



# Loyola/Notre Dame Library Expansion & Renovation

Baltimore, MD



## Thesis Construction Depth

*Modular Curtain Wall Construction*



### *Construction Management Depth*

## Modular Curtain Wall Proposal

Inspired by what universities across the United States are doing to ensure energy conservation in their new construction projects as well as campus retrofits, a modular curtain wall system was proposed to replace the existing stick-built curtain wall system. Modular curtain wall systems are praised for their enhanced efficiency & better overall quality. They operate the way they were designed. Some of the other sustainable features that contribute to the new design of the curtain wall can be found in sections D and E (Mechanical and Lighting Breadths).

In this section, new **schedule**, **cost**, and **construction alterations** will be analyzed to ensure that this system is right for this particular building, which happens to be a library, as previously stated. The original curtain wall was manufactured by Kawneer. The new system will be replaced by VistaWall's unitized system. The Viracon glass inserts will remain since the glass for this system is of a very high quality. The new system provides significantly higher performance than stick-built curtain wall, in terms of movement, load bearing capacity and water penetration. Quality control is much easier to administer since the modules for the wall are constructed, glazed, sealed, and tested off site.

*[Viracon Manufacturer information may be found in Appendix C.1]*

*[Kawneer Manufacturer information may be found in Appendix C.2]*

*[VistaWall Manufacturer information may be found in Appendix C.3]*

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The comparison tables below shows some of the advantages and disadvantages for a modular curtain wall system according to owners, architects, general contractors and October 2007's PACE Seminar industry professionals.

<b>Advantages of Modular Curtain Wall Systems</b>	<b>Disadvantages of Modular Curtain Wall Systems</b>
<ul style="list-style-type: none"> <li>• Reduction in field labor costs by half</li> </ul>	<ul style="list-style-type: none"> <li>• Limits custom made design (architects do not like)</li> </ul>
<ul style="list-style-type: none"> <li>• Benefits Green Building Initiatives: enhanced efficiency &amp; better quality(operates the way it was designed)</li> </ul>	<ul style="list-style-type: none"> <li>• Needs to be implemented in design early on, otherwise, will probably not happen</li> </ul>
<ul style="list-style-type: none"> <li>• Buildings are typical and easier to build.</li> </ul>	<ul style="list-style-type: none"> <li>• Difficult to coordinate trades in field or off site</li> </ul>
<ul style="list-style-type: none"> <li>• Eliminates waste (ex: precast)</li> </ul>	<ul style="list-style-type: none"> <li>• Transportation and code issues</li> </ul>
<ul style="list-style-type: none"> <li>• Owner, architect, engineers, and CM all work together and coordinate early on.</li> </ul>	<ul style="list-style-type: none"> <li>• Designers not inclined to think about these issues</li> </ul>
<ul style="list-style-type: none"> <li>• Save schedule time. At a university this is extremely important.</li> </ul>	<ul style="list-style-type: none"> <li>• Not being coordinated to optimum capacity</li> </ul>
<ul style="list-style-type: none"> <li>• Customizable</li> </ul>	<ul style="list-style-type: none"> <li>• Introduce the need to use a crane</li> </ul>
<ul style="list-style-type: none"> <li>• Easy to maintain</li> </ul>	<ul style="list-style-type: none"> <li>• Need to coordinate with BIM for complex buildings (subs do not like this typically)</li> </ul>

After completing thesis research, here are the advantages and disadvantages of a modular curtain wall system according to subcontractors

<b>Subcontractors: Advantages of Modular Curtain Wall Systems</b>	<b>Subcontractors: Disadvantages of Modular Curtain Wall Systems</b>
<ul style="list-style-type: none"> <li>• Save 20% in field labor costs</li> </ul>	<ul style="list-style-type: none"> <li>• Not good for all building types</li> </ul>
<ul style="list-style-type: none"> <li>• Much easier to install</li> </ul>	<ul style="list-style-type: none"> <li>• Usually call for prevailing wages to pay laborers</li> </ul>
<ul style="list-style-type: none"> <li>• Test off site. Know that it works properly before its installed</li> </ul>	<ul style="list-style-type: none"> <li>• Difficult to coordinate trades in field or off site</li> </ul>
<ul style="list-style-type: none"> <li>• Eliminates waste</li> </ul>	<ul style="list-style-type: none"> <li>• Not enough experience with these types of systems yet</li> </ul>

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## Why Modular Curtain Wall Construction?

### ✓ **Moisture Protection**

Water penetration of curtain wall frame corners is likely to leak to the interior and/or onto insulating glass below. Watertight frame corner construction and good glazing pocket drainage are critical for reliable water penetration resistance.

- ✓ **CAUTION:** Unitized systems generally rely on gaskets and/or the interlock of mating frames for moisture protection at joints between adjacent modules. Some unitized designs are very sensitive to small irregularities in the spacing of adjacent modules; for example, if the module joints are slightly out of tolerance, gaskets may not be properly compressed and moisture protection may suffer.

### ✓ **Watertight Performance**

Integration of perimeter flashings helps ensure watertight performance of the curtain wall and its connection to adjacent wall elements. Proper placement of insulation at the curtain wall perimeter reduces energy loss.

### ✓ **Acoustics**

The acoustic performance of curtain walls is primarily a function of the glazing and internal seals to stop air leakage. Sound insulation of curtain walls can be improved by making construction as airtight as possible.

### ✓ **Health & Indoor Air Quality**

Curtain wall leakage, both air and water, can contribute to IAQ problems by supplying liquid water and condensation moisture for mold growth. This leakage can often remain concealed within the wall system and not become evident until concealed wall components experience significant deterioration and mold growth requiring costly repairs.

### ✓ **Sustainability**

The best strategy for sustainability of curtain walls is to employ good design practices to ensure the durability (maximum service life) of the installation.

[[http://www.wbdg.org/design/env\\_fenestration\\_slpglz.php](http://www.wbdg.org/design/env_fenestration_slpglz.php)]

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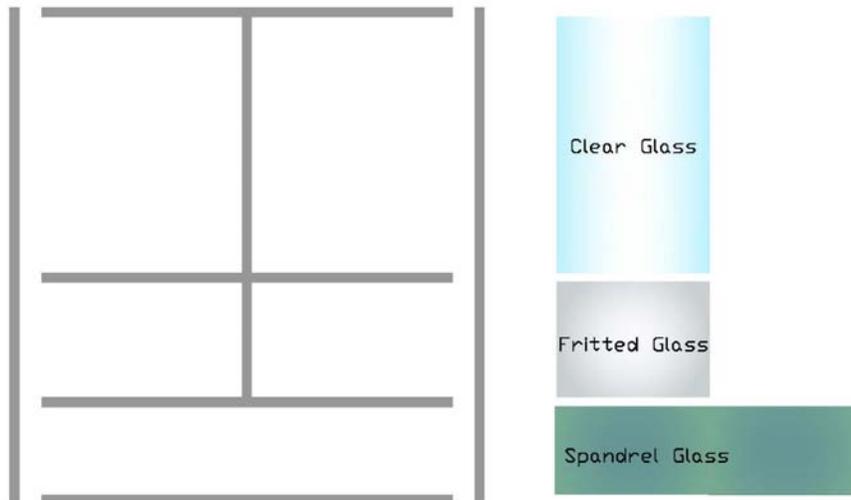
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### Existing Aluminum Curtainwall



### Existing Construction Sequence



Fig. 1 - 6/7/07: Curtainwall and storefront installation on east elevation



Fig. 2 - 6/21/07: Glass installation on east elevation



Fig. 3 - 6/21/07: Aluminum grid on south elevation



Fig. 4 - 6/29/07: Curtainwall grid installation on south elevation



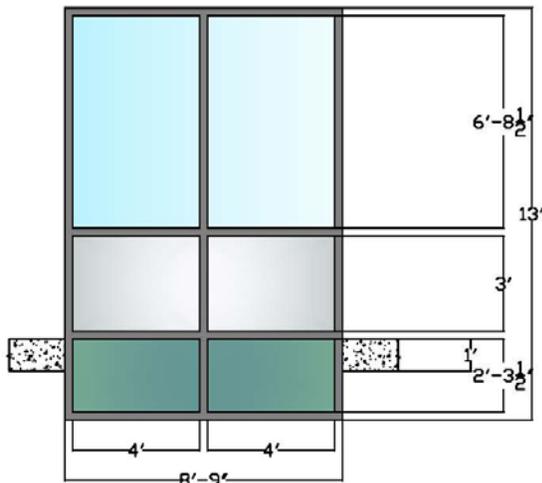
Fig. 5 - 7/6/07: Glass installation on south elevation, excluding fritted glass



Fig. 6 - 11/7/07: Fully Enclosed Addition at west elevation

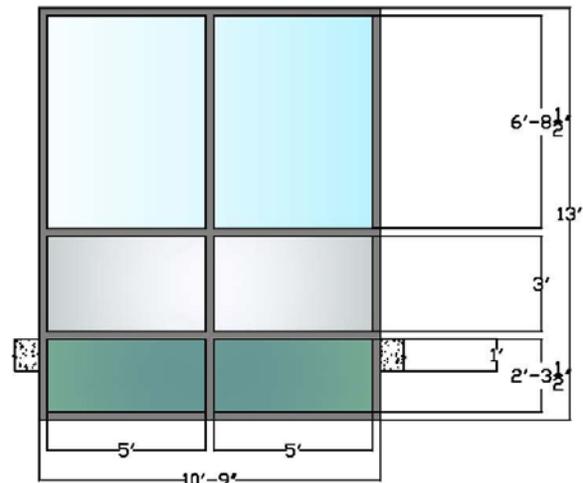
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## Proposed VistaWall Modules



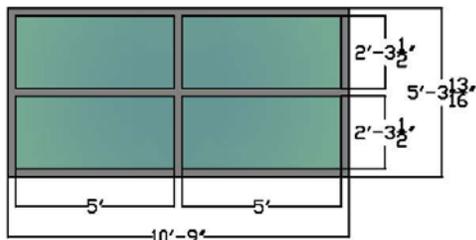
Module A

Typ. for North & East Elevations



Module B

Typ. for West, South & Partial East Elevations



Module C

- Module A
- Module B
- Module C

The fewer times that a module has to be repeated, the quicker the system can be manufactured. If more than five modules need to be manufactured for a project this size, the curtain wall may not be worth building as a modular system. Three modules, as seen below, were designed for the library's new façade.

[See next page for a display of Module A, B, & C distribution on the four sides of the façade.]

(Sketches NTS)

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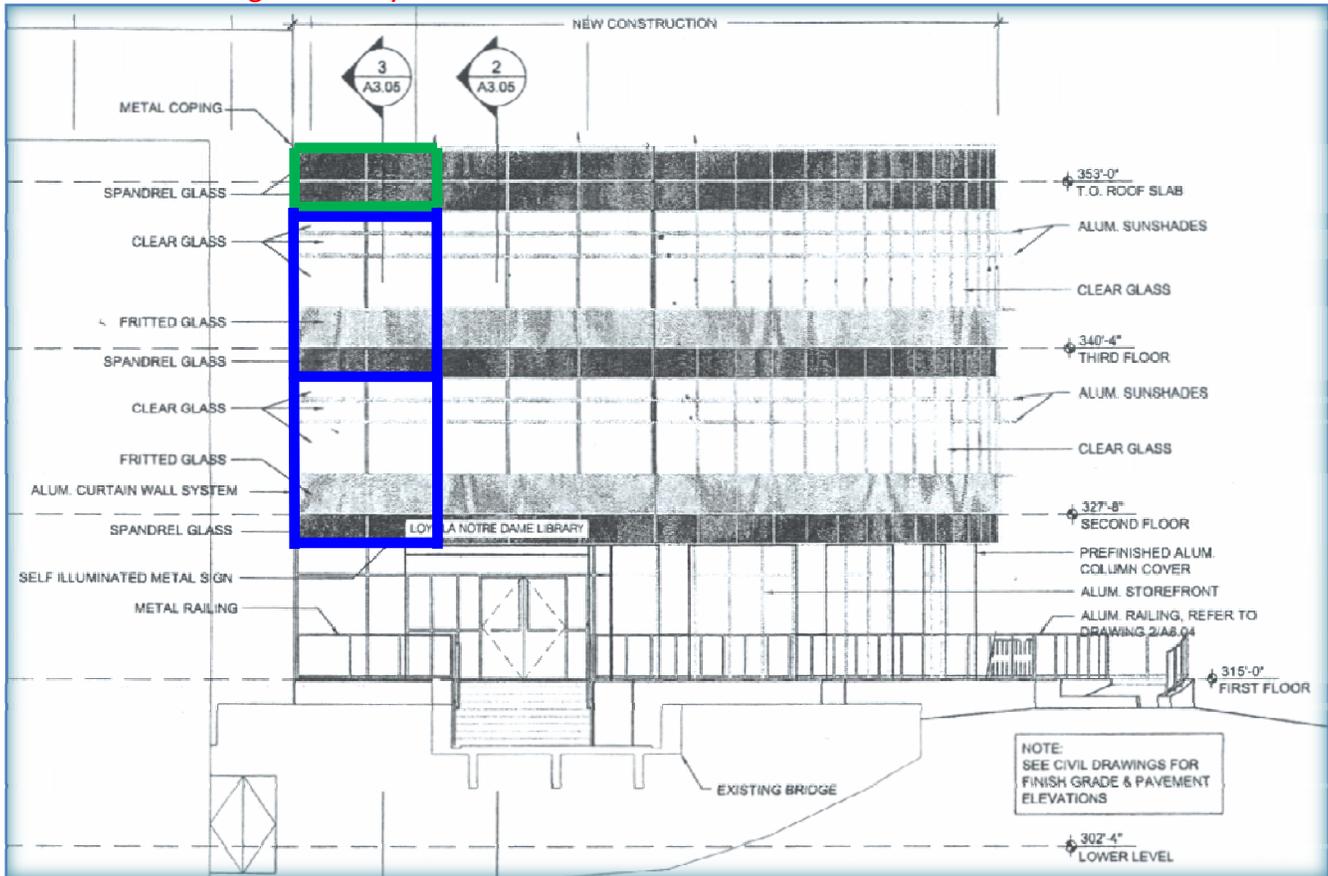
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West Elevation

<u>Number of Modules</u>	<u>Area of Glass</u>
<p><b>Module A</b></p> <ul style="list-style-type: none"> <li>• None</li> </ul>	<p><b>Module A</b></p> <ul style="list-style-type: none"> <li>• 0 SF</li> </ul>
<p><b>Module B</b></p> <ul style="list-style-type: none"> <li>• (4) full modules, (2) ½ modules</li> </ul>	<p><b>Module B</b></p> <ul style="list-style-type: none"> <li>• Clear Glass: <math>6.71' \times 5' = 33.55 \text{ SF} \times 10 \text{ pieces} = 336 \text{ SF}</math></li> <li>• Fritted Glass: <math>5' \times 3' = 15 \text{ SF} \times 10 \text{ pieces} = 150 \text{ SF}</math></li> <li>• Spandrel Glass: <math>2.3' \times 5' = 11.5 \text{ SF} \times 10 \text{ pieces} = 115 \text{ SF}</math></li> </ul>
<p><b>Module C</b></p> <ul style="list-style-type: none"> <li>• (2) full modules, (1) ½ modules</li> </ul>	<p><b>Module C</b></p> <ul style="list-style-type: none"> <li>• Spandrel Glass: <math>2.3' \times 5' = 11.5 \text{ SF} \times 6 \text{ pieces} = 69 \text{ SF}</math></li> </ul>

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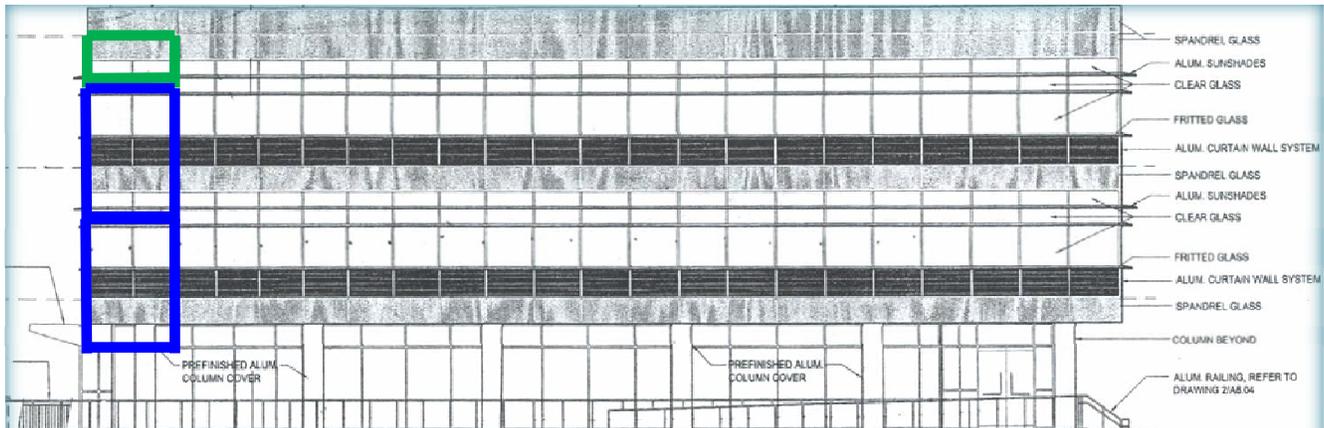
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## Construction Management Depth



South Elevation

<u>Number of Modules</u>	<u>Area of Glass</u>
<p><b>Module A</b></p> <ul style="list-style-type: none"> <li>• None</li> </ul>	<p><b>Module A</b></p> <ul style="list-style-type: none"> <li>• 0 SF</li> </ul>
<p><b>Module B</b></p> <ul style="list-style-type: none"> <li>• (22) full modules</li> </ul>	<p><b>Module B</b></p> <ul style="list-style-type: none"> <li>• Clear Glass: <math>6.71' \times 5' = 33.55 \text{ SF} \times 44 \text{ pieces} = 1,476.2 \text{ SF}</math></li> <li>• Fritted Glass: <math>5' \times 3' = 15 \text{ SF} \times 44 \text{ pieces} = 660 \text{ SF}</math></li> <li>• Spandrel Glass: <math>2.3' \times 5' = 11.5 \text{ SF} \times 44 \text{ pieces} = 506 \text{ SF}</math></li> </ul>
<p><b>Module C</b></p> <ul style="list-style-type: none"> <li>• (11) full modules</li> </ul>	<p><b>Module C</b></p> <ul style="list-style-type: none"> <li>• Spandrel Glass: <math>2.3' \times 5' = 11.5 \text{ SF} \times 44 \text{ pieces} = 506 \text{ SF}</math></li> </ul>

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East Elevation

### Number of Modules

#### Module A

- (21) full modules

#### Module B

- (6) full modules

#### Module C

- (3) full modules, (1) ½ modules

### Area of Glass

#### Module A

- Clear Glass:  $6.71' \times 4' = 26.84 \text{ SF} \times 42 \text{ pieces} = 1,128 \text{ SF}$
- Fritted Glass:  $4' \times 3' = 12 \text{ SF} \times 42 \text{ pieces} = 504 \text{ SF}$
- Spandrel Glass:  $2.3' \times 4' = 9.2 \text{ SF} \times 42 \text{ pieces} = 387 \text{ SF}$

#### Module B

- Clear Glass:  $6.71' \times 5' = 33.55 \text{ SF} \times 12 \text{ pieces} = 403 \text{ SF}$
- Fritted Glass:  $5' \times 3' = 15 \text{ SF} \times 12 \text{ pieces} = 180 \text{ SF}$
- Spandrel Glass:  $2.3' \times 5' = 11.5 \text{ SF} \times 12 \text{ pieces} = 138 \text{ SF}$

#### Module C

- Spandrel Glass:  $2.3' \times 5' = 11.5 \text{ SF} \times 12 \text{ pieces} = 138 \text{ SF}$

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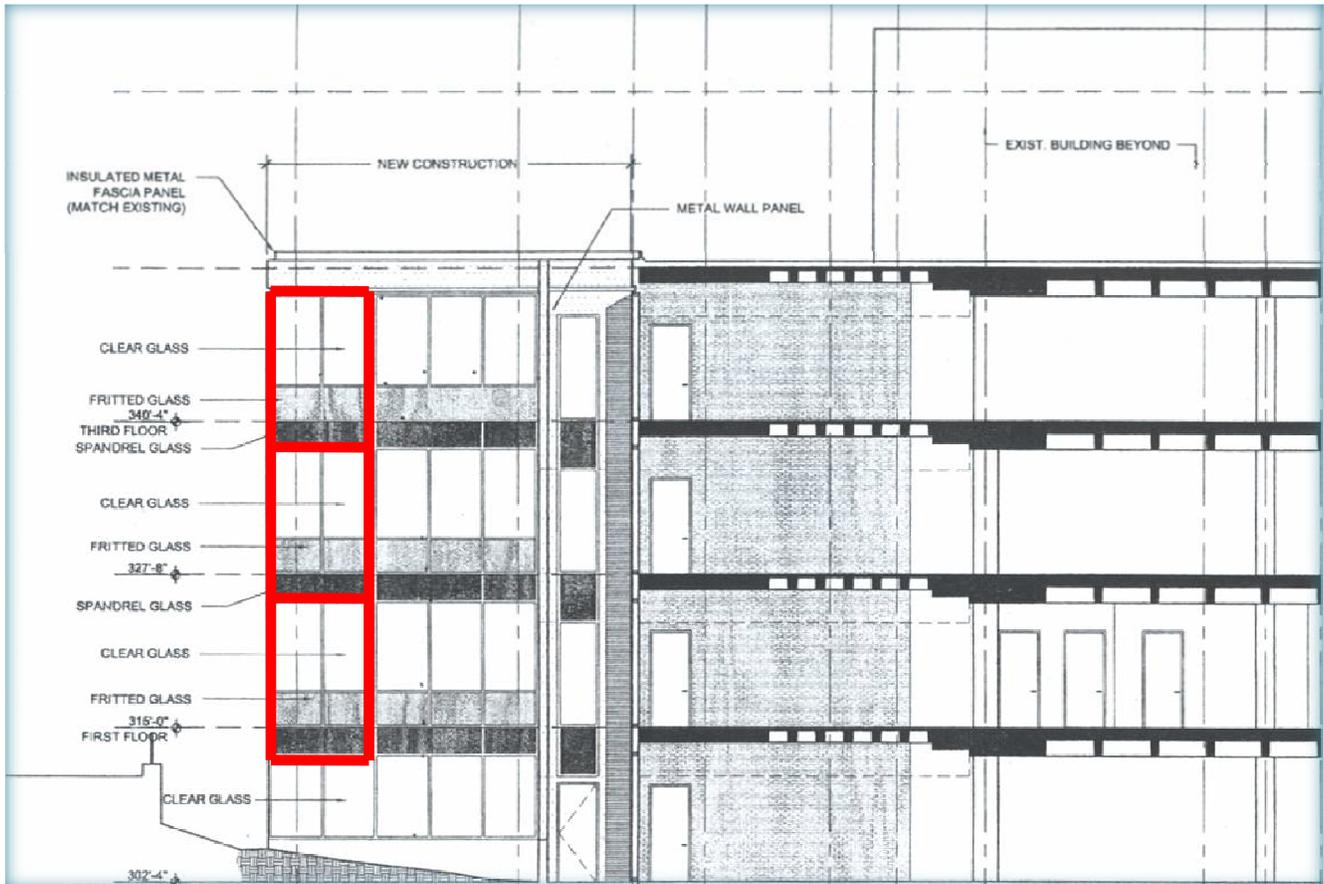
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## Construction Management Depth



North Elevation

<u>Number of Modules</u>	<u>Area of Glass</u>
<b>Module A</b> <ul style="list-style-type: none"><li>• (6) full modules</li><li>• (3) ½ modules</li></ul>	<b>Module A</b> <ul style="list-style-type: none"><li>• Clear Glass: <math>6.71' \times 4' = 26.84 \text{ SF} \times 15 \text{ pieces} = 403 \text{ SF}</math></li><li>• Fritted Glass: <math>4' \times 3' = 12 \text{ SF} \times 15 \text{ pieces} = 180 \text{ SF}</math></li><li>• Spandrel Glass: <math>2.3' \times 4' = 9.2 \text{ SF} \times 15 \text{ pieces} = 138 \text{ SF}</math></li></ul>
<b>Module B</b> <ul style="list-style-type: none"><li>• None</li></ul>	<b>Module B</b> <ul style="list-style-type: none"><li>• 0 SF</li></ul>
<b>Module C</b> <ul style="list-style-type: none"><li>• None</li></ul>	<b>Module C</b> <ul style="list-style-type: none"><li>• 0 SF</li></ul>

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Final Thesis Report

Sandra DiRupo

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## *Construction Management Depth*

<u>Total Number of Modules</u>	<u>Total Area of Curtain wall Glass</u>
<b>Module A</b> <ul style="list-style-type: none"><li>• (27) full modules</li><li>• (3) ½ modules</li></ul>	Clear Glass <ul style="list-style-type: none"><li>• 3,750 SF</li></ul>
<b>Module B</b> <ul style="list-style-type: none"><li>• (32) full modules</li><li>• (2) ½ modules</li></ul>	Fritted Glass <ul style="list-style-type: none"><li>• 1,674 SF</li></ul>
<b>Module C</b> <ul style="list-style-type: none"><li>• (16) full modules</li><li>• (2) ½ modules</li></ul> <hr/>	Spandrel Glass <ul style="list-style-type: none"><li>• 1,353 SF</li></ul> <hr/>
78.5 modules	6,777 SF Glass

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Final Thesis Report

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### Cost Comparison

[Larger view of estimate may be found in Appendix C.4]

Stick Built Curtainwall System Estimate										
	% of Cost	Qty	Unit	Mtl	Qty	Unit	Labor Rate	Crews	Equip	Total
Aluminum Frame	21.1%	4754.2	LF	\$2.00	384	HR	\$25.00	4	/	\$47,908.40
Viracon Low E Solarscreen Clear Glass	36.7%	3750	SF	\$12.00	384	HR	\$25.00	4	/	\$83,400.00
Viracon Low E Solarscreen Spandrel Glass	27.0%	1353	SF	\$17.00	384	HR	\$25.00	4	/	\$61,401.00
Viracon Low E Solarscreen Fritted Glass	30.9%	1674	SF	\$19.00	384	HR	\$25.00	4	/	\$70,206.00
<b>Material Lift Rental (2)</b>	<b>2.1%</b>	/	/	/	<b>3</b>	<b>MTH</b>	/	0	<b>\$800.00</b>	<b>\$4,800.00</b>
Thermal/Moisture Protection Testing	3.3%	75	Tests	\$100.00	/	/	/	1	/	\$7,500.00
<b>Total Cost</b>										<b>\$227,307.00</b>

Modular Curtainwall System Estimate										
	% of Cost	Qty	Unit	Mtl	Qty	Unit	Prevailing Wage Rate	Crews	Equip	Total
Aluminum Frame	5.4%	4754.2	LF	\$2.00	80	HR	\$35.00	4	/	\$20,708.40
Factory Labor	3.6%	/	/	/	80	HR	\$20.00	4	/	\$6,400.00
Viracon Low E Solarscreen Clear Glass	31.5%	3750	SF	\$12.00	80	HR	\$35.00	4	/	\$56,200.00
Viracon Low E Solarscreen Spandrel Glass	19.2%	1353	SF	\$17.00	80	HR	\$35.00	4	/	\$34,201.00
Viracon Low E Solarscreen Fritted Glass	24.1%	1674	SF	\$19.00	80	HR	\$35.00	4	/	\$43,006.00
<b>Crane Rental</b>	<b>5.6%</b>	/	/	/	<b>10</b>	<b>DAY</b>	/	/	<b>\$1,000.00</b>	<b>\$10,000.00</b>
Thermal/Moisture Protection Testing	4.2%	75	Tests	\$100.00	24	HR	/	1	/	\$7,500.00
<b>Total Cost</b>										<b>\$178,155.40</b>

**Cost Difference: \$49,151.60!**

#### Assumptions:

- Not all of the façade glass is included in this estimate. Store front glass, interior glass, and entrance door glass are all excluded in this estimate. Full glass estimate may be found in Technical reports 1 & 2.
- Cost of sealant, clips, and connections not included here either. (this estimate only displays major cost comparisons)
- See the above pages (5-9) for Glass quantities
- VistaWall estimates that a crane would cost about \$1,000/day to rent
- Material lift price taken from R.S. Means
- Proposed Durations given by VistaWall & glazing companies

# Loyola/Notre Dame Library, Baltimore, MD

Final Thesis Report

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Apr. 9, 2008

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After comparing both curtain wall systems, the costs highlighted in red are those that have changed the most between the two wall system estimates.

- **Stick-Built:** The material lift is half the cost of a crane, but almost three months of labor is necessary to install the curtain wall for this system. (Including idle time where all materials were not on site, ready to be installed)
- **Modular:** The crane to erect this type of system is double the cost for a tenth of the time; however, labor savings is huge, even with prevailing wages!

Overall, the project has potential to save 22% for this task because of the labor savings between the two systems. Modular wall systems are not always the best choice. If it's the right project, Modular systems work very well. For example: tall office buildings, uniform areas, buildings where minimal module design would be necessary.

For the library, a modular system may not have been the best choice since more than one module needed to be designed, and the concept was not used for all portions of the building addition due to non-uniformity. Had the building been a more uniform shape, using a modular system could definitely be a consideration that would save the project a ton of labor costs. The project did save \$50,000 overall, saving only 5% of total exterior enclosure costs.

*[See Appendix A.3 for entire assemblies estimate]*

*"The only thing you are going to save on with a unitized system is installation labor. An estimated labor savings of about 20% is what you will save. We probably wouldn't have won the bid had this job been a unitized system. Those jobs are typically prevailing wages too."*

*-Spear Window & Glass Employee  
(Curtain wall Contractor on LND Library)*

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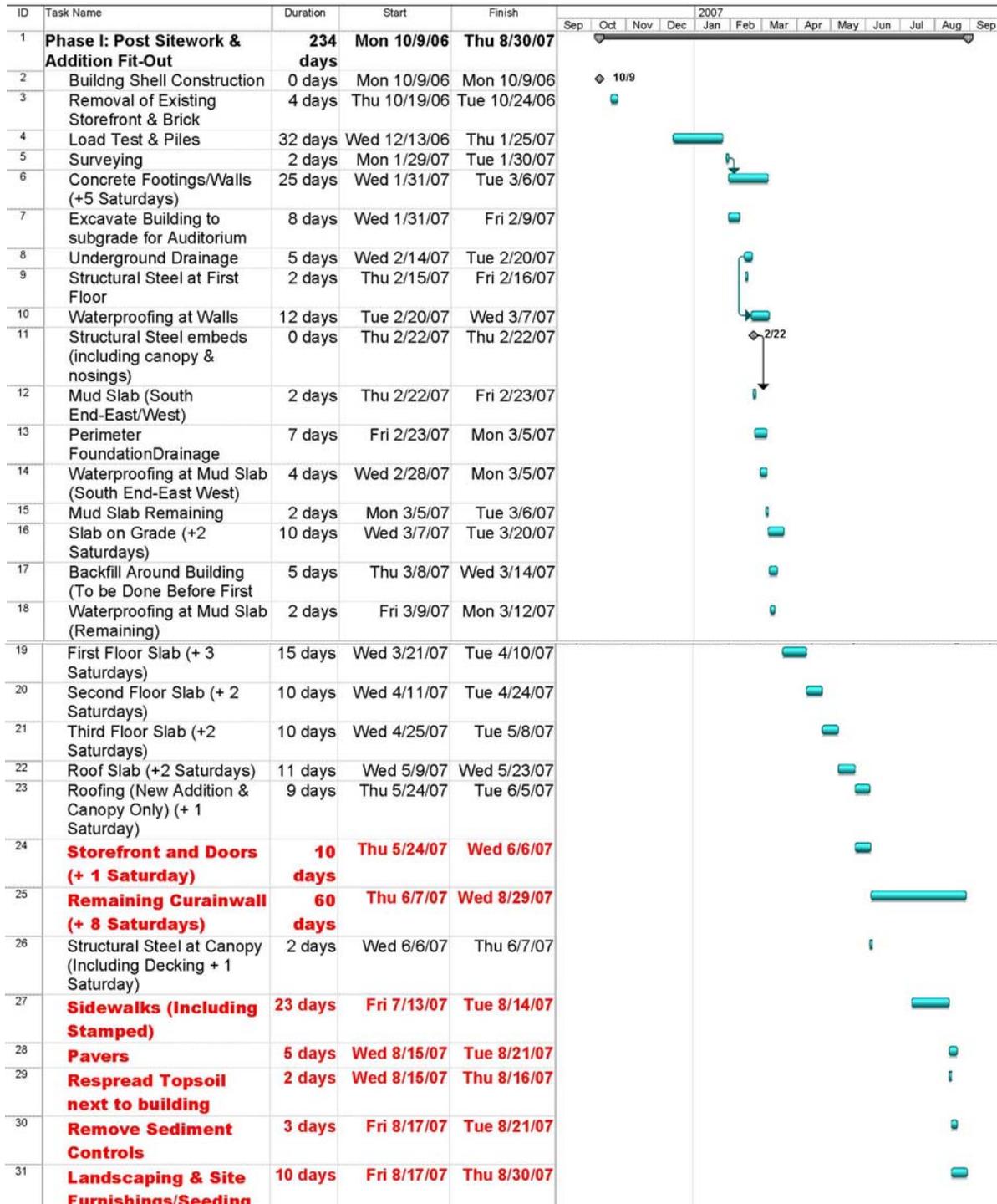
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## Construction Management Depth

### Phase I: Existing Construction Schedule



Caution: Existing Curtain Wall Construction May Cause Task Delays

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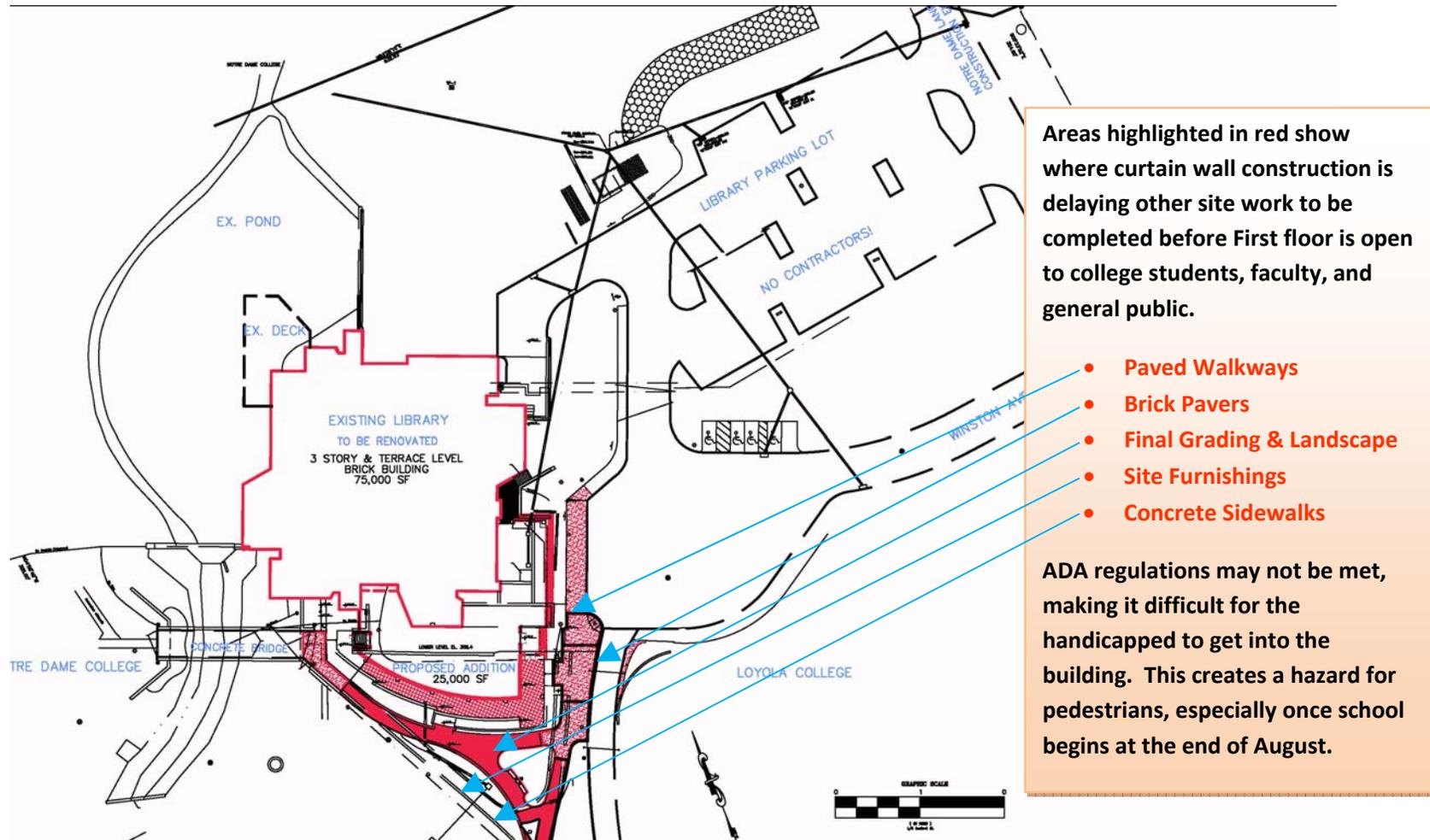
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## Lighting Breadth

### Task Delays



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### Phase I: Proposed Construction Schedule



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Apr. 9, 2008

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### Construction Alterations

#### Materials

For the simple reason of comparing the cost differences of a modular curtain wall system (VistaWall) vs. a stick built curtain wall system (Kawneer), most of the materials were not altered. For example, glass, glazing, and aluminum were all left alone. This made it easier to compare apples with apples.

*(VistaWall and Kawneer manufacturer information may be found in Appendix C.3-4)*

#### Structural Connections

One important feature that does set these two systems apart is the structural steel connection (See figures A & B below). Although the new connection was not analyzed in this report, design criteria should still be met and reviewed by the structural engineer. Because the unitized pieces are now holding more weight at distributed point loads, connections must be able to withstand the additional weight.

#### Weight of Largest Module

Aluminum<sub>max</sub>:  $3 \text{ plf} * 82 \text{ FT} = 246 \text{ lbs}$

Glass<sub>max</sub>:  $6.5 \text{ PSF} * 120 \text{ SF} = 780 \text{ lbs}$

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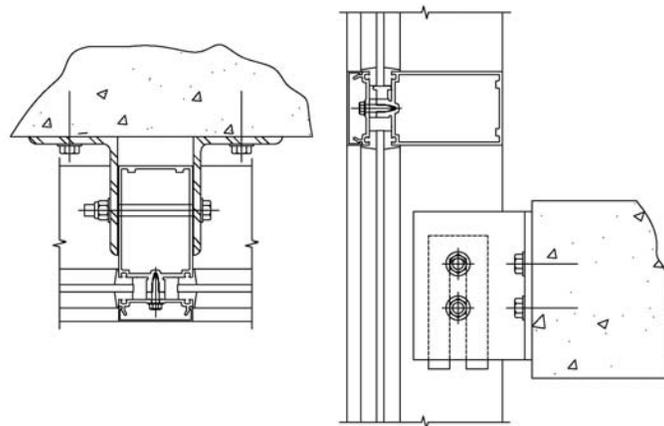
**Total: 1026 lbs**

A thousand pounds is not enough weight to impact the strength of the concrete beams, so no concrete re-design was necessary.

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Figure A

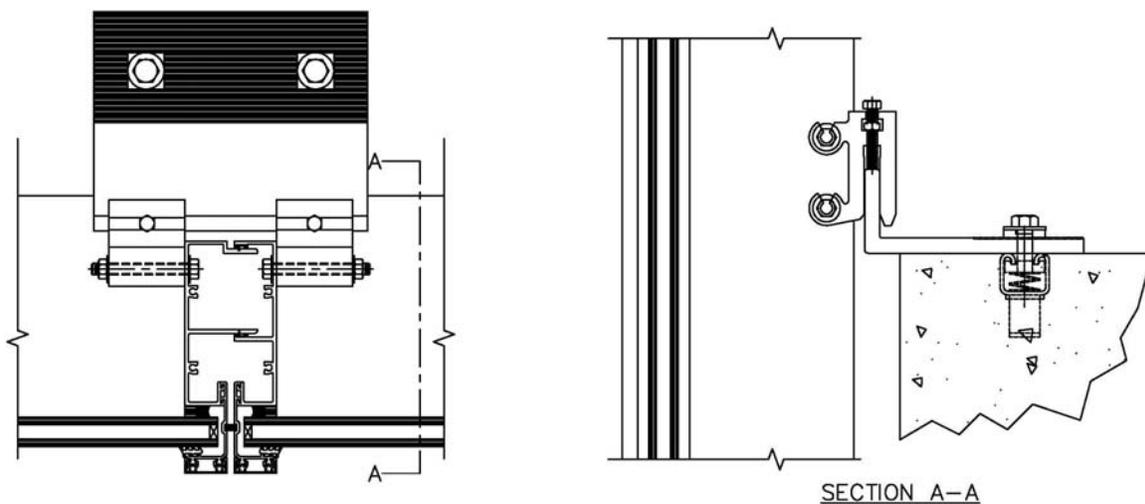
Kawneer: Typical Connection to Floor Slab



With a stick-built system, the connection penetrates the concrete slab horizontally, which is opposite from a unitized system.

Figure B

VistaWall: Typical Connection to Floor Slab



With a unitized system, the connection penetrates the concrete slab vertically, resting on top of the slab.

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Final Thesis Report

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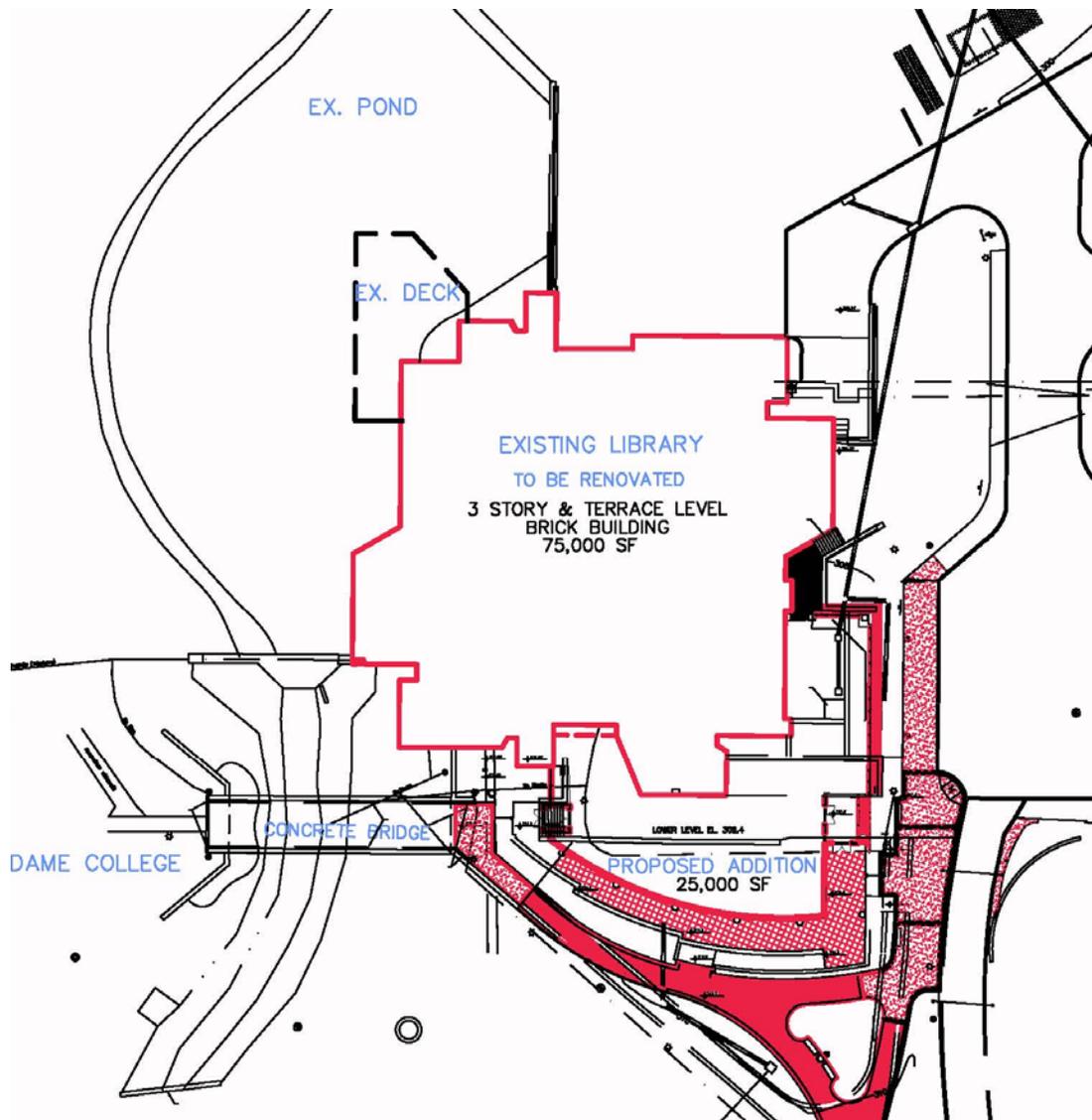
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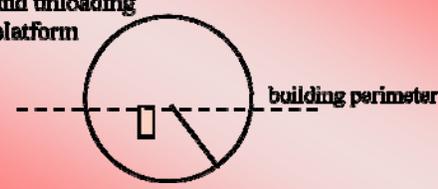
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### Crane Placement

Crane placement should also be planned very carefully, since the building will remain open during construction.



<p><b>Derrick Boom and unloading platform</b></p>  <p>building perimeter</p>	<ul style="list-style-type: none"><li>• Used at building perimeter to lift units into place</li><li>• Start at East and move west</li><li>• Warning: Swinging above entrances is prohibited while occupants are in the building</li></ul>
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### *Construction Management Depth*

### Conclusion

In this analysis, cost and schedule improvements were made by substituting the existing curtain wall construction with the new up and coming modular curtain wall construction. However, because the portion of this building was such a small segment, it may not be a wise idea to use a unitized curtain wall on this project. It is not a uniform shaped building, and this makes it difficult to repeat the same module throughout. Prefabricated construction of any kind is a great idea though. Immense labor savings and schedule reductions were a big plus in this analysis, but the savings were not extraordinary when comparing total project costs. This building is an educational facility, making the schedule a rather difficult one to follow. A modular curtain wall could have really helped the exceeding tasks move along much more quickly, but unfortunately, there are advantages and disadvantages that go along with that, as previously seen in the comparison tables above.

#### **Below are some key findings of this analysis:**

- ✓ Cost of Field Labor Reduced
- ✗ Cost of Factory Labor Reduced
- ✓ Considerable Schedule Reductions
- ✗ Smooth Coordination with other Subcontractors and Manufacturers
- ✗ Simple Modules-Easy to Repeat
- ✗ Subcontractors Familiar with this Method of Construction
- ✗ Reduced Risks
- ✗ Lead Time Reductions
- ✗ Equipment Cost Reductions
- ✓ **Enhanced Efficiency & Higher Quality**

On the right project, modular curtain wall construction could save a lot of money on field labor and cut schedule time in half. The Loyola/Notre Dame Library project was a bit too small for that unfortunately, but it was worth analyzing nonetheless.



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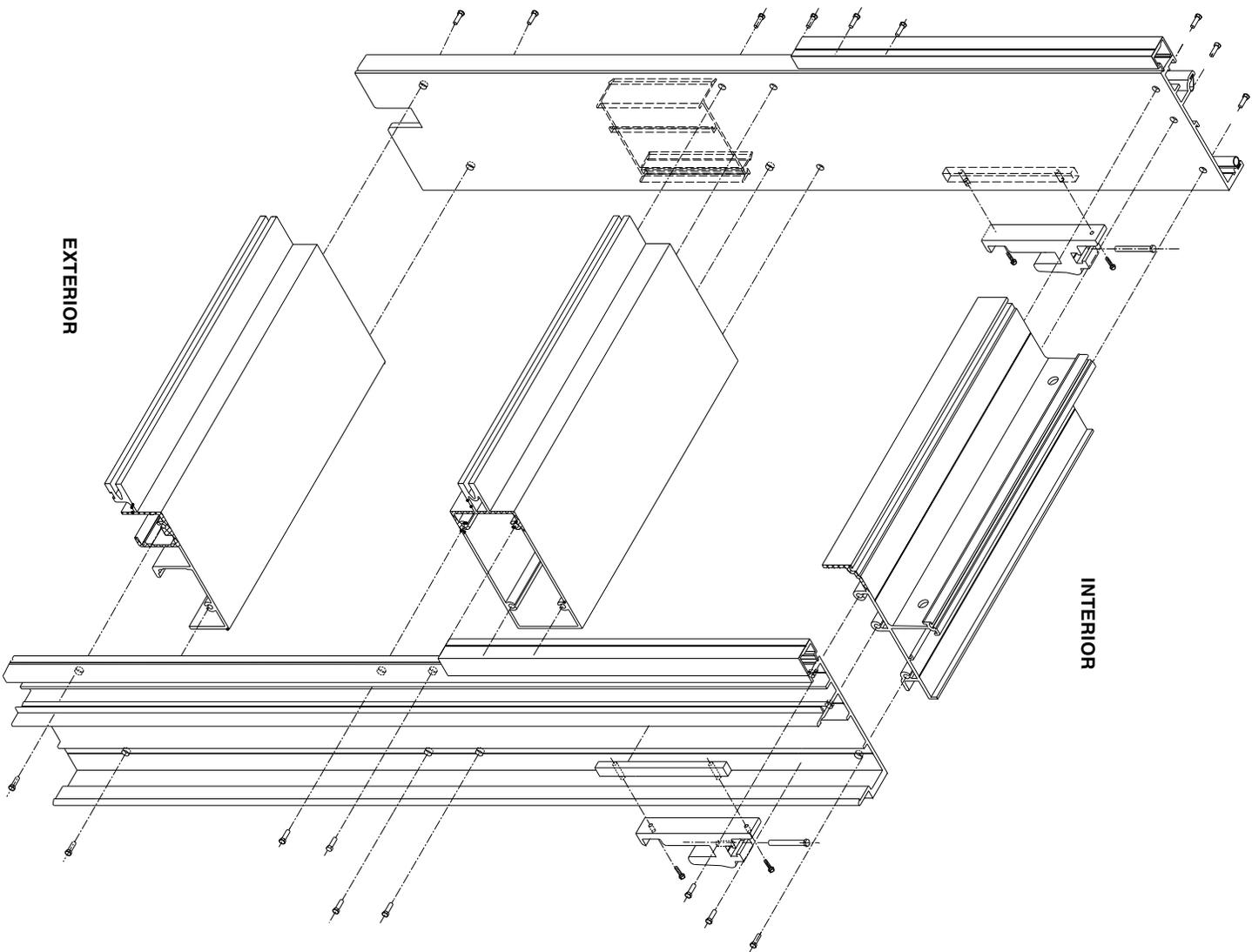
## Product Search Results

**Helpful Hints:**

- 1) To compare individual Glass Types, simply click on the CHECK BOXES to the left of the Glass Type and click the 'Save and Compare' button.
- 2) To toggle between English and Metric values, simply click on the 'English' or 'Metric' buttons below.
- 3) Click on an individual Glass Type in BLUE to view the Glass Code Chart, links to the Glass Make-up Sheet, and Glass Schedule Specification Sheet.

<b>TOOLBOX</b>	Compare Products:	Save and Compare	Clear	English/Metric Conversion:	English	Metric
----------------	-------------------	------------------	-------	----------------------------	---------	--------

Product	Transmittance			Reflectance			U-Value		Shading Coefficient	Relative Heat Gain	SHGC	LSG	European U-Value
	Visible	Solar	U-V	Vis-Out	Vis-In	Solar	Winter	Summer					
Solarscreen Low-E (VE) Insulating Glass <input type="checkbox"/> <a href="#">VE 1-85</a>	76%	47%	26%	12%	13%	21%	0.31	0.29	0.63	129	0.54	1.40	1.6
Silk-Screened Low-E Insulating Glass (Dots) <input type="checkbox"/> <a href="#">VE 1-85</a>	53%	33%	16%	20%	27%	22%	0.31	0.29	0.47	97	0.40	1.33	1.6
Silk-Screened Low-E Insulating Glass (Lines) <input type="checkbox"/> <a href="#">VE 1-85</a>	47%	29%	13%	23%	30%	22%	0.31	0.29	0.43	89	0.37	1.28	1.6
Silk-Screened Low-E Insulating Glass (Holes) <input type="checkbox"/> <a href="#">VE 1-85</a>	42%	26%	11%	25%	34%	23%	0.31	0.29	0.38	81	0.33	1.26	1.6
Solarscreen Low-E (VE) Insulating Glass With Argon Gas <input type="checkbox"/> <a href="#">VE 1-85</a>	76%	47%	26%	12%	13%	21%	0.27	0.24	0.63	128	0.54	1.40	1.3
Silk-Screened Low-E (VE) Laminated Glass (Dots) <input type="checkbox"/> <a href="#">VE 1-85</a>	56%	34%	<1%	19%	24%	21%	0.95	0.86	0.55	123	0.48	1.17	5.3
Silk-Screened Low-E (VE) Laminated Glass (Lines) <input type="checkbox"/> <a href="#">VE 1-85</a>	50%	30%	<1%	21%	27%	22%	0.95	0.86	0.52	117	0.45	1.11	5.3
Silk-Screened Low-E (VE) Laminated Glass (Holes) <input type="checkbox"/> <a href="#">VE 1-85</a>	44%	26%	<1%	24%	31%	22%	0.95	0.86	0.50	111	0.43	1.02	5.3
Silk-Screened Low-E (VE) Insulating Glass With Argon Gas (Dots) <input type="checkbox"/> <a href="#">VE 1-85</a>	53%	33%	16%	20%	27%	22%	0.27	0.24	0.46	96	0.40	1.33	1.3
Silk-Screened Low-E (VE) Insulating Glass With Argon Gas (Lines) <input type="checkbox"/> <a href="#">VE 1-85</a>	47%	29%	13%	23%	30%	22%	0.27	0.24	0.42	87	0.36	1.32	1.3
Silk-Screened Low-E (VE) Insulating Glass With Argon Gas (Holes) <input type="checkbox"/> <a href="#">VE 1-85</a>	42%	26%	11%	25%	34%	23%	0.27	0.24	0.38	79	0.33	1.26	1.3
Silk-Screened Low-E (VE) Insulating Laminated Glass (Dots) <input type="checkbox"/> <a href="#">VE 1-85</a>	51%	28%	1%	20%	24%	22%	0.31	0.28	0.46	95	0.40	1.27	1.6
Silk-Screened Low-E (VE) Insulating Laminated Glass (Lines) <input type="checkbox"/> <a href="#">VE 1-85</a>	45%	25%	1%	22%	27%	22%	0.31	0.28	0.42	87	0.36	1.26	1.6
Silk-Screened Low-E (VE) Insulating Laminated Glass (Holes) <input type="checkbox"/> <a href="#">VE 1-85</a>	40%	22%	1%	25%	31%	22%	0.31	0.28	0.38	79	0.33	1.20	1.6
Solarscreen Low-E (VE) Laminated Glass <input type="checkbox"/> <a href="#">VE 1-85</a>	81%	48%	<1%	9%	9%	19%	0.97	0.88	0.67	147	0.58	1.40	5.4



TYPICAL UNIT  
(4-SIDE CAPTURED SYSTEM)

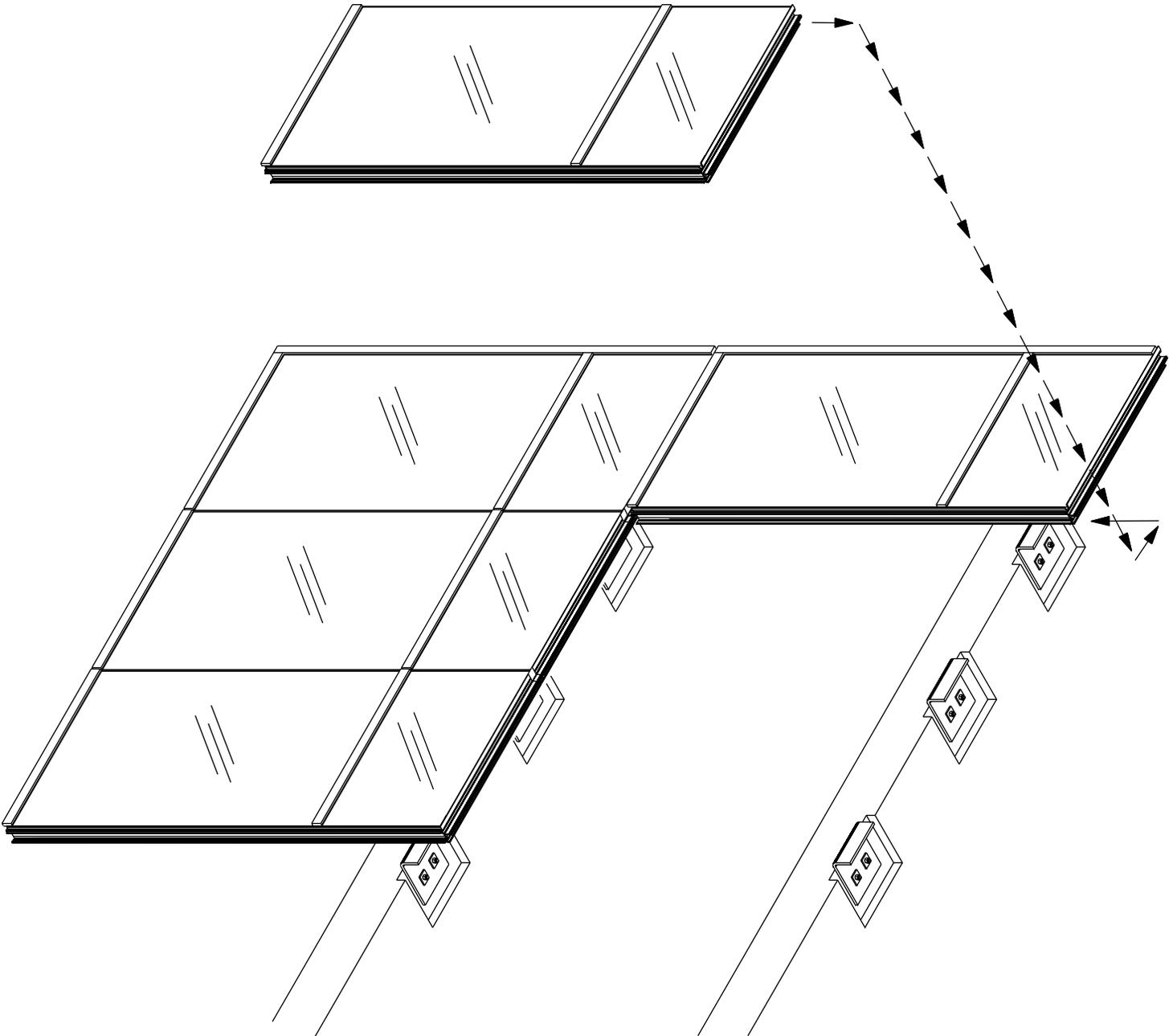
EXTERIOR

INTERIOR

Laws and building and safety codes governing the design and use of glazed entrance, window, and curtain wall products vary widely. Kawneer does not control the selection of product configurations, operating hardware, or glazing materials, and assumes no responsibility therefor.

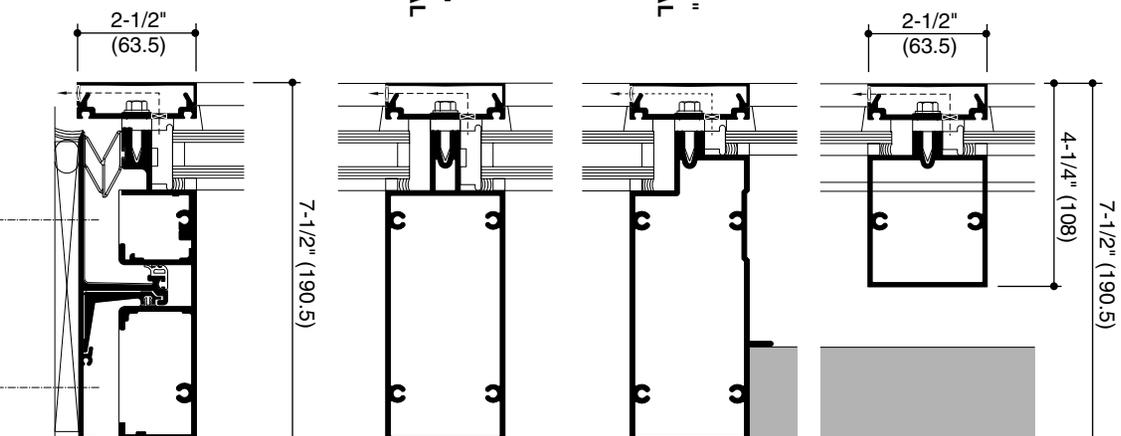
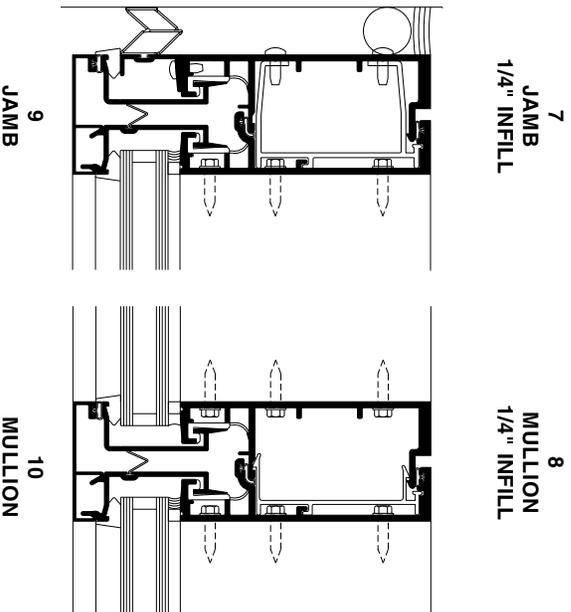
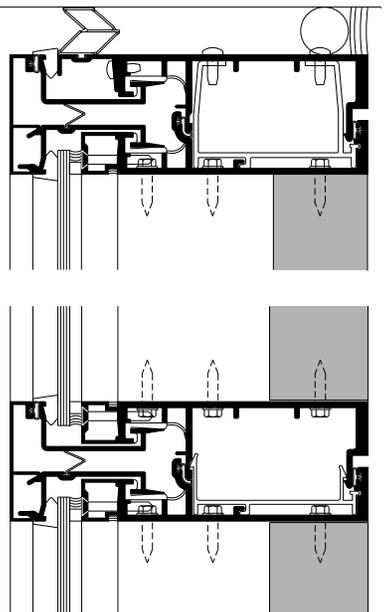
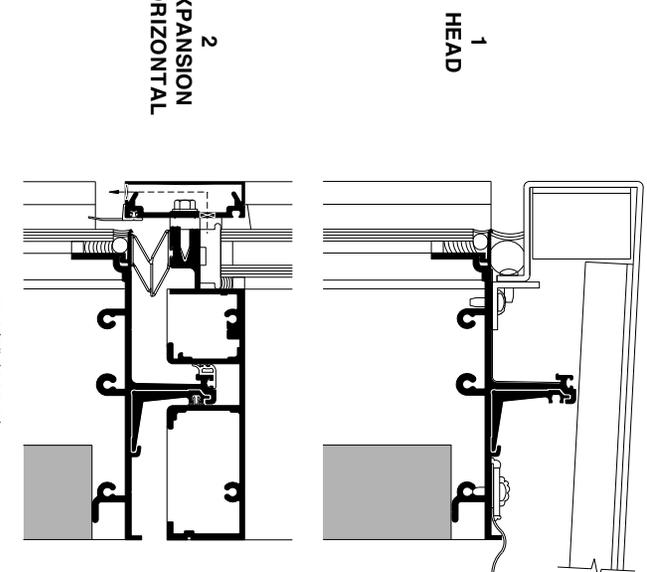
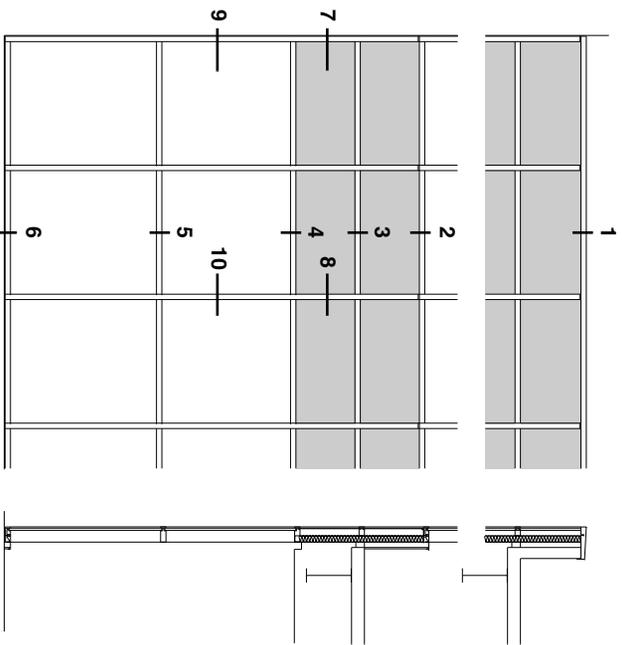
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VERTICAL SSG SYSTEM SHOWN

SCALE: 3" = 1'-0"



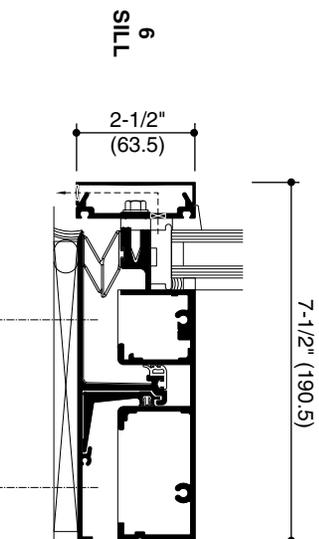
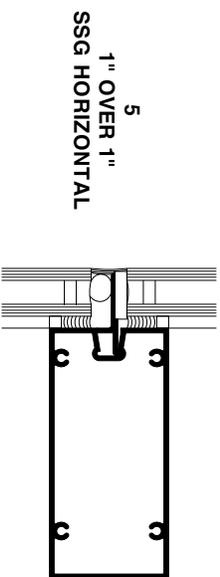
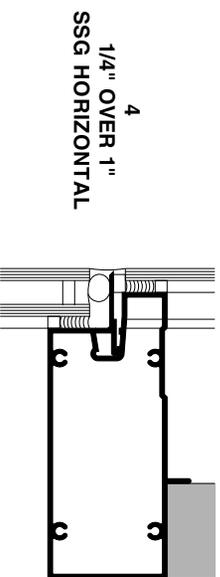
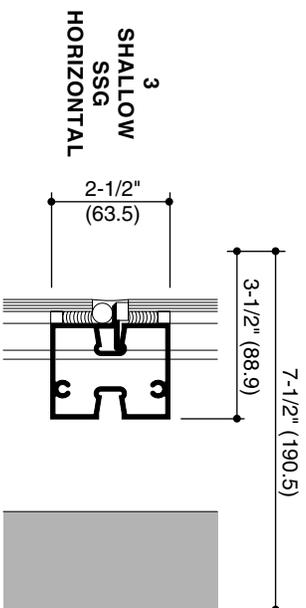
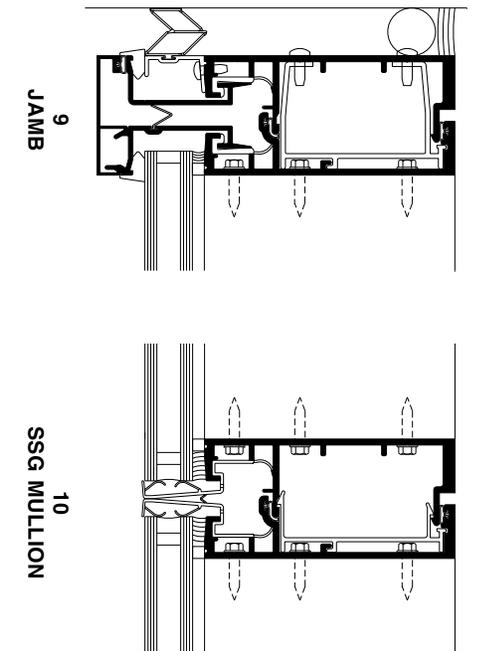
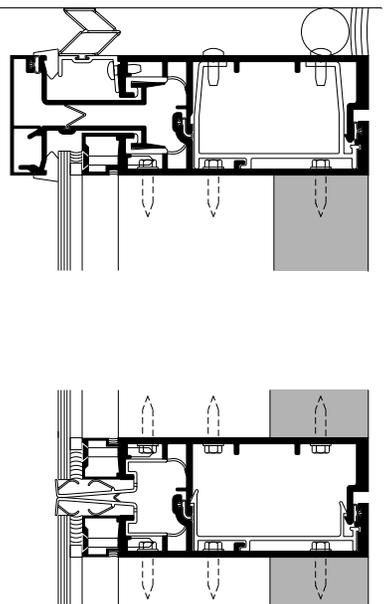
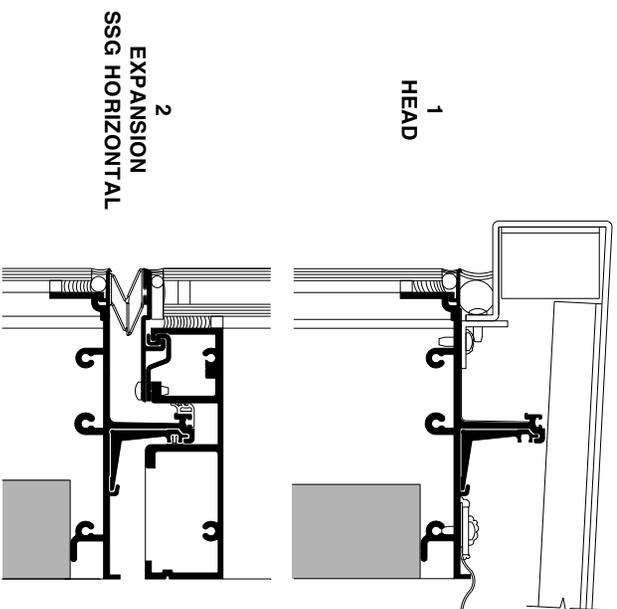
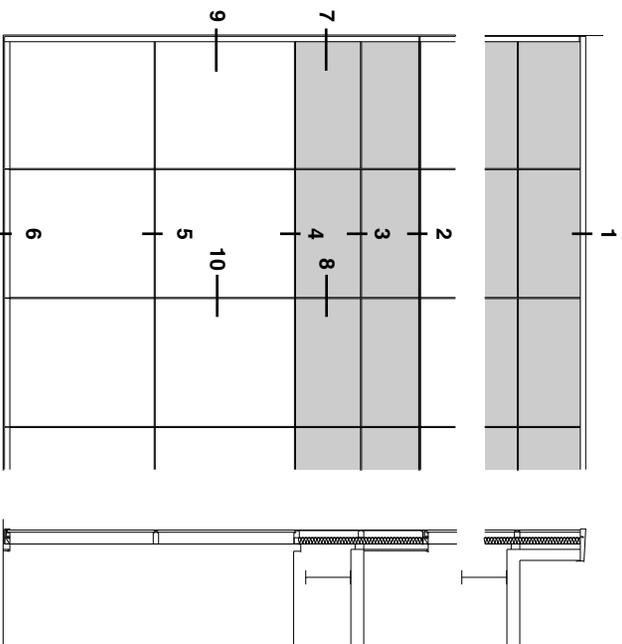
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TYPICAL DETAILS (4-SIDE SSG SYSTEM)

SCALE: 3" = 1'-0"

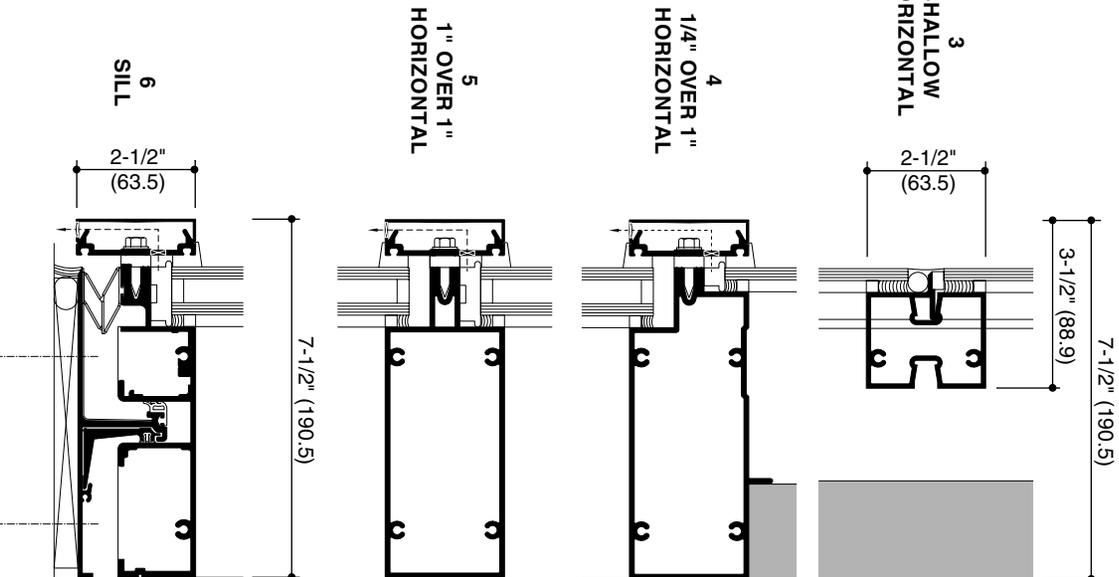
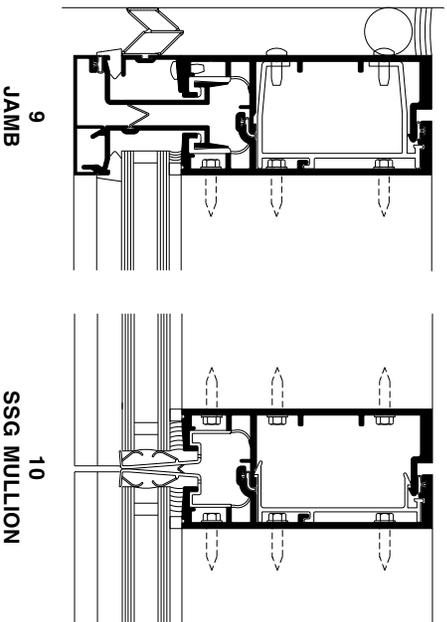
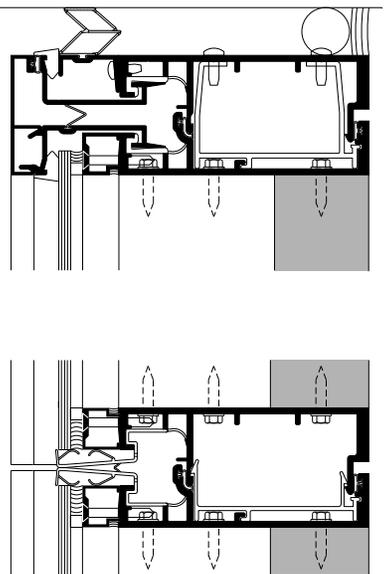
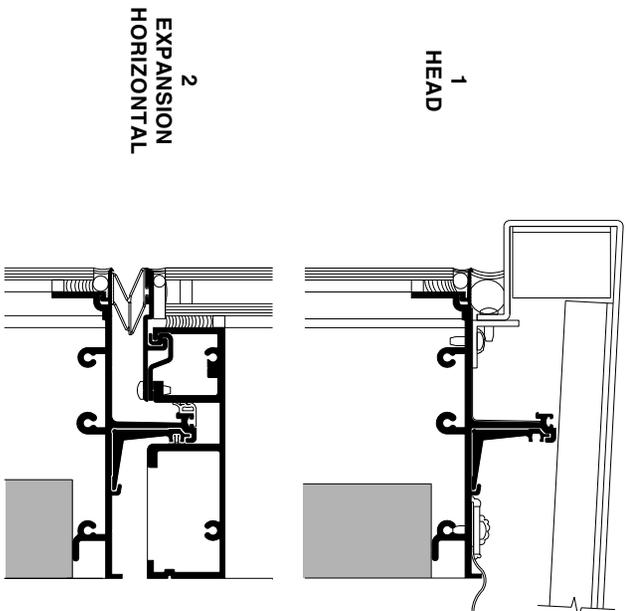
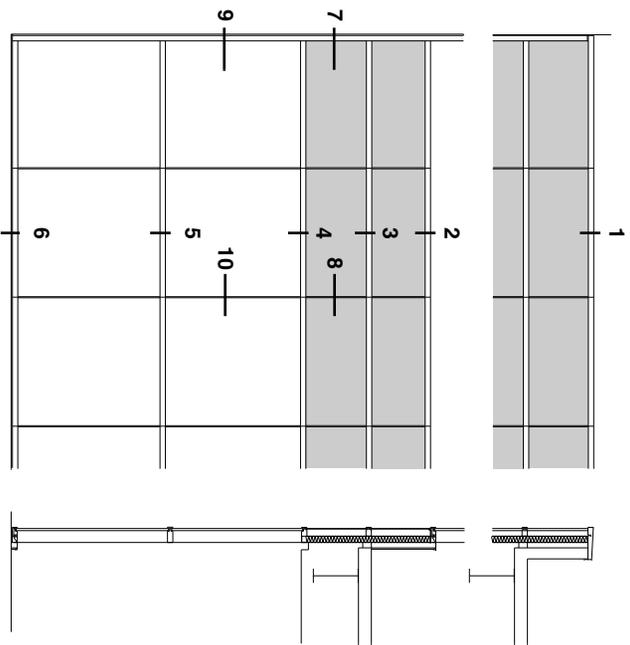


Laws and building and safety codes governing the design and use of glazed entrance, window, and curtain wall products vary widely. Kawneer does not control the selection of product configurations, operating hardware, or glazing materials, and assumes no responsibility therefor.

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SCALE: 3" = 1'-0"

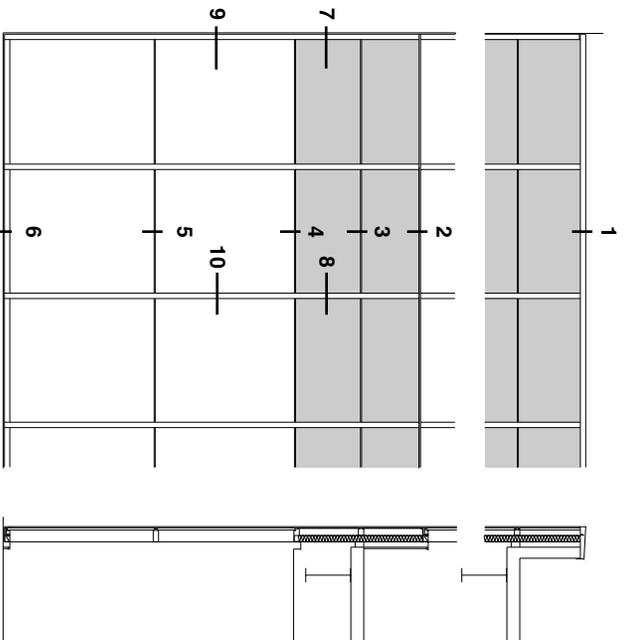


Kawneer reserves the right to change configuration without prior notice when deemed necessary for product improvement.

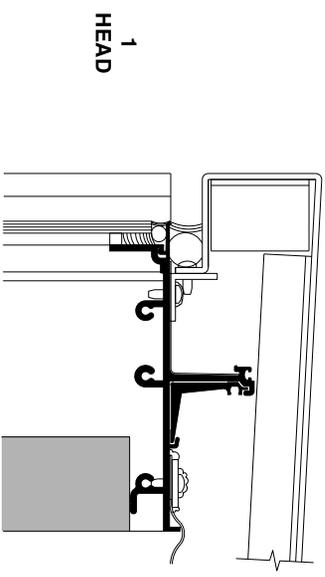
Laws and building and safety codes governing the design and use of glazed entrance, window, and curtain wall products vary widely. Kawneer does not control the selection of product configurations, operating hardware, or glazing materials, and assumes no responsibility therefor.

TYPICAL DETAILS (HORIZONTAL SSG SYSTEM)

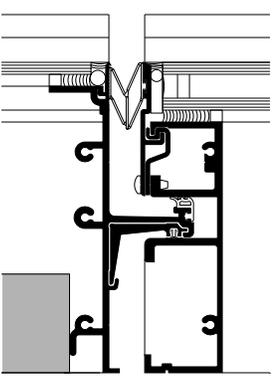
SCALE: 3" = 1'-0"



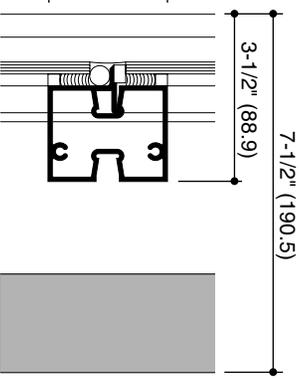
TYPICAL ELEVATION  
(HORIZONTAL SSG SYSTEM)



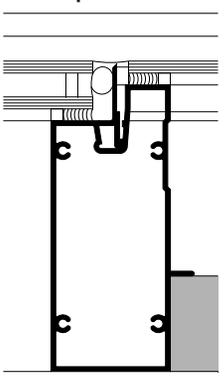
1  
HEAD  
2  
EXPANSION  
SSG HORIZONTAL



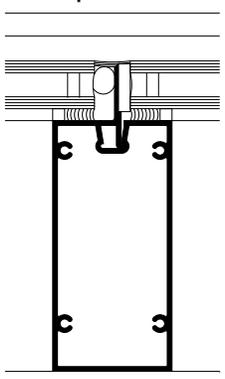
3  
SHALLOW  
SSG  
HORIZONTAL  
2-1/2" (63.5)



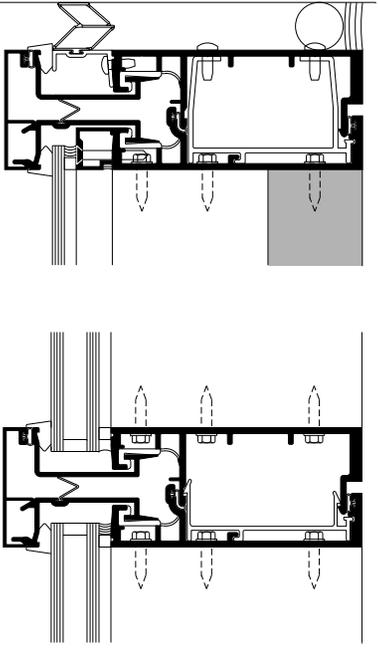
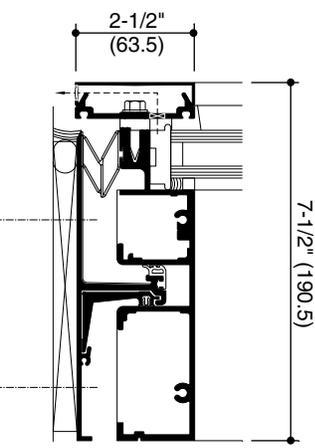
4  
1/4" OVER 1"  
SSG HORIZONTAL



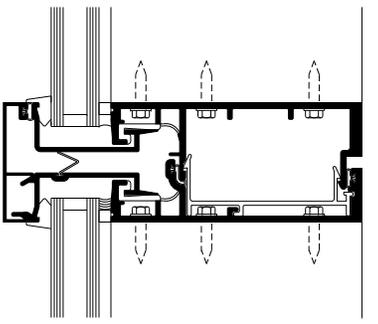
5  
1" OVER 1"  
SSG HORIZONTAL



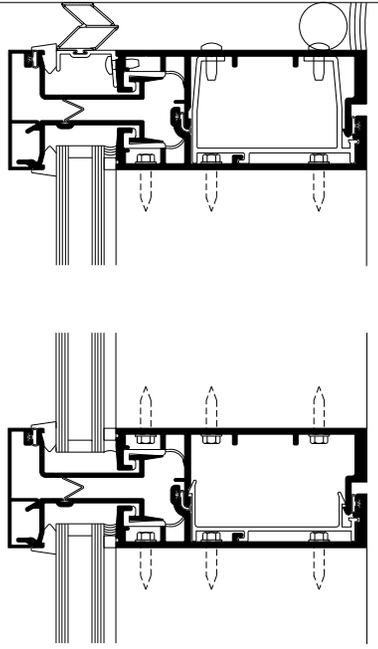
6  
SILL



7  
JAMB  
1/4" INFILL



8  
MULLION  
1/4" INFILL



9  
JAMB

10  
MULLION

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I-BEAM

CURTAIN

WALL

SYSTEMS

CW 400 600





left:  
**Crowne Centre II**  
 Cleveland, OH  
 Kaczmar Architects, Inc.  
 CW-600, CW-900  
 CW-250  
 Naturalite Skylight

below:  
**Corporate Crossing**  
 Dearborn, MI  
 Neumann Smith  
 & Associates  
 CW-600 with granite &  
 aluminum panel infill



Vistawall Architectural Products designs and manufacturers a complete line of innovative entrances, storefronts, window walls and curtain walls. By utilizing the latest in design technology, production equipment and a staff of highly skilled and experienced engineers, Vistawall is committed to providing the best designed and engineered products available. This commitment to having the best people and facilities, and to maintaining high levels of innovation, quality and service assures you of Vistawall's continued support as a leader in the architectural products industry.

### EXPERIENCE THAT COUNTS

In 1965 Vistawall introduced the curtain wall concept called "Pressure Wall." Today, this system is used as the curtain wall basis by almost every major curtain wall manufacturer. But since 1965, Vistawall has expanded the capabilities and flexibilities of this system to meet the architects' design challenges and open the way for tomorrow's innovative designs. As times changed, so did the architects' designs. Low-profile exterior members were chosen to complement reflective glass and create the "glass wall." Thus, CW-400 curtain wall was born. The third generation, called CW-600, followed by offering low-profile horizontal and vertical butt glazing for horizontal "banding" of materials, in both the vision and spandrel areas. Our later generation of curtain wall systems, CW-900 and an adaptation of CW-600, offered another first; curtain walls that readily accept stone in-fills. Please see our Stone Wall brochure for information on these systems.

### DESIGNED TO PERFORM

Vistawall curtain wall systems are designed to meet the most exacting, high-performance specifications. As economical "stick walls," they easily accommodate twin-span applications and most scaffold stabilizing devices. Interior components are thermally isolated from exterior conditions by acetal resin and PVC isolators.

### CW-400

Closed-cell exterior gaskets with custom-fabricated molded corners and dense interior glazing wedges ensure controlled positive compression of the exterior gaskets around the glass. Performance is further guaranteed by an interlocking "lap-joint" of the vertical and



left:  
**Millenium I**  
 Dallas TX  
 HKS Architects  
 CW-600 with glass  
 and granite

cover:  
**Delphi Automotive**  
 Troy, MI  
 Kessler Associates, Inc.  
 CW-600 with  
 Aluminum Panels

horizontal. The horizontals are then bolted in place, compressing the factory-applied weathering tape and ensuring air and water resistance over the life of the building. All weepage at the horizontals is hidden and baffled. CW-400 systems easily accommodate the needs for continuous washer tracks.

**CW-600**

Continuous horizontals, bolted directly to the structural mullion, along with the silicone vertical joint provide positive air and water resistance on the CW-600 system. To promote positive adhesion of the structural silicone to the system, the vertical glass retainer is given an aladine finish and shipped separately to the job site, thus avoiding possible contamination during the erection of the wall. For interior appearance, CW-600 can provide mullion widths as minimal as 2½". At the exterior, a multitude of horizontal widths and styles are available.

**LABOR-SAVING INSTALLATIONS**

Because a system meets high-performance demands, doesn't mean it has to be difficult to install. Vistawall curtain wall systems are designed for most erection and glazing processes to be performed from the interior of the building, thus saving time and reducing labor costs.

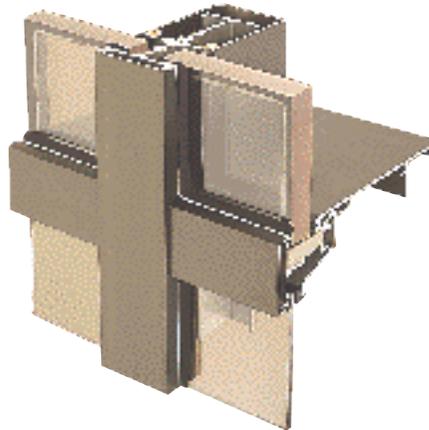
**CUSTOM ENGINEERING**

Vistawall feels that no two jobs are the same. That's why all jobs are thoroughly engineered to determine the components necessary for your specific project criteria. During engineering, Vistawall may draw on its vast library of components with varied face depths and widths, mullion depths, perimeter trims, interior trims, etc. Or, special components may be created.

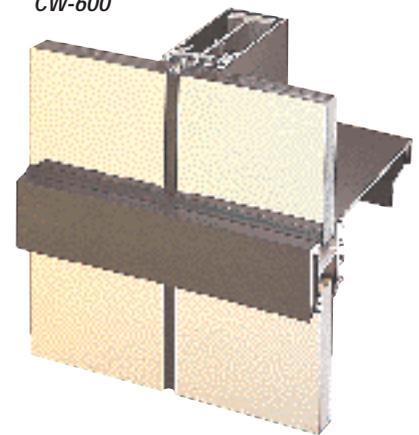
**FINISH OPTIONS**

Vistawall specializes in the application of high-performance fluorocarbon coatings. You can choose from our standard paint colors, or any other color and finish, thus enabling an infinite choice of colors. By finishing interior and exterior trims such as face caps, mullion covers, stool trims and ceiling trims with different colors, the design possibilities are limitless. Vistawall also offers clear, bronze and black anodized finishes.

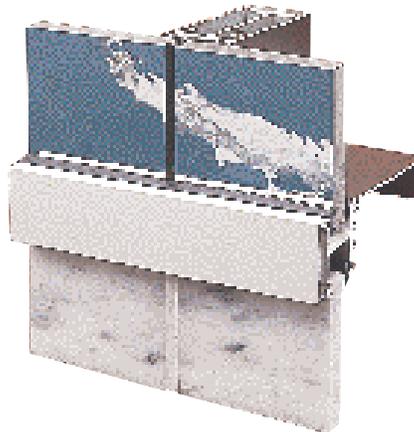
*CW-400*



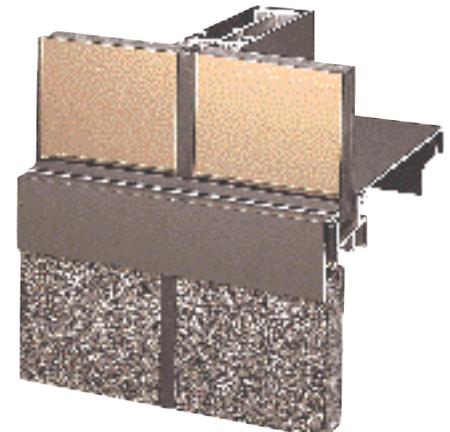
*CW-600*



*CW-600 with marble*



*CW-900 with granite*





From extrusion to fabrication, Vistawall provides you with complete in-house quality control, no matter which finish is specified.

**THE VISTAWALL GROUP**

Through a series of strategic acquisitions, Vistawall Architectural Products has brought together the product and manufacturing expertise of many under one name. Now when you think of Vistawall also think about Moduline Window Systems, Naturalite Skylight Systems and Skywall Translucent Systems – The Vistawall Group. Your single source supplier.

Vistawall has over 40 years of experience designing high performance glazing systems. We are committed to providing the highest quality products and the most appropriate standard or custom solutions at competitive lead times and prices.

Vistawall offers complete production capabilities including extrusion, anodizing, paint, fabrication and engineering.

Vistawall, Naturalite and Skywall are registered trademarks of BlueScope Steel

*Lear Corporation*  
Southfield, MI  
Giffels Associates, Inc.  
CW-400 and CW-600



**VISTAWALL HEADQUARTERS AND CENTRAL OPERATIONS**

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Fax: (972) 551-6264

[design\\_support@vistawall.com](mailto:design_support@vistawall.com)



**VISTAWALL**<sup>®</sup>  
ARCHITECTURAL PRODUCTS

ENGINEERED TO LAST™

[www.vistawall.com](http://www.vistawall.com)

THE VISTAWALL GROUP  
A BLUESCOPE STEEL COMPANY

Modular Curtainwall System Estimate										
	% of Cost	Qty	Unit	Mtl	Qty	Unit	Prevailing Wage Rate	Crews	Equip	Total
Aluminum Frame	5.4%	4754.2	LF	\$2.00	80	HR	\$35.00	4	/	\$20,708.40
Factory Labor	3.6%	/	/	/	80	HR	\$20.00	4	/	\$6,400.00
Viracon Low E Solarscreen Clear Glass	31.5%	3750	SF	\$12.00	80	HR	\$35.00	4	/	\$56,200.00
Viracon Low E Solarscreen Spandrel Glass	19.2%	1353	SF	\$17.00	80	HR	\$35.00	4	/	\$34,201.00
Viracon Low E Solarscreen Fritted Glass	24.1%	1674	SF	\$19.00	80	HR	\$35.00	4	/	\$43,006.00
<b>Crane Rental</b>	<b>5.6%</b>	/	/	/	<b>10</b>	<b>DAY</b>	/	/	<b>\$1,000.00</b>	<b>\$10,000.00</b>
Thermal/Moisture Protection Testing	4.2%	75	Tests	\$100.00	24	HR	/	1	/	\$7,500.00
<b>Total Cost</b>										<b>\$178,155.40</b>

Stick Built Curtainwall System Estimate										
	% of Cost	Qty	Unit	Mtl	Qty	Unit	Labor Rate	Crews	Equip	Total
Aluminum Frame	21.1%	4754.2	LF	\$2.00	384	HR	\$25.00	4	/	\$47,908.40
Viracon Low E Solarscreen Clear Glass	36.7%	3750	SF	\$12.00	384	HR	\$25.00	4	/	\$83,400.00
Viracon Low E Solarscreen Spandrel Glass	27.0%	1353	SF	\$17.00	384	HR	\$25.00	4	/	\$61,401.00
Viracon Low E Solarscreen Fritted Glass	30.9%	1674	SF	\$19.00	384	HR	\$25.00	4	/	\$70,206.00
<b>Material Lift Rental (2)</b>	<b>2.1%</b>	/	/	/	<b>3</b>	<b>MTH</b>	/	0	<b>\$800.00</b>	<b>\$4,800.00</b>
Thermal/Moisture Protection Testing	3.3%	75	Tests	\$100.00	/	/	/	1	/	\$7,500.00
<b>Total Cost</b>										<b>\$227,307.00</b>