



Facilities Planning and Construction Design and Construction Standards

DIVISION 04 – Masonry

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

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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 Masonry and Masonry Accessories

Texas Tech is committed to a contiguous architectural aesthetic on the TTU, TTUHSC and TTUHSC El Paso campuses, incorporating the existing adopted **Spanish Renaissance** plateresque vernacular representative of the main campus in Lubbock, Texas. To that end, Texas Tech requires the use of the adopted Mission blend face brick on building facades. Façade compositions should be comprised of at least 75 - 80% face brick, or, as determined and approved by Facilities Planning and Construction and/or the Board of Regents.

All façade designs shall be approved by the Facilities Planning and Construction Vice Chancellor and Associate Vice Chancellor.

A building date cornerstone shall be placed on each new building at the main public entry and at each subsequent major addition at the time it is constructed. This cornerstone shall show the year in which construction was recognized substantially complete. It may contain memorabilia appropriate at the time of construction. The cornerstone date shall be displayed in Futura font eight inch (8") numeric characters.

NOTE: Exposed exterior concrete block shall not be used without prior approval from the Vice Chancellor or Associate Vice Chancellor of FP&C. The use of regular gray concrete masonry units (CMU) for exposed exterior walls is prohibited. The use of cinder block is prohibited.

Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by the Contract Documents.

Preinstallation meetings are required for all masonry scopes.

Weep Systems: Specify one of the following types:

1. One-piece, cellular plastic Weep/Vent/Screens: flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.

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Weeps shall be provided at a maximum of every 24" at the base of all thru wall flashing.

2. Plastic tubing, medium density polyethylene.

Cavity Drainage: Specify free-draining mesh, made from polymer strands that will not degrade within the wall cavity. Use Mortar Net or approved equal.

Cavity Wall Continuous Insulation: Refer to **Division 7 - Thermal and Moisture Protection**.

Where face brick veneer systems are designed with 1.5" or 2" cavities, specify polyisocyanurate board (Foil Faced) continuous insulation for vertical applications. Cavity wall insulation must be FM Global Approved - (DOW) Dupont Thermax ci or approved equal: ASTM C 1289, Type I, Class 2.

Masonry Flashing: Specify Perma-barrier flashings, copper, asphalt copper, stainless steel, or approved equals as determined by the Design Professional. Specify thru wall flashing and counterflashing bedded in mortar joints whenever possible. When flashing is totally concealed in masonry, specify flexible flashing, copper-laminated flashing, and 7-oz/sq. ft. copper sheet bonded between 2 layers of glass-fiber cloth. Where flashing is indicated to receive counterflashing, specify metal flashing. Where flashing is indicated to be turned down at or beyond the wall face, specify metal flashing.

Masonry Cleaning: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

Masonry Contractor is to engage a masonry Quality Control supervisor, on a full-time basis, for all masonry work. Texas Tech reserves the right to hire an experienced special inspector to observe the installation of all masonry units.

Masonry contractors are to adhere to the Specification for Masonry Structures (ACI 530.1- 95/ ASCE 6-95/-95TMS 602-95) for defining certain cold and hot weather construction requirements.

Submittals and Shop Drawings: for each type of masonry assembly are to include the following:

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1. The construction details.
2. Material descriptions.
3. Dimensions of individual components and profiles.
4. Finishes of masonry units, mortars, grouts, and sealants.
5. Inspection recommendations and preventive maintenance plan.
6. Shop drawings showing fabrication and installation details for each stone unit including details and dimensions, details of reinforcement, lifting connections, anchorages, building elevations, and indication of finished faces. Shop drawings shall be sealed by a licensed Professional Engineer registered in the State of Texas who is legally qualified to practice the engineering services of the kind indicated.
7. Full-size samples for shape of each masonry unit required.
8. Manufacturer's qualification data.
9. Current material test reports for each mix.
10. Warranty information on masonry, mortar, and sealants.

Mockups: For each masonry system, request mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and quality standards for materials and execution. Mockups to include typical components, attachments, method of installation, mortar, and/or joint sealant. All mockups including masonry must be approved by TTUS FP&C prior to release of façade installation.

Sealants: Perform preconstruction field testing of sealant's compatibility and adhesion to each type of construction material applicable and to joint substrates before installing joint sealants. Testing to be per Design Professional and manufacturer's recommendations.

The Design Professional will make recommendations on whether masonry mortar beds and joints are to be used and/or if sealant joints are preferred for the project.

If joint sealant is used, specify DOW 756 product for masonry-to-masonry mortar joints. The DOW 756 color selection may include custom or special colors at no additional cost and will be selected based on mock-up approval by Facilities Planning & Construction.

Stone and Cast Stone Supports: Anchors for cut stone and precast stone shall be fabricated from stainless steel; ASTM A 666, Type 304, tempered as required to support loads imposed without exceeding allowable design stresses. Dowels and pins for anchors shall be fabricated

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from stainless steel, ASTM A 276, Type 304.

Face Brick and CMU Supports: Shelf (relief) angles and support lintels shall be hot-dip galvanized steel, ASTM A 36/A 36M for materials and ASTM A 123/A 123M for galvanizing. Stone anchors shall be designed, and shop drawings stamped by a registered engineer in the State of Texas.

04 20 00 Unit Masonry

Mortar and Masonry Grout:

Mortar for unit masonry veneers (non-reinforced assemblies) shall be specified as Proportion method in accordance with ASTM C 270. Mortar for structural masonry (reinforced) assemblies shall be specified as either Proportion (formulary specification) or Property (performance specification) method, at the Structural Engineer of Records discretion, but in accordance with ASTM C 270. Mortar for Unit Masonry relative to structural masonry assemblies shall be strength evaluate per ASTM C 780.

Mortar for unit masonry (Proportion Method) is to be pre-tested by the mortar manufacturer in the mortar manufacturer's lab to validate developed strengths of the manufacturer's mortar formulary based on the specified mortar Types. *Certificates of Compliance* from the mortar manufacturer are required to be submitted to validate batch strength.

Mortar for unit masonry (Property Method) is to be tested by the Owner's third-party testing lab to validate developed strengths based on the properties specified by the Structural Engineer of Record specific to the mortar Types specified.

Strength of placed mortar can be proven in compliance with the specifications via non-destructive method using the Windsor Penetration Tool, if approved by both Texas Tech and the Structural Engineer of Record.

Masonry mortar used at the site is to arrive pre-batched (bag or gravity-fed silo), based on the manufacturer's proportions establishing the classified strengths for the Type(s) of mortar specified (Type M, S, N, O) by the Design Professional. Do not specify mortar, which may corrode reinforcement steel or steel structural elements (i.e., Sara-bond). Masonry Grout shall be specified in conformance with ASTM C 476 and is to be tested in accordance with ASTM C

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1019.

Specify the following types of mortar for applications stated unless another type is indicated.

1. For masonry below grade or in contact with earth, use Type S or M (Use M only if it is structurally required).
2. For reinforced masonry, use Type S
3. For mortar parge coats, use Type S.
4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type S (The use of Type N will not be allowed unless approved by the FP&C Design Team and the Project's Structural Engineer of Record).
5. For interior walls non-load bearing, use Type N.

For each type of mortar and grout, request description of type and proportions of ingredients.

1. Request test reports for mortar mixes required to comply with property specification. Tests shall conform to ASTM for compressive strength, water retention, and air content.
2. Request test reports, according to ASTM for grout mixes required to comply with compressive strength requirement.

Joints shall be 3/8" with a concave profile unless the work is repair to or immediately adjacent to buildings with flush joints.

Request mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate throughout the project.

Reinforcement to be uncoated steel reinforcing bars per ASTM A 615/A 615M. or ASTM A 996/A 996M, Grade 60. General masonry joint reinforcement per ASTM A 951/A951M

Masonry Joint Reinforcement for single-wythe masonry is to be either ladder or truss type with single pair of side rods. All joint reinforcement shall be hot dip galvanized.

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Masonry Joint reinforcement for multi-wythe masonry to be adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face. Ties shall have hooks or clips to engage a continuous horizontal wire in the facing wythe.

Wire mesh type joint reinforcement is prohibited.

Brick veneer and stone anchorage systems to be per Design Professional's specification and TTUS FP&C approval.

Brick masonry is to be designed and constructed per the Brick Institute of America standards and per ASTM C 216 Requirements.

Brick to be grade SW (Severe Weather) and type FBS (Face Brick Standard) complying with ASTM C216 and ASTM C652 with a minimum compressive strength of not less than 1500 psi. Initial Rate of Absorption of less than 30g/30 sq. in. per minute when tested per ASTM C 67. "Utility" sized brick can be used with the approval of the TTUS FP&C Vice Chancellor or Associate Vice Chancellor.

■ Texas Tech University

■ Texas Tech University Health Sciences Center

■ Texas Tech University Health Sciences Center – El Paso

Brick must be equivalent to masonry products manufactured by **Acme Brick Company**, [Perla East Gate Plant](#), 22436 US-67, Malvern, Arkansas 72104.

MISSION BLEND, Modular and Ruff Texture Face Brick, Product Code 070050122 known as "Texas Tech Blend", or approved equal.

The following blend is the current standard as approved by the BOR and should be considered as the base blend and adjusted to match existing or adjacent buildings.

- ❖ Mission 502 (PEP 502 - 776029) - 10%
- ❖ Mission 503 (PEP 503 - 776030) - 35%

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- ❖ Mission 504 (PEP 504 - 776031) - 47%
- ❖ Mission 505 (PEP 505 - 776032) - 08%

■ **Angelo State University**

Brick must be equivalent to masonry products manufactured by **Acme Brick Company**, [Elgin Plant](#), 1776 Old McDade Rd, Elgin, Texas 78621.

Acme Elgin Blend ELP154, Modular and Velour Texture Face Brick, Product Code 111317 known as "Sierra", or approved equal.

Please note that ASU has two brick blend colors on the campus in San Angelo, Tx. Confirm preferred brick blend prior to specifying.

■ **Midwestern State University**

Brick must be equivalent to masonry products manufactured by [Cloud Ceramics](#), PO Box 369, Concordia, KS 66901, modular and velour texture face brick, or approved equal.

- ❖ Light Autumn - 60%
- ❖ Kansas Gold - 25%
- ❖ Cimarron - 5%
- ❖ Old Rose - 5%
- ❖ Cameo - 5%

Obtain brick units through a single source from a single manufacturer throughout the project. Treating of brick surface with stain or other surface treatment or simulation to obtain a color blend is prohibited unless approved by TTUS Facilities Planning & Construction Vice Chancellor or Associate Vice Chancellor.

The Contractor shall submit brick manufacturer's certification indicating no efflorescence when tested in accordance with ASTM Method C 67 and is rated "not effloresced."

Specify that the masonry contractor is required to build one or more brick sample panels for blend approval. Sample panels are to be constructed on a firm foundation, facing south, in

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location indicated by Texas Tech. **Sample panels shall contain minimum of 100 bricks for best evaluation and confirmation of blend conformance.** Construct consistent with the exterior design.

Panel shall show color range and texture of masonry units, bond, mortar joints, and workmanship. Completed masonry work in the building shall be equal to that shown in the approved panel. Do not remove panel until masonry work is completed or until removal is authorized. Panel shall include sample of openings.

Brick shall be laid with modular coursing, three (3) courses to eight (8) inches. Only full coursing will be permitted at the head of any type of opening. Flemish bond patterning will be assessed for appropriate architectural context on a project-by-project basis and designed into the project at the direction and extents as indicated by the TTUS FP&C Vice Chancellor or Associate Vice Chancellor.

Face brick elevations shall include structural considerations for division of such elevations into panels to accomplish structural support of the brick face and expansion joints for control of thermal expansion damage.

Brick shall be modular size (3 5/8" X 2 1/4" X 7 5/8") unless otherwise approved by the TTUS FP&C Vice Chancellor or Associate Vice Chancellor.

04 22 00 Concrete Unit Masonry

Specify normal weight standard sized concrete masonry units conforming to ASTM C 90 with a minimum average net-area compressive strength of 1900 psi.

Specify units made with integral water repellent.

Integral water repellent to be liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.

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Mortar for concrete masonry:

1. Portland Cement; ASTM C150, Type I. Use Type III for cold weather construction.
2. Masonry Cement; ASTM C91, Type S.
3. Aggregate; graded per ASTM C144.

Grout for concrete masonry:

1. Portland Cement; ASTM C150, Type I. Use Type III for cold weather construction.
2. Masonry Cement; ASTM C91, Type S.
3. Aggregate; graded per ASTM C404, size No. 8.
4. Do not use Calcium Chloride, Air-Entraining, or Water-Reducing Admixtures in grout.
5. Grout slump shall be between 10 & 11 inches.
6. Masonry mortar or concrete shall not be used for grout.

04 43 13 Anchored Stone Masonry Veneer

This section includes all exterior cut and carved stone. A pre-installation meeting is required to review Shop Drawings, specifications, anchorage, supports, sealants/mortar, cleaning, and sealing prior to commencement of the Work.

Dimensional stone includes the following:

1. Panels set with individual anchors.
2. Panels set with wire ties.
3. Trim units, including bands, copings, sills, jambs, and pilasters.
4. Units with carving or inscriptions

Specify that the Contractor shall use a qualified manufacturer of dimensional stone cladding systems that is similar to those indicated for this project that has sufficient production capacity to manufacture required units. Dimensional stone units shall be obtained through a single source from a single manufacturer throughout the project. References will be made available upon request.

Specify that the Installer shall have a minimum of 5 years documented experience and is qualified for installing cut stone to the level of this project. References will be made available upon request.

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Do not allow use of frozen materials or materials mixed or coated with ice or frost. Do not allow building on frozen substrates. Contractor shall comply with cold weather construction requirements in ACI 530.1/ASCE 6/TMS 602 and comply with hot-weather construction requirements in ACI 530.1/ASCE 6/TMS 602.

Building stone is to be carved stone, with the exception of steps, porches, or landings that receive foot traffic, and shall be limestone equal to Lueders Quarry, Jones County, Texas. Limestone is to comply with ASTM C 568 and be classified as medium density.

Exterior traffic surfaces are to be an equal of the original “Carthage Stone” for exterior steps, porches, landings and other traffic surfaces.

Setting Mortar shall be composed of:

1. One (1) part Portland Cement, ASTM C150 (non-staining), Type I.
2. One (1) part hydrated lime, ASTM C207, Type N.
3. Six (6) parts sand, ASTM C144 except graded with 100% passing the No. 16 sieve for joints of $\frac{1}{4}$ inch or less.

Pointing Mortar shall be composed of:

1. One (1) part white Portland Cement, ASTM C150 (non-staining), Type I.
2. One (1) part hydrated lime, ASTM C207, Type N.
3. Three (3) parts sand, ASTM C144 except graded with 100% passing the No. 16 sieve for joints of $\frac{1}{4}$ inch or less.

Tool joints concave with a round tool having a diameter $\frac{1}{8}$ inch larger than the joint width.

Setting shims shall be stainless steel or plastic buttons of the thickness required for the joint size.

The Design Professional will make recommendations to TTUS FP&C on whether masonry mortar beds and joints are to be used and/or sealant joints are preferred for the project. If seal coat for cut stone is recommended by the Design Professional, use SureKleen Weather Seal Natural Stone Treatment WB. If seal coat is required, concealed surfaces are to be sealed before setting. Seal coat will be installed in accordance with industry standards and after the moisture in the stone has stabilized. If Joint sealant is used, specify DOW 756 product. The

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Dow 756 color selection may include catalog order colors at no additional cost to the Owner and will be selected based on mock-up approval by FP&C.

Stone should not come in contact with the ground surface.

04 72 00 Cast Stone Masonry

The following cast stone shapes may be incorporated considering budget constraints:

1. Architectural Headers and Sills at window fenestration
2. Architectural Surrounds at large openings
3. Copings
4. Cornices
5. Articulated parapets
6. Belt coursings
7. Water table
8. Pilasters
9. Columns
10. Medallions
11. Quatrefoils and Cinquefoils
12. Roundels
13. Balustrades
14. Arches
15. Keystones
16. Corbels
17. Finials
18. Scrolls (Ancon and Aileron)
19. Scallops
20. Quoins

Specify a qualified manufacturer of cast stone units like those indicated for this project that has sufficient production capacity to manufacture required units and is currently certified by the Cast Stone Institute (CSI). Cast stone units shall be obtained through a single source from a single manufacturer throughout the project. References will be made available upon request.

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Specify that the Installer shall have a minimum of five years documented experience and is qualified for installing cast stone to the level of this project. References will be available upon request.

Do not allow use of frozen materials or materials mixed or coated with ice or frost. Do not allow building on frozen substrates. Comply with cold-weather construction requirements in ACI 530.1/ASCE 6/TMS 602. Comply with hot-weather construction requirements in ACI 530.1/ASCE 6/TMS 602.

Cast stone leave outs/voids for lifting anchors are required to be grouted in prior to installation.

Specify cast stone units complying with CSI Standards and ASTM C 1364 using wet-cast method. Note, vibrant dry tamp method will not be allowed.

- Portland cement, Type I or Type III, white, ASTM C150 or ASTM C595 Blended Hydraulic Cement (Type 1L).
- Coarse aggregates -- Quartz or limestone, ASTM C33, except for gradation, and are optional for the Vibrant Dry Tamp (VDT) casting method.
- Fine aggregates - Manufactured or natural sands, ASTM C33, except for gradation.
- Inorganic iron oxide pigments, ASTM C979 except that carbon black pigments shall not be used.
- Compressive Strength per ASTM C1194: 6,500 psi minimum at 28 days.
- Absorption per ASTM C1195: 6.0% maximum at 28 days.
- Provide sufficient air content to meet the freeze-thaw requirements for wet cast products when the air content is tested in accordance with Test Method C173/C173M or Test Method C231/C231M.
- Freeze-Thaw per ASTM C666/C666M in accordance with procedure A as modified by ASTM C1364. The CPWL shall be less than 5.0% after 300 cycles of freezing and thawing.
- Linear Drying Shrinkage per ASTM C426: Test and report in accordance with ASTM C1364.

Specify only admixtures specified or approved by Design Professional. Reinforcement to be epoxy coated deformed steel bars complying with ASTM A 615/A 615M, Grade 60.

- ASTM C260 for air-entraining admixtures.
- ASTM C494/C495M Types A - G for water reducing, retarding, accelerating, and high

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- range admixtures.
- Other admixtures: Integral water repellents and other chemicals, for which no ASTM Standard exists, shall be previously established as suitable for use in concrete by proven field performance or through laboratory testing.
- ASTM C618 mineral admixtures of dark and variable colors shall not be used in surfaces intended to be exposed to view.
- ASTM C989 granulated blast furnace slag may be used to improve physical properties.
- Tests are required to verify requirements.

Steel reinforcement:

- ASTM A615/A615M: Grade 60 steel galvanized or epoxy coated when cover is less than 1.5 in.
- ASTM D7957/D7957M: Standard Specification for Solid Round Glass Fiber Reinforced Polymer Bars for Concrete Reinforcement.

All anchors, dowels and other anchoring devices and shims shall be standard building stone anchors or commercial construction use in stainless steel Type 302 or 304.

Cast stone shall be thoroughly cured and seasoned at the manufacturing facility before delivery.

Cast Stone Setting Mortar shall be composed of:

1. One-part Portland Cement, ASTM C150 (non-staining), Type I.
2. One-part hydrated lime, ASTM C207, Type N.
3. Six parts sand, ASTM C144 except graded with 100% passing the No. 16 sieve for joints of ¼ inch or less.

Pointing Mortar shall be composed of:

1. One-part white Portland Cement, ASTM C150 (non-staining), Type I. TTUS FP&C Design
2. One-part hydrated lime, ASTM C207, Type N.
3. Three parts sand, ASTM C144 except graded with 100% passing the No. 16 sieve for joints of ¼ inch or less.

The Design Professional will make recommendations to TTUS FP&C on whether masonry mortar beds and joints are to be used and/or sealant joints are preferred for the project. If a seal

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coat for cast stone is recommended by the Design Professional, use SureKleen Weather Seal Natural

Stone Treatment WB. If a seal coat is required, concealed surfaces are to be sealed before setting. The seal coat will be installed per Cast Stone Institute recommendations and after the moisture in the stone has stabilized. If Joint sealant is used, specify DOW 756 product. The Dow 756 color selection may include catalog order colors at no additional cost to the Owner and will be selected based on mock-up approval by FP&C.

Setting shims shall be stainless steel or high-density impact plastic buttons of the thickness required for the joint size.

Owner may engage a qualified independent testing agency to sample and test cast stone units according to ASTM C 1364.