

ARCH 2431 BUILDING TECHNOLOGY III

MATERIALS RESEARCH & FAÇADE STUDIES

Overview:

This assignment represents **30% of your final grade**. Each student will conduct research, develop 3d models and provide a graphic and oral presentation of two façade materials, one a **Rainscreen Façade with Windows** and one a **Glass Façade**.

Rainscreen Façade with Windows

- Rainscreens can be made using a range of materials including cement board, metal panels, terra cotta and others.
- Rainscreens use various strategies to allow water to penetrate the front of the façade but drain water from behind.
- Windows are typically sized both to function with the needs of interior activities of the building and also to work with the modular dimensions of the rain screen system. You will need to independently research windows.
- Most rainscreens use modular dimensions for their outer skin or panels. These outer skins are then supported by a secondary lightweight structural system that then ties back to the building's primary structural system. This is typically done by connecting to a backup wall made of sheathing and metal studs, which is then secured to the top and bottom to the building slabs. The slabs are then supported by beams, columns and the building foundation.

Glass Façade:

For the glass facade you will select one option from the either **Stick**, **Unitized** or **Window Wall** system.

- **Stick Curtainwall Systems:** The primary assembly of a stick system occurs on site after the separate components (mullions, glass, etc.) have been delivered. As the name implies, the individual sticks or mullions are installed one at a time to the façade of a building. These mullions are typically secured to the edges of the structural slab. After the vertical and horizontal mullions are in place, the glass is installed and secured from the outside with the use of pressure plates. While components are typically less expensive installation takes longer and can be more costly.
- **Unitized Curtainwall Systems:** The primary assembly of Unitized panels occurs in the factory. These modular panels are delivered on site and then lifted and installed. The installation process is faster than for stick systems but requires the use of a large crane or other specialized equipment. The heights of the panels are typically sized to match the floor to floor spacing and they typically use a more sophisticated edge of slab connector than stick systems. Panels are typically 4 sided – with 2 edges having a tongue connection and 2 edges with groove connections so that the panels can fit together.
- **Window Wall Systems:** Unlike Stick and Unitized systems, Window Walls are not hung from the façade but instead are installed between two structural slabs. Installation typically begins with a bottom track on the lower slab and an upper track on the underside of the upper slab. The window components are also modular (like unitized systems) and have a similar tongue-groove connection along the vertical edges of the panels. As these panels sit between the two slabs, they typically have a second component which is designed to cover and insulate the edge of the slab.
- **Structural Glazing Systems** do not require metal mullions and are typically used for Atriums or Airports or other locations where a taller open indoor space is required. As they have no mullions, they often connect to a secondary structural system of steel columns and beams.
(Structural glazing systems will be addressed as part of Building Tech IV, and are not studied in this course)

Developing the assignment:

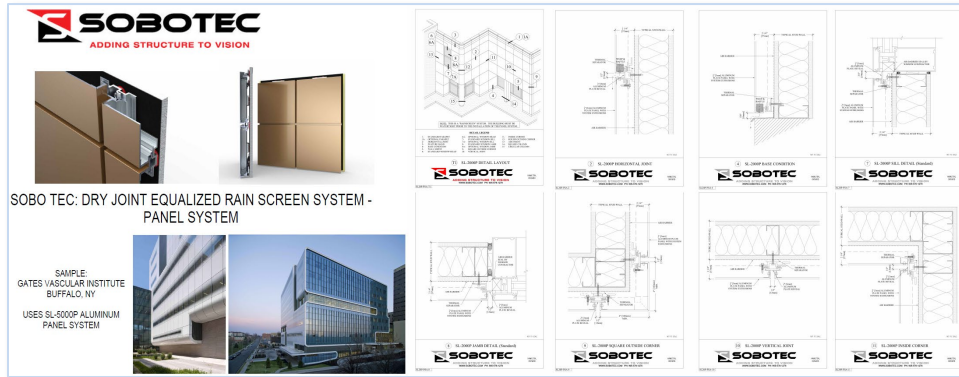
1. **Research:** This assignment begins with research. Each student is asked to identify two possible options for each of the two systems (Rainscreen & Glass Façade). Initial presentation is based on information you gather from the internet, the manufacturers website or from architects who have used the system.
2. **Drawing Representation:** Drawings will demonstrate both your basic understanding of the system and the stages of installation. Working from the manufacturer's information as a reference, you are required to create your own 3d Revit model and families. You are not permitted to make direct use of manufacturers 2d or 3d details or families.
3. **Narrative Oral Presentation:** You will be required to make oral presentations demonstrating your understanding of each system. Keep in mind that the drawings and oral narrative presentation need to work hand-in-hand and should be developed together.

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1. Starting the assignment:

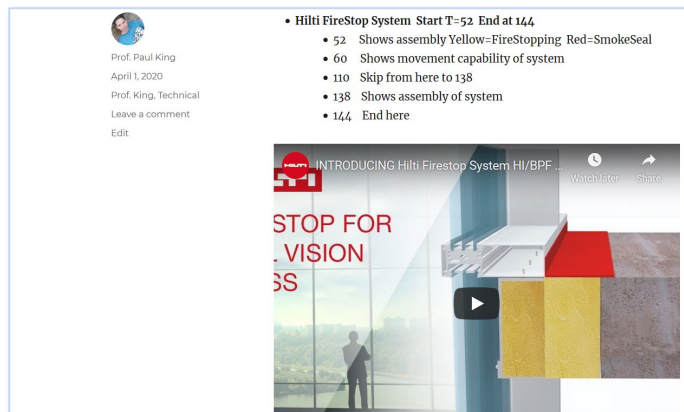
- **Research:** This assignment begins with research. Each student is asked to identify two possible options for each of the two systems (Rainscreen & Glass Façade). Initial presentation is based on information you gather from the internet, the manufacturers website or from architects who have used the system.
- For each system include the following information:
 - Identify the manufacturer who makes the system.
 - Locate and include sample details.
 - Identify an architect who uses each system. (this is often located on the manufacturer's site)
 - Include the name of the architect and the name of the building or owner.
 - Include the location of the building (consider including a site plan)
 - Include photographs of the building (remember we are looking to study the façade)
- Describe the materials used in the system. (from the manufacturer's website)
- Describe the advantages of the system. (from the manufacturer's website)
- **Titleblock:** Format your research on the titleblock provided for the assignment. In Revit customize this titleblock to include the course name/number (ARCH 2431 | Building Tech III), Professors name, semester & year, the name of the manufacturer & the system name, student name and clear closeup "selfie" photo.
- **MIRO Pinup:** Plot to PDF and post your research in MIRO. For the first "research" pinup, each student will include 4 sheets (2 Rainscreen facades & 2 glass facades)



Sample research sheet with manufacturers details (Courtesy of Jean Flores – Fall 2023)

2. Ongoing Research:

- As you develop a better understanding of each system, locate the details you intend to reference. Maintain an updated reference sheet of details for each system – as research will continue throughout this assignment. As the manufacturer provides details for many conditions that may not apply to your building and solution, these should not be included. You may also be required to research and identify details from other companies who provide products needed to properly install your system – for example slab edge connectors. Include these as well.
- Other useful research can be conducted on YouTube and other internet resources. Look to locate videos that illustrate how your system (by manufacturer) or your system type (rainscreen, unitized, stick, window wall) functions. Consider writing a timeline to highlight the critical points and post and share on the class OpenLab website.



Sample YouTube Video with timeline

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3. Analyzing your system:

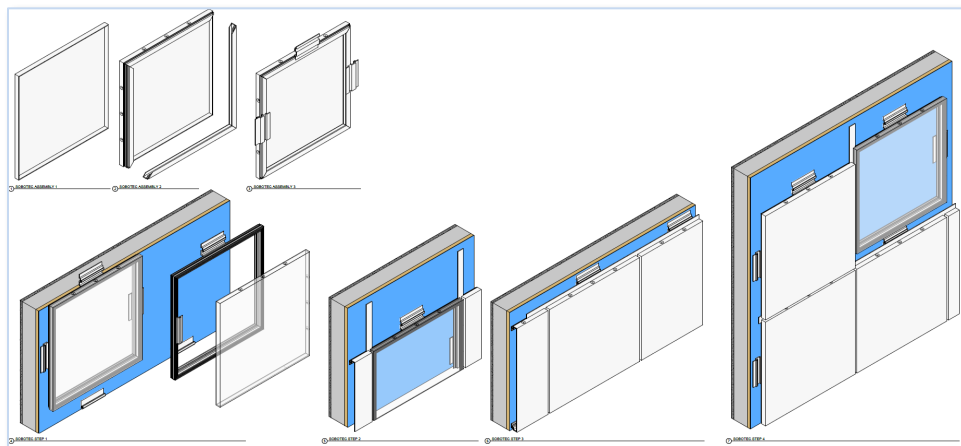
- **Components:** Begin by identifying the components of your system. Locate details that provide dimensions and build accurate 3D families. As you work, assign proper materials and include reference planes and parameters as needed.
- **Building Layout:** Begin to consider how the dimensions of each of your systems components will layout on the façade of the building provided for this assignment.

Start by considering the spacing of the plan grids and how the components of your system can be made to work with their dimensions. You will need to determine the exact dimension and position of your system's components. Start working out the sizes between the repeated column grids and then address how the system adapts to conditions on the outside and inside corners. For the rainscreen system consider how a window fits into this system.

Next work up vertically in section from the first level up, past the slabs and up to the parapet and roof. The dimensions of your components will need to adjust to the various floor to floor conditions.

For the rainscreen system consider how a window fits into this system. In plan what is the condition of the window at the edges, and in section what is the detail of the window at the sill and at the head or lintel. For a rainscreen system both the panels and the windows are typically supported by a backup wall. You must also identify and model the assembly, construction & materials of the backup wall.

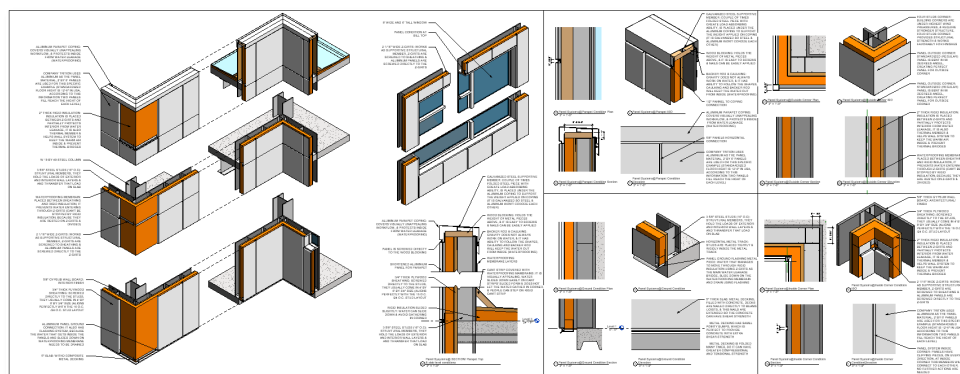
Drawings: Layout of your system is to be represented in plan, section & building elevation at the same scale.



Sample drawings components and assembly of a metal panel rainscreen (Courtesy of Jean Flores – Fall 2023)

4. Developing related groups of 4 views:

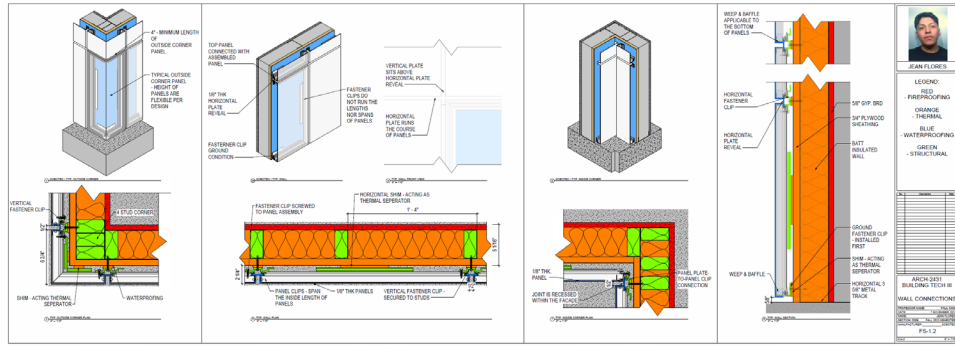
- **Groups of 4:** We will continue to work to develop details at larger scales in groups of 4 related views (plan, section, elevation & isometric) At times you may find that one larger isometric may relate to multiple groups of other views (plan, section, elevation)
- **Aligned isometric views:** A good way to organize is to align groups of isometric views either horizontally or vertically.
- **Notes, leaders and dimensions:** Add clarification to your drawings by providing appropriate notes, leaders and dimensions. It is helpful for the notes to be more than labels but instead to provide a description that explains how two related components connect. On the sheet always group, organize and align annotations.



Sample assorted details of metal panel system (Courtesy of Luka Vardoshvili – Spring 2022)

5. Focus on the following 4 primary elements of each system:

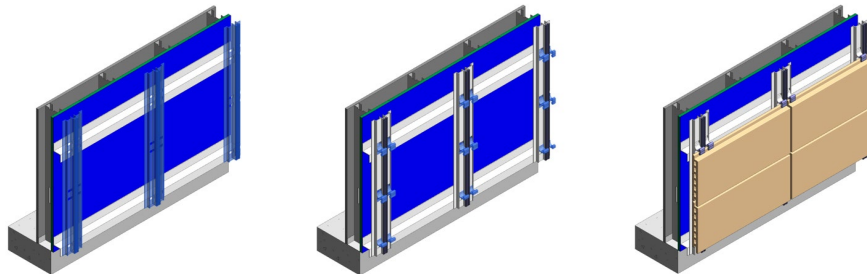
- **Structural:** What holds your system together? How does it connect back to the building's primary structural system. (color code elements as Green)
- **Waterproofing:** What is the waterproofing strategy for your system? (color code as blue)
- **Thermal:** What is the thermal strategy for your system to minimize heat loss/gain? (color code as orange)
- **Fireproofing:** What is the fire protection strategy for your system? (color code as red)



Sample drawings showing use of color coding (Courtesy of Jean Flores – Fall 2023)

6. Stages of Assembly:

- All systems are installed in a specific order. The design of the system's components works hand-in-hand with the logic of the system. Create drawings to help illustrate this process. This can be done by duplicating views and then hiding components to illustrate the stages of assembly.

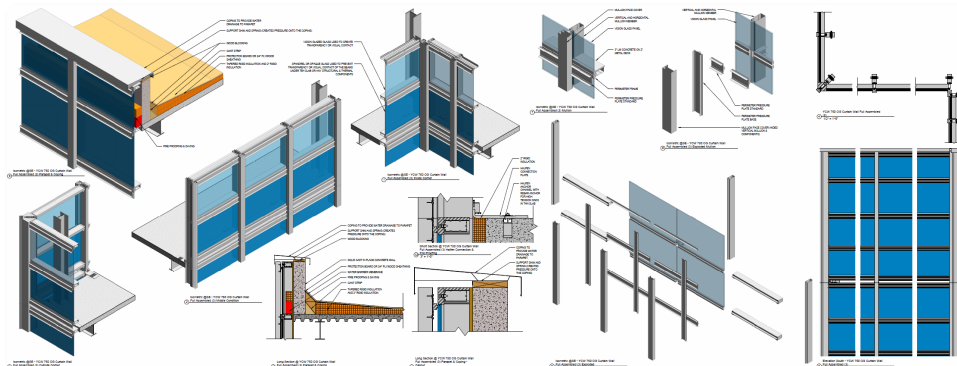


Sample Stages of Assembly – Process of Construction (Courtesy of Oliver Hadi – Fall 2019)

7. Oral Presentation & narrative:

- By the end of his assignment, you will replace all the manufacturers reference details with drawings of your own. Through oral and graphics representation you will describe both how the system works and the stages of installation. You are expected to argue the superiority of your system over others or identify its limitations.

Periodically you should write out your narrative – (what you intend to say at presentation). Review your drawings to see how they can be improved to support your narrative.



Sample assorted details of stick-based curtain wall (Courtesy of Javon Adryan Morgan – Spring 2022)