**DIVISION 13 - SPECIAL CONSTRUCTION**

## SECTION 13121 - PRE-ENGINEERED STEEL TACTICAL TRAINING TOWER

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

Drawings and general provisions of the contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

### 1.2 SUMMARY

This Section includes the following:
Tactical Training Tower.
Design requirements.

### 1.3 RELATED SECTIONS

The following Sections contain requirements that relate to this section:

### 1.4 REFERENCES

**1.4.1 American Iron and Steel Institute (AISI):**
"Specification for the Design of Cold-Formed Steel Structural Members."
**1.4.2 American Institute of Steel Construction (AISC):**
"Manual of Steel Construction", Allowable Stress or Load and Resistance Factor Design.
**1.4.3 American Society for Testing and Materials (ASTM) Publications:**
ASTM A-36 "Standard Specification for Carbon Structural Steel"
ASTM A-123 "Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products"
ASTM A-653 "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process"
ASTM A924 "Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process"
**1.4.4 Occupational Safety and Health Standards (OSHA):**
29 CFR 1910.23 – "Guarding Floor, Wall Openings, and Holes"
29 CFR 1910.24 – "Fixed Industrial Stairs"
29 CFR 1910.27 – "Fixed Ladders"

## PART 2-DESCRIPTION

# TACTICAL TRAINING SIMULATOR

## 2.1 PURPOSE:

This structure will be used to provide safe, accurate, realistic simulations for law enforcement and military personnel to practice and learn tactical procedures necessary to achieve mission objectives and save lives.

## 2.2 GENERAL:

The tower shall utilize a structural steel frame system and curtain wall design. Structural framing systems are considered the norm for high-rise and commercial structures. The curtain wall/exterior wall panel design produces an ideal buffer or protection between the main structural frame of our building and any exterior elements, so that if an exterior wall panel is damaged, no structural damage is likely to occur. This wall panel system also creates a flat surface ideal for ladder or rappelling anywhere on the tower to simulate actual street conditions.

## 2.3 STRUCTURAL INTEGRITY:

The wind loads, deck and the roof loads stated herein represent the standard criteria. Increased loadings, as may be dictated by local jurisdictions, will be accommodated. The primary structural system shall utilize hot-rolled structural steel column and beam frames sized to meet and exceed the loads as indicated. This training simulator shall be considered a nonbuilding structure for both code compliance and load interpretation. The primary and secondary structural system shall also meet and exceed the loads as indicated while maintaining a maximum deflection of L/240.

## 2.4 CODE COMPLIANCE:

The training simulator's primary structural and seismic design shall be in accordance with the building code having jurisdiction in the area of the project. Due to the nature of the intended use of these training towers, the stair design, the means of egress, fire wall requirements as well as other construction issues, are not expected to satisfy the criteria of buildings intended to accommodate public occupancy. This may require a building code variance in some locations; however, this simulator shall meet all applicable OSHA standards. It is the responsibility of the owner to obtain such variance if required.

## 2.5 MATERIALS:

All materials shall be new and shall conform to applicable ASTM specifications. All structural or nonstructural materials used, 10 gauge or less in thickness, whether exposed or not to the elements shall be **hot dipped galvanized**. **When any mention of galvanized is noted within these specifications, it shall be implied to mean hot dipped galvanized.** Any exposed

material which is not galvanized, shall be given one coat of shop paint.

## 2.6 FASTENERS:

All fasteners utilized with galvanized steel panels not exposed to the elements shall be electro-galvanized. All exterior fasteners shall be furnished with a contained EPDM washer under the head for sealing. Structural columns and beams shall be field bolted with (A325) 5/8” diameter electro-galvanized bolts or larger. Anchor bolts shall by furnished by the concrete contractor, unpainted and of the size specified on the anchor bolt plan.

## 2.7 WEATHER SEALING:

All joints in weather tight areas are to be sealed with tape caulk or foam closures as specified on the building plan. Because of the intended use water tightness of simulators is not required or assured.

## 2.8 ROOF SYSTEMS:

Roofs shall be decked with 30" or 36" wide, 18 ga. unpainted galvanized 18 gage steel deck per **ASTM A-653, class G60** with recessed fasteners and shall meet the stated design load. Panels must have 6" on center cell spacing with an actual 4 ¼” flats with an actual 1 ¾” wide recesses and a maximum of 1 ½” deep recesses. Panels must be roll formed.

## 2.9 EXTERIOR WALL SYSTEM:

Wall panel/curtain wall system shall provide for a concentrated rappelling/ladder load of 890 pounds while the primary structural framing supporting this wall system shall provide for a concentrated point load of 2300 pounds. **Rake trims, parapet rake trims, and window opening sill trim corners shall be beveled to prevent rope chafing, personal injury, or equipment damage.**

## 2.10 WALL PANELS:

The exterior wall panels shall be essentially flat to allow for safe laddering and rappelling anywhere on the simulator without the requirement of additional exterior surface plates to form a flat surface. The exterior wall panels shall be of 18 ga. hot-dipped galvanized steel per ASTM A-924, class G-90**.** Panels shall have nominal 4 ¾” flats with a maximum 1 1/8” wide recesses and shall be set in the horizontal plane. Since panels are set in the horizontal plane, sealants are not required to make this structure weather tight (sealants in extreme temperature environments will breakdown prematurely). Panels must be brake formed to provide a maximum 1/8” inside radius. All end joints of all panels must be backed by a splice panel, which extends a minimum of 12” either side of the joint (24” total). Exterior walls panels shall be painted from the customer’s choice of the manufacturer’s available colors.

The interior wall panels shall be corrugated for added strength and durability. The interior wall panels consist of hot-dipped galvanized steel per ASTM A-924. The interior wall panels shall have a ¾" deep maximum corrugation at 3 ½" on center and shall be set in the vertical plane. Interior wall panels shall be painted white.

Painted wall panels (interior and exterior) shall be manufactured from coil coated steel meeting ASTM A-924**,** hot-dipped galvanized, and painted with a **paint system on both sides** of the panel. The base coat shall be a 0.2 to 0.25 mil coat of a polyurethane primer. The topcoat shall be a 0.7 to 0.8 mil coat of silicon protected polyester on the face side. The paint, on both sides of the panel, is to be baked on. The finished surfaces are to have a light wax coating applied after painting.

## 2.11 SECONDARY WALL FRAMING:

Wall framing shall be of conventional steel stud construction. Studs are to run vertically to represent common stud construction and be spaced at no more than 24 inches on center. Stud size and gage shall be determined by the design engineer, and shall accommodate all design criteria stated in other sections of this specification. All rough openings shall be framed in the conventional manner and provide fastening surfaces for all interior and exterior finishes and trims as provided with the building system.

## 2.12 SECONDARY ROOF FRAMING:

Roof framing shall be of conventional steel joist construction, Joists are to be spaced at no more than 24 inches on center and shall have a maximum span length of 14 ft. All rough openings shall be framed in the conventional manner and provide fastening surfaces for all floor and roof decks as provided with the building system.

## 2.13 WINDOW & DOOR LOCATIONS:

Window and door locations indicated on the drawings are suggested only. All such openings are to be field cut and with the exception of the stair wall, may be located according to preference.

## 2.14 WINDOW SHUTTERS:

All window openings shall be provided with a swinging shutter of the proper size for the opening. Framed opening studs/jambs shall be 16 ga. galvanized steel. Shutters for all areas shall be made with double skins of 18 ga. galvanized steel per ASTM A-924. Shutters will be provided as a 1-3/8" thick factory welded hollow metal assembly with a minimum of 3 vertical interior hat channel stiffeners and a 14 ga. hinge reinforcement. The hinges shall be ball-bearing swaged mortise mount, 4" x 4" x 5/32" thick stainless steel, commercial grade, and provided with the appropriate quantities per shutter. Galvanized shutters are required to prevent premature rusting. All shutters shall be provided with a galvanized hold open latch.

## 2.15 DOORS:

Doors for all areas shall be double skins of 18 ga. galvanized steel (total thickness), per ASTM A-924, and shall be an insulated hollow metal swing doors with 3 stainless steel ball-bearing hinges and full weather stripping. Framed opening studs/jambs shall be 16 ga. galvanized steel. This 1 ¾" thick door shall have a baked-on enamel finish and will include a lockset. Locksets shall meet ANSI A156.2 Series 4000 Grade 2 certifications and shall be keyed alike.

## 2.16 PARAPET WALLS:

Parapet walls, if utilized, shall be designed to resist a load of 50 lb/ft and a concentrated point load of 200 lbs in any direction at the top. This wall shall incorporate a minimum of 12 ga. galvanized studs at one foot on center with 18 gage wall panels installed on both sides. The parapet shall incorporate an integral draining system that provides for uniform drainage without the need for a concrete roof covering.

## 2.17 SECONDARY FLOOR SYSTEM:

Interior decks shall be of six inch wide, unpainted 18 ga. **slip resistant galvannealed** steel per **ASTM A-924, A-60** with recessed fasteners and shall meet the stated design load. Panels must have nominal 5" flats with a maximum 1" wide by 1" deep recesses (maximum 1" recess is required to prevent potential injuries). Panels must be brake formed at 90 degrees and provide inside radiuses no greater than 1/8". All floor and roof decks shall be framed with light gage steel "C" joists spaced at no more than 24 inches on center and shall have a maximum span length of 14 ft. Joists size and gage shall be determined by the design engineer, and shall accommodate all design criteria stated in other sections of this specification. Concrete floor covering is not required in non-burn room areas due to the safe (no large recesses to twist ankles or injure knees) and user-friendly floor panels specified. Toe kicks shall be installed around the entire perimeter of each floor to prevent potential injuries due to exposed openings to floor below. Concrete floor covering can be specified for the entire floor while still maintaining stated design live loads. Concrete floor covering is by others.

If concrete floor covering is specified, the concrete shall be a minimum of 1 1/2" thick and shall be fiber reinforced. The concrete shall be pitched toward exterior walls and doors. Even with concrete covering, the steel floor panels, located below, shall alone be designed to carry all of the required loads and shall still be a minimum of 18 ga. thick galv. steel. Concrete is prone to damage in unheated structures due to freeze/thaw conditions, therefore concrete cannot be used to increase the design strength of the steel floor panels/decks in training structures.

## 2.18 STAIRS AND ACCESSORIES:

**2.18.1** Stair **widths shall be 3'-0" wide** and shall include handrails, guardrails, and steel bar grate approach landings. Steel bar grate approaches are provided for safety concerns (i.e., trainee in low visibility environments can "feel" stair approach). Stringers shall be

plate, treads and platforms of bar grate risers to be open. Bar grate treads (19W4 x 1" deep) are to be factory attached to the stringers and shall include a diamond plate nosing. Stairs shall be designed to resist a minimum loading of 100 psf and a minimum concentrated load of 300 lbs at the center of any treadspan.

**2.18.2** Handrails and guardrails shall consist of schedule 40 - 1 1/4" i.d. (1.66" o.d.) round pipe and the openings between rails shall not exceed 12" (minimum of three horizontal rails required). Handrails and guardrails shall be designed to resist a concentrated point load of 200 lbs in any direction at the top. Handrails shall be an all factory welded assembly. Guardrails shall have a factory welded post assembly to allow for the attachment of horizontal rails and shall be a minimum of 42" high. Rail extensions are not to be utilized.

**2.18.3** Stairs, stringers, handrails, guardrails, bar grating, ladders, and platform frames shall be hot-dipped galvanized per ASTM A-123. All welds, holes, cutting, and bending must be made prior to hot-dip galvanizing.

**2.19 <u>SERIES 2000 MOTEL/MALL(S2-MM) FEATURES:</u>**

58'-0" x 42'-4" x 27'-3" ridge (half 2 ½ story, half single story)
16-degree Gable roof on 2 ½ story, flat roof on single story
Roof live load 100 PSF
Wind load 90 mph
Floor live load 100 PSF (including attic area)
Exterior stairs to 2nd floor
Full length cantilevered balcony
Ladder fender brackets (see drawings for Qty.)
2'-6" x 3'-0" Bilco Roof hatches to attic (see drawings for Qty.)
2'-6" x 3'-0" Bilco Roof hatches to roof (see drawings for Qty.)
3'x7' interior steel doors, flush two sides (see drawings for Qty.)
3'x7' exterior steel doors, flush two sides (see drawings for Qty.)
Exhaust fans, 1 ½ HP - belt driven (see drawings for Qty.)
26 Interior rooms
(4) 5000 lb. (OSHA rated) rappelling rings
Parapet flat roof guard with exclusive roof drainage to the exterior of the building

**2.20 <u>NOT USED:</u>**

**2.21 <u>NOT USED:</u>**

**2.22 <u>NOT USED:</u>**

**2.23 <u>NOT USED:</u>**

## 2.24 DESIGN, DRAWINGS & DATA:

The supplier shall be responsible for providing the design exclusive of the foundation. Shall submit, as requested, structural calculations for review. Will, within 15 working days after the receipt of order, submit 2 sets of drawings detailing anchor bolt loadings and locations as well as general plans and elevations. Will submit 2 sets of assembly (steel erection) drawings and 2 sets of assembly manuals concurrent with the shipment of materials. Building parts shall each be identified by individual part numbers clearly written on or attached to the part. Part numbers shall coincide with the drawings.

## 2.25 DELIVERY, INSPECTION & STORAGE:

All components and accessories shall arrive via flat bed trailer. Materials for the burn room may arrive separately via common carrier. Inventory of delivered materials must be taken during delivery or shortly thereafter. Damage to, or shortages noted during delivery must be noted on the freight bill and reported at once to the manufacturer. All claims for damages or shortages must be reported within 48 hours of delivery Security and materials protection in storage is the responsibility of the receiving party. Materials packaged in small cartons must be stored in a secured area to prevent theft and/or damage by the elements. Materials stored outside must be stacked on pallets and covered with suitable waterproof coverings (not plastic).

## 2.26 WARRANTY:

### 2.26.1 General Warranty

The tower supplier shall certify that the training tower and its components have been designed to meet the contract specifications. The tower supplier shall warrant the materials and components to be free of fabricating defects for a period of **one year** from the date of shipment. This warranty is limited to the replacement of defective parts, or at the tower supplier's option, authorization may be given to the PURCHASER to charge back to the supplier an agreed upon amount for extra fieldwork. The supplier will not ship replacement parts nor authorize extra work to any party other than the ORIGINAL PURCHASER. Any pre-engineered structure will require the erector to furnish a certain amount of field fabrication and / or modifications as stated in the manufacturer's handbook. Sections of work requiring field cutting or drilling are indicated on the drawings or in the assembly manual. Other field modifications may be necessitated by site conditions beyond the manufacturer's control. The foregoing are not subject to warranty.

### 2.26.2 Paint Warranty

The paint system shall provide a 30/25 year limited warranty on paint finish, which includes chalking and breakdown of film integrity.

**2.26.3 Structure Warranty**

A 5-year limited warranty shall be provided on the structure itself.

## 2.27 SUBMITTALS:

**2.27.1 GENERAL:** Submit the following in accordance with the Conditions of the Contract and Division 1 Specification Sections:

**2.27.1.1** **PRODUCT DATA**, floor plans, elevations, catalog, general specifications, locations of similar projects completed.

**2.27.1.2** **SAMPLES** of the manufacturer's standard color charts covering both the siding colors and the door and window trim colors shall be furnished to the owner.

**2.27.2 QUALITY ASSURANCE:**

**2.27.2.1** **MANUFACTURER QUALIFICATIONS:**
The manufacturer shall have a minimum of 10 years successful experience in designing and manufacturing Training Towers of similar size and scope as project requires.

**2.27.2.2** **ENGINEERING PROFESSIONAL QUALIFICATIONS:**
The engineering professional who designs the structure for the project must be registered in the State of the training tower's location and have successfully designed a minimum of 10 training towers. Upon request, the engineering professional shall submit an Engineering Qualifications Form stating his licensing number in the state of licensure, as well as listing a minimum of 10 training towers that he has designed and stamped.

*Remove if erection not included in this bid.*
**2.27.2.3** **ERECTOR QUALIFICATIONS:** The erector shall provide evidence of successfully completing two Training Towers of similar size and scope or shall be a certified Tactical Training System erector, as project requires

## 2.28 SUPPLIERS/SYSTEMS:

**2.28.1 Acceptable Suppliers/Systems:** Tactical Training Systems, 314 Wilburn Road, Sun Prairie, WI, 53590, Phone: 800/929-3726 or 608/327-4100, Fax: 866/639-7012 or 608/834-1843, E-mail: info@tacticaltrainingsystems.com, Website: www.tacticaltrainingsystems.com

**2.28.2 Alternate Suppliers/Systems:** Any systems/materials not explicitly meeting the specifications stated herein, shall be pre-approved fourteen days prior to the bid due date. For all systems/materials in question, the supplier/contractor shall provide samples, written specifications, warranties, full set of drawings, and MSDS. An itemized list must be provided that specifically references each item that deviates from this specification. In any case, all performance and warranty criteria stated herein must be met without exception.

## PART 3-EXECUTION *Remove if erection not included in this bid.*

### 3.1 GENERAL

Comply with the manufacturers recommendations for preparation and storage of the tower components.

### 3.2 EXAMINATION

Verify that concrete work has cured a minimum of 14 days. Verify that anchor bolts are at the proper spacing and protrude the proper amount above the concrete. Report any variances to the owner's representative prior to proceeding with erection.

### 3.3 ERECTION

Follow the details supplied by the manufacturer. Report any discrepancies to the manufacturer prior to proceeding.

### 3.4 FIELD QUALITY CONTROL

#### 3.4.1 DEFECTIVE WORK

Materials, components and assemblies not complying with the manufacturer's installation recommendations shall be repaired or replaced, at the option of the manufacturer.

#### 3.4.2 INSPECTION

Verify that all bolted connections are tight, self-drilling screws with integral washers are seated snugly without washer distortion and rivets have not pulled through the attached materials. Replace improperly set or damaged fasteners.

Inspect all panels, trims and accessories for proper installation and fit. Replace any item which is damaged, warped or distorted. Insure that all field mitered corners fit tightly and smoothly.

### 3.4.3 ADJUSTING

Adjust all shutters, swing doors and hatches so that they swing smoothly without binding and so that the appropriate hardware latches without forcing or slamming. Insure that all closures are adjusted so that they close smoothly.

Check all electrical and mechanical devices to make sure that they are working properly. Fans must be tested and demonstrated as working at all speeds.

### 3.4.4 CLEAN-UP

At the end of each day check the site and pick all debris and garbage. Insure that all materials are secured in a neat and orderly fashion.

Thoroughly clean the tower inside and out at the completion of the erection process to remove all debris, garbage, packing materials, metal shavings and dirt.