FIU-UniversityCity Prosperity Project - Pedestrian Bridge

Design Criteria

April 2015 Revision
(Rev 1: revised location of northern tower)

Prepared By:

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engineers | planners | scientists

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1 INTRODUCTION

This report documents the criteria for the analysis and design of the signature pedestrian bridge and access structures. The pedestrian bridge is a new crossing spanning over SW 8th Street. The design criteria in this report are a general guidance for the design of the architectural and structural elements.

1.1 Architectural Vision

Located on the west side of the intersection of SW 8th Street and 109th Avenue, the FIU pedestrian bridge will serve as a critical piece of infrastructure to allow safe student transit across one of the region's busiest highways (60,000 Annual Average Daily Traffic). While safety is of the utmost importance, providing the students and public at large with a bridge that will encourage and sustain its use is of equal value. Achieving a design that will promote its own use is inherently connected to how well it ties into the context of the site, how intriguing it appears from afar, the experience of using it and how the design survives the test of time. The structure is also an opportunity to be a landmark for the campus and serve as a gateway into western Miami-Dade County from the Florida Turnpike.

This structure should function as more than just a path for circulation; it should be a place to be and a place to be experienced, and the FIU campus and its students must be proud of it. It should be a destination in its own right where community members might linger, gather, and create an urban social space -- a linear park. We expect that the bridge might even be used as an event venue. For those reasons, it should be equipped with furniture, shading, protection from the elements, and state of the art safety features such as LED lighting, video surveillance and emergency call boxes.

This sense of satisfaction is intrinsically associated with the uniqueness of the bridge's geometry, materials, and space. A thorough study has been conducted that analyzed the practicality of multiple structural typologies including cable stayed, arched, stress ribbon, tensile nets, trusses, typical box girders, and various others. In the end it was been determined that a truss or a hybrid of sorts was the best typology for the site given the budget, site constraints, and desired aesthetic level. One of the major parameters governing the selection of a truss typology was the ability to seamlessly integrate the required 8 foot missile fence over the roadway into the structure and skin of the bridge. The missile fence should not stick out as its own discrete component but should contribute as a feature that is woven into the holistic design and as such function for the sake of providing shade, safety, reinforcement the geometry, and so forth.

Due to the rapid development of housing north of SW 8th Street an anticipated influx of students will rely on this pedestrian bridge as their primary means to cross over SW 8th Street. Based upon current volumes and known future developments, it is estimated that upwards of 8,000 students will utilize this structure daily within the next decade. In order to accommodate this level of traffic the bridge's useable width has been set at 20 feet minimum (up to 30' if possible) and the bottom of structure needs to maintain a minimum of 18ft clear over any roadway. Due to the roadway clearance and length of ramp necessary to satisfy ADA requirements it has been

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determined that the primary means of access onto the deck will be via staircases and elevators. The northern elevator tower and staircase shall be located northwest corner of the intersection south of the canal to avoid crossing over it. The southern departure is located on the southwest corner of the intersection north of the parking structure and east of the future multiuse building. In keeping with Ambulatory Care Clinic to the East and all the development eastward on US41 a minimum setback of 35 feet is required between the FIU north property line located from the south side of the existing sidewalk (back of sidewalk) for all bridge supports, the elevator tower, and staircase.

In comparison to the north point of departure, the southern point of departure has a much larger area that allows for the landscape and structure's design to synthesize as one comprehensive design. What occurs on the bridge in plan and section should directly affect the landscape plan and vice versa. The intended effect should entice users to congregate and occupy the space interdependent of those whose interests lie solely in the bridge as a means for circulation over SW 8th Street. With the exception of paths of circulation to gain access to the bridge and other relevant points of interest the landscape plan should incorporate minimal hardscape features and instead focus on softscape and native plant selections that require minimal maintenance. Existing stormwater detention capacity in the areas north of the parking garages must be maintained while providing increased capacity for bridge runoff and new hardscape/impervious surfaces.

1.2 Description of Bridge Requirements

The crossing is to be a single span bridge over the US41 right-of-way. The overall length is approximately 250 ft with supports located a minimum of 35'south of the back of sidewalk on SW 8th street on the south side and on SW 7th Terrace on the existing northern canal bank. A support pier may be located on the southern canal bank between US41 and the canal.

The bridge will carry pedestrian and bicycle traffic and shall provide a minimum of 20'-0" total clear walkway (selection committee may grant more credit for wider bridge widths), with access provided through a combination of elevators (single) and stairs. Ramps are prohibited. Refer to Appendix A for an exhibit of precedent for bridges of similar scale and quality that may exemplify the Owner's intent.

Upon contracting, the Design Builder shall prepare a conceptual aesthetic plan identifying the proposed aesthetic treatments to the bridge as part of the preliminary design stage. The plan shall be submitted to the OWNER for review and approval.

Following review and comment resolution of the conceptual aesthetics plan, the Design Builder shall prepare and submit a final aesthetics plan, addressing and/or incorporating OWNER's comments.

The Design Builder shall design and construct all functional and aesthetic elements to meet the following performance requirements:

- Provide at least one machine-room-less (MRL) traction passenger elevator (exterior-grade and weather-resistant) at the north and the south side of the new bridge. All elevator components shall be designed and rated for continuous use with a minimum 120 operations per hour. Elevator systems, components and finishes shall be designed for semi-protected outdoor use. Elevators shall have a 5,000 pound capacity and a minimum vertical speed of 150 feet per minute at rated capacity. Each elevator shall have a front and back entrance with two-speed or center-opening doors with a clear width of 4-feet

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six-inches that will allow passengers with bicycles to roll bikes out in a forward direction rather than backing out of the cab. This two-entrance configuration is expected to speed loading and unloading and also facilitate wheelchair movements. Elevators may also be used to carry golf-carts and maintenance lift equipment. Elevator cabs, doors and entrances shall have highly durable finishes such as Type 316 stainless that are textured where applicable for graffiti and vandal-resistance. Each elevator cab and hoistway shall have one or more transparent walls that allow effective visual surveillance of the elevator cab interior by passersby.

- Provide weather protecting glass enclosed elevator vestibule at each elevator entrance.
- Bike-tire channels on stairways or other innovative features to accommodate cyclists


- Provide woven or welded screen guards at bridge sides from top of walking surface to a height of no less than 8-feet as required by FDOT PPM Chapter 8 (missile protection). Chain-link fence guards will not be acceptable. Provide screen mesh guards fabricated into replaceable framed-panels with mesh and frames composed of Type 316 Stainless-Steel. Provide square weave size 4 mesh per inch with wire diameter of 0.0470 or 0.0630 inches, or square weave size 6 mesh per inch with wire diameter of 0.0350 inches, or square weave size 8 mesh per inch with wire diameter of 0.0280 inches.
- Provide complete NFPA 780-Approved Lightning Protection System for new bridge and bridge approach areas located more than 4 feet above prevailing grade.
- The bridge structure and enclosure and coverings shall be designed to minimize ledges and horizontal surfaces that might allow bird perching, roosting and nesting. Similarly, all pavilions and canopies in the project shall be designed and constructed to avoid bird perching, roosting and nesting.
- All new stairs and steps in the project shall have cast-in-place abrasive nosings width of stair/step less 4-inches with a minimum depth of 3-inches. The surface of the nosings shall provide good visual contrast with stairs and shall be designed to last the life of the project without replacement. (Example Babcock-Davis BSTCA-C3W) http://www.babcockdavis.com/ftpgetfile.php?id=1555
- All stair and step and ramp handrails and pedestrian guardrails and support elements shall be Type 304 or Type 316 Stainless-steel to eliminate painting and repainting requirements. Minimum height of 42 inches measured above top of walkway in accordance with FDOT Structures Design Guidelines **(herein referred to as SDG)** 6.8.2.
- Stairs and steps shall be provided with ample night-time illumination so that visually impaired users can better identify changes in level and transitions.
- Provide an empty conduit system with pull-strings for complete coverage video monitoring system with camera locations not further than 30-feet apart in locations higher than normally reachable. Conduit system shall include separate power and signal

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conduits. Provide "Blue-Light" Emergency Call stations at each end of bridge upper level and at three other locations within the project limits as directed by Owner. Final locations shall be coordinated with the Owner.

- Provide empty conduit system with pull-strings and boxes for future illuminated informational signage, WiFi and public address system at upper level of bridge with final locations coordinated with Owner.
- All lighting for the bridge and bridge stairs and approaches shall be exterior-grade weather-resistant, low-energy, with high-performance metal finishes and shall utilize Light Emitting Diodes as the source of illumination. Light fixtures shall be warranted against defects and abnormal deterioration for a minimum of 5-years. LED Components shall be warranted against failure or noticeable dimming for 5-years.
- Provide a 120-volt 20-ampre GFI duplex electrical receptacle at a maximum spacing of 40-feet along upper level of bridge to facilitate maintenance and provide electrical service for special activities.
- Provide a domestic water hose-bib at each end of upper level of bridge to facilitate maintenance and provide water for special activities.

Additional Features that could be considered by Selection Committee members as "value added", but not a requirement of the Design include:

- Provisions in the design that allow for future installation of an up and a down escalator at the south side of the bridge or that allow for extensions of the bridge for connections to a future building or to an elevated walkway system leading to the FIU parking garages.
- Solar-powered bridge lighting and decorative multi-colored bridge lighting features.
- Innovative reduced-maintenance, storm water management and energy-saving features.
- Incorporation of planters for small flowering plants and shrubs with rainwater/drip irrigation system at bridge upper level.
- Rain and/or sun-protection for all or part of the upper level of bridge and the approaches.
- Bridge usable width at least 20-percent greater than minimum.
- Design features that enhance the user experience and encourage greater use of the bridge.
- Features that provide an educational component about the bridge or its setting or the surrounding environment – for example a weather station and/or a display about the Historic Sweetwater Bridge or the creation of the Tamiami Trail.

The selection criteria will be weighed heavily towards an innovative design that represents the intentions of this project, creating a distinctive landmark for the region. See Conceptual Plans for general plan layout of bridge.

1.3 General Structural Requirements

Design and construct all new structural components that meet the following requirements:

- The service life of the structure shall be 75 years except as outlined in the following table for replaceable components.

Table 1.2-1 Minimum Service Life for Components

Non-Replaceable Components	Minimum Service Life (Years)

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Towers, piles, shafts, pile caps, piers, pier caps, deck, and superstructure	75
Replaceable Components	**Minimum Service Life (Years)**
Bridge Bearings	50
Coatings	20
Railings/Fencing	25
Expansion Joints	25
Other proposed components	As agreed to during final design

- Accommodate a mixed use walkway with a minimum clear width of (20') feet from inside rail to inside rail.
- Provide access to the bridge using a combination of stairs and elevators at both ends of the bridge.
- Bridge and access structures shall meet the requirements of ADA.

2 SPECIFICATIONS AND REFERENCES

All work shall conform to current versions of the following documents. The lists below are in order of precedence.

2.1 FDOT References

- Standard Specifications for Road and Bridge Construction (Specifications)
- Structures Manual (SDG)
- Plans Preparation Manual (PPM)

2.2 AASHTO Specifications

- LRFD Guide Specification for the Design of Pedestrian Bridges
- AASHTO LRFD Bridge Design Specifications (LRFD)
- AASHTO/AWS D1.5M/D1.5:2002 Bridge Welding Code
- AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals
- AASHTO Guide Design Specifications for Bridge Temporary Works

2.3 FHWA References

- FHWA-NHI-05-046, Earth Retaining Structures.
- FHWA-HI-99-007, Rock Slopes.
- FHWA-NHI-01-023, Shallow Foundations.
- FHWA-IF-99-025 Drilled Shafts: Construction Procedures and Design Methods Manual, 1999.

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2.4 Building Codes

Structural elements for stairs, elevators, and ramps shall be designed in accordance with the following references. References listed below are in order of precedence.

- Florida Building Code
- International Building Code
- Building Code Requirements for Structural Concrete ACI 318
- Specifications for Structural Steel Buildings AISC 360
- Minimum Design Loads for Buildings and Other Structures, ASCE 7
- Florida International University General Terms and Conditions, Division 1 Specifications and FIU Building Standards as published on the website located here: http://facilities.fiu.edu/formsandstandards.htm

2.5 Accessibility Codes

- 2006 Standards for Transportation Facilities (ADA)
- 2010 Standards for Accessible Design

3 GEOMETRIC LAYOUT AND CLEARANCE REQUIREMENTS

3.1 Unit and Dimensions

English units are used in this project. All dimensions are measured horizontally and vertically at 70°F, unless otherwise noted.

3.2 Datum

Elevations are based on the National Geodetic Vertical Datum of 1929 (NGVD29).

3.3 Roadway Clearance

The completed bridge shall provide a minimum vertical clearance over the roadway of 17’-6” per PPM, Volume 1, Table 2.10.1.

3.4 Horizontal and Vertical Alignment

See Conceptual Plans in Appendix for geometrics of the bridge.

4 DESIGN LOADINGS

The bridge shall be designed in accordance with AASHTO LRFD requirements and load combinations, unless otherwise noted.

4.1 Dead Loads

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Dead loads of structural components shall be based on unit weights of materials and the computed volumes of the structural elements. Unit weights shall be in accordance with SDG Table 2.2-1.

4.2 Additional Dead Loads

Additional dead loads shall consist of the following

- 6.25 pounds per square foot (psf) for initial concrete overlay
- Pedestrian railing and fencing
- Bridge lighting (use actual weights and location when known)

4.3 Live Load

The bridge shall be designed for pedestrian loading of 90 psf in accordance with Section 3.1 of AASHTO Guide Specifications for Design of Pedestrian Bridges.

4.4 Vibrations

Vibrations shall be investigated in accordance with Section 6 of AASHTO Guide Specifications for Design of Pedestrian Bridges.

4.5 Fatigue

Fatigue loading shall be in accordance with Section 3.5 of AASHTO Guide Specifications for Design of Pedestrian Bridges.

4.6 Wind Loads

Wind loads shall be determined in accordance with SDG Section 2.4. The Basic Wind Speed is 150 mph per Table 2.4.1-2

4.7 Thermal Loads

Thermal forces shall be applied in general accordance with Section 2.7 of the SDG. The mean temperature of the superstructure shall be assumed to be 70°F with a rise or fall in accordance with Table 2.7.1-1.

4.8 Earthquake Effects

Earthquake effects shall be considered in the design in accordance with Section 2.3 of the SDG.

4.9 Vehicular Collision Loads

Structures shall be designed according to SDG Section 2.6 and LRFD Section 3.6.5.

4.10 Construction Loads

The design shall include consideration of all actual construction loads based on erection method and construction equipment to be supported by the structure. At a minimum, the bridge shall be

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designed for a construction live load of 20 psf applied to the walking surface. Wind loads during construction shall be considered in accordance with Section 2.4.3 of the SDG.

4.11 Load Factors and Combinations

Load factors and load combinations shown in the AASHTO LRFD Table 3.4.1-1 & 3.4.1-2 should be used with the following modifications:

• For Extreme Event I, γ_{EQ} for live load shall be taken as 0.0 per SDG Section 2.1.1.

• The load factor for wind pressure of structures, γ_{WS}, shall be modified per SDG Table 2.4.1-1.

4.12 Redundancy and Operational Importance

The operational importance factor shall be 1.00 for all limit states. Redundancy factors shall be determined in accordance with SDG Section 2.10.

5 GENERAL CRITERIA

5.1 Plan Organization and Structures Submittals

In addition to the requirements of the standards listed in the Contract, provide structure design plans that comply with the following:

- Provide structure design plans that include all design details necessary to construct the structure. This includes, but is not limited to, conduit, inserts and attachments, the location of lighting fixtures attached to the structure, railing and aesthetic treatments. For structures where design details are developed and provided by a supplier (such as prefabricated stairs), include the supplier's design drawings as part of the final structure plan set.
- Supplier-detailed drawings that are included in the final plan set may use the supplier's border and title block.
- Situation and Layout (S&L) plan sheets shall be provided for the bridge and access structures.
- For a structure moved into its final location, provide placement tolerances along the X, Y, and Z axis on the Situation and Layout plan sheet for the structure placement.
- Separate the structure plan sheets from all other discipline sheets in the plan set.
- Include in the bridge plan set a soil boring location plan and the soil boring logs used in the geotechnical design of the bridge.
- Place as-constructed quantities on the first sheet of the Structure Situation and Layout for End-of-Project submittals.
- Provide as-constructed locations on the Situation and Layout sheets for a structure moved into its final location.

5.2 Geotechnical Reports

At a minimum, geotechnical investigations shall include a soil boring at each proposed

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bridge support location.

5.3 Vibrations and Monitoring

Protection of existing structures shall be conducted in general accordance with the Specifications Section 455-1.1 and as described herein. The Design Builder shall accept responsibility for any and all vibration-related damages associated with Project Work to existing structures, utilities, or other facilities located in the vicinity of construction-related activities. Where vibration-inducing construction activities are to be performed in the vicinity of existing structures, utilities, or other infrastructures, develop and implement a program to conduct preconstruction surveys and to monitor and control vibrations as follows:

- Conduct site reconnaissance of adjacent properties during site investigations to determine the sensitivity of each adjacent structure to vibrations.
- Report to the OWNER all identified site-specific properties that may be adversely affected by vibrations.
- Conduct preconstruction survey of each structure determined to be susceptible to vibrations.
- Provide OWNER with recommendations to mitigate adverse affects by vibrations.

5.4 Environmental Classification

Superstructure and substructure elements shall be considered exposed to Moderately Aggressive environmental conditions. This classification shall be used when determining design related items such as, but not limited to, concrete cover, concrete class requirements, and admixtures.

5.5 Structural Analysis

Structural analysis of the bridge and foundations shall adequately consider all significant geometric and material nonlinearities of the structural system. Significant time dependent effects from creep and shrinkage of concrete should be considered in the design.

5.6 Deflection Limits

The maximum allowable live load deflection at center of the main span should be Span/500 per SDG Section 10.4. Additionally, the deflection of cantilever arms due to service pedestrian live load shall be limited to Cantilever Length/300.

The horizontal deflection due to lateral wind load shall be limited to Span/500.

5.7 Steel Structures

Steel elements shall be designed in general accordance with SDG Section 5.0.

Steel girders and floor beams will be designed to act compositely with the deck.

All structural steel components designed as fracture critical shall meet the notch toughness requirements.

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5.8 Reinforced Concrete Structures

Superstructure concrete shall be designed in general accordance with SDG Section 4.0.

The Modulus of Elasticity for concrete shall be computed in accordance with SDG Section 1.4.1.

The minimum clear concrete cover shall be in accordance with SDG Section 1.4.2.

The overlay shall not be considered for the composite action.

The capacity due to stay-in-place forms shall be disregarded.

5.9 Deck Systems

The bridge superstructure should be primarily structural steel with concrete walking surface. The design should avoid use of non-redundant, fracture critical members. The following deck systems are acceptable by the OWNER:

A. Full-Depth Precast Concrete Deck Panels:
   - Provide a minimum thickness of 6 ¾" (including a grinding allowance of ¼"; hence a final minimum thickness of not less than 6 ½"), full depth precast concrete deck panels.
   - Provide 2 ¾" clear cover for top mat of reinforcing steel (before grinding).
   - Provide 2" clear cover for bottom mat of reinforcing steel.
   - Provide a minimum design haunch of 2".
   - Provide longitudinal post-tensioning of precast panels.

B. Cast-in-Place Deck Slabs:
   - Provide 6" minimum deck thickness.
   - Provide 2 ½" clear cover for top mat of reinforcing steel.
   - Provide 2" clear cover for bottom mat of reinforcing steel.
   - Provide a minimum design haunch of 2".

C. Other deck systems are subject to approval.

No expansion joints shall be allowed on the structure, except at the ends of the bridge. Design of expansion joints shall be per SDG 6.4. Tabulate the movement rating for each joint and the appropriate gap dimensions for anticipated temperatures at the time of installation. In the design and location of joints, provide for maintenance accessibility and future replacement.

Make all bridge superstructures, enclosed compartments, and bearings accessible for long-term inspection by direct viewing.

5.10 Foundations

All foundation elements shall be constructed in general accordance with the Specifications Section 455 as applicable.

Drilled shafts and piles shall be load tested in accordance with the Specifications Section 455-2.

- Foundations supporting the bridge structure shall be comprised of drilled shafts.

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Drilled shafts shall be designed in accordance with the requirements of SDG Section 3.6. Shafts with diameters exceeding 6 feet shall require a Technical Special Provision in accordance with SDG Section 1.4.4.

The following requirements will apply for drilled shafts:

All drilled shafts shall be furnished and installed in general accordance with the Specifications Section 455 Part C.

The drilled shaft contractor(s) must have five (5) years demonstrated experience with the construction method(s) to be used and experience using them in soil conditions similar to those at the site.

Construction of bridge foundation drilled shafts will use either permanent or temporary casing of the entire shaft excavation, or use slurry (wet) method construction, or a combination or casing and slurry construction. If slurry construction is used, sonic callipering will be required for each shaft.

The Design Build Firm's geotechnical engineer or geotechnical engineer's authorized representative must be on-site during the construction of the first bridge foundation shaft at each support foundation including drilling, cage installation, and placing concrete.

Non-destructive testing (e.g., cross-hole sonic logging, gamma-gamma logging, and low-strain dynamic testing) will be used on each bridge foundation shaft to verify integrity of completed shafts.

Evaluate the laterally-loaded response of piles and drilled shafts under dead, live, and seismic loadings consistent with the type of structure and pile, required service life, and consequences of unacceptable movements on the structure's performance.

Steel casing of drilled shaft shall not be considered as a structural member. Side friction shall not be considered in the capacity of the drilled shaft except approved by the geotechnical engineer. The drilled shaft shall be detailed to accommodate a construction tolerance on the location of the shaft of 3 inches.

At a minimum, all drilled shafts shall meet the construction tolerance per Specifications Section 455-20. Additionally, for each shaft, submit to the OWNER for review and approval the geotechnical engineer's acceptance justification and complete shaft construction and non-destructive testing records and tolerance measurements. Obtain written sign-off of the drilled shafts from the OWNER or OWNER's CEI Consultant.

- Foundations supporting access structure elements may be spread footings or piles. All spread footings, if used, shall be furnished and installed in general accordance with the Specifications Section 455 Part D. Design and construction of spread footings shall be per the recommendations of the Design Builder's geotechnical engineer.
- If driven piles are used, the following requirements will apply:

All piles shall be furnished and installed in general accordance with the Specifications Section 455 Part B.

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The pile hammer shall be confirmed by a Wave Equation Analysis of Pile Driving (WEAP) prior to installation of the piles. The Design Builder's geotechnical design engineer is responsible for providing the required Pile Dynamic Analyzer (PDA) services and Case Pile Wave Analysis Program (CAPWAP) analyses and inspectors' chart during construction of the pile foundations. A minimum of two test piles requiring pile dynamic tests shall be installed in accordance with the Specifications Section 455-5.12. One test pile shall be on the south end of the bridge, and one on the north end. Inspector's charts, PDA, and CAPWAP reports of the test piles shall be submitted to the OWNER for approval prior to driving production piles.

The minimum pile embedment shall be at least 10 feet below the point of fixity and adequate for axial and lateral loading. The OWNER will allow the Design Builder to modify the driving criteria based on field performance, but will require specified submittals before allowing pile driving to be stopped at a higher tip elevation than that shown on the accepted foundation design plans.

Notify the geotechnical engineer immediately if any unusual or otherwise unanticipated pile driving condition is encountered (including if the piles are driven substantially out of the specified tolerances).

Acceptance of Piles - At a minimum, the allowable driving tolerances per the Specifications Section 455-5.15 shall be met. Prior to beginning the placement of pile cap around the piles and/or prior to beginning any backfilling around the piles:

A. Submit for OWNER's review and approval the complete pile data sheet with all tolerance measurements for all piles in each pile group.

B. Obtain written sign-off of the driven piles from OWNER.

5.11 **Scour**

For foundations and retaining wall adjacent to the canal, the design scour depth shall be considered under 100 year and 500 year flood event using the procedure described in HEC 18.

In addition, the construction sequence shall minimize obstruction to the natural flow of the Tamiami Canal. The DBF shall ensure that, at the end of construction, the hydraulic section of the channel is equivalent to the original hydraulic section prior to any construction activities.

5.12 **Aerodynamic Evaluation**

For non-conventional bridge types, aerodynamic analysis shall be considered and evaluated as required.

5.13 **Lighting**

Aesthetic lighting of the structural elements, and underside of the bridge should be considered in the design. The lighting requirements for the walkway will be in accordance with ANSI/IESNA RP-8-00, American National Standard Practice for Roadway Lighting. From RP-8-00 Table 5 the recommended illuminance values are as follows:

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- Average Horizontal Illuminance at bridge walkway is 10.0 lux/1.0 fc
- Minimum Vertical illuminance at 1.5m (4.9 ft.) above bridge walkway measured in both directions parallel to the main pedestrian flow is 5.0/0.5
- Uniformity Ratio Eavg/Emin (Horizontal only) is 4.0

5.14 **Drainage**

Water within the bridge/walkway/bike path shall be collected and conveyed south to the Maidique Campus. Runoff shall be discharged to a self-contained drainage system (ie. exfiltration trench) or if possible, the existing drainage located south of the bridge site. Overflow scuppers shall be provided on bridge.

Visibility of all bridge drainage conveyance systems shall be minimized as much as possible. The conveyance systems (piping) shall not be embedded in the piers, but run on the exterior and be aesthetically integrated with the piers. The conveyance system downspouts may however be integrated with the elevator/stair towers if possible. The conveyance system must be painted in accordance with Section 22.3.1.E of the FDOT SDM.

5.15 **Utilities**

Existing Utilities are of utmost concern. Known conflicts that must be addressed to accommodate the bridge are:

- Relocation of FPL Transmission lines on South side of S.W. 8th Street, either through increasing the elevation of conductors or burying to accommodate bridge section. (see Appendix B for FPL letter pertaining to relocation estimate)
- Relocation of existing traffic signal equipment cabinet and ancillaries on North Side of S.W. 8th Street in order to accommodate north tower.
- Power demands for elevators and aesthetic lighting are also anticipated for the design.

Note: This is only a guide and does not in any way alleviate the Contractor from performing any of the utility coordination functions described in the contract documents.

For utilities placed on a structure, the contractor shall be responsible for designing and installing conduits, hangers, and/or threaded inserts for the utilities listed below. Include the connection design and details in the design calculations and Construction-Ready design plans. Hide the utilities from view; do not attach utilities to the visible exterior of the superstructure. Utility lines shall be suspended by means of cast-in-place anchors.

Electrical grounding and lighting protection shall be provided in accordance with NFPA 70 National Electrical Code and NFPA 780 Standard for the Installation of Lightning Protection Systems.

5.16 **Bearings**

Bearings shall be designed and detailed to be replaceable by jacking the superstructure off the permanent bearings. The longitudinal and transverse analysis of superstructure shall consider the redistribution of reactions and forces when jacks are engaged to replace the bearings. The plans shall indicate the intended position of the jacks. Bearing replacement shall be considered with a reduced live load.

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5.17 Temporary Structures

Temporary works include, but are not limited to, items for temporary excavation support such as sheeting, concrete formworks, and temporary bridge superstructure support. For all temporary works, use a professional engineer licensed in Florida to design, sign, and seal all plans and calculations for temporary structures. Submit shop drawings, installation specifications, and design calculations for review and acceptance.

5.18 Accelerated Bridge Construction (ABC)

For bridges constructed in a staging area and launched, slid, or otherwise transported into final location, provide the following items to the OWNER, stamped by a professional engineer licensed to practice in the State of Florida:

A. Bridge Staging Area (BSA): Design Builder clears the BSA. Provide allowable ground pressures on the plans and geotechnical calculations of the designed ground pressures during all phases of construction at the BSA. Include areas of influence beneath the foundation of the temporary abutments and beneath the permanent foundations;

B. Temporary Support Structures: Provide design of all temporary structures meeting AASHTO Design Guide for Bridge Temporary Works. Show dimensions, alignments, and elevations of temporary supports relative to those of the permanent supports;

C. Permanent Superstructure: Design permanent superstructure including the maximum anticipated and maximum allowed deflections of the ends relative to mid-span as a result of any temporary support conditions necessitated by the chosen method of moving the bridge;

D. Bridge Movement System: Provide the following information in the design of the movement system:

   i. When transporting the bridge using barges, indicate the configuration of the barges and the number of barges. Include details of any support structures used to elevate or lower the structure.

   ii. When sliding the bridge, indicate the type of equipment used including but not limited to jacks, winches, rollers, bearing pads, and slide shoes. Provide a system that allows the structure to be backed up and meets the placement tolerances shown on the plans.

E. Bridge Movement Plan: Detail the sequence and procedures for attaching the Bridge Movement System to the superstructure and actively engaging the load. Show inspection access points under or around the superstructure at lift locations and attachment points. Provide anticipated height change limitations or stroke limits of the jacking systems for the bridge movement systems. Include all scheduling and Traffic Control Plans;

F. Monitoring Plan: Provide a plan for monitoring structure deflections during the move. Include details of all instrumentation, locations of benchmarks, and locations of reference points in the BSA and at the final bridge location. Include details for measuring the deflections of the structure immediately after lifting and immediately before setting the structure.

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G. Utility Agreements and Mitigation Plans: Provide binding agreements to cross all affected above and below ground utilities and include in this agreement a plan to mitigate utility issues via partial shut-down of utility, complete shut-down of utility, redistribution of load, etc.

6 MATERIALS

Materials must comply with the "Buy America Act", 49 U.S. code Section 5323, and per Specifications Section 6-5 and PPM Volume 1, Chapter 13.

6.1 Concrete Elements

All concrete elements shall be furnished and installed in accordance with Specifications Section 400.

6.2 Structural Steel

Material properties for structural steel used in the analysis and design shall be determined in accordance with the Specifications Section 962. Minimum plate dimensions shall be provided in accordance with SDG Section 5.5. All steel elements shall be furnished and installed in accordance with Specifications Section 460. Steel elements shall also meet the following requirements:

i. Do not use cover plates, pins, or hangers.

ii. Do not field-weld without OWNER approval, except for bearing sole plates.

iii. Provide steel diaphragms at the centerline bearing.

iv. For structural steel field splices, use direct-tension indicator tightening.

v. For all miscellaneous steel items permanently cast into the deck, use galvanized steel, stainless steel, or approved coating system.

6.3 Fasteners

Design structural bolted connections in accordance with SDG Section 5.4. Preference is given to 7/8" diameter high strength bolts conforming to ASTM A325 Type 1 for painted connections, and Type 3 for unpainted weathering steel connections. All connections should be designed as "slip-critical". ASTM A490 fasteners shall not be used unless approved by the OWNER.

6.4 Shear Connectors

The material properties of shear connectors used in design shall be in accordance with the Specifications Section 502.

6.5 Concrete

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Concrete Class shall be determined in accordance with SDG Section 1.4.3 and Table 1.4.3-1. The material properties used in analysis and design should be in accordance with Specifications Section 346.

6.6 **Reinforcement**

The reinforcement shall be Grade 60 (fy = 60,000 psi) deformed bars conforming to AASHTO ASTM A615. The maximum length of reinforcing bars shall be 60 feet. Epoxy coated reinforcing steel shall not be used.

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APPENDIX A

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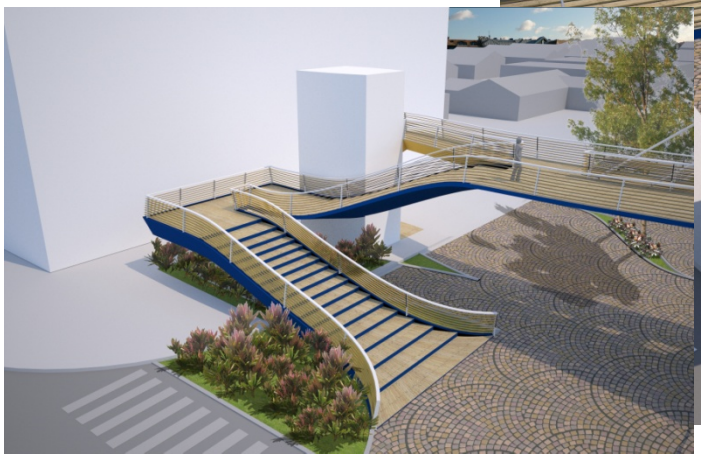
Examples of Signature Pedestrian Bridge Design Concept Precedents

Examples of Signature Pedestrian Bridge Design Concept Precedents



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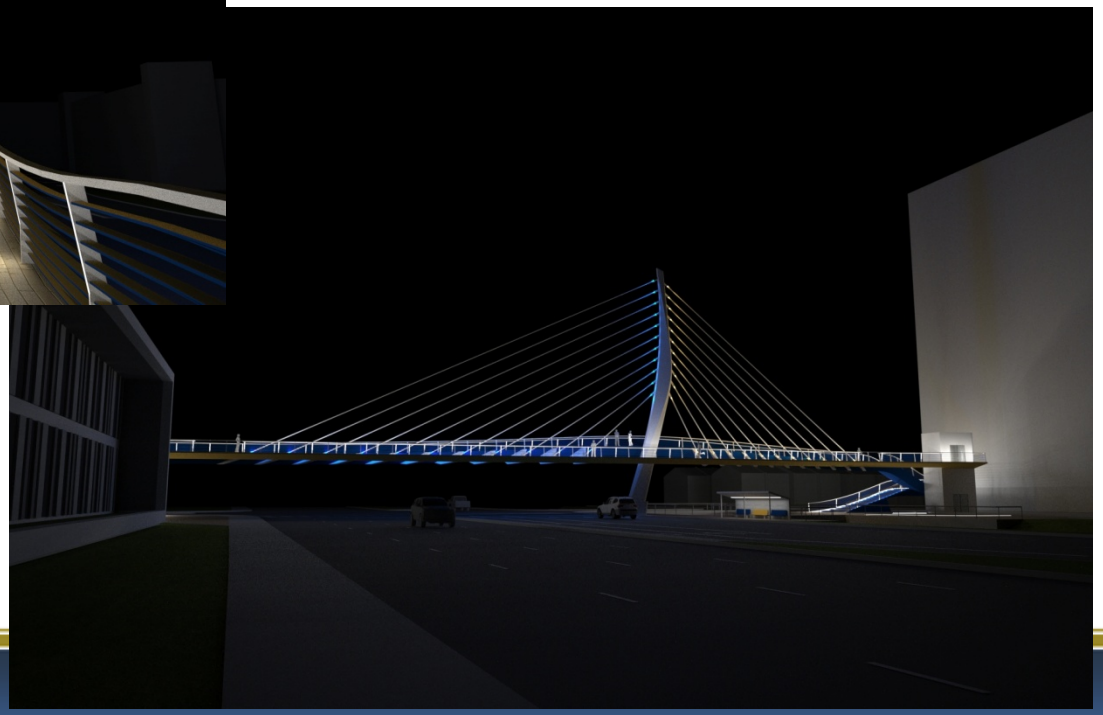

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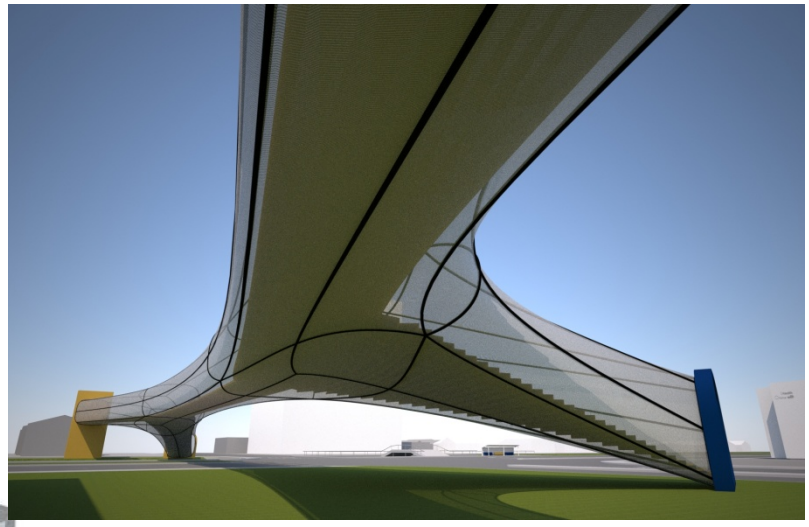

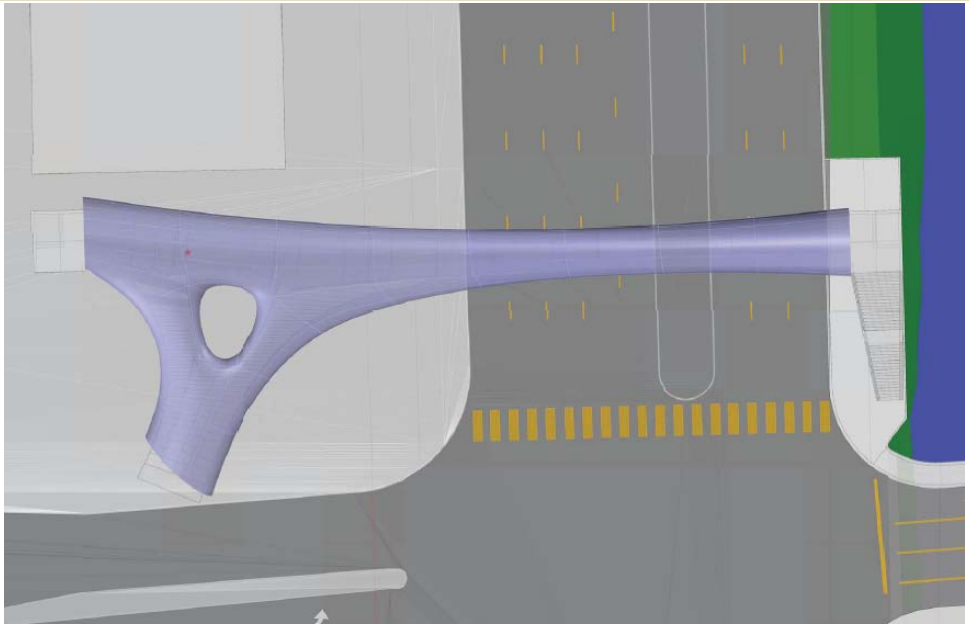

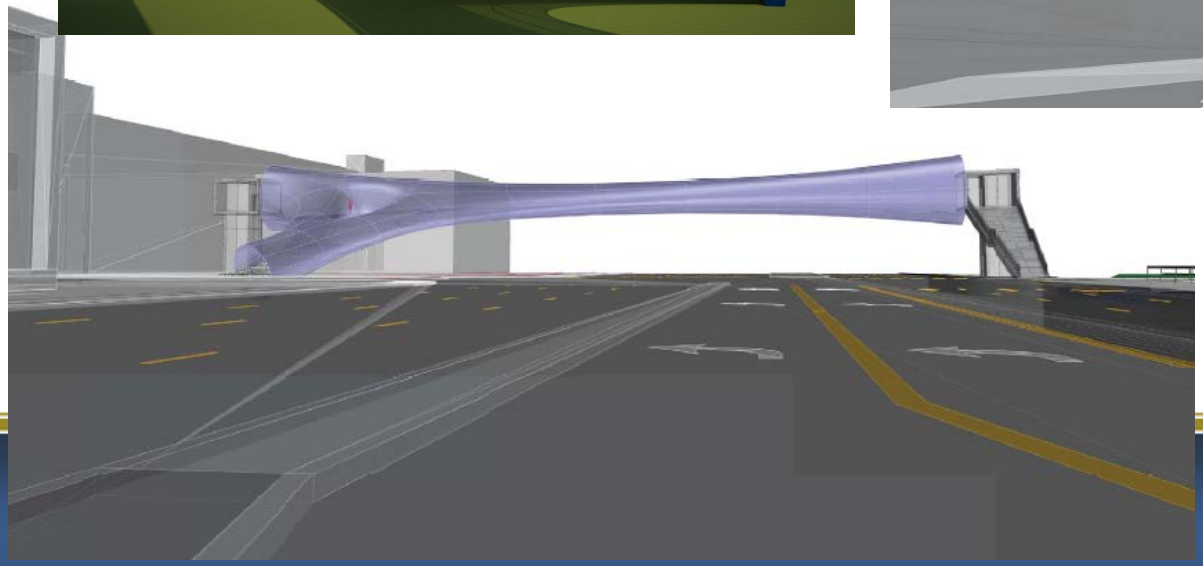

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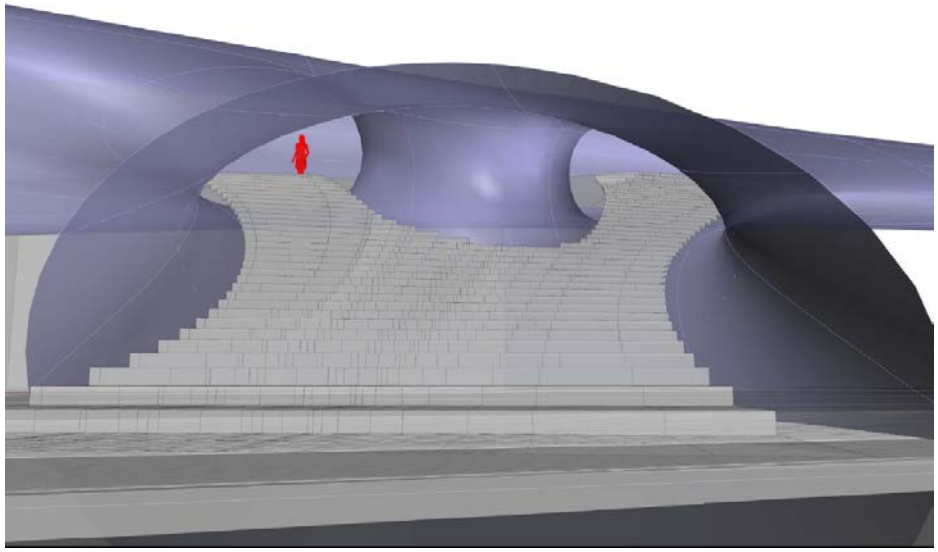

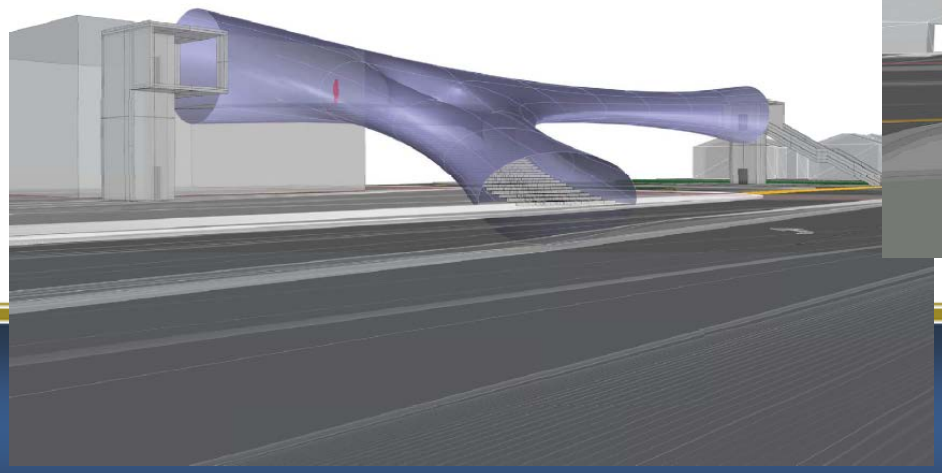

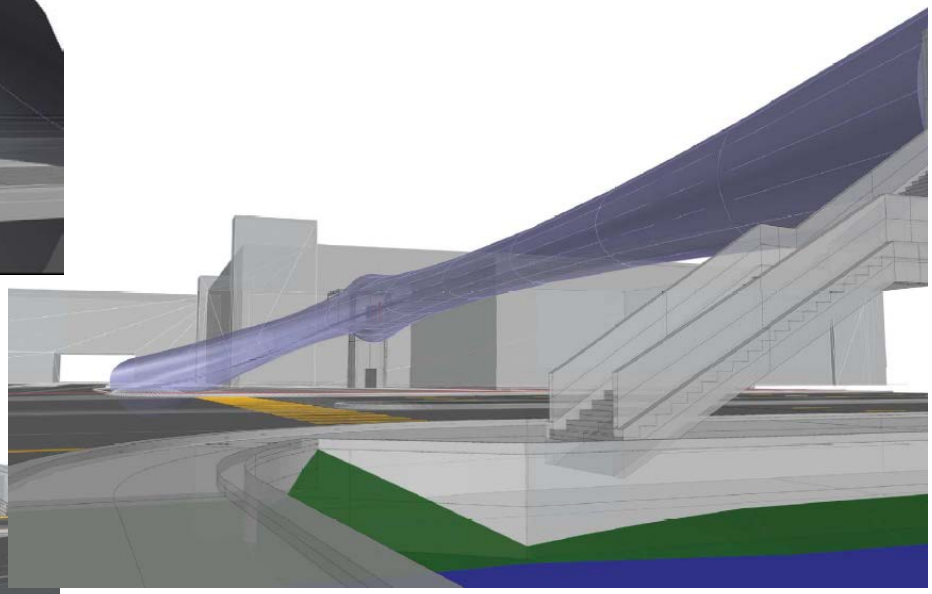

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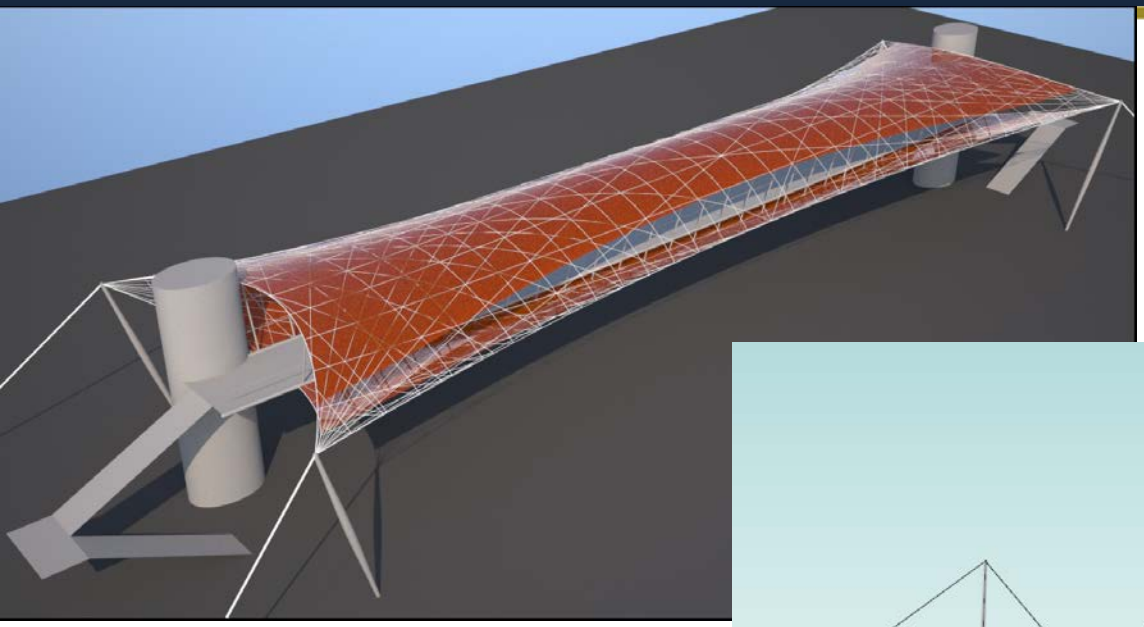

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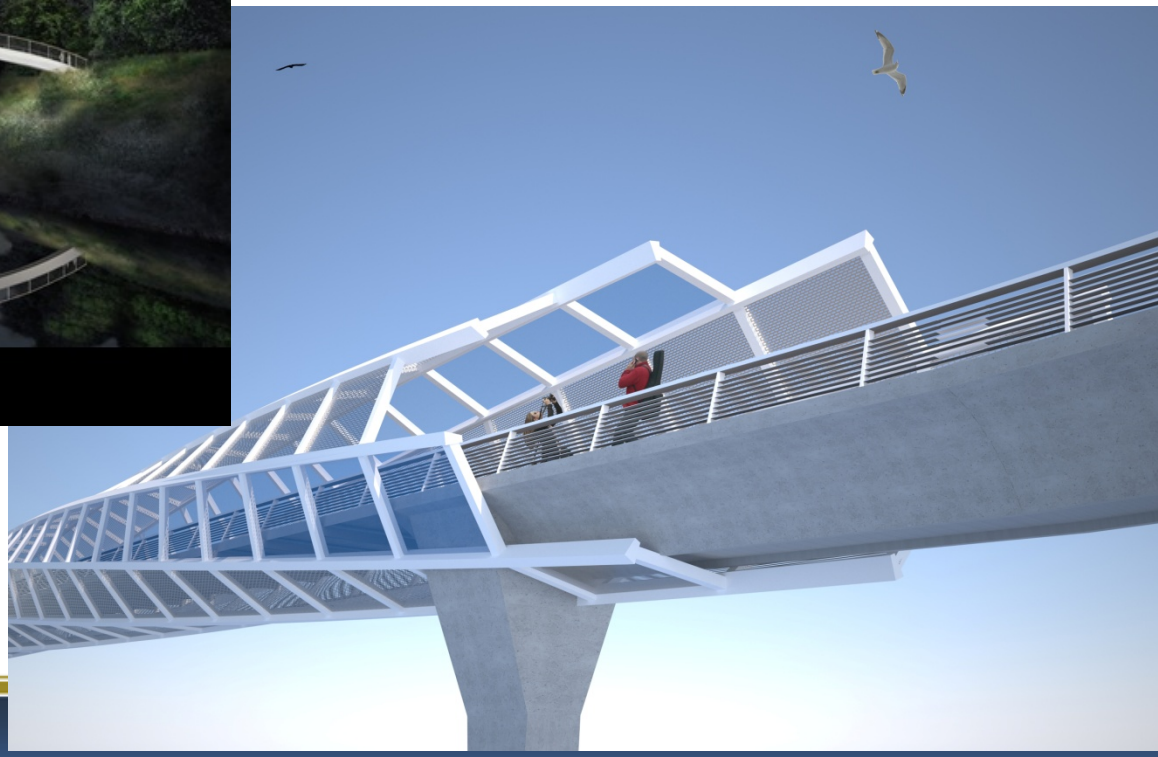

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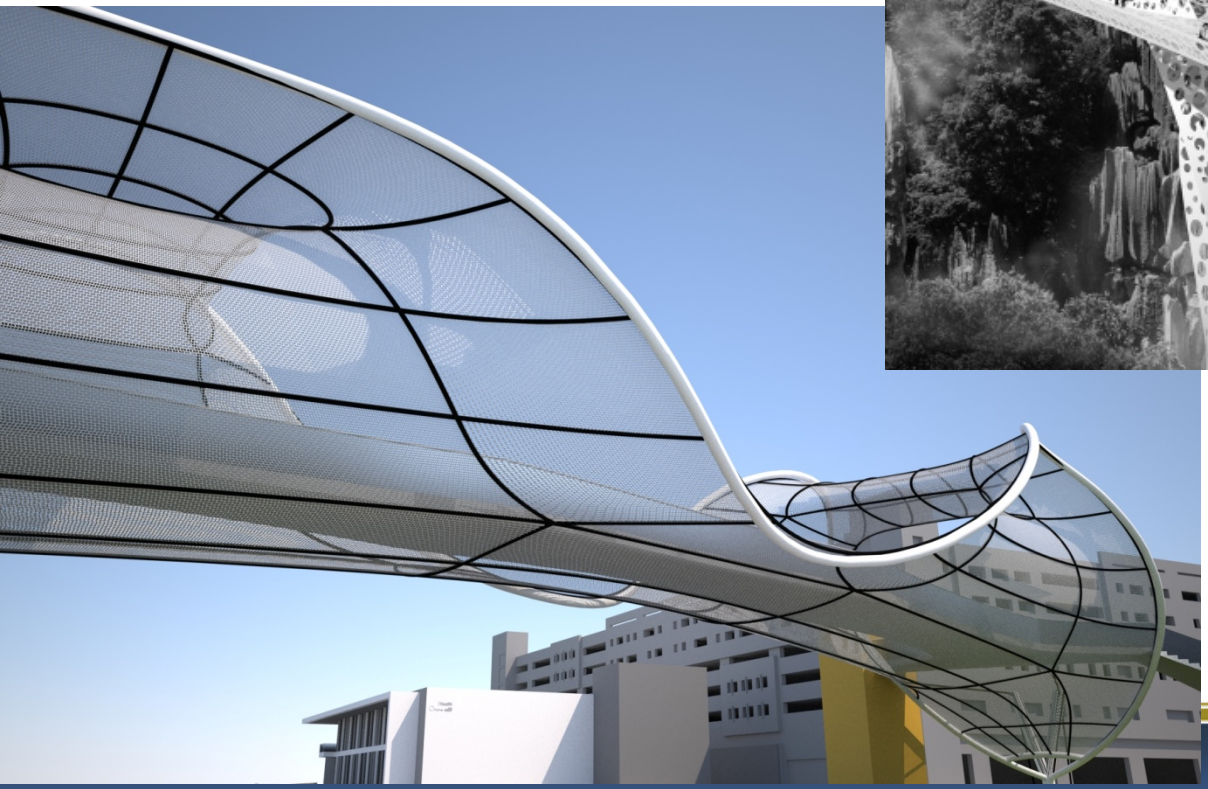

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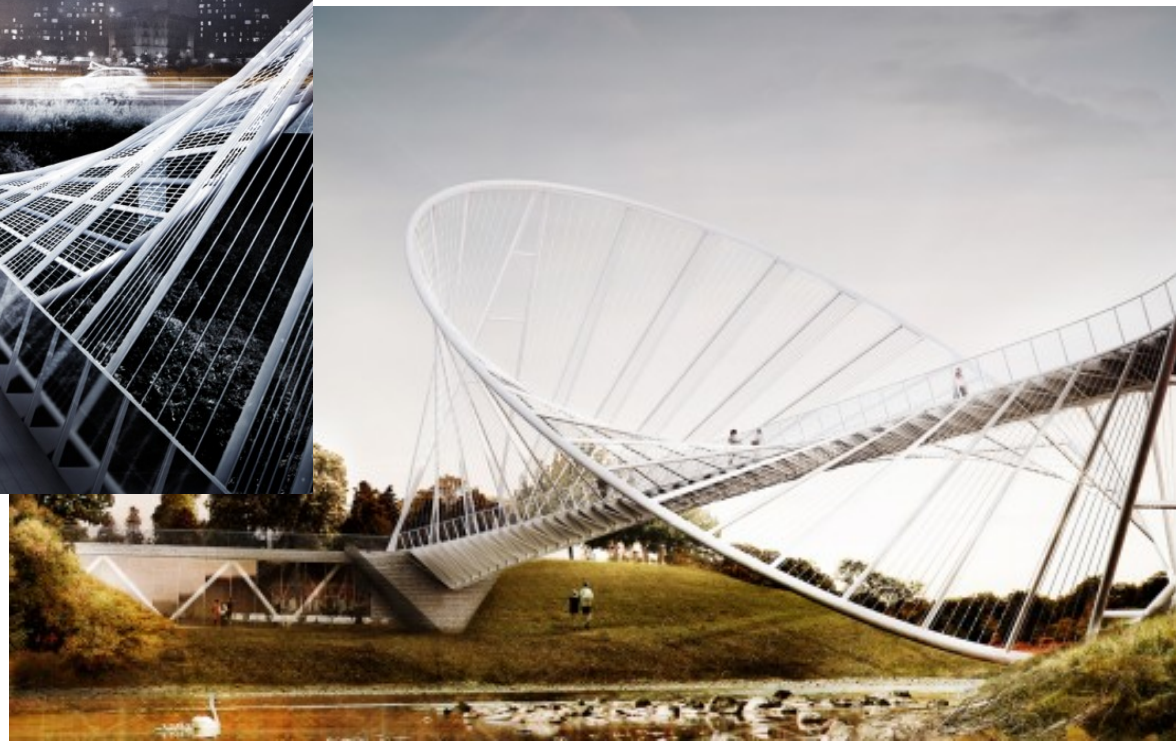

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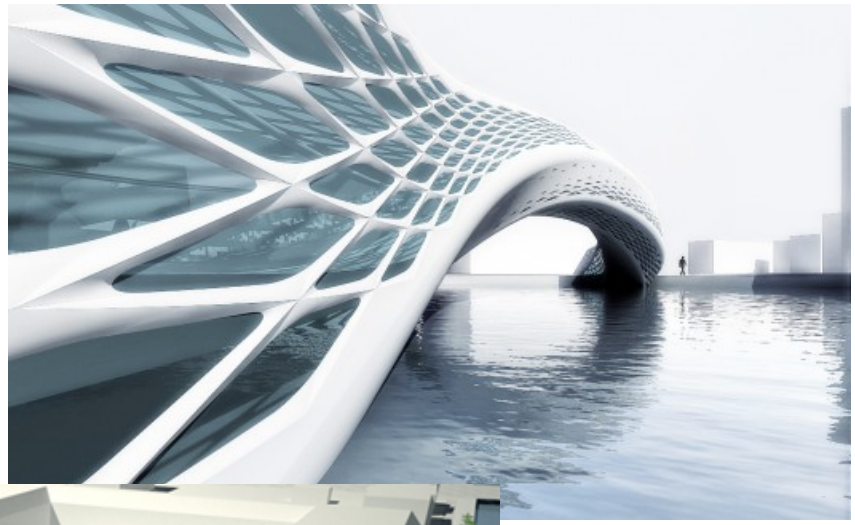

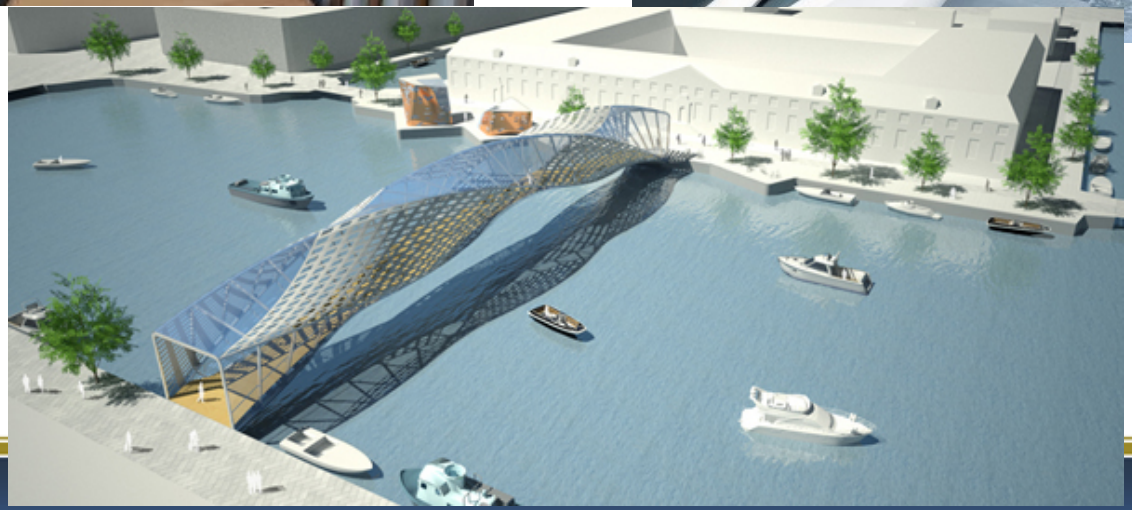

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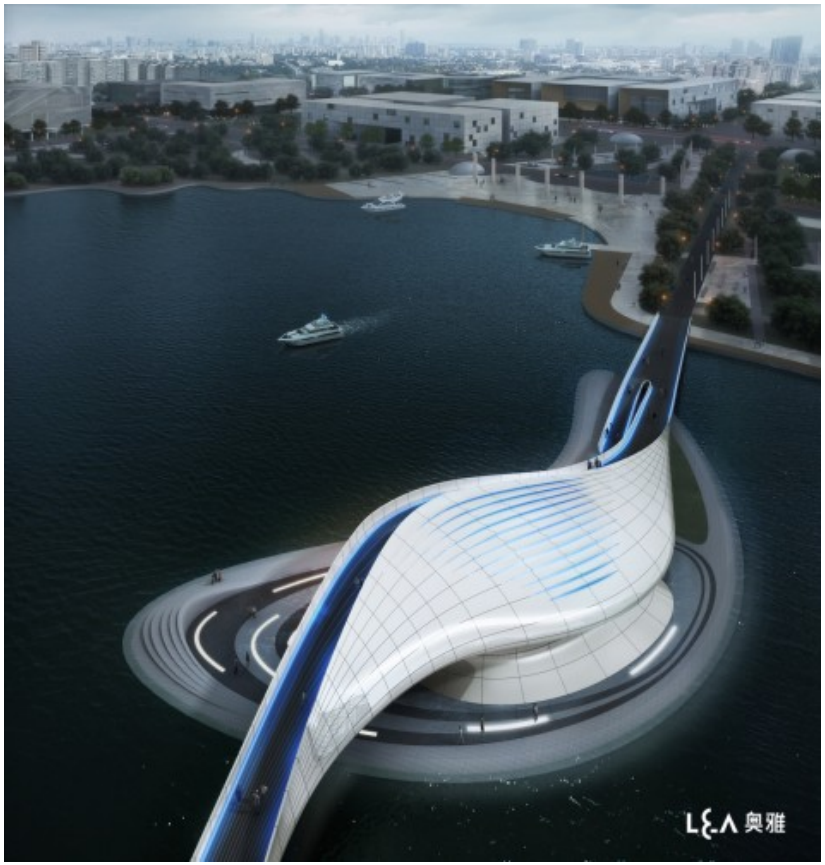

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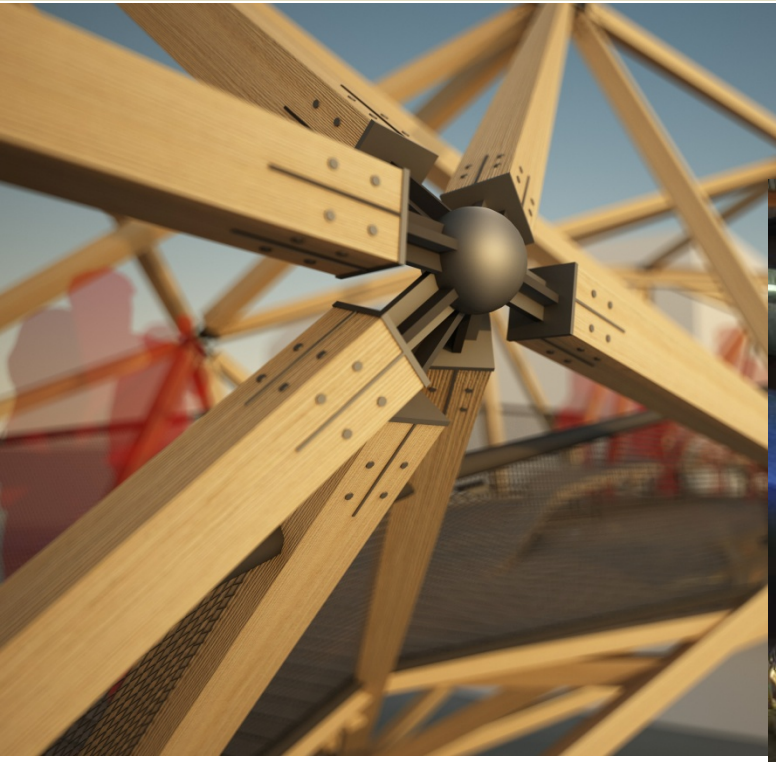

APPENDIX B

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Florida Power & Light Company, 700 Universe Blvd., TS4/JW, Juno Beach, FL 33408
Phone: (561) 904-3604, Fax: (561) 904-3710

FPL

May 9, 2014

Stewart Grant
Facilities Planning Coordinator
FIU
11555 S.W. 17TH Street CSC 142C
Miami, FL 33199

RE: **Proposed Relocation of Transmission Facilities for new pedestrian bridge at Florida International University**

Transmission Line: Flagami-Village Green 138 kV; Tropical-International Section; Strs 50A3, 50A3A, 50A4, and 50A5

Dear Mr. Grant,

We have evaluated your request to relocate the referenced FPL transmission structure(s). The non-binding 'ballpark' estimate to accommodate this potential overhead relocation is $400,000. The scope of the work to accomplish this relocation is relocation/reconstruction of structures with two new spun concrete tangent structures and two new spun concrete inline dead-end structures to allow for new pedestrian bridge construction over SW 8th Street at SW 109th Avenue intersection, as well as to accommodate future signalization improvements at the intersection. The estimate also includes allowance for approximately four (4) single day line de-energizations to accommodate crane work during the pedestrian bridge construction. This estimate is not an offer from FPL to perform the requested work and should not be construed or used as such for detailed planning purposes. It is provided only to assist your preliminary decision-making, and will remain valid for 180 days.

This non-binding estimate is an "order of magnitude" estimate, and is based on previous FPL experience. However, due to the complex nature and variables associated with this type of work, the estimate may not accurately represent the actual costs the applicant would be obligated to pay FPL to relocate these facilities. This estimate does not include the cost to relocate any Distribution facilities or facilities belonging to another utility. Costs associated with the relocation, such as survey work; acquisition and recording of easements; clearing easements of trees and obstructions, etc. have been excluded. This estimate is based upon favorable field conditions, which include cooperation to eliminate conflicts.

Detailed estimate will be provided, should you decide based on this 'ballpark' estimate, and detailed engineering will commence should you elect to pay the non-refundable engineering deposit. The deposit is required due to the complexity and time required to estimate such a project, and would be applied towards the estimated amount owed to FPL for the project, should you decide to proceed with the work, provide the balance payment, and contract for that work, within 90 days of the date the binding estimate is provided.

If you decide to request the detailed estimate on the above 'ballpark' estimate, please send a check payable to the order of 'Florida Power & Light Company' for an amount of $80,000 enabling us to commence the detailed design and estimating process. The request for the estimate must be in writing, and must describe in detail the scope of work requested. Please send the request addressed to my attention along with the check toward the engineering deposit at: Florida Power & Light Company, Transmission Projects Department, 700 Universe Blvd., TS4/JW Juno Beach, Florida 33408.

Binding estimates are valid for 90 days, and would be subject to change in the event of a work scope change. Payment in full and execution of an agreement will be required prior to commencement of construction. Time of construction can vary depending upon easement execution, permitting, resource availability, material delivery and line clearances. Such projects are scheduled after full payment is made and a Relocation Agreement is executed.

Please feel free to contact me on (561) 904-3604, should you have any questions or need additional information.

Sincerely,

George J. Beck, P.E.
Transmission Relocations Engineer

APPENDIX C

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SECTION 14 21 00 - ELECTRIC TRACTION ELEVATORS (MACHINE ROOM-LESS)

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes electric traction passenger elevators.

B. Note: Steel used in this project is required to be in compliance with 49 CFR Part 661 – BUY AMERICA REQUIREMENTS.

C. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
2. Section 042200 "Concrete Unit Masonry" for setting sleeves, inserts, and anchoring devices in masonry and for grouting elevator entrance frames installed in masonry walls.
3. Section 051000 "Metal Framing" for the following:

    a. Attachment plates, angle brackets, and other preparation of structural steel for fastening guide-rail brackets.
    b. Divider beams.
    c. Hoist beams.
    d. Structural-steel shapes for subsills.

4. Section 055000 "Metal Fabrications" for the following:

    a. Attachment plates and angle brackets for supporting guide-rail brackets.
    b. Divider beams.
    c. Hoist beams.
    d. Structural-steel shapes for subsills.
    e. Pit ladders.
    f. Cants in hoistways made from steel sheet.

1.03 DEFINITIONS

A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.

1.04 ACTION SUBMITTALS

A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for car enclosures, hoistway entrances, and operation, control, and signal systems.

B. Shop Drawings:

1. Include plans, elevations, sections, and large-scale details indicating service at each landing, coordination with building structure, relationships with other construction, and locations of equipment.
2. Include large-scale layout of car-control station.
3. Indicate maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.

C. Samples for Initial Selection: For finishes involving color selection.

D. Samples for Verification: For exposed car, hoistway door and frame, and signal equipment finishes; Samples of sheet materials; and trim.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and control closet layout and dimensions, as shown on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.

C. Sample Warranty: For special warranty.

1.06 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data. Include the following:

1. Owners Manual and Wiring Diagrams,
2. Parts list, with recommended parts inventory.

B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

C. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard two-year maintenance agreement, starting on date initial

maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: Elevator manufacturer or an authorized representative who is trained and approved by manufacturer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials, components, and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.09 COORDINATION

A. Coordinate installation of sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.

B. Coordinate locations and dimensions of other work relating to electric traction elevators including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways, pits, and machine rooms.

1.10 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

2. Warranty Period: 1 year from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide ThyssenKrupp Elevator or comparable product.

1. Major elevator components, including driving machines, controllers, signal fixtures, door operators, car frames, cars, and entrances, shall be manufactured by single manufacturer.

2.02 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.

B. Accessibility Requirements: Comply with Section 407 in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.

2.03 ELEVATORS

A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturer's standard components shall be used, as included in standard elevator systems and as required for complete system.

B. Elevator Description:

1. Machine Type: Machine Room Less Electric Traction.
2. Rated Load: 5000 lb.
3. Rated Speed: 150 fpm (minimum)
4. Operation System: Selective-collective automatic operation.
5. Security Features: Keyswitch operation.
6. Dual Car-Control Stations: Provide two car-control stations in each elevator; equip only one with required keyswitches if any.
7. Car Enclosures:

    a. Inside Width: 92 inches (2337 mm) from side wall to side wall.
    b. Inside Depth: 65 inches (1651 mm) from back wall to front wall (return panels).
    c. Inside Height: 94 inches (2388 mm) nominal to underside of ceiling.
    d. Front Walls (Return Panels): Brushed stainless steel.
    e. Car Fixtures: Brushed stainless steel.
    f. Side and Rear Wall Panels: Brushed stainless steel.
    g. Reveals: Brushed stainless steel.
    h. Door Faces (Interior): Brushed stainless steel.
    i. Door Sills: Aluminum, mill finish.
    j. Ceiling: Brushed stainless steel.
    k. Handrails: 1-1/2 inches (38 mm) round, brushed stainless steel, at sides and rear of car.
    l. Floor: prepared to receive aluminum non-slip textured (5WL) material.

8. Hoistway Entrances:

    a. Width: 54 inches (1372 mm).
    b. Height: 84 inches (2134 mm).
    c. Type: Single-speed center opening.
    d. Frames at First Floor: Brushed stainless steel.
    e. Frames at Other Floors: Brushed stainless steel.
    f. Doors and Transoms at First Floor: Brushed stainless steel.
    g. Doors and Transoms at Other Floors: Brushed stainless steel.

h. Sills at First Floor: Aluminum, mill finish.
i. Sills at Other Floors: Aluminum, mill finish.

9. Additional Requirements:

a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from brushed stainless steel.

2.04 MACHINE ROOM-LESS TRACTION SYSTEMS

A. Elevator Machines: Compact energy efficient permanent magnet gearless traction type hoisting machine, consisting of permanent magnet AC motor, brake, and driving sheave.

1. Limit total harmonic distortion of regenerated power to 5 percent per IEEE 519.
2. Provide means for absorbing regenerated power when elevator system is operating on standby power.
3. Provide line filters or chokes to prevent electrical peaks or spikes from feeding back into building power system.

B. Fluid for Hydraulic Buffers: If using hydraulic buffers, use standard hydraulic fluid.

C. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work. Device installation is specified in another Section.

D. Machine Beams: Provide framing to support elevator hoisting machine and deflector sheaves from the building structure. Comply with Section 055000 "Metal Fabrications" for materials and fabrication.

E. Car Frame and Platform: Bolted- or welded-steel units.

F. Guides: Roller guides. Provide guides at top and bottom of car and counterweight frames.

2.05 OPERATION SYSTEMS

A. General: Provide manufacturer's standard microprocessor operation systems as required to provide type of operation indicated.

B. Auxiliary Operations: In addition to primary operation system features, provide the following operational features for elevators:

1. Provide a separate battery powered unit that senses loss of power. Battery shall be 12 volt minimum, scaled nickel cadmium or gel cell construction. When loss of power occurs, elevator shall ascend or descend to nearest landing and open doors automatically. After a predetermined time, the doors shall close and the elevator shall remain inoperative until normal power is restored. The door open and alarm buttons shall operate under battery power. Reduced speed for evacuation on battery operation is permitted.

C. Security Features: Provide the following security features, where indicated. Security features shall not affect emergency firefighters' service.

1. Keyswitch Operation: Push buttons are activated and deactivated by security keyswitches at car-control stations. Key is removable only in deactivated position.

2.06 DOOR REOPENING DEVICES

A. Infrared Array: Provide door reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams shall cause doors to stop and reopen.

B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer shall sound and doors shall begin to close at reduced kinetic energy.

2.07 CAR ENCLOSURES

A. General: Provide steel-framed car enclosures with nonremovable wall panels, with removable car roof, access doors, power door operators, and ventilation.

1. Provide standard railings complying with ASME A17.1/CSA B44 on car tops where required by ASME A17.1/CSA B44.

B. Materials and Finishes: Manufacturer's standards, but not less than the following:

1. Subfloor: Exterior grade plywood, not less than 7/8-inch (22.2-mm) nominal thickness.
2. Floor Finish: To be constructed of aluminum non-slip textured (5WL) material which curves upwards and is integral with the cab walls. Flooring to be welded vertically in ground smooth 6” on all side walls in order to contain spilled liquids from escaping the cab and seeping into the hoistway
3. Stainless-Steel Wall Panels: Flush, metal construction; fabricated from stainless-steel sheet.
4. Fabricate car with recesses and cutouts for signal equipment.
5. Fabricate car door frame integrally with front wall of car.
6. Stainless-Steel Doors: Flush, metal construction; fabricated from stainless-steel sheet.
7. Sight Guards: Provide sight guards on car doors.
8. Sills: Extruded metal, with grooved surface, 1/4 inch (6.4 mm) thick.
9. Metal Ceiling: Flush panels, with incandescent downlights in the center of four low-voltage downlights in each panel. Align ceiling panel joints with joints between wall panels.
10. Handrails: Manufacturer's standard handrails, of shape, metal, and finish indicated.

2.08 HOISTWAY ENTRANCES

A. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile shall accommodate hoistway wall construction.

1. Where gypsum board wall construction is indicated, frames shall be self-supporting with reinforced head sections.

B. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies shall comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction based on testing at as close-to-neutral pressure as possible according to NFPA 252.

1. Fire-Protection Rating: 1-1/2 hours with 30-minute temperature rise of 450 deg F (250 deg C)].

C. Materials and Fabrication: Manufacturer's standards, but not less than the following:

1. Steel Subframes: Formed from cold- or hot-rolled steel sheet, with factory-applied enamel finish or rust-resistant primer. Fabricate to receive applied finish as indicated.
2. Stainless-Steel Frames: Formed from stainless-steel sheet.
3. Star of Life Symbol: Identify emergency elevators with star of life symbol, not less than 3 inches (76 mm) high, on both inside surfaces of hoistway door frames.
4. Stainless-Steel Doors and Transoms: Flush, hollow-metal construction; fabricated from stainless-steel sheet.
5. Sight Guards: Provide sight guards on doors matching door edges.
6. Sills: Extruded metal, with grooved surface, 1/4 inch (6.4 mm) thick.
7. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M.

2.09 SIGNAL EQUIPMENT

A. General: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements with LEDs.

B. General: Provide signal equipment designed for destination-based system. Fabricate lighted elements with LEDs.

C. Car-Control Stations: Provide manufacturer's standard recessed car-control stations. Mount in return panel adjacent to car door unless otherwise indicated.

1. Mark buttons and switches for required use or function. Use both tactile symbols and Braille.
2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.

D. Swing-Return Car-Control Stations: Provide car-control stations mounted on rear of hinged return panel adjacent to car door and with buttons, switches, controls, and indicator lights projecting through return panel but substantially flush with face of return panel.

1. Mark buttons and switches for function. Use both tactile symbols and Braille.
2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.

E. Emergency Communication System: Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in an integral cabinet, with identification, instructions for use, and battery backup power supply. Communication shall be monitored per ASME A17.1, Requirement No. 2.27.1.1.6.

F. Firefighters' Two-Way Telephone Communication Service: Provide flush-mounted cabinet in each car and required conductors in traveling cable for firefighters' two-way telephone communication service specified plans.

G. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door or above car-control station. Also, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served. Include travel direction arrows if not provided in car-control station.

H. Hall Push-Button Stations: Provide one hall push-button station at each landing.

1. Provide units with flat faceplate for mounting with body of unit recessed in wall.
2. Equip units with buttons for calling elevator and for indicating desired direction of travel.
3. Equip units with buttons for calling elevator and for indicating direction of travel or destination as required by system. Provide a signaling system to verify floor selection, where destination registration is required, and to direct passengers to appropriate car.

a. Provide a means for passengers to indicate that they have disabilities so control system can allow extra room in assigned car.
b. Provide for connecting units that require destination registration to building security access system so a card reader can be used to register calls.

I. Provide telephone jack in each unit for firefighters' two-way telephone communication service specified in plans.

1. Possibly insert a provision for either an "In Use" signal or a digital display of car position for single elevators.

2.10 FINISH MATERIALS

A. General: Provide the following materials for exposed parts of elevator car enclosures, car doors, hoistway entrance doors and frames, and signal equipment as indicated.

B. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

1. Metal surface is satin polished after texturing.

C. Stainless-Steel Bars: ASTM A 276, Type 304.

D. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Examine hoistways, hoistway openings, pits, and machine rooms as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Comply with manufacturer's written instructions.

B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.

D. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.

E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

F. Leveling Tolerance: 1/4 inch (6 mm), up or down, regardless of load and travel direction.

G. Set sills flush with finished floor surface at landing.

H. Locate hall signal equipment for elevators as follows unless otherwise indicated:

1. For groups of elevators, locate hall push-button stations between two elevators at center of group or at location most convenient for approaching passengers.
2. Place hall lanterns either above or beside each hoistway entrance.
3. Mount hall lanterns at a minimum of 72 inches (1829 mm) above finished floor.

3.03 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.

B. Operating Test: Load each elevator to rated capacity and operate continuously for 30 minutes over full travel distance, stopping at each level and proceeding immediately to the next. Record temperature rise of elevator machine during 30-minute test period. Record failure to perform as required.

C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.04 PROTECTION

A. Temporary Use: None

3.05 DEMONSTRATION

A. Check operation of each elevator with Owner's personnel present before date of Substantial Completion and again not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

3.06 MAINTENANCE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance during normal working hours.
2. Perform emergency callback service during normal working hours with response time of 2 hours or less.
3. Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of two hours or less.

END OF SECTION 142100

SECTION 14 21 10 – TRANSIT GRADE ELECTRIC TRACTION ELEVATORS (MRL)

CLASS A

PART 1 - GENERAL

This specification was received by the Engineer of Record from a specialized firm in the vertical transportation business. This specification was originally formatted for procurement directly to an elevator contractor directly. Any direct or indirect reference to an elevator contractor shall be interpreted to be the Contractor for this project. In some cases, references were made to other specification sections that do not exist in this contract (i.e. epoxy flooring) and such references have been removed. Should the Contractor need further information to meet such non referenced specifications, then the Contractor is to submit requests for information accordingly or supply information on the product assumed for this optional bid item.

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section

1.2 SUMMARY:

This provides design guidelines for the fabrication, installation, and testing of five elevators as similarly described in Section 14 21 00 - TRACTION PASSENGER ELEVATORS (MRL). Elevators 1, 2, 3, 4 and 5 are to be Class A transit grade elevators Contractor shall provide a transition plate for loading of concentrated loads at elevator #4

1.3 DEFINITIONS:

A. Heavy duty elevator: An elevator designed specifically for the harsh environment and duty load cycles common to transportation system usage.

B. Elevator - a hoisting and lowering mechanism, equipped with a car or platform, which moves in guide rails or racks and serves two or more landings.

C. Elevator, passenger service - an elevator used primarily to carry persons other than the operator and persons necessary for loading and unloading. A transition plate will be provided for loading and unloading of concentrated loads at elevator #4

D. Elevator, gearless- a traction machine, without intermediate gearing, that has the traction sheave and the brake drum mounted directly on the motor shaft.

E. Defective Elevator Work: Operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; the need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions

F. Contractor: The General Contractor.

G. Installer: The responsible party who installs the elevator.

H. OEM: Original Equipment Manufacturer.

I. Owner: The owner in control of the facility.

J. Dwell time: The period of time the elevator is at a landing while the doors open, passengers transfer and doors close.

K. Substantial completion: The point at which the elevator is ready for use, whether the site is finished or not. This is where the jurisdictional inspection usually takes place.

L. Final Acceptance: The point at which the owner accepts the elevator project as being complete including all submittal requirements. This may be a different point in time than substantial completion.

M. Interim Maintenance: Maintenance from the point of substantial completion, but prior to Revenue Service.

N. Beneficial Use: When the elevator is placed into service, may be prior to the site being ready for public use.

O. Revenue Service: The station or facility opening date.

P. Notice to Proceed (NTP): within this document shall mean the date which the elevator installer is notified to proceed with the project.

Q. Authority Having Jurisdiction (AHJ): as defined by ASME A17.1.

R. MSDS: Material Data Safety Sheets, as defined by OSHA

S. OSHA: Occupational Safety and Health Administration

1.4 TEMPORARY AND PERMANENT ELECTRICAL POWER SERVICES:

A. Temporary power for installation shall be made available to Installer at the time of the installation. Permanent power shall be made available for testing. All power shall be provided at no cost to Installer.

B. For the elevator drive systems: 480 volts, 3 phase, 3 wire, 60 Hertz terminating in a disconnect switch within sight of the controller.

C. For lighting and GFCI receptacles: 120 volts, 1 phase, 3 wire, 60 Hertz terminating at the elevator controller location.

D. Separate disconnect for cab lighting and wiring to cab. 120 volts, 1 phase, 3 wire, 60 Hertz terminating in a disconnect switch within sight of the controller.

E. Separate service for other ancillary elevator equipment, where required.

1.5 APPLICABLE CODES, STANDARDS, ORGANIZATIONS AND PUBLICATIONS:

Elevator designs and installations shall be of the heavy duty type, and shall comply with the following.

A. American Society of Mechanical Engineers (ASME)

1. ASME AI7.1 2004 and A17.1S-2005 with Addenda, A17.2.3, A17.5, (hereafter referred to as the “Code”)

B. National Fire Protection Association (NFPA)

1. NFPA No. 130, “Fixed Guideway Transit and Passenger Rail Systems”

2. NFPA No. 13, 70 and 72

C. National Electrical Code (NEC)

D. Americans with Disabilities Act Accessibility Guidelines (ADAAG)

E. American Public Transit Association (APTA) MRL design guidelines

F. IEEE 519 Standard Practices and Requirements for Harmonic Control in Electrical Power Systems

G. American Welding Society (AWS)

H. American Society of Testing and Material (ASTM)

I. International Standards Organization, ISO 281/I-1997 and later editions.

J. American Federation of Bearing Manufacturers Association, AFBMA, Std. 9 and 11

K. National Electrical Manufacturers Association (NEMA)

L. The American Insurance Association

M. Occupational Safety & Health Act (OSHA)

N. International Code Council/ American National Standards Institute, (ICC/ANSI), A117.1-2004

O. American Disabilities Accessibility Guidelines for Buildings and Facilities (ADAAG), 2004

P. Building Officials & Code Administrators International, Inc. (BOCA)

Q. State of Florida Building Code, Latest Adopted Edition, as amended.

R. State of Florida Elevator Regulations, Latest Adopted Edition, as amended.

S. Any additional requirements imposed by local agencies shall be incorporated into elevator installations.

T. In case of a conflict between codes, regulations, or standards, the most stringent requirement shall take precedence.

U. The elevator installer shall be licensed and strictly governed by local and governmental authorities of this area in order to perform this work.

1.6 SUBMITTALS:

A. Submit OEM’s product data and samples for the system proposed for use. Product data shall include, but not limited to the following:

1. Electrical characteristics and connection requirements.

2. Expected heat dissipation of elevator equipment in control room and control areas (i.e. BTU's/hr) based on 120 round trip cycles per hour.

3. Maintenance programs: within sixty (180) days after notice to proceed, and prior to installation, contractor shall submit detailed interim and revenue service maintenance programs, showing functions to be performed and their scheduled frequency.

4. Machine and controller performance data sheets.

5. Pre-acceptance test forms.

B. Shop Drawings: Six (6) copies of the shop drawings shall be provided by the Installer. Submit approval layout drawings to scale. Drawings shall include, but not be limited to the following:

1. Car, guide rails, buffers and other components in hoistway.

2. Maximum rail bracket spacing.

3. Maximum loads imposed on guide rails requiring load transfer to the building structure.

4. Loads on hoisting beams.

5. Clearances and travel of car and counterweight runby.

6. Clear inside hoistway and pit dimensions.

7. Location and sizes of access doors, hoistway entrances and frames.

8. Car & Hall signal and operating fixtures.

9. Remote wiring layouts for each elevator.

10. Refuge space on top of car and pit.

11. Control room, machine area, pit and hoistway layout.

12. Cab design, dimensions and layout.

13. Hoistway-door and frame details

C. Industry recognized layout drawing are to be supplied that will provide the information that is significant and specific to the installation and required for coordination of work by other trades. Contractor to provide standard load calculations for buffer impact loads, counterweight buffer impact loads, hoist beam load, horizontal load, car governor load, and rails reactions including vertical car rail, vertical counterweight load, and vertical pit counterweight load. Contractor will also provide locations of beam pockets, hoist beam locations, and machine locations.

D. Samples of materials and products requiring color or finish selection.

1.7 OPERATING AND MAINTENANCE MANUALS:

A. Maintenance Manuals: Prior to installation, Contractor shall submit six (6) complete sets of Schindler's standard operation and maintenance manuals. for approval. After Engineer's reviews and prior to the beginning of acceptance testing, Contractor will respond to the comments, make changes as necessary and resubmit for final approval. Once final approval is received, then twelve (12) sets of the approved manuals shall be provided by the Contractor. The manuals shall include the following:

1. Complete table of contents.

2. Included will be complete illustrated, exploded views of all assemblies, and a complete, illustrated, exploded view for identifying all system parts.

3. Complete nomenclature of replaceable parts, part numbers, and warehouse location. If product source is another vendor, Contractor shall include name and address of other vendor.

4. Sample copies of a proposed preventive maintenance chart.

5. Descriptions of safety devices.

6. Safety rules, tests, and procedures, including testing of all systems and subsystems.

7. Provide wiring diagrams and component parts lists with descriptions, exploded views and parts numbers to allow an experienced elevator technician to perform maintenance.

8. Detailed lubrication and cleaning schedule indicating weekly, monthly, quarterly, semiannual, and annual lubrication; and a description of each lubrication point, lubrication type, and specification.

9. Control and schematic electrical wiring diagrams of controller, including wiring of safety devices to connections with remote indication and control panels for the elevator.

10. Contractor to provide electrical layout showing placement of lighting, light switches, receptacles, light fixtures, disconnect switches, and convenience outlets in machinery room and pits.

11. Complete detailed drawings and wiring diagram of elevator system.

12. The elevator contractor shall be required to provide certification, in writing and signed by an officer of the organization, that the Owner shall be provided with copies of any and all non-proprietary information, correspondence, bulletins, newsletters, manuals, techniques, procedures, drawings, sketches and any other documents related to maintenance, safety, operations, design changes, modifications, retrofits, etc., which relate to any part, component, equipment, system, subsystem, or material and services applicable to the elevator provided.

    a. All of the above referenced shall be provided as it pertains to the original installation and for a period of ten (10) years after final acceptance of the elevator.

    b. Drawings and information necessary to perform operation and maintenance of the elevators will be provided.

13. The final OEM Owner's manual shall be also provided in an electronic format on CD-ROM.

14. MSDS and product data sheets: Shall be submitted with an index listing each product, along with the application method of the product, approximate quantity of product per elevator, and the component the product is applied to or associated with. The Installer shall allow 6 (six) weeks for review of MSDS

1.8 QUALITY ASSURANCE:

A. OEM's Qualification: Regularly engaged for the past five years in the manufacture of major components for machine room less passenger elevators. As a standard of quality the elevator equipment design and installation shall comply with the code.

B. Installer's Qualifications: OEM's representative or authorized agent of elevator equipment manufacturer who is trained and approved for installation of units required for this Project.

C. Source Limitations: Obtain elevators through one source from a single manufacturing plant. Buy American provisions are stipulated in the General Terms and Conditions of this Contract.

D. Welding: Welding shall be performed in accordance with the requirements of AWS or CWB Welders shall produce evidence of current certification by AWS or CWB.

E. The elevator subcontractor shall guarantee the materials and workmanship of the apparatus furnished under these specifications and will make good any defects not due to ordinary wear and tear or improper use or careless, which may develop within one (1) year from date of completion of each elevator, inclusive of labor and traveling expenses.

F. Labeling Requirements: Every elevator shall be clearly marked with rated load and speed, manufacture serial number, and the designated Owner's identification.

G. Requirements of Regulatory Agencies

1. Application, Permits, Inspections, and Tests

a. Contractor shall obtain and pay for all necessary permits, and perform such tests as may be required for acceptance and approval of elevators by jurisdictional agencies.

b. Contractor shall notify the proper inspectors to witness required testing.

H. Factory Visit:

1. Contractor will be required to make necessary arrangements for one (1) factory inspection visit to view completed operating condition of the elevator. Arrangements for the visit are to accommodate three (3) owner's representatives. Contractor to absorb all costs associated with the same.

2. The OEM/Installer shall not ship the elevator without the approval of the Owner after the conclusion of the factory visit.

1.9 DELIVERY, STORAGE AND HANDLING:

A. Store materials in original protective packaging in a dry and protected area.

B. Protect equipment exposed finishes during transportation storage and erection against damage and stains.

C. Deliver components with factory-installed wooden skids and lifting lugs; pack components in factory-fabricated protective containers.

D. Handle components carefully to avoid damage to components, enclosures, and finish.

E. Store components in clean, dry areas and protect them from weather. Storage shall be in areas designated by the Engineer.

F. Comply with the OEM's rigging instructions for unloading components; and moving components to their final location for installation.

1.10 ACCEPTANCE AND WARRANTY:

A. The manufacturer shall warrant in writing that all equipment manufactured and installed under this specification, for a period of twelve (12) months from the date of Final Payment by the Owner, be free of defects in design, materials, and workmanship, under normal use and service.

B. The warranty shall include materials and labor necessary to correct defects.

C. Defects shall include, but not be limited to, noisy, rough, or substandard operation; loose, damaged, and missing parts; and fluid leaks.

D. Warranty Maintenance Requirements:

1. The installer shall provide an interim maintenance service prior to being added into the Owner's maintenance program. This interim maintenance shall start at final equipment acceptance for the elevator and be provided for a period of twelve (12) months.

2. Provide complete service and maintenance of the elevator and related components including electrical control systems during the interim maintenance period as follows:

a. Tasks:

1) Inspection of completed installation and periodic testing to maintain elevator in completely operable condition.

2) Monitor operation of each elevator at least monthly for a minimum of two (2) hours. Provide monthly documentation of the same to the Owner.

3) Periodic lubrication of parts and equipment components as per OEM's recommendation. Charts are to be provided for each elevator indicating when services are provided.

4) Provide twenty (24) hour emergency service during the maintenance period consisting of a prompt response (within 2 hours) to emergency request by telephone or otherwise from Owner or designated representative if an elevator is inoperable or in case of injury, entrapment, or potential injury to persons.

5) Unlimited regular time callbacks are included with a required response time of one (1) hour. Regular time will be Monday through Friday, 8:00am to 4:30pm, exclusive of holidays.

6) Annual clean down of the elevator and hoistway enclosure is required. Make necessary arrangements with Owner in order to minimize any inconvenience.

7) Reporting: Detailed monthly records of tasks performed including names of individuals performing the tasks, date and time performed, and other pertinent data. Elevator Contractor is required to conform to the requirements of the Owner's data base maintenance system.

E. Provide complete service and maintenance of the elevator and related components including electrical control systems during the interim maintenance period as outline in the maintenance specifications.

1.11 GUARANTEES:

A. Notwithstanding the Specifications forming a part of this Contract, any inspection or approval of the Work by the Engineer, or the existence of any patent or trade name, the Contractor nevertheless unconditionally guarantees that the equipment furnished and installed hereunder shall be of the best quality and shall be fully fit for the purpose for which it is intended.

1.12 SPARE PARTS AND STOCK:

A. Spare Parts: No spare parts to be provided.

1.13 DESIGN CRITERIA:

A. General

1. Elevators shall be designed with provisions for thermal expansion and contraction of complete elevator assemblies.

B. Operational Requirements

1. Hours of operation shall be considered as twenty-four (24) hours per day, seven (7) days per week.

2. Elevator components shall be designed based on the following applied duty cycle during operation:

a. Three (3) Hours with 100% Rated Load

b. Six (6) Hours with 50% Rated Load

c. Fifteen (15) Hours with 25% Rated Load

3. Maximum dwell time per landing in these calculations shall be no more than 10 seconds.

1.14 ENVIRONMENTAL REQUIREMENTS:

A. Elevator cars shall be designed to operate while exposed to the natural elements of weather, including sunlight, rain; all conditions of relative humidity while exposed to salt, airborne dust, and debris, and corrosive elements; and in a dry bulb temperature range of minus ten (10) to plus one hundred and five (+105) degrees Fahrenheit.

B. Sound Level: Elevators shall be designed to operate at or below a seventy (70) decibel sound level, measured five (5) feet above the elevator cab floor at any location, with the elevator operating normally, either free running or under load. For multiple elevator installations, the noise measurements shall be made with only one (1) elevator unit in operation, but with the entire installation complete and in operating condition. An ambient level not to exceed forty-nine (49) decibels shall be maintained prior to units being turned on.

C. Bearings:

Bearings shall be rated for an ISO L10H life as specified, under a fluctuating bearing load. All bearings shall have basic dynamic load ratings.

D. Fasteners:

1. Fasteners shall be compatible with materials being fastened.

2. Fasteners shall be furnished with self locking nuts or retaining rings (spring washers, toothed disks).

3. Fasteners shall be equal to or of greater corrosion resistance than the most corrosion resistant metals being fastened.

E. Ride Quality:

1. All elevators shall have a maximum decibel reading of 70 Dba with the doors closed during a run in the up direction, measured 5 feet above the floor in the center of the cab.

2. All elevators shall have a maximum vibration of 30 milli-g's in the X, Y and Z axis measured with an A95 filter.

1.15 COORDINATION REQUIREMENTS:

A. Alterations: Contractor shall coordinate any alterations required to accommodate elevators with the Owner.

B. Floor finish in cab: Contractor shall coordinate with other appropriate contractors and/or trades.

C. Electrical: The Contractor shall coordinate all trades regarding the installation of CCTV, communications, smoke detectors, power and cab lighting requirements

D. Contractor to provide Pit Drainage: Provide a means to prevent water from accumulating in the pit for outdoor elevators and indoor elevators subject to ground water or station wash downs.

E. Rigging Plan: Contractor shall supply a detailed rigging plan that is approved by the Owner. Rigging plans to include, but not limited to, path of entry and egress, imposed loading on floor surfaces and structures, product data of devices to be utilized in the rigging process with reference dimensions and lifting capacities. Rigging plans to be signed and sealed by a professional engineer registered in the State of Florida.

F. Safety Training: Contractor shall attend appropriate safety training programs provided by the Owner at no extra cost As-Built Drawings: Contractor is responsible to provide revised Contract Drawings to reflect the actual as built condition including all structural, architectural, electrical, mechanical and plumbing connections to the elevators.

G. Lock Cylinders:

1. All locks and keys shall be as per Owner's current standard lock requirements and or Engineer approval.

2. Contractor shall verify with the Engineer that the requirements for hardware have not been amended or superseded.

3. Contractor shall provide the Engineer with length, finish, and camming requirements of each cylinder required

H. Methodology: The contractor shall meet with the Owner provide a written method of installation for approval.

I. Installer is required to coordinate and absorb all costs and efforts to secure required variances for the elevator installations applicable.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER:

A. Subject to compliance with the requirements of this Section, provide machine room-less elevators by Thyssen Krupp or Approved Equal

B. Subject to compliance with the requirements of this Section, provide elevator cabs as specified.

2.2 MATERIAL:

A. Except where product conformance to specific standards is indicated on the Contract Drawings and in ASME/ANSI A17.1, manufacturer's standard materials and equipment may be used in elevator construction, subject to approval. Materials cited below are intended to establish the standard of quality for comparable materials used by the manufacturer.

B. Structural Shapes, Plates, Sheets, and Tubing: ASTM A36 Steel.

C. Sheet Steel: ASNI/ASTM A446, Grade B.

D. Stainless Steel: ASTM A167, Type 316L.

1. Stainless steel to be rolled into exposed surface. Location as noted herein to be selected by Architect from OEM 's standard finishes.

2. Type 316L, #4 finish. Located as noted herein.

E. Aluminum: ASTM B211 or ASTM B221, Alloy 6061, T6.

F. Transparent Glazing Panels: 9/16 inch (14 mm) minimum laminated safety glass conforming to the requirements of ANSI Z97.1 and 16CFR Part 1201.

G. Flooring: Poured epoxy flooring

2.3 SPECIAL FEATURES:

A. General:

1. Elevator shall be of size, arrangement, capacity and shall comply with design criteria, an d in accordance with the requirements ANSI/ASME A17.1-2004 and A17.1S-2005 w/ Addenda Safety Code for Elevators and Escalators, hereinafter in this Section the "Code".

2. Provide all material and equipment necessary for the complete execution of all elevator work as specified in this Section and as shown on the Contract Drawings.

3. Contractor to Provide hoistway guards for protecting hoistway during construction. Hoistway protection shall include high solid panels surrounding each hoistway opening at each floor.

4. All electric equipment, conduit, fittings and wiring shall conform to the requirements of ANSI/NFPA No. 70 National Electric Code.

5. Provide concrete inserts and other similar anchoring devices for the installation of guide rails, machinery and other elevator components.

6. Clearance around equipment located in each elevator control room and machine area shall comply with the applicable provisions of ANSI/NFPA No. 70 National Electrical Code.

7. Provide special control and notification instrumentation required by code officials for low overhead conditions that are not code compliant and require variances.

2.4 SUMMARY OF FEATURES:

A. For elevator system and components, refer to Section 14 21 00 - TRACTION PASSENGER ELEVATORS (MRL) in addition to the following features:

1.	Machine Location:	Overhead within Hoistway
2.	Machine Type:	AC gearless, machine room-less
3.	Car/Hoistway Door Operation:	Power High-speed, heavy duty (Minimum opening speed 3.0 FPS)
4.	Car Operating Panel:	Type 316L stainless Steel #4 finish with vandal resistant features
5.	Car Position Indicator	Type 316L stainless Steel #4 finish with vandal resistant features
6.	Car Direction Indicator	Type 316L stainless Steel #4 finish with vandal resistant features
7.	Hall Call Stations:	Single riser, stainless steel #4 finish with vandal resistant buttons
8.	Communication System:	“Hands-Free”

9. Provide keyed switch in car operating panel or hall pushbutton station as directed to shut down elevator.

10. Maintenance Term: One (1) year after Authority acceptance

2.5 DOOR OPERATOR EQUIPMENT:

Provide a QKS16-IDD door operator with AC motor and ACVF drive. Drive shall be able to interface with open, close and nudge signals of the controller. Mount cab door directly to the hanger assembly for smooth operation.

QKS16-IDD-P Door Operator

The door operator shall provide automatic power operation of the elevator cab doors. When the door operator control is signaled by the elevator control it shall open single speed center parting (C1 or SSCO), single speed telescoping (T1 or SSSO), or two speed telescoping (T2 or 2SSO) door systems. When the car is at a hoistway landing the cab doors and hoistway doors are coupled together and moved by the door operator. The door operator control is to use position and velocity feedback to precisely move the doors to the proper position at the proper velocity.

Features of the QKS16-IDD-P Door Operator:

- Closed loop door system
- 1/3 hp (250 W) AC Motor (No brush noise)
- Nudging feature - 30s delay until nudging starts, adjustable from 0-100s. Nudge close speed = 6in/s (150mm)
- Adjustable door close pressure - Default is 18-20lbf, adjustable up to code limit of 30lbf
- Door hold open - 30s non-adjustable, fixed time value in core software
- Integrated motor, door drive, line filter, and door open/close switch in single module
- Integrated car top maintenance station
- Retractable/separable clutch
- Motion matches preprogrammed profile for smooth and consistent door operation
- Door drive software can be changed for specific adjustment of the elevator door's opening and closing performance requirements.

Linear operator shall have the drive motor directly coupled to the door hanger plates via a timing belt. There are shall be no other moving parts thus avoiding the need for more robust mechanical and electrical systems that are required to overcome the inefficiencies associated with physical characteristics.

All code required car door interlocks and related safety devices will be provided.

A. Door Protection: Electronic Entrance Detector Screen: Provide Cedes MiniMax electronic door detector device, which projects an infrared curtain of light guarding the door opening. Arrange to reopen doors if one beam of the curtain is penetrated. Unit shall have transmitters and receivers spaced at a minimum distance to provide the maximum amount of protection within the height of the doorway. Systems, which have the availability to turn Off or On individual zones within the curtain, will not be allowed.

2.6 HOISTWAY EQUIPMENT:

A. Guide Rails:

1. Guides shall be steel T-section rails. Rail surfaces shall be machined smooth to insure proper operation of guides. Rail ends shall be accurately machined with tongue and matching groove centrally located on web. Non wearing rail surfaces are to be painted at the completion of the elevator in color selected by the Architect.

2. Guides shall be joined and installed in accordance with Section 2.23 of the Code.

3. Guide rails are to be concealed, so view from within elevator cab is minimized.

B. Car Buffers: Spring and/or Oil type with blocking and support. Oil type buffers to be provided with sight glass to ensure proper oil levels. *(User Note: For speeds greater than 200 fpm, oil buffers to be specified)*

C. Counterweight Buffers: Spring and/or Oil type with blocking and support. Oil type buffers to be provided with sight glass to ensure proper oil levels. *(User Note: For speeds greater than 200 fpm, oil buffers to be specified)*

D. Roller Guides: Roller guides shall be mounted on top and bottom of the car and counterweight frames to engage the guide rails.

E. Suspension Means: If steel core ropes are supplied, a means to provide constant lubrication shall be provided. An alarm indicator shall be provided when the oil reservoir is at 25% of capacity.

F. Machine: AC gearless machine, with permanent magnet synchronous motor with a Protection Class of IP21 and Insulation Class F, direct current electro-mechanical disc brakes and integral traction drive sheave. Machine can be mounted to the car guide rail or support beam mounted at the top of the hoistway.

G. Stop Switch: An enclosed stop switch, mounted in the pit of each elevator in accordance with Rule 2.2.6 of the Code, shall prevent operation of elevator when switch is activated. Switch shall be of the type described in Rule 2.2.6 of the Code.

H. Emergency Auxiliary Stop Switch: An enclosed stop switch, mounted in the overhead machine area and/or on the machine of each elevator in accordance with Rule 2.7 of the Code, shall prevent operation of elevator when switch is activated. Switch shall be of the type described in Rule 2.7 of the Code.

I. Dead End Hitch Assemblies: Provide dead end hitch assemblies in accordance with OEM's loading requirements.

J. Counterweight

1. Counterweights shall consist of a steel frame welded or bolted together and necessary steel weight sections. These weight sections shall be held securely in place within the frame**.** Submit paint finish of counterweights for approval. Paint color selection to be determined by the Architect.

    a. A required counterweight screen where no compensation is used.

    b. The bottom of the counterweight shall have a buffer striking plate and means to attach knock-off blocks during rope stretch.

    c. Idler Sheave: To be located directly above the counterweight frame and integral with counterweight frame. The sheave material shall be accurately machined of semi-steel of hardness BHN 220-250 or as per manufacturers requirements.

    d. Roller guides shall be mounted on top and bottom of the counterweight frames to engage the guide rails. Counterweight guides shall be of the roller type; each guide shall consist of three inch (3") large diameter polyurethane rollers equipped with sealed preloaded ball bearings. Each roller shall be supported by a pivoted rocker arm that shall automatically adjust itself to guide rail misalignment and prevent excessive lateral car movement.

K. Governor: Friction type over-speed governor rated for the duty of the elevator specified and to operate the car safety. The finish of pit tension sheave shall be factory paint.

1. Locate the governor where the car or the counterweight in case of overtravel cannot strike it, and where there is adequate space for full movement of governor parts

2. An electrical governor overspeed protective switch that, where operated, shall remove power from the driving machine motor and brake before or at the time of application of the safety.

3. Seal and tag the governor with the running speed, tripping speed, and date last tested as required by Code.

L. Tension Sheave: Provide tension sheave in accordance with OEM's governor and car safety loading requirements

M. Terminal Limits: Limit switches shall slowdown and stop the car at the terminals if the primary automatic stopping system fails.

N. Life Safety Provisions: Life safety hooks and/or other life safety devices for fall protection to be in accordance with OSHA standards/guidelines. Life safety hook and/or other life safety devices locations to be coordinated and installed by the elevator contractor.

2.7 MACHINE COMPONENTS:

A. Motor:

1. Bearings shall be rated with an ISO l10H life of 50,000 hours

2. The motors shall be of the alternating current reversible asynchronous or synchronous type of a design adapted to the severe requirements of elevator service. Motor shall be capable of developing the torque required to meet or exceed an acceleration rate of 2 ft/sec² for the elevator car.

3. A means to protect the windings and bearings from airborne dust shall be provided

4. Insulation of all windings shall be impregnated and baked to prevent absorption of moisture and oil. The insulation resistance between motor frame and windings shall not be less than one megohm. The motor windings shall stand a dielectric test of twice the normal voltage plus 1000 RMS volts of 60 Hertz, alternating current for one minute.

5. Motor leads in the conduit box shall have the same insulation class as the windings. Motor lead wire shall be rated 125 C and shall be sized for 105 C at the motor nameplate amperes at 1.0 Power Factor per Electrical Apparatus Service Association (EASA) recommendations. Leads are to be numbered for clockwise rotation when facing opposite the shaft end.

6. The motor shall be designed to stand the severe loads encountered in elevator service and the windings shall have a minimum insulation temperature rating two ratings higher than the actual temperature rise of the motor, with a minimum rating of NEMA class F.

7. The motor shall be designed to the ASME A17.1 rated load requirements.

8. The 400A gearless hoist machines are electric motors hoisting devices that work directly to raise and lower the elevator car. These machines use ACVF technology to control the permanent magnet synchronous motor. They are designed to be used with steel traction ropes and consists of a drive frame, the motor, a single wrap traction sheave, a dual brake system, cooling fans, an encoder, a sheave/rope guard, conduit box, and isolation materials for mounting. A remote mechanical brake release handle for the PMS420 and LS Z6L is supplied separately as part of the control cabinet. A flexible cable is used to connect the brake release handle to the machine. The remote brake release handle is used to manually release the brakes and allow controlled movement of the car for

emergency conditions or servicing. The machines are designed for hoistway or machine room mounting. When mounted in the hoistway the temperatures at the top of the hoistway shall be maintained within 32 - 122 degrees F (0 to 50 degrees C), 95% relative humidity, non-condensing. The machine sizes, when facing the sheave are as follows: 34.96 inches wide by 28.94 inches deep by 26.86 inches high.

B. Brake:

1. The brake(s) shall be of the self adjusting fail-safe (spring applied and electrically released) type provided with an external manual brake release and designed to meet the service factor demand of its intended use.

C. Gearless Machine:

1. Sheave: The sheave material shall be accurately machined of semi-steel of hardness BHN 220-250.

2. Antivibrational Mounts: For machines that are support beam mounted, an antivibrational mounting pad is to be provided.

2.8 CONTROLLER COMPONENTS:

A. Schindler Miconic GX controller shall be provided for each elevator. Controller shall govern starting, stopping and direction of travel of the elevator. The controller shall utilize solid state start control.

B. Controller shall protect the motor against current overload, phase reversal, and phase failure. A reverse phase relay shall be provided on the controller. Controller shall automatically open the power supply, and bring the car to rest if any of the safety devices fail to operate or if the power fails.

C. Selective Collective Operation: As defined by ASME A17.1 and shall be the pressure upon one or more car buttons shall send the car to the designated landings in the order in which the landings are reached by the car, irrespective of the sequence in which the buttons are pressed, provided the hoistway door interlock and car door switch circuits are completed. During this operation, the car shall also answer calls from the landings, which are in the prevailing direction of travel. Each landing call shall be canceled when answered

1. Pressure upon a hall button at a floor above the car location shall cause the car to start up and answer any up calls as they are reached by the car irrespective of the sequence the buttons have been pressed. The car shall not stop at floors where down buttons only had been pressed. If not further car or up hall calls are registered, the car shall reverse its direction preference to responds to car calls or down hall calls.

2. The car shall start down to answer calls below the car and shall not stop where only up calls are registered. When traveling up, the car shall reverse at the highest call and proceed to answer calls below it. When traveling down, the car shall reverse at the lowest call and answer calls above it.

3. Should both an up and a down call be registered at an intermediate landing, only the call responding to the direction in which the car is traveling shall be canceled upon the stopping of the car at the landing.

D. Controller shall be provided with starting switches of adequate size, together with all relays and switches to accomplish the type of elevator operation indicated herein. Switches that operate

power circuits shall be designed to prevent sticking due to fusing. Overload relay shall be of the manual reset type of suitable size for the motor furnished.

E. All controller components shall be neatly mounted and wired in a vented galvanized enclosure. All terminals and wires shall have identification markings. Steel enclosure to be supplied with a raised base to prevent potential water infiltration within the control room area. The Miconic GX control enclosure shall be certified by CSA, TESA to fully comply with NFPA 70 and CSA-C22.1. The controller is also to be tested to meet industry standards in electro magnetic compatibility, safety and system level operations.

F. The Miconic GX Controller shall be capable of communicating with the Owner SCADA via standard Ethernet LAN connection.

G. The diagnostic system shall be an integral part of the controller and provide user friendly interaction between the service technician and the controller system.

H. Controller will be used for remote monitoring capabilities. The contractor's engineering department will be responsible for programming the controller.

I. The signals as stipulated in Attachment B shall be monitored and controlled remotely.

J. The GCIOB360 board shall be the main processor. It shall control the elevator during normal automatic, hand and feature operations. It shall command the electric drive to control the movement of the elevator and controls the elevator door operation by commanding the CIOMRL board in the car station, which in turn commands the LUST door operator Control module in the car station. The GCIOB360 shall allow for the download of new software programs via a serial communications link.

K. The ASILOGA and ASIBNA boards shall act as a backplane for the GCIOB360 as well as the communications boards (EBCOM, and EBLON). It shall be the interface to the traveling cable and supports the landing leveling unit, pendant station, and other critical peripheral devices. All relay circuitry required satisfying elevator safety codes shall reside on ASIBNA. It shall operate the hoistway access switches. The ASIBNA also shall contain the built-in SMLCD maintenance tool.

L. This drive shall control the traction machine while monitoring temperature and current for protection. These are to be non-regenerative drives, meaning they are to use a bank of brake resistors to dissipate the regenerative energy instead of regenerating to the main line. There shall be a single-phase control transformer provided to reduce the building incoming power for different levels used by the controller. This transformer shall be used to power the 24VDC supply, door operator, machine brake, and safety circuit for system. The bridge rectifier and contactors shall both be used to control the machine brake. Two types of fuses shall be used, slow blow and fast acting. The slow blow fuses shall be used to protect the wiring and transformer in the control cabinet. The fast acting fuses shall protect the electric drive in case of an overload.

M. The controller hardware and boards shall be protected up to a 6kV 3kA transient surge. This rating is determined to be a value to provide a significant amount of lightning protection.

N. The electric drive includes a FEN filter as standard. This **shall** filter out any high frequency noise to reduce interference with other equipment within the building.

O. An alpha numeric fault indicator shall be provided in the service cabinet.

P. In cases where the programming is done by the supplier, the supplier must provide a copy of software chips. Contractor will provide an Eprom with all the base and job specific software for archival purposes.

Q. Each I/O shall be fuse protected or utilize optoisolation.

R. Provide UPS for Controller memory.

S. The ability to monitor the status of any controller remotely via the network.

T. The ability to communicate with all other models of controller manufactured by said manufacturer.

U. The controller shall be designed to operate automatically on standby power.

V. Elevator Drive System

Regenerative Variable Voltage Variable Frequency Drive shall be non-regenerative..

1. Velocity shall be controlled by a feedback loop to within +/- 2% of contract speed and speed shall be independently supervised.

2. Position of floors in the building shall be learned during a slow speed setup run. Once learned, floor locations shall be stored in non-volatile memory. Power loss shall not require the floors to be re-learned. Stopping accuracy shall be +/- 6.3 mm or less. Re-leveling shall be automatic.

3. Resistors shall be provided to absorb the power regenerated by the motor. They shall dissipate power only when the motor is regenerating. Control shall be by IGBT.

4. Maximum total harmonic distortion shall not exceed IEEE Std. 519 to be measured at the elevator disconnect.

W. Dielectric Matting: Dielectric rubber matting to be supplied on floor in front of controller to prevent accidental shock.

2.9 HOISTWAY ENTRANCES

A. General:

1. Hoistway entrances shall be of the horizontal sliding type, with operation and number of panels as indicated on the Contract Drawings.

2. All materials and finished surfaces exposed to public view shall be stainless steel with embossed finish and glass panels as indicated on Contract drawings. Glass panels to be completely flush with door assembly.

3. Contractor to provide the following equipment in 316L stainless steel with a #4 finish:

- All hoistway frames
- All hoistway entrances
- Elevators cab walls
- All Elevator fronts
- All cab doors
- All car stations
- All hall station plates

The following components will be galvanized:

- Fascia
- Dust covers
- Hanger track
- Headers
- Toe Guards

B. Galvanizing of materials is to be in conformance with specification 05 05 13.10.Hoistway Frames and Doors:

1. Entrance frames shall be of bolted *(User note: Optional Welded and Mitered based on hoistway wall configuration*) construction for complete one-piece unit assembly. All frames shall be securely fastened to fixing angles mounted in the hoistway and shall be of Type 316L stainless steel with directional grain in the vertical direction. The landing sills shall be nickel silver mill finish.

2. Hoistway entrances shall be of the horizontal sliding type, with operation and number of panels as indicated on the Contract Drawings.

3. Hoistway doors are to be stainless steel with a #4 satin finish with directional grain in the vertical direction and shall be reinforced and provided with keyways as required for operating mechanisms and door hangers. Each door panel shall have Z style/shaped stainless steel bottom guides that run in landing sill slots. Guides are to be replaceable without removing door panels.

4. Provide stamped stainless jamb markings (2 per entrance) mounted at 5’-0”.

5. Hoistway door hangers and door operator shall be as specified herein.

C. Struts and Closer Support Angles: Hoistway entrances adjacent to non-load bearing walls (gypsum dry wall, gypsum block, etc.) shall have hanger housing and door closers supported by steel angles of adequate size. Angles shall be continuous between sill and building beams above and shall be bolted to the hanger support. For load bearing walls (masonry, concrete block), submit for Engineer's approval, Shop Drawings of the method to be used to support hanger housing and door closers on the wall.

D. Class A: Landing Sills and Guards: Landing sills shall conform to Rule 2.11 of the Code and shall be nickel silver with a mill finish supplied with grooves and trash slots for door guides and machine planed for minimum clearance.. Sill mounting shall be integral with entrance strut wall mounting. Landing sills shall be guarded in accordance with the Code by landing sill guards of nominal 0.078 inch thick galvanized steel.

E. Hanger Supports and Cover Plates: Hanger supports shall be galvanized steel bolted to strut angles and closer support angles. Hanger cover plates shall be of galvanized steel and shall extend the full travel of the doors. Covers shall be made in sections for convenient access when servicing hangers. Hanger sections above door openings shall be removable from within elevator car.

F. Fascia Plate and Dust Cover: Fascia plate and dust cover shall be galvanized steel, reinforced as necessary to ensure a flat even surface throughout. Fascia plate shall extend at least the full width of door opening on each side and fastened to hanger housings and sills above. Dust cover shall extend full width and height of door travel and fastened to hanger support at the highest landing. Toe guard shall be fastened to the sill at the lowest landing.

Fascia plates and dust covers shall be painted, color to be determined by the Architect. *(User Note: Fascia plates are not required if car door interlock is specified, see 2.5 A (10))*

G. Interlocks and Contacts:

1. The doors at each hoistway entrance shall be equipped with approved hoistway door interlocks of the hoistway unit system type tested as required by the Code.

2. Interlock shall prevent operation of the car away from a landing until doors are locked in the closed position. Interlock shall prevent doors from opening at any landing from the corridor side unless car is at rest at that landing, or is in the leveling zone and stopping at that landing.

3. Hoistway door unlocking devices shall conform to the requirements of the Code and shall be provided to permit authorized persons to gain access to hoistway when car is away from landing.

4. Provide an electric contact mounted on the car that will prevent the car from moving away from landing unless car doors are closed.

H. Sight Guards: Stainless steel to match hoistway entrance frame.

2.10 CAB ENCLOSURE COMPONENTS:

A. Elevator Car:

1. General:

a. Elevator car and car components shall meet the applicable requirements of the Code. Car control station and position indicator shall be as specified herein.

b. Entire car assembly, including car frame and platform, shall be free from warps, buckles, and squeaks and rattles. Joints shall be lightproof.

2. Car Frame and Platform:

Class A: Car frame and platform shall be welded galvanized steel units designed and fabricated in accordance with applicable requirements herein and Rule 2.14 of the Code. Elevators designated on the Contract Drawing with a passenger-freight shall be provided a transition plate for loading purposes.

a. Protect car platform with fire retardant material. The platform shall be recessed as required to accept floor finish.

b. For elevators 1, 2, 3 and 5, Contractor to provide sub floor material to be nominal ¾" thick marine grade plywood to prevent water infiltration between finished floor, cab and platform base.

For elevator 4, Contractor to provide sub floor material to be three sheets of ¼" aluminum diamond plate to significantly enhance the durability of the flooring system and to meet the loading requirements of Section 1.2A herein.

c. Floor covering for platform: Poured Epoxy, Color and samples to be submitted to the Architect.

d. Idler Sheaves: To be located directly below the car platform and integral with platform frame. The sheave material shall be accurately machined of semi-steel of hardness BHN 220-250 or per as manufacturers requirements

3. Elevator Car Guides: Car guides shall be of the roller type; each guide shall consist of a set of three (3) large diameter polyurethane rollers equipped with sealed preloaded ball bearings. Each roller shall automatically adjust itself to guide rail misalignment and prevent excessive lateral car movement.

4. Car Enclosures:

a. Car Top: Car top shall be of stretcher leveled, cabinet grade, and nominal 0.109 inch thick furniture sheet steel, reinforced to support 300 pounds on any one square foot area. An emergency exit shall be installed in the car top in conformance with the Code. Interior surface of car top shall be painted reflective white. Exterior surface of car top shall be painted black.

b. Size and detail to withstand design stresses and provide for attachment and support of cladding, housing, ceiling, glass panels, and appurtenances. Paint all members after fabrication. Exterior of car glazing shall be easily accessible for cleaning.

c. Lighting is to be supplied with vandal resistant properties, *(Insert Model Name and Type).* Lighting to be mounted within the car top/canopy. Quantity/number of fixtures as indicated on contract drawings.

d. Interior Walls: Interior walls shall be as shown on the Contract Drawings and in accordance with the following:

1) Finish shall be Type 316L Stainless with rigidized textured surface, pattern to be selected by architect.

2) Glazing per 2.2F.

e. Stationary front return, transom and entrance column are to be provided in Type 316L stainless steel. Finish to be determined by Architect. *(User Note: Returns can be hinged for service)*

f. Car Doors: Car doors shall be of the horizontal sliding type with operator, number of panels, door material and finish of exposed surfaces shall be constructed of and faced with Type 316L stainless steel with direction grain in the vertical direction. Doors shall protect the full width and height of car entrance opening when in the fully closed position. Car doorframe shall be integral with front wall of cab.

5. Car Door Equipment:

a. Door Hangers: Door hangers for car and hoistway doors shall be of the two point suspension sheave type equipped with sealed heavy duty precision ball bearings, eccentric up-thrust rollers. Track shall be of formed galvanized steel and a rounded aluminum track surface to receive sheaves. Contractor to provide drawings for review.

b. Car/Hoistway Door Operator: Car and hoistway doors at each landing shall be opened and closed quietly and smoothly by an electric operator.

c. Door Protection: Electronic Entrance Detector Screen: Provide TriTronics electronic door detector device, which projects an infrared curtain of light guarding the door opening. Arrange to reopen doors if one beam of the curtain is

penetrated. Unit shall have Transmitters and Receivers spaced at a minimum distance to provide the maximum amount of protection within the height of the doorway. Systems, which have the availability to turn Off or On individual zones within the curtain, will not be allowed.

d. Lighting: Car lighting shall provide a minimum of 10-foot candles and shall of the type shown on the Contract Drawings Car lighting shall be provided with emergency battery backup upon failure or interruption of normal car lighting. Emergency lighting unit shall provide required lighting for a minimum of four (4) hours. Battery charger shall be capable of restoring battery to full charge within sixteen (16) hours after resumption of normal power. Provide an external means for testing battery, lamps, and alarm bell.

e. Handrails: Stainless steel handrails with finish to match faceplates of signal and control fixtures shall be provided as shown on the Contract Drawings.

6. Safety: A governor actuated mechanical safety device mounted under the car platform and securely bolted to the car sling. The car safety shall be sized for the capacity and speed noted in Section 14 21 00 TRACTION PASSENGER ELEVATORS (MRL). For Class C loading, the car safety shall be sized for the capacity, concentrated C3 loading and speed noted Section 14 21 00 TRACTION PASSENGER ELEVATORS (MRL).

a. When tripped, the safety mechanism shall engage the rails with sufficient force to stop a fully loaded car with an average rate of retardation within the limits given by the ASME A17.1 Code for the capacity for elevators 1, 2, 3 and 5 and for the capacity per the loading criteria as specifically specified in Section 1.2A herein for Elevator #4.

b. Make provisions to release the car safety. In no event shall the safety be released by downward motion of the car. Raising the car to reset the safety shall be allowed

c. Include .an electrical safety plank switch that will interrupt the power to the hoist machine when the safety is set. Resetting the plank switch shall be separate from resetting the safety jaws.

d. Install a car safety marking plate of corrosion resistant metal showing the data required by the Code.

2.11 SIGNAL DEVICES AND FIXTURES:

A. General: Provide signal fixtures and control devices for each elevator. Buttons and signals shall be tamper resistant of the illuminated type that light-up when activated and remain lit until call or other function has been fulfilled. All signal fixture and control device faceplates shall be of Type 316L, nominal 0.135 inch thick stainless steel with No. 4 finish, unless otherwise shown on the Contract Drawings.

B. Car Operating Station:

1. Provide one (1) main station in the front return of the elevator. *(User Note: For those elevators with both front and rear entrances, one (1) auxiliary station to be located at the rear return in addition to the main station)*.

2. Car operating stations shall contain a numbered call button for each landing served, and buttons for DOOR-OPEN, DOOR-CLOSE, , and ALARM call functions. Buttons shall be tamper resistant Type 316L stainless steel.

3. Station shall also have keyed switches for car light, exhaust fan, inspection, independent operation, emergency stop and a non-contact door reopening device deactivation if a light-ray type device is provided.

4. Station faceplate shall be Type 316L stainless steel with #4 finish. as indicated on the Contract drawings.

5. Engrave the car operating panel with the following:

   a. No Smoking. Minimum 1 inch high lettering.

   b. In Case of Fire Do Not Use Elevator: Minimum ½" lettering

   c. Elevator Number: Minimum 1 inch high lettering.

   d. Elevator Capacity: Minimum 3/8 inch high lettering.

   e. Firefighters Operating Instructions. Minimum 1/8 inch high Lettering. *(User Note: See local authority having jurisdiction fire instruction requirements)*

6. Provide die cast raised markings for the car buttons and car controls in compliance with the "Handicapped Requirements" of ANSI/ASME A17.1. Die cast plates are to be flush with faceplate surface. Plates are surface mounted

7. Emergency Communication: Telephone per contract documents.

C. Top of Car Operating Device: Provide a top-of-car operating device in compliance with the requirements of Rules 2.26 of the Code. The device shall have control switches for UP, DOWN, OPERATE/INSPECT, EMERGENCY STOP, , and LIGHT SWITCH. The device shall also have an 110v ac outlet for extension cord and provided with a light and rigidized guard

D. Hall Stations: Hall stations of the push-button, call acknowledging, stainless steel, tamper resistant type shall be recess mounted into the wall at all elevator landings. Highest landing shall have a single DOWN button. Lowest landing shall have a single UP button. Intermediate landings shall have UP and DOWN buttons with the Up button on top. Faceplate finish shall be Type 316L #4 stainless steel. Appendix "O" fire signs shall be integral within the faceplate, at all floors.

E. Car and Hall Position Indicator: Car position indicator shall be tamper resistant of the illuminated-signal or digital-display type, complete with an adjustable electronic chime that shall sound when car is stopping or passing a floor served by the elevator. Include direction-of-next travel signal if not provided in car control station. Indicator shall be mounted in the return above the car operating station(s).

F. Hall Lanterns:

1. Tamper resistant hall lanterns shall be equipped with illuminated UP and DOWN signal arrows, but provide single arrow where only one direction is possible. Provided units projecting from faceplate for ease of angular viewing. Match materials, finishes and mounting method with hall stations.

2. In conjunction with each hall lantern, provide an adjustable electronic chime signal to indicate that a car is arriving in response to a hall call and to indicate direction of car travel. Signal shall sound one for up direction of travel and twice for down direction.

G. Bell Alarm System: Bell alarm system for each elevator shall be properly located within building and audible outside hoistway when activated by the EMERGENCY STOP switch or the ALARM call button on each car control station.

H. Firefighters' Service System: Firefighters' service system shall be provided in compliance with national and local code requirements.

2.12 WIRING AND ELECTRICAL INSTALLATION:

A. Electrical installation shall be in accordance with Division 16.

B. Conduit and Wiring:

Unless otherwise specified, all electrical conductors in the pits and hoistways, except traveling cable connections to the car shall be provided in rigid zinc-coated steel conduit, or galvanized steel conduit with steel outlet boxes, except that a small amount of flexible conduit may be used where conduit is not subject to moisture or embedded in concrete. Terminal boxes and other similar items shall be of approved construction, thoroughly reinforced, and in no case less than number 12 USSG. All electrical boxes exceeding 150 cubic inches shall be supported independently of the conduits. The rigid conduit shall conform to the specifications here in before specified. All raceway shall be threaded rigid steel conduit. Flexible heavy-duty service cord, type SO, may be used between fixed car wiring and switches on car doors for door reversal devices.

1. All conduit terminating in steel cabinets, junction boxes, wireways, switch boxes, outlet boxes and similar locations shall have approved insulation bushings. If the bushings are constructed completely of insulation material, a steel locknut shall be installed under the bushing. At ends of conduits not terminating in steel cabinets or boxes, the conductors shall be protected by terminal fittings having an insulated opening for the conductors. All conduits terminating in NEMA 4X.

2. Conduit fittings and connections using set screws or indentations as a means of attachment are not permitted

3. Connect motors and other components subject to movement or vibration, to the conduit systems with flexible conduit.

4. The Contractor shall furnish all materials and completely wire all parts of the electrical equipment of the elevators including electrical devices on hatch doors.

5. All solid state and electrical components located on top of the car enclosure or in the hoistway shall be installed within NEMA 4X enclosures or galvanized shrouding if NEMA 4X enclosure is not available.

6. The conduits shall be of such size that the wires or cables can be readily installed and replaced, if necessary. No conduit or raceway shall be less than 3/4 inch trade size, except that for small devices such as door switches, interlocks, etc., ½ inch conduit may be used. The total overall cross sectional area of the wires contained in any conduit shall not exceed 40 percent of the internal area of the conduit.

7. Conduits shall be neatly and systematically run. All exposed conduit and boxes shall be supported by approved and substantial straps, hangers or clamps to the structural steel, reinforced concrete, or other approved supports. Riser conduits in hoistway shall be supported at each floor level.

8. All interlock, hall button and limit switch branch wiring shall be enclosed in flexible steel conduit with covering of liquid tight Type "EF" with connectors having nylon insulated throat.

9. All screws used for terminal connections of all wiring (control room, machine area, hoistway and pit) shall be provided with "star washers" of proper size and type.

C. Conductors:

1. No joints or splices shall be permitted in wiring except at outlets. Tap connectors may be used in wireways provided they meet all UL requirements

2. All wiring shall test free from short circuits or grounds. Insulation resistance between individual external conductors and between conductors and ground shall be not less than one meg-ohm.

3. Provide all necessary conduit and wiring between all remote control rooms, machine areas and hoistway.

D. Traveling Electrical Cable

Traveling cable shall consist of 20 #14 AWG (5 spares), 35 - #18 AWG (12 spares), 13 - #20 AWG twisted shielded pairs (7 spares) and 2 RG6 coal cables.

E. Car and hall operating signal circuits shall not exceed 48 volts.

F. All cabinets containing motor drives, filter boxes, transformers and power reactors shall be preconfigured with legs that raise the controller cabinet above floor level by three inches and shall be isolated from the base building structure with elastomer pads having a minimum static deflection of 3/8" (Mason Type N, or equivalent). All connections to and from the cabinetry shall be flexible in order not to compromise the isolation system. Use non-rigid conduit for the final electrical connection, with all other conduit supports and clamps provided on a neoprene sponge insert.

2.13 OPERATION:

A. General: Operation shall be simplex collective as defined by ASME A17.1.

1. Simplex Collective Operation:

a. Operation shall be automatic by means of the car and landing buttons. Stops registered by the momentary actuation of the car or landing buttons shall be made in the order in which the landings are reached in each direction of travel after the buttons have been actuated. All stops shall be subject to the respective car or landing button being actuated sufficiently in advance of the arrival of the car at that landing to enable the stop to be made. The first car or landing button actuated shall establish the direction of travel for an idle car.

b. "UP" landing calls shall be answered while the car is traveling in the up direction and "DOWN" landing calls shall be answered while the car is traveling down. The car shall reverse after the uppermost or lowermost car or landing calls has been answered, and proceed to answer car calls and landing calls registered in the opposite direction of travel.

c. If the car without registered car calls arrives at a floor where both up and down hall calls are registered, it shall initially respond to the hall call in the direction that the car was traveling. If no car call or hall call is registered for further travel in that direction, the car shall close its doors and immediately reopen them in response to the hall call in the opposite direction. Direction lanterns, if provided, shall indicate the changed direction when the doors reopen.

B. Independent Service: Provide a key switch in the car operating panel which, when actuated, shall cancel previously registered car calls, disconnect the elevator from the hall buttons and allow operation from the car buttons only.

C. Non-Contact Door Reopening Device operation shall be as follows:

1. The doors shall be prevented from closing from their full open position if any obstruction comes within the zone of detection. The detection zone shall move with the doors and if a person or object enters the zone as the doors are closing, the doors shall reverse and reopen. The doors shall re-close after a minimal time interval. A passenger entering or leaving the car shall not cause the doors to stop and reverse unless the doors reach a predetermined proximity to the passenger.

2. After a stop is made, the doors shall remain open for a time interval to permit passenger transfer, after which the doors shall close automatically. This interval shall be less for a car call stop than for a hall call stop or a coincident car/hall call stop.

D. Door Operation:

1. Door close shall be arranged to start after a minimum time, consistent with handicapped requirements, from notification that a car is answering a hall call.

2. Doors shall be arranged to remain open for a time period sufficient to meet handicapped requirements.

3. The time interval for which the elevator doors remain open when a car stops at a landing shall be independently adjustable for response to car calls and response to hall calls.

4. An approved positive interlock shall be provided for each hoistway entrance, which shall prevent operation of the elevator unless all doors for that elevator are closed and shall maintain the doors in their closed position while the elevator is away from the landing. Emergency access to the hoistway as required by governing codes shall be provided.

E. Standby Power Transfer: Upon the loss of normal power provide controls to automatically lower the elevator(s) nonstop to the lowest landing designated by the Fire Department. When arriving at the lowest landing, the elevator doors shall open automatically and remain open until regular door time has expired. The elevator shall then become deactivated.

F. Automatic Leveling: Machine room-Less gearless machine design shall be coordinated with the control so that car shall slow down and stop automatically at the floor (within 1/4 inch) after transition from contract speed. Car level shall be maintained automatically within one-quarter inch of the landing by an anti-creep leveling device regardless of any deviation that maybe caused by the loading or unloading of the car. Landing zone detection shall indicate to the control system the position with respect to the floor level.

G. Top-of-Car Operating Device: Operation of elevator from top-of-car device shall also be subject to applicable electrical protective devices required in Rule 2.26 of the Code.

H. Elevator Control Room:

1. A metal cabinet of not less than twenty (20) cubic feet in volume shall be provided and located in the control room area. Cabinet to be rated to hold flammable materials.

2. Cabinet shall have lockable doors and be mounted on legs or a pedestal, minimum of four (4) inches off the floor.

3. Cabinet shall be painted and marked for elevator purposes, as directed by the Owner, and Contractor shall store small parts, supplies, tools, and other materials within.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to commencing with the installation of elevator equipment, examine the following and verify that no irregularities exist that would affect the quality of execution of work as specified.

1. Hoistway size and plumbness.

2. Anchor brackets.

3. Sill support.

4. Pit depth.

5. Overhead clearance.

3.2 INSTALLATION:

A. Install elevator in accordance with the OEM 's installation procedures and approved Shop Drawings.

B. Verify that electrical wiring installation is in accordance with the OEM's submittal and in accordance with the installation requirements of other Sections of the Specifications.

C. Erect all items square, plumb, straight and accurately fitted with tight joints and intersections.

D. Coordinate all trades to ensure that the installation of the elevators is not in conflict with the work performed of other trades.

E. Isolate non-compatible, dissimilar materials from each other by providing vibration isolation, gaskets or insulating compounds.

F. Provide protective coverings for finished surfaces.

G. Upon completion, touch up and restore damaged or defaced factory finished surfaces. Touch up any marred finishes and replace as directed by the Owner.

H. Remove protective coverings and clean exposed surfaces after completion.

I. Elevator Control Room:

1. A metal cabinet of not less than twenty (20) cubic feet in volume (52 inches high x 36 inches wide x 18 inches deep) shall be provided in the elevator control room.

2. Cabinet shall have lockable doors and be mounted on legs or pedestals, a minimum of four (4) inches off the floor.

3. Cabinet shall be painted and marked for control purposes, as directed by the Engineer, and Contractor shall store small parts, supplies, tools, and other materials within.

J. Welding shall comply with AWS D1.1. Identify field welds with welder's identification stamp.

3.3 FIELD TESTING

A. Acceptance Testing:

1. General: After installation and before date approved for start of interim maintenance, inspect and test the elevator and related equipment to the Engineer's satisfaction that operation of every part of equipment complies with applicable requirements of ASME/ANSI A17.1 including sound level criteria specified in paragraph 1.4E herein. Elevator shall be inspected in accordance with procedures outlined ANSI/ASME A17.2.

    a. Provide test instruments, materials, other necessary facilities, and all labor required for acceptance tests specified.

2. Notification Requirements:

    a. Notify the Project Manager and the Engineer a minimum of five (5) working days prior to each scheduled test.

3. Full Load Run Test: Run elevator continuously a minimum of four (4) hours with full specified rated load, during which time car shall be stopped at top and bottom landings with a minimum standing period of 10 seconds at each landing.

4. Speed Test: Make tests before and after full load tests. Using a tachometer on guide rail, determine actual speed of car in both directions of travel, both with full-specified rated load and no load in car. Tolerances for determining if car speeds meet the specified requirements are as follows:

    a. Ascending Car Speed: Not more than 10 percent above or more than 10 percent below required speed.

    b. Descending Car Speed: Not more than 10 percent above or more than 10 percent below required speed.

5. Car Leveling Test: Determine accuracy of floor landing tests both before and after full load run tests. Minimum of 1/4 inch leveling must be maintained. Test accuracy of landing at all floors with full load and no load in car, in both directions of travel.

6. Electrical Tests: Ensure elevator wiring system is free of short circuits and accidental grounds. Test ground resistance of elevator structure, equipment, and raceways for continuity. Using megohm-meter, determine that insulation resistance of each circuit is more than one (1) megohm or higher as required by the cable manufacturer. Insulation resistance for motors shall be determined under actual conditions after installation.

7. Acceptance: Elevator acceptance will be based upon elevators meeting requirements of Contract Documents and upon evidence of passing specified acceptance tests and inspections. Final testing will be after elevators are connected to permanent power.

8. Test Reports: Within five (5) days after completion of a test, submit a test report stating type of test, test requirements, failures, or problems, and name of certifying Engineer and Title. Safety device failure or defective equipment shall be identified, with description of cause and corrective action taken.

9. Failures for any reasons shall be identified with cause(s) and corrective action taken.

10. Retest Notification Requirements:

    a. The Project Manager and Engineer shall be notified ten (10) days prior to the scheduled retest.

b. If any equipment is found to be damaged or defective, or if the performance of the elevator does not conform to the requirements of the contract specifications or the Safety Code, no approval or acceptance of elevators shall be issued until all defects have been corrected. When the repairs and adjustments have been completed and the discrepancies corrected, the Owner shall be notified and the elevator will be re-inspected. Rejected elevators shall not be used until they have been re-inspected and approved.

11. The certificate of inspection for operational use will be issued to the Owner by the enforcing inspection agency. The certificate shall be posted in the elevator control room and in the car operating station service cabinet.

B. Any deficiencies and defects discovered during the field-testing shall be corrected, repaired, replaced and retested to the satisfactory of the Engineer.

3.4 ADJUSTING AND CLEANING:

A. Immediately upon the completion of the elevators, thoroughly clean each elevator including car and hoistway doors and install 3/4 inch fire retardant plywood on wood studs (2 feet –0 inches on centers) to protect all hoistway doors, frames and sills. This protection shall be maintained until the Owner orders its removal, just prior to acceptance. At that time the Contractor shall perform a complete re-cleaning including doors and cabs.

B. Remove all debris not necessary for the elevator's operation that could cause safety problems.

C. Keep areas orderly and free from debris during the progress of the Project.

D. Remove all loose materials and filings resulting from this work from hoistway surfaces, pits and control room spaces.

E. Clean control room floor of dirt, oil and grease.

3.5 OWNER COORDINATION:

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate elevators.

B. Check operation of elevators with Owner's personnel present and before date of Substantial Completion. Determine that operation systems and devices are functioning properly.

C. Check operation of elevators with Owner's personnel present not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

No separate measurement or payment will be made for Transit Grade Electric Traction Elevators (MRL) Class A and Class C and this will be paid for as part of the overall Contract Lump Sum for that particular item of work, listed in the BID FORM, as applicable.

END OF SECTION 14 21 10