Cladding
Lecture Outline

Part A: Cladding
1. Definition
2. Types
3. Issues to consider
The **building envelope** (*enclosure*) is the physical separator between the interior and the exterior environments of a building.
Cladding

It is that part of the structure, which encloses the interior of the building. It supports no structural loads but must be capable of supporting its own weight and imposed environmental (wind/snow) loads across the height of a building.

The cladding or facing is a non-structural element that is supported from a primary structure, usually a structural frame.
Cladding, in a pure sense means a component which is used to provide the external enclosing walls that is capable of spanning between two points of support.

A significant advantage that comes from releasing the external wall from structural load carrying duties is the freedom we can have in the selection of materials and the flexibility that is available in terms of their application to a framed structure.
Functional Performance

- Strength & stability
- Weather protection
- Thermal insulation
- Durability
- Fire resistance
- Noise resistance

Other Requirements

- Environment friendly
Issues to consider

1. Does the cladding provide the desired aesthetic appeal?
2. How is the cladding system secured back to the structural frame?
3. How have all joints in cladding panels or units been detailed to prevent the passage of water or air from the external environment to the internal environment?
4. Is there a need to incorporate windows or other opening units within a cladding system and if so, how will these be incorporated within the cladding without violating any of the above requirements.
5. Is there a need to provide a form of solar protection to the external face of the cladding system in order to provide protection from excessive heat gain in summer months.
Masonry Walls

Advantages
• Economical
• Durable
• Good fire resistance
• Good thermal insulation

Possible issues
• Poorer noise resistance depending on construction method and quality
• Time consuming in construction
Masonry Walls

Figure 4.2 Solid wall external rendering

Figure 4.3 Brick cavity wall

Figure 4.4 Cavity wall, cavity partially filled with insulation
Masonry Walls

Wood stud backup consisting of drywall interior finish (over vapor retarder, if needed)

Air-weather retarder

CORRUGATED, GALVANIZED SHEET STEEL ANCHOR typically used only in wood stud-backed brick veneer (also called a corrugated tie). Minimum width = 7/8 in. and minimum thickness = 0.03 in., excluding the thickness of zinc coating

Brick veneer

Corrugated sheet steel anchor

Insulation

A 1-in. air space typical between brick veneer and wall sheathing where corrugated sheet steel anchors are used. A minimum of 2-in. of air space required with other (two-piece) anchors.
Masonry Walls

VENEEER EXTENDS CONTINUOUSLY FROM FOUNDATION TO ROOF without any intermediate support

Intermediate floor
Backup wall
Two-piece anchor

Depression in foundation, called BRICK LEDGE

Air space

SHELF ANGLE anchored to spandrel beam; see Figure 28.21

GAP between shelf angle and top of veneer; see Figure 28.7

Two-piece anchor

SHELF ANGLE anchored to spandrel beam; see Figure 28.21

GAP between shelf angle and the veneer below allows the spandrel beam to deflect freely without transferring the gravity load to veneer; see Figure 28.7

Two-piece anchor

GAP between spandrel beam and top of backup wall allows the beam to deflect freely without transferring gravity load to backup wall. Lateral support (restraint) to backup wall required here; see Figure 28.22. Fill gap with insulation and treat with backer rod and sealant.

Depression in foundation, called BRICK LEDGE

Finished ground
Profiled Metal Cladding

Profiled Metal Cladding

Advantages
• Fast construction
• Uniform look
• Good for low rise or industrial building

Possible issues
• Poorer noise, fire and thermal resistance depending on quality of product
• Requires economies of scale
Profiled Metal Cladding

Components
• External cladding – steel or aluminium
• Breather membrane – sheet to allow water vapour
• Spacer – keep external and internal sheets apart
• Vapour barrier – prevent water from entering building
• Acoustic absorption / internal lining – prevent sound from reflecting back into the room
**Profiled Metal Cladding**

**Liner Tray**
Corus Panels and Profiles HL600/130 Structural Liner Tray.

**Insulation**
Rockfibre Insulation 80mm x 100kg/m².

**Insulation**
Rockfibre Insulation 50mm x 23kg/m².

**Fastener**
5.5mm diameter by 45mm long selfdrilling fastener e.g. SD3-T15-5.5x45.

**Side Stitching**
Side stitching in web at tray interlocks 400mm maximum centres.

**Insulation**
Rockfibre Insulation, minimum 30mm thick 100kg/m² nominal density.

**Outer Cladding**
Corus Panels and Profiles External Cladding 0.5mm thick steel.
Profiled Metal Cladding
What are the key shortcomings for using metal sheet (panel) cladding?

One of the problems associated with the use of metal panel systems is that they rarely include the related elements, such as windows and doors, essential to complete the building facade.

‘Total envelope’ packages = one stop shop

Such approach will reduce the likelihood of having problems arising from poor communication particularly in relation to interface details.
Pre-cast concrete cladding panel

Concrete cladding panels connection to frame
Figure 29.3

Pre-cast concrete cladding panel

Advantages
• Similar to curtain wall
• Fast construction
• High quality
• Used for high rise building

Possible issues
• Requires economies of scale
• Openings design
• Lifting equipment
Pre-cast concrete cladding panel

**FIGURE 28.39 (a)** Lightly abrasive-blasted panels with a great deal of surface detailing.

**FIGURE 28.39 (b)** The part of this panel on the left side of the reveal is lightly abrasive-blasted, and the right side part is medium abrasive-blasted.
Pre-cast concrete cladding panel
Pre-cast concrete cladding panel

Steel tube embedded in panel for bearing support; see Figure 28.42

Leveling shims between bearing plate and panel support

Bearing plate embedded in spandrel beam

Steel tube, angle, or wide-flange section embedded in panel for BEARING SUPPORT

Hardware embedded in panel for TIEBACK connection

FLOOR-TO-FLOOR SOLID (OR WINDOW WALL) PANEL

Steel tube, angle, or wide-flange section embedded in panel for bearing support; see Figures 28.42 and 28.43. While this illustration shows bearing support above the beam, it can also be placed in a block-out (pocket) in the beam, which is filled with concrete after the connection is made.

Tieback connection, see Figures 28.43 and 28.44
Rainscreen Cladding

“Rainscreen cladding is a layered cladding system typically comprising an outer skin which incorporates air gaps but forms the primary rain barrier, a ventilated air gap that prevents water ingress, and an effectively impermeable backing wall”.

Advantages
• Increase weather protection
• Commonly used for refurbishment

accepted standard specification for rainscreen cladding. Most designers/specifiers have developed their own in-house specification in a generic format but tailored to meet the requirements of a specific rainscreen cladding project. Thus the specification for rainscreen cladding may differ from contract to contract depending on the materials used. However, two documents have recently been published and are...
Rain screen cladding systems were primarily developed in the UK for the refurbishment of concrete buildings, particularly residential tower blocks and office blocks from the 1960's and 1970's.
Photovoltaic Cladding

The integration of photovoltaics is straightforward with the PV wall cladding panels substituting the traditional rain screen face material.
Photovoltaic Cladding

- The integration of photovoltaics is straightforward with the PV wall cladding panels substituting the traditional rain screen face material.

- The ventilated zone behind the solar panels is ideal for controlling PV temperatures and for providing space for the electrical wiring.

- The PV wall cladding panels can also be inclined to maximise their efficiency.

- Rain screen PV cladding adds little weight to the building, provides space to improve insulation levels and creates a ventilated skin.
Photovoltaic Cladding / Roof

Figure 15. BIPV modules integrated into a façade

Figure 16. BIPV modules integrated into a skylight canopy
Curtain Wall

- Curtain walling is a vertical building enclosure which supports no load other than its own weight and the environmental forces which act upon it.

- Curtain walls are not intended to assist in maintaining the structural integrity of a building. Dead loads and live loads are thus not intended to be transferred via the curtain wall to the foundations.

- 2 basic types of curtain walling installations: stick and unitised.

Curtain wall is the glass, aluminium, metal panel, and sometimes, stone facade used on medium and high rise buildings.
Curtain Wall

Advantages
• Fast construction
• High quality
• Aesthetic look
• Used for high rise building
• Good thermal / noise insulation depending on product design
• Allows daylight / view

Possible issues
• Requires economies of scale
• Openings design
• Lifting equipment
• Expensive
Curtain Wall

Unitised curtain walling
Unitised curtain walling

- installed as a series of factory-assembled frames, usually with interlocking mullions and transoms.
- seals are also applied or prepared in the factory. Unitised systems are used where the movement or deflections in a building are such that a stick system is inappropriate.
- speed of installation, minimal on site labour, and lower installation costs.
- However increased storage and shipping costs, the need for very careful site handling, and the requirement for expensive lifting equipment on site.
- Unitised systems are popular because they eliminate, or reduce, the need for on site sealing, therefore making them less reliant on the standard of site workmanship.
- However, for unitised systems to perform to their full potential, it is critical that the brackets to which the components are fixed are accurately installed.
Curtain Wall

Stick cladding
Stick cladding

- installed on site, component by component, after being prepared and machined in the factory and supplied in knock down form.
- vertical structural mullions (sticks) are fixed first. After the mullions are secure, the horizontal transoms are added and then the glazing panels, spandrels and vents installed in the completed grid
- normally using a pressure plate and facecap. This means that a building has to be unoccupied during refurbishment.
- Stick systems allow on site adjustment, but the performance of the systems is dependent upon the quality of the installation in what are often uncontrolled conditions.
Curtain Wall
Aluminium framing is used for the vast majority of curtain walling applications, primarily for its excellent strength to weight ratio and its ability to be extruded in complex shapes.
Spider Glazing