

PART IV: PRECAST CONCRETE, AND UNIT MASONRY DESIGN

1. SCOPE:

1.1. This part outlines the minimum requirements for the design procedures for concrete, masonry, and metals for new buildings, and repair and alteration projects for existing buildings on the UMB campus.

2. PRECAST CONCRETE:

2.1. **Architectural Precast Concrete:** Architectural precast concrete used in lieu of Indiana Limestone for exterior façade panels shall have a simulated limestone finish, and shall have a face mix that includes fine aggregate to achieve a sugar cube appearance. Exterior precast concrete units (including load-bearing spandrels and columns) for parking structures shall be fabricated by a plant certified by the Precast Concrete Institute (PCI) for group A-1, and the American Precast Association (APA).

2.2. **Architectural Plant Cast Concrete:** Architectural plant cast concrete shall be in compliance with the guidelines regarding structural design and fabrication as defined by the Precast Concrete Institute (PCI) and the American Precast Association (APA).

2.3. **Color:** Plant and structural architectural concrete color shall match Indiana oolitic limestone as quarried in Lawrence, Monroe and Owen Counties, Indiana” grade and standard buff with sand rubbed finish. Examples of recent UMB Projects which have acceptable physical appearances are:

- a. **School:** School of Nursing Addition
Address: 665 West Lombard Street
UMB Project Number: 91-125.
- b. **School:** Campus Center
Address: 601 West Lombard Street
UMB Project Number: 99-311

2.4. All Architectural Precast Concrete shall be designed by a qualified registered professional structural engineer.

2.5. **Precast Concrete Mock-up:** The A/E team shall require a mock-up for the precast concrete assembly. The mock-up shall be a minimum of four (4) feet x four (4) feet or larger as necessary to demonstrate the quality of the workmanship and materials used. The specifications shall include the requirement that the manufacturer of the precast assembly shall demonstrate the ability to make repairs to a damaged panel that results in an acceptable finish quality.

3. UNIT MASONRY:

3.1. **Exterior Architectural Materials:** To support the University’s goal of building a campus setting which represents its strategic values, the masonry materials used shall be selected by the following guidelines and in accordance with the technical requirements defined herein. The Master Plan require the use of Indiana Limestone in the first floor of new buildings and a predominance of “indigenous red-pink” brick throughout the remainder of the facades unless an existing

condition should recommend otherwise. Other materials shall not be used without written request and specific approval of the University for reasons of technological necessity, a sustainable desire for singular identity by a particular organization, or to match a significant adjacent building, etc.

- a. The materials and details employed for weather-proof construction shall be proven, low-maintenance systems with a service expectancy of at least forty (40) years. While state-of-the-art functions in the facility or budgetary and/or schedule limits may suggest the use of the newest technology under development, the exterior expression of these should be found in dependable, time-tested construction. Facades erected as temporary enclosures in anticipation of a future addition may be designed for removal, but it shall be constructed of a good quality “permanent” material, such as a simplified brick detailing, and should not appear to be “temporary” as often the building’s use is extended for years.

3.2. Acceptable Brick and Mortar:

- a. Brick and mortar shall be standard-sized face brick with necessary custom shapes, of a red through-body color set in a running or common bond with natural sand-colored mortar similar to the appearance of Davidge Hall. The University, as a public agency, has not selected a proprietary brick. However, recent construction on the campus exhibits a number of acceptable products that meet this criteria including:

(1) Health Sciences Facility 1:

- a) **Brick:** Glen-Gary “Alwine Maryland blend”, selected range
- b) **Mortar:** Leigh #00351
- c) **Mortar Color:** Indiana Limestone “buff” color

(2) Campus Center:

- A) **Brick:** Cushwa 50-50 blend of the 327 Cambridge and 115 Shenandoah
- B) **Mortar:** Flamingo 223
- C) **Mortar Color:** Pre-cast Limestone match

(3) School of Nursing Addition:

- a) **Brick:** Glen-Gary “Lafayette”
- b) **Mortar:** Riverton R-73
- c) **Mortar Color:** Pre-cast concrete: Limestone match

3.3. Brick Unit Masonry:

- a. **Face Brick:** Unless otherwise required to match an existing condition as directed by UMB, brick units shall conform to ASTM C216, standard size [two and one quarter (2 1/4) inch x three and five eighths (3 5/8) inch x eight (8) inch], grade SW, 5500 min. psi average minimum compressive strength or greater unless otherwise required by the University to match existing conditions. Brick shall be full-bodied, generally smooth textured with no added surface film color other than lightly flashed. A light sand finish may

be provided for softness texture. It shall be type FBS. Brick units shall be standard size [two and one quarter (2 1/4) inch x three and five eighths (3 5/8) inch x eight (8) inch],

- b. **Units:** Specify units without cores or frogs and with exposed surfaces finished for ends of sills, caps and similar applications that would otherwise be exposed.
- c. **Shapes:** Specify special shapes for headers or stretcher units used at corners, movement joints, bond beams, sashes, lintels, relief angles, brick projections, etc. Saw cutting will not be permitted where exposed to view outside a wall face. Projected brick trim etc. shall have a sloped top edge to shed water. A mortar cap or wash is unacceptable.
- d. **Color:** The face brick color and texture; unless required to match existing, shall be selected by the A/E, and reviewed and approved by UMB. Refer to the schedule of recent projects for acceptable brick/mortar color combinations. The A/E shall select and specify two bricks or brick blends, to be supplied by different brick suppliers to provide a competitive bidding environment. Specify that a four (4) foot x four (4) foot mock-up of each proposed brick shall be provided for review and approval by the A/E and the University prior to bidding of the brick work.

3.4. Concrete Unit Masonry:

- a. Concrete masonry units shall comply with ASTM C90 with a minimum compressive strength 1,900 psi. Weight classifications shall be as required by code and design requirements. Do not specify aggregates made from pumice, scoria, or tuff. Specify Type I, moisture controlled units.
- b. Concrete masonry units exposed to exterior conditions shall include an integral water repellent using a liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Specify that the units containing the additive shall be tested according to ASTM E 514 with the test period extended to twenty four (24) hours, and they shall show no visible water or leaks on the back of the test specimen.

3.5. Stone Veneer and Trim:

- a. Indiana limestone veneer and/or trim shall be used in areas as recommended in the UMB Master Plan, and as required by the architectural design. Stone trim units shall be of Indiana oolitic limestone as quarried in Lawrence, Monroe and Owen counties, Indiana, and shall comply with ASTM C568, category II conidium density grade and color standard buff. Specify a Sand-rubbed finish to match stone as utilized in recent projects.
- b. Natural granite shall be utilized in the first course under Indiana Limestone veneer as protection from deterioration by penetration of water-borne salts. The granite shall be dimensioned the same as the full thickness of the limestone veneer. If granite is utilized as door sill's, specify a surface finish which is not slippery when wet. Specify mortar and/or sealant color to match granite in this course rather than Limestone above.

3.6. Cast Stone:

- a. Cast stone may be furnished in lieu of buff colored Indiana Limestone, as provided in the program or as approved by the Office of Facilities Management. Where architectural pre-cast concrete will not provide the shapes, color, sharp edges, or profiles desired by the A/E, Cast Stone may be specified and shall be fabricated by a plant certified by the APA for Vibra dry-tamp cast stone.

3.7. Mortar and Grout Materials:

- a. Specify face brick and stone to be set with a type N integrally-colored mortar complying with ASTM C270.
- b. Existing masonry requiring restoration work shall be repaired according to Brick Institute of America (BIA) Technical Bulletin 7. In accordance with Bulletin 7, samples of the existing mortar shall be removed and analyzed for composition, strength and mortar color as the basis for the specification of the new/replacement material. Portland cement based mortar, which is stronger than adjacent masonry, shall not be used; specify a mortar that is weaker than the existing mortar, and not stronger than type 'M'. For soft old joints, use type 'O'. All joints to be repointed shall be raked out at least three quarter (3/4) inch deep or until a solid surface is found, without mechanical saw cutting, and prepared clean and square to the masonry. Joints shall be repointed to the full depth of the joint according to BIA recommended procedures; surface repointing is not acceptable. Prepare specifications accordingly.

3.8. Masonry Construction Details:

- a. **Contract Drawings:** Contract drawings shall include the following information related to Unit Masonry:
 - (1) Fire resistance rating which must be achieved (four (4) hour, three (3) hour, etc.), if any.
 - (2) Extent of each type of engineered and empirically designed masonry and delineate, as required, to show dimension (nominal thickness, cavity width, setting bed thickness, etc.) and construction (single wythe, multi-wythe, composite, cavity, etc.).
 - (3) Structural requirements coordinated with ACI 530 and ACI 530.1. Latter standards require masonry compressive strengths (psi) of masonry to be placed on drawings.
 - (4) Indicate structural bonding between wythes (continuous wire reinforcing) and space of reinforcing, anchors, etc., as well as the extent of insulation in cavity walls and hollow units. Lintels shall be detailed and cross referenced to structural drawings as scheduled.
 - (5) Details at masonry openings for doors and windows (sill, jamb & head conditions) shall be drawn at a scale of three (3) inch = one (1) foot – zero (0) inch and show all adjacent components of the assembly.
 - (6) Location, types, and details of items to be built into masonry, such as flashing, drip flashings, weeps, damp proofing, mortar net, reglets, polymer mesh wrap around columns, and insulation nailers.

- (7) Location of movement joints and details of each type of movement joint. Show isolation joints between masonry and concrete, and masonry and steel framing, if any. Indicate all remolded joint material, backer rods and sealant at the detail.
 - (8) Details of special bearing areas (particularly for hollow unit masonry) showing extent and type of high-strength units, such as solid CMU areas in hollow CMU walls, vertical and horizontal reinforcement grout or concrete fill for hollow CMU, bond beams, and other special construction required for structural bearing.
 - (9) Architectural design elements shall clearly delineate pattern bonds for exposed surfaces, if other than running bond, areas of colored mortar and type, details of special features such as recesses, offsets and/or special coursing, etc.
- b. **Horizontal Joint Reinforcement:** Specify truss type in single-wythe masonry walls, “ladder” type for multi-wythe cavity masonry walls. At exterior multi-wythe cavity walls use truss type at interior wythe with integral adjustable rectangular exterior wythe ties. Space continuous horizontal wall reinforcing sixteen
 - c. At exterior face of interior wythe of masonry cavity walls specify a damp proof coating. Damp proofing should coat structure as well.
 - d. Construction specifications shall specifically require the use of mortar boards during construction and back troweling of mortar onto rear of exterior wythe. Head joints must be filled solid.
 - e. Specify vertical wall expansion joints approx. thirty (30) feet – zero (0) inches on center and horizontal expansion joints under all relief angles and rigid structural elements per BIA recommendations. Incorporate remolded full depth closed cell neoprene expansion joint material with backer rod and sealant over. Sealant color shall match mortar color unless otherwise required by the designer at adjoining materials.
 - f. In areas subject to vandalism or defacement at brick or stone masonry include an application of a silicone elastomer as a graffiti control measure, in the specifications.
 - g. Contract specification “boiler plate” requirements for masonry construction shall be coordinated with requirements of the drawings for clear, unmitigated direction.
 - h. Architectural details shall clearly indicate the locations of all anchors, ties, reinforcing, joint reinforcement, lintels, insulation, chases, recesses, or openings for other construction for each type of masonry construction included in the project.

END OF SECTION 3 AD - PART IV