
stone lamina

Challenge the status quo with smart & disruptive stone products, perfectly customized to your needs.

TABLE OF CONTENTS

APPENDIX

The Stone Lamina Cladding System

INTRODUCTION

Stone Lamina Composite Panel product is a precision made and engineered cladding system designed to revolutionize the way stone can be used as cladding. Now there is a better alternative to dimensional stone. With Stone Lamina product engineering and design capabilities, there are virtually no applications in which one would choose conventional stone cladding over Stone Lamina composite panels.

Stone Lamina is a new, highly integrated, laminated stone cladding system designed to lower costs, improve performance, and increase design/application versatility for new construction, renovations, and retrofits. Ideally suited for both exterior and interior applications, this high quality, “natural” stone cladding system allows architects, designers, builders, and contractors to improve design aesthetics and marketability of their commercial, institutional, residential, or multi-residential projects.

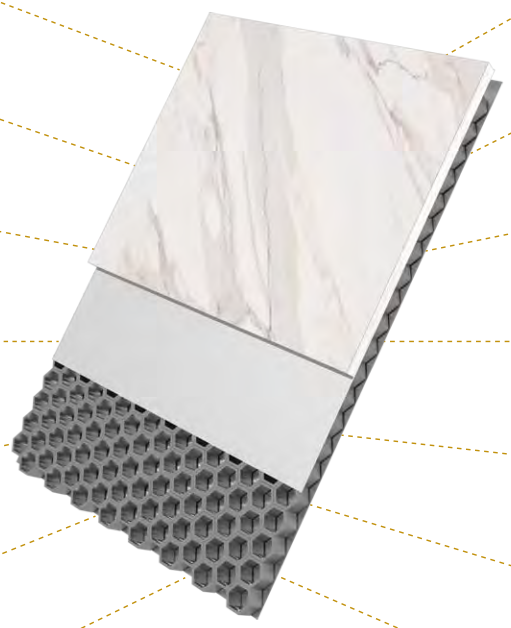
There are different types of Stone Lamina composite panels depending on your requirements, however, they are all designed to work together in a seamless, highly engineered and integrated system. Each panel can be attached in one of four ways (Interlocking Channels, Z-Clips, Anchor Plates, or Adhesive) depending on the application and underlying material (drywall, metal or wood studs, concrete, pre-existing stone, or other materials).

Stone Lamina composite panels can be supplied and installed on both vertical and horizontal surfaces for a fraction of the cost of solid stone panels. They are about 20% of the weight of dimensional stone and provide remarkable savings in terms of transportation, installation time, installation skill required, labour costs, and structural requirements. These panels are strong, light-weight, low cost, easy-to-install, impact and crack resistant, fire and heat resistant, waterproof, environmentally sustainable, and can be made from a number of natural stone materials (and their derivatives) in virtually any pattern, shape, or size imagined. Complete with an exceptional warranty, this beautiful, natural stone composite panel is the cladding system of choice for transformational design, as well as tight construction budgets.


stone lamina

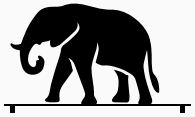
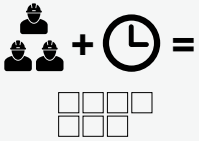
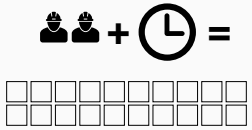
OVERVIEW

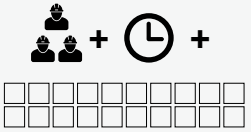
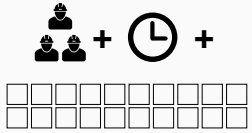
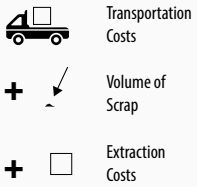
- Good Sound Proofing & Dampening
- Versatile – Highly Integrated Panel Components
- Blast, Earthquake & Impact Resistant
- Lower Cost Design, Transportation, & Installation
- Much Stronger than Natural Stone
- Use Natural or Engineered Stone
- Exceptional Warranty



- Rapid Fabrication & Installation Process
- High Strength to Weight Ratio
- Excellent Fire Resistance
- Highly Precise & Flat Surface
- Lower Cost Stone Cladding Solution
- Thin & Light Weight
- Contributes to LEED Certification

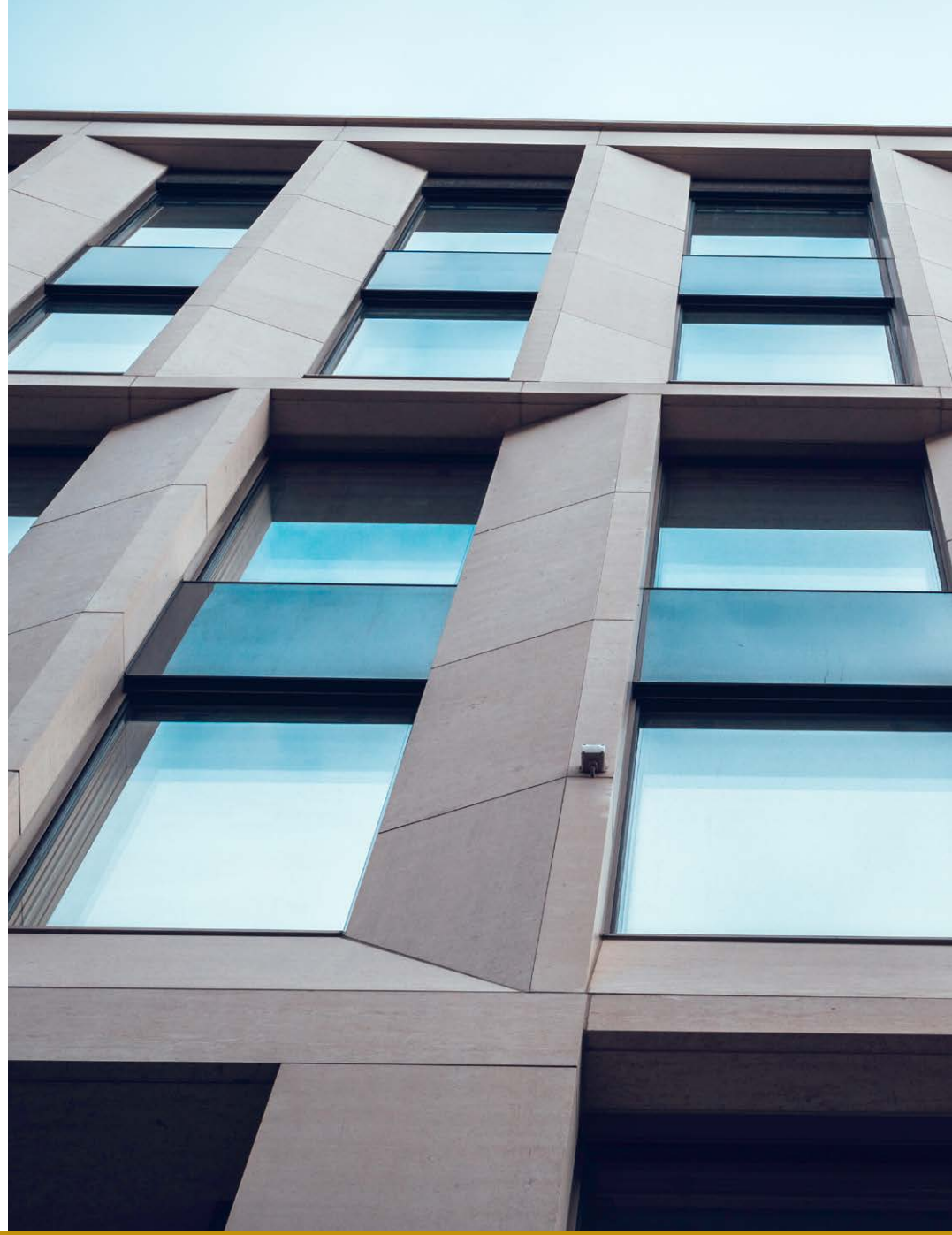
A VISUAL COMPARISON

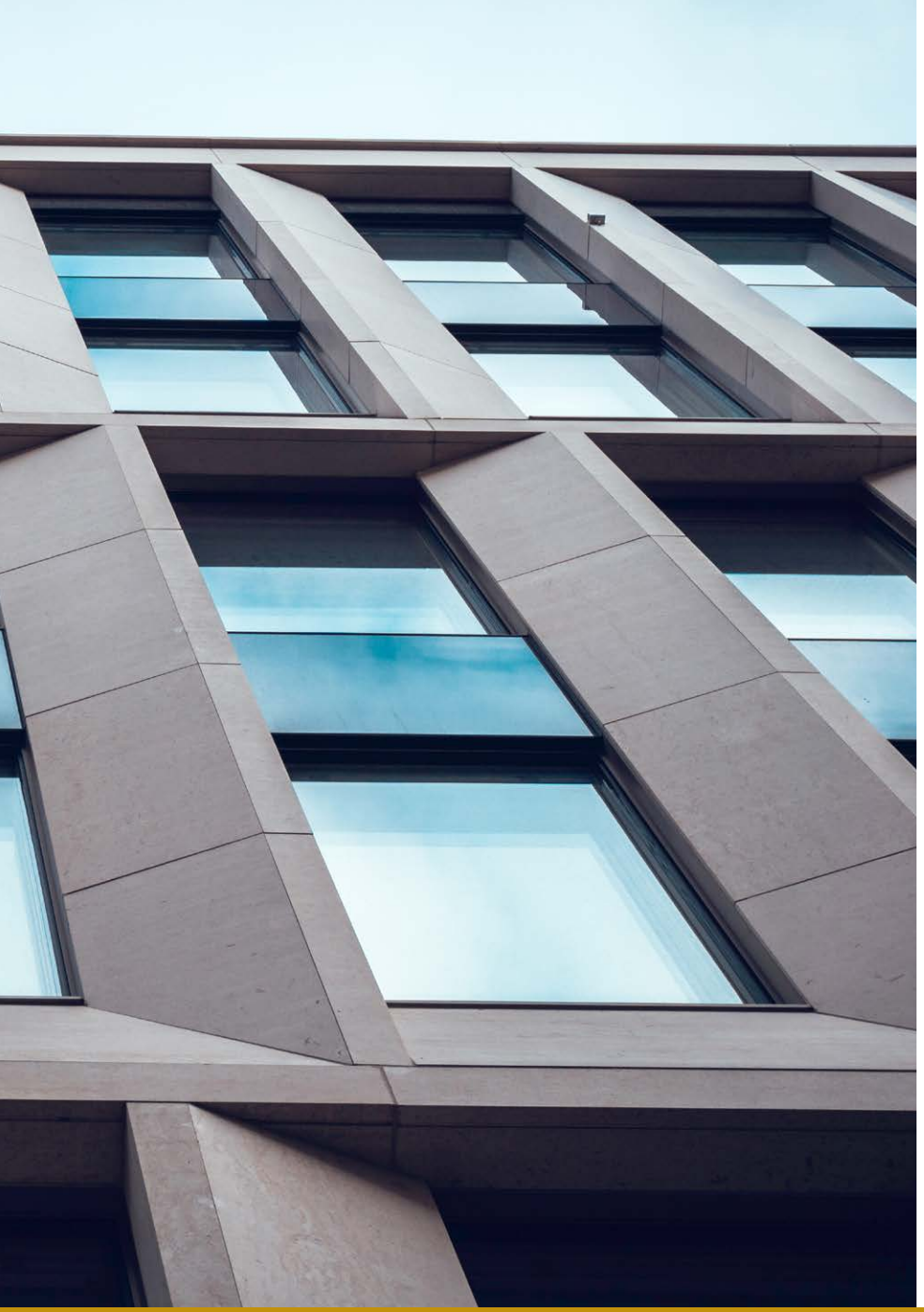
	The Industry Standard	Stone Lamina
1 Panel Size	32″ x 16″	48″ x 96″
2 Panel Strength		
3 Panel Weight	 1000 sq.ft. = 10 Skid	 1000 sq.ft. = 1 skid
4 Installation Speed	 15 Panels (250 sq.ft.)	 60 Panels (1,000 sq.ft.)

	The Industry Standard	Stone Lamina
5 Site Condition	 Average scrap, waste & debris left behind with 1000 sq.ft.	 Average scrap, waste & debris left behind with 1000 sq.ft.
6 Full Customization	 Standard Construction Projects	 Almost Any Design Project
7 General Cost	 60 Panels (1,000 sq.ft.) = $$	 60 Panels (1,000 sq.ft.) = $
8 Environmentally Friendly	 Transportation Costs + Volume of Scrap + Extraction Costs	 Transportation Costs + Volume of Scrap + Extraction Costs

Why Stone Lamina Cladding System?

THE STONE LAMINA COMPOSITE PANEL CLADDING SYSTEM HAS NUMEROUS BENEFITS OVER TRADITIONAL DIMENSIONAL STONE CLADDING. OUR CLADDING SYSTEM IS HIGHLY ENGINEERED AND MANUFACTURED TO EXCEEDINGLY PRECISE LEVELS OF QUALITY AND FINISHING. IT HAS NUMEROUS, TANGIBLE BENEFITS.





Quicker And Lower Cost Design

The Stone Lamina composite panel cladding system takes less time to design than traditional brick, masonry, or traditional dimensional stone. It offers designers and engineers pre-engineered strength capabilities and pre-designed anchoring systems. This eliminates the multiple variables of solid stone cladding that can slow down the design and engineering process.

Rapid Fabrication

Stone Lamina panels can be fabricated in a relatively short time frame. Panels can be constructed as work progresses and delivered on site according to your schedule, ready to install. As a single source supplier, Stone Lamina scheduling and production staff can help to client project schedules on track.

Rapid Installation Speed

With its high strength and low weight density of approximately 3.3 lb/ft², installers can quickly and easily install Stone Lamina composite panels. Light weight panels allow smaller crews to install and cover more area faster than with heavy, thick stone cladding materials. Faster erection will lessen the contractor's risks and costs associated with weather and material damage during construction.

Year-Round Installation

You can install year-round with Stone Lamina composite panels because they do not require field-applied mortar or epoxy. Since Stone Lamina panels are fabricated under factory controlled conditions and use no mortar or grout for installation, they can be installed year-round. Harsh winter weather and rain will have minimal impact on the production and installation schedules.

Low Cost

Stone Lamina composite panels are much lower in cost when you compare the costs of purchase, and factor in the transportation, handling, and installation costs of traditional dimensional stone cladding.

Thin And Light Weight

Up to 80% lighter than traditional stone, steel, wood cladding, or common partitioning materials. They are typically only 1” thick, leaving more room for insulation and floor space. This also means greater ease-of-use and significantly lower costs for transportation, handling, and installation.

High Strength To Weight Ratio

This means higher performance compared to other natural or synthetic materials.

Contributes To LEED Certification

Stone Lamina panels can contribute up to 27 points toward LEED certification.

See appendix 02 for more information.

Excellent Fire Resistance

Stone Lamina aluminum honeycomb panels are highly fire resistant compared to wood, PVC, insulation, drywall, and other sheathing materials. They are composed of non-combustible materials and are rated UBC Class 1 for fire, and are self-extinguishing.

Highly Precise And Flat Surface

Highly flat surfaces are very important. They are needed to achieve highly accurate and trouble-free installations.

Good Sound Proofing And Dampening

The hollow, honeycomb core is highly absorbent to sound and can be used in numerous sound damping and soundproofing applications.

Versatile

Ideal for new, out-of-the-box design ideas because they can be fabricated into virtually any shape, size, or pattern required. Perfect for exterior or interior applications on any surface in new construction, renovations and retrofits.

Blast, Earthquake, And Impact Resistant

Our panels are remarkably impact and crack resistant because they flex without breaking. They can withstand 60 times more impact than a 1 3/4" solid granite panel, when tested with a large missile impact test. That means that they are blast and earthquake resistant when used as an exterior envelope.

Extremely Strong

Stone Lamina composite panels have exceptional crush strength and stiffness, constant crush strength, structural integrity, and fatigue resistance. Thicker honeycomb cores will provide even greater strength.

Impervious To Moisture Penetration

Stone Lamina panels are impervious to moisture penetration which can cause mould or mildew.

Natural Or Engineered Stone

Our composite panels can be made with almost any natural or engineered stone available. They can be custom finished with numerous textures and finishes.

Highly Integrated Panel Components

The various types of Stone Lamina panels are engineered in such a way that they seamlessly integrate with one another for virtually any cladding application imagined.

Application Solution Consulting

As architects, engineers and experienced field technologists, we know how to specify and apply Stone Lamina products to solve real-world design and construction problems. Everything from complex design challenges, to never-been-done-before design concepts, to achieving demanding construction budgets, are all within our reach. With more than 20+ years of application experience, we know how to develop creative and elegant solutions to meet your needs.

An Exceptional Warranty

Stone Lamina composite panels are guaranteed not to delaminate for the life of the structure (provided that they are installed properly using certified installers).

Material, Finishing, and Edging Options

STONE LAMINA COMPOSITE PANELS COME WITH A COMPREHENSIVE LIST OF OPTIONS WHEN IT COMES TO SURFACE MATERIALS, PANEL SIZES, TEXTURES, FINISHES AND EDGINGS. OPTIONS CAN BE TAILORED TO THE NEEDS OF THE CUSTOMER AND THE APPLICATION.

NATURAL OR ENGINEERED SURFACE STONE OPTIONS

Stone Lamina panels can be produced from almost any stone provided that slabs are available in large enough sizes. We provide more than 14 standard stone panels including granites, marbles, limestones, travertine, sandstone, and slate. However, this just a small sampling of what we have at our disposal. We can source stones from across North America and around the world. We can also use translucent stones such as onyx for backlit applications. Our panels also have the ability to use stone derived veneers such as porcelain and engineered stone for special applications.

Innovation

PANEL SIZES

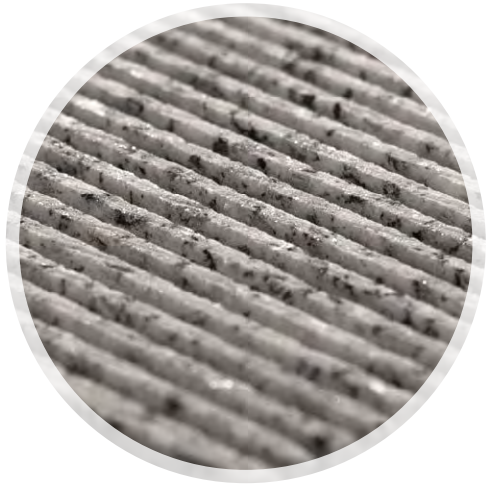
Our standard sized panel is 4 ft x 8 ft (122 x 244 cm). We can also cut-to-size custom square or rectangular shapes, but also other angular and curved shapes depending on your needs. We can also do cutouts within each panel for special applications. In a nutshell, we can do almost anything that you can conceive or require. Panels come in thicknesses of 15/16″ (24 mm) or 9/16″ (14 mm) and weigh only 3.3 lb/ft² (16 kg /m²)... about the same as 1/4″ thick glass.

TEXTURE AND FINISHES

Stone Lamina offers a wide variety of textures and finishes including Spazzolato, Scanalato, Fiammato, Lucidato, Levigato, Sabbiato, Lavaggio, Antico, or Custom finishes.

SPAZZOLATO

An alternative to flaming that produces a rough face while preserving the stone color. A diamond brush head is used to impact the face of the stone so unlike flaming, you aren't jeopardizing the integrity of your panel with this finish and can still preserve the ornamental potential.

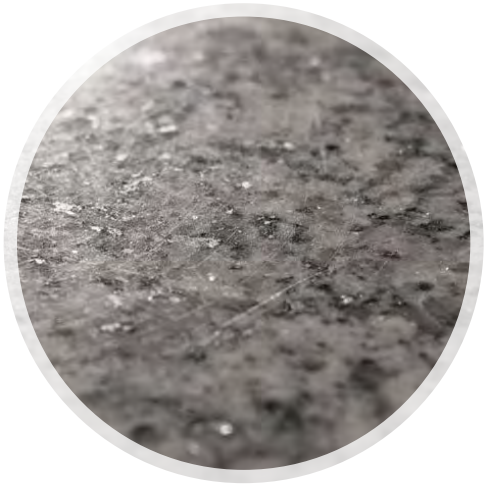


SCANALATO

Parallel grooves sawn across the face of the stone to put ridges in the face of the stone. The width of the groove and the ridge are usually deeper and wider than a tooled finish.

FIAMMATO

A rough granite finish that highlights the sparkling crystals of granite. A method consisting of torching the stone face followed by water cooling to shock the minerals in the stone. Flamed panels are typically used in flooring and exterior applications. The stone veneer needs to be thicker to handle the stress fractures caused by the thermal shock.



LUCIDATO

A smooth, reflective finish. The polished stone finish brings out the rich colors of the stone and enhances natural pattern and veining. It shows off the depth and beauty of the natural stone. This finish reduces the porosity of the Stone Lamina panel... making it more resistant to staining. Polished stone is not recommended for outdoor flooring as there is minimal slip resistance.

LEVIGATO

A smooth and non-reflective finish. The honed texture reduces the vibrant color found in a polished stone leaving you with a warm, but slightly dull finish. The variations in the stone are still visible in this aesthetically pleasing selection. A popular choice for flooring and wall accents.

SABBIATO

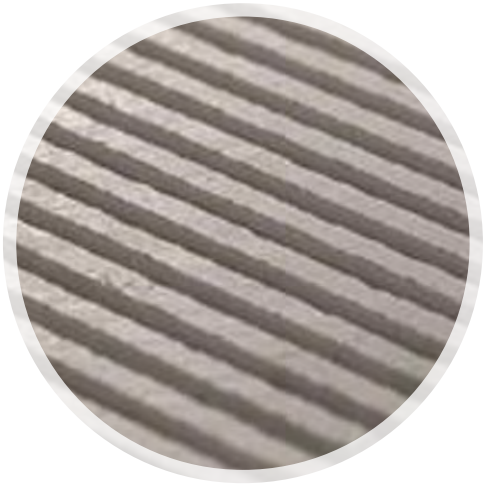
This texture is achieved by blasting the face of the stone with sand through an air gun. It produces a rough finish lighter in color than the polished finish. The stone is left with very small craters in the surface resulting in a silky, matte appearance but without the coarse and sharp protrusions of other textures.

LAVAGGIO

A rustic finish achieved by applying an acid bath to the stone face. When used on softer selections like marble, travertine, limestone, or sandstone, the chemical process etches away heavily at the porous stone, resulting in a beautiful, antiqued appearance. Slight changes are noted on granite but they are minimal in comparison.

ANTICO

An uneven, smooth and “soft” surface created by brushing the surface. The hard areas remain while the softer areas are removed. This technique is only effective on marble and limestone with variations in hardness usually created by veining.



CUSTOM

Any pattern or texture is possible using Stone Lamina‘s high-end CNC and waterjet machines.

STONE EDGE RETURN OPTIONS

We offer 4 edging options including Bird Beak, Fillet, Mitered Edge, and Bullnose… all with mitered joints.

Bird Beak

Quarter oval rounding that becomes flush with the backing abruptly

Fillet

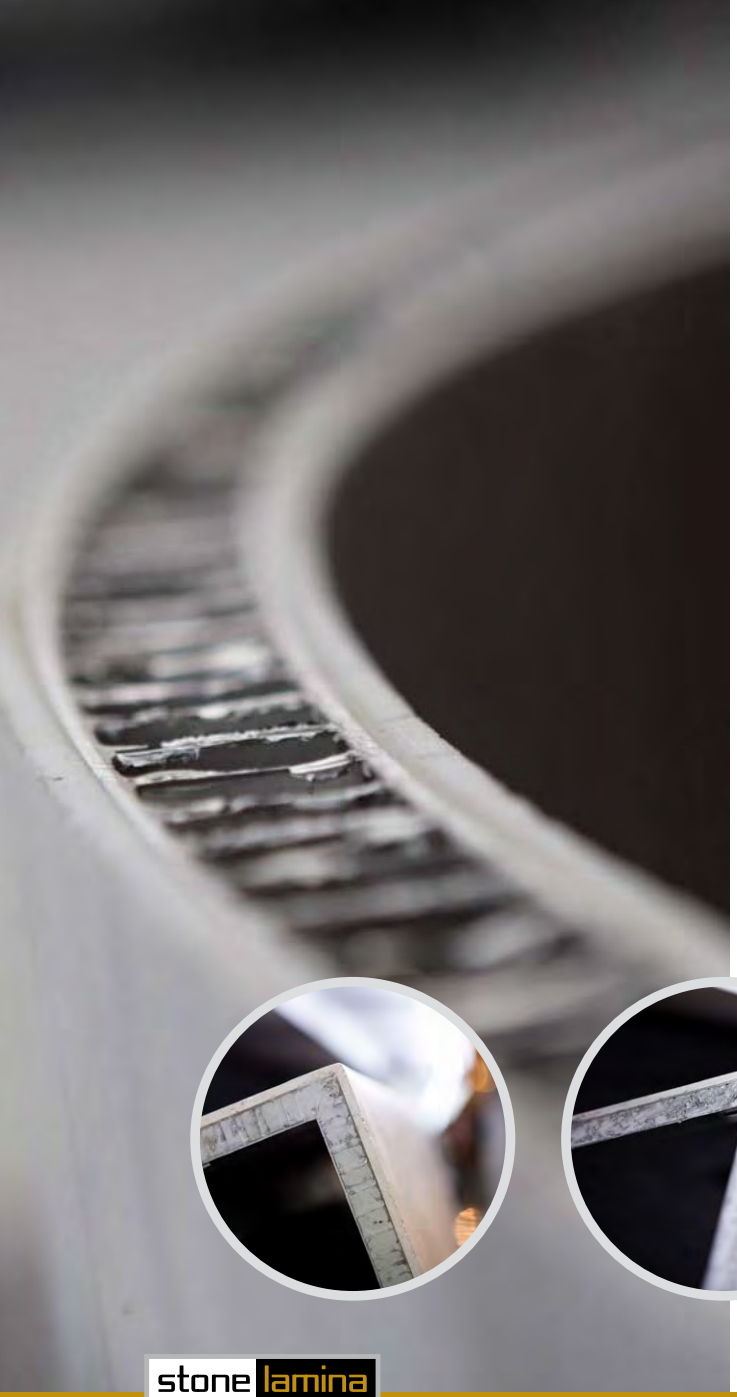
Creates a rounded rectangle effect, but a less rounded edge on the bottom

Mitered Edge

Creates a rounded rectangle effect

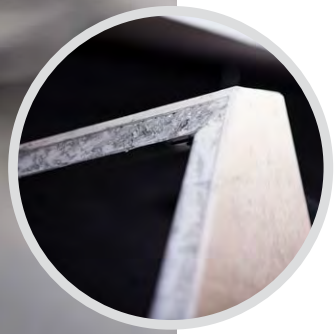
Bullnose

Half circle edge



CUSTOM ACCENTS AND ELEMENTS

Stone Lamina panels can be embedded with names, emblems, logos, signs and other custom designs through sand blasting or etching. This is perfect for exterior or interior retail and commercial applications.

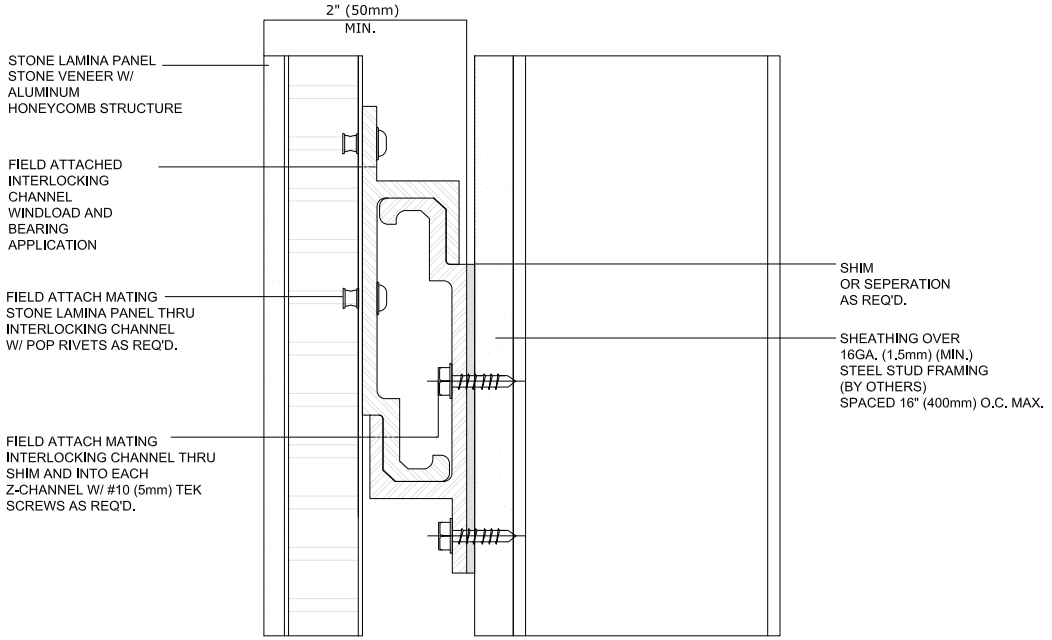


Methods of Installation

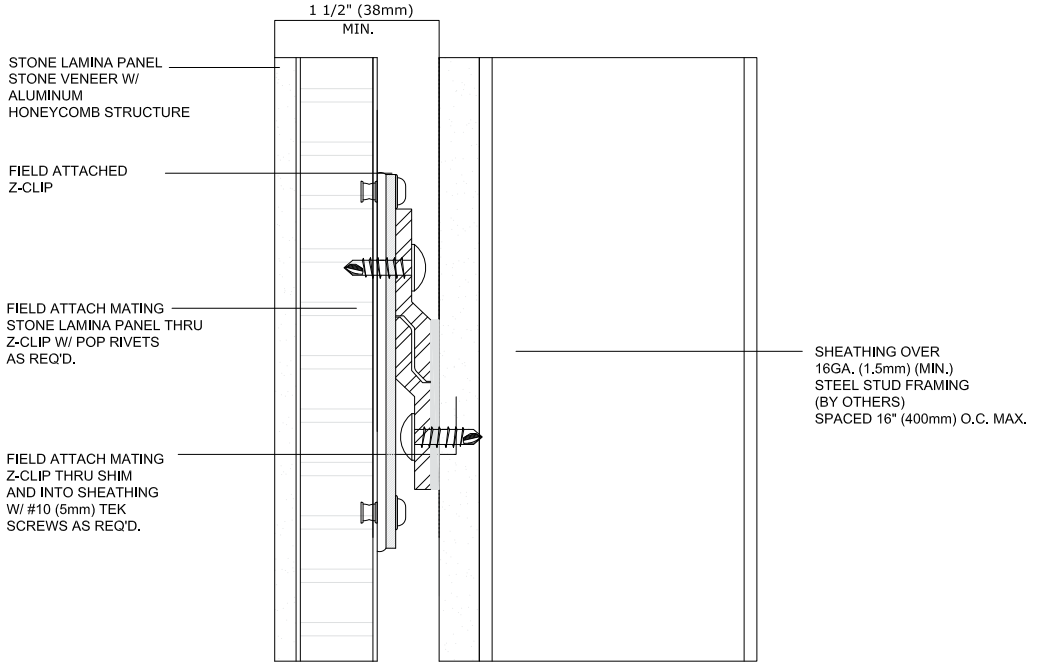
There are four primary methods of installation depending on the application and underlying support material (drywall, metal or wood studs, concrete, pre-existing stone, or other materials). These include interlocking channels, Z-Clips, anchor plates, or adhesive.

SEE APPENDIX 01 FOR THE COMPLETE LIST OF AVAILABLE PANEL ATTACHMENT METHODS AND TECHNICAL DRAWINGS.

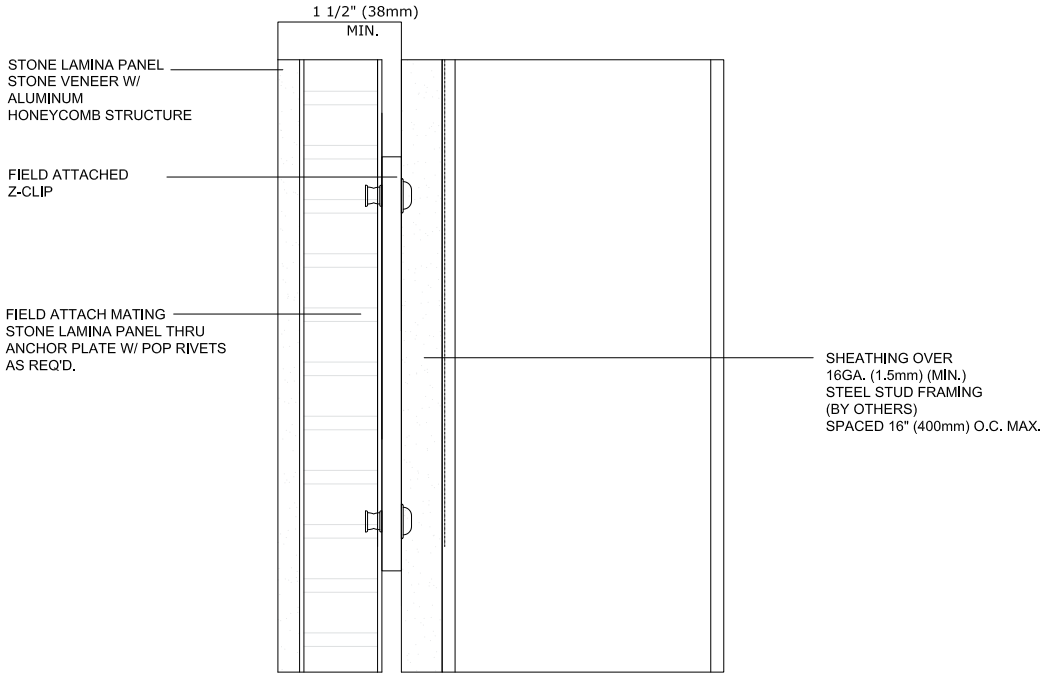
INTERLOCKING CHANNEL SYSTEM



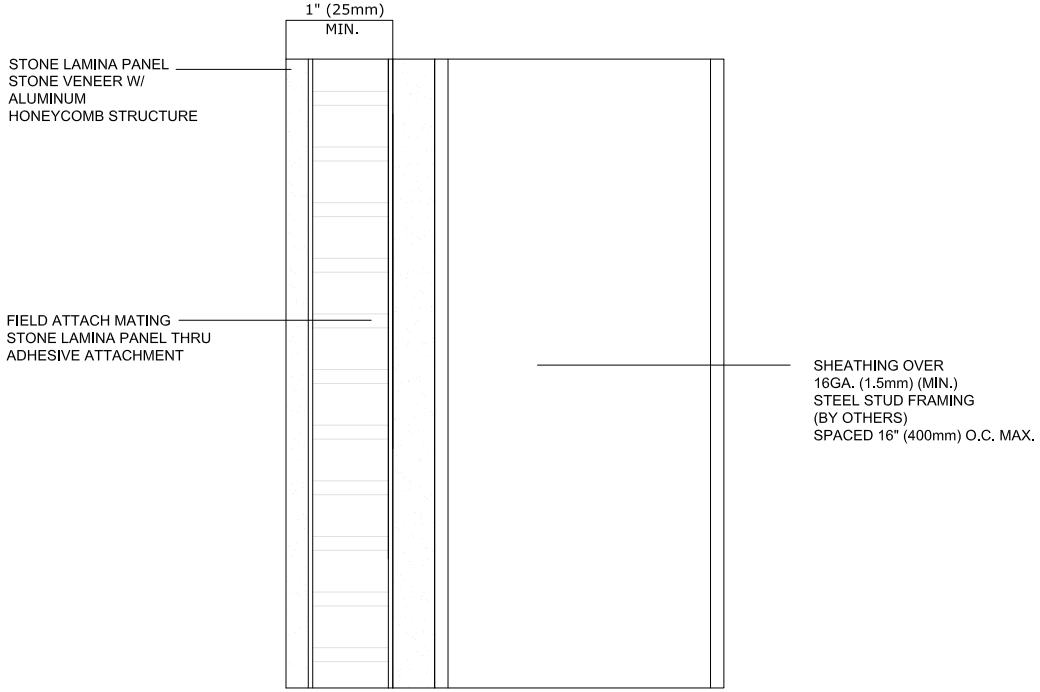
Z-CLIPS


1 1/2" (38mm)
MIN.
STONE LAMINA PANEL
STONE VENEER W/
ALUMINUM
HONEYCOMB STRUCTURE
FIELD ATTACHED
Z-CLIP
FIELD ATTACH MATING
STONE LAMINA PANEL THRU
Z-CLIP W/ POP RIVETS
AS REQ'D.
FIELD ATTACH MATING
Z-CLIP THRU SHIM
AND INTO SHEATHING
W/ #10 (5mm) TEK
SCREWS AS REQ'D.
SHEATHING OVER
16GA. (1.5mm) (MIN.)
STEEL STUD FRAMING
(BY OTHERS)
SPACED 16" (400mm) O.C. MAX.

ANCHOR PLATE



ADHESIVE ATTACHMENT



Our Core Technology: The Composite, Honeycomb Panel

Stone Lamina panels are constructed using a unique, laminated, composite material structure for extreme strength, low weight, and ductility. The SL-AHP standard panel is made from 3003 aluminum alloy foil in the form of a honeycomb cell core sandwiched between two continuous layers of solid aluminum sheathing. On top of the honeycomb core is 2-5mm (0.08-0.20”) of real, natural stone veneer bonded with a special form of aviation epoxy adhesive. This epoxy was chosen for its ability to withstand 300 MPH winds, very high sheering forces, tensile forces, and a wide range of temperature extremes… all without delaminating or losing any structural integrity.

WHY USE A 100% ALUMINUM HONEYCOMB CORE?

The key to the unique properties of our Composite Honeycomb Panel Technology is the design of the aluminum honeycomb cell core. Not all manufacturers of stone panels use an aluminum honeycomb core coupled with aluminum sheathing on either side. Using aluminum throughout the core allows the composite panel to achieve its incredible performance characteristics, such as its ability to sustain a large missile impact of more than 4,000 lb/ft².* For more information about how the 100% honeycomb aluminum core compares to other core materials, please refer to the Appendix.**

* SEE APPENDIX 04: GENERAL TESTING.

** SEE APPENDIX 03:BENEFITS OF HONEYCOMB VERSUS OTHER CORE MATERIALS.

CUSTOMIZATION OF STRENGTH CHARACTERISTICS

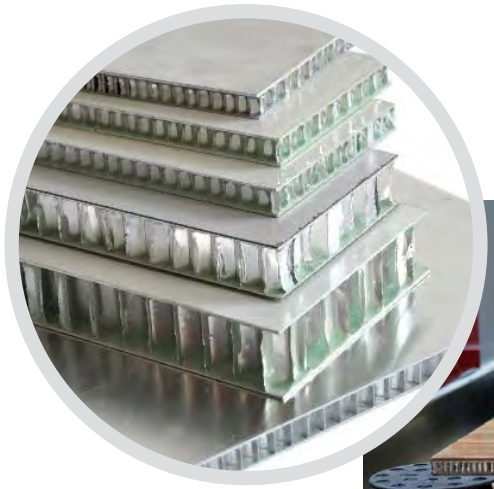
The Honeycomb core can vary in cell size and in thickness to achieve the desired strength characteristics depending on the application. Generally, exterior applications require thicker cores with larger cells than interior applications. Please refer to the Appendix *** for more information on the compressive and sheering strength versus cell size of the aluminum honeycomb core.

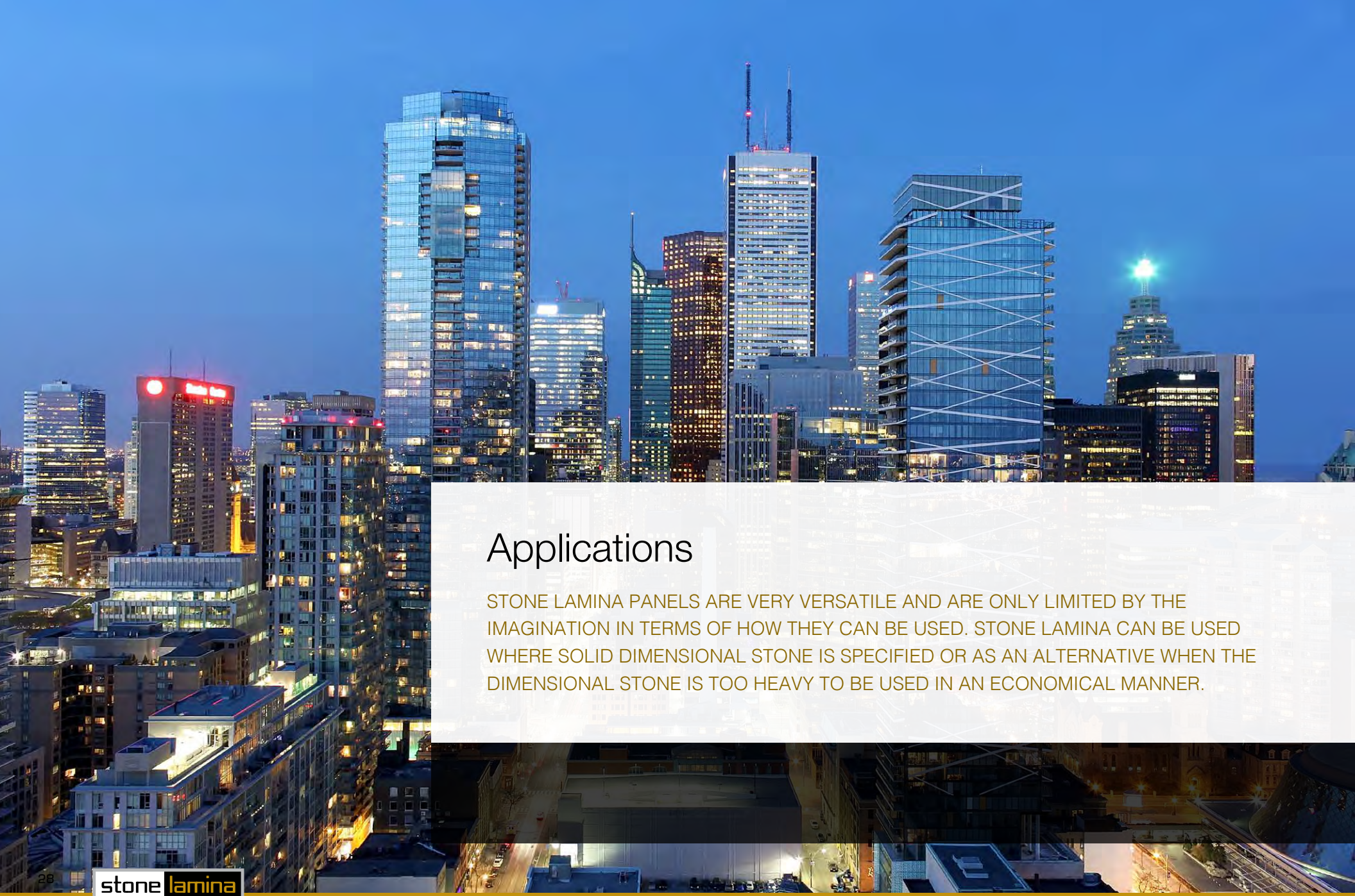
*** SEE APPENDIX 03: ALUMINUM HONEYCOMB CORE.

ALUMINUM HONEYCOMB PANEL EDGE CLOSURE DESIGN

Exposed edge areas are a source of potential weakness in the design as they may be susceptible to local impact or environmental damage. Edge closures are also important because they may also provide localized reinforcement, attachment points, or simply meeting aesthetic requirements. We have a number of edging solutions available depending on the application required.****

**** SEE APPENDIX 03: ALUMINUM HONEYCOMB PANEL EDGE CLOSURE DESIGN DIAGRAMS FOR MORE INFORMATION.





Applications

STONE LAMINA PANELS ARE VERY VERSATILE AND ARE ONLY LIMITED BY THE IMAGINATION IN TERMS OF HOW THEY CAN BE USED. STONE LAMINA CAN BE USED WHERE SOLID DIMENSIONAL STONE IS SPECIFIED OR AS AN ALTERNATIVE WHEN THE DIMENSIONAL STONE IS TOO HEAVY TO BE USED IN AN ECONOMICAL MANNER.

EXTERIOR APPLICATIONS

There a wide variety of uses for Stone Lamina Panels including exterior applications for office buildings, retail store fronts, hotels, casinos, medical centres, train stations, airports, institutional buildings, museums, water walls, fountains, and much more.

INTERIOR APPLICATIONS

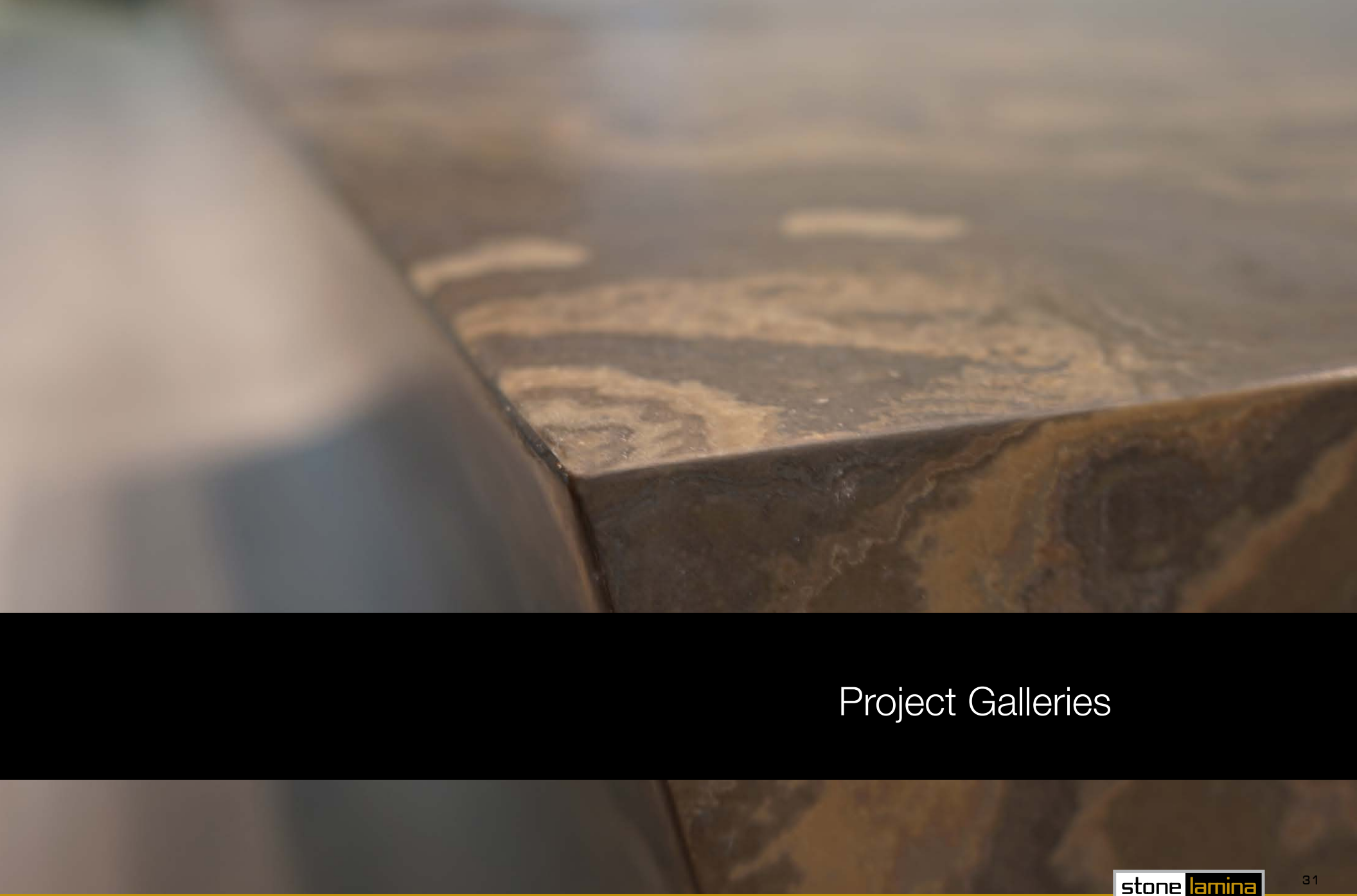
Interior applications include flooring, walls and ceilings in bathrooms, office environments, retail space interiors, shopping malls, lobbies, reception entry areas, elevators, temporary or permanent exhibitions, yachts and ships to name a few.

RENOVATIONS AND RETROFITS

Stone Lamina Panels can also be used to transform existing buildings in renovations, and retrofits over the existing exterior or interior stone, brick, wood, drywall, or concrete surfaces. They can refresh a tired looking building with very little structure modifications and at a relatively low cost compared with other more invasive and labour intensive renovation techniques.

TRANSFORMATIONAL DESIGN - NEW CONCEPTS

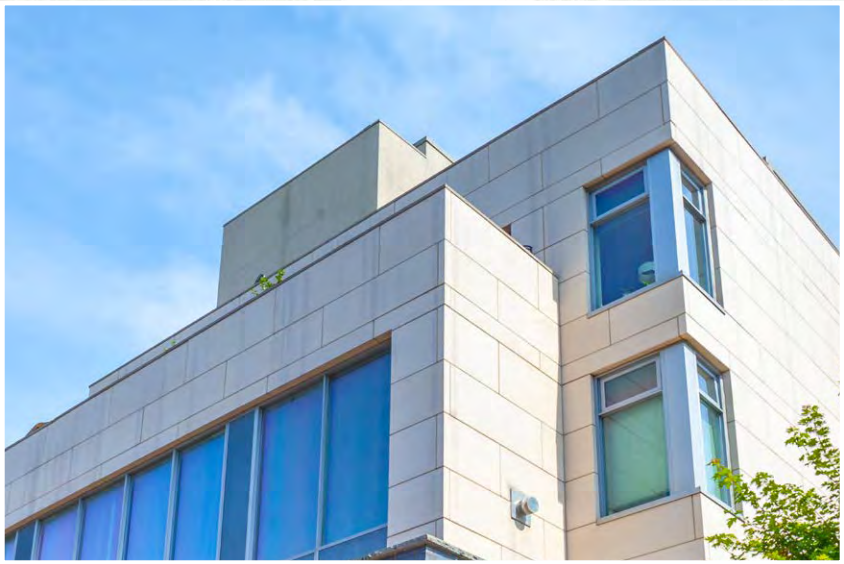
Stone Lamina Composite Panels can be used in a variety of design concepts that incorporate stone panels cut at unusual angles or mounted in technically challenging positions. The ability to have panel cut-outs allows for the use of round windows or protruding accent components. The only limitation is the imagination when it comes to what can be done with Stone Lamina Composite Panels.



Project Galleries

Toronto, Ontario

stone lamina



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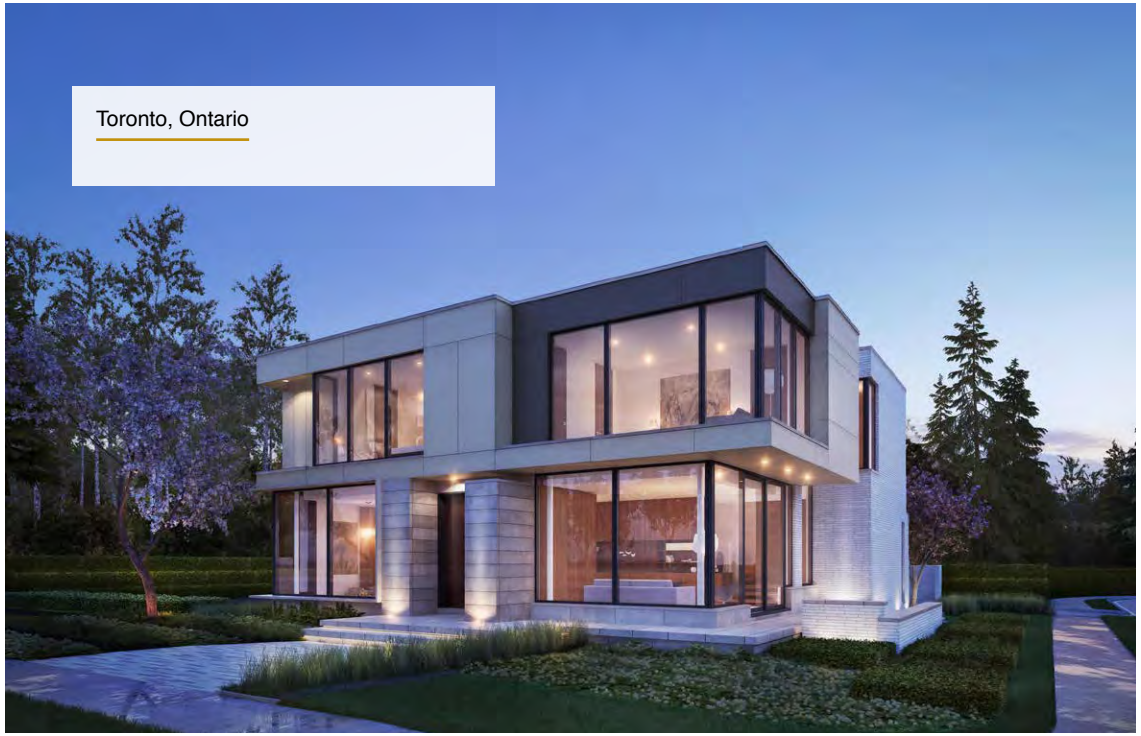
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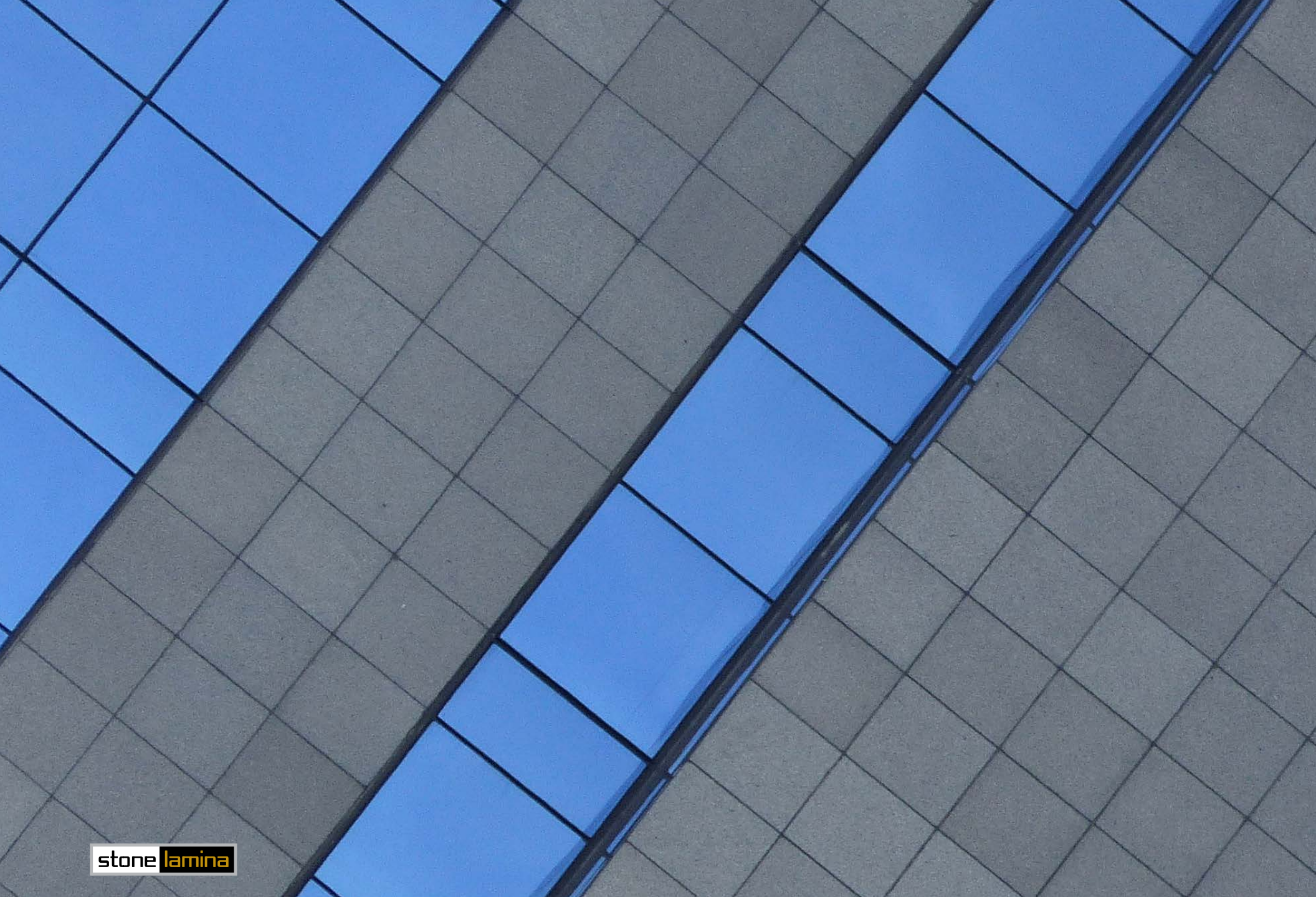
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Toronto, Ontario

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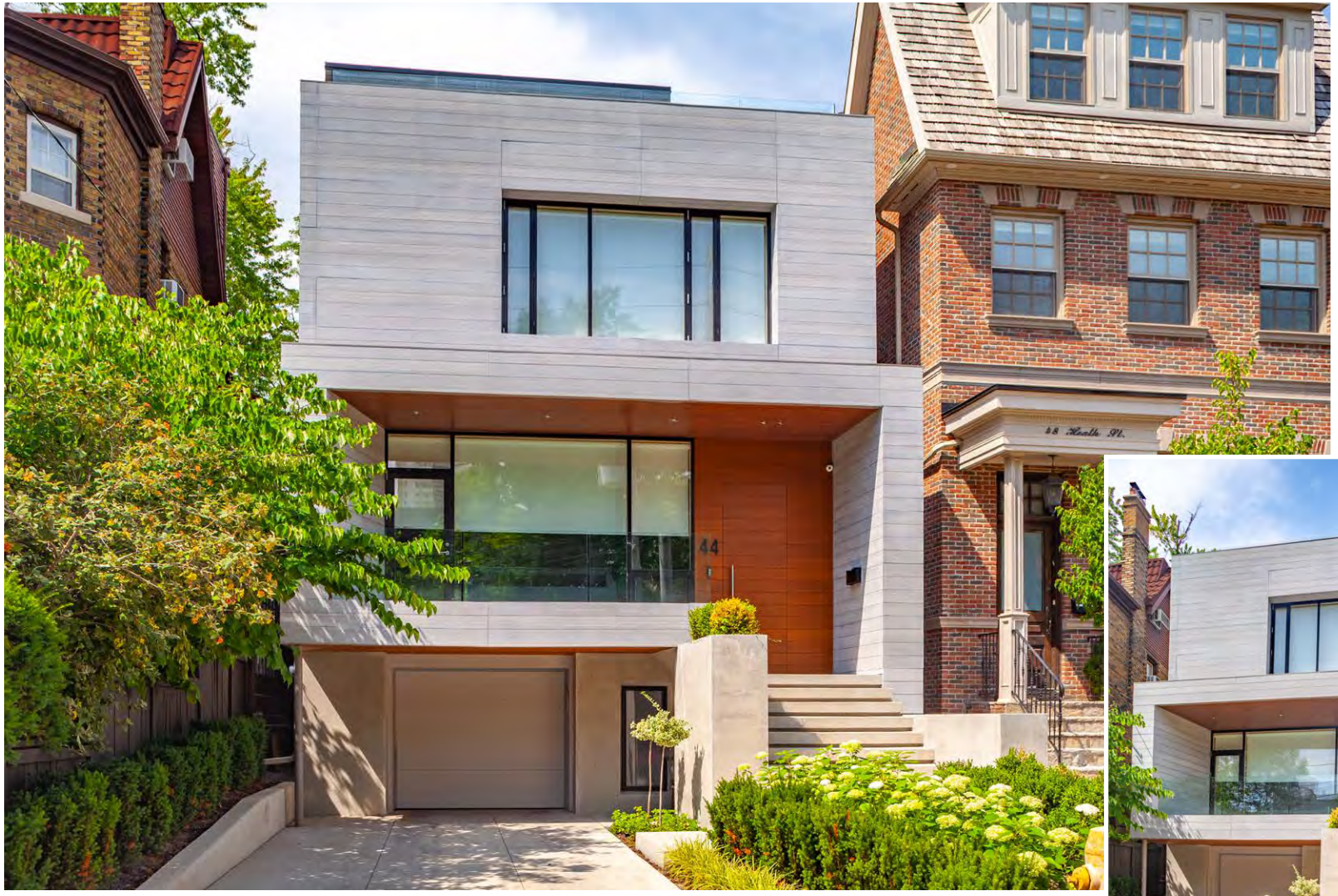

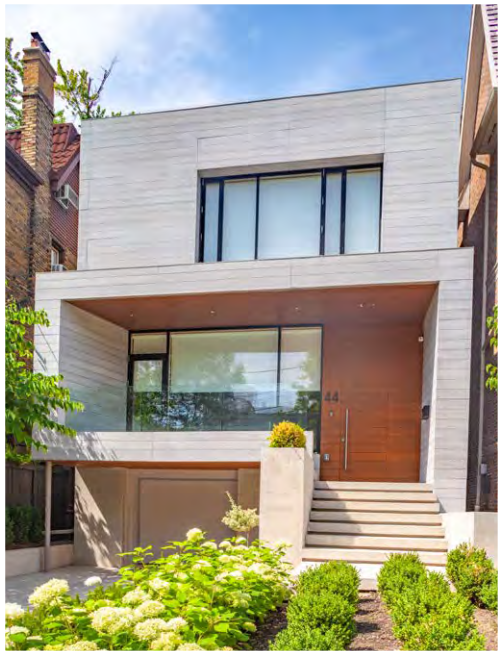

Toronto, Ontario

Consulting Services

Stone Lamina is not just about products, but also Architects, engineers and field technologists that understand our products, and know how to use them to solve real-world design and construction problems. We can help you with everything from complex design challenges, to never-been-done-before design concepts, to achieving demanding construction budgets. With more than 20+ years of application experience, we can help you with planning, budgets, application and project management.

PLANNING STAGES

- Materials Planning
- Detailed Scheduling
- Construction Drawing Support
- Material Specifications

BUDGET ASSESSMENT

- Budget Review
- Ways to reduce Cost
- Detailed Scheduling

APPLICATION SOLUTIONS

- Installation Methods and Analysis
- Materials Solutions
- Performance Quality and Analysis

PROJECT/CONSTRUCTION MANAGEMENT

- Plan, Assess, and report all aspects of the Project until completion
- Oversee the project from the beginning stages until it is completed

APPENDIX


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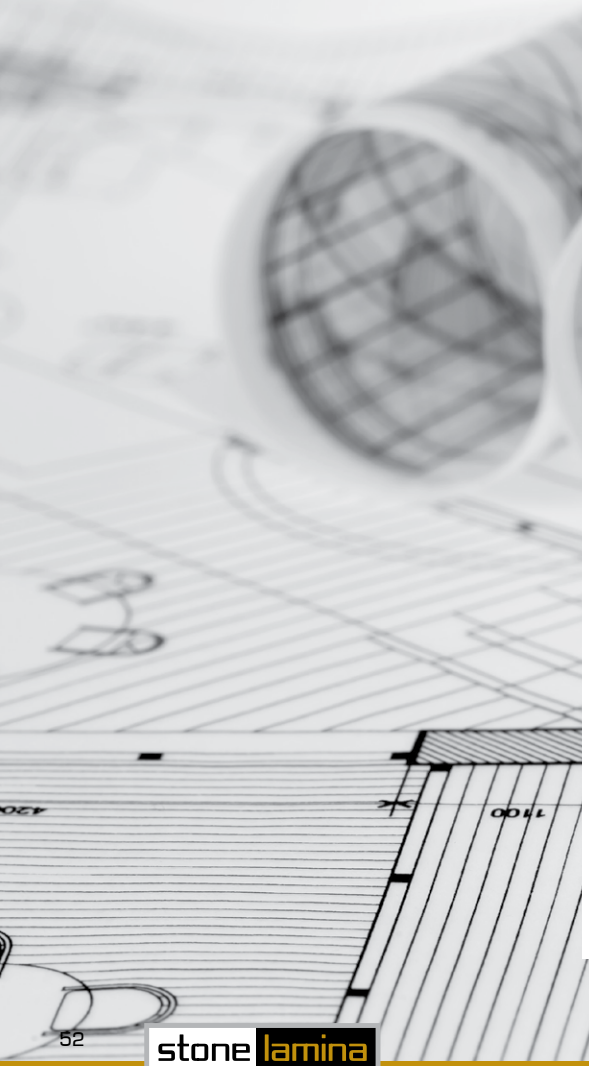
+3,260
+2,070
dormer
10800
11600

APPENDIX 01



TECHNICAL DRAWINGS

SL- 01 TYPICAL ATTACHMENT DETAILS

SL- 02 TYPICAL WIDE INTERLOCKING CHANNEL

SL- 03 TYPICAL WIDE INTERLOCKING CHANNEL WITH THERMALLY BROKEN BRACKET

SL- 04 TYPICAL NARROW INTERLOCKING CHANNEL

SL- 05 TYPICAL WIDE INTERLOCKING JOINT CHANNEL

SL- 06 TYPICAL NARROW INTERLOCKING JOINT CHANNEL

SL- 07 HORIZONTAL REVEAL SECTION

SL- 08 INTERLOCKING CHANNEL SOFFIT SECTION

SL- 09 INTERLOCKING CHANNEL SYSTEM AT BASE

SL- 10 TYPICAL WINDOW SILL DETAILS

SL- 11 TYPICAL WINDOW HEAD DETAILS

SL- 12 TYPICAL COPING DETAIL

SL- 13 STONE LAMINA CORNICE

SL- 14 ANCHOR PLATE ATTACHMENT

SL- 15 ANCHOR PLATE ATTACHMENT

SL- 16 ANCHOR PLATE WITH HORIZONTAL FURRING

SL- 17 INTERIOR ADHESIVE ATTACHMENT OVER GYPSUM WALLBOARD

SL- 18 INTERIOR STRUCTURAL SILICONE ATTACHMENT OVER STEEL STUD FRAMING / FURRING

SL- 19 ADHESIVE ATTACH OVER EXISTING SURFACE

SL- 20 STONE LAMINA RETURN AT RECESSED SOFFIT

SL- 21 CLIP ATTACHMENT TO ELEVATOR CAB WALL

SL- 22 PRE-PANELIZED STEEL STUD SYSTEM

SL- 23 PRE-PANELIZED SPANDREL CONDITION

SL- 24 PRE-PANELIZED SPANDREL WALL SECTION

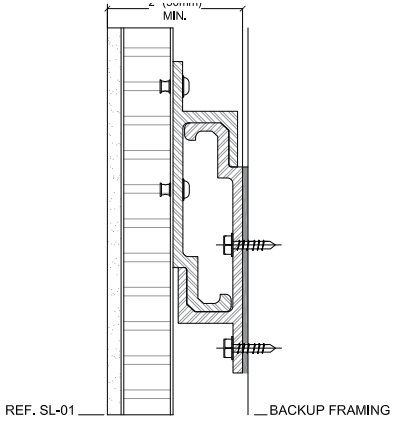
SL- 25 PRE-PANELIZED WALL BYPASSING FLOOR SLAB

SL- 26 EDGE CONDITIONS

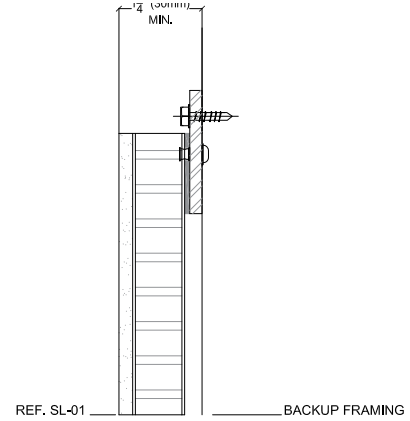
SL- 27 TYPICAL CORNER DETAILS

SL- 28 GLAZED-IN DETAIL

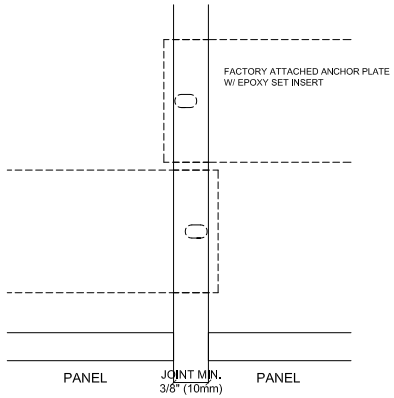
TYPICAL ATTACHMENT DETAILS



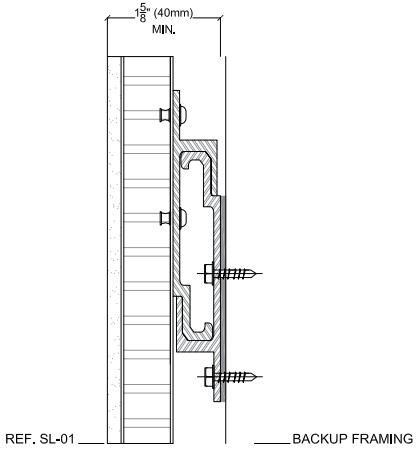
WIDE INTERLOCKING CHANNEL SYSTEM
Interior or Exterior Application



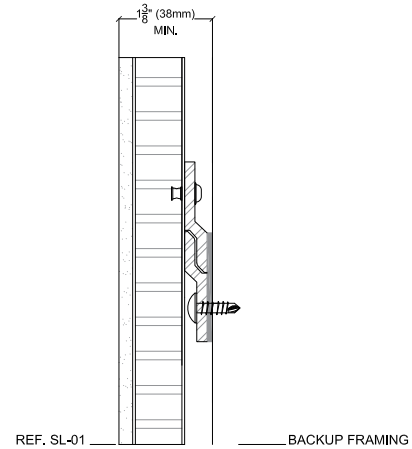
ANCHOR PLATE SYSTEM
Interior or Exterior Application



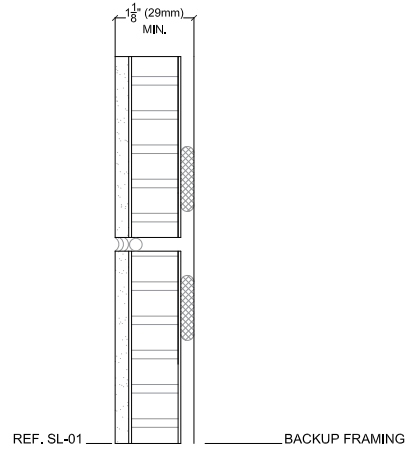
ANCHOR PLATE ELEVATION



NARROW INTERLOCKING CHANNEL SYSTEM

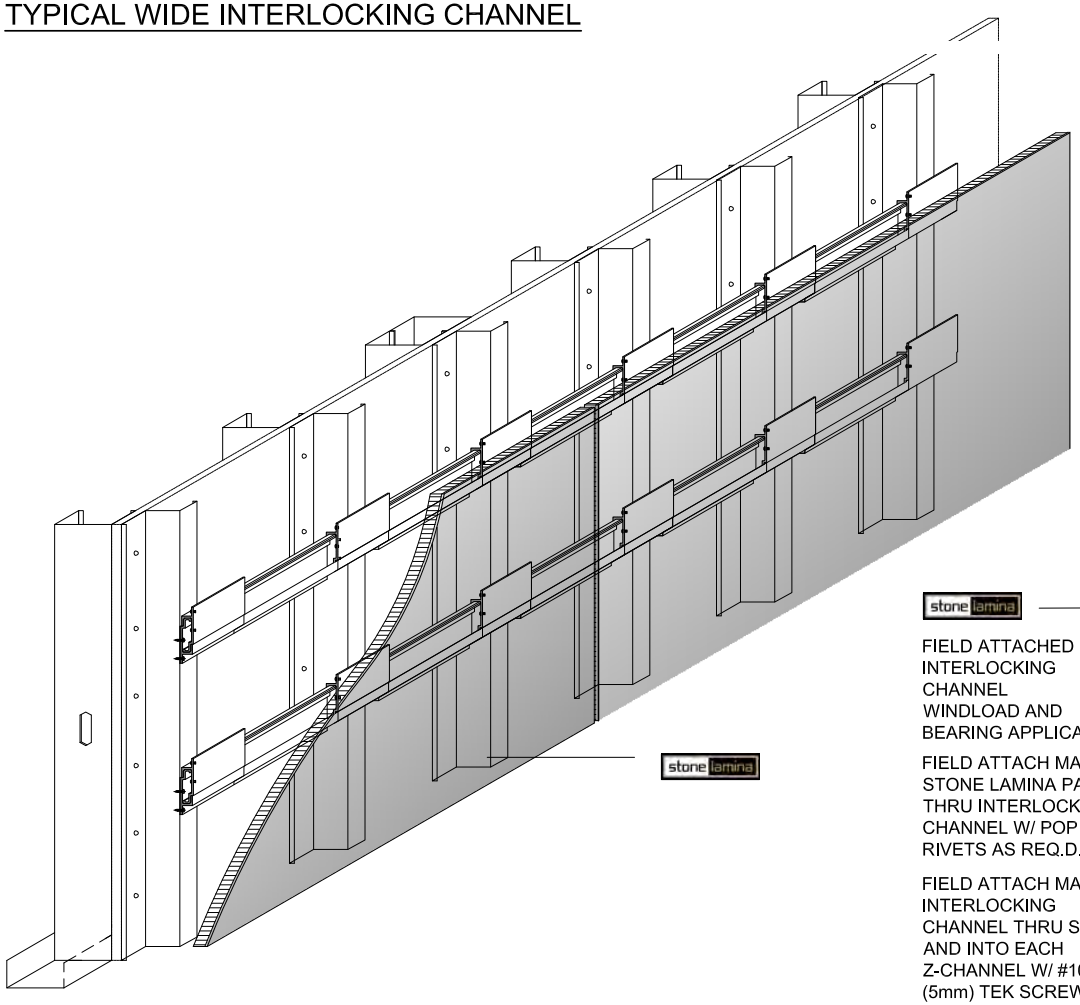


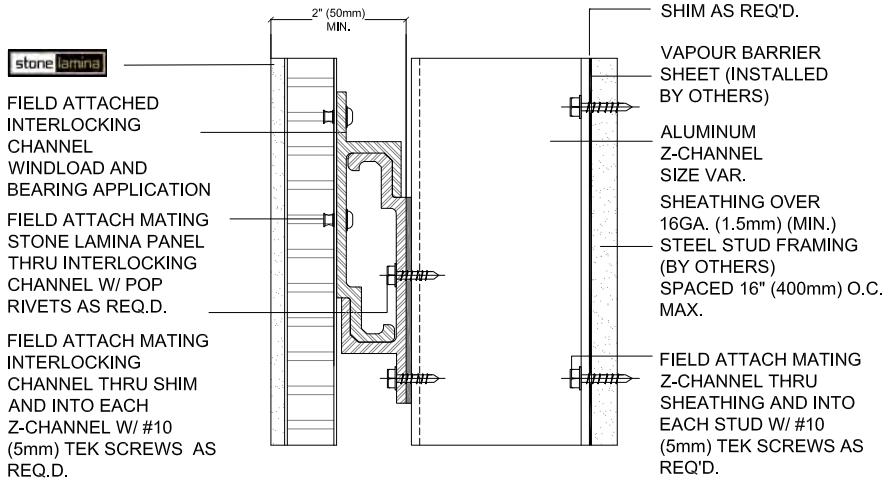
Z-CLIP ATTACHMENT SYSTEM
Elevator Cab Application



ADHESIVE ATTACHMENT SYSTEM
Interior Application

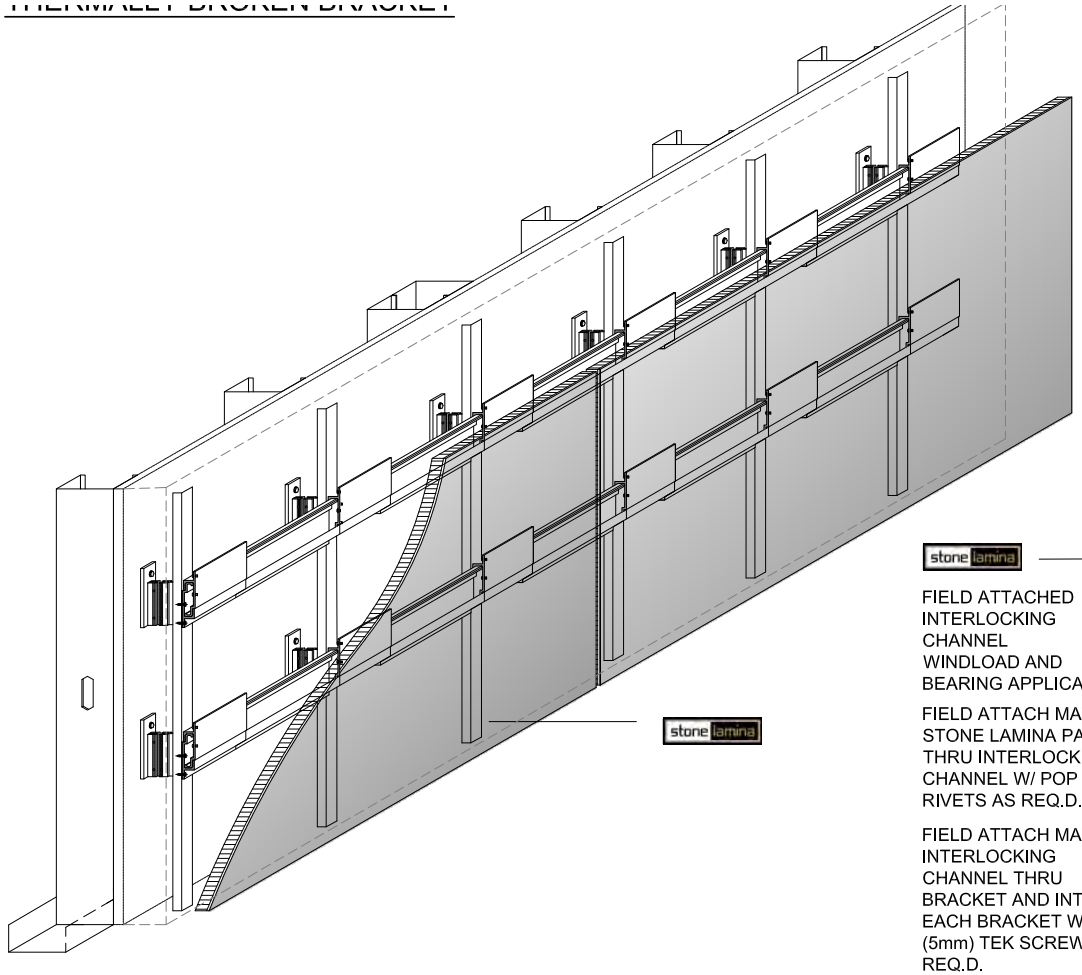
TYPICAL WIDE INTERLOCKING CHANNEL

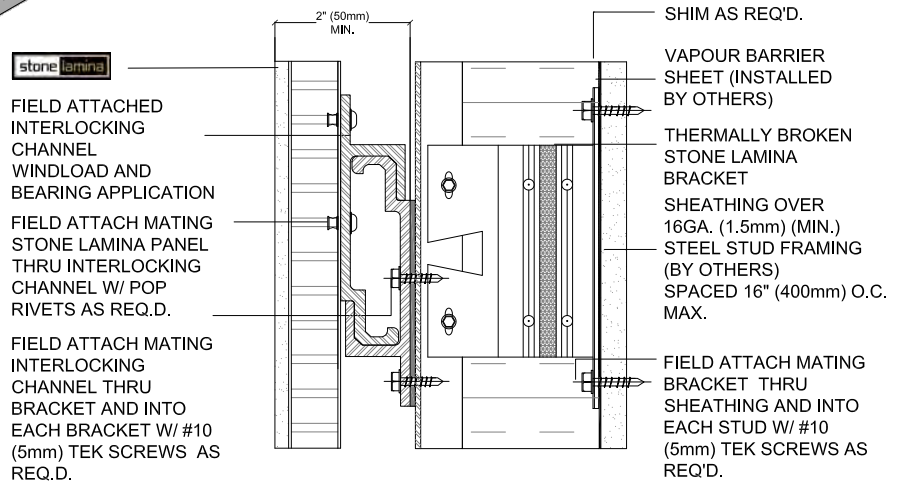




SL-02

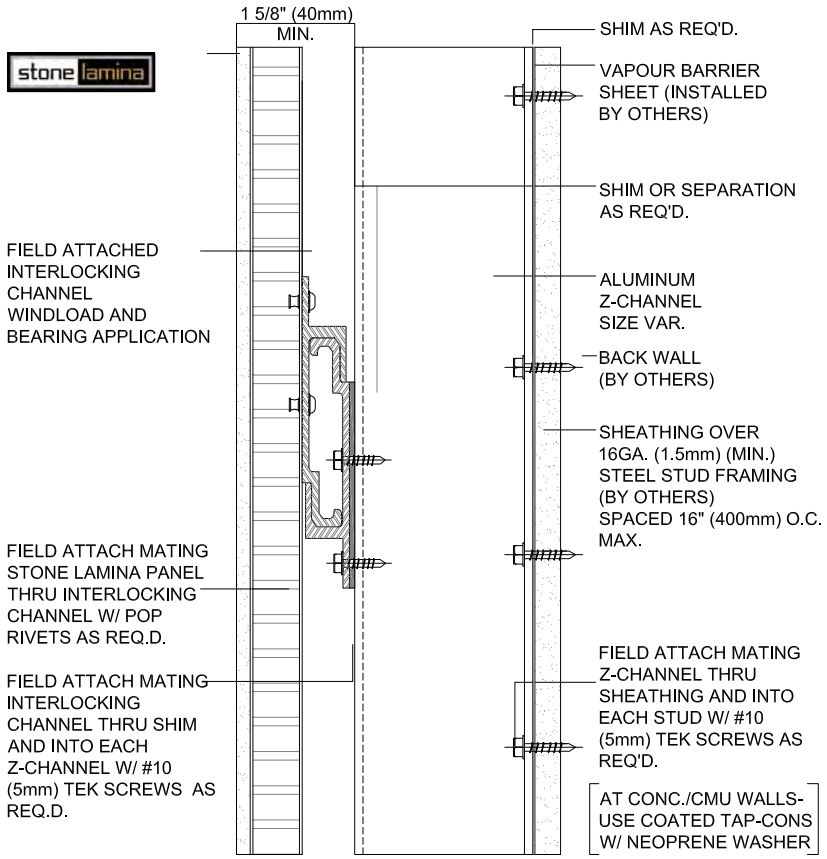
TYPICAL WIDE INTERLOCKING CHANNEL WITH THERMALLY BROKEN BRACKET



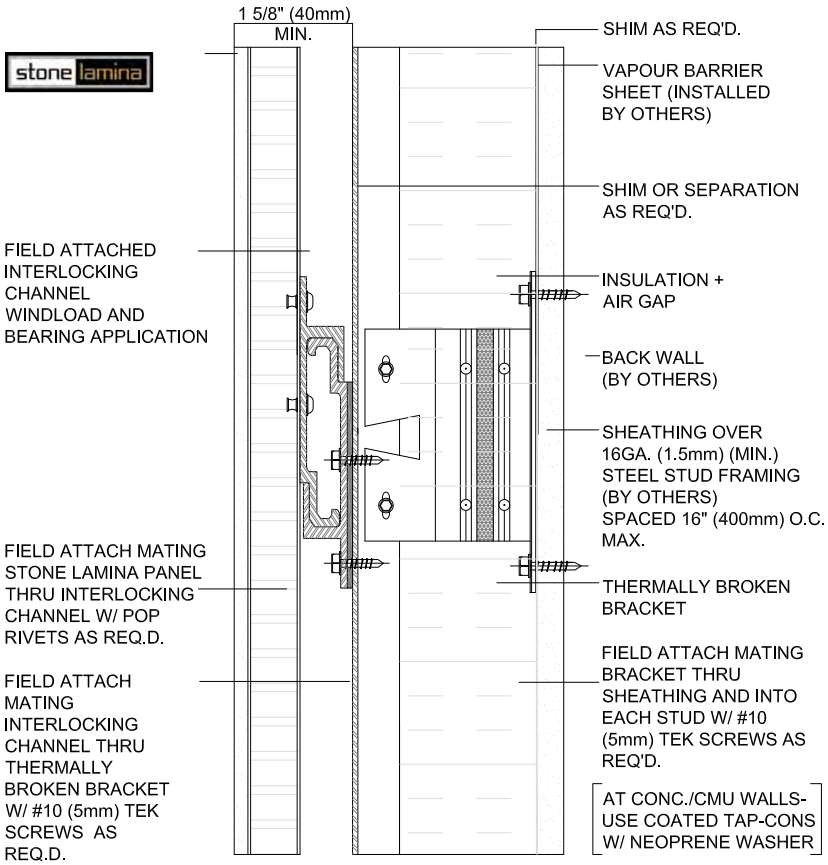


SL-03

TYPICAL NARROW INTERLOCKING CHANNEL

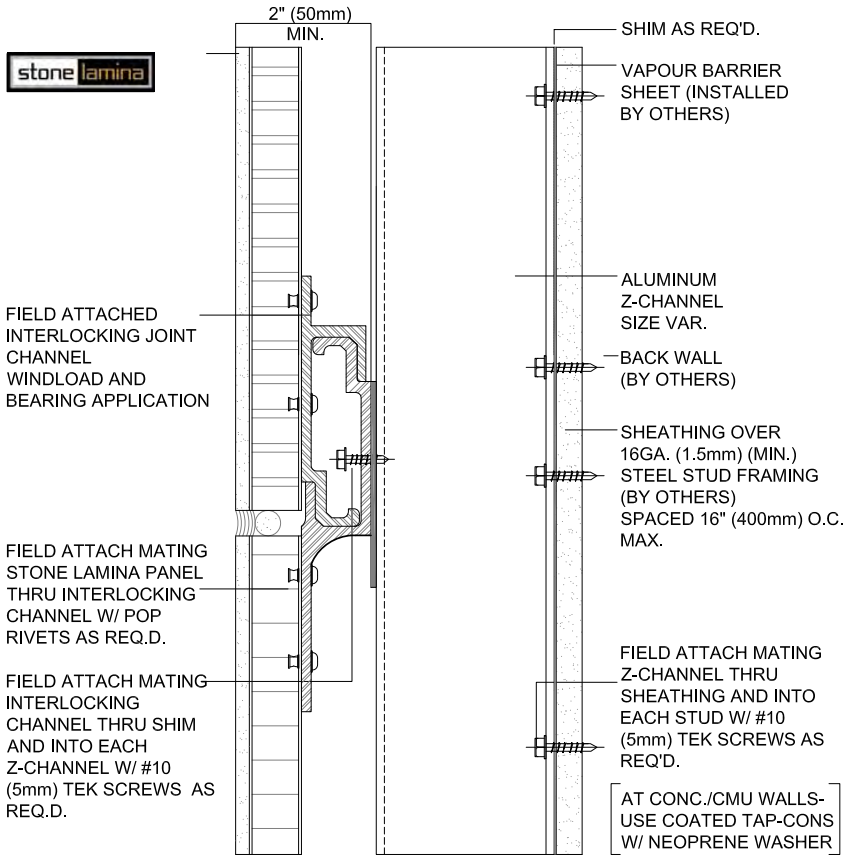


TYPICAL NARRO

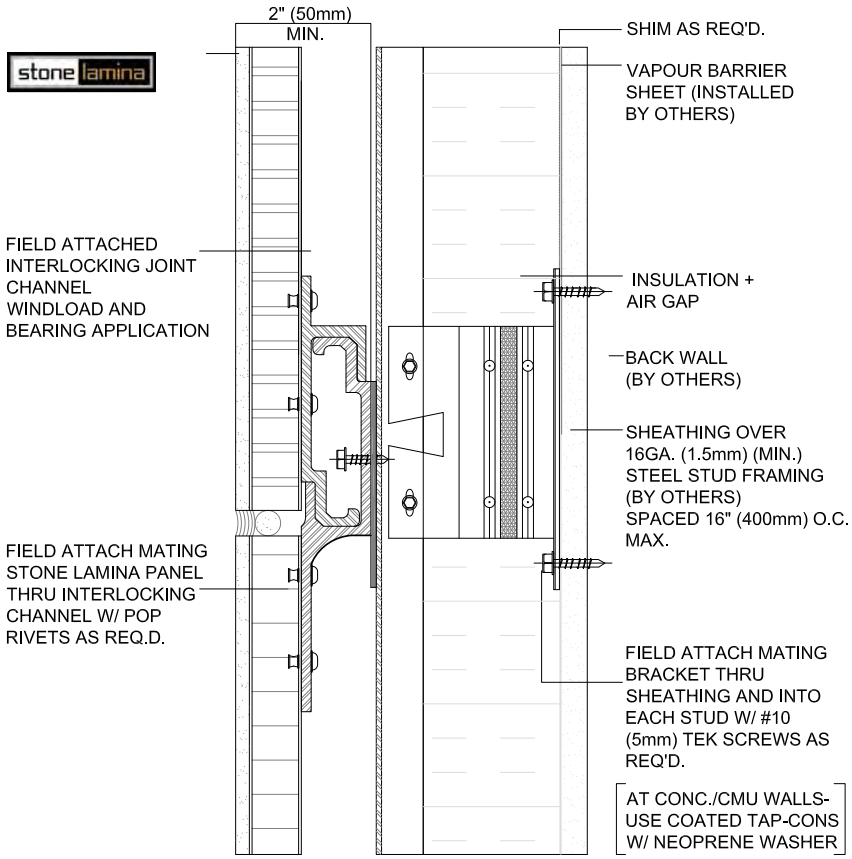


SL-04

TYPICAL WIDE INTERLOCKING JOINT CHANNEL

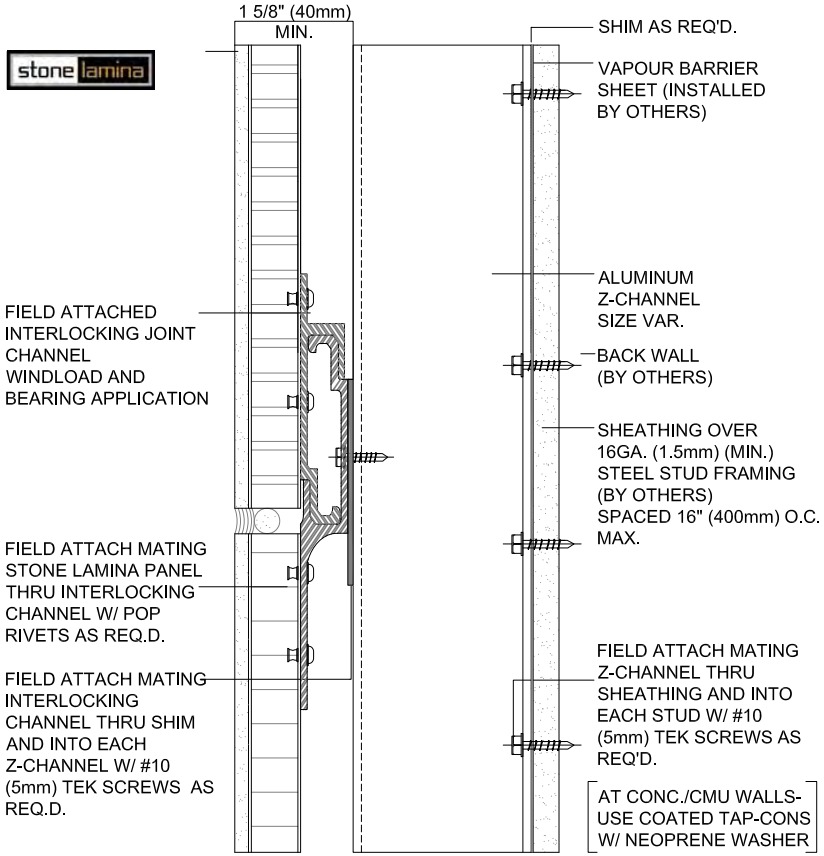


TYPICAL WIDE IN WITH THERMAL

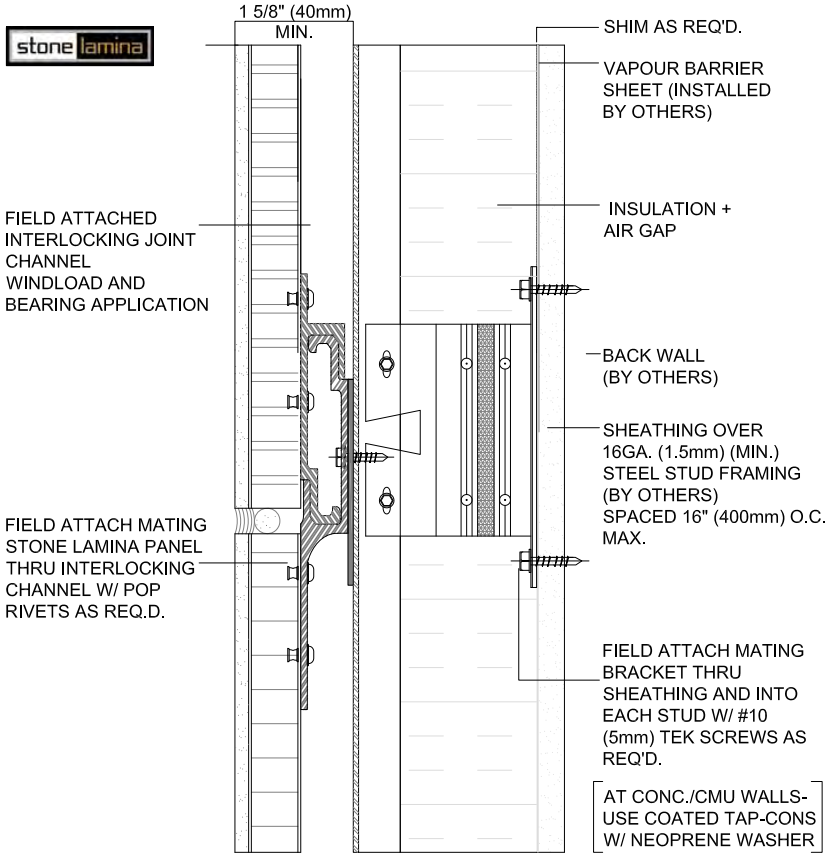


SL-05

TYPICAL NARROW INTERLOCKING JOINT CHANNEL

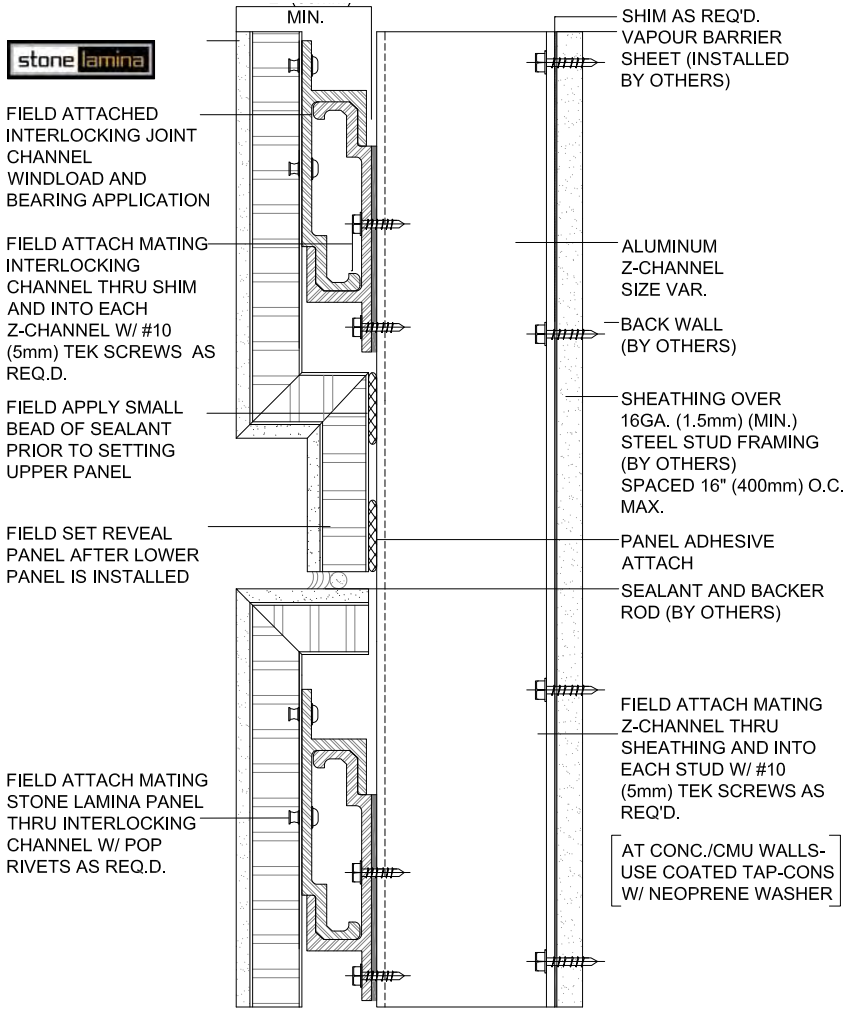


TYPICAL NARROW CHANNEL WITH TH

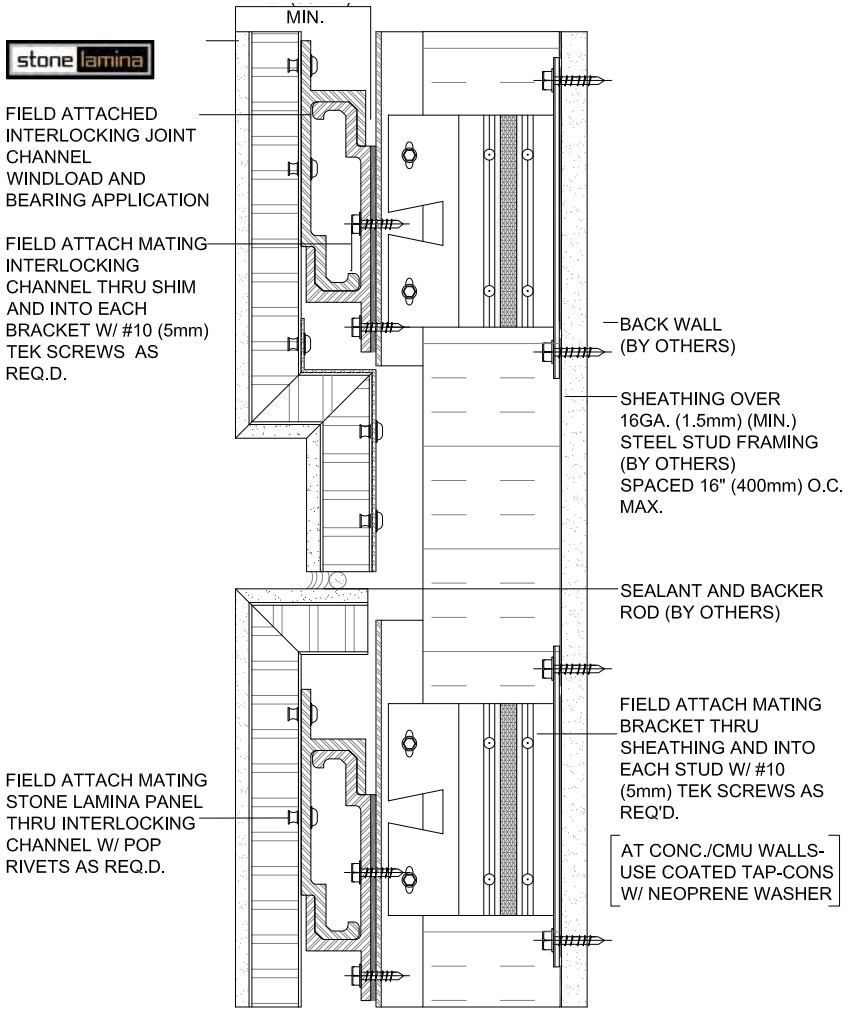


SL-06

HORIZONTAL REVEAL SECTION

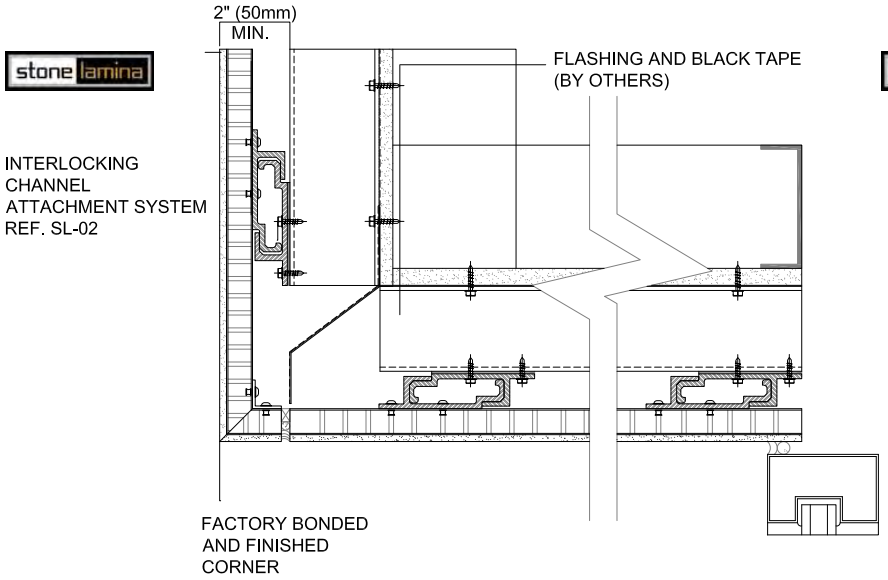


HORIZONTAL REVEAL SECTION WITH T

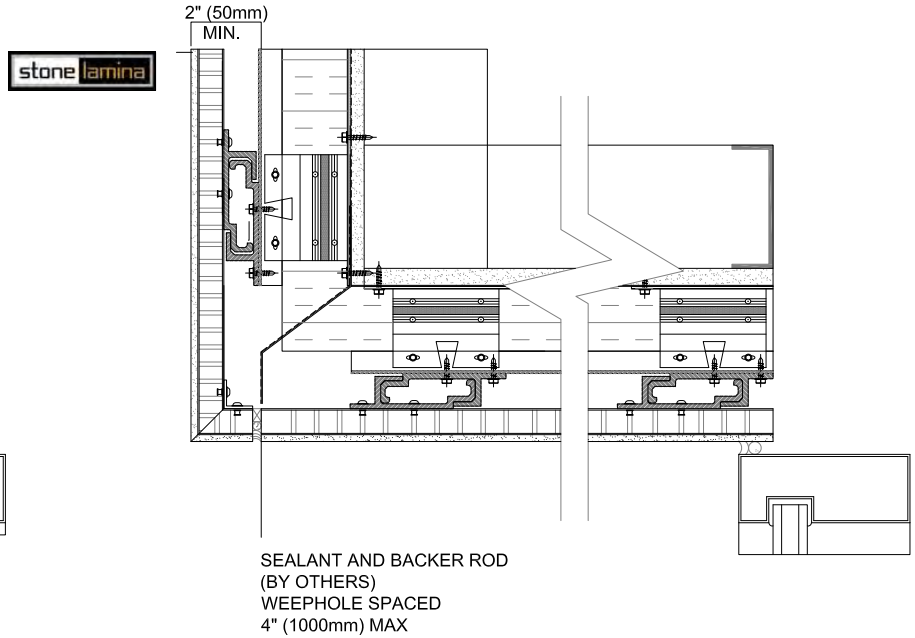


SL-07

INTERLOCKING CHANNEL SOFFIT SECTION



INTERLOCKING CHAN

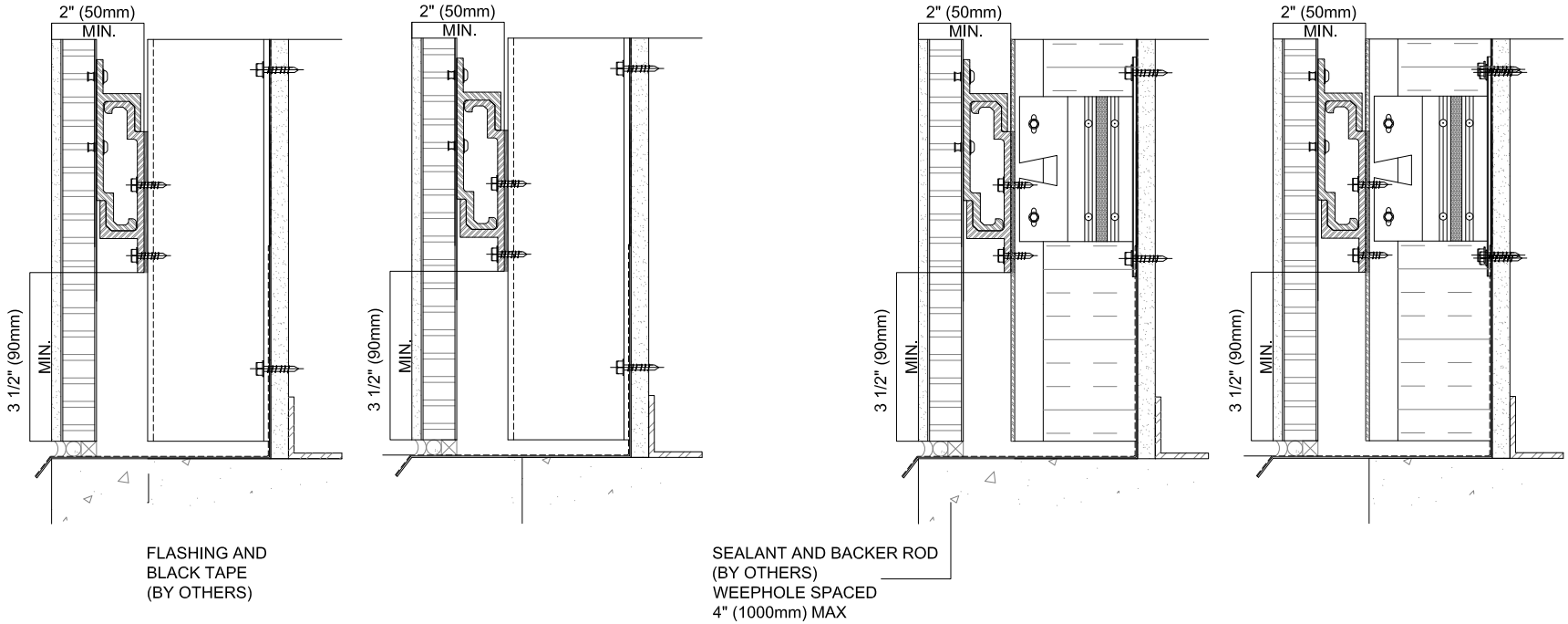


SL-08

INTERLOCKING CHANNEL SYSTEM AT BASE

INTERLOCKING CHANNEL SY

WITH THERMALLY BROKEN B[illegible]



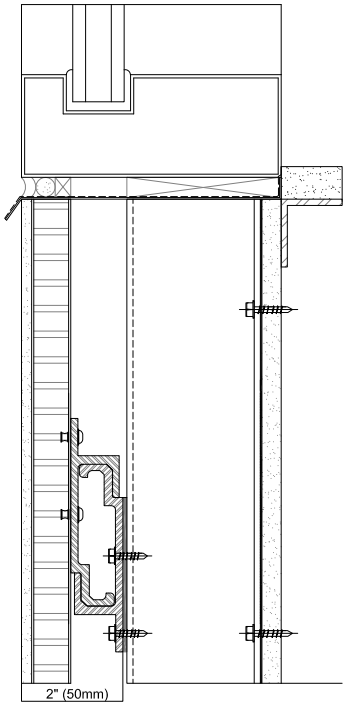
FLUSH SLAB

RECESSED SLAB

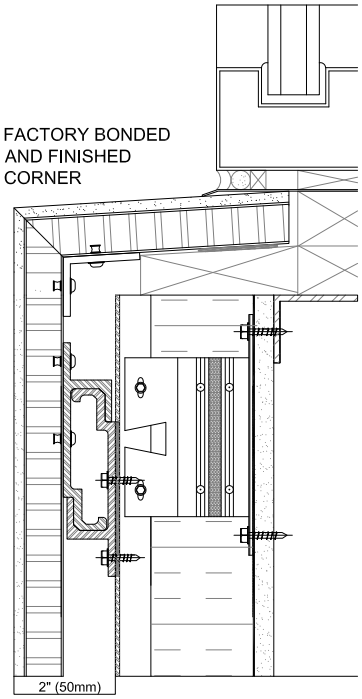
FLUSH SLAB

RECESSED SLAB

TYPICAL WINDOW SILL

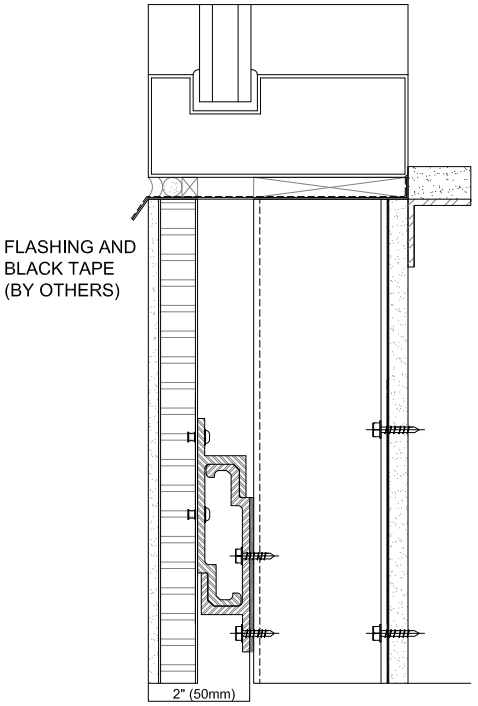


FLUSH WINDOW SILL

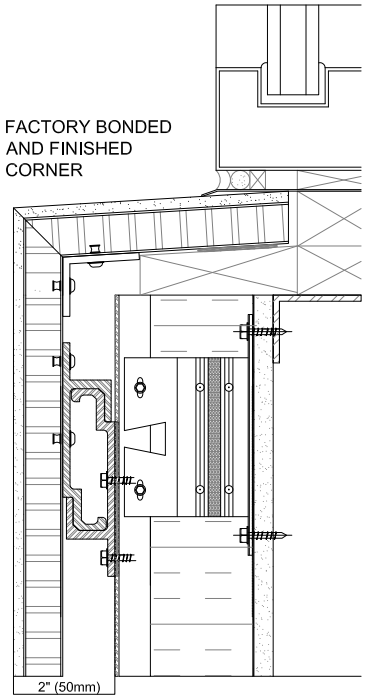


RECESSED WINDOW SILL

TYPICAL WINDOW SII
BROKEN BRACKET



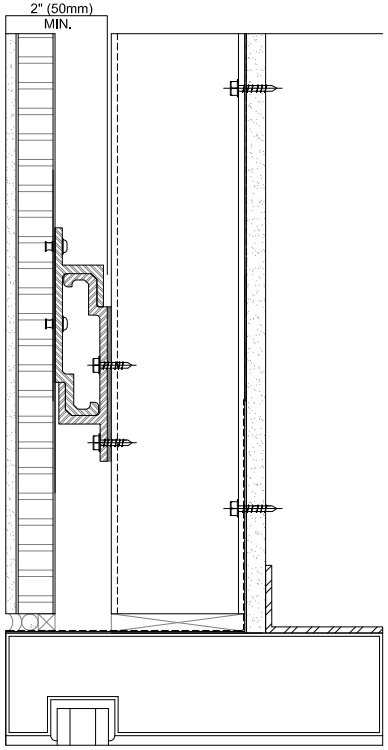
FLUSH WINDOW SILL



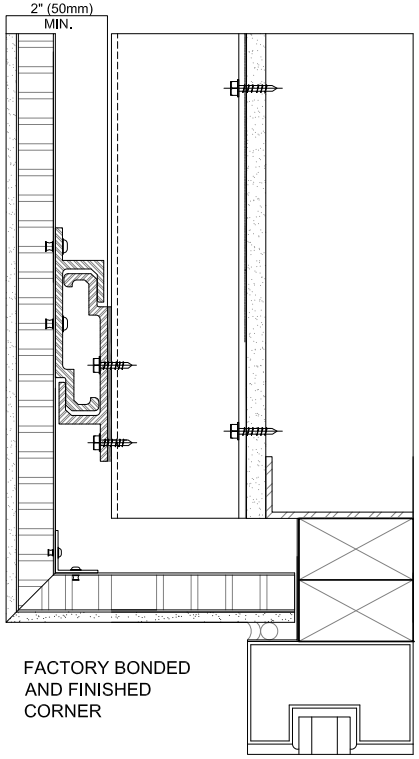
RECESSED WINDOW SILL

SL-10

TYPICAL WINDOW HEAD

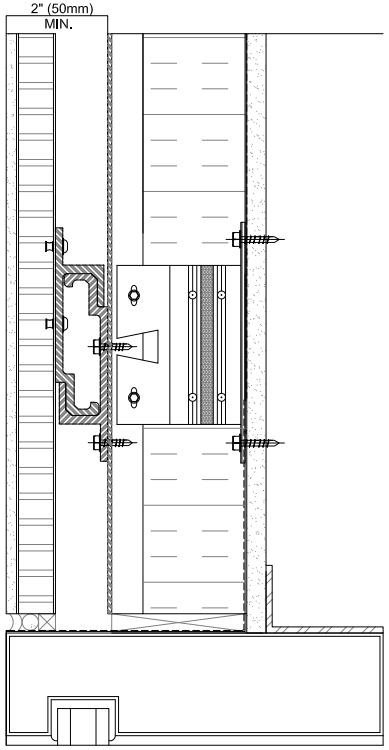


FLUSH WINDOW HEAD

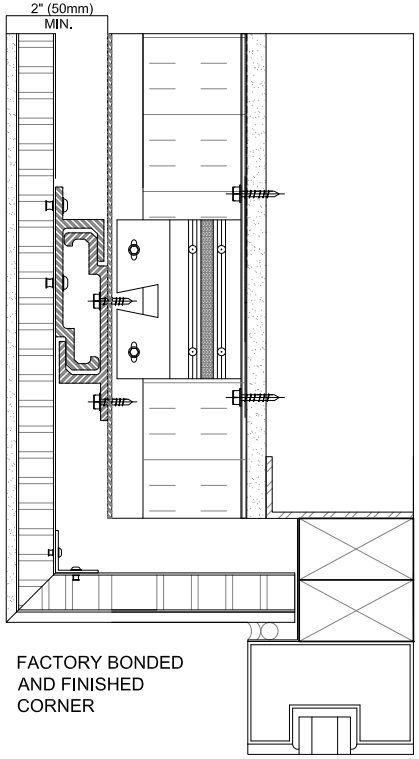


RECESSED WINDOW HEAD

TYPICAL WINDOW HE
BROKEN BRACKET

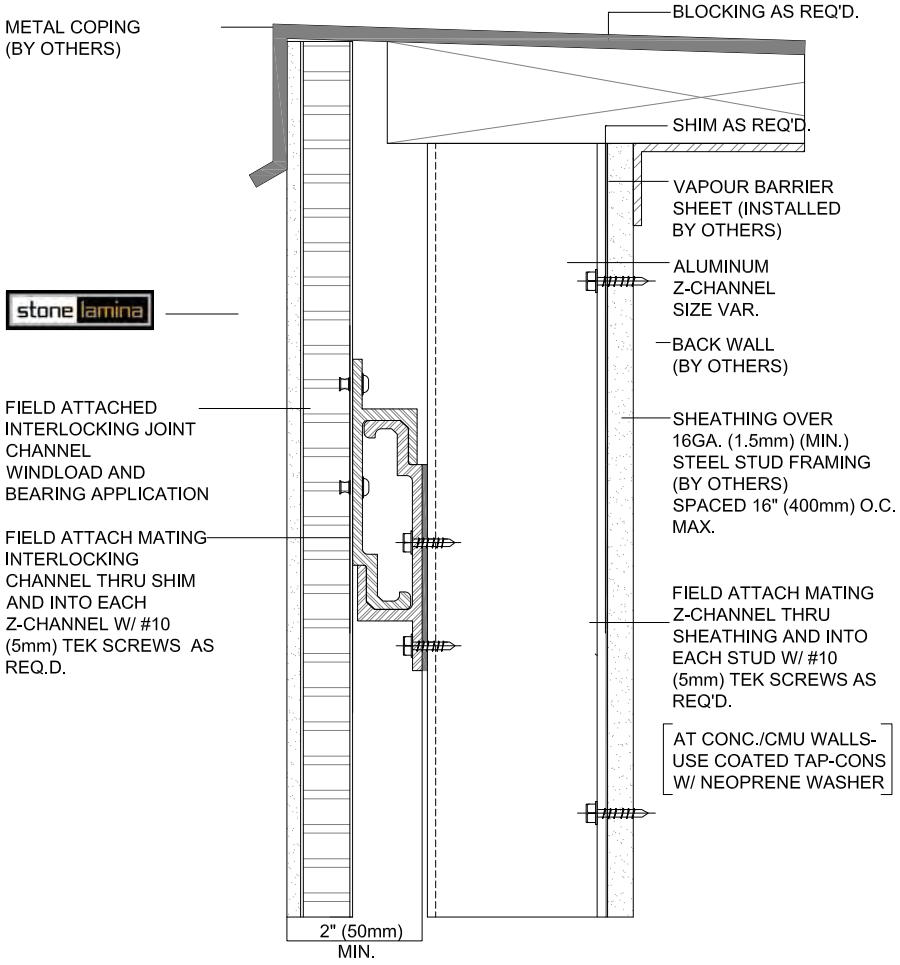


FLUSH WINDOW HEAD

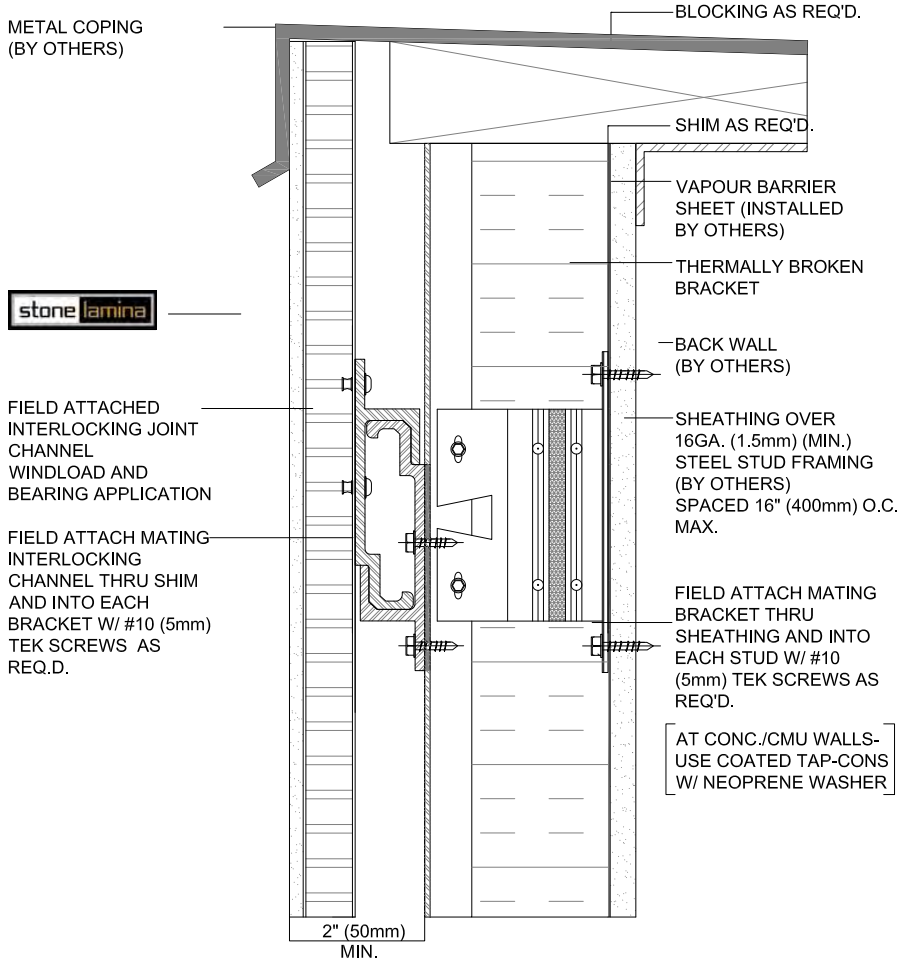


RECESSED WINDOW HEAD

TYPICAL COPING DETAIL

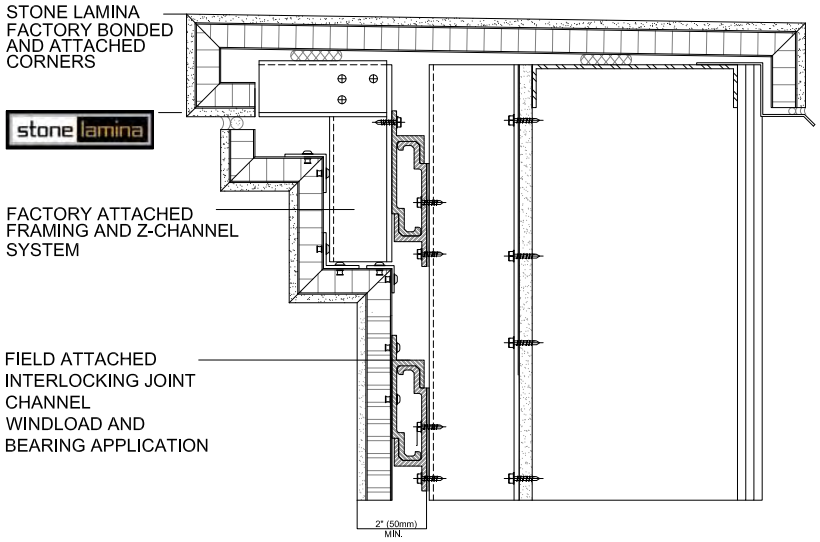


TYPICAL COPING DE
BROKEN BRACKET

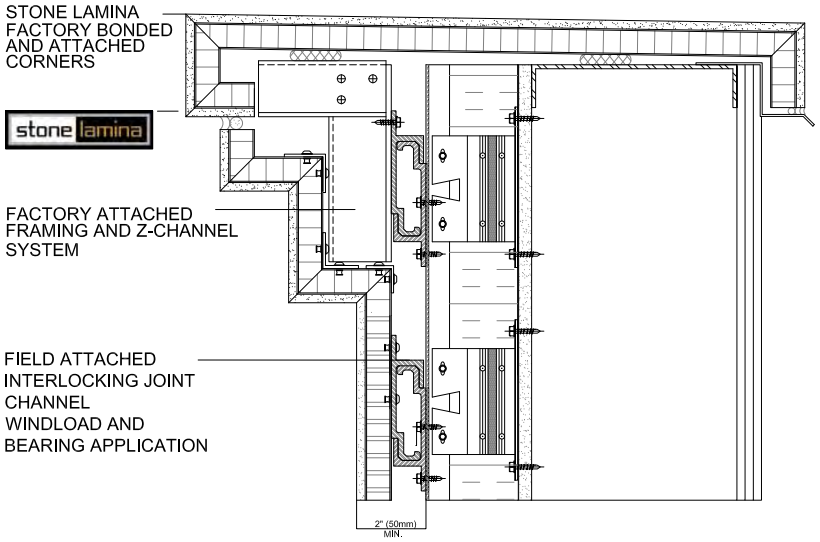


SL-12

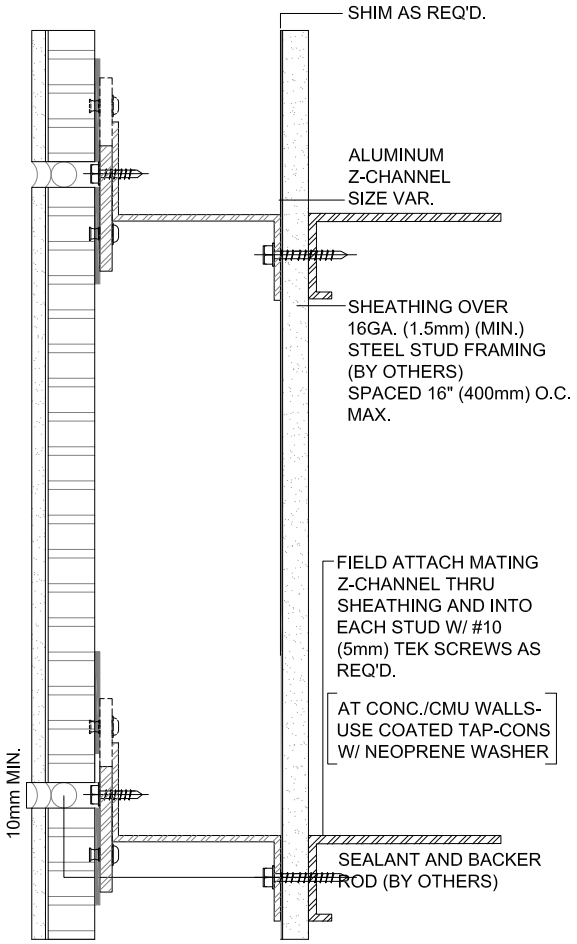
STONE LAMINA CORNICE

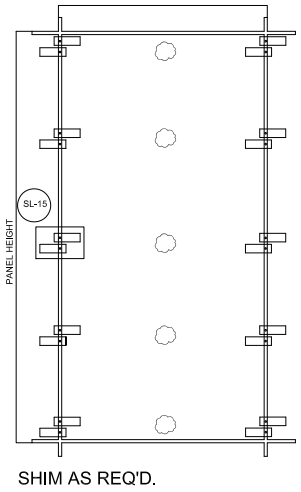


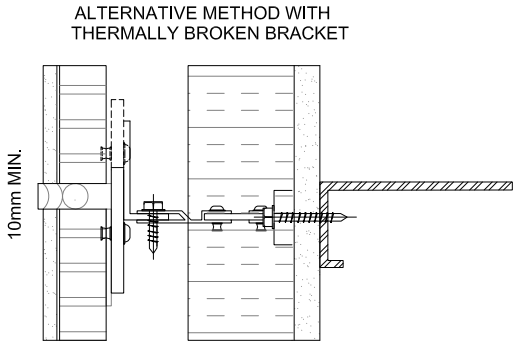
STONE LAMINA CORNICE WITH THERM

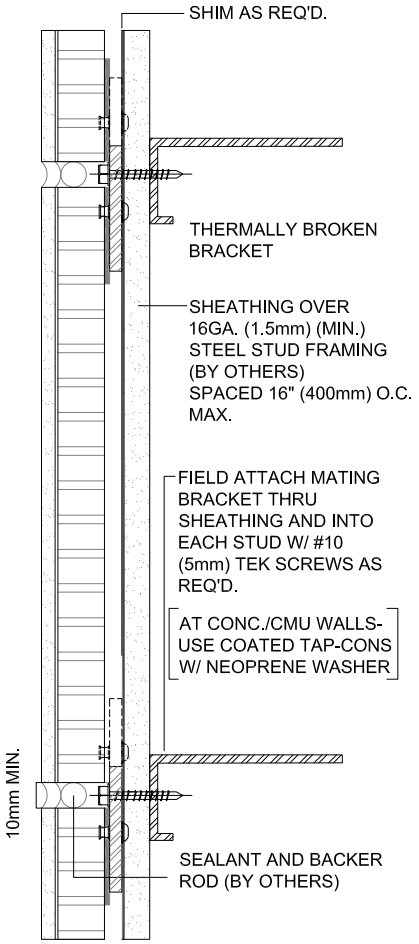


ANCHOR PLATE ATTACHMENT



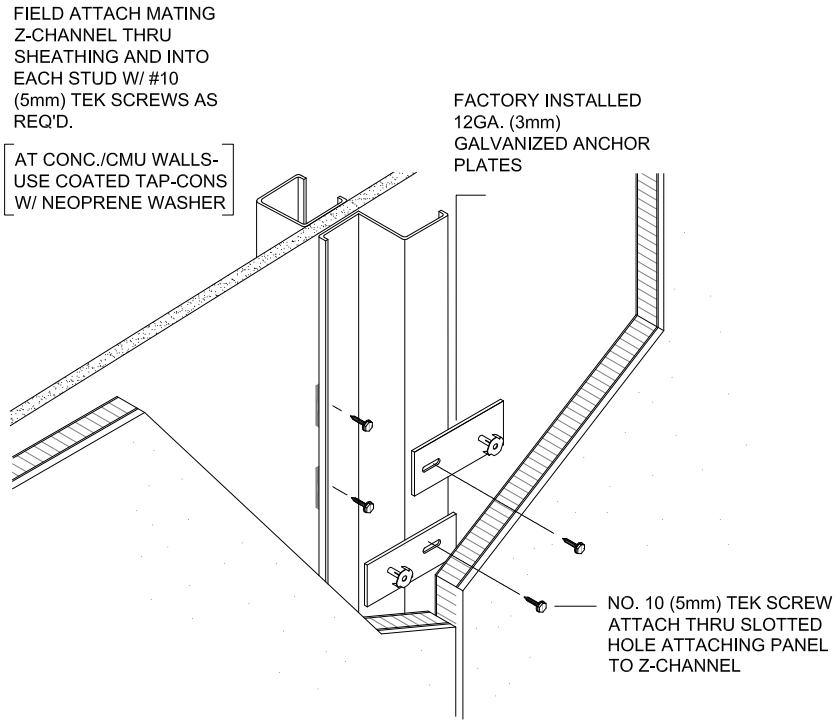




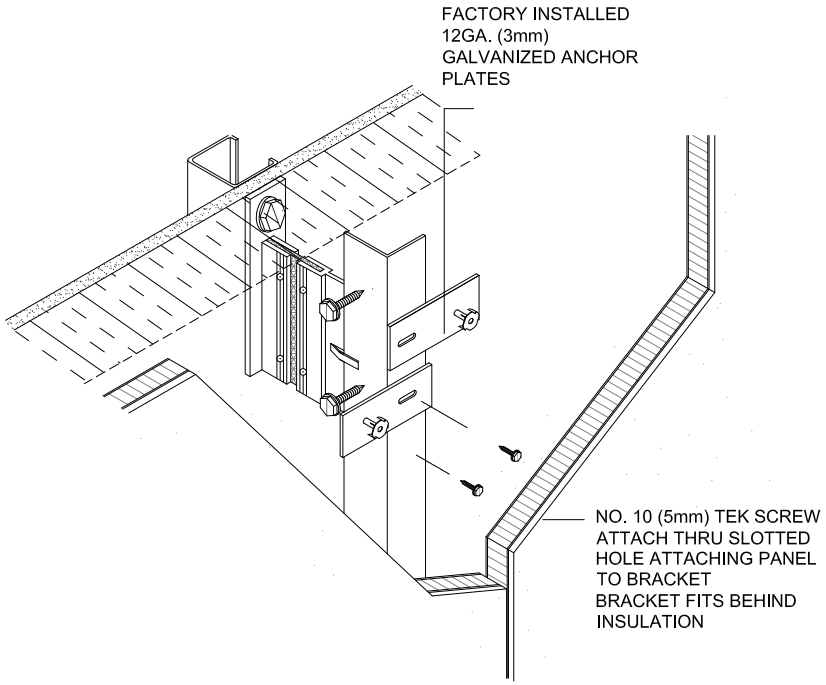


SL-14

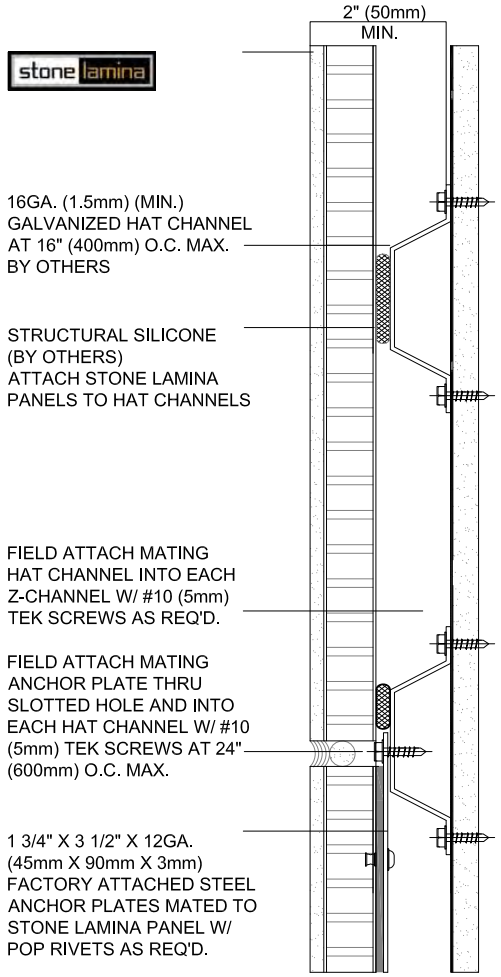
ANCHOR PLATE ATTACHMENT



ANCHOR PLATE ATTACHMENT WITH TH

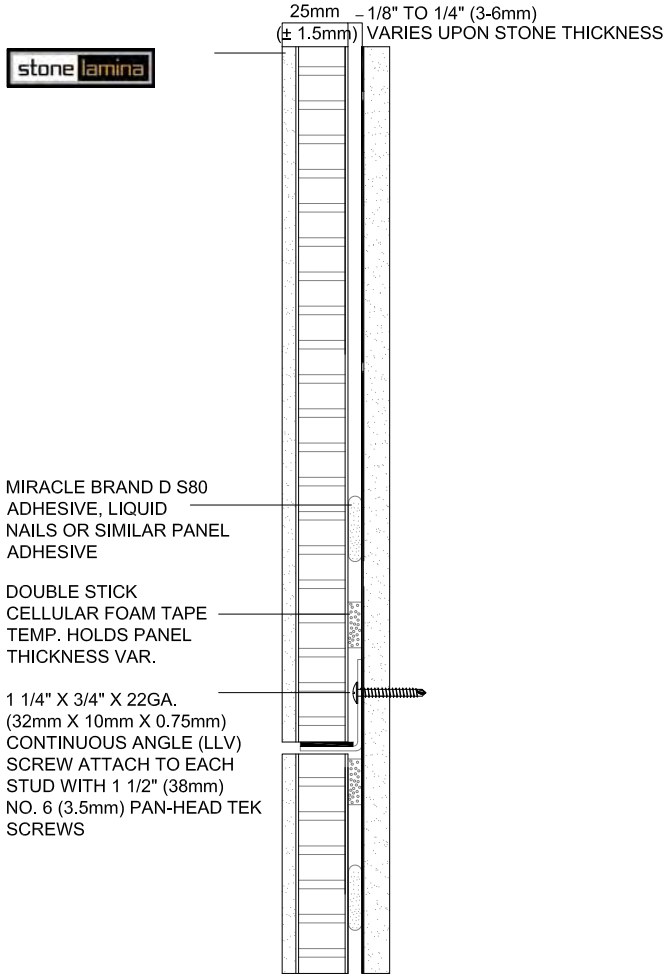


ANCHOR PLATE WITH HORIZONTAL FURRING

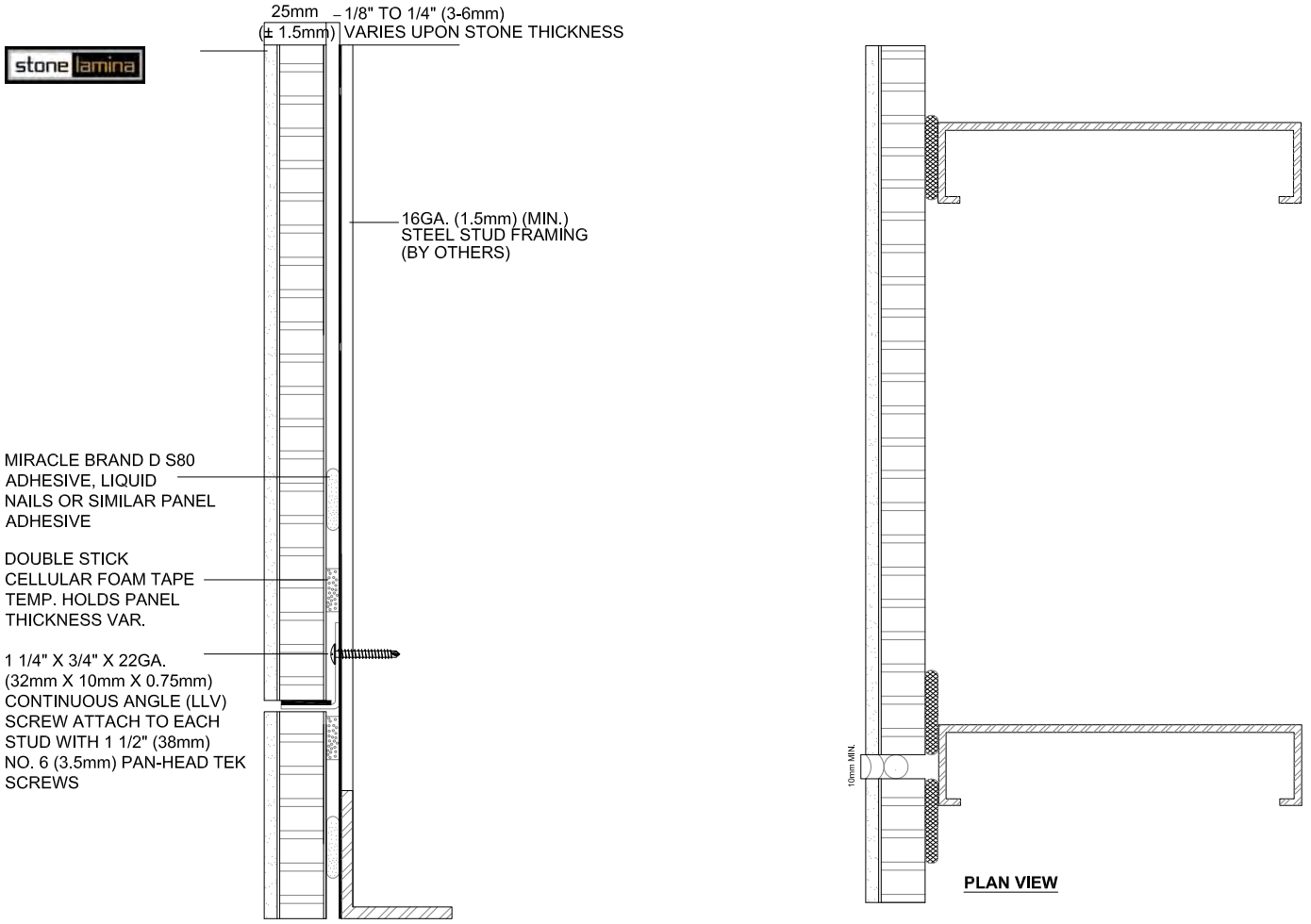


SL-16

INTERIOR ADHESIVE ATTACHMENT OVER GYPSUM WALLBOARD

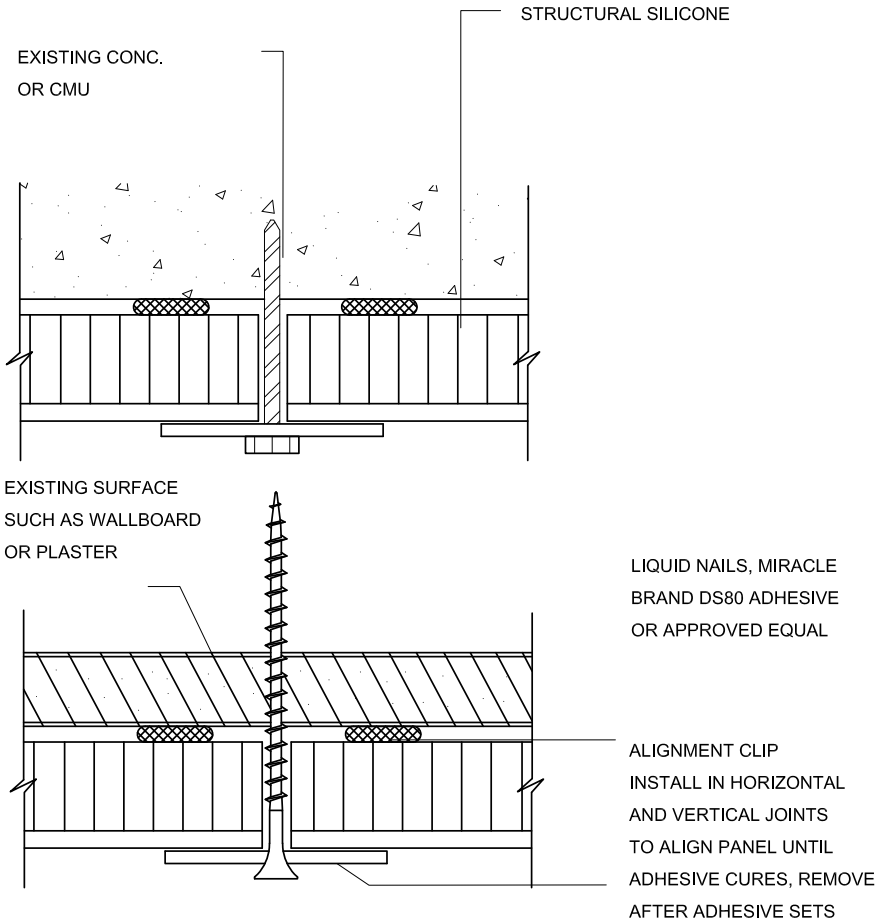


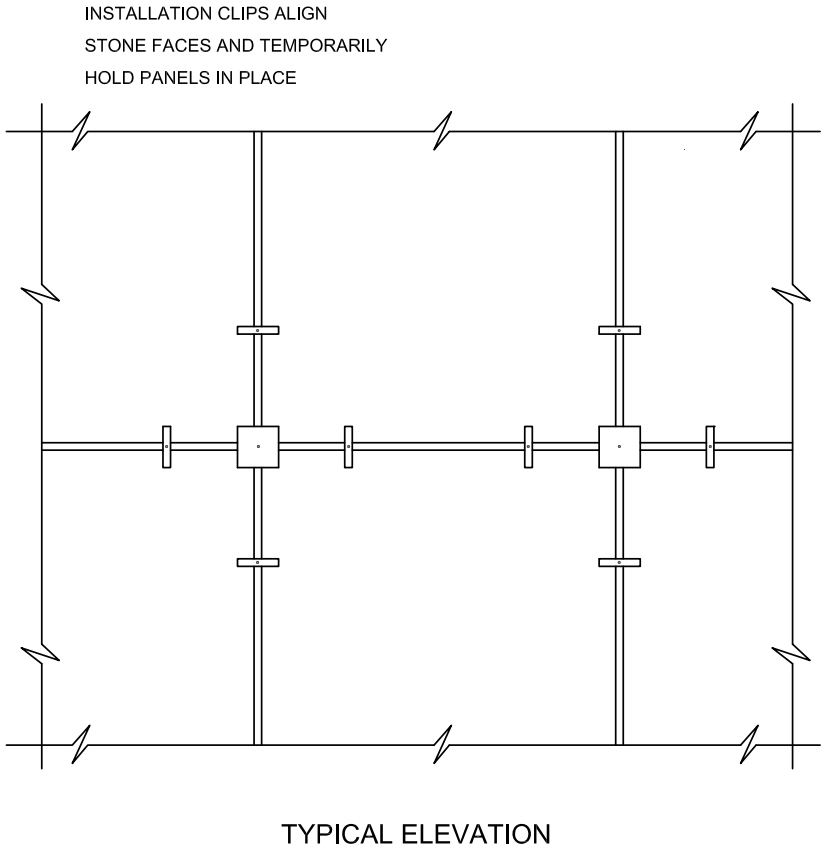
INTERIOR STRUCTURAL SILICONE ATTACHMENT OVER STEEL FRAMING/FURRING



SL-18

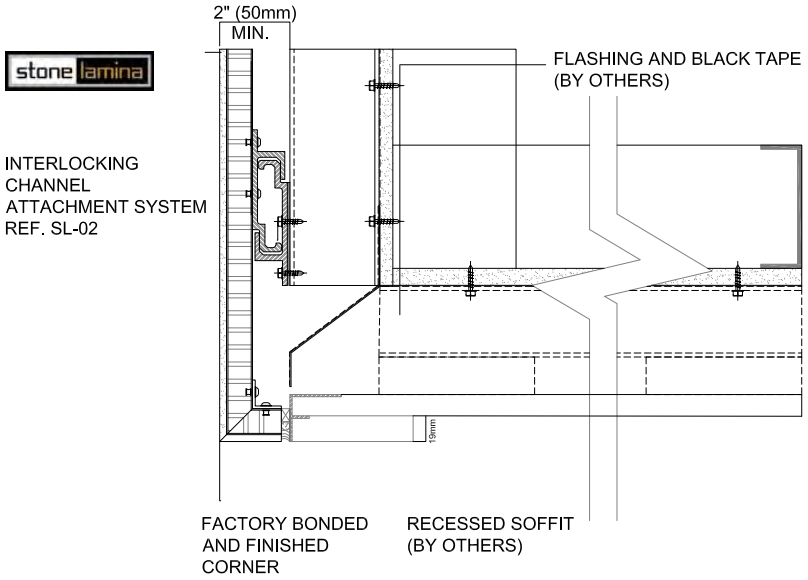
ADHESIVE ATTACHMENT OVER EXISTING SURFACE



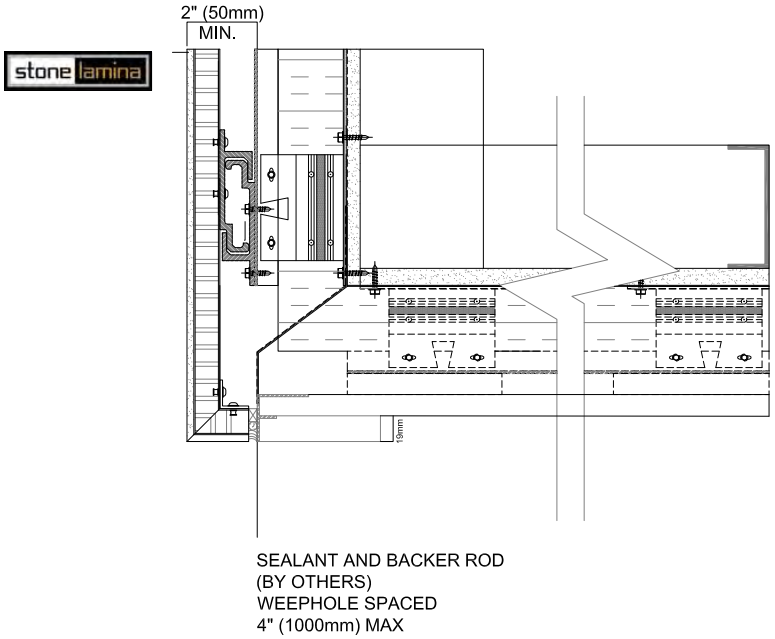


TYPICAL ELEVATION

STONE LAMINA RETURN AT RECESSED SOFFIT

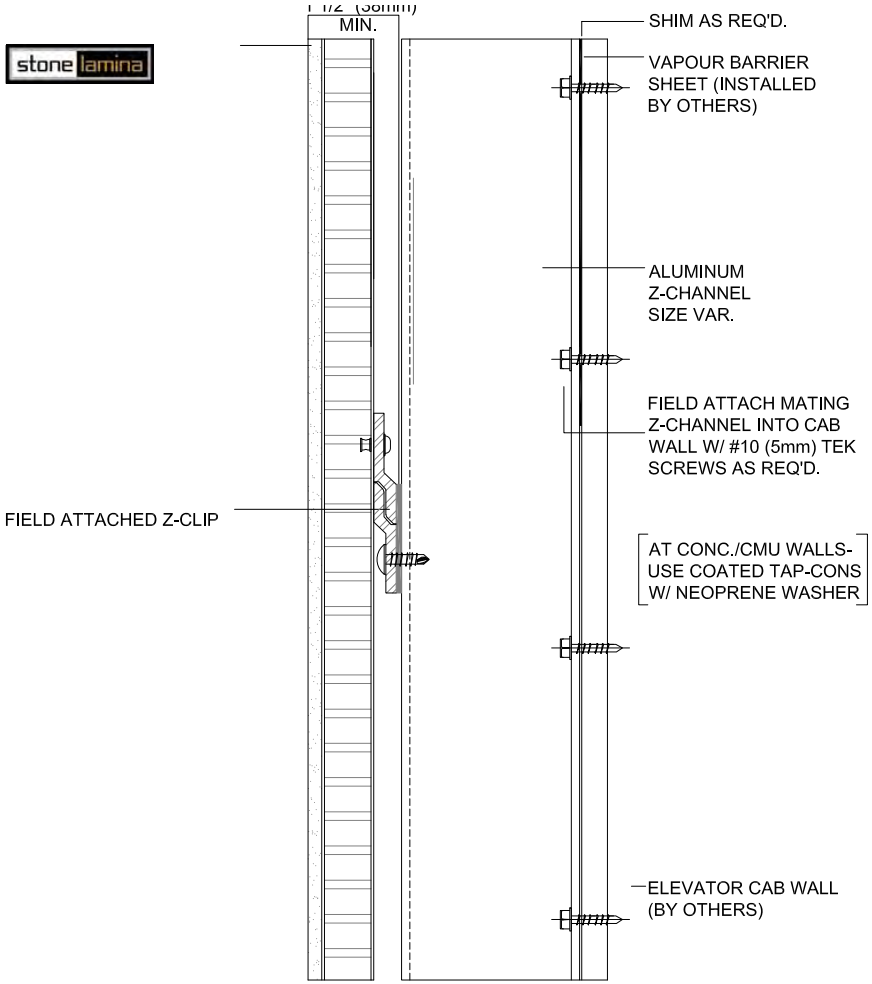


STONE LAMINA RETURN AT RECE
THERMALLY BROKEN BRACKET

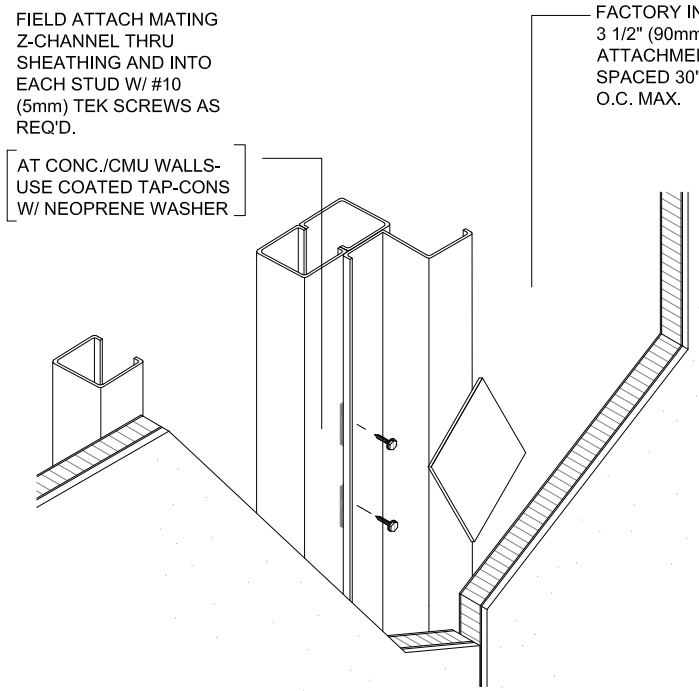


SL-20

CLIP ATTACHMENT TO ELEVATOR CAB WALL



PRE-PANELIZED STEEL STUD SYSTEM



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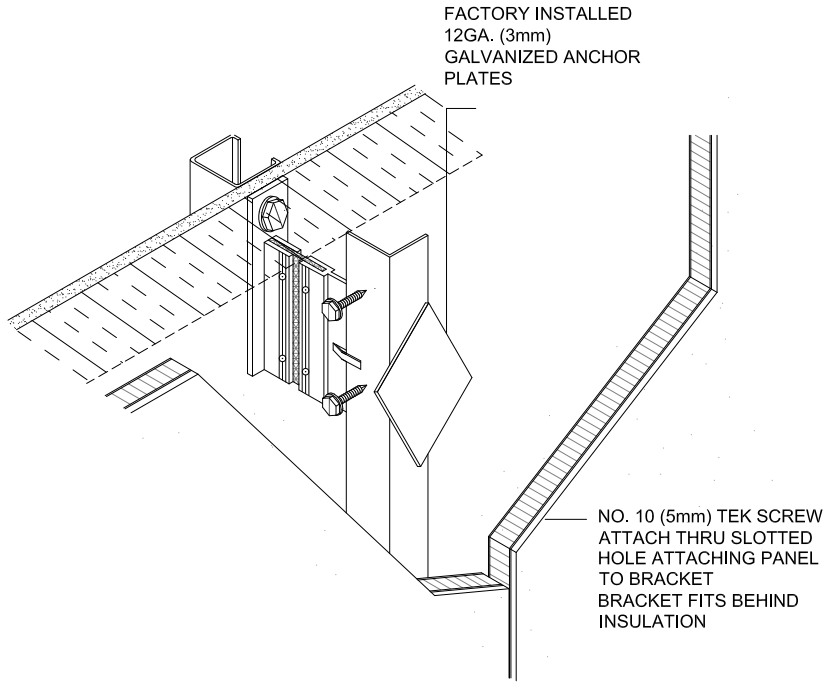
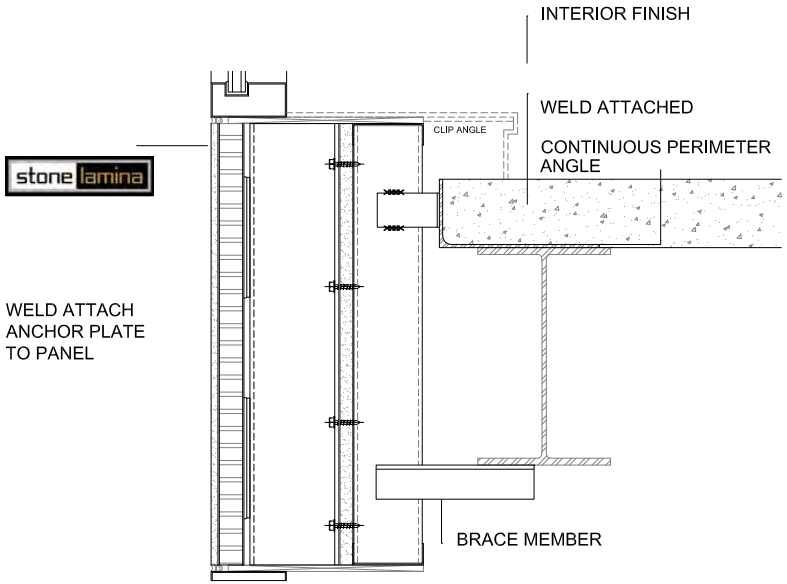
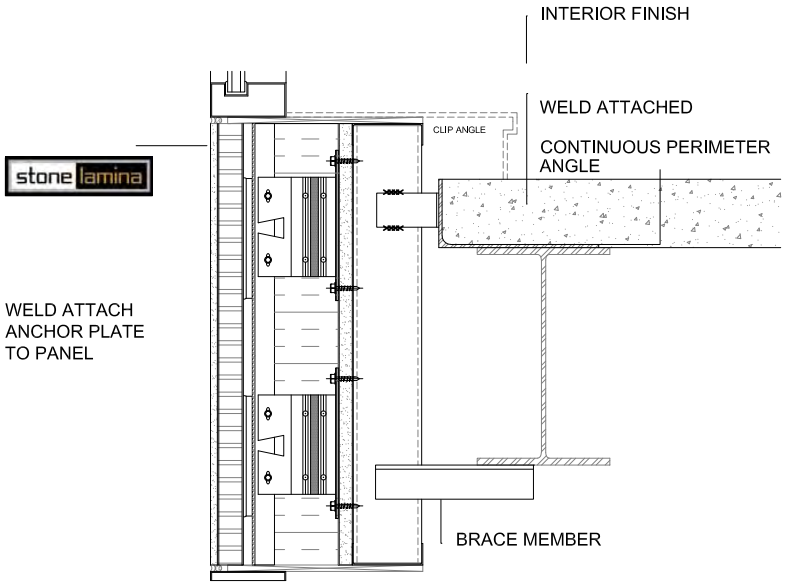


SL-22

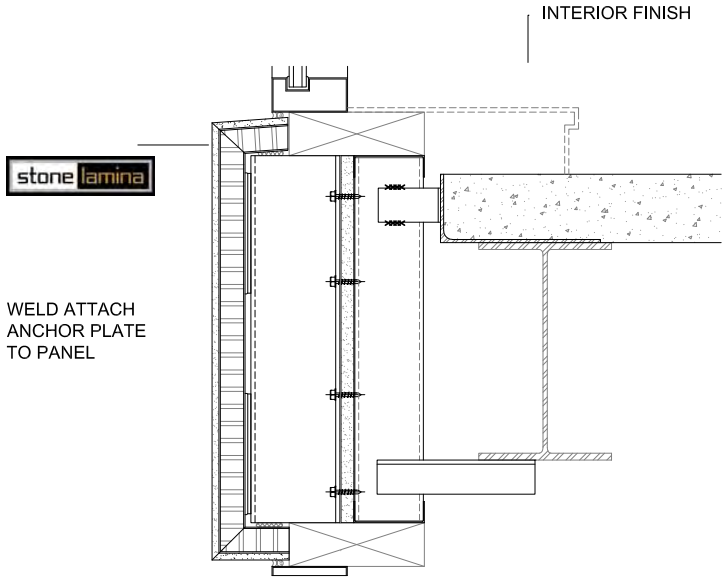
PRE-PANELIZED SPANDREL CONDITION



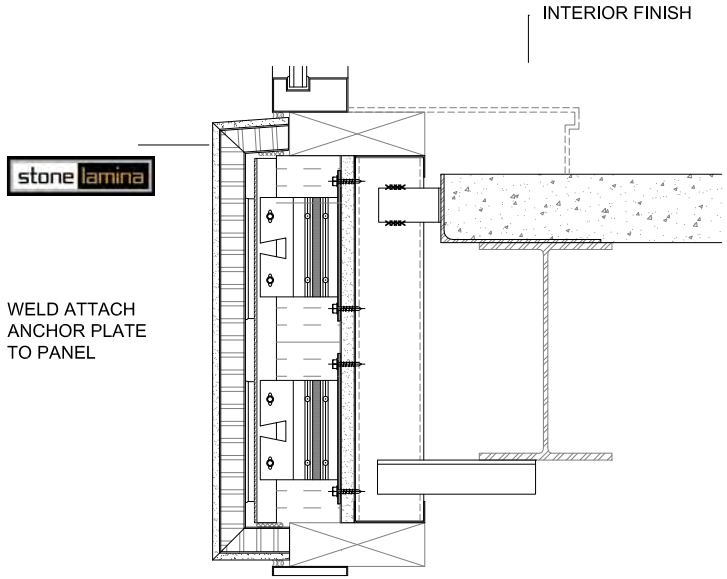
PRE-PANE



PRE-PANELIZED SPANDREL WALL SECTION



PRE-PANELIZ
WITH THERM

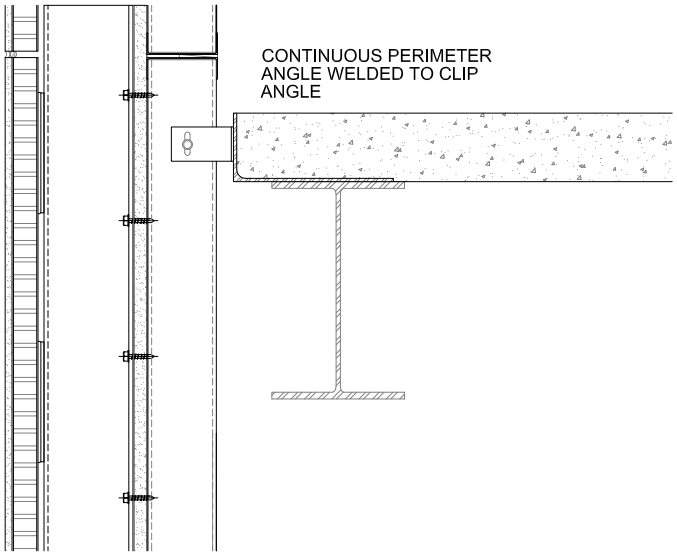


SL-24

PRE-PANELIZED WALL BYPASSING FLOOR SLAB

UPPER PANEL STUDS BEAR ON LOWER PANEL STUDS. NO GRAVITY LOAD ON FLOOR FRAME. ALL GRAVITY LOAD GOES TO FOUNDATION AT GROUND LEVEL.

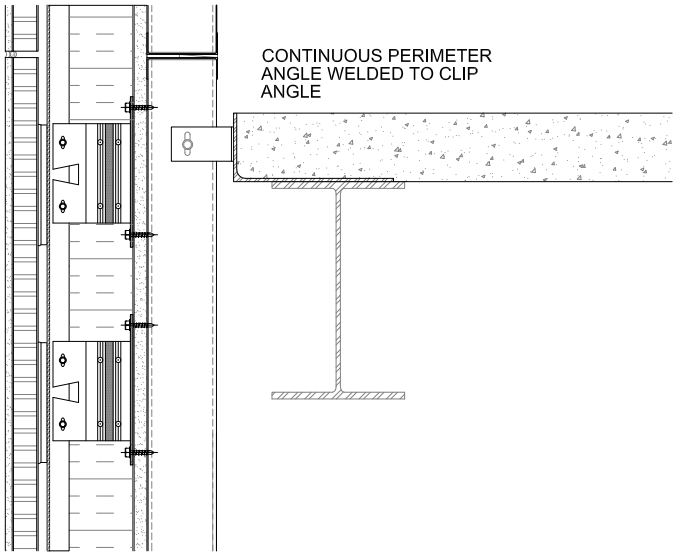
CONTINUOUS PERIMETER ANGLE WELDED TO CLIP ANGLE



PRE-PANELIZ
SLAB WITH T

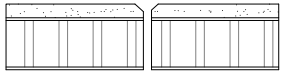
UPPER PANEL STUDS BEAR ON LOWER PANEL STUDS. NO GRAVITY LOAD ON FLOOR FRAME. ALL GRAVITY LOAD GOES TO FOUNDATION AT GROUND LEVEL.

CONTINUOUS PERIMETER ANGLE WELDED TO CLIP ANGLE

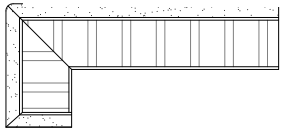


EDGE CONDITIONS

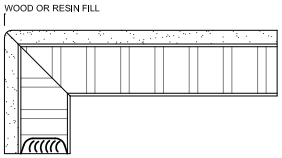
1 FINISHED RETURN



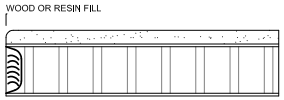
5 CHAMFERED EDGES



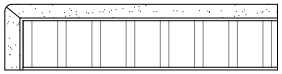
9 FINISHED RETURN AND EDGE



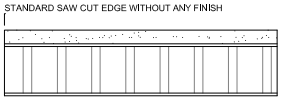
2 FINISHED RETURN W/ EDGE FILL



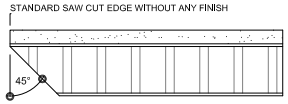
6 PAINTED EDGE FILL



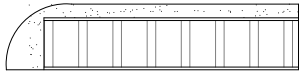
10 FINISHED EDGE



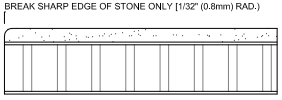
3 STANDARD EDGE



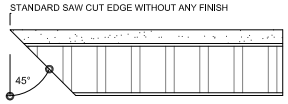
7 QUIRK MITER EDGE



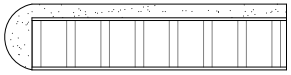
10 BIRD BEAK EDGE



4 SEAMED EDGE



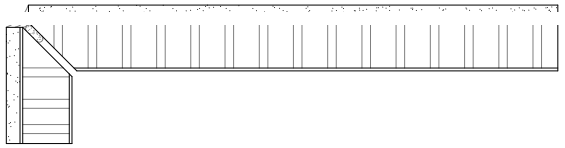
8 MITERED EDGE



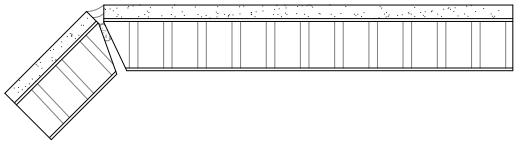
10 BULLNOSE EDGE

SL-26

CORNER CONDITIONS

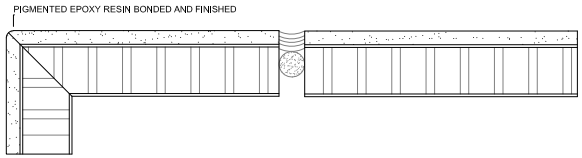


1 90° OUTSIDE CORNER QUIRK MITERED PANEL

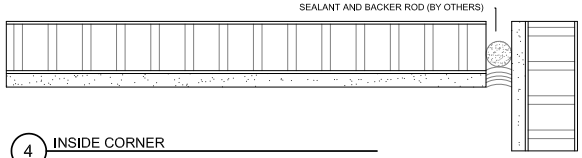


2 45° OUTSIDE CORNER

ALTERNATIVE: 45° BONDED CORNER

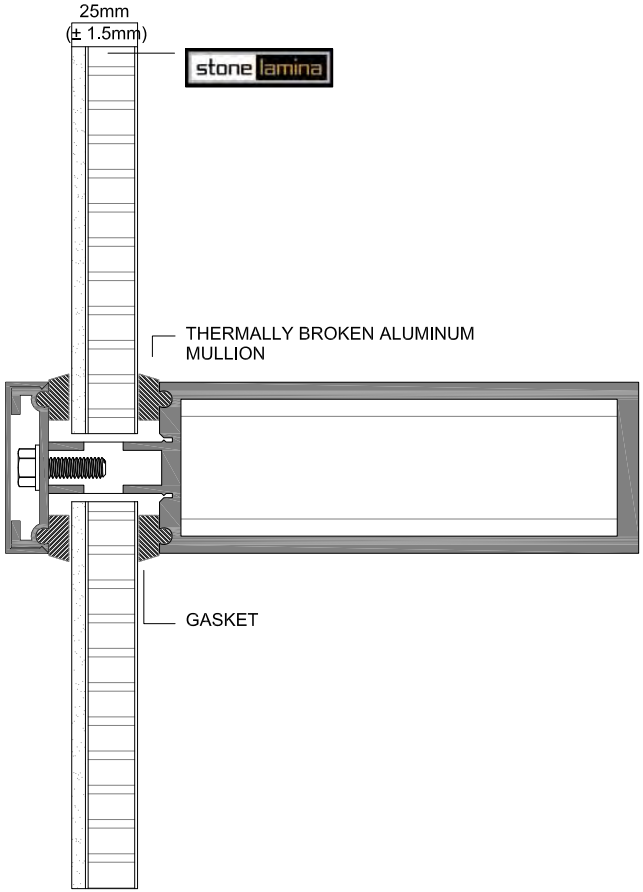


3 FINISHED CORNER



4 INSIDE CORNER

GLAZED-IN DETAIL



SL-28

stone lamina

APPENDIX 02

WHAT IS LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN (LEED)?

LEED is the acronym for the national voluntary program called “Leadership in Energy and Environmental Design.” The LEED Green Building Rating System was developed by the U.S. Green Building Council as a method to define and measure the “green”rating of a building. Buildings can be classified under the categories of LEED-NC for new construction and major renovations, LEED-EB for existing buildings, LEED-CI for commercial interiors, LEED-CS for Core and Shell development, and LEED-H for homes. Rating systems for neighbourhood development (LEED-ND), multiple buildings (LEED-MB), schools and retail building are currently under development. As well, application guides for healthcare facilities and labourites are currently under development by the US Green Building Council (USGBC).

The LEED certification process aims to improve environmental performance, improve the occupant’s wellbeing, and improve the economic returns of the facilities. Buildings qualify as “LEED Certified” if they achieve all of the prerequisites and at least 26 (out of a possible 69) points. The LEED certification levels are:

LEED

LEVEL	POINTS NEEDED
Certified	26-32
Silver	33-38
Gold	39-51
Platinum	52-69

The levels shown above are awarded for total points accumulated on a project. There are currently nine categories of LEED credits - Location and Transportation, Sustainable Sites, Water Efficiency, Energy and Atmosphere, Material and Resources, Indoor Environmental Quality, Innovation, Regional Priority, Integrative Process. Each LEED category is composed of multiple components or credits to recognize sustainable living practices.

COMPRESSIVE AND SHEAR STRENGTH

CATEGORY	MAX POINTS
Energy and Atmosphere	10
Materials and Resources	9
Indoor Air Quality	5
Innovation in Design	3

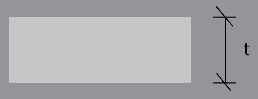
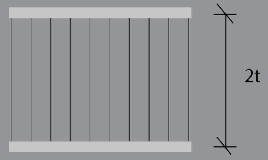
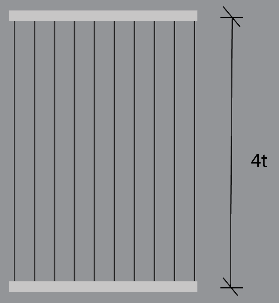
APPENDIX 03

OUR TECHNOLOGY: THE COMPOSITE, HONEYCOMB PANEL

COMPARISON CHART

CORE MATERIALS	ACOUSTIC PROPERTIES	CHEMICAL & CORROSION RESISTANCE	COMPRESSION STRENGTH	FIRE RESISTANCE	FLATNESS, DEFLECTION, STIFFNESS	IMPACT RESISTANCE	THERMAL EFFICIENCY	WATER & MOISTURE RESISTANCE
Aluminum Honeycomb	MED	HIGH	HIGH	HIGH	HIGH	VERY HIGH	HIGH	HIGH
Plypropylene Honeycomb	HIGH	HIGH	HIGH	LOW	HIGH	HIGH	MED	HIGH
Ploystyrene Foam	VERY HIGH	MED	MED	MED	MED	LOW	HIGH	HIGH
Polythylene Foam	HIGH	HIGH	HIGH	VERY LOW	MED	MED	HIGH	MED
Plywood	HIGH	HIGH	HIGH	LOW	MED	HIGH	HIGH	LOW
PVC Foam	MED	HIGH	MED	HIGH	HIGH	HIGH	MED	HIGH
Ployurethane Foam	HIGH	HIGH	MED	MED	HIGH	HIGH	HIGH	HIGH
SKIN MATERIAL								
Natural Stone	MED	HIGH	HIGH	VERY HIGH	HIGH	VERY HIGH	HIGH	HIGH

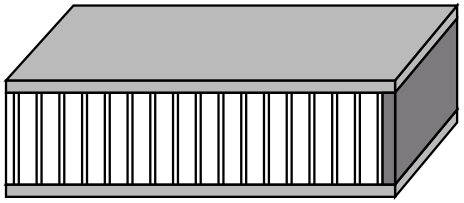
ALUMINUM HONEYCOMB SANDWICH

	SOLID METAL BLOCK 	HONEYCOMB SANDWICH 	THICKER SANDWICH 
Relative Stiffness	100	700 7X Stiffer	3700 37X Stiffer
Relative Strength	100	350 3.5X Stronger	925 9.25X Stronger
Relative Weight	100	103 3% Weight Increase	106 6% Weight Increase

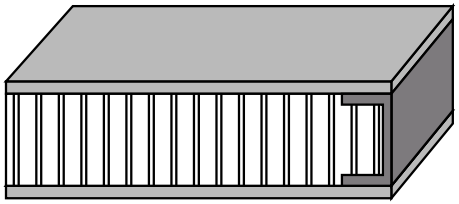
ALUMINUM HONEYCOMB PANEL EDGE CLOSURE DESIGN

When designing of Honeycomb panels it may be necessary to consider methods of closing or sealing the edges. Exposed edge areas are a potential weakness in the design as they may be susceptible to local impact or environmental damage. Edge closures may also provide local reinforcements, attachment points, or simply meet aesthetic requirements.

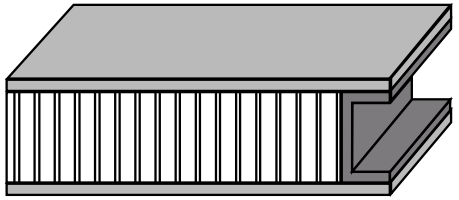
Illustrated below are a number of commonly used methods to close Honeycomb boards.



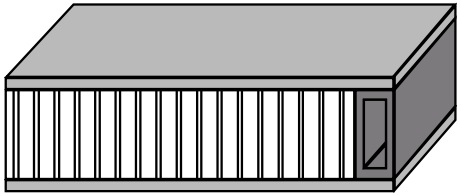
EDGE FILLER - this option is the simplest and a cost effective solution for edge closeout



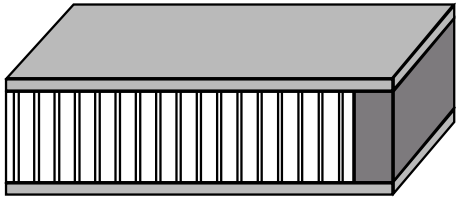
LEGS IN CHANNEL EDGE - this option is great for strength and weight sensitive panels



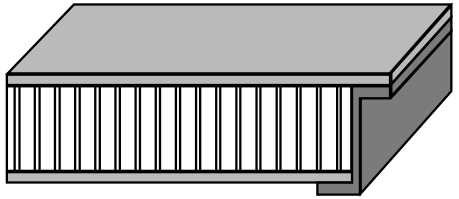
LEGS OUT CHANNEL EDGE - this option allows us to square panels to final size



EXTRUDED BOX - This is the best edge closure for water penetration



SOLID EDGE ENCLOSURE - this edge solution is common when drilling of holes near edges is needed



Z SECTION - this solution is ideal for multi-layer panel system

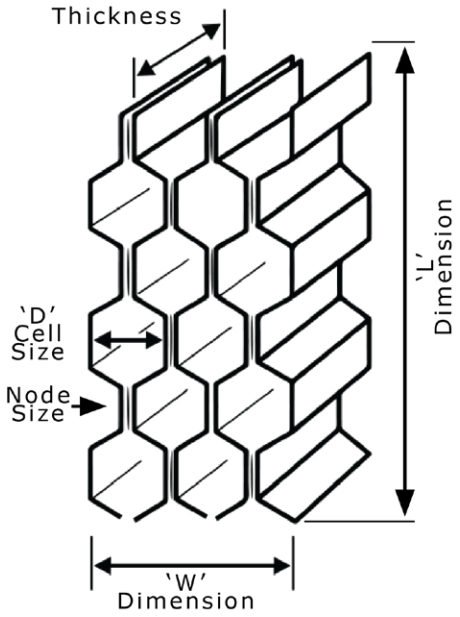
ALUMINUM HONEYCOMB CORE

MAXIMUM STRETCHED SIZE

NODE (A)(mm)	4	5	6	7.5	10	12	15	20	30
CELL SIZE (D) (mm)	1/4	1/3	3/8	1/2	3/4	4/5	1	1	2
ALUMINUM FOIL THICKNESS (mm)	0.04-0.06	0.04-0.06	0.04-0.06	0.04-0.06	0.04-0.06	0.04-0.06	0.04-0.06	0.04-0.06	0.04-0.08

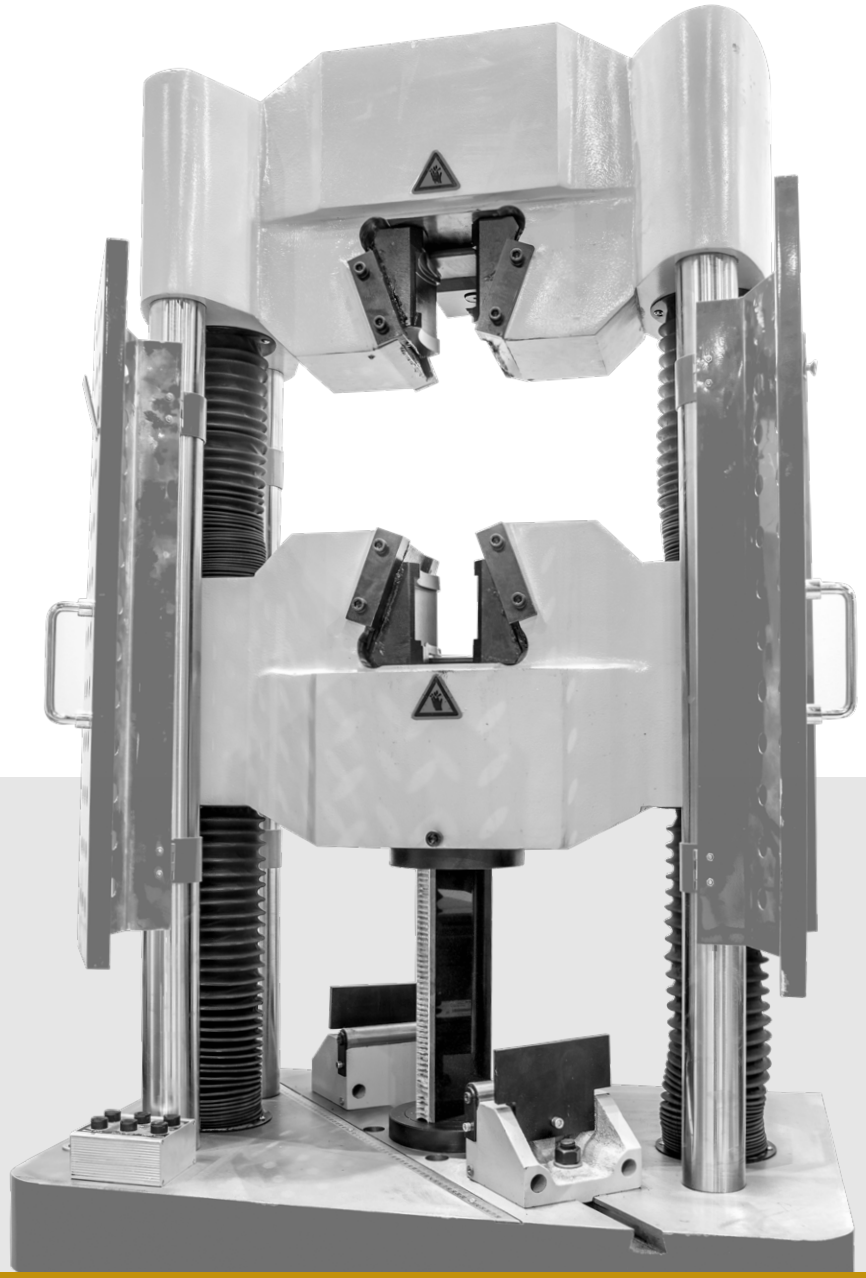
COMPRESSIVE AND SHEAR STRENGTH - ROOM TEMPERATURE

PRODUCT		COMPRESSION		SHEAR			
DENSITY	CELL SIZE (D)	STABILIZED		PARALLEL TO GLUE L DIRECTION		W DIRECTION	
kg/m³ (lb/ft³)	mm (in)	STRENGTH (MPa)	MODULUS (MPa)	STRENGTH (MPa)	MODULUS (MPa)	STRENGTH (MPa)	MODULUS (MPa)
29 (1.8)	19 (3/4)	0.9	165	0.65	110	0.4	55
37 (2.3)	9.5 (3/8)	1.4	240	1.4	190	0.45	90
42 (2.6)	12.7 (1/2)	1.5	275	1.5	220	0.5	100
54 (3.4)	6.35 (1/4)	2.5	540	2.5	260	0.85	130
59 (3.7)	9.5 (3/8)	2.6	630	2.6	280	0.9	140
83 (5.2	6.35 (1/4)	4.6	1000	4.6	440	1.5	220



APPENDIX 04

LAB TESTING



OVERVIEW

Stone Lamina is committed to producing the finest quality stone panels available. As one of the world leaders in natural stone composite honeycomb panels, Stone Lamina observes rigorous quality control procedures and testing. Architects, designers, specifiers and endusers receive the peace of mind that comes from knowing that Stone Lamina has been subjected to testing well beyond the minimum codes. Testing is performed at both independent national laboratories and universities, as well as Stone Lamina Ltd's own research and manufacturing facilities in Toronto, Canada.

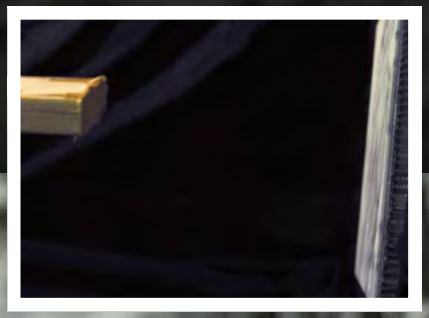
stone lamina

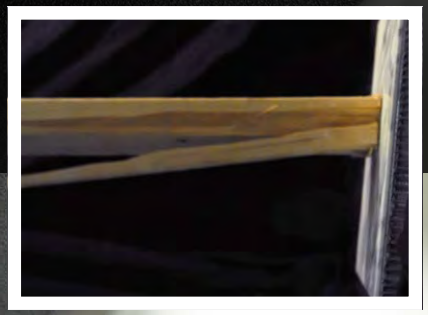
UNIQUE PERFORMANCE CHARACTERISTICS

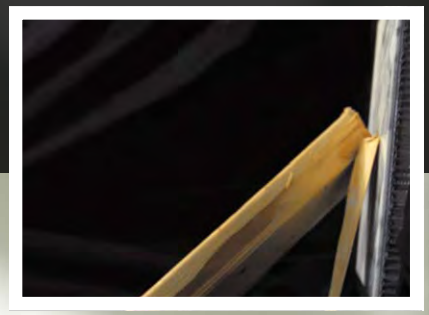
Stone Lamina Composite Panels with Honeycomb Technology perform exceptionally well in a number of areas. The large missile impact test is just such an example.

LARGE MISSILE IMPACT TEST

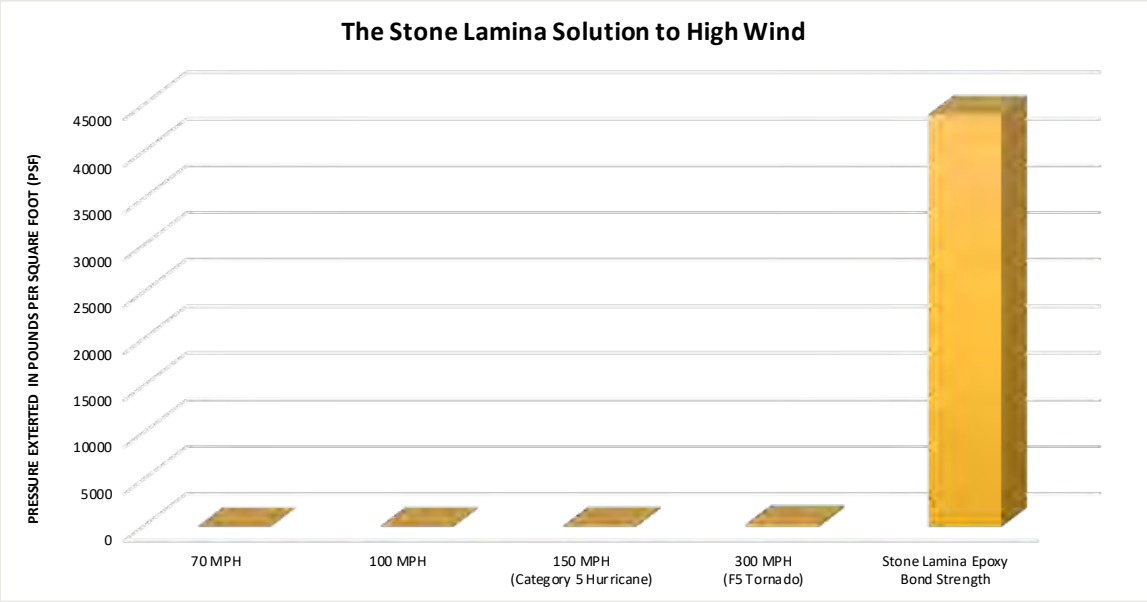
Stone Lamina, unlike solid stone, stands up exceptionally well to the ASTM large missile impact test. With an impact resistance of up to 60 times greater than 1.5” dimensional granite, it holds up to flying debris and can protect a building cladded in an envelop of Stone Lamina Composite Panels. You can see below that a 2” × 4”x 8’ wood stud literally bounces off of the Stone Lamina panel without shattering the panel during the large missile impact test. See below:







Stone Lamina derives its strength from its aluminum honeycomb core bonded to the stone veneer with high performance aviation epoxy. Both of these components are used on aircraft fuselage whose surfaces experience wind speeds of thousands of miles per hour. Please note the example below, in terms of epoxy bond strength, compared to a variety of wind forces.



STRENGTH	PRESSURE EXERTED IN POUNDS PER SQUARE FOOT (lb/ft²)
70 MPH	12.544
100 MPH	25.6
150 MPH (Category 5 Hurricane)	57.6
300 MPH (F5 Tornado)	230.4
Stone Lamina Epoxy Bond Strength	44000

PROTECTING BUILDINGS AND PEOPLE

What are the implications of the exceptional performance of Stone Lamina panels in the large missile impact test? Buildings encapsulated in an envelop of flexible and ductile Stone Lamina Composite Honeycomb Panels, are thoroughly protected from multiple hazards. The superior all-aluminum honeycomb panel core can catch flying debris resulting from hurricane force winds. And with a blast-resistant curtain wall and glazing, Stone Lamina's blast-resistant stone cladding can mitigate the danger to life and property from blast events. Stone Lamina panels survive blast events amazingly well and form an important component in an overall system of protection for any building or structure.

When designing for a single hazard such as a blast event, it is important to consider how the material selected for blast-resistance may conflict with protection from other hazards. It is good to know that Stone Lamina performs very well against all five of what the American FEMA Agency considers as "extreme hazards".

GENERAL TESTING 1

TEST	SPECIFICATION	METHODOLOGY	RESULT
Salt Spray Resistance	ASTM B117	300 hours of exposure	No deleterious effects
Specific Gravity and Water Absorption	ASTM C97	Limestone was tested	0.992 @ 23 oC and 0.4 % respectively
Compressive strength	ASTM C170	Limestone was tested	1.57 MPa (228 psi)
Shear Stress And Shear Modulus	ASTM C273	Compressive force applied until rupture	Core shear stress = 0.91 MPa (132 psi) Core Shear Modulus = 13.5 MPa (1958 psi)
Flatwise Tensile Strength	ASTM C297	Load was applied to the top and bottom layers of the composite panel	1.06 MPa (154 psi)
Flatwise Compressive Strength	ASTM C364	Speed of testing – 2mm/min	1.92 MPa (278 psi)
Shear Strength by Beam Flexure	ASTM C393	Midspan Loading	1.02 MPa (148 psi)
Resistance to Rapid Freezing and Thawing	ASTM C666	200 cycles of rapid freeze and thaw (4oC to -18 oC)	No visible change to stone, aluminum, or adhesive
Flexural Strength	ASTM C880	Tested a Composite panel with granite stone	18.13 MPa (2630 psi)
Screw Withdrawal Test	ASTM D1761	Testing Speed: 2.5 mm/min	2046 N

GENERAL TESTING 2

TEST	SPECIFICATION	METHODOLOGY	RESULT
Air Leakage Resistance	ASTM E283	Air infiltration and exfiltration tests were performed using test pressure of 75 Pa (1.57 psf). The maximum air leakage rate was calculated and compared to the allowable air leakage.	Passed the test. infiltration rate = 0.00 L/s.m2 (0 cfm/ft2) & exfiltration rate = 0.01 L/s.m2 (0.002 cfm/ft2) at 75 Pa test pressure
Static Pressure	ASTM E330-00	The test specimen was also tested to failure with both positive and negative loads. The specimen only showed a permanent deflection of 0.10 mm with a test load of + 5760 Pa (120 psf). The specimen failed at -5006 Pa, the rivets at the backside of the specimen failed	All the panels tested met or exceeded requirements.
Uniform Static Deflection	ASTM E330-02	The test specimen was tested to ± 3840 Pa (80.2 psf) to examine the deflection of 2440 mm panel, the specimen showed a maximum net deflection of 4.14 mm under positive test pressure and 4.93 mm under negative load.	No failure or permanent damage;
Water penetration Resistance	ASTM E331	During the 15-minute test period, using a pressure differential of 720 Pa (15.0 psf), there was no water leakage observed.	No water leakage
Cyclic Pressure Loading	ASTM E1886	Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials	Passed the test. Over 4,500 positive and negative pressure cycles were applied at ± 70 psf (equivalent wind load of 165 mph).
Large Missile Impact Test	ASTM E1996	Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes	Passed the test. A weighted 2×4 was fired at the Stone Lamina panel at 50 fps. There was no penetration.
Fluorescent Ultraviolet Radiation Exposure	ASTM G154	2000 hours of UV exposure	No visible change to stone, aluminum, or adhesive
Linear Thermal Expansion	ISO 10545-8	Tested from room temperature to 100 oC	12.53 × 10-6 per oC

FIRE SAFETY

Stone Lamina Composite Panels are inherently flame resistant. Stone Lamina is composed of non-combustable materials that have passed the CAN/ULC S114 test. Stone Lamina panels have a CAN/ULC S102 flame spread index of 0 and a smoke contribution of 40. The “smoke contribution” is primarily water vapour and can vary by stone type. This gives Stone Lamina a Class A rating under the NFPA standard or Class 1 rating under the UBC standard.

SPECIFIC TESTING

TEST	METHOD	RESULT
Accelerated Weathering in Acid Bath	100 cycles of freeze + heat -10 to 170 °F while partially submerges in a 4ph sulphurous acid solution	Less than 9% reduction in flexural strength No significant difference in load deflection of exposed vs. not exposed specimens
Temperature Cycling	Panel 36” by 48” exposed to 100 cycles rapid heating and cooling from 140 to 65 °F	No damage or browing Recorded 232 psi tensile bond strength
Fastener Pull Out Strength	Self-drilling #8 screws by 1/2” long	120 lbs. average per screw
Deflection	Panel 24” by 36” center loaded with 1,600 lb Supports placed at 36”	Deflection less than 0.028”

FIRE TESTING

TEST	SPECIFICATION	RESULT
Tunnel Test	ASTM E84	Sample passed the test with : Flame Spread Index = 0 Smoke Developed Index = 0.
Surface Burning Characteristics of Building Materials	CAN/ULC S102	The panel received: Flame Spread Rating = 0 Smoke Developed Classification = 40
Non-Combustibility in Building Materials	CAN/ULC S114	The panel passed the test requirements. Observations: there was no visible smoke or flame. The sample did not have a maximum temperature rise of more than 36 oC on the indicating thermocouple. The sample did not loose more than 20% of its original mass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