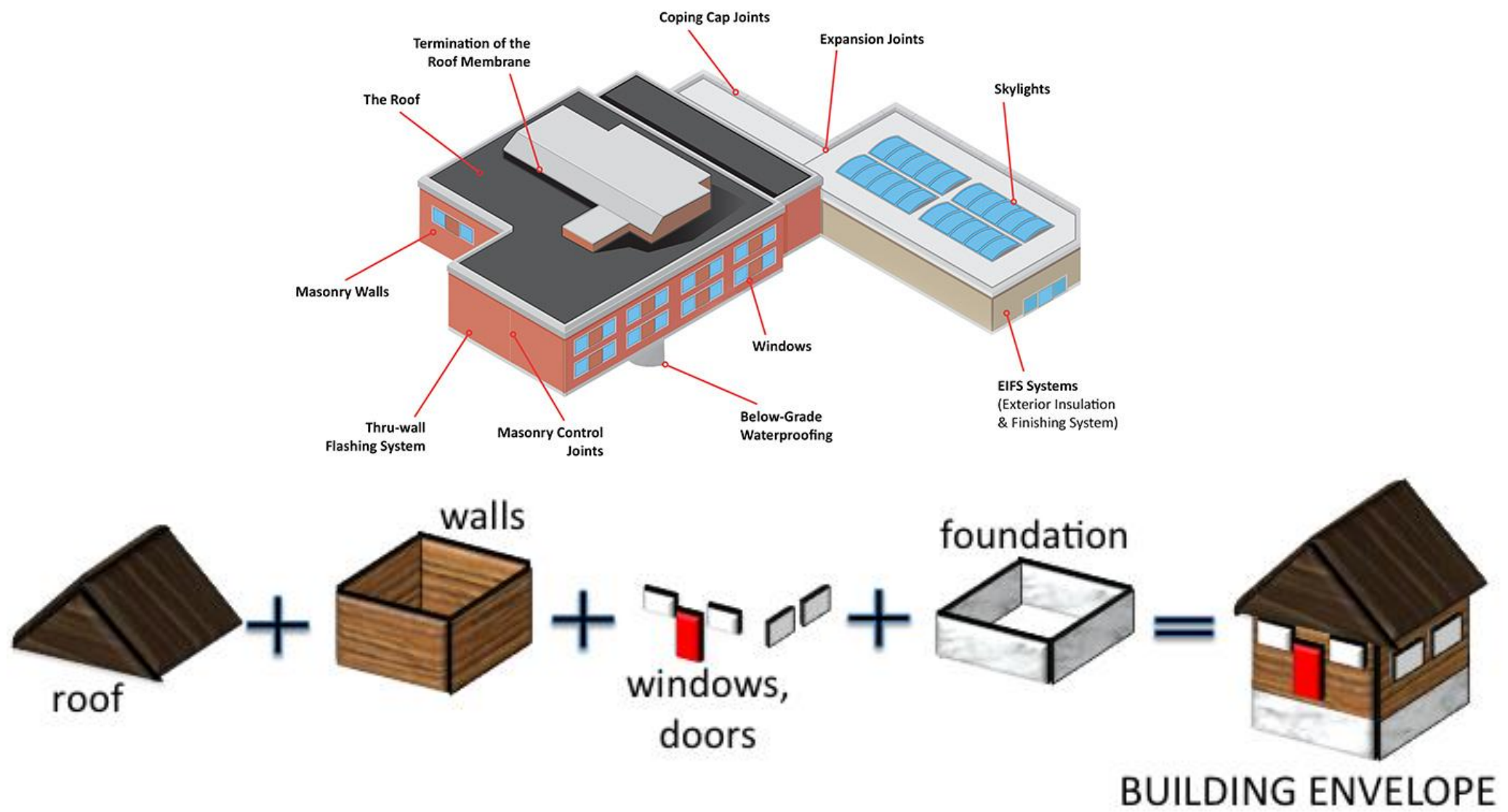




TCM 2430 – Construction Safety

Week 13 – Safety for the Exterior Enclosure (Siding, Glazing, Roofing, Sheathing)

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Elements of Building Envelope

What is construction of exterior enclosure?

- The construction of an exterior enclosure, also known as the **building envelope** or **building enclosure**, refers to the assembly of materials and components that work together to form the outer shell of a building.
- This enclosure is designed to protect the interior of the building from various environmental elements, such as weather, wind, water, and temperature fluctuations, while also providing thermal insulation and maintaining structural integrity.

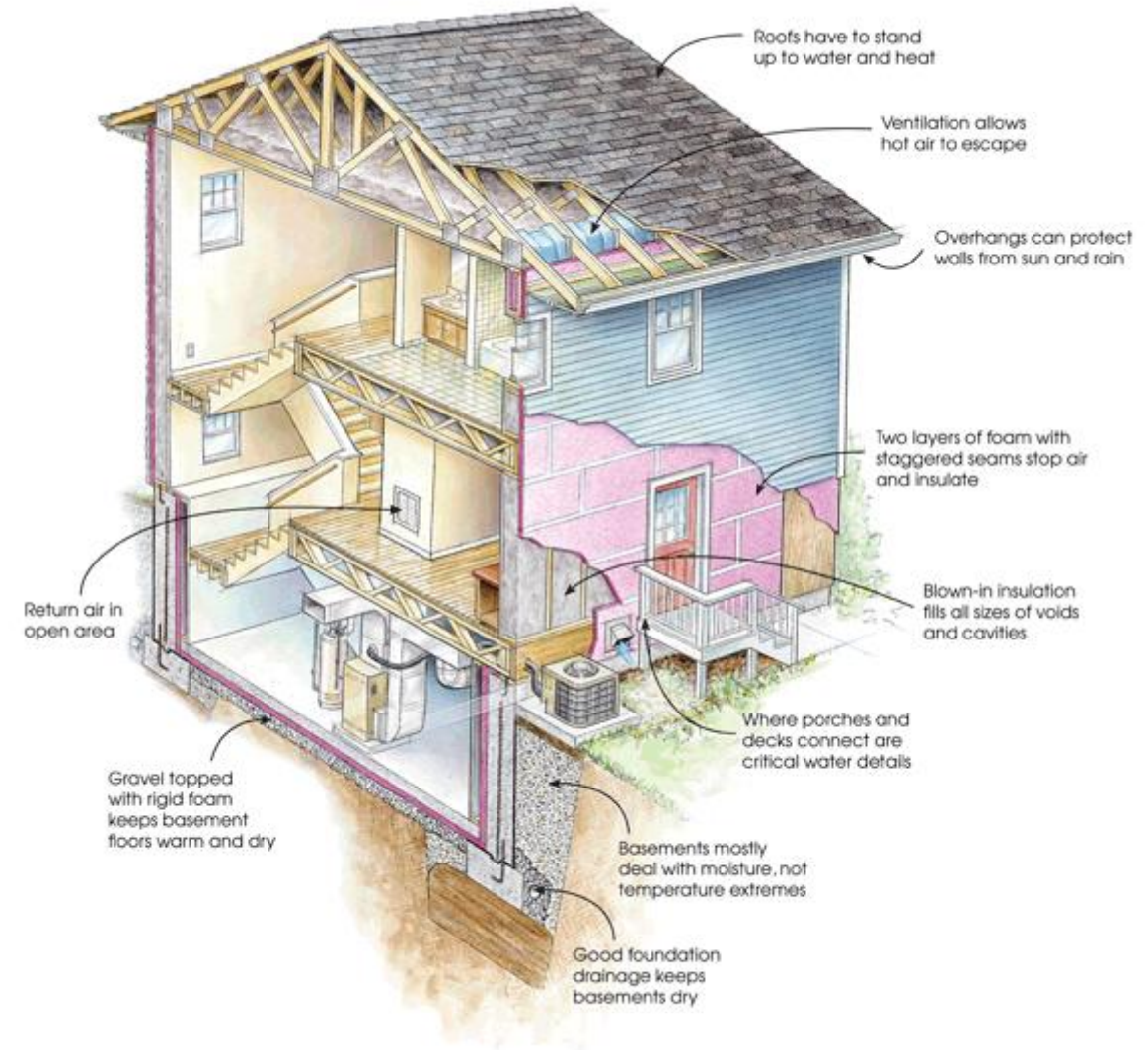
https://www.youtube.com/watch?v=UluRLLwpwew&ab_channel=GreenstoneBuildingProducts



What are the common elements of exterior enclosure?

Structural Elements

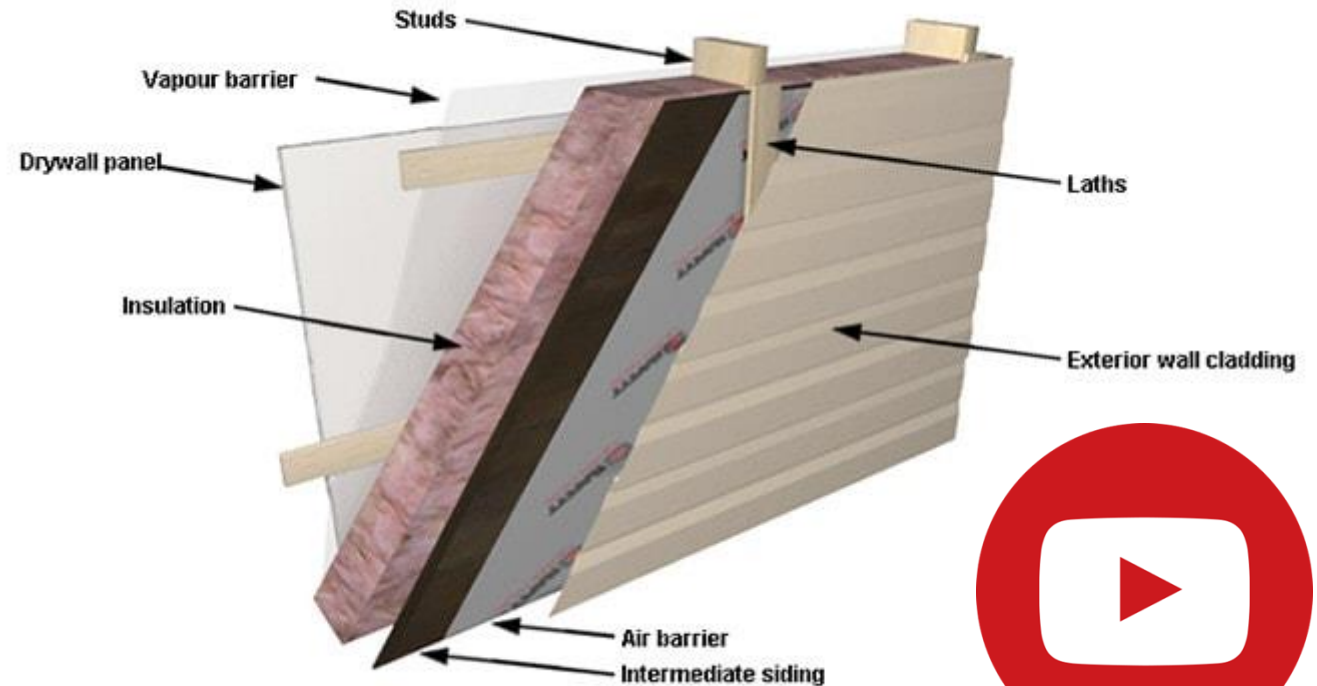
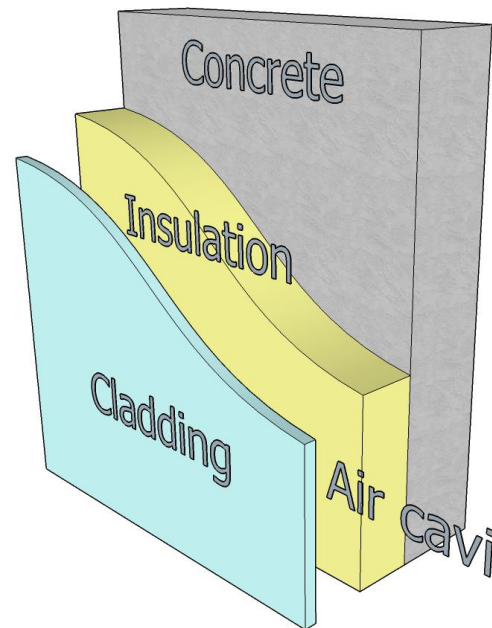
- The framework of the building, including **walls, roofs, floors**, and **foundations**, forms the structural elements of the enclosure. These elements support the building and provide a framework for the exterior materials.



What are the common elements of exterior enclosure?

Exterior Cladding

- This is the **outermost layer of the enclosure** and includes materials like **siding, brick, stucco, or other finishes** that provide **protection against the weather** and **enhance the building's aesthetic appeal**.



What are the common elements of exterior enclosure?

Weather-Resistant Barrier

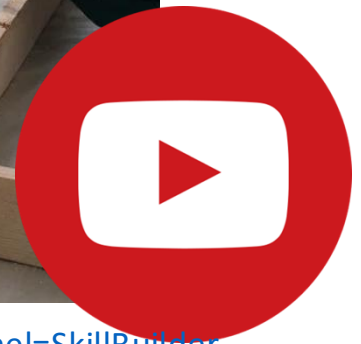
- A weather-resistant barrier is installed **beneath the exterior cladding** to prevent the **penetration of water and air into the building**. This barrier helps **manage moisture** and **protects against water damage**.



What are the common elements of exterior enclosure?

Insulation

- Insulation is placed **within the walls and roof to regulate the temperature inside the building.** It helps in maintaining a **comfortable indoor environment** and improves **energy efficiency.**



What are the common elements of exterior enclosure?

Windows and Doors

- Openings in the enclosure, such as windows and doors, are designed to **allow natural light and ventilation** while providing a barrier against the elements. These openings are equipped with **seals and weather-stripping** to prevent water and air infiltration.



What are the common elements of exterior enclosure?

Roofing Systems

- The type of roofing material used plays a crucial role in **protecting the building from rain, snow, and other environmental factors**. Roofing systems can include **shingles, tiles, metal panels, or other materials**.



https://www.youtube.com/watch?v=Q6ND_8glacs&ab_channel=VeteranConstruction

What are the common elements of exterior enclosure?

Flashing

- Flashing is used to **prevent water from entering the building at joints, corners, and intersections**. It is typically made of metal and is installed around windows, doors, and other vulnerable areas.

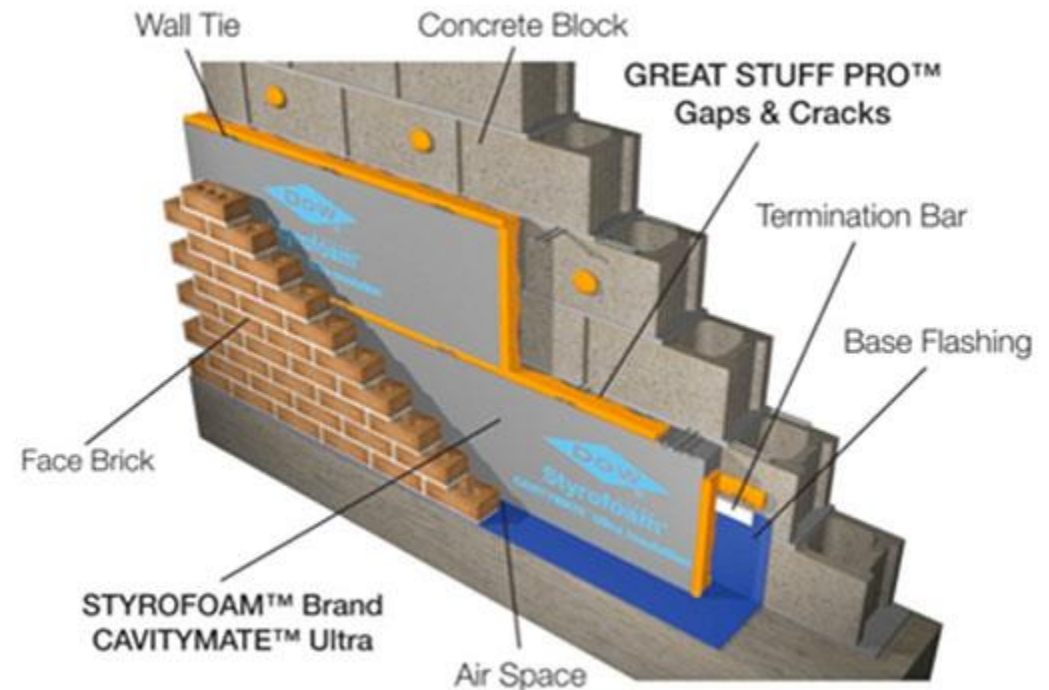
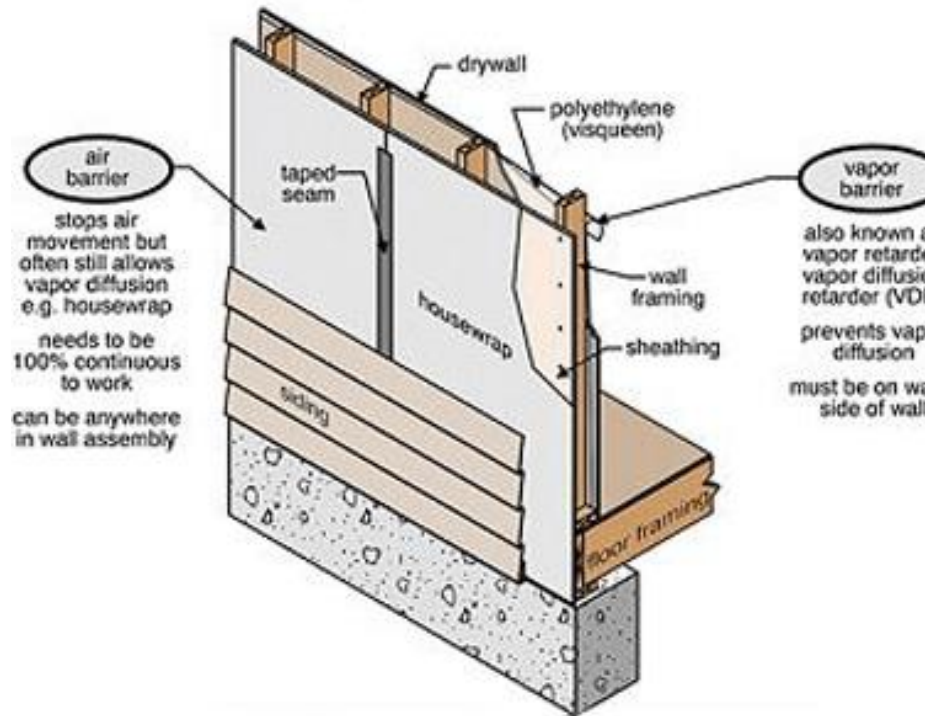


What are the common elements of exterior enclosure?

Air and Vapor Barriers

- These barriers are installed to **control the movement of air and vapor through the building envelope**. They help in **preventing moisture-related issues** and **maintaining indoor air quality**.

Air barrier versus vapor barrier



What are the common elements of exterior enclosure?

Sealants

- Sealants are used to **fill gaps and joints in the exterior enclosure**, providing an **additional layer of protection against water and air infiltration**.



https://www.youtube.com/watch?v=HHEOLfmypyc&ab_chann el=AeroBarrier



What are the common elements of exterior enclosure?

Ventilation Systems

- Adequate ventilation is essential for **maintaining indoor air quality**.
- Ventilation components, such as **vents and fans**, are integrated into the building envelope to facilitate air exchange.



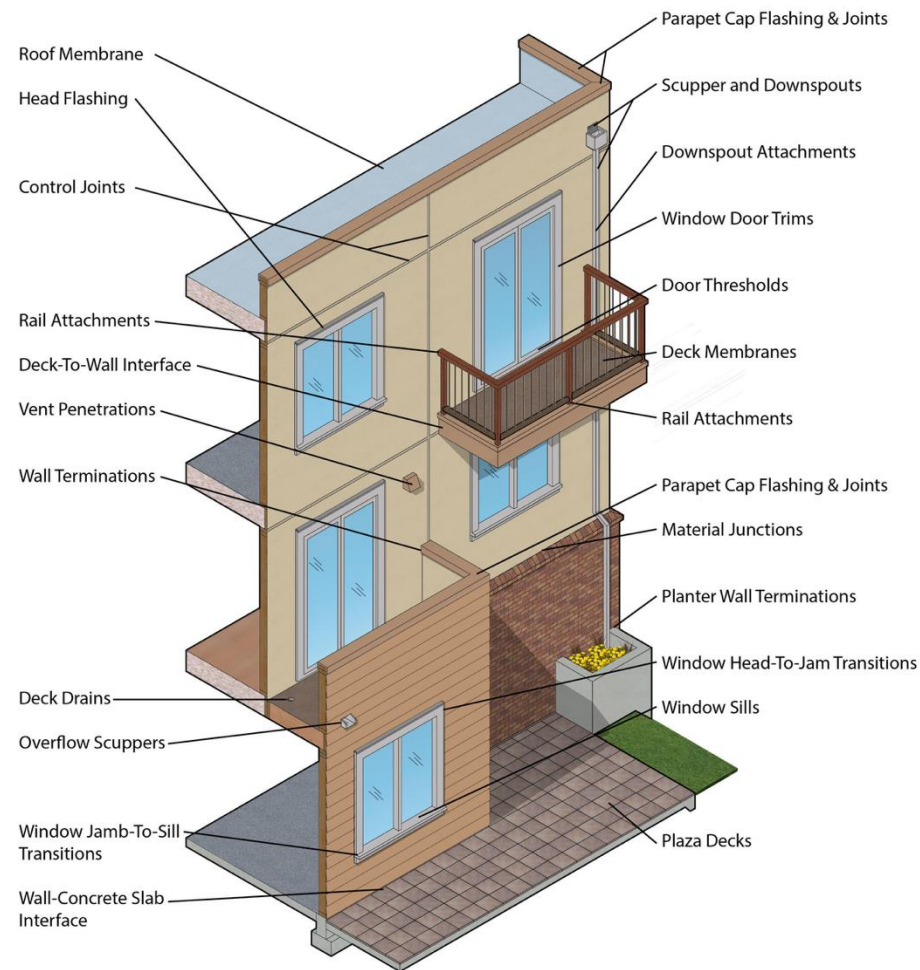


*Diagram is for reference purposes only

Hazards In Installation of Building Envelope Elements

Hazards in installation of building envelope elements

Fall Hazards

- Workers involved in the installation of structural elements often work at heights, especially during the construction of walls, roofs, and floors.
- Fall protection measures, such as **guardrails**, **safety nets**, or personal fall **arrest systems**, should be in place to prevent falls from elevated surfaces.



Hazards in installation of building envelope elements

Lifting and Rigging Safety

- The handling and placement of heavy structural components require proper lifting and rigging procedures.
- Workers should be trained in the safe use of cranes, hoists, and other lifting equipment (*this has been covered in previous lectures*).
- Load capacities must be strictly adhered to, and all equipment should be regularly inspected for safety.



Hazards in installation of building envelope elements

Material Handling

- The movement and placement of construction materials can pose risks of musculoskeletal injuries.
- Proper ergonomics and lifting techniques, as well as the use of mechanical aids, can help reduce the likelihood of strains and injuries.



Hazards in installation of building envelope elements

Structural Stability

- During installation, temporary supports and bracing are often used to stabilize structural elements until the building reaches a certain level of completion.
- Ensuring the stability of these temporary structures is crucial to prevent collapses or shifting during construction.



Hazards in installation of building envelope elements

Tool Safety

- The use of hand and power tools is common in the installation of structural elements.
- Workers should be trained on the proper use of tools, and tools should be well-maintained.
- Personal protective equipment (PPE), such as gloves and eye protection, should be worn as appropriate.



Hazards in installation of building envelope elements

Electrical Safety

- Structural elements often involve electrical work for lighting, wiring, and other systems.
- Proper electrical safety measures, including lockout/tagout procedures and grounding, should be followed to prevent electrical hazards.

STANDARD PPE — REQUIRED EQUIPMENT ON A JOBSITE



HARD HAT — Head protection: ANSI Z89.1. Insulated hard hats (helmets) must be worn when any time there is possible contact with any live electrical wires, conductors, or other conducting surfaces or any surfaces that can cause injuries.

SAFETY GLASSES — Eye and face protection: ANSI Z87.1 To be worn when there is the potential for exposure from flying particles, light radiation, molten metal, chemicals, etc.

GLOVES — Workers exposed to harmful substances, severe cuts, lacerations, abrasions, thermal burns and temperature extremes benefit from hand protection.

INSULATED TOOLS — ASTM F1505 or IEC 900. Must be used whenever a person is using hand tools on or near live electrical conductors or equipment up to 1000 volts.

HIGH VISIBILITY VEST OR SHIRT — Clothing is worn to increase the visibility of the wearer in situations where part or all of the body could be obscured, i.e. construction materials, etc.

WORK BOOTS — Foot protection: ANSI Z41.1. Worn when there is the potential for injury from falling or rolling objects, objects piercing the sole of the foot, electrical hazards, etc.

Hazards in installation of building envelope elements

Weather Conditions

- Adverse weather conditions, such as high winds, rain, or extreme temperatures, can pose additional risks during the installation of structural elements.
- Work should be planned and coordinated to account for weather-related safety concerns.



Hazards in installation of building envelope elements

Scaffolding Safety

- If scaffolding is used for installation, it should be erected, inspected, and maintained by qualified personnel. Workers should be trained in safe scaffolding practices, and guardrails should be in place to prevent falls.



Hazards in installation of building envelope elements

Traffic and Site Access

- If the installation involves work near roadways or areas with vehicular traffic, workers should be aware of traffic control measures, wear high-visibility clothing, and follow safety procedures to prevent accidents involving vehicles.



Hazards in installation of building envelope elements

Respiratory Hazards

- During installation, workers may be exposed to dust, debris, or fumes, especially if cutting or sanding materials.
- Adequate ventilation and the use of respiratory protection may be necessary to protect against respiratory hazards.





Hazards in Glazing and Installation of Windows

Hazards in Glazing and Installation of Windows

Glass Handling and Breakage

- **Cuts and Abrasions:** Broken glass edges can be sharp, leading to cuts and abrasions. Workers should wear cut-resistant gloves and handle glass with care.
- **Falling Fragments:** During installation or removal, glass fragments may fall, posing a risk to workers below. Proper barriers and protective equipment should be in place.



Hazards in Glazing and Installation of Windows

Proper Installation Techniques

- Following manufacturer guidelines and industry best practices is crucial for proper installation.
- Improperly installed windows and doors may pose safety risks, such as structural failures, water leaks, or compromised security.



Hazards in Glazing and Installation of Windows

Crushing Hazards

- The weight of windows and doors can pose a crushing hazard during installation.
- Workers should be cautious when handling and installing large or heavy components, ensuring that there is no risk of trapping body parts.



Hazards in Glazing and Installation of Windows

Sharp Edges and Projections

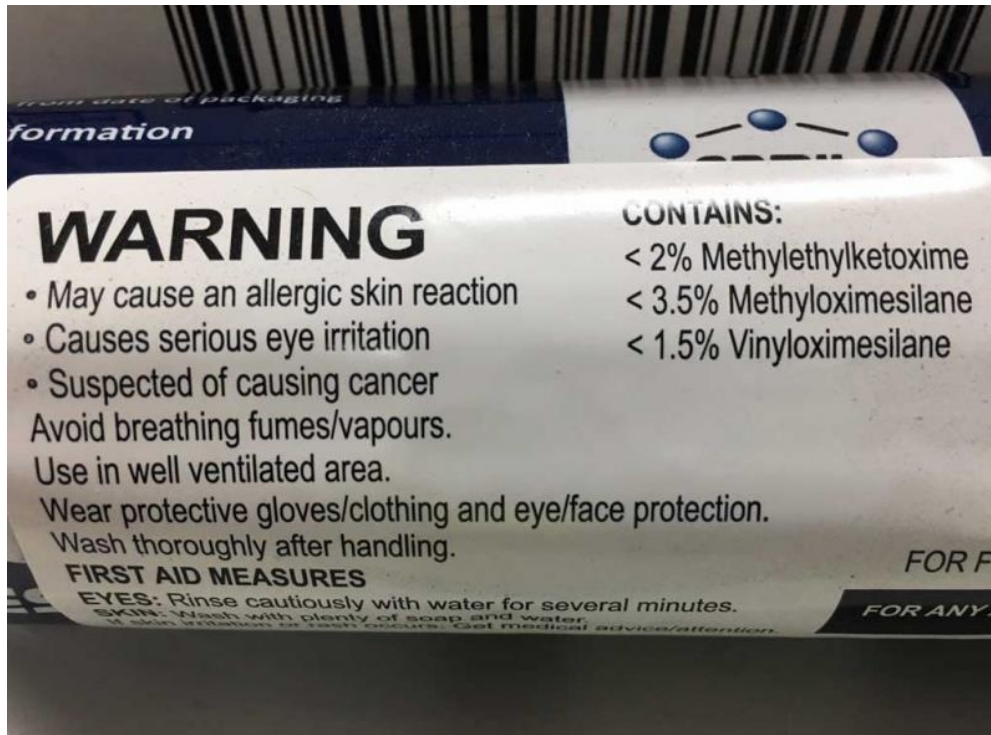
- Windows and doors may have sharp edges or projections that can cause cuts or abrasions.
- Workers should wear appropriate personal protective equipment, such as gloves and safety glasses, to minimize the risk of injuries.



Hazards in Glazing and Installation of Windows

Sealant and Adhesive Hazards

- Chemical Exposure: The use of sealants and adhesives may expose workers to chemicals. Proper ventilation and the use of appropriate PPE, such as gloves and respiratory protection, are necessary.



Hazards in Glazing and Installation of Windows

Glass Fragments and Sharp Edges

- Injuries from Edges: The edges of glass panels can be sharp, leading to injuries if not handled or finished correctly. Workers should be cautious and wear appropriate PPE.





Hazards in Roofing

Hazards in Roofing

Slips and Trips

- Wet or Slippery Surfaces: Weather conditions, such as rain or dew, can create slippery surfaces on the roof. Proper footwear with slip-resistant soles and caution are necessary.



Hazards in Roofing

Tool and Equipment Hazards

- Power Tools: Incorrect use of power tools, such as nail guns or saws, can result in injuries. Workers should be trained on tool operation and safety measures.
- Falling Objects: Tools, equipment, or materials can fall from the roof, posing a danger to workers and bystanders. Implement barricades and warning signs to mark the danger zone.



Hazards in Roofing

Roof Openings

- Unprotected Skylights or Roof Hatches: Workers can fall through unprotected openings on the roof.
- Install guardrails or protective covers to prevent falls.



Hazards in Roofing

Heat Stress

- Exposure to Sun and High Temperatures: Working on a roof under direct sunlight can lead to heat-related illnesses.
- Adequate hydration, breaks, and shaded areas are essential to prevent heat stress.





Hazards in Wood Stud Framing & Sheathing

What is Wood Stud Framing & Sheathing?

- Wood stud framing is a method of constructing the skeletal framework of a building using wooden studs. Studs are vertical members that form the primary structural element of walls.
- Sheathing refers to the material applied to the outer surface of the framing to provide structural support, protect against the elements, and serve as a base for exterior finishes.



What types of materials are used in sheathing?

- **Plywood:** Layers of wood veneers glued together in a cross-grain pattern for strength and stability.
- **Oriented Strand Board (OSB):** Engineered wood product made by compressing strands of wood with resin and wax.
- **Gypsum or Fiberboard:** Specialized sheathing materials that may have fire-resistant or moisture-resistant properties.



What are the functions of sheathing?

- **Structural Support:** Sheathing enhances the overall strength and stability of the building structure.
- **Weather Resistance:** It provides a protective barrier against the elements, such as wind, rain, and snow.
- **Base for Finishes:** Sheathing serves as a surface to attach exterior finishes, such as siding or stucco.



What is the installation process of sheathing?

- Sheathing is typically attached directly to the **exterior side** of the wood stud framing.
- The sheets are secured with **nails or screws**, and the seams are often **staggered** for additional strength.
- Proper installation ensures a **continuous and rigid surface** for exterior finishes.



Hazards in sheathing

Falls from Heights

- **Hazard:** Sheathing is often installed at elevated positions, especially in multi-story buildings. This poses a risk of falls from heights.
- **Safety Measures:** Workers should use appropriate fall protection equipment, such as guardrails, safety nets, or personal fall arrest systems.



Hazards in sheathing

Manual Handling and Lifting

- **Hazard:** Sheathing materials, such as plywood or oriented strand board (OSB), can be heavy and awkward to handle, leading to musculoskeletal injuries.
- **Safety Measures:** Workers should use proper lifting techniques, seek assistance when needed, and utilize mechanical aids to reduce the risk of strain.



Hazards in sheathing

Tool Use and Electrical Hazards

- **Hazard:** Power tools, such as saws and drills, are commonly used in sheathing installation, posing a risk of cuts and electrical hazards.
- **Safety Measures:** Workers should receive training in the safe use of power tools, wear appropriate personal protective equipment (PPE), and follow electrical safety protocols.



Hazards in sheathing

Ergonomic Issues

- **Hazard:** Repetitive motions and awkward postures during sheathing installation can lead to ergonomic issues and discomfort.
- **Safety Measures:** Workers should be trained on proper ergonomic practices, and regular breaks should be encouraged to prevent overexertion.



Hazards in sheathing

Material Storage and Handling

- **Hazard:** Improperly stored sheathing materials can create tripping hazards or cause materials to fall.
- **Safety Measures:** Materials should be stored in designated areas, and workers should be trained on safe handling practices.

