-board fire alarm contractor and the work of other disciplines. 4. The alarms from all fire alarm and protection systems at stations and substations shall be integrated with LIRR JCC central fire alarm system using the LIRR communications backbone. 5. Install pathways for all fire alarm and protection system devices and cabling. 6. Communications for the fire suppression systems and fire alarm systems shall be networked over the communications backbone, and shall be coordinated with the Railroad and the Fire Alarm Contractor. 7. Coordinate with the Railroad for integration, testing and acceptance, and provide fully functioning fire alarm and protection system at all locations specified in the Contract Documents.

Table 3-21-1 Performance Criteria for Security Elements

Element	Requirements
E. Electronic Access Control (EAC)	1. Install a complete EAC system on each station platform, station building, at communications rooms and huts, IT rooms, and in each substation, parking garage, or other location as required by LIRR. Note: The existing LIRR security systems contractor is currently installing EAC at station buildings. The removal or decommissioning of any in-service EAC devices that are incorporated into the station building must be done so by the current LIRR security systems contractor. They shall be given a (2) week notice to remove or decommission their current systems. Additionally, they will need to be given (2) weeks to re-install if needed. This work shall be coordinated through LIRR and shall be accounted for in the Design-Builder's Schedule. 2. Follow Station Design Guidelines, Chapter 7 – Communications and Station Security for EAC device placement, materials and specifications, and as required herein. 3. The EAC system shall be Lenel. 4. Install an EAC control cabinet inside the communications room at each station. Note: EAC control cabinets shall not be installed inside substations. All EAC control cabinet locations shall require approval by the Railroad. 5. At parking garages, the Design-Builder shall submit the EAC control cabinet location to LIRR for review and approval. 6. All EAC devices shall be connected to the control cabinet. 7. Install all pathways and cabling. 8. Coordinate with the Railroad for integration, testing and acceptance, and provide fully functioning EAC system at all locations specified in the Contract Documents.
F. Help Point Intercoms (HPI) and associated supporting equipment	1. Install HPIs on all platforms and one pedestrian underpass. See TP3.12 STATIONS AND ARCHITECTURE for more information. Install a Back-Box (BB) for each HPI. 2. HPIs, BBs and all other equipment required for a complete installation of the HPI element, shall be from Boyce Technologies. 3. Install one HPI at the center of each platform. 4. Install two HPIs approximately at each end of the platform, each being approximately [redacted] from the center HPI. 5. Install all pathways and cabling. 6. AN and AAN shall be structure or column mounted; no free standing or pedestal installation shall be permitted. 7. All HPI shall be furnished with an approved LIRR logo.

Table 3-21-1 Performance Criteria for Security Elements

Element	Requirements
	8. Provide power to the HPIs from a power distribution panel the communications room. 9. Connect all HPIs to the nearest Access Node or Application Access Node (See TP3.20 COMMUNICATIONS). 10. Coordinate with the Railroad for integration, testing and acceptance, and provide fully functioning HPI system.
G. Power for Security	1. All security elements at stations shall be powered through panels located in the communications rooms or IT rooms, consistent with the room in which the end devices or local control cabinet, panel, access node, etc. are terminated. 2. All security elements at parking facilities shall be powered through that facilities power system. Where a communications room is provided, the power for security elements shall adhere to the criteria of the communications room equipment.
H. Testing and Acceptance	1. Pursuant to this Section and provision 3.21.7, develop and submit test plans to LIRR for review and comment, including Factory Acceptance Test (FAT), On-Site Stand-Alone Installed Test (SAT) and System Integration Test (SIT). For each individual system: i. FAT shall be completed and approved for a system element before any field installation of that system element. ii. All components of a system element shall be field installed before SAT for that system element, including caballing installation and testing. iii. All system elements shall be SAT approved before SIT. 2. All testing shall include a full set of procedures documenting all materials and a complete step-by-step set of procedures that demonstrate all aspects of all elements the equipment under test throughout each stage of FAT, SAT and SIT, including all operational functionality of the all elements throughout each stage of testing. 3. All documentation and procedures shall be approved by LIRR before the start of any testing. 4. Coordinate installation of materials and witness of testing with LIRR, and submit all test results for approval before final acceptance by LIRR.

3.21.6 Testing and Acceptance

A. Prepare and submit to the Railroad for approval detailed testing procedures to test each element, including wires and cables, for all systems installed under the Project.

B. In addition to FAT, SAT and SIT requirements, submit for approval a Test Program Plan detailing the overall approach, documentation, coordination and scheduling for completing the testing requirements.

C. Undertake testing using the approved test procedures. Provide the test results to the Railroad for Approval.

D. All cables shall be tested as follows:

   i. Fiber optic cables shall be tested using an OLTS and OTDR and include a reel test, installed segment test, and end-to-end test after all splices and terminations.

   ii. Copper cables shall be tested end-to-end after all terminations.

E. Note: systems and devices to be relocated or turned over to LIRR shall be pre-tested by LIRR prior to the removal of the relevant equipment, conduits and cables. Coordinate activities and provide in the construction schedule minimum 2-week notice to the Railroad for the work required to remove equipment.

F. After the re-installation of any removed equipment that is to be re-used and after test results of relevant wires and cables have been approved by the Railroad, coordinate with the Railroad for testing and acceptance to ensure the systems are operational. No equipment or materials shall be reused unless specifically stated otherwise by LIRR and without written authorization from LIRR.

3.21.7 Summary of Submittals

Item	Section	Submittals	Action
1.	3.21.4	Security Systems Preliminary Design	Review and Comment
2.	3.21.4	Security System Intermediate Design	Review and Comment
3.	3.21.4	Security System Final Design	Review and Approval
4.	3.21.4	Materials Cut Sheets	Review and Comment
5.	3.21.5	Software Configuration Settings	Review and Comment
6.	3.21.5	Application Software Listings	Review and Comment
7.	3.21.5	Factory Acceptance Test (FAT) Procedures	Review and Approval
8.	3.21.5	Factory Acceptance Test (FAT) Results	Review and Comment
9.	3.21.5	On-Site Stand-Alone Test (SAT) Procedures	Review and Approval
10.	3.21.5	On-Site Stand-Alone Test (SAT) Results	Review and Comment
11.	3.21.5	System Integration Test (SIT) Procedures	Review and Approval
12.	3.21.5	System Integration Test (SIT) Results	Review and Comment
13.	3.21.6	Test Program Plan	Review and Approval

END

MTA Capital Construction

CONTRACT #6240

DESIGN-BUILD SERVICES
FOR
LIRR EXPANSION PROJECT
FROM FLORAL PARK TO HICKSVILLE

CONFORMED DOCUMENTS

VOLUME 3
TECHNICAL PROVISIONS
PART 4 – OPERATIONAL READINESS

December 27, 2017

Part 4 – Operational Readiness Requirements

Table of Contents

END

4.1 PROJECT ELEMENTS AND ACCEPTANCE

4.1.1 Section Includes

This section describes the requirements relating to Project Elements, and conditions for acceptance of each Project Element by the Railroad.

4.1.2 Codes and Standards (Not Used)

4.1.3 Project Elements

A. Project Elements are those components of the Project that, when completed, can be tested, commissioned, accepted by the Railroad, and can be placed into service.

B. When the Design-Builder has completed the design and construction of a Project Element, has provided all work elements and products related to the Project Element (e.g., quality records, as-built drawings and record documents, warranties, and etc.), the Design-Builder may apply to the Railroad requesting that the Railroad accept the Project Element.

C. Once a Project Element is accepted by the Railroad, the Railroad will take ownership of the Project Element.

D. Within 30 days of LNTP, the Design-Builder shall submit a proposed list of Project Elements for Railroad Review and Approval. Examples of possible Project Elements include items such as:

1. A fully completed and commissioned undergrade crossing including all work elements associated with the undergrade crossing (i.e., drainage, utilities, roadworks, structural work, traffic signals, and etc.)
2. A fully completed station platform including all work elements associated with the platform (i.e., the structure, lighting, rooms associated with the platform, MEP and vertical conveyance systems, security cameras, and etc.)
3. A fully completed track section including all work associated elements (i.e., utilities, drainage, retaining walls, track, traction power, signals, and etc.)
4. A fully completed traction power substation, tested, commissioned, and available to be put into service.

4.1.4 Project Element Completion

A. In order to achieve completion and acceptance of a Project Element, the Design-Builder must have submitted all as-builts and required Record Documents, provided O&M Manuals and training, and provided certification issued by the Designer of Record that all work has been constructed in accordance with the requirements of the Contract Document and the Released For Construction Documents, and completed all Punch List work.

4.1.5 Summary of Submittals

Item	Section	Submittal	Action
1	4.1.3	Proposed List of Project Elements	Review and Approval

END

4.2 COMMISSIONING, ACCEPTANCE, AND MAINTENANCE PLAN (CAMP)

4.2.1 Section Includes

This section describes the Commissioning, Acceptance, and Maintenance Plan (CAMP) requirements.

4.2.2 Codes and Standards (Not Used)

4.2.3 Commissioning, Acceptance, and Maintenance Plan (CAMP)

A. Commissioning, Acceptance, and Maintenance Plan (CAMP) is a quality focused plan and begins with Design-Builder's Best Value Analysis and selection of materials, equipment and systems for the Project that will fulfill the Railroad's needs and provide a highly sustainable performance at a reasonable life-cycle cost (benefit/cost ratio) with respect to weighted value of customer/owners benefits and the Net Present Value of the initial capital cost, maintenance and operating cost, early component and unit replacement. See TP4.3 ASSET MANAGEMENT for more information on LIRR Asset Management and TP4.4 GIS RECORD DOCUMENTS for information related to GIS submittal requirements for LIRR Asset data.

4.2.4 Commissioning, Acceptance, and Maintenance Plan (CAMP) Requirements

A. The Design-Builder is responsible for development of the Commissioning, Acceptance, and Maintenance Plan (CAMP) for the Project as an integral part of the design development.
B. The Commissioning, Acceptance, and Maintenance Plan (CAMP) shall list by Construction Specifications Institute (CSI) Code those elements contained in the Design-Builder's specifications that lead up to the commissioning, acceptance and maintenance of the constructed elements including equipment and systems; mockup installations; Operation and Maintenance (O&M) Manuals; shop and/or field testing; manufacturer's start-up procedures; pre-functional and integrated checklists; training; spare parts; as-built drawings; software "source" codes; and warranties; as well as Manufacturer's Warranty Requirements outlined under Provision 4.2.4.
C. The Commissioning, Acceptance, and Maintenance Plan (CAMP) shall be progressed during the design development, as a part of Design-Builder's design submissions; shall be presented to the Railroad for review and the comment; and become part of Contract Documents for Construction. The Commissioning, Acceptance, and Maintenance Plan (CAMP) shall include Design-Builder's recommendations for any special Operating and Maintenance, Training, spare parts, warranty/service, mock-up installation, shop and field testing requirements considered critical to the sustainable performance and maintenance of the specified materials, equipment and systems.
D. Standard Operating and Maintenance Manual (O&M): Requirements shall be as noted in TP 2.29 OM MANUALS AND TRAINING and shall include as applicable; a detail system/equipment description; sequence of operations; as installed shop drawings, wiring diagrams, control diagrams and schematics, product submittals, manufacturer's start-up and checkout procedures, troubleshooting guide, and recommended spare parts. The O&M's will serve in part, as elements to be addressed during training sessions. Design-Builder's material and equipment specifications, as a minimum shall include Design-Builder supplying the Railroad with those spare parts required for the first year of operation including filters, belts, lamps, etc.
E. Training: For specialized equipment and systems, the Design-Builder shall, with Railroad input, determine to what extent, if any, training of Railroad operating and maintenance personnel may be required to effectively operate, and maintain the equipment and

systems. In such cases, as a minimum, the contents of the O&M Manuals are to be used as training material for classroom review along with any in-field instructions related the operating requirements. The specification and Commissioning, Acceptance, and Maintenance Plan (CAMP) shall identify the number of training sessions; day and/or night-time hours required and if training sessions are to be video recorded in digital format for Railroad future training of other employees.

F. Maintenance and Warranty Plan Development: The Design-Builder shall develop, as part of the design process, the requirements for a Maintenance and Warranty plan, which is part of Commissioning, Acceptance, and Maintenance Plan (CAMP), as described above. The following shall be considered with regard to warranties:

1. Standard Design-Builder's Warranty: For other non-critical materials, equipment and systems, warranties are to run concurrently with Design-Builder's standard warranty for guarantee workmanship for a period of one year after successful commissioning and Railroad written final acceptance of the operating system, assemblies, equipment, and processes. For others, Manufacturer's warranties shall supersede Design-Builder's standard warranty in scope and duration as recognized by the industry, effective from date of Railroad acceptance.
2. Modified Warranty Requirements: The Standard Design-Builder's Warranty can be extended or be subject to special requirements on a selective basis for individual equipment/system specifications. For example, warranty periods are typically extended for protective elements of facilities, special equipment, and critical systems. In addition to an extension, the Standard Design-Builder's Warranty may also be modified to account for the following:
    i. Specific response time for normal and emergency repairs.
    ii. Self-Help provisions for emergency repairs, or Design-Builder's non-response.
    iii. Post Beneficial Use 3rd Party Maintenance and Service Agreements.
    iv. Longer warranty period and earlier commencement dates.
    v. Failure Reporting, Analysis and Corrective Action System (FRACAS) requirements including Root-cause Analysis and Corrective Action.
3. Service and Maintenance Agreement for Select Systems: For HVAC, elevator and escalator systems and other critical elements, a one-year full service and maintenance agreement shall be required upon agreed beneficial use date of the equipment/system by the Railroad and include provisions for a one-year extension with an established unit price.

4.2.5 Design-Builder's Design Brief

A. Submitted prior to their 15% Design, submission shall include the identification of those specific materials, equipment and systems which represent opportunities for improved sustainable performance and reduced life-cycle cost to be considered by the Railroad. The Design-Builder shall avoid materials, equipment and systems that require frequent periodic maintenance, high-energy consumption, early component replacement, short life spans, or degraded appearance when exposed to harsh weather conditions. Whenever possible materials, equipment specified shall be of the "off the shelf" type.

4.2.6 Final Testing, Operation, and Maintenance Documents

A. During Construction and prior to Railroad's acceptance of the Project, the Design-Builder shall complete each column of the Commissioning, Acceptance, and Maintenance Plan (CAMP) and submit required verification (sign-off sheets, copies of deliverables, testing reports), spare parts, as-built drawings, Final Testing, Operation, Maintenance and Warranty Documents consisting of, at a minimum, the following deliverables neatly organized in binders and in electronic format compatible with the Railroad requirements for entry into Railroad Asset Management System, (for which the Railroad will provide with the standard templates)for subsequent maintenance and operation:

1. Final Testing and Acceptance Signoff Documentation.
2. O&M Manuals including Periodic Maintenance Plan, Trouble-Shooting, and Recommended Spare Parts.
3. Maintenance Training Documentation and Videotaped training session if conducted.
4. Verified Receipt of Specified Spare Parts.
5. Design-Builder's Contract Warranty.
6. Specific Manufacturers' Warranties/Guarantees with contact names and phone numbers.
7. As-Built Drawings.

4.2.7 Summary of Submittals

Item	Section	Submittal	Action
1.	4.2.4	CAMP Included in Design Package	Review and Comment
2.	4.2.5	Design-Builder's Design Brief	Review and Comment
3.	4.2.6	Final Testing, Operation, and Maintenance Documents	Review and Comment

END

4.3 ASSET MANAGEMENT

4.3.1 Section Includes

This section describes the LIRR Asset Management requirements and the submittals required for LIRR assets handover by the Design-Builder.

4.3.2 Codes and Standards

A. MTA- Asset Information Management Standard.

B. LIRR Digital Standards for GIS Data Submissions.

C. Asset Definition and Data Dictionary Document for LIRR Engineering Infrastructure Assets.

4.3.3 Asset Management

A. The purpose of this document is to specify the submission of asset management data associated with the commissioning and acceptance of new assets, in compliance with MTA and LIRR Enterprise Asset Management requirements and Asset Information Management Standard. These data specifications are critical to ensure that at the time of commissioning all asset management data and information related to the assets is being delivered as part of the Contract. See TP4.4 GIS RECORD DOCUMENTS for information related to GIS submittal requirements for LIRR Asset data.

4.3.4 Asset Management Requirements

A. The requirements in provision 4.3.4 apply for all assets being handover/commissioned as part of the Project, including structural, guideway, facilities, stations, traction power systems, signaling and train control systems, communication systems, non-revenue equipment. Table 4.3.1 includes a high-level grouping of asset categories for which this requirement applies. The level of granularity of the asset breakdown is included under each Asset specification template.

B. The Design-Builder is responsible for all labor, material and equipment necessary for the documentation and collection of the Asset information in the templates provided on this specification, for future incorporation into the LIRR Engineering Asset Information System.

C. The requirements in provision 4.3.4 apply for assets that will be incorporated into the Project and will require maintenance to ensure the delivered assets are in a state of good repair and have been maintained according to Original Equipment Manufacturers (OEM) and Contract requirements, until the time of handover.

D. The Design-Builder shall be responsible for collecting and providing asset data using the templates and electronic format provided by the Railroad for all applicable Contract assets within any of asset classifications depicted on Table 4.3.1. Incorporation of asset data into the LIRR Asset Management Information System will be performed by LIRR.

E. Classification/Grouping: The Design-Builder is responsible to group assets using the hierarchy relationships and attributes provided and establish the parent-child relationships. The Design-Builder shall provide attributes and locations associated with each asset as per template specification provided herein.

F. For assets that are a make-up of multiple sub-assets and when commissioned are delivered as a unit, the Design-Builder shall ensure that the sub-asset information is collected before parent asset is assembled.

G. General Asset Information: Provide information listed on Table 4.3.2 for all assets.

Table 4.3.1 ASSET CATEGORIZATION				
ASSET CATEGORY	**REF.**	**ASSET SUB-CATEGORY**	**ASSET SUB-CATEGORY BREAKDOWN (FOR VALIDATION)**	**GIS "LOWEST MAP-ABLE UNIT" (LMU)**
1.0 FACILITIES AND STATIONS	1.1	Passenger Stations	Building	Site & Station Building
			Plumbing	Child of building
			Electrical Systems	Child of building
			HVAC	Child of building
			Fire Protection	Child of building
			Elevators	Child of building
			Escalators	Child of building
			Public Address (PA) Systems (including Station PA System AVPS Backend, AVPS Head End, Yard PA Systems)	Child of building
			CCTV Systems: (Including, Cameras, Monitors, MSP, Recorders)	Child of building
			Security Systems	Child of building
			TVMs	Child of building
			Roads	Child of site
			Parking Lots	Parking Lot
			Sidewalk	Child of site
			Curbing	Child of site
	1.2	Administration Facilities	Building	Site & Facility Building(s)
			Plumbing	Child of building
			Electrical Systems	Child of building
			HVAC	Child of building
			Fire Protection	Child of building
			Elevators	Child of building
			Escalators	Child of building
			Public Address (PA) Systems	Child of building
			Security Systems	Child of building
			Roads	Child of site
			Parking Lots	Parking Lot
			Sidewalk	Child of site

Table 4.3.1 ASSET CATEGORIZATION

ASSET CATEGORY	REF.	ASSET SUB-CATEGORY	ASSET SUB-CATEGORY BREAKDOWN (FOR VALIDATION)	GIS "LOWEST MAP-ABLE UNIT" (LMU)
			Curbing	Child of site
	1.3	Maintenance Facilities	Building	Site & Maintenance Facility Building (Polygon and center point)
			Plumbing	Child of building
			Electrical Systems	Child of building
			HVAC	Child of building
			Fire Protection	Child of building
			Elevators	Child of building
			Escalators	Child of building
			Public Address (PA) Systems (Yard PA Systems)	Child of building
			Security Systems	Child of building
			Roads	Child of site
			Parking Lots	Parking Lot (Polygon & center point)
			Sidewalk	Child of site
			Curbing	Child of site
			Substation Buildings	Site & Building (s) (Polygon and center point)
			MG Buildings	Site & Buildings
2.0 STRUCTURES	2.1	Bridges & Viaducts	Bridges	Bridge (Polygon & Center point)
			Viaducts	Viaduct centerline (Linear)
	2.2	Tunnels	Tunnel Structure	Tunnel centerline (Linear)
			Ventilation systems	Ventilation Plant
			Electrical systems incl. back-up power, lighting, emergency generators	Child of tunnel
			Alarm systems	Child of tunnel
	2.3	Retaining Walls		Retaining wall
	2.4	Culverts		Culvert (point)
	2.5	Towers		Tower (point)
3.0 RAIL-FIXED GUIDEWAY	3.1	Switches	Stock Rail	Child of TO
			Turnout	Turnout (point at center line)
			Frog	Frog (point at frog point)

Table 4.3.1 ASSET CATEGORIZATION

ASSET CATEGORY	REF.	ASSET SUB-CATEGORY	ASSET SUB-CATEGORY BREAKDOWN (FOR VALIDATION)	GIS "LOWEST MAP-ABLE UNIT" (LMU)
			Guardrail	Child of frog
			Switch Point	Child of TO
			Snow Melter	Child of Switch Point
			Switch Machine Motor	Child of Switch Machine
			Switch Machine	Switch Machine (point at center)
			U5 Box	Child of Switch)
			Switch	Switch (Line from switch point to switch point)
	3.2	Insulated Joints & Rail Joints	Insulated Joints	Insulate joint (point at center of joint)
			Rail Joints	Rail Joint (Point at center of joint)
	3.3	Track	Track	Track Center Line (Linear)
			Running Rail	Child of Track
			Ties	Child of Track
			Fastening System	Child of Track
	3.4	Crossings	Crossings Structure	Crossing (Polygon and center point)
			Crossings Gates Mechanism	Mechanism (Points)
			AV Warning	Child of Gate Mechanism
			Event Recorders	Child of Gate Mechanism
4.0 NON-REVENUE EQUIPMENT - MOW EQUIPMENT	4.1	MOW Rail Bound Equipment	Tampers, Stabilizers, ballast regulators, Mechanize Tie Equipment, PES Equipment, Snow Removal Equipment	N/A
	4.2	MOW Heavy Equipment	Payloaders, Backhoes, Skid stear loaders, etc.	N/A
	4.3	MOW Rolling Stock	Gondolas, ballast hoppers, sidee dump cars, flat cars, conveyor cars	N/A
	4.4	MOW Small Engines		N/A
	4.5	MOW High Rail Equipment		N/A
	4.6	MOW Rail Lubricators		Lubricator (point)
5.0 SIGNALING AND TRAIN CONTROL	5.1	Traffic Signals	Signals	Signal (point)
	5.2	Enclosures & Enclosure Equipment	Enclosure	Enclosure (center point)
			Cables	Line from Enclosure to Enclosure. Other

Table 4.3.1 ASSET CATEGORIZATION

ASSET CATEGORY	REF.	ASSET SUB-CATEGORY	ASSET SUB-CATEGORY BREAKDOWN (FOR VALIDATION)	GIS "LOWEST MAP-ABLE UNIT" (LMU)
				cabling child of enclosure.
			Batteries	Child of enclosure
			Compressors	Child of enclosure
			Transformers	Child of enclosure
			Power supplies	Child of enclosure
			Supervisory and Vital Control Equipment	Child of enclosure
			Relays	Child of enclosure
	5.3	Microprocessors		Child of enclosure
	5.4	Supervisory and Vital Control Equipment		N/A
	5.5	Signal Cables		Line from Enclosure to Enclosure. Other cabling child of enclosure.
6.0 SIGNAL POWER GENERATION	6.1	Motor Generator Equipment	MG Motor	Child of MG Building
			MG Generator	Child of MG Building
			MG Motor Starter	Child of MG Building
			MG Transformers	Child of MG Building
			MG Breakers	Child of MG Building
			MG Relays	Child of MG Building
7.0 SIGNAL POWER DISTRIBUTION	7.1	High Tension Equipment	High Tension Cabling	Line from Location to Location
			E/O Disconnect Switches	E/O (Point)
			Manual Line Switches	Manual Switch (Point)
			HT Transformer	Transformer (Point)/ or child of pole
			Poles	Pole (Point)
8.0 TRACTION POWER GENERATION	8.1	Substation Equipment	AC HV Switchgear	Child of substation building
			Traction Power Transformer	Child of substation building
			DC Rectifier	Child of substation building
			DC Switchgear	Child of substation building
			Battery Sets & Chargers	Child of substation building
	8.2	SCADA		N/A
9.0 TRACTION POWER DISTRIBUTION	9.1	Traction Power Distribution/ Third Rail	Contact Rail	Third rail section (line from disconnect switch to disconnect

Table 4.3.1 ASSET CATEGORIZATION

ASSET CATEGORY	REF.	ASSET SUB-CATEGORY	ASSET SUB-CATEGORY BREAKDOWN (FOR VALIDATION)	GIS "LOWEST MAP-ABLE UNIT" (LMU)
		Equipment		switch)
			Protection Board	Child of contact rail
			Third Rail Manual Disconnect Switch	Disconnect switch (point)
			Third Rail Electrical Disconnect Switch	Disconnect switch (point)
			Cable 2000MCM	
			Cable 500MCM	
			Impedance Bonds	Impedance box (point)
			Reactors	Reactor (point)
10.0 COMMUNICATIONS	10.1	Radio	Radios	
			Base Stations	Base station (point)
			Consoles	
			Head End Penta Switch	
			Remote Satellite Receivers	
			Transmision Towers	Transmission Tower
			Test Equipment	
			Cabinet Combiners	
			Splitters	
			Radio Cable	
	10.2	Telephones	Wayside	Wayside (point)
			Digital	N/A
			Analogue	N/A
		Public Address Systems	Included on stations and maintenance facilities	Child of station building or Facility Building
	10.3	Network Components	Synchronous Optical Network (SONET) equipment	N/A
			Software	N/A
			Remote telemetry	N/A
			Electronic clocks	N/A
	10.4	Cable	Fiber optic and copper network	Line
	10.5	Fiber Optic Equipment	Fiber Optic Equipment	N/A
		CCTV Systems	Included on stations	Child of station building
	10.6	Outside Plant	Huts and Cases	Hut /Case (center point)
			Poles, Radio Poles	Pole (point)
	10.7	Signs	Signs	

Table 4.3.1 ASSET CATEGORIZATION				
ASSET CATEGORY	**REF.**	**ASSET SUB-CATEGORY**	**ASSET SUB-CATEGORY BREAKDOWN (FOR VALIDATION)**	**GIS "LOWEST MAP-ABLE UNIT" (LMU)**
		Alarms	Tunnel Alarms included in Tunnels , Elevator Alarms Included on elevators	
	10.8	Construction Equipment	Including Cable Trencher, Trailers, Stands, Digger, Skid Steer, Compressors, Chippers	N/A

Table 4.3.2 General Asset Information		
Attribute	**Data Type**	**Description**
Unique ID Number	NUMERIC	Uniquely identify the asset
GISOBJ-ID	NUMERIC	Join ID that connect asset with its respective GIS feature.
Name	ALN	Name of Asset
Parent Asset Unique ID	NUMERIC	Unique Identifier of Parent Asset
Parent Asset GIS ID	NUMERIC	GIS identifier of parent asset GIS feature. See TP4.4 GIS RECORD DOCUMENTS.
Description	ALN	Noun – Modifier – Attribute1 – Attribute2 - … Attribute n Example: (Bridge, Underpass, Box and Girder, 1054ft Span, 62ft Wide)
Equipment Nomenclature		The nomenclature assigned to asset and labelled on the front of the asset the time of installation. (Referred to Asset specification)
Location	ALN	Location of asset
Status	ALN	Status of Assets
Operational Status	ALN	Operational Status
Value	NUMERIC	Equals the actual purchase or construction price of the asset
Serial Number	ALN	Factory assigned serial number stamped on the faceplate.
Model	ALN	Model of Asset
Manufacturer	ALN	Asset Manufacturer.
Item number	ALN	This is an identifying number used in the RMS 201 database. Item numbers are not stamped on the asset but can be found in the signal prints. In situations where the item number in the signal prints does not match asset in the field, the relay must be identified based on its ohmic value, its manufacturer, or manufacturers part number and then matched to the correct item number in the RMS.
FTA Category		FTA designation for top level of asset classification
FTA Class		Breakdown of FTA category
Manufacture Date	DATE	Date asset was manufactured
Installation Date	DATE	Date asset was installed
Expected Life	NUMERIC	The anticipated duration for which the asset will be available for service

Table 4.3.2 General Asset Information		
Attribute	**Data Type**	**Description**
Physical Characteristics	ALN	Size may be expressed as a combination of multiple measures (for example height, width, length) or a single measure (gallon capacity)
Asset Condition Rating	NUMERIC	Overall Condition Rating based on rollup of condition assessments.
Management Responsibility	ALN	The organizational unit or third party business responsible for managing the asset.
Maintenance Responsibility	ALN	The organizational unit (Agency and Division) or third party business responsible for maintaining the asset
Ownership	ALN	The organizational unit (Agency and Division) that is the asset's owner. This designation may also refer to an external agency if the asset is owned by a non-MTA entity.
Rebuilt	Y/N	Was the asset rebuilt Yes/No (If applicable)
Date of last Rebuild	DATE	Date of last rebuild, if applicable.
Re-Manufacture	ALN	Company that re-manufactured asset. (If Applicable)
Age Today	NUMERIC	Age of asset at the current date.
Age End of Year	NUMERIC	Age of asset at the end of the year.
Linear Asset	Y/N	Is this asset a linear asset. (Refer to Linear Asset Requirements)
Criticality	ALN	How critical asset is to operations / impact to operations when inoperative.
Decommission Date	DATE	Date asset was decommissioned
Decommission Reason	ALN	Reason asset was decommissioned.
Inspection Due Date	DATE	Date next inspection is due.
Comments	ALN	Any addition information.

4.3.5 Asset Management Submittals

A. Upon completion of the design phase of the Project, the Design-Builder shall submit for review, a comprehensive list of asset being incorporated within the Project scope. Asset should be grouped and classified as per asset hierarchies included in TPA4.3A ASSET DEFINITION AND DATA DICTIONARY DOCUMENT.

B. Upon completion of project work, the Design-Builder shall collect and submit LIRR compliant Asset Information per each asset listed in Table 4.3.1, using the corresponding asset template specification reference provided by the Railroad.

C. All information shall be provided using the Microsoft Excel electronic templates to be provided.

D. Upon completion of project work, the Design-Builder shall submit complete documentation of maintenance activities.

E. The Design-Builder shall provide their internal QA/QC process for asset data capture and maintenance.

4.3.6 Linear Asset

A. Linear asset is an asset that has length, and in which length plays a critical role in its maintenance and required to be manage in dynamic segments. The attributes of a linear asset vary along its length and work on a linear asset is performed in segments.

4.3.7 Linear Asset Data Requirements

A. Main Track linear assets should contain a single track between two endpoints defined by block section or interlocking section and referenced to the following linear referencing methods:

1. Linear footage from a Zero-start (0 as westerly –most point of origin).
2. Mile Post (branch-specific).
3. Stationing (branch-specific).
4. Chaining (track-specific).

B. Runoffs, turnouts, crossovers, and side tracks will each be defined as individual assets for the entire length of the track and should not be included in the Main Track asset.

C. The Design-Builder shall define Yard track asset as each continuous track within the yard between crossovers using linear referencing for end points.

D. The Design-Builder shall identify the Track infrastructure components in the track hierarchy as sub-assets if they meet the identification criteria for assets, or otherwise represent as attributes and properties of the track asset.

E. The Design-Builder shall define each characteristic, property, or attribute separately within the boundaries of an asset using from/to boundaries, such as tangent track from location X to location Y, or wood ties from location A to location B, or powered from location C to D. Boundary locations are defined using linear referencing, such as milepost/offset.

4.3.8 Spare Parts or Replacement Parts

The Design-Builder shall identify for each asset, fixed or linear, any provided spare parts associated with each asset and provide the following information for each spare part: item, location where spare part is located, vendor information, part attributes and components.

4.3.9 Asset Warranties

A. The Design-Builder shall provide Vendor information, assets associated with the warranty, location of each asset, and warranty start and end date.

B. The Design-Builder shall provide warranties based upon either calendar periods, equipment usage, or both.

4.3.10 Asset Safety Requirements:

A. The Design-Builder shall provide safety data sheet (SDS), or product safety data sheet (PSDS) for all applicable assets as well as any additional required safety precautions for the use and handling of such asset.

B. The Design-Builder shall provide proof of compliance to FCC (Federal Communications Commission) and OSHA (Occupational Safety and Health Administration) safety standards for all applicable assets.

C. The Design-Builder shall provide Lock-out / Tag-out (LOTO) procedures that must be followed for a successful and safe isolation of equipment from its energy sources.

4.3.11 Preventive Maintenance (PM)

A. The Design-Builder shall provide preventive maintenance (PM) requirements and frequencies for all assets. Complete PM requirements shall be provided in the form of sequential work tasks and instructions detailing all work requirements to include, required equipment, work procedures, applicable safety requirements and any environmental hazards as well as waste disposal procedures. All required parts and special tools shall be identified as well as mandatory protective clothing. The Design-Builder shall provide and input the start date and frequencies for all required preventive maintenance tasks.

4.3.12 Data Submission

A. Templates provided by the Railroad shall be formatted with the Design-Builder's data. Instructions for entering required data are included. Templates will also be furnished electronically. The Design-Builder shall submit the data, both electronically (CD) and hard copy.

B. The Railroad will review the completed templates for accuracy, completeness, and consistency. Incomplete templates or templates not prepared in accordance with Contract Documents will be returned for correction.

C. The Design-Builder shall resubmit the revised templates for approval, within 10 Calendar Days.

D. LIRR Asset Information Management System Population: Approved templates will be uploaded into LIRR's Asset Information Management System by LIRR.

E. In the event uploading of data cannot be performed successfully, due to missing, incomplete or incorrect data, the Design-Builder shall perform revisions as required until database is successfully populated. All necessary revisions will be performed at no additional cost.

F. Quality Control and Quality Assurance (QA/ QC):
   1. The Design-Builder shall provide their internal QA/QC process for asset data capture and maintenance.
   2. The Design-Builder shall verify the accuracy and completeness of the submitted asset data and subjecting the data to internal quality control processes. Submittals containing asset data found to be inaccurate or incomplete per the LIRR EAM Standard will be returned for resubmittal with any necessary corrections made at the Design-Builder's expense.

4.3.13 Interim Maintenance

A. Upon completion of asset installation and testing, the Design-Builder shall perform periodic interim maintenance to all required assets as specified in the Contract Documents until such time as the assets are handed over to the LIRR.

B. The Design-Builder will be furnished maintenance work orders for all scheduled maintenance activities. Work orders will be provided by the Railroad at frequencies corresponding to the asset's maintenance schedule. Each work order will indicate the asset, location of the asset and scheduled maintenance activity for that asset.

C. Upon completion of the required maintenance service, the Design-Builder shall document maintenance activities on the work order. Data input required includes:

1. Services performed to each asset or system.
2. Parts consumed to include manufacturer, part number, make, and model.
3. Utilized spare parts (If any).
4. Special equipment required.
5. Tests performed and results.
6. Inspections performed and results.
7. Type and quantity of service fluids used.
8. Consumable parts utilized such as filters, belts, etc.
9. Adjustments and calibrations.
10. Assessment of operating condition.
11. Time of service.
12. Name of service person.

D. If unscheduled maintenance is required, the Design-Builder shall notify the Railroad immediately. Upon notification, the Railroad will provide a work order. The Design-Builder shall document work order as specified herein.

E. The Design-Builder shall submit the completed documentation of all maintenance activities within 24 hours of the work being completed to the Railroad.

F. All completed work orders will be reviewed and analyzed for compliance with Reliability.

4.3.14 Summary of Submittals

Item	Section	Submittal	Action
1.	4.3.5.A	List of Assets	Review and Comment
2.	4.3.5.B	LIRR Compliant Asset Information Using Final Data Template	Review and Approval
3.	4.3.5.D	Documentation of Maintenance Activities	Review and Approval
4.	4.3.5.E	Quality Assurance / Quality Control Review	Review and Comment

END

4.4 GIS RECORD DOCUMENTS

4.4.1 Section Includes

This section describes the requirements for submitting GIS data for LIRR assets.

4.4.2 Codes and Standards

A. Metadata Standard: FGDC Content Standards for Digital Geospatial Metadata.

4.4.3 GIS Record

A. The purpose of this document is to standardize digital submission of GIS data associated with asset commissioning and acceptance in compliance with the Enterprise Asset Management vision and enterprise geospatial policies of the Railroad. These data standards are a critical piece of asset management data and information, as they make it possible to access and maintain the GIS data throughout the life cycle of infrastructure assets. See TP4.3 ASSET MANAGEMENT for information on LIRR Asset Management.

B. The main goals of this document are to:

1. Provide the Design-Builder with clear guidelines, data standards and submission procedures on all “Lowest Map-able Unit” (LMU) GIS data related to LIRR infrastructure.
2. Provide examples (samples) of the submission of As-Built plans.
3. Ensure consistency of standards for all incoming Railroad asset data.
4. Provide a mechanism and process to validate the new incoming asset data.

4.4.4 GIS Data Specification

A. Lowest Map-able Unit (LMU) – is defined as the smallest feature that can be reliably mapped for the GIS data collection and visualization purpose. For example, a signal case is the LMU, while all the components within the case are represented as assets and have a parent child relationship.

B. Parent-Child Relationship – Based on the LMU, a parent-child relationship is managed by creating primary and foreign keys. The relationship could be 1-1 or 1-M between GIS features and non gis assets or between gis features. The parent GISOBJID will become the foreign key in the child asset.

C. The data specification addresses geospatial elements (i.e. points, lines, polygons, imagery) stored in GIS data files, as well as the attributes that describe these elements and any relevant metadata which describes the geographic and attribute data itself. This specification applies to all incoming infrastructure assets within the Railroad, including LMU as well as any associated child assets.

D. Upon completion of the design phase of the Project, if required, the Design-Builder shall submit for review a GIS design draft of the Project. This data must include all planned LIRR compliant GIS data for all newly installed, rebuilt, relocated, and demolished utilities.

E. Upon completion of project work, the Design-Builder shall collect and submit LIRR compliant GIS data for all newly installed, rebuilt, or demolished utilities.

F. Upon completion of the Project Work, the Design-Builder shall submit all required As-Built drawings (AutoCAD format) in compliance with this standard including spatially referenced geometry, attributes, and metadata.

4.4.5 GIS Data Submission Requirements

A. The acceptable file formats for GIS data files are:

1. Native ESRI format (e.g., Geodatabase, file Geodatabase).
2. Simplified ESRI format (e.g., SHP).
3. CAD format (e.g., DXF), etc.
4. Images (e.g., TIFF, JEPG).
5. 3D point cloud (.LAS).
6. Photos (geotagged).

B. File names of GIS data files must follow the naming convention listed in the Exhibit II.

C. The following standards are applicable to the Project which have a geospatial aspect associated but not limited to asset inventory. The deliverables of digital data must adhere to the following standards outlined in this document:
   1. GIS Features and Attributes: All assets must include some form of geographic location to incorporate into Railroad's location registry in accordance with Table 4.4.1.
   2. LIRR Datum and Coordinate System: The Design-Builder shall collect and submit the data using sub-foot accuracy and following coordinate system /datum should be used:
      a. NAD 1983 State Plane New York Long Island FIPS 3104 Feet (WKID: 2263). All GIS data should include the following coordinate systems.
   3. Horizontal Data Requirements:
      a. Projection: Lambert_Conformal_Conic
      b. False_Easting: 984250.000000
      c. False_Northing: 0.000000
      d. Central_Meridian: -74.000000
      e. Standard_Parallel_1: 40.666667
      f. Standard_Parallel_2: 41.033333
      g. Latitude_Of_Origin: 40.166667
      h. Linear Unit: Foot_US (0.304801)
      i. Geographic Coordinate System: GCS_North_American_1983
      j. Angular Unit: Degree (0.0174532925199433299)
      k. Prime Meridian: Greenwich (0.000000000000000000)
      l. Datum: D_North_American_1983
      m. Spheroid: GRS_1980
      n. Semimajor Axis: 6378137.000000000000000000
      o. Semiminor Axis: 6356752.314140356100000000
      p. Inverse Flattening: 298.257222101000020000
      q. Elevation and depth data are to be survey grade.
   4. Vertical Data Requirements:
      a. North American Vertical Datum of 1988 (NAVD88)
      b. For more information about NAVD 88, visit http://www.region2coastal.com/view-flood-maps-data/understanding-vertical-datums/

D. Metadata: All GIS data files must be associated with metadata information. The metadata for each of the dataset should follow the FGDC Metadata Implementation Specification. See Table 4.4.1 for the metadata information. For more information about FGDC

metadata, refer to Metadata Standard: FGDC Content Standards for Digital Geospatial Metadata.

E. Quality Assurance and Quality Control (QA/ QC):
   1. The Design-Builder shall provide their internal QA/QC process for GIS data capture and maintenance.
   2. The Design-Builder shall verify the accuracy and completeness of the submitted GIS data and subjecting the data to internal quality control processes. Submittals containing GIS data found to be spatially inaccurate or incomplete per the GIS Standard will be returned for resubmittal with any necessary corrections made at the Design-Builder's expense.
   3. All GIS data deliverables will undergo a Quality Assurance and Quality Control (QA/QC) within LIRR before acceptance of data. The accuracy and consistency of the GIS data should match with LIRRs GIS base maps.

F. Media and Delivery: All media must be labeled with the project details (project name, date of submission etc.). Data must be provided on standard transfer media or by electronic format.
   1. CD ROM (CD-R)/DVD-R.
   2. Compressed e-mail attachment (10MB size limit).
   3. FTP site. Please provide details.

Table 4.4.1 LIRR FGDC METADATA STANDARD

CATEGORY	ITEM	DESCRIPTION	EXAMPLES
Identification Confirmation	Name of data set	Standardized name of data set	LIRR_InsulatedJoints
	Subject or theme of data	Insulated Joints	
	Attributes and definitions	See IJ file layout in IJ layout worksheet	
	Spatial Data Maintained By	Name of organization (LIRR), department (PTC, Signals, Engineering, etc.)	LIRR, Signals
	Currency Date of Spatial Data	Date of last update to spatial data	2014-01-01T00:00 2014-01-01T00:00 2014-01-11T00:00
	Publication Date	Date published	
	Date of Last Reconciliation	Date of most recent spatial to assessment data reconciliation	
	Restrictions on Usage	Description of data sharing policy	Contact LIRR
	External files associated with data set	File name and location for any files required to interpret data	online link
Data Quality Information	Limitations	Insulated Joints are only for internal LIRR use	
	Positional Accuracy	(If available)	
	Data Completeness	Match rate of spatial data to attribute data [many-to-one, one-to-many, many-to-many	The data is 98% complete.

		issues]	
	Spatial QA/QC Contact	Name of individual responsible, with Address, Phone and/or email	
	Source Data Location	Source Location	LIRR
Spatial Data Organization	Spatial Data Model	Name of our data model once adopted	Vector or Raster data model
	Object Type	"Polygon"	
Spatial Reference	Coordinate System	Name of Coordinate System	NAD 1983 State Plane New York Long Island FIPS 3104 Feet
	Map Projection	Include all specifics necessary to identify projection	Transverse Mercator, Lambert
	Datum	Datum of Coordinate System	NAD83
	Units	Units of Coordinate System	feet
Distribution	Contact Information to acquire data	Contact name, phone, web site, etc.	
	Format	Describe data format	ESRI Geodatabase, Shapefile
	Media	Describe media	
	Online location	URL of site where Parcel data can be down-loaded	
	Price	Cost of Acquiring Data	$xxx per town per year; $yyy for entire county
Metadata Reference	Compiled By	Organization which prepared the metadata	
	Creation Date	Date of metadata	

Exhibit I

Feature Class: Refueling Stations

Type: Point

Attributes	Associated Domain	Data Type, Value	Description
GISOBJID		Integer (10)	Unique ID to link GIS and EAM or any other enterprise system
X-coordinate		Double	Point to the nearest foot, NAD 1983 State Plane New York Long Island FIPS 3104 Feet
Y-coordinate		Double	Point to the nearest foot, NAD 1983 State Plane New York Long Island FIPS 3104 Feet
Latitude		Double	WGS84 reference datum
Longitude		Double	WGS84 reference datum

Fuel_type		Text (25)	Fuel type
Location		Text (100)	Location description
Department		Text (100)	Responsible department

Exhibit II

Naming Convention

The naming convention uses the first 3 letters of the structure to associate the feature class with a valid name.
Non-Asset related features:

<Theme>_<Origin>_<name>
<Demography>_<NYC>_<CB2000>
DEM_NYC_CB2000

Asset related features:

<Theme>_<Origin>_<Systems>_<Category>_<Name>
<Infrastructure>_<LIRR>_<Guideway>_<Tracks>_<MilePost>
INF_LIRR_GUI_TRA_MILEPOST

4.4.6 Summary of Submittals

Item	Section	Submittal	Action
1.	4.4.4	Initial LIRR Complaint GIS data	Review and Comment
2.	4.4.4	As Built Drawings (AutoCAD format)	Review and Comment
3.	4.4.5	Provide QAQC process for GIS data	Review and Comment
4.	4.4.5	Final As Built LIRR Complaint GIS data	Review and Comment

END

4.5 TRAFFIC SIGNAL & ITS TEST PROGRAM

4.5.1 Section Includes

This section describes the testing and inspection procedures for the Traffic Signal Installations and Intelligent Transportation Systems.

4.5.2 Codes and Standards

NYSDOT Standard Specifications.

4.5.3 General

A. The Design-Builder's Designer of Record shall refer to the Traffic Signal Inspection Form (TE260), included in Appendix TPA4.5A, and complete it and sign off on prior to the acceptance of new signals.

B. The Inspection form contains the Installation Checklist for following components of the Traffic Signal:

1. Poles.
2. Pull Boxes.
3. Span Wire Assembly (including Signal Heads).
4. Controller Cabinet and Controller.
5. Disconnect Box and/or Meter Socket
6. Detectors.
7. Overhead Cables (Shielded/Interconnect).
8. Pedestrian Signals (including pushbuttons)
9. Conduits (including Risers).
10. Signs (Overhead).
11. Signs (Ground/Pole Mounted).
12. Miscellaneous.

4.5.4 Standard Specifications for Tests

A. The Design-Builder shall perform all required tests, and shall advise the Railroad so that the Railroad may witness all tests.

B. Testing equipment shall be supplied by the Design-Builder.

C. Prior to placing a signal in operation, the Design-Builder shall perform the following tests:

1. Continuity Test: Each circuit shall be tested for continuity.
2. Ground Test: All traffic signal grounding systems when completed in place shall have a resistance to ground of not more than that shown in the table below as determined in the following manner:

i. Temporarily connect a 10 ampere load between the AC + side of the equipment cabinet fuse and the ground system. It should be assured that the power company applied voltage is 120 volts AC at the time of the test.

ii. Disconnect the power company AC neutral from the ground system.

iii. Connect a voltmeter between the power company AC neutral and the ground system.

[redacted]

iv. If the voltmeter reading is higher than the appropriate voltage shown in the above table under the [redacted] ampere load, the grounding system has an unacceptable resistance to ground. Additional grounding, including electrical bonding of underground metallic conduit, may be necessary in order to meet the requirements of this test.

D. Insulation Resistance Test: An insulation resistance test at [redacted] shall be made on each circuit between the circuit and ground. The insulation resistance shall not be less than [redacted] on each circuit except that inductive loop detector circuits shall have an insulation resistance of not less than [redacted]. The insulation resistance test shall not be performed on magnetometer sensing elements. Splices in the pullbox adjacent to the magnetometer sensing elements shall not be made prior to performing an insulation resistance test on the lead-in conductors between the pullbox and the controller cabinet field terminals.

E. Functional Test. After satisfactory completion of all other tests, a functional test of the traffic signal control equipment shall be performed to demonstrate that every part of the signal system operates in accordance with the plans, specifications and to the satisfaction of the Railroad. The functional test for each signal system shall consist of not less than ten days of continuous satisfactory operation. If unsatisfactory performance of the system components is discovered during this time, the condition shall be corrected and the test repeated until ten days of continuous satisfactory operation is obtained.

F. Functional tests shall not begin on a Friday or on the day before a legal holiday. On the day the functional test begins, initial turn-on shall be made between the hours of 9:00 am and 2:00 pm unless otherwise ordered by the Engineer. Prior to turn-on all signal control equipment required for signal system shall be installed and ready for operation including pedestrian signal indications, pedestrian signs and push buttons, and vehicle detectors. All louvers, visors, and signal heads shall be directed to provide maximum visibility.

G. Temporary shut downs caused by power interruption or traffic accidents shall not constitute discontinuity of the functional test.

END

4.6 BASE CONTRACT WORK CLOSEOUT

4.6.1 Section Includes

This section describes the closeout requirements that apply to the completion and closeout of Base Contract Work in the event that the option for Completion Option Work is not exercised.

4.6.2 Codes and Standards (Not Used)

4.6.3 Base Completion Closeout

A. All elements of the work included in the Base Contract Work scope shall be completed.

B. All stations and associated facilities shall be ADA compliant.

C. All temporary works shall be removed from the site except as set out below, or as directed by the Railroad.

D. Develop a Demobilization Plan that identifies which work elements are complete, which are incomplete, and steps that need to be taken so that the site shall be safe and secure, including the installation of “temporary left in place work”.

4.6.4 Temporary Left In Place Work

A. Provide temporary platform extending from the permanent new platform to the active track:

1. Platform edge shall meet LIRR CE-1 Platform clearance requirements.
2. Temporary platform shall meet all the requirements set out in TP3.12.4.4.
3. Provide code compliant lighting levels at all platform surfaces.
4. Provide security camera coverage, to match the requirements for the permanent platforms.
5. Temporary and permanent platform surfaces shall meet ADA requirements.
6. Temporary platform shall be the full length of the permanent platform.
7. Temporary continuous guardrails, meeting code requirements, shall be provided at permanent and temporary platform ends to the limits of the train clearance envelope.
8. Attachment of any temporary elements to the permanent platform shall be easily removed without damage to the permanent platform.
9. The platform shall be constructed of durable materials so that the platform has a durable life of 5 years.

B. All security / safety fencing shall be inspected, and brought up to a state of good repair. Install new security / safety fencing in all areas where required to provide for a safe and secure operating environment, including areas which were planned to receive permanent security / safety fencing in the Completion Option Work scope.

4.6.5 Completed Construction Documents

A. Provide completed Construction Documents.

B. The completed Construction Documents to be included in Base Contract Work must consist of separate packages of Design Plans and Project Specifications for the construction included in the Completion Option Work. The Construction Documents for the Completion Work Option shall be developed in a form and format that will allow for their use in soliciting bids for the Completion Options Work and construction of the Completion Option Work by others and without further work or adjustments.

C. The Completion Option Work shall consist of all Work as currently defined in the Contract Documents that is not part of the Base Contract Work and the Parking Structure Option Work.

4.6.6 Summary of Submittals

Item	Section	Submittal	Action
1	4.6.3	Demobilization Plan	Review and Approval
2	4.6.5	Completed Construction Documents	Review and Approval

END