Section XXXXX

Uniline’s Unirail Fall Protection System

Note to Specifier



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General:
This specification is for Uniline’s unirail. Each application of a Unirail is specific to its location. Therefore, this specification needs to be modified to suit the project. Specific sections that need to be modified have a comment box (similar to this one) describing the action that needs to be taken.

About this Specification:
Currently, many fall protection companies do not follow best practice standards while designing unirails. Using the latest standards, this specification directs designs to conform to fall protection’s best practices

Product information:
Unirail is an engineered system comprised of anodized aluminum components designed to protect workers in fall restraint, fall arrest and while window washing. The Unirail system is unique, because like a horizontal lifeline the system will bend absorbing the workers energy and like a rigid rail the system will distribute energy amongst several anchorages. Additionally, the system performs similarly to a rigid rail, providing continuous uninhibited movement.

OSHA has determined that only Qualified Persons in fall protection can design unirail(s). If a unirail is not designed by a Qualified Person various critical may be overlooked leading workers and staff to a false sense of safety.

Questions:
If you have a question about this specification or have a general fall protection question, feel free to call Gravitec Systems (1-800-755-8455).

Removing Boxed Text:
Click on the Show/Hide button (paragraph symbol) on the menu bar (For more information go to the *Display Hidden Notes.doc* found within this flash drive).

# Part 1 General

## System Description

NOTE TO SPECIFIER:
There are many different applications for a Unirail. This specification focuses on three applications: fall restraint, fall arrest, and window washing

Provide the recipient of this document with a clear understanding of the system’s purpose. If any information is unknown or varies, provide enough information so the bidders can clearly interpret your intended product.

A. Type of system required:
This specification is for Uniline’s Unirail. If a Unirail is not what you are looking for, please refer to our other specifications.

B. System location:
Where will the system be located (roof, tower, wall, etc…)? Where will the system be located in relation to the worker (foot, waist, or head level)?

C. Maximum number of workers on system at one time:
Will rescuers need to use this system if a person falls?

D. Materials required for system:
Uniline primarily supplies all components with anodized aluminum or molded plastic.

E. Workers task while on the system:
What are workers doing while connected to the system? How are workers doing the task?

F. Type of fall protection required:
How will the workers be protected from the fall hazard? Will the workers never be able to reach the hazard (fall restraint)? Will the workers be allowed to have an arrested fall (fall arrest)? Will the workers be suspended from the system (window washing)?

G. Additional Components:
Will you need any hardware to connect the workers to the system? How many trolleys do you need?

H. Insurances required:
What insurances are required (e.g. Commercial Liability, Workers’ Comp., etc…)

### A. Type of system required: Unirail

### B. System location: Roof/ Wall/ Tower/ Etc… Foot/ Waist/ Head Height?

### C. Maximum number of workers on system at one time: ##

### D. Systems environmental exposure: What are the service conditions (indoors, outdoors, corrosive environment)? What materials will be required (steel, hot dip galvanizing, stainless steel, marine grade stainless etc…)?

### E. Workers task while on the system: Workers will walk along edge. Occasionally, workers are required to look over the edge. While walking, workers need to carry heavy objects.

### F. Type of fall protection required: Fall Restraint, Fall Arrest, or Window Washing

### G. Additional components: All attaching devices necessary for # workers.

### H. Insurances required: Commercial Liability and Workers’ Comp.

## 1.2 Related Sections

NOTE TO SPECIFIER
Delete any sections below not relevant to this project.
Add others sections as required, below are a few examples:

Section 08600 - Skylights
Section 11060 – Theater and Stage Equipment
Section 11140 – Vehicle Service Equipment
Section 11160 – Loading Dock Equipment
Section 11200 – Water Supply and Treatment Equipment
Section 11500 – Industrial and Process Equipment
Section 13120 - Pre-Engineered Structures
Section 13160 - Aquariums
Section 13165 - Aquatic Park Facilities
Section 13600 – Solar and Wind Energy Equipment
Section 15100 - Building Services Piping
Section 15700 – Heating, Ventilating, and Air Conditioning Equipment
Section 16700 - Communications

### A. Section 03300 - Cast-In-Place Concrete

### B. Section 03400 - Pre-Cast Concrete

### C. Section 05100 – Structural Metal Framing

### D. Section 05400 – Cold Formed Metal Framing

### E. Section 05310 - Metal Deck

### F. Section 06100 – Rough Carpentry

### G. Section 07510 - Built-Up Roofing

### H. Section 07700 - Roof Specialties and Accessories

### I. Section 11010 - Maintenance Equipment

## 1.3 References

NOTE TO SPECIFIER
Delete any sections below not relevant to this project; add others as required.

### A. Occupational Safety & Health Administration (OSHA)

#### 1. 29 CFR 1910.23(c) (1) & 29 CFR 1926.501(b) (1) - Occupational Health and Safety Standards General Industry & Construction: Duty to have fall protection

#### 2. 29 CFR 1926.502(d) (15) (i-ii) - Safety and Health Regulations for Construction: Anchor Design Requirements

#### 3. 29 CFR 1910.66 I(c) (10), I (d) (iv), II (2) - General Industry: Anchor Design Requirements

### B. American National Standards Institute (ANSI)

#### 1. Z359.0 [2012] – Definitions and Nomenclature Used for Fall Protection and Fall Arrest.

#### 2. Z359.1 [2007] – Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components

#### 3. Z359.2 [2007] – Minimum Requirements for a Comprehensive Managed Fall Protection Program

#### 4. Z359.3 [2007] – Safety Requirements for Positioning and Travel Restraint Systems.

#### 5. Z359.4 [2007] – Safety Requirements for Assisted-Rescue and Self-Rescue Systems, Subsystem and Components.

#### 6. Z359.6 [2009] – Specifications and Design Requirements for Active Fall Protection Systems.

#### 7. Z359.12 [2009] – Connecting Components for Personal Fall Arrest Systems

#### 8. Z359.13 [2009] – Personal Energy Absorbers and Energy Absorbing Lanyards

#### 9. Z359.14 [2012] – Safety Requirements for Self-Retracting Devices for Personal Fall Arrest and Rescue Systems.

### C. Materials, Bolting, Finishing: American Society of Testing Materials (ASTM)

#### 1. A36 - Standard Specification for Carbon Structural Steel.

#### 2. A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

#### 3. A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

#### 4. A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

#### 5. A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications

#### 6. A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

#### 7. A666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

### D. American Welding Society (AWS) D1.1/D1 - Structural Welding Code – Steel

### E. Design Standards

#### 1. American Institute of Steel Construction (AISC) 325-11 [14th ed.] – Steel Construction Manual

#### 2. National Design Specification (ANSI/NDS) [2012] – Wood Construction Manual

#### 3. International Building Code (IBC) [2012] – Building Design Manual

#### 4. American Society of Civil Engineers (ASCE/SEI) 7-10 [2010] – Minimum Design Loads for Buildings and Other Structures

#### 5. American Concrete Institute (ACI) 318-11 Building Code Requirements for Structural Concrete.

### F. International Window Cleaning Association (ANSI/IWCA) I 14.1 [2006] - Window Cleaning Safety Standard: Anchorages and Fall Protection

## 1.4 Performance

### A. System shall comply with 1.1 System Description

### B. Performance Requirements

#### 1. The Fall Protection System shall be designed to allow users to walk the entire length of the system without catching or binding. The system shall be designed to support required number of users in case of a fall and to prevent the users from free falling more than 6 feet. All components shall be designed by the fall protection system supplier and shall meet the applicable requirements of ANSI standards, IWCA standards, and OSHA regulations.

#### 2. Structural Performance:

##### a. Structure supporting Uniline Unirail system must be capable of withstanding design loads as required by governing regulations and codes. Where component design loads are specified herein, they represent design minimum requirements.

##### b. All unirails shall be designed with a minimum 2:1 safety factor.

## 1.5 Design

### A. Design Requirements

#### 1. Fall protection unirails shall comply with current applicable OSHA, ANSI, IWCA, and state regulations and standards.

#### 2. The fall protection system and any supporting structure shall be designed by:

####  Capital Safety Phone: 1-800-328-61463833 Sala Way Website: [www.capitalsafety.com](http://www.capitalsafety.com)Red Wing, MN 55066 E-mail: info@capitalsafety.com.

####  Gravitec Systems Inc. Phone: 1-800-755-845521291 Urdahl Road NW, Website: www.gravitec.comPoulsbo, WA 98370-7124 E-mail: solutions@gravitec.com.

#### 3. General Requirements:

##### a. Unirails shall be designed and installed, under the supervision of a Qualified Person, as part of a complete personal Fall Protection system.

##### b. The unirail must be level (less than a 5% grade).

##### c. Engineers shall, at minimum determine the performance of the system when a fall occurs on the shortest span (largest forces) and the longest span (largest total fall distance) in the system.

##### e. Anchorages for unirails systems shall be verified and designed, prior to use, by a Qualified Person with experience and training in designing and using unirails systems.

##### f. Unirail shall satisfy the seismic conditions for nonstructural components as described by ASCE/SEI 7 and the most current edition of the IBC. No exceptions can be taken if the system is required to function for life-safety purposes after an earthquake.

##### g. The fall arrest system shall consist of a stainless steel safety cable attached to the structure. The cable shall be continuous or shall have swaged splices, which allow the user to pass without disconnecting from the system.

##### h. Brackets and supports shall be attached to the structure with appropriate anchors of proper size to adequately support the intended loaded.

i. The unirail shall comply with Uniline design requirements.

Restraint These systems protect workers from nearby fall hazards by restricting their movements. The equipment and components can be the same as those used in fall arrest systems, but the performance of a fall restraint system eliminates any potential for impact loading on the user or system components.

#### 4. Restraint Unirails shall be designed per ANSI Z359.2 & ANSI Z359.6:

##### a. The Unirail shall prevent workers from reaching and falling into any open hole or off the edge of a working surface.

##### b. The Unirail shall comply with the requirements for fall arrest Unirails as indicated in this document.

##### c. Where a worker is using a full body harness the force on the worker’s body shall not exceed 400 lbs.

##### d. The use of fall restraint systems shall be limited to surfaces at or less than a slope of 4:12 from the horizontal. This is so a fall will not result in dynamic loading on the fall restraint system or where the authorized person could end up being suspended vertically from the system.

Arrest Often, the nature or location of work forbids the use of fall restraint systems. If so, fall arrest systems are the next best option. In these systems, the personal protective equipment is configured to allow a fall. However, the worker’s fall is arrested before striking the ground or other hazardous obstacles.

#### 4. Fall Arrest unirail (s) shall be designed per ANSI Z359.2 & ANSI Z359.6:

##### a. The selection, design, and installation of fall arrest Unirails shall be performed under the supervision of a Qualified Person.

##### b. Fall arrest unirails shall have the strength capable of sustaining static loads applied to the trolley at the system’s worst case loading of at least two times the maximum arresting force.

##### c. When more than one user is attached to a unirail, the strengths set forth in b. above shall be multiplied by the number of users attached to the system.

##### d. The swing fall shall comply with ANSI Z359.6 [5.3]

##### e. The clearance safety margin shall comply with ANSI Z359.6 [7.2.6.2]

Window Washing Window washing has its own unique standards that require a much stronger system. Due to these standards window washing anchorages have a higher cost.

#### 5. Window Washing System (ANSI/IWCA I-14.1):

##### a. Fall Protection Systems shall provide independent fall arrest anchorages in addition to suspension line anchorages for each descent location as required by IWCA.

##### b. The trolley shall be designed to be compatible with current window cleaning industry standard equipment (e.g. rope descent systems, Boatswain chairs, swing stages, transportable suspension devises).

##### c. Design of the Unirails, and equipment shall meet or exceed the following:

###### I. The primary support trolley(s) and the safety line trolley(s) shall be designed by a registered professional engineer and designed to support an ultimate capacity of not less than 4 times the rated load (swing staging) plus the fall arrest load for each operator suspended from the track.

###### II. All unirail and supporting structure shall be connected to the super structure using a minimum of two fasteners (e.g. bolts, epoxy anchors, threaded rod, etc...) per anchorage.

### B. Sub-System Requirements

#### 1. Harnesses and Vertical Lifelines (VLLs) used with the system shall comply with ANSI Z359.1

#### 2. Connecting Components (carabiners and snaphooks) used with the system shall comply with ANSI Z359.12

#### 3. Energy Absorbing Lanyards (EALs) used with the system shall comply with ANSI Z359.13

4. Self Retracting Lifelines (SRLs) used with the system shall comply with ANSI Z359.14

### C. Unirails shall be used exclusively for their designed use and shall be marked to prevent other uses.

### D. The design shall take into consideration the potential uses of and loads on the unirail, in order to facilitate the prompt rescue of workers who may fall while attached to the system.

## 1.6 Submittals

NOTE TO SPECIFIER
Check section number for continuity

### A. Submit under provisions of Section ##### – Submittal Procedures

### B. Product Data: Uniline’s data sheet on each product to be used, including:

#### 1. Preparation instructions and recommendations.

#### 2. Storage and handling requirements and recommendations

#### 3. Installation methods

### C. Drawings and Calculations:

#### 1. Drawings:

##### a. Show the layout of the system including where the system is located and the complete assembly of all components.

##### b. Include a specification of the number, location, and qualifications of workers using the system.

##### c. Clearly specify the equipment dimensions, materials, fabrication details, hardware, and installation instructions.

#### 2. Calculations:

##### a. Calculations shall be prepared under the supervision of a registered Professional Engineer and Qualified Person.

##### b. Include a statement defining the type of system and indicating that the design is in accordance with the requirements of ANSI Z359.6.

#### 3. The Professional Engineer who oversaw the design of the system shall affix their professional seal to each drawing and calculation package issued.

### D. Operation and Maintenance Data shall be prepared per Z359.2 & ANSI Z359.6:

#### 1. Include complete list of equipment replacement parts; identify each entry with the equipment description and part numbers.

#### 2. Include technical information for servicing equipment.

#### 3. Include legible “as-constructed” drawings of the installed system.

#### 4. Include installation date and system owner’s name and address.

#### 5. Include detailed operating procedures:

##### a. Written by a Qualified or Competent Person.

##### b. Identifying the unirails location

##### c. Stating any safety precautions that shall be followed during access and egress.

##### d. Describing the limitation on use of system: maximum load, designated equipment, required clearance and maximum number of persons permitted to be attached to the system at one time.

##### e. Instructions for inspection, maintenance, and retirement of the system and all of its components, including how often inspection and maintenance are to be performed and a description of the qualifications required for persons performing these tasks.

##### f. Procedure for inspection:

###### I. Required or recommended inspection intervals.

###### II. Detailed instruction for inspecting each component of the system.

###### III. Description of acceptance or rejection criteria, including retirement criteria, of each component of the system.

###### IV. Fall protection procedures shall include a requirement that any incidents, including accidents or near misses, be investigated to determine if procedures can be improved.

#### 6. Provide or direct the owner of the system or the employer of the workers using the system to develop and implement a rescue plan before the system is used.

## 1.7 Quality Assurance

### A. Single Source: Obtain all materials and equipment required under this section from a single supplier.

### B. Designer/Installer Qualifications: Engage a single firm to assume undivided responsibility for the design and fabrication of all fall protection system components. Firm shall have a minimum of 5 years documented experience in the fabrication of such components similar to that required for this project. Additionally, the firm shall have a minimum of 5 years documented experience in the installation of such components and who offers a regular inspection and maintenance service on such systems.

### C. Design Engineer: Employ a firm with a minimum of 10 years experience designing fall protection systems with a minimum of 5 systems installed in the previous 12 months. Who employs a registered Professional Engineer (PE), with evidence of being the principal PE on at least 3 fall arrest systems which have been in use for no less than 1 year prior to bid closing date.

### D. Professional Engineer and Fall Protection Qualified Person: Shall oversee the fall protection systems’ design, such that all component items meet the “Structural Performance” requirements, including sizing and spacing of all attachments to the building structure and verify the design is compliant with all applicable OSHA and ANSI standards. Additionally, they must prepare, stamp and sign all required calculations; while also approving the system designer’s drawings

### E. Welding to be executed by certified welders in accordance with AWS requirements.

## 1.8 Delivery, Storage & Handling

### A. Material delivery shall be coordinated with all effected entities.

### B. Storage and Protection:

#### 1. Store originally packaged materials in a cool, dry, and protected location.

#### 2. Materials shall be in new condition and show no signs of damage.

## 1.9 Sequencing

### A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

## 1.10 Warranty

### A. Manufacturer's standard year warranty for materials and workmanship.

# Part 2 Products

## 2.1 Manufacturers

### A. Manufacturers shall comply with the *Quality Assurance* section of this documentation.

### B. All supporting structure which connects the unirail to the super structure shall be designed by:

####  Gravitec Systems Inc. Phone: 1-800-755-845521291 Urdahl Road NW, Website: www.gravitec.comPoulsbo, WA 98370-7124 E-mail: solutions@gravitec.com.

## 2.2 pRODUCTS

### A. Capital Safety3833 Sala Way Red Wing, MN 55066

## 2.3 Materials

NOTE TO SPECIFIER
Delete any sections below not relevant to this project; add others as required.

### A. Product

#### 1. The system shall be a complete and turnkey complying with the performance and design criteria of this document.

#### 2. The Unirail (s) shall be the product of Uniline.

#### 3. Components: All system components shall be anodized aluminum or molded plastic.

##### 4. The Uniline Fall Protection System shall be attached to the supporting structure with appropriate fasteners. The fasteners shall be designed to support a load on the fall protection system of 2 times the maximum design load without failure.

#### 5. Provide all designed sub-system items per Section 1.5 (B) of this document.

#### B. Supporting Structure

#### 1. Structural Components shall comply with the applicable standards:

##### a. Structural Steel: ASTM A36

##### b. Structural Tubing: ASTM A500 Grade B

##### c. Structural Bars, Plates, Shapes, and Sheet Piling: ASTM A6

##### d. Piping: ASTM A53

#### 2. Fasteners shall comply with the applicable standards:

##### a. Structural Bolts: ASTM A325

##### b. Alloy-Steel and Stainless Steel Bolting: ASTM A193

#### 3. Flashing and Sealing Material shall comply with the applicable standards:

#### 4. Material substitutions shall be better than or equal to the requirements found in this section.

#### 5 Fabrication

##### a. Fabricate work true to dimension, square, plumb, level, and free from distortion or defects detrimental to performance.

##### b. Coordinate the system with supporting structure.

##### c. Welding:

###### I. AWS D 1.1 as applicable.

###### II. If Butt welds are used, then surplus welding material is to be ground off to ensure exposed surfaces are smooth. Fillet welds shall not be ground.

###### III. Slag is to be removed from the materials surface.

NOTE TO SPECIFIER
Delete any sections below not relevant to this project; add others as required.

#### 6 Finishes

##### a. Hot Dipped Galvanizing: Comply with ASTM A123.

##### b. Powder Coat: Safety Yellow

## 2.4 Unirail Design

### A. Unirail design shall comply with the *Design Requirement* section of this document.

### B. Steel design shall comply with AISC 14th ed.

### C. Wood design shall comply with ANSI/NDS [2005]

### D. Concrete design shall comply with ACI [2008]

### E. Fall protection systems attached onto an existing or new structure shall comply with IBC [2009] and ASCE/SEI [2010]

# Part 3 Execution

## 3.1 Installation

### A. Installation shall be performed by:

###  Gravitec Systems Inc. Phone: 1-800-755-845521291 Urdahl Road NW, Website: www.gravitec.comPoulsbo, WA 98370-7124 E-mail: solutions@gravitec.com.

### B. Install in accordance with approved shop drawings and manufacturer’s instructions.

### C. The Uniline Fall Protection System shall be installed under the direction of manufacturer’s authorized trained personnel and under the supervision of a Qualified Person

### D. Install anchorages and fasteners in accordance with their manufacturer’s recommendations to obtain the allowable working loads published in the product literature and in accordance with this specification.

### E. Do not load or stress the Uniline Fall Protection System until all materials and fasteners are properly installed and ready for service.

### F. Where bolting is used for fastening, no fewer than three threads are to be exposed and the nut is to be positively locked using a thread-locking fluid or the double nutting technique.

### G. Dissimilar materials with greater than 0.15V shall be separated by a faying surface.

## 3.2 Field Quality Control

### A. After the Uniline Fall Protection System is installed and properly tensioned, Uniline approved authorized Qualified or Competent Person shall inspect and operate the system and shall make all final adjustments for proper operation.

## 3.3 Adjustments And final Inspection

### A. 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.

### B. Provide a complete drawing set with any revisions to the design or layout of the unirails during installation.

NOTE TO SPECIFIER
While deliberating on deleting or adding to the training portion of this specification, note that OSHA requires that each employee is trained, as necessary, by a Competent Person qualified in the nature of the hazard and the correct procedure for the installed systems (1926.503a2). Allowing the contractor to provide training is an excellent way to build into a managed fall protection program. It is acceptable to delay training until the employees are available.

## 3.4 Operator Training

### A Provide a minimum of 4 hours of operator training after system has been installed. Training is to be for the users of the system conducted at the installation site.

## 3.5 Maintenance, Inspection and Testing

### A. Provide manufacturer maintenance, inspection and testing instructions.

### B. Provide documentation that is consistent with applicable OSHA, ANSI and IWCA standards.

End of Section