

## **SECTION 042000 - UNIT MASONRY**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Concrete masonry units.
  - 2. [Precast Concrete](#)
  - 3. Decorative concrete masonry units.
  - 4. Glazed concrete masonry units.
  - 5. Mortar and grout.
  - 6. Steel reinforcing bars.
  - 7. Masonry joint reinforcement.
  - 8. Ties and anchors.
  - 9. Embedded flashing.
  - 10. Miscellaneous masonry accessories.
- B. Related Sections:
  - 1. Section 051200 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
  - 2. [Section 034500 Architectural Precast wall panels](#)
  - 3. Section 055000 "Metal Fabrications" for furnishing steel lintels and shelf angles for unit masonry.
  - 4. Section 071900 "Water Repellents" for water repellents applied to unit masonry.
  - 5. [Section 071900 "Sealants" for Precast](#)
  - 6. Section 076200 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

#### **1.3 DEFINITIONS**

- A. CMU(s): Concrete Masonry Unit(s).
- B. BCMU(s): Burnished Concrete Masonry Units.
- C. GBMU(s): Glazed Block Masonry Units.
- D. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

#### **1.4 PERFORMANCE REQUIREMENTS**

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
  - 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
  - 2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.
- B. [Provide Structural Precast that reaches 6,000 PSI 28 day strength](#)

#### **1.5 PRECONSTRUCTION TESTING**

- A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
2. Mortar Test (Property Specification): For each mix required, according to ASTM C 109/C 109M for compressive strength[, ASTM C 1506 for water retention, and ASTM C 91 for air content].
3. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
4. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.
5. Prism Test: For each type of construction required, according to ASTM C 1314.

B. **Preconstruction Testing Service:** Precast Producer will submit QC reports to show the panels meet or exceed all specified compressive requirements above.

C.

## 1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement. Show elevations of reinforced walls.
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
4. Precast panels in lieu of Masonry
  - a. Corner Details
  - b. Wall Panel design with connection details

C. Samples for Initial Selection:

1. Decorative CMUs, in the form of small-scale units.
2. Colored mortar.
3. Precast Samples of 18" x 18" showing Burnished Block finish and mortar color

D. Samples for Verification: For each type and color of the following:

1. Exposed Decorative CMUs (Burnished Block).
2. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.
3. Accessories embedded in masonry.
4. Precast Mock up of 4' x 4' showing Burnished Block finish, mortar color and specialty embeds in concrete

## 1.7 INFORMATIONAL SUBMITTALS

A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

B. Qualification Data: For testing agency.

C. Material Certificates: For each type and size of the following

1. PCI Certification and Product Data shall be submitted for the precast components

2. Masonry units.
    - a. Include data on material properties and material test reports substantiating compliance with requirements.
    - b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
  3. Cementitious materials. Include brand, type, and name of manufacturer.
  4. Pre-blended, dry mortar mixes. Include description of type and proportions of ingredients.
  5. Grout mixes. Include description of type and proportions of ingredients.
  6. Reinforcing bars.
  7. Joint reinforcement.
  8. Anchors, ties, and metal accessories.
- D. Shop Drawings: Detail fabrication and installation of architectural precast concrete units. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit. Indicate joints, reveals, and extent and location of each surface finish. Indicate details at building corners.
1. Indicate separate face and backup mixture locations and thicknesses.
  2. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware and connections.
  3. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
  4. Indicate locations, extent, and treatment of dry joints if two-stage casting is proposed.
  5. Include plans and elevations showing unit location and sequence of erection for special conditions.
  6. Indicate location of each architectural precast concrete unit by same identification mark placed on panel.
  7. Indicate relationship of architectural precast concrete units to adjacent materials.
  8. Design Modifications: If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept. Any deviations from the construction documents in panel design, finish or detailing shall be highlighted in the Shop Drawing for Architect review.
  9. Indicate locations of Electrical systems to be integrated in the precast wall panels
  10. Comprehensive engineering analysis [**signed** and sealed] [certified] by the qualified professional engineer responsible for its preparation. Show governing panel types, connections, and types of reinforcement, including special reinforcement. Indicate location, type, magnitude, and direction of loads imposed on the building structural frame from architectural precast concrete.
- E. Design Mixtures for each precast concrete mixture. Include compressive strength and water absorption tests
- F. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
  2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- G. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

- H. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

## 1.8 QUALITY ASSURANCE

### A. Precast Quality Assurance

1. Installer Qualifications: A precast concrete erector qualified and designated by PCI's Certificate of Compliance to erect Category [A (Architectural Systems) for non-load] [S2 (Complex **Structural** Systems) for load]-bearing members.
2. Installer Qualifications: A precast concrete erector who has retained a "PCI-Certified Field Auditor" to conduct a field audit of a project in same category as this Project before erection of precast concrete and who can produce an Erectors' Post-Audit Declaration.
3. Fabricator Qualifications: A firm that assumes responsibility for engineering architectural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
  1. Participates in PCI's plant certification program [at time of **bidding**] and is designated a PCI-certified plant for Category AA Architectural Cladding and Load Bearing Units
  2. Precast Production Plant shall include 8-head main bridge automated and 8 head bridge automated auxiliary honing/polishing machine with water recycle equipment capable of finishing 15' x 60' panels with a honed/polished finish to match Design Reference Sample. Facilities shall include tilt table for panel handling during polishing. *Small one head floor finishing machines or handheld polishers are not acceptable.*
4. Testing Agency Qualifications: An independent testing agency, [acceptable to authorities **having jurisdiction,**] qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
5. Design Standards: Comply with ACI 318 (ACI 318M) and design recommendations of PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of architectural precast concrete units indicated.
6. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."
7. Welding: Qualify procedures and personnel according to AWS D1.1/D.1.1M, "Structural Welding Code - Steel"; and AWS D1.4, "Structural Welding Code - Reinforcing Steel."
8. Calculated Fire-Test-Response Characteristics: Where indicated, provide architectural precast concrete units whose fire resistance has been calculated according to [ACI 216.1/TMS 0216.1, "Standard Method for **Determining Fire** Resistance of Concrete and Masonry Construction Assemblies,"] [PCI MNL 124, "Design for Fire Resistance of Precast Prestressed Concrete,"] and is acceptable to authorities having jurisdiction.
9. Sample Panels: Approved 12" x 12" material samples, along with a range sample and approved full size panels shall remain at the precast plant facility for reference in approving color, finish, and quality of workmanship during production casting.
10. Mockups: After range sample approval, but before precast production; when required by contract; construct a full—sized mockup as outlined in the contract drawings. Obtain approval of mockup

shop drawings by all trades. Install at the precast plant or on site as directed by the architect to verify all selections and compatibility of architectural materials made under various sample submittals including precast, windows and caulking, to demonstrate aesthetic effects and set quality standards for materials and installation execution. Approval of mockups does not constitute approval of deviations from the Contract Documents unless such deviations are specifically approved by the Architect in writing.

11. **Preconstruction Testing Mockup:** Provide a full-size mockup of architectural precast concrete indicated on Drawings for preconstruction testing. Refer to Division [011] [088] < Insert **Division number**> Section "<Insert Section title>" for preconstruction testing requirements.

A. Build preconstruction testing mockup as indicated on Drawings including [aluminum framing, glass, sealants,] <Insert construction> and architectural precast concrete complete with anchors, connections, flashings, and joint fillers.

B. Build preconstruction testing mockup at testing agency facility.

12. **Preinstallation Conference:** Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

B. Masonry Quality Assurance

C. **Testing Agency Qualifications:** Qualified according to ASTM C 1093 for testing indicated.

D. **Source Limitations for Masonry Units:** Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

E. **Source Limitations for Mortar Materials:** Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

F. **Masonry Standard:** Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

G. **Sample Panels:** Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects.

1. Build sample panels for each type of exposed unit masonry construction; inclusive of a typical exterior wall and a typical interior wall in sizes approximately 48 inches (1200 mm) long by 48 inches (1200 mm) high by full thickness.

2. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.

3. Clean one-half of exposed faces of panels with masonry cleaner indicated.

4. Protect approved sample panels from the elements with weather-resistant membrane.

5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect and Mille Lacs of Ojibwe in writing.

a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.

H. **Mockups:** Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of typical wall area as shown on Drawings.

2. Build mockups for typical exterior and interior walls in sizes approximately 48 inches (1200 mm)] long by 48 inches (1200 mm) high by full thickness, including face and backup wythes and accessories.
    - a. Include a sealant-filled joint at least 16 inches (400 mm) long in each mockup.
    - b. Include lower corner of window opening framed with stone trim at upper corner of exterior wall mockup. Make opening approximately 12 inches (300 mm) wide by 16 inches (400 mm) high.
    - c. Include pre-finished CMUs on one face of interior unit masonry wall mockup.
  3. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
  4. Protect accepted mockups from the elements with weather-resistant membrane.
  5. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
    - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect and the Owner in writing.
    - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
  6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- I. Pre-installation Conference: Conduct conference at Project site.

#### 1.9 PRECAST DELIVERY, STORAGE, AND HANDLING

- A. Deliver architectural precast concrete units in such quantities and at such times to limit unloading units temporarily on the ground.
- B. Support units during shipment on non-staining shock-absorbing material.
- C. Store units with adequate dunnage and bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.
- D. Place stored units so identification marks are clearly visible, and units can be inspected.
- E. Handle and transport units in a position consistent with their shape and design in order to avoid excessive stresses which would cause cracking or damage.
- F. Lift and support units only at designated points shown on Shop Drawings.

#### 1.10 MASONRY DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver pre-blended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

### 1.11 PROJECT CONDITIONS (Does not pertain to Precast substitution)

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
  - 1. Extend cover a minimum of 24 inches (600 mm) down both sides of walls and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
  - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
  - 2. Protect sills, ledges, and projections from mortar droppings.
  - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
  - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

## PART 2 - PRODUCTS

### 2.1 Precast Manufactures

- 1. Available Fabricators: Subject to compliance with requirements, fabricators offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Fabricators: Subject to compliance with requirements, provide Hammer Brushed products by one of the following:
    - A. Taracon Precast; 6189 170<sup>th</sup> St. N Hawley, MN 56549
    - B. Approved Equal

## 2.2 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work. No defective units shall be used in finished areas.

## 2.3 CONCRETE MASONRY UNITS

- A. Regional Materials: CMUs shall be manufactured within 500 miles (800 km) of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
- B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
  - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
  - 2. Provide square-edged units for outside corners unless otherwise indicated.
- C. Integral Water Repellent: Provide units made with integral water repellent for exposed units
  - 1. Integral Water Repellent: 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.
    - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) ACM Chemistries; RainBloc.
      - 2) BASF Aktiengesellschaft; Rheopel Plus.
      - 3) Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block.
- D. CMUs: ASTM C 90.
  - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi (19.3 MPa).
  - 2. Density Classification: Normal weight unless otherwise indicated].
  - 3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
  - 4. Size (Width): Manufactured to the following dimensions:
    - a. 4" nominal; 3-5/8" actual.
    - b. 6" nominal; 5-5/8" actual.
    - c. 8" nominal; 7-5/8" actual.
    - d. 10" nominal; 9-5/8" actual.
    - e. 12" nominal; 11-5/8" actual.
  - 5. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

- E. Decorative CMUs: ASTM C 90.
1. Products: Subject to compliance with requirements, provide available products that may be incorporated into the Work to include, but are not limited to, the following]:
    - a. Burnished Block: Anchor Block Company, 2300 McKnight Road, North St. Paul, MN 55109-2830; PH: 651-777-8321. [www.anchorblock.com](http://www.anchorblock.com)
    - b. Burnished Block: Amcon Block & Precast, Inc., 2211 Hwy. 10 South, St. Cloud, MN 56304; PH: 800-251-8321. [www.amconblock.com](http://www.amconblock.com)
    - c. Burnished Block: County Materials Corporation; 1203 70<sup>th</sup> Av, Roberts, Wisconsin 54023; 800-207-9962. [www.countymaterials.com](http://www.countymaterials.com)
  2. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi (19.3 MPa).
  3. Density Classification: Normal weight.
  4. Size (Width): Manufactured to dimensions specified in "CMUs" Paragraph above.
  5. Pattern and Texture:
    - a. Standard pattern, ground-face finish.
    - b. Units shall be laid in a running bond as indicated.
    - c. Units shall be ground both face sides for finishes on interior and exterior. Units laid up as the common wall of the shower stalls in the Shower Building, may be ground on exterior face only to a height of 7'-4" AFF. Glazed Block "soaps" shall be set on interior to finish shower stalls (both Men and Women).
  6. Colors: Equal to County Materials; Premier Ultra 63 Burnished Block. Color A: 240A Dawn and Color B: 241A Quiet Beach.
  7. Bullnose Edges where indicated or shown radiused.
  8. Lintel Units where shown over doors, windows, openings and at truss bearing.
- F. Concrete Lintels: ASTM C 1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than CMUs.
- G. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

#### **2.4 MORTAR AND GROUT MATERIALS (Not Required in Precast Substitution)**

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C 91.
  1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Holcim (US) Inc.; Mortamix Masonry Cement.
    - b. Lafarge North America Inc.; Magnolia Masonry Cement.
    - c. Lehigh Cement Company; Lehigh Masonry Cement.
    - d. National Cement Company, Inc.; Coosa Masonry Cement.
    - e. Spec Mix.
- E. Mortar Cement: ASTM C 1329.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Lafarge North America Inc.; Lafarge Mortar Cement.
  - b. Spec-Mix.
  
- F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.
  1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Davis Colors; True Tone Mortar Colors.
    - b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
    - c. Solomon Colors, Inc.; SGS Mortar Colors.
  
- G. Colored Cement Product: Packaged blend made from masonry cement or mortar cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
  1. Products: Subject to compliance with requirements, [provide the following available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Colored Masonry Cement:
      - 1) Capital Materials Corporation; Flamingo Color Masonry Cement.
      - 2) Cemex S.A.B. de C.V.; Richcolor Masonry Cement.
      - 3) Essroc, Italcementi Group; Brixment-in-Color.
      - 4) Holcim (US) Inc.; Rainbow Mortamix Custom Color Masonry Cement.
      - 5) Lafarge North America Inc.; U.S. Cement Custom Color Masonry Cement.
      - 6) Lehigh Cement Company; Lehigh Custom Color Masonry Cement.
      - 7) National Cement Company, Inc.; Coosa Masonry Cement.
  2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
  3. Pigments shall not exceed 5 percent of masonry cement or mortar cement] by weight.
  
- H. Aggregate for Mortar: ASTM C 144.
  1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
  2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
  3. White-Mortar Aggregates: Natural white sand or crushed white stone.
  4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
  
- I. Aggregate for Grout: ASTM C 404.
  
- J. Epoxy Pointing Mortar: ASTM C 395, epoxy-resin-based material formulated for use as pointing mortar for structural-clay tile facing units (and approved for such use by manufacturer of units); in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's colors.
  
- K. Refractory Mortar Mix: Ground fireclay or non-water-soluble, calcium aluminate, medium-duty refractory mortar that passes ASTM C 199 test; or an equivalent product acceptable to authorities having jurisdiction.

- L. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Euclid Chemical Company (The); Accelguard 80.
    - b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
    - c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.
  
- M. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent by same manufacturer.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following]:
    - a. ACM Chemistries; RainBloc for Mortar.
    - b. BASF Aktiengesellschaft; Rheopel Mortar Admixture.
    - c. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
  
- N. Shower Building: (shower stall CMU Sealer) Use a clear finish, concrete and masonry sealer, equal to that as manufactured as THORO – Concrete and Masonry Sealer to coat all walls, caps and floors in each shower stall in both Men and Women shower stalls. Height of sealant shall be 7'4" AFF on the three, dividing walls. Include coating on CMU caps between units.
  
- O. Water: Potable.

## 2.5 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M, Grade 60.
- B. Prestressing Stands: ASTM A 416/A416 M, Grade 270 uncoated, 7 wire, low-relaxation strand
- C. Masonry Joint Reinforcement, General: ASTM A 951/A 951M. (Not required in Precast substitution)
  - 1. Interior Walls: Hot-dip galvanized, carbon steel.
  - 2. Exterior Walls: Hot-dip galvanized, carbon steel.
  - 3. Wire Size for Side Rods: 0.187-inch (4.76-mm) diameter.
  - 4. Wire Size for Cross Rods: 0.187-inch (4.76-mm) diameter.
  - 5. Wire Size for Veneer Ties: 0.187-inch (4.76-mm)] diameter.
  - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
  - 7. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.
- D. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

## 2.6 STEEL CONNECTION MATERIALS for Precast Substitution

- 1. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.
- 2. Carbon-Steel-Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished, AWS D1.1/D1.1M, Type A or B, with arc shields and with minimum mechanical properties of PCI MNL 117, Table 3.2.3.
- 3. Carbon-Steel Plate: ASTM A 283/A 283M.
- 4. Malleable Iron Castings: ASTM A 47/A 47M.

5. Carbon-Steel Castings: ASTM A 27/A 27M, Grade 60-30 (Grade 415-205).
6. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.
7. Carbon-Steel Structural Tubing: ASTM A 500, Grade B.
8. Wrought Carbon-Steel Bars: ASTM A 675/A 675M, Grade 65 (Grade 450).
9. Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706/A 706M.

Grade A (ASTM F 568 M, Property Class 4.6);

10. Carbon-steel hex head bolts, studs and nuts, ASTM A 563 (ASTM A 563M); and flat, unhardened steel washers, ASTM F 844.
11. High-Strength Bolts and Nuts: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural

## 2.7 TIES AND ANCHORS (Not needed in Precast Substitution, all embeds needed cast into precast wall)

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
  1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 641/A 641M, Class 1 coating.
  2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
  3. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304 or Type 316.
  4. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 (Z180) zinc coating.
  5. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
  6. Stainless-Steel Sheet: ASTM A 666, Type 304 or Type 316.
  7. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
  8. Stainless-Steel Bars: ASTM A 276 or ASTM a 666, Type 304.
- B. Corrugated Metal Ties: Metal strips not less than 7/8 inch (22 mm) wide with corrugations having a wavelength of 7.6 to 12.7 mm and an amplitude of 0.06 to 0.10 inch (1.5 to 2.5 mm) made from 0.030-inch- (0.76-mm-) thick, steel sheet, galvanized after fabrication.
- C. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch (16-mm) cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches (50 mm) parallel to face of veneer.
- D. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches (100 mm) wide.
  1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches (50 mm) long may be used for masonry constructed from solid units.
  2. Where wythes do not align or are of different materials, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches (32 mm).
  3. Wire: Fabricate from 1/4-inch- (6.35-mm-) diameter, hot-dip galvanized steel wire ties may be used in interior walls unless otherwise indicated.
- E. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
  1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- (6.35-mm-) diameter, hot-dip galvanized steel wire may be used at interior walls unless otherwise indicated.
  2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm) of masonry face, made from 0.25-inch- (6.35-mm-) diameter, hot-dip galvanized steel wire may be used at interior walls unless otherwise indicated.

- F. Partition Top anchors: 0.105-inch- (2.66-mm-) thick metal plate with 3/8-inch- (9.5-mm-) diameter metal rod 6 inches (152 mm) long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- G. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.35 mm) thick by 24 inches (610 mm) long, with ends turned up 2 inches (51 mm) or bent to configuration indicated. Use stainless steel in Shower Building all locations mentioned.
  - 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.
  - 2. Shower Building: Group 2 (A4) stainless-steel, plates, brackets and bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

## 2.8 MISCELLANEOUS ANCHORS (Not Required for precast substitution)

- A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.
- B. Anchor Bolts: Headed or L-shaped] steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.
- C. Post installed Anchors: Torque-controlled expansion anchors.
  - 1. Load Capacity: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
  - 2. Material for Interior Locations: Group 2 (A4) stainless-steel, plates, brackets and bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

## 2.9 EMBEDDED FLASHING MATERIALS (not required for the precast substitution)

- A. Flexible Flashing: Use the following unless otherwise indicated:
  - 1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.030 inch (0.76 mm).
    - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) Advanced Building Products Inc.; Peel-N-Seal.
      - 2) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
      - 3) Dayton Superior Corporation, Dur-O-Wal Division; Dur-O-Barrier Thru-Wall Flashing.
      - 4) Fiberweb, Clark Hammerbeam Corp.; Aquaflash 500.
      - 5) Grace Construction Products, W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
      - 6) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
      - 7) Hohmann & Barnard, Inc.; Textroflash.
      - 8) W. R. Meadows, Inc.; Air-Shield Thru-Wall Flashing.
      - 9) Polyguard Products, Inc.; [Polyguard 300] [Polyguard 400].
      - 10) Sandell Manufacturing Co., Inc.; Sando-Seal.
      - 11) Williams Products, Inc.; Everlastic MF-40.

- b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
- B. Application: Unless otherwise indicated, use the following:
  - 1. Where flashing is indicated to receive counterflashing, use metal flashing.
  - 2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
  - 3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge or flexible flashing with a metal drip edge.
  - 4. Where flashing is fully concealed, use flexible flashing.
- C. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

**2.10 MISCELLANEOUS MASONRY ACCESSORIES (Not Needed for Precast Substitution)**

- A. Compressible Filler: Pre-molded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or urethane.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
    - b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
    - c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
    - d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

**2.11 MASONRY CLEANERS**

- A. Proprietary Acidic Cleaner: 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 units installed during a work day shall be cleaned after their daily installation using manufacturer's recommended water technique.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Diedrich Technologies, Inc.
    - b. EaCo Chem, Inc.
    - c. ProSoCo, Inc.

- B. Clean surfaces of precast concrete units exposed to view.

1. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.
2. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.
  - a. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff fiber brushes and sponges, and rinse with clean water. Protect other work from staining or damage due to cleaning operations.
  - b. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.
  - c. Use cleaning processes that have been tested for use on honed/polished finishes to maintain the quality of finish noted on the approved samples and mockups.

## **2.12 MORTAR AND GROUT MIXES (Not Required with Precast Substitution)**

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
  1. Do not use calcium chloride in mortar or grout.
  2. Use masonry cement or mortar cement mortar unless otherwise indicated.
  3. For exterior masonry, use masonry cement or mortar cement mortar.
  4. For reinforced masonry, use masonry cement or mortar cement mortar.
  5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Pre-blended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
  1. For masonry below grade or in contact with earth, use Type S.
  2. For reinforced masonry, use Type N.
  3. 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 N.
- D. Pigmented Mortar: Use colored cement product.
  1. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
  2. Mix to match Architect's sample.
  3. Application: Use pigmented mortar for exposed mortar joints with the following units:
    - a. Decorative CMUs.
- E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
  1. Mix to match Architect's sample.
  2. Application: Use colored aggregate mortar for exposed mortar joints with the following units:
    - a. Decorative CMUs.

- F. Grout for Unit Masonry: Comply with ASTM C 476.
  - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
  - 2. Proportion grout in accordance with ASTM C 476, paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).
  - 3. Provide grout with a slump of 8 to 11 inches (203 to 279 mm) as measured according to ASTM C 143/C 143M.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
  - 2. Verify that foundations are within tolerances specified.
  - 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION, GENERAL-PRECAST**

- A. Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.
- B. Erect architectural precast concrete level, plumb, and square within specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.
  - 1. Install temporary steel or plastic spacing shims or bearing pads as precast concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
  - 2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
  - 3. Remove projecting lifting devices and grout fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
  - 4. Unless otherwise indicated, maintain uniform joint widths of 3/4 inch (19 mm).
- C. Connect architectural precast concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.
  - 1. Do not permit connections to disrupt continuity of roof flashing.
- D. Welding: Comply with applicable AWS D1.1/D1.1M and AWS D1.4 for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.

1. Protect architectural precast concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.
  2. Welds not specified shall be continuous fillet welds, using no less than the minimum fillet as specified by AWS.
  3. Clean weld-affected metal surfaces with chipping hammer followed by brushing and apply a minimum 4.0-mil- (0.1-mm-) thick coat of galvanized repair paint to galvanized surfaces according to ASTM A 780.
  4. Clean weld-affected metal surfaces with chipping hammer followed by brushing and reprime damaged painted surfaces.
  5. Remove, reweld, or repair incomplete and defective welds.
- E. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.
1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot. For friction connections, apply specified bolt torque and check 25 percent of bolts at random by calibrated torque wrench.
- F. Grout connections where required or indicated. Retain grout in place until it can support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.

### **3.3 INSTALLATION, GENERAL-MASONRY**

- A. Thickness: Build walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections. Coordinate with other trades and accommodate access panels and equipment sizes prior laying up walls or chases.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
  1. Mix units from several pallets or cubes as they are placed.

### **3.4 ERECTION TOLERANCES-PRECAST**

- A. Erect architectural precast concrete units level, plumb, square, true, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I.

B. Erect architectural precast concrete units level, plumb, square, and true, without exceeding the following noncumulative erection tolerances:

1. Plan Location from Building Grid Datum: Plus or minus **1/2 inch (13 mm)**.
2. Plan Location from Centerline of Steel: Plus or minus **1/2 inch (13 mm)**.
3. Top Elevation from Nominal Top Elevation: As follows:
  - a. Exposed Individual Panel: Plus or minus **1/4 inch (6 mm)**.
  - b. Non-Exposed Individual Panel: Plus or minus **1/2 inch (13 mm)**.
  - c. Exposed Panel Relative to Adjacent Panel: **1/4 inch (6 mm)**.
  - d. Non-Exposed Panel Relative to Adjacent Panel: **1/2 inch (13 mm)**.
4. Support Elevation from Nominal Support Elevation: As follows:
  - a. Maximum Low: **1/2 inch (13 mm)**.
  - b. Maximum High: **1/4 inch (6 mm)**.
5. Maximum Plumb Variation over the Lesser of Height of Structure or **100 Feet (30 m)**: **1 inch (25 mm)**.
6. Plumb in Any **10 Feet (3 m)** of Element Height: **1/4 inch (6 mm)**.
7. Maximum Misalignment of Matching Edges: **1/4 inch (6 mm)**.
8. Joint Width (Governs over Joint Taper): Plus or minus **1/4 inch (6 mm)**.
9. Maximum Joint Taper: **3/8 inch (10 mm)**.
10. Joint Taper in **10 Feet (3 m)**: **1/4 inch (6 mm)**.
11. Maximum Jog in Alignment of Matching Faces: **1/4 inch (6 mm)**.
12. Differential Bowing or Camber, as Erected, between Adjacent Members of Same Design: **1/4 inch (6 mm)**.
13. Opening Height between Spandrels: Plus or minus **1/4 inch (6 mm)**.

### 3.5 TOLERANCES-MASONRY

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.

4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

### 3.6 LAYING MASONRY WALLS (Not Needed for Precast Substitution)

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches (100-mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
  1. Install compressible filler in joint between top of partition and underside of structure above.
  2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch (13-mm) clearance between end of anchor rod and end of tube. Space anchors 48 inches (1200 mm) o.c. unless otherwise indicated.
  3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.

### **3.7 MORTAR BEDDING AND JOINTING (Not needed for Precast Substitution)**

- A. Lay hollow CMUs as follows:
  1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
  2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
  3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
  4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
  5. Owner shall be notified upon the commencement of masonry installation.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
  1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
  2. Allow cleaned surfaces to dry before setting.
  3. Wet joint surfaces thoroughly before applying mortar.
- D. Tool all exposed joints and scores slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

### **3.8 MASONRY JOINT REINFORCEMENT (Not needed for precast Substitution)**

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
  1. Space reinforcement not more than 16 inches (406 mm) o.c.
  2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
  3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

### **3.9 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE (Not required in Precast Substitution)**

- A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:
  - 1. Provide an open space not less than 1/2 inch (13 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
  - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
  - 3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

### **3.10 CONTROL AND EXPANSION JOINTS (For Precast these requirements would be the sealants specification)**

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
  - 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
  - 2. Install preformed control-joint gaskets designed to fit standard sash block.
  - 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
  - 4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.
- C. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 "Joint Sealants," but not less than 3/8 inch (10 mm).
  - 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

### **3.11 LINTELS (Not Required in the precast substitution)**

- A. Install steel lintels where indicated.
- B. Provide masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.
- C. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

### **3.12 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS (Not required in precast substitution)**

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
  - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
  - 2. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
  - 3. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches (38 mm) or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
  - 4. Install metal drip edges and sealant stops with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
  - 5. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall and adhere flexible flashing to top of metal drip edge.
  - 6. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall and adhere flexible flashing to top of metal flashing termination.
  - 7. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.
- D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- E. Place pea gravel in cavities as soon as practical to a height equal to height of first course above top of flashing, but not less than 2 inches (50 mm), to maintain drainage.
  - 1. Fill cavities full height by placing pea gravel in cavities as masonry is laid so that at any point masonry does not extend more than 24 inches (600 mm) above top of pea gravel.
- F. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

### **3.13 REINFORCED UNIT MASONRY INSTALLATION (Not required in precast substitution)**

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
  2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
  2. Limit height of vertical grout pours to not more than 12.67 ft. (3.86 m).

### **3.14 FIELD QUALITY CONTROL-PRECAST**

- A. Special Inspections: [Owner will engage] [Engage] a qualified special inspector to perform the following special inspections and prepare reports:
1. Erection of precast concrete members.
  2. <Insert special inspections.>
- B. Owner will engage a qualified testing agency to perform tests and prepare test reports.
- C. Field welds will be subject to visual inspections and nondestructive testing according to ASTM E 165 or ASTM E 709. High-strength bolted connections will be subject to inspections.
- D. Testing agency will report test results promptly and in writing to Contractor and Architect.
- E. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.
- F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### **3.15 FIELD QUALITY CONTROL-Masonry**

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Level 1 Special Inspections according to the "International Building Code."

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
  2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
  3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- F. Mortar Aggregate Ratio Test Proportion Specification: For each mix provided, according to ASTM C 780.
- G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
- H. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

### **3.16 REPAIRING-PRECAST**

- A. Repair architectural precast concrete units for approval by the Architect. The Architect reserves the right to reject repaired units that do not comply with contract requirements and approved full size samples and mockups.
- B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet (6 m).
- C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.
- D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.
- E. Remove and replace damaged architectural precast concrete units when repairs do not comply with requirements.

### **3.17 REPAIRING, POINTING, AND CLEANING-MASONRY**

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on sample wall panel; leave one-half of panel un-cleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
  - 3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
  - 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
  - 6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
  - 7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
  - 8. Clean stone trim to comply with stone supplier's written instructions.

### **3.18 MASONRY WASTE DISPOSAL (Not required with Precast Substitution)**

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site. Adhere to Mille Lacs Band of Ojibwe requirements.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed. Adhere to Mille Lacs Band of Ojibwe requirements.
  - 1. Crush masonry waste to less than 4 inches (100 mm) in each dimension.
  - 2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in "Earth Moving."
  - 3. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property. Adhere to jurisdictional requirements.

**END OF SECTION 042000**