

# COMPARATIVE ANALYSIS REPORT

*Exterior Cladding Systems for  
BaylorScott & White Pflugerville Hospital*



**RESPECTFULLY SUBMITTED BY**

*Brian K Melcher*

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## INTRODUCTION

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Field Verified was asked to provide a comparative analysis of 3-Coat Stucco and the Exterior Insulation Finish System (EIFS) claddings being considered for this project. Code compliance, constructability, warranties, durability and aesthetic capabilities of each were to be described to allow for comparison.

For stucco, a traditional 3-coat stucco system with a cementitious finish coat over continuous insulation and an barrier was evaluated.

For EIFS, a water managed EIFS that includes continuous insulation and an air/vapor barrier on the sheathing was evaluated.

A narrative of each will follow, as well as a table with brief facts on each comparison category.

## EIFS NARRATIVE

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Commercial water-managed EIFS has been vastly improved from the mistakes made by installers around the country in the early 90's. Independent studies by the National Institute of Building Sciences have shown that the disastrous event that gave EIFS such a negative reputation were **100% installer error** and that most of those errors would have still been negligent defects on stucco or siding clad homes. (i.e. no roof diverter flashing and improper window flashing.)

Modern, water managed EIFS systems are commonly installed in the Southwest. Water Managed EIFS systems include an air/vapor barrier at the sheathing and a drainage plane, providing a redundant layer of protection and performance. In this way, EIFS is very similar to the evolution of metal panels. Metal panels with sealed joints were installed for decades without a weather barrier on the sheathing. Experience showed the vulnerability of this approach and now all fully sealed metal panel systems have a redundant weather barrier installed over the sheathing.

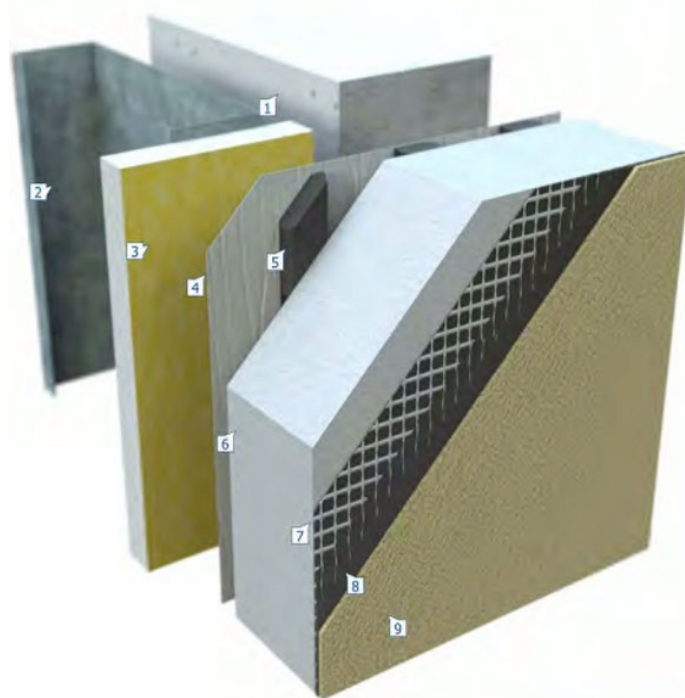


Figure 1: Water Managed EIFS

Water Managed EIFS is a typical exterior cladding system in Southwest and provided by the nations largest constuction manufacturing companies. It is the primary enclosure system on hundreds of healthcare buildings. Local Texas trade partners have been successfully installing water managed EIFS for 15 years and the industry has the most robust installer and inspector certification program in the building enclosure industry.

### Evaluation factors for Water Managed EIFS

**Code Compliance:** An EIFS with air/vapor barrier is 2012 IECC compliant because it provides an air barrier and continuous insulation at a rate of R-3.8 per inch (2 inches achieves R-7.5). Manufacturer provided details are often thorough enough to match the conditions of a commercial project. This is a great benefit to design drawings, shop drawing submittals and construction activities.

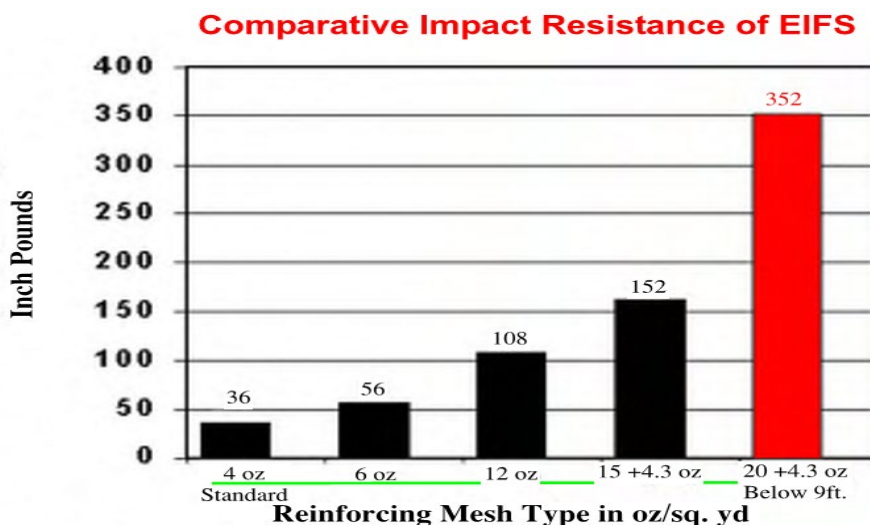
**Constructibility:** The air/vapor barrier is applied to the sheathing, after the sheathing joints and fastener heads are treated per the manufacturers recommendations. Tie-in to openings, transitions and terminations are completed at this level. At this point, the building is air and water tight. Cementitious adhesive is applied with a notched trowel. The vertical notches of the adhesive allow space for a drainage plane and the insulating foam is then pressed into the adhesive. Once installed, the foam is rasped (heavily sanded) until flat. This integral foam provides a truly continuous insulation for a very energy efficient building.

Once flat, a polymer modified cementitious base coat is applied, with fiberglass reinforcing mesh embedded in the base coat. It is troweled smooth and ready for finish coat once dry. Each step of the EIFS construction requires 24 hours dry-time, or less. No wetting or wet curing is required.

Generally, EIFS does not present constructibility issues, as the installation process is clearly described in the manufacturer's instructions and details.

**Warranties:** EIFS warranties vary by manufacturer. Labor & Material warrantues are available to owners. System warranties typical span 10 years with warranty extensions beyond 10 years per specific manufacturer requirements. This is a great indicator of the reliability and durability of the EIFS assembly as the manufacturer considers a long warranty to be of little risk. EIFS manufacturers include the largest chemical companies in the US (BASF & Tremco/RPM).

**Durability:** EIFS walls are very durable. The reinforcing mesh provides strength to the assembly. At areas of traffic, a second layer of high-impact mesh can be added to improve the performance, as shown in this mildly entertaining video of destructive testing. <https://www.youtube.com/watch?v=CpBrc8Lv74w>





Often, a modified stucco systems applied over chicken wire and foam insulation are incorrectly labeled as EIFS. These systems are on both residential and commercial buildings and have very low impact resistance, often sustaining damage from shopping carts and loading equipment.

The commercial EIFS recommended for this project has impact-resistance far greater than any stucco system, and is able to achieve hurricane safe ratings by passing large missile impact tests.

This strength comes from the thickness of the mesh. High impact mesh is used at traffic areas on the first floor to provide this high impact zone of durability. Where stucco and siding would be crushed by impact, the EIFS will absorb the force and maintain integrity.

For this reason alone we represent that EIFS provides for a more durable and longer life than stucco and many other claddings.

Further, EIFS is not prone to cracking, crazing, staining from efflorescence or shadows from uneven application. The aesthetic result of EIFS is superior to stucco over the life of the building. When stucco begins to crack and fail, the base coat and mesh used in EIFS is the most common repair.

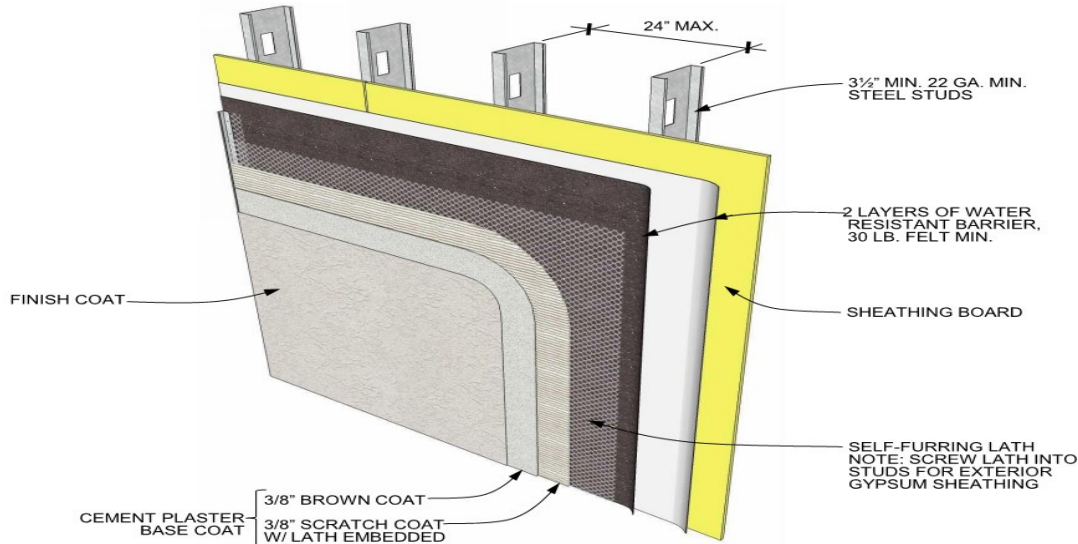
**Aesthetic Capabilities:** The acrylic based finish coat is resistant to fading, cracking, spalling and efflorescence. It is commonly used as the finish coat on stucco assemblies because of the many textures and uniformity of color and finish available. These options and performance come standard in an EIFS assembly.

Numerous custom shapes are available for architectural features with EIFS as the EPS can be shaped and then encapsulated into the system normally.

Control joints are not necessary because of the flexibility of EIFS provided by the foam. Aesthetic reveals can be cut into the foam as desired for design intent. Only expansion joints are needed at breaks in the substrate

## 3-COAT STUCCO NARRATIVE

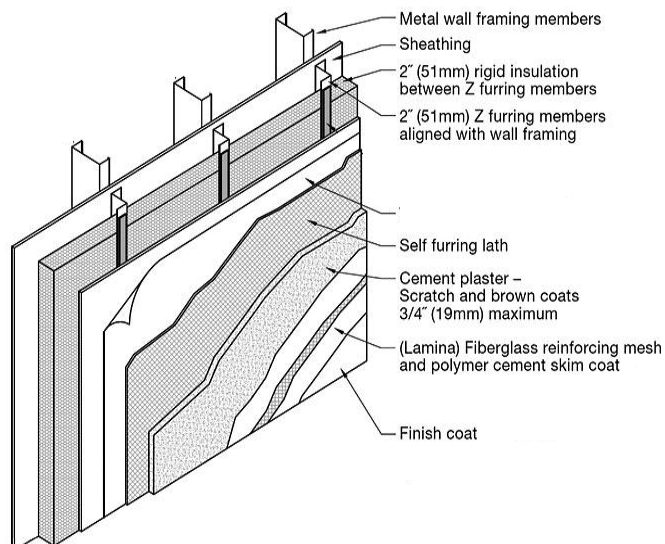
A traditional 3-coat stucco system with air barrier (See Figure 2) directly on the sheathing (i.e. Tyvek or other sheet or fluid applied membranes) then covered by one layer of Grade-D building is **no longer code compliant** due to 2012 changes to the IBC and IECC requiring continuous insulation the exterior side of the wall.



**Figure 2: Tradition 3-Coat Stucco**

A 3-coat stucco system with continuous insulation, as depicted in Figure 3, is the only IECC compliant stucco system and should not be judged as the traditional stucco system. In this configuration, a metal "Z" is attached at the studs, over the sheathing and air barrier to allow for the insulation. Grade D building paper and lath are then attached to the Z flashing.

This configuration is new to the industry and has naturally reduced impact resistance because it is installed in a "floating" position over insulation more similar to residential construction than commercial. This configuration is also more prone to cracking and requires new details for waterproofing and meeting fire code requirements. In short, changes to the energy code have changed the configuration of stucco walls and it is no longer the tried and true assembly, but rather a familiar product suspended on the wall in a new and unusual configuration.



**Figure 3: Reinforced 3-Coat Stucco with Continuous Insulation**

**Constructibility:** Continuous insulation three coat stucco is not well suited to current commercial construction. As an exterior skin, detailing is difficult, the 1 inch thick stucco now requires 2 inches of insulation and large metal flashing flashings are not part of the air/vapor barrier and inherently interfere with and complicate building envelope details. Stucco integrates best with flanged fenestrations, a rarity in high performing windows, doors and louvers.

Selecting an appropriate air/vapor barrier presents challenges because the attachment of the lath will place thousands of holes in the air/vapor barrier. As a result, the designer has limited available products that will provide the ability to achieve the preferred air leakage or vapor permeance rating for the building.

There are 10 steps involved in the 3-Coat Stucco (Air barrier, metal supports, insulation, building paper, lath and flashing, scratch coat, wet curing, brown coat, wet curing, finish coat).

Application of the stucco is a difficult task. The product has to be mixed at a hopper and pumped to the location. This creates logistical issues for construction sites.

Additionally, the wet curing process requires hose strung along to each level of scaffold. Personnel are needed to mist the stucco coats as required to keep them moist. This is more than once a day, especially in the summer. It also means that if stucco is applied before the weekend, someone must be there to maintain the moist cure process for the manufacturer required duration.

**Warranties:** Stucco systems come with no specific system warranty. To the extent manufactured EIFS products are used in the reinforced 3 coat stucco systems, manufacturer's material warranties are available.

**Durability:** 3-coat stucco is very durable. The primary cause for stucco degradation is moisture infiltration at cracks.

However, stucco is not required by code to pass a large missile impact test. A standard stucco system is not able to achieve a hurricane-safe rating.

**Aesthetic Capabilities:** Finding a stucco building where the stucco looks new, flat, uniformly colored and free of cracks is difficult, especially in the commercial mid-rise area. As a firm providing forensic investigations and expert testimony, we have a steady work flow related to alleged stucco defects. The explanation "it's stucco, stucco cracks" does not get very far in a defense. The 10 year statute typical exceeds stucco's ability to perform without significant cracking and degradation. The ASTM standard for stucco is rigid and intense and we have yet to see an installer that is able to meet every aspect of the mixing, application thickness and curing requirements once put under scrutiny. The best defense is that while sub-standard, the stucco work is on par with other local buildings. For these reasons, many contractors avoid 3-coat stucco on buildings where structural loads are likely to contribute to cracking (mid/high-rise construction, 4 story wood frame construction).

Smooth finishes that are popular now are also problematic. A TSIB Bulletin states that "Smooth finish is possible in both materials, but not recommended as a smooth finish tends to crack and the smooth texture highlights minor imperfections. Designers are encouraged to select a finish with some texture to hide minor hand applied imperfections and cracks that are inherent with cement plaster systems." ([http://www.tsib.org/pdf/technical/60-120\\_STUCCO\\_VS\\_ACRYLIC\\_FINISH.pdf](http://www.tsib.org/pdf/technical/60-120_STUCCO_VS_ACRYLIC_FINISH.pdf))

## **SUMMARY**

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It is the recommendation of the author that an EIFS system with air barrier be allowed for use healthcare building. As is typical, the first floor should include high impact mesh at traffic areas, to provide durability and performance that is unmatched by stucco. The attributes shown in the table are performance advantages that benefit the architect in detailing and designing the exterior, the contractor and trades in construction, and the performance over the life of the building.

At Field Verified, we are engaged in healthcare facilities for over 50% of our workload, with 15-20 active healthcare projects at anytime. Our recommendations adjust for the region, the climate, and the work force. Our entire field staff has achieved AWCI EIFS Certified Inspector status. Local EIFS installers have AWCI EIFS Certified Installers who are trained by an industry regulating organization and get manufacturer specific training as well. There is not equivalent support for stucco installers or from typical stucco product manufacturers. In fact, stucco products (sand, cement, and lime) are often sourced from multiple manufacturers.

The EIFS installation process is a well defined, well instructed series of steps. This allows all parties the best opportunity to succeed. EIFS is recommended because of the industry regulation and manufacturer involvement that provide clear specifications, detailing, shop drawings and installation instructions that can be followed and monitored.

The continuous insulation requirement has drastically changed the support structure and detailing of three coat stucco. Details are evolving and unique issues are being identified each time it is attempted. It is not as simple as it used to be and will certainly be less durable over insulation instead of a rigid substrate.

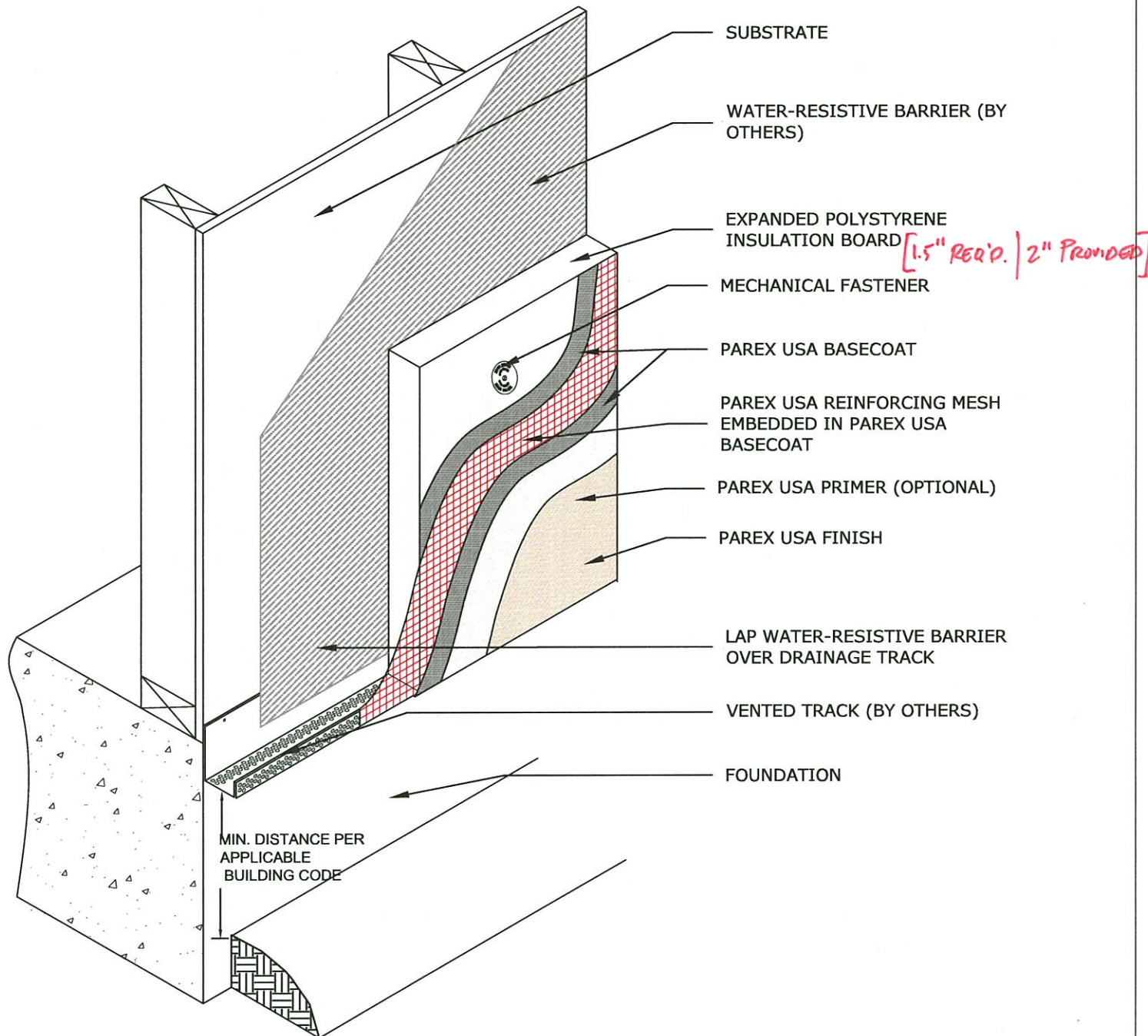
EIFS manufacturers provide standard details for windows, doors, penetrations and parapets that maintain a continuous air barrier and provide a standardized transition to dissimilar materials (lapped air barrier and a sealant joint at the face of the EIFS). When designing a wall with 3-coat stucco, detailing at windows becomes especially difficult. Stucco cladding is ideal for flanged fenestrations as the weather barrier buried beneath an inch of stucco. Storefront and curtain wall systems used on commercial structures that align with the face of stucco require recessed sealant joints and typically an additional line of sealant at the face. These difficult conditions often lead to installer error and water penetration.

Continuous insulation is built into the EIFS assembly. Commercial window details have been in place for decades and are able to exceed the standards set forth for healthcare facilities.

We believe that the use of the building, the weather conditions in Pflugerville, the lack of industry details and support for a new stucco configuration, and code required components dictates a recommendation for a combination of EIFS and high-impact EIFS to meet the needs of the building.

We recommend EIFS to provide the longest lasting assembly, highest impact resistance and durability, most consistent aesthetic result and most reliable waterproofing details for this project. We are confident that continuous insulation EIFS with an air barrier supplied by a proven manufacturer and installed by a trained and experienced installer is ideally suited for healthcare construction, energy efficiency and code compliance, high aesthetic standards and long term performance of the building.

We highly recommend selecting an appropriate EIFS manufacturer and assembly for this project. We believe that Water Managed EIFS with an air barrier supplied by a proven manufacturer and installed by a trained and experienced installer is ideally suited for healthcare construction, energy efficiency and code compliance, high aesthetic standards and long term performance of the building.



## SWM LCR T1.02 TERMINATION AT GRADE

STANDARD WATERMASTER LCR SYSTEM  
OPTIMUM WATERMASTER LCR SYSTEM

- NOTES:
1. See G 1.01 A, B or C for Drainage Options
  2. See G 1.02 for termination Options.

Disclaimer: The design, specifications, and construction shall comply with all local building codes and standards. Parex USA installation guidelines are for general information and guidance only and Parex USA specifically disclaims any liability for the use of this design, and for design, engineering, or workmanship of any project. The assembly shall be designed to prevent condensation within the assembly. The designer and the user shall provide final drawings and specifications. Products shown other than those manufactured by Parex USA are shown for clarity of the Parex USA product only. Contact the manufacturer of such other products for installation instructions.



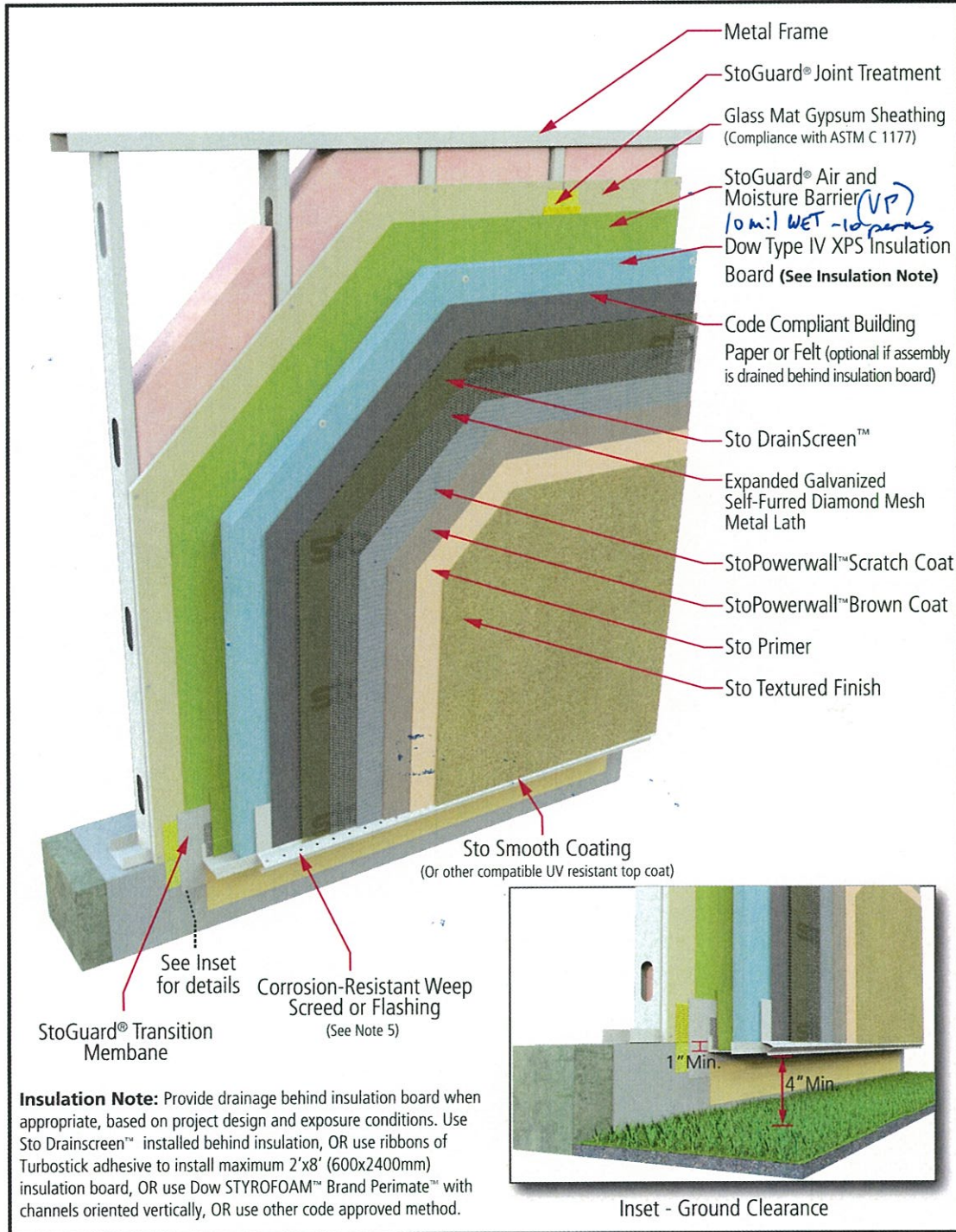
• RS/INCH

• ALT HR BARRIER = STO AIR SEAL (VP) - 30 or 40 mil dry - 12 perms



# Sto®Powerwall®ci Termination at Grade: Sheathing Flush with Foundation

Detail No.: 63s.02  
Date: March 2016



### Notes:

- StoGuard® joint treatment options:
  - StoGuard® RapidFill (joints ≤ 1/4 inch [6 mm])
  - Sto Gold Fill® with StoGuard® Mesh (joints ≤ 1/8 inch [3 mm])
  - StoGuard® Fabric with StoGuard® air and moisture barrier (joints ≤ 1/8 inch [3 mm])
- StoGuard® Transition Membrane Options:
  - StoGuard® RaidSeal® with StoGuard® Mesh
  - Sto Gold Fill with StoGuard® Mesh
- StoGuard® air and moisture barrier options:
  - Sto Gold Coat® (vapor permeable)
  - Sto EmeraldCoat® (high perm)
  - Sto VaporSeal™ (vapor impermeable)
  - Sto AirSeal™ (high perm) (Not for use with Sto Guard Fabric)
- Refer to product bulletins and Sto Specification S 507x for complete information on Sto products. Refer to StoGuard® Air and Moisture Barrier detail series 20.XX for information on detailing with StoGuard®.
- IMPORTANT. Refer to Sto Detail 63s.FP for special requirements related to Noncombustible Type construction and Fire-Resistive Rated Construction
- Cladding termination minimum 4" (101 mm) above finish grade, minimum 2" (51mm) above paved surfaces. In areas where the probability of termite infestation is very heavy, foam plastic insulation may require at least 6" (152 mm) clearance above grade (see IBC Section 2903.9).

**IMPORTANT:** Components not identified as Sto are furnished by other manufacturers and are not necessarily installed by trades who install the Sto products. Refer to project specific contract documents.

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### ATTENTION

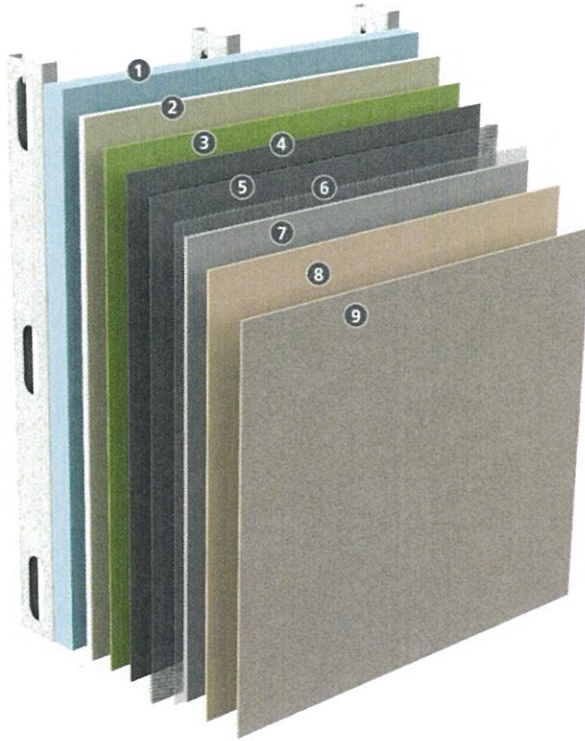
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## StoPowerwall® ci

Portland cement stucco with continuous air and moisture barrier, continuous insulation, cavity wall design, and high performance finish



- 1) Dow Type IV XPS Insulation Board
- 2) Substrate: Glass mat gypsum sheathing in compliance with ASTM C 1177 (or building code compliant wood-based sheathing - Type V construction only)
- 3) StoGuard® Air and Moisture Barrier
- 4) Code compliant paper or felt WRB
- 5) Sto DrainScreen drainage mat
- 6) Code compliant minimum 2.5 lb/yd<sup>2</sup> (1.4 kg/m<sup>2</sup>) self-furred galvanized steel diamond mesh metal lath
- 7) ASTM C 926 compliant stucco (as manufactured or listed by Sto Corp.)
- 8) Sto primer (optional)
- 9) Sto Textured Finish

### System Description

StoPowerwall ci is an energy efficient stucco wall assembly with a continuous air and moisture barrier and continuous insulation. It combines the strength and durability of traditional stucco with an advanced cavity wall design and Sto high performance finishes.

### Uses

StoPowerwall ci can be used in residential or commercial wall construction where energy efficiency, superior aesthetics, and air and moisture control are essential in the climate extremes of North America

### NFPA 285 Compliance Documents

#### Test Report:

Southwest Research Institute SwRI  
Project No. 01.16941.01.001b dated January 26, 2012.

#### IBC Recognition for Types I-IV Construction:

ESR 2323, ESR 1233

#### Engineering Analysis:

Hughes Associates Dated May, 6  
2014 HAI Project # IJJB05184.001

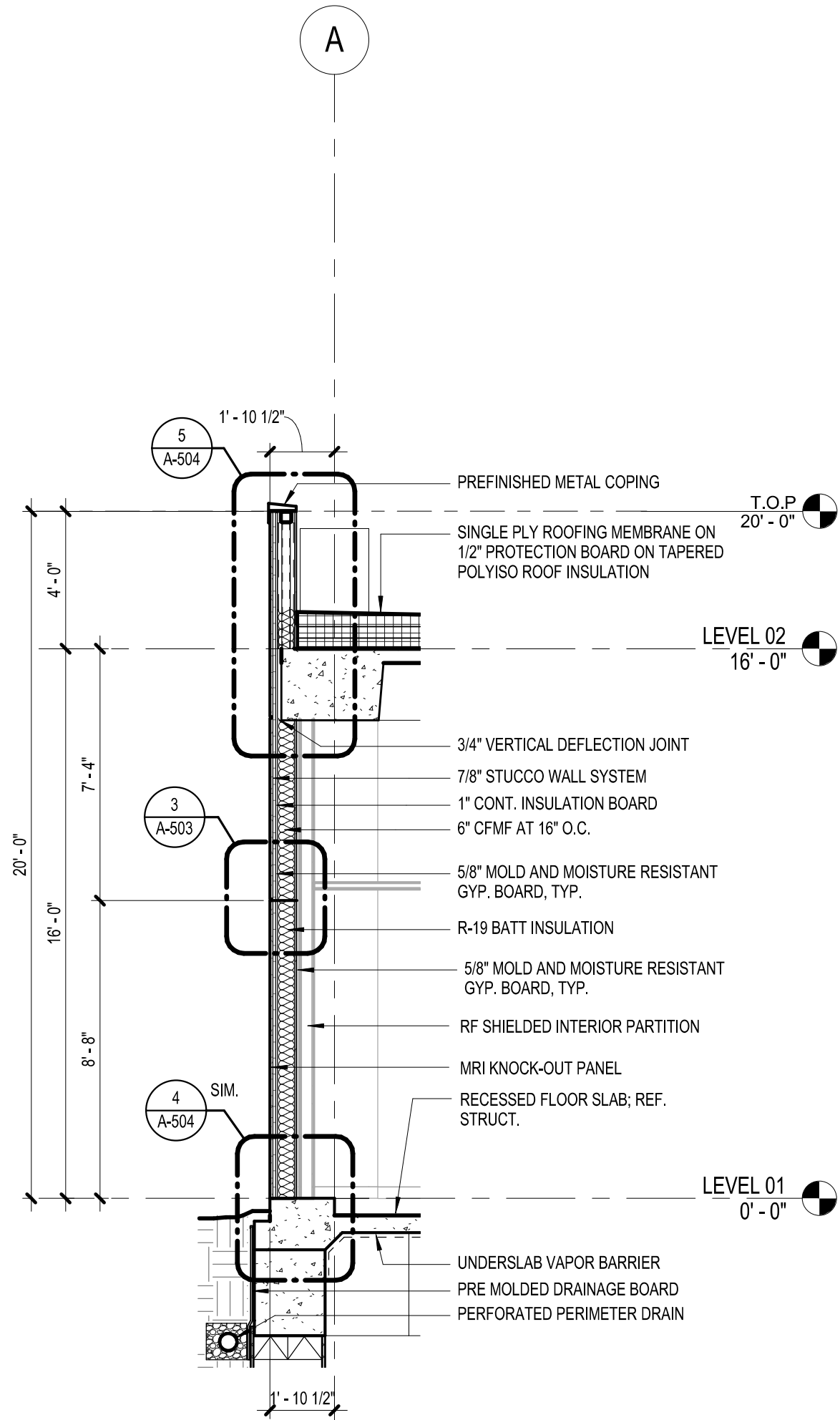
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Revision: 000  
Date: 6/2015



#### Attention

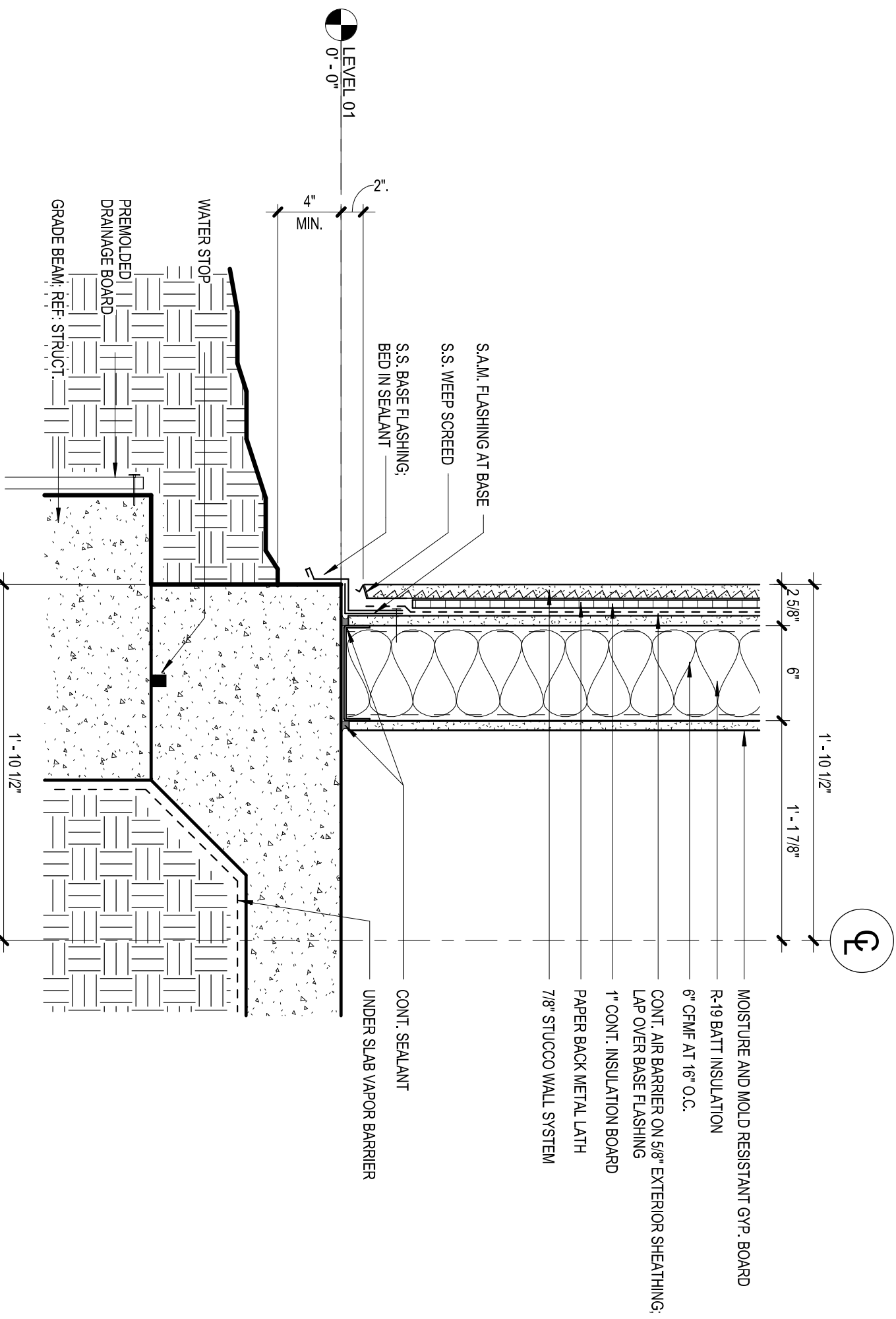
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**WALL SECTION**

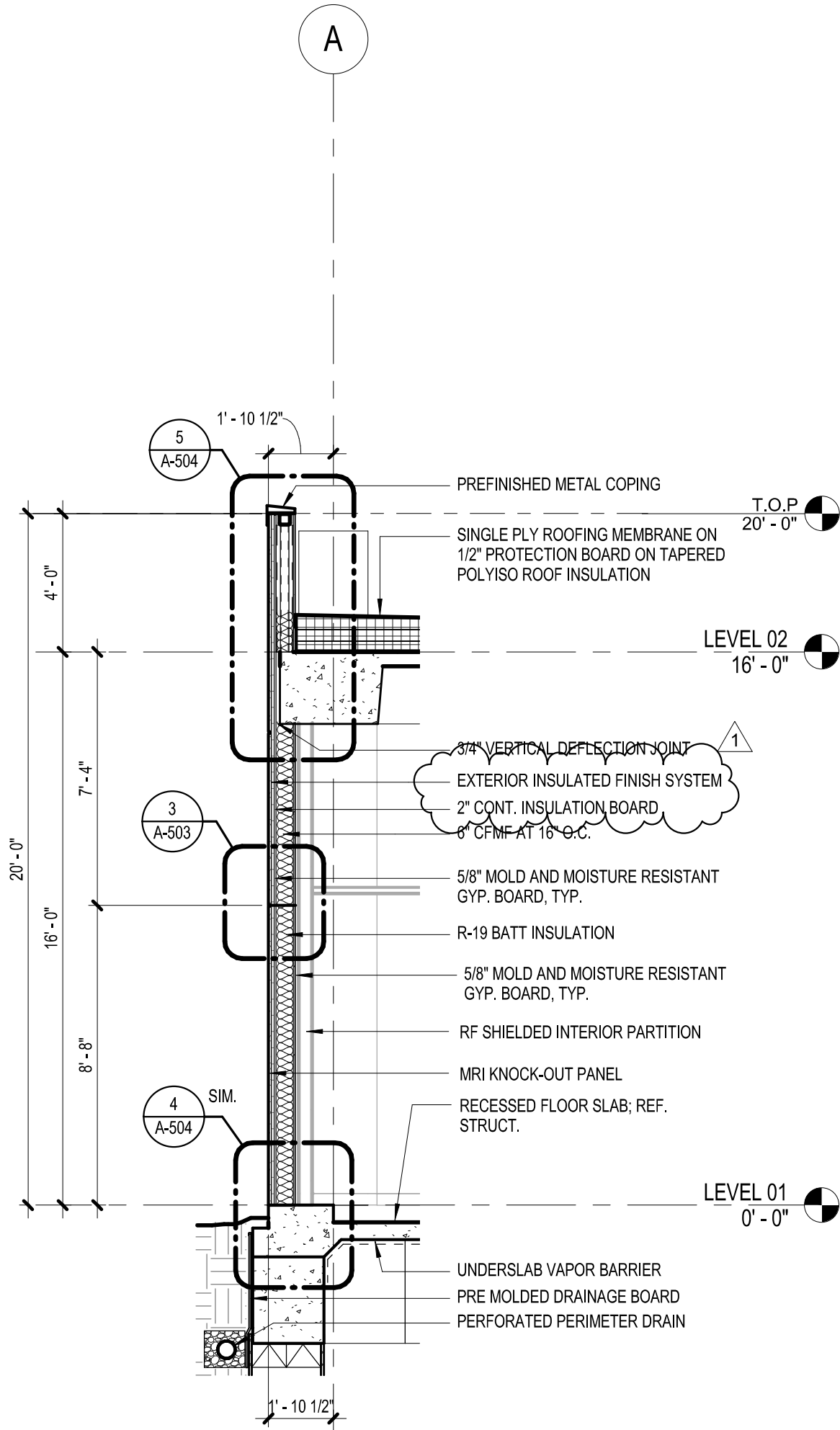
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**EXTERIOR SECTION DETAIL**

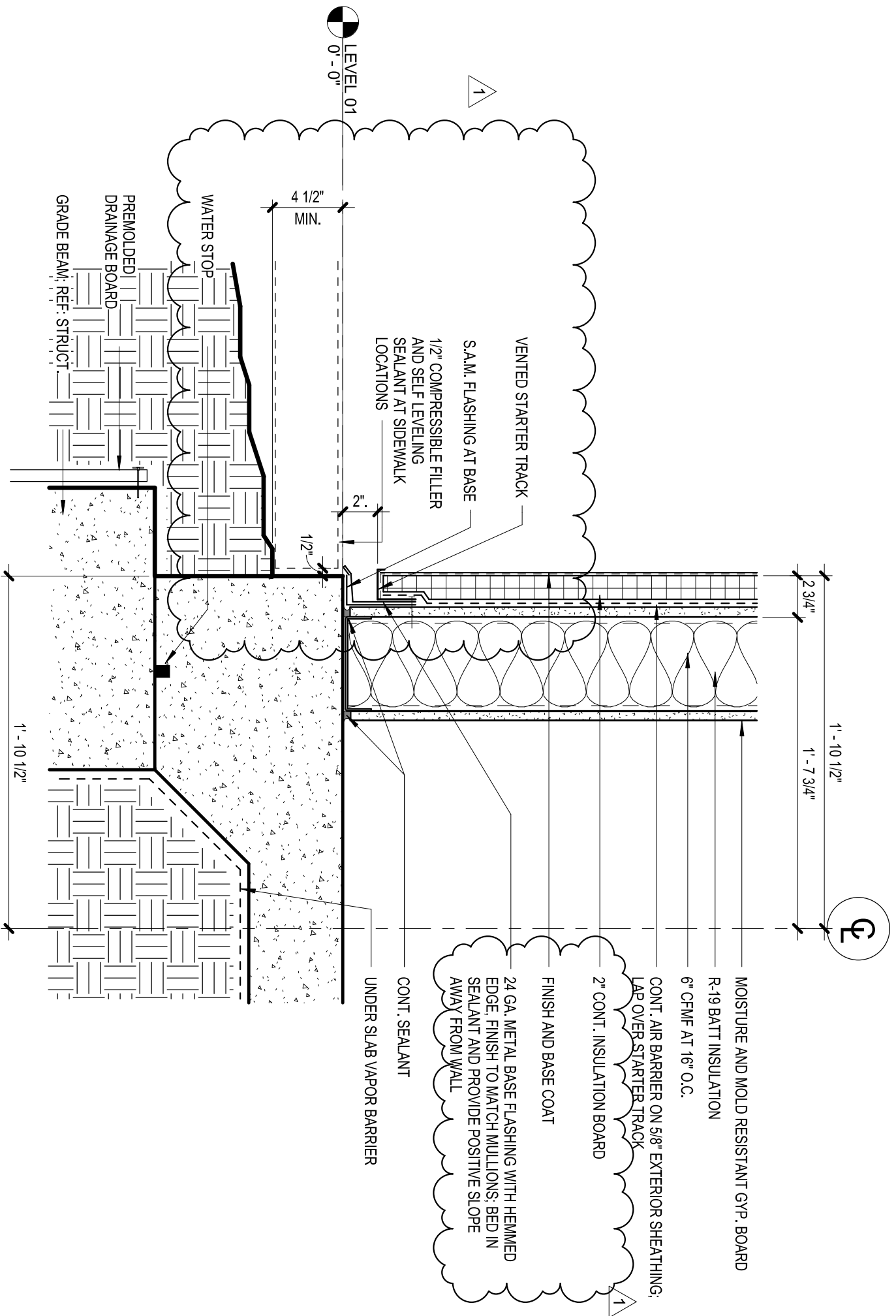
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**WALL SECTION**

SCALE: 1/4" = 1'-0"



4

**EXTERIOR SECTION DETAIL**

SCALE: 1 1/2" = 1'-0"