



Introduction to Timber Curtain Walls for Commercial Applications

This Online Learning Seminar is available through a professional courtesy provided by:



by PACIFIC ARCHITECTURAL MILLWORK

Reveal Windows & Doors

1435 Pioneer Street

Brea, CA 92821

Tel: 562.905.3200

Fax: 562.694.6794

Email: info@revealwd.com

Web: reveal.dev1.bwmmedia.com



**EDUCATION
PARTNER**

**AIA
Continuing
Education
Provider**

START

©2018 Reveal Windows & Doors. The material contained in this course was researched, assembled, and produced by Reveal Windows & Doors and remains its property. "LEED" and related logo is a trademark owned by the U.S. Green Building Council and is used by permission. The LEED® Rating System was authored by and is the property of the USGBC. Any portion of the Rating System appearing in this course is by permission of the USGBC. Questions or concerns about the content of this course should be directed to the program instructor. This multimedia product is the copyright of AEC Daily.

powered by  www.aecdaily.com

Introduction to Timber Curtain Walls for Commercial Applications

To ensure the current status of this course, including relevant association approvals, please view the course details [here](#).

AIA **Continuing** **Education** **Provider**

The American Institute of Architects

Course No. AEC1297

This program qualifies for 1.0 LU/HSW Hour

Course Expiry Date: 09/25/2022

AEC Daily Corporation is a registered provider of AIA-approved continuing education under Provider Number J624. All registered AIA CES Providers must comply with the AIA Standards for Continuing Education Programs. Any questions or concerns about this provider or this learning program may be sent to AIA CES (cessupport@aia.org or (800) AIA 3837, Option 3).

This learning program is registered with AIA CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

AIA continuing education credit has been reviewed and approved by AIA CES. Learners must complete the entire learning program to receive continuing education credit. AIA continuing education Learning Units earned upon completion of this course will be reported to AIA CES for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon completion of the test.

AEC Daily Corporation has met the standards and requirements of the Registered Continuing Education Program. Credit earned on completion of this program will be reported to RCEP at RCEP.net. A certificate of completion will be issued to each participant. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the RCEP.




REGISTERED CONTINUING EDUCATION PROGRAM

How to Use This Online Learning Course

To **view** this course, use the **arrows** at the bottom of each slide or the up and down arrow keys on your keyboard.

To **print or exit** the course at any time, press the **ESC** key on your keyboard. This will minimize the full-screen presentation and display the menu bar.

Within this course is a  **test password** that you will be required to enter in order to proceed with the online examination. Please be sure to remember or write down this exam password so that you have it available for the test.

To receive a **certificate** indicating course completion, refer to the instructions at the end of the course.

For **additional information** and post-seminar assistance, click on any of the logos and icons within a page or any of the links at the top of each page.

Purpose and Learning Objectives

Purpose:

Timber curtain wall systems in commercial applications are a beautiful alternative to standard aluminum storefront systems, offering durable, low-maintenance, aluminum or wood-capped exteriors with the warmth and richness of wood interiors. This course describes the design benefits, components, options, and installation of timber curtain walls. Also discussed is how this resource-responsible system can help satisfy LEED® credit requirements, meet energy-efficiency expectations, and maximize outdoor views while creating indoor spaces that are uniquely modern and comfortable.

Learning Objectives:

At the end of this program, participants will be able to:

- explain how timber curtain walls contribute to occupant comfort and well-being by offering increased access to daylight, maximized views, low-VOC finishes, and operable integrated windows
- compare the lower environmental impacts of timber to aluminum curtain walls in terms of global warming potential, acidification, and eutrophication across the life cycle of the product
- list the criteria for evaluating the thermal performance of timber curtain wall systems to meet building code and energy-efficiency expectations
- describe how durable timber curtain wall systems use natural resources responsibly with FSC®-certified wood components that help satisfy LEED credit requirements, and
- discuss the components and basic installation methods of timber curtain walls that result in a modern design statement showcasing sustainable design, clean lines, and natural beauty.

Contents

Timber Curtain Wall System Components and Benefits

Life Cycle Impact Comparison

Thermal Performance of Timber Curtain Wall Systems

Timber Curtain Wall Systems and LEED

From Concept through Installation

Timber Curtain Wall Applications





Timber Curtain Wall System Components and Benefits

Timber Curtain Wall Systems: Improved Design and Performance

As an alternative to standard aluminum storefront systems, the timber curtain wall is ideal for applications where the desire is for a structural window wall with the warmth and richness of wood on the interior combined with the durability and low-maintenance of exterior aluminum or wood caps.

Timber curtain wall systems add to the beauty and sustainability of the architect's design, improving thermal performance to create commercial buildings with comfortable interiors and beautiful exteriors.



Timber Curtain Wall System

Architects can use wood mullions to create true curtain wall systems featuring wood interiors that span multiple floors or single-story storefronts. Both these options are composed of a mullion system that starts with vertical and horizontal wood timbers.

Profiles of the mullions, gaskets, glass-capturing hardware, and covers vary by manufacturer and design requirements, but many of the components are similar.

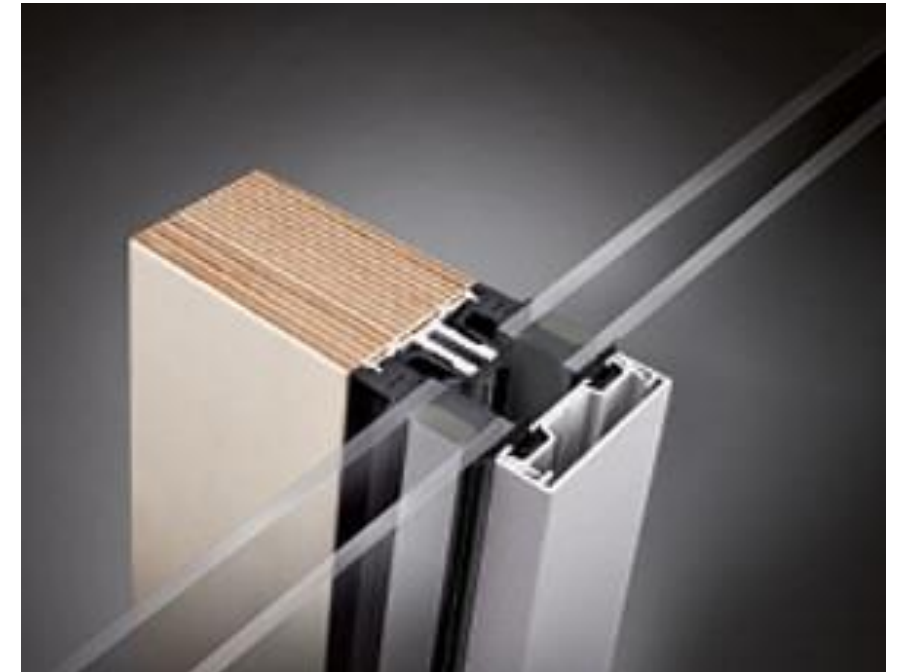


Timber Curtain Wall System Components

Vertical mullions are the primary support for the non-load-bearing timber curtain wall system. The dimensions of the mullions are calculated based on the building's design criteria (wind load, building drift, dimensions of the curtain wall configurations, and wood species).

The structural, engineered wood mullions are milled to the project-specific dimensions, and then gaskets, pressure plates, and other components are added to the mullions for assembly in the shop or on-site. The final step is glazing.

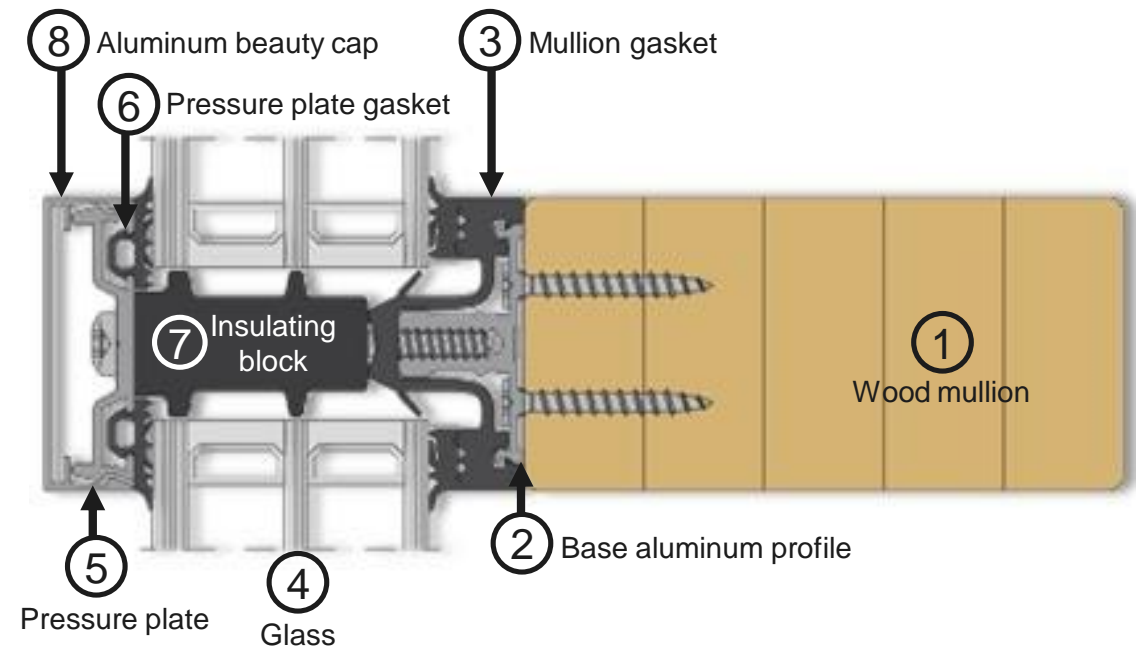
Horizontal mullions (also referred to as transoms) complete the system and are attached by a number of methods.



Timber Curtain Wall System Components

This diagram gives a closer look at each of the components of a typical system.

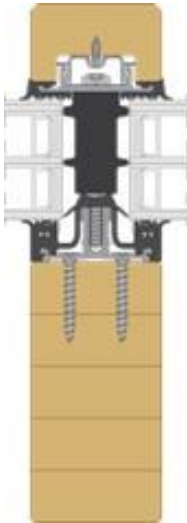
The **wood mullion (1)** can be made from a variety of wood species: Douglas fir, pine, mahogany, sapele, red cedar, white oak, red oak, and maple. Manufacturers offer engineered lumber in a variety of types and finishes based on design, engineering parameters, and cost. The diagram illustrates how the shop-applied, **base aluminum profile (2)** is secured to the wood mullion with screws. Above the base, the **mullion gasket (3)** provides an elastic seal between the wood and the glazing system.



Triple-glazed, insulated units (4) sit on either side of the optional insulating block (7) and are held in place by the **pressure plate (5)**, **gasket (6)**, and screws through the base aluminum profile. This version of a wood mullion incorporates the optional **insulating block (7)** that is sometimes used to help mitigate extreme temperatures. Finally, the **aluminum beauty cap (8)** snaps into place for a finished look on the exterior. Beauty caps come in both wood and aluminum and in a variety of profiles and finishes.

Timber Curtain Wall System Variations

Here are just a few examples of different details for glulam (glued, laminated timber) mullion beauty caps. These vary by application and manufacturer.



Glulam mullion, triple-glazed, with a wood beauty cap



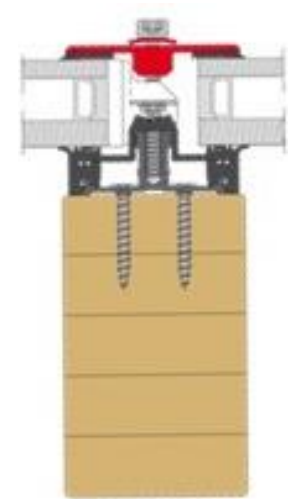
Interior view of glulam mullion with aluminum (exterior) beauty cap



Three variations of aluminum beauty cap with a mill finish; aluminum beauty caps also available in a variety of painted finishes



Glulam mullion with an aluminum beauty cap



Low-profile, flat pressure plate with no beauty cap

Timber Curtain Wall System Benefits: Maximize Views

What does the use of a timber curtain wall allow architects to do?

In the photograph you can see that there are two types of mullions:

- A very heavy structural mullion that supports the load vertically and horizontally
- The much thinner wood mullions of the timber curtain wall system

The architect maximizes the view by keeping the large structural mullions to a minimum.

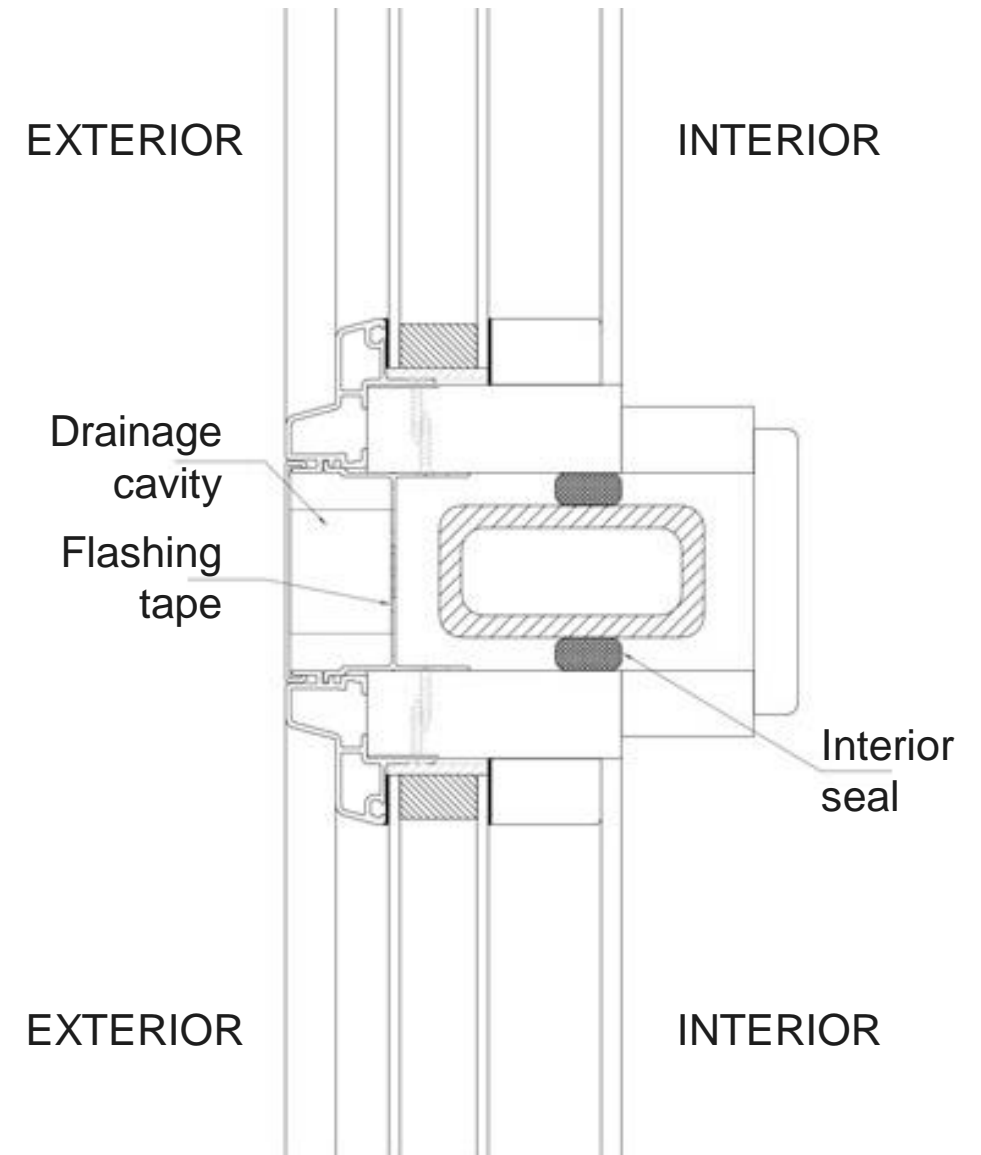


Typical Window Wall Mullion

This detail shows a typical window wall mullion using individual windows instead of a timber curtain wall system. Individual windows would be installed into punched openings that require shimming and caulking at each location.

On the interior, wood extension jamb material and wood mull covers wrap the steel stud. On the exterior, field-installed, custom break metal, flashing materials, and blocks waterproof each opening.

This detail requires the coordination of as many as six trades (steel framer, window supplier, window installer, waterproofer, finish carpenter, painter) and would result in a much wider horizontal and vertical mullion around each window.



Timber Curtain Wall System Benefits: Maximize Views

Not only does the timber curtain wall have a slimmer, unobtrusive sight line, but it is also a much cleaner, more streamlined, contemporary-style system. The large, glazed openings optimize exterior views and natural light to the interior. Furthermore, installation of this system does not require coordination of design, quality, execution, and/or multiple trade schedules.

The timber curtain wall detail shows why the mullion is so much narrower than the detail shown on the prior slide. There is no need for steel framing, exterior aluminum trim, or interior millwork. All the components are part of the single system.



Timber Curtain Wall System Benefits: Warm, Natural Beauty

Wood species can be chosen to complement the overall design, show an appreciation for nature and sustainable design, brand a space as upscale and modern, and add the beautiful warmth of woodgrain texture and color to any space.

Wood timber curtain wall mullions on the exterior and interior of a building not only lend a less institutional look to the building than aluminum, but they also complement the warm tones of millwork and furnishings. When designing spaces with a timber curtain wall, architects can choose wood mullions milled from a variety of wood species such as Douglas fir, cedar, maple, pine, and oak. Many suppliers also offer prefinishing.



Timber Curtain Wall System Benefits: Warm, Natural Beauty

The combination of large spans of glass framed by wood mullions and unfettered by bulky posts makes a timber curtain wall system an excellent choice—whether the goal is to showcase the beauty outdoors or bring focus to what is behind a retail storefront.

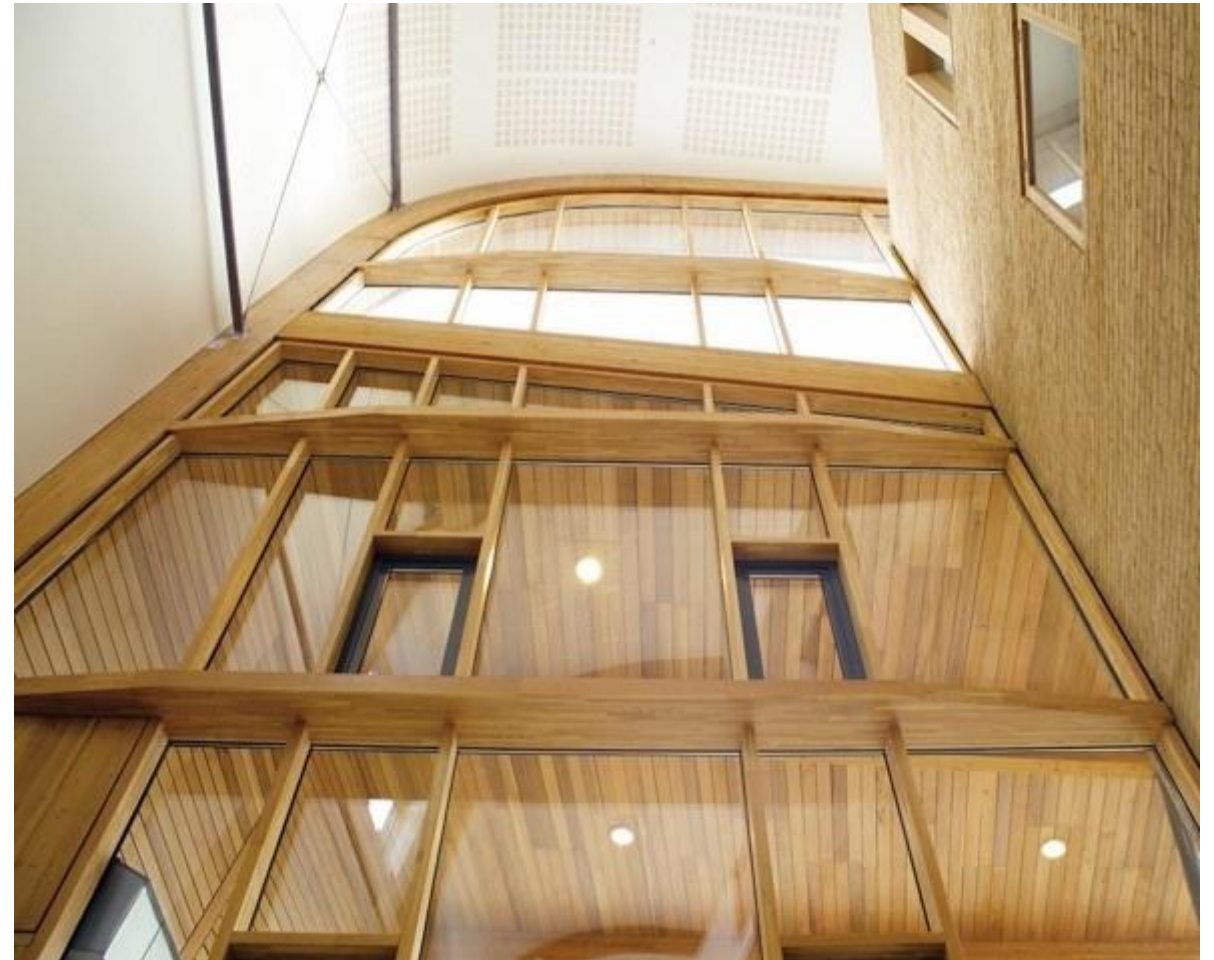
A timber curtain wall makes a statement by giving a nod to sustainable building and the modern trend towards cleaner lines and larger spans of glass.



Timber Curtain Wall System Benefits: Maximize Daylighting

Studies have shown that well-lit spaces with consistent, comfortable interior temperatures, reduced noise levels, and increased views to the exterior may improve productivity, reduce absenteeism, increase building values, and enhance the overall well-being of office workers. One of the challenges for architects is to provide the benefits of large spans of glass without compromising interior comfort, functionality, and design.

A timber curtain wall can contribute to providing a visually stimulating and productive environment, reducing building energy costs in combination with a daylight-responsive, electric lighting control system. Building occupants can be given the power to control ventilation with operating windows; the wall can be designed to add access to the exterior with integrated, glazed door systems.



Timber Curtain Wall System Benefits: Maximize Daylighting

The abundance of natural light and views to the exterior contributed to satisfying LEED® credits for daylighting and views on this timber curtain wall project. By increasing ventilation with operable windows built into the timber curtain wall system, the project earned additional points for improving indoor environmental quality. Occupants are able to control ventilation throughout the day by opening and closing windows around the room.

Note that the office lights are not turned on in the photograph. A daylight-responsive control system is programmed to turn on the artificial lighting only when sufficient natural light is not available, thereby reducing energy costs. All these components work together to improve indoor environmental quality while reducing energy consumption and cost for the building owner.



Timber Curtain Wall System Benefits: Standout Design

Architects often use wood on exterior building elevations to add interest. Natural materials add a visual “pop” to what would otherwise be a flat exterior façade. Timber curtain walls allow architects to tie the fenestration into the overall wood design with texture and color variations highlighted on the exterior.

Imagine this building with aluminum panels and curtain wall. It would lack the organic, textural interest that makes this exterior façade unique.

Timber curtain walls give architects the freedom to:

- combine a timber curtain wall with other wood materials to create an exterior façade with texture and personality
- add energy-efficient wood windows and doors into the timber curtain wall frames, and
- make a design statement that takes traditional curtain walls to a new level of modern design.



Timber Curtain Wall System Benefits: Ventilation and Comfort

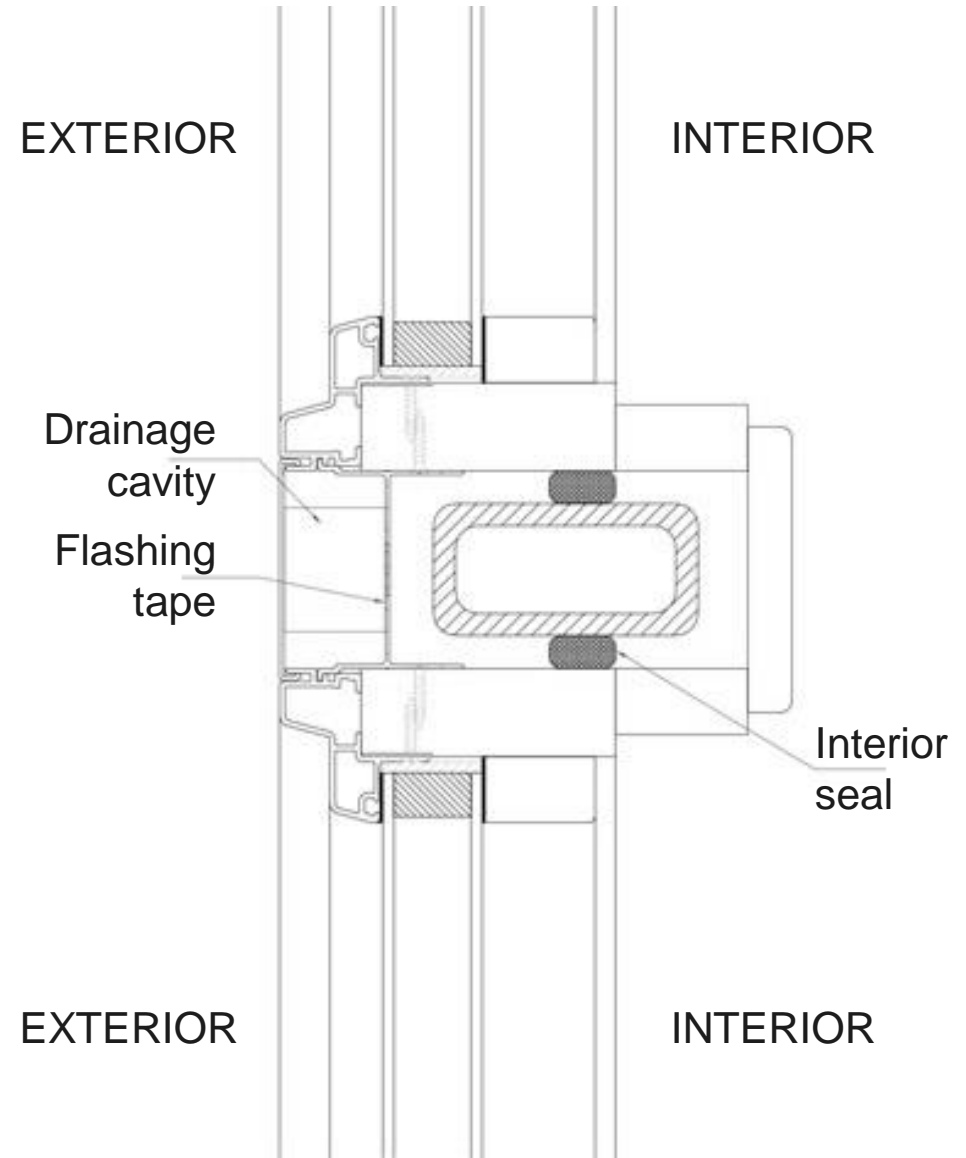
Architects can easily integrate windows and door systems into timber curtain walls to increase ventilation, aid passive heating and cooling, and allow traffic flow. These ventilation options can help to increase interior comfort as well as contribute toward LEED certification.

Many manufacturers offer casements, awnings, tilt-turn windows, multislide doors, pivot doors, and ADA-compliant French door and bifolding door systems as part of their timber curtain wall offerings. These venting units can be either all wood, wood-clad, or aluminum-framed and are offered in a variety of colors, wood species, and wood finishes.



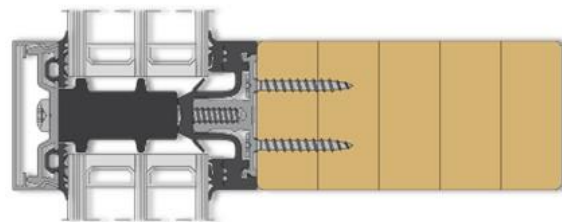
Review Question

What are the drawbacks of the typical window wall mullion shown here?



Answer

The typical window wall mullion requires the coordination of as many as six trades and results in a much wider horizontal and vertical mullion around each window. The timber curtain wall has a slimmer, unobtrusive sight line, and installation does not require coordination of design, quality, execution, and/or multiple trade schedules. The timber curtain wall mullion detail is much narrower, and all the components are part of the single system.



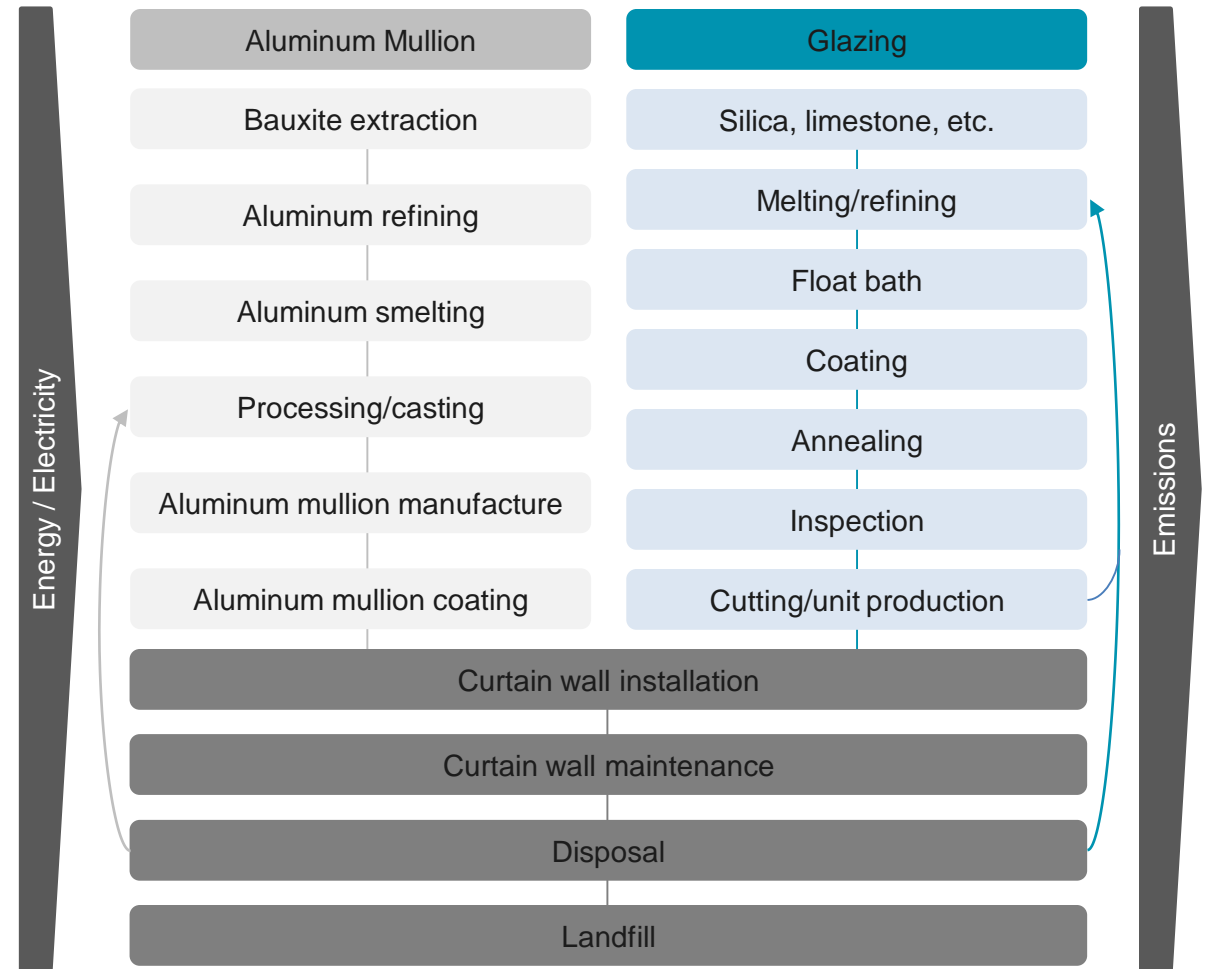


Life Cycle Impact Comparison

Environmental Life Cycle Impacts

To compare the environmental life cycle impacts of aluminum versus timber curtain walls, the figures shown on these two slides have been adapted from a study by Kim and Azari.* At each point along the process, energy is consumed and by-products are released that impact our environment.

This figure outlines the system boundaries for the curtain wall with aluminum mullions, beginning with the mining of the raw material bauxite. The aluminum is refined, smelted, and then cast. From this point, aluminum mullions are created, coated, and then shipped to the jobsite for installation. Throughout the life span of the building, the aluminum curtain wall will require maintenance until it finds its way into the landfill. The right side outlines the process from raw material to cutting for the glass component of the system.



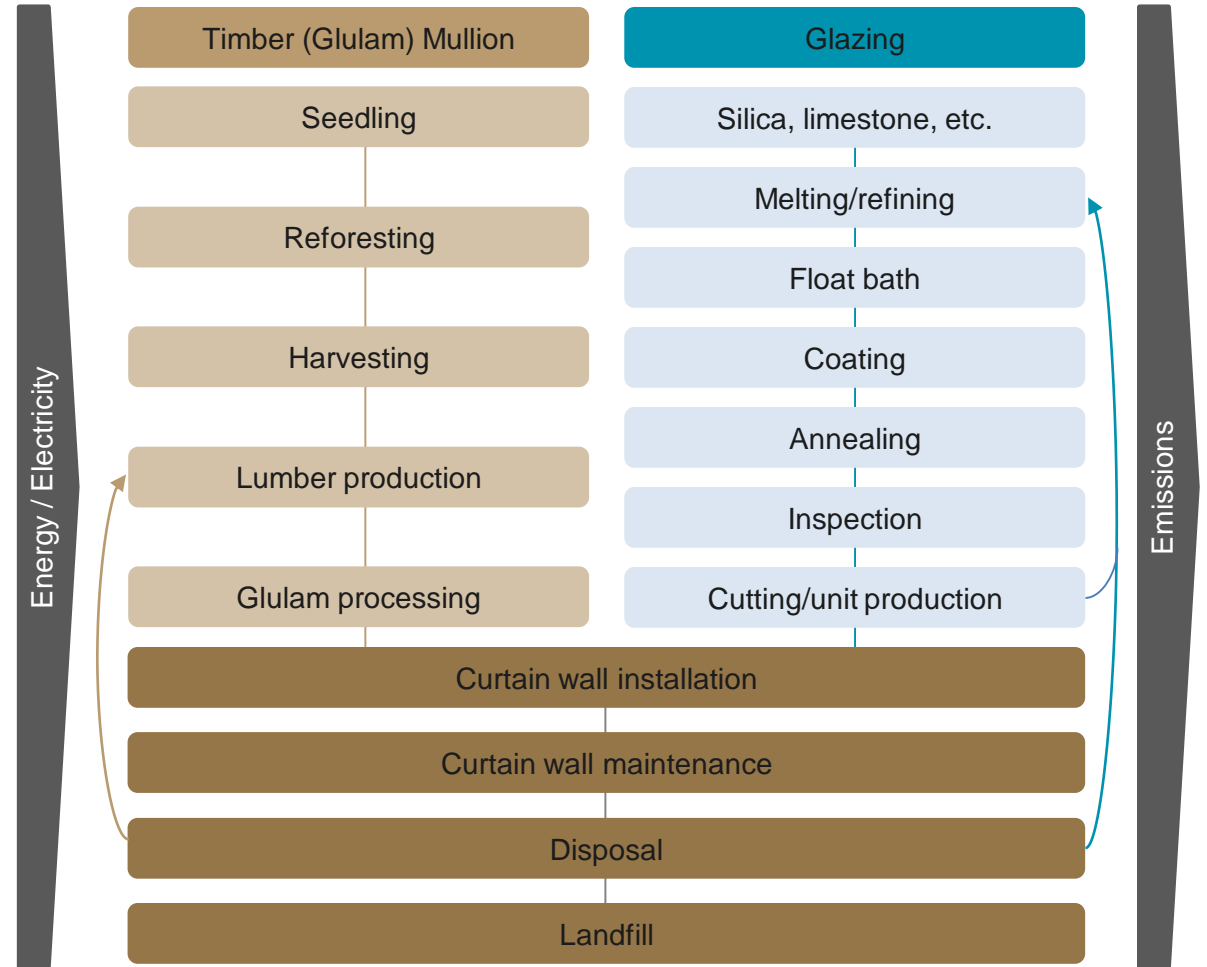
*Kim, Yong-Woo and Rahman Azari. "A Comparative Study on Environmental Life Cycle Impacts of Curtain Walls." *Construction Research Congress*, 2012, <https://doi.org/10.1061/9780784412329.162>. Accessed October 2018.

Environmental Life Cycle Impacts

You can see that the glazing life cycle on the right side is exactly the same for the timber (glulam) mullions here.

The left side outlines the system boundaries that are unique to the timber curtain wall system—seedlings are planted and reforesting, harvesting, and lumber production all occur before the processing of the glulam mullions. Throughout the entire life span outlined here, a timber curtain wall also has an effect on our environment.

In the next few slides, you will see comparisons of the environmental life cycle impacts of these systems.



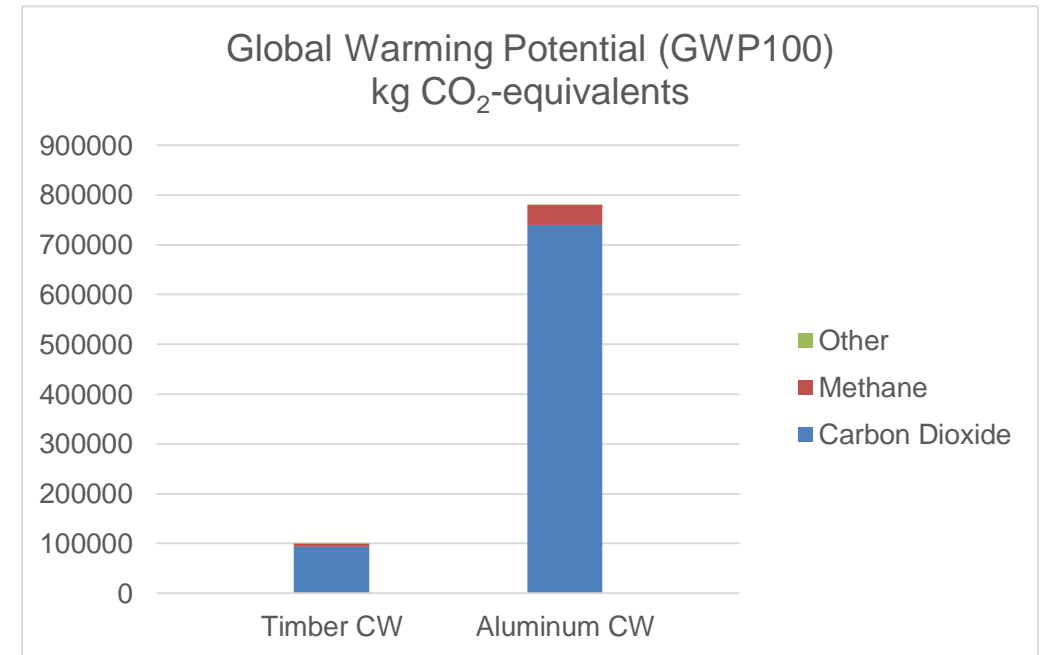
*Kim, Yong-Woo and Rahman Azari. "A Comparative Study on Environmental Life Cycle Impacts of Curtain Walls." *Construction Research Congress*, 2012, <https://doi.org/10.1061/9780784412329.162>. Accessed October 2018.

Global Warming

Carbon dioxide released into the earth's atmosphere increases the greenhouse effect, causing the planet to be warmer than it would be naturally.

If we compare the effect of the widely used aluminum system to that of the timber curtain wall, you can see that nearly eight times the greenhouse gases are generated from the life cycle of an aluminum curtain wall.

Commercial markets account for the largest percentage of the aluminum curtain wall share, and segment growth is expected worldwide due to the demand from emerging markets in the Asia-Pacific region. Shifting the focus away from aluminum towards more sustainable and less polluting timber curtain walls could have a beneficial impact on reducing greenhouse gases.



Acidification

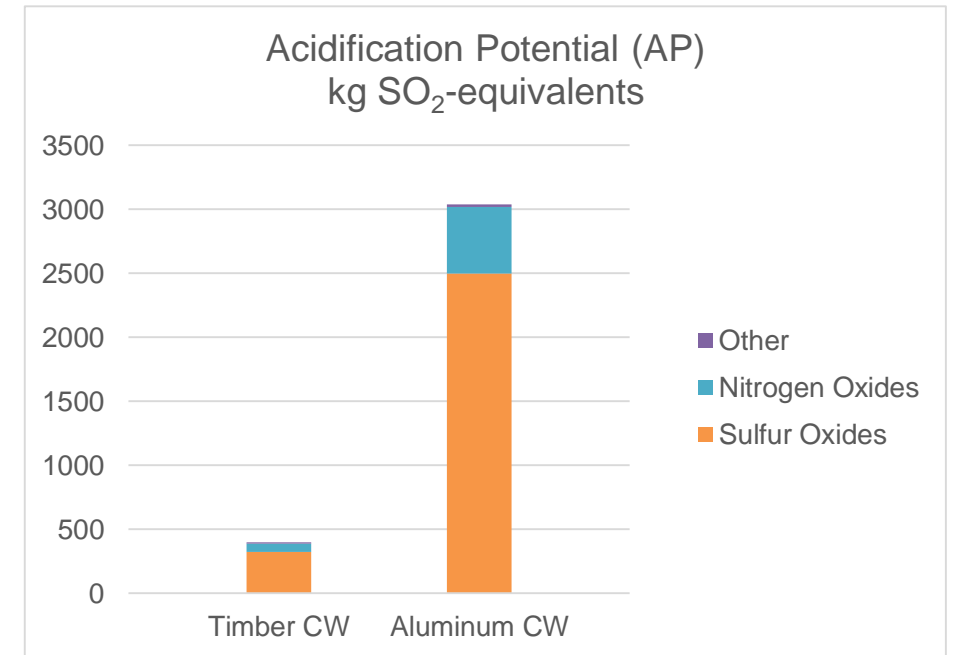
Acidification occurs when compounds such as sulfur and nitrogen oxides undergo chemical reactions that reduce natural pH levels. Dry deposits and/or wet deposits, known as acid rain, increase acidity in soil and our oceans.

Ocean acidification has an adverse effect on many marine organisms that produce calcium carbonate shells or skeletons (coral, clams, mussels, sea urchins, barnacles, and certain microscopic plankton). Many of the fish we eat are dependent on these shelled animals as a food source.

Acidification of soils can affect vegetation, especially in acid-sensitive areas where the soil is not rich in neutralizing limestone, resulting in a susceptibility to viruses, fungi, and insect pests.

Long-term changes in soil chemistry deplete nutrients available to plant life and promote the release of poisonous metals such as aluminum, cadmium, and mercury through chemical reactions with acids.

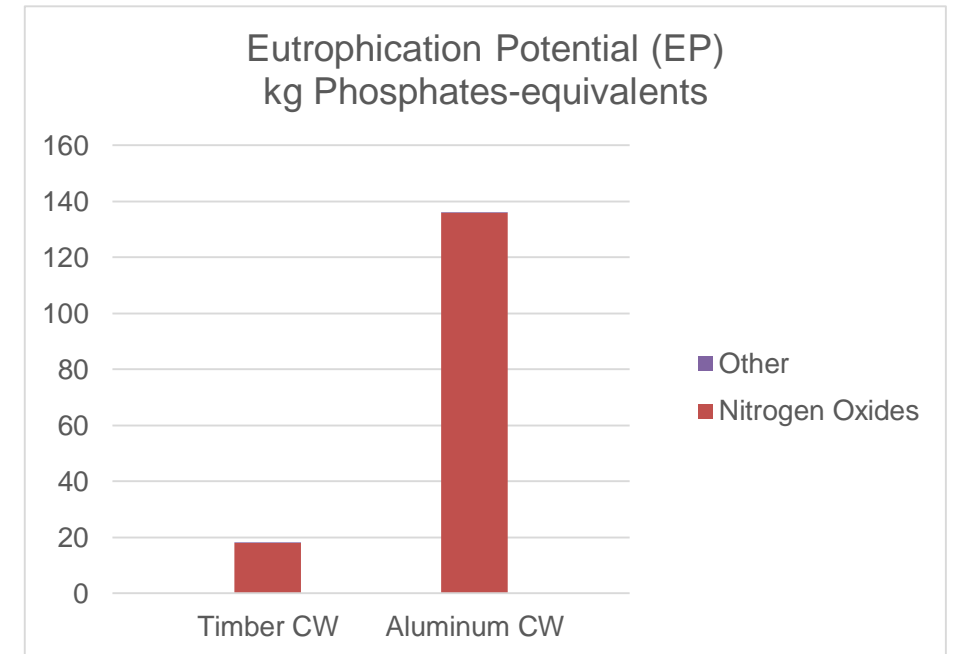
Throughout the life cycle of an aluminum curtain wall, nearly six times more acidification compared to a timber curtain wall occurs as sulfur dioxide and nitrogen oxides are released into our atmosphere.



Eutrophication

Eutrophication occurs naturally but is accelerated by human activities that cause a rapid increase in water's mineral and nutrient levels. As bodies of water become overly enriched, plants and algae are stimulated to grow excessively. The resulting oxygen depletion creates dead zones where few organisms can survive, killing fish and impacting the aquatic ecosystem.

The graph shows that aluminum curtain walls contribute almost seven times the phosphorous pollution that causes eutrophication compared to timber curtain walls.



Carbon Footprint

Over twenty-five percent of all aluminum produced worldwide is used in construction.* By exploring alternative sustainable materials for even a small percentage of their projects, architects have the opportunity to help lessen the harmful impact of aluminum on our environment. Timber curtain walls not only take less energy to produce but are more energy efficient, resulting in a smaller carbon footprint than aluminum.

A comparative study of window frame material concluded, “From the conceptual design and numerical analysis, it was found that the wood window frames performed better than uPVC and aluminum frames, thermally as well as environmentally...The carbon footprint of aluminum window frames is almost four times higher than that of the wood window frame.”**



*“Global Demand for Semi-Finished Aluminum Products in 2017, by Sector.” *Statista*, n.d., <https://www.statista.com/statistics/280983/share-of-aluminum-consumption-by-sector/>. Accessed October 2018.

**Sinha, Arijit and Andreja Kutnar. “Carbon Footprint versus Performance of Aluminum, Plastic, and Wood Window Frames from Cradle to Gate.” *Buildings*, vol. 2, 2012, pp. 542-553, <https://doi.org/10.3390/buildings2040542>. Accessed October 2018.

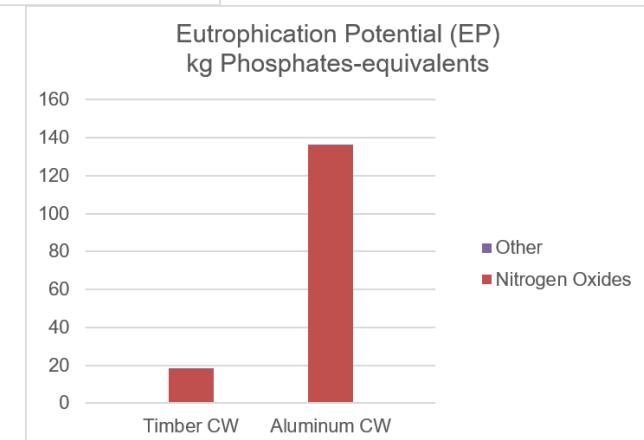
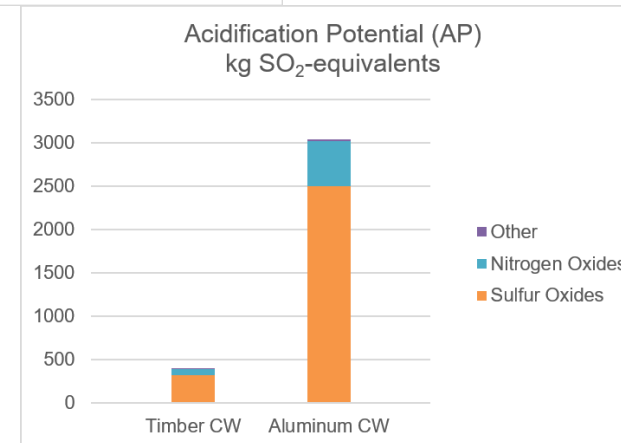
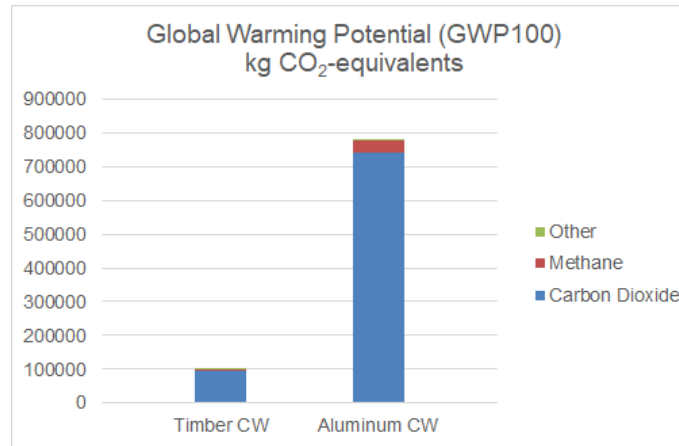
Review Question

How do aluminum and timber curtain walls compare in terms of global warming potential, acidification, and eutrophication?



Answer

Compared to timber curtain walls, aluminum curtain walls generate nearly eight times the greenhouse gases, six times more acidification, and seven times the phosphorous pollution.





Thermal Performance of Timber Curtain Wall Systems

Thermal Performance

We have seen that timber curtain wall systems offer architects a more environmentally responsible choice when compared to aluminum curtain walls. Now let's take a closer look at how architects can compare thermal performance.

The National Fenestration Rating Council (NFRC) is a nonprofit organization that publishes tested thermal performance ratings for the fenestration industry. These ratings can be viewed in the certified products directory of the [NFRC website](#). Energy performance ratings (such as those shown on this label for a timber curtain wall assembly) are calculated for the whole unit—not just the glass. This is important since the material that surrounds the glass can greatly affect the overall performance of the unit.

The information provided by the NFRC allows architects to compare the thermal performance of different types of window and door systems as well as glazing options within those systems. Architects can use this information to see how changing one value may affect the others, how specific values compare from one system to another, and how to specify products that meet or exceed the performance criteria for their design.

ENERGY PERFORMANCE RATINGS	
U-Factor (U.S./I-P)	Solar Heat Gain Coefficient
0.30	0.25
ADDITIONAL PERFORMANCE RATINGS	
Visible Transmittance	Air Leakage (U.S. / I-P)
0.57	—
Condensation Resistance	
48	—
<small>Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information. www.nfrc.org</small>	

NFRC Label

NFRC labels include ratings for:

- U-factor
- solar heat gain coefficient (SHGC)
- visible transmittance (VT)
- condensation resistance, and sometimes
- air leakage.

In the next few slides, we will take a closer look at each of the ratings defined here.

U-FACTOR

The rate of heat loss of a window assembly.

The lower the U-factor, the greater a window's resistance to heat flow and the better its insulating properties.

SOLAR HEAT GAIN COEFFICIENT

Represents the ability of the insulated glass unit to resist or reflect the sun's solar radiation.

The lower a window's SHGC, the less solar heat it transmits.

VISIBLE TRANSMITTANCE

The amount of light in the visible portion of the spectrum that passes through a glazing material.

A higher VT means more daylight is able to enter the space.

CONDENSATION RESISTANCE

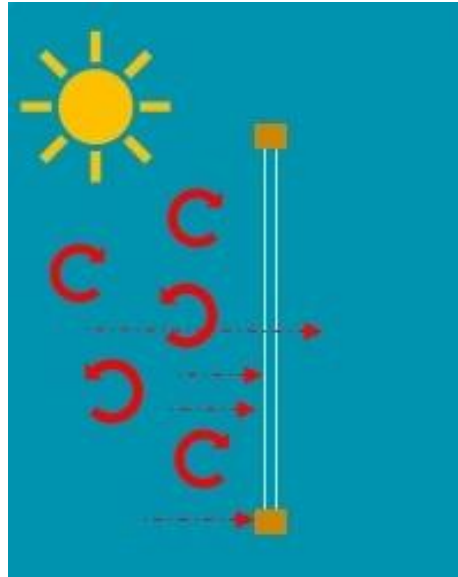
Measures how well a product resists condensation.

The higher the number the better the resistance.

NFRC Label: U-Factor

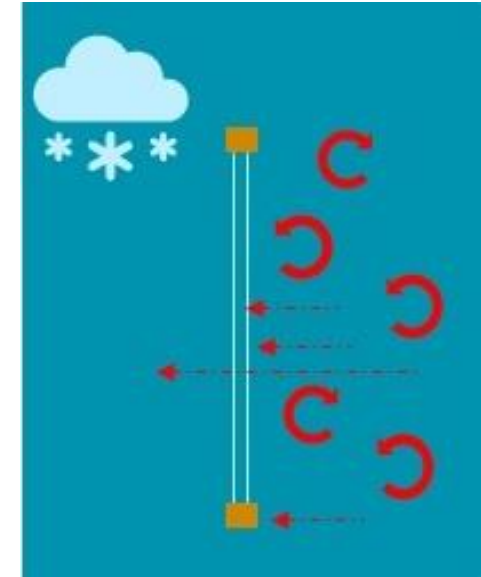
By comparing U-factors, the architect can determine how fenestration units will resist heat flow. In warmer weather, the goal is to limit the flow of warmer outside temperatures into the cooler interior space.

Units with lower U-factors help to keep interior environments cooler when outside temperatures are warmer. This reduces the need for air conditioning, lowering energy consumption and costs. When the climate is cold, it is more important to keep warm air inside. Units with lower U-factors provide a barrier to the flow of heat to the exterior, reducing heating costs.



Warmer Climates

Specifying lower U-factors allows less heat flow from the exterior to the interior of the space, resulting in lower costs for cooling. Unlike aluminum, thermally-resistant wood frames do not conduct heat.



Cooler Climates

Windows with lower U-factors resist the loss of heat to the exterior, reducing the cost of heating the space. Because wood frames are thermally resistant, they aid in keeping warm air inside in cold climates so spaces remain comfortable and heating costs are reduced.

NFRC Label: U-Factor

The natural insulating value of timber mullions complements high-efficiency glazing systems by adding additional resistance to heat flow. Unlike aluminum, wood does not conduct heat or cold. The sample NFRC label shows the U-factor of a triple-glazed, aluminum-clad timber curtain wall system.

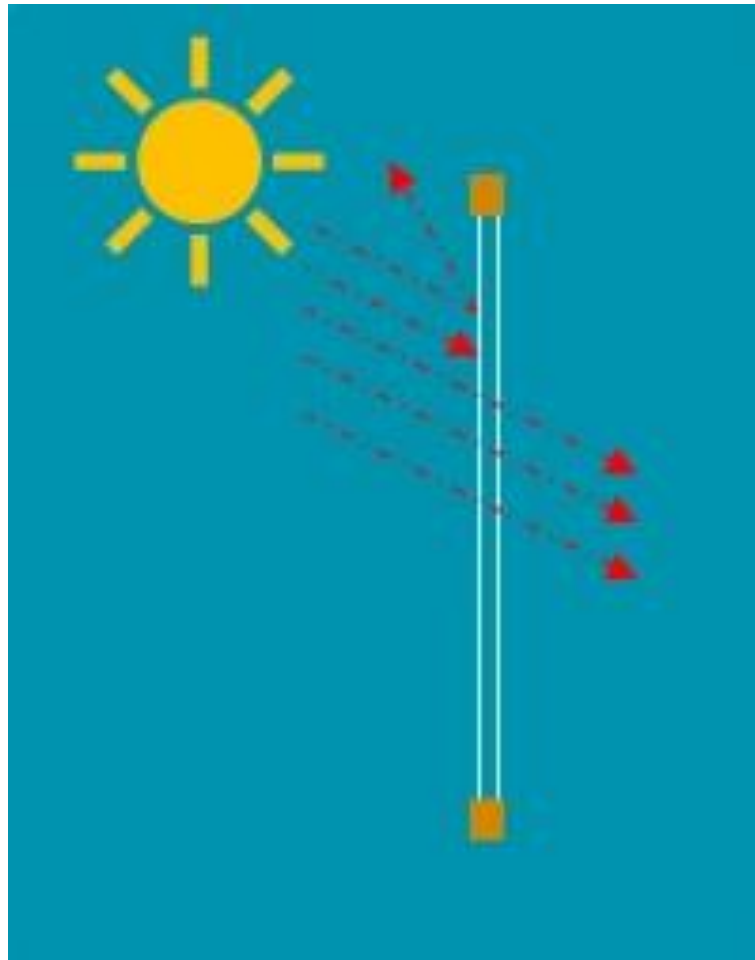
ENERGY PERFORMANCE RATINGS	
U-Factor (U.S./I-P)	Solar Heat Gain Coefficient
0.30	0.25
ADDITIONAL PERFORMANCE RATINGS	
Visible Transmittance	Air Leakage (U.S. / I-P)
0.57	—
Condensation Resistance	—
48	—



Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information. www.nfrc.org

NFRC Label: SHGC

The sun's solar radiation can make inside environments uncomfortable by directly transmitting heat or heating the air and surfaces inside the building. Many of us have had the experience of having to move away from a window because of the heat that was transmitted through the glass.

The addition of tints, low-emissivity coatings, and solar films can reduce this radiation.

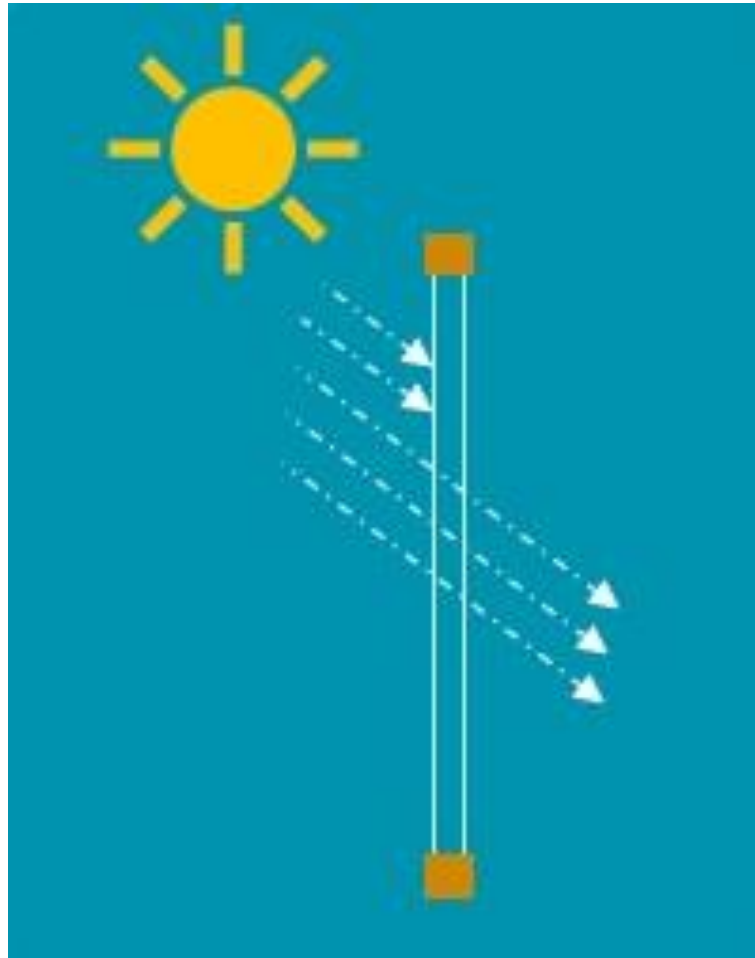




 Jane Doe Windows 	
CERTIFIED Curtain Wall Aluminum Clad Wood Frame GWCW Double-Glazing • Argon Fill • 0.022 XXX-X-X-XXXXX-XXXXX	
ENERGY PERFORMANCE RATINGS	
U-Factor (U.S./I-P) 0.30	Solar Heat Gain Coefficient 0.25
ADDITIONAL PERFORMANCE RATINGS	
Visible Transmittance 0.57	Air Leakage (U.S. / I-P) —
Condensation Resistance 48	—
<small>Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information. www.nfrc.org</small>	

NFRC Label: VT

While coatings, tints, and films reduce the amount of solar radiation into buildings, they can also block the visible daylight that would normally come through the glass.

Since not all coatings have the same affect on daylight, the visible transmittance value allows architects to compare the amount of light that is blocked by one glazing system to another to choose the best combination for the project.



 Jane Doe Windows 	
National Fenestration Rating Council® CERTIFIED	
Curtain Wall Aluminum Clad Wood Frame GWCW Double-Glazing • Argon Fill • 0.022 XXX-X-X-XXXXX-XXXXX	
ENERGY PERFORMANCE RATINGS	
U-Factor (U.S./I-P)	Solar Heat Gain Coefficient
0.30	0.25
ADDITIONAL PERFORMANCE RATINGS	
Visible Transmittance	Air Leakage (U.S. / I-P)
0.57	—
Condensation Resistance	—
48	—
Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information. www.nfrc.org	

NFRC Label: Condensation Resistance

When warm, moist air hits a cooler glass surface, condensation can form. Over time, excessive condensation can damage frames or cause finishes to peel.

Condensation resistance is related to a number of factors that include exterior temperatures and indoor relative humidity. In order to provide greater resistance to condensation, thermal breaks in the framing members are designed to equal or exceed the condensation resistance of the insulating glass.



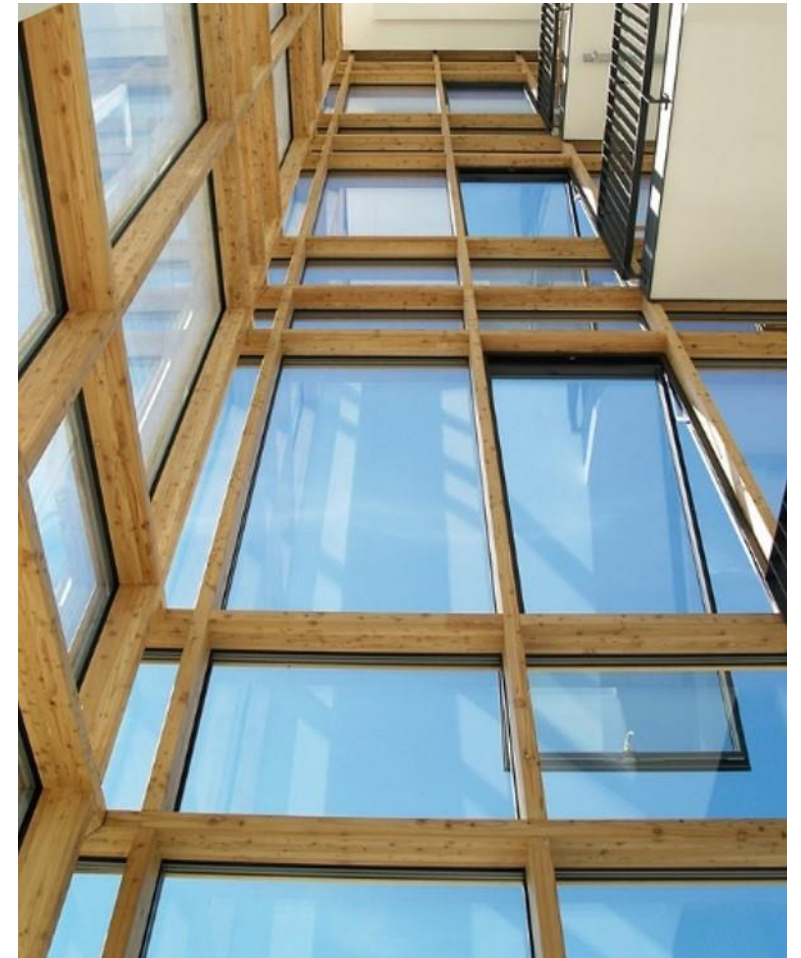
ENERGY PERFORMANCE RATINGS	
U-Factor (U.S./I-P)	Solar Heat Gain Coefficient
0.30	0.25
ADDITIONAL PERFORMANCE RATINGS	
Visible Transmittance	Air Leakage (U.S. / I-P)
0.57	—
Condensation Resistance	—
48	—

Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information. www.nfrc.org

Glazing Options



Timber curtain walls can complement a variety of glazing choices, thermally as well as aesthetically. Whether the goal is to maximize daylighting, energy efficiency, or optical performance, or to make a bold, modern architectural statement, there are a great many options to choose from.

- Glazing: dual- and triple-glazed insulating glass, tints, metallic and low-emissivity coatings and fritting
- Louvers: installed into frames to control light and provide shading
- Architectural and specialty glazing options: for example, switch glass for privacy





Review Question

What is the value of the NFRC label for architects?

 National Fenestration Rating Council® CERTIFIED	Jane Doe Windows 	
Curtain Wall Aluminum Clad Wood Frame GWCW Double-Glazing • Argon Fill • 0.022 XXX-X-X-XXXXX-XXXXX		
ENERGY PERFORMANCE RATINGS		
U-Factor (U.S./I-P)	Solar Heat Gain Coefficient	
0.30	0.25	
ADDITIONAL PERFORMANCE RATINGS		
Visible Transmittance	Air Leakage (U.S. / I-P)	
0.57	—	
Condensation Resistance	—	
48	—	
<small>Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information. www.nfrc.org</small>		

Answer

The NFRC label allows architects to compare the thermal performance of different types of window and door systems as well as glazing options within those systems. This information can show how changing one value may affect the others, how specific values compare from one system to another, and how to specify products that meet or exceed the performance criteria for the design.

 National Fenestration Rating Council® CERTIFIED		Jane Doe Windows		
Curtain Wall Aluminum Clad Wood Frame GWCW Double-Glazing • Argon Fill • 0.022 XXX-X-X-XXXXX-XXXXX				
ENERGY PERFORMANCE RATINGS				
U-Factor (U.S./I-P)		Solar Heat Gain Coefficient		
0.30		0.25		
ADDITIONAL PERFORMANCE RATINGS				
Visible Transmittance		Air Leakage (U.S. / I-P)		
0.57		—		
Condensation Resistance		—		
48		—		
<small>Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information. www.nfrc.org</small>				



Timber Curtain Wall Systems and LEED

Sustainability

The increase in legislative and social mandates for more sustainable buildings points to analyzing their environmental impact as an integrated process. The design team's choices of materials impact the communities that the raw materials are sourced from, the energy that is consumed, and the waste that is expelled through the life cycle of the building.

Timber curtain walls are just one of many sustainable building products that can help buildings achieve more environmentally friendly design in conformance with many green building programs and standards.



Green Building

California has mandated a net zero energy goal for all commercial buildings by 2030, with 50 percent of the existing commercial structures required to achieve the same standard by 2030.

The U.S. Green Building Council® states that its Leadership in Energy and Environmental Design (LEED) system is “the most widely used green building rating system in the world.” With a total of 110 possible points, buildings can qualify for Certified (40–49 points), Silver (50–59 points), Gold (60–79 points), and Platinum (80+ points) rating levels.

A timber curtain wall system is an innovative fenestration option that can help architects reach their net zero energy and LEED goals by providing a thermally superior frame material that is beautiful and energy efficient.

In the next few slides, we will look at how using timber curtain walls in your building designs contributes to satisfying a number of credits in LEED v4. For more details on any of the credits, please refer to the [USGBC](#).



LEADERSHIP IN ENERGY AND
ENVIRONMENTAL DESIGN

LEED v4: Energy and Atmosphere

A timber curtain wall system may help satisfy this prerequisite and credit:

Energy and Atmosphere Prerequisite: Minimum Energy Performance

The prerequisite aims to reduce the environmental and economic harms of excessive energy use by achieving a minimum level of energy efficiency for the building and its systems.

Energy and Atmosphere Credit: Optimize Energy Performance

Buildings can achieve increasing levels of energy performance beyond the prerequisite standard to reduce environmental and economic harms associated with excessive energy use.

Option 1. Whole-Building Energy Simulation (1–20 points)

Option 2. Prescriptive Compliance: ASHRAE Advanced Energy Design Guide (1–6 points)



Specifying a timber curtain wall system with high-efficiency glazing can enhance the units' thermal performance; the addition of venting windows and doors enables passive heating and cooling, contributing to further energy savings.

LEED v4: Indoor Environmental Quality

Specifying a timber curtain wall for your project may contribute to satisfying the following credit:

Indoor Environmental Quality Credit: Daylight

This credit aims to connect building occupants with the outdoors, reinforce circadian rhythms, and reduce the use of electrical lighting by introducing daylight into the space.

Option 1. Simulation: Spatial Daylight Autonomy and Annual Sunlight Exposure (1–3 points)

Option 2. Simulation: Illuminance Calculations (1–2 points)

Option 3. Measurement (1–3 points)

Increased access to daylight has positive human behavioral and health effects and uses less electric lighting energy, conserving natural resources and reducing air pollution. Timber curtain walls can contribute natural beauty to a well-designed daylit building.



LEED v4: Indoor Environmental Quality

Specifying a timber curtain wall that captures an outdoor view may contribute to satisfying this credit:

Indoor Environmental Quality Credit: Quality Views (1 point)

The intent of this credit is to give building occupants a connection to the natural outdoor environment by providing quality views.

Achieve a direct line of sight to the outdoors via vision glazing for 75% of all regularly occupied floor area, with additional requirements specifying the type of view to be achieved.

The average American spends 90 percent of time indoors. Research has shown that workers who have views to the outside are likely to be more productive and exhibit improved health, a decrease in stress indicators, and better cognitive function.* The thinner mullions of a timber curtain wall system offer an unobtrusive sight line that maximizes views.

*McSweeney, J. et al. "Indoor Nature Exposure (INE): A Health-Promotion Framework." *Health Promotion International*, vol. 30, no. 1, 2015, pp. 126-139, <https://doi.org/10.1093/heapro/dau081>. Accessed September 2018.



LEED v4: Indoor Environmental Quality

Specifying timber curtain wall systems that use adhesives and finishes meeting LEED v4 requirements for volatile organic compound levels contributes to satisfying the following credit:

Indoor Environment Quality Credit: Low-Emitting Materials

This credit seeks to reduce concentrations of chemical contaminants that can damage air quality, human health, productivity, and the environment.

Option 1. Product Category Calculations, 1–3 points

Option 2. Budget Calculation Method, 1–3 points

Project teams should specify products that meet the compliance thresholds established by recognized standards, or choose products classified as inherently nonemitting.



Concentrations of volatile organic compounds (VOCs) are consistently higher indoors than outdoors, and prolonged exposure has been linked to chronic health problems including asthma and cancer. Look for timber curtain wall systems that contribute to a safe environment for occupants.

LEED v4: Materials and Resources

Specifying FSC®-certified wood for your timber curtain wall project may contribute to satisfying this credit:

Materials and Resources Credit: Building Product Disclosure and Optimization—Sourcing of Raw Materials, 1–2 points

This credit encourages the use of products and materials for which life cycle information is available and that have environmentally, economically, and socially preferable life cycle impacts, and rewards project teams for selecting products verified to have been extracted or sourced in a responsible manner.

Option 2. Leadership Extraction Practices (1 point)

Wood products must be certified by the Forest Stewardship Council® or USGBC-approved equivalent. Products meeting wood products criteria are valued at 100% of their cost for the purposes of credit achievement calculation.

The wood glulam mullions in a timber curtain wall system can be specified to be made from FSC-certified lumber.



Wood: A Renewable and Protected Resource

Sustainable forest management promotes balance between the increasing demand for wood and the preservation of the health of forests.

As a renewable resource, wood species and finishes give architects a multitude of timber mullion design options. Specifying certified, sustainably harvested materials supports responsible procurement and forestry, and our environment.



Durability and Strength

Wood has long been used for its durability, a key component of sustainability. Glued, laminated timber (glulam) mullions have greater strength and stiffness than steel and are stronger pound for pound.

Glulam is a structurally engineered wood product that offers consistent material quality while optimizing the structural values of wood. With six times less embodied energy to produce compared to steel, timber curtain wall systems made from glulam offer architects environmentally responsible artistic freedom without sacrificing structural requirements.

Replaceable, exterior beauty caps are all that are exposed to the exterior elements on this system, protecting the wood from rain and sun.





From Concept through Installation

Specifying: The Details Make a Difference

Timber curtain wall systems are complicated and require design expertise and support throughout the project stages—from planning through construction. Well-qualified suppliers can offer architects design assistance, data reports for performance and code requirements, and comprehensive architectural details and support.

Specifying a timber curtain wall from a supplier who offers on-site assistance as well as high-quality shop drawings will ensure that the installation team has the guidance it needs.



PLANNING/DESIGN

Design, engineering, and budgeting support and the option for a turn-key, furnish-and-install package



PRECONSTRUCTION/ PROCUREMENT

Accurate, detailed shop drawings, site verification, and scheduling coordination



CONSTRUCTION

Timely and professional execution of the building plan, and high-quality products that live up to expectations

From Concept through Installation

In the following slides, we will take a brief look at the progress of a timber curtain wall installation from concept through construction and highlight some of the important milestones.

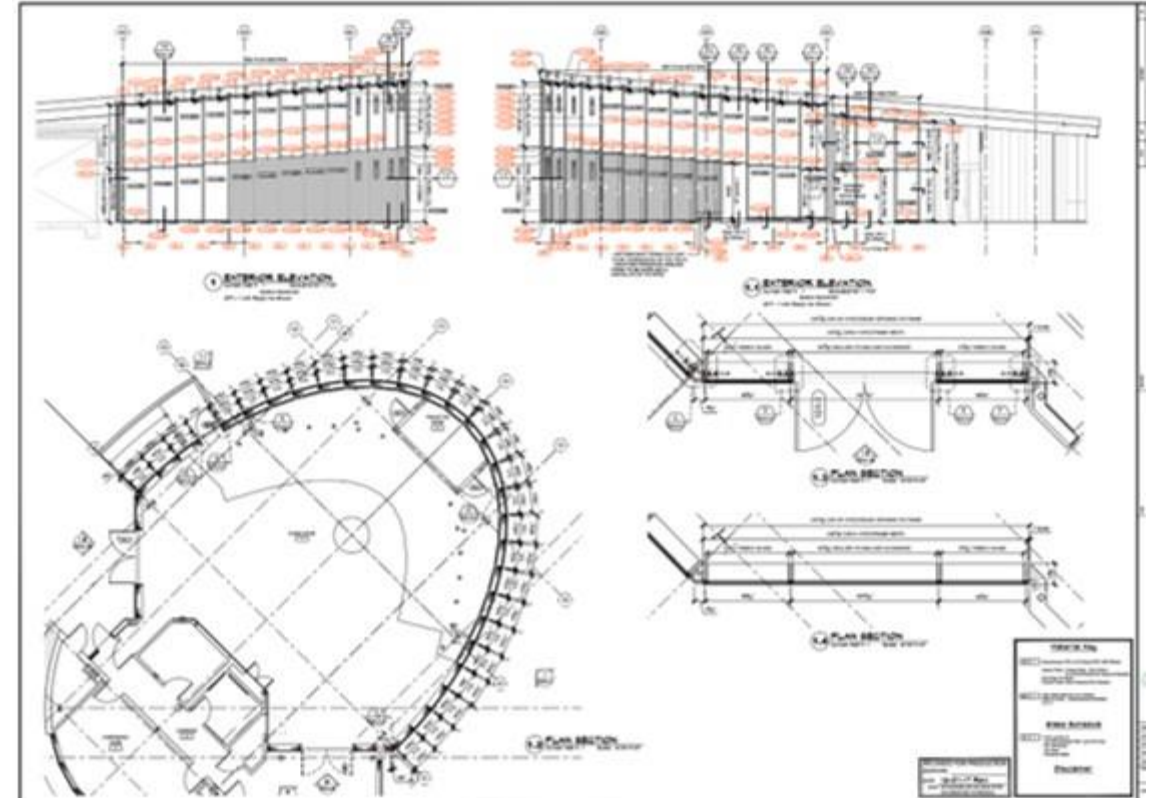
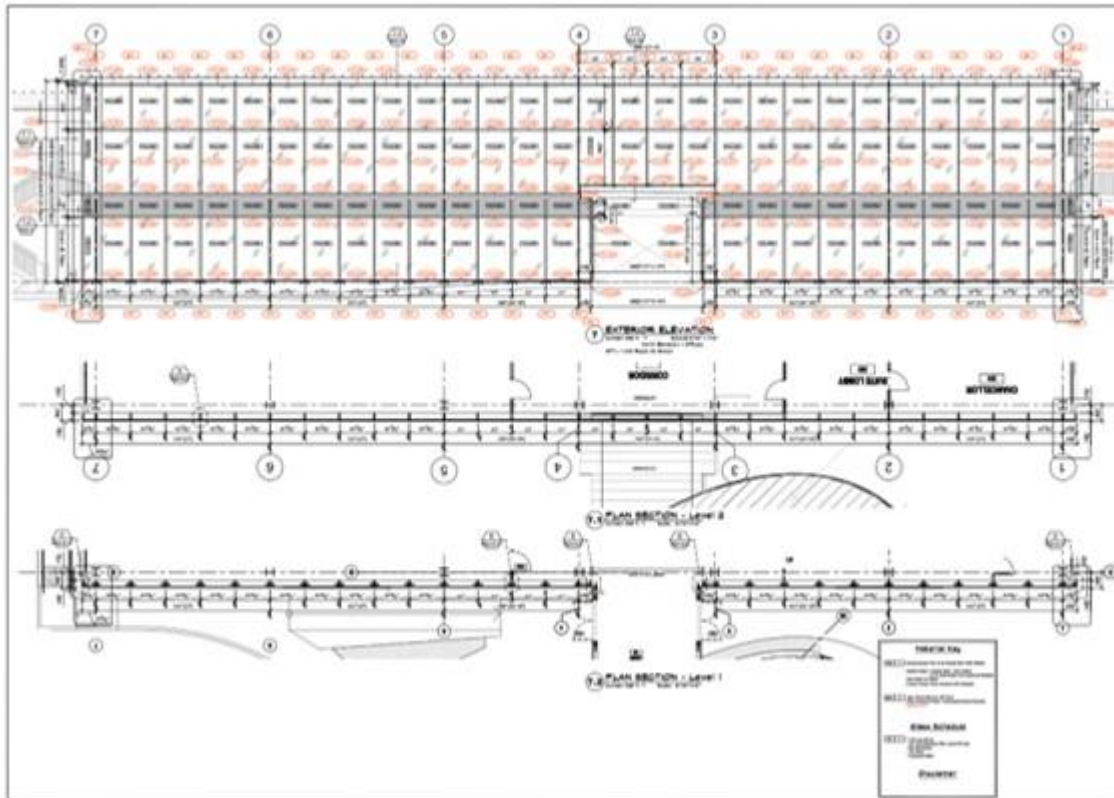
When specifying a timber curtain wall system for your project, partnering with a full-service company that offers design assistance early on has a number of advantages, helping you to:

- navigate through the unique design parameters of timber curtain wall systems
- integrate timber curtain wall details into architectural drawings that will reflect actual conditions, profiles, and interfaces with adjacent trades, and
- establish budgetary costs and identify possible value engineering options.



Submittals/Shop Drawings

Other advantages to expect from a full-service supplier include high-quality installation shop drawings, product samples (wood, glass, wood finish), LEED certification assistance, and product specifications.



Project Management

The project management team offers on-site installation and logistical support and coordinates submittals, deliveries, and installation.

The team reviews the scope of the project with the general contractor, installers, and adjacent trades as well as the shop to ensure that the materials provided are delivered as specified.



Project Management

Here the project management team verifies site conditions and rough openings for the proper alignment of the timber curtain wall system by laying out a template.



Installation: Vertical Mullions

Prefinished wood mullions are palletized, numbered, and delivered to the jobsite where they are staged and protected from moisture.

Installation begins with the vertical mullions that have been fitted with the attachment hardware for the horizontal mullions, as shown in this slide.



Installation: Vertical Mullions

There are a number of methods by which vertical mullions are installed at the head and sill, including by welding, with bolt and lag screws, or with other types of fasteners. These methods depend on site conditions, manufacturer-specific hardware types, and applications.

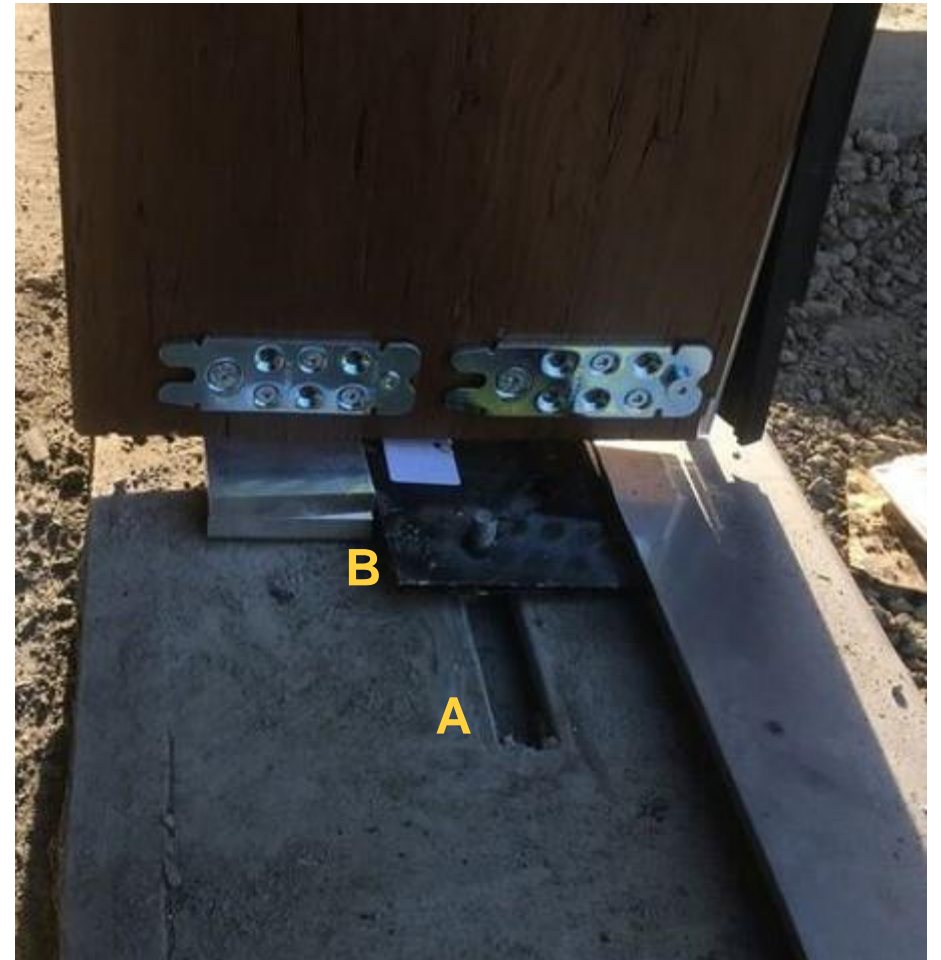
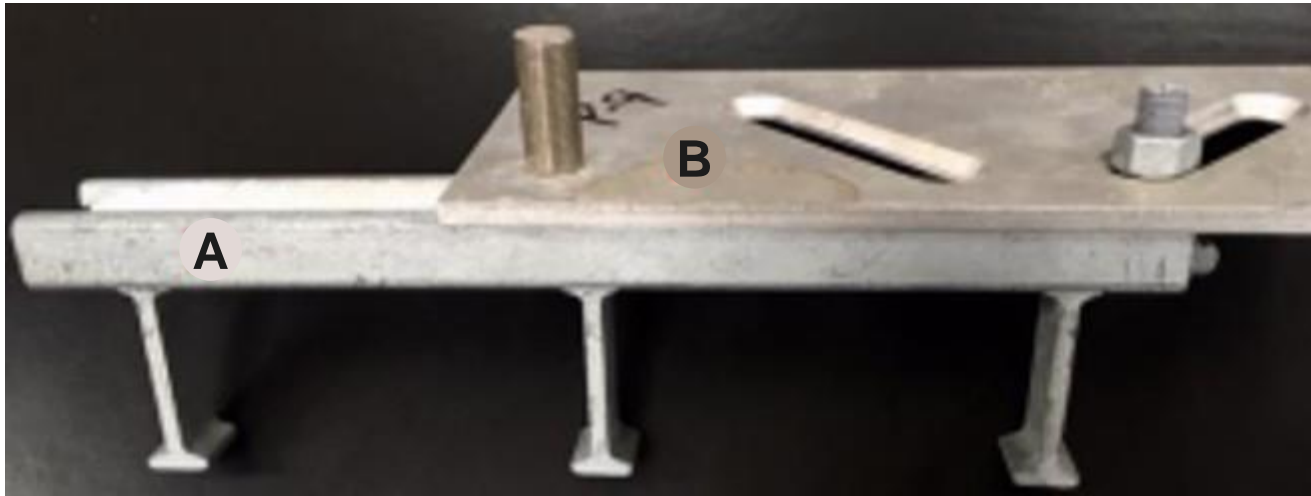
Stamped engineer drawings ensure that connection requirements meet the structural needs of the building design.



Installation: Vertical Mullions

The two-piece pin attachment shown in this slide is just one of several hardware options used to install the vertical mullions.

- A. The embedded mounting bracket is installed within the concrete.
- B. The pin attachment plate is fastened to the vertical, embedded mounting bracket with bolts and nuts.



Installation: Vertical Mullion

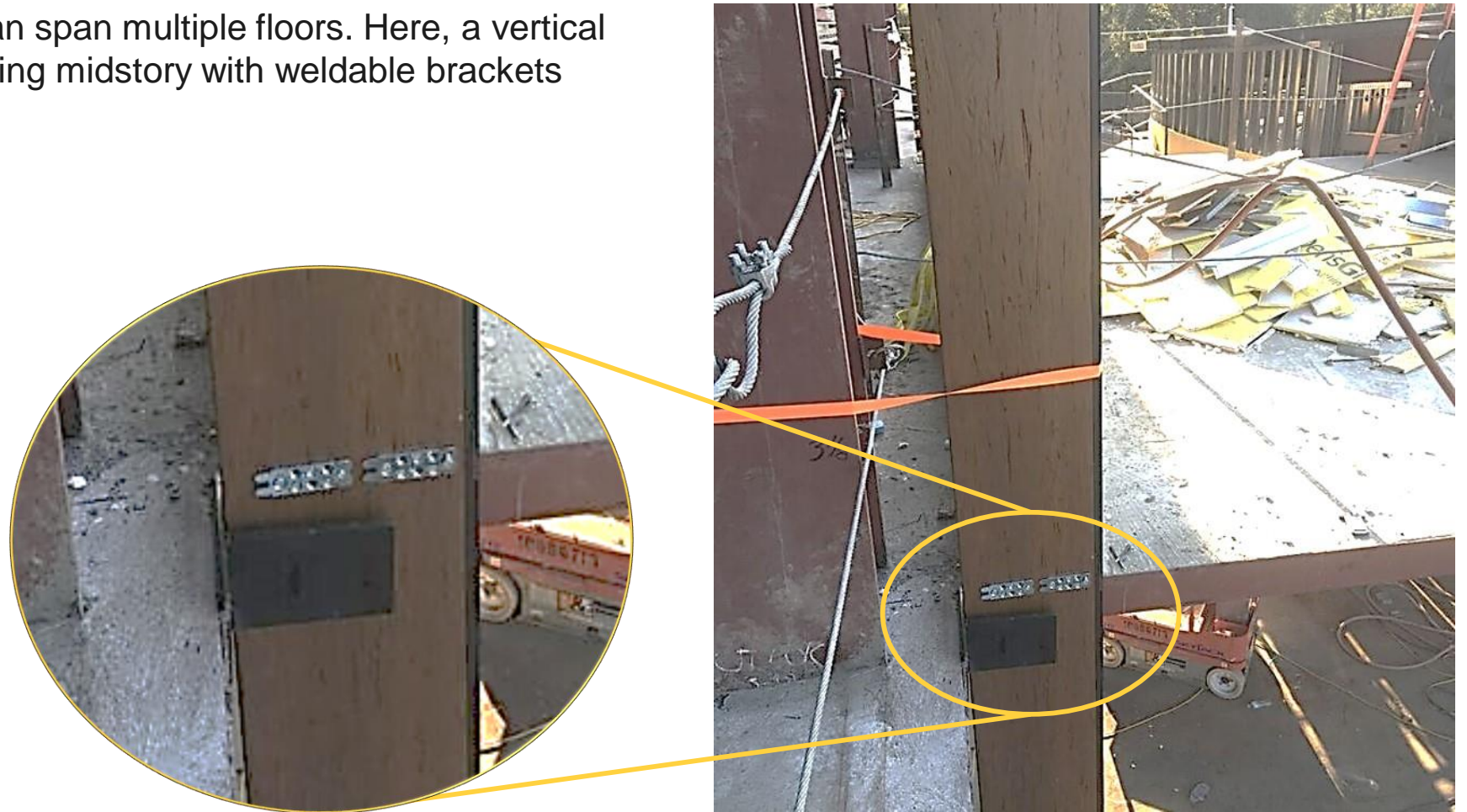
At the head, the vertical mullion on this project is installed with a welded steel bracket.

Through-bolts inserted into elongated holes that allow for upward and downward movement hold the mullion in place.



Installation: Vertical Mullion

Timber curtain wall systems can span multiple floors. Here, a vertical mullion is attached to the building midstory with weldable brackets and through-bolts.

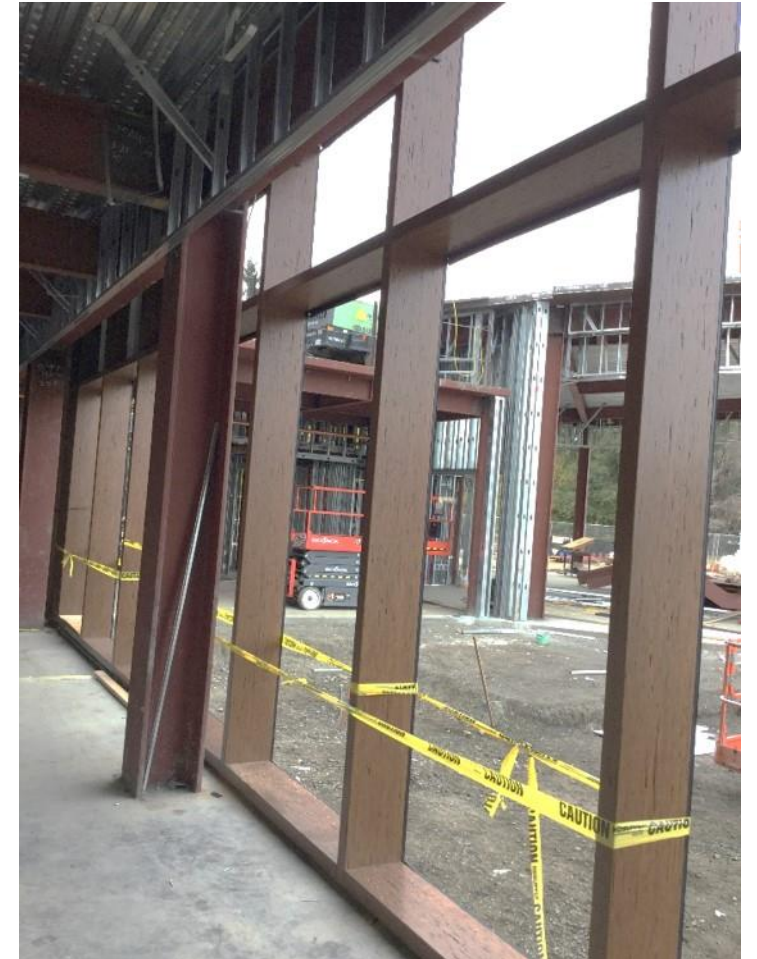


Installation: Horizontal Mullions

Vertical mullions and transoms (horizontal mullions) are installed and ready for waterproofing and glazing. Caution tape discourages other trades from walking on the horizontal mullion.



Please remember the **test password MULLION**. You will be required to enter it in order to proceed with the online test.



Installation: Horizontal Mullions

Now waterproofing membranes, L-angles, profiles, gaskets, and setting chairs are installed.



Installation: Glazing

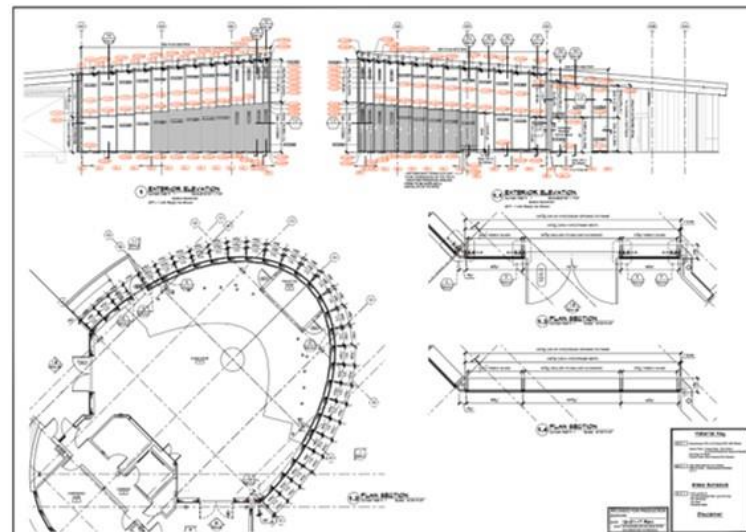
The glass panels and pressure plates have been installed and the project is beginning to take shape.

The roof will finish off the exterior and later, when there is less chance of damage, the aluminum beauty caps will be snapped on.



From Concept through Installation

In this project, the supplier lent support from concept through execution with design assistance, shop drawings, installation, and project management.





Timber Curtain Wall Applications

Explore the Design Possibilities

Turn a corridor into a work of art.



Give a retail space a modern, sophisticated personality.



Explore the Design Possibilities

Create office spaces with natural appeal.



Highlight a nature center with natural light and wood mullions.



Explore the Design Possibilities

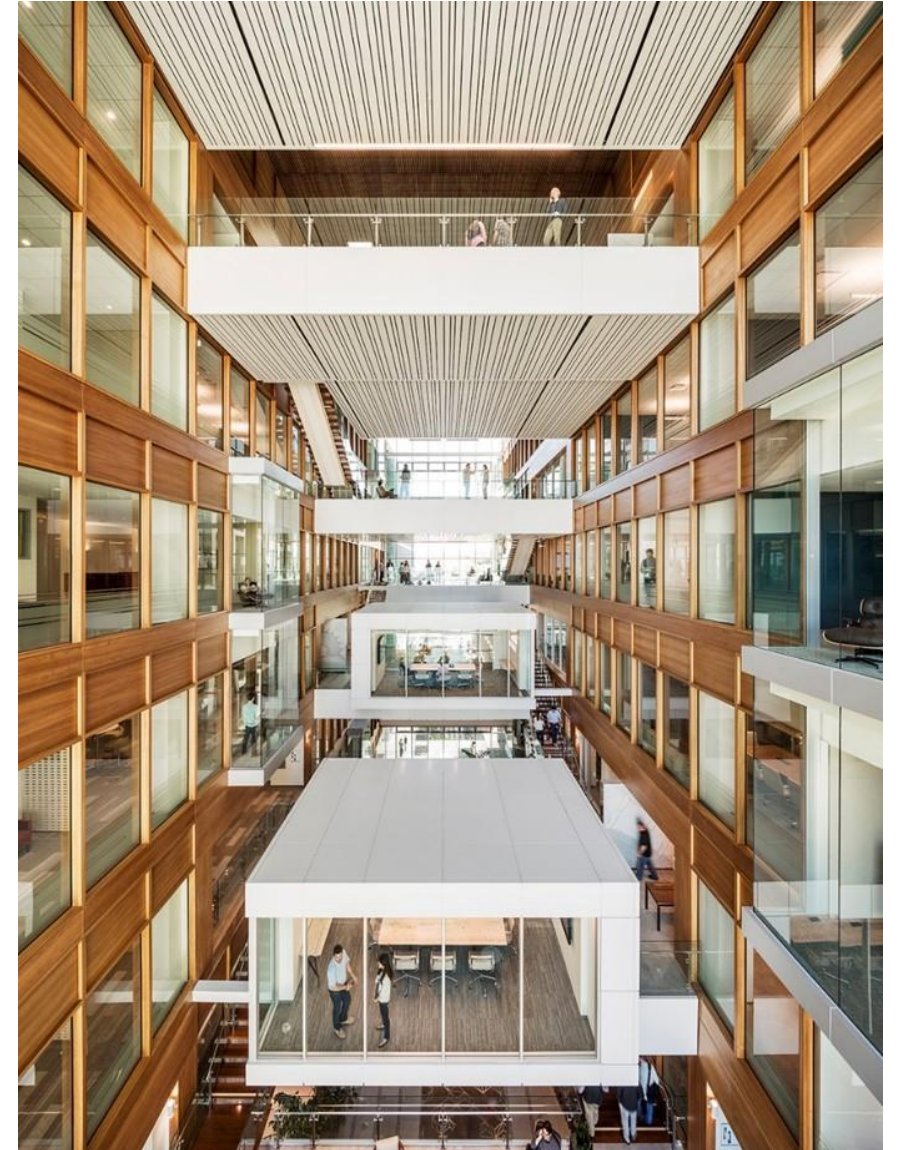
Design commercial spaces with natural materials that inspire.



Summary

Timber curtain wall systems are an ideal alternative to standard aluminum storefront systems, offering a durable, low-maintenance, structural aluminum exterior with the warmth and richness of a wood interior. Timber curtain walls have reduced life cycle impacts compared to traditional aluminum curtain walls, and NFRC thermal performance ratings can guide architects in specifying system and glazing options that will meet the performance demands of the project.

Timber curtain walls contribute to resource-responsible, sustainable building designs; FSC-certified wood components, enhanced energy performance, and maximized daylighting and views are just some of the ways that timber curtain walls can help satisfy green building certification program requirements.



Summary

A partnership between the architect and a full-service timber curtain wall supplier offers project advantages from the design phase through to completion, providing guidance on navigating timber curtain wall's unique design parameters, value engineering options, high-quality shop drawings, product specifications, LEED certification assistance, coordination of trades, and much more.

Timber curtain wall systems give architects expansive freedom to combine the curtain wall with other wood materials, integrate windows and doors, and present clean lines and large spans of glass to make a modern design statement with the warmth and natural beauty of wood.



Conclusion

If you desire AIA/CES, state licensing or CE credits for another organization, please click on the button to commence your online test. A score of 80% or better will allow you to print your Certificate of Completion; you may also go to your AEC Daily Transcript to see your completed courses and certificates.

For additional knowledge and post-seminar assistance, click on the Ask an Expert link.

If you have colleagues that might benefit from this seminar, please let them know. Feel free to revisit the AEC Daily website to download additional programs.

MORE >

powered by  **@AEC DAILY.**
www.aecdaily.com



by PACIFIC ARCHITECTURAL MILLWORK

©2018 Reveal Windows & Doors. The material contained in this course was researched, assembled, and produced by Reveal Windows & Doors and remains its property. "LEED" and related logo is a trademark owned by the U.S. Green Building Council and is used by permission. The LEED® Rating System was authored by and is the property of the USGBC. Any portion of the Rating System appearing in this course is by permission of the USGBC. Questions or concerns about the content of this course should be directed to the program instructor. This multimedia product is the copyright of AEC Daily.

Questions? Ask an Expert – [click here](#)

Click Here to Take the Test

Exit