DIVISION 13 – Special Construction

Preface

The Texas Tech University System's '*Design and Construction Standards*', as administrated by Facilities Planning and Construction, are intended to serve as guidelines to the Design Professional and Construction Management teams for design development and construction administration of Texas Tech University System (TTUS) Capital Projects. They communicate the minimum expectations and requirements relative to specific building systems, design provisions, general specification requirements, and administrative procedures for new facilities being constructed on Texas Tech University System (ASU, MSU, TTU, TTUHSC, and TTUHSC El Paso) campuses. Several, but not all requirements for each component Institution or Agency within the TTU System are covered. Design Professionals, Construction Managers at Risk and/or Design-Build Firms shall also refer to provisions covered in their service Agreements, as well as within the project's Basis of Design (BOD) document.

In addition, the 'Design and Construction Standards' shall also be utilized in conjunction with the approved project specific Program and Schematic Design development. In the event of conflict between this document and specific project requirements, Design Professionals, Construction Managers at Risk and/or Design-Build Firms shall contact Facilities Planning & Construction for clarification.

The guidelines within the '*Design and Construction Standards*' are not intended to prohibit the use of alternative design solutions, methods, systems, products or devices not covered in this document. Offered alternatives deviating from or not covered in these standards shall be documented by the Design Professional and/or Construction Management teams and submitted to Facilities Planning & Construction for approval prior to implementation.

Throughout the '*Design and Construction Standards*' there are references to manufacturer specific products. These are to be considered the 'Basis of Design' to establish the expected

minimum quality requirements. Design Professionals are encouraged to identify and include equivalent products and/or manufacturers offering comparable products to facilitate open bidding environments.

General Requirements for Special Construction

Special construction projects are those that require unique expertise, innovation, and often involve unconventional techniques, materials, or both. Examples of such projects include pre-engineered structures, air-supported structures, and integrated construction. This Division 13 attempts to ensure that professionals in this field are equipped with the right knowledge, expertise, and tools to deliver these unique, challenging projects with a high level of quality and success. Adhering to Division 13 guidelines is crucial to ensuring that projects are completed on time to a high-quality standard, meeting the necessary safety and regulatory requirements.

Examples of Division 13 Special Construction Work that has been used infrequently but implemented on TTUS FP&C projects include fountains, tubs and hydro-therapy pools, clean rooms, cold storage rooms, paint spray booths, modular buildings, exterior fabrics, greenhouses, pre-engineered metal buildings, grandstands and bleachers, bus shelters, automated parking equipment, sound, vibration, and seismic control systems, and radiation protection systems.

For the purpose of this Division 13 guideline, only those sections used most frequently on TTUS FP&C projects are included.

13 34 19 Pre-Engineered Metal Building Systems

Provide a complete, integrated set of mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior.

Obtain metal building system components, including primary and secondary framing and metal panel assemblies, from single source from single manufacturer.

Engage a qualified professional structural engineer, licensed in the state of Texas, to design metal building systems.

Pre-Engineered Metal Building (PEMB) systems shall withstand the effects of gravity loads and lateral loads and stresses, deflection and drift limits, thermal movement, seismic performance, fire resistance ratings within limits and under conditions indicated according to the Structural Engineer of Record contracted by TTUS FP&C who will design the foundation systems for the structure. In addition, all PEMB systems are to be designed in conformance with FM Global's Approval Guide requirements. Coordinate sizes and locations of concrete foundations and casting of anchor-rod inserts into foundation walls and footings. Anchor rod installation, concrete, reinforcement, and formwork requirements to be specified in Section 03 30 00 "Cast-in-Place Concrete."

If required, metal building systems shall withstand the effects of earthquake motions determined according to ASCE/SEI 7, or as indicated by the Structural Engineer of Record contracted by TTUS FP&C.

Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

Where assemblies are indicated to have a fire-resistance rating, provide metal panel assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 or ASTM E 108 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

Manufacturer's standard I-shaped primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafters, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing. Provide I-shaped frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.

This section covers the general requirements for the following materials, as required to meet the project scope requirements. It is the design professional's responsibility to comprehensively specify all relevant systems to meet the design intent.

1) Structural-steel framing.
2) Metal roof panels.
3) Metal wall panels.
4) Foamed-insulation-core metal wall panels.
5) Metal soffit panels.
6) Thermal insulation.
7) Personnel doors and frames.
8) Aluminum Windows.
9) Accessories.

Structural Steel Framing: Manufacturer's primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafters, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing. Comply with AISC 360, "Specification for Structural Steel Buildings" for structural steel. Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolted connections. Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses for cold-formed steel.

W-Shapes: ASTM A 992/A 992M; ASTM A 572/A 572M, Grade 50 or 55 (345 or 380); or ASTM A 529/A 529M, Grade 50 or 55 (345 or 380).

Channels, Angles, M-Shapes, and S-Shapes: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55 (345 or 380); or ASTM A 529/A 529M, Grade 50 or 55 (345 or 380).

Plate and Bar: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55 (345 or 380); or ASTM A 529/A 529M, Grade 50 or 55 (345 or 380).

Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.

Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B or C, structural tubing.

Metal Roof Panels: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable, as well as FM Loss Prevention Data Sheet 1-49. Identify materials with FM Global markings. Fire/Windstorm Classification: Class 1A-90. Hail resistance Very Severe Hail (VSH) or Severe Hail (SH) equal to Petersen PacClad Tite-Loc Plus. Provide metal roof panels when tested according to CRRC-1, three-year, aged, solar reflectance index (SRI) of not less than 0.55 and emissivity of not less than .75.

Metal Wall Panels: Exposed-Fastener, Reverse-Rib, metal wall panels formed with recessed, trapezoidal major valleys and intermediate stiffening valleys symmetrically spaced or flat pan between major valleys; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.

Foam-Insulation-Core Metal Wall Panels: Fire propagation characteristics for exterior wall assemblies containing foam plastics must be in compliance with Chapter 26 of the IBC, and also must pass NFPA 285 fire testing, as well as conform with FM Global Data Sheet 1-12. Surface-Burning Characteristics flame-spread index of 25 or less and a smoke-developed index of 450 or less, per ASTM E 84.

Metal Soffit Panels: Provide factory-formed metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners and factory-applied sealant in side laps. Include accessories required for weathertight installation.

Thermal Insulation: Exterior Continuous Insulation - in compliance with FM Approvals 4880 Factory Mutual Class 1 Insulated Wall and Ceiling Panels. Faced, Polyisocyanurate Board Insulation: ASTM C 1289, Type I (foil facing), Class 2. UL Classified Class A UL 723 for maximum flame-spread and smoke-developed indexes of 75 and 450, per ASTM E 84. Fire Performance Evaluations approvals required per NFA 285.

Swinging Personnel Doors and Frames: As specified in Section 08 11 13 Hollow Metal Doors and Frames. Prepared and reinforced at strike and at hinges to receive field-applied hardware according to BHMA A156 Series.

Aluminum Windows: As specified in Section 08 51 13 Aluminum Windows.

Accessories: Provide accessories (clips, cleats, closure trims and strips, backing plates, thermal spacer blocks, flashing and trim, gutters, down leaders, roof vents, dampers, louvers, sealants, etc.) as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to the greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.

Submittals: Product Data, Qualifications Data (Installer and Vendor), Welding Certifications, Erector Certifications, Letter of Design Certification, Materials Test Reports, Samples, Warranty, O&M Data, Structural Calculations, Shop Drawings as follows:

1) Delegated Design Structural Calculations: Include structural performance analysis data indicating compliance with structural performance requirements and design data signed and sealed by the qualified professional engineer licensed in the state of Texas and responsible for their preparation.
2) Anchor-Rod Plans: Submit anchor-rod plans and templates before foundation work begins. Include location, diameter, and minimum required projection of anchor rods required to attach metal building to foundation. Indicate column reactions at each location.
3) Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
4) Metal Roof and Wall Panel Layout Drawings: Show layouts of panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, clip spacing, trim, flashings, closures, and special

Preinstallation Conference: Conduct conferences at Project site to cover foundation construction

as well as structural erection.

Quality Control: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances. Special inspections will not be required if fabrication is performed by an IAS AC472-accredited manufacturer approved by authorities having jurisdiction to perform such work without special inspection. Submit copy of certificate of compliance to authorities having jurisdiction, certifying that Work was performed according to requirements.

Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

13 49 00 Radiation Protection

Provide materials and workmanship, including joints and fasteners, that maintain continuity of radiation protection at all points and in all directions equivalent to materials specified in thicknesses and locations indicated. Materials, thicknesses, and configurations indicated are based on radiation protection design prepared by Owner's radiation health physicist. This design is available to Contractor on request.

Obtain each type of radiation protection product from a single source from a single manufacturer.

Owner will engage a qualified, licensed medical physicist to perform tests (Public Exposure Survey and Equipment Performance Evaluation) inspections after radiographic equipment (CT, DR, MRI, US, etc.) has been placed, installed, and calibrated in operating condition. Correct deficiencies in or remove and replace radiation protection that inspection reports indicate does not comply with specified requirements from radiation health physicist design requirements analysis report.

This section covers the general requirements for the following materials, as required to meet the project scope requirements. It is the design professional’s responsibility to comprehensively specify all relevant systems to meet the design intent.

1) Lead sheet, strip, and plate.
2) Lead-lined concrete masonry units.
3) Lead-lined gypsum board.
4) Lead glass.
5) Lead-lined, hollow-metal doors and door frames.
6) Lead-lined flush wood doors.
7) Lead-lined, observation-window frames.
8) Modular shielding partitions.
9) Informational signs.

The thickness of lead provides the same attenuation (reduction of radiation passing through) as the material in question under the specified conditions. Lead equivalence specified for materials used in diagnostic x-ray rooms is measured at 100 kV unless otherwise indicated.

Lead Sheet, Strip, and Plate: ASTM B 749, Alloy UNS No. L51121 (chemical-copper lead).

Lead-Lined Concrete Masonry Units: Fabricated from two solid concrete units, complying with ASTM C 90 or ASTM C 129, separated vertically by a single sheet of lead permanently bonded or anchored between the two halves. Size lead sheets to provide a 1-inch (25-mm) overlap with adjacent units or provide supplemental lead to ensure uninterrupted protection.

Lead-Lined Gypsum Board: 5/8-inch-thick gypsum board complying with Section 09 29 00 "Gypsum Board," of width and length required for support spacing and to prevent cracking during handling, and with a single sheet of lead laminated to the back of the board.

Lead Sheet Lining: Full width and length of board as indicated on Drawings.

Lead Glass: Lead-barium, polished glass containing not less than 60 percent heavy metal oxides, including not less than 48 percent lead oxide by weight.

Steel Doors and Frames: Complying with NAAMM-HMMA 861, except with a single continuous sheet of lead of thickness as indicated on Drawings extending from top to bottom and edge to edge, installed either between back-to-back stiffeners or between stiffeners and stop face of

door and lined with lead sheet of thickness not less than that required for doors and walls where frames are used. Furnish with additional reinforcements and internal supports to adequately carry the weight of lead-lined doors. Install reinforcements and supports before installing lead lining. Form lead sheet to match frame contour, continuous in each jamb and across the head, lapping the stops. Form lead shields around areas prepared to receive hardware. Fabricate lead lining wide enough to maintain an effective lap with lead of adjacent shielding.

Lead-Lined Flush Wood Doors: Solid-core wood doors (Premium Grade) with lead lining, thickness as indicated on Drawings. Veneer face, seven ply, bonded mineral, particleboard, structural composite lumber, or glued-wood-stave core. Plastic-laminate face, five ply, bonded mineral,
Particleboard, structural composite lumber, or glued-wood-stave core. One or more continuous sheets of lead extending from top to bottom and edge to edge, constructed either in the core or between the core and faces, at manufacturer's option. In addition to requirements specified, comply with "Architectural Woodwork Standards and WDMA I.S.1-A, "Architectural
Wood Flush Doors."

Lead-Lined Observation Window Frames: Fabricate from 0.043-inch- thick, formed-steel sheet or 0.064-inch- thick aluminum extrusions with mitered corners, welded or bolted with concealed fasteners.

Lead-Lined Modular Shielding Partitions: Partial-height modular partitions assembled from factory-finished standard components consisting of lead-lined, enameled-steel framing members; lead-lined opaque panels; lead glazing plastic vision panels; and hardware necessary for assembly and for securing to other construction. Fabricate opaque panels from honeycomb-core metal panels with polyurethane paint finish.

Informational Signs: High-pressure-laminate engraving stock with contrasting face and core, machine engraved from master templates for accurately formed letters, numbers, and symbols.

Submittals: Product Data, Qualifications Data (Installer and Vendor), Samples, Warranty, O&M Data, Shop Drawings as follows:

1) Show layout of radiation-protected areas. Indicate lead thickness or lead equivalence of components. Show components and installation conditions not fully dimensioned or detailed in product data.
2) Show ducts, pipes, conduit, and other objects that penetrate radiation protection; include details of penetrations.
3) Show locations of electrical conduit and boxes for connecting door operators, door operator switches, and door interlock switches.
4) Include diagrams for power, signal, and control wiring.

Preinstallation Conference: Conduct conference at Project site.

Quality Controls: The specific installation requirements for each project specific lead shielded material is to be specified by the design professional based on the requirements provided from the qualified, licensed radiation physicist.

Do not deliver or install radiation protection until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period. Verify actual dimensions by field measurements before fabrication.

Examine substrates in areas to receive radiation protection, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of radiation protection. Proceed with installation only after unsatisfactory conditions have been corrected.

Acceptance of final installation approval is contingent on acknowledgement of compliant built conditions by Owner’s third-party radiation testing specialist.