

AR 17-53 BUILDING MATERIALS AND CONSTRUCTION - IV

MODULE I - WALL FINISHES (12 hrs)

MODULE -I

- **Plaster**: Lime plaster and gypsum plaster. Fire resistant plaster, X-Ray shielding plaster and acoustic plaster. Plaster over masonry and ceiling.
- **Paints and varnish**: Characteristics of an ideal paint and varnish. Classification – various types of paints. Painting process. Defects in painting works. Process of varnish.
- **Wall cladding** : stone cladding, tile cladding, Wooden cladding and metal cladding. Stucco finish and other finishes.
- **Sketches** : Stone cladding, Metal cladding

CLADDING SYSTEMS

Cladding has to service a number of critical functions in a series of complex relationships:

- **protection and security** - from the environment, from negative aspects of society
- **comfort** - light, humidity, sound, ventilation
- expression and celebration
- **sustainability** - contribution to life cycle costing; maintenance and durability
- Another function of cladding is to provide some **insulation**. The multiple layers of a building are designed in part to trap air, creating an insulating barrier which keeps temperatures stable.

The more layers of insulation, the less climate control is needed, because the climate control is built into the structure.

- **Impacts** such as high winds and collisions with objects can also be absorbed in part by the cladding, protecting the structural elements of a building.

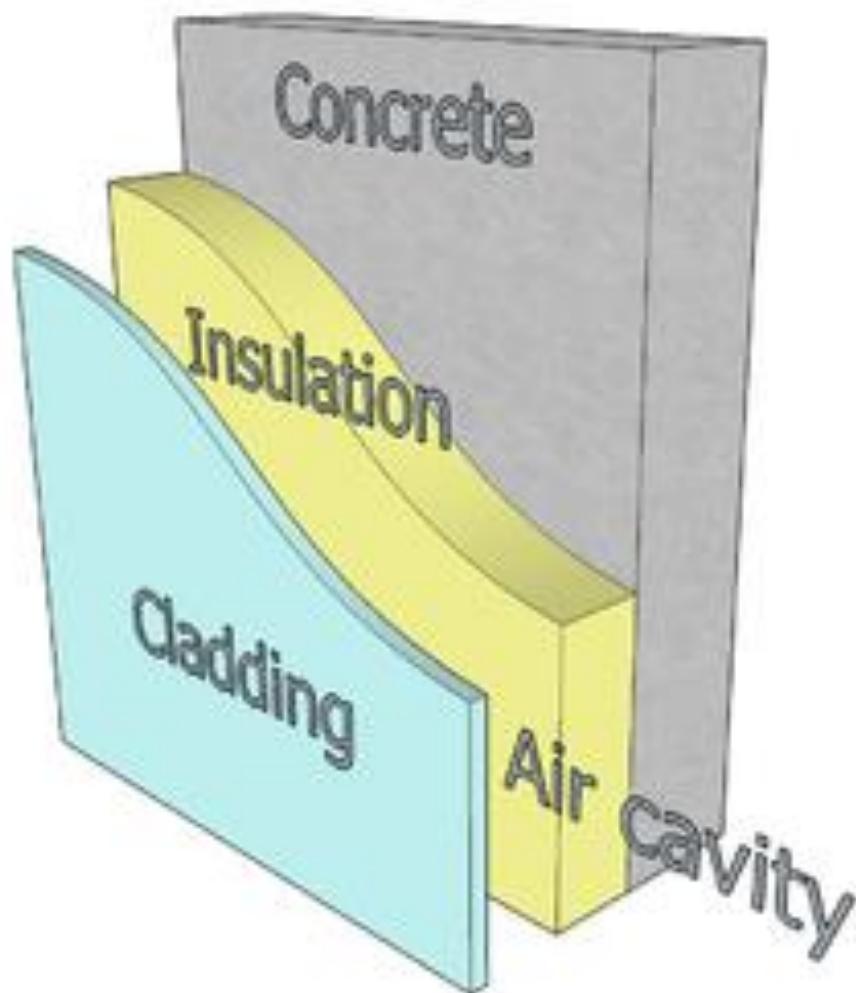
CLADDING

- Cladding is the application of one material over another to provide skin or layer intended to control the infiltration of weather elements, or for aesthetic purposes.
- It is mainly done for protecting the exteriors or for increasing the aesthetic value of the walls.
- This in turns helps increase the durability of the external walls. It also helps in preventing noise.

Many materials and processes are used in cladding:

1. stone (in blocks and veneers),
2. Concrete
3. Timber cladding
4. Weatherboard cladding
5. Fiber cement cladding
6. Brick
7. Vinyl cladding
8. Ceramics
9. Steel
10. Aluminum and other metals, glass, and plastics.

- Cladding can be made of any of a wide range of materials including wood, metal, brick, vinyl, and composite materials that can include aluminium, wood, blends of cement and recycled polystyrene, wheat/rice straw fibres.[\[2\]](#)
- Rainscreen cladding is a form of weather cladding designed to protect against the elements, but also offers thermal insulation.
- The cladding does not itself need to be waterproof, merely a control element: it may serve only to direct water or wind safely away in order to control run-off and prevent its infiltration into the building structure.
- Cladding may also be a control element for noise, either entering or escaping. Cladding can become a fire risk by design or material.



- Cladding is a non-loadbearing skin or layer attached to the outside of a home to shed water and protect the building from the effects of weather.
- The primary roles of cladding are to control the infiltration of weather elements and the egress of water vapour while providing a durable, aesthetically pleasing appearance. Secondary roles can include sound and thermal insulation, fire resistance, and the capacity for cleaning in dusty, polluted or vandal prone environments
- Your choice of cladding should be based on a careful assessment and prioritisation of each of these roles for each orientation of your home. By choosing cladding materials specific to an elevation or exposure, you can often achieve the best in physical performance and aesthetics.

- West-facing gable walls are clad in durable steel, while the sun-protected north, south and courtyard walls are clad in weatherboard.

For example, in situations where a building's external envelope does not need to be fully 'sealed' (e.g. under deep verandas), highly breathable cladding can be an advantage. In areas or elevations with high exposure to sun, wind or rain, a very different approach is required.



- **Performance considerations**

Cladding is typically made from wood, metal, plastic (vinyl), masonry or an increasing range of composite materials. It can be attached directly to the frame or to an intermediate layer of battens or spacers to prevent condensation and allow water vapour to escape.

Cladding systems include horizontal or vertical boards, sheet materials or smaller overlapping panels such as shingles and tiles. Each system uses different methods to prevent wind and rain entering through the joints, and each system's effectiveness varies depending on wind direction and speed and the degree of exposure to rain.

- **Appearance**

The range of textures, colours, styles and finishes available means that the aesthetic outcome is limited only by the designer's imagination, council regulations or extreme site conditions.

Colour

Apart from aesthetic considerations, the colour of external cladding influences its capacity to absorb or reflect heat. In most climates, it is preferable to use lighter colours or proprietary reflective finishes, especially for roofing (see Passive cooling).

Well designed applications of darker cladding elements can be beneficial in colder climates (see 'Trombe walls' below).

Texture or profile

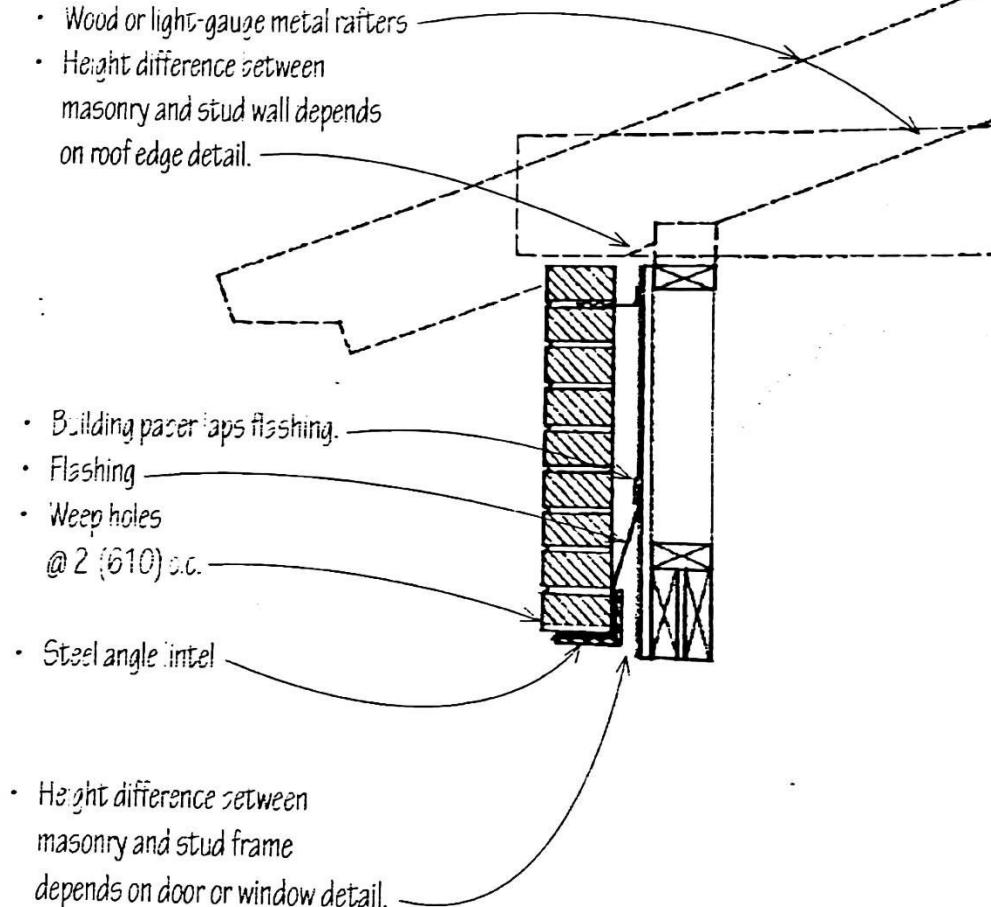
Most cladding materials have a distinctive profile or texture that can create horizontal, vertical or angled patterns and shadow textures. Often a well designed blend of cladding materials can offer both a pleasing appearance and a better matching of materials to specific conditions (e.g. impact zones or areas requiring more frequent wash-down).

Cladding options

- **RECONSTITUTED TIMBER PRODUCTS**
Many reconstituted timber products are made from forestry waste with minimal energy or chemical input, high manufacturing waste recovery and water recycling. These products are among the most sustainable of all cladding options. Check variations between brands on Ecospecifier. Try to ensure that forestry waste rather than saw log grade timbers are used and that the product contains no old growth forest products.

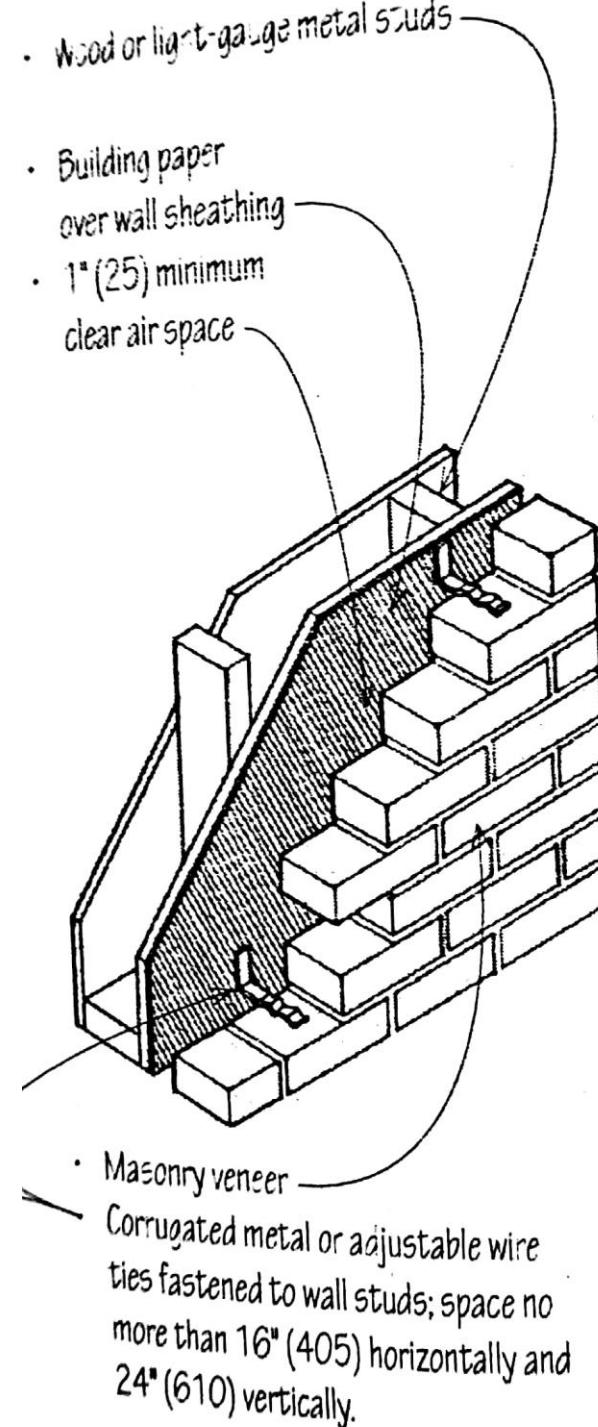
Brick – Masonry Veneer Cladding

- Masonry veneer construction consist of a single Wythe of masonry serving as a weather barrier and anchored but not bonded to a supporting structural frame.
- In residential construction wood or metal stud walls are typically faced with brick veneer.



Brick – Masonry Veneer Cladding

- Availability: Most common cladding system.
- Maintenance: Lowest maintenance if unpainted and not rendered; otherwise high.
- Durability: Highly durable on well designed footings. Less suited to seismic loads and reactive soils.
- Breathability: High with very low condensation risk when breathable sarking is used, due to well ventilated, wide cavity.
- Waterproofness: Low. Requires wide cavity and specially designed ties, flashings and cavity drainage. Cavity ties and weep holes must be cleared of mortar droppings on completion.
- Insulation: Poor insulator.
- Fire resistance: Excellent but structural capacity during fires is under-utilised in non-loadbearing cladding applications (e.g. brick veneer)
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TYPES

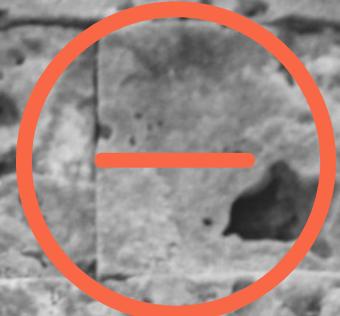
SOLID STONE CLADDING

- SOLID STONE SIDING IS ONE OF THE OLDEST TYPES OF SIDING AVAILABLE
- IT OFFERS HIGH LEVEL OF PROTECTION AND ALMOST NO MAINTENANCE IS REQUIRED.
- DUE TO BEING REAL STONE IT WILL NOT BE DAMAGED FROM DIRECT SUNLIGHT AND SO IT WON'T PEEL OVER TIME OR LOOSE ITS NATURAL COLOR.
- NATURAL STONE IS ALSO STRONG ENOUGH TO PROTECT THE INTERIOR OF YOUR HOUSE FROM NATURAL ELEMENTS. IN THIS WAY YOU CAN COMBINE BEAUTY WITH PROPER PROTECTION.

TYPES

NATURAL STONE VENEER

- SIMILAR TO SOLID STONE SIDING, NATURAL STONE CLADDING IS MADE FROM REAL STONE PROCESSED THROUGH SPECIAL DIAMOND BLADED SAWS TO CUT OFF THE OUTSIDE LAYER.
 - THE NATURAL STONE CLADDING IS NOT A FULL STONE, BUT RATHER A SLAB OF STONE THAT CAN BE AFFIXED TO THE SIDE OF AN EXISTING STRUCTURE.
-
- THIS PRODUCES VENEERS WITH NOMINAL THICKNESSES OF
 - 31-37 MM [1 1/4 TO 1 1/2 INCHES]
 - AT AN AVERAGE WEIGHT OF 50-75KG/SQM (DEPENDING ON STONE SELECTION).



PROS

Stone is impenetrable and will last a lifetime

The look and feel of real stone is unmatched.

Stone veneer gives you a similar look of stone but about half the cost

Resistant to moisture, extreme temperatures, insects, and fire

Zero maintenance other than being cleaned with a pressure washer

CONS

Installing natural stone requires heavy labor and installation time driving up the cost

Stone veneer can have the same moisture problems as stucco

INSTALLATION: WET CLADDING

STEP 1: CALCULATING MATERIALS

HOW MUCH STONE DO YOU
NEED?

BEGIN BY FIGURING THE
SQUARE FOOTAGE OF THE
AREA YOU PLAN TO COVER
WITH STONE (LENGTH X
HEIGHT). IF YOUR PROJECT
INCLUDES CORNER STONES,
DEDUCT 1 SQUARE FOOT FOR
EACH LINEAR FOOT OF
CORNERS THAT YOU WILL
UTILIZE.



INSTALLATION:

WET CLADDING

MORTAR JOINT SIZE

ONE ASPECT TO CONSIDER

- WHEN CALCULATING YOUR MATERIALS IS THE SIZE OF THE MORTAR JOINT BETWEEN THE PIECES OF STONE. MOST STONE IS PACKAGED ASSUMING A 1/2" [13MM] MORTAR JOINT. IF YOUR JOINT WILL VARY (SUCH AS A DRY-STACK OR OVER GROUT APPLICATION) ADJUST YOUR ESTIMATES ACCORDINGLY.



STEP 2: SURFACE PREPARATION

STONE VENEER CAN BE

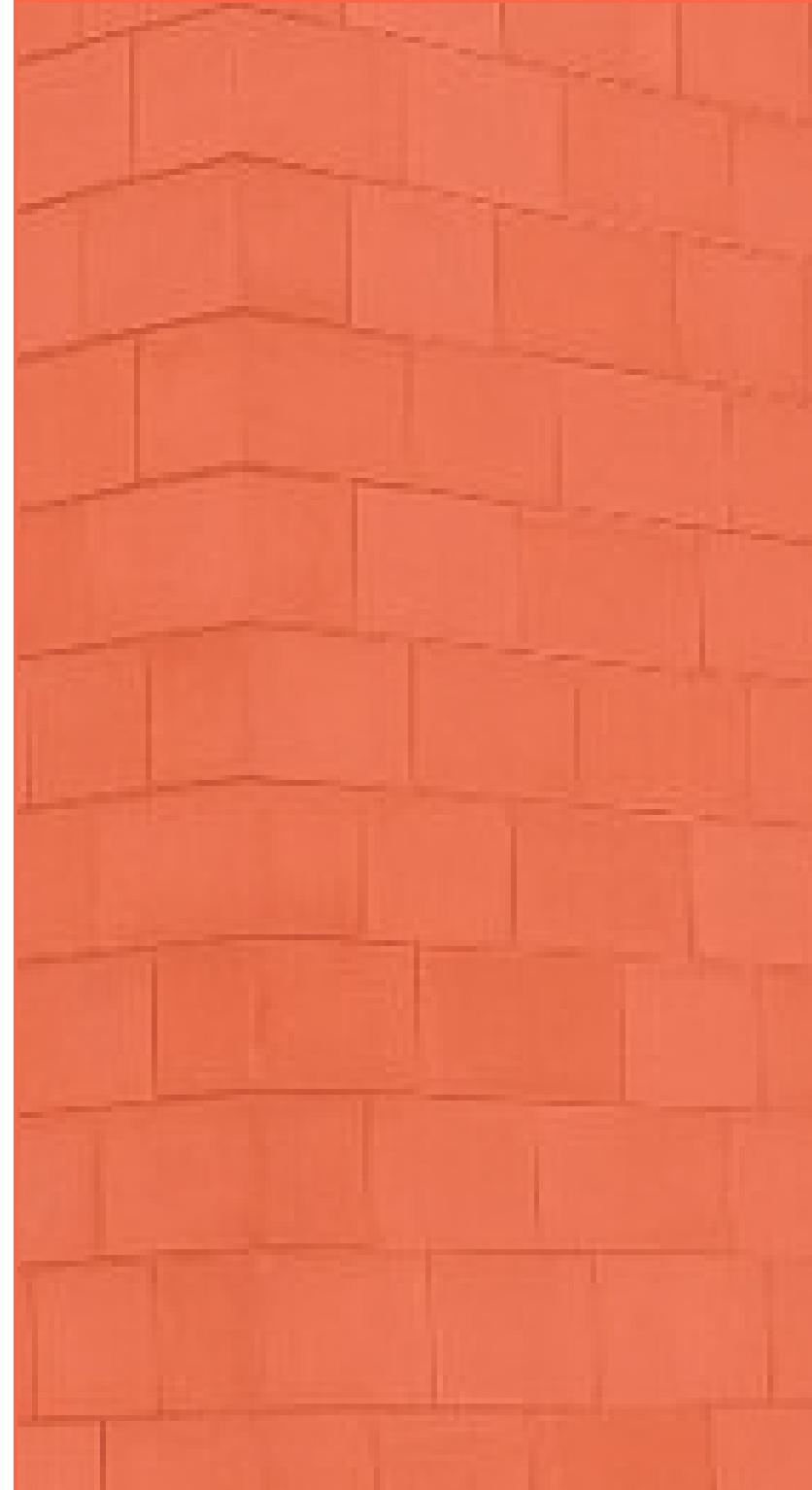
- INSTALLED DIRECTLY TO
- THESE SURFACES IF CLEAN
- AND ABSENT OF ANY PAINT
- OR DEBRIS

SURFACES THAT HAVE BEEN

- PAINTED MUST BE SAND
- BLASTED OR OTHERWISE
- STRIPPED OF PAINT. SURFACE
- MUST BE FREE OF PAINT,
- DUST, OR DIRT.

IF CLEANING OF SURFACE IS

- TOO DIFFICULT, METAL LATH
- MAY BE AFFIXED TO THE
- SURFACE WITH CONCRETE
- NAILS



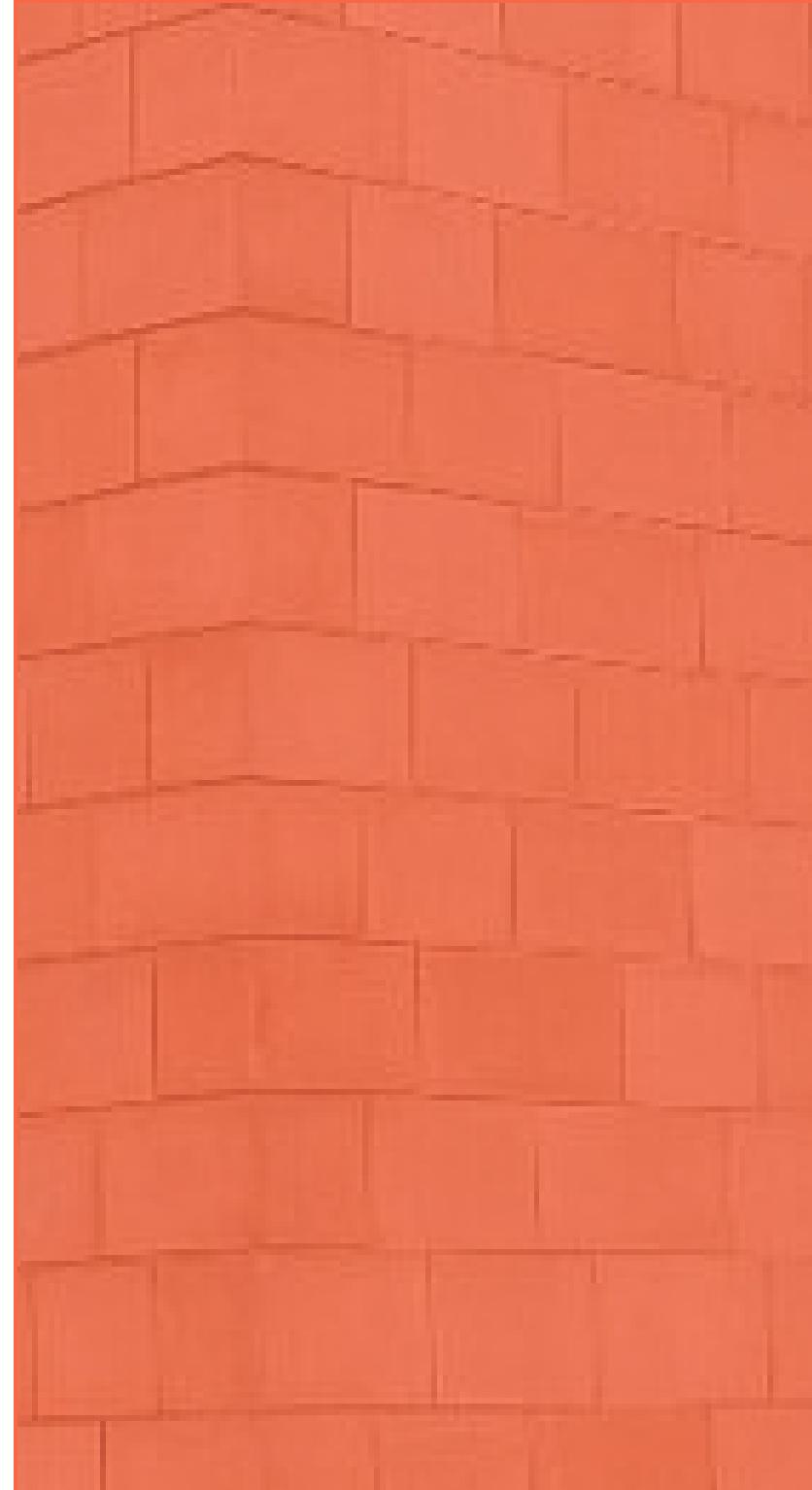
STEP 3: SCRATCH COAT

A SCRATCH COAT WILL BE NEEDED WHEN METAL LATH IS USED. THIS STEP IS NOT NECESSARY WHEN APPLYING STONE VENEER TO A CLEANED CONCRETE, MASONRY, OR STUCCO SURFACE.

APPLYING THE SCRATCH COAT IF A SCRATCH COAT IS NECESSARY, USE A MASONRY TROWEL TO APPLY A 13MM LAYER OF CEMENT OVER YOUR METAL LATH.



- STEP 4: APPLYING THE STONE
-
- BEFORE APPLYING THE STONE, IT IS A GOOD IDEA TO LAY THE STONE OUT FLAT TO DETERMINE THE SIZING AND COLORS OF EACH INDIVIDUAL PIECE, HOW THEY WILL BE LAID AND IF ANY TRIMMING IS NECESSARY. ATTEMPT TO KEEP JOINTS A CONSISTENT HEIGHT AND WIDTH.
- NORMALLY VERTICAL AND HORIZONTAL JOINTS SHOULD BE STAGGERED TO PREVENT LONG, UNBROKEN LINES THAT MAY DRAW THE EYE TO A PARTICULAR AREA.



- STEP 5: GROUTING & TOOLING

- ONCE THE STONE HAS BEEN
AFFIXED TO THE SCRATCH COAT
USING MORTAR, THE JOINTS, OR
GAPS BETWEEN THE STONE,
WILL BE FILLED WITH GROUT.



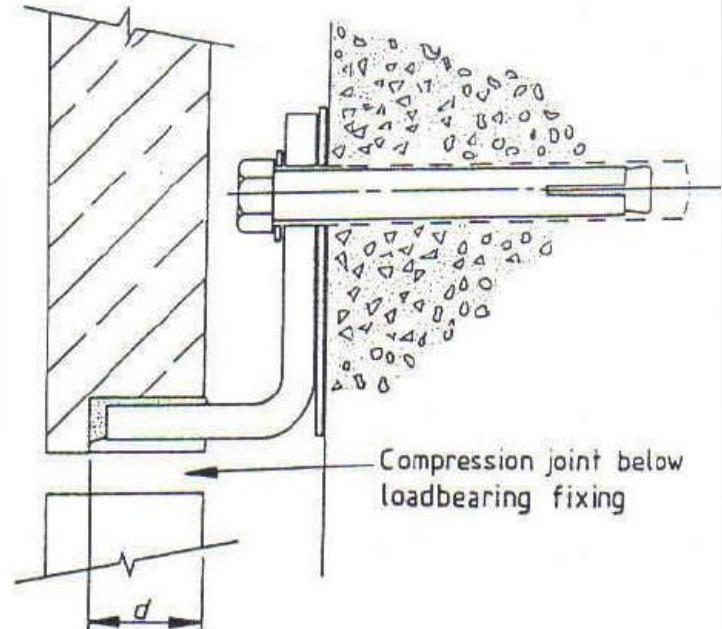
Stone Cladding

CLADDING STONE - DEFINITION :

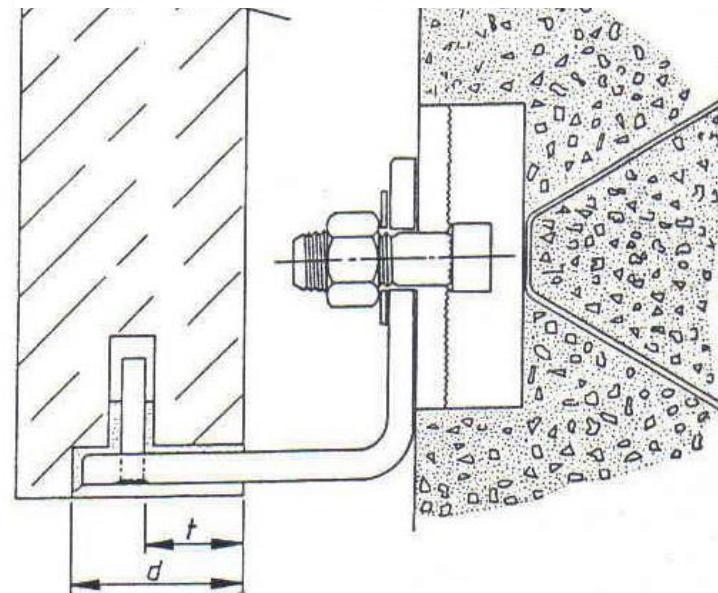
- “A facing of thin stone - limestone, sandstone, slate, marble or granite – additional to the required statutory construction, but not so bonded to that construction as to exert common action under load”.

The design phase.

- The decision on the type of cladding needs to be made early in the design process and will be determined by the function of the cladding, the size, height and location of the project, the type of structure and the programme.



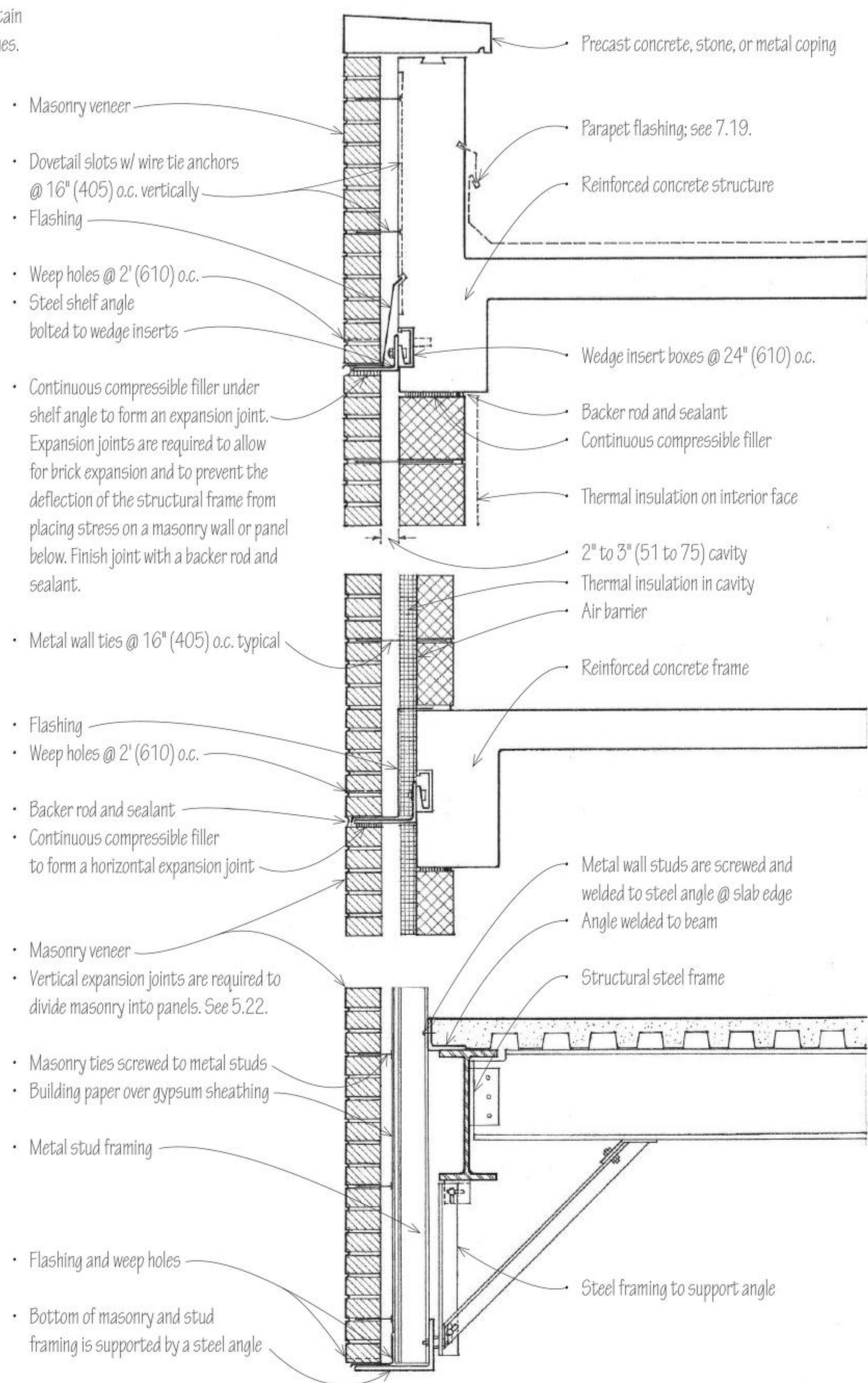
(a) Bottom edge support



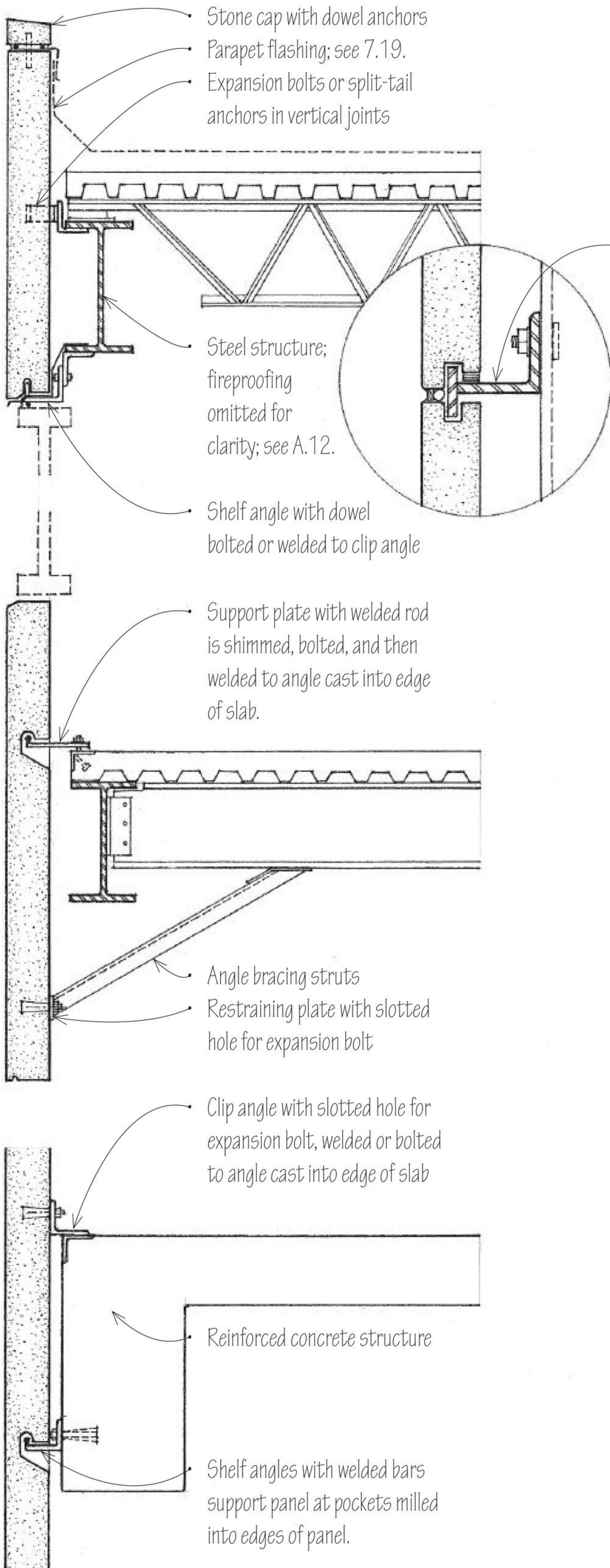
(b) Bottom edge support with restraint



Masonry veneers can also be used as curtain walls supported by steel or concrete frames.



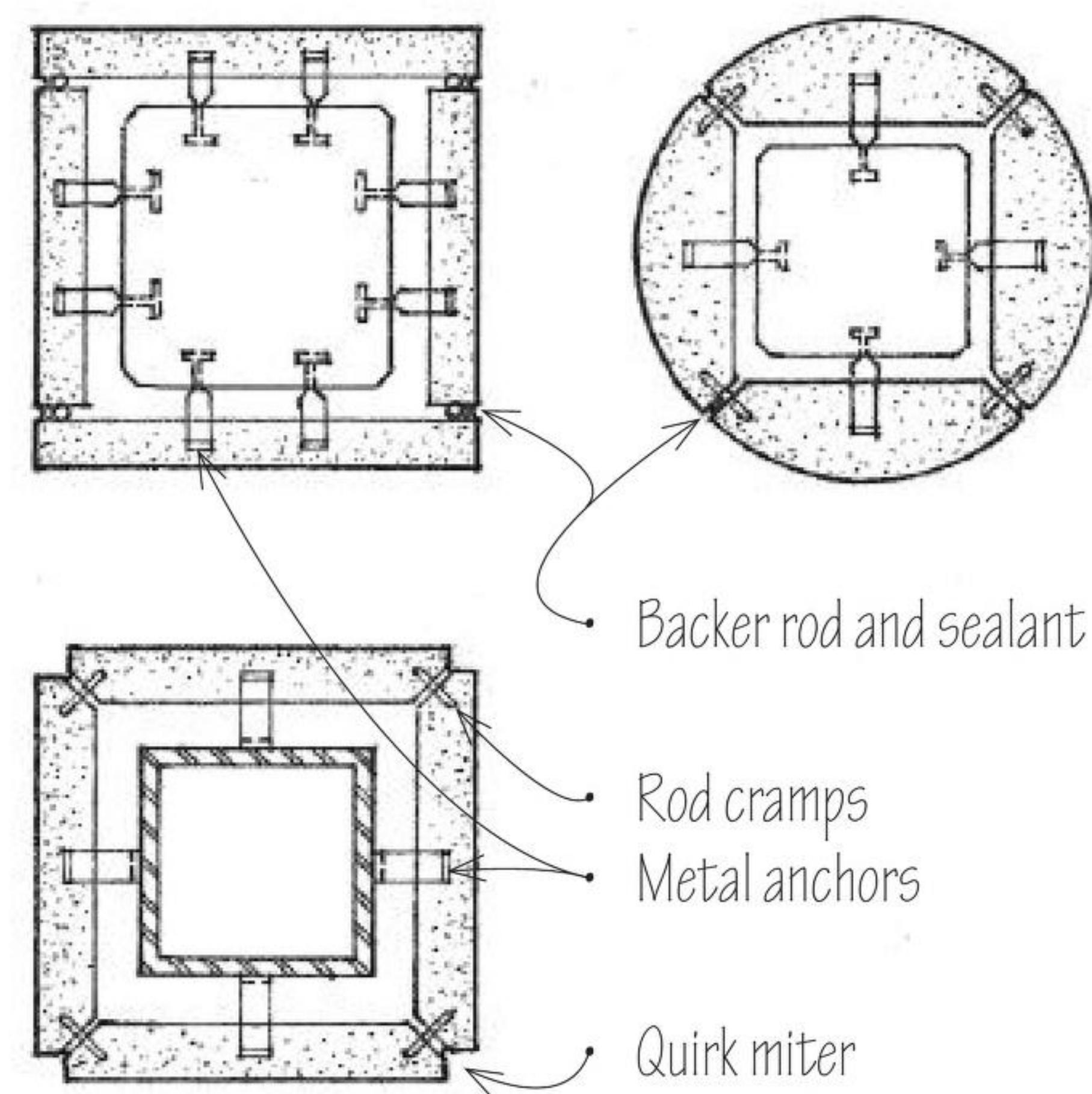
7.30 STONE VENEER



Stone facings may be set in mortar and tied to a concrete or masonry backup wall; see 5.33–5.34. Large stone veneer panels from 1½" to 3" (32 to 75) thick may also be supported by the steel or concrete structural frame of a building in a number of ways.

- Monolithic stone panels may be fastened directly to the structural frame of a building.
- Stone panels may be mounted on a steel subframe designed to transmit gravity and lateral loads from the slabs to the structural frame of a building. The subframe consists of vertical steel struts that support horizontal stainless steel or aluminum angles. Bars welded to the angles engage slots in the lower and upper edges of the stone panels.
- Stone veneers may be preassembled into larger panels by mounting the thin slabs on non-corrosive metal framing, or by bonding them to reinforced precast concrete panels with bent stainless steel anchors. A moisture barrier and bonding agent may be applied between the concrete and stone to prevent concrete salts from staining the stonework.

The required anchorages should be carefully engineered and take into account the strength of the stone veneer, especially at anchorage points, the gravity and lateral loads to be sustained, and the anticipated range of structural and thermal movement. Some anchors must carry the weight of the stonework and transfer the load to the supporting structural wall or frame. Others only restrain the stonework from lateral movement. Still others must offer resistance to shear. All connecting hardware should be of stainless steel or nonferrous metal to resist corrosion and prevent staining of the stonework. Adequate tolerances must be built in to allow for proper fitting and shimming, if necessary.



Columns

Typical Monolithic Stone Panel Details

- **FIBRE CEMENT**

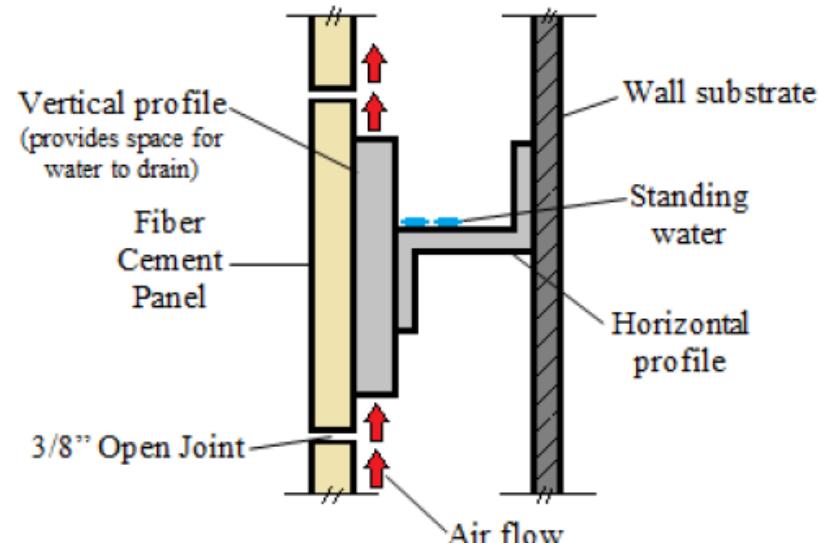
- Manufactured in a strict factory controlled environment, most fibre cement products have high sustainability credentials.

- However, considerable variations can occur between brands and manufacturing plants depending on waste recovery rates, water sourcing and recycling, and energy efficiency (particularly the recovery of autoclave energy).

- Typically produced as planks, weatherboards or sheets.

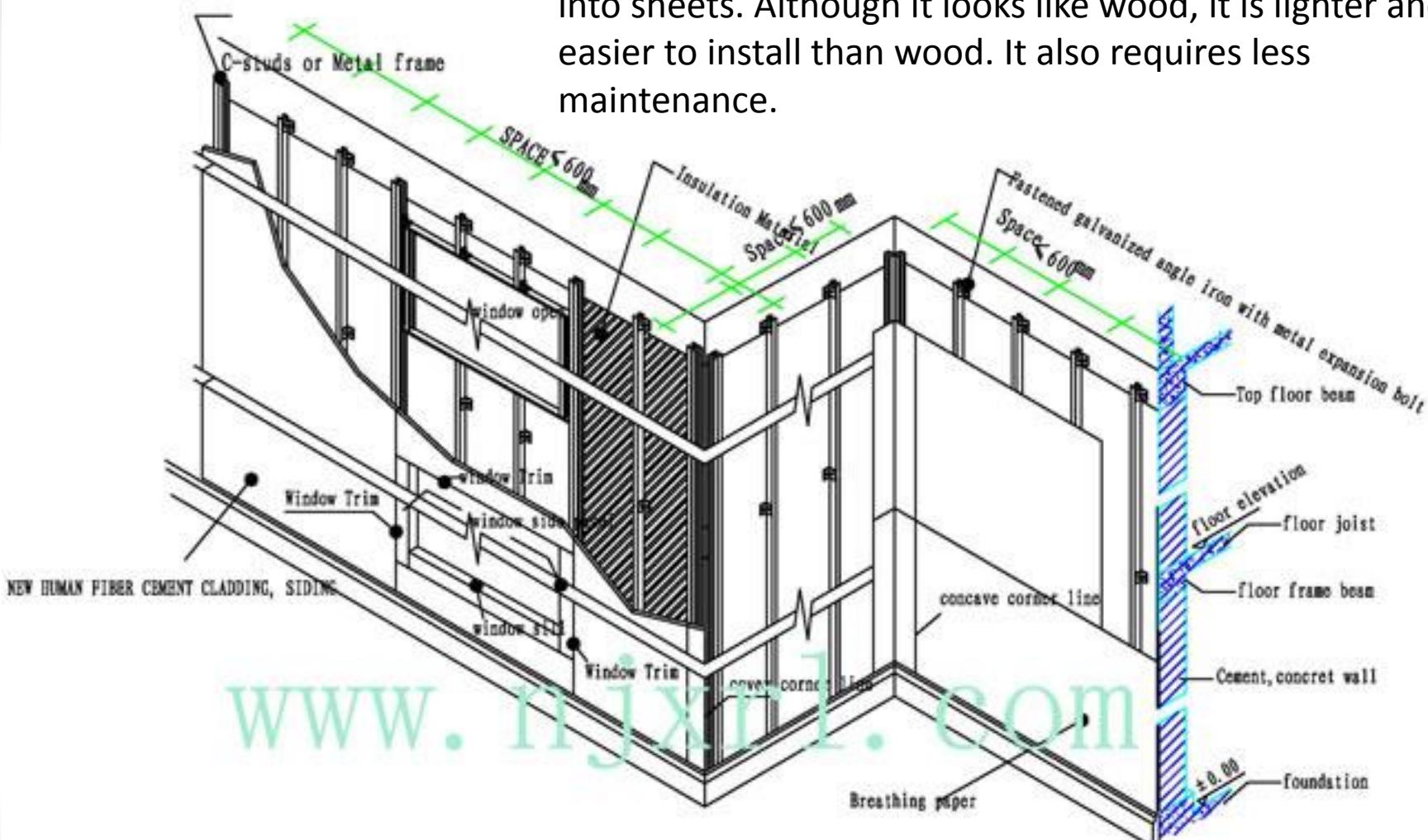
- Sheet products are generally thinner and therefore less material intensive but often have higher site waste rates — particularly on complex designs and shapes.

Maintenance: Low maintenance due to stability but requires painting to maintain waterproofness. Some applications in sheltered locations require one-off staining. Stamped or sawn patterns applied during manufacture can add aesthetic variation.



• FIBRE CEMENT

Fiber cement cladding • This particular type of cladding is made by compressing sand, cement, and cellular fiber into sheets. Although it looks like wood, it is lighter and easier to install than wood. It also requires less maintenance.



SECTION OF WALL STRUCTURE

- **FIBRE CEMENT**

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Fiber cement is usually compared to other budget-friendly heavily processed materials like PVC or aluminum panels.

- One of the main reasons that architects opt for fiber cement over other low-cost alternatives is that, when detailed properly, it looks like a much more expensive product.
- Dense, high-quality fiber cement panels can mimic the appearance of stone or concrete at a much lower cost.



- **shakes and Shingles:** Fiber cement shakes and shingles are harnessed on both small and large façades. They are used to imitate the appearance of wood without the associated wear and tear. Shakes and shingles are available as both individual pieces and panels.



Soffit: Available in vented and non-vented style, many fiber cement manufacturers make soffit panels that will neither warp nor rot, making it easier to coat the underside of architectural eaves. Vented styles will allow you to better the control air flow throughout your building.



Plywood siding

- Maintenance: Moderate to low depending on grade.

Durability: Moderate to very high depending on grade, species, glues and maintenance. Low grade ply requires similar protection to timber. While expensive, marine grade ply is among the most durable finishes available for corrosive environments (e.g. waterfront) but can contain toxic glues and preservatives.

Breathability: Generally low but variable with thickness and grade. Breathable sarking is essential and vapour cavities are strongly recommended in high condensation risk climates.

Waterproofness: High depending on finish and joint detailing.

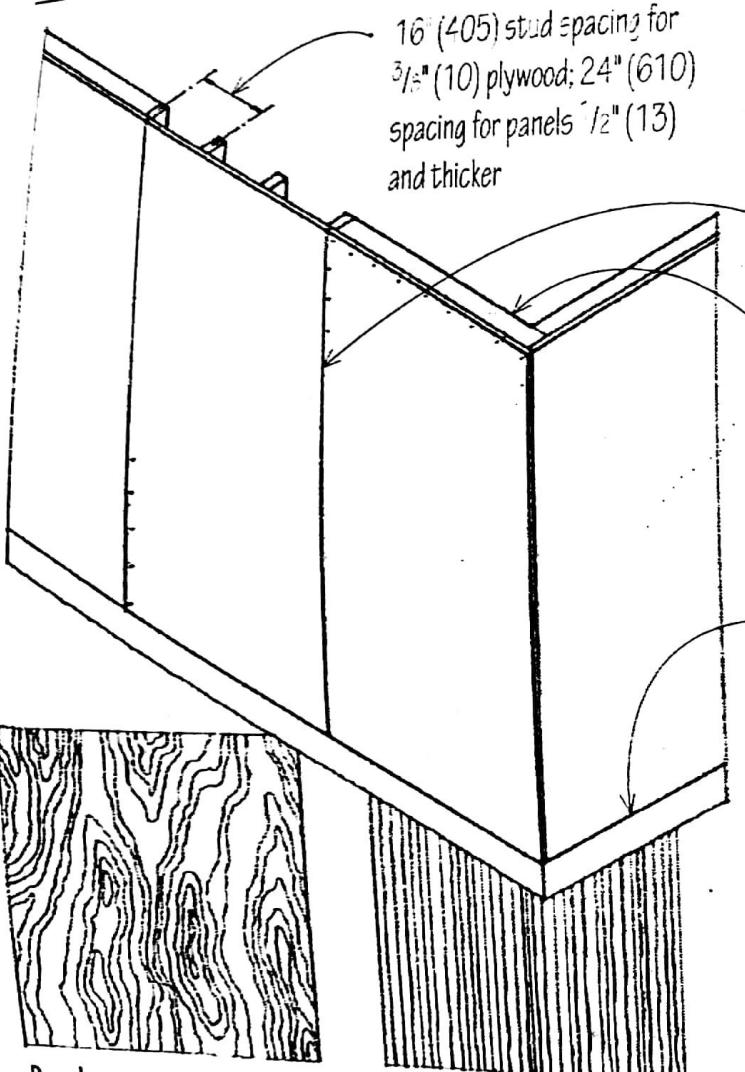
Insulation: Limited.

Fire resistance: Poor to average.

Finishes: Generally painted, oiled or stained.

Plvwood siding

7.32 PLYWOOD SIDING

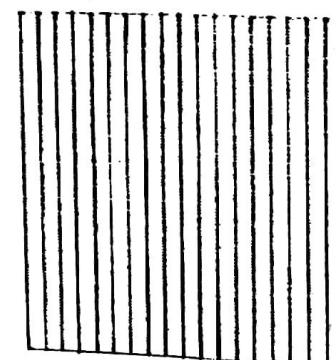


Rough sawn

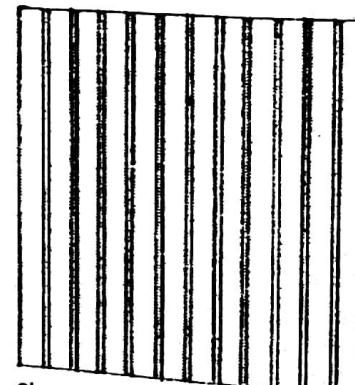
Panel Textures

Striated

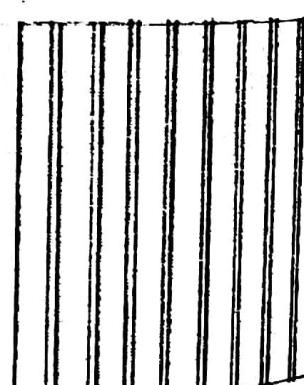
Panel Siding Patterns



Texture 1-11



Channel Groove



Reverse Board and Batten

Exterior-grade plywood siding panels are typically 4' x 8' (1220 x 2440), although 9' and 10' (2.8 and 3.0 m) lengths are available. The most common patterns imitate vertical board siding. The panel surface may have a grooved, rough-sawn, brush or striated texture, and may be stained or treated with a clear water-repellant finish. Medium-density overlay (MDO) is an exterior plywood panel having a melamine or phenolic resin overlay on one or both sides, providing a smooth base for painting.

Horizontal joints, which must be protected by flashing or other means, are very noticeable. These horizontal lines should therefore be coordinated with other exterior wall elements such as windows and door openings.

Metal Cladding



Metal cladding

Insulated and bonded metal panels are used primarily to clad industrial-type buildings; see 6.07. They may have facings of anodized aluminum or steel with porcelain, vinyl, acrylic, or enamel finishes. The panels are typically 3' (915) wide and span vertically between horizontal steel girts spaced 8' to 24' (2.5 to 7.3 m) apart, depending on the type and profile of panel used. Consult manufacturer for profiles, sizes, allowable spans, thermal and acoustical ratings, and installation details.

:

METAL Cladding options

- ACM Panels
- Corrugated Panels
- Dry Joint Panel Systems
- Metal Skin Panels (thick and thin)
- Open Joint Panels
- Perforated Panels
- Phenolic Panels – HPL PANELS

MATERIAL OVERVIEW:

- **HPL (High Pressure Laminates)** are highly durable exterior wall cladding products that are available in a diverse range of decors to create a contemporary, cost effective rainscreen façade.
- HPL panel manufacturers have a large range of colors and patterns to select from, and can offer either printed images or actual wood grains.
- Brands : 1. FunderMax exterior wall cladding
- Produced in lamination presses under great pressure and high temperature.
- Double-hardened acrylic PUR resins provide extremely effective weather protection that is particularly suitable for long-lasting balconies and façade claddings.

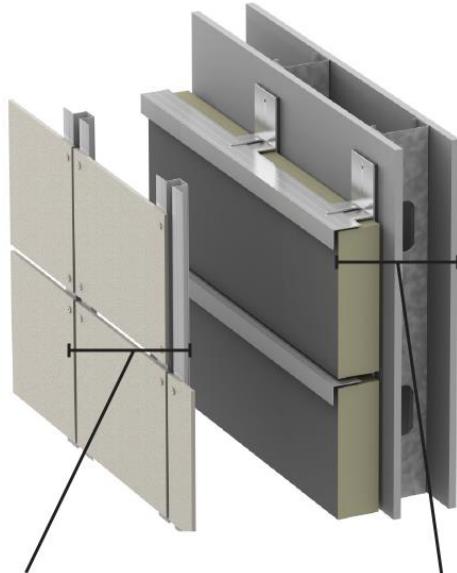
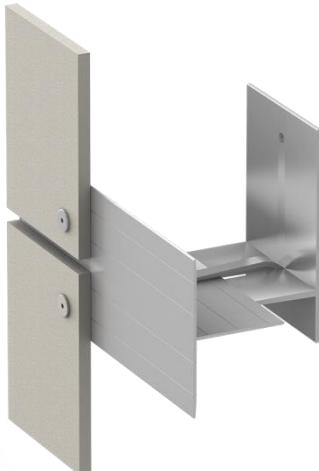
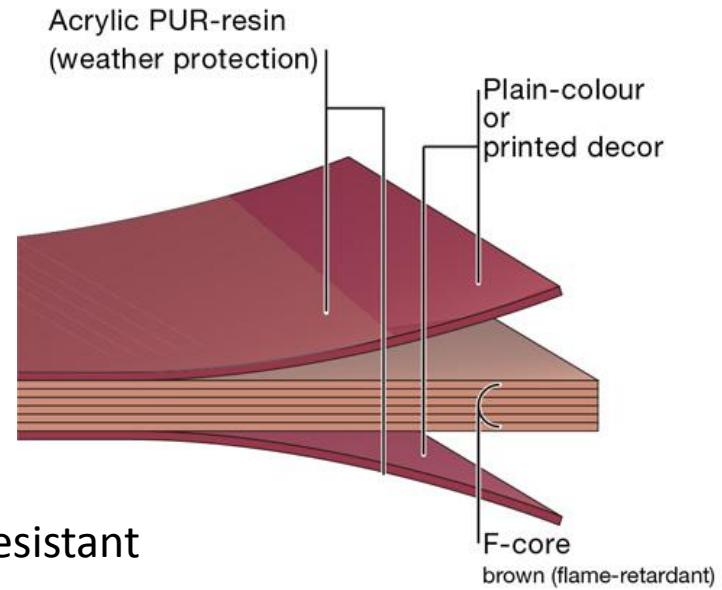


MATERIAL OVERVIEW:

- **HPL (High Pressure Laminates)**

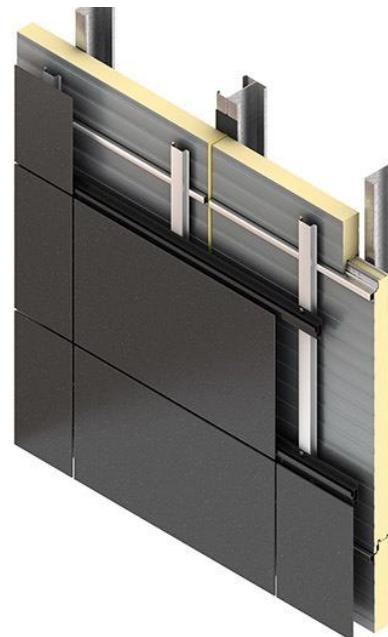


1. Scratch resistant
2. Easy to clean
3. Solvent resistant
4. Easy to install
5. Extremely weather resistant
6. Optimal light-fastness
7. Double hardened




PANEL SUB-FRAMING

C.I. SUB-FRAMING



Insulated and bonded metal panels are used primarily to clad industrial-type buildings; see 6.07. They may have facings of anodized aluminum or steel with porcelain, vinyl, acrylic, or enamel finishes. The panels are typically 3' (915) wide and span vertically between horizontal steel girts spaced 8' to 24' (2.5 to 7.3 m) apart, depending on the type and profile of panel used. Consult manufacturer for profiles, sizes, allowable spans, thermal and acoustical ratings, and installation details.



Steel

•

Steel cladding comes in a wide variety of cold formed profiles with varying base metal gauge and structural capacity. New steel finishes are being trialled which rely on weathering to produce a thick rust coating that protects the steel from further corrosion and allows it to become more corrosion resistant over time.

Maintenance: Very low. Steel finishes are very durable and, while coloured finishes often fade, they rarely require repainting for maintenance. Because steel expands, adequate tolerances must be left at joins and junctions.

Durability: Durability is very high: galvanised corrugated steel can last more than 100 years on a building and is a material highly sought after for decorative reuse. However, it must be installed carefully, with fixings and flashings that are compatible for corrosion and life span. Scratches, lead pencil marks and swarf from cutting can lead to early corrosion.

Breathability: Steel cladding is a vapour barrier and its excellent conductivity makes it highly susceptible to dew-point formation and water vapour condensation. It should always be fixed via a breathable cavity (often provided by the profile).

Steel

- Waterproofness: Among the most waterproof of cladding materials.

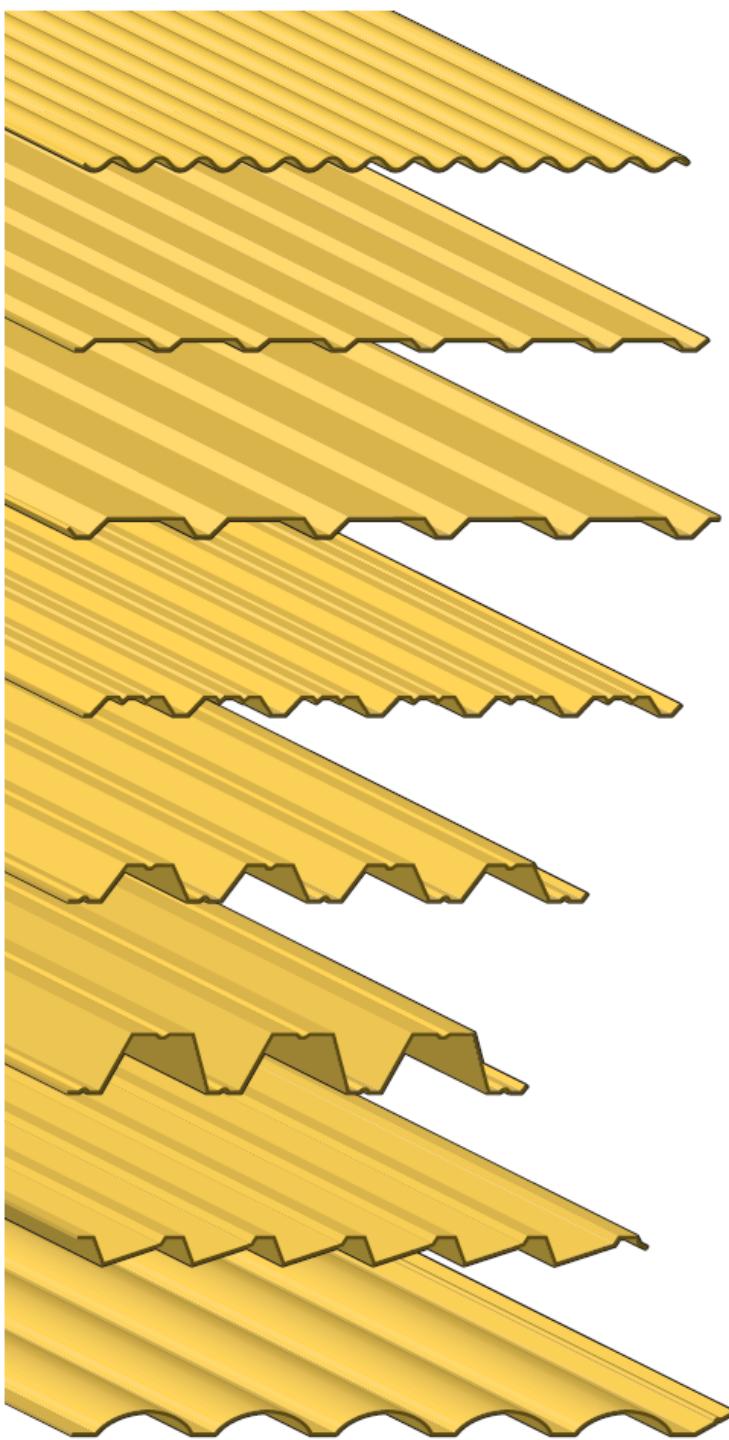
- Insulation: Zero insulation.

- Fire resistance: High in both roofing and walling applications.

- Toxicity: Non-toxic.

- Finishes: A range of standard colours and finishes including galvanised and zinc/aluminium corrosion treatments. A range of standard baked enamel pre-finish colours is available.

Metal cladding profiles



Sinusoidal

Shallow (20mm) trapezoidal

Standard (30mm) trapezoidal

Trapezoidal with stiffeners

Bold trapezoidal with stiffeners

Deep trapezoidal with stiffeners

Asymmetric trapezoidal

Half round

2.2.1 Vertical cladding

The profiles provide vertical lines on the wall face. These lines are less emphasised if the cladding is placed with the broad face out as is usually the case. The appearance of vertical profiled cladding varies considerably with the way that the light falls on it because of shadowing which can also lead to pleasing textural effects on the wall.



Vertical profile

2.2.2 Horizontal cladding

The profile lines follow the eaves line; for buildings which have a low height to width ratio, the building shape is emphasised in a pleasing way and the effect is frequently highlighted by architects using more dramatic profile shapes.



Horizontal profiles

2.2.4 Flat composite panel

Composite panels consist of two skins of metal with an insulation core, manufactured in a factory, usually in an automated process. This type of panel is manufactured with an intrinsic side joint, but not end joint – so the end join details are assembled on site. This has aesthetic implications and it is why this type of panel is differentiated from the bi-modular panel described further on.



- Unique secret-fix joint design allows primary fixings to be hidden from view, which combined with the smooth flat face provides outstanding external aesthetics.
- Flexible design allows vertical and horizontal panel installation.
- Available with a wide range of flashing options, ancillaries, integrated window, integrated louvre, fabricated corner and curved panel options

Aluminium

- Aluminium cladding has a similar range of profiles to steel but also includes a folded weatherboard product. It is more corrosion resistant than steel. Aluminium cladding comes in a wide variety of cold formed profiles with varying base metal gauge and structural capacity.

Availability: Available in all regions of Australia.

Maintenance: Low. Powdercoated finishes generally have a life expectancy of 15 years and, although fading is common, they rarely require repainting for protection.

Durability: Durability is very high due to corrosion resistance of the material itself (rather than protective coatings). Life span and corrosion compatibility of fixings and flashings is essential. Careful installation is required.

Aluminium

- Breathability: Aluminium is a vapour barrier and its excellent conductivity makes it highly prone to dew-point formation and water vapour condensation. It should always be fixed via a breathable cavity (sometimes provided by the profile).

Waterproofness: Among the most waterproof of cladding materials.

Insulation: Zero insulation.

Fire resistance: Good.

Toxicity: Non-toxic.

Finishes: Generally powdercoated in standard colours but for special orders any colour can be supplied.

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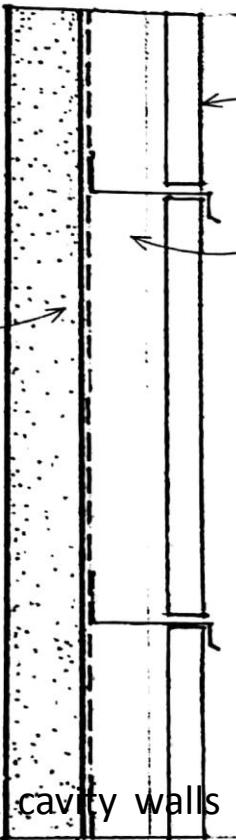
Rain Screen Wall Systems

- Water can penetrate exterior wall joints and assemblies by the kinetic energy of rain drops, gravity flow, surface tension, **capillary action**, and **pressure differential**.
- According to how exterior walls prevent water penetration they can be categorized as follows.
 1. Mass wall systems – such as concrete masonry and solid masonry walls , shed most of rain at the exterior face , absorb remainder and dry by releasing absorbed moisture as vapour.
 2. Barrier wall system - Exterior insulation and finish system (**EIFS**) walls, rely on a continuous seal at the exterior face , which requires ongoing maintenance to be effective in resisting solar radiation , thermal movement and cracking.
 3. Drainage walls – such as stucco walls, use a drainage plane or moisture barrier between exterior cladding and supporting wall for additional moisture resistance.
 4. Rainscreen walls – consist of an outer layer of cladding (the rainscreen) an air cavity and a drainage plane on a rigid water resistant and air tight support wall.

Rain Screen Wall Systems

Interior Side

- An air-barrier system contains the primary joint seals, controls the flow of air and noise through the wall, and is airtight and rigid enough to withstand wind pressures.
- Thermal insulation is situated on the indoor side of the air cavity. The air barrier itself may be a continuous membrane placed on either side of the insulation or on either side of the interior wall layer.



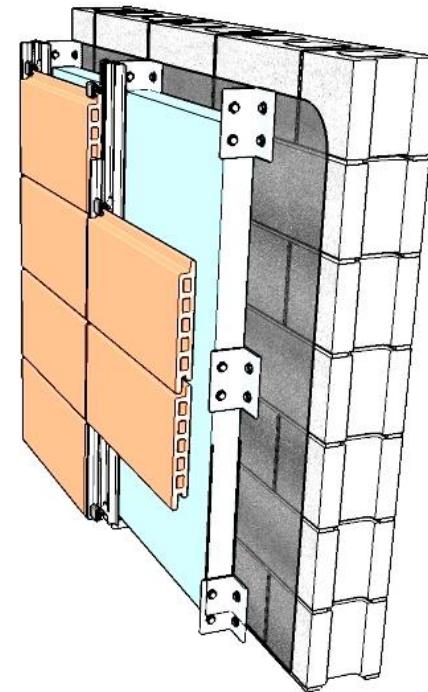
Exterior Side

- Vented cladding (the rainscreen) deflects the kinetic force of rain and deters water penetration at the exterior face of a wall.
- An air cavity provides a place for the equalization of air pressure to occur, is wide enough to prevent the capillary movement of water, and serves as a drainage layer for any water that manages to penetrate the rainscreen.

- Simple rain screen walls such as brick cavity walls and furred out clapboards walls, rely on cladding to shed most of the rain while the air cavity serves as the drainage layer to remove any water that may penetrate the outer layer.
- The cavity should be wide enough to prevent the capillary movement of this water from bridging the cavity and reaching the support wall.
- Pressure differential can drive water through an opening in the a wall assembly, pressure equalized rainscreen PER walls utilize vented cladding and air cavity .
- The primary seals against the air and vapour are located on the indoor side of cavity, where they are exposed to little if any water.

RAINSCREEN

- Rainscreen is constructed as panels with a ventilated cavity between them and an inner air barrier.
- Rainscreen is either built by mounting support rails and panels on an inner wall of concrete, brick or blockwork (overcladding) or is part of a curtain wall (panelised, unitised or stick) that is self-supporting with integral cavity and air barrier (integral rainscreen) Figure
- The panels may be of any material including metal, gfrp, stone, glass and ceramics.



There are two basic types of rainscreen:

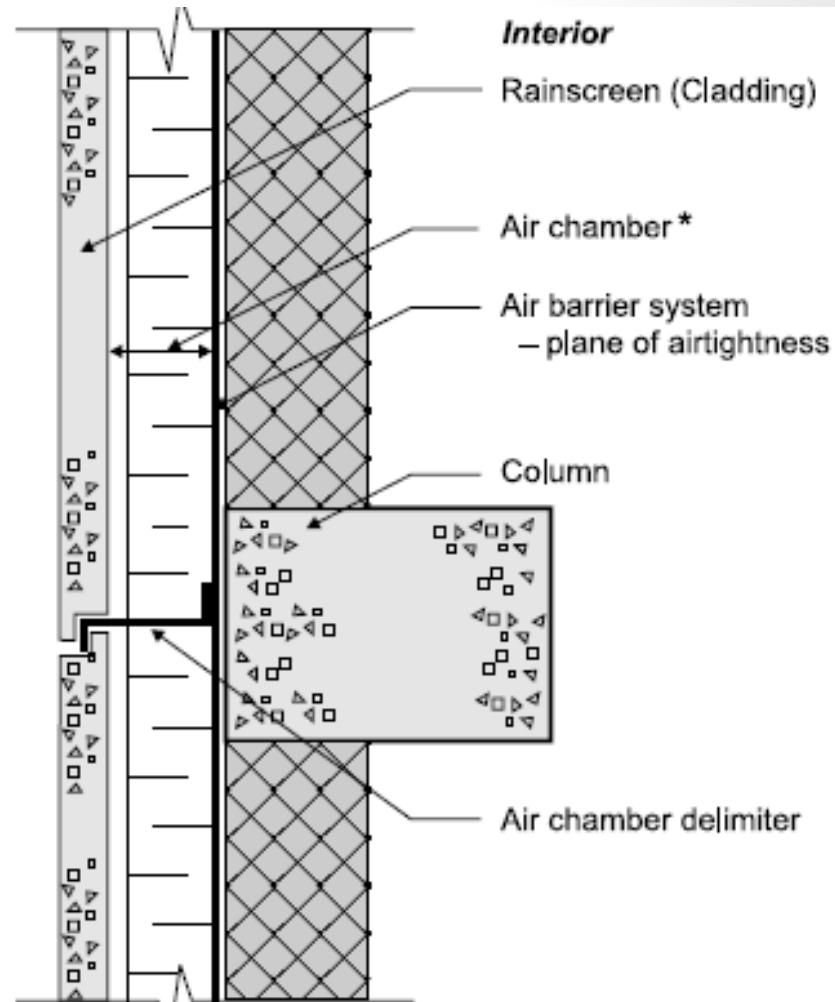
- **Drained and ventilated rainscreen** cladding systems allow any penetrating moisture to drain or evaporate and vent to the outside. In this case it is necessary to detail the façade so that any penetrating water cannot cross the gap between the rainscreen and the internal wall construction.
- **Pressure-equalised (PE)** rainscreen cladding systems allow the movement of air between the inside and outside of the rainscreen. This equalises the pressure across the rainscreen so that water is not driven, or sucked through the joints.

PER - RAINSCREEN

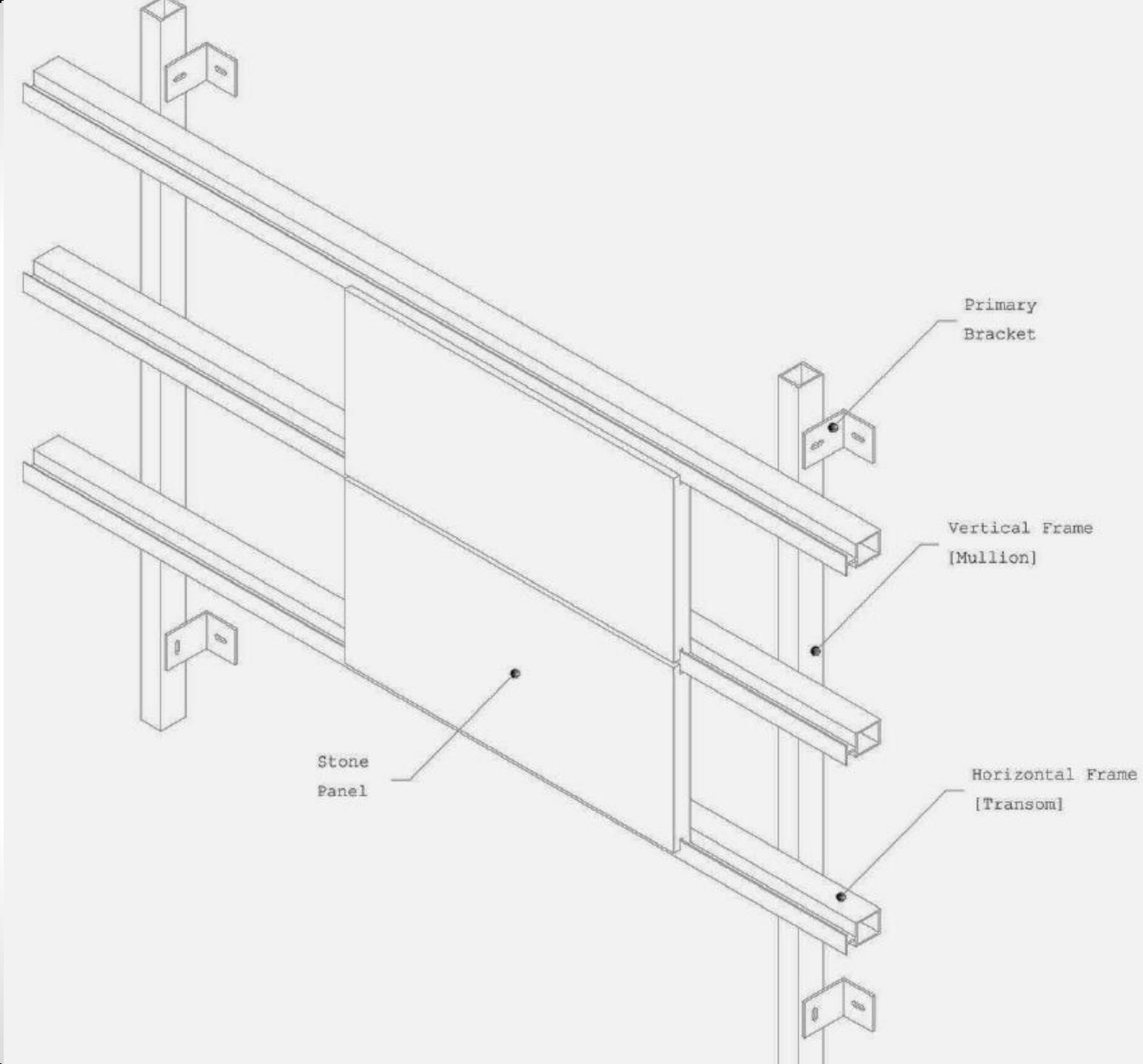
Exterior

Interior

- Rain screen cladding systems aim to protect a building's wall construction from damages that can occur through moisture penetration.
- The air cavity design behind a cladding material allows air to flow through the space, which dries the insulation as well as the back of the cladding panel.
- In theory, pressure equalization means a zero air pressure differential at all times across the rainscreen, i.e., a complete elimination of the driving force for pressure-induced water penetration.
- In practice, the wall assembly must comprise three components (Figure 1): a rainscreen (i.e., vented cladding), a compartmented air chamber and an air barrier system. The air chamber compartments must be small enough, the air barrier system must be airtight enough, and the area of the venting through the rainscreen must be large enough to allow sufficient air to move in and out of the compartments under the applied air pressure.



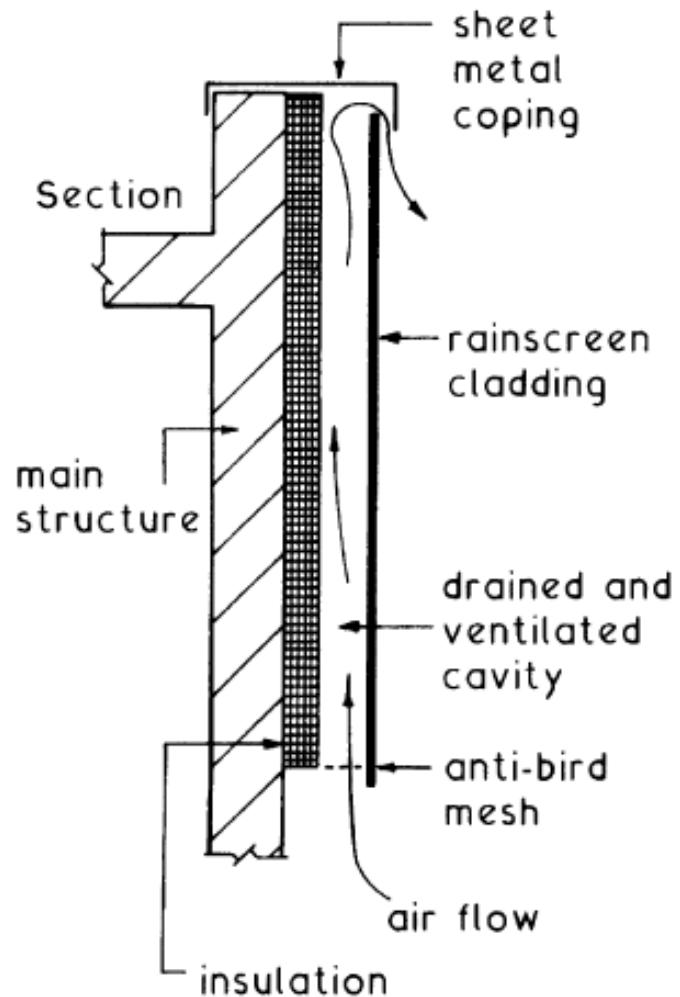
- **Rainscreen Cladding**
- Ventilated rainscreen cladding is a system of cladding which the stone panels are used as part of a system that shields the majority of the supporting structure from direct rainfall. It combines a cavity and drainage system behind the panels to remove any moisture that gets past the rainscreen panels.
There are two types of rainscreen panels:
- - **Pressure – Equalised**
- The cavity behind the panels is divided into compartments to generate pressure to impede the ingress of water through the open joints.
- - **Drained-and-Ventilated**
- The open joints between the stones permits air movement, thereby encouraging the drying out of moisture that gets through the joints.



RAINSCREEN CLADDING

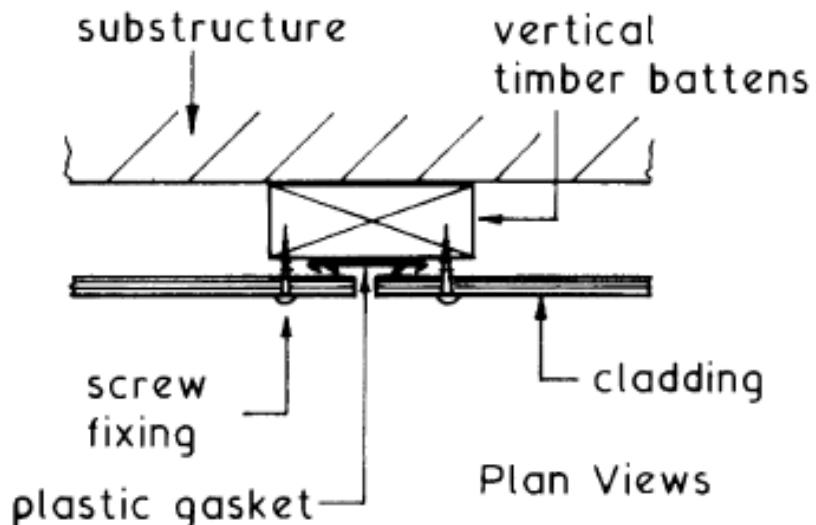
- Comprises a number of layers each with a separate function with regard to weather tightness, insulation and ventilation.
- **Overcladding** - a superficial treatment, applied either as a component of new construction work, or as a facade and insulation enhancement to existing structures.
- The outer weather resistant decorative panelling is 'loose fit' in concept, which is easily replaced to suit changing tastes, new materials and company image.
- Panels attach to the main structure with a grid of simple metal framing or vertical timber battens.
- This allows space for a ventilated and drained cavity, with provision for insulation to be attached to the substructure; a normal requirement in upgrade/refurbishment work.

PRINCIPLES



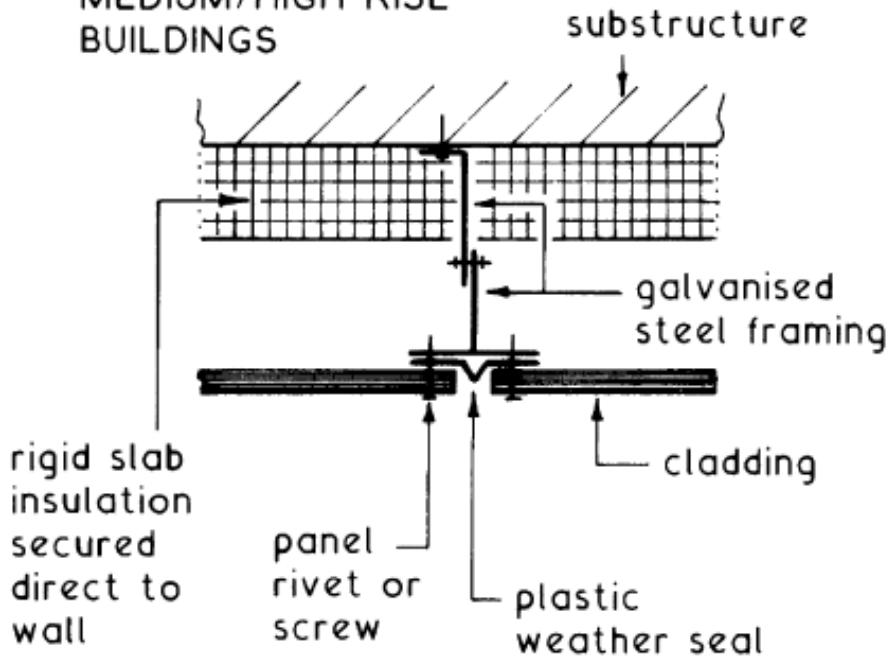
RAINSCREEN CLADDING

LOW RISE BUILDINGS



Plan Views

MEDIUM/HIGH RISE BUILDINGS



Note (1): Cladding materials include, plastic laminates, fibre cement, ceramics, aluminium, enamelled steel and various stone effects.

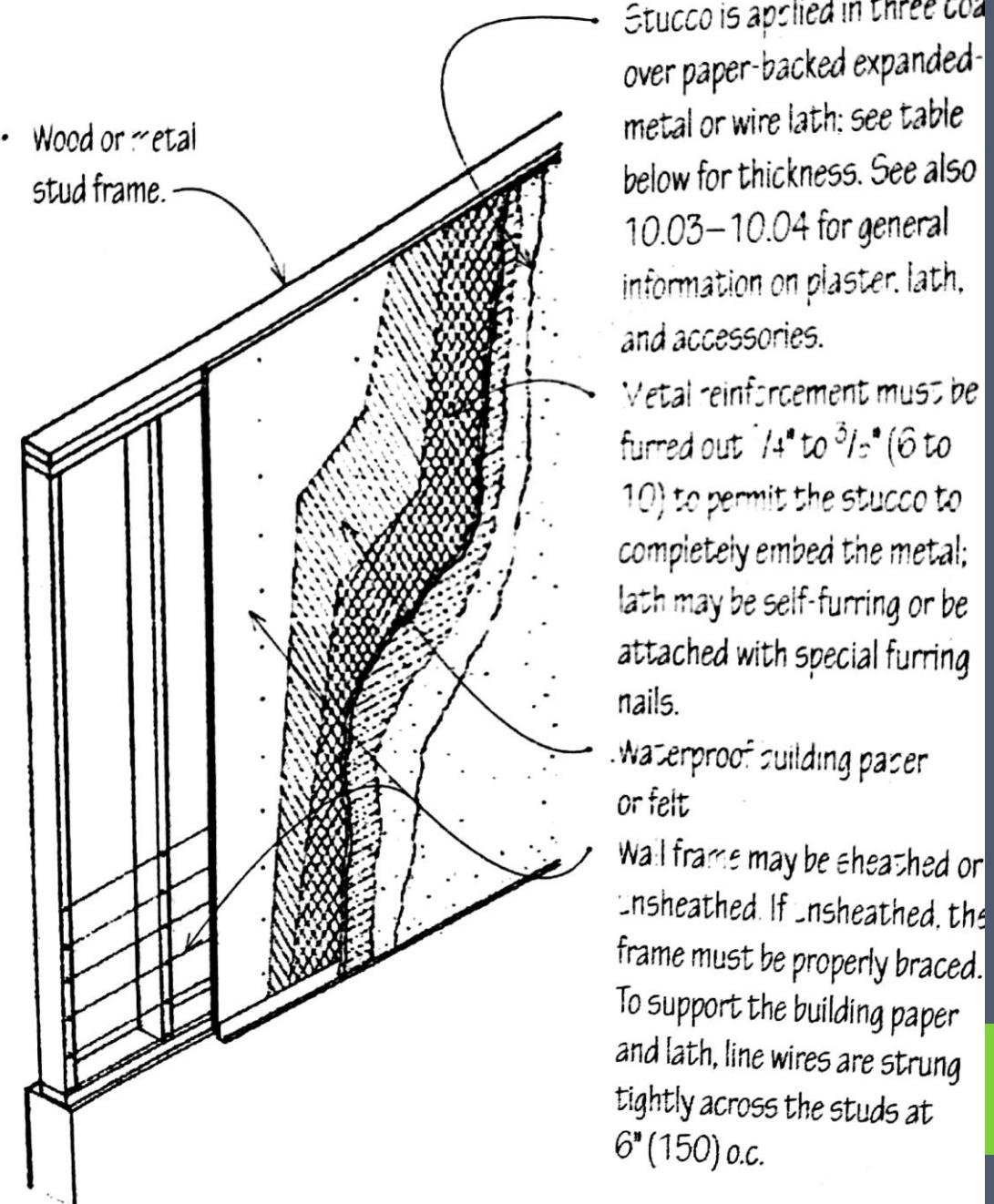
Note (2): Anti-bird mesh coated with intumescent material to form a fire stop cavity barrier.

A photograph of a modern two-story house. The exterior walls are made of light-colored stucco. The house features several windows with bright orange frames. A dark wood deck is visible at the bottom right. The foreground shows some greenery and a small sign in the grass.

STUCCO

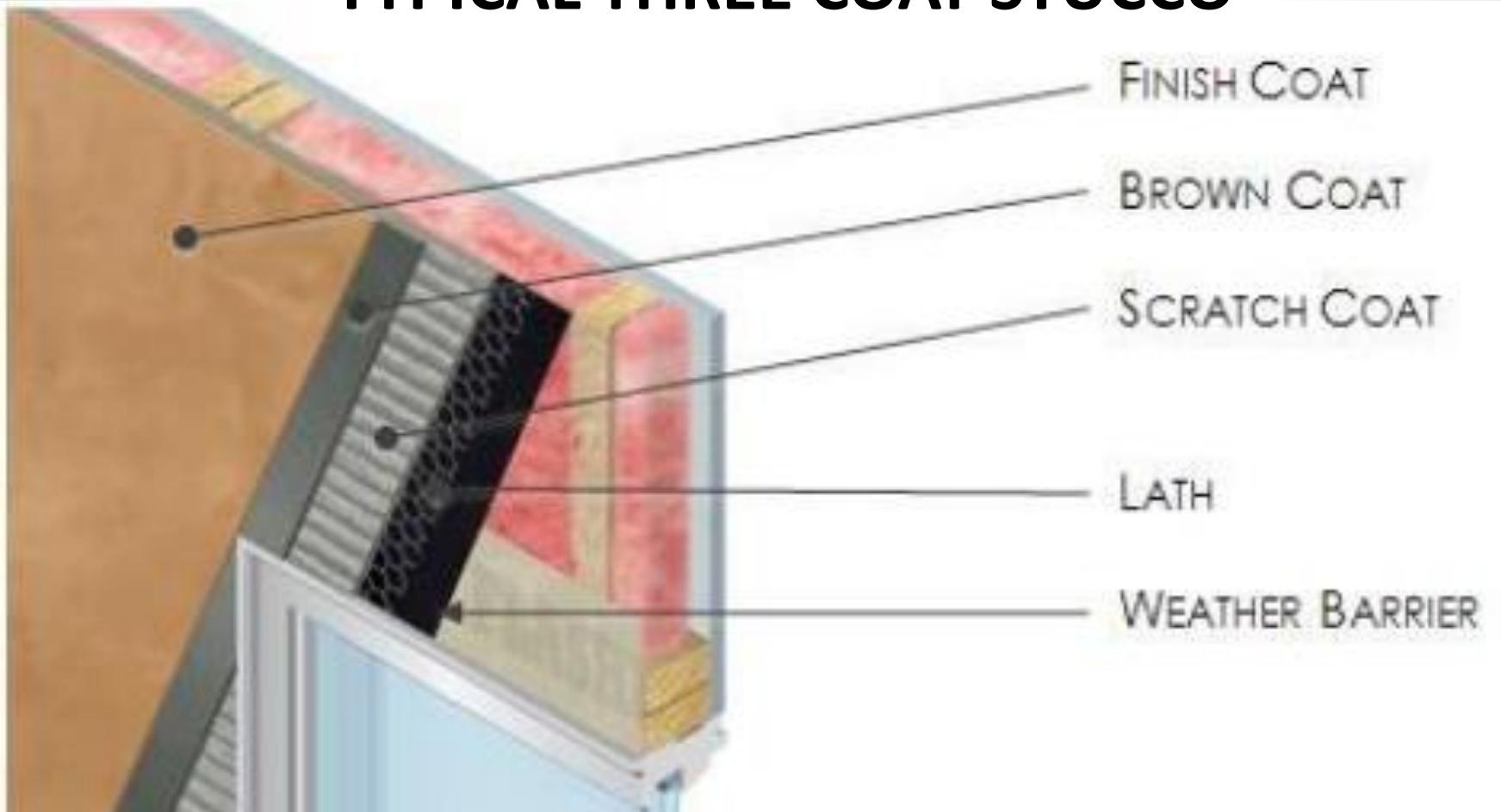
STUCCO

- Stucco is a coarse plaster composed of Portland or masonry cement, sand, and hydrated lime, mixed with water and applied in a plastic state to form a hard covering for exterior walls
- This weather and fire resistant finish normally used for exterior walls and soffits, but it can also be used for interior walls and ceiling that are subjected to direct wetting or damp conditions.

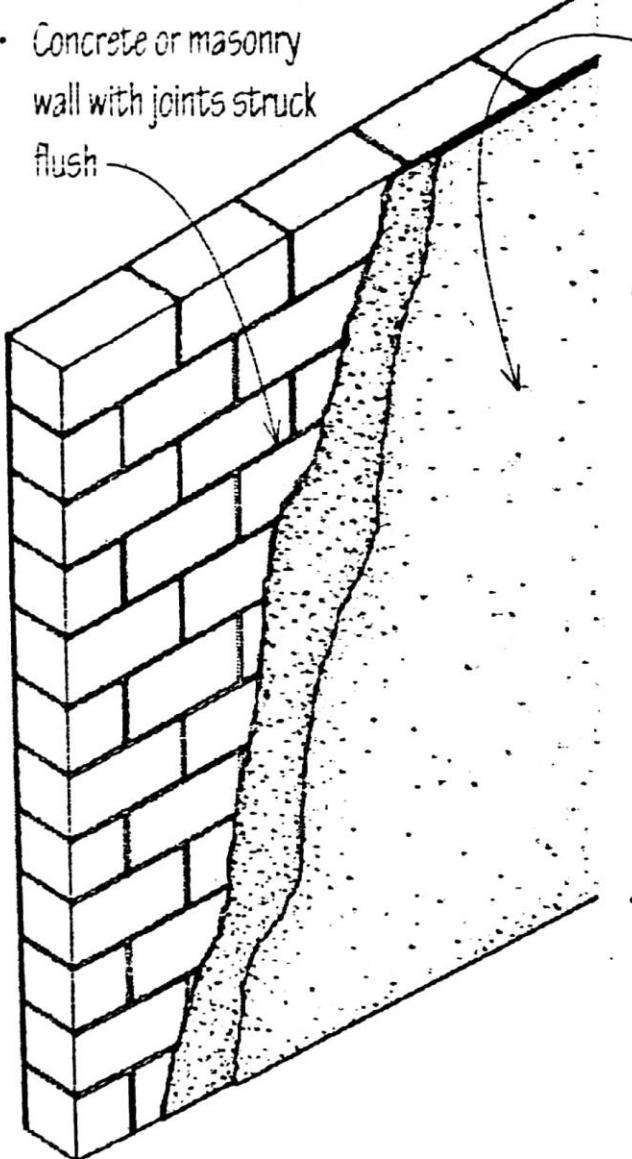


Stud Wall Base

TYPICAL THREE COAT STUCCO



- Concrete or masonry wall with joints struck flush



Stucco is applied in two coats over a suitable masonry or concrete surface; see table below for thickness.

- The masonry or concrete wall should be structurally sound and its surface should be free of dust, grease, or other contaminants that would prevent good suction or chemical bond. In addition, the surface should be rough and porous enough to ensure a good mechanical bond.
- Metal reinforcement, a dash coat of portland cement and sand, or a bonding agent is used if a good bond is doubtful.

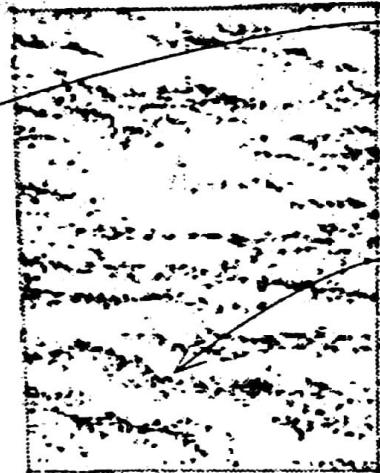
Masonry or Concrete Base

Thickness of Portland Cement Stucco

Base	Minimum Finished Thickness from Face of Base
Expanded metal or wire lath	$\frac{7}{8}$ " (22); exterior $\frac{5}{8}$ " (16); interior
Masonry walls	$\frac{1}{2}$ " (13)
Concrete walls	$\frac{7}{8}$ " (22) maximum
Concrete ceilings	$\frac{5}{8}$ " (10) maximum

Stucco Finishes

The finish coat may have a float, stippled, combed, or pebbled texture. The finish may be natural or be integrally colored through the use of pigment, colored sand, or stone chips.



Float finish is a fine-textured finish produced with a carpet or rubber-faced float.

Stipple-troweled finish is first stippled with a broom; the high spots are then troweled.

Combed finish is formed with a notched or serrated tool.

Rock-dash finish is produced by machine-spraying small pebbles onto unset stucco.

