Gentlemen,

Per your request, HEI has evaluated the energy cost savings of the "SmartWall" concrete masonry wall system in comparison with a Heavy Weight concrete masonry wall and an Insulated Concrete Sandwich Panel wall system. The same 200,000 square foot "big box" retail type building was used as the basis of design. The building is rectangular with approximately 45,000 square foot of exterior wall surface area and is of typical current construction. The Trace 700 program was utilized to determine the heat loss/gain of the building located both in Omaha, NE and Raleigh, NC. This program runs an hour by hour analysis of heat gain/loss through all components of a building for an indicated climate zone, while taking into account thermal lagging due to construction.

The wall density and the R-value of the wall were varied for the different wall constructions; all other variables were held constant. An energy cost study was done to determine an approximate annual energy (operating) savings associated with the systems studied.

The SmartWall CMU and Heavy Weight CMU walls are each composed of single wythe 12" concrete masonry units reinforced 48" on center vertically with grout and rebar. The other cores of the block are filled with Poly foam insulation. The SmartWall CMU utilizes a lightweight concrete masonry unit. The Insulated Concrete Sandwich Panel has 2" extruded polystyrene insulation between 3” normal weight concrete interior and exterior segments joined with metal ties.

Client provided R-values of 10.15 (hr)(ft²)(°F)/Btu, 6.4 (hr)(ft²)(°F)/Btu and 3.6 (hr)(ft²)(°F)/Btu for the Insulated Concrete Sandwich Panel, SmartWall CMU and Heavy Weight CMU were used respectively. Trace allows the user to select material type and from this the program determines material density and thus thermal lagging. Lightweight concrete was used for the SmartWall CMU and normal weight concrete was used for the Insulated Concrete Sandwich Panel and the Heavy Weight CMU. The R-value alone indicates that the heat transfer through the Insulted Concrete Sandwich Panel and the SmartWall CMU will be significantly less than the Heavy Weight CMU. The impact the wall type will have on the overall building load will vary dependant on the percentage of wall surface area and its relation to other factors including roof load, internal load and geographic location.

For this study, we looked at a comparison of the wall peak load versus the overall peak building load in both heating and cooling. The results can be seen on the attached Figure (“Sheet 3” Heat Gain/Loss by Wall Type). Although the buildings were run in areas with substantially different climates and the peak heat load is much higher in Omaha, the percentage of overall wall heating peak load reduction for the buildings with the Insulated Concrete Sandwich Panel and SmartWall CMU remain similar. It is important to note that these results reflect peak load savings, which determines the size of equipment needed for the building, not the (annual) energy savings of the building. For this building, the Insulated Concrete Sandwich Panel saved 7 tons out of roughly 230 tons at peak load in Omaha and 6 tons out of 230 in Raleigh in comparison to the Heavy Weight CMU. This equates to an equipment savings between $4,500 and $5,000 depending on the complexity of the rooftop units. The SmartWall CMU saved 5 tons out of roughly 230 tons at peak load in Omaha and 4 tons out of 230 tons at peak load in Raleigh in comparison to the Heavy Weight CMU. This equates to an equipment savings around $4,000 depending on the complexity of the rooftop units. While this is a benefit to the owner, it does not obtain a LEED credit point on its own.
The table below represents what percentage of the heat gain/loss comes from each building component for the building in Omaha.

<table>
<thead>
<tr>
<th>Building Component</th>
<th>Insulated Concrete Sandwich Panel</th>
<th>SmartWall CMU</th>
<th>Heavy Weight CMU</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R-Value (hr)(ft²)(°F)/Btu</td>
<td>% Heating Load</td>
<td>% Cooling Load</td>
</tr>
<tr>
<td>Roof</td>
<td>18.6</td>
<td>36.2</td>
<td>25.3</td>
</tr>
<tr>
<td>Wall</td>
<td>10.15</td>
<td>13.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Glass</td>
<td>.93</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Lights</td>
<td>0</td>
<td>14.8</td>
<td>0</td>
</tr>
<tr>
<td>People</td>
<td>0</td>
<td>24</td>
<td>0</td>
</tr>
<tr>
<td>Misc. (equip)</td>
<td>0</td>
<td>7.5</td>
<td>0</td>
</tr>
<tr>
<td>Outside Air</td>
<td>50.3</td>
<td>26.9</td>
<td>46.9</td>
</tr>
</tbody>
</table>

As you can see, the wall load is a relatively small portion of the overall building load for this particular building type. Other types of building will have different percentages, it is therefore not realistic to set a definitive percentage of building heat gain/loss based on wall type alone. To maximize the overall heat gain/loss by varying only wall type, the building must have a large wall-load to building-load ratio. This would happen where the roof load, ventilation load and internal load of the building is minimized with the impact of wall maximized.

It is also difficult to say exactly how often a building will be in the heating mode versus the cooling mode. Varying factors such as location, climate and building occupancy largely impact heating and cooling. Generally speaking, a building is cooling during the summer months and heating during the winter months. A building can be cooling in the winter months if it is high in occupancy or has large internal equipment loads. During the summer there can be a small amount of reheat to bring the space to desired set point. The attached graphs are representative of the amount of heating (kBtu) shown in pink and cooling (kWh) shown in blue, used each month of the year for each of site studied and each alternate. As expected, Duluth is heating for a greater portion of the year while Raleigh is cooling more of the year and Omaha falls in between the two.

The US Green Building Council has established a Leadership in Energy and Environmental Design, or LEED, rating system as a way to certify buildings as being environmentally friendly, sustainable and efficient. Credit EA 1 of the LEED New Construction 2.2 rating system is intended to "achieve increasing levels of energy performance above the baseline in the prerequisite standard to reduce environmental impacts associated with excessive energy use." The credit is broken down into 10 savings categories for new buildings, starting at 1 point for 10.5% savings and culminating with 10 points for 42% savings. To show that a building meets the energy savings, a summary printout from an energy analysis program must show the design energy cost is less than energy cost budget as defined by the Energy Cost Budget Method of ASHRAE 90.1 2004. The Energy Cost Budget Method compares the base building with the improved building to see how much energy savings there will be. It allows designers and building owners to make trade-offs in building construction, lighting, and heating and cooling elements, as long as the resultant building is more efficient than the original building. For this study, we were trying to determine if utilizing either the Insulated Concrete Sandwich Panel or SmartWall CMU in lieu of the Heavy Weight CMU could help in achieving points toward this credit. The percentage of savings needed to achieve LEED points is reduced from earlier work performed under LEED NC 2.1 and called for 15% savings to achieve the first point. This is due to the more stringent requirements of meeting ASHRAE 90.1 2004 in lieu of the previously required standard of ASHRAE 90.1 2001.

Several programs are available to illustrate compliance with ASHRAE 90.1 2004; our office utilizes COMCheck and has typically found this acceptable to code officials and authorities having jurisdiction nationwide. Since this study is evaluating wall type alone, COM Check is beneficial in that it allows the user to check compliance of envelope, lighting and mechanical systems independently. COMCheck asks the user to enter basic design information about the building such as square footage, gross area, location, and construction type. The building
construction can either be picked from a list of wall assemblies within COM Check or the user may enter a unique wall assembly. For this application, a unique wall assembly was entered for each wall type using the previously stated R-values. COM Check outputs for the three wall types in Omaha and Raleigh are attached to the back of this report. All wall types for Raleigh and both the Insulated Concrete Sandwich Panel and SmartWall CMU in Omaha show compliance where the Heavy Weight CMU in Omaha does not comply. While this envelope study shows that the Heavy Weight CMU envelope alone does not comply in Omaha, the building as a whole does pass the Energy Cost Budget Method. The Energy Cost Budget Method evaluates the performance of a building in its entirety, taking into account how various components interact and allows the user to apply trade-offs amongst building components.

To approximate annual energy savings, system types and utility rates must be plugged into the Trace 700 energy analysis program. The building was run with gas fired heating and direct expansion cooling rooftop units, common for this type of building. Direct expansion cooling uses electricity as the utility source. For the purpose of this study, flat utility rates of $.45/therm and $.065 kWh were utilized. These rates were held constant from earlier work done (for ESCSI) in the winter of 2003; although they are lower than current rates they will not affect the percent savings for LEED as they are consistent for all wall types and locations. Continually changing rates and local utilities offering peak and off-peak rates will result in varying energy savings. However, the flat rate load will give a good approximation of the type of energy savings that can be achieved by comparison of the two sites. In addition, equipment first cost and interest rates were left out to place the emphasis on annual operating savings.

The results of the energy cost analysis, which is what LEED utilizes, are shown in attached “TRACE 700 Economic Summary Reports” and summarized in the attached table “Yearly Utility and Cooling Capacity Savings by Wall Type.” The study, which was run for Omaha and Raleigh, showed the greatest energy savings during the coldest months and in the colder climates. To emphasize the impact colder climates have on the energy savings, the same study was run in Duluth, MN. As expected, the energy savings were greatest at this location.

Based on the above information, the percent annual energy savings that can be achieved solely from substituting wall types are substantially less than the peak capacity savings. This is due to several factors; mainly that the building is seldom running at peak capacity. Some portions of the year the building is in economizer mode (economizer is a function that enables the building to be conditioned by utilizing outside air thus reducing the demand for mechanical cooling) and some portions of the year very little heating and cooling will be needed.

If you have any questions or comments please do not hesitate to call.

Sincerely,

HENDERSON ENGINEERS

This report was prepared for ESCSI by Henderson Engineers, Lenexa, KS. The original report has been edited for readability, but none of the factual results have been changed. All original tables, figures, and attachments are included are presented unchanged.
### Yearly Utility and Cooling Capacity Savings by Wall Type

#### Omaha

<table>
<thead>
<tr>
<th>Wall Type</th>
<th>First Year Utility Cost</th>
<th>Percent Savings Over Heavy Weight CMU</th>
<th>Building Tonnage</th>
<th>Tonnage Percent Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy Weight CMU</td>
<td>$119,152.54</td>
<td>2.4%</td>
<td>237.4</td>
<td>2.3%</td>
</tr>
<tr>
<td>SmartWall CMU</td>
<td>$116,345.69</td>
<td>3.5%</td>
<td>232</td>
<td>3.0%</td>
</tr>
<tr>
<td>Insulated Concrete Sandwich Panel</td>
<td>$115,035.12</td>
<td>2.4%</td>
<td>230.3</td>
<td>3.0%</td>
</tr>
</tbody>
</table>

#### Raleigh

<table>
<thead>
<tr>
<th>Wall Type</th>
<th>First Year Utility Cost</th>
<th>Percent Savings Over Heavy Weight CMU</th>
<th>Building Tonnage</th>
<th>Tonnage Percent Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy Weight CMU</td>
<td>$114,395.11</td>
<td>1.5%</td>
<td>237.1</td>
<td>1.8%</td>
</tr>
<tr>
<td>SmartWall CMU</td>
<td>$112,685.78</td>
<td>2.2%</td>
<td>232.9</td>
<td>2.4%</td>
</tr>
<tr>
<td>Insulated Concrete Sandwich Panel</td>
<td>$111,920.05</td>
<td>2.2%</td>
<td>231.5</td>
<td>2.4%</td>
</tr>
</tbody>
</table>

#### Duluth

<table>
<thead>
<tr>
<th>Wall Type</th>
<th>First Year Utility Cost</th>
<th>Percent Savings Over Heavy Weight CMU</th>
<th>Building Tonnage</th>
<th>Tonnage Percent Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy Weight CMU</td>
<td>$121,507.03</td>
<td>3.3%</td>
<td>207.7</td>
<td>1.7%</td>
</tr>
<tr>
<td>SmartWall CMU</td>
<td>$117,439.26</td>
<td>5.0%</td>
<td>204.2</td>
<td>1.9%</td>
</tr>
<tr>
<td>Insulated Concrete Sandwich Panel</td>
<td>$115,388.96</td>
<td>5.0%</td>
<td>203.8</td>
<td>1.9%</td>
</tr>
</tbody>
</table>
### HEAT GAIN / LOSS BY WALL TYPE

#### OMAHA

<table>
<thead>
<tr>
<th>Wall (Btu/hr)</th>
<th>HEATING PEAK LOADS</th>
<th>Total Building (Btu/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy Weight CMU</td>
<td>SmartWall CMU</td>
<td>Insulated Concrete Sandwich Panel</td>
</tr>
<tr>
<td>753,837</td>
<td>426,083</td>
<td>269,329</td>
</tr>
<tr>
<td>Percent Savings over Heavy Weight CMU</td>
<td>2,161,569</td>
<td>2,000,496</td>
</tr>
<tr>
<td>SmartWall CMU</td>
<td>Insulated Concrete Sandwich Panel</td>
<td>13.1%</td>
</tr>
<tr>
<td>43.5%</td>
<td>64.3%</td>
<td>19.6%</td>
</tr>
</tbody>
</table>

#### COOLING PEAK LOADS

<table>
<thead>
<tr>
<th>Wall (Btu/hr)</th>
<th>Total Building (Btu/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy Weight CMU</td>
<td>SmartWall CMU</td>
</tr>
<tr>
<td>107,151</td>
<td>51,194</td>
</tr>
<tr>
<td>Percent Savings over Heavy Weight CMU</td>
<td>2,784,299</td>
</tr>
<tr>
<td>SmartWall CMU</td>
<td>Insulated Concrete Sandwich Panel</td>
</tr>
<tr>
<td>52.2%</td>
<td>61.5%</td>
</tr>
</tbody>
</table>

#### RAFFLE

<table>
<thead>
<tr>
<th>Wall (Btu/hr)</th>
<th>HEATING PEAK LOADS</th>
<th>Total Building (Btu/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy Weight CMU</td>
<td>SmartWall CMU</td>
<td>Insulated Concrete Sandwich Panel</td>
</tr>
<tr>
<td>516,192</td>
<td>291,761</td>
<td>184,424</td>
</tr>
<tr>
<td>Percent Savings over Heavy Weight CMU</td>
<td>1,441,051</td>
<td>1,334,359</td>
</tr>
<tr>
<td>SmartWall CMU</td>
<td>Insulated Concrete Sandwich Panel</td>
<td>13.7%</td>
</tr>
<tr>
<td>43.5%</td>
<td>64.3%</td>
<td>20.1%</td>
</tr>
</tbody>
</table>

#### COOLING PEAK LOADS

<table>
<thead>
<tr>
<th>Wall (Btu/hr)</th>
<th>Total Building (Btu/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy Weight CMU</td>
<td>SmartWall CMU</td>
</tr>
<tr>
<td>131,829</td>
<td>66,007</td>
</tr>
<tr>
<td>Percent Savings over Heavy Weight CMU</td>
<td>2,795,037</td>
</tr>
<tr>
<td>SmartWall CMU</td>
<td>Insulated Concrete Sandwich Panel</td>
</tr>
<tr>
<td>49.9%</td>
<td>61.2%</td>
</tr>
</tbody>
</table>
TRACE® 700 Economic Summary
By Henderson Engineers, Inc.

Project Information
Weather file Omaha, Nebraska
Project Name ESCSI LEED Comparison
Location Omaha, NE
Building Owner
User ES
Company Henderson Engineers
Comments

Alternative 1 - Heavy Weight CMU
Alternative 2 - SmartWall CMU
Alternative 3 - Insulated Concrete Sandwich Panel

Economic Summary

First Year
Util. Cost
119,152.54
116,345.69
115,035.12

Monthly Utility Costs

TRACE® 700 v4.1 calculated at 10:53 AM on 01/16/2006
Economics Summary Page 1 of 2
TRACE® 700 Economic Summary
By Henderson Engineers, Inc.

Project Information
Weather file: Raleigh, North Carolina
Project Name: ESCSI LEED Comparison
Location: Raleigh, NC
Building Owner: ES
User: Henderson Engineers
Comments:

Alternative 1 - Heavy Weight CMU
Alternative 2 - SmartWall CMU
Alternative 3 - Insulated Concrete Sandwich Panel

Economic Summary

<table>
<thead>
<tr>
<th>First Year</th>
<th>Util. Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>114,395.11</td>
</tr>
<tr>
<td></td>
<td>112,685.78</td>
</tr>
<tr>
<td></td>
<td>111,920.05</td>
</tr>
</tbody>
</table>

Monthly Utility Costs

![Monthly Utility Costs Graph](chart.png)
TRACE® 700 Economic Summary
By Henderson Engineers, Inc.

Project Information
- Weather file: Duluth, Minnesota
- Project Name: ESCSI LEED Comparison
- Location: Duluth, MN
- Building Owner:
- User: ES
- Company: Henderson Engineers
- Comments:
- Alternative 1: Heavy Weight CMU
- Alternative 2: SmartWall CMU
- Alternative 3: Insulated Concrete Sandwich Panel

Economic Summary
- First Year Util. Cost
  - 121,507.03
  - 117,439.26
  - 115,388.96

Monthly Utility Costs

TRACE® 700 v4.1 calculated at 11:29 AM on 01/16/2006
Economics Summary Page 1 of 2
COMcheck Software Version 3.1 Release 1
Envelope Compliance Certificate

Standard 90.1-2004
Report Date: 12/22/05
Data filename: G:\2003\0350000800 Buildex LEED Energy Comparison\201\comcheck\2004\Omaha heavyweight.cck

Section 1: Project Information
Project Title: Omaha Heavy Weight CMU
Construction Site: Owner/Agent: Designer/Contractor:

Section 2: General Information
Building Location (for weather data): Omaha, Nebraska
Heating Degree Days (base 65 degrees F): 6300
Cooling Degree Days (base 50 degrees F): 3398
Building Type for Envelope Requirements: Non-Residential
Project Type: New Construction
Glazing Area Percentage: 0%

Building Type: Retail Sales, Wholesale Showroom
Floor Area: 198000

Section 3: Requirements Checklist

Envelope FAILS: Design 9% worse than code.

Climate-Specific Requirements:

<table>
<thead>
<tr>
<th>Component Name/Description</th>
<th>Gross Area or Perimeter</th>
<th>Cavity R-Value</th>
<th>Cont. R-Value</th>
<th>Proposed U-Factor</th>
<th>Budget U-Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof 1: Metal Building, Standing Seam</td>
<td>198000</td>
<td>0.0</td>
<td>19.0</td>
<td>0.051</td>
<td>0.065</td>
</tr>
<tr>
<td>Exterior Wall 1: Heavy Weight CMU, HC 14.0</td>
<td>50320</td>
<td>---</td>
<td>---</td>
<td>0.278</td>
<td>0.089</td>
</tr>
<tr>
<td>Door 1: Insulated Metal, swinging</td>
<td>388</td>
<td>---</td>
<td>---</td>
<td>0.143</td>
<td>0.700</td>
</tr>
<tr>
<td>Floor 1: Slab-On-Grade/Unheated</td>
<td>2139</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

(a) Budget U-factors are used for software baseline calculations ONLY, and are not code requirements.

Insulation:
1. Open-blown or poured loose-fill insulation has not been used in attic roof spaces with ceiling slope greater than 3 in 12.
2. Wherever vents occur, they are baffled to deflect incoming air above the insulation.
3. Recessed lights, equipment and ducts are not affecting insulation thickness.
4. No roof insulation is installed on a suspended ceiling with removable ceiling panels.
5. All exterior insulation is covered with protective material.
6. Cargo and loading dock doors are equipped with weather seals.

Fenestration and Doors:
7. Windows and skylights are labeled and certified by the manufacturer for U-factor and SHGC.
8. Fixed windows and skylights unlabeled by the manufacturer have been site labeled using the default U-factor and SHGC.
9. Other unlabeled vertical fenestration, operable and fixed, that are unlabeled by the manufacturer have been site labeled.

Omaha Heavy Weight CMU

Page 1 of 2
using the default U-factor and SHGC. No credit has been given for metal frames with thermal breaks, low-emissivity coatings, gas fillings, or insulating spacers.

Air Leakage and Component Certification:

- 10. All joints and penetrations are caulked, gasketed, weather-stripped, or otherwise sealed.
- 11. Windows, doors, and skylights certified as meeting leakage requirements.
- 12. Component R-values & U-factors labeled as certified.
- 13. Building entrance doors have a vestibule and equipped with closing devices.

Exceptions:

- Buildings less than four stories above grade. Building entrances with revolving doors.
- Doors that open directly from a space less than 3000 sq. ft. in area.
COMcheck Software Version 3.1 Release 1
Envelope Compliance Certificate

Standard 90.1-2004
Report Date: 12/22/05
Data filename: G:\2003\0350000800 Buildex LEED Energy Comparison201\comcheck\2004\Omaha smartwall.cck

Section 1: Project Information
Project Title: Omaha SmartWall CMU
Owner/Agent: 
Design/Contractor: 

Section 2: General Information
Building Location (for weather data): Omaha, Nebraska
Heating Degree Days (base 65 degrees F): 6300
Cooling Degree Days (base 50 degrees F): 3398
Building Type for Envelope Requirements: Non-Residential
Project Type: New Construction
Glazing Area Percentage: 0%

Building Type
Retail Sales, Wholesale Showroom

Floor Area
198000

Section 3: Requirements Checklist

Envelope PASSES: Design 5% better than code.

Climate-Specific Requirements:

<table>
<thead>
<tr>
<th>Component Name/Description</th>
<th>Gross Area or Perimeter</th>
<th>Cavity R-Value</th>
<th>Cont. R-Value</th>
<th>Proposed U-Factor</th>
<th>Budget U-Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof 1: Metal Building, Standing</td>
<td>198000</td>
<td>0.0</td>
<td>19.0</td>
<td>0.051</td>
<td>0.065</td>
</tr>
<tr>
<td>Seam</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exterior Wall 1: SmartWall CMU,</td>
<td>50320</td>
<td></td>
<td></td>
<td>0.156</td>
<td>0.089</td>
</tr>
<tr>
<td>HC 11.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door 1: Insulated Metal, Swinging</td>
<td>388</td>
<td></td>
<td></td>
<td>0.143</td>
<td>0.700</td>
</tr>
<tr>
<td>Floor 1: Slab-On-Grade Unheated</td>
<td>2139</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(a) Budget U-factors are used for software baseline calculations ONLY, and are not code requirements.

Insulation:

☐ 1. Open-blown or poured loose-fill insulation has not been used in attic roof spaces with ceiling slope greater than 3 in 12.
☐ 2. Wherever vents occur, they are baffled to deflect incoming air above the insulation.
☐ 3. Recessed lights, equipment and ducts are not affecting insulation thickness.
☐ 4. No roof insulation is installed on a suspended ceiling with removable ceiling panels.
☐ 5. All exterior insulation is covered with protective material.
☐ 6. Cargo and loading dock doors are equipped with weather seals.

Fenestration and Doors:

☐ 7. Windows and skylights are labeled and certified by the manufacturer for U-factor and SHGC.
☐ 8. Fixed windows and skylights unlabeled by the manufacturer have been site labeled using the default U-factor and SHGC.
☐ 9. Other unlabeled vertical fenestration, operable and fixed, that are unlabeled by the manufacturer have been site labeled.
using the default U-factor and SHGC. No credit has been given for metal frames with thermal breaks, low-emissivity coatings, gas fillings, or insulating spacers.

Air Leakage and Component Certification:

☐ 10. All joints and penetrations are caulked, gasketed, weather-stripped, or otherwise sealed.
☐ 11. Windows, doors, and skylights certified as meeting leakage requirements.
☐ 12. Component R-values & U-factors labeled as certified.
☐ 13. Building entrance doors have a vestibule and equipped with closing devices.

Exceptions:

- Buildings less than four stories above grade. Building entrances with revolving doors.
- Doors that open directly from a space less than 3000 sq. ft. in area.

Section 4: Compliance Statement

Compliance Statement: The proposed envelope design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed envelope system has been designed to meet the Standard 90.1-2004 requirements in COMcheck Version 3.1 Release 1 and to comply with the mandatory requirements in the Requirements Checklist.

Principal Envelope Designer-Name ___________________________ Signature ___________________________ Date ___________________________
COMcheck Software Version 3.1 Release 1
Envelope Compliance Certificate

Standard 90.1-2004
Report Date: 12/22/05
Data filename: G:\2003\0360000080 Buildex LEED Energy Comparison\201\comcheck\2004\Omaha smartwall revised.cck

Section 1: Project Information
Project Title: Omaha Insulated Concrete Sandwich Panel
Construction Site: Owner/Agent: Designer/Contractor:

Section 2: General Information
Building Location (for weather data): Omaha, Nebraska
Heating Degree Days (base 65 degrees F): 6380
Cooling Degree Days (base 50 degrees F): 3398
Building Type for Envelope Requirements: Non-Residential
Project Type: New Construction
Glazing Area Percentage: 0%

Building Type
Retail Sales, Wholesale Showroom

Floor Area
198000

Section 3: Requirements Checklist

Envelope PASSES: Design 13% better than code.

Climate-Specific Requirements:

<table>
<thead>
<tr>
<th>Component Name/Description</th>
<th>Gross Area or Perimeter</th>
<th>Cavity R-Value</th>
<th>Cont. R-Value</th>
<th>Proposed U-Factor</th>
<th>Budget U-Factor</th>
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<tr>
<td>Roof 1: Metal Building, Standing Seam</td>
<td>198000</td>
<td>0.0</td>
<td>19.0</td>
<td>0.051</td>
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<tr>
<td>Exterior Wall 1: Insulated Concrete Sandwich Panel, HC 15.0</td>
<td>50320</td>
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<td>0.099</td>
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</tr>
<tr>
<td>Door 1: Insulated Metal, Swinging</td>
<td>388</td>
<td>---</td>
<td>---</td>
<td>0.143</td>
<td>0.700</td>
</tr>
<tr>
<td>Floor 1: Slab-On-Grade/Unheated</td>
<td>2139</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

(a) Budget U-factors are used for software baseline calculations ONLY, and are not code requirements.

Insulation:
1. Open-blown or poured loose-fill insulation has not been used in attic roof spaces with ceiling slope greater than 3 in 12.
2. Wherever vents occur, they are baffled to deflect incoming air above the insulation.
3. Recessed lights, equipment and ducts are not affecting insulation thickness.
4. No roof insulation is installed on a suspended ceiling with removable ceiling panels.
5. All exterior insulation is covered with protective material.
6. Cargo and loading dock doors are equipped with weather seals.

Fenestration and Doors:
7. Windows and skylights are labeled and certified by the manufacturer for U-factor and SHGC.
8. Fixed windows and skylights unlabeled by the manufacturer have been site labeled using the default U-factor and SHGC.
9. Other unlabeled vertical fenestration, operable and fixed, that are unlabeled by the manufacturer have been site labeled.
using the default U-factor and SHGC. No credit has been given for metal frames with thermal breaks, low-emissivity coatings, gas fillings, or insulating spacers.

Air Leakage and Component Certification:

☐ 10. All joints and penetrations are caulked, gasketed, weather-stripped, or otherwise sealed.
☐ 11. Windows, doors, and skylights certified as meeting leakage requirements.
☐ 12. Component R-values & U-factors labeled as certified.
☐ 13. Building entrance doors have a vestibule and equipped with closing devices.

Exceptions:
- Buildings less than four stories above grade.
- Building entrances with revolving doors.
- Doors that open directly from a space less than 3000 sq. ft. in area.

Section 4: Compliance Statement

Compliance Statement: The proposed envelope design represented in this document is consistent with the building plans, specifications and other calculations submitted with this permit application. The proposed envelope system has been designed to meet the Standard 90.1-2004 requirements in COMcheck Version 3.1 Release 1 and to comply with the mandatory requirements in the Requirements Checklist.

Principal Envelope Designer-Name

Signature

Date
COMcheck Software Version 3.1 Release 1
Envelope Compliance Certificate

Standard 90.1-2004
Report Date: 12/22/05
Data filename: G:\2003\035000800 Buildex LEED Energy Comparison\201\comcheck\2004\Raleigh heavyweight.ckk

Section 1: Project Information
Project Title: Raleigh Heavy Weight CMU
Construction Site: Owner/Agent: Designer/Contractor:

Section 2: General Information
Building Location (for weather data): Raleigh, North Carolina
Heating Degree Days (base 65 degrees F): 3397
Cooling Degree Days (base 50 degrees F): 4612
Building Type for Envelope Requirements: Non-Residential
Project Type: New Construction
Glazing Area Percentage: 0%

Building Type:
Retail Sales, Wholesale Showroom

Floor Area: 198000

Section 3: Requirements Checklist

Envelope PASSES: Design 2% better than code:

Climate-Specific Requirements:

<table>
<thead>
<tr>
<th>Component Name/Description</th>
<th>Gross Area or Perimeter</th>
<th>Cavity R-Value</th>
<th>Cont. R-Value</th>
<th>Proposed U-Factor</th>
<th>Budget U-Factor</th>
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<tbody>
<tr>
<td>Roof 1: Metal Building, Standing Seam</td>
<td>198000</td>
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<td>19.0</td>
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<td>Door 1: Insulated Metal, Swinging</td>
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<tr>
<td>Floor 1: Slab-On-Grade:Unheated</td>
<td>2139</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

(a) Budget U-factors are used for software baseline calculations ONLY, and are not code requirements.

Insulation:
1. Open-blown or poured loose-fill insulation has not been used in attic roof spaces with ceiling slope greater than 3 in 12.
2. Wherever vents occur, they are baffled to deflect incoming air above the insulation.
3. Recessed lights, equipment and ducts are not affecting insulation thickness.
4. No roof insulation is installed on a suspended ceiling with removable ceiling panels.
5. All exterior insulation is covered with protective material.
6. Cargo and loading dock doors are equipped with weather seals.

Fenestration and Doors:
7. Windows and skylights are labeled and certified by the manufacturer for U-factor and SHGC.
8. Fixed windows and skylights unlabeled by the manufacturer have been site labeled using the default U-factor and SHGC.
9. Other unlabeled vertical fenestration, operable and fixed, that are unlabeled by the manufacturer have been site labeled.
using the default U-factor and SHGC. No credit has been given for metal frames with thermal breaks, low-emissivity coatings, gas fillings, or insulating spacers.

**Air Leakage and Component Certification:**

- 10. All joints and penetrations are caulked, gasketed, weather-stripped, or otherwise sealed.
- 11. Windows, doors, and skylights certified as meeting leakage requirements.
- 12. Component R-values & U-factors labeled as certified.
- 13. Building entrance doors have a vestibule and equipped with closing devices.

*Exceptions:*

  - Buildings less than four stories above grade. Building entrances with revolving doors.
  - Doors that open directly from a space less than 3000 sq. ft. in area.

**Section 4: Compliance Statement**

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<th>Principal Envelope Designer-Name</th>
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<th>Date</th>
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COMcheck Software Version 3.1 Release 1
Envelope Compliance Certificate

Standard 90.1-2004
Report Date: 12/22/05
Data filename: G:\2003\035000800 Buildex LEED Energy Comparison\201\comcheck\2004\Raleigh smartwall.cck

Section 1: Project Information
Project Title: Raleigh SmartWall CMU
Construction Site: Owner/Agent: Designer/Contractor:

Section 2: General Information
Building Location (for weather data): Raleigh, North Carolina
Heating Degree Days (base 65 degrees F): 3397
Cooling Degree Days (base 50 degrees F): 4612
Building Type for Envelope Requirements:
Project Type: Non-Residential
Glazing Area Percentage: New Construction
0%

Building Type: Floor Area
Retail Sales, Wholesale Showroom 198000

Section 3: Requirements Checklist
Envelope PASSES: Design 11% better than code.

Climate-Specific Requirements:

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<th>Component Name/Description</th>
<th>Gross Area or Perimeter</th>
<th>Cavity R-Value</th>
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<th>Proposed U-Factor</th>
<th>Budget U-Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof 1: Metal Building, Standing Seam</td>
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<td>19.0</td>
<td>0.051</td>
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<td>Exterior Wall 1: Smart Wall CMU, HC 11.0</td>
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<tr>
<td>Door 1: Insulated Metal, Swinging</td>
<td>388</td>
<td>---</td>
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Insulation:
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2. Wherever vents occur, they are baffled to deflect incoming air above the insulation.
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5. All exterior insulation is covered with protective material.
6. Cargo and loading dock doors are equipped with weather seals.

Fenestration and Doors:
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**Air Leakage and Component Certification:**

- [ ] 10. All joints and penetrations are caulked, gasketed, weather-stripped, or otherwise sealed.
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- [ ] 12. Component R-values & U-factors labeled as certified.
- [ ] 13. Building entrance doors have a vestibule and equipped with closing devices.

*Exceptions:*
- Buildings less than four stories above grade. Building entrances with revolving doors.
- Doors that open directly from a space less than 3000 sq. ft. in area.

---

**Section 4: Compliance Statement**

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Raleigh SmartWall CMU
COMcheck Software Version 3.1 Release 1

Envelope Compliance Certificate

Standard 90.1-2004

Report Date: 12/22/05
Data filename: G:\2003\03\00\00\00\Buildex LEED Energy Comparison\201\comcheck\2004\1\Raleigh smartwall revised.cck

Section 1: Project Information

Project Title: Raleigh Insulated Concrete Sandwich Panel
Construction Site: Owner/Agent: Designer/Contractor:

Section 2: General Information

Building Location (for weather data): Raleigh, North Carolina
Heating Degree Days (base 65 degrees F): 3397
Cooling Degree Days (base 50 degrees F): 4612
Building Type for Envelope Requirements: Non-Residential
Project Type: New Construction
Glazing Area Percentage: 0%

Building Type: Retail Sales, Wholesale Showroom
Floor Area: 198000

Section 3: Requirements Checklist

Envelope PASSES: Design 15% better than code.

Climate-Specific Requirements:

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<tr>
<th>Component Name/Description</th>
<th>Gross Area or Perimeter</th>
<th>Cavity R-Value</th>
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<td>198000</td>
<td>0.0</td>
<td>19.0</td>
<td>0.051</td>
<td>0.065</td>
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<tr>
<td>Exterior Wall 1: Insulated Concrete Sandwich Panel, HC 15.0</td>
<td>50320</td>
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<td>---</td>
<td>0.099</td>
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<tr>
<td>Door 1: Insulated Metal, Swinging</td>
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Insulation:

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☐ 13. Building entrance doors have a vestibule and equipped with closing devices.

Exceptions:
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Principal Envelope Designer-Name ____________________________________________
Signature __________________________________________________________________
Date ____________________________