

DIVISION 4 - MASONRY

04100 - MORTAR

- 1. PROHIBITED:** Testing mortar as an individual component on University of Minnesota projects.
- 2. Mortar Design:** Mortar types shall be as recommended in the appendix to ASTM C270, X1, "Selection and Use of Mortar for Unit Masonry."
- 3. Mortar Ingredients:** Mortar ingredients shall conform to applicable ASTM standards.
- 4. Mortar Color:** To provide uniform mortar color in exposed masonry, the same brand and proportions of mortar ingredients, including coloring agent, shall be used throughout the project. The coloring agent shall be premixed with the cement ingredients.
- 5. Construction Quality Control Testing for New Construction:** Prism testing shall be used. Refer to Section 04200 - Unit Masonry.

04200 - UNIT MASONRY

1. Industry Standards: Requirements for masonry materials, anchorage, reinforcement, flashing and laying shall comply with recognized industry standards, including ASTM, Brick Industry of America (BIA), National Concrete Masonry Association (NCMA) and others as applicable.

2. Quality Control

2.1. Contractor Quality Control: Prior to construction, the contractor shall provide test results that confirm mortar/masonry compatibility on all units. Conduct pre-construction testing by a university-approved independent testing laboratory.

2.1.1. The flexural bond strength using the ASTM C1072 testing method shall be no less than 80 psi unless the A/E specifically accepts another test method.

2.2. University Quality Control: During construction, the university shall retain an independent testing laboratory to conduct tests on the unit masonry.

2.2.1. Structural Concrete Masonry Unit (CMU) Minimum Testing Requirements: Structural CMU shall be evaluated using non-grouted prisms (ASTM C 1312) or grouted prisms (ASTM C 1017) as the A/E specifies.

2.2.2. The A/E shall specify if gross area or net area shall be used for CMU test calculations.

2.2.3. Grout shall be tested according to ASTM C 1019. Each test shall consist of three cylinders, of which one is tested after seven days and two are tested after 28 days.

2.2.4. The A/E shall specify the Non-Structural CMU Minimum Testing Requirements.

3. Face Brick

3.1. PROHIBITED: Face brick for exterior horizontal or sloping applications such as windowsills, parapet caps, copings, top of screen walls and planter walls.

3.2. The A/E shall select the face brick and the university shall approve it prior to requesting bids. The Initial Rate of Absorption (IRA) for brick shall range from 4 gm/30 in. sqd./min. to 20 gm/30 in sqd./min. An acceptable variance in the IRA range of the brick tested shall be no more than 40 percent of the maximum rate.

3.3. Face brick shall comply with ASTM C216, Grade SW, and Type as the A/E selects.

3.4. The A/E shall specify that the contractor is to construct sample brick and mortar panels prior to ordering brick. The number and size of panels shall be appropriate to the scale of the project. Sample panels shall be subject to A/E and university approval. Use approved panels as a standard of workmanship for acceptance of construction. Approved panels shall be retained until final acceptance of masonry work. Panels shall include typical wall construction with unique details, including through-wall flashing.

3.5. University Quality Control

3.5.1. The university shall retain an independent testing laboratory to conduct tests on the unit masonry during construction.

3.5.2. Face brick shall be tested for compliance with minimum test requirements:

3.5.2.1. Bond wrench testing shall be specified to measure the bond strength per ASTM C 1072 at a rate that the A/E specifies. The results shall meet the criteria specified for the pre-construction testing.

3.5.2.2. If the face brick is to be load bearing, make and test prisms in compression per ASTM C 1312 at a rate that the A/E specifies.

4. Concrete Units: CMU shall meet the requirements of the applicable industry standard. When required, the A/E shall specify the appropriate water-repellent surface coating for exterior applications. When used as an exterior veneer, horizontal joint reinforcement shall be installed in the bed joints at every other course.

5. Reinforcement and Anchors: Masonry anchors shall be corrosion resistant.

6. Control Joints and Expansion Joint Reinforcement: Drawings shall detail and indicate location and pattern of control and expansion joints, and joint reinforcement.

6.1. Masonry walls and partitions shall have control joints in CMU and built-in expansion joints in brick/CMU to prevent cracking due to temperature, moisture and building frame-related movements. Joints in CMU walls shall divide the walls into panels as NCMA recommends. Joints in brick masonry shall divide the walls into panels as BIA recommends.

6.2. In multi-story construction, provide horizontal support steel as necessary to carry the masonry facing. The clear space between the top of the brick and bottom of the steel shall meet BIA requirements. Parapets shall have additional vertical joints to accommodate the additional thermal movement.

7. Mortar Joints: Exposed mortar joints shall be tooled in a concave direction.

8. Flashing

8.1. PROHIBITED: PVC flashing.

8.2. The A/E shall locate and detail flashing to prevent moisture intrusion into the wall or building. The flashing material for this purpose must be compatible with adjacent materials. Membrane flashing shall be a minimum of 40 mils thick. Flashing shall extend a minimum of 1/4 inch beyond the outside face of the exterior unit and be turned downward to form a drip. Flashing is to be adhered to the horizontal support below. Vertical termination of flashing shall be mechanically fastened with continuous termination bar. Water cut off mastic shall be installed between backup wall and flashing, and between flashing and termination bar. Details in contract documents shall include flashing end dam and prefabricated corner installation requirements.

8.3. At wall/roof junctions, including parapet walls, provide a flashing/counter flashing detail with adequate height to allow re-roofing without having to replace the through-wall flashing.

8.4. At the top of masonry walls, membrane flashing shall be adhered to the face of the masonry wall at the top of the exterior wythe and attached to the roof membrane on the building side.

8.5. Wall cavity vents shall be installed in the exterior wythe of masonry walls two courses above the base flashing and two courses below the top of the wall. The University Exceptions Committee shall review rain screen design walls.

9. Tuck-Pointing Existing Masonry Structures

9.1. Tuck-pointing without dust control generates significant amounts of dust that can be inhaled. Tuck-pointing may include sandblasting, cutting or grinding of mortar and brick. The dust generated contains crystalline silica that can damage electronic equipment and cause irreversible lung damage in people. Previous tuck-pointing jobs have caused occupants in buildings to complain of irritation.

9.2. Perform work in a manner that reduces dust emissions and prevents it from migrating into affected buildings. Control dust emissions that can be inhaled throughout the workday to concentrations less than 0.3 mg/m³.

9.3. Use wet methods and/or a local exhaust system to control dust. Grinders can be equipped with a shroud that is connected to a vacuum system. Note that vacuum dust collection is least effective when vertical grinding. The following companies distribute tuck-pointing grinders that are designed for shrouds and vacuum systems: The Tansmatic Group/Trans-Industries Companies, Wilmington, N.C. (products by Dustcontrol AB); and Nilfisk-Advance America Inc., Malvern, Pa.

9.4. Before the commencement of work, the A/E must review the work site and surrounding structures. The A/E must consider the type of work scheduled and the prevailing wind patterns to plan how to minimize effects of dust on surrounding buildings and the building work site:

9.4.1. Use additional filter systems on affected buildings to reduce dust from migrating into HVAC systems. Additional filtration may include, but not be limited to, pre-filters on building air intakes and inside individual air-handling units, and higher efficiency primary filters. Use caution to avoid overly restricting the supply of fresh air into a building by over filtration or failure to replace clogged filters.

9.4.2. Seal openings to minimize infiltration through building envelopes. Consider the types of windows in affected buildings. If windows are operable, seal the window openings with a plastic sheet barrier.

9.4.3. In courtyards or inside corners of buildings, use fans to circulate air out of the work area.

9.4.4. Refer to Appendix B - Dust, Containment, Odor and Fungal Control Measures for additional measures that might be necessary.

10. Masonry Veneer: Brick or block facing with steel stud backup shall not be used for Type I or Type II buildings. When used for Type III structures, the studs shall be designed to meet the more stringent deflection standards of the Brick Industry, rather than the Steel Stud Institute. Also, pay special attention to protecting the ties from rusting by using corrosion-resistant ties, corrosion-resistant compatible screws, and adequate flashing and drains. The A/E shall provide complete details.

04400 - STONE

1. Industry Standards: Material and installation shall comply with recognized industry standards, including the American Institute of Steel Construction, Indiana Limestone Institute of America, Marble Institute of America, National Building Quarries Association, ASTM and others as applicable.

1.1. Test stone in accordance with the requirements under Section 4200 - Unit Masonry, 3. Face Brick.

2. Stone

2.1. The A/E shall select and approve stone samples, along with the university's approval prior to requesting bids.

2.2. Stone used for remodeling projects or for additions to existing structures shall match the existing stone. The new stone shall be matched to a cleaned section of the existing stone.

2.3. The A/E shall specify the appropriate grade and quality of stone for each area of the project. Specifications shall include the requirement that the contractor provide stone samples and mockup panels to verify the design intent, including anchorage, joints, details and appearance. The number and size of the panels shall be appropriate to the scale of the project. Mockup panels shall be subject to university and A/E approval. Approved panels shall be used as a standard of workmanship for acceptance of construction.

3. Anchors, Supports and Accessories

3.1. Details shall account for the expected construction tolerances such as plumb and level of the supporting structure.

3.2. Consult industry standards for the physical characteristics and safety factors recommended for each type of stone that is used.

3.3. Anchors, supports, and accessories shall be stainless steel 304L.

4. Control Joints and Joint Reinforcement: Drawings shall indicate location and pattern of control joints and joint reinforcement.

5. Flashing

5.1. PROHIBITED: PVC flashing.

5.2. Flashing material shall be non-staining, non-corrosive and shall have a life span compatible with the stone.

5.3. The A/E shall locate and detail the flashing to prevent moisture intrusion into the wall or building. The flashing material for this purpose must be compatible with adjacent materials. The membrane flashing shall be a minimum of 40 mils thick. Flashing shall extend a minimum of 1/4 inch beyond the outside face of the exterior unit and be turned downward to form a drip. Flashing is to be adhered to the horizontal support below. Vertical termination of flashing shall be mechanically fastened with continuous termination bar. Water cut off mastic shall be installed between backup wall and flashing, and between flashing and termination bar. Details in contract documents shall include flashing end dam and prefabricated corner installation requirements.

5.4. At wall/roof junctions, including parapet walls, provide a flashing/counter flashing detail with adequate height to allow re-roofing without having to replace the through-wall flashing.

5.5. At the top of stone walls, membrane flashing is to be adhered to the face of the stone wall at the top of the exterior wythe and attached to the roof membrane on the building side.

5.6. Wall cavity vents shall be installed in the exterior stone wythe above the base flashing below the top of the wall. The University Exceptions Committee shall review rainscreen design walls.

5.7. Provide continuous stainless steel flashing between the stone cap and the top of the wall with drips on each side of the wall.

6. Coating/Staining

6.1. Non-absorbent stone shall be used where subject to staining, salts and other abrasives.

6.2. Specify damp-proofing on the backside of limestone where it is at or below grade.

6.3. Landscape the base of the building to minimize debris from splashing back and staining the stone.

04490 - MASONRY RESTORATION AND CLEANING

- 1. PROHIBITED:** Water-repellant coatings on exterior masonry.

- 2. Preliminary Considerations:** Prior to commencing any design work, review the scope of the masonry restoration project with the University Architect's Office for direction regarding historic building designation and other building history information. Restoration work on historically designated buildings shall be in accordance with The Secretary of Interior's Standards for the Treatment of Historic Properties with Illustrated Guidelines for Preserving, Rehabilitating & Reconstructing Historic Buildings.

- 3. Long Lead Time for Items:** Early in the design process, identify any replacement items that need a long lead time such as terra cotta or special stone or cast stone items. Recognize such items in the project schedule.

- 4. Pre-Construction Testing:** Existing brick, cast stone, terra cotta trim replacement brick, mortar, cleaning products and methods shall be tested as early as possible in the design phase. Early testing provides time for additional testing, to determine how tested materials withstand variable weather conditions, as well as to determine other long-term effects. The university shall engage a testing agency under a separate contract based upon the scope of the project and the architect's recommendations.

- 5. Drawings:** Prepare drawings that clearly define the extent of the restoration and cleaning work.

- 6. Allowances and Unit Prices:** Consider using quantity allowances and unit prices to evaluate and value quantity changes from allowances, additions or deletions in restoration work.

- 7. Definitions:** Define restoration terms such as low-, medium- and high-pressure sprays, as well as other terms to ensure proper restoration procedures and quality control.

- 8. Submittals:** Require product data sheets, shop drawings, material samples for each type of masonry to be used, mortar and mortar components, masonry patching compounds, anchors and other accessories.

- 9. Quality Assurance:** Specify the minimum qualifications and experience of restoration firms, supervisors, workers, cast stone and terra cotta manufacturers, and chemical manufacturers. Define any source limitations to ensure a consistent quality of material.

- 10. Mockups:** Specify field-prepared/constructed mockups and in-wall sample panels for replacement brick, colored mortar samples, sealant and masonry patching compounds to establish a standard of quality for restoration work.

11. Project Conditions: Specify the appropriate requirements for hot weather and cold weather.

12. Sequencing/Scheduling: Evaluate each restoration project and specify the appropriate sequencing of cleaning, repairing, replacing and pointing operations for the particular project conditions and materials.

13. Special Products and Materials: Specify such items, including brick, stone, terra cotta, mortar, chemicals, cleaners, patching materials and anchors.

14. Protection: Specify the necessary protection for people, property and the environment.

15. Restoration Procedures: Specify such procedures that pertain to removing/replacing, patching, cleaning, paint removing, pointing again and final cleaning.

16. Anti-Graffiti Coatings: The University Architect's Office shall review the use of anti-graffiti coatings.

17. Field Quality Control: Advise the university of places where independent inspection and testing is required. The architect shall ensure that the restoration project conforms to the restoration contract documents and quality control measures by visiting and observing the site on a regular basis.

End of Division 4 - Masonry
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