

# CARDINAL WUERL NORTH CATHOLIC HIGH SCHOOL

Cranberry Township, PA

SIZE | 177,129 SF

DELIVERY METHOD | Design-Bid-Build, Multiple Prime

ARCHITECT | Astorino

PROJECT COST | \$72.5 million

SCHEDULE | June 2012 – June 2014

CM AGENCY | Campayno Consulting Services

CONTRACT TYPE | GMP

OWNER | Catholic Diocese of Pittsburgh

GENERAL CONTRACTOR | Mascaro Construction

## Analysis #1: Prefabricated Masonry Panels

Opportunity to reduce schedule – original exterior construction on critical path for 62 days!  
 • Schedule reduction = 6 months → 5 WEEKS

Site Congestion can be alleviated

Quality Control, Lightweight, Energy Efficient

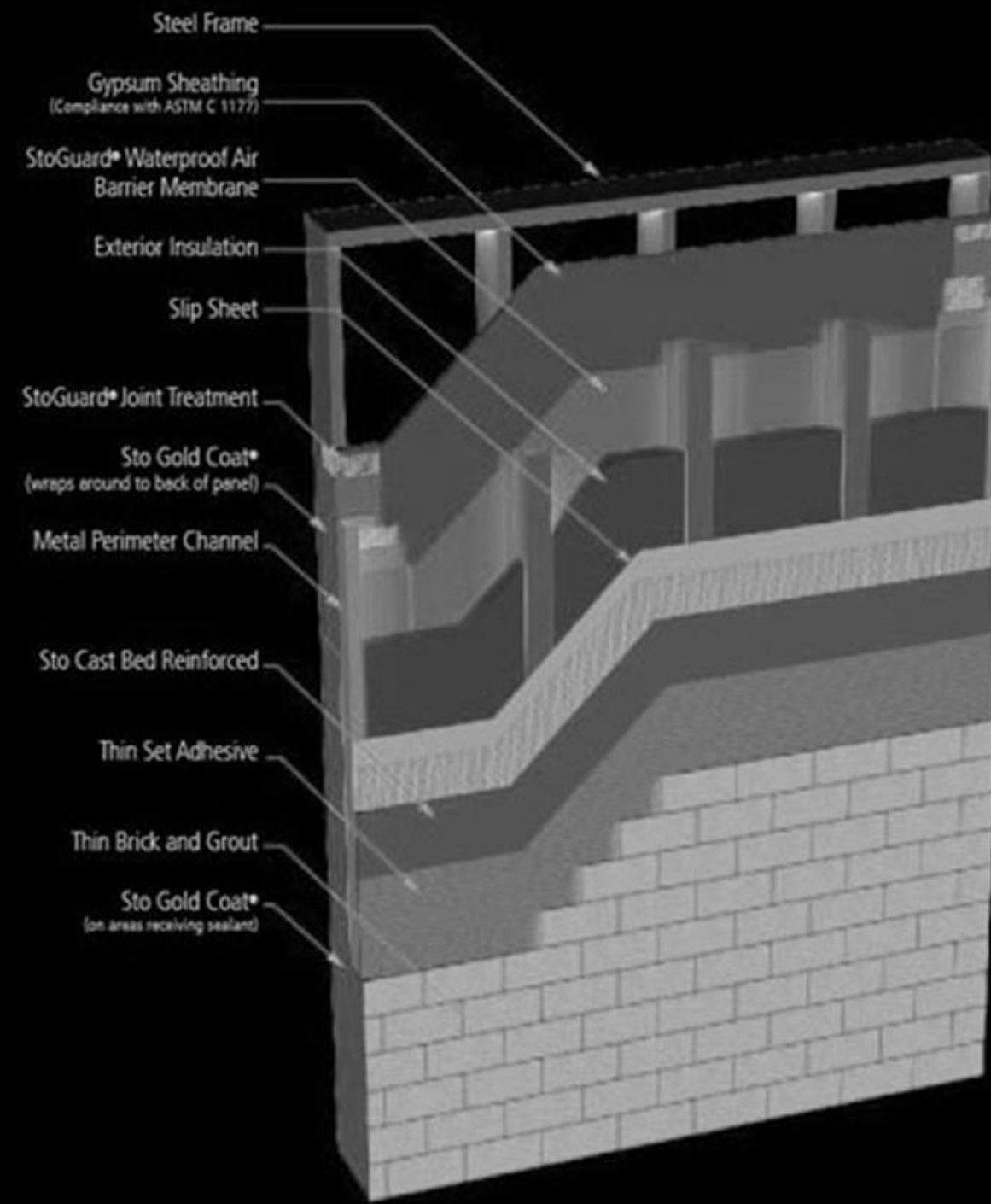
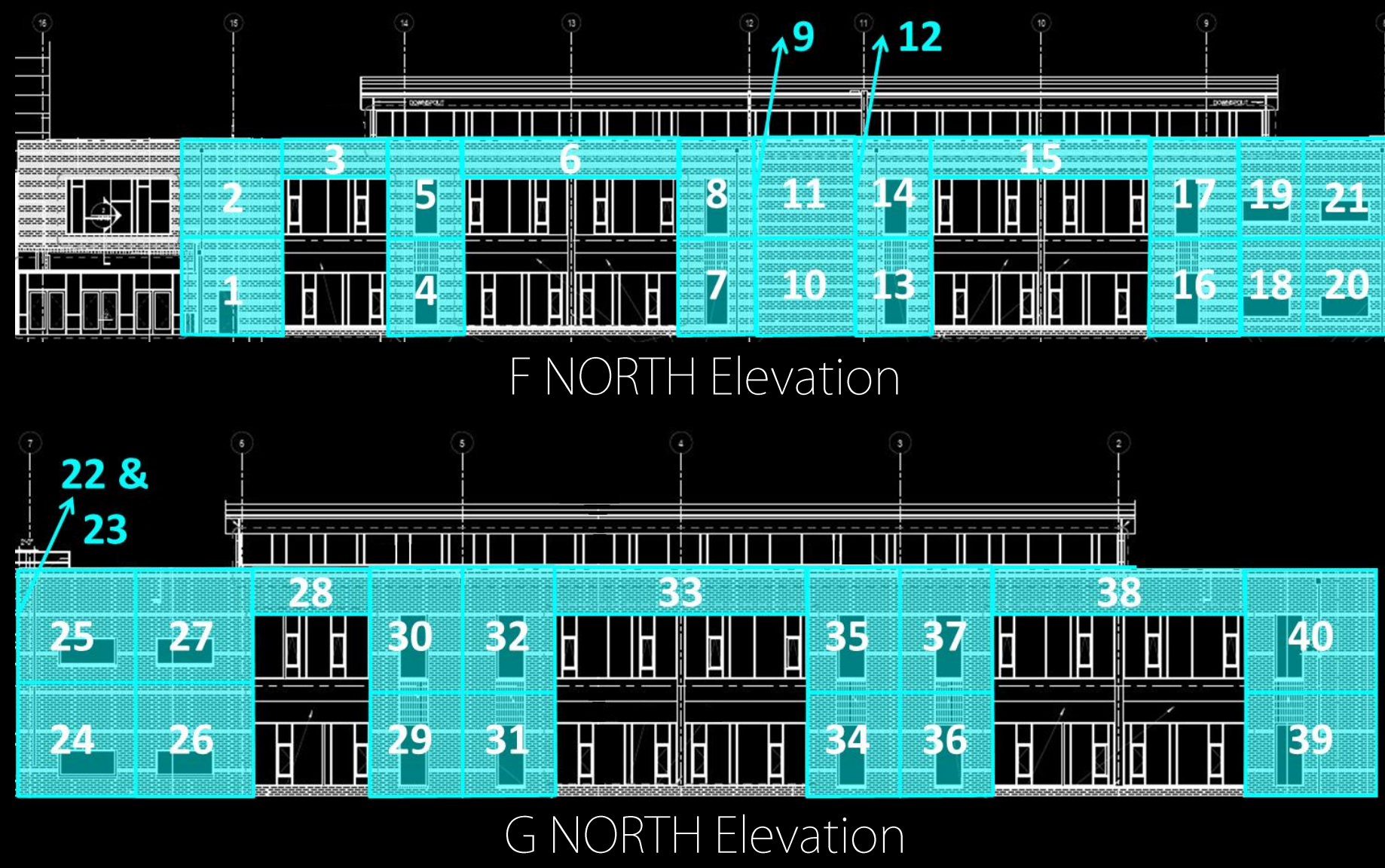
Mechanical – Match R-Value ✓

Architectural – Waterproofing & Air Barrier ✓

• Breadth #1 Topic

Structural – Brick Veneer to Curtain Wall ✓

• Breadth #2 Topic



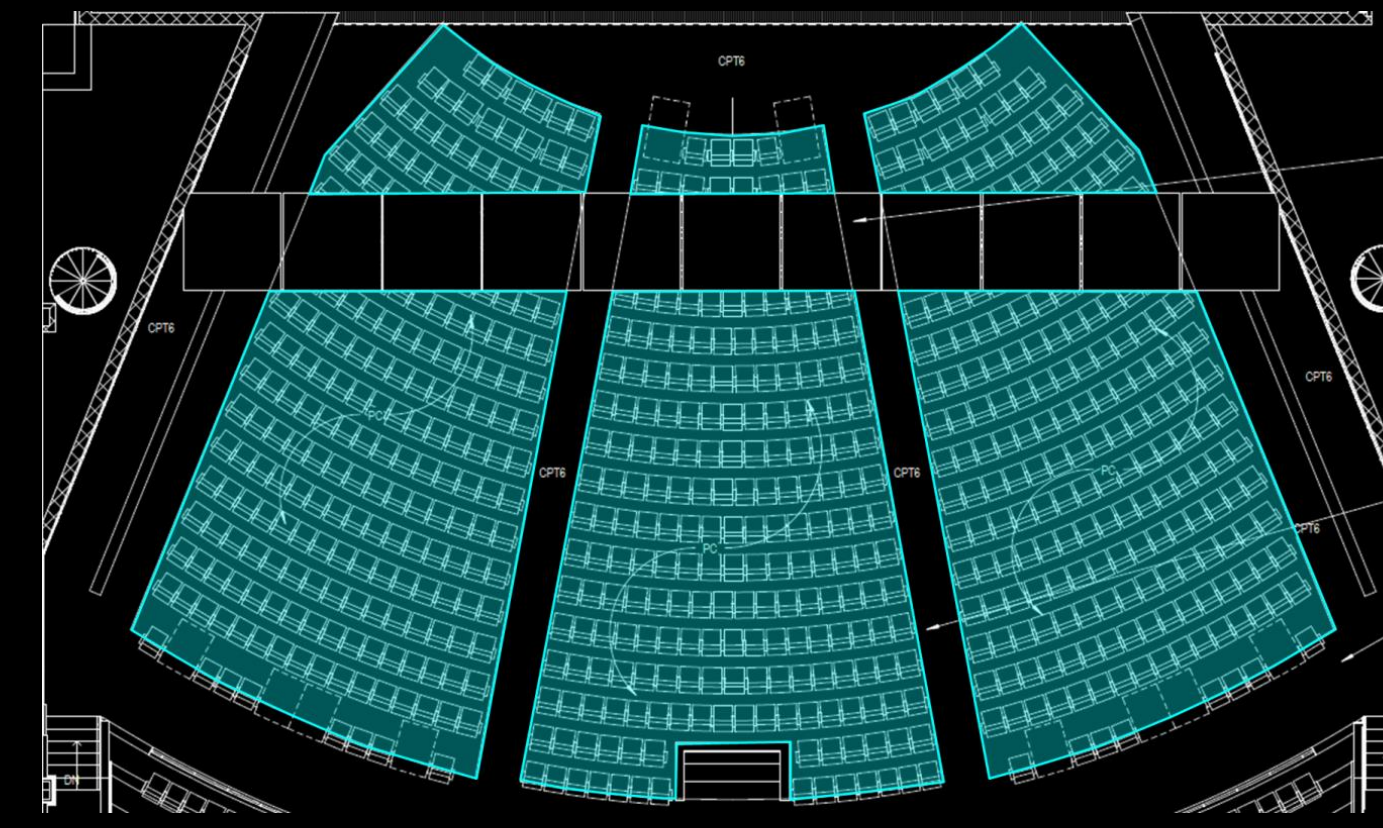
PREFABRICATED EXTERIOR MASONRY PANELS ESTIMATE	
Stick-Built Construction Costs	\$ 1,516,000.00
Cost/SF of Prefabricated Panels	\$ 62.00
Gross Square Feet of Panel Area	44,657
Estimated Cost of Prefabrication	\$ 2,768,734.00
Current Facade Critical Path Duration (days)	62
Prefabrication Critical Path Duration (days)	2
Critical Path Reduction (days)	60
General Conditions Cost/Day	\$ 6,835.00
General Conditions Savings	\$ 410,100.00
<b>Structural Redesign Costs</b>	
Footing Redesign Difference	\$ 28,340.14
Column Redesign Difference	\$ -
<b>TOTAL COST OF PREFABRICATED PANELS</b>	<b>\$ 2,330,293.86</b>
<b>STICK BUILT vs. PREFAB COST DIFFERENCE</b>	<b>\$ (814,293.86)</b>

\$815,000 loss associated with this, despite GC & structural savings compared to original method

Regardless of all tangible benefits, overall costs are the bottom line.

DO NOT use prefabricated masonry panels at CWNCHS.. Schedule not critical to reduce.

## Analysis #2: Lifetime Analysis – VE Finishes



Diocese will own & operate the facility post-construction

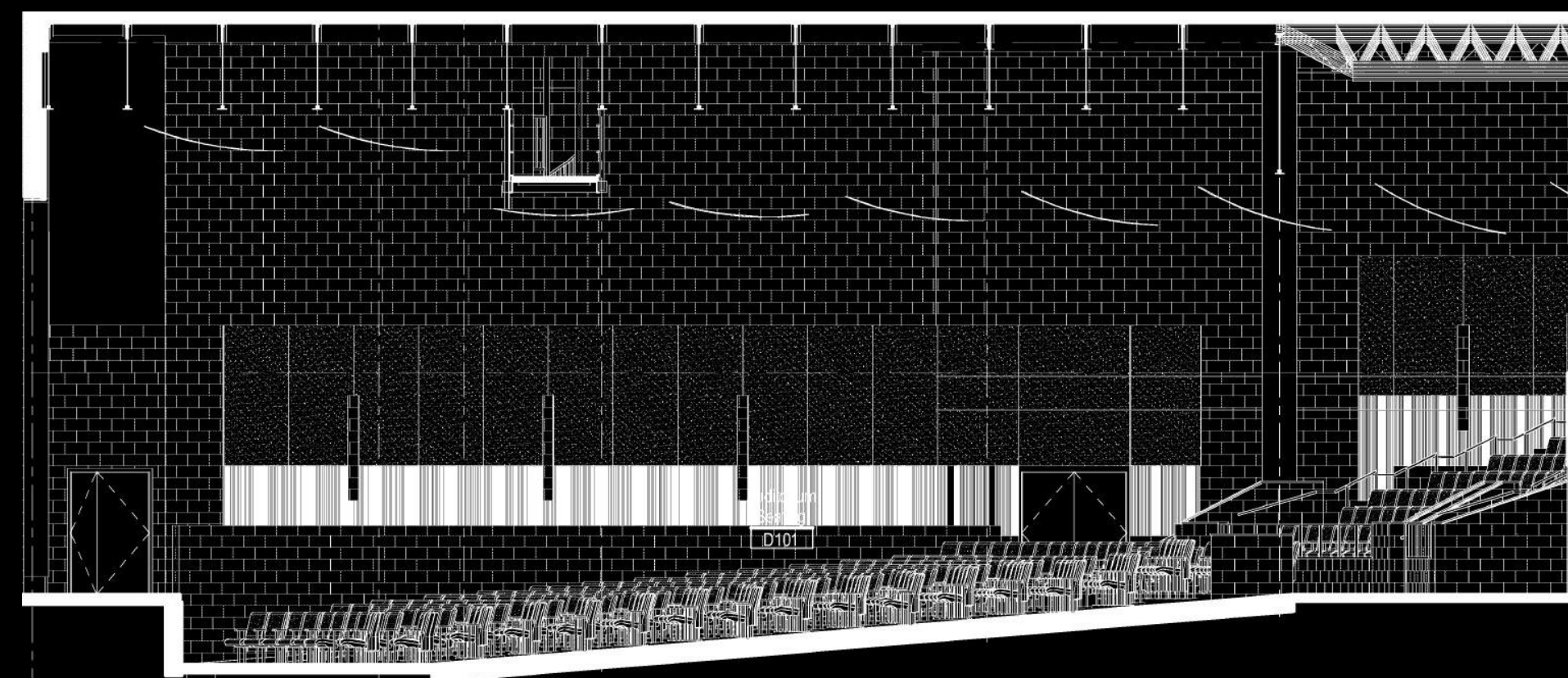
Initial savings may be misleading & ineffective form of analysis

Present Value Life-Cycle Cost (LCC) analysis is more realistic

Large cost savings reported in Division 9: Finishes

- Total VE = \$2,740,000
- Reported from Finishes; = \$540,000
- LCC Analysis = \$328,275

$$P = F \left( \frac{1}{(1+i)^n} \right)$$



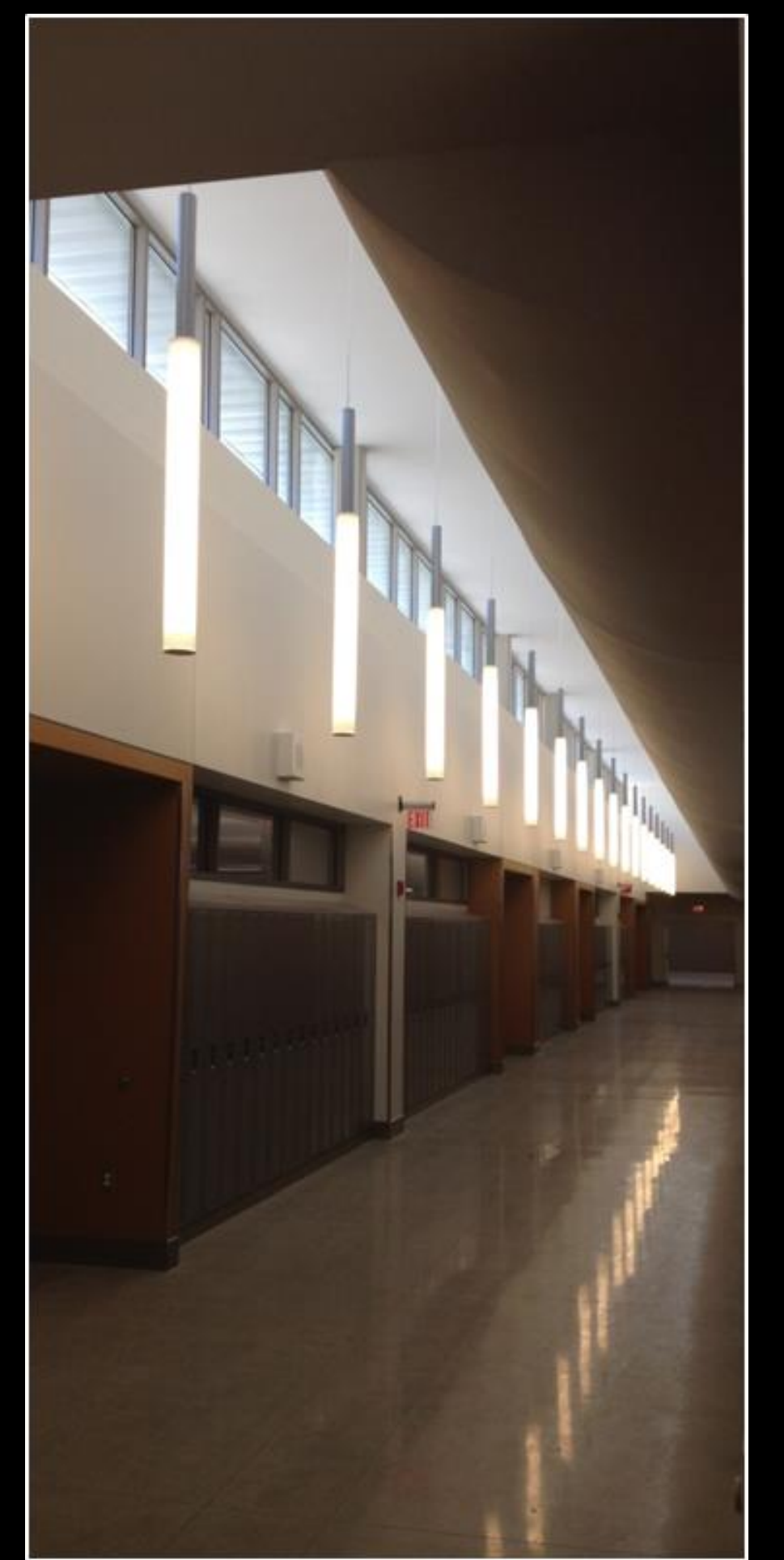
Materials	Original VE	Present Value LCC
Ceramic Tile vs. Paint	\$ 152,275.00	\$ 40,523.21
VCT vs. Carpet	\$ 16,000.00	\$ 15,968.62
School Zone vs. Ultima	\$ 34,000.00	\$ (19,758.83)
Curved Drywall vs. Linear Wood	\$ 54,000.00	\$ 57,695.50
Polished Concrete vs. Linoleum	\$ 72,000.00	\$ 39,479.61
<b>TOTAL COST REDUCTION</b>	<b>\$ 328,275.00</b>	<b>\$ 133,908.11</b>
<b>% Difference</b>		<b>59%</b>

Use PV LCC with finishes when owner operates building post-construction

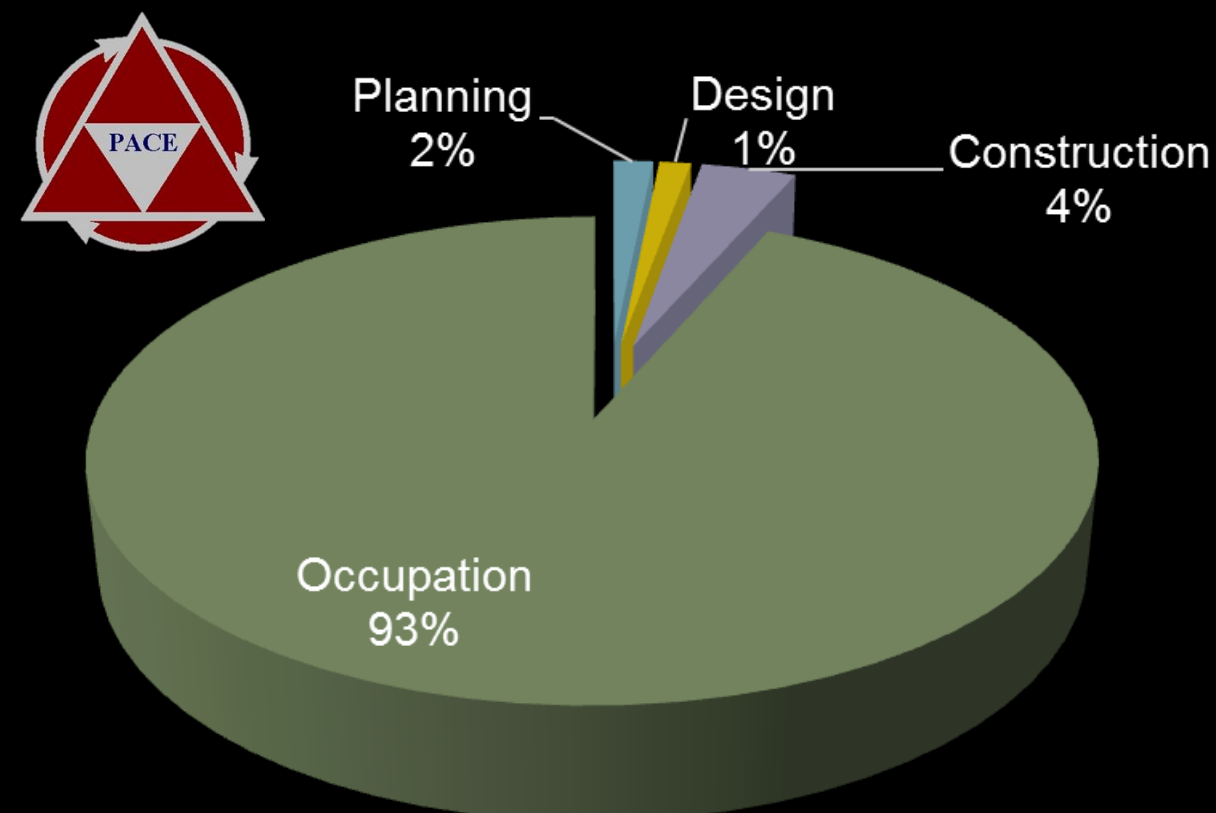
- Obtain accurate information from manufacturers for:
  - Repairs
  - Cleaning
  - Refinishing

Use Carpet in place of VCT to save \$54,000 in present value

Analysis was not used to disprove all VE; only to provide more realistic data



## Analysis #3: Efficient FM Information Turnover



Presented at PACE Conference – November 2013

CWNCHS BIM Focus = Record Modeling

Avoid "paper dump" – EFFICIENCY!

Interviews conducted for industry consensus

Make process more user friendly for FM

What is the best way to go about this?

Hire early and train before turnover

- Understand costs are incurred; minimal compared to BIM & CMMS
- Minimal Costs with huge payoff

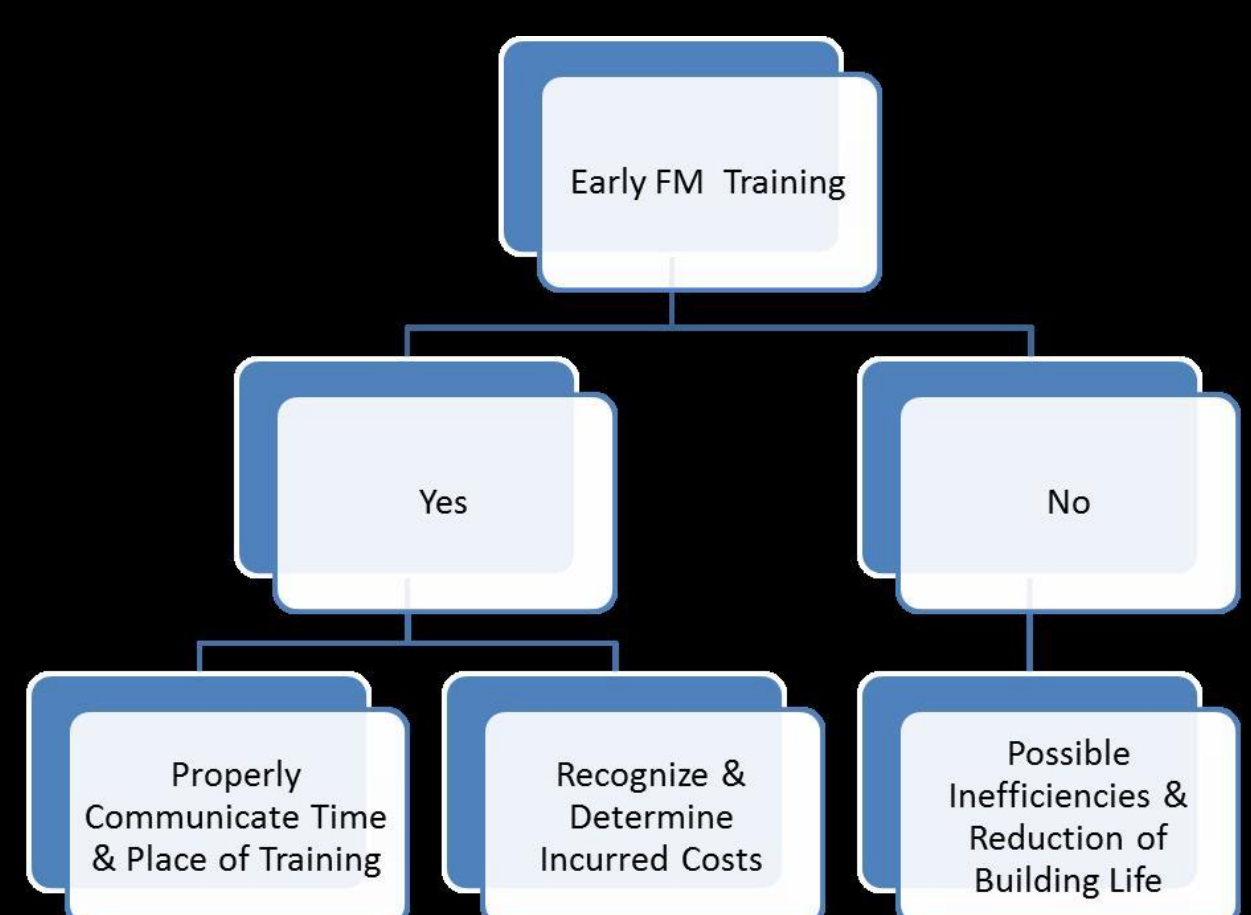
FM must be willing to learn/accept new technology

- Can be determined during hiring process

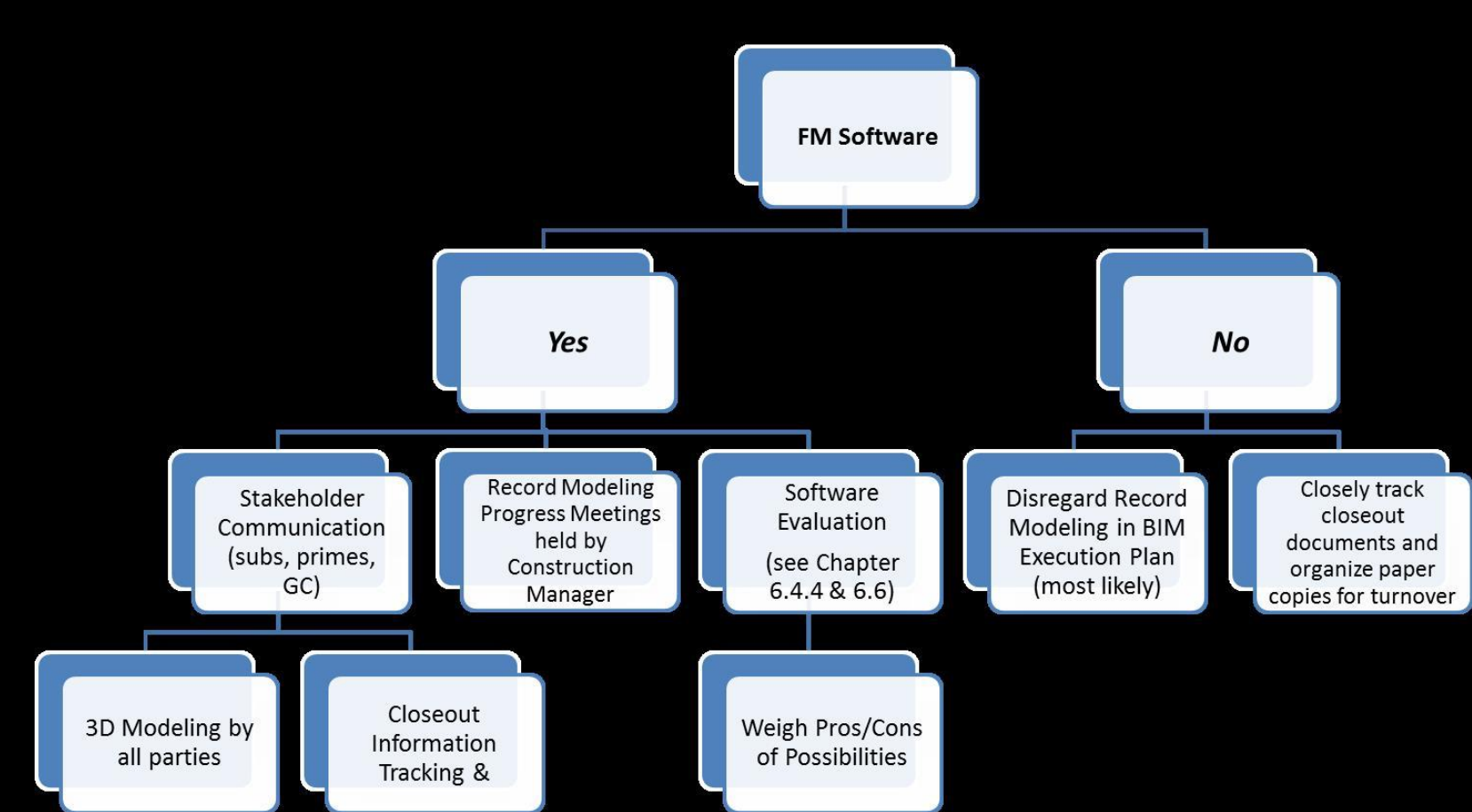
Determine BIM/CMMS aspirations and FM training procedures ASAP using decision tree below

Amount of early training may be dependent upon building systems complexity

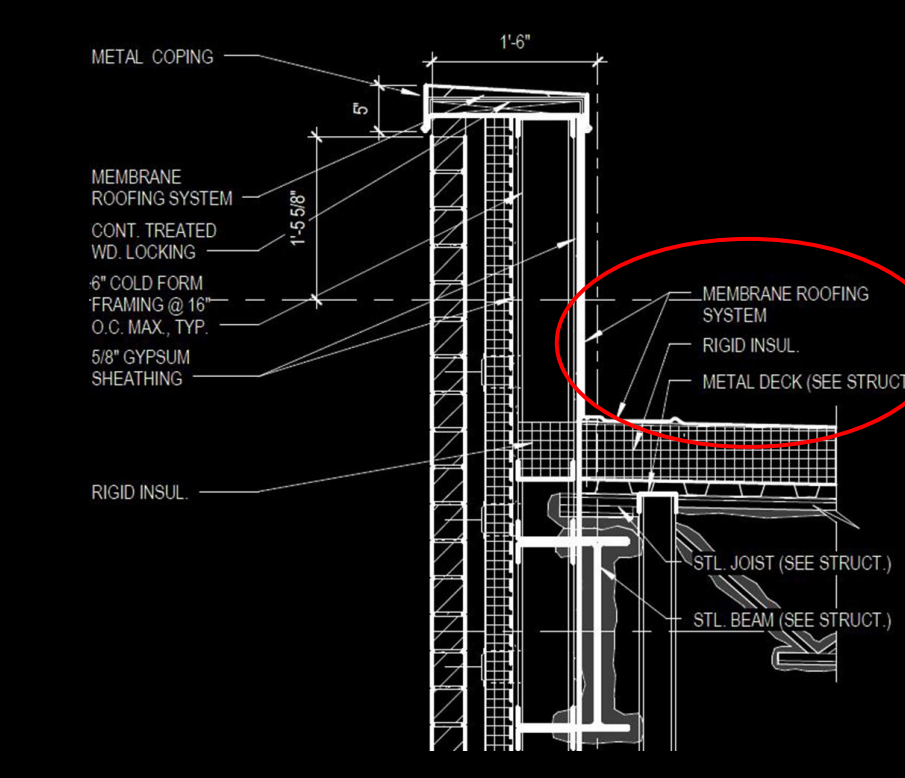
### Owner Guide: Early FM Training



### Owner Guide: BIM/CMMS Software



## Analysis #4: Alternative Roofing System Analysis



TPO scheduled to be installed beginning in February 2013

TPO adhesive not able to be applied <25° F

Re-sequencing after delayed building pad turnover + cold-weather presented problems:

- \$15,000 in overtime pay
- Quality risks
- Phoenix Roofing required to increase manpower

Could have been avoided with different system recommendation

Use Duro-Last PVC Roofing System

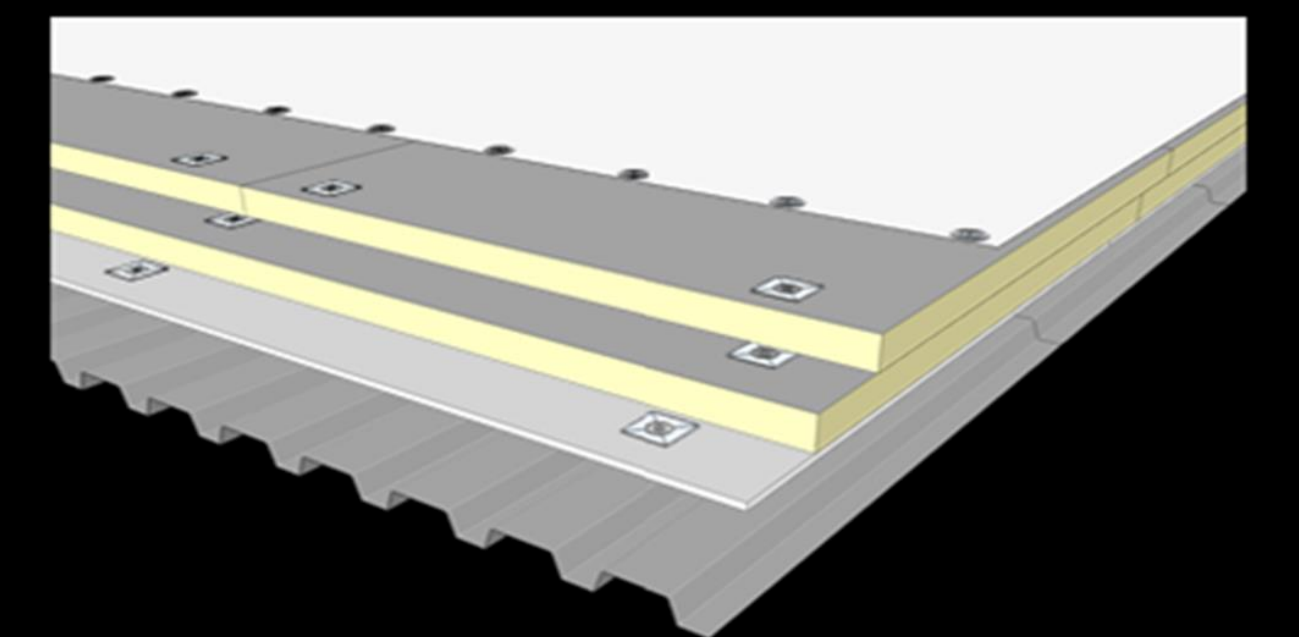
- 60-mil to increase to 25-yr warranty
- 75% Prefabrication in warehouse

Mechanically-attached at perimeter

- Cold-weather installation is not a problem

Less seams → better quality system

No structural concern → lighter or equal weight



General Conditions Savings from Critical Path Reduction	
<b>Days TPO on Critical Path</b>	
Gymnasium	11 days
Cafeteria	10 days
Area F	13 days
Total TPO Critical Path Time	40 days
Prefabrication of PVC Reduction	(40 days)*(0.75) = 30 days
On-Site PVC Install Duration	10 days
<b>GC Cost Savings</b>	
Total GC Costs	\$2,871,341
Daily GC Costs (21 months)	\$6,835/day
<b>Total Savings</b>	<b>\$205,050</b>

Time saved from prefabrication; maximum of 30 days

Constructability/quality improved

GC → \$15,000 saved (no OT)

Owner → \$199,555.51 saved (60-mil)

PVC Analysis	
Pros	Cons
<ul style="list-style-type: none"> <li>• Strength</li> <li>• Durability</li> <li>• Weather Resistance</li> <li>• Prefabrication</li> <li>• LEED Credit</li> <li>• Cost Competitive</li> <li>• Workmanship</li> </ul>	<ul style="list-style-type: none"> <li>• Mechanically fastened</li> <li>• Somewhat higher initial investment</li> <li>• Risk – GC payback may not be as high as estimated</li> </ul>
TPO Analysis	
Pros	Cons
<ul style="list-style-type: none"> <li>• Cheap</li> <li>• White Surface</li> <li>• Fully-Adhered</li> <li>• LEED Credit</li> </ul>	<ul style="list-style-type: none"> <li>• Can't install in cold weather</li> <li>• Not very durable</li> <li>• No prefabrication</li> <li>• Poor workmanship &amp; quality of installation during winter weather</li> </ul>



Alec Hanley

Construction Management

Advisor – Ray Sowers