

**(Specifier Notes:**

***The purpose of this guide specification is to assist the specifier in correctly specifying exterior limestone cladding and its installation. The specifier needs to edit this guide specification to fit the needs of each specific project.***

***Throughout the guide specification, there are Specifier Notes to assist in the editing of this guide specification. Brackets [ ] have been used to indicate when a selection or a decision is required. References have been made to MasterFormat Division numbers and titles and should be coordinated with other Sections.)***

SECTION 04 42 23

EXTERIOR LIMESTONE CLADDING

***(Specifier Notes: This specification assumes secondary framing and structural support for the cladding is designed and installed by others.)***

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Delegated engineering.
- B. Exterior limestone cladding field set individually with mechanical devices to building structural frame with sealant filled joints.

***(Specifier Note: RETAIN any of the bracketed options in the subparagraph below to suit the project.)***

- C. Trim panels, including [headers,] [bands,] [copings,] [jambs,] [sills,] [and] [soffits].

1.2 DELEGATED ENGINEERING REQUIREMENTS

- A. Contract Documents: Concept of work specified by this Section is expressed on Drawings and in Specifications however, they may not indicate or specify full extent of work that may be required.
- B. Delegated Engineering Responsibility: Employ delegated engineering professional to provide engineering for each member and component of exterior limestone cladding required to meet concept expressed in Contract Documents that includes, but is not limited to, following:
  - 1. Engineer to withstand structural design loads within limits and under conditions indicated, specified, or required, without material failure or permanent deformation of building structural frame or work specified according to following:

***(Specifier Note: ADD additional regulations below to suit the project.)***

- a. Authorities having jurisdiction.
  - b. Applicable local building codes.
  - c. [Wind tunnel testing.]
  - d. Criteria indicated in Contract Documents.
- 2. Comprehensive engineering analysis indicating location, type, magnitude, and direction of loads imposed on building structural frame.
  - 3. Preparation of engineering calculations, shop drawings, and other submittals with professional seal affixed according to respective jurisdictional licensing regulations.

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C. Delegated Engineering Assumptions:

1. Allowable working stress for limestone no more than lowest average of initial flexural strength testing, less one standard deviation, as determined by testing specified in PART 1 "Pre-construction Quality Control" Article.
2. Corners and Wind Pressures:
  - a. Corners in Typical Windload Zones: Both surfaces shall be assumed to experience inward and outward design pressures simultaneously.
  - b. Corners in Corner Windload Zones: Simultaneous occurrence of inward design pressure on one surface, and outward design pressure on adjoining surface is not required.
3. A 1/3 increase in allowable working stress for wind or seismic loads not acceptable.
4. Limestone failure defined as cracking or appearance of cracking and spalling at anchor points.
5. Adhesively adhered liner blocks, without dowels, not acceptable.

D. Safety Factors: Engineer to withstand following load effects without exceeding allowable working stress by following safety factors:

1. Cold-Formed Stainless Steel: As determined by delegated engineering professional consistent with engineering quality standards.
2. Oolitic Limestone: 8.
3. Dolomitic Limestone: 6.
4. Stone Anchor Concentrated Stresses: 10.
5. Post-Installed Anchors in Concrete: 5 according to ASTM E 488.
6. Post-Installed Anchors in Masonry: 6 according to ASTM E 488.

E. Cladding Quality Standards:

1. ASTM C 1242.
2. ILI – Indiana Limestone Handbook.

F. Delegated Engineering Quality Standards: Determine allowable working stresses of products according to following unless other standards are required by authorities having jurisdiction or applicable local building codes:

1. Limestone: Physical properties based on testing according to ASTM C 568.
2. Cold-Formed Stainless Steel:
  - a. ASCE 8 – Standard Specifications for the Design of Cold-Formed Stainless Steel Structural Members.
  - b. AISI – SG-673, Cold-Formed Steel Design Manual, Part 1, Specifications for the Design of Cold-Formed Steel Structural Members, and Addendum.

1.3 SUBMITTALS

- A. Product Data: Manufacturers technical literature for each product indicated, specified or required.
- B. Shop Drawings: Detailed plans, elevations, sections, and large-scale details of products; include following:
  1. Seal of delegated engineering professional.
  2. For structural attachments including following:

- a. Direction and working stresses of loads imposed by anchors, fasteners, and attachment devices.
    - b. Direction and working stresses of each movement type specified under delegated engineering and performance requirements.
  - 3. Limestone variety, profiles, thickness, dimensions, face finish, direction of grain, slots, holes, miters, corner conditions, and tolerances.
  - 4. Trim panels, including [headers,] [bands,] [copings,] [jambs,] [sills,] [and] [soffits].
  - 5. Individually number each piece of limestone to correspond to number marked on back of limestone after fabrication.
  - 6. For anchors and fasteners, manufacturers, products, types, sizes, lengths, spacings, embedment, and edge distances of attachment devices.
  - 7. Loose, cast-in, and field-set hardware, inserts, and connections.
  - 8. Material descriptions, types, sizes, and profiles for isolation between dissimilar surfaces.
- C. Samples for Verification:
- 1. Limestone Panels: Full-size samples for each different limestone panel showing full range of exposed color and finish to be expected.
  - 2. Accessories: Samples of manufactured products, including anchors, ties, cavity drainage material, flashing materials, weeps, vents, and other accessories.
  - 3. Flashing: Samples of each shape, profile, intersection and transition required, not less than 12 inches long, including end dam, and splice/lap joint for lintel/shelf angle flashing; demonstrate soldering quality.
- D. Installer Qualifications: Written data for company, principal personnel, experience, and training required by PART 1 "Quality Assurance" Article.
- E. Delegated Engineering Calculations: Engineering calculations, sealed by delegated engineering professional, for portion of work designated as delegated engineering; Test reports not acceptable substitute for calculations.
- F. Limestone Availability Certification: After samples are approved, certify availability of each limestone variety in sufficient quantities for work.
- G. Fastener and Anchor Test Reports: Certified reports of last completed set of mechanical tests for each device.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications:
- 1. Experience: Company with not less than 5 years experience in performing specified work similar to scope of this Project, and with a record of successful in-service performance, and sufficient production capability, facilities and personnel, to produce required work.
  - 2. Supervision: Installer shall maintain a full time supervisor on job site during times specified work is in progress and who has minimum 10 years experience in installing systems similar to type and scope required for this project.
- B. Sheet Metal Flashing Installer Qualifications: Sheet metal firm experienced with proper fabrication and installation of specified work similar in design, material and extent to scope of this project, and with a record of successful in-service performance and completion of projects for minimum 10 years.
- C. Delegated Engineering Professional Qualifications:
- 1. Professional engineer legally authorized to practice in jurisdiction where Project is located.

2. Experienced in providing engineering services of kind indicated resulting in installations of limestone cladding similar to this Project in material, design, and extent.
- D. Mockups: Before beginning work of this Section, build as many mockups as required to verify selections made under submittals and to demonstrate aesthetic effects and for work execution. Use materials and installation methods specified.
1. Build 48 inch square for each type of cladding finish.
  2. Locate at locations indicated or, if not indicated, as directed by Architect; facing south.
  3. Clean exposed faces.
  4. Notify Architect 7 days in advance of dates and times when mockup will be constructed.
  5. Protect approved mockups from elements with weather-resistant covering.
  6. Maintain during construction in an undisturbed condition as a standard for judging completed work.
  7. Approval is for following qualities; approval does not constitute approval of deviations from Contract Documents, unless specifically approved by Architect in writing:
    - a. Color, texture, and blending of limestone units.
    - b. Relationship of sealant colors to limestone units.
    - c. Tooling of joints.
    - d. Other aesthetic qualities as determined by Architect.
  8. When directed, demolish and remove mockups from site, including foundations.
- E. Pre-Installation Conference:
1. Conduct at Project site.

***(Specifier Note: EDIT attendees in brackets that are appropriate to project conditions.)***

2. Attendees include Owner, Contractor, Architect, limestone cladding installer, [cold-formed steel stud framing installer], [sheathing installer], [weather barrier installer], [concrete masonry installer], [cast-in-place concrete installer], Technical Representative of Manufacturer, and Owner's testing agency.
3. Review Contract Document requirements.
4. Review approved submittals.
5. Review installation procedures, including, but not limited to:
  - a. Handling, storing and protecting products and materials.
  - b. Evaluation of substrates on which limestone cladding will be installed.
  - c. Fabrication and placement of flashings.
  - d. Setting limestone cladding.
  - e. Anchoring and attaching limestone cladding.
  - f. Protecting installed limestone cladding, including stain prevention.
  - g. Cleaning installed limestone cladding.
6. Tour representative areas of required work, discuss and evaluate for compliance with Contract Documents, including substrate conditions, surface preparations, sequence of installation and other preparatory work performed by other installers.
7. Review required inspection and testing procedures.
8. Review forecasted weather conditions and procedures for coping with unfavorable conditions.
9. Record discussions, including decisions and agreements reached, and furnish copy of record to each party attending.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Limestone and Accessories: Store and handle according to following:

1. To prevent deterioration or damage due to contaminants, breaking, chipping, or other causes.
2. ILI - The Contractors Handbook on Indiana Limestone.

## 1.6 FIELD CONDITIONS

- A. Stain Prevention: Prevent mortar and soil from staining exposed limestone.
1. Protect base of walls from rain-splashed mud and mortar splatter.
  2. Protect sills, ledges, projections, and adjacent construction from mortar droppings.
  3. Prevent rain from splashing mortar droppings or dirt from scaffolding onto face of exposed limestone.

## PART 2 - PRODUCTS

### 2.1 LIMESTONE

- A. Material Quality Standard: ASTM C 568, Classification II or III.

### 2.2 LIMESTONE PANELS

- A. Basis of Design: Contract Documents are based on limestone panels fabricated by Earthworks, Inc. to establish a standard of quality.

***(Specifier Note: RETAIN one of bracketed options in subparagraph below.)***

1. Selection: [Aux Vases Buff][Aus Vases Blue][Country Villa][Dove Gray][EW Gold] [Pewter Mist].

***(Specifier Note: CONFIRM with manufacturer thickness that would be required for the size of panels used on the project.)***

2. Dimensions: [ - insert for width, length, height, and depth as required - ].

***(Specifier Note: RETAIN one of bracketed options in subparagraph below.)***

3. Finish: [Smooth][Sandblasted][Bushhammered][Rockfaced].

### 2.3 INSTALLATION MATERIALS

- A. Setting Shims and Buttons: One of following, of thickness necessary to prevent point loading of limestone on anchors, and of depths to suit anchors without intruding into required depths of pointing materials.
1. High Density Plastic:
    - a. Description: Fire retardant, engineered copolymer plastic with compressive strength of not less than 10,000 psi.
    - b. Acceptable Manufacturer and Product: Korolath of New England, Inc.; Korolath Stone Shims.
  2. Stainless Steel: ASTM applicable to device, Type 304.
- B. Pin Grommets: Rubber or neoprene of diameter required for pin and wall thickness to accommodate differential volumetric expansion of limestone.
- C. Elastomeric Setting Pads:

1. Product Quality Standard: AASHTO M 251.
  2. Minimum Physical Properties:
    - a. Hardness: 50 to 70 Shore, Type A durometer according to ASTM D 2240.
    - b. Tensile Strength: Not less than 2,250 psi according to ASTM D 412.
  3. Description: Plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet.
- D. Cementitious Dampproofing for Limestone: Non-staining, non-corrosive cementitious products recommended by ILI and compatible with joint sealants.
- E. Weep Baffles: PVC coated, open cell, reticulated urethane foam, of density required for application.
- F. Sealants for Joints in Limestone Cladding and Filling Kerfs: Silicone as specified in appropriate Division 07 Section.

#### 2.4 EMBEDDED FLASHING MATERIALS

***(Specifier Note: There are several flashing materials and methods that are commonly used, therefore editing of this Article is required to compliment the flashing details indicated on the Drawings. This guide specification offers several types of embedded flashing.)***

***(Specifier Note – Flashing Type 1 – Field Assembled Metal-Membrane: This method utilizing a sheet metal, rubberized asphalt membranes, and termination bars. If this method is selected, RETAIN one of the first two paragraphs below for the sheet metal, the solder paragraph, and the rubberized asphalt membrane paragraph.)***

- A. Copper: One of following mill non-patinated:
1. ASTM B 370, Temper H00, cold-rolled copper sheet, 16 ounces per square foot weight or 0.0216 inch thick, unless noted otherwise.
  2. ASTM B 370, Temper H01, high-yield copper sheet, 12 ounces per square foot weight or 0.0162 inch thick, unless noted otherwise.
- B. Stainless Steel: ASTM A 240 or ASTM A 666, Type 304, 2D annealed finish, not less than 0.0250 inch (24 gage) thick, unless noted otherwise.

***(Specifier Note: RETAIN one of bracketed options in paragraph below; Sn50 is for copper and Sn60 is for stainless steel.)***

- C. Solder: ASTM B 32, [Grade Sn50, 50 percent tin and 50 percent lead.][Grade Sn60, acid flux recommended by sheet manufacturer.].
- D. Rubberized Asphalt Membranes: Not less than 40 mils thick, cold applied, self-adhering sheet consisting of cross-laminated polyethylene film laminated to rubberized asphalt adhesive, with release-paper backing.

***(Specifier Note – Flashing Type 2 – Single Flexible Sheets: This method utilizing a single sheet of flexible material. If this method is selected, RETAIN any one of the paragraphs below. None of these materials can be exposed to the exterior and should only be specified for details that will fully enclose the flashing.)***

- A. Copper Laminated Sheets: Not less than 5 ounces per square foot copper sheet bonded between 2 layers of glass-fiber cloth.

- B. Asphalt Coated Copper Sheets: Not less than 5 ounces per square foot copper sheet coated with flexible asphalt.
- C. EPDM Sheets: ASTM D 4637, ethylene-propylene-diene terpolymer sheet, not less than 0.040 inch thick.
- D. Sealant for Sheet Metal Flashing: ASTM C 920, chemically curing silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

***(Specifier Note – Flashing Type 3 – Pre-Manufactured Metal-Membrane: This method is similar to Type 1, however, the various materials are pre-manufactured and ready to set in place without the need to assemble the various components. If this method is selected, RETAIN paragraphs below.)***

- E. Pre-Manufactured Metal-Membrane System:
  - 1. Description: Pre-assembled and pre-cut flashing unit composed of following components in single unit:
    - a. Stainless Steel Drip Edge:
      - 1) Material Quality Standard: ASTM A 240 or A 666, Type 304, 2D annealed finish.
      - 2) Description: 3 inch wide by length of unit of not less than 0.0140 inches (28 gage) thick metal with hemmed drip edge bent down to 30 degree angle.
    - b. Flexible Flashing Material: Minimum 40 mils thick polymeric membrane, reinforced with synthetic fibers, ultraviolet degradation resistant, incorporating DuPont's Elvaloy© KEE, keytone ethylene ester, polymer.
    - c. Weep Material: 3/16 inch thick woven mesh composed of recycled polyester adhered to flexible flashing molded and shaped in open weave configuration to maintain drainage at weeps without being clogged by mortar droppings, size as required to extend across entire width of cavity.
    - d. Termination Bar: High strength plastic strip with holes for attaching to substrate at 6 inches on center, pre-attached to flexible flashing membrane.
  - 2. Dimensions:
    - a. Width: 5-1/2 inches.
    - b. Height: [12] [15] [18] [24] inches.
  - 3. Joinery Shapes: Pre-formed of same material as flexible flashing membrane of configuration indicated, specified, or required for application.
  - 4. Basis of Design: Contract Documents are based on products specified to establish a standard of quality.
    - a. Manufacturer: MortarNet USA Ltd.
    - b. Product: TotalFlash™.

***(Specifier Note: RETAIN one of bracketed options in subparagraph below; may need to coordinate with structural engineer.)***

- F. Steel [Shelf Angles][Loose Lintels]: Steel angles and shapes as specified in Division 05 Section "Metal Fabrications".

***(Specifier Note: If Flashing Type 1 is selected, DELETE weeps, cavity drainage material, and termination bars in three paragraphs below.)***

- G. Weeps: One of following in color selected from manufacturer's standard colors available:
1. Plastic: One-piece, flexible extrusion made from ultraviolet light resistant polypropylene copolymer, consisting of honeycomb matrix of multiple cells, designed to fill head joint with outside face held back 1/8 inch from exterior face of limestone cladding.
  2. Mesh: Compressed, 200 denier polyester with 90 percent open mesh and bonded with flame retardant adhesive.

## 2.5 FASTENERS AND ANCHORS

A. Selection Criteria:

1. Only domestically manufactured anchors and fasteners are acceptable.
2. Diameter, material thicknesses, and lengths as determined by delegated engineering, and as indicated below, sufficient to attach or anchor item to substrate indicated without failure.

B. Setting Devices:

1. Types: Pins, dowels, clips, anchors, straps, tiebacks, bolts, washers, nuts, and other devices of type, size, and configuration required by delegated engineering or conditions.
2. Material: ASTM for stainless steel applicable to device, Type 304.
3. Available Manufacturers:
  - a. Dur-O-Wall Masonry; a Division of Dayton Superior.
  - b. Fero Corporation.
  - c. Halfen Anchoring Systems.
  - d. Heckman Building Products.
  - e. Holmann & Barnard.
  - f. Krando Metal Products.

C. Cast-in-Place Concrete Inserts:

1. Material and Finish Product Quality Standards:
  - a. Channels: ASTM A 666, Type 304 stainless steel.
  - b. T-Bolts: ASTM F 738M, Type 304 stainless steel.
  - c. Washers: ASTM A 240 or ASTM A 480, Type 304, stainless steel, dimensions and permissible variations according to ASTM F 436, Type 1 or ASME B18.22.1, Type A, flat; lock washers not acceptable.
  - d. Stainless Steel Nuts: ASTM F 594, Group 1, Alloy 304, nylon inserts.
2. Acceptable Manufacturers:
  - a. Halfen Anchoring Systems.
  - b. Unistrut Corp.

D. Post-Installed Anchor Bolts for Concrete and Masonry:

1. Product Quality Standards: ACI 318, D.1 and ICC-ES AC193; approved for cracked concrete conditions when used in concrete that is cracked or may become cracked under connected load.
2. Material and Finish: ASTM F 593, Group 1, Alloy 304 stainless steel.
3. Acceptable Manufacturers and Products:

- a. ITW; Redhead Truebolt Wedge Anchor.
  - b. Powers; Bull Wedge Anchor.
  - c. Simpson; Strong-Bolt Wedge Anchor.
- 4. Not Acceptable: Chemical type anchors.
- E. Structural Epoxy Adhesive:
  - 1. Product Quality Standard: ASTM C 881.
  - 2. Description: Solvent free, 100 percent solids, moisture tolerant, high modulus, structural epoxy adhesive, suitable for adhering anchors within limestone shinkages and holes.
  - 3. Basis of Design: Sika Corporation; Sikadur 31, HI-Mod Gel.
  - 4. Acceptable Manufacturers:
    - a. AKEMI.
    - b. Bonstone Materials Corporation.
    - c. Ciba, a Division of BASF.
    - d. ITW Red Head.
    - e. Sika Corporation.
- F. Threaded Fasteners: Stainless steel heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers.
  - 1. Bolts: ASTM F 593, Group 1, Alloy 304.
  - 2. Nuts: ASTM F 594, Group 1, Alloy 304.
- G. Dovetail Anchor Slots: Fabricated from stainless steel sheet, not less than 0.0336 in thick, with bent tab anchors. Prevent intrusion of concrete or debris into slots.

## 2.6 METAL FLASHING FABRICATION

- A. Field Measurements: Where metal flashing is to fit, cope, or be tailored to other construction, check actual dimensions of other construction by accurate field measurements before fabrication.
- B. Fabrication Procedures: Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
  - 1. Shop form flashing on a bending brake in lengths practical for application.
  - 2. Shape, trim and hand seam on bench as far as practical with proper tools.
  - 3. Form exposed metal work without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated.
  - 4. Make angle bends and folds for interlocking metal with full regard for expansion and contraction to avoid buckling or fullness in metal after installation.
  - 5. Form materials to shape indicated with straight lines, sharp angles and smooth curves.
  - 6. Fold and hem exposed edges of flashings.
- C. Flashing Joinery: Fabricate interior and exterior corners, intersections, and complex flashing conditions in shop, rather than in field, with properly folded, constructed and continuous soldered joints. Field fabricated panels are not acceptable.

## 2.7 LIMESTONE FABRICATION

- A. Fabrication Quality Standards: In addition to standards specified elsewhere, comply with following, unless otherwise specified:
  - 1. ASTM C 1242.

2. ILI – Indiana Limestone Handbook.
3. Delegated engineering.
4. Approved submittals.

B. Limestone Quarry:

1. Quarry limestone in contiguously extracted, matching blocks from a single bed of quarry stratum in a manner to ensure fabricated limestone will match approved submittals; fabrication from random sequence of blocks not permitted.
2. Inspect quarried blocks and reject blocks with cracks extending through block.

C. Fabrication Plant:

1. Inspect limestone for compliance with requirements for appearance, material, and fabrication. Replace defective panels.
2. Grade and mark limestone for overall uniform appearance when assembled in place. Natural variations in appearance are acceptable if installed limestone panels match range of colors and other appearance characteristics represented in approved samples.
3. Limestone panels with cracks shall not be used except for cutting out smaller panels without cracks.

D. Fabricating Limestone: Fabricate in a manner to ensure limestone will match approved submittals.

1. Selection: Select limestone for fabrication that complies with following:
  - a. Pre-construction testing.
  - b. Fabricator's quality control inspections.
  - c. Production flexural strength testing.
2. Panel Identification:
  - a. Mark limestone panels, on surface that will be concealed after installation, with designations used on approved shop drawings to identify individual limestone panels.
  - b. Orient markings on vertical panels so that they are right side up when panels are installed.
3. Cutting, Sawing, and Drilling:
  - a. Control depth of limestone and back check to maintain minimum clearance of not less than 1 inch between backs of limestone panels and other substrates behind limestone.
  - b. Make sizes, shapes, grain drift, and finishes required to comply with requirements indicated without cracks, broken corners, chipped edges, or other defects.
  - c. Shape to produce joints uniform in width.
  - d. Mortise and drill sinkages, rabbets, and holes for anchors, dowels, fasteners, supports, and lifting devices.
  - e. For square edges, cut straight, true, and at right angle to face; unless otherwise indicated, finish edge to match exposed face.
  - f. For quirk-miter corners, unless otherwise indicated, provide for cramp anchorage in top and bottom bed joints.
  - g. Make arises straight, sharp, true, and continuous at joints.
  - h. Cut kerfs so that dead load of limestone will be isolated from metal surfaces by not less than 1/16 inch; nibs or bulbs not allowed on kerf legs.
  - i. Form reveals, reglets, openings and other features.
  - j. Slope tops of projections and copings for drainage.
  - k. Cut water drips at underside of horizontal returns and soffits.

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4. Liner Blocks: Include pins and other anchorage devices in addition to adhesive.
- E. Contiguous Work: Provide chases, reveals, reglets, openings, and similar features as required to accommodate contiguous work.
- F. Tolerances: According to ILI – Indiana Limestone Handbook.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Acceptance of Surfaces and Conditions:
  1. Examine substrates for compliance with requirements, installation tolerances and other conditions affecting performance.
  2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
  3. Starting work within a particular area will be construed as acceptance.

#### 3.2 PREPARATION

- A. Substrate Cleaning: Remove defects or deficiencies that would result in poor or potentially defective installation of limestone cladding, or, that would cause latent defects in work.
- B. Limestone Cleaning: Clean dirty or stained limestone surfaces by removing soil, stains, and foreign materials before setting.

#### 3.3 SETTING LIMESTONE

- A. Installation Quality Standards: In addition to standards specified elsewhere, perform work according to following, unless otherwise specified:
  1. ASTM C 1242.
  2. ILI – Indiana Limestone Handbook.
  3. Delegated engineering.
  4. Approved submittals.
- B. Lay Out and Bond Patterns:
  1. Lay out walls in advance for accurate patterns, mortar joints, locations of openings, movement-type joints, returns, and offsets.
  2. Avoid using limestone panels of less than half-size panels at corners, jambs, and where possible at other locations.
  3. Interlock corners of each course.

***(Specifier Note: RETAIN one of subparagraph below, RETAIN appropriate bracketed options, or EDIT one to fit project; show details of pattern and mortar joints on Drawings because terminology may not be clear.)***

4. Arrange limestone in range ashlar pattern with course heights as indicated, [uniform] [random] lengths, and uniform joint widths, with offset between vertical joints as indicated.
5. Arrange limestone in broken-range ashlar pattern with uniform course heights, random lengths, and uniform joint widths.
6. Arrange limestone in three-course, random-range ashlar pattern with random course heights, random lengths (interrupted coursed), and uniform joint widths.

7. Arrange limestone in [coursed] [uncoursed] rubble pattern with joint widths within tolerances indicated. [Insert small limestone pieces into spaces between larger limestone panels as needed to produce joints as uniform in width as practical.]
  8. Arrange limestone in polygonal (mosaic) pattern with uniform joint widths.
  9. Arrange limestone with color and size variations uniformly dispersed for an evenly blended appearance.
- C. Openings: Leave for equipment to be installed before completion of limestone cladding; after installation of equipment, complete limestone cladding to match adjacent construction.
- D. Cutting and Trimming:
1. Saw-Cut Surfaces: Use power saws to cut limestone that is fabricated with saw-cut surfaces. Cut lines straight and true, with edges eased slightly to prevent snipping.
  2. Rough Surfaces: Use hammer and chisel to shape limestone.
- E. Sorting and Blending:
1. Sort and remove limestone that does not comply with requirements relating to aesthetic effects, physical properties, fabrication, or that is otherwise unsuitable for intended use.
  2. Mix panels to produce uniform blend of colors and textures; if color blending is a critical aspect of work, manufacturer shall provide instructions for blending.
- F. Steel Loose Lintels: Set where indicated or required with not less than 8 inches of bearing at each jamb, unless otherwise indicated.
- G. Installation Requirements:
1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure limestone cladding in place.
  2. Locate shims so point loading does not adversely affect limestone performance.
  3. Shim and adjust anchors, supports, and accessories to set limestone accurately in locations indicated.
  4. Set limestone with uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances.
  5. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated. Keep joints free of mortar and other rigid materials.
  6. Field application of epoxy adhesive not permitted.
- H. Weeps: Install weeps at not less than 24 inches on centers in head joints of first course of limestone cladding immediately above embedded flashings.
- I. Tolerances: According to ILI – Indiana Limestone Handbook.
- 3.4 EMBEDDED FLASHINGS
- A. General: Drawings may not necessarily indicate or describe full extent of work required for embedded flashing.
- B. Scheduled Locations: In addition to conditions shown on Drawings, install embedded flashings within limestone cladding cavity at following locations to direct downward flow of infiltrated water within cavity to exterior:
1. Shelf angles with end dams at through-wall openings; and with lap joints.
  2. Lintels without end dams or laps.
  3. Jambs at through-wall openings, full height from sill to head.
  4. Other obstructions.

- C. Preparation: Substrate surfaces shall be smooth and free from projections that could puncture flashing.

**(Specifier Note: As indicated above, there are several flashing materials and methods that are commonly used, therefore editing of this Article is required to compliment the flashing details indicated on the Drawings. This guide specification offers several types of embedded flashing.)**

**(Specifier Note – Flashing Type 1 – Field Assembled Metal-Membrane: If this method is selected, RETAIN paragraph below.)**

- D. Flashing Installation: Install flashings to direct infiltrated water to exterior.
1. Install 4 inch wide sheet metal with outside hemmed drip edge true to line and levels indicated; minimize quantity of lap joints by using longest units possible. At lap joints, form neat and aligned joints by interlocking splice plate within hemmed edge of sheet metal flashing profile; apply sealant and rubberized asphalt flashing as indicated to create water-resistant joint.
  2. Apply rubberized asphalt membrane beginning 1 inch from outside edge of sheet metal and extend up wall of backup construction not less than 12 inches.
  3. Attach termination bar with screws and seal top with continuous sealant.
  4. At continuous shelf angles, terminate horizontal flashings at through-wall openings with properly folded and constructed sheet metal end dams with a depth of not less than 1 brick course, with continuous soldered joints.
  5. At lintels, terminate horizontal flashings at end of lintel with properly folded and constructed sheet metal end dams with a depth of not less than 1 brick course, with continuous soldered joints.

**(Specifier Note – Flashing Type 2 – Single Flexible Sheets: If this method is selected, RETAIN paragraph below.)**

- A. Flashing Installation: Set sheets in proper alignment with formed end dams, laps, and attachments to back construction indicated by manufacturer's instructions.

**(Specifier Note – Flashing Type 3 – Pre-Manufactured Metal-Membrane: If this method is selected, RETAIN paragraph below.)**

- B. Flashing Installation:
1. Set pre-manufactured units in proper alignment with outside hemmed sheet metal drip edge true to line and levels indicated.
  2. Lap pre-manufactured units and seal with sealant.
  3. Apply adhesives as indicated by manufacturer's instructions.
  4. Form inside and outside corners according to conditions and lap with pre-manufactured units.

### 3.5 ADJUSTING

- A. Damage Repair:
1. If acceptable to Architect, repair damage according to ILI - Repairing Damage to Indiana Limestone.
  2. If damaged cannot be repaired, remove and replace limestone panels that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining panels. Install new panels to match adjoining panels and install fresh mortar, pointed to eliminate evidence of replacement.

3.6 CLEANING

- A. Final Cleaning: Clean installed work according to following:
1. ILI's Indiana Limestone Handbook.
  2. ILI's How to Avoid Small Area Stains and Blemishes.

END OF SECTION