

# INDIANA LIMESTONE THIN VENEER PROFESSIONAL INSTALLATION GUIDE





# DISCLAIMER

This document is intended to be used as a reference for industry professionals who are competent to evaluate the significance and limitations of the information provided herein. This publication should not be used as the sole guide for adhered Indiana limestone veneer and construction. Polycor disclaims any and all legal responsibility for the consequences of applying the information.

It is important to note that details and construction practices vary based on geographical requirements and practice. Design and construction must be adapted for each specific project and factor in regional judgment based on past experiences.



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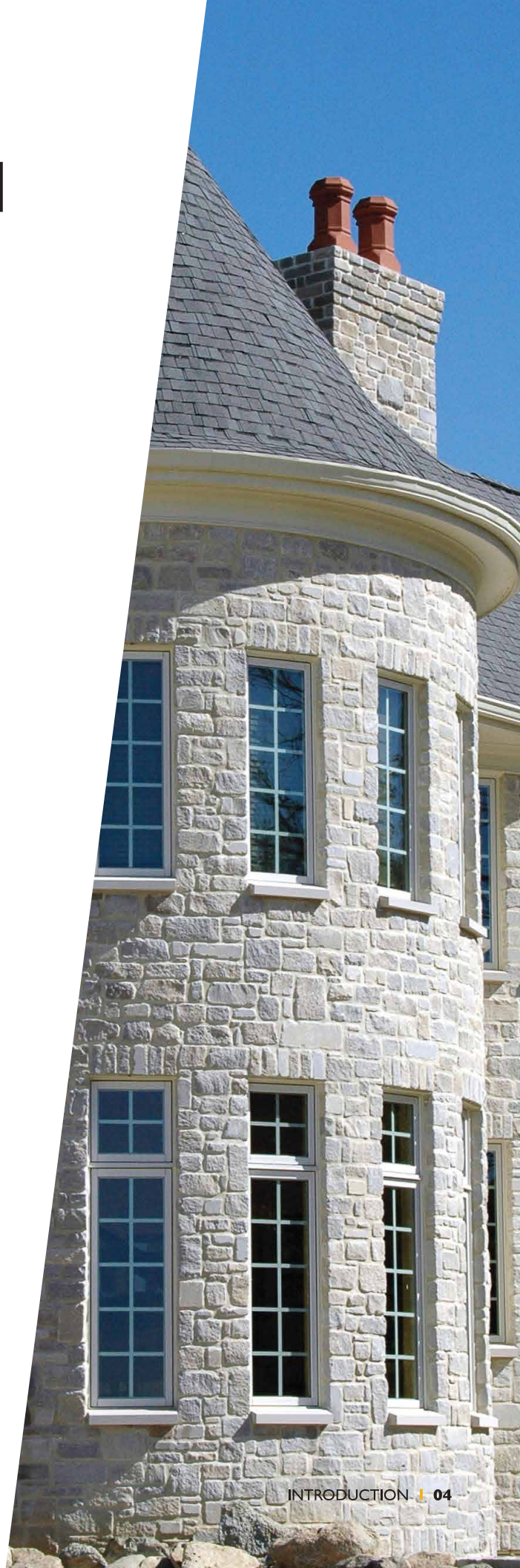
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# INTRODUCTION

Typically products are installed by adhering directly to a properly designed and prepared support wall. Thin veneer is also referred to as adhered veneer by building codes and other industry documents.

A variety of different methods, products, and materials are available; some are proprietary. Installation should be in accordance with applicable building codes, manufacturer instructions, industry best practices, and project construction documents. Contact the thin veneer supplier or fabricator for further information regarding recommended installation methods and trained installers.





# CODES & STANDARDS

## MASONRY INDUSTRY CODES, STANDARDS & OTHER REFERENCES

This installation guide is written specifically to address adhered Indiana limestone. Other documents to consult are:

- Applicable Building Code, e.g., International Building Code
- Application State or Local Municipal Codes, e.g., California has code modifications for thin veneers
- National Masonry Model Code, e.g., Building Code Requirements and Specification for Masonry Structures (TMS 402/602)
- ASTM C1242-15: Standard Guide for Selection, Design, and Installation of Dimension Stone Attachment Systems
- American National Standards Institute (ANSI) I 18.4 – Modified Dry Set Cement Mortars
- Indiana limestone Handbook – 23rd Edition
- International Masonry Institute



# SYSTEMS OVERVIEW

## THIN MASONRY VENEER SYSTEMS OVERVIEW

Thin masonry veneer systems offer masonry veneers that are thinner and lighter. There are many different types of adhered masonry veneer systems. Depending on the system used, these lightweight veneers can help reduce shipping and construction costs. Also, thin veneer stones can be applied without a stone ledge in the foundation wall. Natural thin stone products have proven to be more durable than manufactured thin stone products.

Thin masonry veneer systems can be installed as barrier or drainage walls. Properly designed drainage thin masonry veneer systems offer advantages of increased drainage and drying capabilities. Barrier systems do not include adequate provisions for drainage and drying in many climates, so use of this wall type should be carefully considered. Consideration should be based on support wall type, moisture control layer type and location, climate, regional experience, level of installer training, and opportunities for inspection during installation.



# WALL COMPONENTS

## THIN MASONRY VENEER SYSTEM COMPONENTS

Durable exterior wall systems include an assembly of parts to control moisture, air movement, vapor diffusion, and energy. Depending on application and regional modifications, below is a list of potential wall components for thin veneers:

- Support Wall
- Weep Screed
- Flashing
- Weep Vents
- Casing Beads
- Water/Air/Vapor Barrier
- Drainage Mat
- Insulation
- Lath
- Lath Fasteners
- Mortar Scratch Coat
- Setting Bed
- Veneer Units
- Pointing Mortar
- Backer Rod and Caulk
- Water Repellent

## SUPPORT WALL

The success of thin veneers depends greatly on the proper design and preparation of the support wall. Indiana limestone can be installed over:

- Poured-in-place concrete
- Precast concrete and tilt-up wall panels
- Concrete masonry units
- Framed wood or metal stud wall with sheathing

Do not install Indiana limestone over any deteriorating, unsound surface or existing finish experiencing moisture related issues. The following substrates are typically not good applications for adhered veneers:

- Existing siding in unsound condition
- EIFS
- Clay brick
- Surfaces below water level

## POURED-IN-PLACE CONCRETE, PRECAST & TILT-UP WALL PANELS

- New concrete should be properly cured to accept thin veneer setting material.
- Check for and remove contaminants such as dirt, dust, stains, paint, organic matter, form-release agents, or other substances that could inhibit mortar bond.
- Surfaces with a Concrete Surface Profile (CSP) equal to or greater than 2 are usually acceptable for the installation of thin masonry veneers.
- Make sure the wall is sound and without defects.
- Check for plumb, level, and low or high points – modify setting method and material accordingly.
- Poured-in-place concrete walls may have to be made level before using thin set applications.
- Provide capillary break between poured-in-place concrete, precast, and tilt-up wall panels and limestone veneer units to eliminate prolonged contact with alkali sources.

## CONCRETE MASONRY UNITS (CMU)

- New masonry should be properly cured to accept thin veneer setting material.
- Check for and remove contaminants such as dirt, dust, stains, paint, organic matter, form-release agents, or other substances that could inhibit mortar bond.
- Make sure the wall is sound and without defects.
- Provide capillary break between concrete masonry units and limestone veneer units to eliminate prolonged contact with alkali sources.

## FRAMED WOOD OR METAL STUD WALLS WITH SHEATHING

- Per ASTM C1242-15, exterior walls to receive thin natural stone veneers should be designed with a stiffness ratio of L/1000 minimum.
- CMU walls typically have stiffness ratios much greater than L/1000.
- Thin natural stone veneer systems have been successful on substrates with stiffness ratios of L/600. Use regional judgement.
- Single story metal studs to be a minimum of 20-gauge spaced 16” on center.
- Properly protected sheathing can be OSB, plywood, tile backer wall board, or cement board.
- Do not install Indiana limestone adhered veneers over open stud systems.
- Install sheathing with recommended gaps between sheets and movement joints – per sheathing manufacturer.



## CEMENT BOARD SHEATHING

- For exterior applications use exterior-rated cement board.
- For exterior applications install cement board sheathing over primary wall sheathing to comply with structural, fire code, and wind code requirements.
- For both exterior and interior cement board sheathing, install recommended movement joints—per sheathing manufacturer.
- Properly prepare joints between sheathing boards according to sheathing manufacturer.
- Dampen cement board before applying scratch coat.

## INTERIOR USES

- Design interior wall stiffness to  $L/600$  minimum.
- Indiana limestone can be directly applied to interior tile backer wallboard or cement board.
- Do not install adhered veneer units directly to wood substrates.
- Dry-stack applications are acceptable for interior applications.
- Movement joints in adhered veneer should align with points of expected movement in the support wall.

## WEEP SCREEDS, FLASHING & WEEP VENTS

- Install code required corrosion resistant weep screeds, flashing, and weep vents at base of wall, over doors, windows, and any other location of the veneer where the downward flow of moisture is interrupted.
- Use stainless steel or other non-staining weep screeds and flashing.
- When using adhesive flashing membranes, use metal drip edge and hold flashing back from veneer face  $1/2'' - 3/4''$  to prevent flashing drool from coming out of wall.
- Secure weep screed and flashing to support wall to make watertight.
- Install flashing or other water-resistant material at top of the thin veneer to ensure water does not enter the veneer system from above—especially at locations where a different veneer material is installed above the thin masonry veneer.
- Install weep vents 24'' on-center. If using rope wicks, install 16'' on-center.
- Install roof kickout flashing to keep rooftop rainwater from flowing onto veneer units.

## CASING BEADS

- Casing beads must be corrosion resistant.
- Casing beads can be used to cover otherwise exposed scratch coat and setting bed at edges of wall panels.
- Casing beads can be used to define movement joints in scratch coat and setting bed. Refer to Technical Services Information Bureau Technical Bulletin 60.155.

## WATER/AIR/VAPOR BARRIER

- Install code approved water/air/vapor barrier in proper location(s) within wall assembly to control condensation and other moisture before thin veneer is applied.
- Connect appropriate barriers to be air and water tight at openings and penetrations such as windows, doors, louvers, electrical boxes, conduit, and plumbing.
- Install fluid-applied and sheet membrane barriers over moisture-sensitive support walls such as wood sheathing.
- Install a minimum of two layers of building paper or building wrap water-resistive barrier under thin veneer systems on non-moisture sensitive support walls.
- Lap water-resistive barrier 2" minimum horizontally (shingle-style) and 6" minimum vertically or per manufacturer's instructions.
- One layer water-resistive barrier can be used behind a drainage mat, continuous insulation, or paper-backed lath.

## DRAINAGE MAT

- Install required drainage mats or furring strips per local building code.
- Install drainage mats or furring strips behind thin veneers installed over wood support walls.
- Drainage mats should have filter fabric or other means to keep scratch coat mortar from interrupting the downward flow of moisture.
- Use rigid drainage mats to provide rapid drying capacity to the wall and to not allow self-furring dimpled metal lath to sink into them.
- Drainage mats thickness to be 3/16" minimum and 3/4" maximum.
- 3/8" (10 mm) minimum drainage mats are required by the 2005 National Building Code of Canada.



## CONTINUOUS INSULATION

- Install primary air/water/vapor barrier under exterior continuous rigid insulation, as required.
- Install rigid sheathing over exterior continuous rigid insulation before installing adhered veneer.
- Tape or foam seams between sheets of insulation to make watertight and for continuity of thermal resistance.
- When continuous insulation is thicker than 1/2", lath fasteners and spacing should be engineered to carry dead and live loads.
- For insulation greater than 1 1/2", metal Z-furring channels are often used in lieu of screws or other fasteners.
- Consider installing Z-furring channels perpendicular to metal studs to minimize thermal transfer.

## LATH

- For natural stone adhered veneers, use a minimum of 3.4 pound/square foot expanded metal galvanized diamond metal lath conforming to *ASTM C1063-15: Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster*.
- All lath and lath accessories must be corrosion resistant.
- Consider using stainless steel lath in coastal regions and other situations where durability, corrosion of the metal lath, and staining are a concern.
- Non-metallic lath material should meet standards of ASTM C1780-13, and be approved by local building officials.
- Lath should be self-furring or attached with self-furring fasteners to allow at least 1/4" of mortar behind lath.
- Install metal lath with "cups" facing up to help prevent mortar from sagging and to create a physical bond.
- Correctly installed, metal lath will feel rough to the touch when swiping hand down and smooth going up.
- Lap metal lath 1" minimum on all sides and ends.
- The ends of adjoining lath pieces should be staggered.
- Install lath tight against support wall so there is no spring effect.
- Wrap metal lath tight around corners 12" minimum and fasten to a framing member.

## LATH FASTENERS

- Use corrosion resistant fasteners that conform to ASTM C1063.
- Fasteners should penetrate wood studs 1 1/4" minimum and 3/8" minimum into metal studs.
- Copper staples can be used with a wide crown.
- Fasteners should have a 7/16" minimum washer or head to prevent lath pull out.
- Space fasteners 7" maximum vertically and 16" maximum horizontally.
- When continuous exterior insulation is thicker than 1/2", engineer sheathing and lath fasteners spacing and type to carry dead and live loads.
- Helpful fastener engineering documents include: *Foam Sheathing Coalition's "Guide to Attaching Exterior Wall Coverings Through Foam Sheathing" December 7, 2011*, and *Dr. J Technical Evaluation Report TER Number 1302-01, September 11, 2013*.
- Be aware that some natural stone adhered veneer systems are near or greater than 25 psf.
- With adhered veneer systems weighing over 25 psf, use Z-furring channels to support stone over exterior continuous insulation greater than 1 1/2" thick.
- Where applicable, install Z-furring channels perpendicular to wall framing to minimize thermal transfer.

## MORTAR

- Use polymer-modified, non-staining, sag-resistant Type S (ASTM C270) stone veneer mortar for both scratch coat and setting bed.
- Use low-alkali cement mortar mixes or polymer compounds to minimize staining potential.
- Polymer compounds such as epoxy can be used, per ASTM C1242-15, if compatible with stone and substrate and do not exhibit long-term creep or staining.
- To reduce potential darkening effect on veneer units from mortar setting bed, match mortar color to stone or lighter. Construct a mock-up to evaluate mortar/ stone compatibility.
- The use of "low efflorescence" ANSI A118.7 high performance sanded grout between units will minimize staining potential.



## VENEER UNITS

- The national masonry model code (TMS 402/602) defines “prescriptive requirements” for adhered veneer unit size to not exceed: 2 5/8” in specified thickness, 36” in any face dimension, 5 ft<sup>2</sup> in total face area, and shall not weigh more than 15 psf.
- If adhered veneer units do not conform to these prescriptive requirements, designers can use the “alternative design” approach as outlined in TMS 402, Section 6.3.1.
- For prescriptive requirements design, the average thickness of Indiana limestone shall not be more than 1 1/4” thick.
- Indiana limestone veneer units should be 3 ft<sup>2</sup> or less face area if support wall has deflection ratio of less than L/1000.
- Indiana limestone units 3/4” thick are more prone to breakage during handling and staining issues as compared to thicker units.
- Check veneer units for cracks, damage, consistent thickness, cleanliness, and excessive over-cut corner pieces. Over-cutting should not be more than 1/3 stone depth.
- Clean the back surface of veneer units to be adhered of all dirt, debris, loose stone, or sediment before applying.

## VENEER JOINTS

- For maximum weather-resistance in mild to severe climates, use 3/8” concave mortar joints.
- Rough cut flush, raked, or stack bond joints will not be as water-resistant as tooled joints.
- Raked or weathered joints should be compressed as firmly as possible when mortar is “thumb print hard.”
- Keep mortar joints 1/2” maximum width to minimize shrinkage cracks in joint.
- Pointing mortar can be used to achieve different colors.
- Use professional and regional judgement when using dry-stack stone patterns. The Rocky Mountain Masonry Institute states: “Dry-stack patterns are not recommended for exterior use in harsh environments like Colorado.”
- When using dry-stack patterns, consider using Thinset (ANSI 118.4) medium-grade or high-grade depending on exposure.

## MOVEMENT JOINTS

- Per the national masonry model code (TMS 402/602), it is the responsibility of the building designer to locate movement joints—not the mason.
- Align both vertical and horizontal veneer movement joints with expected movement locations in the support wall.
- Discontinue lath, scratch coat, and setting bed at movement joints.
- Movement joints to be at least 3/8" wide.
- ASTM C1242-15 recommends vertical movement joints to be spaced 15' on-center maximum.
- The Building Stone Institute recommends vertical movement joints to be spaced 30' on-center maximum in walls without windows.
- Add distance between vertical movement joints around outside corners.
- Consider locating veneer movement joints at all inside corners.
- For interior applications, align veneer movement joints with expected points of movement in the support wall.
- Install 3/8" movement joints at interface of stone veneer to window/door frames, other penetrations, and dissimilar veneer materials for installation of backer rod and sealant.
- When locating a movement joint by an opening near a corner, locate it on the corner side of the opening.
- Locate horizontal movement joints to accommodate vertical movement of building structure—this is especially important with wood substrates.
- Decrease movement joint spacing in veneer with support walls less stiff than L/1000.
- Movement joint sealant should be non-staining.
- For additional information about the use of sealants with Indiana limestone, refer to the Indiana limestone Handbook.
- Use professional and regional judgement when locating movement joints.

## WATER REPELLENT

- In general, water repellents are not required for Indiana limestone veneers.
- When using water repellents, use highly vaporpermeable penetrating clear liquids of low viscosity.
- For areas in need of protection due to expected graffiti, consult stone sealant manufacturers for recommendation. Graffiti repellents sit atop the stone and may change the appearance of the stone.
- For additional information regarding water repellents, refer to the Indiana limestone Handbook.



# INSTALLATION

## SCRATCH COAT

Two acceptable methods of scratch coat installation are using the traditional hardened scratch coat or the “Scratch and Go” method.

### OPTION #1: TRADITIONAL SCRATCH COAT

- Completely encapsulate lath with 1/2” to 3/4” mortar thickness.
- Create horizontal texture in scratch coat with steel comb or 1/8” notched trowel.
- Allow scratch coat to dry for 24 to 48 hours.
- Dampen scratch coat with potable water before installing units.

### OPTION #2: “SCRATCH AND GO”

- This technique is sometimes desirable for construction sequencing purposes.
- Completely encapsulate lath with 1/2” to 3/4” mortar thickness.
- Keep work area limited to 10 square feet so mortar on the wall does not fully set before placing stones.
- Back-butter and install veneer units. See the next section of this guide, Setting of Veneer Units.
- Use shims to keep stones from sagging.

## SETTING OF VENEER UNITS

- Dampen dried scratch coat or cement board sheathing with potable water before applying veneer units. Surface should be moist but not saturated.
- In hot weather conditions or with hot units, dampen back of stone.
- Apply 1/2" minimum thick setting bed mortar to back ASTM C1242-15 (~100%).
- Place a slight excess of mortar at edges of stone to allow some mortar to squeeze out of the stone edges and fill the joints when pressure is applied.
- Place stone firmly into scratch coat with slight rotating motion.
- If unit gets disturbed during installation, remove unit and reset with new mortar.
- Do not install veneer units when other trades will be working nearby resulting in vibration for 24-hours, e.g., site work or interior work.
- The resulting total mortar thickness behind the stone should be between 3/4" and 1 1/4".

## CLEANING

- Keep stone veneer units clean during installation to ease final cleaning.
- Installing veneer units from top down helps keep units clean during construction.
- Let mortar droppings on stone face dry slightly and then pick off or carefully brush so as not to smear.
- Use clean, potable water for cleaning.
- Pre-wet veneer first before applying cleaning solutions.
- Use mild soap powder, detergent, or a mild water and vinegar solution with a soft bristle brush to remove any dirt or mortar smears.
- Do not use cleaning acids.
- Do not use high pressure cleaning methods unless approved.
- Test cleaning solutions and procedures on mock-up panel or sample panel on building.
- Keep Indiana limestone veneer protected from rundown from cleaning different veneer systems above.
- "New Building Bloom" may appear on veneer soon after construction, caused mainly by water in fresh mortar. This phenomenon is common and typically goes away in the first year of occupancy.
- For help with difficult or chronic cleaning issues, contact the stone supplier.

## WORKMANSHIP

- Store materials off the ground and keep them covered to reduce exposure to rain, snow, ground water and mud splatters.
- Cover adjacent grade to avoid stains from splashing water or mud. Keep protection in place until final landscaping is in place.
- Cover tops of unfinished walls with water-resistant material during inclement weather and at the end of each workday.
- Use clean, potable water for mortar, grout, wetting of substrate, veneer units, and cleaning.
- Protect adjacent surfaces near the veneer installation area from potential damage, such as windows, doors, other cladding materials, and wood floors.
- Minimize material handling on site to reduce veneer unit chippage and breakage.
- Turn up scaffolding boards near wall at night to prevent rain splash onto veneer.
- Keep stone veneer units clean during installation to ease final cleaning.
- Let the mortar droppings on stone face dry slightly.
- Then, pick off or carefully brush off so as not to smear.

## HOT & COLD WEATHER CONSTRUCTION

- Install scratch coat and veneer units according to hot and cold weather provisions as cited in the national masonry model code (TMS 602-1 I, Section 1.8D).
- In hot and dry climates and conditions it is imperative to dampen substrate and back of veneer units so moisture is not absorbed too quickly from mortar, resulting in improperly hydrated mortar and a weakened bond.
- Providing shade or frequent misting of wall may be required for proper curing of mortar.

## TESTING

- When fully cured, veneer units should be bonded to wall with at least 50 psi minimum shear strength based on gross unit surface when tested in accordance with ASTM C1780 and test method ASTM C482, or shall be adhered in compliance with Article 3.3C of the National Masonry Model Code (TMS 402/602).
- Additional periodic testing of veneer units during installation per ASTM C1242-15.
- Require observation during installation and testing per manufacturer instructions with proprietary lathless bonding systems.
- See Section Overhead, Horizontal, & Tilting-Forward Applications of this guide.

## MAINTENANCE

- Keep excessive moisture from saturating the wall.
- Adjust landscape sprinklers, gutters and downspouts, roof kickout flashing, scuppers, etc. to prevent water from constantly wetting the wall.
- Adjust landscaping to prevent dirt from splashing onto wall.
- Periodically remove organic matter such as ivy, moss, and mildew.
- Ivy should be cut at base, allowed to dry, and then be brushed off. Do not pull ivy suckers out of stone.
- Inspect cladding hands-on approximately one year after installation to verify performance.
- Periodically inspect veneer for cracked/ loose units or cracked mortar joints that may appear from building shifts and settlement. ASTM C1496 offers a guide to inspection.
- Repoint mortar joint cracks and replace cracked or loose units to restore the wall's natural weather resistance and durability.
- Do not subject Indiana limestone to contact with de-icing materials or other harsh chemicals. Do not use de-icing chemicals on the area immediately adjacent to an Indiana limestone veneer. Prolonged exposure to these conditions may discolor or damage the surface.







# DESIGN CONSIDERATIONS

## BASE OF WALL

- 1/2" clearance above walking surface with same foundation as building.
- 2" clearance above paved areas.
- 6" clearance above earth.
- In areas where de-icing salts and solutions will be used, consider the application of a breathable, penetrating water repellent to the face of veneer units, 24" high above surface, to protect stone from staining and deterioration. Protect bottom edge of veneer unit from absorbing moisture and contaminants.

## WINDOW SILLS

- Window sills and courses protruding more than 1/2" should be supported with corrosion resistant clip angles at both ends of sill pieces to resist eccentric rotational forces.
- Clip angle should support at least 2/3 of the depth of the sill or protruding stone.
- Sills should have at least 1 1/2" overhang.
- Sills should have a drip-cut on the underside unless bottom edge of sill is installed with a 5% pitch or greater.
- Sills should be pitched away from window.
- Lug sills are more water-resistant than sills that stop at jamb.
- Skyward facing joints between sill pieces and at the end of sill pieces should be raked 3/4" deep for placement of backer rod and caulk.

## TOP OF WALL

- Create top of wall details to resist wind-driven moisture that may saturate top of stone, setting bed, scratch coat, or support wall.
- Consider installing back rod and caulk between top of thin veneer and top of wall wood blocking before metal wall cap is installed.
- Install through-wall sheet metal flashing under top of wall coping stones. Provide 1 1/2" overhang on coping stone with drip cut on the underside. Rake joints between top-of-wall coping stones 3/4" deep for installation of back rod and caulk.

## OVERHEAD, HORIZONTAL & TILTING-FORWARD APPLICATIONS

- These applications should be approved by the local building official and visually inspected during installation, and sample units should be tested for bond strength.
- Overhead, horizontal, and tilting-forward applications should use supplemental mechanical anchors.

# GUARANTEE & CONTACT INFORMATION

## GUARANTEE

All Indiana limestone meets or exceeds the strength requirements set forth in ASTM C568 for Type II Dimensional limestone.

## CONTACT INFORMATION

Why use Polycor stone? From quarry to delivery, we own the supply chain. A wide portfolio of marbles, granites and limestones. Better quality control. Shorter lead times. Lasting results.

Your architecture and landscape designs need premium materials. Let Polycor help you set the stage with stone.

### **Need help today? We're available!**

**P** 1.877.123.4567

**F** 123.456.7890

[info@polycorhardscape.com](mailto:info@polycorhardscape.com)

