

## **1.0 GENERAL**

### **1.1 WORK SEQUENCE**

- .1 Supply and installation of permanent engineered fall protection system as shown on the drawings and as specified in the Contract Documents. Work includes but is not limited to:
  - .1 Materials and labour to install permanent fall protection anchors, lifeline and active fall protection system.
  - .2 All associated structural framing and reinforcement.
  - .3 Load testing of permanent anchors following installation and/or retrofit repairs in accordance with Section 11 24 20 – Fall Protection Anchor Testing and as directed by the Departmental Representative.

### **1.2 REFERENCE STANDARDS**

- .1 Reference Standards are latest editions, unless noted otherwise.
- .2 Canadian Standards Association (CSA)
  - .1 CSA G40.20/G40.21, General Requirement for Rolled or Welded Structural Quality Steel
  - .2 CSA W47.1, Certification of Companies for Welding of Steel Structures.
  - .3 CSA W59, Welded Steel Construction - Metal ARC Welding.
  - .4 CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .5 CAN/CSA Z271: Safety Code for Suspended Elevating Platforms
  - .6 CSA Fall Arrest Systems – Practical Essentials
  - .7 CSA/CAN Z259.15: Anchorage Connectors
  - .8 CSA Z259.16: Design of Active Fall Protection Systems
  - .9 CSA Z259.2.1: Fall Arresters, VLL, and Rails
  - .10 CSA Z259.2.2: Self-Retracting Devices for Personal Fall Arrest Systems
  - .11 CSA Z259.11: Energy Absorbers and Lanyards
  - .12 CSA Z259.12: Connecting Components for Personal Fall Arrest Systems (PFAS)
  - .13 CAN/CSA Z91 Health and Safety Code for Suspended Equipment Operations
- .3 American Society for Testing and Materials International (ASTM)
  - .1 ASTM A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
  - .2 ASTM A500, Cold Formed Welded and Seamless Carbon Steel Structural

Tubing in Rounds and Shapes.

### **1.3 REGULATORY REQUIREMENTS**

- .1 Conform to the Occupational Health and Safety Act and regulations that apply to the work being performed.
- .2 Conform to the National Building Code and requirements of CAN/CSA Z91 (Safety Code for Suspended Equipment Operations), CAN/CSA Z271 (Safety Code for Suspended Elevating Platforms), & CAN/CSA Z259.16 (Design of Active Fall-Protection Systems).

### **1.4 DESIGN AND COORDINATION**

- .1 Permanent fall protection anchorages are to be designed to resist without fracture a pull-out force of 22 kN, applied in the most adverse direction.
- .2 Pre-engineered fall protection anchorages are to have testing certification. Testing must have been completed within the last ten (10) years.
- .3 Coordinate work of this Section with structural steel fabrication to provide structural framing and reinforcement for permanent anchor loading as required.
- .4 Coordinate work of this Section with waterproofing to provide continuous waterproofing protection.

### **1.6 SUBMITTALS**

- .1 Submit shop drawings for all pre-engineered proprietary systems and components. Shop drawings are to include but not be limited to the following:
  - .1 Show complete anchor layout and configuration of the system, including all components and accessories.
  - .2 Fall protection components and system layout must meet or exceed the performance requirements of CSA Z91, CSA Z271, CSA Z259.16, the Occupational Health and Safety Act and National Building Code.
  - .3 Include dimensions, detail drawings of attachment to structure and design details.
  - .4 Indicate method of attachment to the building structure. Professional Engineer must certify the attachment point for required loads.
  - .5 Drawings to be stamped by a Professional Engineer registered in the Province of New Brunswick.
  - .6 Manufacturer's descriptive literature for each product, including section or other type details
  - .7 Manufacturer's written installation instructions and quality assurance statements describing fabrication quality control measures.
- .2 Submit test data from a qualified testing laboratory indicating that all pre-engineered proprietary anchors have been load tested in accordance with CSA Z91

and CSA Z271.

## **1.7 WELDER QUALIFICATIONS**

- .1 Welders Certificates: furnish welders' qualifications to Departmental Representative.
- .2 Welding procedures, welders and welding operations shall be qualified in accordance with Canadian Welding Bureau Standards.
- .3 Steel fabricators must be certified under requirements of CSA W47.1.
- .4 Each welder to possess identification symbol issued by authority having jurisdiction.
- .5 Certification of companies for fusion welding of steel structures to be in accordance with CSA-W47.1.
- .6 Manufacturer Qualifications: company specializing in manufacturing Products specified in this section with minimum three years documented experience.

## **1.8 QUALITY ASSURANCE**

- .1 Submit Test Reports and substantiating engineering data prepared an independent laboratory indicating that system meets required performance criteria. Testing must have been completed within the last ten (10) years.
- .2 Welding to be visual and non-destructive (magnetic particle) tested prior to galvanising by a qualified testing agency. Contractor to coordinate inspection of welds (co-ordinate with weld inspection agency) prior to application of hot-dip galvanising, primer, paint, etc. Fabricator to conduct testing and provide proof of quality assurance. Departmental Representative may, at his discretion conduct testing of materials and assemblies including in shop testing at the point of manufacture. Contractor to completely remove and replace deficient welds at his own cost. Replacement welds to be re-inspected.
- .3 Design of structural support framing components and inspection of the installation to be completed under direct supervision of a Professional Engineer.
- .4 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.
- .5 Co-ordinate the Work with installation of structural steel fabrication and erection, roofing assembly, and sheet metal work.

## **1.9 WARRANTY**

- .1 Warrant products installed under this section of work to be free of defects in materials and/or manufacture for a period of 5 years (from the date of project completion) when installed in accordance with the manufacturer's written instructions.

## **2.0 PRODUCTS**

### **2.1 MANUFACTURER**

- .1 Fall protection anchor and system manufacturer(s) to be a company specializing in the design and installation of permanent fall arrest and fall restraint safety systems.
  - .1 Fall protection anchor and system manufacturer to have minimum 5 years documented experience in the fabrication and installation of fall protection systems.

### **2.2 FALL PROTECTION ANCHORAGE REQUIREMENTS**

- .1 All installed and/or retrofitted permanent anchorage components are to be in accordance with CAN/CSA Z259.16: Design of Active Fall Protection Systems and CAN/CSA Z271: Safety Code for Suspended Elevating Platforms.
  - .1 Strength requirements: All fall arrest anchors are to be designed to withstand 22.2 kN without fracture and/or pull out and 11.1 kN without permanent deformation of any component of the anchor system, when subject to load testing after installation.
  - .2 Anchoring systems shall be made of stainless steel, aluminum, hot-dipped galvanized, or other corrosion-resistant material as approved by the Departmental Representative. Bolts and hardware shall be stainless steel.
  - .3 Anchorage connection points shall be made of a closed loop not less than 19 mm diameter material, with eye opening of not less than 35 mm diameter or equivalent.
- .2 Anchor Bolts to be stainless steel per ASTM F593 CW2 (316).

## **2.3 MATERIALS**

### **.1 Welded Anchors:**

- .1 Welded anchors are to be supplied and installed on site in accordance with the drawings and as directed by the Departmental Representative.
- .2 Exposed structural units: Stainless Steel, Type 316 or better.
- .3 Cast in place material: Stainless Steel, Type 316 or better.
- .4 Welding materials: in accordance with CSA W59.
- .5 Fasteners: Stainless Steel Type 316 or better, lock washers and hex nuts.

### **.2 Bolted Anchors:**

- .1 Bolted anchor assemblies are to be supplied and installed on site in accordance with the drawings and as directed by the Departmental Representative.
- .2 Exposed structural units: Stainless Steel, Type 316 or better.
- .3 Cast in place material: Stainless Steel, Type 316 or better.
- .4 Welding materials: in accordance with CSA W59.
- .5 Fasteners: Stainless Steel Type 316 or better, lock washers and hex nuts.

## **2.4 FABRICATION**

- .1 Fit and shop assemble items in largest practical sections, for delivery to site.
- .2 Fabricate items with joints tightly fitted and secured.
- .3 Continuously seal joined members by intermittent welds and plastic filler.
- .4 Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- .5 Exposed Mechanical Fastenings: screws or bolts; consistent with design of component.
- .6 Furnish and install components required for anchorage of fabrications.
- .7 Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- .8 Seal weld to prevent water ingress into void spaces such as within pedestal or pier anchors and fill with expanding foam to prevent moisture accumulation.

## **2.5 FINISHES**

- .1 Prepare uncoated steel surfaces: SSPC-SP 2, no more than 4 hours before applying epoxy primer.
- .2 Concealed steel anchors, clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

- .3 Do not prime surfaces in direct contact with concrete or where field welding is required.
- .4 Concealed Structural Components and Anchors: galvanize after fabrication to CAN/CSA-G164 to minimum 600 g/sq m galvanized coating.

## **2.6 WATERPROOFING AND COATINGS**

- .1 Coordinate installation with Waterproofing and/or Coating Contractor for sealing of membrane to anchors.

## **3.0 EXECUTION**

### **3.1 EXAMINATION**

- .1 Report to the Departmental Representative in writing, defects of work prepared by other trades and other unsatisfactory site conditions.
- .2 Verify site dimensions before commencement of work. Final placement of anchors must ensure coverage of exterior surfaces as intended by the anchor layout shown on the drawings.
- .3 Commencement of work will imply acceptance of prepared work.

### **3.2 PREPARATION**

- .1 In the event of structural deficiencies, deck corrosion or deterioration, ensure that a structural engineer has assessed and approved all surfaces upon which the work of this Section depends. Institute repairs and/or reinforcement where necessary.
- .2 If necessary, protect building interior and contents against ingress of water, dust, debris or other material.

### **3.3 INSTALLATION**

- .1 Install all anchors and equipment in accordance with manufacturer's printed instructions, shop drawings and as specified.
- .2 Ensure anchors and equipment is installed under the supervision of a Professional Engineer.
- .3 Where necessary, provide protection against deterioration due to contact of dissimilar materials.

- .4 Where bolting is used for fastening anchors, no fewer than two threads are to be exposed.

### **3.4 FIELD QUALITY CONTROL**

- .1 All new and/or retrofitted anchor installations to be tested using non-destructive load testing by a qualified testing agency as determined by the Departmental Representative upon completion of work. Testing is to be conducted in accordance with Section 11 24 20 – Fall Protection Anchor Testing.

### **3.5 ADJUSTING AND FINAL INSPECTION**

- .1 Verify that all manufactured units have been installed in accordance with specifications and details, and will function as intended. Adjust any items where necessary to ensure proper operation.
- .2 Fall protection system manufacturer is to perform final inspection for acceptance and provide documentation to commission the system upon completion of Work.

### **3.6 CLEANING**

- .1 Remove all debris and scrap resulting from the execution of this trade.
- .2 Clean manufactured units using materials and methods approved by manufacturer. Do not use cleaners or techniques which could impair performance of the fall protection system or waterproofing and wall coatings.

**END OF SECTION**