Section 112429

BEMO USA Corporation – fall protectionsystems

Note to Specifier

General:   
This specification is forthe XSPatforms’ XSImpact.XSImpact(s) support XSLinked and LinkedPro lifeline systemsand are used as independent single anchor points. Each application of the XSImpact 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.

Questions:   
If you have a question about this specification or have a general fall protection question, feel free to contact XSPlatforms at info@xsplatforms.com.

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 two applications for a XSImpact usedwitha XSLinked or LinkedPro lifeline system and used as a single point anchor. These two applications have similar requirements and therefore will be treated the same throughout this document.Additionally, there are two different ways the applications can be used: fall arrest and fall restraint. This specification primarily focuses on these 2 different applications.

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:   
Will the XSImpact(s) be used in conjunction with an XSLinked of LinkedPro lifeline system or will they be used as single anchor points? If neither of these applications are suitable for what you are looking for, please refer to our other specifications.

B. System location:   
Where will the system be located (roof, wall, ceiling etc…)? What structure will the XSImpact(s) be connected (Aluminum Roofing Panels, Steel Roofing Panels, Built up Roofing, Concrete, or Flat Non-Penetrating)?

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:   
XSPlatforms primarily supplies all components with a 304 stainless steel. However,theXSBase plates are made of Aluminum. If these materials do not meet what you are looking for please specify the requirements.

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)?

G. Additional Information:   
Is this specifications written with another specification? Is there any other pertinent information for this system?

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

### A. Type of system required: BEMO Xtrusion anchor point(s)Use in combination with XSLinked/LinkedPro system or as single anchor points

### B. System location: Roof

### 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 or fall arrest system(s)

### G. Additional information: Supporting Documents

### 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.

## 1.4 Performance

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

### B. Performance Requirements

#### 1. The BEMO Xtrusion Anchor shall provide a secure attachment means to the supporting structure in conjunction with the manufacturer’s requirements. The anchor shall provide compatible connects with the applicable personal connection equipment. All components shall be designed by the fall protection system supplier and shall meet the applicable requirements of ANSI and applicable OSHA regulations.

#### 2. Structural Performance:

##### a. Structure supporting BEMO Xtrusion Anchor point(s) must be capable of withstanding the design loads as required by governing regulations and codes. Where component design loads are specified herein, they represent design minimum requirements.

##### b. All fall protection components shall be designed with a minimum 2:1 safety factor.

## 1.5 Design

### A. Design Requirements

#### 1. The BEMO Xtrusion Anchor shall comply with current applicable OSHA, ANSI, and state regulations and standards.

#### 2. BEMO Xtrusion Anchor(s) and any supporting structure shall be designed by a BEMO Registered Partner/Installer. Details can be obtained from BEMO USA Corporation:

### **BEMO USA Corporation**

### **1755 N. 48th Street**

### **Mesa, AZ 85205**

### **Tel 480-545-790**

### [**sales@bemousa.com**](mailto:sales@bemousa.com)

#### 3. General Requirements:

##### a. Xtrusion Anchor connection to structure shall be designed and installed, under the supervision of a Qualified Person, as part of a complete personal Fall Protection system.

##### b. The integrated energy absorbers shall not be used to limit the maximum arrest force of the worker. Xtrusion Anchor energy absorbers shall be used only to control or reduce the maximum arrest load on the structure.

##### c. The design engineer shall ensure the increased clearance requirements of a deployed Xtrusion Anchor system will not conflict with the required clearance of the system.

##### d. Xtrusion Anchor point(s)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.

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

f. The designer shall take into account environmental factors (snow, ice, debris, etc...) when designing an anchor point such that the Xtrusion Anchor functions properly.

g. The Xtrusion Anchor(s) shall comply with BEMO 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 anchors of BEMO shall be designed per ANSI Z359.2&ANSI Z359.6:

##### a. The Xtrusion Anchor(s) shall prevent workers from reaching and falling into any open hole or off the edge of a working surface.

##### b. The installed system, containing Xtrusion Anchor anchor points, shall comply with the requirements for fall arrest anchor(s) as indicated in this document.

##### c. Xtrusion anchor(s) may be used in restraint systems; provided that the engineer has determined that the restraint forces will not cause the Xtrusion Anchor(s) to deploy and ensures that the anchor extension in combination with other deformations of the restraint system will not permit the worker(s) to reach the fall hazard.

##### d. The use of fall restraint systems shall be limited to surfaces at or less than a slope of 1:3 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.

#### 5. Fall Arrest anchor point(s) shall be designed per ANSI Z359.2 &ANSI Z359.6:

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

b. Anchorages designed for fall arrest systems shall have the strength capable of sustaining static loads applied in the directions permitted by the system of at least two times the maximum arresting force.

NOTE TO SPECIFIER  
The following item is only for use with lifelines.

##### c. When more than one user is attached to a horizontal lifeline, the load on the lifeline can be determined using either lumped mass or sequential fall calculations as described in ANSI Z359.6 [6.3.6]

##### 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]

f. Where a worker is using a full body harness the force on the worker’s body shall not exceed 8kN / 1800lbs.

### B. Sub-System Requirements

#### 1. Harnesses used with the system shall comply with ANSI Z359.1

#### 2. Connecting Components (carabiners and snap hooks) 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

### C. The fall protection system shall be used exclusively for its 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 fall protection system, in order to facilitate the prompt rescue of workers who may fall while attached to the system.

### E. The Xtrusion anchor(s) designed to meet EN ISO 9227(salt spray test).

### F. If required by engineer of record, the installer shall test the Xtrusion Anchor design using a 5 kN (1124 lbf) load for 30 seconds on applicable roof structures (tensile test).

### G. The Xtrusion anchor shall be capable of providing a consistent level of energy absorption in any direction in the plane of the roof structure.

### H. Each component of the Xtrusion Anchor shall be full traceable.

## 1.6 Submittals

NOTE TO SPECIFIER  
Check section number for continuity

### A. Product Data: BEMO’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

### B. 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 anchor attachment 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.

### C. Operation and Maintenance Data shall be prepared per ANSI 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 Xtrusion anchor(s) 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 of 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 one 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 Xtrusion Anchor(s) to the super structure shall be designed by a BEMO Registered Installer/Partner (details can be obtained by emailing sales@bemousa.com)

## 2.2 PRODUCTS

### A. **BEMO USA Corporation**

### **1755 N. 48th Street**

### **Mesa, AZ 85205**

### **Tel 480-545-790**

### [**sales@bemousa.com**](mailto:sales@bemousa.com)

## 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 solution complying with the performance and design criteria of this document.

#### 2. The energy absorbing Xtrusion Anchor anchor(s) shall be the product of BEMO USA Corporation.

#### 3. Components: All system connectors, cables and bolts shall be stainless steel Type 316 or epoxy coated aluminum. Fabricated supports required for additional support may be carbon steel with a corrosion resistant coating. However a faying surface shall be used to prevent galvanic reactions.

##### 4. XSBase plates and anchors: Provided complete with required components for weatherproof mounting to the following surfaces:

NOTE TO SPECIFIER  
Select the required roof surface(s) from the following paragraphs and delete the ones not required.

##### a. Standing Seam Roof Type.

##### b. Metal Roofing Type.

c. Green Roofing Type.

##### f. Insulated Roof Deck Type.

##### e. Concrete Deck Type.

##### f. Timber Deck Type.

g. Non-Penetrating.

#### 5. The Xtrusion anchor(s) 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.

#### 6. 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. Structural Components shall comply with the applicable design specification:

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

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

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

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

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

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

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

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

#### 6 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.

## 2.4 XSIMPACT Design

### A. The Xtrusion anchor design shall comply with the *Design Requirement* section of this document.

### B. 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 a BEMO Registered Installer/Partner. Details can be obtained from BEMO USA Corp:

### **BEMO USA Corp**

### **1755 N. 48th Street**

### **Mesa, AZ 85205**

### **Tel 480-545-790**

### [**sales@bemousa.com**](mailto:sales@bemousa.com)

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

### C. The BEMO 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 BEMO 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.

### H. Xtrusion anchor point(s) must be secured to roof surface with waterproof mechanical connectors as approved.

## 3.2 Field Quality Control

### A. After the BEMO Fall Protection System is installed, BEMO’s 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 fall protection system 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 (or as required by the manufacturer) 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 and ANSI standards.

### C. Annual maintenance and re-inspections on the BEMO Fall Protection System must be performed by an authorized Qualified or Competent Person to assure the System is in proper working condition for re-certification and safe-to-use.

### D. BEMO Fall Protection Systems have to be fully re-tested by an authorized Qualified or Competent Person after each 5 years in operation.

### **End of Section**