Value Engineering Masonry
ARCHETYPES AND CONCEPTS TO OPTIMIZE SAVINGS THROUGH MASONRY

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For the Michigan Structural Masonry Coalition

Michigan Masonry Coalition 2018

Accessory Suppliers
Stone & Block Suppliers

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LE CET
Laborer-Contractor Partnerships
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INTERNATIONAL
INSTITUTE

MCE
Michigan Council of Employers of Bricklayers and Allied Craftworkers

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Objectives / Outline

To gain insight into overall building types suited for masonry as structure

To have been exposed to aspects of macro design that provide cost savings

To understand micro-design options that provide cost savings

Masonry Archetypes

A quick overview of where masonry leads the way
Masonry Best Fit Archetypes

Places where people sleep
Primary education facilities
Secure/hardened facilities
Places you don’t want to burn...

Places Where People Sleep

Apartments
Hotels
Residence Halls
Senior Living Facilities
Correctional Facilities
Places Where People Sleep

Residence Halls

Hillcrest Hall - OU

Figure Credits: International Masonry Institute / Oakland University
Primary Education Facilities

K-12 Classroom Wings
Performance Areas
Competition Areas

Figure Credits: Penhale & Yates

Secure and Hardened Facilities

Correctional Facilities
Tornado Shelter Facilities
Blast Protection

Figure Credit: JDH Engineering

Shelter walls designed for both missile impact and shelter wind loads (grey)
Interior walls – partitions or structural. No requirement for missile impact resistance (beige)
Shelter rated windows or shelter rated shutters
Shelter rated doors end of corridor
Typical interior doors (all classrooms)

Figure Credit: International Masonry Institute
Macro-Design Concepts

A LOOK AT TWO KEY OVERALL BUILDING CONCEPTS TO CONSIDER FOR OPTIMIZING COST WITH MASONRY

Macro-Design Concepts

Steel frames are not required
Align Walls where possible
Eliminate Steel Framing

Redundant structural cost
Takes up floor space / requires supplemental finishing
May add fire-protection costs
Takes longer to get to building enclosure
Schedule savings when coordinated properly

Eliminate Steel Framing

Redundant structural cost

Masonry can carry the load:
- Beam bearing: 8” x 8” at $f'_m = 2,000$ psi: 47,250# (ASD)
- Beam bearing: 8” x 8” at $f'_m = 2,500$ psi: 59,400# (ASD)
- (plate edge 1” in from face of 12” CMU)

Masonry can carry the load:
- 23’-4” tall, hollow, 8” CMU with $f'_m = 2,500$ psi can carry 9,450 plf
## Eliminate Steel Framing

### Redundant structural cost

<table>
<thead>
<tr>
<th></th>
<th>Steel Frame/Stud 2” Rigid Insul.</th>
<th>CMU – 2” Rigid Insul.</th>
<th>CMU – 3” Spray Foam</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Cost</strong></td>
<td>$30,784</td>
<td>$24,537</td>
<td>$22,406</td>
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<tr>
<td><strong>Present Worth</strong></td>
<td>$35,798</td>
<td>$28,256</td>
<td>$25,119</td>
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<td><strong>Present Worth (/SF)</strong></td>
<td>$45.52</td>
<td>$35.93</td>
<td>$31.94</td>
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</tbody>
</table>
Eliminate Steel Framing

Takes up floor space / requires supplemental finishing

Align and Employ Multiple Walls

Optimizes load paths
Minimizes gravity load
Minimizes shear load
Provides nice resiliency
Align and Employ Multiple Walls

Figure Credit: Fusco, Shaffer & Pappas, Inc.
Align and Employ Multiple Walls

Micro-Design Concepts

A LOOK AT A COUPLE WAYS TO OPTIMIZE MASONRY BENEFITS WITHIN A MASONRY BUILDING

Figure Credits: Fusco, Shaffer & Pappas, Inc.
Micro-Design Concepts

Use masonry lintels

Bear beams and girders on masonry

Use masonry modules
  ◦ Horizontally
  ◦ Vertically

Don’t under-specify $f'_m$

Use Masonry Lintels

Steel lintels can add 6-8 weeks... to as much as 12 weeks delay

Differential movement eliminated

Detailing dramatically better (flashing and steel infill)

Thermal bridging reduced

Control joints better placed for better wall structural performance
Use Masonry Lintels

Detailing dramatically better (flashing and steel infill)

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Control joints better placed for better wall structural performance

Micro-Design Concepts

Use masonry modules
- Horizontally
- Vertically
Micro-Design Concepts

Use masonry modules
- Horizontally
- Vertically

Conclusions

Many building types are well served by masonry as structure and envelope

Masonry as structure and envelope can bring many benefits when well considered

Smaller details can affect schedule and cost efficiency of masonry buildings
Questions and Discussion....

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