Nebraska-specific Advanced Commercial Building Energy Code Study

Final Report Documentation

13 November 2009

Contract # 38617 04
Vendor # 517852
LAD Project # 002-10106-000
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Contract # 38617 04

State of Nebraska
Department of Administrative Services
Nebraska-specific
Advanced Commercial Building Energy Code Study
Final Report

13 November 2009

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Leo A Daly
# LIST OF TERMS AND ACRONYMS

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<th>Term/Abbreviation</th>
<th>Description</th>
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<tr>
<td>AFUE</td>
<td>annual fuel utilization efficiency</td>
</tr>
<tr>
<td>AIRR</td>
<td>adjusted internal rate of return</td>
</tr>
<tr>
<td>ASHRAE</td>
<td>American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc.</td>
</tr>
<tr>
<td>Btu</td>
<td>british thermal unit; one Btu = energy required to raise one lb. of water one °F</td>
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<tr>
<td>CEE</td>
<td>Consortium for Energy Efficiency</td>
</tr>
<tr>
<td>c.i.</td>
<td>continuous insulation</td>
</tr>
<tr>
<td>CO₂</td>
<td>Carbon Dioxide</td>
</tr>
<tr>
<td>COP</td>
<td>coefficient of performance</td>
</tr>
<tr>
<td>DOE</td>
<td>Department of Energy</td>
</tr>
<tr>
<td>DHW</td>
<td>domestic hot water</td>
</tr>
<tr>
<td>DX</td>
<td>direct expansion</td>
</tr>
<tr>
<td>EER</td>
<td>energy efficiency ratio</td>
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<tr>
<td>EPAct</td>
<td>Energy Policy Act</td>
</tr>
<tr>
<td>ERV</td>
<td>energy recovery ventilator</td>
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<tr>
<td>FEMP</td>
<td>federal energy management program</td>
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<tr>
<td>HVAC</td>
<td>heating, ventilation, air conditioning</td>
</tr>
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<td>HW</td>
<td>hot water</td>
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<tr>
<td>IECC</td>
<td>International Energy Conservation Code</td>
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<tr>
<td>LCCA</td>
<td>life cycle cost analysis</td>
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<td>LEED™</td>
<td>Leadership in Energy and Environmental Design</td>
</tr>
<tr>
<td>LCCA</td>
<td>life cycle cost analysis</td>
</tr>
<tr>
<td>MMBtu</td>
<td>one million Btu</td>
</tr>
<tr>
<td>MUD</td>
<td>Metropolitan Utilities District</td>
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<td>NEO</td>
<td>Nebraska Energy Office</td>
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<tr>
<td>NIST</td>
<td>National Institute of Standards and Technology</td>
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<tr>
<td>NOx</td>
<td>Nitrogen Oxides</td>
</tr>
<tr>
<td>NPPD</td>
<td>Nebraska Public Power District</td>
</tr>
<tr>
<td>NPV</td>
<td>net present value</td>
</tr>
<tr>
<td>OM&amp;R</td>
<td>operating, maintenance, and repair</td>
</tr>
<tr>
<td>OPPD</td>
<td>Omaha Public Power District</td>
</tr>
<tr>
<td>PV</td>
<td>present value</td>
</tr>
<tr>
<td>R</td>
<td>thermal resistance</td>
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<tr>
<td>SEER</td>
<td>seasonal energy efficiency ratio</td>
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<tr>
<td>SIR</td>
<td>savings to investment ratio</td>
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<tr>
<td>SHGC</td>
<td>solar heat gain coefficient</td>
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<td>SO₂</td>
<td>Sulfur Dioxide</td>
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<td>SOW</td>
<td>scope of work</td>
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<tr>
<td>therm</td>
<td>one therm ≈ 100,000 Btu</td>
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<td>U-value</td>
<td>thermal conductivity</td>
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<tr>
<td>VAV</td>
<td>variable air volume</td>
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<tr>
<td>VFD</td>
<td>variable frequency drive</td>
</tr>
<tr>
<td>VLT</td>
<td>visible light transmittance also VT</td>
</tr>
<tr>
<td>VSD</td>
<td>variable speed drive</td>
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<tr>
<td>WWR</td>
<td>window-to-wall ratio</td>
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Nebraska-Specific Advanced Commercial Building Energy Code Study

Executive Summary

The Nebraska-Specific Advanced Commercial Building Energy Code Study evaluated and quantified the potential economic, energy and environmental benefits to the State of Nebraska of adopting a Statewide Advanced Commercial Building Energy Code. The study also assessed the benefits associated with the reduction in carbon emissions and other environmental pollutants attributed to the generation and consumption of energy is commercial buildings.

An Increase of Between 1.28 and 3.36 Percent in Building Costs Achieves 30 Percent in Energy Savings
In the analysis of ten commercial building types in the state’s three climate zones, the study found that an average incremental construction cost of between 1.28 and 3.36 percent would result in a 30 percent reduction in the energy savings in Nebraska.

After 20 Years, Energy Cost Savings in Commercial Buildings Total $53.8 Million
The study found energy cost savings associated with commercial buildings for the first year totaled $6.2 million and the 20 year cumulative life cycle cost savings exceeded $53.8 million. The specific energy cost savings are quantified by climate zone and for the state for one and 20 years in the figure below.

And the Savings Compound for All Nebraskans
While the commercial building owners are the immediate beneficiaries of the energy cost savings, the advanced building energy code’s attributes will provide benefits for other Nebraskans. The 30 percent reduction in energy use will help shield all Nebraskans from future energy price fluctuations. The benefits to the state’s economy include additional investments in construction costs of an estimated $63 million in the first year, primarily aiding local builders and supply companies. Since more than 80 percent of the money Nebraskans spend on energy leaves the state, any reduction in energy costs will have positive impact on the state’s economy.
Methodology

This study focused on ten commonly constructed building models set in three representative climate zones of Nebraska: Chadron, Norfolk, and Omaha. Computer-based whole building energy models, intended to assess many aspects of building operation and design, were assembled to analyze each building type. The Omaha location proposed models for the ten building types were developed to achieve a 30-percent energy reduction over an ASHRAE Standard 90.1-2004 Appendix G compliant baseline building. Identical energy savings strategies were then utilized for Norfolk and Chadron models resulting in energy savings at approximately the 30-percent level.

All ten building types were found to be capable of achieving the 30-percent energy reduction by employing common building industry energy savings strategies. However, the application of specific strategies varied for each building type. High efficiency HVAC systems, energy recovery systems, enhanced wall insulation, increased roof insulation, high performance glazing, and high efficiency lighting represented the most common methods for demonstrating energy savings. Care was taken to focus on strategies not considered onerous or atypical to today’s construction industry, but rather those that are routinely found in energy-responsible construction exceeding the current code-mandated minimum requirements. Additionally, building occupancy densities and operational schedules for each model were defaulted to ASHRAE-recommended values.

After achieving 30 percent energy savings in the models, the estimated capital, operating, maintenance and replacement costs for energy-affecting systems were developed and used with a 20-year comparative life cycle cost analysis (LCCA) between a model’s baseline with the prescriptive requirements of the 2003 IECC and the proposed (energy-improved) building. The life cycle cost analysis, utilizing the U.S. Department of Energy FEMP analysis methodology, resulted in the economic indicators: net present value, simple and discounted payback periods, savings-to-investment ratio (SIR), and adjusted internal rate of return (AIRR). Finally, the analysis led to an environmental impact estimate related to the reduced release of carbon dioxide, nitrogen oxides, sulfur dioxide, and mercury.

Results

Economic Impacts

In general, the results of the life cycle cost analyses are mixed, with certain building models reflecting positive net present values and varying accompanying payback periods in favor of the 30-percent energy improved alternative models. An abbreviated summary of the life cycle cost analyses results follows in Table 1.

Conversely, other alternative building models do not reflect a beneficial net present worth or payback, in spite of positive annual energy cost savings when compared to the baseline model. The primary cause for cases failing to demonstrate a viable payback with the 30-percent alternative models is likely due to the magnitude of the periodic system and/or major component replacement costs when compared to baseline systems.
### Table 1 - Life Cycle Cost Analyses Results Summary

Only capital investment costs related to building components, systems and equipment affecting energy usage were compared between the baseline and energy-improved models. Non-common capital investment costs (essentially those only impacting regulated energy consumption), typical periodic recurring preventative maintenance, and non-recurring maintenance and repair costs that differentiate each model were developed for use with each LCCA model. Additionally, for the purposes of evaluating the economic impacts of long-term financing on the differing model capital investments as relate to energy-contributing building systems, components and equipment, commercial (non-school) building models presume a 20-year fixed rate mortgage at 6.5%, and the elementary and secondary school building models presume a 20-year tax-exempt bond financing at 4.65%.
In the case of the elementary and secondary schools buildings, the study’s scope-defined HVAC systems modeled for the alternative energy-improved models were rooftop air-to-air heat pumps. Although not deemed a viable choice to preserve the universal applicability of the study, prior LEO A DALY client experience with school district projects within Nebraska and surrounding states suggests that alternative HVAC systems, employing vertical bore ground-source geothermal heat pumps, have the potential to improve investment returns and typically realize payback periods under 10 years.

Using the utility rate schedules listed in Table 2, the Nebraska statewide total first year energy cost savings for the 30-percent (energy-improved) alternative buildings would amount to $6,258,689 over baseline buildings that comply with the currently-adopted State of Nebraska energy code (2003 IECC).

<table>
<thead>
<tr>
<th>Utility</th>
<th>Omaha</th>
<th>Norfolk</th>
<th>Chadron</th>
</tr>
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<tr>
<td>Electricity</td>
<td>OPPD Schedule 231</td>
<td>NPPD Schedule GS</td>
<td>NPPD Schedule GS</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>MUD Schedule B</td>
<td>Black Hills Energy Schedule TSS</td>
<td>Source Gas provider average</td>
</tr>
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Table 2 - Utility Rate Schedules by Location

Energy Impacts

This study clearly demonstrates that significant statewide reduction in future energy consumption could be achieved with the adoption of an Advanced Energy Code. An estimated accumulated 20-year energy savings of 108,738,240 MMBtu would result by the construction of 30-percent (energy-improved) alternative buildings when compared to their current code-minimum compliant counterparts. Table 3 below shows the 20-year cumulative energy savings for a single average building in each of the zones. Also shown is the statewide cumulative energy savings for all such commercial buildings potentially constructed and operated during the 20-year study period.

<table>
<thead>
<tr>
<th>Location</th>
<th>Average Single Building</th>
<th>All Building Starts</th>
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<tr>
<td></td>
<td>[MMBtu]</td>
<td></td>
</tr>
<tr>
<td>Omaha</td>
<td>11,443</td>
<td>108,738,240</td>
</tr>
<tr>
<td>Norfolk</td>
<td>12,207</td>
<td></td>
</tr>
<tr>
<td>Chadron</td>
<td>9,761</td>
<td></td>
</tr>
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</table>

Table 3 – 20 Year Cumulative Energy Consumption Savings

Treatment of Non-regulated Power (Plug) Loads

Although analyzed for their overall contribution to electricity consumption, cooling loads, and heating loads in the prototypical building models, for the purposes of this study, presently non-regulated building user power (plug) loads have been discounted in regard to their contributions toward potential energy savings percentage improvement reductions. Non-regulated plug loads typically include among others: appliances, computers, printers, and copiers. Incidentally, such treatment of plug loads is also the case for all federally-funded (non-LEED™ certifiable targeted) energy-improved building projects, as permitted by EPAct 2005.

Environmental Impacts
A focus of the environmental impact assessment of this study was the reduction in carbon dioxide emissions, a detrimental atmospheric greenhouse gas, and other environmental pollutants created as by-products of energy production. Emissions are produced when fuels are combusted at off-site power plants producing electricity and by on-site heaters and furnaces producing heating energy. A reduction in the four major pollutants would be achieved by reducing commercial building demand for electricity and natural gas. Carbon dioxide, nitrogen oxides, sulfur dioxide, and mercury 20-year accumulated potential savings associated with the adoption of a statewide improved energy code are summarized in Table 4.

<table>
<thead>
<tr>
<th>Emission</th>
<th>Location Average</th>
<th>Single Building</th>
<th>All Building Starts</th>
<th>Statewide Cumulative</th>
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</thead>
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<tr>
<td>Carbon Dioxide (CO₂) [lbs.]</td>
<td>Omaha</td>
<td>2,074,725</td>
<td>1,745,949</td>
<td>2,115,678</td>
</tr>
<tr>
<td>Nitrogen Oxides (NOₓ) [lbs.]</td>
<td>Norfolk</td>
<td>2,785</td>
<td>2,914</td>
<td>3,160</td>
</tr>
<tr>
<td>Sulfur Dioxide (SO₂) [lbs.]</td>
<td>Chadron</td>
<td>11,114</td>
<td>10,566</td>
<td>9,629</td>
</tr>
<tr>
<td>Mercury (Hg) [mg]</td>
<td>Statewide Cumulative</td>
<td>8,804</td>
<td>4,216</td>
<td>11,661</td>
</tr>
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Table 4 – 20 Year Cumulative Emissions Reductions

The Large Big Box Retail models demonstrated a counterintuitive increase in most emissions, despite a 30-percent reduction in energy consumption. This model achieved significant heating savings, drastically reducing its use of natural gas. However, requirements for increased fan power resulted in increased electricity consumption, driving up the overall associated carbon dioxide, nitrogen oxides, and mercury emissions compared to baseline model emissions.

Statewide Construction

Data sourced by the Nebraska Energy Office regarding annual construction starts by commercial building type were used to assess overall statewide impacts of an Advanced Energy Code. Over 92-percent of construction starts are located in the greater Omaha-metro representative climate region, including the Lincoln-Omaha interstate corridor. Therefore, aggregate statewide impacts are heavily weighted towards the Omaha results.

Historical construction data shows an average of 1,249 commercial buildings are constructed in Nebraska annually, involving an average 25,528 square feet per building. Located throughout the state, these buildings may or may not be located within a local code jurisdiction that presently categorizes data regarding the construction building type. Additionally, there are no statewide reporting standards, uniform or otherwise, for local code jurisdictions that presently track building construction type data.

For the purposes of this study, the cumulative statewide energy consumption, energy cost savings, incremental (delta) construction cost, and environmental emissions impacts for modeled building types constructed in Nebraska were determined by utilizing building type model energy consumption results developed as part of (eQUEST) energy modeling software analyses within the appropriate Nebraska State Energy Code Building Climate Zone, and applying this information to the model's corresponding
(BLCC) LCCA analysis, in turn multiplied by the total number of buildings, per building type and climate zone, as listed in Table 5 below. Note that building types not modeled in this study (i.e. hospitals, churches, theatres, industrial buildings, hotels) are not included in the annual construction start data. The ten building types represented by this study account for 903 of the 1249 historical commercial building construction starts.

<table>
<thead>
<tr>
<th>Building Type</th>
<th>Zone 13b</th>
<th>Zone 14b</th>
<th>Zone 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Office Building</td>
<td>10 + 1 = 11</td>
<td>1 + 0 = 1</td>
<td>0 + 0 = 0</td>
</tr>
<tr>
<td>38% Window-to-Wall Ratio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large Office Building</td>
<td>10 + 1 = 11</td>
<td>1 + 0 = 1</td>
<td>1 + 0 = 1</td>
</tr>
<tr>
<td>18% Window-to-Wall Ratio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small Office Building</td>
<td>31 + 3 = 34</td>
<td>2 + 0 = 2</td>
<td>0 + 0 = 0</td>
</tr>
<tr>
<td>38% Window-to-Wall Ratio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small Office Building</td>
<td>62 + 7 = 69</td>
<td>4 + 1 = 5</td>
<td>1 + 0 = 1</td>
</tr>
<tr>
<td>18% Window-to-Wall Ratio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small Retail Building</td>
<td>310 + 36 = 346</td>
<td>21 + 2 = 22</td>
<td>4 + 1 = 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strip Mall</td>
<td>133 + 16 = 149</td>
<td>9 + 1 = 10</td>
<td>1 + 0 = 1</td>
</tr>
<tr>
<td>Big Box Retail</td>
<td>88 + 10 = 98</td>
<td>6 + 1 = 7</td>
<td>1 + 0 = 1</td>
</tr>
<tr>
<td>Elementary Schools</td>
<td>40 + 5 = 45</td>
<td>3 + 0 = 3</td>
<td>1 + 0 = 1</td>
</tr>
<tr>
<td>Secondary Schools</td>
<td>20 + 2 = 22</td>
<td>1 + 1 = 2</td>
<td>1 + 0 = 1</td>
</tr>
<tr>
<td>Warehouse</td>
<td>44 + 5 = 49</td>
<td>3 + 1 = 4</td>
<td>1 + 0 = 1</td>
</tr>
</tbody>
</table>

Table 5 - Annual Commercial Building Construction Starts by Zone

Note: The first number in each category indicates the estimated number of buildings, per modeled building type, constructed in the top 40 most-populous communities in Nebraska. The second number indicates the estimated number of buildings, per modeled building type, constructed outside of Nebraska’s 40 most-populous communities.

**Life Cycle Cost Analysis (LCCA)**

The life cycle cost models developed for this study are based on a 20-year life, employing (BLCC Version 5.3-09) life cycle software as provided through the U.S. Department of Commerce’s National Institute of Standards and Technology, exercising the Federal Energy Management Program (FEMP) model structure analysis approach option.

**Recommendations**

The results of the study’s energy modeling phases indicate that the differences in typical commercial building energy consumption between the 2003 IECC, Nebraska’s currently-adopted energy code, and
the 2006 IECC edition are generally marginal, and not significant enough to warrant adoption of the 2006 IECC code edition at this juncture. Of the 30 total building models evaluated (10 prototypes, each at the 3 climate zones):

- 21 models resulted in having either net negative energy savings (i.e. – increased energy consumption) or up to a 1-Percent improvement at best
- 3 models yielded energy improvements between 1 and 3-Percent
- 6 models showed energy improvement gains of greater than 3-Percent.

Of this latter group, Small Retail Facilities (statewide) carried the best potential for improved energy reduction, followed by Large Offices-18% WWR, Large Big Box Retail facilities, Secondary Schools and Elementary Schools, all in the Omaha climate zone. The tabulated results are listed in Table 6, page 9.

Generally, the 2003 IECC models located in Chadron performed better than the 2006 IECC models in the same zone. This is likely due to the 2006 IECC simplification of the climate zone definitions from the 2003 IECC edition. Three climate zones, 13b (Omaha), 14b (Norfolk), and 15 (Chadron) existed under the 2003 IECC, each with a unique set of prescriptive requirements. Depending upon the building window to wall ratio, the 2003 IECC also had unique prescriptive requirements for roof and wall insulation as subsets of each climate zone requirements. In the 2006 IECC and ASHRAE Standard 90.1-2004, Nebraska was redefined as one homogenous climate zone.

Conversely, this study clearly demonstrates that the State of Nebraska would positively benefit from the promulgation of a Nebraska-specific Statewide Advanced Energy Code based on a requirement for all new commercial building construction to achieve a minimum 30-percent energy savings improvement over comparable ASHRAE Standard 90.1-2004 compliant baseline buildings. The demonstrated benefits include:

- **Economic** – The amortization of increased capital investment outlays associated with new building construction constructed in compliance with an Advanced Energy Code may generally be more than offset through commensurate reductions in operating energy cost outlays over the building’s life. Using average 2009 R.S. MEANS Cost Guide unit construction costs for the modeled buildings, and given the study-presumed construction starts by building type per climate zone, the Nebraska statewide impact on additional capital construction costs employing an Advanced Energy Code slightly exceeds $43 Million annually on an estimated $3.36 Billion in statewide construction, or approximately a 1.28-Percent average increase in construction cost per building. Individual building models represent construction cost variations from as low as nearly a 1.4-Percent cost savings in construction for Large Big Box Retail facilities, to as high as 7.6-Percent added average construction cost for Retail Strip Malls to obtain the 30-Percent targeted energy savings over ASHRAE Standard 90.1-2004.

- **Reduced Energy Consumption** – The statewide annual energy savings (refer to Table 3, page 4) are approximately $6.3 Million annually, which translates into tangential benefits for the public utility services being afforded opportunities to delay having to implement (build) larger or add...
additional generating capacity and the associated interstate energy transmission/delivery infrastructure to support new commercial building construction.

- **Positive Environmental Impacts** – The demonstrated reductions in such pollutants resulting from the implementation of an Advanced Energy Code for Nebraska can be related to other studies sponsored by various U.S. Federal Government Agencies such as the Environmental Protection Agency linking increases in the evaluated pollutants as hazardous to individual health, the earth’s atmosphere (ozone layer degradation), and land, lakes and waterway resources. Reducing the additional amounts of these pollutants associated with new construction is beneficial to both the State of Nebraska and the world at-large. Initiatives favoring environmental pollution reduction are not only currently deemed ‘politically correct’ by an ever-growing percentage of the population, but are also deemed as good stewardship considerate of future generations by many others.

Additionally, although not modeled as part of this study, it can be readily deduced that by including requirements within such an Advanced Energy Code for applicability to substantial (area) additions and major renovations of existing commercial buildings, similar benefits would accrue to the State.
## Analysis Summaries

Selected data from the aforementioned study models is summarized in the following Analysis Summary spreadsheets, in addition to the inclusion of various salient economic and atmospheric emission statistics for each building model. In addition to the BLCC LCCA report output documentation contained herein are analysis summary spreadsheets for each building model comparison portraying select resultant model statistics for building energy consumption type (electricity and natural gas), economic (capital investment and mortgage/bond-related costs), and atmospheric pollution related characteristics.

### Table 6 - Comparative Performance of Minimally Code Compliant Buildings under 2003 IECC and 2006 IECC

<table>
<thead>
<tr>
<th>Building Model Description</th>
<th>Climate Zone</th>
<th>Minimally Code Compliant Building Energy Consumption [MMbtu]</th>
<th>% Reduction</th>
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<tr>
<td></td>
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<td>2934</td>
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<td>2511</td>
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## Nebraska-specific Advanced Commercial Building Energy Code Study

### Master Summary

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<tr>
<th>Model</th>
<th>Variable</th>
<th>Unit</th>
<th>Omaha (a)</th>
<th>Norfolk (a)</th>
<th>Chadron (a)</th>
<th>State-wide Impact (b)</th>
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<td>48.38</td>
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</table>

**Notes:**
- (a) Figure accounts for single building operation during applicable time frame.
- (b) Figure accounts for cumulative effects of all construction starts during applicable time frame.

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## Nebraska-specific Advanced Commercial Building Energy Code Study

### Total Building Construction Cost Increase

<table>
<thead>
<tr>
<th>Model</th>
<th>Annual Construction Starts (a)</th>
<th>Model Area</th>
<th>Typical Area-based Cost (b)</th>
<th>Typical Model Total Cost</th>
<th>30% Energy Saving Building Average Incremental Cost (c), (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[sf] [$/sf] [$$] [$$] [%]</td>
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<td></td>
<td></td>
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<tr>
<td>Large Office 18% WWR</td>
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<td>$170</td>
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<td>60000</td>
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<td></td>
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<td>$201</td>
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<td><strong>$1,900,590,000</strong></td>
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Notes:
(a) Annual construction start data as provided by NEO
(b) Typical area-based costs based upon from RSMeans 2009 Square Foot Costs
(c) Average incremental costs of 30-percent energy saving alternative buildings over baseline buildings from capital cost estimate
(d) Percent additional cost over typical model total cost

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### Nebraska-specific Advanced Commercial Building Energy Code Study

**Analysis Summary**

#### Location Cost

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<thead>
<tr>
<th>Location</th>
<th>Annual Energy Consumption</th>
<th>Annual Energy Cost</th>
<th>Capital Investment Cost</th>
<th>Annual Energy Cost Savings</th>
<th>Capital Investment Cost Savings</th>
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<td>[OMAHA]</td>
<td>[NORFOLK]</td>
<td>[CHADRON]</td>
<td>[STATE-WIDE]</td>
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#### Annual Energy Consumption

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<th>Capital Investment Cost</th>
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#### Capital Investment Cost

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<th>Capital Investment Cost Savings</th>
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#### Environmental Impact

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#### 2007 IECC

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#### 2006 IECC

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#### 30% Alternative

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### Notes

- **Note a:** Building Components / Systems Affecting Energy Consumption ONLY.
- **Note b:** Assumed Annual Construction Starts by Region - Data as provided by the Nebraska Energy Office

**Date:** 11/13/2009

**DALY Project #002-10106-000**

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NOTES: (a) Building Components / Systems Affecting Energy Consumption ONLY.
(b) Assumed Annual Construction Starts by Region - Data as provided by the Nebraska Energy Office
## Nebraska-specific Advanced Commercial Building Energy Code Study

### Analysis Summary

#### LARGEST OFFICE 18% WWR

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- Building Components / Systems Affecting Energy Consumption ONLY.
- Assumed Annual Construction Starts by Region - Data as provided by the Nebraska Energy Office.
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NOTES: (a) Building Components / Systems Affecting Energy Consumption ONLY.
(b) Assumed Annual Construction Starts by Region - Data as provided by the Nebraska Energy Office

11/13/2009
DALY Project #002-10106-000
Page5 of 12
## Nebraska-specific Advanced Commercial Building Energy Code Study

### Analysis Summary

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### Environmental Impact

- CO2
- NOx
- SO2
- Hg

**Notes:**

(a) Building Components / Systems Affecting Energy Consumption ONLY.

(b) Assumed Annual Construction Starts by Region - Data as provided by the Nebraska Energy Office
### Nebraska-specific Advanced Commercial Building Energy Code Study

#### Analysis Summary

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**Notes:**

(a) Building Components / Systems Affecting Energy Consumption ONLY.

(b) Assumed Annual Construction Starts by Region - Data as provided by the Nebraska Energy Office

---

**Environmental Impact**

- **CO2**
- **NOx**
- **SO2**
- **Hg**

(Note a) (Year 1) (Year 1) CO2 NOx SO2 Hg

(Note b) Assumed Annual Construction Starts by Region - Data as provided by the Nebraska Energy Office
## Nebraska-specific Advanced Commercial Building Energy Code Study

### Analysis Summary

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**NOTES:**

(a) Building Components / Systems Affecting Energy Consumption ONLY.

(b) Assumed Annual Construction Starts by Region - Data as provided by the Nebraska Energy Office

DALY Project #1002-10306-000

11/13/2009

10 YR Emissions Savings
(per single bldg)

219,254 363 802 1,437

Annual Emissions Savings
(all bldgs this zone)

636,841 496 5,159

Annual Emissions Savings
(all bldgs this zone)

155,550 319 268 1,449

Annual Emissions Savings
(all bldgs statewide)

137,540 277 255 1,278

Annual Emissions Savings
(all bldgs this zone)

61,684 50 514 0

Annual Emissions Savings
(all bldgs this zone)

31,873,787 54,339 107,836 223,207

Annual Emissions Savings
(all bldgs this zone)

7,649,141 6,113 63,444 0

Annual Emissions Savings
(all bldgs this zone)

137,540 277 255 1,278

Annual Emissions Savings
(all bldgs this zone)

219,254 363 802 1,437

Annual Emissions Savings
(all bldgs this zone)

55,364 724 1,496

Annual Emissions Savings
(all bldgs this zone)
### Nebraska-specific Advanced Commercial Building Energy Code Study

#### Analysis Summary

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#### BIG BOX RETAIL

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#### Environmental Impact

- CO2
- NOx
- SO2
- Hg

#### Notes:

- (a) Building Components / Systems Affecting Energy Consumption ONLY.
- (b) Assumed Annual Construction Starts by Region - Data as provided by the Nebraska Energy Office

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#### Environmental Impact

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#### Notes:

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<td></td>
<td>Gas [MMBtu]</td>
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<td>30% Alternative</td>
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<td></td>
<td>Total (MMBtu)</td>
<td>1,919</td>
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<tr>
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<td>Ele [MMBtu]</td>
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<td>Gas [MMBtu]</td>
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<td>STATE-WIDE</td>
<td>Total (MMBtu)</td>
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<td>678,391</td>
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<td>Ele [MMBtu]</td>
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<td></td>
<td>Gas [MMBtu]</td>
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</table>

NOTES: (a) Building Components / Systems Affecting Energy Consumption ONLY.
(b) Assumed Annual Construction Starts by Region - Data as provided by the Nebraska Energy Office
### Nebraska-specific Advanced Commercial Building Energy Code Study

#### Analysis Summary

<table>
<thead>
<tr>
<th>Location</th>
<th>Energy Consumption</th>
<th>2003 IECC to 2006 IECC Comparison</th>
<th>2003 IECC to 30% Alternative Comparison</th>
<th>Notes</th>
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<td>[$]</td>
<td>[Year 1]</td>
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<td>80,000</td>
<td>2,800</td>
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<td></td>
<td>44,765 895</td>
<td>3,016</td>
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<td>NORFOLK</td>
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<td>2,800</td>
<td>-4,900</td>
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<td>6,108 122,966</td>
<td>401</td>
<td>2,836</td>
<td>-4,999</td>
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<tr>
<td>CHADRON</td>
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<td>80,000</td>
<td>2,800</td>
<td>-4,900</td>
</tr>
<tr>
<td></td>
<td>6,108 122,966</td>
<td>401</td>
<td>2,836</td>
<td>-4,999</td>
</tr>
<tr>
<td>STATE-WIDE</td>
<td>25 500,000</td>
<td>80,000</td>
<td>2,800</td>
<td>-4,900</td>
</tr>
</tbody>
</table>

**Notes:**
(a) Building Components / Systems Affecting Energy Consumption ONLY.
(b) Assumed Annual Construction Starts by Region - Data as provided by the Nebraska Energy Office

**Construction Starts:**
- OMAHA: 20
- NORFOLK: 2
- CHADRON: 11
- STATE-WIDE: 25

**Energy Consumption:**
- Elec: [kWh]
- Gas: [therm]

**Annual Emission Savings:**
- CO2: [lbs]
- NOx: [lbs]
- SO2: [lbs]
- Hg: [mg]
- Strom: [#]

**20 Year Mortgage Cost:**
- Each: 20

**Annual Savings:**
- Δ: 20 Year Mortgage Cost

**Accumulated 20 Year Savings:**
## Nebraska-specific Advanced Commercial Building Energy Code Study

### Analysis Summary

<table>
<thead>
<tr>
<th>Location</th>
<th>Energy Consumption</th>
<th>Cost</th>
<th>2003 IECC to 2006 IECC Comparison</th>
<th>2003 IECC to 30% Alternative Comparison</th>
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<tr>
<td>OMAHA</td>
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<td>$ (Note a)</td>
<td>$</td>
<td>$ (Year 1)</td>
<td>$ (Year 1)</td>
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<tr>
<td>NORFOLK</td>
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<tr>
<td>CHADRON</td>
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</tr>
<tr>
<td>STATE-WIDE</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

### Environmental Impact

- CO2
- NOx
- SO2
- Hg

### Annual Emissions Savings

- Electric (kWh)
- Natural Gas (therm)

### Notations:

- (a) Building Components / Systems Affecting Energy Consumption ONLY.
- (b) Assumed Annual Construction Starts by Region - Data as provided by the Nebraska Energy Office.

**NOTES:**

11/13/2009
DALY Project #1002-1019-000
Page 12 of 12
PURPOSE

The purpose of this study is to quantify the potential economic, energy, and environmental benefits to the State of Nebraska related to adopting a Statewide Advanced Energy Code. This study demonstrates the promulgation of a Nebraska Specific Advanced Energy Code could dramatically reduce energy consumption attributable to new commercial buildings constructed within the state. Coupled with reduced energy consumption, an Advanced Energy Code offers the potential to reduce carbon emissions and other environmental pollutants attributable to the generation of energy utilized in most commercial buildings. Whether produced at a remote source or at the building site, a significant portion of commercial building energy consumption is associated with heating, ventilation, air-conditioning, and lighting power.

BACKGROUND

This documentation submittal is in accordance with the Scope of Work (SOW) for the Nebraska-specific Advanced Commercial Building Energy Code Study (NABEC) dated 10/01/2008 as issued under RFP No. 2780Z1 by the State of Nebraska – Department of Administrative Services (AS) Material Division in support of the Nebraska Energy Office (NEO). The Omaha, Nebraska corporate headquarters office of LEO A DALY - Planning Architecture Engineering Interiors, under Service Contract No. 38617 04 dated 04/14/2009 has prepared this project progress documentation including all underlying engineering analysis related thereto with exceptions as noted.

KEY PROJECT TEAM MEMBERS

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Daniel J. Dellovechio, P.E., Vice President Mechanical Engineering, LEO A DALY, Project Manager – (402) 390-4463

SCOPE OF WORK

The engineering efforts required for this technical study consisted of: preparing whole building energy models of ten representative (prototypical) commercial buildings across three Nebraska climate zones; achieving 30- percent energy reduction when compared to comparable ASHRAE Standard 90.1-2004
Appendix G baseline compliant models; estimating capital costs for systems affecting energy consumption for baseline models conforming to the prescriptive requirements of the 2003 IECC and the proposed models; estimating operating, maintenance, and replacement costs over the 20-year study life for systems affecting energy consumption, and combining data into life cycle cost analyses to determine the economic impact of energy saving measures.

The engineering efforts required for this 100-Percent final submittal, per this technical study’s project Scope of Work (SOW), include documentation related to life cycle cost analyses (LCCA) for study’s ten (10) prototypical commercial building models located within the three Nebraska statewide climate zones (as defined under the current state energy code - IECC 2003) compared to comparable building models employing advanced energy-saving strategies capable of achieving a nominal 30-Percent energy savings improvement over ASHRAE Standard 90.1-2004. The requisite energy models were provided as part of the earlier (35% and 65%) project study milestone submittals. This submittal augments the earlier efforts with the inclusion of the related LCCA documentation, including analysis summary spreadsheets that portray resultant model statistics for energy type consumption, economic, and atmospheric pollution characteristics. If desired, please refer to the report Appendices to view a copy of the complete project SOW.

**Typical Building Definitions**

Whole building energy analyses of the ten (10) prototypical commercial building models were completed using the building descriptions detailed in the project SOW. A brief description of each building type modeled in this study follows:

a) **Large Office Building – 38% WWR** - (60,000 GSF; 3-stories; 100x200-feet; 38-feet high)
b) **Large Office Building – 18% WWR** - (with other model characteristics same as Large Office Building – 38% WWR)
c) **Small Office Building – 38% WWR** - (10,000 GSF; 1-story; 75x133-feet; 14-feet high)
d) **Small Office Building – 18% WWR** - (with other model characteristics same as Small Office Building – 38% WWR)
e) **Small Retail Building - 8% WWR** - (5,000 GSF; 1-story; 40x125-feet; 14-feet high)
f) **Retail Strip Mall** (13,500 GSF; 6-bays including restaurant, auto supply store, medical supply store & three retail shops; 1 story; 75 x 180-feet; 14-feet high).
g) **Large Big Box Retail Building - 2% WWR** (100,000 GSF; 1-story; 250 x 400-feet; 20-feet high) Includes 6,000 SF offices and 14,000 SF storage.
h) **Elementary Education Building – 18% WWR** (50,000 GSF; 1-story; 150 x 333.25-feet; 14-feet high). Includes 20% Gym/Multi-Purpose/Cafeteria and 10% Media Center/Occupancy area.
i) **Secondary Education Building – 18% WWR** (80,000 GSF; 1-story; U-Shaped @ 116.67 x 300-feet overall; 14-feet high). Includes 20% Gym/Lockers/Cafeteria and 10% Library/Media Center/Occupancy area.
j) **Warehouse - 0% WWR** (48,000 GSF; 1-story; 200 x 240-feet; 18-feet high). Includes 400 SF Office/Support area.
As was determined during various project progress meetings and teleconferences, although the study’s SOW included requirements to model the Elementary Education Building, Secondary Education Building, and the Warehouse Building under the 30% better than ASHRAE Std. 90.1-2004 scenarios in concert with the ASHRAE Advanced Energy Guidelines (AEDGs) for those building types, it was discovered (during the 35% project phase) that employing the AEDGs, originally developed/based upon the 1999 edition of ASHRAE Std. 90.1, would result in energy models roughly 30-Percent better than the prescriptive parameters of ASHRAE Std. 90.1-1999, and not the 2004 edition (which is more stringent). Thus study models employing the AEDGs were not pursued.

**COMcheck Compliance**

The study SOW includes a requirement for analyses of building envelope and lighting systems for the Retail Strip Mall and Large Big Box Retail Building under the 30%-BTA energy models using the U.S. Department of Energy’s Building Energy Code Compliance (COMcheck) software program. LEO A DALY earlier confirmed (during the 35% project phase) with representatives of DOE’s Pacific Northwest National Laboratory (PNNL), Mr. Mark Halverson, Senior Research Engineer of DOE’s Energy and Environment Directorate, and Ms. Pamela C. Cole, that COMcheck software, in its current genesis, is incapable of indicating an overall (aggregated) 30-Percent energy improvement for building envelope, lighting and HVAC systems, but rather only component energy percentage improvements over prescriptive code requirements for building envelope and lighting systems, and a pass/fail assessment of HVAC systems. Given this information, NEO concurred with LEO A DALY during the 35% project phase that COMcheck analyses of these parameters would not result in useful information relevant to the 30%-BTA models, and as such, were not pursued further.

**ANALYSIS METHODOLOGY**

The final economic, energy, and environmental results of this study required a long line of steps to be completed. The following sections describe the general methodology, with specific model notes as necessary.

**Zone Definition and Weather**

The first step in the analysis of this study was to create the baseline models pursuant to the requirements set forth in ASHRAE Standard 90.1-2004. Under the requirements of the 2006 IECC and ASHRAE Standard 90.1-2004, the entire state of Nebraska is contained in climate zone 5A. The three cities representing Nebraska climate zones as described under the 2003 International Energy Conservation Code (IECC), include Omaha (zone 13b), Norfolk (zone 14b), and Chadron (zone 15). Table 1 shows the study cities and their respective climate zones.
Representative City | 2003 IECC Climate Zone | 2006 IECC Climate Zone | ASHRAE 90.1-2004 Climate Zone
--- | --- | --- | ---
Chadron | 15 | 5A | 5A
Norfolk | 14b | 5A | 5A
Omaha | 13b | 5A | 5A

Table 1 - Nebraska Climate Zones

Completing the whole building energy simulations required the use of hourly weather data files. In this case, typical meteorological year (TMY2) data was obtained from the U.S. National Renewable Energy Laboratory (NREL). The TMY2 weather files are based upon actual weather data collected between 1961 and 1990 and are intended to represent typical hourly weather patterns for a given location.

Prescriptive Code Requirements

The codes and standards used in this study each contain unique requirements for minimum prescriptive compliance in the areas of envelope, lighting power, and HVAC system efficiency. These minimum requirements varied depending upon the buildings climate zone and window to wall ratio. The baseline models employed the values listed in Table 2, Table 3, and Table 4 as required by location.

<table>
<thead>
<tr>
<th>Component</th>
<th>2003 IECC (15)</th>
<th>2006 IECC (5A)</th>
<th>ASHRAE 90.1-2004 (5A)</th>
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</thead>
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<td>WWR</td>
<td>Minimum</td>
<td>WWR</td>
<td>Minimum</td>
</tr>
<tr>
<td>Wall</td>
<td>0-10</td>
<td>R-13+3 c.i.</td>
<td>All</td>
</tr>
<tr>
<td>10.1-25</td>
<td>R-13+3 c.i.</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>25.1-40</td>
<td>R-13+3 c.i.</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Roof</td>
<td>0-10</td>
<td>R-20 c.i.</td>
<td>All</td>
</tr>
<tr>
<td>10.1-25</td>
<td>R-24 c.i.</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>25.1-40</td>
<td>R-24 c.i.</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Window</td>
<td>0-10</td>
<td>U-0.7 SHGC-any</td>
<td>0-40</td>
</tr>
<tr>
<td>10.1-25</td>
<td>U-0.5 SHGC-0.50</td>
<td>-</td>
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<tr>
<td>25.1-40</td>
<td>U-0.5 SHGC-0.40</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 2 - Chadron Zone Prescriptive Requirements
software models were first adjusted using the U.S. Department of Energy broken aluminum frames. To compensate for frame effects, the glazing values input into the e
Percent visible light transmittance glazing units for the proposed model building cases employ low
Based on a given model’s particular WWR glazing requirement, glass areas are

<table>
<thead>
<tr>
<th>Component</th>
<th>2003 IECC (13b)</th>
<th>2006 IECC (5A)</th>
<th>ASHRAE 90.1-2004 (5A)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>WWR Minimum</td>
<td>WWR Minimum</td>
<td>WWR Minimum</td>
</tr>
<tr>
<td>Wall</td>
<td>0-10 R-13</td>
<td>All R-13+3.8 c.i.</td>
<td>All R-13+3.8 c.i.</td>
</tr>
<tr>
<td></td>
<td>10.1-25 R-13</td>
<td>-</td>
<td>-</td>
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<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Roof</td>
<td>0-10 R-19 c.i.</td>
<td>All R-20 c.i.</td>
<td>All R-15</td>
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<td></td>
<td>10.1-25 R-20 c.i.</td>
<td>-</td>
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<tr>
<td></td>
<td>25.1-40 R-24 c.i.</td>
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<td>-</td>
</tr>
<tr>
<td>Window</td>
<td>0-10 U-any SHGC-any</td>
<td>0-40</td>
<td>0-10 U-0.57 SHGC-0.49</td>
</tr>
<tr>
<td></td>
<td>10.1-25 U-0.5 SHGC-0.50</td>
<td>-</td>
<td>10.1-40 U-0.57 SHGC-0.39</td>
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<td></td>
<td>25.1-40 U-0.5 SHGC-0.40</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 4 - Omaha Zone Prescriptive Requirements

ASHRAE Standard 90.1-2004

Energy models prepared for this study, as related to the 30-Percent better than the 2006 IECC analyses (aka: energy-improved models), employed whole-building modeling criteria as defined in ASHRAE Standard 90.1-2004 (Appendix G). In concurrence with NEO, Appendix G of the standard was employed (without amendments) in the energy models, as it provides guidance on how to prepare comparative analyses of proposed whole-building building energy models that would substantially exceed the minimum basic energy requirements of an ASHRAE Standard 90.1 (baseline) compliant building. The 2006 IECC (Section 501.1) provides a means for code-compliance through whole building computer-based analysis using ASHRAE Standard 90.1-2004 as an acceptable compliance path strategy. Furthermore, prototypical internal building load schedules relating to personnel occupancy, artificial lighting, emergency lighting, receptacle (plug loads), HVAC system, and service (domestic) hot water systems, as listed under the standard’s User’s Manual (2004 Edition) were employed “as is”.

Generally, thermal zoning for each building model followed ASHRAE Standard 90.1-2004 Appendix G methodology for defining models without designed HVAC zones. Perimeter spaces with depths of 15-feet and containing only one exterior orientation were defined as separate thermal blocks. Additionally, interior spaces were assigned as one thermal block, unless otherwise required by the building description. In the case of the more detailed elementary and secondary schools, a generic floor plan was developed to assist in the zoning process.

Fenestration and Solar Control

Based on a given model’s particular WWR glazing requirement, glass areas are uniformly distributed along all four exposed perimeters (Retail Strip Mall being an exception). Unless noted otherwise, glazing units for the proposed model building cases employ low-e insulating glass units having a 64-Percent visible light transmittance (similar to PPG-Solarban 70XL (2) Starphire glass) fitted in thermally-broken aluminum frames. To compensate for frame effects, the glazing values input into the e-QUEST software models were first adjusted using the U.S. Department of Energy - Lawrence Berkeley National
Laboratory’s WINDOW (Version 5.2.17a) software. This allowed the use of fenestration assembly values, as opposed to center of glass values.

Unless noted specifically, study models for both baseline and proposed cases exclude exterior/interior shading devices such as overhangs, fixed or operable vertical (side) fins or interior daylight shelves.

Treatment of Non-regulated Power (Plug) Loads

Although analyzed for their overall contribution to electricity consumption, cooling loads, and heating loads in the prototypical building models, for the purposes of this study, presently non-regulated building user power (plug) loads have been discounted in regard to their contributions toward potential energy savings percentage improvement reductions. Non-regulated plug loads for commercial buildings can typically include appliances, computers, printers, copiers. Incidentally, such is also the case on all federally-funded (non-LEED™ certifiable targeted) energy-improved building projects, as permitted by EPAct 2005 and shown in Equation 1.

\[
\text{% Improvement} = \frac{(\text{Baseline Energy Consumption} - \text{Proposed Energy Consumption})}{(\text{Baseline Energy Consumption} - \text{Receptacle Energy Consumption})}
\]

Equation 1: Method of determining energy reduction compared to baseline

30-Percent Alternative Models

There are numerous combinations of potential energy conservative building component and engineering system improvements that may be developed and modeled to achieve a 30-Percent energy reduction improvement over current code-minimum baseline models. However, the approach utilized for this study focused on limiting the types of approaches to render a degree of consistency between the models to better facilitate comparisons.

Generally the following described upgrades were utilized. Exterior perimeter walls were limited to a common 6-inch stud cavity system to accommodate improved insulation requirements; either an R-30, or in a few instances, R-40 roof insulation was modeled over the baseline requirements; HVAC systems with the aforementioned improved SEER and AFUE ratings were modeled, and in several instances the additional application (where practical) of variable air volume (VAV) and variable speed drive (VFD) fan and pump motor control technology was applied, in addition to heat recovery/reclaim (wheel-based) equipment technology to pre-treat the code-required minimum outdoor (fresh) ventilation air requirements. Where ambient lighting upgrades were applied, T5 fluorescent lamp technology coupled with electronic ballasts were modeled against a baseline T8 lamp scenario.

Intentionally, none of the upgrades related to building envelope, windows, HVAC, or lighting features associated with the energy-improved alternative models included in this study are considered onerous or atypical to today’s construction industry, but rather are those that are often routinely found today in energy-responsible construction (that exceeds the current code-mandated minimum requirements).

Approaches used on each model can be found in the individual model section summaries located in this report.
Commercial Utility Rate Schedules

For the purposes of developing related energy consumption and demand-related costs in the comparative software models, the energy utility provider rate schedules were utilized as shown in Table 5. The Chadron area natural gas provider, Source Gas, has multiple potential natural gas commodity suppliers and thus several potential commodity rates. Nebraska Municipal Power Pool (NMPP) Energy is one of several gas source suppliers to the Public Alliance for Community Energy (ACE). Source Gas is aligned with ACE. ACE rates employed: $0.86/therm - an average of historical data for the past year (June 2008 – May 2009) including $0.71/therm averaged consumption rate plus customer charges.

<table>
<thead>
<tr>
<th>Utility</th>
<th>Omaha</th>
<th>Norfolk</th>
<th>Chadron</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>OPPD Schedule 231</td>
<td>NPPD Schedule GS</td>
<td>NPPD Schedule GS</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>MUD Schedule B</td>
<td>Black Hills Energy Schedule TSS</td>
<td>Source Gas provider average</td>
</tr>
</tbody>
</table>

Table 5 - Utility Rate Schedules by Location

Life Cycle Cost Analyses (LCCA)

The life cycle cost models developed for this study are based on a 20-year life, employing (BLCC Version 5.3-09) life cycle software as provided through the U.S. Department of Commerce's National Institute of Standards, exercising the Federal Energy Management Program (FEMP) model structure analysis approach option. In addition to BLCC LCCA report output documentation contained herein, are analysis summary spreadsheets for each building model comparison portraying select resultant model statistics for building energy consumption type (electricity and natural gas), economic (capital investment and mortgage/bond-related costs), and atmospheric pollution related characteristics.

The life cycle cost analyses (LCCA) employed a 20-year study life within the BLCC software program's Federal Energy Management Program (FEMP) model option. Default (BLCC program) U.S. Department of Energy (DOE) commercial energy sector discount and inflation rates based from the current year (2009) were utilized in the LCCA models as follows:

- Real Discount Rate (excluding general price inflation): 3.0%
- Nominal Discount Rate (including general price inflation): 4.2%
- Implied Long-term Average Rate of Energy Inflation: 1.2%

Capital Investment Cost Estimation

The initial capital investment cost for each baseline (2003 IECC) building model and its comparable alternative improved energy-savings model cost (employing a 30% Energy Savings better than ASHRAE Standard 90.1-2004) was estimated by a professional cost estimator. For this project, LEO A DALY retained as a sub-consultant, the cost estimation firm of Building Cost Consultants, Inc. of Plattsmouth, NE, to provide these services. The capital investment cost data may be found in the Appendices. Only capital investment costs impacting energy consumption as associated with various alternative energy-related building components, systems and equipment were estimated. These include exterior perimeter window glazing, walls, and roof envelopes, HVAC systems, and (as applicable) electric ambient lighting systems.
Preventative (Recurring) and Non-Recurring Maintenance Costs

Integral to the LCCA models are the costs associated with periodic component maintenance and system replacement that must be incurred as a result of the repairable economic lifetime of the component/system expiring within the study’s given 20-year model life. For the purposes of this study, these costs are primarily associated with the various Heating, Ventilating and Air-Conditioning (HVAC) systems and their major components. Examples include packaged rooftop A/C units, DX split-system condensing units, furnaces, refrigeration compressors, boiler maintenance & chemical treatment, variable speed motor drives (VFDs), VAV terminal fans (on fan-powered boxes), as well as fluorescent lighting components such as lamps and ballasts. In response to the various systems modeled as part of this study, LEO A DALY developed the periodic maintenance and component replacement costs and their cycles for use in the LCCA analyses. These costs were sourced/adapted from a variety of resources including the 2008-2009 Whitestone Building Maintenance and Repair Cost Reference (13th Annual Edition as published by Whitestone Research); State of Iowa Department of Natural Resources – 2008 Life Cycle Cost Analysis Guidelines; and dialogs with various (Omaha area) HVAC equipment manufacturer representatives. Certain economic life cycle frequencies were developed and/or modified from the prior-referenced sources as deemed appropriate by LEO A DALY, based on our prior professional experience in the HVAC field.

Mortgage Loan/Bond Rates

For the purposes of evaluating the economic impacts of long-term (20 year) financing on the differing model capital investments as relate to energy-contributing building systems, components and equipment, commercial (non-school) building models presume a presumed 20-year fixed rate mortgage at 6.5%, and the elementary and secondary school building models presume a 20-year tax-exempt bond financing at 4.65%. The following caveats are nonetheless acknowledged.

- Commercial Construction Models (i.e. – non-schools): Commercial projects are subject to economic volatility as well as cyclical fluctuations in borrower credit criteria and bank loan underwriting standards, especially in the unpredictable post-Great Recession financial climate. It should also be noted, that while commercial loans may be amortized over a 20-year period, they generally require refinancing at a ‘balloon’ date, typically about 5 years after issue.

- School District Tax Exempt Bond Issues: financing terms on projects of governmental subdivisions depends on conditions in the overall economy, and the interest rate is a function of bond underwriting credit approvals and attractiveness to investors of the varying tax-exempt status of the bonds

Software Programs

DOE-2 eQUEST Energy Simulation Software

For the purposes of this engineering technical study, each prototypical building type has been modeled using the Quick Energy Simulation Tool (eQUEST) software v3.6 to develop the various energy performance/consumption models. eQUEST serves as the graphical user interface tool for creating detailed energy models in the DOE-2 building description language. Additionally, each software
simulation model includes representative present-day energy costs as derived from commercial building electricity and natural gas utility rate schedules of the utility providers for the various study regions within the State.

BLCC Life Cycle Cost Analysis Software

In order to accomplish the various LCCA analyses, LEO A DALY utilized the results of the foregoing described energy analyses as input for the SOW-required computer-based life cycle cost analysis modeling software, Building Life Cycle Cost (BLCC) Version 5.3-09, as issued through the U.S. Department of Commerce - National Institute of Standards and Technology (NIST) Office of Applied Economics – Building and Fire Research Laboratory.

ASSUMPTIONS & PARAMETERS

HVAC Systems

HVAC system cooling equipment associated with the energy-improved models employ EnergySTAR-compliant or better SEER ratings, generally as based on Tier 1 commercially-available off-the-shelf (COTS) equipment as locatable on the Consortium For Energy Efficiency's (CEE) High Efficiency Commercial Air Conditioning and Heat Pump Initiatives program website. Likewise, when commercially-available, the energy-improved models employ gas-fired heating equipment with condensing efficiencies of at least 90-Percent AFUE.

For HVAC equipment included under the 30%-BTA (energy-improved) models, commercial off-the-shelf (COTS) high-efficiency HVAC equipment energy efficiency ratings (EERs) tabulated (as of January 2009) under the Consortium For Energy Efficiency - Commercial Air Conditioning and Heat Pump Initiative (HECAC) website (http://www.cee1.org) was employed. The CEE Tier 1 rating category schedules, representing a larger equipment source availability pool and less-costly improved efficiency, were utilized in the study. Tabulated commercial equipment manufacturer products included on the CEE website are considered improved quality over basic code-minimum compliant equipment.

EPAct 2005 (Section 433.4 – Energy Efficiency Performance Standard)

The U.S. Energy Policy Act of 2005 (EPAct 2005) describes how the U.S. federal government defines a “30-Percent Energy Savings” that varies from ASHRAE Standard 90.1 in that it permits the exclusion of non-regulated plug loads (eg. – receptacle loads such as computers, printers, copiers, electronic devices, etc.) from a compliance analysis. With NEO concurrence that internal plug loads are non-regulated from a code standpoint, such could be discounted in the 30-Percent better than ASHRAE Std. 90.1-2004 (30%-BTA) energy-improved models prepared for the purposes of this study, at least for the purposes of showing an energy savings (as these loads would be consistent in both baseline and improved energy model simulations). Nonetheless, energy costs associated with prototypical plug loads have been included in all energy simulation models. It should be noted that the inclusion of plug loads in comparative energy model studies (from an energy consumption standpoint) results in the requirement for substantially increased energy reduction measures (and thus capital costs to implement same) in order to achieve target percentage energy savings.
RESULTS / CONCLUSIONS

Large Office 38-Percent WWR

The first model completed in the study exhibited decent economic returns in the effort to achieve energy reduction. The high window-to-wall ratio naturally led investigators to utilize an improved fenestration system, with significant savings from that feature alone.

The other improvements over the baseline model both concerned the HVAC system. First, the large office employed a packaged, direct expansion, variable air volume (VAV) system with variable speed drives (VSD) on the main ventilation fans. This feature allowed the fans, a major consumer of energy, to throttle back during periods of low building demand. To gain the remaining savings necessary to achieve the 30-percent energy reduction threshold, the HVAC systems were modeled following CEE Tier 1 efficiency criteria. In contrast, the baseline building was modeled with a constant air volume (CAV) HVAC system, per ASHRAE Std. 90.1-2004 Appendix G.

The large office models were used as test platforms to examine the effectiveness of other different energy savings strategies thru individual parametric energy sub-modeling tests, both independently and in combination with other energy savings measures. The results of this process can be seen in the “Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case” bar charts for each location, found in the study’s archived data files available from NEO. Other building models used this concept in the development of a 30-percent energy-improved alternative model, but did not explicitly record each individual strategy as part of the earlier project phase (printed) submittal documentation.

Large Office 18-Percent WWR

This large office model description is identical to the previous large office model, except for the reduced amount of fenestration. Smaller window areas caused all the large office 18-percent WWR models to consume less energy than their 38-percent fenestration counterparts. However, the smaller glass area provided less opportunity to save energy by solely upgrading the window assembly. Therefore, the 18-percent model incorporated an upgraded roof with R-30 insulation in addition to the VAV system with VSD, CEE Tier 1 efficiencies, and the improved fenestration found with the 38-percent WWR model.

It should be noted that the 30-percent energy-improved alternative models for both the Omaha and Norfolk locations show the same total energy consumption on the analysis summary sheets. This is not an error, as the individual end-use consumption differs for each model and through data numerical rounding, happens to sum to the same total value.

Another item of note is the comparison of energy consumption between the 38-percent WWR and 18-percent WWR versions of the large office. The model with less fenestration consumed significantly less total energy than the model with the high glazing ratio. When compared with the 38-percent WWR model, the 18-percent WWR office required incorporating additional energy savings measures and a greater capital expenditure, as a percent increase over the 2003 IECC base case, to achieve the 30-percent reduction target.
Small Office 38-Percent WWR

The small office models retain the same basic rectangular footprint and space use as the large office models. However, the small office is only a single-story building, magnifying the importance of the wall and roof insulation relative to energy consumption. A high efficiency HVAC system with heat recovery, reduced lighting power consumption, significantly improved wall and roof insulation, and high performance glazing were all employed to achieve the 30-percent savings over the baseline model.

Despite achieving 30-percent energy consumption reductions and associated energy cost savings, none of the 38-percent WWR small office models were able to demonstrate a positive NPV over the study’s 20-year life cycle.

Small Office 18-Percent WWR

The 18-percent WWR version of the small office was very similar to the 38-percent WWR model in both description and use of strategies to achieve a 30-percent energy consumption reduction. The sole difference was the model-basis glass type with slightly higher thermal conductivities and SHGC. The 18-percent WWR small office model resulted in poorer economic performance than the small office 38-percent WWR model.

As with the large office models, the overall energy consumption for the 18-percent WWR small office was less than the 38-percent WWR version. Unlike the large office models, the 38-percent WWR small office required a higher initial capital expenditure, as a percent increase over the 2003 IECC baseline, than the 18-percent WWR version. This limited comparison demonstrates the intuitive, that all else being equal, buildings with lower ratios of fenestration will consume less energy than otherwise identical buildings with high fenestration ratios. However, it should be noted that the difficulty in achieving a 30-percent energy savings does not necessarily correlate solely with glazing ratio, but rather also depends upon many facets of the building characteristics including: building proportions, internal volume to envelope ratio, building function, and the energy savings strategies employed.

Small Retail

The small retail model carried the least amount of floor area in this study and had a high ratio of building exterior envelope to internal volume. Much like the small office models, this high ratio placed emphasis on improving the wall and roof insulation in order to achieve 30-percent energy savings over the baseline. Improvements to the solar performance of this model’s windows were also included, however this component contributed minimally to the overall savings because of the small window-to-wall ratio. In addition to the envelope upgrades, high efficiency HVAC systems were incorporated into the model.

The Small Retail model exhibited the best economic results in the study, with each model showing positive NPV, and a SIR value greater than 2.0. Key to this is that the system components and sizes used in the proposed and baseline models are very similar; causing the differences in maintenance and replacement costs to be small.
Retail Strip Mall

The retail strip mall model housed a variety of space uses within each bay, including general retail, supply stores, and a restaurant. The inclusion of a restaurant created a unique situation requiring the inclusion of a make-up air ventilation system to augment kitchen hood-related exhaust air.

Strategies incorporated into the 30-percent energy-improved alternative model included: improved wall rigid insulation, high performance glazing with external shading, and high efficiency HVAC equipment augmented with heat recovery. A large portion of the energy savings for this model was accomplished by reducing the heating energy associated with ventilation through the use of a heat recovery wheel.

Despite the challenges presented by this unique case, the Retail Strip Mall model achieved favorable economic returns, second only to the Small Retail building.

Big Box Retail

The large big box retail model contained the largest floor area of any building in this study. The baseline model reported a particularly high energy consumption to heat the building. Therefore, a focus of this model was recovering energy from air streams using a total energy wheel (ERV). Though the model showed increased fan energy, the combination of ERV, high efficiency HVAC cooling equipment, increased wall and roof insulation, insulated dock doors, and improved windows, resulted in energy savings very near the 30-percent level for the Omaha model.

This model had the unique economic result of an instant payback that was never negated during the 20-year study life. Its ASHRAE Standard 90.1-2004 baseline model was mandated to use a packaged DX VAV system with hot water reheat. The initial cost of this system resulted in a higher baseline capital cost than the alternative energy-improved building model. The resultant capital savings, coupled with the yearly energy cost savings, was enough to offset the increased OM&R and replacement costs for the proposed system.

Elementary School

While the elementary school baseline and proposed models’ HVAC systems are both packaged single zone heat pumps, there is a significant first cost premium for the proposed system to incorporate energy recovery provisions associated with the zone heat pumps, in addition to a slight increase in roof insulation to achieve 30-percent energy savings. The elementary school model yielded a moderate payback period for two of the three Nebraska climate zones, falling just within the life cycle time-frame. The Chadron model did not realize as much energy cost savings from the addition of the energy recovery provisions due to the 2003 IECC requirements for a more insulated baseline envelope.
Secondary School

The secondary school exhibited the poorest economic performance of all study models. A number of elements contributed to this result including the building footprint, the SOW proposed HVAC system, OM&R costs. The shape of the school necessitated the use of a relatively high number of thermal zones to satisfy the requirements of zoning set forth in ASHRAE Standard 90.1-2004.

In this case, the proposed building was modeled with rooftop air-to-air heat pumps, while the baseline building, per ASHRAE 90.1-2004, was modeled as a variable air volume system with parallel fan powered boxes. While the capital costs for the 30-percent (energy-improved) alternative building were slightly lower than the baseline system and the model saved annual energy costs, the 20-year life cycle showed significantly higher expenditures to maintain and replace components of the proposed heat pump system.

Although not modeled under the requirements for this study, it is believed through prior LEO A DALY client experience with school district projects within Nebraska and surrounding states, that were alternative HVAC systems employing vertical bore ground-source geothermal heat pumps deemed as a viable choice, such approaches often yield improved investment returns and payback periods well under 10 years.

Warehouse

The warehouse was described as a largely unoccupied storage area with a small occupied perimeter support office zone. After discussions with the Nebraska Energy Office, both the baseline and proposed warehouse models deviated from ASHRAE Standard 90.1-2004 by incorporating more-typical heating-only HVAC systems to serve the main warehouse storage areas, as opposed to systems also capable of cooling. It was determined that even though ASHRAE Standard 90.1-2004 requires that a cooling system be modeled, doing so would deviate from the intent of this study and not produce realistic and useful results relevant to the majority of warehouses typically constructed in Nebraska.

The majority of energy savings in this building model came from a reduction of the envelope load through increased wall and roof insulation. Like many of the other study buildings with gas-fired heating equipment, a 90% AFUE efficient furnace was also utilized in the proposed model. The cooling efficiency of the DX split system AC serving the office space was also improved, however the energy savings percentage from this latter feature was much smaller than for the other buildings in this study, again due to the office area being only a very small portion of the total building area that was cooled.

Statewide

Generally, the 30-percent energy-improved models performed best in the Omaha representative climate zone region, but showed less attractive economic paybacks in the Norfolk and Chadron regions. A likely cause of this result is the reduction of insulation requirements from the 2003 IECC to the 2006 IECC/ASHRAE Std. 90.1-2004 minimum requirements. As shown in Table 6, approximately one-third of the models showed better energy performance under the 2003 IECC than the newer code.
Selected summary data from the (DOE-2 eQUEST) energy software models, and various salient economic and atmospheric emission statistics for each building model, has been consolidated in the Analysis Summary spreadsheets which may be found under the Executive Summary section of this report.

### Economic Impacts

In general, the results of the study’s LCCA economic analyses appear to mixed, with certain building models reflecting positive net present values and varying accompanying payback periods in favor of the
30-Percent energy improved alternative models, whereas other building models do not reflect a beneficial economic net present worth or payback, in spite of often appreciable annual energy cost savings, and in some instances, lower initial capital outlays related to the 30-Percent energy-improved alternative-related investment costs. It appears that in most cases whereby no payback is achieved with the 30-Percent energy-improved alternative models, the primary reason is believed to be attributable to the magnitude of the periodic non-recurring system and/or major component replacement costs primarily attributable to HVAC-related equipment, as such must occur within the study’s 20-year model life due to the inherent limits on maintainable life.

An abbreviated summary of the life cycle cost analyses results follows:

<table>
<thead>
<tr>
<th>Building Model Description</th>
<th>Climate Zone</th>
<th>Payback (Yr)</th>
<th>SIR</th>
<th>AIRR [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Simple</td>
<td>Discounted</td>
<td></td>
</tr>
<tr>
<td>Large Office Building – 38% WWR</td>
<td>Omaha</td>
<td>Yes (14)</td>
<td>Yes (16)</td>
<td>1.83</td>
</tr>
<tr>
<td></td>
<td>Norfolk</td>
<td>Yes (13)</td>
<td>Yes (16)</td>
<td>2.12</td>
</tr>
<tr>
<td></td>
<td>Chadron</td>
<td>Yes (13)</td>
<td>Yes (15)</td>
<td>2.19</td>
</tr>
<tr>
<td>Large Office Building – 18% WWR</td>
<td>Omaha</td>
<td>Yes (16)</td>
<td>Yes (16)</td>
<td>1.41</td>
</tr>
<tr>
<td></td>
<td>Norfolk</td>
<td>Yes (16)</td>
<td>Yes (18)</td>
<td>1.27</td>
</tr>
<tr>
<td></td>
<td>Chadron</td>
<td>Yes (16)</td>
<td>Yes (20)</td>
<td>1.16</td>
</tr>
<tr>
<td>Small Office Building – 38% WWR</td>
<td>Omaha</td>
<td>Yes (20)</td>
<td>No</td>
<td>0.94</td>
</tr>
<tr>
<td></td>
<td>Norfolk</td>
<td>Yes (20)</td>
<td>No</td>
<td>0.87</td>
</tr>
<tr>
<td></td>
<td>Chadron</td>
<td>Yes (20)</td>
<td>No</td>
<td>0.99</td>
</tr>
<tr>
<td>Small Office Building – 18% WWR</td>
<td>Omaha</td>
<td>Yes (20)</td>
<td>No</td>
<td>0.72</td>
</tr>
<tr>
<td></td>
<td>Norfolk</td>
<td>Yes (20)</td>
<td>No</td>
<td>0.71</td>
</tr>
<tr>
<td></td>
<td>Chadron</td>
<td>Yes (20)</td>
<td>No</td>
<td>0.70</td>
</tr>
<tr>
<td>Small Retail Building</td>
<td>Omaha</td>
<td>Yes (8)</td>
<td>Yes (9)</td>
<td>2.91</td>
</tr>
<tr>
<td></td>
<td>Norfolk</td>
<td>Yes (9)</td>
<td>Yes (10)</td>
<td>2.69</td>
</tr>
<tr>
<td></td>
<td>Chadron</td>
<td>Yes (11)</td>
<td>Yes (11)</td>
<td>2.13</td>
</tr>
<tr>
<td>Retail Strip Mall</td>
<td>Omaha</td>
<td>Yes (8)</td>
<td>Yes (9)</td>
<td>2.59</td>
</tr>
<tr>
<td></td>
<td>Norfolk</td>
<td>Yes (11)</td>
<td>Yes (16)</td>
<td>1.55</td>
</tr>
<tr>
<td></td>
<td>Chadron</td>
<td>Yes (15)</td>
<td>Yes (16)</td>
<td>1.41</td>
</tr>
<tr>
<td>Large Big Box Retail</td>
<td>Omaha</td>
<td>Yes (Immediate)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Norfolk</td>
<td>Yes (Immediate)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Chadron</td>
<td>Yes (Immediate)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Elementary Education Building</td>
<td>Omaha</td>
<td>Yes (20)</td>
<td>Yes (20)</td>
<td>1.02</td>
</tr>
<tr>
<td></td>
<td>Norfolk</td>
<td>Yes (20)</td>
<td>No</td>
<td>0.55</td>
</tr>
<tr>
<td></td>
<td>Chadron</td>
<td>No</td>
<td>No</td>
<td>0.08</td>
</tr>
<tr>
<td>Secondary Education Building</td>
<td>Omaha</td>
<td>No</td>
<td>No</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Norfolk</td>
<td>No</td>
<td>No</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Chadron</td>
<td>No</td>
<td>No</td>
<td>-</td>
</tr>
<tr>
<td>Warehouse</td>
<td>Omaha</td>
<td>Yes (20)</td>
<td>No</td>
<td>0.56</td>
</tr>
<tr>
<td></td>
<td>Norfolk</td>
<td>Yes (20)</td>
<td>No</td>
<td>0.63</td>
</tr>
<tr>
<td></td>
<td>Chadron</td>
<td>Yes (20)</td>
<td>No</td>
<td>0.55</td>
</tr>
</tbody>
</table>

Table 7 - Life Cycle Cost Analyses Results Summary
Statewide Impacts / Annual Construction Starts

For the purposes of assessing overall Nebraska statewide impacts relevant to the adoption of an Advanced Energy Code, annual construction starts by building type was utilized as follows, based on data sourced by the Nebraska Energy Office.

Historical construction data shows an average of 1,249 commercial buildings are constructed in Nebraska annually, involving an average 25,528 square feet per building. Located throughout the state, these buildings may or may not be located within a local code jurisdiction that presently categorizes data regarding the construction building type. Additionally, there are no statewide reporting standards, uniform or otherwise, for local code jurisdictions that presently track building construction type data.

To determine the appropriate number of building types and locations for use in this study as related to addressing cumulative statewide economic and energy analysis statistics, the Nebraska Energy Office:

- collected building type data as compiled from four of the state’s largest code jurisdictions – Omaha, Lincoln, Hastings and North Platte;
- analyzed the building type data collected from each of these jurisdictions and determined which of the modeled building types correlated to the building types indicated in the data;
- extrapolated by population the building type and number data from these communities to the state’s 40 most-populous communities;
- determined the location and State Energy Code Building Climate Zone of each of the 40 communities;
- analyzed the collected building type data to determine the number of not modeled building types indicated on the community building data (eg. hospitals, laboratories, computer centers, churches, theatres, industrial buildings, hotels, other, etc…)
- extrapolated the not modeled building type and number data from the 40 communities;
- compared the actual and extrapolated building construction numbers to the available historic construction data and ascribed the additional historic construction numbers to the communities within Nebraska that are not among the 40 most-populous communities (10.4% or 130 commercial building structures);

Thus, given the above, for the purposes of this study, the cumulative statewide energy consumption, energy cost savings, incremental (delta) construction cost, and environmental emissions impacts for modeled building types constructed in Nebraska were then determined by utilizing building type model energy consumption results developed as part of the (DOE-2 eQUEST) energy modeling software analyses within the appropriate Nebraska State Energy Code Building Climate Zone, and applying this information to the model’s corresponding (BLCC) LCCA analysis, in turn multiplied by the total number of buildings, per building type and climate zone, as listed in Table 8 below.

Note that building types not modeled in this study (i.e. hospitals, churches, theatres, industrial buildings, hotels) are not included in the annual construction start data. Furthermore, the ten building types represented by this study account for 903 of the 1249 historical commercial building construction starts.
Study-Modeled Commercial Building Annual Construction Starts

<table>
<thead>
<tr>
<th>Building Type</th>
<th>Zone 13</th>
<th>Zone 14</th>
<th>Zone 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Office Building</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38% Window-to-Wall Ratio</td>
<td>10 + 1 = 11</td>
<td>1 + 0 = 1</td>
<td>0 + 0 = 0</td>
</tr>
<tr>
<td>Large Office Building</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18% Window-to-Wall Ratio</td>
<td>10 + 1 = 11</td>
<td>1 + 0 = 1</td>
<td>1 + 0 = 1</td>
</tr>
<tr>
<td>Small Office Building</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38% Window-to-Wall Ratio</td>
<td>31 + 3 = 34</td>
<td>2 + 0 = 2</td>
<td>0 + 0 = 0</td>
</tr>
<tr>
<td>Small Office Building</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18% Window-to-Wall Ratio</td>
<td>62 + 7 = 69</td>
<td>4 + 1 = 5</td>
<td>1 + 0 = 1</td>
</tr>
<tr>
<td>Small Retail Building</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>310 + 36 = 346</td>
<td>21 + 2 = 22</td>
<td>4 + 1 = 5</td>
<td></td>
</tr>
<tr>
<td>Big Box Retail</td>
<td>133 + 16 = 149</td>
<td>9 + 1 = 10</td>
<td>1 + 0 = 1</td>
</tr>
<tr>
<td>Elementary Schools</td>
<td>88 + 10 = 98</td>
<td>6 + 1 = 7</td>
<td>1 + 0 = 1</td>
</tr>
<tr>
<td>Secondary Schools</td>
<td>40 + 5 = 45</td>
<td>3 + 0 = 3</td>
<td>1 + 0 = 1</td>
</tr>
<tr>
<td>Warehouse</td>
<td>20 + 2 = 22</td>
<td>1 + 1 = 2</td>
<td>1 + 0 = 1</td>
</tr>
<tr>
<td>Warehouse</td>
<td>44 + 5 = 49</td>
<td>3 + 1 = 4</td>
<td>1 + 0 = 1</td>
</tr>
</tbody>
</table>

Table 8 - Annual Commercial Building Construction Starts by Zone

Note: The first number in each category indicates the estimated number of buildings, per modeled building type, constructed in the top 40 most-populous communities in Nebraska. The second number indicates the estimated number of buildings, per modeled building type, constructed outside of Nebraska’s 40 most-populous communities.

As seen in Table 8, over 92-percent of construction starts are located in the greater Omaha-metro representative climate region, including the Lincoln-Omaha interstate corridor. Therefore, aggregate statewide impacts are heavily weighted towards the Omaha results.

Energy Impacts

This study clearly demonstrates that significant statewide reduction in future energy consumption could be achieved with the adoption of an Advanced Energy Code. An estimated accumulated 20-year energy savings of 108,738,240 MMBtu would result by the construction of 30-percent (energy-improved) alternative buildings when compared to their current code-minimum compliant counterparts. Table 9 below shows the 20-year cumulative energy savings for a single average building in each of the zones. Also shown is the statewide cumulative energy savings for all such commercial buildings potentially constructed and operated during the 20-year study period.
Environmental Impacts

A focus of the environmental impact assessment of this study was the reduction in carbon dioxide emissions, a detrimental atmospheric greenhouse gas, and other environmental pollutants created as by-products of energy production. Emissions are produced when fuels are combusted at off-site power plants producing electricity and by on-site heaters and furnaces producing heating energy. A reduction in the four major pollutants would be achieved by reducing commercial building demand for electricity and natural gas. Carbon dioxide, nitrogen oxides, sulfur dioxide, and mercury 20-year accumulated potential savings associated with the adoption of a statewide improved energy code are summarized in Table 10.

<table>
<thead>
<tr>
<th>Emission</th>
<th>Location Average Single Building</th>
<th>All Building Starts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Omaha</td>
<td>Norfolk</td>
</tr>
<tr>
<td>Carbon Dioxide (CO$_2$) [lbs.]</td>
<td>2,074,725</td>
<td>1,745,949</td>
</tr>
<tr>
<td>Nitrogen Oxides (NO$_x$) [lbs.]</td>
<td>2,785</td>
<td>2,914</td>
</tr>
<tr>
<td>Sulfur Dioxide (SO$_2$) [lbs.]</td>
<td>11,114</td>
<td>10,566</td>
</tr>
<tr>
<td>Mercury (Hg) [mg]</td>
<td>8,804</td>
<td>4,216</td>
</tr>
</tbody>
</table>

Table 10 – 20-Year Cumulative Emissions Reductions

The Large Big Box Retail models demonstrated a counterintuitive increase in most emissions, despite a 30-percent reduction in energy consumption. This model achieved significant heating savings, drastically reducing its use of natural gas. However, requirements for increased fan power resulted in increased electricity consumption, driving up the overall associated carbon dioxide, nitrogen oxides, and mercury emissions compared to baseline model emissions.
Recommendations

The results of the study’s energy modeling phases indicate that the differences in typical commercial building energy consumption between the 2003 IECC, Nebraska’s currently-adopted energy code, and the 2006 IECC edition are generally marginal, and not significant enough to warrant adoption of the 2006 IECC code edition at this juncture. Of the 30 total building models evaluated (10 prototypes, each at the 3 climate zones):

- 21 models resulted in having either net negative energy savings (ie. – increased energy consumption) or up to a 1-Percent improvement at best
- 3 models yielded energy improvements between 1 and 3-Percent
- 6 models showed energy improvement gains of greater than 3-Percent.

Of this latter group, Small Retail Facilities (statewide) carried the best potential for improved energy reduction, followed by Large Offices-18% WWR, Large Big Box Retail facilities, Secondary Schools and Elementary Schools, all in the Omaha climate zone. The tabulated results are listed in Table 6, page 14.

Generally, the 2003 IECC models located in Chadron performed better than the 2006 IECC models in the same zone. This is likely due to the 2006 IECC simplification of the climate zone definitions from the 2003 IECC edition. Three climate zones, 13b (Omaha), 14b (Norfolk), and 15 (Chadron) existed under the 2003 IECC, each with a unique set of prescriptive requirements. Depending upon the building window to wall ratio, the 2003 IECC also had unique prescriptive requirements for roof and wall insulation as subsets of each climate zone requirements. In the 2006 IECC and ASHRAE Standard 90.1-2004, Nebraska was redefined as one homogenous climate zone.

Conversely, this study clearly demonstrates that the State of Nebraska would positively benefit from the promulgation of a Nebraska-specific Statewide Advanced Energy Code based on a requirement for all new commercial building construction to achieve a minimum 30-percent energy savings improvement over comparable ASHRAE Standard 90.1-2004 compliant baseline buildings. The demonstrated benefits include:

- Economic – The amortization of increased capital investment outlays associated with new building construction constructed in compliance with an Advanced Energy Code may generally be more than offset through commensurate reductions in operating energy cost outlays over the building’s life. Using average 2009 R.S. MEANS Cost Guide unit construction costs for the modeled buildings, and given the study-presumed construction starts by building type per climate zone, the Nebraska statewide impact on additional capital construction costs employing an Advanced Energy Code slightly exceeds $43 Million annually on an estimated $3.36 Billion in statewide construction, or approximately a 1.28-Percent average increase in construction cost per building. Individual building models represent construction cost variations from as low as nearly a 1.4-Percent cost savings in construction for Large Big Box Retail facilities, to as high as 7.6-Percent added average construction cost for Retail Strip Malls to obtain the 30-Percent targeted energy savings over ASHRAE Standard 90.1-2004.
• **Reduced Energy Consumption** – The statewide annual energy savings (refer to Table 9, Page 18) are approximately $6.3 Million annually, which translates into tangential benefits for the public utility services being afforded opportunities to delay having to implement (build) larger or add additional generating capacity and the associated interstate energy transmission/delivery infrastructure to support new commercial building construction.

• **Positive Environmental Impacts** – The demonstrated reductions in such pollutants resulting from the implementation of an Advanced Energy Code for Nebraska can be related to other studies sponsored by various U.S. Federal Government Agencies such as the Environmental Protection Agency linking increases in the evaluated pollutants as hazardous to individual health, the earth’s atmosphere (ozone layer degradation), and land, lakes and waterway resources. Reducing the additional amounts of these pollutants associated with new construction is beneficial to both the State of Nebraska and the world at-large. Initiatives favoring environmental pollution reduction are not only currently deemed ‘politically correct’ by an ever-growing percentage of the population, but are also deemed as good stewardship considerate of future generations by many others.

Additionally, although not modeled as part of this study, it can be readily deduced that by including requirements within such an Advanced Energy Code for applicability to substantial (area) additions and major renovations of existing commercial buildings, similar benefits would accrue to the State.

Respectfully Submitted,
LEO A DALY – Planning-Architecture-Engineering-Interiors

Daniel J. Dellovechio, PE, LEED® AP
Vice President, Mechanical Engineer
Project Manager
<table>
<thead>
<tr>
<th>Component</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Envelope</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Wall Assembly</td>
<td>Same as baseline</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gross Area: 21600 sf</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Net Area: 13392 sf</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roof Assembly</td>
<td>Same as baseline</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gross Area: 20000 sf</td>
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<tr>
<td>Window Assembly</td>
<td>Solarban 70XL Starphire w/ thermally broken aluminum frame: U-0.42; SHGC-0.27; VLT-0.543 Gross Area: 8208 sf</td>
<td></td>
<td>Generic glazing: U-0.47; SHGC-0.39</td>
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<tr>
<td><strong>Interior Loads</strong></td>
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<tr>
<td>Lighting</td>
<td>Same as baseline</td>
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<tr>
<td>Daylighting Controls</td>
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<td><strong>HVAC Systems</strong></td>
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<td></td>
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<tr>
<td>System 1</td>
<td>Packaged VAV w/ Elec Reheat System fans with VSD</td>
<td>Packaged Single Zone Rooftop Units</td>
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<td>Cooling Cap [kBtu/h] (tons)</td>
<td>581.254 (48.4)</td>
<td>127.163 (10.6)</td>
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<td>10.1 EER</td>
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<tr>
<td>Design Airflow [cfm]</td>
<td>15815</td>
<td>4327</td>
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<tr>
<td>Fan Demand [kW]</td>
<td>15.545</td>
<td>3.223</td>
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<td>TSP [in. w.g.]</td>
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<td>3.5</td>
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<tr>
<td>Economizer</td>
<td>None</td>
<td>Yes, drybulb control</td>
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<tr>
<td>Heat recovery</td>
<td>None</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Associated VAV Boxes</td>
<td>1@ 3393 cfm, 140.92 kBtu/h Heating</td>
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</tr>
<tr>
<td></td>
<td>1@ 1604 cfm, 66.61 kBtu/h Heating</td>
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<tr>
<td></td>
<td>1@ 2056 cfm, 85.40 kBtu/h Heating</td>
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<tr>
<td></td>
<td>1@1646 cfm, 34.19 kBtu/h Heating</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>1@ 7116 cfm, 295.60 kBtu/h Heating</td>
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<tr>
<td><strong>System 2</strong></td>
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<td></td>
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<tr>
<td>Cooling Cap [kBtu/h] (tons)</td>
<td>631.169 (52.6)</td>
<td>62.961 (5.2)</td>
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</table>
## Nebraska Energy Code Study – 30% Alternative Model Changes

### Large Office 38% WWR – Omaha, NE

<table>
<thead>
<tr>
<th>Component</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling Efficiency</td>
<td>10.7 EER</td>
<td>12 SEER</td>
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<td>2047</td>
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<tr>
<td>Fan Demand [kW]</td>
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<td>1.574</td>
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<td>TSP [in. w.g.]</td>
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<td>3.6</td>
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<tr>
<td>Economizer</td>
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<td>Yes, drybulb control</td>
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</tr>
<tr>
<td>Heat recovery</td>
<td>None</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Associated VAV Boxes</td>
<td>1@ 4127 cfm, 171.44 kBtu/h Heating</td>
<td>N/A</td>
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</tr>
<tr>
<td></td>
<td>1@ 1904 cfm, 79.08 kBtu/h Heating</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1@ 2390 cfm, 99.28 kBtu/h Heating</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1@1827 cfm, 75.89 kBtu/h Heating</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1@ 7116 cfm, 295.60 kBtu/h Heating</td>
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**System 3**

<table>
<thead>
<tr>
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<th>EL1 Sys1 PVAVS (T)</th>
<th>EL1 Sys1 PSV (G.N3)</th>
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<tr>
<td>Cooling Cap [kBtu/h]</td>
<td>681.777 (56.8)</td>
<td>81.742 (6.8)</td>
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<tr>
<td>(tons)</td>
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<tr>
<td>Cooling Efficiency</td>
<td>10.7 EER</td>
<td>10.1 EER</td>
</tr>
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<td>Heating Cap [kBtu/h]</td>
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<td>None</td>
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<tr>
<td>Associated VAV Boxes</td>
<td>1@ 4127 cfm, 171.44 kBtu/h Heating</td>
<td>N/A</td>
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<tr>
<td></td>
<td>1@ 1904 cfm, 79.08 kBtu/h Heating</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1@ 2390 cfm, 99.28 kBtu/h Heating</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1@1827 cfm, 75.89 kBtu/h Heating</td>
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<td></td>
<td>1@ 7116 cfm, 295.60 kBtu/h Heating</td>
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**System 4**

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<tr>
<th>Component</th>
<th>EL1 Sys1 PSV (G.W4)</th>
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<tbody>
<tr>
<td>Cooling Cap [kBtu/h]</td>
<td>63.099 (5.3)</td>
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<td>(tons)</td>
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<tr>
<td>Cooling Efficiency</td>
<td>12.0 SEER</td>
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<tr>
<td>Heating Cap [kBtu/h]</td>
<td>114.010</td>
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<td>Component</td>
<td>Alternative Building</td>
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<td>----------------------------</td>
<td>---------------------------------------------------------------------------------------</td>
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<tr>
<td>Heating Efficiency</td>
<td>80% AFUE</td>
</tr>
<tr>
<td>Design Airflow [cfm]</td>
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<tr>
<td>Fan Demand [kW]</td>
<td>1.584</td>
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<tr>
<td>Heat recovery</td>
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**System 5**

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<tbody>
<tr>
<td>Cooling Cap [kBtu/h]</td>
<td>258.550 (21.5)</td>
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<tr>
<td>(tons)</td>
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<tr>
<td>Cooling Efficiency</td>
<td>9.3 EER</td>
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</tr>
<tr>
<td>Heating Cap [kBtu/h]</td>
<td>455.112</td>
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<tr>
<td>Heating Efficiency</td>
<td>80% AFUE</td>
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<tr>
<td>Design Airflow [cfm]</td>
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<tr>
<td>Fan Demand [kW]</td>
<td>5.197</td>
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<tr>
<td>TSP [in. w.g.]</td>
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**System 6**

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<td>Cooling Cap [kBtu/h]</td>
<td>158.344 (13.2)</td>
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<td>(tons)</td>
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<td>Heating Cap [kBtu/h]</td>
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<td>Heat recovery</td>
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**System 7**

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<tr>
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<tr>
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**System 8**

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<tr>
<th>Component</th>
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<td>System 8</td>
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**System 9**

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<td>System 9</td>
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**System 10**

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<td>Heating Cap [kBtu/h]</td>
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<td>Heating Efficiency</td>
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**System 15**

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### Nebraska Energy Code Study – 30% Alternative Model Changes

#### Large Office 38% WWR – Norfolk, NE

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**System 5**

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**System 7**

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**System 8**

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**System 9**

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**System 10**

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| **System 12** | **EL1 Sys1 PSV (T.E22)** |       |
| Cooling Cap [kBtu/h] (tons) | 77.714 (6.5) |       |
| Cooling Efficiency | 10.1 EER |       |
| Heating Cap [kBtu/h] | 144.801 |       |
| Heating Efficiency | 80% AFUE |       |
| Design Airflow [cfm] | 2543 |       |
| Fan Demand [kW] | 1.903 |       |
| TSP [in. w.g.] | 3.6 |       |
| Economizer | Yes, drybulb control |       |
| Heat recovery | None |       |
| Associated VAV Boxes | N/A |       |

| **System 13** | **EL1 Sys1 PSV (T.N23)** |       |
| Cooling Cap [kBtu/h] (tons) | 93.509 (7.8) |       |
| Cooling Efficiency | 10.1 EER |       |
| Heating Cap [kBtu/h] | 182.517 |       |
| Heating Efficiency | 80% AFUE |       |
| Design Airflow [cfm] | 2693 |       |
| Fan Demand [kW] | 2.007 |       |
| TSP [in. w.g.] | 3.6 |       |
| Economizer | Yes, drybulb control |       |
| Heat recovery | None |       |
| Associated VAV Boxes | N/A |       |

<p>| <strong>System 14</strong> | <strong>EL1 Sys1 PSV (T.W24)</strong> |       |
| Cooling Cap [kBtu/h] (tons) | 73.453 (6.1) |       |
| Cooling Efficiency | 10.1 EER |       |</p>
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<td><strong>System 15</strong></td>
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### Nebraska Energy Code Study – 30% Alternative Model Changes

**Large Office 38% WWR – Chadron, NE**

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<td>Roof Assembly</td>
<td>Same as baseline Gross Area: 20000 sf</td>
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<td>Window Assembly</td>
<td>Solarban 70XL Starphire w/ thermally broken aluminum frame: U-0.42; SHGC-0.27; VLT-0.543 Gross Area: 8208 sf</td>
<td>Generic glazing: U-0.47; SHGC-0.39</td>
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<td>1@ 3393 cfm, 140.92 kBtu/h Heating 1@ 1604 cfm, 66.61 kBtu/h Heating 1@ 2056 cfm, 85.40 kBtu/h Heating 1@1646 cfm, 34.19 kBtu/h Heating 1@ 7116 cfm, 295.60 kBtu/h Heating</td>
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<td><strong>EL1 Sys1 PSV (G.E2)</strong></td>
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**System 3**

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<th>EL1 Sys1 PSV (G.N3)</th>
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**System 4**

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**System 8**  
*EL1 Sys1 PSV (M.N13)*

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**System 9**  
*EL1 Sys1 PSV (M.W14)*

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**System 10**  
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</table>
## Environmental

### Wall
- Same as baseline
- Gross Area: 21600 sf
- Net Area: 17712 sf

### Roof
- R-30; Insulation entirely above deck; Absorptance = 0.7
- Gross Area: 20000 sf

### Window
- Solarban 70XL Starphire w/ thermally broken aluminum frame
- U-0.42; SHGC-0.27; VLT-0.543
- Gross Area: 3888 sf

## Interior Loads

### Lighting
- Same as baseline

### Daylighting Controls
- None

## HVAC Systems

### System 1
- Packaged VAV w/ Elec Reheat System fans with VSD
- Packaged Single Zone Rooftop Units

#### System 1 Details
- **Cooling Cap [kBtu/h] (tons)**: 524.467 (43.7) | 89.780 (7.5)
- **Cooling Efficiency**: 10.7 EER | 10.1 EER
- **Heating Cap [kBtu/h]**: 0 | 157.050
- **Heating Efficiency**: 80% | 80%
- **Design Airflow [cfm]**: 13463 | 2804
- **Fan Demand [kW]**: 13.233 | 2.121
- **TSP [in. w.g.]**: 4.6 | 3.6
- **Economizer**: None | Yes, Drybulb
- **Heat Recovery**: None | None
- **Associated VAV Boxes**:
  - 1@ 2332 cfm, 96.89 kBtu/h Heating
  - 1@ 1116 cfm, 46.38 kBtu/h Heating
  - 1@ 1739 cfm, 36.11 kBtu/h Heating
  - 1@ 1159 cfm, 48.15 kBtu/h Heating
  - 1@ 7116 cfm, 295.60 kBtu/h Heating
  - N/A
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<td>Fan Demand [kW]</td>
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**System 5**

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**System 6**

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**System 7**

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**System 8**  
*EL1 Sys1 PSV (M.N13)*

- Cooling Cap [kBtu/h] (tons)  
  - 77.655 (6.5)
- Cooling Efficiency  
  - 10.1 EER
- Heating Cap [kBtu/h]  
  - 137.679
- Heating Efficiency  
  - 80%
- Design Airflow [cfm]  
  - 2164
- Fan Demand [kW]  
  - 1.656
- TSP [in. w.g.]  
  - 3.6
- Economizer  
  - Yes, Drybulb
- Heat recovery  
  - None
- Associated VAV Boxes  
  - N/A

**System 9**  
*EL1 Sys1 PSV (M.W14)*

- Cooling Cap [kBtu/h] (tons)  
  - 49.841 (4.2)
- Cooling Efficiency  
  - 10.1 EER
- Heating Cap [kBtu/h]  
  - 88.003
- Heating Efficiency  
  - 80%
- Design Airflow [cfm]  
  - 1513
- Fan Demand [kW]  
  - 1.178
- TSP [in. w.g.]  
  - 3.7
- Economizer  
  - Yes, Drybulb
- Heat recovery  
  - None
- Associated VAV Boxes  
  - N/A

**System 10**  
*EL1 Sys1 PSV (M.C15)*

- Cooling Cap [kBtu/h] (tons)  
  - 263.914 (22.0)
- Cooling Efficiency  
  - 9.3 EER
- Heating Cap [kBtu/h]  
  - 455.112
- Heating Efficiency  
  - 80%
- Design Airflow [cfm]  
  - 7116
- Fan Demand [kW]  
  - 5.197
- TSP [in. w.g.]  
  - 3.4
- Economizer  
  - Yes, Drybulb
- Heat recovery  
  - None
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## Nebraska Energy Code Study – 30% Alternative Model Changes

**Large Office 18% WWR – Norfolk, NE**

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<td>R-15; Insulation entirely above deck; Absorptance = 0.7</td>
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<td>Packaged Single Zone Rooftop Units</td>
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<td>1@ 1154 cfm, 47.02 kBtu/h Heating</td>
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**System 5**  
*EL1 Sys1 PSV (G.C5)*

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**System 6**  
*EL1 Sys1 PSV (M.S11)*

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**System 7**  
*EL1 Sys1 PSV (M.E12)*

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**System 8**

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**System 9**

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<td>Design Airflow [cfm]</td>
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<tr>
<td>Fan Demand [kW]</td>
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<td>TSP [in. w.g.]</td>
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<td>Heat recovery</td>
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**System 10**

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<td>Fan Demand [kW]</td>
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**System 15**

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<td>Fan Demand [kW]</td>
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<td>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</td>
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<td>Wall</td>
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<td>Roof</td>
<td>R-30; Insulation entirely above deck; Absorptance = 0.7</td>
<td>R-15; Insulation entirely above deck; Absorptance = 0.7</td>
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<td>Window</td>
<td>Solarban 70XL Starphire w/ thermally broken aluminum frame U-0.42; SHGC-0.27; VLT-0.543</td>
<td>Generic glazing: U-0.47; SHGC-0.39</td>
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<td><strong>Interior Loads</strong></td>
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<td>Lighting</td>
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<td>Daylighting Controls</td>
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<td><strong>HVAC Systems</strong></td>
<td>Packaged VAV w/ Elec Reheat System fans with VSD</td>
<td>Packaged Single Zone Rooftop Units</td>
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<td><strong>System 1</strong></td>
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<td><strong>EL1 Sys1 PSV (G.S1)</strong></td>
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<td>Cooling Cap [kBtu/h] (tons)</td>
<td>405.744 (33.8)</td>
<td>78.999 (6.6)</td>
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<td>10.1 EER</td>
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<td><strong>EL1 Sys1 PSV (G.E2)</strong></td>
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<tr>
<td>Cooling Cap [kBtu/h] (tons)</td>
<td>438.485 (36.5)</td>
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<td>10.7 EER</td>
<td>12 SEER</td>
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### Large Office 18% WWR – Chadron, NE

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<th>Component</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
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<td>Heating Cap [kBtu/h]</td>
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<td>Design Airflow [cfm]</td>
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<td>1438</td>
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<tr>
<td>Fan Demand [kW]</td>
<td>14.304</td>
<td>1.017</td>
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<td>TSP [in. w.g.]</td>
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<td>Associated VAV Boxes</td>
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<tr>
<td></td>
<td>1@ 1385 cfm, 52.96 kBtu/h Heating</td>
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<tr>
<td></td>
<td>1@ 2133 cfm, 81.56 kBtu/h Heating</td>
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<td></td>
<td>1@ 1483 cfm, 56.69 kBtu/h Heating</td>
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<td>1@ 7732 cfm, 295.60 kBtu/h Heating</td>
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**System 3**

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<td>Cooling Cap [kBtu/h] (tons)</td>
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<td>53.235</td>
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<td>1@ 1385 cfm, 52.96 kBtu/h Heating</td>
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<td>1@ 2133 cfm, 81.56 kBtu/h Heating</td>
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<td>1@ 1483 cfm, 56.69 kBtu/h Heating</td>
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<td>1@ 7732 cfm, 295.60 kBtu/h Heating</td>
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**System 4**

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**System 5**

- **EL1 Sys1 PSV (G.C5)**

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**System 6**

- **EL1 Sys1 PSV (M.S11)**

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**System 7**

- **EL1 Sys1 PSV (M.E12)**

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**System 8**

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<th><strong>EL1 Sys1 PSV (M.N13)</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling Cap [kBtu/h]</td>
<td>61.246</td>
<td></td>
</tr>
<tr>
<td>(tons)</td>
<td>(5.1)</td>
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</tr>
<tr>
<td>Cooling Efficiency</td>
<td>10.1 EER</td>
<td></td>
</tr>
<tr>
<td>Heating Cap [kBtu/h]</td>
<td>134.202</td>
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<tr>
<td>Heating Efficiency</td>
<td>80%</td>
<td></td>
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<tr>
<td>Design Airflow [cfm]</td>
<td>2288</td>
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<tr>
<td>Fan Demand [kW]</td>
<td>1.600</td>
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<tr>
<td>TSP [in. w.g.]</td>
<td>3.6</td>
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<tr>
<td>Economizer</td>
<td>Yes, Drybulb</td>
<td></td>
</tr>
<tr>
<td>Heat recovery</td>
<td>None</td>
<td></td>
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<tr>
<td>Associated VAV Boxes</td>
<td>N/A</td>
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**System 9**

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<th><strong>EL1 Sys1 PSV (M.W14)</strong></th>
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<tr>
<td>Cooling Cap [kBtu/h]</td>
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<td>(tons)</td>
<td>(3.8)</td>
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<tr>
<td>Heating Cap [kBtu/h]</td>
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<td>80%</td>
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<tr>
<td>Design Airflow [cfm]</td>
<td>1779</td>
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<tr>
<td>Fan Demand [kW]</td>
<td>1.249</td>
<td></td>
</tr>
<tr>
<td>TSP [in. w.g.]</td>
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<td></td>
</tr>
<tr>
<td>Economizer</td>
<td>Yes, Drybulb</td>
<td></td>
</tr>
<tr>
<td>Heat recovery</td>
<td>None</td>
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<td>Associated VAV Boxes</td>
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**System 10**

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<th><strong>EL1 Sys1 PSV (M.C15)</strong></th>
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<tr>
<td>Cooling Cap [kBtu/h]</td>
<td>206.324</td>
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<tr>
<td>(tons)</td>
<td>(17.2)</td>
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<td>Cooling Efficiency</td>
<td>9.3 EER</td>
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<td>Heating Cap [kBtu/h]</td>
<td>458.384</td>
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<tr>
<td>Design Airflow [cfm]</td>
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<tr>
<td>Fan Demand [kW]</td>
<td>5.197</td>
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<td>TSP [in. w.g.]</td>
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<td>Economizer</td>
<td>Yes, Drybulb</td>
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<td>Heat recovery</td>
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<td>Associated VAV Boxes</td>
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## Large Office 18% WWR – Chadron, NE

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<tr>
<th>Component</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
<th>Notes</th>
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<tbody>
<tr>
<td><strong>System 11</strong></td>
<td><strong>EL1 Sys1 PSV (T.S21)</strong></td>
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<tr>
<td>Cooling Cap [kBtu/h] (tons)</td>
<td>107.297 (8.9)</td>
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<td>Cooling Efficiency</td>
<td>9.5 EER</td>
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<tr>
<td>Heating Cap [kBtu/h]</td>
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<td>Heating Efficiency</td>
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<tr>
<td>Design Airflow [cfm]</td>
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<td>Fan Demand [kW]</td>
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<td>TSP [in. w.g.]</td>
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<tr>
<td>Economizer</td>
<td>Yes, Drybulb</td>
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<tr>
<td>Heat recovery</td>
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<tr>
<td>Associated VAV Boxes</td>
<td>N/A</td>
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| **System 12** | **EL1 Sys1 PSV (T.E22)** | | |
| Cooling Cap [kBtu/h] (tons) | 48.332 (4.0) | | |
| Cooling Efficiency | 10.1 EER | | |
| Heating Cap [kBtu/h] | 94.695 | | |
| Heating Efficiency | 80% | | |
| Design Airflow [cfm] | 1660 | | |
| Fan Demand [kW] | 1.165 | | |
| TSP [in. w.g.] | 3.6 | | |
| Economizer | Yes, Drybulb | | |
| Heat recovery | None | | |
| Associated VAV Boxes | N/A | | |

| **System 13** | **EL1 Sys1 PSV (T.N23)** | | |
| Cooling Cap [kBtu/h] (tons) | 71.439 (6.0) | | |
| Cooling Efficiency | 10.1 EER | | |
| Heating Cap [kBtu/h] | 147.724 | | |
| Heating Efficiency | 80% | | |
| Design Airflow [cfm] | 2288 | | |
| Fan Demand [kW] | 1.600 | | |
| TSP [in. w.g.] | 3.6 | | |
| Economizer | Yes, Drybulb | | |
| Heat recovery | None | | |
| Associated VAV Boxes | N/A | | |

| **System 14** | **EL1 Sys1 PSV (T.W24)** | | |
| Cooling Cap [kBtu/h] (tons) | 50.442 (4.2) | | |
| Cooling Efficiency | 10.1 EER | | |
### Nebraska Energy Code Study – 30% Alternative Model Changes

#### Large Office 18% WWR – Chadron, NE

<table>
<thead>
<tr>
<th>Component</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td>Heating Cap [kBtu/h]</td>
<td>99.775</td>
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<td>Heating Efficiency</td>
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<tr>
<td>Design Airflow [cfm]</td>
<td>1779</td>
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<tr>
<td>Fan Demand [kW]</td>
<td>1.249</td>
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<tr>
<td>TSP [in. w.g.]</td>
<td>3.6</td>
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<tr>
<td>Economizer</td>
<td>Yes, Drybulb</td>
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<td></td>
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<tr>
<td>Heat recovery</td>
<td>None</td>
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<tr>
<td>Associated VAV Boxes</td>
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**System 15**

<table>
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<tr>
<th>Component</th>
<th>EL1 Sys1 PSV (T.C25)</th>
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<td>Cooling Cap [kBtu/h] (tons)</td>
<td>249.234 (20.8)</td>
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<td>Cooling Efficiency</td>
<td>9.3 EER</td>
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<tr>
<td>Heating Cap [kBtu/h]</td>
<td>514.243</td>
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<tr>
<td>Heating Efficiency</td>
<td>80%</td>
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<tr>
<td>Design Airflow [cfm]</td>
<td>7732</td>
<td></td>
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<tr>
<td>Fan Demand [kW]</td>
<td>5.197</td>
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<tr>
<td>TSP [in. w.g.]</td>
<td>3.4</td>
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<tr>
<td>Economizer</td>
<td>Yes, Drybulb</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heat recovery</td>
<td>None</td>
<td></td>
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<tr>
<td>Associated VAV Boxes</td>
<td>N/A</td>
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# Nebraska Energy Code Study – 30% Alternative Model Changes

## Small Office 38% WWR - Omaha, NE

<table>
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<th>Component</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
<th>Notes</th>
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<tbody>
<tr>
<td><strong>Envelope</strong></td>
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<tr>
<td>Wall Assembly</td>
<td>R-21+7.5ci wall</td>
<td>R-13</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gross Area: 5834 sf Net Area:3617 sf</td>
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<td></td>
</tr>
<tr>
<td>Roof Assembly</td>
<td>R-40; Insulation entirely above deck; Absorptance = 0.7</td>
<td>R-15; Insulation entirely above deck; Absorptance = 0.7</td>
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<tr>
<td></td>
<td>Gross Area: 10000 sf</td>
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<tr>
<td>Window Assembly</td>
<td>Solarban 80 w/ thermally broken aluminum frame: U-0.41; SHGC-0.24; VLT-0.407 Gross Area:2217 sf</td>
<td>Generic glazing: U-0.57; SHGC-0.39</td>
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<tr>
<td><strong>Interior Loads</strong></td>
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<tr>
<td>Lighting</td>
<td>LPD= 0.8 W/sf (T-5 lamps)</td>
<td>LPD= 1.0 W/sf (T-8 lamps)</td>
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<tr>
<td>Daylighting Controls</td>
<td>None</td>
<td>None</td>
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<tr>
<td><strong>HVAC Systems</strong></td>
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<tr>
<td></td>
<td>Split system with dedicated ERV (independent fans); 90% eff. furnace</td>
<td>Packaged Single Zone Rooftop Units</td>
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<tr>
<td><strong>System 1</strong></td>
<td><strong>EL1 Sys1 PVVT (G.S1)</strong></td>
<td><strong>EL1 Sys1 PSV (G.S1)</strong></td>
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<tr>
<td>Cooling Cap [kBtu/h]</td>
<td>55.840 (4.66)</td>
<td>89.654 (7.5)</td>
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<tr>
<td>(Tons)</td>
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<tr>
<td>Cooling Efficiency</td>
<td>11.5 EER</td>
<td>10.1 EER</td>
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<tr>
<td>Heating Cap [kBtu/h]</td>
<td>99.112</td>
<td>160.163</td>
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<td>Heating Efficiency</td>
<td>90% AFUE</td>
<td>80% AFUE</td>
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<tr>
<td>Design Airflow [cfm]</td>
<td>1859</td>
<td>2679</td>
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<tr>
<td>Fan Demand [kW]</td>
<td>1.495</td>
<td>2.031</td>
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<td>TSP [in. w.g.]</td>
<td>3.5</td>
<td>3.5</td>
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<tr>
<td>Economizer</td>
<td>Yes, OA drybulb control</td>
<td>None</td>
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<tr>
<td>Heat recovery</td>
<td>Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.</td>
<td>None</td>
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<tr>
<td><strong>System 2</strong></td>
<td><strong>EL1 Sys1 PVVT (G.E2)</strong></td>
<td><strong>EL1 Sys1 PSV (G.E2)</strong></td>
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<tr>
<td>Cooling Cap [kBtu/h]</td>
<td>30.376 (2.53)</td>
<td>46.834 (3.9)</td>
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<tr>
<td>(Tons)</td>
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<tr>
<td>Cooling Efficiency</td>
<td>14 SEER</td>
<td>12 SEER</td>
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<tr>
<td>Heating Cap [kBtu/h]</td>
<td>53.527</td>
<td>83.244</td>
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<td>Heating Efficiency</td>
<td>90% AFUE</td>
<td>80% AFUE</td>
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<td>Design Airflow [cfm]</td>
<td>984</td>
<td>1386</td>
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<td>Fan Demand [kW]</td>
<td>0.815</td>
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<td>TSP [in. w.g.]</td>
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<td>Economizer</td>
<td>Yes, OA drybulb control</td>
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<tr>
<td>Heat recovery</td>
<td>Dedicated, stand-alone total</td>
<td>None</td>
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<tr>
<td>Component</td>
<td>Alternative Building</td>
<td>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</td>
<td>Notes</td>
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<tr>
<td><strong>System 3</strong></td>
<td><strong>EL1 Sys1 PVVT (G.N3)</strong></td>
<td><strong>EL1 Sys1 PSV (G.N3)</strong></td>
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<td>Cooling Cap [kBtu/h] (Tons)</td>
<td>39.369 (3.3)</td>
<td>58.131 (4.8)</td>
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<td>Cooling Efficiency</td>
<td>14 SEER</td>
<td>12 SEER</td>
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<td>Heating Cap [kBtu/h]</td>
<td>70.097</td>
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<td>90% AFUE</td>
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<td>Design Airflow [cfm]</td>
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<td>Fan Demand [kW]</td>
<td>1.006</td>
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<tr>
<td>Economizer</td>
<td>Yes, OA drybulb control</td>
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<tr>
<td>Heat recovery</td>
<td>Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.</td>
<td>None</td>
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<td><strong>System 4</strong></td>
<td><strong>EL1 Sys1 PVVT (G.W4)</strong></td>
<td><strong>EL1 Sys1 PSV (G.W4)</strong></td>
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<td>Cooling Cap [kBtu/h] (Tons)</td>
<td>31.924 (2.7)</td>
<td>47.880 (4.0)</td>
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<td>12 SEER</td>
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<td>Heating Cap [kBtu/h]</td>
<td>56.287</td>
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<td>90% AFUE</td>
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<td>Fan Demand [kW]</td>
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<tr>
<td>Economizer</td>
<td>Yes, OA drybulb control</td>
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<tr>
<td>Heat recovery</td>
<td>Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.</td>
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<td><strong>System 5</strong></td>
<td><strong>EL1 Sys1 PVVT (G.C5)</strong></td>
<td><strong>EL1 Sys1 PSV (G.C5)</strong></td>
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<td>Cooling Cap [kBtu/h] (Tons)</td>
<td>82.516 (6.9)</td>
<td>112.161 (9.3)</td>
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<td>Heating Cap [kBtu/h]</td>
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<td>Design Airflow [cfm]</td>
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<td>Fan Demand [kW]</td>
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<tr>
<td>Economizer</td>
<td>Yes, OA drybulb control</td>
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<tr>
<td>Heat recovery</td>
<td>Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.</td>
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<tr>
<td>Component</td>
<td>Alternative Building</td>
<td>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</td>
<td>Notes</td>
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<tr>
<td><strong>Envelope</strong></td>
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<tr>
<td>Wall Assembly</td>
<td>R-21+7.5ci wall</td>
<td>R-13</td>
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<tr>
<td></td>
<td>Gross Area: 5834 sf</td>
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<tr>
<td></td>
<td>Net Area: 3617 sf</td>
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<tr>
<td>Roof Assembly</td>
<td>R-40; Insulation entirely above deck; Absorptance = 0.7</td>
<td>R-15; Insulation entirely above deck; Absorptance = 0.7</td>
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<tr>
<td>Window Assembly</td>
<td>Solarban 80 w/ thermally broken aluminum frame: U-0.41; SHGC-0.24; VLT-0.407</td>
<td>Generic glazing: U-0.57; SHGC-0.39</td>
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<tr>
<td></td>
<td>Gross Area: 2217 sf</td>
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<td></td>
</tr>
<tr>
<td><strong>Interior Loads</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lighting</td>
<td>LPD= 0.8 W/sf (T-5 lamps)</td>
<td>LPD= 1.0 W/sf (T-8 lamps)</td>
<td></td>
</tr>
<tr>
<td>Daylighting Controls</td>
<td>None</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td><strong>HVAC Systems</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Split system with dedicated ERV (independent fans); 90% eff. furnace</td>
<td>Packaged Single Zone Rooftop Units</td>
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</tr>
<tr>
<td><strong>System 1</strong></td>
<td><strong>EL1 Sys1 PVVT (G.S1)</strong></td>
<td><strong>EL1 Sys1 PSV (G.S1)</strong></td>
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<tr>
<td>Cooling Cap [kBtu/h] (Tons)</td>
<td>55.875 (4.7)</td>
<td>85.694 (7.1)</td>
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<td>Cooling Efficiency</td>
<td>11.5 EER</td>
<td>10.1 EER</td>
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<td>Heating Cap [kBtu/h]</td>
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<td>Design Airflow [cfm]</td>
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<td>Fan Demand [kW]</td>
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<tr>
<td>Economizer</td>
<td>Yes, OA drybulb control</td>
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<tr>
<td>Heat recovery</td>
<td>Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.</td>
<td>None</td>
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<td><strong>System 2</strong></td>
<td><strong>EL1 Sys1 PVVT (G.E2)</strong></td>
<td><strong>EL1 Sys1 PSV (G.E2)</strong></td>
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<td>Cooling Cap [kBtu/h] (Tons)</td>
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<td>12 SEER</td>
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<td>Heating Cap [kBtu/h]</td>
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<td>Heating Efficiency</td>
<td>90% AFUE</td>
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<td>Design Airflow [cfm]</td>
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<td>Fan Demand [kW]</td>
<td>0.866</td>
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<td>Economizer</td>
<td>Yes, OA drybulb control</td>
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<td>Heat recovery</td>
<td>Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.</td>
<td>None</td>
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<td>Component</td>
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<td>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</td>
<td>Notes</td>
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<td><strong>System 3</strong></td>
<td><strong>EL1 Sys1 PVVT (G.N3)</strong></td>
<td><strong>EL1 Sys1 PSV (G.N3)</strong></td>
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<td>Cooling Cap [kBtu/h] (Tons)</td>
<td>38.903 (3.2)</td>
<td>53.520 (4.5)</td>
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<tr>
<td>Cooling Efficiency</td>
<td>14 SEER</td>
<td>12 SEER</td>
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<td>Heating Cap [kBtu/h]</td>
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<tr>
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<td>Yes, OA drybulb control</td>
<td>None</td>
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<tr>
<td>Heat recovery</td>
<td>Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.</td>
<td>None</td>
<td></td>
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</table>

| **System 4**               | **EL1 Sys1 PVVT (G.W4)** | **EL1 Sys1 PSV (G.W4)** |       |
| Cooling Cap [kBtu/h] (Tons)| 31.856 (2.7)            | 45.706 (3.8)               |       |
| Cooling Efficiency         | 14 SEER                | 12 SEER                      |       |
| Heating Cap [kBtu/h]       | 56.389                 | 87.745                       |       |
| Heating Efficiency         | 90% AFUE               | 80% AFUE                      |       |
| Design Airflow [cfm]       | 1058                  | 1472                         |       |
| Fan Demand [kW]            | 0.860                 | 1.129                         |       |
| TSP [in. w.g.]             | 3.6                   | 3.6                           |       |
| Economizer                 | Yes, OA drybulb control | None                         |       |
| Heat recovery              | Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff. | None |

| **System 5**               | **EL1 Sys1 PVVT (G.C5)** | **EL1 Sys1 PSV (G.C5)** |       |
| Cooling Cap [kBtu/h] (Tons)| 85.490 (7.1)            | 103.139 (8.6)             |       |
| Cooling Efficiency         | 11.5 EER               | 10.1 EER                    |       |
| Heating Cap [kBtu/h]       | 145.677                | 204.915                     |       |
| Heating Efficiency         | 90% AFUE               | 80% AFUE                     |       |
| Design Airflow [cfm]       | 2834                  | 2834                         |       |
| Fan Demand [kW]            | 2.230                 | 2.104                        |       |
| TSP [in. w.g.]             | 3.5                   | 3.5                          |       |
| Economizer                 | Yes, OA drybulb control | None                         |       |
| Heat recovery              | Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff. | None |
### Nebraska Energy Code Study – 30% Alternative Model Changes

**Small Office 38% WWR - Chadron, NE**

<table>
<thead>
<tr>
<th>Component</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
<th>Notes</th>
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<tr>
<td><strong>Envelope</strong></td>
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<tr>
<td>Wall Assembly</td>
<td>R-21+7.5ci wall</td>
<td>R-13</td>
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<tr>
<td></td>
<td>Gross Area: 5833 sf</td>
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<td>Net Area: 3617 sf</td>
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<tr>
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<td>R-40; Insulation entirely above deck; Absorptance = 0.7</td>
<td>R-15; Insulation entirely above deck; Absorptance = 0.7</td>
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<td>Gross Area: 10000 sf</td>
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<tr>
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<td>Solarban 80 w/ thermally broken aluminum frame: U-0.41; SHGC-0.24; VLT-0.407</td>
<td>Generic glazing: U-0.57; SHGC-0.39</td>
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<td>Gross Area: 2216 sf</td>
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<td><strong>Interior Loads</strong></td>
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<tr>
<td>Lighting</td>
<td>LPD= 0.8 W/sf</td>
<td>LPD= 1.0 W/sf</td>
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<tr>
<td></td>
<td>(T-5 lamps)</td>
<td>(T-8 lamps)</td>
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<tr>
<td>Daylighting Controls</td>
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<td>None</td>
<td></td>
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<tr>
<td><strong>HVAC Systems</strong></td>
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</tr>
<tr>
<td></td>
<td>Split system with dedicated ERV (independent fans); 90% eff. furnace</td>
<td>Packaged Single Zone Rooftop Units</td>
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</tr>
<tr>
<td><strong>System 1</strong></td>
<td><strong>EL1 Sys1 PVVT (G.S1)</strong></td>
<td><strong>EL1 Sys1 PSV (G.S1)</strong></td>
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<tr>
<td>Cooling Cap [kBTU/h]</td>
<td>54.446</td>
<td>83.420</td>
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<tr>
<td>(Tons)</td>
<td>(4.5)</td>
<td>(7.0)</td>
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<td>Cooling Efficiency</td>
<td>11.5 EER</td>
<td>10.1 EER</td>
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<td>Heating Cap [kBTU/h]</td>
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<td>161.116</td>
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<td>Heating Efficiency</td>
<td>90% AFUE</td>
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<tr>
<td>Design Airflow [cfm]</td>
<td>2067</td>
<td>2994</td>
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<tr>
<td>Fan Demand [kW]</td>
<td>1.529</td>
<td>2.090</td>
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<td>TSP [in. w.g.]</td>
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<td>3.5</td>
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<tr>
<td>Economizer</td>
<td>Yes, OA drybulb control</td>
<td>None</td>
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<tr>
<td>Heat recovery</td>
<td>Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.</td>
<td>None</td>
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<tr>
<td><strong>System 2</strong></td>
<td><strong>EL1 Sys1 PVVT (G.E2)</strong></td>
<td><strong>EL1 Sys1 PSV (G.E2)</strong></td>
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<tr>
<td>Cooling Cap [kBTU/h]</td>
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<tr>
<td>(Tons)</td>
<td>(2.4)</td>
<td>(3.6)</td>
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<td>Cooling Efficiency</td>
<td>14 SEER</td>
<td>12 SEER</td>
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<tr>
<td>Heating Cap [kBTU/h]</td>
<td>52.269</td>
<td>83.704</td>
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<td>Design Airflow [cfm]</td>
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<td>Fan Demand [kW]</td>
<td>0.813</td>
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<tr>
<td>Economizer</td>
<td>Yes, OA drybulb control</td>
<td>None</td>
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<tr>
<td>Heat recovery</td>
<td>Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.</td>
<td>None</td>
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<tr>
<td>Component</td>
<td>Alternative Building</td>
<td>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</td>
<td>Notes</td>
</tr>
<tr>
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<td>----------------------</td>
<td>-------------------------------------------------</td>
<td>-------</td>
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<tr>
<td><strong>System 3</strong></td>
<td><strong>EL1 Sys1 PVVT (G.N3)</strong></td>
<td><strong>EL1 Sys1 PSV (G.N3)</strong></td>
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<tr>
<td>Cooling Cap [kBtu/h] (Tons)</td>
<td>32.756 (2.7)</td>
<td>47.213 (3.9)</td>
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<td>Cooling Efficiency</td>
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<td>Heating Cap [kBtu/h]</td>
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<td>Design Airflow [cfm]</td>
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<td>Fan Demand [kW]</td>
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<tr>
<td>Heat recovery</td>
<td>Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

| **System 4** | **EL1 Sys1 PVVT (G.W4)** | **EL1 Sys1 PSV (G.W4)** | |
| Cooling Cap [kBtu/h] (Tons) | 30.926 (2.6) | 45.914 (3.8) | |
| Cooling Efficiency | 14 SEER | 12 SEER | |
| Heating Cap [kBtu/h] | 57.575 | 89.123 | |
| Heating Efficiency | 90% AFUE | 80% AFUE | |
| Design Airflow [cfm] | 1189 | 1676 | |
| Fan Demand [kW] | 0.907 | 1.205 | |
| TSP [in. w.g.] | 3.6 | 3.6 | |
| Economizer | Yes, OA drybulb control | None | |
| Heat recovery | Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff. | None | |

<p>| <strong>System 5</strong> | <strong>EL1 Sys1 PVVT (G.C5)</strong> | <strong>EL1 Sys1 PSV (G.C5)</strong> | |
| Cooling Cap [kBtu/h] (Tons) | 82.276 (6.9) | 97.284 (8.1) | |
| Cooling Efficiency | 11.5 EER | 10.1 EER | |
| Heating Cap [kBtu/h] | 142.696 | 193.881 | |
| Heating Efficiency | 90% AFUE | 80% AFUE | |
| Design Airflow [cfm] | 3021 | 3021 | |
| Fan Demand [kW] | 2.230 | 2.104 | |
| TSP [in. w.g.] | 3.5 | 3.5 | |
| Economizer | Yes, OA drybulb control | None | |
| Heat recovery | Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff. | None | |</p>
<table>
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<tr>
<th>Component</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
<th>Notes</th>
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<td><strong>Envelope</strong></td>
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<td>Wall Assembly</td>
<td>R-21+7.5ci wall&lt;br&gt;Gross Area: 5834 sf&lt;br&gt;Net Area: 4784 sf</td>
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<td>R-15; Insulation entirely above deck; Absorptance = 0.7</td>
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<td>Generic glazing: U-0.57; SHGC-0.39</td>
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<td><strong>Interior Loads</strong></td>
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<tr>
<td>Lighting</td>
<td>LPD= 0.8 W/sf&lt;br&gt;(T-5 lamps)</td>
<td>LPD= 1.0 W/sf&lt;br&gt;(T-8 lamps)</td>
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<tr>
<td>Daylighting Controls</td>
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<td>None</td>
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<tr>
<td><strong>HVAC Systems</strong></td>
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</tr>
<tr>
<td></td>
<td>Split system with dedicated ERV (independent fans); 90% eff. furnace</td>
<td>Packaged Single Zone Rooftop Units</td>
<td></td>
</tr>
<tr>
<td><strong>System 1</strong></td>
<td><strong>EL1 Sys1 PVVT (G.S1)</strong></td>
<td><strong>EL1 Sys1 PSV (G.S1)</strong></td>
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<tr>
<td>Cooling Cap [kBtu/h]</td>
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<tr>
<td>Cooling Efficiency</td>
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<td>10.1 EER</td>
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<td>Heating Cap [kBtu/h]</td>
<td>74.902</td>
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<td>Design Airflow [cfm]</td>
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<td>Fan Demand [kW]</td>
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<tr>
<td>Economizer</td>
<td>Yes, OA drybulb control</td>
<td>None</td>
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<tr>
<td>Heat recovery</td>
<td>Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.</td>
<td>None</td>
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</tr>
<tr>
<td><strong>System 2</strong></td>
<td><strong>EL1 Sys1 PVVT (G.E2)</strong></td>
<td><strong>EL1 Sys1 PSV (G.E2)</strong></td>
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<tr>
<td>Cooling Cap [kBtu/h]</td>
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</tr>
<tr>
<td>Cooling Efficiency</td>
<td>14 SEER</td>
<td>12 SEER</td>
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<tr>
<td>Economizer</td>
<td>Yes, OA drybulb control</td>
<td>None</td>
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<tr>
<td>Heat recovery</td>
<td>Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.</td>
<td>None</td>
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</table>
Nebraska Energy Code Study – 30% Alternative Model Changes  
Small Office 18% WWR - Omaha, NE

<table>
<thead>
<tr>
<th>Component</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System 3</strong></td>
<td><strong>EL1 Sys1 PVVT (G.N3)</strong></td>
<td><strong>EL1 Sys1 PSV (G.N3)</strong></td>
<td></td>
</tr>
<tr>
<td>Cooling Cap [kBtu/h]</td>
<td>35.229 (2.9)</td>
<td>49.139 (4.1)</td>
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<tr>
<td>(Tons)</td>
<td></td>
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<tr>
<td>Cooling Efficiency</td>
<td>14 SEER</td>
<td>12 SEER</td>
<td></td>
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<tr>
<td>Heating Cap [kBtu/h]</td>
<td>62.713</td>
<td>89.566</td>
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<td>Heating Efficiency</td>
<td>90% AFUE</td>
<td>80% AFUE</td>
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<tr>
<td>Design Airflow [cfm]</td>
<td>1061</td>
<td>1186</td>
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<tr>
<td>Fan Demand [kW]</td>
<td>0.878</td>
<td>0.925</td>
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<tr>
<td>TSP [in. w.g.]</td>
<td>3.6</td>
<td>3.6</td>
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<tr>
<td>Economizer</td>
<td>Yes, OA drybulb control</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Heat recovery</td>
<td>Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

| **System 4**               | **EL1 Sys1 PVVT (G.W4)**             | **EL1 Sys1 PSV (G.W4)**                       |       |
| Cooling Cap [kBtu/h]       | 24.541 (2.0)                         | 35.029 (2.9)                                 |       |
| (Tons)                     |                                      |                                               |       |
| Cooling Efficiency         | 14 SEER                              | 12 SEER                                       |       |
| Heating Cap [kBtu/h]       | 42.986                               | 62.723                                        |       |
| Heating Efficiency         | 90% AFUE                             | 80% AFUE                                      |       |
| Design Airflow [cfm]       | 765                                  | 950                                           |       |
| Fan Demand [kW]            | 0.633                                | 0.743                                         |       |
| TSP [in. w.g.]             | 3.6                                  | 3.6                                           |       |
| Economizer                 | Yes, OA drybulb control              | None                                          |       |
| Heat recovery              | Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff. | None                                          |       |

| **System 5**               | **EL1 Sys1 PVVT (G.C5)**             | **EL1 Sys1 PSV (G.C5)**                       |       |
| Cooling Cap [kBtu/h]       | 82.516 (6.9)                         | 112.161 (9.3)                                 |       |
| (Tons)                     |                                      |                                               |       |
| Cooling Efficiency         | 11.5 EER                             | 10.1 EER                                      |       |
| Heating Cap [kBtu/h]       | 144.938                              | 197.207                                       |       |
| Heating Efficiency         | 90% AFUE                             | 80% AFUE                                      |       |
| Design Airflow [cfm]       | 2781                                 | 2781                                          |       |
| Fan Demand [kW]            | 2.230                                | 2.104                                         |       |
| TSP [in. w.g.]             | 3.5                                  | 3.5                                           |       |
| Economizer                 | Yes, OA drybulb control              | None                                          |       |
| Heat recovery              | Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff. | None                                          |       |
### Nebraska Energy Code Study – 30% Alternative Model Changes

#### Small Office 18% WWR - Norfolk, NE

<table>
<thead>
<tr>
<th>Component</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
<th>Notes</th>
</tr>
</thead>
</table>
| **Envelope**                     | **Wall Assembly** R-21+7.5ci wall  
Gross Area: 5834 sf  
Net Area: 4784 sf  
R-13 | R-15; Insulation entirely above deck; Absorptance = 0.7  
Gross Area: 10000 sf | R-13; Insulation entirely above deck; Absorptance = 0.7 |
| **Roof Assembly**                | Solarban 70XL Starphire w/ thermally broken alum frame:  
U-0.42; SHGC-0.27; VLT-0.543  
Gross Area: 1050 sf  
Generic glazing:  
U-0.57; SHGC-0.39 |                              |                                            |
| **Window Assembly**              | **Lighting** LPD= 0.8 W/sf  
(T-5 lamps)  
LPD= 1.0 W/sf  
(T-8 lamps) |                              |                                            |
| **Daylighting Controls**         | None  
(G.S1) |                              |                                            |
| **HVAC Systems**                 | Split system with dedicated ERV (independent fans); 90% eff. furnace  
Packaged Single Zone  
Rooftop Units |                              |                                            |
| **System 1**                     | **EL1 Sys1 PVVT (G.S1)**              | **EL1 Sys1 PSV (G.S1)**                |                                            |
| Cooling Cap [kBtu/h] (Tons)      | 41.833 (3.5)                          | 59.413 (5.0) |                                            |
| Cooling Efficiency               | 11.5 EER                              | 10.1 EER                                  |                                            |
| Heating Cap [kBtu/h]             | 74.524                                | 117.082                                   |                                            |
| Heating Efficiency               | 90% AFUE                              | 80% AFUE                                 |                                            |
| Design Airflow [cfm]             | 1355                                  | 1732                                      |                                            |
| Fan Demand [kW]                  | 1.069                                 | 1.289                                      |                                            |
| TSP [in. w.g.]                   | 3.5                                   | 3.5                                       |                                            |
| Economizer                       | Yes, OA drybulb control               | None                                      |                                            |
| Heat recovery                    | Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff. | None                                      |                                            |
| **System 2**                     | **EL1 Sys1 PVVT (G.E2)**              | **EL1 Sys1 PSV (G.E2)**                 |                                            |
| Cooling Cap [kBtu/h] (Tons)      | 23.560 (2.0)                          | 32.738 (2.7) |                                            |
| Cooling Efficiency               | 14 SEER                               | 12 SEER                                   |                                            |
| Heating Cap [kBtu/h]             | 42.432                                | 64.333                                    |                                            |
| Heating Efficiency               | 90% AFUE                              | 80% AFUE                                 |                                            |
| Design Airflow [cfm]             | 760                                   | 967                                       |                                            |
| Fan Demand [kW]                  | 0.618                                 | 0.743                                     |                                            |
| TSP [in. w.g.]                   | 3.6                                   | 3.7                                       |                                            |
| Economizer                       | Yes, OA drybulb control               | None                                      |                                            |
| Heat recovery                    | Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff. | None                                      |                                            |
### Component Comparison

<table>
<thead>
<tr>
<th>System</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System 3</strong></td>
<td><strong>EL1 Sys1 PVVT (G.N3)</strong></td>
<td><strong>EL1 Sys1 PSV (G.N3)</strong></td>
<td></td>
</tr>
<tr>
<td>Cooling Cap [kBtu/h] (Tons)</td>
<td>34.568 (2.9)</td>
<td>44.407 (3.7)</td>
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<tr>
<td>Cooling Efficiency</td>
<td>14 SEER</td>
<td>12 SEER</td>
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<tr>
<td>Heating Cap [kBtu/h]</td>
<td>63.277</td>
<td>92.609</td>
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<td>Heating Efficiency</td>
<td>90% AFUE</td>
<td>80% AFUE</td>
<td></td>
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<tr>
<td>Design Airflow [cfm]</td>
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<td>1203</td>
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<tr>
<td>Fan Demand [kW]</td>
<td>0.878</td>
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<td>TSP [in. w.g.]</td>
<td>3.6</td>
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<tr>
<td>Economizer</td>
<td>Yes, OA drybulb control</td>
<td>None</td>
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<tr>
<td>Heat recovery</td>
<td>Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

| **System 4** | **EL1 Sys1 PVVT (G.W4)**       | **EL1 Sys1 PSV (G.W4)**                       |       |
| Cooling Cap [kBtu/h] (Tons) | 23.911 (2.0)                       | 32.475 (2.7)                                 |       |
| Cooling Efficiency | 14 SEER                         | 12 SEER                                       |       |
| Heating Cap [kBtu/h] | 42.565                           | 63.660                                        |       |
| Heating Efficiency | 90% AFUE                         | 80% AFUE                                      |       |
| Design Airflow [cfm] | 763                              | 953                                           |       |
| Fan Demand [kW]   | 0.620                            | 0.731                                         |       |
| TSP [in. w.g.]   | 3.6                              | 3.6                                           |       |
| Economizer        | Yes, OA drybulb control          | None                                          |       |
| Heat recovery     | Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff. | None                                          |       |

<p>| <strong>System 5</strong> | <strong>EL1 Sys1 PVVT (G.C5)</strong>       | <strong>EL1 Sys1 PSV (G.C5)</strong>                       |       |
| Cooling Cap [kBtu/h] (Tons) | 83.704 (7.0)                        | 103.139 (8.6)                                |       |
| Cooling Efficiency | 11.5 EER                         | 10.1 EER                                      |       |
| Heating Cap [kBtu/h] | 145.677                          | 204.915                                       |       |
| Heating Efficiency | 90% AFUE                         | 80% AFUE                                      |       |
| Design Airflow [cfm] | 2834                             | 2834                                          |       |
| Fan Demand [kW]   | 2.230                            | 2.104                                         |       |
| TSP [in. w.g.]   | 3.5                              | 3.5                                           |       |
| Economizer        | Yes, OA drybulb control          | None                                          |       |
| Heat recovery     | Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff. | None                                          |       |</p>
<table>
<thead>
<tr>
<th>Component</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Envelope</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall Assembly</td>
<td>R-21+7.5ci wall</td>
<td>R-13</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gross Area: 5834 sf</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Net Area: 4784 sf</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roof Assembly</td>
<td>R-40; Insulation entirely above deck; Absorptance = 0.7</td>
<td>R-15; Insulation entirely above deck; Absorptance = 0.7</td>
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</tr>
<tr>
<td></td>
<td>Gross Area: 10000 sf</td>
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<td></td>
</tr>
<tr>
<td>Window Assembly</td>
<td>Solarban 70XL Starphire w/ thermally broken alum frame: U-0.42; SHGC-0.27; VLT-0.543</td>
<td>Generic glazing: U-0.57; SHGC-0.39</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gross Area: 1050 sf</td>
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<tr>
<td><strong>Interior Loads</strong></td>
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</tr>
<tr>
<td>Lighting</td>
<td>LPD= 0.8 W/sf</td>
<td>LPD= 1.0 W/sf (T-8 lamps)</td>
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<tr>
<td>Daylighting Controls</td>
<td>None</td>
<td>None</td>
<td></td>
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<tr>
<td><strong>HVAC Systems</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Split system with dedicated ERV (independent fans); 90% eff. furnace</td>
<td>Packaged Single Zone Rooftop Units</td>
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</tr>
<tr>
<td><strong>System 1</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Coolings Cap [kBtu/h]</td>
<td>41.322 (3.5)</td>
<td>57.640 (4.8)</td>
<td></td>
</tr>
<tr>
<td>(Tons)</td>
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<tr>
<td>Cooling Efficiency</td>
<td>11.5 EER</td>
<td>10.1 EER</td>
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<tr>
<td>Heating Cap [kBtu/h]</td>
<td>74.123</td>
<td>113.249</td>
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<td>Heating Efficiency</td>
<td>90% AFUE</td>
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<tr>
<td>Design Airflow [cfm]</td>
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<td>1892</td>
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<tr>
<td>Fan Demand [kW]</td>
<td>1.103</td>
<td>1.321</td>
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<tr>
<td>TSP [in. w.g.]</td>
<td>3.5</td>
<td>3.5</td>
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<tr>
<td>Economizer</td>
<td>Yes, OA drybulb control</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Heat recovery</td>
<td>Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.</td>
<td>None</td>
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<tr>
<td><strong>System 2</strong></td>
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<tr>
<td>Coolings Cap [kBtu/h]</td>
<td>20.917 (2.0)</td>
<td>29.695 (2.5)</td>
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<tr>
<td>(Tons)</td>
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<tr>
<td>Cooling Efficiency</td>
<td>14 SEER</td>
<td>12 SEER</td>
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<tr>
<td>Heating Cap [kBtu/h]</td>
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<td>Heating Efficiency</td>
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<tr>
<td>Design Airflow [cfm]</td>
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<td>Fan Demand [kW]</td>
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<td>TSP [in. w.g.]</td>
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<tr>
<td>Economizer</td>
<td>Yes, OA drybulb control</td>
<td>None</td>
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</tr>
<tr>
<td>Heat recovery</td>
<td>Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>
### Nebraska Energy Code Study – 30% Alternative Model Changes

**Small Office 18% WWR - Chadron, NE**

<table>
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<tr>
<th>Component</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System 3</strong></td>
<td><strong>EL1 Sys1 PVVT (G.N3)</strong></td>
<td><strong>EL1 Sys1 PSV (G.N3)</strong></td>
<td></td>
</tr>
<tr>
<td>Cooling Cap [kBtu/h] (Tons)</td>
<td>31.976 (2.9)</td>
<td>39.004 (3.3)</td>
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</tr>
<tr>
<td>Cooling Efficiency</td>
<td>14 SEER</td>
<td>12 SEER</td>
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<tr>
<td>Heating Cap [kBtu/h]</td>
<td>60.713</td>
<td>81.391</td>
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<td>Heating Efficiency</td>
<td>90% AFUE</td>
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<tr>
<td>Design Airflow [cfm]</td>
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<td>Fan Demand [kW]</td>
<td>0.878</td>
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<td>TSP [in. w.g.]</td>
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<td>3.6</td>
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</tr>
<tr>
<td>Economizer</td>
<td>Yes, OA drybulb control</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Heat recovery</td>
<td>Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff.</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

| **System 4**               | **EL1 Sys1 PVVT (G.W4)** | **EL1 Sys1 PSV (G.W4)**                          |       |
| Cooling Cap [kBtu/h] (Tons)| 22.847 (2.0)         | 31.730 (2.6)                                    |       |
| Cooling Efficiency         | 14 SEER              | 12 SEER                                         |       |
| Heating Cap [kBtu/h]       | 42.614               | 62.853                                          |       |
| Heating Efficiency         | 90% AFUE             | 80% AFUE                                        |       |
| Design Airflow [cfm]       | 848                  | 1070                                            |       |
| Fan Demand [kW]            | 0.647                | 0.770                                           |       |
| TSP [in. w.g.]             | 3.6                  | 3.6                                             |       |
| Economizer                 | Yes, OA drybulb control | None                                |       |
| Heat recovery              | Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff. | None |

<p>| <strong>System 5</strong>               | <strong>EL1 Sys1 PVVT (G.C5)</strong> | <strong>EL1 Sys1 PSV (G.C5)</strong>                          |       |
| Cooling Cap [kBtu/h] (Tons)| 82.276 (7.0)         | 98.225 (8.2)                                    |       |
| Cooling Efficiency         | 11.5 EER             | 10.1 EER                                        |       |
| Heating Cap [kBtu/h]       | 142.696              | 193.881                                         |       |
| Heating Efficiency         | 90% AFUE             | 80% AFUE                                        |       |
| Design Airflow [cfm]       | 3021                 | 3021                                            |       |
| Fan Demand [kW]            | 2.230                | 2.104                                           |       |
| TSP [in. w.g.]             | 3.5                  | 3.5                                             |       |
| Economizer                 | Yes, OA drybulb control | None                                |       |
| Heat recovery              | Dedicated, stand-alone total enthalpy wheel: 76% sensible eff., 74% latent eff. | None |</p>
<table>
<thead>
<tr>
<th>Component</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td><strong>Envelope</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Wall | R-21 + R-7.5 ci  
U-Value = 0.059  
Gross Area: 21600 sf  
Net Area: 17712 sf | R-13 + R-3.8 ci  
U-Value = 0.084 | |
| Roof | R-40 Entirely above deck  
U-Value = 0.025  
Gross Area: 20000 sf | R-15 Entirely above deck  
U-Value = 0.063 | |
| Window | Solarban 70XL Starphire  
w/ thermally broken  
aluminum frame.  
U-Value = 0.57  
SHGC = 0.261  
Gross Area: 3888 sf | ASHRAE Standard 90.1 minimum required assembly U-Value  
U-Value = 0.57  
SHGC = 0.49 | |
<p>| <strong>Interior Loads</strong> | | | |
| Lighting | 1.5 W/ft² | 1.5 W/ft² | |
| Daylighting Controls | None | None | |
| <strong>HVAC Systems</strong> | | | Packaged Single Zone Rooftop Units |
| <strong>System 1</strong> | | | |
| Cooling Cap [kBtu/h] (tons) | 30.923 (2.58) | 37.507 (3.13) | |
| Cooling Efficiency | 14 SEER | 12 SEER | |
| Heating Cap [kBtu/h] | 54.159 | 72.242 | |
| Heating Efficiency | 90% | 80% | |
| Design Airflow [cfm] | 645 | 721 | |
| Fan Demand [kW] | 0.532 | 0.595 | |
| Economizer | Drybulb | None | |
| Heat recovery | None | None | |
| <strong>System 2</strong> | | | |
| Cooling Cap [kBtu/h] (tons) | 59.185* (4.93) | 73.172 (6.10) | *Split load between two units |
| Cooling Efficiency | 14 SEER | 10.1 EER | |
| Heating Cap [kBtu/h] | 100.838 | 137.084 | |
| Heating Efficiency | 90% | 80% | |
| Design Airflow [cfm] | 1265 | 1448 | |
| Fan Demand [kW] | 1.001 | 1.146 | |
| Economizer | Drybulb | None | |
| Heat recovery | None | None | |</p>
<table>
<thead>
<tr>
<th>Component</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System 3</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooling Cap [kBtu/h] (tons)</td>
<td>15.921 (1.33)</td>
<td>21.190 (1.77)</td>
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<tr>
<td>Cooling Efficiency</td>
<td>14 SEER</td>
<td>12 SEER</td>
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</tr>
<tr>
<td>Heating Cap [kBtu/h]</td>
<td>26.517</td>
<td>38.921</td>
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<td>Heating Efficiency</td>
<td>90%</td>
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<td><strong>System 4</strong></td>
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<tr>
<td>Cooling Cap [kBtu/h] (tons)</td>
<td>64.166* (5.35)</td>
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<td><strong>System 5</strong></td>
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<td>Cooling Cap [kBtu/h] (tons)</td>
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<td>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</td>
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<td>Wall</td>
<td>R-21 + R-7.5 ci</td>
<td>R-13 + R-3.8 ci</td>
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<td>Net Area: 17712 sf</td>
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<tr>
<td>Roof</td>
<td>R-40 Entirely above deck</td>
<td>R-15 Entirely above deck</td>
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<td>U-Value = 0.025</td>
<td>U-Value = 0.063</td>
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<td>Window</td>
<td>Solarban 70XL Starphire w/ thermally broken aluminum frame.</td>
<td>ASHRAE Standard 90.1 minimum required assembly U-Value</td>
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<td>U-Value = 0.57</td>
<td>U-Value = 0.57</td>
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<td>Gross Area: 20000 sf</td>
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<td><strong>Interior Loads</strong></td>
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<tr>
<td>Lighting</td>
<td>1.5 W/ft²</td>
<td>1.5 W/ft²</td>
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<tr>
<td>Daylighting Controls</td>
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<td>None</td>
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<td><strong>HVAC Systems</strong></td>
<td>Split system DX w/ residential type gas furnace</td>
<td>Packaged Single Zone Rooftop Units</td>
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<td><strong>System 1</strong></td>
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<td>Cooling Cap <a href="tons">kBtu/h</a></td>
<td>27.942 (2.33)</td>
<td>34.226 (2.85)</td>
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<td>12 SEER</td>
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<td>Drybulb</td>
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<td>None</td>
<td>None</td>
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<tr>
<td><strong>System 2</strong></td>
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<td>Cooling Cap <a href="tons">kBtu/h</a></td>
<td>52.873* (4.4)</td>
<td>65.792 (5.48)</td>
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<td>10.1 EER</td>
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### Nebraska Energy Code Study – 30% Alternative Model Changes
Small Retail 8% WWR – Norfolk, NE

<table>
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<tr>
<th>Component</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
<th>Notes</th>
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<tbody>
<tr>
<td><strong>System 3</strong></td>
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<td>Cooling Cap [kBtu/h] (tons)</td>
<td>14.326 (1.19)</td>
<td>19.511 (1.63)</td>
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<td><strong>System 4</strong></td>
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<tr>
<td>Cooling Cap [kBtu/h] (tons)</td>
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<td>71.632 (5.97)</td>
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<td>None</td>
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<tr>
<td><strong>System 5</strong></td>
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<tr>
<td>Cooling Cap [kBtu/h] (tons)</td>
<td>13.550 (1.13)</td>
<td>17.594 (1.47)</td>
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<td>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</td>
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<tr>
<td>Wall</td>
<td>R-21 + R-7.5 ci</td>
<td>R-13 + R-3.8 ci</td>
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<tr>
<td></td>
<td>U-Value = 0.059</td>
<td>U-Value = 0.084</td>
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<td>Gross Area: 21600 sf</td>
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<td>Net Area: 17712 sf</td>
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<tr>
<td>Roof</td>
<td>R-40 Entirely above deck</td>
<td>R-15 Entirely above deck</td>
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<tr>
<td></td>
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<td>U-Value = 0.063</td>
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<td>Solarban 70XL Starphire w/ thermally broken aluminum frame.</td>
<td>ASHRAE Standard 90.1 minimum required assembly</td>
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<td>U-Value = 0.57</td>
<td>U-Value = 0.57</td>
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<td>SHGC = 0.261</td>
<td>SHGC = 0.49</td>
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<tr>
<td>Lighting</td>
<td>1.5 W/ft²</td>
<td>1.5 W/ft²</td>
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<tr>
<td>Daylighting Controls</td>
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<td><strong>HVAC Systems</strong></td>
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<tr>
<td>Split system DX w/ residential type gas furnace</td>
<td>Packaged Single Zone Rooftop Units</td>
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<td><strong>System 1</strong></td>
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<tr>
<td>Cooling Cap [kBtu/h] (tons)</td>
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<tr>
<td><strong>System 2</strong></td>
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<td>Cooling Cap [kBtu/h] (tons)</td>
<td>40.954 (3.41)</td>
<td>53.141 (4.43)</td>
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<td>Heating Cap [kBtu/h]</td>
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<td>Heat recovery</td>
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## Nebraska Energy Code Study – 30% Alternative Model Changes
### Small Retail 8% WWR – Chadron, NE

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<th>Component</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
<th>Notes</th>
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<tbody>
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<td><strong>System 3</strong></td>
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<td>Cooling Cap [kBtu/h] (tons)</td>
<td>12.071 (1.00)</td>
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<tr>
<td>Heat recovery</td>
<td>None</td>
<td>None</td>
<td></td>
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</table>

| **System 4** |                      |                                               |       |
| Cooling Cap [kBtu/h] (tons) | 46.883 (3.91)          | 63.916 (5.33)                                 |       |
| Cooling Efficiency | 14.0 SEER             | 12.0 SEER                                     |       |
| Heating Cap [kBtu/h] | 108.163               | 154.023                                       |       |
| Heating Efficiency | 90%                   | 80%                                           |       |
| Design Airflow [cfm] | 1530                  | 1870                                          |       |
| Fan Demand [kW] | 1.099                 | 1.344                                         |       |
| Economizer | Drybulb              | None                                          |       |
| Heat recovery | None                 | None                                          |       |

<p>| <strong>System 5</strong> |                      |                                               |       |
| Cooling Cap [kBtu/h] (tons) | 10.8 (0.90)           | 14.749 (1.23)                                 |       |
| Cooling Efficiency | 14.0 SEER             | 12.0 SEER                                     |       |
| Heating Cap [kBtu/h] | 24.354                | 34.777                                        |       |
| Heating Efficiency | 90%                   | 80%                                           |       |
| Design Airflow [cfm] | 354                   | 432                                           |       |
| Fan Demand [kW] | 0.278                 | 0.340                                         |       |
| Economizer | Drybulb              | None                                          |       |
| Heat recovery | None                 | None                                          |       |</p>
<table>
<thead>
<tr>
<th>Component</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
<th>Notes</th>
</tr>
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<tbody>
<tr>
<td><strong>Envelope</strong></td>
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<tr>
<td>Wall Assembly</td>
<td>R-13 + 10 ci U-Value = 0.055, Gross Area: 7140 sf, Net Area: 5520 sf</td>
<td>R-13 + R-3.8 ci U-Value = 0.084</td>
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<tr>
<td>Roof Assembly</td>
<td>Same as baseline, Gross Area: 13500 sf</td>
<td>R-15 Entirely above deck U-Value = 0.063</td>
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<td>Window Assembly</td>
<td>Solarban 70XL w/ thermally broken frame, U-Value = 0.37, SHGC = 0.27, VT = 0.57, Gross Area: 1620 sf</td>
<td>Generic glazing: U-Value = 0.57, SHGC = 0.49, VT = 0.81</td>
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<td><strong>Interior Loads</strong></td>
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<tr>
<td>Lighting</td>
<td>Same as baseline</td>
<td>1.5 W/ft²</td>
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<td><strong>HVAC Systems</strong></td>
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<tr>
<td></td>
<td>DX Split System Furnace</td>
<td>Packaged Single Zone Rooftop Units</td>
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</tr>
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## Nebraska Energy Code Study – 30% Alternative Model Changes

**Retail Strip Mall – Omaha, NE**

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<td>Design Airflow [cfm]</td>
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<tr>
<td>Fan Demand [kW] (bhp)</td>
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<tr>
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<td>Total Energy Wheel</td>
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## Nebraska Energy Code Study – 30% Alternative Model Changes
### Retail Strip Mall – Omaha, NE

<table>
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<tr>
<th>Component</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
<th>Notes</th>
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<td><strong>System 17</strong></td>
<td><em>EL1 Sys1 PSZ (G.C17)</em></td>
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<td><strong>KITCHEN MAU</strong></td>
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<td>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</td>
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<td>Fan Demand [kW] (bhp)</td>
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**System 7**

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<td>Component</td>
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<td>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</td>
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<tr>
<td>Fan Demand [kW] (bhp)</td>
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# Nebraska Energy Code Study – 30% Alternative Model Changes

**Retail Strip Mall – Chadron, NE**

<table>
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<th>Component</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
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<tr>
<td><strong>Envelope</strong></td>
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<tr>
<td>Wall Assembly</td>
<td>R-13 + 10 ci U-Value = 0.055 Gross Area: 7140 sf Net Area: 5520 sf</td>
<td>R-13 + R-3.8 ci U-Value = 0.084</td>
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<tr>
<td>Roof Assembly</td>
<td>Same as baseline Gross Area: 13500sf</td>
<td>R-15 Entirely above deck U-Value = 0.063</td>
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<tr>
<td>Window Assembly</td>
<td>Solarban 70XL w/ thermally broken frame U-Value = 0.37 SHGC = 0.27 VT = 0.57 Gross Area: 1620 sf</td>
<td>Generic glazing: U-Value = 0.57 SHGC = 0.49 VT = 0.81</td>
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<td><strong>Interior Loads</strong></td>
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<td>Lighting</td>
<td>Same as baseline</td>
<td>1.5 W/ft²</td>
<td>T-8 lamps for both</td>
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<td>Daylighting Controls</td>
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<td>Packaged Single Zone Rooftop Units</td>
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<td>107.752</td>
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<td>Design Airflow [cfm]</td>
<td>1271</td>
<td>1271</td>
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<tr>
<td>Fan Demand [kW] (bhp)</td>
<td>1.210 (1.64)</td>
<td>1.263 (1.71)</td>
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<tr>
<td>TSP [in. w.g.]</td>
<td>5.0</td>
<td>5.0</td>
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<tr>
<td>Economizer</td>
<td>Yes, drybulb</td>
<td>None</td>
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<tr>
<td>Heat recovery</td>
<td>Total Energy Wheel</td>
<td>None</td>
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<td><strong>System 13</strong></td>
<td><strong>EL1 Sys1 PSZ (G.S13)</strong></td>
<td><strong>EL1 Sys1 PSZ (G.S13)</strong></td>
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<td>Cooling Cap [kBtu/h]</td>
<td>18.975 (1.58)</td>
<td>24.848 (2.07)</td>
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<tr>
<td>Heating Cap [kBtu/h]</td>
<td>38.547</td>
<td>54.778</td>
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<td>660</td>
<td>788</td>
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<td>Alternative Building</td>
<td>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</td>
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<tr>
<td>Fan Demand [kW] (bhp)</td>
<td>0.649 (0.88)</td>
<td>0.810 (1.09)</td>
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<td>TSP [in. w.g.]</td>
<td>5.2</td>
<td>5.2</td>
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<tr>
<td>Economizer</td>
<td>Yes, drybulb</td>
<td>None</td>
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<td>Heat recovery</td>
<td>Total Energy Wheel</td>
<td>None</td>
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<td><strong>System 14</strong></td>
<td><strong>EL1 Sys1 PSZ (G.N14)</strong></td>
<td><strong>EL1 Sys1 PSZ (G.N14)</strong></td>
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<tr>
<td>Cooling Cap [kBtu/h] (tons)</td>
<td>14.395 (1.20)</td>
<td>18.358 (1.53)</td>
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<td>Heating Cap [kBtu/h]</td>
<td>30.822</td>
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<td>80%</td>
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<td>Design Airflow [cfm]</td>
<td>475</td>
<td>558</td>
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<td>Fan Demand [kW] (bhp)</td>
<td>0.474 (0.64)</td>
<td>0.582 (0.79)</td>
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<td>5.3</td>
<td>5.3</td>
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<tr>
<td>Economizer</td>
<td>Yes, drybulb</td>
<td>None</td>
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<td>Heat recovery</td>
<td>Total Energy Wheel</td>
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<td><strong>System 15</strong></td>
<td><strong>EL1 Sys1 PSZ (G.C15)</strong></td>
<td><strong>EL1 Sys1 PSZ (G.C15)</strong></td>
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<tr>
<td>Cooling Cap [kBtu/h] (tons)</td>
<td>38.847 (3.24)</td>
<td>43.013 (3.58)</td>
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<td>Heating Cap [kBtu/h]</td>
<td>85.850</td>
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<td>1258</td>
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<td>Fan Demand [kW] (bhp)</td>
<td>1.198 (1.62)</td>
<td>1.250 (1.69)</td>
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<td>5.0</td>
<td>5.0</td>
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<td>Economizer</td>
<td>Yes, drybulb</td>
<td>None</td>
<td></td>
</tr>
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<td>Heat recovery</td>
<td>Total Energy Wheel</td>
<td>None</td>
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<td><strong>System 16</strong></td>
<td><strong>EL1 Sys1 PSZ (G.S16)</strong></td>
<td><strong>EL1 Sys1 PSZ (G.S16)</strong></td>
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<td>Cooling Cap [kBtu/h] (tons)</td>
<td>18.877 (1.57)</td>
<td>24.738 (2.06)</td>
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<td>Heating Cap [kBtu/h]</td>
<td>38.374</td>
<td>54.562</td>
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<td>80%</td>
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<td>Design Airflow [cfm]</td>
<td>656</td>
<td>784</td>
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<td>Fan Demand [kW] (bhp)</td>
<td>0.646 (0.87)</td>
<td>0.807 (1.09)</td>
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<td>5.2</td>
<td>5.2</td>
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<tr>
<td>Economizer</td>
<td>Yes, drybulb</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Heat recovery</td>
<td>Total Energy Wheel</td>
<td>None</td>
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<td>Component</td>
<td>Alternative Building</td>
<td>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</td>
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<td><strong>System 17</strong></td>
<td><strong>EL1 Sys1 PSZ (G.C17)</strong></td>
<td><strong>EL1 Sys1 PSZ (G.C17)</strong></td>
<td></td>
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<tr>
<td>Cooling Cap [kBtu/h] (tons)</td>
<td>41.057 (3.42)</td>
<td>45.143 (3.76)</td>
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<td>Cooling Efficiency</td>
<td>14 SEER</td>
<td>10.1 EER</td>
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<td>Heating Cap [kBtu/h]</td>
<td>115.462</td>
<td>144.118</td>
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<td>Heating Efficiency</td>
<td>90%</td>
<td>80%</td>
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<td>Design Airflow [cfm]</td>
<td>1065</td>
<td>1065</td>
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<tr>
<td>Fan Demand [kW] (bhp)</td>
<td>1.022 (1.38)</td>
<td>1.067 (1.44)</td>
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<td>5.1</td>
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<td>Yes, drybulb</td>
<td>None</td>
<td></td>
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<td>Heat recovery</td>
<td>Total Energy Wheel</td>
<td>None</td>
<td></td>
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<td><strong>System 18</strong></td>
<td><strong>EL1 Sys1 PSZ (G.N18)</strong></td>
<td><strong>EL1 Sys1 PSZ (G.N18)</strong></td>
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<td>Cooling Cap [kBtu/h] (tons)</td>
<td>21.528 (1.79)</td>
<td>25.883 (2.16)</td>
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<tr>
<td>Cooling Efficiency</td>
<td>14 SEER</td>
<td>12 SEER</td>
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<td>Heating Cap [kBtu/h]</td>
<td>58.975</td>
<td>77.043</td>
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<td>Heating Efficiency</td>
<td>90%</td>
<td>80%</td>
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<td>Design Airflow [cfm]</td>
<td>570</td>
<td>646</td>
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<td>Fan Demand [kW] (bhp)</td>
<td>0.564 (0.76)</td>
<td>0.667 (0.90)</td>
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<td>TSP [in. w.g.]</td>
<td>5.2</td>
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<tr>
<td>Economizer</td>
<td>Yes, drybulb</td>
<td>None</td>
<td></td>
</tr>
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<td>Heat recovery</td>
<td>Total Energy Wheel</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td><strong>System 19</strong></td>
<td><strong>EL1 Sys1 PSZ (G.E19)</strong></td>
<td><strong>EL1 Sys1 PSZ (G.E19)</strong></td>
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<td>Cooling Cap [kBtu/h] (tons)</td>
<td>54.101 (4.51)</td>
<td>69.626 (5.80)</td>
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<td>14 SEER</td>
<td>10.1 EER</td>
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<td>Heating Cap [kBtu/h]</td>
<td>153.156</td>
<td>207.383</td>
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<td>90%</td>
<td>80%</td>
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<td>1394</td>
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<td>Fan Demand [kW] (bhp)</td>
<td>1.311 (1.77)</td>
<td>1.724 (2.33)</td>
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<td>TSP [in. w.g.]</td>
<td>5.0</td>
<td>5.0</td>
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<td>Economizer</td>
<td>Yes, drybulb</td>
<td>None</td>
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<td>Heat recovery</td>
<td>Total Energy Wheel</td>
<td>None</td>
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<tr>
<td><strong>System 20</strong></td>
<td><strong>EL1 Sys1 PSZ (G.S20)</strong></td>
<td><strong>EL1 Sys1 PSZ (G.S20)</strong></td>
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<td>Cooling Cap [kBtu/h] (tons)</td>
<td>26.024 (2.17)</td>
<td>32.682 (2.72)</td>
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<td>14 SEER</td>
<td>12 SEER</td>
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<td>Heating Cap [kBtu/h]</td>
<td>65.560</td>
<td>88.639</td>
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<td>80%</td>
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<td>886</td>
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<td>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</td>
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<td>Fan Demand [kW] (bhp)</td>
<td>0.729 (0.99)</td>
<td>0.903 (1.22)</td>
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<td>TSP [in. w.g.]</td>
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<td>Economizer</td>
<td>Yes, drybulb</td>
<td>None</td>
<td></td>
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<td>Heat recovery</td>
<td>Total Energy Wheel</td>
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<td><strong>System 21</strong> KITCHEN MAU</td>
<td><strong>KITCHEN MAU</strong></td>
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<td>Heating Cap [kBtu/h]</td>
<td>259.521</td>
<td>322.428</td>
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<td>80%</td>
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<td>2825</td>
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<td>Fan Demand [kW] (bhp)</td>
<td>2.31 (3.12)</td>
<td>2.709 (3.66)</td>
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<td>4.3</td>
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<td>Economizer</td>
<td>Yes, drybulb</td>
<td>None</td>
<td></td>
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<td>Heat recovery</td>
<td>Total Energy Wheel</td>
<td>None</td>
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<td>Alternative Building</td>
<td>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</td>
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<td><strong>Envelope</strong></td>
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<td>Wall Assembly</td>
<td>R-19+7.5 ci</td>
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<td></td>
<td>Gross Area: 26000 sf</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Net Area: 25480 sf</td>
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<td>Roof Assembly</td>
<td>R-30</td>
<td></td>
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<td></td>
<td>Gross Area: 100000 sf</td>
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<td>Window Assembly</td>
<td>Solarban 70XL Starphire w/ thermally broken aluminum frame:</td>
<td>Generic glazing:</td>
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<td></td>
<td>U-0.42; SHGC-0.27; VLT-0.563</td>
<td>U-0.47; SHGC-0.39; VLT-0.81</td>
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<td>Gross Area: 520 sf</td>
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<td>Lighting</td>
<td>Same as baseline</td>
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<td>None</td>
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<td><strong>HVAC Systems</strong></td>
<td>Packaged Single Zone Rooftop Units</td>
<td>Packaged Rooftop VAV w/ HW Reheat</td>
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<td><strong>System 1</strong></td>
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<td><strong>EL1 Sys1 PVAVS (G)</strong></td>
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<td>Cooling Cap [kBtu/h]</td>
<td>191.086 (16)</td>
<td>602.969 (51)</td>
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<td>Heating Cap [kBtu/h]</td>
<td>370.328</td>
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<td>80%</td>
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<td>Design Airflow [cfm]</td>
<td>4396</td>
<td>16578</td>
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<td>Fan Demand [kW] (bhp)</td>
<td>2.968 (4.0)</td>
<td>13.643 (18.3)</td>
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<td>TSP [in. w.g.]</td>
<td>3.3</td>
<td>3.8</td>
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<td>Economizer</td>
<td>Yes, drybulb</td>
<td>Yes, drybulb</td>
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<tr>
<td>Heat recovery</td>
<td>Yes, enthalpy wheel</td>
<td>None</td>
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<tr>
<td>Associated VAV Boxes</td>
<td>N/A</td>
<td>1 @ 6565, 273 kBtu/h heating</td>
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<td></td>
<td></td>
<td>1 @ 4117, 171 kBtu/h heating</td>
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<tr>
<td></td>
<td></td>
<td>1 @ 5084, 212 kBtu/h heating</td>
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<tr>
<td></td>
<td></td>
<td>1 @ 812, 34 kBtu/h heating</td>
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<td><strong>System 2</strong></td>
<td><strong>EL1 Sys1 PSZ (G.E2)</strong></td>
<td>HVAC System 2</td>
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<tr>
<td>Cooling Cap [kBtu/h]</td>
<td>115.628 (10)</td>
<td>619.921 (52)</td>
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<td>Heating Cap [kBtu/h]</td>
<td>223.824</td>
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<td>2639</td>
<td>16222</td>
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<tr>
<td>Component</td>
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<td>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</td>
<td>Notes</td>
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<td><strong>Component</strong></td>
<td><strong>Alternative Building</strong></td>
<td><strong>ASHRAE 90.1-2004 Baseline Building</strong></td>
<td><strong>Notes</strong></td>
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<tr>
<td>Fan Demand [kW] (bhp)</td>
<td>1.851 (2.5)</td>
<td>13.350 (17.9)</td>
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<td>TSP [in. w.g.]</td>
<td>3.5</td>
<td>3.8</td>
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<tr>
<td>Economizer</td>
<td>Yes, drybulb</td>
<td>Yes, drybulb</td>
<td></td>
</tr>
<tr>
<td>Heat recovery</td>
<td>Yes, enthalpy wheel</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Associated VAV Boxes</td>
<td>N/A</td>
<td>1@ 3948 cfm, 164 kBTU/h heating</td>
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<tr>
<td></td>
<td></td>
<td>1@ 1531 cfm, 64 kBTU/h heating</td>
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<td>1@ 10743 cfm, 447 kBTU/h heating</td>
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<tr>
<td><strong>System 3</strong></td>
<td><strong>EL1 Sys1 PSZ (G.N3)</strong></td>
<td><strong>HVAC System 3</strong></td>
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<tr>
<td>Cooling Cap [kBTU/h] (tons)</td>
<td>139.173 (12)</td>
<td>1348.173 (113)</td>
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<tr>
<td>Cooling Efficiency</td>
<td>9.5 EER</td>
<td>9.0 EER</td>
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<tr>
<td>Heating Cap [kBTU/h]</td>
<td>271.369</td>
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<td>Heating Efficiency</td>
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<td>Design Airflow [cfm]</td>
<td>3124</td>
<td>34863</td>
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<td>Fan Demand [kW] (bhp)</td>
<td>2.178 (2.9)</td>
<td>28.093 (37.7)</td>
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<td>TSP [in. w.g.]</td>
<td>3.5</td>
<td>3.8</td>
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<tr>
<td>Economizer</td>
<td>Yes, drybulb</td>
<td>Yes, drybulb</td>
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<tr>
<td>Heat recovery</td>
<td>Yes, enthalpy wheel</td>
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<td><strong>System 4</strong></td>
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<td>Cooling Cap [kBTU/h] (tons)</td>
<td>22.104 (2)</td>
<td>1478.953 (124)</td>
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<td>Cooling Efficiency</td>
<td>12 SEER</td>
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<td>Heating Cap [kBTU/h]</td>
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<td>512</td>
<td>38272</td>
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<td>0.421 (0.6)</td>
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<td>Cooling Cap [kBTU/h] (tons)</td>
<td>814.303 (68)</td>
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### Nebraska Energy Code Study – 30% Alternative Model Changes
**Large Big Box Retail 2% WWR – Omaha, NE**

<table>
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<tr>
<th>Component</th>
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**System 6**
**EL1 Sys1 PSZ (G.W6)**

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**System 7**
**EL1 Sys1 PSZ (G.N7)**

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<td>Heating Cap [kBtu/h]</td>
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**System 8**
**EL1 Sys1 PSZ (G.C8)**

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<th>Cooling Cap [kBtu/h] (tons)</th>
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<td>System 9</td>
<td><strong>EL1 Sys1 PSZ (SOUTH CORE)</strong></td>
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<td><strong>Envelope</strong></td>
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<td>Wall Assembly</td>
<td>R-19+7.5 ci</td>
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<td>Roof Assembly</td>
<td>R-30</td>
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<td>Window Assembly</td>
<td>Solarban 70XL Starphire w/ thermally broken aluminum frame:</td>
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<td></td>
<td>U-0.42; SHGC-0.27; VLT-0.563</td>
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<td>Gross Area: 520 sf</td>
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<td>Packaged Single Zone Rooftop Units</td>
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<td>Cooling Cap [kBtu/h]</td>
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<td>(tons)</td>
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<td>Heating Cap [kBtu/h]</td>
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<td>Design Airflow [cfm]</td>
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<td>Associated VAV Boxes</td>
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<td><strong>System 2</strong></td>
<td><strong>EL1 Sys1 PSZ (G.E2)</strong></td>
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<td>Cooling Cap [kBtu/h]</td>
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<td>(tons)</td>
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<td>Cooling Efficiency</td>
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<td>Heating Cap [kBtu/h]</td>
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<td>Design Airflow [cfm]</td>
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<td>Component</td>
<td>Alternative Building</td>
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<td>Fan Demand [kW] (bhp)</td>
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<td>Heat recovery</td>
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<td>Associated VAV Boxes</td>
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**System 3**

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<tr>
<td>Cooling Cap [kBTu/h] (tons)</td>
<td>157.651 (14)</td>
<td>1336.796 (112)</td>
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<td>9.5 EER</td>
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<td>Heating Cap [kBTu/h]</td>
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<td>35534</td>
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<td>2.507 (3.4)</td>
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<td>1@ 35534 cfm, 1449 kBTu/h heating</td>
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**System 4**

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<tr>
<td>Cooling Cap [kBTu/h] (tons)</td>
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<td>Yes, drybulb</td>
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**System 5**

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Page 2
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<tr>
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**System 6**

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<td>Heating Cap [kBtu/h]</td>
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<td>Design Airflow [cfm]</td>
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<td>Fan Demand [kW] (bhp)</td>
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<td>TSP [in. w.g.]</td>
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**System 7**

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<td>Design Airflow [cfm]</td>
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<td>Fan Demand [kW] (bhp)</td>
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<td>TSP [in. w.g.]</td>
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**System 8**

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## Nebraska Energy Code Study – 30% Alternative Model Changes

**Large Big Box Retail 2% WWR – Norfolk, NE**

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<th>Component</th>
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**System 9**

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<tr>
<td>Cooling Efficiency</td>
<td>9.0 EER</td>
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<tr>
<td>Heating Cap [kBtu/h]</td>
<td>2252.462</td>
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<tr>
<td>Heating Efficiency</td>
<td>80%</td>
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<tr>
<td>Design Airflow [cfm]</td>
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<tr>
<td>Fan Demand [kW] (bhp)</td>
<td>12.999 (17.4)</td>
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<td>3.0</td>
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<tr>
<td>Economizer</td>
<td>Yes, drybulb</td>
<td></td>
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</tr>
<tr>
<td>Heat recovery</td>
<td>Yes, enthalpy wheel</td>
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</tr>
<tr>
<td>Associated VAV Boxes</td>
<td>N/A</td>
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### Component Alternatives

<table>
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<tr>
<th>Component</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
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<tr>
<td><strong>Envelope</strong></td>
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<td>Wall Assembly</td>
<td>R-19+7.5 ci</td>
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<td>Roof Assembly</td>
<td>R-30</td>
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<td>Solarban 70XL Starphire w/ thermally broken aluminum frame:</td>
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<td>Generic glazing: U-0.47; SHGC-0.39; VLT-0.81</td>
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<td></td>
<td>U-0.42; SHGC-0.27;</td>
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<td>VLT-0.563</td>
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<td>Lighting</td>
<td>Same as baseline</td>
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<tr>
<td>Daylighting Controls</td>
<td>None</td>
<td>None</td>
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<td><strong>HVAC Systems</strong></td>
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<td>System 1</td>
<td><strong>EL1 Sys1 PSZ (G.S1)</strong></td>
<td><strong>EL1 Sys1 PVAVS (G)</strong></td>
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<tr>
<td>Cooling Cap [kBtu/h] (tons)</td>
<td>160.855 (19)</td>
<td>515.053 (43)</td>
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<td>Cooling Efficiency</td>
<td>9.5 EER</td>
<td>9.3 EER</td>
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<td>Heating Cap [kBtu/h]</td>
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<td>Heating Efficiency</td>
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<td>Design Airflow [cfm]</td>
<td>4899</td>
<td>17846</td>
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<td>Fan Demand [kW] (bhp)</td>
<td>3.044 (4.1)</td>
<td>13.517 (18.2)</td>
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<td>TSP [in. w.g.]</td>
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<tr>
<td>Economizer</td>
<td>Yes, drybulb</td>
<td>Yes, drybulb</td>
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<tr>
<td>Heat recovery</td>
<td>Yes, enthalpy wheel</td>
<td>None</td>
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<td>Associated VAV Boxes</td>
<td>N/A</td>
<td>1 @ 7588, 191 kBtu/h heating</td>
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<td>1 @ 4283, 164 kBtu/h heating</td>
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<td>1 @ 5137, 197 kBtu/h heating</td>
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<td></td>
<td>1 @ 838, 32 kBtu/h heating</td>
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<td>System 2</td>
<td><strong>EL1 Sys1 PSZ (G.E2)</strong></td>
<td><strong>HVAC System 2</strong></td>
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<td>Cooling Cap [kBtu/h] (tons)</td>
<td>92.096 (7.7)</td>
<td>554.132 (47)</td>
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<td>Cooling Efficiency</td>
<td>10.1 EER</td>
<td>9.3 EER</td>
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<td>Heating Cap [kBtu/h]</td>
<td>232.159</td>
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<td>Heating Efficiency</td>
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<td>Design Airflow [cfm]</td>
<td>2721</td>
<td>17970</td>
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<td>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</td>
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<tr>
<td>Fan Demand [kW] (bhp)</td>
<td>1.757 (2.4)</td>
<td>13.610 (18.3)</td>
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<td>TSP [in. w.g.]</td>
<td>3.5</td>
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<tr>
<td>Economizer</td>
<td>Yes, drybulb</td>
<td>Yes, drybulb</td>
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<tr>
<td>Heat recovery</td>
<td>Yes, enthalpy wheel</td>
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<tr>
<td>Associated VAV Boxes</td>
<td>N/A</td>
<td>1@ 44763 cfm, 171 kBTU/h heating</td>
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<td>1@ 1544 cfm, 59 kBTU/h heating</td>
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<td></td>
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<td>1@ 11952 cfm, 457 kBTU/h heating</td>
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**System 3**

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<th>Component</th>
<th>EL1 Sys1 PSZ (G.N3)</th>
<th>HVAC System 3</th>
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<tr>
<td>Cooling Cap [kBTU/h] (tons)</td>
<td>108.557 (9)</td>
<td>1182.612 (99)</td>
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<tr>
<td>Cooling Efficiency</td>
<td>9.5 EER</td>
<td>9.0 EER</td>
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<tr>
<td>Heating Cap [kBTU/h]</td>
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<td>Heating Efficiency</td>
<td>80%</td>
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<tr>
<td>Design Airflow [cfm]</td>
<td>3136</td>
<td>37880</td>
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<tr>
<td>Fan Demand [kW] (bhp)</td>
<td>2.012 (2.7)</td>
<td>28.093 (37.7)</td>
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<tr>
<td>TSP [in. w.g.]</td>
<td>3.5</td>
<td>3.8</td>
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<tr>
<td>Economizer</td>
<td>Yes, drybulb</td>
<td>Yes, drybulb</td>
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<tr>
<td>Heat recovery</td>
<td>Yes, enthalpy wheel</td>
<td>None</td>
</tr>
<tr>
<td>Associated VAV Boxes</td>
<td>N/A</td>
<td>1@ 37880 cfm, 1449 kBTU/h heating</td>
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**System 4**

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<th>Component</th>
<th>EL1 Sys1 PSZ (G.W4)</th>
<th>HVAC System 4</th>
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<tr>
<td>Cooling Cap [kBTU/h] (tons)</td>
<td>18.079 (1.5)</td>
<td>1297.577 (109)</td>
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<tr>
<td>Cooling Efficiency</td>
<td>12 SEER</td>
<td>9.0 EER</td>
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<td>Heating Cap [kBTU/h]</td>
<td>43.870</td>
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<tr>
<td>Heating Efficiency</td>
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<tr>
<td>Design Airflow [cfm]</td>
<td>544</td>
<td>41584</td>
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<tr>
<td>Fan Demand [kW] (bhp)</td>
<td>0.412 (0.6)</td>
<td>30.840 (41.3)</td>
</tr>
<tr>
<td>TSP [in. w.g.]</td>
<td>4.1</td>
<td>3.8</td>
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<tr>
<td>Economizer</td>
<td>Yes, drybulb</td>
<td>Yes, drybulb</td>
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<tr>
<td>Heat recovery</td>
<td>Yes, enthalpy wheel</td>
<td>None</td>
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<td>Associated VAV Boxes</td>
<td>N/A</td>
<td>1 @ 41584 cfm, 1590 kBTU/h heating</td>
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**System 5**

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<tr>
<td>Cooling Cap [kBTU/h] (tons)</td>
<td>665.290 (56)</td>
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<td>Component</td>
<td>Alternative Building</td>
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</tr>
<tr>
<td>Cooling Efficiency</td>
<td>9 EER</td>
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<tr>
<td>Heating Cap [kBtu/h]</td>
<td>1833.368</td>
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<tr>
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<tr>
<td>Design Airflow [cfm]</td>
<td>18141</td>
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<tr>
<td>Fan Demand [kW] (bhp)</td>
<td>10.296 (13.8)</td>
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<td>TSP [in. w.g.]</td>
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<td>Economizer</td>
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<tr>
<td>Heat recovery</td>
<td>Yes, enthalpy wheel</td>
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<tr>
<td>Associated VAV Boxes</td>
<td>N/A</td>
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</table>

**System 6**  
**EL1 Sys1 PSZ (G.W6)**

| Cooling Cap [kBtu/h] (tons)       | 69.526 (5.8)         |                                                 |                |
| Cooling Efficiency                | 10.1 EER             |                                                 |                |
| Heating Cap [kBtu/h]              | 147.336              |                                                 |                |
| Heating Efficiency                | 80%                  |                                                 |                |
| Design Airflow [cfm]              | 2482                 |                                                 |                |
| Fan Demand [kW] (bhp)             | 1.634 (2.2)          |                                                 |                |
| TSP [in. w.g.]                    | 3.5                  |                                                 |                |
| Economizer                        | Yes, drybulb         |                                                 |                |
| Heat recovery                      | Yes, enthalpy wheel  |                                                 |                |
| Associated VAV Boxes              | N/A                  |                                                 |                |

**System 7**  
**EL1 Sys1 PSZ (G.N7)**

| Cooling Cap [kBtu/h] (tons)       | 27.113 (2.3)         |                                                 |                |
| Cooling Efficiency                | 12 SEER              |                                                 |                |
| Heating Cap [kBtu/h]              | 58.879               |                                                 |                |
| Heating Efficiency                | 80%                  |                                                 |                |
| Design Airflow [cfm]              | 918                  |                                                 |                |
| Fan Demand [kW] (bhp)             | 0.654 (0.9)          |                                                 |                |
| TSP [in. w.g.]                    | 3.8                  |                                                 |                |
| Economizer                        | Yes, drybulb         |                                                 |                |
| Heat recovery                      | Yes, enthalpy wheel  |                                                 |                |
| Associated VAV Boxes              | N/A                  |                                                 |                |

**System 8**  
**EL1 Sys1 PSZ (G.C8)**

<p>| Cooling Cap [kBtu/h] (tons)       | 256.706 (21.4)       |                                                 |                |
| Cooling Efficiency                | 9.3 EER              |                                                 |                |</p>
<table>
<thead>
<tr>
<th>Component</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
<th>Notes</th>
</tr>
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<tbody>
<tr>
<td>Heating Cap [kBtu/h]</td>
<td>590.325</td>
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<td>Design Airflow [cfm]</td>
<td>8515</td>
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<td>Fan Demand [kW] (bhp)</td>
<td>5.275 (7.1)</td>
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<tr>
<td>Economizer</td>
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<td></td>
</tr>
<tr>
<td>Heat recovery</td>
<td>Yes, enthalpy wheel</td>
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<td></td>
</tr>
<tr>
<td>Associated VAV Boxes</td>
<td>N/A</td>
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<td><strong>System 9</strong></td>
<td><strong>EL1 Sys1 PSZ (SOUTH CORE)</strong></td>
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<td>Cooling Cap [kBtu/h] (tons)</td>
<td>729.718 (61)</td>
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<td>Heating Cap [kBtu/h]</td>
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<td>Design Airflow [cfm]</td>
<td>19922</td>
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<td>Fan Demand [kW] (bhp)</td>
<td>11.270 (15.1)</td>
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<tr>
<td>Economizer</td>
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<tr>
<td>Heat recovery</td>
<td>Yes, enthalpy wheel</td>
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</tr>
<tr>
<td>Associated VAV Boxes</td>
<td>N/A</td>
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</table>
### Nebraska Energy Code Study – 30% Alternative Model Changes

**Elementary School 18% WWR – Omaha, NE**

<table>
<thead>
<tr>
<th>Component</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td><strong>Envelope</strong></td>
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</tr>
<tr>
<td>Wall Assembly</td>
<td>Same as baseline</td>
<td>R-13 + R-3.8 c.i., U =0.084</td>
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<tr>
<td></td>
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<td>Gross Area: 13540 sf</td>
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<tr>
<td></td>
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<td>Net Area: 11100 sf</td>
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<td>Roof Assembly</td>
<td>R-17 entirely above deck</td>
<td>R-15 entirely above deck</td>
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<tr>
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<td>Gross Area: 50000 sf</td>
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<tr>
<td>Window Assembly</td>
<td>Same as baseline</td>
<td>Generic glazing: U-0.57; SHGC-0.39; VLT-0.81</td>
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<tr>
<td></td>
<td>Gross Area: 2440 sf</td>
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<td><strong>Interior Loads</strong></td>
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<tr>
<td>Lighting</td>
<td>Same as baseline</td>
<td>LPD = 1.2 W/sf</td>
<td>T-8 lamps for both</td>
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<tr>
<td>Daylighting Controls</td>
<td>None</td>
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<td>None</td>
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<td><strong>HVAC Systems</strong></td>
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<td>Packaged Single Zone Heat</td>
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<td>Packaged Single Zone Heat Pumps</td>
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<td>Pumps</td>
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<td><strong>System 1</strong></td>
<td><strong>EL1 Sys1 PSZ (G.NW1)</strong></td>
<td><strong>HVAC System 1</strong></td>
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<td>Cooling Cap [kBtu/h]</td>
<td>48.995 (4)</td>
<td>52.226 (5)</td>
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<tr>
<td>(tons)</td>
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<tr>
<td>Heating Cap [kBtu/h]</td>
<td>39.337</td>
<td>45.577</td>
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<tr>
<td>Heating Efficiency</td>
<td>Same as baseline</td>
<td>13.0 SEER</td>
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<tr>
<td>Design Airflow [cfm]</td>
<td>819</td>
<td>1023</td>
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<tr>
<td>Fan Demand [kW] (bhp)</td>
<td>0.616 (0.9)</td>
<td>0.770 (1.1)</td>
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<tr>
<td>TSP [in. w.g.]</td>
<td>Same as baseline</td>
<td>3.5</td>
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<tr>
<td>Economizer</td>
<td>Same as baseline</td>
<td>Yes, drybulb</td>
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</tr>
<tr>
<td>Heat recovery</td>
<td>Yes, enthalpy wheel</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td><strong>System 2</strong></td>
<td><strong>EL1 Sys1 PSZ (G.W2)</strong></td>
<td><strong>HVAC System 2</strong></td>
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<tr>
<td>Cooling Cap [kBtu/h]</td>
<td>157.754 (14)</td>
<td>158.030 (14)</td>
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<td>(tons)</td>
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<tr>
<td>Heating Cap [kBtu/h]</td>
<td>125.860</td>
<td>126.080</td>
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<tr>
<td>Fan Demand [kW] (bhp)</td>
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<td>TSP [in. w.g.]</td>
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<tr>
<td>Economizer</td>
<td>Same as baseline</td>
<td>Yes, drybulb</td>
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</tr>
<tr>
<td>Heat recovery</td>
<td>Yes, enthalpy wheel</td>
<td>None</td>
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</table>
## Nebraska Energy Code Study – 30% Alternative Model Changes

### Elementary School 18% WWR – Omaha, NE

<table>
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<tr>
<th>Component</th>
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**System 7**

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**System 8**

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### Nebraska Energy Code Study – 30% Alternative Model Changes

**Elementary School 18% WWR – Omaha, NE**

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| **System 16** | *EL1 Sys1 PSZ (G.C16)* | **HVAC System 16** | |
| Cooling Cap [kBtu/h] (tons) | 352.290 (30) | 354.745 (30) | |
| Cooling Efficiency | Same as baseline | 9.0 EER | |
| Heating Cap [kBtu/h] | 290.410 | 292.433 | |
| Heating Efficiency | Same as baseline | 3.1 COP | |
| Design Airflow [cfm] | Same as baseline | 8288 | |
| Fan Demand [kW] (bhp) | 5.041 (6.8) | 5.048 (6.8) | |
| TSP [in. w.g.] | Same as baseline | 2.8 | |
| Economizer | Same as baseline | Yes, drybulb | |
| Heat recovery | Yes, enthalpy wheel | None | |

<p>| <strong>System 17</strong> | <em>EL1 Sys1 PSZ (G.N17)</em> | <strong>HVAC System 17</strong> | |
| Cooling Cap [kBtu/h] (tons) | 137.910 (12) | 138.138 (12) | |
| Cooling Efficiency | Same as baseline | 9.3 EER | |
| Heating Cap [kBtu/h] | 110.028 | 110.210 | |
| Heating Efficiency | Same as baseline | 3.1 COP | |
| Design Airflow [cfm] | Same as baseline | 2589 | |
| Fan Demand [kW] (bhp) | 1.774 (2.4) | 1.772 (2.4) | |
| TSP [in. w.g.] | Same as baseline | 3.2 | |
| Economizer | Same as baseline | Yes, drybulb | |
| Heat recovery | Yes, enthalpy wheel | None | |</p>
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<td>R-13 + R-3.8 c.i., U =0.084</td>
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<td>Gross Area: 50000 sf</td>
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<td>U-0.57; SHGC-0.39; VLT-0.81</td>
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Page 2
## Nebraska Energy Code Study – 30% Alternative Model Changes

**Elementary School 18% WWR – Norfolk, NE**

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<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
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# Nebraska Energy Code Study – 30% Alternative Model Changes

## Elementary School 18% WWR – Norfolk, NE

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<td>Same as baseline</td>
<td>3072</td>
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<tr>
<td>Fan Demand [kW] (bhp)</td>
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<td>2.046 (2.8)</td>
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<td>TSP [in. w.g.]</td>
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<tr>
<td>Economizer</td>
<td>Same as baseline</td>
<td>Yes, drybulb</td>
<td></td>
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<tr>
<td>Heat recovery</td>
<td>Yes, enthalpy wheel</td>
<td>None</td>
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</tr>
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| **System 13** | *EL1 Sys1 PSZ (G.S13)* | *HVAC System 13* |       |
| Cooling Cap [kBtu/h] (tons) | 111.274 (10) | 111.609 (10) |       |
| Cooling Efficiency | Same as baseline | 10.1 EER |       |
| Heating Cap [kBtu/h] | 89.822 | 90.092 |       |
| Heating Efficiency | Same as baseline | 3.2 COP |       |
| Design Airflow [cfm] | Same as baseline | 2736 |       |
| Fan Demand [kW] (bhp) | Same as baseline | 1.834 (2.5) |       |
| TSP [in. w.g.] | Same as baseline | 3.2 |       |
| Economizer | Same as baseline | Yes, drybulb |       |
| Heat recovery | Yes, enthalpy wheel | None |       |

| **System 14** | *EL1 Sys1 PSZ (G.C14)* | *HVAC System 14* |       |
| Cooling Cap [kBtu/h] (tons) | 32.585 (3) | 32.970 (3) |       |
| Cooling Efficiency | Same as baseline | 13.0 SEER |       |
| Heating Cap [kBtu/h] | 28.437 | 28.773 |       |
| Heating Efficiency | Same as baseline | 7.7 HSPF |       |
| Design Airflow [cfm] | Same as baseline | 948 |       |
| Fan Demand [kW] (bhp) | Same as baseline | 0.715 (1.0) |       |
| TSP [in. w.g.] | Same as baseline | 3.6 |       |
| Economizer | Same as baseline | Yes, drybulb |       |
| Heat recovery | Yes, enthalpy wheel | None |       |
### System 15
<table>
<thead>
<tr>
<th>Component</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
<th>Notes</th>
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<tr>
<td>Cooling Cap [kBtu/h] (tons)</td>
<td>EL1 Sys1 PSZ (G.C15)</td>
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<tr>
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<td>78.024</td>
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<td>(7)</td>
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<td>Cooling Efficiency</td>
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<td>Heating Cap [kBtu/h]</td>
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<td>Heating Cap [kBtu/h]</td>
<td>252.589</td>
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<td></td>
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<td>Heating Cap [kBtu/h]</td>
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<td>88.787</td>
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<td>Design Airflow [cfm]</td>
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<tr>
<td><strong>Envelope</strong></td>
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<td>Wall Assembly</td>
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<td>R-13 + R-3.8 c.i., U =0.084</td>
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<tr>
<td></td>
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<td>Net Area: 11100 sf</td>
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<td>Roof Assembly</td>
<td>R-17 entirely above deck</td>
<td>R-15 entirely above deck</td>
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<td>Gross Area: 50000 sf</td>
<td>Gross Area: 50000 sf</td>
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<td>Window Assembly</td>
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<td>Generic glazing: U-0.57; SHGC-0.39; VLT-0.81</td>
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<td>Gross Area: 2440 sf</td>
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<td><strong>Interior Loads</strong></td>
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<td>Lighting</td>
<td>Same as baseline</td>
<td>LPD = 1.2 W/sf</td>
<td>T-8 lamps for both cases</td>
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<td>Daylighting Controls</td>
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<td>0.785</td>
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<td>3.5</td>
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<td>Same as baseline</td>
<td>Yes, drybulb</td>
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<tr>
<td>Heat recovery</td>
<td>Yes, enthalpy wheel</td>
<td>None</td>
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<td>System 2</td>
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<td>Cooling Cap [kBtu/h] (tons)</td>
<td>112.579</td>
<td>113.034</td>
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<td>(10)</td>
<td>(10)</td>
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<td>Cooling Efficiency</td>
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<td>10.1 EER</td>
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<td>Heating Cap [kBtu/h]</td>
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<td>90.182</td>
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<td>3.2 COP</td>
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<td>Design Airflow [cfm]</td>
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<td>3367</td>
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<td>Economizer</td>
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<tr>
<td>Heat recovery</td>
<td>Yes, enthalpy wheel</td>
<td>None</td>
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<td><strong>System 3</strong></td>
<td><em>EL1 Sys1 PSZ (G.SSW3)</em></td>
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<td>Cooling Cap [kBtu/h] (tons)</td>
<td>114.928 (10)</td>
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<td>Cooling Efficiency</td>
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<td>Heating Cap [kBtu/h]</td>
<td>91.693</td>
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<td>2.209 (3.0)</td>
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<td>Economizer</td>
<td>Same as baseline</td>
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<tr>
<td>Heat recovery</td>
<td>Yes, enthalpy wheel</td>
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</table>

| **System 4** | *EL1 Sys1 PSZ (G.S4)* | *HVAC System 4* | |
| Cooling Cap [kBtu/h] (tons) | 112.021 (10) | 112.508 (10) | |
| Cooling Efficiency | Same as baseline | 10.1 EER | |
| Heating Cap [kBtu/h] | 89.373 | 89.762 | |
| Heating Efficiency | Same as baseline | 3.2 COP | |
| Design Airflow [cfm] | Same as baseline | 3430 | |
| Fan Demand [kW] (bhp) | Same as baseline | 2.143 (2.9) | |
| TSP [in. w.g.] | Same as baseline | 3.2 | |
| Economizer | Same as baseline | Yes, drybulb | |
| Heat recovery | Yes, enthalpy wheel | None | |

<p>| <strong>System 5</strong> | <em>EL1 Sys1 PSZ (G.NS)</em> | <em>HVAC System 5</em> | |
| Cooling Cap [kBtu/h] (tons) | 89.814 (8) | 90.139 (8) | |
| Cooling Efficiency | Same as baseline | 10.1 EER | |
| Heating Cap [kBtu/h] | 72.499 | 72.762 | |
| Heating Efficiency | Same as baseline | 3.2 COP | |
| Design Airflow [cfm] | Same as baseline | 2616 | |
| Fan Demand [kW] (bhp) | Same as baseline | 1.676 (2.3) | |
| TSP [in. w.g.] | Same as baseline | 3.3 | |
| Economizer | Same as baseline | Yes, drybulb | |
| Heat recovery | Yes, enthalpy wheel | None | |</p>
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<tr>
<th>Component</th>
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<td>Cooling Cap [kBtu/h] (tons)</td>
<td>292.813 (25)</td>
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<td>Cooling Cap [kBtu/h] (tons)</td>
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<td>76.040</td>
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<tr>
<td>Heat recovery</td>
<td>Yes, enthalpy wheel</td>
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### Nebraska Energy Code Study – 30% Alternative Model Changes

**Elementary School 18% WWR – Chadron, NE**

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<td>Cooling Cap [kBtu/h] (tons)</td>
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<td>0.786 (1.1)</td>
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<td>TSP [in. w.g.]</td>
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<td>Economizer</td>
<td>Same as baseline</td>
<td>Yes, drybulb</td>
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<tr>
<td>Heat recovery</td>
<td>Yes, enthalpy wheel</td>
<td>None</td>
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</tr>
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| **System 10** | **EL1 Sys1 PSZ (G.E10)** | **HVAC System 10** |       |
| Cooling Cap [kBtu/h] (tons) | 116.090 (10) | 116.575 (10) |       |
| Cooling Efficiency | Same as baseline | 10.1 EER |       |
| Heating Cap [kBtu/h] | 92.620 | 93.007 |       |
| Heating Efficiency | Same as baseline | 3.2 COP |       |
| Design Airflow [cfm] | Same as baseline | 3502 |       |
| Fan Demand [kW] (bhp) | Same as baseline | 2.181 (3.0) |       |
| TSP [in. w.g.] | Same as baseline | 3.2 |       |
| Economizer | Same as baseline | Yes, drybulb |       |
| Heat recovery | Yes, enthalpy wheel | None |       |

<p>| <strong>System 11</strong> | <strong>EL1 Sys1 PSZ (G.SE11)</strong> | <strong>HVAC System 11</strong> |       |
| Cooling Cap [kBtu/h] (tons) | 40.836 (4) | 41.017 (4) |       |
| Cooling Efficiency | Same as baseline | 13.0 SEER |       |
| Heating Cap [kBtu/h] | 35.637 | 35.795 |       |
| Heating Efficiency | Same as baseline | 7.7 HSPF |       |
| Design Airflow [cfm] | Same as baseline | 1274 |       |
| Fan Demand [kW] (bhp) | Same as baseline | 0.874 (1.2) |       |
| TSP [in. w.g.] | Same as baseline | 3.5 |       |
| Economizer | Same as baseline | Yes, drybulb |       |
| Heat recovery | Yes, enthalpy wheel | None |       |</p>
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<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
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<td><strong>System 12</strong></td>
<td><strong>EL1 Sys1 PSZ (G.S12)</strong></td>
<td><strong>HVAC System 12</strong></td>
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<td>Cooling Cap [kBtu/h] (tons)</td>
<td>109.301 (10)</td>
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| **System 13** | **EL1 Sys1 PSZ (G.S13)** | **HVAC System 13** |       |
| Cooling Cap [kBtu/h] (tons) | 97.285 (9) | 97.708 (9) |       |
| Cooling Efficiency | Same as baseline | 10.1 EER |       |
| Heating Cap [kBtu/h] | 78.530 | 78.872 |       |
| Heating Efficiency | Same as baseline | 3.2 COP |       |
| Design Airflow [cfm] | Same as baseline | 2979 |       |
| Fan Demand [kW] (bhp) | Same as baseline | 1.873 (2.6) |       |
| TSP [in. w.g.] | Same as baseline | 3.2 |       |
| Economizer | Same as baseline | Yes, drybulb |       |
| Heat recovery | Yes, enthalpy wheel | None |       |

<p>| <strong>System 14</strong> | <strong>EL1 Sys1 PSZ (G.C14)</strong> | <strong>HVAC System 14</strong> |       |
| Cooling Cap [kBtu/h] (tons) | 30.247 (3) | 30.774 (3) |       |
| Cooling Efficiency | Same as baseline | 13.0 SEER |       |
| Heating Cap [kBtu/h] | 26.396 | 26.856 |       |
| Heating Efficiency | Same as baseline | 7.7 HSPF |       |
| Design Airflow [cfm] | Same as baseline | 1008 |       |
| Fan Demand [kW] (bhp) | Same as baseline | 0.713 (1.0) |       |
| TSP [in. w.g.] | Same as baseline | 3.6 |       |
| Economizer | Same as baseline | Yes, drybulb |       |
| Heat recovery | Yes, enthalpy wheel | None |       |</p>
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<td><strong>System 15</strong></td>
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<td><em>EL1 Sys1 PSZ (G.C16)</em></td>
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<td>Cooling Cap [kBtu/h] (tons)</td>
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<td>Roof Assembly</td>
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<td>Gross Area: 80000 sf</td>
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<td>Solarban 70XL Starphire w/ thermally broken aluminum frame:</td>
<td>Generic glazing: U-0.57; SHGC-0.39; VLT-0.81</td>
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<td>U-0.402; SHGC-0.27; VLT-0.554</td>
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<td>(tons)</td>
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<td>(36.0)</td>
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<td>Heat recovery</td>
<td>Yes, enthalpy wheel</td>
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<tr>
<td>Associated VAV Boxes</td>
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<td>1 @ 2272 cfm, 76 kBtu/h htg</td>
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<td>1 @ 1200 cfm, 40 kBtu/h htg</td>
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<td>1 @ 2105 cfm, 70 kBtu/h htg</td>
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<td>1 @ 2076 cfm, 69 kBtu/h htg</td>
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<td>1 @ 1319 cfm, 44 kBtu/h htg</td>
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<td>1 @ 1404 cfm, 53 kBtu/h htg</td>
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<td>1 @ 2120 cfm, 80 kBtu/h htg</td>
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<td>1 @ 3300 cfm, 110 kBtu/h htg</td>
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<td><strong>System 2</strong></td>
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<td>Yes, enthalpy wheel</td>
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**System 5** *EL1 Sys1 PSZ (G.E5)*

- Cooling Cap [kBtu/h] (tons) 78.662 (6.56)
- Cooling Efficiency 11.0 EER
- Heating Cap [kBtu/h] 77.135
- Heating Efficiency 2.4 COP
- Design Airflow [cfm] 1620
- Fan Demand [kW] (bhp) 1.171 (1.57)
- TSP [in. w.g.] 3.5
- Economizer Yes, drybulb
- Heat recovery Yes, enthalpy wheel
- Associated VAV Boxes N/A

**System 6** *EL1 Sys1 PSZ (G.E6)*

- Cooling Cap [kBtu/h] (tons) 40.973 (3.41)
- Cooling Efficiency 11.6 EER
- Heating Cap [kBtu/h] 38.093
- Heating Efficiency 3.48 COP
- Design Airflow [cfm] 1585
- Fan Demand [kW] (bhp) 1.179 (1.58)
- TSP [in. w.g.] 3.6
- Economizer Yes, drybulb
- Heat recovery Yes, enthalpy wheel
- Associated VAV Boxes N/A

**System 7** *EL1 Sys1 PSZ (G.SW7)*

- Cooling Cap [kBtu/h] (tons) 48.922 (4.08)
- Cooling Efficiency 11.6 SEER
- Heating Cap [kBtu/h] 45.484
- Heating Efficiency 3.48
- Design Airflow [cfm] 989
- Fan Demand [kW] (bhp) 0.755 (1.01)
- TSP [in. w.g.] 3.7
- Economizer Yes, drybulb
- Heat recovery Yes, enthalpy wheel
- Associated VAV Boxes N/A
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**System 15 EL1 Sys1 PSZ (G.SE15)**

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**System 16 EL1 Sys1 PSZ (G.W16)**

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<td>Cooling Cap [kBtu/h] (tons)</td>
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<td>TSP [in. w.g.]</td>
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<td>Economizer</td>
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<tr>
<td>Heat recovery</td>
<td>Yes, enthalpy wheel</td>
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<tr>
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<td><strong>System 21</strong></td>
<td><strong>El1 Sys1 PSZ (G.W21)</strong></td>
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### Nebraska Energy Code Study – 30% Alternative Model Changes
#### Secondary School 18% WWR – Omaha, NE

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**System 25 EL1 Sys1 PSZ (G.E25)**

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**System 26 EL1 Sys1 PSZ (G.N26)**

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**System 27 EL1 Sys1 PSZ (G.C27)**

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<td><strong>System 28</strong></td>
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# Nebraska Energy Code Study – 30% Alternative Model Changes

## Secondary School 18% WWR – Norfolk, NE

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<th>Component</th>
<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
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<td><strong>Envelope</strong></td>
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<td>Wall Assembly</td>
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<tr>
<td>Roof Assembly</td>
<td>Same as baseline</td>
<td>Gross Area: 80000 sf</td>
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<td>Window Assembly</td>
<td>Solarban 70XL Starphire w/ thermally broken aluminum frame: U-0.402; SHGC-0.27; VLT-0.554</td>
<td>Generic glazing: U-0.57; SHGC-0.39; VLT-0.81</td>
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<td><strong>Interior Loads</strong></td>
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<td>Lighting</td>
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<td>ASHRAE 90.1 Space Dependent</td>
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<td>Daylighting Controls</td>
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<td><strong>HVAC Systems</strong></td>
<td>Packaged Single Zone Rooftop Units</td>
<td>Packaged Rooftop VAV w/ HW Reheat</td>
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<td>1 @ 13022 cfm, 478 kBTu/h htg</td>
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<th>Component</th>
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### Component | Alternative Building | ASHRAE 90.1-2004 Baseline Building (0° Rotation) | Notes
--- | --- | --- | ---
TSP [in. w.g.] | 2.8 | | |
Economizer | Yes, drybulb | | |
Heat recovery | Yes, enthalpy wheel | | |
Associated VAV Boxes | N/A | | |
**System 28** | **EL1 Sys1 PSZ (G.C28)** | | |
Cooling Cap [kBtu/h] (tons) | 58.972 (4.92) | | |
Cooling Efficiency | 11.6 EER | | |
Heating Cap [kBtu/h] | 57.827 | | |
Heating Efficiency | 3.48 COP | | |
Design Airflow [cfm] | 1431 | | |
Fan Demand [kW] (bhp) | 1.024 (1.37) | | |
TSP [in. w.g.] | 3.5 | | |
Economizer | Yes, drybulb | | |
Heat recovery | Yes, enthalpy wheel | | |
Associated VAV Boxes | N/A | | |
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<td>Generic glazing: U-0.57; SHGC-0.39; VLT-0.81</td>
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## Interior Loads

| Lighting               | Same as baseline                                          | ASHRAE 90.1 Space Dependent                     |                       |
| Daylighting Controls   | None                                                      | None                                            |                       |

## HVAC Systems

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<td>9.2 EER</td>
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<td>Yes, drybulb</td>
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<td>Heat recovery</td>
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<td>1 @ 2257 cfm, 70 kBtu/h htg</td>
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<td>1 @ 1465 cfm, 45 kBtu/h htg</td>
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<td>1 @ 3557 cfm, 109 kBtu/h htg</td>
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### Component Alternative Building ASHRAE 90.1-2004 Baseline Building (0° Rotation) Notes

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<td>Fan Demand [kW] (bhp)</td>
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<td>19.233 (25.8)</td>
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<td>Heat recovery</td>
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<td>1 @ 3178 cfm, 98 kBTU/h hgt 1 @ 8030 cfm, 246 kBTU/h hgt 1 @ 13858 cfm, 477 kBTU/h hgt</td>
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#### System 3

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#### System 4

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<td><strong>System 5</strong></td>
<td><strong>EL1 Sys1 PSZ (G.E5)</strong></td>
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<td>Cooling Cap [kBtu/h] (tons)</td>
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<td><strong>System 6</strong></td>
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<td><strong>System 7</strong></td>
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<td><strong>System 9</strong></td>
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<td>Design Airflow [cfm]</td>
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<td>Fan Demand [kW] (bhp)</td>
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<td>Heat recovery</td>
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<tr>
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<td><strong>System 18</strong></td>
<td><strong>EL1 Sys1 PSZ (G.NNW18)</strong></td>
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<tr>
<td>Cooling Cap [kBtu/h] (tons)</td>
<td>58.7 (4.92)</td>
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<td>Cooling Efficiency</td>
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<tr>
<td>Heating Cap [kBtu/h]</td>
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<td><strong>System 19</strong></td>
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<td><strong>System 20</strong></td>
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<td>-----------</td>
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<tr>
<td>Heat recovery</td>
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<td><strong>System 21</strong></td>
<td><strong>EL1 Sys1 PSZ (G.W21)</strong></td>
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<td>Cooling Cap [kBtu/h] (tons)</td>
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<td>Cooling Cap [kBtu/h] (tons)</td>
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<td><strong>System 23</strong></td>
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<td><strong>System 24</strong></td>
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<tr>
<td>(tons)</td>
<td>(9.8)</td>
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<td><strong>System 25</strong></td>
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<td><strong>System 26</strong></td>
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<td><strong>System 27</strong></td>
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<td><strong>Envelope</strong></td>
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<td>Rooftop Units and Gas-fired unit ventilators</td>
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## Nebraska Energy Code Study – 30% Alternative Model Changes
**Warehouse – Norfolk, NE**

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<th>Alternative Building</th>
<th>ASHRAE 90.1-2004 Baseline Building (0° Rotation)</th>
<th>Notes</th>
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<tr>
<td><strong>Envelope</strong></td>
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</tr>
<tr>
<td>Wall Assembly</td>
<td>R-10 ci + R-10 ci (masonry wall)</td>
<td>R-13 + R-3.8 ci U-Value = 0.084</td>
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<td>Lighting</td>
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<td>Average 0.8 W/ft² in warehouse Average 1 W/ft² in office support spaces</td>
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## Nebraska Energy Code Study – 30% Alternative Model Changes
### Warehouse – Chadron, NE

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<td>U-Value = 0.049</td>
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<td>R-40 Entirely above deck</td>
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<td>Gross Area: 48000 sf</td>
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<td>Lighting</td>
<td>Same as baseline</td>
<td>Average 0.8 W/ft² in warehouse</td>
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<td>Daylighting Controls</td>
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<td>System 1</td>
<td>DX Split System Furnace and Gas-fired Unit Ventilators</td>
<td>Packaged Single Zone Rooftop Units and Gas-fired unit ventilators</td>
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<td>Cooling Cap [kBtu/h] (tons)</td>
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Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

1.0: Enthalpy Wheel; Effectiveness - 76% Sensible, 74% Latent

2.0: Daylighting: Continuous Control

3.0: Gas heating section @ 0.80 AFUE max available

LARGE OFFICE WITH 38% WWR (OMAHA, NE)
### Large Office 38% Glass Energy Results Summary
#### Omaha, NE

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<tr>
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<td>2003 IECC</td>
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<td>64.80</td>
<td>2.2%</td>
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<tr>
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<td>2006 IECC</td>
<td>2932.4</td>
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<td>2.2%</td>
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<tr>
<td>1.20</td>
<td>Improved Fenestration</td>
<td>2736.6</td>
<td>$45,048</td>
<td>8.4%</td>
<td>262.40</td>
<td>8.7%</td>
<td>1.20: PPG Solarban 70XL;</td>
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<td>1.30</td>
<td>Improved Wall</td>
<td>2924.2</td>
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<td>74.80</td>
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<td>1.40</td>
<td>Improved Roof</td>
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<td>2871.5</td>
<td>$47,609</td>
<td>3.2%</td>
<td>127.50</td>
<td>4.3%</td>
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<tr>
<td>1.50</td>
<td>Composite Envelope</td>
<td>2605.9</td>
<td>$43,700</td>
<td>11.1%</td>
<td>393.10</td>
<td>13.1%</td>
<td>1.50: Combination of envelope</td>
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<td>improvements: 1.20, 1.30, 1.40</td>
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<tr>
<td>1.51</td>
<td>Composite Envelope</td>
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<td>13.8%</td>
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<td>2.00</td>
<td>Daylighting controls</td>
<td>2775.7</td>
<td>$44,242</td>
<td>10.0%</td>
<td>223.30</td>
<td>7.4%</td>
<td>2.00: Daylighting: Continuous</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Control</td>
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</tr>
<tr>
<td>2.01</td>
<td>Daylighting controls</td>
<td>2541.7</td>
<td>$40,651</td>
<td>17.3%</td>
<td>457.30</td>
<td>15.2%</td>
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<td>2.02</td>
<td>Daylight w/ Comp. Envelope</td>
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<td>613.90</td>
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<tr>
<td>2.10</td>
<td>Reduced LPD</td>
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<td>135.60</td>
<td>4.5%</td>
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<td>2.11</td>
<td>Reduced LPD</td>
<td>2493.8</td>
<td>$41,216</td>
<td>16.2%</td>
<td>505.20</td>
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</tr>
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<td>2.12</td>
<td>Reduced LPD</td>
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<td>$40,981</td>
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<td>527.60</td>
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<tr>
<td>3.00</td>
<td>CEE Tier 1</td>
<td>2906.7</td>
<td>$47,182</td>
<td>4.1%</td>
<td>92.30</td>
<td>3.1%</td>
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<tr>
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<td>CEE Tier 2</td>
<td>2890.1</td>
<td>$46,804</td>
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<td>108.90</td>
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<tr>
<td>3.14</td>
<td>CEE Tier 1</td>
<td>2329.9</td>
<td>$37,780</td>
<td>23.2%</td>
<td>669.10</td>
<td>22.3%</td>
<td>3.14: 1.51 + 2.00 + 3.00</td>
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<tr>
<td>3.18</td>
<td>CEE Tier 1</td>
<td>2422.1</td>
<td>$39,584</td>
<td>19.5%</td>
<td>576.90</td>
<td>19.2%</td>
<td>3.18: 1.51 + 2.10 + 3.00</td>
<td></td>
</tr>
</tbody>
</table>

*Reported value excludes Misc Equipment electrical end-use
### Large Office 38% Glass Energy Results Summary
**Omaha, NE**

|-----|--------------------------|----------------------------|--------------------------|-------------------------------|-------------------------------|--------------------------------|----------------------------------------------------------------------------------|
| 0.00| Base Case                | 2973.5                     | $48,685                  |                                |                               |                                 | ASHRAE 90.1-2004 Baseline Appendix G  
Walls: U-0.084; Roof: U-0.063;  
Floors - U-0.052;  
Windows: U-0.57, SHGC-0.39 |
|     | Base +90°                | 3027.2                     | $49,690                  |                                |                               |                                 |                                                                                |
|     | Base +180°               | 2967.8                     | $48,659                  |                                |                               |                                 |                                                                                |
|     | Base +270°               | 3027.5                     | $49,686                  |                                |                               |                                 |                                                                                |
|     | Avg Base Case            | 2999.0                     | $49,180                  |                                |                               |                                 |                                                                                |
| 3.30| Enthalpy Wheel           | 2679.9                     | $45,622                  | 7.2%                          | 319.10                        | 10.6%                          | 3.30: Enthalpy Wheel;  
Effectiveness - 76% Sensible,  
74% Latent                         |
| 3.40| Enthalpy Wheel           | 2168.4                     | $37,178                  | 24.4%                         | 830.60                        | 27.7%                          | 3.40: 3.30 + 3.00 + 2.10 + 1.50                              |
|     | Enthalpy Wheel           | 1995.5                     | $33,542                  | 31.8%                         | 1003.50                       | 33.5%                          | 3.41: 3.30 + 3.00 + 2.10 + 2.00 + 1.50 |
| 3.50| VAV w/ VSD               | 2343.8                     | $48,884                  | 0.6%                          | 655.20                        | 21.8%                          | 3.50: PVAV w/ VSD                                                                              |
| 3.51| VAV w/ VSD               | 2076.2                     | $43,227                  | 12.1%                         | 922.80                        | 30.8%                          | 3.51: 3.50 + 3.00 + 1.20                                                                  |

*Reported value excludes Misc Equipment electrical end-use
Baseline Energy End-uses

- Conditioned Lighting: 19.3%
- Unconditioned Lighting: 5.9%
- Fans - Ventilation: 30.5%
- Pumps & Aux: 0.3%
- DHW: 1.0%
- Space Heating: 25.1%
- Space Cooling: 17.9%

LARGE OFFICE WITH 38% WWR (OMAHA, NE)
## Building Energy Performance Summary - Base Case

### End Use

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Building</th>
<th>Baseline Building +90</th>
<th>Baseline Building +180</th>
<th>Baseline Building +270</th>
<th>Baseline Average</th>
<th>% End Use of Baseline</th>
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<tbody>
<tr>
<td>Energy</td>
<td>[MMbtu]</td>
<td>[kW or therm/hr]</td>
<td>[MMbtu]</td>
<td>[kW or therm/hr]</td>
<td>[MMbtu]</td>
<td>[kW or therm/hr]</td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>579.6</td>
<td>54.0</td>
<td>579.6</td>
<td>54.0</td>
<td>579.6</td>
</tr>
<tr>
<td>Unconditioned</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lighting</td>
<td>Electricity</td>
<td>176.6</td>
<td>12.0</td>
<td>176.6</td>
<td>12.0</td>
<td>176.6</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>1020.1</td>
<td>95.0</td>
<td>1020.1</td>
<td>95.0</td>
<td>1020.1</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Heat Rejection</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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<tr>
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<td>Space Cooling CHW</td>
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<td>524.0</td>
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<td>Space Heating Steam/ HW</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Space Heating Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Space Heating Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Space Heating Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Space Heating Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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<tr>
<td>Space Heating</td>
<td>Space Heating Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Space Heating Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Space Heating Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Space Heating Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Space Heating Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Space Heating Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Space Heating Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Space Heating Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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</tr>
<tr>
<td>Space Heating</td>
<td>Space Heating Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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<tr>
<td>Space Heating</td>
<td>Space Heating Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Space Heating Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>
30% Alternative Energy End-uses

- Conditioned Lighting: 19.3%
- Unconditioned Lighting: 5.9%
- Alt Energy Savings: 30.8%
- Space Heating: 23.1%
- Space Cooling: 16.3%
- Fans - Ventilation: 3.6%
- Pumps & Aux: 0.1%

LARGE OFFICE WITH 38% WWR (OMAHA, NE)
Large Office 38% Glass Energy Results Summary
Omaha, NE

Description: 3.51: 3.50 + 3.00 + 1.20
Packaged VAV w/ VSD, electric terminal reheat; CEE Tier 1 cooling efficiencies; Solarban 70XL fenestration w/ thermally broken frame

### Building Energy Performance Summary

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<thead>
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<th>End Use</th>
<th>Energy Source</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference Alt-Baseline</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption Average</th>
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<tbody>
<tr>
<td></td>
<td>Energy [MMBtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>Energy [MMBtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>(%)</td>
<td>(%)</td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>579.6</td>
<td>54.0</td>
<td>579.6</td>
<td>54.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Unconditioned Lighting</td>
<td>Electricity</td>
<td>176.6</td>
<td>12.0</td>
<td>176.6</td>
<td>12.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>1020.1</td>
<td>95.0</td>
<td>1020.1</td>
<td>95.0</td>
<td>0.0%</td>
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<td>Electricity</td>
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<tr>
<td></td>
<td>Steam/HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>100.0%</td>
</tr>
<tr>
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<td>Electric/HW</td>
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<td>149.8</td>
<td>535.6</td>
<td>176.0</td>
<td>8.8%</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>Chilled Water</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>100.0%</td>
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<tr>
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<td>0.0</td>
<td>100.0%</td>
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<td>Pumps &amp; Aux</td>
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<td>80.2%</td>
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<td>915.1</td>
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<td>Fans - Exhaust</td>
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<td>100.0%</td>
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<td>DHW</td>
<td>Electric/HW</td>
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<td>29.3</td>
<td>3.4</td>
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<tr>
<td></td>
<td>Gas</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Total w/o Misc Equipment | 2076.2 | 2999.0 | 30.8% |

Alt Energy Savings | 922.8

Total w/ Misc Equipment | 3096.3 | 4019.1 | 23.0% |

### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$43,027</td>
<td>$41,898</td>
</tr>
<tr>
<td>Gas</td>
<td>$200</td>
<td>$7,282</td>
</tr>
<tr>
<td>Steam/HW</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Chilled Water</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$43,227</strong></td>
<td><strong>$49,180</strong></td>
</tr>
</tbody>
</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

- **3.51**: 3.50 + 3.00 + 1.20
- **3.50**: PVAV w/ VSD
- **3.41**: 3.30 + 3.00 + 2.10 + 2.00 + 1.50
- **3.40**: 3.30 + 3.00 + 2.10 + 1.50
- **3.30**: Enthalpy Wheel; Effectiveness - 76% Sensible, 74% Latent
- **3.18**: 1.51 + 2.10 + 3.00
- **3.14**: 1.51 + 2.00 + 3.00
- **3.01**: CEE Tier 2 HVAC equipment efficiencies
- **3.00**: CEE Tier 1 HVAC equipment efficiencies
- **2.12**: 2.10 + 1.51
- **2.11**: 2.10 + 1.50
- **2.10**: LPD=0.8 W/sf; T5 Lamps w/ Electronic Ballast
- **2.03**: 2.00 + 1.51
- **2.01**: 2.00 + 1.20
- **2.00**: Daylighting: Continuous Control
- **1.51**: Combination of envelope improvements: 1.20, 1.30, 1.41
- **1.50**: Combination of envelope improvements: 1.20, 1.30, 1.40
- **1.41**: R-40 Roof
- **1.40**: R-30 Roof
- **1.30**: R-21+7 Sci Walls w/ stud derating
- **1.20**: PPG Solarban 70XL; Assembly U-0.420, SHGC=0.270 [SC=0.310], VLT=0.543
- **1.11**: 2006 IECC
- **1.10**: 2003 IECC (Norfolk 14b)

**Energy Use Reduction vs. Base Case**

**LARGE OFFICE WITH 38% WWR (NORFOLK, NE)**

- 31.9%
- 23.2%
- 28.7%
- 11.6%
- 19.1%
- 22.0%
- **Gas heating section @ 0.80 AFUE max available**

**Energy Use Reduction vs. Base Case**

0.0% 5.0% 10.0% 15.0% 20.0% 25.0% 30.0% 35.0% 40.0%
## Large Office 38% Glass Energy Results Summary
### Norfolk, NE

<table>
<thead>
<tr>
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<td>$49,635</td>
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<td>Windows: U-0.57, SHGC-0.39</td>
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<td>Avg Base Case</td>
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<tr>
<td>1.10</td>
<td>2003 IECC</td>
<td>2982.5</td>
<td>$44,900</td>
<td>$5,339 10.6%</td>
<td>96.67 3.1%</td>
<td>1.10: 2003 IECC (Norfolk 14b)</td>
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<td>1.11</td>
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<td>$49,302</td>
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<td>78.17 2.5%</td>
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<tr>
<td>1.20</td>
<td>Improved Fenestration</td>
<td>2806.3</td>
<td>$52,583</td>
<td>-$2,343 -4.7%</td>
<td>272.88 8.9%</td>
<td>1.20: PPG Solarban 70XL</td>
<td>1.20: PPG Solarban 70XL</td>
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<tr>
<td>1.30</td>
<td>Improved Wall</td>
<td>2997.7</td>
<td>$49,112</td>
<td>$1,128 2.2%</td>
<td>81.47 2.6%</td>
<td>1.30: R-21+7.5ci Walls w/ stud</td>
<td>1.30: R-21+7.5ci Walls w/ stud</td>
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<tr>
<td>1.40</td>
<td>Improved Roof</td>
<td>2961.9</td>
<td>$48,767</td>
<td>$1,473 2.9%</td>
<td>117.27 3.8%</td>
<td>1.40: R-30 Roof</td>
<td>1.40: R-30 Roof</td>
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<tr>
<td>1.41</td>
<td>Improved Roof</td>
<td>2937.5</td>
<td>$48,540</td>
<td>$1,700 3.4%</td>
<td>141.67 4.6%</td>
<td>1.41: R-40 Roof</td>
<td>1.41: R-40 Roof</td>
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<tr>
<td>1.50</td>
<td>Composite Envelope</td>
<td>2656.1</td>
<td>$44,257</td>
<td>$5,983 11.9%</td>
<td>423.07 13.7%</td>
<td>1.50: Combination of envelope</td>
<td>1.50: Combination of envelope</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>improvements: 1.20, 1.30, 1.40</td>
<td>1.50: Combination of envelope</td>
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</tr>
<tr>
<td>1.51</td>
<td>Composite Envelope</td>
<td>2632</td>
<td>$44,034</td>
<td>$6,206 12.4%</td>
<td>447.18 14.5%</td>
<td>1.51: Combination of envelope</td>
<td>1.51: Combination of envelope</td>
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<tr>
<td></td>
<td></td>
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<td></td>
<td>improvements: 1.20, 1.30, 1.40</td>
<td>1.51: Combination of envelope</td>
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<tr>
<td>2.00</td>
<td>Daylighting Controls</td>
<td>2871.8</td>
<td>$44,998</td>
<td>$5,241 10.4%</td>
<td>207.37 6.7%</td>
<td>2.00: Daylighting: Continuous</td>
<td>2.00: Daylighting: Continuous</td>
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<tr>
<td>2.01</td>
<td>Daylighting Controls</td>
<td>2627.5</td>
<td>$41,054</td>
<td>$9,185 18.3%</td>
<td>451.68 14.7%</td>
<td>2.01: 2.00 +1.20</td>
<td>2.01: 2.00 +1.20</td>
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<tr>
<td>2.02</td>
<td>Daylight w/ Comp. Envelope</td>
<td>2448.6</td>
<td>$39,415</td>
<td>$10,825 21.5%</td>
<td>630.57 20.5%</td>
<td>2.03: 2.00 + 1.51</td>
<td>2.03: 2.00 + 1.51</td>
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<tr>
<td>2.10</td>
<td>Reduced LPD</td>
<td>2952.3</td>
<td>$47,180</td>
<td>$3,059 6.1%</td>
<td>126.88 4.1%</td>
<td>2.10: LPD=0.8 W/sf; T5 Lamps w/ Electronic Ballast</td>
<td>2.10: LPD=0.8 W/sf; T5 Lamps w/ Electronic Ballast</td>
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</tr>
<tr>
<td>2.11</td>
<td>Reduced LPD</td>
<td>2551.8</td>
<td>$41,798</td>
<td>$8,442 16.8%</td>
<td>527.38 17.1%</td>
<td>2.11: 2.10 + 1.50</td>
<td>2.11: 2.10 + 1.50</td>
<td></td>
</tr>
<tr>
<td>2.12</td>
<td>Reduced LPD</td>
<td>2525.9</td>
<td>$41,559</td>
<td>$8,681 17.3%</td>
<td>553.27 18.0%</td>
<td>2.12: 2.10 + 1.51</td>
<td>2.12: 2.10 + 1.51</td>
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<tr>
<td>3.00</td>
<td>CEE Tier 1</td>
<td>2996.9</td>
<td>$48,393</td>
<td>$1,847 3.7%</td>
<td>82.27 2.7%</td>
<td>3.00: CEE Tier 1 HVAC</td>
<td>3.00: CEE Tier 1 HVAC</td>
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</tr>
<tr>
<td>3.01</td>
<td>CEE Tier 2</td>
<td>2982.8</td>
<td>$48,069</td>
<td>$2,171 4.3%</td>
<td>96.37 3.1%</td>
<td>3.01: CEE Tier 2 HVAC</td>
<td>3.01: CEE Tier 2 HVAC</td>
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<tr>
<td>3.14</td>
<td>CEE Tier 1</td>
<td>2402.3</td>
<td>$38,412</td>
<td>$11,828 23.5%</td>
<td>676.88 22.0%</td>
<td>3.14: 1.51 + 2.00 + 3.00</td>
<td>3.14: 1.51 + 2.00 + 3.00</td>
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<tr>
<td>3.18</td>
<td>CEE Tier 1</td>
<td>2491.6</td>
<td>$40,476</td>
<td>$9,764 19.4%</td>
<td>587.57 19.1%</td>
<td>3.18: 1.51 + 2.10 + 3.00</td>
<td>3.18: 1.51 + 2.10 + 3.00</td>
<td></td>
</tr>
</tbody>
</table>

*Reported excluding Misc Equipment electrical end-use
## Large Office 38% Glass Energy Results Summary
### Norfolk, NE

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<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>Base Case</td>
<td>3053.8</td>
<td>49,635</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Base +90°</td>
<td>3108</td>
<td>50,867</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Base +180°</td>
<td>3047.1</td>
<td>49,595</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Base +270°</td>
<td>3107.8</td>
<td>50,861</td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Avg Base Case</td>
<td>3079.2</td>
<td>50,240</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.30</td>
<td>Enthalpy Wheel</td>
<td>2720.7</td>
<td>47,022</td>
<td>6.4%</td>
<td>358.47</td>
<td>11.6%</td>
<td></td>
<td>3.30: Enthalpy Wheel; Effectiveness - 76% Sensible, 74% Latent</td>
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<tr>
<td>3.40</td>
<td>Enthalpy Wheel</td>
<td>2194.1</td>
<td>38,344</td>
<td>23.7%</td>
<td>885.07</td>
<td>28.7%</td>
<td></td>
<td>3.40: 3.30 + 3.00 + 2.10 + 1.50</td>
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<tr>
<td>3.41</td>
<td>Enthalpy Wheel</td>
<td>2031.2</td>
<td>37,331</td>
<td>25.7%</td>
<td>1047.98</td>
<td>34.0%</td>
<td></td>
<td>3.41: 3.30 + 3.00 + 2.10 + 2.00 + 1.50</td>
</tr>
<tr>
<td>3.50</td>
<td>VAV w/VSD</td>
<td>2365.6</td>
<td>48,407</td>
<td>3.6%</td>
<td>713.57</td>
<td>23.2%</td>
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<td>3.50: PVAV w/ VSD</td>
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<tr>
<td>3.51</td>
<td>VAV w/VSD</td>
<td>2096.6</td>
<td>43,222</td>
<td>14.0%</td>
<td>982.57</td>
<td>31.9%</td>
<td></td>
<td>3.51: 3.50 + 3.00 + 1.20</td>
</tr>
</tbody>
</table>

*Reported excluding Misc Equipment electrical end-use
Baseline Energy End-uses

- Conditioned Lighting: 18.8%
- Unconditioned Lighting: 5.7%
- Fans - Ventilation: 30.1%
- Pumps & Aux: 0.4%
- Space Cooling: 14.7%
- Space Heating: 29.2%
- DHW: 1.0%

LARGE OFFICE WITH 38% WWR (NORFOLK, NE)
## Building Energy Performance Summary - Base Case

### Norfolk, NE

### Large Office 38% Glass Energy Results Summary

### Energy Source Baseline Building Baseline Building +90 Baseline Building +180 Baseline Building +270 Baseline Average % End Use of Baseline

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
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<td>Electricity</td>
<td>$41,916</td>
<td>$43,277</td>
<td>$41,945</td>
<td>$43,269</td>
<td>$42,602</td>
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<td>Gas</td>
<td>$7,719</td>
<td>$7,590</td>
<td>$7,650</td>
<td>$7,592</td>
<td>$7,638</td>
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<tr>
<td>Steam/ HW</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Chilled Water</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td>$49,635</td>
<td>$50,867</td>
<td>$49,595</td>
<td>$50,861</td>
<td>$50,240</td>
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</tbody>
</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)*

**DOE-2 Reports:** Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Savings: 31.9%

Conditioned Lighting: 18.8%

Unconditioned Lighting: 5.7%

Space Heating: 25.1%

Space Cooling: 13.9%

Pumps & Aux: 0.1%

Fans - Ventilation: 3.5%

DHW: 1.0%

LARGE OFFICE WITH 38% WWR (NORFOLK, NE)
Large Office 38% Glass Energy Results Summary  
Norfolk, NE

Description: 3.51: 3.50 + 3.00 + 1.20  
Packaged VAV w/ VSD, electric terminal reheat; CEE Tier 1 cooling efficiencies; Solarban 70XL fenestration w/ thermally broken frame

### Building Energy Performance Summary

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference Alt-Baseline</th>
<th>% of End Use As Designed</th>
<th>Baseline Consumption Average</th>
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<tr>
<td></td>
<td>Energy [MMBtu]</td>
<td>Peak [kW or therms/hr]</td>
<td>Energy [MMBtu]</td>
<td>Peak [kW or therms/hr]</td>
<td>[%]</td>
<td>[%]</td>
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<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>579.6 54.0</td>
<td>579.6 54.0</td>
<td>0.0%</td>
<td>18.6%</td>
<td>14.1%</td>
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<td>Lighting</td>
<td>Electricity</td>
<td>176.6 12.0</td>
<td>176.6 12.0</td>
<td>0.0%</td>
<td>5.7%</td>
<td>4.3%</td>
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<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>1020.1 95.0</td>
<td>1020.1 95.0</td>
<td>0.0%</td>
<td>32.7%</td>
<td>24.9%</td>
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<tr>
<td>Space Heating</td>
<td>Electricity</td>
<td>772.1 647.3</td>
<td>0.0 0.0</td>
<td>24.8%</td>
<td>0.0%</td>
<td>0.0%</td>
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<tr>
<td>Space Heating</td>
<td>Gas</td>
<td>900.3 19.5</td>
<td>100.0%</td>
<td>0.0%</td>
<td>22.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Steam/ HW</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>Elec</td>
<td>428.2 128.7</td>
<td>454.1 156.6</td>
<td>5.7%</td>
<td>13.7%</td>
<td>11.1%</td>
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<tr>
<td>Space Cooling</td>
<td>Chilled Water</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
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<td>Heat Rejection</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>2.2 0.2</td>
<td>11.2 0.8</td>
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<td>0.1%</td>
<td>0.3%</td>
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<tr>
<td>Fans - Ventilation</td>
<td>Electricity</td>
<td>107.6 49.3</td>
<td>927.3 44.1</td>
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<td>3.5%</td>
<td>22.6%</td>
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<tr>
<td>Fans - Exhaust</td>
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<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
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<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
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<tr>
<td>DHW</td>
<td>Elec</td>
<td>30.3 3.6</td>
<td>30.1 3.6</td>
<td>-0.7%</td>
<td>1.0%</td>
<td>0.7%</td>
</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Total w/o Misc Equipment 2096.6 3079.2 31.9% 100.0% 100.0%
Alternative Energy Savings 982.6
Total w/ Misc Equipment 3116.7 4099.3 24.0%

### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
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<tbody>
<tr>
<td>Electricity*</td>
<td>$43,022</td>
<td>$42,602</td>
</tr>
<tr>
<td>Gas</td>
<td>$200</td>
<td>$7,638</td>
</tr>
<tr>
<td>Steam/ HW</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Chilled Water</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td>$43,222</td>
<td>$50,240</td>
</tr>
</tbody>
</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

- 3.51: 3.50 + 3.00 + 1.20
- 3.50: PVAV w/ VSD
- 3.41: 3.30 + 3.00 + 2.10 + 2.00 + 1.50
- 3.40: 3.30 + 3.00 + 2.10 + 1.50
- 3.30: Enthalpy Wheel; Effectiveness - 76% Sensible, 74% Latent
- 3.18: 1.51 + 2.10 + 3.00
- 3.14: 1.51 + 2.00 + 3.00

- 3.01: CEE Tier 2 HVAC equipment efficiencies
- 3.00: CEE Tier 1 HVAC equipment efficiencies

- 2.12: 2.10 + 1.51
- 2.11: 2.10 + 1.50
- 2.10: LPD=0.8 W/sf; TS Lamps w/ Electronic Ballast
- 2.03: 2.00 + 1.51
- 2.01: 2.00 + 1.20

- 2.00: Daylighting: Continuous Control

- 1.51: Combination of envelope improvements: 1.20, 1.30, 1.41
- 1.50: Combination of envelope improvements: 1.20, 1.30, 1.40

- 1.41: R-40 Roof
- 1.40: R-30 Roof
- 1.30: R-21+7 Sci Walls w/ stud derating
- 1.20: PPG Solarban 70XL; Assembly U-0.420, SHGC=0.270 (SC=0.310), VLT=0.543
- 1.11: 2006 IECC
- 1.10: 2003 IECC (Chadron 15)

Legend: Gas heating section @ 0.80 AFUE max available

Energy Use Reduction vs. Base Case

LARGE OFFICE WITH 38% WWR (CHADRON, NE)
### Large Office 38% Glass Energy Results Summary

**Chadron, NE**

<table>
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<tr>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>Base Case</td>
<td>2752.9 [MMBtu]</td>
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<tr>
<td></td>
<td>Base +270°</td>
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<td>Composite Envelope</td>
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<tr>
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<td>Daylighting Controls</td>
<td>2338</td>
<td>$38,172</td>
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<td>Daylight w/ Comp. Envelope</td>
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<td>4.7%</td>
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<td>CEE Tier 1</td>
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<td>CEE Tier 2</td>
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<td>3.14</td>
<td>CEE Tier 1</td>
<td>2143.6</td>
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<td>3.18</td>
<td>CEE Tier 1</td>
<td>2233</td>
<td>$37,851</td>
<td>$9,382</td>
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<td>539.95</td>
<td>19.5%</td>
<td>3.18: 1.51 + 2.10 + 3.00</td>
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</table>

*Reported excluding Misc equipment electrical end-use
## Large Office 38% Glass Energy Results Summary

### Chadron, NE

<table>
<thead>
<tr>
<th></th>
<th></th>
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<td>Base Case</td>
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<td>$46,621</td>
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<td>$47,868</td>
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<tr>
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<td>Base +180°</td>
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<td>Base +270°</td>
<td>2797</td>
<td>$47,874</td>
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<td></td>
<td>Avg Base Case</td>
<td>2772.95</td>
<td>$47,233</td>
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</tr>
<tr>
<td>3.30</td>
<td>Enthalpy Wheel</td>
<td>2520.7</td>
<td>$44,924</td>
<td>$2,309</td>
<td>4.9%</td>
<td>252.25</td>
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<td>3.30: Enthalpy Wheel; Effectiveness - 76% Sensible, 74% Latent</td>
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<td>3.40</td>
<td>Enthalpy Wheel</td>
<td>2035.4</td>
<td>$36,608</td>
<td>$10,625</td>
<td>22.5%</td>
<td>737.55</td>
<td>26.6%</td>
<td>3.40: 3.30 + 3.00 + 2.10 + 1.50</td>
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<tr>
<td>3.41</td>
<td>Enthalpy Wheel</td>
<td>1864</td>
<td>$32,805</td>
<td>$14,428</td>
<td>30.5%</td>
<td>908.95</td>
<td>32.8%</td>
<td>3.41: 3.30 + 3.00 + 2.10 + 2.00 + 1.50</td>
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<tr>
<td>3.50</td>
<td>VAV w/VSD</td>
<td>2227.8</td>
<td>$41,993</td>
<td>$5,239</td>
<td>11.1%</td>
<td>545.15</td>
<td>19.7%</td>
<td>3.50: PVA w/ VSD</td>
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<tr>
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<td>VAV w/VSD</td>
<td>1967.5</td>
<td>$35,423</td>
<td>$11,810</td>
<td>25.0%</td>
<td>805.45</td>
<td>29.0%</td>
<td>3.51: 3.50 + 3.00 + 1.20</td>
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</table>

*Reported excluding Misc equipment electrical end-use
Baseline Energy End-uses

- Conditioned Lighting: 20.9%
- Unconditioned Lighting: 6.4%
- Fans - Ventilation: 33.5%
- Space Heating: 22.9%
- Space Cooling: 14.9%
- Pumps & Aux: 0.4%
- DHW: 1.1%

LARGE OFFICE WITH 38% WWR (CHADRON, NE)
### Building Energy Performance Summary - Base Case

#### Chadron, NE

**Large Office 38% Glass Energy Results Summary**

#### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
<th>% End Use of Baseline</th>
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<tr>
<td>Electricity*</td>
<td>$40,970</td>
<td>$42,488</td>
<td>$41,002</td>
<td>$42,493</td>
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<td>Gas</td>
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<td>$5,380</td>
<td>$5,566</td>
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<td>Steam/ HW</td>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Chilled Water</td>
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<td>$0</td>
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<td>$0</td>
<td>$0</td>
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<td>Total</td>
<td>$46,621</td>
<td>$47,868</td>
<td>$46,568</td>
<td>$47,874</td>
<td>$47,233</td>
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</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

**DOE-2 Reports:** Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Savings 29.0%

Conditioned Lighting 20.9%

Unconditioned Lighting 6.4%

Space Heating 24.8%

Space Cooling 13.8%

Fans - Ventilation 3.9%

DHW 1.1%

Pumps & Aux 0.1%
Description: 3.51: 3.50 + 3.00 + 1.20
Packaged VAV w/ VSD, electric terminal reheat; CEE Tier 1 cooling efficiencies; Solarban 70XL fenestration w/ thermally broken frame

### Building Energy Performance Summary

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<th>End Use</th>
<th>Energy Source</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference Alt-Baseline</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption Average</th>
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<td>Peak [kW or therms/hr]</td>
<td>[MMBtu]</td>
<td>Peak [kW or therms/hr]</td>
<td>[%]</td>
<td>[%]</td>
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<td>Conditioned Lighting</td>
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<td>54.0</td>
<td>579.6</td>
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<td>Unconditioned Lighting</td>
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<td>Electricity</td>
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<td>0.0%</td>
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<td>0.0</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
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Total w/o Misc Equipment | 1967.5 | 2773.0 | 29.0% |

Alternative Energy Savings | 805.5 |

Total w/ Misc Equipment | 2987.6 | 3793.1 | 21.2% |

### Energy Cost Summary

<table>
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<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
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<tbody>
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<td>$41,738</td>
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<tr>
<td>Gas</td>
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<td>$5,495</td>
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<tr>
<td>Steam/ HW</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Chilled Water</td>
<td>$0</td>
<td>$0</td>
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</table>

Total $35,423 $47,233

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

- 3.52: 3.50 + 3.00 + 1.40 + 1.20
- 3.51: 3.50 + 3.00 + 1.20
- 3.50: PVAV w/ VSD + 3.00
- 3.41: 3.30 + 3.00 + 2.10 + 2.00 + 1.51
- 3.40: 3.30 + 3.00 + 2.10 + 1.50
- 3.30: Enthalpy Wheel;
- 3.18: 1.51 + 2.10 + 3.00
- 3.14: 1.51 + 2.00 + 3.00

- 3.01: CEE Tier 2 HVAC equipment efficiencies
- 3.00: CEE Tier 1 HVAC equipment efficiencies
- 2.12: 2.10 + 1.51
- 2.11: 2.10 + 1.50
- 2.10: LPD=0.8 W/sf; T5 Lamps w/ Electronic Ballast
- 2.03: 2.00 + 1.51
- 2.01: 2.00 + 1.20
- 2.00: Daylighting: Continuous Control

- 1.51: Combination of envelope improvements: 1.20, 1.30, 1.41
- 1.50: Combination of envelope improvements: 1.20, 1.30, 1.40
- 1.41: R-40 Roof
- 1.40: R-30 Roof
- 1.30: R-21+7.5c Walls w/ stud derating
- 1.20: PPG Solarban 70XL;
- 1.11: 2006 IECC
- 1.10: 2003 IECC (Omaha 18b)

Energy Use Percent Reduction vs. Base Case

- LARGE OFFICE WITH 18% WWR (OMAHA, NE)
<table>
<thead>
<tr>
<th>Run</th>
<th>Name</th>
<th>Annual Energy Use* [MMBtu]</th>
<th>Annual Cost* [$]</th>
<th>Cost Savings vs. Avg. Base* [%]</th>
<th>Energy Use Savings vs. Base* [%]</th>
<th>Energy Use Reduction vs. Base* [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>Base Case</td>
<td>2545.0</td>
<td>$42,455</td>
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<tr>
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<td>Avg Base Case</td>
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<td>-63.8 (-2.5%)</td>
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<td>$525 (1.2%)</td>
<td>49.4 (1.9%)</td>
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<tr>
<td>1.20</td>
<td>Improved Fenestration</td>
<td>2432.4</td>
<td>$40,707</td>
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<td>127.5 (5.0%)</td>
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<td>1.30</td>
<td>Improved Wall</td>
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<td>84.9 (3.3%)</td>
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<tr>
<td>1.40</td>
<td>Improved Roof</td>
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<td>93.4 (3.6%)</td>
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<tr>
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<td>Improved Roof</td>
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<tr>
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<td>Composite Envelope</td>
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<td>1.51</td>
<td>Composite Envelope</td>
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<td>2.00</td>
<td>Daylighting controls</td>
<td>2351.8</td>
<td>$38,115</td>
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<td>208.1 (8.1%)</td>
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<tr>
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<td>Daylighting controls</td>
<td>2249.2</td>
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<td>Daylighting controls</td>
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<tr>
<td>2.10</td>
<td>Reduced LPD</td>
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<td>3.00</td>
<td>CEE Tier 1</td>
<td>2486.7</td>
<td>$41,135</td>
<td>$1,590 (3.7%)</td>
<td>73.2 (2.9%)</td>
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<tr>
<td>3.01</td>
<td>CEE Tier 2</td>
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<tr>
<td>3.14</td>
<td>CEE Tier 1</td>
<td>2024.3</td>
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<td>535.6 (20.9%)</td>
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<td>3.18</td>
<td>CEE Tier 1</td>
<td>2105.7</td>
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<td>454.2 (17.7%)</td>
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<td>3.30</td>
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<td>279.0 (10.9%)</td>
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<tr>
<td>3.40</td>
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<td>3.41</td>
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<td>840.1 (32.8%)</td>
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</table>

*Reported excluding Misc Equipment electrical end-use
## Large Office 18% Glass Energy Results Summary

**Omaha, NE**

<table>
<thead>
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</thead>
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<td>$42,455</td>
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<td></td>
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<td></td>
<td>Base +90°</td>
<td>2577.1</td>
<td>$43,007</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASHRAE 90.1-2004 Baseline Appendix G Walls: U-0.084; Roof: U-0.063; Floors - U-0.052 Windows: U-0.57, SHGC-0.39</td>
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<td>Base +180°</td>
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<tr>
<td></td>
<td>Base +270°</td>
<td>2577.2</td>
<td>$43,006</td>
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<tr>
<td></td>
<td>Avg Base Case</td>
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<td>$42,725</td>
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<td>3.50</td>
<td>VAV w/VSD</td>
<td>1925.6</td>
<td>$40,043</td>
<td>$2,681</td>
<td>6.3%</td>
<td>634.3</td>
<td>24.8%</td>
<td>3.50: PVAV w/ VSD + 3.00</td>
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<td></td>
<td>3.51</td>
<td>1839.5</td>
<td>$38,208</td>
<td>$4,516</td>
<td>10.6%</td>
<td>720.4</td>
<td>28.1%</td>
<td>3.51: 3.50 + 3.00 + 1.20</td>
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<td></td>
<td>3.52</td>
<td>1786.3</td>
<td>$37,034</td>
<td>$5,690</td>
<td>13.3%</td>
<td>773.6</td>
<td>30.2%</td>
<td>3.52: 3.50 + 3.00 + 1.40 + 1.20</td>
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</tbody>
</table>

*Reported excluding Misc Equipment electrical end-use*
Baseline Energy End-uses

- Conditioned Lighting: 22.6%
- Unconditioned Lighting: 6.9%
- Fans - Ventilation: 27.1%
- Pumps & Aux: 0.4%
- Space Cooling: 18.4%
- Space Heating: 23.4%
- DHW: 1.1%

LARGE OFFICE WITH 18% WWR (OMAHA, NE)
# Large Office 18% Glass Energy Results Summary

Omaha, NE

## Building Energy Performance Summary - Base Case

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Baseline Building</th>
<th>Baseline Building +90</th>
<th>Baseline Building +180</th>
<th>Baseline Building +270</th>
<th>Baseline Average</th>
<th>% End Use of Baseline</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Source</td>
<td>(MMbtu) [kW or therm/hr]</td>
<td>(MMbtu) [kW or therm/hr]</td>
<td>(MMbtu) [kW or therm/hr]</td>
<td>(MMbtu) [kW or therm/hr]</td>
<td>(MMbtu) [kW or therm/hr]</td>
<td>(MMbtu) [kW or therm/hr]</td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>579.6 54.0</td>
<td>579.6 54.0</td>
<td>579.6 54.0</td>
<td>579.6 54.0</td>
<td>579.6 54.0</td>
<td>579.6 54.0</td>
</tr>
<tr>
<td>Unconditioned</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lighting</td>
<td>Electricity</td>
<td>176.6 12.0</td>
<td>176.6 12.0</td>
<td>176.6 12.0</td>
<td>176.6 12.0</td>
<td>176.6 12.0</td>
<td>176.6 12.0</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>1020.1 95.0</td>
<td>1020.1 95.0</td>
<td>1020.1 95.0</td>
<td>1020.1 95.0</td>
<td>1020.1 95.0</td>
<td>1020.1 95.0</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Electricity</td>
<td>600.9 16.0</td>
<td>599.6 16.0</td>
<td>599.6 16.0</td>
<td>599.6 16.0</td>
<td>599.6 16.0</td>
<td>599.6 16.0</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Steam/ HW</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td>Space Cooling</td>
<td>Electricity</td>
<td>464.8 157.2</td>
<td>476.1 159.2</td>
<td>464.2 157.0</td>
<td>476.2 159.2</td>
<td>470.3 158.2</td>
<td>470.3 158.2</td>
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<td>CHW</td>
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<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
</tr>
<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
<td>10.1 0.8</td>
<td>10.1 0.8</td>
<td>10.1 0.8</td>
<td>10.1 0.8</td>
<td>10.1 0.8</td>
<td>10.1 0.8</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fans - Ventilation</td>
<td>Electricity</td>
<td>683.7 34.4</td>
<td>705.8 35.4</td>
<td>684.5 34.5</td>
<td>705.8 35.4</td>
<td>695.0 34.9</td>
<td>695.0 34.9</td>
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<tr>
<td>Fans - Exhaust</td>
<td>Electricity</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DHW</td>
<td>Elec</td>
<td>29.3 3.4</td>
<td>29.3 3.4</td>
<td>29.3 3.4</td>
<td>29.3 3.4</td>
<td>29.3 3.4</td>
<td>29.3 3.4</td>
</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Total w/o Misc Equipment</td>
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<td>2545.0</td>
<td>2577.1</td>
<td>2540.2</td>
<td>2577.2</td>
<td>2559.9</td>
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<tr>
<td>Total w/ Misc Equipment</td>
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<td>3597.2</td>
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<td>3580.0</td>
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## Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
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<tbody>
<tr>
<td>Electricity*</td>
<td>$36,596</td>
<td>$37,161</td>
<td>$36,618</td>
<td>$37,160</td>
<td>$36,884</td>
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<td>Gas</td>
<td>$5,859</td>
<td>$5,846</td>
<td>$5,811</td>
<td>$5,846</td>
<td>$5,841</td>
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<tr>
<td>Steam/ HW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$0</td>
</tr>
<tr>
<td>Chilled Water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$0</td>
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<tr>
<td>Total</td>
<td>$42,455</td>
<td>$43,007</td>
<td>$42,429</td>
<td>$43,006</td>
<td>$42,725</td>
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*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
30% Alternative Energy End-uses

- Conditioned Lighting: 22.9%
- Unconditioned Lighting: 7.0%
- Space Heating: 18.2%
- Space Cooling: 17.4%
- Pumps & Aux: 0.1%
- Fans - Ventilation: 3.8%
- Alternative Energy Savings: 30.6%

LARGE OFFICE WITH 18% WWR (OMAHA, NE)
Large Office 18% Glass Energy Results Summary  
Omaha, NE

Description:  
3.52: 3.50 + 3.00 + 1.40 + 1.20  
Packaged VAV w/ VSD, electric terminal reheat; CEE Tier 1 cooling efficiencies; R-30 roof; Solarban 70XL fenestration w/ thermally broken frame

### Building Energy Performance Summary

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption Average</th>
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<td>Peak [kW or therm/hr]</td>
<td>Energy [MMbtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>[%]</td>
<td>[%]</td>
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<td>Conditioned Lighting</td>
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<td>54</td>
<td>579.6</td>
<td>54.0</td>
<td>0.0%</td>
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<td>Electricity</td>
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<td>12</td>
<td>176.6</td>
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<td>0.0%</td>
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<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>1020.1</td>
<td>95</td>
<td>1020.1</td>
<td>95.0</td>
<td>0.0%</td>
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<td>Electricity</td>
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<td>605.3</td>
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<td>16.4%</td>
</tr>
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<td>Steam/ HW</td>
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<td>16.0</td>
<td>100.0%</td>
<td>0.0%</td>
<td>16.7%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
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</tr>
<tr>
<td>Space Cooling Elec</td>
<td>Chilled Water</td>
<td>441.1</td>
<td>136.3</td>
<td>470.3</td>
<td>158.2</td>
<td>6.2%</td>
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<tr>
<td>Space Cooling</td>
<td>Chilled Water</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
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<td>Heat Rejection</td>
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<td>Pumps &amp; Aux</td>
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<td>0.0%</td>
<td></td>
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<tr>
<td>Fans - Exhaust</td>
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<td>0.0</td>
<td>0.0%</td>
<td></td>
<td></td>
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<tr>
<td>Refrigeration</td>
<td>Electricity</td>
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<td>0.0</td>
<td>0.0%</td>
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<td></td>
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<tr>
<td>HP Supplement</td>
<td>Electricity</td>
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<td>0.0</td>
<td>0.0%</td>
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<td></td>
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<tr>
<td>DHW</td>
<td>Elec</td>
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<td>3.4</td>
<td>29.3</td>
<td>3.4</td>
<td>-0.7%</td>
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<tr>
<td>DHW</td>
<td>Gas</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
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<td></td>
</tr>
<tr>
<td>Total w/o Misc Equipment</td>
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<td>1786.3</td>
<td>2559.9</td>
<td>30.2%</td>
<td>100.0%</td>
<td></td>
</tr>
</tbody>
</table>

### Alternative Energy Savings

- Total w/o Misc Equipment: **773.6**
- Total w/ Misc Equipment: **2806.4**

### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
</tr>
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<tbody>
<tr>
<td>Electricity*</td>
<td>$36,834</td>
<td>$36,884</td>
</tr>
<tr>
<td>Gas</td>
<td>$200</td>
<td>$5,841</td>
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<tr>
<td>Steam/ HW</td>
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<td>$0</td>
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<tr>
<td>Chilled Water</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td><strong>$37,034</strong></td>
<td><strong>$42,725</strong></td>
</tr>
</tbody>
</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

*DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms*
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

Energy Use Percent Reduction vs. Base Case

LARGE OFFICE WITH 18% WWR (NORFOLK, NE)
## Large Office 18% Glass Energy Results Summary

**Norfolk, NE**

<table>
<thead>
<tr>
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<th></th>
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<th></th>
</tr>
</thead>
<tbody>
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<td>0.00</td>
<td>Base Case</td>
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<tr>
<td></td>
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<td>Avg Base Case</td>
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<tr>
<td>1.20</td>
<td>Improved Fenestration</td>
<td>2481.2</td>
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<td>1.30</td>
<td>Improved Wall</td>
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<tr>
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<td>Improved Roof</td>
<td>2508.5</td>
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<td>4.0%</td>
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<td>11.7%</td>
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<td>Composite Envelope</td>
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<tr>
<td>2.00</td>
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<td>2422.5</td>
<td>$38,253</td>
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<td>Daylighting controls</td>
<td>2314.2</td>
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<td>11.5%</td>
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<td>501.5</td>
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<td>Reduced LPD</td>
<td>2498.4</td>
<td>$40,319</td>
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<td>115.4</td>
<td>4.4%</td>
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<td>Reduced LPD</td>
<td>2204.0</td>
<td>$36,802</td>
<td>$6,277</td>
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<tr>
<td>2.12</td>
<td>Reduced LPD</td>
<td>2158.7</td>
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<td>$6,512</td>
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<td>455.1</td>
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<td>CEE Tier 1</td>
<td>2550.9</td>
<td>$41,728</td>
<td>$1,351</td>
<td>3.1%</td>
<td>62.9</td>
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<td>$1,623</td>
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<td>74.7</td>
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<td>3.14</td>
<td>CEE Tier 1</td>
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<td>$9,170</td>
<td>23.1%</td>
<td>542.2</td>
<td>20.7%</td>
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<td>3.18</td>
<td>CEE Tier 1</td>
<td>2151.0</td>
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<td>462.8</td>
<td>17.7%</td>
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<tr>
<td>3.30</td>
<td>Enthalpy Wheel</td>
<td>2293.1</td>
<td>$40,746</td>
<td>$2,333</td>
<td>5.4%</td>
<td>320.7</td>
<td>12.3%</td>
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<tr>
<td>3.40</td>
<td>Enthalpy Wheel</td>
<td>1886.3</td>
<td>$34,021</td>
<td>$9,058</td>
<td>21.0%</td>
<td>727.5</td>
<td>27.8%</td>
<td></td>
</tr>
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</table>

*Reported excluding Misc Equipment electrical end-use
# Large Office 18% Glass Energy Results Summary

Norfolk, NE

<table>
<thead>
<tr>
<th>Run</th>
<th>Name</th>
<th>Annual Energy Use* [MMBtu]</th>
<th>Annual Energy Cost* [$]</th>
<th>Savings vs Avg. Base* [%]</th>
<th>Energy Use Reduction vs. Base* [MMBtu]</th>
<th>Energy Use Reduction vs. Base* [%]</th>
<th>Notes</th>
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<tbody>
<tr>
<td>0.00</td>
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<td>2599.4</td>
<td>$42,779</td>
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<tr>
<td></td>
<td>Base +90°</td>
<td>2630.7</td>
<td>$43,398</td>
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<tr>
<td></td>
<td>Base +180°</td>
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<td>$42,745</td>
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<td></td>
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<td></td>
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<tr>
<td></td>
<td>Base +270°</td>
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<td>$43,393</td>
<td></td>
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<tr>
<td></td>
<td>Avg Base Case</td>
<td>2613.8</td>
<td>$43,079</td>
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<td></td>
<td>ASHRAE 90.1-2004 Baseline Appendix G Walls: U-0.084; Roof: U-0.063; Floors - U-0.052 Windows: U-0.57, SHGC-0.39</td>
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<tr>
<td>3.41</td>
<td>Enthalpy Wheel</td>
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<td>$12,778</td>
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<td>883.2</td>
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<td>3.50</td>
<td>VAV w/VSD</td>
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<td>$36,797</td>
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<td>3.51</td>
<td>VAV w/VSD</td>
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<td>18.4%</td>
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<td>VAV w/VSD</td>
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<td>$34,108</td>
<td>$8,971</td>
<td>20.8%</td>
<td>827.5</td>
<td>31.7%</td>
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</tbody>
</table>

*Reported excluding Misc Equipment electrical end-use
Baseline Energy End-uses

- Conditioned Lighting: 22.2%
- Unconditioned Lighting: 68%
- Fans - Ventilation: 26.7%
- Space Heating: 27.9%
- Space Cooling: 14.9%
- Pumps & Aux: 0.4%
- DHW: 1.2%

LARGE OFFICE WITH 18% WWR (NORFOLK, NE)
# Large Office 18% Glass Energy Results Summary

Norfolk, NE

## Building Energy Performance Summary - Base Case

### Energy Source: Baseline Building / Baseline Building +90 / Baseline Building +180 / Baseline Building +270 / Baseline Average

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy [MMBtu]</th>
<th>Peak [kW or therm/hr]</th>
<th>Energy [MMBtu]</th>
<th>Peak [kW or therm/hr]</th>
<th>Energy [MMBtu]</th>
<th>Peak [kW or therm/hr]</th>
<th>Energy [MMBtu]</th>
<th>Peak [kW or therm/hr]</th>
<th>Energy [MMBtu]</th>
<th>Peak [kW or therm/hr]</th>
<th>% End Use of Baseline</th>
</tr>
</thead>
<tbody>
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<td>Conditioned Lighting</td>
<td>579.6</td>
<td>54.0</td>
<td>579.6</td>
<td>54.0</td>
<td>579.6</td>
<td>54.0</td>
<td>579.6</td>
<td>54.0</td>
<td>579.6</td>
<td>54.0</td>
<td>15.9%</td>
</tr>
<tr>
<td>Lighting</td>
<td>176.6</td>
<td>12.0</td>
<td>176.6</td>
<td>12.0</td>
<td>176.6</td>
<td>12.0</td>
<td>176.6</td>
<td>12.0</td>
<td>176.6</td>
<td>12.0</td>
<td>4.9%</td>
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<tr>
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<td>95.0</td>
<td>1020.1</td>
<td>95.0</td>
<td>1020.1</td>
<td>95.0</td>
<td>1020.1</td>
<td>95.0</td>
<td>1020.1</td>
<td>95.0</td>
<td>28.1%</td>
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<tr>
<td>Space Heating</td>
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<td>730.0</td>
<td>18.0</td>
<td>726.4</td>
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<td>729.7</td>
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<td>Space Cooling</td>
<td>386.1</td>
<td>137.6</td>
<td>393.9</td>
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<td>385.4</td>
<td>137.4</td>
<td>393.9</td>
<td>137.2</td>
<td>389.8</td>
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<td>Space Cooling CHW</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Heat Rejection</td>
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<td>0.8</td>
<td>11.2</td>
<td>0.8</td>
<td>11.2</td>
<td>0.8</td>
<td>11.2</td>
<td>0.8</td>
<td>11.2</td>
<td>0.8</td>
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<tr>
<td>Fans - Ventilation</td>
<td>683.7</td>
<td>34.1</td>
<td>709.3</td>
<td>35.2</td>
<td>685.2</td>
<td>34.1</td>
<td>709.0</td>
<td>35.2</td>
<td>696.8</td>
<td>34.7</td>
<td>19.2%</td>
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<tr>
<td>Fans - Exhaust</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
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<tr>
<td>Refrigeration</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
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<tr>
<td>DHW Elec</td>
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<td>3.6</td>
<td>30.1</td>
<td>3.6</td>
<td>30.1</td>
<td>3.6</td>
<td>30.1</td>
<td>3.6</td>
<td>30.1</td>
<td>3.6</td>
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<tr>
<td>DHW Gas</td>
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<td>0.0</td>
<td>0.0</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
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<tr>
<td>Total w/o Misc Equipment</td>
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<td>2630.7</td>
<td>2594.5</td>
<td>2630.6</td>
<td>2613.8</td>
<td>2633.9</td>
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<td></td>
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<tr>
<td>Total w/ Misc Equipment</td>
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<td>3650.8</td>
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## Energy Cost Summary

### Energy Source: Baseline Cost / Baseline Cost +90 / Baseline Cost +180 / Baseline Cost +270 / Baseline Average

**Electricity**
- Baseline Cost: $36,530
- Baseline Cost +90: $37,166
- Baseline Cost +180: $36,543
- Baseline Cost +270: $37,160
- Baseline Average: $36,850

**Gas**
- Baseline Cost: $6,249
- Baseline Cost +90: $6,232
- Baseline Cost +180: $6,202
- Baseline Cost +270: $6,233
- Baseline Average: $6,229

**Steam/ HW**
- Baseline Cost: $0
- Baseline Cost +90: $0
- Baseline Cost +180: $0
- Baseline Cost +270: $0
- Baseline Average: $0

**Chilled Water**
- Baseline Cost: $0
- Baseline Cost +90: $0
- Baseline Cost +180: $0
- Baseline Cost +270: $0
- Baseline Average: $0

**Total**
- Baseline Cost: $42,779
- Baseline Cost +90: $43,398
- Baseline Cost +180: $42,745
- Baseline Cost +270: $43,393
- Baseline Average: $43,079

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
30% Alternative Energy End-uses

- **Conditioned Lighting**: 22.2%
- **Unconditioned Lighting**: 68%
- **Alternative Energy Savings**: 31.7%
- **Space Heating**: 20.0%
- **Space Cooling**: 14.6%
- **Pumps & Aux**: 0.1%
- **Fans - Ventilation**: 3.6%
- **DHW**: 1.2%

LARGE OFFICE WITH 18% WWR (NORFOLK, NE)
Large Office 18% Glass Energy Results Summary  
Norfolk, NE  

Description:  
3.52: 3.50 + 3.00 + 1.40 + 1.20  
Packaged VAV w/ VSD, electric terminal reheat; CEE Tier 1 cooling efficiencies; R-30 roof; Solarban 70XL fenestration w/ thermally broken frame

### Building Energy Performance Summary

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference (Alt-Baseline)</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption Average</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Energy [MMBtu]</td>
<td>Peak [kW or therms/hr]</td>
<td>Energy [MMBtu]</td>
<td>Peak [kW or therms/hr]</td>
<td>[%]</td>
<td>[%]</td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>579.6 54.0</td>
<td>579.6 54.0</td>
<td>0.0%</td>
<td>20.7%</td>
<td>15.9%</td>
</tr>
<tr>
<td>Unconditioned</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lighting</td>
<td>Electricity</td>
<td>176.6 12.0</td>
<td>176.6 12.0</td>
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<td>6.3%</td>
<td>4.9%</td>
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<tr>
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<td>Electricity</td>
<td>1020.1 95.0</td>
<td>1020.1 95.0</td>
<td>0.0%</td>
<td>36.3%</td>
<td>28.1%</td>
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<td>Space Heating</td>
<td>Electricity</td>
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<td>18.6%</td>
<td>0.0%</td>
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<tr>
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<td>0.0%</td>
<td>20.1%</td>
<td>0.0%</td>
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<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>Elec</td>
<td>381.7 114.8</td>
<td>389.8 137.4</td>
<td>2.1%</td>
<td>13.6%</td>
<td>10.7%</td>
</tr>
<tr>
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<td>Chilled Water</td>
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<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
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<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
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<tr>
<td>Fans - Ventilation</td>
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<td>3.4%</td>
<td>19.2%</td>
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<tr>
<td>Fans - Exhaust</td>
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<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
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<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Elec</td>
<td>30.2 3.6</td>
<td>30.1 3.6</td>
<td>-0.3%</td>
<td>1.1%</td>
<td>0.8%</td>
</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
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<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Total w/o Misc Equipment  
1786.3 2613.8 31.7% 100.0% 100.0%

Alternative Energy Savings  
827.5

Total w/ Misc Equipment  
2806.4 3633.9

### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
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<tr>
<td>Electricity</td>
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<tr>
<td>Steam/ HW</td>
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<td>$0</td>
</tr>
<tr>
<td>Chilled Water</td>
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<td>$0</td>
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<td><strong>Total</strong></td>
<td><strong>$34,108</strong></td>
<td><strong>$43,079</strong></td>
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</tbody>
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*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
**Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case**

- **3.52**: 3.50 + 3.00 + 1.40 + 1.20
- **3.51**: 3.50 + 3.00 + 1.20
- **3.50**: PVAV w/ VSD + 3.00
- **3.41**: 3.30 + 3.00 + 2.10 + 2.00 + 1.50
- **3.40**: 3.30 + 3.00 + 2.10 + 1.50
- **3.30**: Enthalpy Wheel;
- **3.18**: 1.51 + 2.10 + 3.00
- **3.14**: 1.51 + 2.00 + 3.00
- **3.01**: CEE Tier 2 HVAC equipment efficiencies
- **3.00**: CEE Tier 1 HVAC equipment efficiencies
- **2.12**: 2.10 + 1.51
- **2.11**: 2.10 + 1.50
- **2.10**: LPD=0.8 W/sf; T5 Lamps w/ Electronic Ballast
- **2.03**: 2.00 + 1.51
- **2.01**: 2.00 + 1.20
- **2.00**: Daylighting: Continuous Control
- **1.51**: Combination of envelope improvements: 1.20, 1.30, 1.41
- **1.50**: Combination of envelope improvements: 1.20, 1.30, 1.40
- **1.41**: R-40 Roof
- **1.40**: R-30 Roof
- **1.30**: R-21+7.5ci Walls w/ stud derating
- **1.20**: PPG Solarban 70XL;
- **1.11**: 2006 IECC
- **1.10**: 2003 IECC (Chadon 15)

**Energy Use Percent Reduction vs. Base Case**

- **29.3%**
- **26.9%**
- **23.0%**
- **22.0%**
- **18.6%**
- **18.1%**
- **17.0%**

**LARGE OFFICE WITH 18% WWR (CHADRON, NE)**
# Large Office 18% Glass Energy Results Summary

**Chadron, NE**

<table>
<thead>
<tr>
<th></th>
<th></th>
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<td>Windows: U-0.57, SHGC-0.39</td>
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<td>1.10</td>
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<td>-285</td>
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<td>1.20</td>
<td>Improved Fenestration</td>
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<td>$2,112</td>
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<td>1.30</td>
<td>Improved Wall</td>
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<td>1.40</td>
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<td>1.50</td>
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<td>2.00</td>
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<td>$6,325</td>
<td>15.7%</td>
<td>292.55</td>
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<td>2.02</td>
<td>Daylighting controls</td>
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<td>466.55</td>
<td>19.9%</td>
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<td>2.10</td>
<td>Reduced LPD</td>
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<tr>
<td>2.11</td>
<td>Reduced LPD</td>
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<td>$34,176</td>
<td>$6,039</td>
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<td>2.12</td>
<td>Reduced LPD</td>
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<tr>
<td>3.00</td>
<td>CEE Tier 1</td>
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<td>$1,309</td>
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<td>CEE Tier 2</td>
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<td>66.15</td>
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<td>3.14</td>
<td>CEE Tier 1</td>
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<td>502.25</td>
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<td>3.18</td>
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<td>$7,055</td>
<td>17.5%</td>
<td>422.85</td>
<td>18.1%</td>
<td>3.18: 1.51 + 2.10 + 3.00</td>
</tr>
</tbody>
</table>

*Reported excluding Misc Equipment electrical end-use
## Large Office 18% Glass Energy Results Summary
### Chadron, NE

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<thead>
<tr>
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<td></td>
</tr>
<tr>
<td>3.30</td>
<td>Enthalpy Wheel</td>
<td>2129.8</td>
<td>$38,491</td>
<td>$1,724</td>
<td>4.3%</td>
<td>209.45</td>
<td>3.30: Enthalpy Wheel; Effectiveness - 76% Sensible, 74% Latent</td>
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<tr>
<td>3.40</td>
<td>Enthalpy Wheel</td>
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<td>$7,993</td>
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<tr>
<td>3.41</td>
<td>Enthalpy Wheel</td>
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<td>742.35</td>
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<tr>
<td>3.50</td>
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<td>628.65</td>
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<td>VAV w/VSD</td>
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<td>684.25</td>
<td>3.52: 3.50 + 3.00 + 1.40 + 1.20</td>
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</table>

*Reported excluding Misc Equipment electrical end-use
Baseline Energy End-uses

- Conditioned Lighting: 24.8%
- Fans - Ventilation: 29.5%
- Space Heating: 21.4%
- Space Cooling: 14.9%
- Pumps & Aux: 0.5%
- Unconditioned Lighting: 7.5%
- DHW: 1.3%
<table>
<thead>
<tr>
<th>End Use</th>
<th>Source</th>
<th>Baseline Building</th>
<th>Baseline Building +90</th>
<th>Baseline Building +180</th>
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<th>Baseline Average</th>
<th>% End Use of Baseline</th>
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<td>579.6 [MMbtu]</td>
<td>54.0 [kW or therm/hr]</td>
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<tr>
<td>Unconditioned Lighting</td>
<td>Electricity</td>
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<td>176.6 [MMbtu]</td>
<td>12.0 [kW or therm/hr]</td>
<td>176.6 [MMbtu]</td>
<td>12.0 [kW or therm/hr]</td>
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<td>1020.1 [MMbtu]</td>
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<td>Space Heating</td>
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<td>Space Heating Gas</td>
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<td>501.6 [MMbtu]</td>
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<td>11.8 [MMbtu]</td>
<td>0.8 [kW or therm/hr]</td>
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<td>11.8 [MMbtu]</td>
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<td>0.0 [MMbtu]</td>
<td>0.0 [kW or therm/hr]</td>
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<td>30.1 [MMbtu]</td>
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<td>30.1 [MMbtu]</td>
<td>3.4 [kW or therm/hr]</td>
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<td>DHW</td>
<td>Gas</td>
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<td>3359.35 [MMbtu]</td>
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**Energy Cost Summary**

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<td>Steam/ HW</td>
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<tr>
<td>Chilled Water</td>
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<tr>
<td>Total</td>
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<td>$40,551</td>
<td>$39,851</td>
<td>$40,561</td>
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*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
30% Alternative Energy End-uses

LARGE OFFICE WITH 18% WWR (CHADRON, NE)

- Conditioned Lighting: 24.8%
- Space Heating: 18.7%
- Space Cooling: 14.4%
- Alternative Energy Savings: 29.3%
- Fans - Ventilation: 4.0%
- Pumps & Aux: 0.1%
- DHW: 1.3%
- Unconditioned Lighting: 7.5%
Large Office 18% Glass Energy Results Summary  
Chadron, NE

Description: 3.52: 3.50 + 3.00 + 1.40 + 1.20  
Packaged VAV w/ VSD, electric terminal reheat; CEE Tier 1 cooling efficiencies; R-30 roof; Solarban 70XL fenestration w/ thermally broken frame

<table>
<thead>
<tr>
<th>Building Energy Performance Summary</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference Alt-Baseline</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption Average</th>
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<td>End Use</td>
<td>Energy Source</td>
<td>Energy [MMbtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>Energy [MMbtu]</td>
<td>Peak [kW or therm/hr]</td>
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<tr>
<td>Unconditioned</td>
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<td>1020.1</td>
<td>95.0</td>
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<td>Gas</td>
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<td>Space Heating</td>
<td>Steam/ HW</td>
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<td>0.0%</td>
<td>0.0%</td>
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<td>Space Cooling</td>
<td>Elec</td>
<td>336.0</td>
<td>102.0</td>
<td>349.7</td>
<td>125.8</td>
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<td>Space Cooling</td>
<td>Chilled Water</td>
<td>0.0</td>
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<td>0.0%</td>
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<td>Heat Rejection</td>
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<td>0.0</td>
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<td>0.0%</td>
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<td>Fans - Ventilation</td>
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<td>0.0%</td>
<td>0.0%</td>
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<tr>
<td>Refrigeration</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
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<td>HP Supplement</td>
<td>Electricity</td>
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<td>0.0%</td>
<td>0.0%</td>
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<td>DHW</td>
<td>Elec</td>
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<td>DHW</td>
<td>Gas</td>
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<td>0.0%</td>
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<tr>
<td>Total w/o Misc Equipment</td>
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<td>1655.0</td>
<td>2339.3</td>
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Energy Cost Summary

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<tr>
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<th>As Designed Cost</th>
<th>Baseline Cost</th>
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<tbody>
<tr>
<td>Electricity*</td>
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<td>$35,872</td>
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<td>Gas</td>
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<td>$4,344</td>
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<tr>
<td>Steam/ HW</td>
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<td>$0</td>
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<tr>
<td>Chilled Water</td>
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<td>Total</td>
<td>$31,489</td>
<td>$40,215</td>
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</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

- **30.0%**

- **3.6%**

- **1.5%**

**SMALL OFFICE WITH 38% WWR (OMAHA, NE)**
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<td>$7,522</td>
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<td>ASHRAE 90.1-2004 Baseline Appendix G</td>
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<td>Base +90°</td>
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<td>$7,664</td>
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<td></td>
<td>Walls: U-0.084; Roof: U-0.063; Floors - U-0.052</td>
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<td>Base +180°</td>
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<td>$7,492</td>
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<td>Windows: U-0.57, SHGC-0.39</td>
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<td>Base +270°</td>
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<td>Avg Base Case</td>
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<tr>
<td>1.10</td>
<td>2003 IECC</td>
<td>440.8</td>
<td>$7,499</td>
<td>$81</td>
<td>1.1%</td>
<td>16.3</td>
<td>3.6%</td>
<td>1.10: 2003 IECC (Omaha 13b)</td>
</tr>
<tr>
<td>1.11</td>
<td>2006 IECC</td>
<td>450.1</td>
<td>$7,582</td>
<td>-$1</td>
<td>0.0%</td>
<td>7.0</td>
<td>1.5%</td>
<td>1.11: 2006 IECC</td>
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<tr>
<td>3.42</td>
<td>Alternative</td>
<td>319.9</td>
<td>$5,654</td>
<td>$1,926</td>
<td>25.4%</td>
<td>137.2</td>
<td>30.0%</td>
<td>Split System w/ dedicated ERV; 90% eff. furnace; CEE Tier 1; LPD=0.8 W/sf; R-21+7.5ci wall, R-40 roof, Solarban 80 w/ thermally broken frame</td>
</tr>
</tbody>
</table>

*Reported excluding Misc Equipment electrical end-use
Baseline Energy End-uses

- Conditioned Lighting: 21.1%
- Unconditioned Lighting: 6.4%
- Space Heating: 36.2%
- Space Cooling: 15.9%
- Fans - Ventilation: 17.6%
- Pumps & Aux: 0.7%
- DHW: 1.9%

**Small Office with 38% WWR (Omaha, NE)**
# Building Energy Performance Summary - Base Case

**End Use** | **Energy Source** | **Baseline Building** | **Baseline Building +90** | **Baseline Building +180** | **Baseline Building +270** | **Baseline Average** | % End Use of Baseline
--- | --- | --- | --- | --- | --- | --- | ---
Conditioned Lighting | Electricity | 96.6 | 9.0 | 96.6 | 9.0 | 96.6 | 9.0 | 96.6 | 9.0 | 15.7%
Unconditioned Lighting | Electricity | 29.4 | 2.0 | 29.4 | 2.0 | 29.4 | 2.0 | 29.4 | 2.0 | 4.8%
Misc Equipment | Electricity | 157.5 | 14.7 | 157.5 | 14.7 | 157.5 | 14.7 | 157.5 | 14.7 | 25.6%
Space Heating | Electricity | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
Space Heating | Gas | 164.0 | 7.0 | 166.5 | 7.0 | 164.6 | 7.0 | 166.4 | 7.0 | 26.9%
Space Heating | Steam/ HW | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
Space Cooling | Electricity | 72.3 | 29.2 | 74.2 | 30.0 | 70.7 | 28.9 | 74.3 | 29.9 | 11.9%
Space Cooling | CHW | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
Heat Rejection | Electricity | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
Pumps & Aux | Electricity | 3.3 | 0.3 | 3.3 | 0.3 | 3.3 | 0.3 | 3.3 | 0.3 | 0.5%
Fans - Ventilation | Electricity | 78.9 | 7.5 | 82.3 | 7.8 | 79.1 | 7.5 | 82.3 | 7.8 | 13.1%
Fans - Exhaust | Electricity | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
Refrigeration | Electricity | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
HP Supplement | Electricity | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
DHW | Elec | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
DHW | Gas | 8.9 | 0.0 | 8.9 | 0.0 | 8.9 | 0.0 | 8.9 | 0.0 | 1.4%

Total w/o Misc Equipment | 453.4 | 461.2 | 452.6 | 461.2 | 461.2 | 457.1
Total w/ Misc Equipment | 610.9 | 618.7 | 610.1 | 618.7 | 614.6

## Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
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<tbody>
<tr>
<td>Electricity*</td>
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<td>$5,816</td>
<td>$5,663</td>
<td>$5,796</td>
<td>$5,743</td>
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<td>Gas</td>
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<td>$1,848</td>
<td>$1,829</td>
<td>$1,848</td>
<td>$1,838</td>
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<tr>
<td>Steam/ HW</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Chilled Water</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td>$7,522</td>
<td>$7,664</td>
<td>$7,492</td>
<td>$7,644</td>
<td>$7,580</td>
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</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
SMALL OFFICE WITH 38% WWR (OMAHA, NE)
Small Office 38% Glass Energy Results Summary  
Omaha, NE

Description:  
3.42: 3.30 + 3.02 + 3.00 + 2.10 + 1.51 (with Solarban 80 Fenestration replacing Solarban 70XL)  
Split System w/ dedicated ERV; 90% eff. furnace; CEE Tier 1; LPD=0.8 W/sf; R-21+7.5ci wall, R-40 roof, Solarban 80 w/ thermally broken frame

<table>
<thead>
<tr>
<th>Building Energy Performance Summary</th>
<th>Alternative Energy Performance Summary</th>
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</thead>
<tbody>
<tr>
<td><strong>End Use</strong></td>
<td><strong>Alternative Building</strong></td>
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<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
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<tr>
<td>Unconditioned Lighting</td>
<td>Electricity</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Electricity</td>
</tr>
<tr>
<td>Space Heating - Gas</td>
<td>Gas</td>
</tr>
<tr>
<td>Space Heating - Steam/ HW</td>
<td>Steam/ HW</td>
</tr>
<tr>
<td>Space Cooling - Electric</td>
<td>Elec</td>
</tr>
<tr>
<td>Space Cooling - Chilled Water</td>
<td>Chilled Water</td>
</tr>
<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
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<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
</tr>
<tr>
<td>Fans - Ventilation</td>
<td>Electricity</td>
</tr>
<tr>
<td>Fans - Exhaust</td>
<td>Electricity</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
</tr>
<tr>
<td>DHW</td>
<td>Elec</td>
</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
</tr>
<tr>
<td><strong>Total w/o Misc Equipment</strong></td>
<td><strong>Total w/o Misc Equipment</strong></td>
</tr>
<tr>
<td><strong>Alternative Energy Savings</strong></td>
<td><strong>Energy Cost Summary</strong></td>
</tr>
<tr>
<td><strong>As Designed Cost</strong></td>
<td><strong>Baseline Cost</strong></td>
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<tr>
<td><strong>Electricity</strong></td>
<td>$4,693</td>
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<tr>
<td><strong>Gas</strong></td>
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<tr>
<td><strong>Steam/ HW</strong></td>
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<td><strong>Chilled Water</strong></td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>$5,654</strong></td>
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*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)  
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

- Alternative: 31.3%
- 2006 IECC: 2.1%
- 2003 IECC: 6.5%

SMALL OFFICE WITH 38% WWR (NORFOLK, NE)

Energy Use Reduction vs. Base Case
### Small Office 38% Glass Energy Results Summary

**Norfolk, NE**

<table>
<thead>
<tr>
<th></th>
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<td>Base +270°</td>
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<td>$7,593</td>
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<td>$7,474</td>
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<td>2.1%</td>
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<td>3.42</td>
<td>Alternative</td>
<td>328.9</td>
<td>$5,763</td>
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<td>150.1</td>
<td>31.3%</td>
<td>3.42: 3.30 + 3.02 + 3.00 + 2.10 + 1.51 (with Solarban 80 Fenestration replacing Solarban 70XL)</td>
</tr>
</tbody>
</table>

*Reported excluding Misc Equipment electrical end-use
Baseline Energy End-uses

- Conditioned Lighting: 20.2%
- Unconditioned Lighting: 6.1%
- Space Heating: 40.8%
- Space Cooling: 13.2%
- Pumps & Aux: 0.8%
- Fans - Ventilation: 17.1%
- DHW: 1.9%

SMALL OFFICE WITH 38% WWR (NORFOLK, NE)
## Building Energy Performance Summary - Base Case

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</tr>
</thead>
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<td>[MMbtu]</td>
<td>[kW or therm/hr]</td>
<td>[MMbtu]</td>
<td>[kW or therm/hr]</td>
<td>[MMbtu]</td>
<td>[kW or therm/hr]</td>
<td>[MMbtu]</td>
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<td>96.6</td>
<td>9.0</td>
<td>96.6</td>
<td>9.0</td>
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<td>14.7</td>
<td>157.5</td>
<td>14.7</td>
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<tr>
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<tr>
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<td>3.7</td>
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<tr>
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<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>DHW</td>
<td>Elec</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
<td>9.1</td>
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### Energy Cost Summary

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<th>Energy Source</th>
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<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
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<tbody>
<tr>
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<td>$5,557</td>
<td>$5,688</td>
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<td>$1,882</td>
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<td>$1,891</td>
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<td>Steam/ HW</td>
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<td>$0</td>
</tr>
<tr>
<td>Chilled Water</td>
<td></td>
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<td>Total</td>
<td>$7,435</td>
<td>$7,590</td>
<td>$7,414</td>
<td>$7,593</td>
<td>$7,508</td>
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*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy End-uses

- Conditioned Lighting: 16.1%
- Unconditioned Lighting: 6.1%
- Alternative Energy Savings: 31.3%
- Space Heating: 17.9%
- Space Cooling: 8.5%
- Pumps & Aux: 1.2%
- Fans - Ventilation: 17.0%
- DHW: 1.9%

**Small Office with 38% WWR (Norfolk, NE)**
### Description:
3.42: 3.30 + 3.02 + 3.00 + 2.10 + 1.51 (with Solarban 80 Fenestration replacing Solarban 70XL)
Split System w/ dedicated ERV; 90% eff. furnace; CEE Tier 1; Reduced LPD; Improved wall, R-40 roof, Solarban 80 w/ thermally broken frame

### Small Office 38% Glass Energy Results Summary
Norfolk, NE

#### Building Energy Performance Summary - Alternative

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference Alt-Baseline</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy</td>
<td>Peak Energy</td>
<td>Power</td>
<td></td>
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<td></td>
<td>[MMBtu]</td>
<td>[kW or therms/hr]</td>
<td></td>
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<td></td>
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<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>77.3 7.2</td>
<td>96.6 9.0</td>
<td>20.0%</td>
<td>23.5%</td>
<td>20.2%</td>
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<tr>
<td>Lighting</td>
<td>Electricity</td>
<td>29.4 2.0</td>
<td>29.4 2.0</td>
<td>0.0%</td>
<td>8.9%</td>
<td>6.1%</td>
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<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>157.5 14.7</td>
<td>157.5 14.7</td>
<td>0.0%</td>
<td>47.9%</td>
<td>32.9%</td>
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<td>Space Heating</td>
<td>Electricity</td>
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<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
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<tr>
<td>Space Heating</td>
<td>Gas</td>
<td>85.6 4.0</td>
<td>195.2 8.0</td>
<td>56.1%</td>
<td>26.0%</td>
<td>40.8%</td>
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<tr>
<td>Space Heating</td>
<td>Steam/ HW</td>
<td>0.0 0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>Elec</td>
<td>40.6 16.0</td>
<td>63.1 26.5</td>
<td>35.7%</td>
<td>12.3%</td>
<td>13.2%</td>
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<tr>
<td>Space Cooling</td>
<td>Chilled Water</td>
<td>0.0 0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>5.6 0.3</td>
<td>3.7 0.3</td>
<td>-51.4%</td>
<td>1.7%</td>
<td>0.8%</td>
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<tr>
<td>Fans - Ventilation</td>
<td>Electricity</td>
<td>81.4 7.0</td>
<td>81.9 7.8</td>
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<td>17.1%</td>
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<tr>
<td>Fans - Exhaust</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
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<td>Refrigeration</td>
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<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Elec</td>
<td>0.0 0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
<td>9.0 0.0</td>
<td>9.1 0.0</td>
<td>1.1%</td>
<td>2.7%</td>
<td>1.9%</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total w/o Misc Equip</td>
<td></td>
<td>328.9 479.0</td>
<td></td>
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<td>100.0%</td>
<td>100.0%</td>
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<tr>
<td>Total w/ Misc Equip</td>
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<td>486.4 636.5</td>
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#### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$4,778</td>
<td>$5,617</td>
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<tr>
<td>Gas</td>
<td>$985</td>
<td>$1,891</td>
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<tr>
<td>Steam/ HW</td>
<td>$0</td>
<td>$0</td>
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<tr>
<td>Chilled Water</td>
<td>$0</td>
<td>$0</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>$5,763</strong></td>
<td><strong>$7,508</strong></td>
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*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

Energy Use Reduction vs. Base Case

- Alternative: 28.6%
- 2006 IECC: 1.8%
- 2003 IECC: 4.2%

SMALL OFFICE WITH 38% WWR (CHADRON, NE)
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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<td>0.00</td>
<td>Base Case</td>
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<td>$6,885</td>
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<tr>
<td></td>
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<td>Base +180°</td>
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<td>$6,839</td>
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<tr>
<td></td>
<td>Base +270°</td>
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<td>$7,032</td>
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<td>Avg Base Case</td>
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<td>ASHRAE 90.1-2004 Baseline Appendix G</td>
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<td></td>
<td></td>
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<td>Walls: U-0.084; Roof: U-0.063; Floors - U-0.052 Windows: U-0.57, SHGC-0.39</td>
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<td>1.10</td>
<td>2003 IECC</td>
<td>413</td>
<td>$7,093</td>
<td>-$147</td>
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<td>18.2</td>
<td>4.2%</td>
<td>1.10: 2003 IECC (Chadron 15)</td>
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<tr>
<td>1.11</td>
<td>2006 IECC</td>
<td>423.3</td>
<td>$6,917</td>
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<td>7.9</td>
<td>1.8%</td>
<td>1.11: 2006 IECC</td>
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<td>3.42</td>
<td>Alternative</td>
<td>308</td>
<td>$5,413</td>
<td>$1,534</td>
<td>22.1%</td>
<td>123.2</td>
<td>28.6%</td>
<td>Split System w/ dedicated ERV; 90% eff. furnace; CEE Tier 1; Reduced LPD; Improved wall, R-40 roof, Solarban 80 w/ thermally broken frame</td>
</tr>
</tbody>
</table>

*Energy consumption reported excluding Misc Equipment electrical end-use
Baseline Energy End-uses

- **Conditioned Lighting**: 22.4%
- **Unconditioned Lighting**: 0.9%
- **Fans - Ventilation**: 19.0%
- **Space Cooling**: 14.1%
- **Space Heating**: 34.7%
- **DHW**: 2.1%

**Small Office with 38% WWR (Chadron, NE)**
## Building Energy Performance Summary - Base Case

*Small Office 38% Glass Energy Results Summary*
*Chadron, NE*

### End Use Energy Source

<table>
<thead>
<tr>
<th>End Use</th>
<th>Baseline Building</th>
<th>Baseline Building +90</th>
<th>Baseline Building +180</th>
<th>Baseline Building +270</th>
<th>Baseline Average</th>
<th>% End Use of Baseline</th>
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<tbody>
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<td></td>
<td>Energy [MMbtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>Energy [MMbtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>Energy [MMbtu]</td>
<td>Peak [kW or therm/hr]</td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>96.6</td>
<td>9.0</td>
<td>96.6</td>
<td>9.0</td>
<td>96.6</td>
</tr>
<tr>
<td>Unconditioned Lighting</td>
<td>Electricity</td>
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<td>2.0</td>
<td>29.4</td>
<td>2.0</td>
<td>29.4</td>
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<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>157.5</td>
<td>14.7</td>
<td>157.5</td>
<td>14.7</td>
<td>157.5</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Electricity</td>
<td>149.2</td>
<td>7.0</td>
<td>149.8</td>
<td>7.0</td>
<td>149.7</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Steam/ HW</td>
<td>157.5</td>
<td>14.7</td>
<td>157.5</td>
<td>14.7</td>
<td>157.5</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>Electricity</td>
<td>60.2</td>
<td>24.3</td>
<td>62.5</td>
<td>25.8</td>
<td>62.7</td>
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<tr>
<td>Space Cooling</td>
<td>CHW</td>
<td>80.0</td>
<td>30.0</td>
<td>82.5</td>
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<td>82.1</td>
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<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
<td>3.8</td>
<td>0.3</td>
<td>3.8</td>
<td>0.3</td>
<td>3.8</td>
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<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>79.7</td>
<td>7.6</td>
<td>84.2</td>
<td>8.0</td>
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<td>Fans - Ventilation</td>
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<td>425.9</td>
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<td>431.225</td>
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<td>592.9</td>
<td>583.4</td>
<td>593.1</td>
<td>588.725</td>
</tr>
</tbody>
</table>

### Total w/o Misc Equipment

|                        | 428.0             | 435.4             | 425.9             | 435.6             | 431.225          |

### Total w/ Misc Equipment

|                        | 585.5             | 592.9             | 583.4             | 593.1             | 588.725          |

### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>$5,514</td>
<td>$5,653</td>
<td>$5,469</td>
<td>$5,657</td>
<td>$5,573</td>
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<td>Gas</td>
<td>$1,371</td>
<td>$1,376</td>
<td>$1,370</td>
<td>$1,375</td>
<td>$1,373</td>
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<tr>
<td>Steam/ HW</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Chilled Water</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
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<tr>
<td>Total</td>
<td>$6,885</td>
<td>$7,029</td>
<td>$6,839</td>
<td>$7,032</td>
<td>$6,946</td>
</tr>
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</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)*

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy End-uses

- Conditioned Lighting: 17.9%
- Unconditioned Lighting: 6.8%
- Space Heating: 15.1%
- Space Cooling: 9.3%
- Pumps & Aux: 1.3%
- Fans - Ventilation: 18.8%
- DHW: 2.1%

Additional Information:

- Alternative Energy Savings: 28.6%
- Small Office with 38% WWR (Chadron, NE)
Small Office 38% Glass Energy Results Summary
Chadron, NE

Description: 3.42: 3.30 + 3.02 + 3.00 + 2.10 + 1.51 (with Solarban 80 Fenestration replacing Solarban 70XL)
Split System w/ dedicated ERV; 90% eff. furnace; CEE Tier 1; Reduced LPD; Improved wall, R-40 roof, Solarban 80 w/ thermally broken frame

### Building Energy Performance Summary - Alternative

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference Alt-Baseline</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy [MMBtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>Energy [MMBtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>[%]</td>
<td>[%]</td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>77.3</td>
<td>7.2</td>
<td>96.6</td>
<td>20.0%</td>
<td>25.1%</td>
</tr>
<tr>
<td>Unconditioned Lighting</td>
<td>Electricity</td>
<td>29.4</td>
<td>2.0</td>
<td>29.4</td>
<td>0.0%</td>
<td>9.5%</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>157.5</td>
<td>14.7</td>
<td>157.5</td>
<td>0.0%</td>
<td>51.1%</td>
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<td>Space Heating</td>
<td>Electricity</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Gas</td>
<td>65.3</td>
<td>4.0</td>
<td>149.5</td>
<td>56.3%</td>
<td>21.2%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>Electricity</td>
<td>40.2</td>
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<td>33.9%</td>
<td>13.1%</td>
</tr>
<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>5.8</td>
<td>0.3</td>
<td>3.8</td>
<td>-52.6%</td>
<td>1.9%</td>
</tr>
<tr>
<td>Fans - Ventilation</td>
<td>Electricity</td>
<td>81.0</td>
<td>6.9</td>
<td>82.1</td>
<td>1.3%</td>
<td>26.3%</td>
</tr>
<tr>
<td>Fans - Exhaust</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Elec</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
<td>9.0</td>
<td>0.0</td>
<td>9.1</td>
<td>1.1%</td>
<td>2.9%</td>
</tr>
</tbody>
</table>

Total w/o Misc Equipment: 308.0 [MMBtu]
Alternative Energy Savings: 123.2 [MMBtu] (28.6%)
Total w/ Misc Equipment: 465.5 [MMBtu]

### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>$4,769</td>
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<tr>
<td>Gas</td>
<td>$644</td>
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<td>Steam/ HW</td>
<td>$0</td>
<td>$0</td>
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<td>Chilled Water</td>
<td>$0</td>
<td>$0</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>$5,413</strong></td>
<td><strong>$6,946</strong></td>
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*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)
DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

- **Alternative**: 29.4%
- **2006 IECC**: 2.1%
- **2003 IECC**: 3.6%

*SMALL OFFICE WITH 18% WWR (OMAHA, NE)*
<table>
<thead>
<tr>
<th></th>
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<td>0.00</td>
<td>Base Case</td>
<td>403.8</td>
<td>$6,688</td>
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</tr>
<tr>
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<td>Base +90°</td>
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<td>$6,771</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Base +180°</td>
<td>403.7</td>
<td>$6,716</td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td>Base +270°</td>
<td>408.9</td>
<td>$6,767</td>
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<tr>
<td></td>
<td>Avg Base Case</td>
<td>406.325</td>
<td>$6,735</td>
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<td>*Reported excluding Misc Equipment electrical end-use</td>
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<td>1.10</td>
<td>2003 IECC</td>
<td>391.5</td>
<td>$6,645</td>
<td>$90</td>
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<td>14.82</td>
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<td>1.10: 2003 IECC (Omaha 13b)</td>
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<td>1.11</td>
<td>2006 IECC</td>
<td>397.7</td>
<td>$6,696</td>
<td>$39</td>
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<td>1.11: 2006 IECC</td>
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<td>3.42</td>
<td>Alternative</td>
<td>286.9</td>
<td>$5,198</td>
<td>$1,537</td>
<td>22.8%</td>
<td>119.43</td>
<td>29.4%</td>
<td>Split system w/ dedicated ERV; 90% eff. furnace; CEE Tier 1; Reduced LPD; Improved wall, R-40 roof, and Solarban 70XL w/ thermally broken frame</td>
</tr>
</tbody>
</table>

Small Office 18% Glass Energy Results Summary
Omaha, NE

ASHRAE 90.1-2004 Baseline
Appendix G
Walls: U-0.084; Roof: U-0.063; Floors - U-0.052
Windows: U-0.57, SHGC-0.39
## Small Office 18% Glass Energy Results Summary
Omaha, NE

### Building Energy Performance Summary - Base Case

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Baseline Building Energy [MMbtu]</th>
<th>Baseline Building Peak [kW or therm/hr]</th>
<th>Baseline Building +90 Energy [MMbtu]</th>
<th>Baseline Building +90 Peak [kW or therm/hr]</th>
<th>Baseline Building +180 Energy [MMbtu]</th>
<th>Baseline Building +180 Peak [kW or therm/hr]</th>
<th>Baseline Building +270 Energy [MMbtu]</th>
<th>Baseline Building +270 Peak [kW or therm/hr]</th>
<th>Baseline Average</th>
<th>% End Use of Baseline</th>
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<tbody>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>96.6</td>
<td>9.0</td>
<td>96.6</td>
<td>9.0</td>
<td>96.6</td>
<td>9.0</td>
<td>96.6</td>
<td>9.0</td>
<td>96.6</td>
<td>9.0</td>
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<td>2.0</td>
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<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>157.5</td>
<td>14.7</td>
<td>157.5</td>
<td>14.7</td>
<td>157.5</td>
<td>14.7</td>
<td>157.5</td>
<td>14.7</td>
<td>157.5</td>
<td>14.7</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Electricity</td>
<td>143.9</td>
<td>6.0</td>
<td>145.8</td>
<td>6.0</td>
<td>144.3</td>
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<td>6.0</td>
<td>144.9</td>
<td>6.0</td>
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<tr>
<td>Space Heating</td>
<td>Steam/ HW</td>
<td>59.8</td>
<td>25.5</td>
<td>61.2</td>
<td>26.0</td>
<td>59.2</td>
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<td>3.3</td>
<td>0.3</td>
<td>3.3</td>
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<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
<td>61.9</td>
<td>5.8</td>
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<td>62.8</td>
<td>5.9</td>
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<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
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<td>0.3</td>
<td>3.3</td>
<td>0.3</td>
<td>3.3</td>
<td>0.3</td>
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<td>0.3</td>
<td>3.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Fans - Ventilation</td>
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<td>8.9</td>
<td>2.0</td>
<td>8.9</td>
<td>2.0</td>
<td>8.9</td>
<td>2.0</td>
<td>8.9</td>
<td>2.0</td>
<td>8.9</td>
<td>2.0</td>
</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
<td>1.635</td>
<td></td>
<td>1.653</td>
<td></td>
<td>1.667</td>
<td></td>
<td>1.652</td>
<td></td>
<td>$1,652</td>
<td>$0</td>
</tr>
<tr>
<td>Total w/o Misc Equipment</td>
<td></td>
<td>403.8</td>
<td></td>
<td>408.9</td>
<td></td>
<td>404.7</td>
<td></td>
<td>408.9</td>
<td></td>
<td>406.325</td>
<td>1.6%</td>
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<tr>
<td>Total w/ Misc Equipment</td>
<td></td>
<td>561.3</td>
<td></td>
<td>566.4</td>
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<td>561.2</td>
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<td>566.4</td>
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<td>563.825</td>
<td>1.6%</td>
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### Energy Cost Summary

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<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
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<td>Electricity*</td>
<td>$5,053</td>
<td>$5,118</td>
<td>$5,049</td>
<td>$5,115</td>
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<td>Gas</td>
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<td>$1,653</td>
<td>$1,667</td>
<td>$1,652</td>
<td>$1,652</td>
</tr>
<tr>
<td>Steam/ HW</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Chilled Water</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td>$6,688</td>
<td>$6,771</td>
<td>$6,716</td>
<td>$6,767</td>
<td>$6,735</td>
</tr>
</tbody>
</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy End-uses

- Conditioned Lighting: 19.0%
- Alternative Energy Savings: 29.4%
- Unconditioned Lighting: 7.2%
- Space Heating: 12.9%
- Space Cooling: 10.4%
- Pumps & Aux: 1.3%
- Fans - Ventilation: 17.6%
- DHW: 2.2%

Small Office with 18% WWR (Omaha, NE)
Small Office 18% Glass Energy Results Summary
Omaha, NE

Description: 3.42: 3.30 + 3.02 + 3.00 + 2.10 + 1.51
Split system w/ dedicated ERV; 90% eff. furnace; CEE Tier 1; Reduced LPD; Improved wall, R-40 roof, and Solarban 70XL w/ thermally broken frame

<table>
<thead>
<tr>
<th>Building Energy Performance Summary</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference</th>
<th>% of End Use</th>
<th>Baseline Consumption</th>
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</thead>
<tbody>
<tr>
<td>End Use</td>
<td>Energy Source</td>
<td>Average</td>
<td>Alt-Baseline</td>
<td>As Designed</td>
<td>Average</td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>77.3</td>
<td>96.6</td>
<td>20.0%</td>
<td>17.4%</td>
</tr>
<tr>
<td>Lighting</td>
<td>Electricity</td>
<td>29.4</td>
<td>29.4</td>
<td>0.0%</td>
<td>6.6%</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>157.5</td>
<td>157.5</td>
<td>0.0%</td>
<td>35.4%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Gas</td>
<td>52.5</td>
<td>144.9</td>
<td>63.8%</td>
<td>11.8%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Steam/ HW</td>
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<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>Elec</td>
<td>42.3</td>
<td>60.4</td>
<td>29.9%</td>
<td>9.5%</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>Chilled Water</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Heat Rejection</td>
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<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>5.2</td>
<td>3.3</td>
<td>-57.6%</td>
<td>1.2%</td>
</tr>
<tr>
<td>Fans - Ventilation</td>
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<td>71.4</td>
<td>62.8</td>
<td>-13.6%</td>
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</tr>
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<td>Fans - Exhaust</td>
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<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
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<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
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<tr>
<td>HP Supplement</td>
<td>Electricity</td>
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<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Elec</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
<td>8.8</td>
<td>8.9</td>
<td>1.1%</td>
<td>2.0%</td>
</tr>
</tbody>
</table>

| Total w/o Misc Equipment           | 286.9               | 406.3           | 29.4%            | 100.0%       | 100.0%              |
| Alternative Energy Savings         | 119.4               |                 |                  |              |                     |
| Total w/ Misc Equipment            | 444.4               | 563.8           |                  |              |                     |

Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$4,423</td>
<td>$5,083</td>
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<tr>
<td>Gas</td>
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<td>$1,652</td>
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<tr>
<td>Steam/ HW</td>
<td>$0</td>
<td>$0</td>
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<td>Chilled Water</td>
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<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td>$5,198</td>
<td>$6,735</td>
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*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

- Alternative: 31.4%
- 2006 IECC: 2.4%
- 2003 IECC: 4.6%

Small Office with 18% WWR (Norfolk, NE)
### Small Office 18% Glass Energy Results Summary
Norfolk, NE

<table>
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<tr>
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<tbody>
<tr>
<td>0.00</td>
<td>Base Case</td>
<td>421.4 [MMBtu]</td>
<td>$6,670</td>
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<td>ASHRAE 90.1-2004 Baseline</td>
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<tr>
<td></td>
<td>Base +90°</td>
<td>430.4 [MMBtu]</td>
<td>$6,759</td>
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<td>Appendix G</td>
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<tr>
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<td>Base +180°</td>
<td>424.5 [MMBtu]</td>
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<td></td>
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<td></td>
<td>Walls: U-0.084; Roof: U-0.063;</td>
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<tr>
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<td>Base +270°</td>
<td>430.5 [MMBtu]</td>
<td>$6,760</td>
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<td>Floors - U-0.052</td>
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<td>Avg Base Case</td>
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<td></td>
<td>Windows: U-0.57, SHGC-0.39</td>
</tr>
<tr>
<td>1.10</td>
<td>2003 IECC</td>
<td>407.2 [MMBtu]</td>
<td>$6,605</td>
<td>$106</td>
<td>1.6%</td>
<td>19.50</td>
<td>4.6%</td>
<td>1.10: 2003 IECC (Chadron 15)</td>
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<tr>
<td>1.11</td>
<td>2006 IECC</td>
<td>416.5 [MMBtu]</td>
<td>$6,656</td>
<td>$55</td>
<td>0.8%</td>
<td>10.20</td>
<td>2.4%</td>
<td>1.11: 2006 IECC</td>
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<tr>
<td>3.42</td>
<td>Alternative</td>
<td>292.6 [MMBtu]</td>
<td>$5,308</td>
<td>$1,403</td>
<td>20.9%</td>
<td>134.10</td>
<td>31.4%</td>
<td>Split system w/ dedicated ERV;</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>90% eff. furnace; CEE Tier 1;</td>
</tr>
<tr>
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<td></td>
<td>Reduced LPD; Improved wall, R-40 roof, and Solarban 70XL w/</td>
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<td></td>
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<td></td>
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<td>thermally broken frame</td>
</tr>
</tbody>
</table>

*Reported excluding Misc Equipment electrical end-use*
Baseline Energy End-uses

- Conditioned Lighting: 22.6%
- Unconditioned Lighting: 0.9%
- Space Heating: 40.9%
- Space Cooling: 12.1%
- Fans - Ventilation: 14.5%
- Pumps & Aux: 0.9%
- DHW: 2.1%

**Small Office with 18% WWR (Norfolk, NE)**
## Building Energy Performance Summary - Base Case

### End Use | Energy Source | Baseline Building | Baseline Building +90 | Baseline Building +180 | Baseline Building +270 | Baseline Average | % End Use of Baseline
--- | --- | --- | --- | --- | --- | --- | ---
Conditioned Lighting | Electricity | 96.6 | 9.0 | 96.6 | 9.0 | 96.6 | 9.0 | 96.6 | 9.0 | 16.5%
Unconditioned Lighting | Electricity | 29.4 | 2.0 | 29.4 | 2.0 | 29.4 | 2.0 | 29.4 | 2.0 | 5.0%
Misc Equipment | Electricity | 157.5 | 14.7 | 157.5 | 14.7 | 157.5 | 14.7 | 157.5 | 14.7 | 27.0%
Space Heating | Electricity | 170.9 | 7.0 | 174.6 | 7.0 | 174.6 | 7.0 | 174.5 | 7.0 | 29.9%
Space Heating | Gas | 51.0 | 22.4 | 52.6 | 22.8 | 52.7 | 22.8 | 51.7 | 22.5 | 8.8%
Space Cooling | Electricity | 60.7 | 5.8 | 62.8 | 6.0 | 62.8 | 6.0 | 61.8 | 5.9 | 10.6%
Heat Rejection | Electricity | 3.7 | 0.3 | 3.7 | 0.3 | 3.7 | 0.3 | 3.7 | 0.3 | 0.6%
Pumps & Aux | Electricity | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
Fans - Ventilation | Electricity | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
Fans - Exhaust | Electricity | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
Refrigeration | Electricity | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
DHW | Electric | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
DHW | Gas | 9.1 | 0.0 | 9.1 | 0.0 | 9.1 | 0.0 | 9.1 | 0.0 | 1.6%
Total w/o Misc Equipment | 421.4 | 430.4 | 424.5 | 430.5 | 426.7
Total w/ Misc Equipment | 578.9 | 587.9 | 582.0 | 588.0 | 584.2

### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$4,980</td>
<td>$5,025</td>
<td>$4,935</td>
<td>$5,026</td>
<td>$4,991</td>
</tr>
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<td>$1,721</td>
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<td>$1,720</td>
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<tr>
<td>Steam/ HW</td>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
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<tr>
<td>Chilled Water</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
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<td>$6,759</td>
<td>$6,656</td>
<td>$6,760</td>
<td>$6,711</td>
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*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
SMALL OFFICE WITH 18% WWR (NORFOLK, NE)

Alternative Energy End-uses

- Conditioned Lighting: 18.1%
- Unconditioned Lighting: 6.9%
- Alternative Energy Savings: 31.4%
- Space Heating: 14.8%
- Space Cooling: 8.6%
- Pumps & Aux: 1.3%
- Fans - Ventilation: 16.8%
- DHW: 2.1%
Small Office 18% Glass Energy Results Summary
Norfolk, NE

Description: 3.42: 3.30 + 3.02 + 3.00 + 2.10 + 1.51
Split system w/ dedicated ERV; 90% eff. furnace; CEE Tier 1; Reduced LPD; Improved wall, R-40 roof, and Solarban 70XL w/ thermally broken frame

<table>
<thead>
<tr>
<th>Building Energy Performance Summary</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference Alt-Baseline</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption Average</th>
</tr>
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<tbody>
<tr>
<td>End Use</td>
<td>Energy Source</td>
<td>Energy [MMBtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>[MMBtu]</td>
<td>Peak [kW or therm/hr]</td>
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<td>2.0</td>
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<td>14.7</td>
<td>157.5</td>
<td>14.7</td>
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<td>0.0</td>
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<td>Fans - Ventilation</td>
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<td>61.8</td>
<td>5.9</td>
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<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
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<td>0.0</td>
<td>0.0</td>
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<tr>
<td>HP Supplement</td>
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</tr>
<tr>
<td>DHW</td>
<td>Elec</td>
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<td>0.0</td>
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<td>DHW</td>
<td>Gas</td>
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<td>Total w/o Misc Equipment</td>
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Energy Cost Summary

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<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
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<tbody>
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<td>Electricity*</td>
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<tr>
<td>Gas</td>
<td>$799</td>
<td>$1,720</td>
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<td>Steam/ HW</td>
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<td>$0</td>
</tr>
<tr>
<td>Chilled Water</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td>$5,308</td>
<td>$6,711</td>
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*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

- Alternative: 27.8%
- 2006 IECC: 2.4%
- 2003 IECC: 4.6%

SMALL OFFICE WITH 18% WWR (CHADRON, NE)
## Small Office 18% Glass Energy Results Summary
**Chadron, NE**

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<td>ASHRAE 90.1-2004 Baseline Appendix G</td>
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<td>Walls: U-0.084; Roof: U-0.063; Floors - U-0.052</td>
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<tr>
<td>1.10</td>
<td>2003 IECC</td>
<td>366.1</td>
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<td>17.55</td>
<td>4.6%</td>
<td>1.10: 2003 IECC (Chadron 15)</td>
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<tr>
<td>1.11</td>
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<td>374.4</td>
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<td>1.11: 2006 IECC</td>
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<td>3.42</td>
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<td>$4,995</td>
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<td>27.8%</td>
<td>Split system w/ dedicated ERV; 90% eff. furnace; CEE Tier 1; Reduced LPD; Improved wall, R-40 roof, and Solarban 70XL w/ thermally broken frame</td>
</tr>
</tbody>
</table>

*Reported excluding Misc Equipment electrical end-use
Baseline Energy End-uses

- Conditioned Lighting: 25.2%
- Unconditioned Lighting: 7.7%
- Space Heating: 35.2%
- Space Cooling: 12.5%
- Pumps & Aux: 1.0%
- Fans - Ventilation: 16.0%
- DHW: 2.4%

Small office with 18% WWR (Chadron, NE)
## Building Energy Performance Summary - Base Case

### End Use Energy Source

<table>
<thead>
<tr>
<th>End Use</th>
<th>Baseline Building</th>
<th>Baseline Building +90</th>
<th>Baseline Building +180</th>
<th>Baseline Building +270</th>
<th>Baseline Average</th>
<th>% End Use of Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy</td>
<td>Peak</td>
<td>Energy</td>
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<tr>
<td></td>
<td>[MMbtu]</td>
<td>[kW or therm/hr]</td>
<td>[MMbtu]</td>
<td>[kW or therm/hr]</td>
<td>[MMbtu]</td>
<td>[kW or therm/hr]</td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>96.6</td>
<td>9.0</td>
<td>96.6</td>
<td>9.0</td>
<td>96.6</td>
</tr>
<tr>
<td>Unconditioned</td>
<td>Lighting</td>
<td>29.4</td>
<td>2.0</td>
<td>29.4</td>
<td>2.0</td>
<td>29.4</td>
</tr>
<tr>
<td>Misc Equipment</td>
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<td>157.5</td>
<td>14.7</td>
<td>157.5</td>
<td>14.7</td>
<td>157.5</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Electricity</td>
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<td>136.7</td>
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<td>136.5</td>
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<td>49.2</td>
<td>21.0</td>
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<td>Space Cooling</td>
<td>Electricity</td>
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<td>62.1</td>
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<tr>
<td>Heat Rejection</td>
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<td>3.9</td>
<td>0.3</td>
<td>3.9</td>
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<td>60.1</td>
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<td>61.4</td>
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<tr>
<td>Fans - Ventilation</td>
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<td>5.7</td>
<td>62.1</td>
<td>5.9</td>
<td>62.2</td>
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<tr>
<td>Fans - Exhaust</td>
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<td>3.9</td>
<td>0.3</td>
<td>3.9</td>
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<tr>
<td>Refrigeration</td>
<td>Electricity</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>DHW</td>
<td>Elec</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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<td>0.0</td>
<td>9.1</td>
<td>0.0</td>
<td>9.1</td>
</tr>
</tbody>
</table>

### Total

- Total w/o Misc Equipment: 379.8 [MMbtu] / 387.0 [MMbtu] / 380.9 [MMbtu] / 386.9 [MMbtu] / 383.65 [MMbtu]
- Total w/ Misc Equipment: 537.3 [MMbtu] / 544.5 [MMbtu] / 538.4 [MMbtu] / 544.4 [MMbtu] / 541.15 [MMbtu]

### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
<th>% End Use of Baseline</th>
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</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$4,882</td>
<td>$4,944</td>
<td>$4,847</td>
<td>$4,945</td>
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<td>$1,261</td>
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<td>Steam/ HW</td>
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<tr>
<td>Chilled Water</td>
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<td>$6,097</td>
<td>$6,206</td>
<td>$6,155</td>
<td>$6,155</td>
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</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Conditioned Lighting 20.1%
Unconditioned Lighting 7.7%
Alternative Energy Savings 27.8%

Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW
Alternative Energy Savings

SMALL OFFICE WITH 18% WWR (CHADRON, NE)
### Small Office 18% Glass Energy Results Summary
Chadron, NE

Description: 3.42: 3.30 + 3.02 + 3.00 + 2.10 + 1.51
Split system w/ dedicated ERV; 90% eff. furnace; CEE Tier 1; Reduced LPD; Improved wall, R-40 roof, and Solarban 70XL w/ thermally broken frame

### Building Energy Performance Summary

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference of As Designed</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption of As Designed</th>
</tr>
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<tr>
<td></td>
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<td>Percent</td>
<td>[kW or therm/hr]</td>
<td>[MMBtu]</td>
<td>[kW or therm/hr]</td>
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<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>77.3 7.2</td>
<td>96.6 9.0</td>
<td>20.0%</td>
<td>17.8%</td>
<td>17.9%</td>
</tr>
<tr>
<td>Unconditioned Lighting</td>
<td>Electricity</td>
<td>29.4 2.0</td>
<td>29.4 2.0</td>
<td>0.0%</td>
<td>6.8%</td>
<td>5.4%</td>
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<td>Misc Equipment</td>
<td>Electricity</td>
<td>157.5 14.7</td>
<td>157.5 14.7</td>
<td>0.0%</td>
<td>36.3%</td>
<td>29.1%</td>
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<tr>
<td>Space Heating</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
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<td>0.0%</td>
<td>0.0%</td>
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<td>25.0%</td>
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<td>0.0%</td>
<td>0.0%</td>
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<td>48.0 20.6</td>
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<td>Chilled Water</td>
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<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>5.8 0.3</td>
<td>3.9 0.3</td>
<td>-48.7%</td>
<td>1.3%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Fans - Ventilation</td>
<td>Electricity</td>
<td>71.9 6.0</td>
<td>61.4 5.8</td>
<td>-17.1%</td>
<td>16.6%</td>
<td>11.3%</td>
</tr>
<tr>
<td>Fans - Exhaust</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Elec</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
<td>9.0 0.0</td>
<td>9.1 0.0</td>
<td>1.1%</td>
<td>2.1%</td>
<td>1.7%</td>
</tr>
<tr>
<td>Total w/o Misc Equipment</td>
<td></td>
<td>276.9 38.7</td>
<td>27.8%</td>
<td>100.0%</td>
<td>100.0%</td>
<td></td>
</tr>
<tr>
<td>Alternative Energy Savings</td>
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<td>106.8</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total w/ Misc Equipment</td>
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<td>434.4</td>
<td>541.2</td>
<td></td>
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</tr>
</tbody>
</table>

**Energy Cost Summary**

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$4,509</td>
<td>$4,905</td>
</tr>
<tr>
<td>Gas</td>
<td>$490</td>
<td>$1,250</td>
</tr>
<tr>
<td>Steam/ HW</td>
<td></td>
<td>$0</td>
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<tr>
<td>Chilled Water</td>
<td></td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td>$4,995</td>
<td>$6,155</td>
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</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

- Alternative: 29.9%
- 2006 IECC: 0.4%
- 2003 IECC: -5.3%

SMALL RETAIL WITH 8% WWR (OMAHA, NE)
## Small Retail 8% Glass Energy Results Summary

Omaha, NE

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
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<tbody>
<tr>
<td>0.00</td>
<td>Base Case</td>
<td>481.5</td>
<td>$7,042</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASHRAE 90.1-2004 Baseline</td>
</tr>
<tr>
<td></td>
<td>Base +90°</td>
<td>486.9</td>
<td>$7,090</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Appendix G</td>
</tr>
<tr>
<td></td>
<td>Base +180°</td>
<td>481.5</td>
<td>$7,045</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Walls: U-0.084; Roof: U-0.063; Floors - U-0.052</td>
</tr>
<tr>
<td></td>
<td>Base +270°</td>
<td>486.8</td>
<td>$7,089</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Windows: U-0.57, SHGC-0.39</td>
</tr>
<tr>
<td></td>
<td>Avg Base Case</td>
<td>484.175</td>
<td>$7,067</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.10</td>
<td>2003 IECC</td>
<td>510</td>
<td>$7,385</td>
<td>-$318</td>
<td>-4.5%</td>
<td>-25.83</td>
<td>-5.3%</td>
<td>2003 IECC</td>
</tr>
<tr>
<td>1.11</td>
<td>2006 IECC</td>
<td>482.2</td>
<td>$7,023</td>
<td>$43</td>
<td>0.6%</td>
<td>1.98</td>
<td>0.4%</td>
<td>2006 IECC</td>
</tr>
<tr>
<td>3.42</td>
<td>As Designed</td>
<td>339.5</td>
<td>$5,350</td>
<td>$1,717</td>
<td>24.3%</td>
<td>144.68</td>
<td>29.9%</td>
<td>Alternative</td>
</tr>
</tbody>
</table>

*Reported excluding Misc Equipment electrical end-use
Baseline Energy End-uses

- Conditioned Lighting: 19.2%
- Unconditioned Lighting: 2.3%
- Space Heating: 46.1%
- Space Cooling: 14.2%
- Fans - Ventilation: 15.9%
- Pumps & Aux: 0.7%
- DHW: 1.7%

SMALL RETAIL WITH 8% WWR (OMAHA, NE)
## Building Energy Performance Summary - Base Case

### End Use | Energy Source | Baseline Building | Baseline Building +90 | Baseline Building +180 | Baseline Building +270 | Baseline Average | % End Use of Baseline |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>93.1</td>
<td>6.8</td>
<td>93.1</td>
<td>6.8</td>
<td>93.1</td>
<td>6.8</td>
</tr>
<tr>
<td>Unconditioned</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lighting</td>
<td>Electricity</td>
<td>10.9</td>
<td>0.6</td>
<td>10.9</td>
<td>0.6</td>
<td>10.9</td>
<td>0.6</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>161.3</td>
<td>11.7</td>
<td>161.3</td>
<td>11.7</td>
<td>161.3</td>
<td>11.7</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Electricity</td>
<td>221.9</td>
<td>0.3</td>
<td>224.8</td>
<td>0.3</td>
<td>224.7</td>
<td>0.3</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>Electricity</td>
<td>68.4</td>
<td>19.4</td>
<td>69.0</td>
<td>18.9</td>
<td>68.5</td>
<td>19.4</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>CHW</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>3.3</td>
<td>0.0</td>
<td>3.3</td>
<td>0.0</td>
<td>3.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Fans - Ventilation</td>
<td>Electricity</td>
<td>75.9</td>
<td>3.8</td>
<td>77.8</td>
<td>3.9</td>
<td>75.9</td>
<td>3.8</td>
</tr>
<tr>
<td>Fans - Exhaust</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>DHW</td>
<td>Electric</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
<td>8.0</td>
<td>0.0</td>
<td>8.0</td>
<td>0.0</td>
<td>8.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

**Total w/o Misc Equipment** | | 481.5 | 486.9 | 481.5 | 486.8 | 484.1 | 484.175 |
**Total w/ Misc Equipment** | | 642.8 | 648.2 | 642.8 | 648.1 | 645.4 | 645.475 |

### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$4,684</td>
<td>$4,704</td>
<td>$4,688</td>
<td>$4,704</td>
<td>$4,695</td>
</tr>
<tr>
<td>Gas</td>
<td>$2,358</td>
<td>$2,386</td>
<td>$2,357</td>
<td>$2,385</td>
<td>$2,372</td>
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<tr>
<td>Total</td>
<td>$7,042</td>
<td>$7,090</td>
<td>$7,045</td>
<td>$7,089</td>
<td>$7,067</td>
</tr>
</tbody>
</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

**DOE-2 Reports:** Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/hr to therms
Alternative Energy End-uses

- Conditioned Lighting: 19.2%
- Unconditioned Lighting: 2.3%
- Alternative Energy Savings: 29.9%
- Space Heating: 23.9%
- Space Cooling: 10.6%
- Pumps & Aux: 0.7%
- Fans - Ventilation: 11.8%
- DHW: 1.7%

SMALL RETAIL WITH 8% WWR (OMAHA, NE)
### Building Energy Performance Summary

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy Peak [MMBtu]</td>
<td>Energy Peak [kW or therms/hr]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>93.1 6.8</td>
<td>93.1 6.8</td>
<td>0.0%</td>
<td>18.6%</td>
<td>14.4%</td>
</tr>
<tr>
<td>Unconditioned Lighting</td>
<td>Electricity</td>
<td>10.9 0.6</td>
<td>10.9 0.6</td>
<td>0.0%</td>
<td>2.2%</td>
<td>1.7%</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>161.3 11.7</td>
<td>161.3 11.7</td>
<td>0.0%</td>
<td>32.2%</td>
<td>25.0%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Gas</td>
<td>115.7 0.3</td>
<td>223.3 0.3</td>
<td>48.2%</td>
<td>23.1%</td>
<td>34.6%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Steam/ HW</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>Elec</td>
<td>51.3 15.2</td>
<td>68.7 19.2</td>
<td>25.4%</td>
<td>10.2%</td>
<td>10.6%</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>Chilled Water</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>3.4 0.0</td>
<td>3.3 0.0</td>
<td>-3.0%</td>
<td>0.7%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Fans - Ventilation</td>
<td>Electricity</td>
<td>57.1 3.2</td>
<td>76.9 3.9</td>
<td>25.7%</td>
<td>11.4%</td>
<td>11.9%</td>
</tr>
<tr>
<td>Fans - Exhaust</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Elec</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
<td>8.0 0.0</td>
<td>8.0 0.0</td>
<td>0.0%</td>
<td>1.6%</td>
<td>1.2%</td>
</tr>
</tbody>
</table>

Total w/o Misc Equipment: 339.5 484.2 29.9% 100.0% 100.0%

Alternative Energy Savings: 144.7
Total w/ Misc Equipment: 500.8 645.5

### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$3,992</td>
<td>$4,695</td>
</tr>
<tr>
<td>Gas</td>
<td>$1,358</td>
<td>$2,372</td>
</tr>
<tr>
<td>Total</td>
<td>$5,350</td>
<td>$7,067</td>
</tr>
</tbody>
</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

- **Alternative**: 32.4%
- **2006 IECC**: 0.8%
- **2003 IECC**: -5.4%

**SMALL RETAIL WITH 8% WWR (NORFOLK, NE)**

Energy Use Reduction vs. Base Case

-10.0%  -5.0%  0.0%  5.0%  10.0%  15.0%  20.0%  25.0%  30.0%  35.0%
### Small Retail 8% Glass Energy Results Summary

Norfolk, NE

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>Base Case</td>
<td>515.5</td>
<td>$7,420</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>ASHRAE 90.1-2004 Baseline</td>
</tr>
<tr>
<td></td>
<td>Base +90°</td>
<td>523.9</td>
<td>$7,571</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Appendix G</td>
</tr>
<tr>
<td></td>
<td>Base +180°</td>
<td>515.5</td>
<td>$7,420</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Walls: U-0.084; Roof: U-0.063; Floors - U-0.052</td>
</tr>
<tr>
<td></td>
<td>Base +270°</td>
<td>523.6</td>
<td>$7,571</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Windows: U-0.57, SHGC-0.39</td>
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<td></td>
<td>Avg Base Case</td>
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<td>$7,496</td>
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<td>-</td>
<td>-</td>
<td></td>
</tr>
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<td>1.10</td>
<td>2003 IECC</td>
<td>547.6</td>
<td>$7,777</td>
<td>-281</td>
<td>-3.8%</td>
<td>-27.98</td>
<td>-5.4%</td>
</tr>
<tr>
<td>1.11</td>
<td>2006 IECC</td>
<td>515.7</td>
<td>$7,400</td>
<td>$96</td>
<td>1.3%</td>
<td>3.92</td>
<td>0.8%</td>
</tr>
<tr>
<td>3.42</td>
<td>As Designed</td>
<td>351.5</td>
<td>$5,689</td>
<td>$1,807</td>
<td>24.1%</td>
<td>168.13</td>
<td>32.4%</td>
</tr>
</tbody>
</table>

*Energy consumption reported excluding Misc Equipment electrical end-use
Baseline Energy End-uses

- Conditioned Lighting: 17.9%
- Unconditioned Lighting: 2.1%
- Space Heating: 51.2%
- Space Cooling: 11.4%
- Pumps & Aux: 0.7%
- Fans - Ventilation: 15.1%
- DHW: 1.6%

Small Retail with 8% WWR (Norfolk, NE)
## Building Energy Performance Summary - Base Case

**Small Retail 8% Glass Energy Results Summary**  
**Norfolk, NE**

### End Use Energy Source Summary

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Baseline Building</th>
<th>Baseline Building +90</th>
<th>Baseline Building +180</th>
<th>Baseline Building +270</th>
<th>Baseline Average</th>
<th>% End Use of Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy [MMbtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>Energy [MMbtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>Energy [MMbtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>Energy [MMbtu]</td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>93.1</td>
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<td>93.1</td>
<td>6.8</td>
<td>93.1</td>
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<tr>
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<td>Electricity</td>
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<td>0.6</td>
<td>10.9</td>
<td>0.6</td>
<td>10.9</td>
<td>0.6</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>161.3</td>
<td>11.7</td>
<td>161.3</td>
<td>11.7</td>
<td>161.3</td>
<td>11.7</td>
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<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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<td>Gas</td>
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<td>Steam/ HW</td>
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<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>3.7</td>
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<td>3.7</td>
<td>0.0</td>
<td>3.7</td>
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<td>76.6</td>
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<td>0.0</td>
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<td>Electricity</td>
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<td>0.0</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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<tr>
<td>DHW</td>
<td>Elec</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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<tr>
<td>DHW</td>
<td>Gas</td>
<td>8.2</td>
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### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$4,960</td>
<td>$5,096</td>
<td>$4,960</td>
<td>$5,096</td>
<td>$4,960</td>
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<tr>
<td>Gas</td>
<td>$2,460</td>
<td>$2,475</td>
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<tr>
<td>Total</td>
<td>$7,420</td>
<td>$7,571</td>
<td>$7,420</td>
<td>$7,571</td>
<td>$7,496</td>
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</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Conditioned Lighting 17.9%
Unconditioned Lighting 2.1%
Alternative Energy Savings 32.4%

Conditioned Lighting
Unconditioned Lighting
Space Heating
Space Cooling
Pumps & Aux
Fans - Ventilation
DHW

Alternative Energy End-uses

SMALL RETAIL WITH 8% WWR (NORFOLK, NE)
**Small Retail 8% Glass Energy Results Summary**

**Norfolk, NE**

**Description:** Alternative

Split system; 90% eff. furnace; CEE Tier 1; Improved wall, R-40 roof, and Solarban 70XL w/ thermally broken frame

### Building Energy Performance Summary

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference Alt-Baseline</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy Peak</td>
<td>Energy Peak</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>[MMBtu]</td>
<td>[MMBtu]</td>
<td></td>
<td>(%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[kW or therms/hr]</td>
<td>[kW or therms/hr]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>93.1</td>
<td>93.1</td>
<td>0.0%</td>
<td>18.2%</td>
<td>13.7%</td>
</tr>
<tr>
<td>Unconditioned Lighting</td>
<td>Electricity</td>
<td>10.9</td>
<td>10.9</td>
<td>0.0%</td>
<td>2.1%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>161.3</td>
<td>161.3</td>
<td>0.0%</td>
<td>31.5%</td>
<td>23.7%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Gas</td>
<td>136.3</td>
<td>265.9</td>
<td>48.7%</td>
<td>26.6%</td>
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<td>Space Heating</td>
<td>Steam/ HW</td>
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<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>Electric</td>
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<td>8.4%</td>
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<tr>
<td>Space Cooling</td>
<td>Chilled Water</td>
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<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>3.7</td>
<td>3.6</td>
<td>-2.8%</td>
<td>0.7%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Fans - Ventilation</td>
<td>Electricity</td>
<td>56.4</td>
<td>78.4</td>
<td>28.1%</td>
<td>11.0%</td>
<td>11.5%</td>
</tr>
<tr>
<td>Fans - Exhaust</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Elec</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
<td>8.2</td>
<td>8.2</td>
<td>0.0%</td>
<td>1.6%</td>
<td>1.2%</td>
</tr>
</tbody>
</table>

Total w/o Misc Equipment

|                            | 351.5 | 519.6 | 32.4% |

Alternative Energy Savings

|                            | 168.1 |

Total w/ Misc Equipment

|                            | 512.8 | 680.9 |

### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
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<tbody>
<tr>
<td>Electricity*</td>
<td>$4,293</td>
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<tr>
<td>Gas</td>
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<td>$2,468</td>
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<td>Total</td>
<td>$5,689</td>
<td>$7,496</td>
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*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

- 2003 IECC: -5.7%
- 2006 IECC: 0.7%
- Alternative: 32.3%

SMALL RETAIL WITH 8% WWR (CHADRON, NE)
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>Base Case</td>
<td>444.3</td>
<td>$6,605</td>
<td></td>
<td></td>
<td></td>
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<td>ASHRAE 90.1-2004 Baseline</td>
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<tr>
<td></td>
<td>Base +90°</td>
<td>452.6</td>
<td>$6,769</td>
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<td>Base +180°</td>
<td>444.3</td>
<td>$6,608</td>
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<td>Walls: U-0.084; Roof: U-0.063; Floors - U-0.052</td>
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<td>Base +270°</td>
<td>451</td>
<td>$6,724</td>
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<td></td>
<td></td>
<td>Windows: U-0.57, SHGC-0.39</td>
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<tr>
<td></td>
<td>Avg Base Case</td>
<td>448.05</td>
<td>$6,677</td>
<td></td>
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<td></td>
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<tr>
<td>1.10</td>
<td>2003 IECC</td>
<td>473.8</td>
<td>$6,941</td>
<td>-$264</td>
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<td>-25.75</td>
<td>-5.7%</td>
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<tr>
<td>1.11</td>
<td>2006 IECC</td>
<td>444.8</td>
<td>$6,576</td>
<td>$101</td>
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<td>3.25</td>
<td>0.7%</td>
<td>2006 IECC</td>
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<tr>
<td>3.42</td>
<td>As Designed</td>
<td>303.4</td>
<td>$4,992</td>
<td>$1,685</td>
<td>25.2%</td>
<td>144.65</td>
<td>32.3%</td>
<td>Alternative</td>
</tr>
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</table>

*Energy consumption reported excluding Misc Equipment electrical end-use
Baseline Energy End-uses

- Conditioned Lighting: 20.8%
- Unconditioned Lighting: 2.4%
- Space Heating: 45.6%
- Space Cooling: 11.2%
- Pumps & Aux: 0.8%
- Fans - Ventilation: 17.2%
- DHW: 1.8%

Small Retail with 8% WWR (Chadron, NE)
### Building Energy Performance Summary - Base Case

**Small Retail 8% Glass Energy Results Summary**  
**Chadron, NE**

#### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
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<tr>
<td>Electricity*</td>
<td>$4,770</td>
<td>$4,922</td>
<td>$4,772</td>
<td>$4,875</td>
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<td>Gas</td>
<td>$1,835</td>
<td>$1,847</td>
<td>$1,836</td>
<td>$1,849</td>
<td>$1,842</td>
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<tr>
<td>Total</td>
<td>$6,605</td>
<td>$6,769</td>
<td>$6,608</td>
<td>$6,724</td>
<td>$6,677</td>
</tr>
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</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

**DOE-2 Reports:** Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
**Alternative Energy End-uses**

- **Conditioned Lighting**: 20.8%
- **Unconditioned Lighting**: 2.4%
- **Space Heating**: 21.7%
- **Space Cooling**: 7.7%
- **Fans - Ventilation**: 12.4%
- **Pumps & Aux**: 0.9%
- **DHW**: 1.8%
- **Alternative Energy Savings**: 32.3%

*SMALL RETAIL WITH 8% WWR (CHADRON, NE)*
Description: Alternative
Split system; 90% eff. furnace; CEE Tier 1; Improved wall, R-40 roof, and Solarban 70XL w/ thermally broken frame

### Building Energy Performance Summary

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference Alt-Baseline</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy Peak</td>
<td>Energy Peak</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[MMBtu]</td>
<td>[kW or therm/hr]</td>
<td></td>
<td>[MMBtu]</td>
<td>[kW or therm/hr]</td>
<td></td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
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<td>93.1 6.8</td>
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<td>Electricity</td>
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<td>10.9 0.6</td>
<td>0.0%</td>
<td>2.3%</td>
<td>1.8%</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>161.3 11.1</td>
<td>161.3 11.7</td>
<td>0.0%</td>
<td>34.7%</td>
<td>26.5%</td>
</tr>
<tr>
<td>Space Heating Gas</td>
<td>Electricity</td>
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<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating Steam/HW</td>
<td>Electricity</td>
<td>204.5 0.3</td>
<td>204.5 0.3</td>
<td>52.4%</td>
<td>20.9%</td>
<td>33.6%</td>
</tr>
<tr>
<td>Space Heating Elec</td>
<td>Electricity</td>
<td>50.3 13.9</td>
<td>50.3 13.9</td>
<td>31.8%</td>
<td>7.4%</td>
<td>8.3%</td>
</tr>
<tr>
<td>Space Cooling Chilled Water</td>
<td>Electricity</td>
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<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>3.8 0.0</td>
<td>3.8 0.0</td>
<td>-2.6%</td>
<td>0.8%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Fans - Ventilation</td>
<td>Electricity</td>
<td>77.2 3.9</td>
<td>77.2 3.9</td>
<td>27.9%</td>
<td>12.0%</td>
<td>12.7%</td>
</tr>
<tr>
<td>Fans - Exhaust</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW Elec</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
<td>8.2 0.0</td>
<td>8.2 0.0</td>
<td>0.0%</td>
<td>1.8%</td>
<td>1.3%</td>
</tr>
</tbody>
</table>

Total w/o Misc Equipment

|                        | 303.4 | 448.1 | 32.3% | 100.0% | 100.0% |

Alternative Energy Savings

|                        | 144.7 | 609.4 |

Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$4,078</td>
<td>$4,835</td>
</tr>
<tr>
<td>Gas</td>
<td>$914</td>
<td>$1,842</td>
</tr>
<tr>
<td>Total</td>
<td>$4,992</td>
<td>$6,677</td>
</tr>
</tbody>
</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

2006 IECC
-1.0%

2003 IECC
-1.9%

RETAIL STRIP MALL (OMAHA, NE)
### Retail Strip Mall Energy Results Summary
**Omaha, NE**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
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<td>Base Case</td>
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<td>$35,484</td>
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<tr>
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<td>Base +180°</td>
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<tr>
<td></td>
<td>Base +270°</td>
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<tr>
<td></td>
<td>Avg Base Case</td>
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<tr>
<td>1.10</td>
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<td>2174</td>
<td>$36,960</td>
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<td>-40.75</td>
<td>-1.9%</td>
<td>2003 IECC</td>
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<td>1.11</td>
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<td>-3.1%</td>
<td>-21.75</td>
<td>-1.0%</td>
<td>2006 IECC</td>
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<tr>
<td>3.42</td>
<td>As Designed</td>
<td>1482</td>
<td>$21,324</td>
<td>$14,364</td>
<td>40.2%</td>
<td>651.25</td>
<td>30.5%</td>
<td>Alternative</td>
</tr>
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</table>

*Reported excluding Misc Equipment electrical end-use*
# Building Energy Performance Summary - Base Case

## End Use Energy Source

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Baseline Building</th>
<th>Baseline Building +90</th>
<th>Baseline Building +180</th>
<th>Baseline Building +270</th>
<th>Baseline Average</th>
<th>% End Use of Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>250.4 18.2</td>
<td>250.4 18.2</td>
<td>250.4 18.2</td>
<td>250.4 18.2</td>
<td>250.4 18.2</td>
<td>8.7%</td>
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<tr>
<td>Unconditioned</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lighting</td>
<td>Electricity</td>
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<td>29.4 0.0</td>
<td>29.4 0.0</td>
<td>29.4 0.0</td>
<td>29.4 0.0</td>
<td>1.0%</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>735.4 51.3</td>
<td>735.4 52.0</td>
<td>735.4 51.3</td>
<td>735.4 52.0</td>
<td>735.4 51.7</td>
<td>25.6%</td>
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<tr>
<td>Space Heating</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating Gas</td>
<td>Gas</td>
<td>1051.7 1.2</td>
<td>1041.7 1.1</td>
<td>1054.4 1.2</td>
<td>1057.4 1.2</td>
<td>1051.3 1.2</td>
<td>36.6%</td>
</tr>
<tr>
<td>Space Heating Steam/ HW</td>
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<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>Electricity</td>
<td>351.8 74.2</td>
<td>360.6 74.6</td>
<td>350.2 74.2</td>
<td>360.2 74.4</td>
<td>355.7 74.4</td>
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<tr>
<td>Space Cooling CHW</td>
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<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>11.0 0.0</td>
<td>11.1 0.0</td>
<td>11.1 0.0</td>
<td>11.0 0.0</td>
<td>11.1 0.0</td>
<td>0.4%</td>
</tr>
<tr>
<td>Fans - Ventilation</td>
<td>Electricity</td>
<td>418.3 21.4</td>
<td>437.4 22.2</td>
<td>414.5 21.2</td>
<td>438.2 22.3</td>
<td>427.1 21.8</td>
<td>14.9%</td>
</tr>
<tr>
<td>Fans - Exhaust</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Elec</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW Gas</td>
<td>Gas</td>
<td>8.3 0.0</td>
<td>8.3 0.0</td>
<td>8.3 0.0</td>
<td>8.3 0.0</td>
<td>8.3 0.0</td>
<td>0.3%</td>
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<tr>
<td>Total w/o Misc Equipment</td>
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<td>2120.9</td>
<td>2138.9</td>
<td>2118.3</td>
<td>2154.9</td>
<td>2133.25</td>
<td></td>
</tr>
<tr>
<td>Total w/ Misc Equipment</td>
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<td>2856.3</td>
<td>2874.3</td>
<td>2853.7</td>
<td>2890.3</td>
<td>2868.65</td>
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</table>

## Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$25,370</td>
<td>$25,859</td>
<td>$25,229</td>
<td>$25,855</td>
<td>$25,578</td>
</tr>
<tr>
<td>Gas</td>
<td>$10,114</td>
<td>$10,021</td>
<td>$10,137</td>
<td>$10,166</td>
<td>$10,110</td>
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<tr>
<td>Total</td>
<td>$35,484</td>
<td>$35,880</td>
<td>$35,366</td>
<td>$36,021</td>
<td>$35,688</td>
</tr>
</tbody>
</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy End-uses

- Conditioned Lighting: 11.7%
- Unconditioned Lighting: 1.4%
- Space Heating: 27.3%
- Space Cooling: 10.7%
- Pumps & Aux: 0.8%
- Fans - Ventilation: 17.2%
- DHW: 0.4%
- Alternative Energy Savings: 30.5%

Retail Strip Mall (Omaha, NE)
Retail Strip Mall Energy Results Summary
Omaha, NE

Description: Alternative Packaging Rooftop; 90% eff. furnace; Energy Recovery Wheel; CEE Tier 1; Improved wall; and Solarban 70XL w/ thermally broken frame

Building Energy Performance Summary

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference Alt-Baseline</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy [MMBtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>Energy [MMBtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>[%]</td>
<td>[%]</td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
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<td>18.2</td>
<td>250.4</td>
<td>18.2</td>
<td>0.0%</td>
</tr>
<tr>
<td>Unconditioned Lighting</td>
<td>Electricity</td>
<td>29.4</td>
<td>0.0</td>
<td>29.4</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>735.4</td>
<td>49.9</td>
<td>735.4</td>
<td>51.7</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Gas</td>
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<td>0.5</td>
<td>1051.3</td>
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<td>Steam/ HW</td>
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<tr>
<td>Space Cooling</td>
<td>Elec</td>
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<td>355.7</td>
<td>74.4</td>
<td>35.9%</td>
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<td>0.0</td>
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<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
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<td>Electricity</td>
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<td>427.1</td>
<td>21.8</td>
<td>14.0%</td>
</tr>
<tr>
<td>Fans - Exhaust</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
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<tr>
<td>HP Supplement</td>
<td>Electricity</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Elec</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
<td>8.3</td>
<td>0.0</td>
<td>8.3</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Total w/o Misc Equipment: 1482.0 [MMBtu] 2133.3 [MMBtu] 30.5% 100.0% 100.0%

Alternative Energy Savings: 651.3 [MMBtu]
Total w/ Misc Equipment: 2217.4 [MMBtu] 2868.7 [MMBtu]

Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$15,622</td>
<td>$25,578</td>
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<tr>
<td>Gas</td>
<td>$5,702</td>
<td>$10,110</td>
</tr>
<tr>
<td>Total</td>
<td>$21,324</td>
<td>$35,688</td>
</tr>
</tbody>
</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

- 2003 IECC: -2.3%
- 2006 IECC: -1.2%
- Alternative: 32.6%

Energy Use Reduction vs. Base Case

RETAIL STRIP MALL (NORFOLK, NE)
## Retail Strip Mall Energy Results Summary
### Norfolk, NE

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>0.00</td>
<td>Base Case</td>
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<td>ASHRAE 90.1-2004 Baseline</td>
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<td>$30,686</td>
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<td></td>
<td></td>
<td>Appendix G</td>
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<td>Base +180°</td>
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<td></td>
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<td></td>
<td>Walls: U-0.084; Roof: U-0.063; Floors - U-0.052</td>
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<tr>
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<td>Base +270°</td>
<td>2250.6</td>
<td>$30,668</td>
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<td>Windows: U-0.57, SHGC-0.39</td>
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<td>Avg Base Case</td>
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<td>2281</td>
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<td>-$932</td>
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<td>-51.58</td>
<td>-2.3%</td>
<td>2003 IECC</td>
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<td>-27.78</td>
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</tr>
<tr>
<td>3.42</td>
<td>As Designed</td>
<td>1502.4</td>
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<td>$8,176</td>
<td>26.9%</td>
<td>727.03</td>
<td>32.6%</td>
<td>Alternative</td>
</tr>
</tbody>
</table>

*Reported excluding Misc Equipment electrical end-use
## Building Energy Performance Summary - Base Case

### End Use Energy Source

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Baseline Building</th>
<th>Baseline Building +90</th>
<th>Baseline Building +180</th>
<th>Baseline Building +270</th>
<th>Baseline Average</th>
<th>% End Use of Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy [MMBtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>Energy [MMBtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>Energy [MMBtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>Energy [MMBtu]</td>
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<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>250.4 18.2</td>
<td>250.4 18.2</td>
<td>250.4 18.2</td>
<td>250.4 18.2</td>
<td>250.4 18.2</td>
<td>250.4 18.2</td>
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<tr>
<td>Unconditioned</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lighting</td>
<td>Electricity</td>
<td>29.4 1.6</td>
<td>29.4 1.6</td>
<td>29.4 1.6</td>
<td>29.4 1.6</td>
<td>29.4 1.6</td>
<td>29.4 1.6</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>735.4 52.0</td>
<td>735.4 52.0</td>
<td>735.4 52.0</td>
<td>735.4 52.0</td>
<td>735.4 52.0</td>
<td>735.4 52.0</td>
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<tr>
<td>Space Heating</td>
<td>Electricity</td>
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<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
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<tr>
<td>Space Heating Gas</td>
<td>Gas</td>
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<tr>
<td>Space Cooling</td>
<td>Electricity</td>
<td>304.5 62.4</td>
<td>311.8 62.8</td>
<td>305.9 63.5</td>
<td>311.5 66.6</td>
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<tr>
<td>Space Cooling CHW</td>
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<td></td>
<td></td>
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<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
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<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
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<td>12.4 0.0</td>
<td>12.4 0.0</td>
<td>12.3 0.0</td>
<td>12.4 0.0</td>
<td>12.4 0.0</td>
</tr>
<tr>
<td>Fans - Ventilation</td>
<td>Electricity</td>
<td>422.6 19.8</td>
<td>444.3 20.4</td>
<td>376.5 19.5</td>
<td>445.5 20.5</td>
<td>422.2 20.1</td>
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<td>Fans - Exhaust</td>
<td>Electricity</td>
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<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Elec</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW Gas</td>
<td></td>
<td>8.6 0.0</td>
<td>8.6 0.0</td>
<td>8.6 0.0</td>
<td>8.6 0.0</td>
<td>8.6 0.0</td>
<td>0.3%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Total w/o Misc Equipment</td>
<td></td>
<td>2215.9</td>
<td>2254.7</td>
<td>2196.5</td>
<td>2250.6</td>
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<td>Total w/ Misc Equipment</td>
<td></td>
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<td>2964.825</td>
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### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
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<tbody>
<tr>
<td>Electricity*</td>
<td>$19,960</td>
<td>$20,521</td>
<td>$19,933</td>
<td>$20,543</td>
<td>$20,240</td>
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<td>Gas</td>
<td>$10,085</td>
<td>$10,165</td>
<td>$10,293</td>
<td>$10,125</td>
<td>$10,167</td>
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<tr>
<td>Total</td>
<td>$30,045</td>
<td>$30,686</td>
<td>$30,226</td>
<td>$30,668</td>
<td>$30,407</td>
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</tbody>
</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMBtu/h to therms
Alternative Energy End-uses

- Conditioned Lighting: 11.2%
- Unconditioned Lighting: 1.3%
- Alternative Energy Savings: 32.6%
- Space Heating: 28.9%
- Space Cooling: 8.5%
- Pumps & Aux: 0.8%
- Fans - Ventilation: 16.3%
- DHW: 0.4%

Retail Strip Mall (Norfolk, NE)
Retail Strip Mall Energy Results Summary  
Norfolk, NE

Description:  Alternative
Packaged Rooftop; 90% eff. furnace; Energy Recovery Wheel; CEE Tier 1; Improved wall; and Solarban 70XL w/ thermally broken frame

### Building Energy Performance Summary

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference Alt-Baseline</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy</td>
<td>Peak</td>
<td>Energy</td>
<td>Peak</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[MMBtu]</td>
<td>[kW or therm/hr]</td>
<td>[MMBtu]</td>
<td>[kW or therm/hr]</td>
<td>[%]</td>
<td>[%]</td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>250.4 18.2</td>
<td>250.4 18.2</td>
<td>0.0%</td>
<td>11.2%</td>
<td>8.4%</td>
</tr>
<tr>
<td>Unconditioned</td>
<td>Lighting</td>
<td>29.4 1.6</td>
<td>29.4 1.6</td>
<td>0.0%</td>
<td>1.3%</td>
<td>1.0%</td>
</tr>
<tr>
<td></td>
<td>Misc Equipment</td>
<td>735.4 52.0</td>
<td>735.4 52.0</td>
<td>0.0%</td>
<td>32.9%</td>
<td>24.8%</td>
</tr>
<tr>
<td></td>
<td>Space Heating</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>Space Heating</td>
<td>Gas</td>
<td>644.1 0.5</td>
<td>1198.0 1.2</td>
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<td>Space Heating</td>
<td>Steam/ HW</td>
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<td>0.0%</td>
<td>0.0%</td>
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<tr>
<td></td>
<td>Space Cooling</td>
<td>Elec</td>
<td>189.8 43.2</td>
<td>308.4 63.8</td>
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<td>Chilled Water</td>
<td>0.0 0.0</td>
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<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>Heat Rejection</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>17.7 0.4</td>
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<td>-43.3%</td>
<td>0.8%</td>
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<tr>
<td></td>
<td>Fans - Ventilation</td>
<td>Electricity</td>
<td>362.5 19.9</td>
<td>422.2 20.1</td>
<td>14.1%</td>
<td>16.2%</td>
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<tr>
<td></td>
<td>Fans - Exhaust</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>Refrigeration</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>HP Supplement</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>DHW</td>
<td>Elec</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>DHW</td>
<td>Gas</td>
<td>8.5 0.0</td>
<td>8.6 0.0</td>
<td>1.2%</td>
<td>0.4%</td>
</tr>
</tbody>
</table>

Total w/o Misc Equipment 1502.4 2229.4 32.6% 100.0% 100.0%
Alternative Energy Savings 727.0
Total w/o Misc Equipment 2237.8 2964.8

### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$16,637</td>
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<td>Gas</td>
<td>$5,593</td>
<td>$10,167</td>
</tr>
<tr>
<td>Total</td>
<td>$22,230</td>
<td>$30,407</td>
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</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

- 2003 IECC: -1.4%
- 2006 IECC: -0.4%
- Alternative: 31.3%

Energy Use Reduction vs. Base Case

RETAIL STRIP MALL (CHADRON, NE)
## Retail Strip Mall Energy Results Summary

*Chadron, NE*

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>Base Case</td>
<td>1937.5</td>
<td>$27,266</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASHRAE 90.1-2004 Baseline</td>
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<tr>
<td></td>
<td>Base +90°</td>
<td>1949.6</td>
<td>$27,750</td>
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<td></td>
<td></td>
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<td>Appendix G</td>
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<td>Base +180°</td>
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<td>Avg Base Case</td>
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<td>$27,572</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Windows: U-0.57, SHGC-0.39</td>
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<tr>
<td>1.10</td>
<td>2003 IECC</td>
<td>1975.2</td>
<td>$28,233</td>
<td>-$662</td>
<td>-2.4%</td>
<td>-26.75</td>
<td>-1.4%</td>
<td>2003 IECC</td>
</tr>
<tr>
<td>1.11</td>
<td>2006 IECC</td>
<td>1955.8</td>
<td>$28,082</td>
<td>-$511</td>
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<td>-7.35</td>
<td>-0.4%</td>
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<tr>
<td>3.42</td>
<td>As Designed</td>
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<td>$7,072</td>
<td>25.7%</td>
<td>609.95</td>
<td>31.3%</td>
<td>Alternative</td>
</tr>
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</table>

*Reported excluding Misc Equipment electrical end-use
Baseline Energy End-uses

- Conditioned Lighting: 12.9%
- Unconditioned Lighting: 1.5%
- Pumps & Aux: 0.6%
- Fans - Ventilation: 21.8%
- Space Cooling: 13.8%
- Space Heating: 49.0%
- DHW: 0.4%

RETAIL STRIP MALL (CHADRON, NE)
# Retail Strip Mall Energy Results Summary

## Chadron, NE

## Building Energy Performance Summary - Base Case

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Baseline Building</th>
<th>Baseline Building +90</th>
<th>Baseline Building +180</th>
<th>Baseline Building +270</th>
<th>Baseline Average</th>
<th>% End Use of Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy [MMbtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>Energy [MMbtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>Energy [MMbtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>Energy [MMbtu]</td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>250.4 18.2</td>
<td>250.4 18.2</td>
<td>250.4 18.2</td>
<td>250.4 18.2</td>
<td>250.4 18.2</td>
<td>9.3%</td>
</tr>
<tr>
<td>Unconditioned</td>
<td>Electricity</td>
<td>250.4 18.2</td>
<td>250.4 18.2</td>
<td>250.4 18.2</td>
<td>250.4 18.2</td>
<td>250.4 18.2</td>
<td>1.1%</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>735.4 53.3</td>
<td>735.4 49.9</td>
<td>735.4 53.3</td>
<td>735.4 49.9</td>
<td>735.4 51.6</td>
<td>27.4%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating Gas</td>
<td></td>
<td>962.2 1.0</td>
<td>941.2 1.0</td>
<td>957.1 1.0</td>
<td>957.2 1.0</td>
<td>954.4 1.0</td>
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<tr>
<td>Space Heating Steam/ HW</td>
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<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
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<tr>
<td>Space Cooling</td>
<td>Electricity</td>
<td>261.4 46.4</td>
<td>274.9 51.1</td>
<td>263.4 46.3</td>
<td>276.3 51.1</td>
<td>269.0 48.7</td>
<td>10.0%</td>
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<td>Space Cooling CHW</td>
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<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
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<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>12.7 0.0</td>
<td>12.6 0.0</td>
<td>12.7 0.0</td>
<td>12.5 0.0</td>
<td>12.6 0.0</td>
<td>0.5%</td>
</tr>
<tr>
<td>Fans - Ventilation</td>
<td>Electricity</td>
<td>412.8 19.6</td>
<td>432.5 20.3</td>
<td>412.6 19.4</td>
<td>438.1 20.5</td>
<td>424.0 20.0</td>
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<tr>
<td>Fans - Exhaust</td>
<td>Electricity</td>
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<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
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<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Elec</td>
<td>8.6 0.0</td>
<td>8.6 0.0</td>
<td>8.6 0.0</td>
<td>8.6 0.0</td>
<td>8.6 0.0</td>
<td>0.3%</td>
</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Total w/o Misc Equipment: 1937.5 1949.6 1934.2 1972.5 1948.45
Total w/ Misc Equipment: 2672.9 2685.0 2669.6 2707.9 2683.85

## Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$18,859</td>
<td>$19,525</td>
<td>$19,904</td>
<td>$19,643</td>
<td>$19,232</td>
</tr>
<tr>
<td>Gas</td>
<td>$8,407</td>
<td>$8,225</td>
<td>$8,362</td>
<td>$8,364</td>
<td>$8,340</td>
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<tr>
<td>Total</td>
<td>$27,266</td>
<td>$27,750</td>
<td>$27,266</td>
<td>$28,007</td>
<td>$27,572</td>
</tr>
</tbody>
</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy End-uses

Conditioned Lighting 12.9%
Unconditioned Lighting 1.5%
Alternative Energy Savings 31.3%
Space Heating 26.3%
Space Cooling 8.4%
Pumps & Aux 0.9%
DHW 0.4%
Fans - Ventilation 18.3%

RETAIL STRIP MALL (CHADRON, NE)
Retail Strip Mall Energy Results Summary  
Chadron, NE

Description: Alternative  
Packaged Rooftop; 90% eff. furnace; Energy Recovery Wheel; CEE Tier 1; Improved wall; and Solarban 70XL w/ thermally broken frame

### Building Energy Performance Summary

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Alternative Building Energy [MMBtu]</th>
<th>Average Baseline Energy [MMBtu]</th>
<th>Energy Difference to Alt-Baseline</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption Average [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>250.4 18.2</td>
<td>250.4 18.2</td>
<td>0.0%</td>
<td>12.1%</td>
<td>9.3%</td>
</tr>
<tr>
<td>Unconditioned Lighting</td>
<td>Electricity</td>
<td>29.4 0.0</td>
<td>29.4 0.0</td>
<td>0.0%</td>
<td>1.4%</td>
<td>1.1%</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>735.4 53.3</td>
<td>735.4 51.6</td>
<td>0.0%</td>
<td>35.5%</td>
<td>27.4%</td>
</tr>
<tr>
<td>Space Heating Gas</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating Electric</td>
<td>Electricity</td>
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<td>512.0 0.5</td>
<td>46.4%</td>
<td>24.7%</td>
<td>35.6%</td>
</tr>
<tr>
<td>Space Cooling Elec</td>
<td>Chilled Water</td>
<td>269.0 48.7</td>
<td>163.3 37.2</td>
<td>39.3%</td>
<td>7.9%</td>
<td>10.0%</td>
</tr>
<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>12.6 0.0</td>
<td>18.4 0.4</td>
<td>-45.7%</td>
<td>0.9%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Fans - Ventilation</td>
<td>Electricity</td>
<td>424.0 20.0</td>
<td>356.5 20.0</td>
<td>15.9%</td>
<td>17.2%</td>
<td>15.8%</td>
</tr>
<tr>
<td>Fans - Exhaust</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Elec</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
<td>8.6 0.0</td>
<td>8.5 0.0</td>
<td>1.2%</td>
<td>0.4%</td>
<td>0.3%</td>
</tr>
</tbody>
</table>

**Total w/o Misc Equipment**  
**Alternative Energy Savings**: **610.0**  
**Total w/ Misc Equipment**: **2073.9**  
**Total w/ Misc Equipment**: **2683.9**

### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$15,991</td>
<td>$19,232</td>
</tr>
<tr>
<td>Gas</td>
<td>$4,508</td>
<td>$6,340</td>
</tr>
<tr>
<td>Total</td>
<td>$20,499</td>
<td>$25,572</td>
</tr>
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</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

- Alternative: 29.6%
- 2006 IECC: 3.7%
- 2003 IECC: 0.0%

LARGE BIG BOX RETAIL WITH 2% WWR (OMAHA, NE)
## Big Box Retail 2% WWR Energy Results Summary

**Omaha, NE**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>Base Case</td>
<td>6849.9</td>
<td>$99,889</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Base +90°</td>
<td>6893.4</td>
<td>$100,349</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Base +180°</td>
<td>6854.9</td>
<td>$99,937</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Base +270°</td>
<td>6840.1</td>
<td>$99,881</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Avg Base Case</td>
<td>6859.6</td>
<td>$100,014</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.10</td>
<td>2003 IECC</td>
<td>6861.1</td>
<td>$100,085</td>
<td>-$71</td>
<td>-0.1%</td>
<td>-1.53</td>
<td>0.0%</td>
<td>1.10: 2003 IECC (Omaha 13b)</td>
</tr>
<tr>
<td>1.11</td>
<td>2006 IECC</td>
<td>6605.1</td>
<td>$97,551</td>
<td>$2,463</td>
<td>2.5%</td>
<td>254.48</td>
<td>3.7%</td>
<td>1.11: 2006 IECC</td>
</tr>
<tr>
<td>3.51</td>
<td>Alternative</td>
<td>4827.7</td>
<td>$89,166</td>
<td>$10,848</td>
<td>10.8%</td>
<td>2031.88</td>
<td>29.6%</td>
<td>Drybulb economizer; Dedicated ERV w/enthalpy wheel; CEE Tier 1 cooling equipment efficiencies; R-19+7.5 ci wall; R-30 roof; Solarban 70XL w/ thermally broken frame; Insulated dock doors</td>
</tr>
</tbody>
</table>

*Reported value excludes Misc Equipment electrical end-use
### Building Energy Performance Summary - Base Case

**End Use** | **Energy Source** | **Baseline Building** | **Baseline Building +90** | **Baseline Building +180** | **Baseline Building +270** | **Baseline Average** | **% End Use of Baseline**
---|---|---|---|---|---|---|---
Conditioned Lighting | Electricity | 2086.3 | 153.0 | 2086.3 | 153.0 | 2086.3 | 153.0 | 2086.3 | 153.0 | 22.6%
Unconditioned Lighting | Electricity | 217.7 | 18.0 | 217.7 | 18.0 | 217.7 | 18.0 | 217.7 | 18.0 | 2.4%
Misc Equipment | Electricity | 2380.9 | 174.6 | 2380.9 | 174.6 | 2380.9 | 174.6 | 2380.9 | 174.6 | 25.8%
Space Heating | Electricity | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
Space Heating | Gas | 3024.4 | 59.0 | 3066.7 | 59.5 | 3030.7 | 59.5 | 3013.2 | 59.6 | 32.8%
Space Heating | Steam/ HW | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
Space Cooling | Electricity | 1161.8 | 384.8 | 1161.0 | 385.5 | 1160.4 | 385.0 | 1163.2 | 385.8 | 12.6%
Space Cooling | CHW | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
Heat Rejection | Electricity | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
Pumps & Aux | Electricity | 15.7 | 2.2 | 16.4 | 2.2 | 15.5 | 2.2 | 15.2 | 2.2 | 0.2%
Fans - Ventilation | Electricity | 307.8 | 77.1 | 309.1 | 77.1 | 308.1 | 77.6 | 308.3 | 77.4 | 3.3%
Fans - Exhaust | Electricity | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
Refrigeration | Electricity | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
HP Supplement | Electricity | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
DHW | Elec | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
DHW | Gas | 36.2 | 0.1 | 36.2 | 0.1 | 36.2 | 0.1 | 36.2 | 0.1 | 0.4%

Total w/o Misc Equipment | 6849.9 | 6893.4 | 6854.9 | 6840.1 | 6859.6
Total w/ Misc Equipment | 9230.8 | 9274.3 | 9235.8 | 9221.0 | 9240.5

### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$71,251</td>
<td>$71,324</td>
<td>$71,240</td>
<td>$71,346</td>
<td>$71,291</td>
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<tr>
<td>Gas</td>
<td>$28,638</td>
<td>$29,025</td>
<td>$28,697</td>
<td>$28,535</td>
<td>$28,724</td>
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<tr>
<td>Steam/ HW</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Chilled Water</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td>$99,889</td>
<td>$100,349</td>
<td>$99,937</td>
<td>$99,881</td>
<td>$100,014</td>
</tr>
</tbody>
</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
30% Alternative Energy End-uses

- Conditioned Lighting: 30.4%
- Unconditioned Lighting: 3.2%
- Space Heating: 6.1%
- Space Cooling: 16.0%
- Fans - Ventilation: 13.7%
- DHW: 0.6%
- Alt Energy Savings: 29.6%
- Pumps & Aux: 0.4%

LARGE BIG BOX RETAIL WITH 2% WWR (OMAHA, NE)
### Building Energy Performance Summary

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption Average</th>
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<tbody>
<tr>
<td></td>
<td>Energy</td>
<td>Peak</td>
<td>Energy</td>
<td>Peak</td>
<td>[%]</td>
<td>[%]</td>
</tr>
<tr>
<td></td>
<td>[MMBtu]</td>
<td>[kW or therm/hr]</td>
<td>[MMBtu]</td>
<td>[kW or therm/hr]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>2086.3</td>
<td>153.0</td>
<td>2086.3</td>
<td>153.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Unconditioned Lighting</td>
<td>Electricity</td>
<td>217.7</td>
<td>18.0</td>
<td>217.7</td>
<td>18.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>2380.9</td>
<td>174.6</td>
<td>2380.9</td>
<td>174.6</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Gas</td>
<td>415.4</td>
<td>18.7</td>
<td>3033.8</td>
<td>59.4</td>
<td>86.3%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>Elec</td>
<td>1099.9</td>
<td>218.4</td>
<td>1161.6</td>
<td>385.3</td>
<td>5.3%</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>Chilled Water</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>27.8</td>
<td>2.8</td>
<td>15.7</td>
<td>2.2</td>
<td>-77.1%</td>
</tr>
<tr>
<td>Fans - Ventilation</td>
<td>Electricity</td>
<td>942.2</td>
<td>62.7</td>
<td>308.3</td>
<td>77.3</td>
<td>-205.6%</td>
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<tr>
<td>Fans - Exhaust</td>
<td>Electricity</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Elec</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
<td>38.4</td>
<td>0.1</td>
<td>36.2</td>
<td>0.1</td>
<td>-6.1%</td>
</tr>
<tr>
<td>Total w/o Misc Equipment</td>
<td></td>
<td>4827.7</td>
<td>6859.6</td>
<td>29.6%</td>
<td></td>
<td>100.0%</td>
</tr>
<tr>
<td>Alt Energy Savings</td>
<td></td>
<td>2031.9</td>
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<td></td>
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<tr>
<td>Total w/ Misc Equipment</td>
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<td>7208.6</td>
<td>9240.5</td>
<td>22.0%</td>
<td></td>
<td>100.0%</td>
</tr>
</tbody>
</table>

### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$84,826</td>
<td>$71,291</td>
</tr>
<tr>
<td>Gas</td>
<td>$4,340</td>
<td>$28,724</td>
</tr>
<tr>
<td>Steam/ HW</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Chilled Water</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td>$89,166</td>
<td>$100,014</td>
</tr>
</tbody>
</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

Energy Use Reduction vs. Base Case

- Alternative: 29.9%
- 2006 IECC: 4.3%
- 2003 IECC: 3.8%

LARGE BIG BOX RETAIL WITH 2% WWR (NORFOLK, NE)
### Big Box Retail 2% WWR Energy Results Summary
#### Norfolk, NE

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
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<th></th>
<th></th>
<th></th>
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</thead>
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<tr>
<td>0.00</td>
<td>Base Case</td>
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<td></td>
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<tr>
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<td>Base +90°</td>
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<td>$100,537</td>
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<td></td>
<td>Walls: U-0.08; Roof: U-0.06;</td>
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<tr>
<td></td>
<td>Base +180°</td>
<td>7141.1</td>
<td>$100,293</td>
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<td></td>
<td></td>
<td></td>
<td>Floors - U-0.05;</td>
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<tr>
<td></td>
<td>Base +270°</td>
<td>7126</td>
<td>$100,194</td>
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<td></td>
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<td></td>
<td>Windows: U-0.57, SHGC-0.39</td>
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<td></td>
<td>Avg Base Case</td>
<td>7144.8</td>
<td>$100,337</td>
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<td>1.10</td>
<td>2003 IECC</td>
<td>6869.8</td>
<td>$98,074</td>
<td>$2,264</td>
<td>2.3%</td>
<td>274.95</td>
<td>3.8%</td>
<td>1.10: 2003 IECC (Norfolk 14b)</td>
</tr>
<tr>
<td>1.11</td>
<td>2006 IECC</td>
<td>6838.1</td>
<td>$99,918</td>
<td>$419</td>
<td>0.4%</td>
<td>306.65</td>
<td>4.3%</td>
<td>1.11: 2006 IECC</td>
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<tr>
<td>3.51</td>
<td>Alternative</td>
<td>5009.3</td>
<td>$91,563</td>
<td>$8,774</td>
<td>8.7%</td>
<td>2135.45</td>
<td>29.9%</td>
<td>Drybulb economizer; Dedicated ERV w/enthalpy wheel; CEE Tier 1 cooling equipment efficiencies; R-19+7.5 ci wall; R-30 roof; Solarban 70XL w/ thermally broken frame; Insulated dock doors</td>
</tr>
</tbody>
</table>

*Reported value excludes Misc Equipment electrical end-use
### Building Energy Performance Summary - Base Case

#### End Use Energy Source

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Baseline Building</th>
<th>Baseline Building +90</th>
<th>Baseline Building +180</th>
<th>Baseline Building +270</th>
<th>Baseline Average</th>
<th>% End Use of Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[MMbtu]</td>
<td>[kW or therm/hr]</td>
<td>[MMbtu]</td>
<td>[kW or therm/hr]</td>
<td>[MMbtu]</td>
<td>[kW or therm/hr]</td>
<td>[MMbtu]</td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>2086.3</td>
<td>153.0</td>
<td>2086.3</td>
<td>153.0</td>
<td>2086.3</td>
<td>153.0</td>
</tr>
<tr>
<td>Unconditioned Lighting</td>
<td>Electricity</td>
<td>217.7</td>
<td>18.0</td>
<td>217.7</td>
<td>18.0</td>
<td>217.7</td>
<td>18.0</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>2380.9</td>
<td>174.6</td>
<td>2380.9</td>
<td>174.6</td>
<td>2380.9</td>
<td>174.6</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Electricity</td>
<td>3495.3</td>
<td>57.6</td>
<td>3518.2</td>
<td>57.6</td>
<td>3493.0</td>
<td>57.6</td>
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<td>Space Heating Gas</td>
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<td>57.6</td>
<td>3476.5</td>
<td>57.6</td>
<td>3493.0</td>
<td>57.6</td>
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<td>Space Heating Steam/ HW</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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<tr>
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<td>984.9</td>
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<td>985.0</td>
<td>329.3</td>
<td>984.7</td>
<td>328.7</td>
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</tr>
<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>17.7</td>
<td>2.2</td>
<td>18.5</td>
<td>2.2</td>
<td>17.6</td>
<td>2.2</td>
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<tr>
<td>Fans - Ventilation</td>
<td>Electricity</td>
<td>304.8</td>
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<td>305.1</td>
<td>72.4</td>
<td>304.6</td>
<td>72.4</td>
</tr>
<tr>
<td>Fans - Exhaust</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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<td>0.0</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>DHW</td>
<td>Elec</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
<td>37.2</td>
<td>0.1</td>
<td>37.2</td>
<td>0.1</td>
<td>37.2</td>
<td>0.1</td>
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</tbody>
</table>

#### Total w/o Misc Equipment

|                          | 7143.9        | 7168.0            | 7141.1                 | 7126.0                  | 7144.8                        |
|                          | 9524.8        | 9548.9            | 9522.0                 | 9506.9                  | 9525.7                        |

#### Total w/ Misc Equipment

|                          | 9524.8        | 9548.9            | 9522.0                 | 9506.9                  | 9525.7                        |

### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
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<tbody>
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<td>Electricity*</td>
<td>$70,954</td>
<td>$70,976</td>
<td>$70,940</td>
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<td>Gas</td>
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<td>Steam/ HW</td>
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<td>$0</td>
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<tr>
<td>Chilled Water</td>
<td></td>
<td></td>
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<td>Total</td>
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<td>$100,537</td>
<td>$100,293</td>
<td>$100,194</td>
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*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

**DOE-2 Reports:** Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Conditioned Lighting: 29.2%
Unconditioned Lighting: 3.0%
Space Heating: 6.5%
Space Cooling: 14.8%
Pumps & Aux: 0.4%
Fans - Ventilation: 15.6%
DHW: 0.6%
Alt Energy Savings: 29.9%

LARGE BIG BOX RETAIL WITH 2% WWR (NORFOLK, NE)
Big Box Retail 2% WWR Energy Results Summary
Norfolk, NE

Description: Drybulb economizer; Dedicated ERV w/enthalpy wheel; CEE Tier 1 cooling equipment efficiencies; R-19+7.5 ci wall; R-30 roof; Solarban 70XL w/ thermally broken frame; Insulated dock doors

<table>
<thead>
<tr>
<th>Building Energy Performance Summary</th>
<th>End Use</th>
<th>Energy Source</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference Alt-Baseline</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Energy [MMBtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>Energy [MMBtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>[%]</td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>2086.3</td>
<td>153.0</td>
<td>2086.3</td>
<td>153.0</td>
<td>0.0%</td>
<td>28.2%</td>
</tr>
<tr>
<td>Lighting</td>
<td>Electricity</td>
<td>217.7</td>
<td>18.0</td>
<td>217.7</td>
<td>18.0</td>
<td>0.0%</td>
<td>2.9%</td>
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<tr>
<td>misc Equipment</td>
<td>Electricity</td>
<td>2380.9</td>
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<td>2380.9</td>
<td>174.6</td>
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<tr>
<td>Space Heating</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
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<td>Space Heating</td>
<td>Gas</td>
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<td>3495.8</td>
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<tr>
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<td>Steam/ HW</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>Elec</td>
<td>1054.1</td>
<td>207.6</td>
<td>985.2</td>
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<td>Space Cooling</td>
<td>Chilled Water</td>
<td>0.0</td>
<td>0.0</td>
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<td>0.0%</td>
<td>0.0%</td>
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<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
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<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>30.6</td>
<td>2.9</td>
<td>17.8</td>
<td>2.2</td>
<td>-72.4%</td>
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<tr>
<td>Fans - Ventilation</td>
<td>Electricity</td>
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<td>73.1</td>
<td>304.9</td>
<td>72.4</td>
<td>-266.0%</td>
<td>15.1%</td>
</tr>
<tr>
<td>Fans - Exhaust</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Elec</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
<td>39.4</td>
<td>0.1</td>
<td>37.2</td>
<td>0.1</td>
<td>-5.9%</td>
<td>0.5%</td>
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<tr>
<td>Total w/o Misc Equipment</td>
<td></td>
<td></td>
<td>5009.3</td>
<td>7144.8</td>
<td>29.9%</td>
<td>100.0%</td>
<td>100.0%</td>
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<td>Alt Energy Savings</td>
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<td>2135.5</td>
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<td>100.0%</td>
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<td></td>
<td></td>
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<tr>
<td>Total w/ Misc Equipment</td>
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<td>7390.2</td>
<td>9525.7</td>
<td>22.4%</td>
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Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$87,190</td>
<td>$70,962</td>
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<tr>
<td>Gas</td>
<td>$4,373</td>
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<td>Steam/ HW</td>
<td>$0</td>
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<td>Chilled Water</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td>$91,563</td>
<td>$100,337</td>
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</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMBtu/h to therms
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

Alternative

2006 IECC

2003 IECC

Energy Use Reduction vs. Base Case

LARGE BIG BOX RETAIL WITH 2% WWR (CHADRON, NE)

28.4%

4.3%

3.2%
<table>
<thead>
<tr>
<th>Run</th>
<th>Name</th>
<th>Annual Energy Use* [MMBtu]</th>
<th>Annual Energy Cost* [$]</th>
<th>Cost Savings vs Avg. Base* [%]</th>
<th>Energy Use Reduction vs. Base* [MMBtu]</th>
<th>Energy Use Reduction vs. Base* [%]</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>Base Case</td>
<td>6327.4</td>
<td>$92,443</td>
<td></td>
<td></td>
<td></td>
<td>ATSHRAE 90.1-2004 Baseline Appendix G Walls: U-0.084; Roof: U-0.063; Floors - U-0.052; Windows: U-0.57, SHGC-0.39</td>
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<tr>
<td></td>
<td>Base +90°</td>
<td>6356.9</td>
<td>$92,724</td>
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<td>2003 IECC (Chadron 15)</td>
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<tr>
<td></td>
<td>Base +180°</td>
<td>6308.5</td>
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<td>1.11: 2006 IECC</td>
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<tr>
<td></td>
<td>Base +270°</td>
<td>6301.8</td>
<td>$92,252</td>
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<td>Drybulb Economizer; Dedicated ERV w/enthalpy wheel; CEE Tier 1 cooling equipment efficiencies; R-19+7.5 ci wall; R-30 roof; Solarban 70XL with thermally broken frame; Insulated dock doors</td>
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<tr>
<td>Avg Base Case</td>
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<tr>
<td>1.10</td>
<td>2003 IECC</td>
<td>6121.7</td>
<td>$90,636</td>
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<td>201.95</td>
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<tr>
<td>1.11</td>
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<td>275.05</td>
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<td>3.51</td>
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<td>1796.75</td>
<td>28.4%</td>
<td>1.10: 2003 IECC (Chadron 15)</td>
</tr>
</tbody>
</table>

*Reported value excludes Misc Equipment electrical end-use
Baseline Energy End-uses

- Conditioned Lighting: 33.0%
- Unconditioned Lighting: 3.4%
- Space Heating: 44.9%
- Space Cooling: 12.9%
- Fans - Ventilation: 4.9%
- Pumps & Aux: 0.3%
- DHW: 0.6%

LARGE BIG BOX RETAIL WITH 2% WWR (CHADRON, NE)
## Big Box Retail 2% WWR Energy Results Summary

**Chadron, NE**

### Building Energy Performance Summary - Base Case

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Baseline Building</th>
<th>Baseline Building +90</th>
<th>Baseline Building +180</th>
<th>Baseline Building +270</th>
<th>Baseline Average</th>
<th>% End Use of Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy</td>
<td>Peak [MMbtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>Peak [MMbtu]</td>
<td>Peak [kW or therm/hr]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conditioned</td>
<td>Lighting</td>
<td>Electricity</td>
<td>2086.3</td>
<td>153.0</td>
<td>2086.3</td>
<td>153.0</td>
<td>2086.3</td>
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<tr>
<td>Unconditioned</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lighting</td>
<td></td>
<td>Electricity</td>
<td>217.7</td>
<td>18.0</td>
<td>217.7</td>
<td>18.0</td>
<td>217.7</td>
</tr>
<tr>
<td>Misc Equipment</td>
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<td>2380.9</td>
<td>174.6</td>
<td>2380.9</td>
<td>174.6</td>
<td>2380.9</td>
</tr>
<tr>
<td>Space Heating</td>
<td></td>
<td>Electricity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Space Heating</td>
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<td>Gas</td>
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<td>Space Heating</td>
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<td>Steam/ HW</td>
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<tr>
<td>Space Cooling</td>
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<td>CHW</td>
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<td>Heat Rejection</td>
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<td>Electricity</td>
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<td></td>
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</tr>
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<td>Pumps &amp; Aux</td>
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<td>16.2</td>
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<td>Electricity</td>
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<td>Refrigeration</td>
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<td>HP Supplement</td>
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<td>Electricity</td>
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<td>DHW</td>
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<td>Gas</td>
<td>37.2</td>
<td>0.1</td>
<td>37.2</td>
<td>0.1</td>
<td>37.2</td>
</tr>
</tbody>
</table>

Total w/o Misc Equipment: 6327.4
Total w/ Misc Equipment: 8708.3

### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$67,499</td>
<td>$67,547</td>
<td>$67,492</td>
<td>$67,545</td>
<td>$67,521</td>
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<td>$24,903</td>
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<td>Steam/ HW</td>
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<td></td>
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<td></td>
<td>$0</td>
</tr>
<tr>
<td>Chilled Water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$0</td>
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<tr>
<td>Total</td>
<td>$92,443</td>
<td>$92,724</td>
<td>$92,274</td>
<td>$92,252</td>
<td>$92,424</td>
</tr>
</tbody>
</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
30% Alternative Energy End-uses

- Conditioned Lighting: 33.0%
- Alternative Energy Savings: 28.4%
- Unconditioned Lighting: 3.4%
- Space Heating: 4.5%
- Space Cooling: 14.1%
- Pumps & Aux: 0.5%
- Fans - Ventilation: 15.5%
- DHW: 0.6%

LARGE BIG BOX RETAIL WITH 2% WWR (CHADRON, NE)
### Building Energy Performance Summary

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference</th>
<th>% of End Use</th>
<th>Baseline Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Energy [MMBtu]</td>
<td>Energy [MMBtu]</td>
<td>Alt-Baseline</td>
<td>As Designed</td>
<td>Average</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Peak [kW or therm/hr]</td>
<td>Peak [kW or therm/hr]</td>
<td>[%]</td>
<td>[%]</td>
<td>[%]</td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>2086.3</td>
<td>2086.3</td>
<td>0.0%</td>
<td>30.2%</td>
<td>24.0%</td>
</tr>
<tr>
<td>Unconditioned Lighting</td>
<td>Electricity</td>
<td>217.7</td>
<td>217.7</td>
<td>0.0%</td>
<td>3.2%</td>
<td>2.5%</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>2380.9</td>
<td>2380.9</td>
<td>0.0%</td>
<td>34.5%</td>
<td>27.4%</td>
</tr>
<tr>
<td>Space Heating Gas</td>
<td>Steam/ HW</td>
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<td>4.1%</td>
<td>32.6%</td>
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<td>Space Heating Gas</td>
<td>Elec</td>
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<td>12.9%</td>
<td>9.4%</td>
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<tr>
<td>Space Cooling Chilled Water</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>28.6</td>
<td>16.8</td>
<td>-70.5%</td>
<td>0.4%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Fans - Ventilation</td>
<td>Electricity</td>
<td>979.0</td>
<td>310.4</td>
<td>-215.4%</td>
<td>14.2%</td>
<td>3.6%</td>
</tr>
<tr>
<td>Fans - Exhaust</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Elec</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
<td>39.4</td>
<td>37.2</td>
<td>-5.9%</td>
<td>0.6%</td>
<td>0.4%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total w/o Misc Equipment</th>
<th>[MMBtu]</th>
<th>Energy Savings</th>
<th>[%]</th>
<th>Total w/ Misc Equipment</th>
<th>[MMBtu]</th>
<th>[%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>4526.9</td>
<td>6323.7</td>
<td>1796.8</td>
<td>28.4%</td>
<td>6907.8</td>
<td>8704.6</td>
<td>20.6%</td>
</tr>
</tbody>
</table>

### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$81,277</td>
<td>$67,521</td>
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<tr>
<td>Gas</td>
<td>$2,804</td>
<td>$24,903</td>
</tr>
<tr>
<td>Chimney</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td>$84,081</td>
<td>$92,424</td>
</tr>
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</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Consumption Savings vs. ASHRAE 90.1-2004 Base Case

- Alternative: 29.6%
- IECC 2006: 1.8%
- IECC 2003: -0.9%

Energy Use Reduction vs. Base Case

ELEMENTARY WITH 18% WWR (OMAHA, NE)
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>Base Case</td>
<td>2732.1</td>
<td>$56,129</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASHRAE 90.1-2004 Baseline Appendix G Walls: U-0.084; Roof: U-0.063; Floors - U-0.052 Windows: U-0.57, SHGC-0.39</td>
</tr>
<tr>
<td></td>
<td>Base +90°</td>
<td>2777.6</td>
<td>$56,766</td>
<td>$722</td>
<td>-1.3%</td>
<td>-24.7</td>
<td>-0.9%</td>
<td>1.10: IECC 2003 (Omaha 13b)</td>
</tr>
<tr>
<td></td>
<td>Base +180°</td>
<td>2733.5</td>
<td>$55,977</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.11: IECC 2006</td>
</tr>
<tr>
<td></td>
<td>Base +270°</td>
<td>2773.1</td>
<td>$56,606</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.00: Alternative Dedicated ERV w/enthalpy wheel; Roof U-value = 0.056</td>
</tr>
<tr>
<td></td>
<td>Avg Base Case</td>
<td>2754.1</td>
<td>$56,369</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Reported value excludes Misc Equipment electrical end-use
Baseline Energy End-uses

- Conditioned Lighting: 15.1%
- Unconditioned Lighting: 5.3%
- HP Supplement: 28.1%
- DHW: 5.6%
- Space Heating: 19.4%
- Space Cooling: 13.0%
- Fans - Ventilation: 13.3%
- Pumps & Aux: 0.3%

ELEMENTARY WITH 18% WWR (OMAHA, NE)
## Building Energy Performance Summary - Base Case

**End Use** | **Energy Source** | **Baseline Building** | **Baseline Building +90** | **Baseline Building +180** | **Baseline Building +270** | **Baseline Average** | % End Use of Baseline
---|---|---|---|---|---|---|---
Conditioned Lighting | Electricity | 414.6 | 57.0 | 414.6 | 57.0 | 414.6 | 57.0 | 414.6 | 57.0 | 11.1%
Unconditioned Lighting | Electricity | 147.2 | 10.0 | 147.2 | 10.0 | 147.2 | 10.0 | 147.2 | 10.0 | 4.0%
Misc Equipment | Electricity | 971.2 | 114.8 | 971.2 | 114.8 | 971.2 | 114.8 | 971.2 | 114.8 | 26.1%
Space Heating | Electricity | 538.4 | 211.4 | 527.7 | 201.6 | 540.5 | 211.3 | 525.6 | 201.8 | 533.1 | 206.5 | 14.3%
Space Heating | Gas | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0
Space Heating | Steam/ HW | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0
Space Cooling | Electricity | 354.0 | 621.7 | 363.5 | 248.8 | 353.5 | 261.5 | 363.9 | 248.9 | 358.7 | 345.2 | 9.6%
Space Cooling | CHW | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0
Heat Rejection | Electricity | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0
Pumps & Aux | Electricity | 7.9 | 0.9 | 7.9 | 0.9 | 7.9 | 0.9 | 7.9 | 0.9 | 7.9 | 0.9 | 0.2%
Fans - Ventilation | Electricity | 360.2 | 33.6 | 372.3 | 33.9 | 360.2 | 33.7 | 371.7 | 33.9 | 366.1 | 33.8 | 9.8%
Fans - Exhaust | Electricity | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0
Refrigeration | Electricity | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0
HP Supplement | Electricity | 756.3 | 783.7 | 790.9 | 783.6 | 756.1 | 783.6 | 788.7 | 783.7 | 773.0 | 783.7 | 20.8%
DHW | Elec | 153.5 | 1.0 | 153.5 | 1.0 | 153.5 | 1.0 | 153.5 | 1.0 | 153.5 | 1.0 | 4.1%
DHW | Gas | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0

| Total w/o Misc Equipment | 2732.1 | 2777.6 | 2733.5 | 2773.1 | 2754.1
| Total w/ Misc Equipment | 3703.3 | 3748.8 | 3704.7 | 3744.3 | 3765.3

## Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$54,518</td>
<td>$55,155</td>
<td>$54,366</td>
<td>$54,995</td>
<td>$54,758</td>
</tr>
<tr>
<td>Gas</td>
<td>$1,611</td>
<td>$1,611</td>
<td>$1,611</td>
<td>$1,611</td>
<td>$1,611</td>
</tr>
</tbody>
</table>

| Total | $56,129 | $56,766 | $55,977 | $56,606 |

*Electricity cost excludes Misc Equipment consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-F; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
30% Alternative Energy End-uses

- Conditioned Lighting: 15.1%
- Unconditioned Lighting: 5.3%
- Space Heating: 7.1%
- Space Cooling: 11.7%
- Pumps & Aux: 0.3%
- Fans - Ventilation: 20.4%
- HP Supplement: 6.4%
- DHW: 4.1%
- Alt Energy Savings: 29.6%
**Elementary 18% WWR Energy Results Summary**

**Omaha, NE**

Description: Dedicated ERV w/enthalpy wheel; Roof U-value = 0.056

### Building Energy Performance Summary

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference Alt-Baseline</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy</td>
<td>Peak</td>
<td>Energy</td>
<td>Peak</td>
<td>[]</td>
<td>[]</td>
</tr>
<tr>
<td></td>
<td>[MMBtu]</td>
<td>[kW or therm/hr]</td>
<td>[MMBtu]</td>
<td>[kW or therm/hr]</td>
<td>[%]</td>
<td>[%]</td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>414.6</td>
<td>57.0</td>
<td>414.6</td>
<td>57.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Unconditioned</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lighting</td>
<td>Electricity</td>
<td>147.2</td>
<td>10.0</td>
<td>147.2</td>
<td>10.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>971.2</td>
<td>114.8</td>
<td>971.2</td>
<td>114.8</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Electricity</td>
<td>195.3</td>
<td>181.7</td>
<td>533.1</td>
<td>206.5</td>
<td>63.4%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Gas</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>Elec</td>
<td>321.3</td>
<td>198.1</td>
<td>358.7</td>
<td>345.2</td>
<td>10.4%</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>Chilled Water</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td>0.0%</td>
</tr>
<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td>0.0%</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>9.3</td>
<td>0.9</td>
<td>7.9</td>
<td>0.9</td>
<td>-17.7%</td>
</tr>
<tr>
<td>Fans - Ventilation</td>
<td>Electricity</td>
<td>561.2</td>
<td>67.0</td>
<td>366.1</td>
<td>33.8</td>
<td>-53.3%</td>
</tr>
<tr>
<td>Fans - Exhaust</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td>0.0%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td>0.0%</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>177.4</td>
<td>343.8</td>
<td>773.0</td>
<td>783.7</td>
<td>77.1%</td>
</tr>
<tr>
<td>DHW</td>
<td>Elec</td>
<td>112.0</td>
<td>21.1</td>
<td>0.0</td>
<td>0.0</td>
<td>3.8%</td>
</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
<td>153.5</td>
<td>1.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

**Total w/o Misc Equipment**

|                        | 1938.3        | 2754.1           | 29.6%                      | 100.0%                     | 100.0%                      |

**Alt Energy Savings**

|                        | 815.8         | 3725.3           |                            |                            |

**Total w/ Misc Equipment**

|                        | 2909.5        | 3725.3           | 21.9%                      |

### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$39,608</td>
<td>$54,758</td>
</tr>
<tr>
<td>Gas</td>
<td>$1,611</td>
<td></td>
</tr>
<tr>
<td>Steam/ HW</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td>Chilled Water</td>
<td>$0</td>
<td></td>
</tr>
</tbody>
</table>

**Total**

|                        | $39,608         | $56,369       |

*Electricity cost excludes Misc Equipment consumption cost (based upon virtual rate)*

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Consumption Savings vs. ASHRAE 90.1-2004 Base Case

Energy Use Reduction vs. Base Case

- Alternative: 34.1%
- IECC 2006: 2.7%
- IECC 2003: 4.1%

ELEMENTARY WITH 18% WWR (NORFOLK, NE)
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>Base Case</td>
<td>2888.1</td>
<td>$49,410</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASMRAE 90.1-2004 Baseline</td>
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<tr>
<td></td>
<td>Base +90°</td>
<td>2939.4</td>
<td>$50,360</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Appendix G</td>
</tr>
<tr>
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<td>Base +180°</td>
<td>2887.6</td>
<td>$49,401</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Walls: U-0.084; Roof: U-0.063; Floors - U-0.052</td>
</tr>
<tr>
<td></td>
<td>Base +270°</td>
<td>2936.5</td>
<td>$50,321</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Windows: U-0.57, SHGC-0.39</td>
</tr>
<tr>
<td></td>
<td>Avg Base Case</td>
<td>2912.9</td>
<td>$49,873</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>1.10</td>
<td>IECC 2003</td>
<td>2792.1</td>
<td>$48,909</td>
<td>3.6%</td>
<td>$1,783</td>
<td>120.8</td>
<td>4.1%</td>
<td>1.10: IECC 2003 (Norfolk 14b)</td>
</tr>
<tr>
<td>1.11</td>
<td>IECC 2006</td>
<td>2834.9</td>
<td>$48,607</td>
<td>2.5%</td>
<td>$1,265</td>
<td>78.0</td>
<td>2.7%</td>
<td>1.11: IECC 2006</td>
</tr>
</tbody>
</table>

*Reported value excludes Misc Equipment electrical end-use
Baseline Energy End-uses

- Conditioned Lighting: 14.2%
- Unconditioned Lighting: 5.1%
- Space Heating: 18.3%
- Space Cooling: 8.9%
- HP Supplement: 35.6%
- Fans - Ventilation: 12.3%
- Pumps & Aux: 0.3%
- DHW: 5.4%

ELEMENTARY WITH 18% WWR (NORFOLK, NE)
## Building Energy Performance Summary - Base Case

### End Use Energy Source

<table>
<thead>
<tr>
<th>End Use</th>
<th>Baseline Building</th>
<th>Baseline Building +90</th>
<th>Baseline Building +180</th>
<th>Baseline Building +270</th>
<th>Baseline Average</th>
<th>% End Use of Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy [MMbtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>Energy [MMbtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>Energy [MMbtu]</td>
<td>Peak [kW or therm/hr]</td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>414.6</td>
<td>57.0</td>
<td>414.6</td>
<td>57.0</td>
<td>414.6</td>
<td>57.0</td>
</tr>
<tr>
<td>Lighting</td>
<td>147.2</td>
<td>10.0</td>
<td>147.2</td>
<td>10.0</td>
<td>147.2</td>
<td>10.0</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>971.2</td>
<td>114.8</td>
<td>971.2</td>
<td>114.8</td>
<td>971.2</td>
<td>114.8</td>
</tr>
<tr>
<td>Space Heating</td>
<td>540.8</td>
<td>183.5</td>
<td>523.3</td>
<td>170.9</td>
<td>542.0</td>
<td>183.3</td>
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<tr>
<td>Space Heating Gas</td>
<td></td>
<td></td>
<td>0.0</td>
<td></td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Space Heating Steam/ HW</td>
<td></td>
<td></td>
<td>0.0</td>
<td></td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Space Cooling</td>
<td>256.2</td>
<td>216.9</td>
<td>263.2</td>
<td>202.8</td>
<td>255.9</td>
<td>216.8</td>
</tr>
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<td>Space Cooling CHW</td>
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<td></td>
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<td></td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Heat Rejection</td>
<td></td>
<td></td>
<td>0.0</td>
<td></td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>8.7</td>
<td>0.9</td>
<td>8.7</td>
<td>0.9</td>
<td>8.7</td>
<td>0.9</td>
</tr>
<tr>
<td>Fans - Ventilation</td>
<td>351.8</td>
<td>33.2</td>
<td>362.5</td>
<td>33.2</td>
<td>351.5</td>
<td>33.2</td>
</tr>
<tr>
<td>Fans - Exhaust</td>
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<td></td>
<td>0.0</td>
<td></td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Refrigeration</td>
<td></td>
<td></td>
<td>0.0</td>
<td></td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>HP Supplement</td>
<td>1010.8</td>
<td>837.8</td>
<td>1061.9</td>
<td>838.3</td>
<td>1009.7</td>
<td>839.0</td>
</tr>
<tr>
<td>DHW</td>
<td></td>
<td></td>
<td>0.0</td>
<td></td>
<td>0.0</td>
<td></td>
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<tr>
<td>DHW Gas</td>
<td>158.0</td>
<td>1.0</td>
<td>158.0</td>
<td>1.0</td>
<td>158.0</td>
<td>1.0</td>
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<tr>
<td>Total w/o Misc Equipment</td>
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### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
<th>Baseline Average +90</th>
<th>Baseline Average +180</th>
<th>Baseline Average +270</th>
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<tbody>
<tr>
<td>Electricity*</td>
<td>$47,900</td>
<td>$48,850</td>
<td>$47,891</td>
<td>$48,811</td>
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<td>$1,510</td>
<td>$1,510</td>
<td>$1,510</td>
<td>$1,510</td>
<td>$1,510</td>
<td>$1,510</td>
<td>$1,510</td>
</tr>
<tr>
<td>Steam/ HW</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Chilled Water</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
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<tr>
<td>Total</td>
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<td>$49,401</td>
<td>$50,321</td>
<td>$49,873</td>
<td>$50,873</td>
<td>$50,821</td>
<td>$50,753</td>
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</table>

*Electricity cost excludes Misc Equipment consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-F; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
### Elementary 18% WWR Energy Results Summary
Norfolk, NE

**Description:** Dedicated ERV w/enthalpy wheel; Roof U-value = 0.056

#### Building Energy Performance Summary

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy [MMBtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>Energy [MMBtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>414.6</td>
<td>57.0</td>
<td>414.6</td>
<td>57.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Unconditioned Lighting</td>
<td>Electricity</td>
<td>147.2</td>
<td>10.0</td>
<td>147.2</td>
<td>10.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>971.2</td>
<td>114.8</td>
<td>971.2</td>
<td>114.8</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Electricity</td>
<td>210.0</td>
<td>144.1</td>
<td>532.0</td>
<td>179.0</td>
<td>60.5%</td>
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<tr>
<td></td>
<td>Gas</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
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<tr>
<td>Space Cooling</td>
<td>Electric</td>
<td>232.6</td>
<td>187.9</td>
<td>259.8</td>
<td>210.4</td>
<td>10.5%</td>
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<tr>
<td></td>
<td>Chilled Water</td>
<td>0.0</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>10.1</td>
<td>0.9</td>
<td>8.7</td>
<td>0.9</td>
<td>-16.4%</td>
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<tr>
<td>Fans - Ventilation</td>
<td>Electricity</td>
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<td>66.7</td>
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<td>-62.7%</td>
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<td>Fans - Exhaust</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
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<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>208.7</td>
<td>355.7</td>
<td>1035.8</td>
<td>841.9</td>
<td>79.9%</td>
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<td>Elec</td>
<td>115.3</td>
<td>21.9</td>
<td>0.0</td>
<td>0.0</td>
<td>4.0%</td>
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<tr>
<td>DHW</td>
<td>Gas</td>
<td>158.0</td>
<td>1.0</td>
<td>100.0%</td>
<td>100.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

**Total w/o Misc Equipment:** 1919.1 / 2912.9 / 34.1% 100.0% 100.0%

**Alt Energy Savings:** 993.8

**Total w/ Misc Equipment:** 2890.3 / 3884.1 / 25.6%

#### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
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<td>$48,363</td>
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<tr>
<td>Gas</td>
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<tr>
<td>Steam/ HW</td>
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<td>$0</td>
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<tr>
<td>Chilled Water</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$34,741</strong></td>
<td><strong>$49,873</strong></td>
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</table>

*Electricity cost excludes Misc Equipment consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
**Alternative Energy Consumption Savings vs. ASHRAE 90.1-2004 Base Case**

- **Alternative**
  - Energy Use Reduction: 28.8%

- **IECC 2006**
  - Energy Use Reduction: 2.8%

- **IECC 2003**
  - Energy Use Reduction: 4.2%

*ELEMENTARY WITH 18% WWR (CHADRON, NE)*
## Elementary 18% WWR Energy Results Summary
### Chadron, NE

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>0.00</td>
<td>Base Case</td>
<td>2363.6</td>
<td>$40,228</td>
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<td></td>
<td></td>
<td></td>
<td>ASHRAE 90.1-2004 Baseline Appendix G</td>
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<td>Base +90°</td>
<td>2408.6</td>
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<td></td>
<td>Walls: U-0.084; Roof: U-0.063; Floors - U-0.052</td>
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<td>Base +270°</td>
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<td></td>
<td>Avg Base Case</td>
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<td>1.10</td>
<td>IECC 2003</td>
<td>2285.4</td>
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<td>100.8</td>
<td>4.2%</td>
<td>1.10: IECC 2003 (Chadron 15)</td>
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<tr>
<td>1.11</td>
<td>IECC 2006</td>
<td>2318.6</td>
<td>$39,767</td>
<td>$889</td>
<td>2.2%</td>
<td>67.6</td>
<td>2.8%</td>
<td>1.11: IECC 2006</td>
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</table>

*Reported value excludes Misc Equipment electrical end-use
## Building Energy Performance Summary - Base Case

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Baseline Building</th>
<th>Baseline Building +90</th>
<th>Baseline Building +180</th>
<th>Baseline Building +270</th>
<th>Baseline Average</th>
<th>% End Use of Baseline</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td>Energy Peak</td>
<td>Energy Peak</td>
<td>Energy Peak</td>
<td>Energy Peak</td>
<td>Energy Peak</td>
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<tr>
<td></td>
<td>[MMbtu]</td>
<td>[kW or therm/hr]</td>
<td>[MMbtu]</td>
<td>[kW or therm/hr]</td>
<td>[MMbtu]</td>
<td>[kW or therm/hr]</td>
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</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>414.6</td>
<td>57.0</td>
<td>414.6</td>
<td>57.0</td>
<td>414.6</td>
<td>57.0</td>
</tr>
<tr>
<td>Unconditioned</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>10.0</td>
<td>147.2</td>
<td>10.0</td>
<td>147.2</td>
<td>10.0</td>
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<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>971.2</td>
<td>114.8</td>
<td>971.2</td>
<td>114.8</td>
<td>971.2</td>
<td>114.8</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Electricity</td>
<td>415.9</td>
<td>165.9</td>
<td>429.8</td>
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<td>419.1</td>
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<td>0.0</td>
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<td>0.0</td>
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<tr>
<td>Space Heating Steam/ HW</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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<tr>
<td>Space Cooling</td>
<td>Electricity</td>
<td>216.4</td>
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<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
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<td>0.9</td>
<td>9.6</td>
<td>0.9</td>
<td>9.7</td>
<td>0.9</td>
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<tr>
<td>Pumps &amp; Aux</td>
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<td>759.2</td>
<td>672.1</td>
<td>759.2</td>
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<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>157.4</td>
<td>1.0</td>
<td>157.4</td>
<td>1.0</td>
<td>157.4</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Total w/o Misc Equipment  | 2363.6        | 2408.6            | 2368.2                | 2404.2                 | 2386.2                | 2386.2            |                       |

Total w/ Misc Equipment   | 3334.8        | 3379.8            | 3339.4                | 3375.4                 | 3357.4                | 3357.4            |                       |

### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
<th>% End Use of Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$38,863</td>
<td>$39,715</td>
<td>$38,933</td>
<td>$39,652</td>
<td>$39,291</td>
<td>$39,291</td>
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<td>Gas</td>
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<td>$1,365</td>
<td>$1,365</td>
<td>$1,365</td>
<td>$1,365</td>
<td>$1,365</td>
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<tr>
<td>Steam/ HW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$0</td>
</tr>
<tr>
<td>Chilled Water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td>$40,228</td>
<td>$41,080</td>
<td>$40,298</td>
<td>$41,017</td>
<td>$40,656</td>
<td>$40,656</td>
</tr>
</tbody>
</table>

*Electricity cost excludes Misc Equipment consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-F; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Elementary 18% WWR Energy Results Summary
Chadron, NE

Description: Dedicated ERV w/enthalpy wheel; Roof U-value = 0.056

Building Energy Performance Summary

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption Average</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Energy [MMBtu]</td>
<td>Peak [kW or therms/hr]</td>
<td>Energy [MMBtu]</td>
<td>Peak [kW or therms/hr]</td>
<td>[%]</td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>414.6</td>
<td>57.0</td>
<td>414.6</td>
<td>57.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Unconditioned</td>
<td></td>
<td></td>
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<td></td>
</tr>
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<td>Lighting</td>
<td>Electricity</td>
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<td>10.0</td>
<td>147.2</td>
<td>10.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>971.2</td>
<td>114.8</td>
<td>971.2</td>
<td>114.8</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Electricity</td>
<td>157.5</td>
<td>126.9</td>
<td>422.8</td>
<td>166.2</td>
<td>62.8%</td>
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<tr>
<td>Space Heating</td>
<td>Gas</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
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<td>Space Cooling</td>
<td>Elec</td>
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<td>7.4%</td>
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<td>Chilled Water</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
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<tr>
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<td>-57.9%</td>
</tr>
<tr>
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<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
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<tr>
<td>Refrigeration</td>
<td>Electricity</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
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<tr>
<td>HP Supplement</td>
<td>Electricity</td>
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<td>674.5</td>
<td>759.2</td>
<td>82.9%</td>
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<tr>
<td>DHW</td>
<td>Elec</td>
<td>114.9</td>
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<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
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<td>100.0</td>
<td>1.0</td>
<td>100.0%</td>
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<td>Total w/o Misc Equipment</td>
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<td></td>
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<tr>
<td>Total w/ Misc Equipment</td>
<td></td>
<td>2670.9</td>
<td>3357.4</td>
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<td>20.4%</td>
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Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$30,754</td>
<td>$39,291</td>
</tr>
<tr>
<td>Gas</td>
<td>$1,365</td>
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</tr>
<tr>
<td>Steam/ HW</td>
<td>$0</td>
<td></td>
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<tr>
<td>Chilled Water</td>
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<tr>
<td>Total</td>
<td>$30,754</td>
<td>$40,656</td>
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*Electricity cost excludes Misc Equipment consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

SECONDARY SCHOOL 18% WWR (OMAHA, NE)
# Secondary School 18% WWR Energy Results Summary

Omaha, NE

<table>
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<tr>
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<tbody>
<tr>
<td>0.00</td>
<td>Base Case</td>
<td>4192.4</td>
<td>$81,880</td>
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<td></td>
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<td>ASHRAE 90.1-2004 Baseline Appendix G</td>
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<td>Base +90°</td>
<td>4144.5</td>
<td>$80,976</td>
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<td></td>
<td>Walls: U-0.084; Roof: U-0.063; Floors - U-0.052</td>
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<td></td>
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<td>4175.2</td>
<td>$81,566</td>
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<td></td>
<td>Windows: U-0.57, SHGC-0.39</td>
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<td>Avg Base Case</td>
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<td></td>
<td></td>
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<tr>
<td>1.10</td>
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<td>4163.6</td>
<td>$81,600</td>
<td>-$216</td>
<td>-0.3%</td>
<td>2.1</td>
<td>0.1%</td>
<td>1.10: IECC 2003 (Omaha, Zone 13B)</td>
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<td>1.11</td>
<td>IECC 2006</td>
<td>4010.6</td>
<td>$78,762</td>
<td>$2,622</td>
<td>3.2%</td>
<td>155.2</td>
<td>3.7%</td>
<td>1.11: IECC 2006</td>
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<tr>
<td>2.00</td>
<td>Alternative</td>
<td>2892.7</td>
<td>$59,625</td>
<td>$21,759</td>
<td>26.7%</td>
<td>1273.1</td>
<td>30.6%</td>
<td>2.00 CEE Tier 1 Equipment Efficiency, ERV, R-20ci Roof, R-13 + 7.5ci Wall, Glazing U-0.402 and SHGC = 0.270</td>
</tr>
</tbody>
</table>

*Reported value excludes Misc Equipment electrical end-use
Baseline Energy Consumption End-uses

- Conditioned Lighting: 18.6%
- Unconditioned Lighting: 5.8%
- Pumps & Aux: 0.0%
- Fans - Ventilation: 8.8%
- DHW: 7.4%
- Space Heating: 36.6%
- Space Cooling: 22.7%

SECONDARY SCHOOL 18% WWR (OMAHA, NE)
### Building Energy Performance Summary - Base Case

| End Use                | Energy Source | Conditioned Lighting Electricity | Unconditioned Lighting Electricity | Misc Equipment Electricity | Space Heating Electricity | Space Heating Gas | Space Heating Steam/ HW | Space Cooling Electricity | Space Cooling CHW | Heat Rejection Electricity | Pumps & Aux Electricity | Fans - Ventilation Electricity | Fans - Exhaust Electricity | Refrigeration Electricity | HP Supplement Electricity | DHW Elec | DHW Gas |
|------------------------|---------------|----------------------------------|-----------------------------------|----------------------------|--------------------------|-------------------|-------------------------|--------------------------|----------------|---------------------------|-------------------------|---------------------------|--------------------------|--------------------------|-------------------------|------------|
|                        |               | [MMbtu] | [kW or therm/hr] | [MMbtu] | [kW or therm/hr] | [MMbtu] | [kW or therm/hr] | [MMbtu] | [kW or therm/hr] | [MMbtu] | [kW or therm/hr] | [MMbtu] | [kW or therm/hr] | [MMbtu] | [kW or therm/hr] | [MMbtu] | [kW or therm/hr] |
| Conditioned Lighting   | Electricity   | 775.2  | 94.2                | 775.2  | 94.2                | 775.2  | 94.2                | 775.2  | 94.2                | 775.2  | 94.2                | 775.2  | 94.2                | 775.2  | 94.2                | 14.1%      |
| Unconditioned Lighting | Electricity   | 241.4  | 16.4                | 241.4  | 16.4                | 241.4  | 16.4                | 241.4  | 16.4                | 241.4  | 16.4                | 241.4  | 16.4                | 4.4%       |
| Misc Equipment         | Electricity   | 1344.3 | 163.6               | 1344.3 | 163.6               | 1344.3 | 163.6               | 1344.3 | 163.6               | 1344.3 | 163.6               | 1344.3 | 163.6               | 24.4%      |
| Space Heating          | Electricity   | 1536.8 | 950.0               | 1511.4 | 941.7               | 1526.8 | 943.1               | 1519.5 | 946.0               | 1523.6 | 945.2               | 27.7%      |
| Space Heating          | Gas           | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0%       |
| Space Heating          | Steam/ HW     | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0%       |
| Space Cooling          | Electricity   | 954.6  | 386.9               | 939.6  | 385.2               | 950.4  | 385.8               | 938.8  | 385.1               | 945.9  | 385.7               | 17.2%      |
| Space Cooling          | CHW           | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0%       |
| Heat Rejection         | Electricity   | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0%       |
| Pumps & Aux            | Electricity   | 1.5    | 0.2                | 1.5    | 0.2                | 1.5    | 0.2                | 1.5    | 0.2                | 1.5    | 0.2                | 0.0%       |
| Fans - Ventilation     | Electricity   | 373.3  | 55.5                | 365.8  | 54.4                | 370.3  | 54.5                | 364.8  | 54.6                | 368.6  | 54.7                | 6.7%       |
| Fans - Exhaust         | Electricity   | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0%       |
| Refrigeration          | Electricity   | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0%       |
| HP Supplement          | Electricity   | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0%       |
| DHW                    | Elec          | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0    | 0.0                | 0.0%       |
| DHW                    | Gas           | 309.6  | 1.5                | 309.6  | 1.5                | 309.6  | 1.5                | 309.7  | 1.5                | 309.6  | 1.5                | 5.6%       |

### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
</tr>
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<tbody>
<tr>
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<td>$77,943</td>
<td>$78,533</td>
<td>$78,079</td>
<td>$78,350</td>
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<td>$3,033</td>
<td>$3,033</td>
<td>$3,034</td>
<td>$3,033</td>
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<tr>
<td>Steam/ HW</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Chilled Water</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td>$81,880</td>
<td>$80,976</td>
<td>$81,566</td>
<td>$81,113</td>
<td>$81,384</td>
</tr>
</tbody>
</table>

*Electricity cost excludes Misc Equipment consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
30% Alternative Energy Consumption End-uses

- Conditioned Lighting: 18.6%
- Unconditioned Lighting: 5.8%
- Space Heating: 5.0%
- Space Cooling: 12.7%
- Pumps & Aux: 0.8%
- Fans - Ventilation: 19.3%
- HP Supplement: 3.4%
- DHW: 3.9%
- Alt Energy Savings: 30.6%

SECONDARY SCHOOL 18% WWR (OMAHA, NE)
Secondary School 18% WWR Energy Results Summary  
Omaha, NE

Description: 2.00 CEE Tier 1 Equipment Efficiency, ERV, R-20ci Roof, R-13 + 7.5ci Wall, Glazing U-0.402 and SHGC = 0.270

<table>
<thead>
<tr>
<th>Building Energy Performance Summary - Alternative</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption</th>
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</thead>
<tbody>
<tr>
<td>End Use</td>
<td>Energy Source</td>
<td>Energy Peak</td>
<td>Energy Peak</td>
<td>Alt-Baseline</td>
<td>[%]</td>
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<td>---------</td>
<td>---------------</td>
<td>-------------</td>
<td>-------------</td>
<td>--------------</td>
<td>-----</td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>775.2</td>
<td>94.2</td>
<td>775.2</td>
<td>94.2</td>
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<tr>
<td>Unconditioned Lighting</td>
<td>Electricity</td>
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<td>16.4</td>
<td>241.4</td>
<td>16.4</td>
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<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
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<td>163.6</td>
<td>1344.3</td>
<td>163.6</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Electricity</td>
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<td>207.6</td>
<td>1523.6</td>
<td>945.2</td>
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<td>Space Heating</td>
<td>Gas</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>Elec</td>
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<td>241.7</td>
<td>945.9</td>
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<td>Chilled Water</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
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<td>Heat Rejection</td>
<td>Electricity</td>
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<td>Pumps &amp; Aux</td>
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<td>1.5</td>
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<td>Fans - Ventilation</td>
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<td>804.8</td>
<td>83.2</td>
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<td>Fans - Exhaust</td>
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<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
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<tr>
<td>HP Supplement</td>
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<tr>
<td>DHW</td>
<td>Elec</td>
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<td>29.9</td>
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<tr>
<td>DHW</td>
<td>Gas</td>
<td>309.6</td>
<td>1.5</td>
<td>100.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Total w/o Misc Equipment: 2892.7 MMBtu, 4165.8 MMBtu, 30.6% savings

Alt Energy Savings: 1273.1 MMBtu

Total w/ Misc Equipment: 4237.0 MMBtu, 5510.1 MMBtu, 23.1%

Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$59,625</td>
<td>$78,350</td>
</tr>
<tr>
<td>Gas</td>
<td>$3,033</td>
<td>$0</td>
</tr>
<tr>
<td>Steam/ HW</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Chilled Water</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td>$59,625</td>
<td>$81,384</td>
</tr>
</tbody>
</table>

*Electricity cost excludes Misc Equipment consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-F; Energy costs from ES-D; Gas peak converted from MMBtu/h to therms
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

- Alternative: 33.6%
- IECC 2006: 3.7%
- IECC 2003: 3.3%

SECONDARY SCHOOL 18% WWR (NORFOLK, NE)
### Secondary School 18% WWR Energy Results Summary
**Norfolk, NE**

<table>
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<tr>
<th></th>
<th></th>
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<td>Base +90°</td>
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<td></td>
<td>Walls: U-0.084; Roof: U-0.063; Floors - U-0.052</td>
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<td></td>
<td>Base +180°</td>
<td>4307.8</td>
<td>$74,206</td>
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<td></td>
<td></td>
<td>Windows: U-0.57, SHGC-0.39</td>
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<tr>
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<td>Base +270°</td>
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<tr>
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<td>Avg Base Case</td>
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<td>1.10</td>
<td>IECC 2003</td>
<td>4170.5</td>
<td>$72,104</td>
<td>$2,160</td>
<td>2.9%</td>
<td>140.6</td>
<td>3.3%</td>
<td>1.10: IECC 2003 (Norfolk, Zone 14B)</td>
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<tr>
<td>1.11</td>
<td>IECC 2006</td>
<td>4149.5</td>
<td>$71,622</td>
<td>$2,642</td>
<td>3.6%</td>
<td>161.6</td>
<td>3.7%</td>
<td>1.11: IECC 2006</td>
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<tr>
<td>2.00</td>
<td>Alternative</td>
<td>2864.1</td>
<td>$52,905</td>
<td>$21,359</td>
<td>28.8%</td>
<td>1447.0</td>
<td>33.6%</td>
<td>2.00 CEE Tier 1 Equipment Efficiency, ERV, R-20 Roof, R-13 + 7.5ci Wall, Glazing U-0.402 and SHGC = 0.270</td>
</tr>
</tbody>
</table>

*Reported value excludes Misc Equipment electrical end-use
## Building Energy Performance Summary - Base Case

### Norfolk, NE

<table>
<thead>
<tr>
<th>End Use</th>
<th>Baseline Building</th>
<th>Baseline Building +90</th>
<th>Baseline Building +180</th>
<th>Baseline Building +270</th>
<th>Baseline Average</th>
<th>% End Use of Baseline</th>
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<tbody>
<tr>
<td>Source</td>
<td>Energy Peak</td>
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<td>Energy Peak</td>
<td>Energy Peak</td>
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</tr>
<tr>
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<td>[MMbtu] [kW or therms/hr]</td>
<td>[MMbtu] [kW or therms/hr]</td>
<td>[MMbtu] [kW or therms/hr]</td>
<td>[MMbtu] [kW or therms/hr]</td>
<td></td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>775.2 94.2</td>
<td>775.2 94.2</td>
<td>775.2 94.2</td>
<td>775.2 94.2</td>
<td>775.2 94.2</td>
<td>13.7%</td>
</tr>
<tr>
<td>Unconditioned</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lighting</td>
<td>241.4 16.4</td>
<td>241.4 16.4</td>
<td>241.4 16.4</td>
<td>241.4 16.4</td>
<td>241.4 16.4</td>
<td>4.3%</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>1344.3 163.6</td>
<td>1344.3 163.6</td>
<td>1344.3 163.6</td>
<td>1344.3 163.6</td>
<td>1344.3 163.6</td>
<td>23.8%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>1856.4 947.7</td>
<td>1834.0 940.4</td>
<td>1840.7 939.7</td>
<td>1841.8 943.6</td>
<td>1843.2 942.8</td>
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<tr>
<td>Space Heating - Gas</td>
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<td>0.0 0.0</td>
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<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating - Steam/ HW</td>
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<td>0.0 0.0</td>
<td>0.0 0.0</td>
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<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>763.4 304.3</td>
<td>751.9 303.4</td>
<td>754.3 303.4</td>
<td>749.6 303.3</td>
<td>754.8 303.6</td>
<td>13.3%</td>
</tr>
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<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Heat Rejection</td>
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<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>1.6 0.2</td>
<td>1.7 0.2</td>
<td>1.7 0.2</td>
<td>1.7 0.2</td>
<td>1.7 0.2</td>
<td>0.0%</td>
</tr>
<tr>
<td>Fans - Ventilation</td>
<td>384.6 59.6</td>
<td>377.3 59.2</td>
<td>378.8 59.7</td>
<td>375.7 59.2</td>
<td>379.1 59.4</td>
<td>6.7%</td>
</tr>
<tr>
<td>Fans - Exhaust</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW - Gas</td>
<td>315.7 1.5</td>
<td>315.7 1.5</td>
<td>315.7 1.5</td>
<td>315.8 1.5</td>
<td>315.7 1.5</td>
<td>5.6%</td>
</tr>
</tbody>
</table>

**Total w/o Misc Equipment**

### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
</tr>
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<tbody>
<tr>
<td>Electricity*</td>
<td>$71,924</td>
<td>$71,208</td>
<td>$71,395</td>
<td>$71,284</td>
<td>$71,453</td>
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<td>Gas</td>
<td>$2,811</td>
<td>$2,811</td>
<td>$2,811</td>
<td>$2,811</td>
<td>$2,811</td>
</tr>
<tr>
<td>Steam/ HW</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Chilled Water</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td>$74,735</td>
<td>$74,019</td>
<td>$74,206</td>
<td>$74,096</td>
<td>$74,264</td>
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</table>

*Electricity cost excludes Misc Equipment consumption cost (based upon virtual rate)

**DOE-2 Reports:** Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
30% Alternative Energy Consumption End-uses

- Conditioned Lighting: 18.0%
- Unconditioned Lighting: 5.6%
- Space Heating: 47%
- Space Cooling: 9.7%
- Pumps & Aux: 0.8%
- DHW: 3.8%
- HP Supplement: 4.9%
- Fans - Ventilation: 18.9%
- Alt Energy Savings: 33.6%

SECONDARY SCHOOL 18% WWR (NORFOLK, NE)
Secondary School 18% WWR Energy Results Summary  
Norfolk, NE

Description: 2.00 CEE Tier 1 Equipment Efficiency, ERV, R-20 Roof, R-13 + 7.5ci Wall, Glazing U-0.402 and SHGC = 0.270

| Building Energy Performance Summary - Alternative | Alternative Building | Average Baseline | Energy Difference | % of End Use of As Designed | Baseline Consumption
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy [MMBtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>Energy [MMBtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>[%]</td>
</tr>
<tr>
<td>Conditioned Lighting Electricity</td>
<td>775.2</td>
<td>94.2</td>
<td>775.2</td>
<td>94.2</td>
<td>0.0%</td>
</tr>
<tr>
<td>Unconditioned Lighting Electricity</td>
<td>241.4</td>
<td>16.4</td>
<td>241.4</td>
<td>16.4</td>
<td>0.0%</td>
</tr>
<tr>
<td>Misc Equipment Electricity</td>
<td>1344.3</td>
<td>163.6</td>
<td>1344.3</td>
<td>163.6</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating Electricity</td>
<td>201.6</td>
<td>153.7</td>
<td>1843.2</td>
<td>942.8</td>
<td>89.1%</td>
</tr>
<tr>
<td>Space Heating Gas</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Cooling Elec</td>
<td>416.9</td>
<td>209.8</td>
<td>754.8</td>
<td>303.6</td>
<td>44.8%</td>
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<tr>
<td>Space Cooling Chilled Water</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Heat Rejection Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Pumps &amp; Aux Electricity</td>
<td>35.7</td>
<td>4.0</td>
<td>1.7</td>
<td>0.2</td>
<td>-2031.3%</td>
</tr>
<tr>
<td>Fans - Ventilation Electricity</td>
<td>814.5</td>
<td>82.5</td>
<td>379.1</td>
<td>59.4</td>
<td>-114.9%</td>
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<tr>
<td>Fans - Exhaust Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Refrigeration Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>HP Supplement Electricity</td>
<td>213.1</td>
<td>590.6</td>
<td>0.0</td>
<td>0.0</td>
<td>5.1%</td>
</tr>
<tr>
<td>DHW ELEC</td>
<td>165.7</td>
<td>31.1</td>
<td>0.0</td>
<td>0.0</td>
<td>3.9%</td>
</tr>
<tr>
<td>DHW Gas</td>
<td>315.7</td>
<td>1.5</td>
<td>100.0%</td>
<td>0.0%</td>
<td>5.6%</td>
</tr>
<tr>
<td>Total w/o Misc Equipment</td>
<td>2864.1</td>
<td>4311.1</td>
<td>33.6%</td>
<td>100.0%</td>
<td>100.0%</td>
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<tr>
<td>Alt Energy Savings</td>
<td>1447.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total w/ Misc Equipment</td>
<td>4208.4</td>
<td>5655.4</td>
<td>25.6%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$52,905</td>
<td>$71,453</td>
</tr>
<tr>
<td>Gas</td>
<td>$2,811</td>
<td></td>
</tr>
<tr>
<td>Steam/ HW</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td>Chilled Water</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>$52,905</td>
<td>$74,264</td>
</tr>
</tbody>
</table>

*Electricity cost excludes Misc Equipment consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-F; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

- Alternative: 30.8%
- IECC 2006: 4.1%
- IECC 2003: 3.8%

SECONDARY SCHOOL 18% WWR (CHADRON, NE)
### Secondary School 18% WWR Energy Results Summary

#### Chadron, NE

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>Base Case</td>
<td>3878.8</td>
<td>$66,914</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASHRAE 90.1-2004 Baseline Appendix G</td>
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<tr>
<td></td>
<td>Base +90°</td>
<td>3830.6</td>
<td>$66,107</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Walls: U-0.084; Roof: U-0.063; Floors - U-0.052</td>
</tr>
<tr>
<td></td>
<td>Base +180°</td>
<td>3855.7</td>
<td>$66,536</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Windows: U-0.57, SHGC-0.39</td>
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<tr>
<td></td>
<td>Base +270°</td>
<td>3835.8</td>
<td>$66,197</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.10: IECC 2003 (Chadron, Zone 15)</td>
</tr>
<tr>
<td></td>
<td>Avg Base Case</td>
<td>3850.2</td>
<td>$66,439</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.11: IECC 2006</td>
</tr>
<tr>
<td>1.10</td>
<td>IECC 2003</td>
<td>3704.8</td>
<td>$64,152</td>
<td>$2,287</td>
<td>3.4%</td>
<td>145.4</td>
<td>3.8%</td>
<td>2.00 CEE Tier 1 Equipment Efficiency, ERV, R-20ci Roof, R-13 + 7.5ci Wall, Glazing U-0.402 and SHGC = 0.270</td>
</tr>
<tr>
<td>1.11</td>
<td>IECC 2006</td>
<td>3691.5</td>
<td>$63,820</td>
<td>$2,619</td>
<td>3.9%</td>
<td>158.7</td>
<td>4.1%</td>
<td></td>
</tr>
<tr>
<td>2.00</td>
<td>Alternative</td>
<td>2664.8</td>
<td>$49,546</td>
<td>$16,893</td>
<td>25.4%</td>
<td>1185.4</td>
<td>30.8%</td>
<td></td>
</tr>
</tbody>
</table>

*Reported value excludes Misc Equipment electrical end-use
Baseline Energy Consumption End-uses

- Conditioned Lighting: 20.1%
- Unconditioned Lighting: 6.3%
- Pumps & Aux: 0.0%
- Fans - Ventilation: 9.7%
- DHW: 8.2%
- Space Heating: 37.4%
- Space Cooling: 18.2%

SECONDARY SCHOOL 18% WWR (CHADRON, NE)
### Building Energy Performance Summary - Base Case

**Secondary School 18% WWR Energy Results Summary**

**Chadron, NE**

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Baseline Building</th>
<th>Baseline Building +90</th>
<th>Baseline Building +180</th>
<th>Baseline Building +270</th>
<th>Baseline Average</th>
<th>% End Use of Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Energy Peak</td>
<td>Energy Peak</td>
<td>Energy Peak</td>
<td>Energy Peak</td>
<td>Energy Peak</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[MMbtu] [kW or therm/hr]</td>
<td>[MMbtu] [kW or therm/hr]</td>
<td>[MMbtu] [kW or therm/hr]</td>
<td>[MMbtu] [kW or therm/hr]</td>
<td>[MMbtu] [kW or therm/hr]</td>
<td></td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>775.2</td>
<td>94.2</td>
<td>775.2</td>
<td>94.2</td>
<td>775.2</td>
<td>94.2</td>
</tr>
<tr>
<td>Unconditioned Lighting</td>
<td>Electricity</td>
<td>241.4</td>
<td>16.4</td>
<td>241.4</td>
<td>16.4</td>
<td>241.4</td>
<td>16.4</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>1344.3</td>
<td>163.6</td>
<td>1344.3</td>
<td>163.6</td>
<td>1344.3</td>
<td>163.6</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Electricity</td>
<td>1452.4</td>
<td>843.0</td>
<td>1429.2</td>
<td>834.9</td>
<td>1439.3</td>
<td>843.5</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Gas</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Steam/ HW</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>Electricity</td>
<td>712.4</td>
<td>285.1</td>
<td>696.4</td>
<td>283.4</td>
<td>706.6</td>
<td>284.9</td>
</tr>
<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>1.8</td>
<td>0.2</td>
<td>1.9</td>
<td>0.2</td>
<td>1.9</td>
<td>0.2</td>
</tr>
<tr>
<td>Fans - Ventilation</td>
<td>Electricity</td>
<td>380.3</td>
<td>55.5</td>
<td>371.2</td>
<td>54.0</td>
<td>376.0</td>
<td>55.2</td>
</tr>
<tr>
<td>Fans - Exhaust</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>DHW</td>
<td>Elec</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
<td>315.3</td>
<td>1.5</td>
<td>315.3</td>
<td>1.5</td>
<td>315.3</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Total w/o Misc Equipment</strong></td>
<td>3878.8</td>
<td>3830.6</td>
<td>3855.7</td>
<td>3835.8</td>
<td>3850.2</td>
<td><strong>Total w/ Misc Equipment</strong></td>
<td>5223.1</td>
</tr>
</tbody>
</table>

### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$64,184</td>
<td>$63,377</td>
<td>$63,806</td>
<td>$63,466</td>
<td>$63,709</td>
</tr>
<tr>
<td>Gas</td>
<td>$2,730</td>
<td>$2,730</td>
<td>$2,730</td>
<td>$2,731</td>
<td>$2,730</td>
</tr>
<tr>
<td>Steam/ HW</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Chilled Water</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$66,914</td>
<td>$66,107</td>
<td>$66,536</td>
<td>$66,197</td>
<td>$66,439</td>
</tr>
</tbody>
</table>

*Electricity cost excludes Misc Equipment consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
30% Alternative Energy Consumption End-uses

- Conditioned Lighting: 20.1%
- Unconditioned Lighting: 6.3%
- Alt Energy Savings: 30.8%
- Space Heating: 3.9%
- Space Cooling: 10.1%
- Pumps & Aux: 1.0%
- HP Supplement: 2.5%
- Fans - Ventilation: 21.0%
- DHW: 4.3%

SECONDARY SCHOOL 18% WWR (CHADRON, NE)
## Secondary School 18% WWR Energy Results Summary

**Chadron, NE**

### Building Energy Performance Summary - Alternative

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy [MMBtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>Energy [MMBtu]</td>
<td>Peak [kW or therm/hr]</td>
<td>(%)</td>
<td>(%)</td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>775.2 94.2</td>
<td>775.2 94.2</td>
<td>0.0%</td>
<td>19.3%</td>
<td>14.9%</td>
</tr>
<tr>
<td>Unconditioned Lighting</td>
<td>Electricity</td>
<td>241.4 16.4</td>
<td>241.4 16.4</td>
<td>0.0%</td>
<td>6.0%</td>
<td>4.6%</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>1344.3 163.6</td>
<td>1344.3 163.6</td>
<td>0.0%</td>
<td>33.5%</td>
<td>25.9%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Electricity</td>
<td>151.4 167.9</td>
<td>1439.9 838.2</td>
<td>89.5%</td>
<td>3.8%</td>
<td>27.7%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Gas</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Steam/ HW</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>Elec</td>
<td>390.2 205.2</td>
<td>702.2 284.2</td>
<td>44.4%</td>
<td>9.7%</td>
<td>13.5%</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>Chilled Water</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>37.5 4.0</td>
<td>1.9 0.2</td>
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<td>0.9%</td>
<td>0.0%</td>
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<tr>
<td>Fans - Ventilation</td>
<td>Electricity</td>
<td>808.0 82.7</td>
<td>374.4 54.6</td>
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<td>7.2%</td>
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<tr>
<td>Fans - Exhaust</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>95.8 506.6</td>
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<td>2.4%</td>
<td>0.0%</td>
<td>0.0%</td>
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<tr>
<td>DHW</td>
<td>Elec</td>
<td>165.3 30.1</td>
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<td>4.1%</td>
<td>0.0%</td>
<td>0.0%</td>
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<tr>
<td>DHW</td>
<td>Gas</td>
<td>315.3 15.1</td>
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<td>0.0%</td>
<td>6.1%</td>
<td>0.0%</td>
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<tr>
<td>Total w/o Misc Equipment</td>
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<td><strong>2664.8</strong></td>
<td><strong>3850.2</strong></td>
<td><strong>30.8%</strong></td>
<td>100.0%</td>
<td>100.0%</td>
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<tr>
<td>Alt Energy Savings</td>
<td></td>
<td><strong>1185.4</strong></td>
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<tr>
<td>Total w/ Misc Equipment</td>
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<td><strong>3849.5</strong></td>
<td><strong>5194.5</strong></td>
<td><strong>22.8%</strong></td>
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### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
</tr>
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<tbody>
<tr>
<td>Electricity*</td>
<td>$49,546</td>
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<tr>
<td>Gas</td>
<td>$2,730</td>
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<td>Steam/ HW</td>
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<td>$0</td>
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<tr>
<td>Chilled Water</td>
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<td>$0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$49,546</strong></td>
<td><strong>$66,439</strong></td>
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</tbody>
</table>

*Electricity cost excludes Misc Equipment consumption cost (based upon virtual rate)*

**DOE-2 Reports:** Energy uses from BEPS; Energy peaks from PS-F; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

- 2003 IECC: -0.4%
- 2006 IECC: 0.1%
- Alternative: 29.8%

Energy Use Reduction vs. Base Case

WAREHOUSE (OMAHA, NE)
## Warehouse Energy Results Summary

Omaha, NE

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>0.00</td>
<td>Base Case</td>
<td>1408.8</td>
<td>$20,553</td>
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<td>ASHRAE 90.1-2004 Baseline</td>
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<td>Appendix G</td>
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<tr>
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<td>Base +180°</td>
<td>1414.8</td>
<td>$20,571</td>
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<td></td>
<td></td>
<td></td>
<td>Walls: U-0.084; Roof: U-0.063;</td>
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<td></td>
<td>Base +270°</td>
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<td>Floors - U-0.052</td>
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<td></td>
<td>Avg Base Case</td>
<td>1411.825</td>
<td>$20,563</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Windows: U-0.57, SHGC-0.39</td>
</tr>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1.10</td>
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<td>1417.4</td>
<td>$20,688</td>
<td>-$125</td>
<td>-0.6%</td>
<td>-5.58</td>
<td>-0.4%</td>
<td>2003 IECC</td>
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<td>1.11</td>
<td>2006 IECC</td>
<td>1410.6</td>
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<td>-$20</td>
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<td>1.22</td>
<td>0.1%</td>
<td>2006 IECC</td>
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<td>3.42</td>
<td>As Designed</td>
<td>990.8</td>
<td>$16,280</td>
<td>$4,283</td>
<td>20.8%</td>
<td>421.03</td>
<td>29.8%</td>
<td>Alternative</td>
</tr>
</tbody>
</table>

*Reported excluding Misc Equipment electrical end-use
Baseline Energy End-uses

WAREHOUSE (OMAHA, NE)

- Conditioned Lighting: 22.9%
- Unconditioned Lighting: 0.0%
- Space Heating: 47.8%
- Space Cooling: 0.4%
- Pumps & Aux: 0.0%
- Fans - Ventilation: 21.2%
- DHW: 0.2%

- Unconditioned Lighting: 7.4%
### Building Energy Performance Summary - Base Case

**End Use** | **Energy Source** | **Baseline Building** | **Baseline Building +90** | **Baseline Building +180** | **Baseline Building +270** | **Baseline Average** | **% End Use of Baseline**
---|---|---|---|---|---|---|---
Conditioned Lighting | Electricity | 323.7 | 34.6 | 323.7 | 34.6 | 323.7 | 34.6 | 323.7 | 34.6 | 16.9%
Unconditioned Lighting | Electricity | 104.5 | 1.4 | 104.5 | 1.4 | 104.5 | 1.4 | 104.5 | 1.4 | 5.5%
Misc Equipment | Electricity | 503.9 | 53.9 | 503.9 | 53.9 | 503.9 | 53.9 | 503.9 | 53.9 | 26.3%
Space Heating | Electricity | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
Space Heating | Gas | 669.7 | 0.9 | 678.5 | 0.9 | 679.9 | 0.9 | 670.9 | 0.9 | 35.2%
Space Cooling | Electricity | 6.8 | 1.9 | 6.1 | 1.8 | 5.6 | 1.6 | 6.5 | 1.8 | 0.3%
Space Cooling | CHW | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
Heat Rejection | Electricity | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
Pumps & Aux | Electricity | 0.7 | 0.0 | 0.7 | 0.0 | 0.7 | 0.0 | 0.7 | 0.0 | 0.1%
Fans - Ventilation | Electricity | 301.2 | 25.5 | 299.7 | 25.4 | 298.2 | 25.3 | 299.8 | 25.4 | 15.6%
Fans - Exhaust | Electricity | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
Refrigeration | Electricity | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
HP Supplement | Electricity | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
DHW | Elec | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0%
DHW | Gas | 2.2 | 0.0 | 2.2 | 0.0 | 2.2 | 0.0 | 2.2 | 0.0 | 0.1%

Total w/o Misc Equipment | 1408.8 | 1415.4 | 1414.8 | 1408.3 | 1411.825
Total w/ Misc Equipment | 1912.7 | 1919.3 | 1918.7 | 1912.2 | 1915.725

### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
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</thead>
<tbody>
<tr>
<td>Electricity*</td>
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<td>$13,993</td>
<td>$13,957</td>
<td>$14,002</td>
<td>$13,997</td>
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<td>Gas</td>
<td>$6,519</td>
<td>$6,601</td>
<td>$6,614</td>
<td>$6,531</td>
<td>$6,566</td>
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<tr>
<td>Total</td>
<td>$20,553</td>
<td>$20,594</td>
<td>$20,571</td>
<td>$20,533</td>
<td>$20,563</td>
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</tbody>
</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
WAREHOUSE (OMAHA, NE)

Alternative Energy End-uses

- Conditioned Lighting: 22.9%
- Unconditioned Lighting: 7.4%
- Space Heating: 21.3%
- Space Cooling: 0.2%
- Fans - Ventilation: 18.2%
- Pumps & Aux: 0.0%
- DHW: 0.2%

Alternative Energy Savings:
- 29.8%
### Warehouse Energy Results Summary

**Omaha, NE**

**Description:** Alternative
- DX split system w/ gas furnace and gas fired radiant heat; 90% eff. furnace; CEE Tier 1; Improved wall; R-40 roof

#### Building Energy Performance Summary

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference Alt-Baseline</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy</td>
<td>Peak</td>
<td>Energy</td>
<td>Peak</td>
<td>(%)</td>
<td>(%)</td>
</tr>
<tr>
<td></td>
<td>[MMBtu]</td>
<td>[kW or therm/hr]</td>
<td>[MMBtu]</td>
<td>[kW or therm/hr]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>323.7</td>
<td>34.6</td>
<td>323.7</td>
<td>34.6</td>
<td>0.0%</td>
</tr>
<tr>
<td>Unconditioned</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lighting</td>
<td>Electricity</td>
<td>104.5</td>
<td>0.0</td>
<td>104.5</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>503.9</td>
<td>53.9</td>
<td>503.9</td>
<td>53.9</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Gas</td>
<td>300.3</td>
<td>0.6</td>
<td>674.8</td>
<td>0.9</td>
<td>55.5%</td>
</tr>
<tr>
<td>Space Cooling</td>
<td>Elec</td>
<td>2.7</td>
<td>1.6</td>
<td>6.3</td>
<td>1.8</td>
<td>56.8%</td>
</tr>
<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>0.7</td>
<td>0.0</td>
<td>0.7</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Fans - Ventilation</td>
<td>Electricity</td>
<td>256.7</td>
<td>25.4</td>
<td>299.7</td>
<td>25.4</td>
<td>14.4%</td>
</tr>
<tr>
<td>Fans - Exhaust</td>
<td>Electricity</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Elec</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>DHW</td>
<td>Gas</td>
<td>2.2</td>
<td>1.4</td>
<td>2.2</td>
<td>0.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Total w/o Misc Equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternative Energy Savings</td>
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</tr>
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<td>Total w/ Misc Equipment</td>
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<td>1915.7</td>
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#### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$13,234</td>
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<td>Total</td>
<td>$16,280</td>
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</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

- Alternative: 31.8%
- 2006 IECC: 0.1%
- 2003 IECC: 0.0%

WAREHOUSE (NORFOLK, NE)
## Warehouse Energy Results Summary
Norfolk, NE

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
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<td>Base Case</td>
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<td>1548.4</td>
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<td></td>
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<td></td>
<td>ASHRAE 90.1-2004 Baseline</td>
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<tr>
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<td>Base +180°</td>
<td>1547.8</td>
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<td>Base +270°</td>
<td>1540.4</td>
<td>$21,034</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Walls: U-0.084; Roof: U-0.063; Floors - U-0.052</td>
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<td>Avg Base Case</td>
<td>1544.325</td>
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<td>21.6%</td>
<td>491.23</td>
<td>31.8%</td>
<td>Alternative</td>
</tr>
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</table>

*Reported excluding Misc Equipment electrical end-use
Baseline Energy End-uses

- Conditioned Lighting: 21.0%
- Unconditioned Lighting: 6.8%
- Space Cooling: 0.3%
- Pumps & Aux: 0.0%
- Fans - Ventilation: 19.6%
- DHW: 0.1%

WAREHOUSE (NORFOLK, NE)
## Building Energy Performance Summary - Base Case

### Norfolk, NE

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Baseline Building</th>
<th>Baseline Building +90</th>
<th>Baseline Building +180</th>
<th>Baseline Building +270</th>
<th>Baseline Average</th>
<th>% End Use of Baseline</th>
</tr>
</thead>
<tbody>
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<td></td>
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<td>Peak [kW or them/hr]</td>
<td>Energy [MMbtu]</td>
<td>Peak [kW or them/hr]</td>
<td>Energy [MMbtu]</td>
<td>Peak [kW or them/hr]</td>
<td>Energy [MMbtu]</td>
</tr>
<tr>
<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>323.7 34.6</td>
<td>323.7 34.6</td>
<td>323.7 34.6</td>
<td>323.7 34.6</td>
<td>323.7 34.6</td>
<td>323.7 34.6</td>
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<tr>
<td>Unconditioned Lighting</td>
<td>Electricity</td>
<td>104.5 1.4</td>
<td>104.5 1.4</td>
<td>104.5 1.4</td>
<td>104.5 1.4</td>
<td>104.5 1.4</td>
<td>104.5 1.4</td>
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<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>503.9 53.9</td>
<td>503.9 53.9</td>
<td>503.9 53.9</td>
<td>503.9 53.9</td>
<td>503.9 53.9</td>
<td>503.9 53.9</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
</tr>
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<td>Space Heating Gas</td>
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<td>810.4 1.0</td>
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<td>0.7 0.0</td>
<td>0.7 0.0</td>
<td>0.7 0.0</td>
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<tr>
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<td>0.0 0.0</td>
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<tr>
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<td>Elec</td>
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<td>0.0 0.0</td>
<td>0.0 0.0</td>
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<td>2.2 0.0</td>
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|                          |               | 1540.7 1548.4      | 1547.8 1540.4       | 1544.325               |
| Total w/o Misc Equipment |               | 2044.6 2052.3      | 2051.7 2044.3       | 2048.225               |

### Energy Cost Summary

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<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
<th>Total</th>
<th>$21,057</th>
<th>$21,090</th>
<th>$21,062</th>
<th>$21,034</th>
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<td>$14,138</td>
<td>$14,193</td>
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<td>Total</td>
<td>$21,057</td>
<td>$21,090</td>
<td>$21,062</td>
<td>$21,034</td>
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<td>$21,061</td>
<td>$21,090</td>
<td>$21,062</td>
<td>$21,034</td>
<td>$21,061</td>
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</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy End-uses

- Conditioned Lighting: 21.0%
- Unconditioned Lighting: 6.8%
- Alternative Energy Savings: 31.8%

- Space Heating: 23.4%
- Space Cooling: 0.1%
- Pumps & Aux: 0.0%
- Fans - Ventilation: 16.7%
- DHW: 0.1%

WAREHOUSE (NORFOLK, NE)
### Warehouse Energy Results Summary

**Norfolk, NE**

**Description:** Alternative
*DX split system w/ gas furnace and gas fired radiant heat; 90% eff. furnace; CEE Tier 1; Improved wall; R-40 roof*

### Building Energy Performance Summary

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption Average</th>
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<tr>
<td></td>
<td>Energy Peak [MMBtu]</td>
<td>Peak [kW or therms/hr]</td>
<td>Energy Peak [MMBtu]</td>
<td>Peak [kW or therms/hr]</td>
<td>[%]</td>
<td>[%]</td>
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<td>Conditioned Lighting</td>
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<td>Unconditioned Lighting</td>
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<td>104.5 1.4</td>
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<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
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<td>503.9 53.9</td>
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<td>0.0%</td>
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<tr>
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<td>Chilled Water</td>
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<tr>
<td>Pumps &amp; Aux Elec</td>
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<td>0.7 0.0</td>
<td>0.0% 0.0%</td>
<td>0.0%</td>
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<td>Fans - Exhaust</td>
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<td>0.0%</td>
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<td>0.0%</td>
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<td>Electricity</td>
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<td>0.0% 0.0%</td>
<td>0.0%</td>
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<td>Elec</td>
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<td>0.0% 0.0%</td>
<td>0.0%</td>
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<td>Gas</td>
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<td>2.2 0.0</td>
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<td>0.1%</td>
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**Total w/o Misc Equipment**

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<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
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<td>Electricity</td>
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<td><strong>Total</strong></td>
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<td><strong>$21,061</strong></td>
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*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

**DOE-2 Reports:** Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
Alternative Energy Savings vs. ASHRAE 90.1-2004 Base Case

WAREHOUSE (CHADRON, NE)

Energy Use Reduction vs. Base Case

- 2006 IECC: 0.2%
- 2003 IECC: 0.0%
- Alternative: 29.7%
## Warehouse Energy Results Summary

**Chadron, NE**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
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*Reported excluding Misc Equipment electrical end-use
WAREHOUSE (CHADRON, NE)

Baseline Energy End-uses

- Conditioned Lighting: 23.4%
- Unconditioned Lighting: 7.6%
- Space Heating: 46.8%
- Space Cooling: 0.3%
- Pumps & Aux: 0.1%
- Fans - Ventilation: 21.7%
- DHW: 0.2%

Conditioned Lighting 23.4%
Unconditioned Lighting 7.6%
Space Heating 46.8%
Space Cooling 0.3%
Pumps & Aux 0.1%
Fans - Ventilation 21.7%
DHW 0.2%
## Building Energy Performance Summary - Base Case

### Warehouse Energy Results Summary
Chadron, NE

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Baseline Building</th>
<th>Baseline Building +90</th>
<th>Baseline Building +180</th>
<th>Baseline Building +270</th>
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<th>% End Use of Baseline</th>
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<td>[MMbtu]</td>
<td>[kW or therm/hr]</td>
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<td>[kW or therm/hr]</td>
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<td>0.0</td>
<td>0.0</td>
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<td>0.0</td>
<td>0.0</td>
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<td>Elec</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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### Energy Cost Summary

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Baseline Cost</th>
<th>Baseline Cost +90</th>
<th>Baseline Cost +180</th>
<th>Baseline Cost +270</th>
<th>Baseline Average</th>
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<td>$19,770</td>
<td>$19,744</td>
<td>$19,709</td>
<td>$19,743</td>
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</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
WAREHOUSE (CHADRON, NE)
**Building Energy Performance Summary**

<table>
<thead>
<tr>
<th>End Use</th>
<th>Energy Source</th>
<th>Alternative Building</th>
<th>Average Baseline</th>
<th>Energy Difference Alt-Baseline</th>
<th>% of End Use of As Designed</th>
<th>Baseline Consumption Average</th>
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<td>[kW or therm/hr]</td>
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<td>Conditioned Lighting</td>
<td>Electricity</td>
<td>323.7 18.2</td>
<td>323.7 34.6</td>
<td>0.0%</td>
<td>21.9%</td>
<td>17.2%</td>
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<tr>
<td>Unconditioned Lighting</td>
<td>Electricity</td>
<td>104.5 1.4</td>
<td>104.5 1.4</td>
<td>0.0%</td>
<td>7.1%</td>
<td>5.5%</td>
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<tr>
<td>Misc Equipment</td>
<td>Electricity</td>
<td>503.9 52.0</td>
<td>503.9 53.9</td>
<td>0.0%</td>
<td>34.1%</td>
<td>26.7%</td>
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<tr>
<td>Space Heating</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Space Heating</td>
<td>Gas</td>
<td>281.3 0.6</td>
<td>646.8 0.9</td>
<td>56.5%</td>
<td>19.1%</td>
<td>34.3%</td>
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<tr>
<td>Space Heating</td>
<td>Steam/ HW</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
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<tr>
<td>Space Cooling</td>
<td>Electric</td>
<td>2.2 1.3</td>
<td>3.8 0.9</td>
<td>41.3%</td>
<td>0.1%</td>
<td>0.2%</td>
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<tr>
<td>Space Cooling</td>
<td>Chilled Water</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
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<tr>
<td>Heat Rejection</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
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<tr>
<td>Pumps &amp; Aux</td>
<td>Electricity</td>
<td>0.8 0.0</td>
<td>0.8 0.0</td>
<td>0.0%</td>
<td>0.1%</td>
<td>0.0%</td>
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<tr>
<td>Fans - Ventilation</td>
<td>Electricity</td>
<td>257.2 25.5</td>
<td>300.2 25.4</td>
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<td>17.4%</td>
<td>15.9%</td>
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<tr>
<td>Fans - Exhaust</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
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<td>0.0%</td>
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<tr>
<td>Refrigeration</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
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<tr>
<td>HP Supplement</td>
<td>Electricity</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
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<td>0.0%</td>
<td>0.0%</td>
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<tr>
<td>DHW</td>
<td>Electric</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
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<tr>
<td>DHW</td>
<td>Gas</td>
<td>2.2 0.0</td>
<td>2.2 0.0</td>
<td>0.0%</td>
<td>0.1%</td>
<td>0.1%</td>
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</tbody>
</table>

**Total w/o Misc Equipment**

|                             | 971.9 MMBtu   | 1382.0 MMBtu         | 29.7% | 100.0% | 100.0% |

**Alternative Energy Savings**

|                              | 410.1 MMBtu |

**Total w/ Misc Equipment**

|                              | 1475.8 MMBtu | 1885.9 MMBtu |

**Energy Cost Summary**

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>As Designed Cost</th>
<th>Baseline Cost</th>
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<tbody>
<tr>
<td>Electricity*</td>
<td>$13,284</td>
<td>$14,122</td>
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<tr>
<td>Gas</td>
<td>$2,455</td>
<td>$5,621</td>
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<td><strong>Total</strong></td>
<td><strong>$15,739</strong></td>
<td><strong>$19,743</strong></td>
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</table>

*Electricity cost excludes Misc Equipment electrical consumption cost (based upon virtual rate)

DOE-2 Reports: Energy uses from BEPS; Energy peaks from PS-E; Energy costs from ES-D; Gas peak converted from MMbtu/h to therms
State of Nebraska
Nebraska Energy Office

Nebraska-specific Advanced Commercial Building
Energy Code Study

Capital Cost Estimates

BCC Project # 09-08-0120

September 2, 2009
## SUMMARY SHEET

<table>
<thead>
<tr>
<th>BUILDING TYPE</th>
<th>2003 IECC BASELINE BUILDING TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
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<tbody>
<tr>
<td><strong>LARGE OFFICE - 18% WWR</strong></td>
<td></td>
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<tr>
<td>Large Office - Chadron, Nebraska - 18% WWR</td>
<td>$579,428.00</td>
<td>$877,948.00</td>
<td>$298,520.00</td>
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<td>Large Office - Norfolk, Nebraska - 18% WWR</td>
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<td>$916,448.00</td>
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<td>Large Office - Omaha, Nebraska - 18% WWR</td>
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<td><strong>LARGE OFFICE - 38% WWR</strong></td>
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<tr>
<td>Large Office - Chadron, Nebraska - 38% WWR</td>
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<td>$934,548.00</td>
<td>$292,368.00</td>
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<td>Large Office - Norfolk, Nebraska - 38% WWR</td>
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<td>$939,148.00</td>
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<td><strong>SMALL OFFICE - 18% WWR</strong></td>
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<td>Small Office - Chadron, Nebraska - 18% WWR</td>
<td>$172,216.00</td>
<td>$249,739.00</td>
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<td>$82,156.92</td>
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<td>Small Office - Chadron, Nebraska - 38% WWR</td>
<td>$184,257.98</td>
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<td>Small Office - Omaha, Nebraska - 38% WWR</td>
<td>$177,882.08</td>
<td>$272,758.00</td>
<td>$94,875.92</td>
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<tr>
<td><strong>SMALL RETAIL - 8% WWR</strong></td>
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<tr>
<td>Small Retail - Chadron, Nebraska - 8% WWR</td>
<td>$73,690.00</td>
<td>$99,780.00</td>
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<td>$105,780.00</td>
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<td>Small Retail - Omaha, Nebraska - 8% WWR</td>
<td>$79,190.00</td>
<td>$102,780.00</td>
<td>$23,590.00</td>
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<tr>
<td>BUILDING TYPE</td>
<td>2003 IECC BASELINE BUILDING TOTAL</td>
<td>ALTERNATIVE (PROPOSED) BUILDING TOTAL</td>
<td>ADDED (DELTA) COST TOTAL</td>
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<tr>
<td>-------------------------------</td>
<td>-----------------------------------</td>
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<tr>
<td><strong>ELEMENTARY - 18% WWR</strong></td>
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<tr>
<td>Elementary 18% WWR - Chadron, Nebraska</td>
<td>$502,930.00</td>
<td>$673,430.00</td>
<td>$170,500.00</td>
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<td>Elementary 18% WWR - Norfolk, Nebraska</td>
<td>$527,630.00</td>
<td>$698,130.00</td>
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<td>Elementary 18% WWR - Omaha, Nebraska</td>
<td>$558,614.80</td>
<td>$741,030.00</td>
<td>$182,415.20</td>
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<td><strong>Retail Strip Mall</strong></td>
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<tr>
<td>Retail Strip Mall - Chadron, Nebraska</td>
<td>$197,325.00</td>
<td>$299,236.60</td>
<td>$101,911.60</td>
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<td>Retail Strip Mall - Norfolk, Nebraska</td>
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<td>Retail Strip Mall - Omaha, Nebraska</td>
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<td><strong>Large Big Box Retail</strong></td>
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<td>Large Box Retail - Chadron, Nebraska - 2% WWR</td>
<td>$1,184,420.00</td>
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<td><strong>Warehouse</strong></td>
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<td>Warehouse - Chadron, Nebraska</td>
<td>$214,280.00</td>
<td>$397,980.00</td>
<td>$183,700.00</td>
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<tr>
<td>Warehouse - Norfolk, Nebraska</td>
<td>$214,280.00</td>
<td>$397,980.00</td>
<td>$183,700.00</td>
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<tr>
<td>Warehouse - Omaha, Nebraska</td>
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<td>$397,980.00</td>
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<td><strong>Secondary School - 18% WWR</strong></td>
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<td>Secondary School - Chadron, Nebraska - 18% WWR</td>
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<td>$1,115,913.54</td>
<td>$1,135,488.00</td>
<td>$19,574.46</td>
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### Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Secondary School - Chadron, Nebraska - 18% WWR

**September 2, 2009**

**BCC Project # 09-08-0120**

### DESCRIPTION

<table>
<thead>
<tr>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
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<tr>
<td><strong>General:</strong></td>
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<tr>
<td>Exterior Wall System</td>
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<td>R13 fiberglass batt</td>
<td>21,467</td>
<td>S.F.</td>
<td>$3.50</td>
<td>$75,134.50</td>
<td>R13 fiberglass batt</td>
<td>21,467</td>
<td>S.F.</td>
<td>$4.00</td>
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<td>insulation in 4-inch mtl.</td>
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<tr>
<td>studs plus R3.8 continuous</td>
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<tr>
<td>rigid insulation.</td>
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<td>Exterior Roof System</td>
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<tr>
<td>R20 (above deck)</td>
<td>80,000</td>
<td>S.F.</td>
<td>$2.29</td>
<td>$183,200.00</td>
<td>R20 (above deck)</td>
<td>80,000</td>
<td>S.F.</td>
<td>$2.29</td>
<td>$183,200.00</td>
<td>$0.00</td>
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<td>polisocyanurate insulation.</td>
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<tr>
<td>Exterior Windows</td>
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<tr>
<td>Interior clear glass; No</td>
<td>3,870</td>
<td>S.F.</td>
<td>$41.00</td>
<td>$158,670.00</td>
<td>PPG-Solarban (70XL (2) Starphire)</td>
<td>3,870</td>
<td>S.F.</td>
<td>$56.00</td>
<td>$216,720.00</td>
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<tr>
<td>thermal frames.</td>
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<td>insulated glass w/</td>
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<tr>
<td>H.V.A.C.</td>
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<tr>
<td>Packaged Rooftop V.A.V.</td>
<td>1</td>
<td>EA.</td>
<td>$169,000.00</td>
<td>$169,000.00</td>
<td>Packaged single zone</td>
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<td>EA.</td>
<td>$7,800.00</td>
<td>$7,800.00</td>
<td>($161,200.00)</td>
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<tr>
<td>V.A.V. with electric reheat - 101 tons.</td>
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<td>V.A.V. Parallel Fan Powered Boxes - 2,362 CFM.</td>
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<td>$2,800.00</td>
<td>$2,800.00</td>
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<td>V.A.V. Parallel Fan Powered Boxes - 1,282 CFM.</td>
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<td>$1,800.00</td>
<td>$1,800.00</td>
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</table>
### Building Type: Secondary School - Chadron, Nebraska - 18% WWR

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 3,528 CFM.</td>
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<td>$4,000.00</td>
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<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 2,257 CFM.</td>
<td>1 EA.</td>
<td>$2,800.00</td>
<td>$2,800.00</td>
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<td>V.A.V. Parallel Fan Powered Boxes - 2,256 CFM.</td>
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<td>V.A.V. Parallel Fan Powered Boxes - 2,232 CFM.</td>
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<td>V.A.V. Parallel Fan Powered Boxes - 1,465 CFM.</td>
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<td>V.A.V. Parallel Fan Powered Boxes - 1,526 CFM.</td>
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<td>V.A.V. Parallel Fan Powered Boxes - 2,296 CFM.</td>
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<td>V.A.V. Parallel Fan Powered Boxes - 4,899 CFM.</td>
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<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 4,468 CFM.</td>
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### Building Type
Secondary School - Chadron, Nebraska - 18% WWR

#### Description

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### Description

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<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
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<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 1,526 CFM.</td>
<td>1 EA.</td>
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<td>System 4</td>
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<td>$7,800.00</td>
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<td>$11,700.00</td>
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### Nebraska-Specific Advanced Commercial Building Energy Code Study

**Secondary School - Chadron, Nebraska - 18% WWR**

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## 2003 IECC BASELINE BUILDING

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### Building Type: Secondary School - Chadron, Nebraska - 18% WWR

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<th>UNIT</th>
<th>COST / UNIT</th>
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<td>1,600 CFM.</td>
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<td>$12,700.00</td>
<td>$12,700.00</td>
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<tr>
<td>690 CFM.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$4,900.00</td>
<td>$4,900.00</td>
<td>$4,900.00</td>
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<tr>
<td>3,680 CFM.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$22,500.00</td>
<td>$22,500.00</td>
<td>$22,500.00</td>
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</tr>
<tr>
<td>1,330 CFM.</td>
<td></td>
<td>2</td>
<td>EA.</td>
<td>$11,000.00</td>
<td>$22,000.00</td>
<td>$22,000.00</td>
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<tr>
<td>1,060 CFM.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$8,500.00</td>
<td>$8,500.00</td>
<td>$8,500.00</td>
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<tr>
<td>640 CFM.</td>
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<td>$4,800.00</td>
<td>$4,800.00</td>
<td>$4,800.00</td>
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</table>

**Lighting:**

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>ASHRAE 90.1 Space Dependant - T-8 lamps.</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ASHRAE 90.1 Space Dependant - T-8 lamps.</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>530 EA.</td>
<td>$100.00</td>
<td>$53,000.00</td>
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<td>530 EA.</td>
<td>$100.00</td>
<td>$53,000.00</td>
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**TOTALS =**

- **$1,035,804.50**
- **$1,084,788.00**
- **$48,983.50**
### Exterior Wall System

<table>
<thead>
<tr>
<th>Description</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>ADDED (DELTA) COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.</td>
<td>21,467 S.F. $3.50 $75,134.50</td>
<td>R13 fiberglass batt insulation in 4-inch mtl. Studs plus R7.5 continuous rigid insulation.</td>
<td>21,467 S.F. $4.00 $85,868.00</td>
</tr>
</tbody>
</table>

### Exterior Roof System

<table>
<thead>
<tr>
<th>Description</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>ADDED (DELTA) COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>R20 (above deck) polyisocyanurate insulation.</td>
<td>80,000 S.F. $2.29 $183,200.00</td>
<td>R20 (above deck) polyisocyanurate insulation.</td>
<td>80,000 S.F. $2.29 $183,200.00</td>
</tr>
</tbody>
</table>

### Exterior Windows

<table>
<thead>
<tr>
<th>Description</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>ADDED (DELTA) COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interior clear glass; No thermal frames.</td>
<td>3,870 S.F. $41.00 $158,670.00</td>
<td>PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.</td>
<td>3,870 S.F. $56.00 $216,720.00</td>
</tr>
</tbody>
</table>

### H.V.A.C.

<table>
<thead>
<tr>
<th>Description</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>ADDED (DELTA) COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaged Rooftop V.A.V. with electric reheat - 89 tons.</td>
<td>1 EA. $185,000.00 $185,000.00</td>
<td>Packaged single zone rooftop unit - 5 tons.</td>
<td>1 EA. $6,500.00 $6,500.00</td>
</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 2,201 CFM.</td>
<td>1 EA. $2,700.00 $2,700.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 1,183 CFM.</td>
<td>1 EA. $1,700.00 $1,700.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Building Type: Secondary School - Norfolk, Nebraska - 18% WWR

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 3,303 CFM.</td>
<td>1 EA.</td>
<td>$3,800.00</td>
<td>$3,800.00</td>
<td></td>
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<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 2,086 CFM.</td>
<td>1 EA.</td>
<td>$2,600.00</td>
<td>$2,600.00</td>
<td></td>
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</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 2,085 CFM.</td>
<td>1 EA.</td>
<td>$2,600.00</td>
<td>$2,600.00</td>
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<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 2,052 CFM.</td>
<td>1 EA.</td>
<td>$2,600.00</td>
<td>$2,600.00</td>
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</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 1,311 CFM.</td>
<td>1 EA.</td>
<td>$1,800.00</td>
<td>$1,800.00</td>
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</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 1,431 CFM.</td>
<td>1 EA.</td>
<td>$1,900.00</td>
<td>$1,900.00</td>
<td></td>
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</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 2,159 CFM.</td>
<td>1 EA.</td>
<td>$2,700.00</td>
<td>$2,700.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 2,300 CFM.</td>
<td>2 EA.</td>
<td>$2,800.00</td>
<td>$5,600.00</td>
<td></td>
<td></td>
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</table>
## DESCRIPTION

<table>
<thead>
<tr>
<th>Description</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 2,100 CFM.</td>
<td></td>
<td>2</td>
<td>EA.</td>
<td>$2,700.00</td>
<td>$5,400.00</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 3,302 CFM.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$3,800.00</td>
<td>$3,800.00</td>
<td></td>
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</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 3,331 CFM.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$3,800.00</td>
<td>$3,800.00</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>System 2</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packaged Rooftop V.A.V. with HW reheat - 60 tons.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$130,000.00</td>
<td>$130,000.00</td>
<td>Packaged single zone rooftop unit - 3 tons.</td>
<td>1</td>
<td>EA.</td>
<td>$3,900.00</td>
<td>$3,900.00</td>
<td>($126,100.00)</td>
</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 2,978 CFM.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$3,500.00</td>
<td>$3,500.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 3,800 CFM.</td>
<td></td>
<td>2</td>
<td>EA.</td>
<td>$4,300.00</td>
<td>$8,600.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 2,600 CFM.</td>
<td></td>
<td>5</td>
<td>EA.</td>
<td>$3,100.00</td>
<td>$15,500.00</td>
<td></td>
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<tr>
<td>System 3</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packaged Rooftop V.A.V. with HW reheat - 81 tons.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$167,000.00</td>
<td>$167,000.00</td>
<td>Packaged single zone rooftop unit - 8 tons.</td>
<td>1</td>
<td>EA.</td>
<td>$10,400.00</td>
<td>$10,400.00</td>
<td>($156,600.00)</td>
</tr>
</tbody>
</table>
# Nebraska-Specific Advanced Commercial Building Energy Code Study

**September 2, 2009**  
**BCC Project # 09-08-0120**

**Building Type:** Secondary School - Norfolk, Nebraska - 18% WWR

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 3,539 CFM.</td>
<td>1 EA.</td>
<td>$4,000.00</td>
<td>$4,000.00</td>
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<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 3,176 CFM.</td>
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<td>$3,700.00</td>
<td>$3,700.00</td>
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<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 1,419 CFM.</td>
<td>1 EA.</td>
<td>$1,900.00</td>
<td>$1,900.00</td>
<td></td>
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</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 1,885 CFM.</td>
<td>1 EA.</td>
<td>$2,400.00</td>
<td>$2,400.00</td>
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</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 1,304 CFM.</td>
<td>1 EA.</td>
<td>$1,800.00</td>
<td>$1,800.00</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 1,803 CFM.</td>
<td>1 EA.</td>
<td>$2,300.00</td>
<td>$2,300.00</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 2,000 CFM.</td>
<td>2 EA.</td>
<td>$2,500.00</td>
<td>$5,000.00</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 1,212 CFM.</td>
<td>1 EA.</td>
<td>$1,700.00</td>
<td>$1,700.00</td>
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</table>
### Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Secondary School - Norfolk, Nebraska - 18% WWR

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<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 3,648 CFM.</td>
<td>1 EA.</td>
<td>$4,200.00</td>
<td>$4,200.00</td>
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<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 3,647 CFM.</td>
<td>1 EA.</td>
<td>$4,200.00</td>
<td>$4,200.00</td>
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<td></td>
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<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 2,300 CFM.</td>
<td>2 EA.</td>
<td>$2,800.00</td>
<td>$5,600.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 1,431 CFM.</td>
<td>1 EA.</td>
<td>$1,900.00</td>
<td>$1,900.00</td>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaged single zone rooftop unit - 5 tons.</td>
<td>1 EA.</td>
<td>$6,500.00</td>
<td>$6,500.00</td>
<td></td>
</tr>
<tr>
<td>Packaged single zone rooftop unit - 5 tons.</td>
<td>1 EA.</td>
<td>$6,500.00</td>
<td>$6,500.00</td>
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</tr>
<tr>
<td>Packaged single zone rooftop unit - 4 tons.</td>
<td>1 EA.</td>
<td>$5,200.00</td>
<td>$5,200.00</td>
<td></td>
</tr>
<tr>
<td>Packaged single zone rooftop unit - 3 tons.</td>
<td>1 EA.</td>
<td>$3,900.00</td>
<td>$3,900.00</td>
<td></td>
</tr>
</tbody>
</table>

**Building Cost Consultants, Inc.**
P.O. Box 278, Plattsmouth, NE 68048  Phone: (402) 298-8260  Fax: (402) 298-8290  bccdsieh@cox.net
<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
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</thead>
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<tr>
<td>System 8</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$10,400.00</td>
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<tr>
<td>System 9</td>
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<td>1</td>
<td>EA.</td>
<td>$6,500.00</td>
<td>$6,500.00</td>
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<td>System 10</td>
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<td>1</td>
<td>EA.</td>
<td>$9,100.00</td>
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<tr>
<td>System 11</td>
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<td>$15,600.00</td>
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<td>EA.</td>
<td>$11,700.00</td>
<td>$11,700.00</td>
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<td>System 14</td>
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<td>1</td>
<td>EA.</td>
<td>$7,800.00</td>
<td>$7,800.00</td>
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<tr>
<td>System 15</td>
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<td>1</td>
<td>EA.</td>
<td>$5,200.00</td>
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</tr>
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</table>

Building Type: Secondary School - Norfolk, Nebraska - 18% WWR
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<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
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<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>System 16</td>
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<td>Packaged single zone rooftop unit - 8 tons.</td>
<td>1</td>
<td>EA.</td>
<td>$10,400.00</td>
<td>$10,400.00</td>
<td>$10,400.00</td>
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<tr>
<td>System 17</td>
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<td>Packaged single zone rooftop unit - 8 tons.</td>
<td>1</td>
<td>EA.</td>
<td>$10,400.00</td>
<td>$10,400.00</td>
<td>$10,400.00</td>
</tr>
<tr>
<td>System 18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Packaged single zone rooftop unit - 5 tons.</td>
<td>1</td>
<td>EA.</td>
<td>$6,500.00</td>
<td>$6,500.00</td>
<td>$6,500.00</td>
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<tr>
<td>System 19</td>
<td></td>
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<td></td>
<td></td>
<td>Packaged single zone rooftop unit - 3 tons.</td>
<td>1</td>
<td>EA.</td>
<td>$3,900.00</td>
<td>$3,900.00</td>
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<tr>
<td>System 20</td>
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<td>Packaged single zone rooftop unit - 5 tons.</td>
<td>1</td>
<td>EA.</td>
<td>$6,500.00</td>
<td>$6,500.00</td>
<td>$6,500.00</td>
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<tr>
<td>System 21</td>
<td></td>
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<td></td>
<td>Packaged single zone rooftop unit - 10 tons.</td>
<td>1</td>
<td>EA.</td>
<td>$13,000.00</td>
<td>$13,000.00</td>
<td>$13,000.00</td>
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<tr>
<td>System 22</td>
<td></td>
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<td></td>
<td></td>
<td>Packaged single zone rooftop unit - 2 tons.</td>
<td>1</td>
<td>EA.</td>
<td>$2,600.00</td>
<td>$2,600.00</td>
<td>$2,600.00</td>
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<tr>
<td>System 23</td>
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<td>Packaged single zone rooftop unit - 10 tons.</td>
<td>1</td>
<td>EA.</td>
<td>$13,000.00</td>
<td>$13,000.00</td>
<td>$13,000.00</td>
</tr>
</tbody>
</table>
### Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Secondary School - Norfolk, Nebraska - 18% WWR

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
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</tr>
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<tbody>
<tr>
<td>System 24</td>
<td></td>
<td></td>
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<tr>
<td>System 25</td>
<td></td>
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<tr>
<td>System 26</td>
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<tr>
<td>System 27</td>
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<td>System 28</td>
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### ALTERNATIVE (PROPOSED) BUILDING

<table>
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<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaged single zone rooftop unit - 9 tons.</td>
<td>1</td>
<td>EA.</td>
<td>$11,700.00</td>
<td>$11,700.00</td>
<td></td>
</tr>
<tr>
<td>Packaged single zone rooftop unit - 9 tons.</td>
<td>1</td>
<td>EA.</td>
<td>$11,700.00</td>
<td>$11,700.00</td>
<td></td>
</tr>
<tr>
<td>Packaged single zone rooftop unit - 13 tons.</td>
<td>1</td>
<td>EA.</td>
<td>$16,900.00</td>
<td>$16,900.00</td>
<td></td>
</tr>
<tr>
<td>Packaged single zone rooftop unit - 32 tons.</td>
<td>1</td>
<td>EA.</td>
<td>$41,600.00</td>
<td>$41,600.00</td>
<td></td>
</tr>
<tr>
<td>Packaged single zone rooftop unit - 5 tons.</td>
<td>1</td>
<td>EA.</td>
<td>$6,500.00</td>
<td>$6,500.00</td>
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</table>

### Heat Recovery Units:

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
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</tr>
</thead>
<tbody>
<tr>
<td>780 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$7,000.00</td>
<td>$7,000.00</td>
</tr>
<tr>
<td>460 CFM.</td>
<td>4</td>
<td>EA.</td>
<td>$3,200.00</td>
<td>$12,800.00</td>
</tr>
<tr>
<td>1,320 CFM.</td>
<td>4</td>
<td>EA.</td>
<td>$11,000.00</td>
<td>$44,000.00</td>
</tr>
<tr>
<td>750 CFM.</td>
<td>2</td>
<td>EA.</td>
<td>$7,000.00</td>
<td>$14,000.00</td>
</tr>
<tr>
<td>1,350 CFM.</td>
<td>2</td>
<td>EA.</td>
<td>$11,200.00</td>
<td>$22,400.00</td>
</tr>
<tr>
<td>1,800 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$13,300.00</td>
<td>$13,300.00</td>
</tr>
<tr>
<td>2,060 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$15,500.00</td>
<td>$15,500.00</td>
</tr>
<tr>
<td>2,400 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$19,200.00</td>
<td>$19,200.00</td>
</tr>
<tr>
<td>1,190 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$9,300.00</td>
<td>$9,300.00</td>
</tr>
<tr>
<td>280 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$2,400.00</td>
<td>$2,400.00</td>
</tr>
<tr>
<td>1,600 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$12,700.00</td>
<td>$12,700.00</td>
</tr>
</tbody>
</table>
### Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Secondary School - Norfolk, Nebraska - 18% WWR

#### DESCRIPTION

<table>
<thead>
<tr>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>690 CFM. 1 EA.</td>
<td></td>
<td></td>
<td>$4,900.00</td>
<td>$4,900.00</td>
</tr>
<tr>
<td>3,680 CFM. 1 EA.</td>
<td></td>
<td></td>
<td>$22,500.00</td>
<td>$22,500.00</td>
</tr>
<tr>
<td>1,330 CFM. 2 EA.</td>
<td></td>
<td></td>
<td>$11,000.00</td>
<td>$22,000.00</td>
</tr>
<tr>
<td>1,060 CFM. 1 EA.</td>
<td></td>
<td></td>
<td>$8,500.00</td>
<td>$8,500.00</td>
</tr>
<tr>
<td>640 CFM. 1 EA.</td>
<td></td>
<td></td>
<td>$4,800.00</td>
<td>$4,800.00</td>
</tr>
</tbody>
</table>

#### Lighting:

| ASHRAE 90.1 Space Dependant - T-8 lamps. | 530 EA. | $100.00 | $53,000.00 |

#### ALTERNATIVE (PROPOSED) BUILDING

<table>
<thead>
<tr>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EA.</td>
<td>$4,900.00</td>
<td>$4,900.00</td>
</tr>
<tr>
<td>1</td>
<td>EA.</td>
<td>$22,500.00</td>
<td>$22,500.00</td>
</tr>
<tr>
<td>2</td>
<td>EA.</td>
<td>$11,000.00</td>
<td>$22,000.00</td>
</tr>
<tr>
<td>1</td>
<td>EA.</td>
<td>$8,500.00</td>
<td>$8,500.00</td>
</tr>
<tr>
<td>1</td>
<td>EA.</td>
<td>$4,800.00</td>
<td>$4,800.00</td>
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#### TOTALS =

<table>
<thead>
<tr>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
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</thead>
<tbody>
<tr>
<td>530</td>
<td>EA.</td>
<td>$100.00</td>
<td>$53,000.00</td>
</tr>
</tbody>
</table>

**ADDED (DELTA) COST TOTAL**: $8,316.50

**TOTALS =** $1,059,304.50

**Lighting: ASHRAE 90.1 Space Dependant - T-8 lamps.**

<table>
<thead>
<tr>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
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</thead>
<tbody>
<tr>
<td>530</td>
<td>EA.</td>
<td>$100.00</td>
<td>$53,000.00</td>
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</table>

**TOTALS =** $1,059,304.50

**ADDED (DELTA) COST TOTAL**: $8,316.50
## Nebraska-Specific Advanced Commercial Building Energy Code Study

### Building Type:
**Secondary School - Omaha, Nebraska - 18% WWR**

### General:

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exterior Wall System</td>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs without continuous rigid insulation.</td>
<td>21,467</td>
<td>S.F.</td>
<td>$2.62</td>
<td>$56,243.54</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>R13 fiberglass batt insulation in 4-inch mtl. Studs plus R7.5 continuous rigid insulation.</td>
<td>21,467</td>
<td>S.F.</td>
<td>$4.00</td>
<td>$85,868.00</td>
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</tbody>
</table>

### Exterior Roof System

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>R20 (above deck) polyisocyanurate insulation.</td>
<td>80,000</td>
<td>S.F.</td>
<td>$2.29</td>
<td>$183,200.00</td>
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</tbody>
</table>

### Exterior Windows

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interior clear glass; No thermal frames.</td>
<td>3,870</td>
<td>S.F.</td>
<td>$41.00</td>
<td>$158,670.00</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.</td>
<td>3,870</td>
<td>S.F.</td>
<td>$56.00</td>
<td>$216,720.00</td>
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</tbody>
</table>

### H.V.A.C.

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaged Rooftop V.A.V. with electric reheat - 120 tons.</td>
<td>1</td>
<td>EA.</td>
<td>$198,000.00</td>
<td>$198,000.00</td>
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</tbody>
</table>

### Packaged single zone rooftop unit - 7 tons.

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 2,272 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$2,800.00</td>
<td>$2,800.00</td>
<td></td>
</tr>
</tbody>
</table>

| V.A.V. Parallel Fan Powered Boxes - 1,200 CFM. | 1 | EA. | $1,700.00 | $1,700.00 |

| ADDED (DELTA) COST TOTAL | $29,624.46 | $0.00 | $58,050.00 | ($188,900.00) |

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Building Cost Consultants, Inc.  
P.O. Box 278, Plattsmouth, NE 68048  
Phone: (402) 298-8260  
Fax: (402) 298-8290  
bccdsieh@cox.net
<table>
<thead>
<tr>
<th>DESCRIPTION</th>
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<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 3,302 CFM.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$3,800.00</td>
<td>$3,800.00</td>
</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 2,106 CFM.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$2,600.00</td>
<td>$2,600.00</td>
</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 2,105 CFM.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$2,600.00</td>
<td>$2,600.00</td>
</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 2,076 CFM.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$2,500.00</td>
<td>$2,500.00</td>
</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 1,319 CFM.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$1,800.00</td>
<td>$1,800.00</td>
</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 1,404 CFM.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$1,900.00</td>
<td>$1,900.00</td>
</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 2,120 CFM.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$2,600.00</td>
<td>$2,600.00</td>
</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 2,300 CFM.</td>
<td></td>
<td>2</td>
<td>EA.</td>
<td>$2,800.00</td>
<td>$5,600.00</td>
</tr>
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### Nebraska-Specific Advanced Commercial Building Energy Code Study

September 2, 2009

BCC Project # 09-08-0120

#### Building Type: Secondary School - Omaha, Nebraska - 18% WWR

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<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 2,000 CFM.</td>
<td>2 EA.</td>
<td>$2,500.00</td>
<td>$5,000.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 3,300 CFM.</td>
<td>1 EA.</td>
<td>$3,800.00</td>
<td>$3,800.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 3,329 CFM.</td>
<td>1 EA.</td>
<td>$3,800.00</td>
<td>$3,800.00</td>
<td></td>
<td></td>
</tr>
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#### System 2

<table>
<thead>
<tr>
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<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaged Rooftop V.A.V. with HW reheat - 74 tons.</td>
<td>1 EA.</td>
<td>$158,000.00</td>
<td>$158,000.00</td>
<td></td>
</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 3,028 CFM.</td>
<td>1 EA.</td>
<td>$3,500.00</td>
<td>$3,500.00</td>
<td></td>
</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 3,700 CFM.</td>
<td>2 EA.</td>
<td>$4,200.00</td>
<td>$8,400.00</td>
<td></td>
</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 2,600 CFM.</td>
<td>5 EA.</td>
<td>$3,100.00</td>
<td>$15,500.00</td>
<td></td>
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#### System 3

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaged Rooftop V.A.V. with HW reheat - 108 tons.</td>
<td>1 EA.</td>
<td>$204,000.00</td>
<td>$204,000.00</td>
<td></td>
</tr>
</tbody>
</table>

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Back to Summary
### Building Type: Secondary School - Omaha, Nebraska - 18% WWR

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<th>DESCRIPTION</th>
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<th>COST / UNIT</th>
<th>TOTAL</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 3,476 CFM.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$4,100.00</td>
<td>$4,100.00</td>
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<td></td>
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</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 3,136 CFM.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$3,700.00</td>
<td>$3,700.00</td>
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<td></td>
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</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 1,433 CFM.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$1,900.00</td>
<td>$1,900.00</td>
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</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 1,907 CFM.</td>
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<td>EA.</td>
<td>$2,400.00</td>
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<td></td>
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<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 1,341 CFM.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$1,900.00</td>
<td>$1,900.00</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 1,790 CFM.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$2,300.00</td>
<td>$2,300.00</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>V.A.V. Parallel Fan Powered Boxes - 3,880 CFM.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$4,400.00</td>
<td>$4,400.00</td>
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<td>V.A.V. Parallel Fan Powered Boxes - 1,202 CFM.</td>
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<td>1</td>
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<td>$1,700.00</td>
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### Nebraska-Specific Advanced Commercial Building Energy Code Study

#### September 2, 2009

**BCC Project #: 09-08-0120**

**Building Type:** Secondary School - Omaha, Nebraska - 18% WWR

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<th>DESCRIPTION</th>
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<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
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<td>V.A.V. Parallel Fan Powered Boxes - 3,713 CFM.</td>
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<th>DESCRIPTION</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
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<tbody>
<tr>
<td>Packaged single zone rooftop unit - 7 tons.</td>
<td>1 EA.</td>
<td>$9,100.00</td>
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<td>Packaged single zone rooftop unit - 7 tons.</td>
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<td>Packaged single zone rooftop unit - 4 tons.</td>
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<td>$5,200.00</td>
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Building Cost Consultants, Inc.  
P.O. Box 278, Plattsmouth, NE 68048  
Phone: (402) 298-8260  Fax: (402) 298-8290  
bccdsieh@cox.net
### Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Secondary School - Omaha, Nebraska - 18% WWR

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<th>DESCRIPTION</th>
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<th>UNIT</th>
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<td>Packaged single zone rooftop unit - 16 tons.</td>
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<td>Packaged single zone rooftop unit - 14 tons.</td>
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<td>EA.</td>
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<td>Packaged single zone rooftop unit - 4 tons.</td>
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**Building Cost Consultants, Inc.**
P.O. Box 278, Plattsmouth, NE 68048  Phone: (402) 298-8260  Fax: (402) 298-8290  bccdsieh@cox.net
### Alternative (Proposed) Building Costs

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
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<td>System 16</td>
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<td>System 18</td>
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<td>System 20</td>
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<td>System 21</td>
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<td>System 22</td>
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<td>System 23</td>
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**Building Type:** Secondary School - Omaha, Nebraska - 18% WWR

Nebraska-Specific Advanced Commercial Building Energy Code Study
September 2, 2009
BCC Project # 09-08-0120

Back to Summary
### ALTERNATIVE (PROPOSED) BUILDING

<table>
<thead>
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<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
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<td>System 25</td>
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<td>System 26</td>
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<td>System 27</td>
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<td>System 28</td>
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<td>Heat Recovery Units:</td>
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*Back to Summary*
### Building Type: Secondary School - Omaha, Nebraska - 18% WWR

<table>
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<th>DESCRIPTION</th>
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<table>
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<tr>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
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<th>COST / UNIT</th>
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<tr>
<td>690 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$4,900.00</td>
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<tr>
<td>3,680 CFM.</td>
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<td>1,330 CFM.</td>
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<td>1,060 CFM.</td>
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<tr>
<td>640 CFM.</td>
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<td>EA.</td>
<td>$4,800.00</td>
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<thead>
<tr>
<th>Lighting:</th>
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<tbody>
<tr>
<td>ASHRAE 90.1 Space Dependant - T-8 lamps.</td>
<td>530</td>
<td>EA.</td>
<td>$100.00</td>
<td>$53,000.00</td>
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</table>

| ASHRAE 90.1 Space Dependant - T-8 lamps. | 530 | EA.  | $100.00    | $53,000.00 |

**TOTALS =**

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**$1,115,913.54**

**$1,135,488.00**

**$19,574.46**
### Nebraska-Specific Advanced Commercial Building Energy Code Study

**September 2, 2009**

**BCC Project # 09-08-0120**

**Building Type:** Warehouse - Chadron, Nebraska

### BACK TO SUMMARY

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<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
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<td><strong>General:</strong></td>
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<tr>
<td>Exterior Wall System</td>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.</td>
<td>15,840</td>
<td>S.F.</td>
<td>$3.50</td>
<td>$55,440.00</td>
<td>R21 fiberglass batt insulation in 6-inch mtl. Studs plus R-10 inside and R-10 Outside (masonry wall) continuous rigid insulation (U=0.049)</td>
<td>15,840</td>
<td>S.F.</td>
<td>$9.00</td>
<td>$142,560.00</td>
<td>$87,120.00</td>
</tr>
<tr>
<td>Exterior Roof System</td>
<td>R20 (above deck) polyisocyanurate insulation.</td>
<td>48,000</td>
<td>S.F.</td>
<td>$2.29</td>
<td>$109,920.00</td>
<td>R40 (above deck) polyisocyanurate insulation.</td>
<td>48,000</td>
<td>S.F.</td>
<td>$3.75</td>
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<td>Exterior Windows</td>
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<td>20</td>
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<td>Insulated clear glass; Standard Aluminum frames.</td>
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<tr>
<td>System 1</td>
<td>Packaged single zone rooftop units and gas-fired unit ventilators (2 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$2,000.00</td>
<td>$2,000.00</td>
<td>DX split system furnace and gas-fired unit ventilators (2 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$3,800.00</td>
<td>$3,800.00</td>
<td>$1,800.00</td>
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</tbody>
</table>

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Building Cost Consultants, Inc.  
P.O. Box 278, Plattsmouth, NE  68048  
Phone: (402) 298-8260  
Fax: (402) 298-8290  
bccdsieh@cox.net
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<th>QTY</th>
<th>UNIT</th>
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<th>ADDED (DELTA) COST TOTAL</th>
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<td>Packaged single zone rooftop units and gas-fired unit ventilators (4 tons)</td>
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<td>$3,400.00</td>
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<td>DX split system furnace and gas-fired unit ventilators (4 tons)</td>
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<td>DX split system furnace and gas-fired unit ventilators (6 tons)</td>
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<td>DX split system furnace and gas-fired unit ventilators (4 tons)</td>
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<td>DX split system furnace and gas-fired unit ventilators (6 tons)</td>
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<td>DX split system furnace and gas-fired unit ventilators (6 tons)</td>
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<td>$10,800.00</td>
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**Building Type:** Warehouse - Chadron, Nebraska

<table>
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<th>TOTAL</th>
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<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
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<tr>
<td>Average 0.8 W / ft² in warehouse -</td>
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<tr>
<td>T-8 lamps.</td>
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<tr>
<td>T-8 lamps.</td>
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## Exterior Wall System
R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.

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<th>DESCRIPTION</th>
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<th>TOTAL</th>
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<tbody>
<tr>
<td>Exterior Wall System</td>
<td>15,840</td>
<td>S.F.</td>
<td>$3.50</td>
<td>$55,440.00</td>
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</table>

R21 fiberglass batt insulation in 6-inch mtl. Studs plus R-10 inside and R-10 Outside (masonry wall) continuous rigid insulation (U=0.049)

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
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<th>ADDED (DELTA) COST TOTAL</th>
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<tbody>
<tr>
<td>Exterior Wall System</td>
<td>15,840</td>
<td>S.F.</td>
<td>$9.00</td>
<td>$142,560.00</td>
<td>$87,120.00</td>
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## Exterior Roof System
R20 (above deck) polyisocyanurate insulation.

<table>
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<tr>
<th>DESCRIPTION</th>
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<th>TOTAL</th>
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<tr>
<td>Exterior Roof System</td>
<td>48,000</td>
<td>S.F.</td>
<td>$2.29</td>
<td>$109,920.00</td>
</tr>
</tbody>
</table>

R40 (above deck) polyisocyanurate insulation.

<table>
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<tr>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exterior Roof System</td>
<td>48,000</td>
<td>S.F.</td>
<td>$3.75</td>
<td>$180,000.00</td>
<td>$70,080.00</td>
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</tbody>
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## Exterior Windows
Insulated clear glass; Standard Aluminum frames.

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
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</thead>
<tbody>
<tr>
<td>Exterior Windows</td>
<td>20</td>
<td>S.F.</td>
<td>$41.00</td>
<td>$820.00</td>
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</table>

Insulated clear glass; Standard Aluminum frames.

<table>
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</thead>
<tbody>
<tr>
<td>Exterior Windows</td>
<td>20</td>
<td>S.F.</td>
<td>$41.00</td>
<td>$820.00</td>
<td>$0.00</td>
</tr>
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</table>

## H.V.A.C.
Packaged single zone rooftop units and gas-fired unit ventilators (2 tons)

<table>
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<tr>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>UNIT</th>
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<tbody>
<tr>
<td>System 1</td>
<td>1</td>
<td>EA.</td>
<td>$2,000.00</td>
<td>$2,000.00</td>
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DX split system furnace and gas-fired unit ventilators (2 tons)

<table>
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<tr>
<th>DESCRIPTION</th>
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<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
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</thead>
<tbody>
<tr>
<td>System 1</td>
<td>1</td>
<td>EA.</td>
<td>$3,800.00</td>
<td>$3,800.00</td>
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<tr>
<td>DESCRIPTION</td>
<td>2003 IECC BASELINE BUILDING</td>
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<td>UNIT</td>
<td>COST / UNIT</td>
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</tr>
<tr>
<td>-----------------------------------------------------------------------------</td>
<td>------------------------------</td>
<td>-----</td>
<td>------</td>
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</tr>
<tr>
<td>System 2 Packaged single zone rooftop units and gas-fired unit ventilators (4 tons)</td>
<td>1 EA.</td>
<td>$3,400.00</td>
<td>$3,400.00</td>
<td>DX split system furnace and gas-fired unit ventilators (4 tons)</td>
<td>1 EA.</td>
</tr>
<tr>
<td>System 3 Packaged single zone rooftop units and gas-fired unit ventilators (6 tons)</td>
<td>1 EA.</td>
<td>$5,100.00</td>
<td>$5,100.00</td>
<td>DX split system furnace and gas-fired unit ventilators (6 tons)</td>
<td>1 EA.</td>
</tr>
<tr>
<td>System 4 Packaged single zone rooftop units and gas-fired unit ventilators (4 tons)</td>
<td>1 EA.</td>
<td>$3,400.00</td>
<td>$3,400.00</td>
<td>DX split system furnace and gas-fired unit ventilators (4 tons)</td>
<td>1 EA.</td>
</tr>
<tr>
<td>System 5 Packaged single zone rooftop units and gas-fired unit ventilators (6 tons)</td>
<td>1 EA.</td>
<td>$5,100.00</td>
<td>$5,100.00</td>
<td>DX split system furnace and gas-fired unit ventilators (6 tons)</td>
<td>1 EA.</td>
</tr>
<tr>
<td>System 6 Packaged single zone rooftop units and gas-fired unit ventilators (6 tons)</td>
<td>1 EA.</td>
<td>$5,100.00</td>
<td>$5,100.00</td>
<td>DX split system furnace and gas-fired unit ventilators (6 tons)</td>
<td>1 EA.</td>
</tr>
<tr>
<td>Lighting: Average 0.8 W / ft² in warehouse. T-8 lamps.</td>
<td>240 EA.</td>
<td>$100.00</td>
<td>$24,000.00</td>
<td>Average 0.8 W / ft² in warehouse. T-8 lamps.</td>
<td>240 EA.</td>
</tr>
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### Description

<table>
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<th>2003 IECC BASELINE BUILDING</th>
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</thead>
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<table>
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<tr>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
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**TOTALS =** $214,280.00

<table>
<thead>
<tr>
<th>ADDED (DELTA) COST TOTAL</th>
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<tr>
<td>$397,980.00</td>
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<tr>
<td>$183,700.00</td>
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### Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Warehouse - Omaha, Nebraska

#### Description

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<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
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<th>QTY</th>
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</tr>
<tr>
<td>Exterior Wall System</td>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs without continuous rigid insulation.</td>
<td>15,840</td>
<td>S.F.</td>
<td>$2.62</td>
<td>$41,500.80</td>
<td>R21 fiberglass batt insulation in 6-inch mtl. Studs plus R-10 inside and R-10 Outside (masonry wall) continuous rigid insulation (U=0.049)</td>
<td>15,840</td>
<td>S.F.</td>
<td>$9.00</td>
<td>$142,560.00</td>
<td>$101,059.20</td>
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<tr>
<td>Exterior Roof System</td>
<td>R20 (above deck) polyisocyanurate insulation.</td>
<td>48,000</td>
<td>S.F.</td>
<td>$2.29</td>
<td>$109,920.00</td>
<td>R40 (above deck) polyisocyanurate insulation.</td>
<td>48,000</td>
<td>S.F.</td>
<td>$3.75</td>
<td>$180,000.00</td>
<td>$70,080.00</td>
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<tr>
<td>Exterior Windows</td>
<td>Insulated clear glass; Standard Aluminum frames.</td>
<td>20</td>
<td>S.F.</td>
<td>$41.00</td>
<td>$820.00</td>
<td>Insulated clear glass; Standard Aluminum frames.</td>
<td>20</td>
<td>S.F.</td>
<td>$41.00</td>
<td>$820.00</td>
<td>$0.00</td>
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<tr>
<td>H.V.A.C.</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>System 1</td>
<td>Packaged single zone rooftop units and gas-fired unit ventilators (2 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$2,000.00</td>
<td>$2,000.00</td>
<td>DX split system furnace and gas-fired unit ventilators (2 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$3,800.00</td>
<td>$3,800.00</td>
<td>$1,800.00</td>
</tr>
</tbody>
</table>
### Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Warehouse - Omaha, Nebraska

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<tbody>
<tr>
<td>System 2</td>
<td>Packaged single zone rooftop units and gas-fired unit ventilators (4 tons)</td>
<td>1</td>
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<td>$3,400.00</td>
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<tr>
<td></td>
<td>DX split system furnace and gas-fired unit ventilators (4 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$7,200.00</td>
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<tr>
<td></td>
<td><strong>ADDED (DELTA) COST</strong></td>
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<td></td>
<td></td>
<td><strong>$3,800.00</strong></td>
</tr>
<tr>
<td>System 3</td>
<td>Packaged single zone rooftop units and gas-fired unit ventilators (6 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$5,100.00</td>
<td>$5,100.00</td>
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<tr>
<td></td>
<td>DX split system furnace and gas-fired unit ventilators (6 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$10,800.00</td>
<td>$10,800.00</td>
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<td><strong>ADDED (DELTA) COST</strong></td>
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<td><strong>$5,700.00</strong></td>
</tr>
<tr>
<td>System 4</td>
<td>Packaged single zone rooftop units and gas-fired unit ventilators (4 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$3,400.00</td>
<td>$3,400.00</td>
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<tr>
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<td>DX split system furnace and gas-fired unit ventilators (4 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$7,200.00</td>
<td>$7,200.00</td>
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<tr>
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<td><strong>ADDED (DELTA) COST</strong></td>
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<td><strong>$3,800.00</strong></td>
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<tr>
<td>System 5</td>
<td>Packaged single zone rooftop units and gas-fired unit ventilators (6 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$5,100.00</td>
<td>$5,100.00</td>
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<tr>
<td></td>
<td>DX split system furnace and gas-fired unit ventilators (6 tons)</td>
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<td>EA.</td>
<td>$10,800.00</td>
<td>$10,800.00</td>
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<tr>
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<td><strong>ADDED (DELTA) COST</strong></td>
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<td><strong>$5,700.00</strong></td>
</tr>
<tr>
<td>System 6</td>
<td>Packaged single zone rooftop units and gas-fired unit ventilators (6 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$5,100.00</td>
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<tr>
<td></td>
<td>DX split system furnace and gas-fired unit ventilators (6 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$10,800.00</td>
<td>$10,800.00</td>
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<tr>
<td></td>
<td><strong>ADDED (DELTA) COST</strong></td>
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<td></td>
<td></td>
<td><strong>$5,700.00</strong></td>
</tr>
<tr>
<td>Lighting:</td>
<td>Average 0.8 W / ft² in warehouse. T-8 lamps.</td>
<td>240</td>
<td>EA.</td>
<td>$100.00</td>
<td>$24,000.00</td>
</tr>
<tr>
<td></td>
<td>Average 0.8 W / ft² in warehouse. T-8 lamps.</td>
<td>240</td>
<td>EA.</td>
<td>$100.00</td>
<td>$24,000.00</td>
</tr>
<tr>
<td></td>
<td><strong>ADDED (DELTA) COST</strong></td>
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<td></td>
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<td><strong>$0.00</strong></td>
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### Building Type: Warehouse - Omaha, Nebraska

#### DESCRIPTION

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<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
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<th>UNIT</th>
<th>COST / UNIT</th>
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<th>QTY</th>
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<td>TOTALS =</td>
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<td>$397,980.00</td>
<td>$197,639.20</td>
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Building Cost Consultants, Inc. P.O. Box 278, Plattsmouth, NE 68048 Phone: (402) 298-8260 Fax: (402) 298-8290 bccdsieh@cox.net
# Nebraska-Specific Advanced Commercial Building Energy Code Study

**September 2, 2009**  
**BCC Project #: 09-08-0120**

**Building Type:** Large Box Retail - Chadron, Nebraska - 2% WW

## 2003 IECC BASELINE BUILDING

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<thead>
<tr>
<th>DESCRIPTION</th>
<th>QTY</th>
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<tbody>
<tr>
<td><strong>General:</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Exterior Wall System</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.</td>
<td>26,000</td>
<td>S.F.</td>
<td>$3.50</td>
<td>$91,000.00</td>
</tr>
<tr>
<td>R19 fiberglass batt insulation in 6-inch mtl. Studs plus R7.5 continuous rigid insulation.</td>
<td>26,000</td>
<td>S.F.</td>
<td>$5.25</td>
<td>$136,500.00</td>
</tr>
<tr>
<td><strong>Exterior Roof System</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R20 (above deck) polyisocyanurate insulation.</td>
<td>100,000</td>
<td>S.F.</td>
<td>$2.29</td>
<td>$229,000.00</td>
</tr>
<tr>
<td>R30 (above deck) polyisocyanurate insulation.</td>
<td>100,000</td>
<td>S.F.</td>
<td>$2.85</td>
<td>$285,000.00</td>
</tr>
<tr>
<td><strong>Exterior Windows</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Interior clear glass; No thermal frames.</td>
<td>520</td>
<td>S.F.</td>
<td>$41.00</td>
<td>$21,320.00</td>
</tr>
<tr>
<td>PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.</td>
<td>520</td>
<td>S.F.</td>
<td>$56.00</td>
<td>$29,120.00</td>
</tr>
<tr>
<td><strong>H.V.A.C.</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>System 1</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Packaged rooftop V.A.V. with H.W. reheat - 43 tons.</td>
<td>1</td>
<td>EA.</td>
<td>$86,000.00</td>
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<tr>
<td>V.A.V. Boxes - 3,700 CFM.</td>
<td>2</td>
<td>EA.</td>
<td>$3,700.00</td>
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<tr>
<td>V.A.V. Boxes - 2,100 CFM.</td>
<td>2</td>
<td>EA.</td>
<td>$2,100.00</td>
<td>$4,200.00</td>
</tr>
<tr>
<td>V.A.V. Boxes - 2,550 CFM.</td>
<td>2</td>
<td>EA.</td>
<td>$2,550.00</td>
<td>$5,100.00</td>
</tr>
<tr>
<td>V.A.V. Boxes - 838 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$800.00</td>
<td>$800.00</td>
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</table>

## ALTERNATIVE (PROPOSED) BUILDING

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>QTY</th>
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</tr>
<tr>
<td><strong>Exterior Wall System</strong></td>
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<td></td>
</tr>
<tr>
<td>R19 fiberglass batt insulation in 6-inch mtl. Studs plus R7.5 continuous rigid insulation.</td>
<td>26,000</td>
<td>S.F.</td>
<td>$5.25</td>
<td>$136,500.00</td>
</tr>
<tr>
<td><strong>Exterior Roof System</strong></td>
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<tr>
<td>R30 (above deck) polyisocyanurate insulation.</td>
<td>100,000</td>
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<td>$2.85</td>
<td>$285,000.00</td>
</tr>
<tr>
<td><strong>Exterior Windows</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.</td>
<td>520</td>
<td>S.F.</td>
<td>$56.00</td>
<td>$29,120.00</td>
</tr>
<tr>
<td><strong>H.V.A.C.</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>System 1</strong></td>
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<tr>
<td>Packaged Single Zone Rooftop Unit - 19 tons.</td>
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<td>V.A.V. Boxes - 3,700 CFM.</td>
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<td>$7,400.00</td>
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<tr>
<td>V.A.V. Boxes - 2,100 CFM.</td>
<td>2</td>
<td>EA.</td>
<td>$2,100.00</td>
<td>$4,200.00</td>
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<tr>
<td>V.A.V. Boxes - 2,550 CFM.</td>
<td>2</td>
<td>EA.</td>
<td>$2,550.00</td>
<td>$5,100.00</td>
</tr>
<tr>
<td>V.A.V. Boxes - 838 CFM.</td>
<td>1</td>
<td>EA.</td>
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<td>$800.00</td>
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## ADDED (DELTA) COST TOTAL

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<tr>
<td><strong>System 1</strong></td>
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</tbody>
</table>

**Building Cost Consultants, Inc.**  
P.O. Box 278, Plattsmouth, NE 68048  
Phone: (402) 298-8260  
Fax: (402) 298-8290  
bccdsieh@cox.net
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<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
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</thead>
<tbody>
<tr>
<td>System 2</td>
<td>Packaged rooftop V.A.V. with H.W. reheat - 47 tons.</td>
<td>1 EA.</td>
<td>$94,000.00</td>
<td>$94,000.00</td>
<td>Packaged Single Zone Rooftop Unit - 8 tons.</td>
<td>1 EA.</td>
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<td>V.A.V. Boxes - 3,000 CFM.</td>
<td>15 EA.</td>
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<td>V.A.V. Boxes - 800 CFM.</td>
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<tr>
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<td>V.A.V. Boxes - 3,000 CFM.</td>
<td>4 EA.</td>
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<td>System 3</td>
<td>Packaged rooftop V.A.V. with H.W. reheat - 99 tons.</td>
<td>1 EA.</td>
<td>$198,000.00</td>
<td>$198,000.00</td>
<td>Packaged Single Zone Rooftop Unit - 9 tons.</td>
<td>1 EA.</td>
<td>$9,000.00</td>
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<td>($189,000.00)</td>
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<td>V.A.V. Boxes - 3,000 CFM.</td>
<td>13 EA.</td>
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<td>System 4</td>
<td>Packaged rooftop V.A.V. with H.W. reheat - 109 tons.</td>
<td>1 EA.</td>
<td>$218,000.00</td>
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<td>Packaged Single Zone Rooftop Unit - 2 tons.</td>
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<td>$2,000.00</td>
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<td>V.A.V. Boxes - 3,000 CFM.</td>
<td>14 EA.</td>
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<tr>
<td>System 5</td>
<td>Packaged Single Zone Rooftop Unit - 56 tons.</td>
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<td>$56,000.00</td>
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<tr>
<td>System 6</td>
<td>Packaged Single Zone Rooftop Unit - 6 tons.</td>
<td>1 EA.</td>
<td>$6,000.00</td>
<td>$6,000.00</td>
<td>$6,000.00</td>
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</tbody>
</table>
### Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Large Box Retail - Chadron, Nebraska - 2% WWR

#### System 7
- **Description:** Packaged Single Zone Rooftop Unit - 3 tons.
- **Quantity:** 1 EA.
- **Cost/Unit:** $3,000.00
- **Total:** $3,000.00

#### System 8
- **Description:** Packaged Single Zone Rooftop Unit - 22 tons.
- **Quantity:** 1 EA.
- **Cost/Unit:** $22,000.00
- **Total:** $22,000.00

#### System 9
- **Description:** Packaged Single Zone Rooftop Unit - 61 tons.
- **Quantity:** 1 EA.
- **Cost/Unit:** $61,000.00
- **Total:** $61,000.00

#### Heat Recovery Units:
- **1,397 CFM.**
- **853 CFM.**
- **1,061 CFM.**
- **154 CFM.**
- **8,305 CFM.**
- **456 CFM.**
- **219 CFM.**
- **2,486 CFM.**
- **7,574 CFM.**

- **Boiler**
  - **Description:** 2,300 MBH Gas-fired with hydronic piping.
  - **Quantity:** 2 EA.
  - **Cost/Unit:** $45,000.00
  - **Total:** $90,000.00

- **Lighting:** None

---

**TOTALS =**
- **2003 IECC BASELINE BUILDING**
  - **Total:** $1,184,420.00
- **ALTERNATIVE (PROPOSED) BUILDING**
  - **Total:** $803,420.00

**ADDED (DELTA) COST TOTAL**
- **Total:** ($381,000.00)
## Nebraska-Specific Advanced Commercial Building Energy Code Study
### September 2, 2009
BCC Project # 09-08-0120

**Building Type:** Large Box Retail - Norfolk, Nebraska - 2% WWR  
**Back to Summary**

<table>
<thead>
<tr>
<th>Description</th>
<th>2003 IECC Baseline Building</th>
<th>QTY</th>
<th>UNIT</th>
<th>Cost / Unit</th>
<th>Total</th>
<th>Alternative (Proposed) Building</th>
<th>QTY</th>
<th>UNIT</th>
<th>Cost / Unit</th>
<th>Total</th>
<th>Added (Delta) Cost Total</th>
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<td><strong>General:</strong></td>
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<tr>
<td><strong>Exterior Wall System</strong></td>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.</td>
<td>26,000</td>
<td>S.F.</td>
<td>$3.50</td>
<td>$91,000.00</td>
<td>R19 fiberglass batt insulation in 6-inch mtl. Studs plus R7.5 continuous rigid insulation.</td>
<td>26,000</td>
<td>S.F.</td>
<td>$5.25</td>
<td>$136,500.00</td>
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<td><strong>Exterior Roof System</strong></td>
<td>R20 (above deck) polyisocyanurate insulation.</td>
<td>100,000</td>
<td>S.F.</td>
<td>$2.29</td>
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<td>R30 (above deck) polyisocyanurate insulation.</td>
<td>100,000</td>
<td>S.F.</td>
<td>$2.85</td>
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<td><strong>Exterior Windows</strong></td>
<td>Interior clear glass; No thermal frames.</td>
<td>520</td>
<td>S.F.</td>
<td>$41.00</td>
<td>$21,320.00</td>
<td>PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.</td>
<td>520</td>
<td>S.F.</td>
<td>$56.00</td>
<td>$29,120.00</td>
<td>$7,800.00</td>
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<tr>
<td><strong>H.V.A.C.</strong></td>
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</tr>
<tr>
<td>System 1</td>
<td>Packaged rooftop V.A.V. with H.W. reheat - 53 tons.</td>
<td>1</td>
<td>EA.</td>
<td>$106,000.00</td>
<td>$106,000.00</td>
<td>Packaged Single Zone Rooftop Unit - 19 tons.</td>
<td>1</td>
<td>EA.</td>
<td>$19,000.00</td>
<td>$19,000.00</td>
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<tr>
<td>V.A.V. Boxes - 2,000 CFM.</td>
<td>4</td>
<td>EA.</td>
<td>$2,000.00</td>
<td>$8,000.00</td>
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<td>($8,000.00)</td>
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<tr>
<td>V.A.V. Boxes - 2,500 CFM.</td>
<td>2</td>
<td>EA.</td>
<td>$2,500.00</td>
<td>$5,000.00</td>
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<td>($5,000.00)</td>
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<td>V.A.V. Boxes - 2,500 CFM.</td>
<td>3</td>
<td>EA.</td>
<td>$2,500.00</td>
<td>$7,500.00</td>
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<td>($7,500.00)</td>
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<tr>
<td>V.A.V. Boxes - 906 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$900.00</td>
<td>$900.00</td>
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<td>($900.00)</td>
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</table>
# Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type**: Large Box Retail - Norfolk, Nebraska - 2% WWR

## System 2
- **Packaged rooftop V.A.V. with H.W. reheat - 53 tons.**
  - 1 EA. $106,000.00 $106,000.00
- **V.A.V. Boxes - 2,100 CFM.**
  - 2 EA. $2,100.00 $4,200.00
- **V.A.V. Boxes - 1,704 CFM.**
  - 1 EA. $1,700.00 $1,700.00
- **V.A.V. Boxes - 1,900 CFM.**
  - 6 EA. $1,900.00 $11,400.00

## System 3
- **Packaged rooftop V.A.V. with H.W. reheat - 112 tons.**
  - 1 EA. $168,000.00 $168,000.00
- **V.A.V. Boxes - 3,000 CFM.**
  - 12 EA. $3,000.00 $36,000.00

## System 4
- **Packaged rooftop V.A.V. with H.W. reheat - 123 tons.**
  - 1 EA. $184,500.00 $184,500.00
- **V.A.V. Boxes - 3,000 CFM.**
  - 1 EA. $3,000.00 $3,000.00

## System 5
- **Packaged Single Zone Rooftop Unit - 77 tons.**
  - 1 EA. $75,000.00 $75,000.00

## System 6
- **Packaged Single Zone Rooftop Unit - 8 tons.**
  - 1 EA. $8,000.00 $8,000.00

---

*Building Cost Consultants, Inc.*
P.O. Box 278, Plattsmouth, NE 68048 Phone: (402) 298-8260 Fax: (402) 298-8290 bccdsieh@cox.net
### Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Large Box Retail - Norfolk, Nebraska - 2% WWR

**Description:**

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
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<td>System 7</td>
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<td>System 8</td>
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<tr>
<td>System 9</td>
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**Alternative (Proposed) Building:**

<table>
<thead>
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<th>DESCRIPTION</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
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<tr>
<td>Packaged Single Zone Rooftop Unit - 3 tons.</td>
<td>1</td>
<td>EA.</td>
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<td>$3,000.00</td>
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<td>Packaged Single Zone Rooftop Unit - 28 tons.</td>
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<td>Packaged Single Zone Rooftop Unit - 84 tons.</td>
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<td>$80,000.00</td>
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**Heat Recovery Units:**

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<tr>
<th>CFM</th>
<th>QTY</th>
<th>UNIT</th>
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<tr>
<td>1,397 CFM.</td>
<td>1</td>
<td>EA.</td>
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<td>$11,200.00</td>
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<tr>
<td>853 CFM.</td>
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<td>$7,000.00</td>
<td>$7,000.00</td>
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<tr>
<td>1,061 CFM.</td>
<td>1</td>
<td>EA.</td>
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<td>$8,000.00</td>
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<tr>
<td>154 CFM.</td>
<td>1</td>
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<td>$1,100.00</td>
<td>$1,100.00</td>
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<td>8,305 CFM.</td>
<td>1</td>
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<tr>
<td>456 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$3,200.00</td>
<td>$3,200.00</td>
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<tr>
<td>219 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$1,600.00</td>
<td>$1,600.00</td>
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<tr>
<td>2,486 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$19,200.00</td>
<td>$19,200.00</td>
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<tr>
<td>7,574 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$55,000.00</td>
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**Boiler:**

<table>
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<th>CFM</th>
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<td>2</td>
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**Lighting:**

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**TOTALS =**

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**ADDED (DELTA) COST TOTAL:**

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<tr>
<td>($216,100.00)</td>
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### Nebraska-Specific Advanced Commercial Building Energy Code Study
September 2, 2009

**Building Type:** Large Box Retail - Omaha, Nebraska - 2% WWR  
**Project #:** 09-08-0120

#### DESCRIPTION

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<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
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<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
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<td><strong>General:</strong></td>
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<tr>
<td><strong>Exterior Wall System</strong></td>
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<tr>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs without continuous rigid insulation.</td>
<td>26,000</td>
<td>S.F.</td>
<td>$2.62</td>
<td>$68,120.00</td>
<td></td>
<td>R19 fiberglass batt insulation in 6-inch mtl. Studs plus R7.5 continuous rigid insulation.</td>
<td>26,000</td>
<td>S.F.</td>
<td>$5.25</td>
<td>$136,500.00</td>
<td>$68,380.00</td>
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<tr>
<td><strong>Exterior Roof System</strong></td>
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<tr>
<td>R20 (above deck) polyisocyanurate insulation.</td>
<td>100,000</td>
<td>S.F.</td>
<td>$2.26</td>
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<td>R30 (above deck) polyisocyanurate insulation.</td>
<td>100,000</td>
<td>S.F.</td>
<td>$2.85</td>
<td>$285,000.00</td>
<td>$59,000.00</td>
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<td><strong>Exterior Windows</strong></td>
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<tr>
<td>Interior clear glass; No thermal frames.</td>
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<tr>
<td></td>
<td>520</td>
<td>S.F.</td>
<td>$41.00</td>
<td>$21,320.00</td>
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<td>PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.</td>
<td>520</td>
<td>S.F.</td>
<td>$56.00</td>
<td>$29,120.00</td>
<td>$7,800.00</td>
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<td><strong>H.V.A.C.</strong></td>
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</tr>
<tr>
<td><strong>System 1</strong></td>
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<tr>
<td>Packaged rooftop V.A.V. with H.W. reheat - 51 tons.</td>
<td>1</td>
<td>EA.</td>
<td>$102,000.00</td>
<td>$102,000.00</td>
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<td>Packaged Single Zone Rooftop Unit - 16 tons.</td>
<td>1</td>
<td>EA.</td>
<td>$16,000.00</td>
<td>$16,000.00</td>
<td>($86,000.00)</td>
</tr>
<tr>
<td>V.A.V. Boxes - 3,300 CFM.</td>
<td>2</td>
<td>EA.</td>
<td>$3,300.00</td>
<td>$6,600.00</td>
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<td>V.A.V. Boxes - 2,050 CFM.</td>
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<td>EA.</td>
<td>$2,050.00</td>
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<tr>
<td>V.A.V. Boxes - 2,500 CFM.</td>
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<td>EA.</td>
<td>$2,500.00</td>
<td>$5,000.00</td>
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<tr>
<td>V.A.V. Boxes - 812 CFM.</td>
<td>1</td>
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<td>$800.00</td>
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<td>($800.00)</td>
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Building Cost Consultants, Inc.  
P.O. Box 278, Plattsmouth, NE 68048  
Phone: (402) 298-8260  
Fax: (402) 298-8290  
bccdsieh@cox.net
### Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Large Box Retail - Omaha, Nebraska - 2% WWR  
**BCC Project #:** 09-08-0120

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>System 2</td>
<td>Packaged rooftop V.A.V. with H.W. reheat - 52 tons.</td>
<td>1 EA.</td>
<td>$104,000.00</td>
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<td></td>
<td>V.A.V. Boxes - 2,000 CFM.</td>
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<td>V.A.V. Boxes - 750 CFM.</td>
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<td>V.A.V. Boxes - 2,200 CFM.</td>
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<td>$2,200.00</td>
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<td>System 3</td>
<td>Packaged rooftop V.A.V. with H.W. reheat - 113 tons.</td>
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<td>$169,500.00</td>
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<td>V.A.V. Boxes - 2,900 CFM.</td>
<td>12 EA.</td>
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<td>Packaged rooftop V.A.V. with H.W. reheat - 124 tons.</td>
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<td>V.A.V. Boxes - 3,200 CFM.</td>
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<td>System 5</td>
<td>Packaged Single Zone Rooftop Unit - 68 tons.</td>
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<td>System 6</td>
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<td>1 EA.</td>
<td>$6,000.00</td>
<td>$6,000.00</td>
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</table>

#### System 2

- **Alternative (Proposed) Building**
  - Packaged Single Zone Rooftop Unit - 10 tons. | 1 EA. | $10,000.00 | $10,000.00 |

#### System 3

- **Added (Delta) Cost**
  - ($94,000.00)

#### System 4

- **Added (Delta) Cost**
  - ($184,000.00)

### Building Cost Consultants, Inc.
P.O. Box 278, Plattsmouth, NE 68048 Phone: (402) 298-8260 Fax: (402) 298-8290
bccdsieh@cox.net
## Alternative (Proposed) Building Cost

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
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<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
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<tr>
<td>System 7</td>
<td></td>
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<td>Packaged Single Zone Rooftop Unit - 3 tons.</td>
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<td>System 8</td>
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<td></td>
<td>Packaged Single Zone Rooftop Unit - 25 tons.</td>
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<td>$25,000.00</td>
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<tr>
<td>System 9</td>
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<td>Packaged Single Zone Rooftop Unit - 75 tons.</td>
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<td>Heat Recovery Units:</td>
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<td></td>
<td>1,397 CFM.</td>
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<td>853 CFM.</td>
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<td></td>
<td>1,061 CFM.</td>
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<td>154 CFM.</td>
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<td>8,305 CFM.</td>
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<td>456 CFM.</td>
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<td>219 CFM.</td>
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<td>2,486 CFM.</td>
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<td>7,574 CFM.</td>
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<td>Boiler</td>
<td>2,300 MBH Gas-fired with hydronic piping.</td>
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<td>EA.</td>
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<tr>
<td>Lighting</td>
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<td>$834,420.00</td>
<td>($191,970.00</td>
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### Building Type: Retail Strip Mall - Chadron, Nebraska

#### DESCRIPTION

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
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<tr>
<td><strong>General:</strong></td>
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<tr>
<td>Exterior Wall System</td>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.</td>
<td>7,140</td>
<td>S.F.</td>
<td>$3.50</td>
<td>$24,990.00</td>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs plus R10 continuous rigid insulation.</td>
<td>7,140</td>
<td>S.F.</td>
<td>$4.44</td>
<td>$31,701.60</td>
<td>$6,711.60</td>
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<tr>
<td>Exterior Roof System</td>
<td>R20 (above deck) polyisocyanurate insulation.</td>
<td>13,500</td>
<td>S.F.</td>
<td>$2.29</td>
<td>$30,915.00</td>
<td>R20 (above deck) polyisocyanurate insulation.</td>
<td>13,500</td>
<td>S.F.</td>
<td>$2.29</td>
<td>$30,915.00</td>
<td>$0.00</td>
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<tr>
<td>Exterior Windows</td>
<td>Insulated clear glass; Standard Aluminum frames.</td>
<td>1,620</td>
<td>S.F.</td>
<td>$41.00</td>
<td>$66,420.00</td>
<td>PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.</td>
<td>1,620</td>
<td>S.F.</td>
<td>$56.00</td>
<td>$90,720.00</td>
<td>$24,300.00</td>
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<tr>
<td><strong>H.V.A.C.:</strong></td>
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<td></td>
<td></td>
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<tr>
<td>System 1</td>
<td>Packaged single zone rooftop units (4 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$4,000.00</td>
<td>$4,000.00</td>
<td>DX split system furnace (2 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$3,600.00</td>
<td>$3,600.00</td>
<td>($400.00)</td>
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<tr>
<td>System 2</td>
<td>Packaged single zone rooftop units (2 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$2,000.00</td>
<td>$2,000.00</td>
<td>DX split system furnace (2 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$3,600.00</td>
<td>$3,600.00</td>
<td>$1,600.00</td>
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### Building Type: Retail Strip Mall - Chadron, Nebraska

#### 2003 IECC BASELINE BUILDING

<table>
<thead>
<tr>
<th>System</th>
<th>Description</th>
<th>QTY</th>
<th>Unit</th>
<th>Cost / Unit</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>System 3</td>
<td>Packaged single zone rooftop units (1 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$1,000.00</td>
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<td>System 4</td>
<td>Packaged single zone rooftop units (2 tons)</td>
<td>1</td>
<td>EA.</td>
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<td>System 5</td>
<td>Packaged single zone rooftop units (2 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$2,000.00</td>
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<tr>
<td>System 6</td>
<td>Packaged single zone rooftop units (4 tons)</td>
<td>1</td>
<td>EA.</td>
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<td>System 7</td>
<td>Packaged single zone rooftop units (2 tons)</td>
<td>1</td>
<td>EA.</td>
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<td>$2,000.00</td>
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<td>System 8</td>
<td>Packaged single zone rooftop units (2 tons)</td>
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<td>EA.</td>
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<td>System 9</td>
<td>Packaged single zone rooftop units (4 tons)</td>
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<td>EA.</td>
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<td>EA.</td>
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#### ALTERNATIVE (PROPOSED) BUILDING

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<th>Description</th>
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<th>Unit</th>
<th>Cost / Unit</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>System 3</td>
<td>DX split system furnace (1 tons)</td>
<td>1</td>
<td>EA.</td>
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<td>$1,800.00</td>
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<td>DX split system furnace (2 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$3,600.00</td>
<td>$3,600.00</td>
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<tr>
<td>System 5</td>
<td>DX split system furnace (2 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$3,600.00</td>
<td>$3,600.00</td>
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<tr>
<td>System 6</td>
<td>DX split system furnace (3 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$5,400.00</td>
<td>$5,400.00</td>
</tr>
<tr>
<td>System 7</td>
<td>DX split system furnace (2 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$3,600.00</td>
<td>$3,600.00</td>
</tr>
<tr>
<td>System 8</td>
<td>DX split system furnace (2 tons)</td>
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<td>EA.</td>
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<td>$3,600.00</td>
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<tr>
<td>System 9</td>
<td>DX split system furnace (3 tons)</td>
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<td>System 10</td>
<td>DX split system furnace (2 tons)</td>
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#### ADDED (DELTA) COST TOTAL

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<td>System 5</td>
<td>DX split system furnace (2 tons)</td>
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<tr>
<td>System 6</td>
<td>DX split system furnace (3 tons)</td>
<td>$1,400.00</td>
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<tr>
<td>System 7</td>
<td>DX split system furnace (2 tons)</td>
<td>$1,600.00</td>
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<tr>
<td>System 8</td>
<td>DX split system furnace (2 tons)</td>
<td>$1,600.00</td>
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<tr>
<td>System 9</td>
<td>DX split system furnace (3 tons)</td>
<td>$1,400.00</td>
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<td>System 10</td>
<td>DX split system furnace (2 tons)</td>
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<tr>
<td>System 11</td>
<td>Packaged single zone rooftop units (2 tons)</td>
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<tr>
<td>System 12</td>
<td>Packaged single zone rooftop units (4 tons)</td>
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<td>System 13</td>
<td>Packaged single zone rooftop units (2 tons)</td>
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<td>System 14</td>
<td>Packaged single zone rooftop units (2 tons)</td>
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<td>System 15</td>
<td>Packaged single zone rooftop units (4 tons)</td>
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<td>System 16</td>
<td>Packaged single zone rooftop units (2 tons)</td>
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<td>System 17</td>
<td>Packaged single zone rooftop units (4 tons)</td>
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<td>System 18</td>
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<td>System 19</td>
<td>Packaged single zone rooftop units (6 tons)</td>
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<td>System 20</td>
<td>Packaged single zone rooftop units (3 tons)</td>
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<tr>
<td>System 21</td>
<td>Packaged single zone rooftop units - Kitchen MAU</td>
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</tbody>
</table>

Heat Recovery Units:
- 538 CFM. | 1 | EA. | $3,900.00 | $3,900.00 | $3,900.00 |
- 539 CFM. | 4 | EA. | $3,900.00 | $15,600.00 | $15,600.00 |
- 2,175 CFM. | 1 | EA. | $16,000.00 | $16,000.00 | $16,000.00 |

Lighting:
- 1.5 W / ft² - T8 Lamps | 90 | EA. | $100.00 | $9,000.00 | 1.5 W / ft² - T8 Lamps | 90 | EA. | $100.00 | $9,000.00 | $0.00 |

**TOTALS =** $197,325.00 $299,236.60 $101,911.60
### Building Type: Retail Strip Mall - Norfolk, Nebraska

#### DESCRIPTION

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<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
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<tbody>
<tr>
<td><strong>General</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Exterior Wall System</strong></td>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.</td>
<td>7,140</td>
<td>S.F.</td>
<td>$3.50</td>
<td>$24,990.00</td>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs plus R10 continuous rigid insulation.</td>
<td>7,140</td>
<td>S.F.</td>
<td>$4.44</td>
<td>$31,701.60</td>
<td>$6,711.60</td>
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<tr>
<td><strong>Exterior Roof System</strong></td>
<td>R20 (above deck) polyisocyanurate insulation.</td>
<td>13,500</td>
<td>S.F.</td>
<td>$2.29</td>
<td>$30,915.00</td>
<td>R20 (above deck) polyisocyanurate insulation.</td>
<td>13,500</td>
<td>S.F.</td>
<td>$2.29</td>
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<td><strong>Exterior Windows</strong></td>
<td>Insulated clear glass; Standard Aluminum frames.</td>
<td>1,620</td>
<td>S.F.</td>
<td>$41.00</td>
<td>$66,420.00</td>
<td>PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.</td>
<td>1,620</td>
<td>S.F.</td>
<td>$56.00</td>
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<td>1</td>
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<td>$4,000.00</td>
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<td>1.5 W / ft² - T8 Lamps</td>
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**Nebraska-Specific Advanced Commercial Building Energy Code Study**  
September 2, 2009  
BCC Project # 09-08-0120

**Building Type:** Retail Strip Mall - Omaha, Nebraska  
[Back to Summary]

<table>
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<tr>
<td>Exterior Wall System</td>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs without continuous rigid insulation.</td>
<td>7,140</td>
<td>S.F.</td>
<td>$2.62</td>
<td>$18,706.80</td>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs plus R10 continuous rigid insulation.</td>
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<td>$4.44</td>
<td>$31,701.60</td>
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<td>Packaged single zone rooftop units (4 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$4,000.00</td>
<td>$4,000.00</td>
<td>DX split system furnace (3 tons)</td>
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### Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Retail Strip Mall - Omaha, Nebraska

**BCC Project # 09-08-0120**

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<td>System 11</td>
<td>Packaged single zone rooftop units (2 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$2,000.00</td>
<td>$2,000.00</td>
<td>DX split system furnace (2 tons)</td>
<td>1</td>
<td>EA.</td>
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<td>$2,400.00</td>
</tr>
</tbody>
</table>

Building Cost Consultants, Inc.  
P.O. Box 278, Plattsmouth, NE 68048  
Phone: (402) 298-8260  
Fax: (402) 298-8290  
bccdsieh@cox.net
## Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Retail Strip Mall - Omaha, Nebraska

### DESCRIPTION

<table>
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<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
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### ALTERNATIVE (PROPOSED) BUILDING

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<th>DESCRIPTION</th>
<th>QTY</th>
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<td>DX split system furnace (7 tons)</td>
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### Heat Recovery Units:

- 538 CFM: 1 EA. | $3,900.00 | $3,900.00 | $3,900.00
- 539 CFM: 4 EA. | $3,900.00 | $15,600.00
- 2,175 CFM: 1 EA. | $16,000.00 | $16,000.00 |

### Lighting:

- 1.5 W / ft² - T8 Lamps: 90 EA. | $100.00 | $9,000.00
- 1.5 W / ft² - T8 Lamps: 90 EA. | $100.00 | $9,000.00 |

### TOTALS

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<tr>
<th></th>
<th>2003 IECC BASELINE BUILDING</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>ADDITIONAL (DELTA) COST TOTAL</th>
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<tr>
<td><strong>System 19</strong></td>
<td>$9,000.00</td>
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<td>$3,600.00</td>
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<tr>
<td><strong>System 20</strong></td>
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<td><strong>System 21</strong></td>
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<td><strong>Lighting</strong></td>
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<td><strong>TOTALS</strong></td>
<td>$208,041.80</td>
<td>$320,836.60</td>
<td>$112,794.80</td>
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Building Cost Consultants, Inc.  
P.O. Box 278, Plattsmouth, NE 68048  
Phone: (402) 298-8260  
Fax: (402) 298-8290  
bccdsieh@cox.net
<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
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<tr>
<td>General:</td>
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<tr>
<td><strong>Exterior Wall System</strong></td>
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<tr>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.</td>
<td>13,540 S.F.</td>
<td>$3.50</td>
<td>$47,390.00</td>
<td>13,540 S.F.</td>
<td>$3.50</td>
<td>$47,390.00</td>
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<tr>
<td><strong>Exterior Roof System</strong></td>
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<tr>
<td>R20 (above deck) polyisocyanurate insulation.</td>
<td>50,000 S.F.</td>
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<td>50,000 S.F.</td>
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<td>$100,000.00</td>
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<td><strong>Exterior Windows</strong></td>
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<tr>
<td>Insulated clear glass; Standard Aluminum frames.</td>
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<td>2,440 S.F.</td>
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<td><strong>H.V.A.C.</strong></td>
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<tr>
<td><strong>System 1</strong></td>
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</tr>
<tr>
<td>Packaged single zone heat pumps (5 tons)</td>
<td>1 EA.</td>
<td>$6,500.00</td>
<td>$6,500.00</td>
<td>1 EA.</td>
<td>$5,200.00</td>
<td>$5,200.00</td>
<td>($1,300.00)</td>
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<tr>
<td>Packaged single zone heat pumps (10 tons)</td>
<td>1 EA.</td>
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<td>1 EA.</td>
<td>$13,000.00</td>
<td>$13,000.00</td>
<td>$0.00</td>
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<td></td>
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</tbody>
</table>

Building Cost Consultants, Inc.  P.O. Box 278, Plattsmouth, NE 68048  Phone: (402) 298-8260  Fax: (402) 298-8290  bccdsieh@cox.net
### Nebraska-Specific Advanced Commercial Building Energy Code Study

#### Building Type: Elementary 18% WWR - Chadron, Nebraska

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
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<td>System 3</td>
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<td>EA.</td>
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<td>$13,000.00</td>
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<td>System 4</td>
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<td>$10,400.00</td>
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<td>UNIT</td>
<td>COST / UNIT</td>
<td>TOTAL</td>
<td>ALTERNATIVE (PROPOSED) BUILDING</td>
<td>QTY</td>
<td>UNIT</td>
<td>COST / UNIT</td>
<td>TOTAL</td>
<td>ADDED (DELTA) COST TOTAL</td>
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<tr>
<td>System 9</td>
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### Alternative (Proposed) Building

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<th>COST / UNIT</th>
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### Heat Recover Units:

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### Lighting:

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<th>TOTAL</th>
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### Added (Delta) Cost

- System 15: $0.00
- System 16: $0.00
- System 17: $0.00

Building Cost Consultants, Inc. P.O. Box 278, Plattsmouth, NE 68048 Phone: (402) 298-8260 Fax: (402) 298-8290 bccdsieh@cox.net
Nebraska-Specific Advanced Commercial Building Energy Code Study
September 2, 2009

Building Type: Elementary 18% WWR - Chadron, Nebraska

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
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<tr>
<td>TOTALS =</td>
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### Exterior Wall System

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<th>Description</th>
<th>Baseline</th>
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<tr>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.</td>
<td>13,540 S.F.</td>
<td>$3.50</td>
<td>$47,390.00</td>
<td>13,540 S.F.</td>
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### Exterior Roof System

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<tr>
<td>R20 (above deck) polysisocyanurate insulation.</td>
<td>50,000 S.F.</td>
<td>$2.29</td>
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<td>R17 entirely above deck</td>
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### Exterior Windows

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<tr>
<td>Insulated clear glass; Standard Aluminum frames.</td>
<td>2,440 S.F.</td>
<td>$41.00</td>
<td>$100,040.00</td>
<td>Insulated clear glass; Standard Aluminum frames (U=0.57 and SHGC = 0.34).</td>
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### H.V.A.C.

<table>
<thead>
<tr>
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<tr>
<td>System 1 Packaged single zone heat pumps (5 tons)</td>
<td>1 EA.</td>
<td>$6,500.00</td>
<td>$6,500.00</td>
<td>Packaged single zone heat pumps (4 tons)</td>
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<tr>
<td>System 2 Packaged single zone heat pumps (11 tons)</td>
<td>1 EA.</td>
<td>$14,300.00</td>
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<td>Packaged single zone heat pumps (11 tons)</td>
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### Alternative (Proposed) Building Comparison

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<th>QTY</th>
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<th>Cost / Unit</th>
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<td>System 3</td>
<td>Packaged single zone heat pumps (11 tons)</td>
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<td>System 4</td>
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<tr>
<td>System 5</td>
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<td>System 6</td>
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<td>$36,400.00</td>
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<tr>
<td>System 7</td>
<td>Packaged single zone heat pumps (10 tons)</td>
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<td>EA.</td>
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<tr>
<td>System 8</td>
<td>Packaged single zone heat pumps (7 tons)</td>
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<td>1</td>
<td>EA.</td>
<td>$9,100.00</td>
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### Added (Delta) Cost Total

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<tr>
<th>System 3</th>
<th>Packaged single zone heat pumps (11 tons)</th>
<th>Added (Delta) Cost</th>
<th>Total Cost</th>
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<tr>
<td>System 4</td>
<td>Packaged single zone heat pumps (11 tons)</td>
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<tr>
<td>System 5</td>
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<tr>
<td>System 6</td>
<td>Packaged single zone heat pumps (28 tons)</td>
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<td>System 7</td>
<td>Packaged single zone heat pumps (10 tons)</td>
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<td>System 8</td>
<td>Packaged single zone heat pumps (7 tons)</td>
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<tr>
<td></td>
<td>System 9</td>
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<tr>
<td></td>
<td>System 10</td>
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<td>System 11</td>
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<td>System 12</td>
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<td></td>
<td>System 13</td>
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<td></td>
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<td></td>
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## Nebraska-Specific Advanced Commercial Building Energy Code Study

**September 2, 2009**

**BCC Project # 09-08-0120**

### Building Type:
Elementary 18% WWR - Norfolk, Nebraska

### DESCRIPTION

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<tr>
<th>2003 IECC BASELINE BUILDING</th>
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<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
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<tr>
<td><strong>System 15</strong></td>
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</tr>
<tr>
<td>Packaged single zone heat pumps (7 tons)</td>
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<td>EA.</td>
<td>$9,100.00</td>
<td>$9,100.00</td>
<td>Packaged single zone heat pumps (7 tons)</td>
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<td>Packaged single zone heat pumps (26 tons)</td>
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<tr>
<td>Packaged single zone heat pumps (10 tons)</td>
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<td>Packaged single zone heat pumps (10 tons)</td>
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<td>EA.</td>
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<tr>
<td>550 CFM.</td>
<td>3</td>
<td>EA.</td>
<td>$4,400.00</td>
<td>$13,200.00</td>
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<td>1,660 CFM.</td>
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<td>2,270 CFM.</td>
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<td>LPD 1.2 with S.F. T-8 Lamps</td>
<td>330</td>
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<td>$0.00</td>
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Building Type: Elementary 18% WWR - Norfolk, Nebraska

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<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
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<td>TOTALS =</td>
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<td>$527,630.00</td>
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## Nebraska-Specific Advanced Commercial Building Energy Code Study

**September 2, 2009**

**BCC Project #: 09-08-0120**

**Building Type:** Elementary 18% WWR - Omaha, Nebraska

### Description

<table>
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<tr>
<th>DESCRIPTION</th>
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<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
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<tr>
<td><strong>General:</strong></td>
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<tr>
<td>Exterior Wall System</td>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs without continuous rigid insulation.</td>
<td>13,540</td>
<td>S.F.</td>
<td>$2.62</td>
<td>$35,474.80</td>
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<tr>
<td></td>
<td>R13 fiberglass batt insulation in 4-inch mtl. Studs plus R3.8 continuous rigid insulation.</td>
<td>13,540</td>
<td>S.F.</td>
<td>$3.50</td>
<td>$47,390.00</td>
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<td>Added (Delta) Cost</td>
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<td>$11,915.20</td>
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<tr>
<td>Exterior Roof System</td>
<td>R20 (above deck) polyisocyanurate insulation.</td>
<td>50,000</td>
<td>S.F.</td>
<td>$2.29</td>
<td>$114,500.00</td>
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<tr>
<td></td>
<td>R17 entirely above deck</td>
<td>50,000</td>
<td>S.F.</td>
<td>$2.00</td>
<td>$100,000.00</td>
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<tr>
<td>Exterior Windows</td>
<td>Insulated clear glass; Standard Aluminum frames.</td>
<td>2,440</td>
<td>S.F.</td>
<td>$41.00</td>
<td>$100,040.00</td>
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<td></td>
<td>Insulated clear glass; Standard Aluminum frames (U=0.57 and SHGC = 0.34).</td>
<td>2,440</td>
<td>S.F.</td>
<td>$41.00</td>
<td>$100,040.00</td>
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<td><strong>H.V.A.C.</strong></td>
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<tr>
<td>System 1</td>
<td>Packaged single zone heat pumps (5 tons)</td>
<td>1</td>
<td>EA.</td>
<td>$6,500.00</td>
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<td>TOTAL</td>
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<tr>
<td>System 3</td>
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<tr>
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<td>$15,600.00</td>
</tr>
<tr>
<td>System 8</td>
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<td>$10,400.00</td>
<td>$10,400.00</td>
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<tr>
<td>DESCRIPTION</td>
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<td>COST / UNIT</td>
<td>TOTAL</td>
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<tr>
<td>System 9</td>
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</tbody>
</table>
### Nebraska-Specific Advanced Commercial Building Energy Code Study

**September 2, 2009**

**Building Type:** Elementary 18% WWR - Omaha, Nebraska

#### DESCRIPTION

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<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
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<td>1,440 CFM.</td>
<td>1</td>
<td>EA.</td>
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<td>$8,700.00</td>
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<td>LPD 1.2 with S.F. T-8 Lamps</td>
<td>330</td>
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**Building Cost Consultants, Inc.**
P.O. Box 278, Plattsmouth, NE 68048
Phone: (402) 298-8260 Fax: (402) 298-8290
bccdsieh@cox.net
### Description

<table>
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<th>DESCRIPTION</th>
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<th>QTY</th>
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**ADDED (DELTA) COST TOTAL:** $182,415.20
## Nebraska-Specific Advanced Commercial Building Energy Code Study

### Building Type:
**Small Retail - Chadron, Nebraska - 8% WWR**

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<tr>
<td><strong>Exterior Wall System</strong></td>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.</td>
<td>4,620</td>
<td>S.F.</td>
<td>$3.50</td>
<td>$16,170.00</td>
<td>R21 fiberglass batt insulation in 6-inch mtl. Studs plus R7.5 continuous rigid insulation.</td>
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<td>$2.29</td>
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<td>R40 (above deck) polyisocyanurate insulation.</td>
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<td>S.F.</td>
<td>$3.75</td>
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<td><strong>Exterior Windows</strong></td>
<td>Insulated clear glass; Standard Aluminum frames.</td>
<td>370</td>
<td>S.F.</td>
<td>$41.00</td>
<td>$15,170.00</td>
<td>PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.</td>
<td>370</td>
<td>S.F.</td>
<td>$56.00</td>
<td>$20,720.00</td>
<td>$5,550.00</td>
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<td><strong>H.V.A.C.</strong></td>
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<tr>
<td><strong>System 1</strong></td>
<td>Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 3 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$3,000.00</td>
<td>$3,000.00</td>
<td>CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 2 ton.</td>
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<td>EA.</td>
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<td><strong>System 2</strong></td>
<td>Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 5 ton.</td>
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<td>$5,000.00</td>
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## Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Small Retail - Chadron, Nebraska - 8% WWR

### Table of System Costs

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<th>QTY</th>
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<th>COST / UNIT</th>
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<tr>
<td>System 3</td>
<td>Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 2 ton.</td>
<td>1 EA.</td>
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<td>System 4</td>
<td>Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 6 ton.</td>
<td>1 EA.</td>
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<tr>
<td>System 5</td>
<td>Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 2 ton.</td>
<td>1 EA.</td>
<td>$2,000.00</td>
<td>$2,000.00</td>
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</tr>
<tr>
<td>Lighting</td>
<td>T-8 Lamps.</td>
<td>130 EA.</td>
<td>$130.00</td>
<td>$16,900.00</td>
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**ALTERNATIVE (PROPOSED) BUILDING**

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<th>DESCRIPTION</th>
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<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
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<td>System 4</td>
<td>1 EA.</td>
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<tr>
<td>System 5</td>
<td>1 EA.</td>
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<td>$1,500.00</td>
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<tr>
<td>Lighting</td>
<td>130 EA.</td>
<td>$130.00</td>
<td>$16,900.00</td>
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**ADDED (DELTA) COST TOTAL**

- **System 3:** $(500.00)
- **System 4:** $4,000.00
- **System 5:** $(500.00)

**TOTALS**

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<th><strong>ALTERNATIVE (PROPOSED) BUILDING</strong></th>
<th><strong>ADDED (DELTA) COST TOTAL</strong></th>
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<td><strong>System 4</strong></td>
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<td><strong>TOTALS</strong></td>
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### Nebraska-Specific Advanced Commercial Building Energy Code Study
September 2, 2009

**Building Type:** Small Retail - Norfolk, Nebraska - 8% WWR

#### DESCRIPTION

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<th>UNIT</th>
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<td>Exterior Wall System</td>
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<td></td>
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<tr>
<td>R13 fiberglass batt</td>
<td>4,620</td>
<td>S.F.</td>
<td>$3.50</td>
<td>$16,170.00</td>
<td>R21 fiberglass batt</td>
<td>4,620</td>
<td>S.F.</td>
<td>$5.50</td>
<td>$25,410.00</td>
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<td>insulation in 4-inch mtl.</td>
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<td>Studies plus R3.8 continuous</td>
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<td>studs plus R3.8</td>
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<td>rigid insulation.</td>
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<td>Exterior Roof System</td>
<td>5,000</td>
<td>S.F.</td>
<td>$2.29</td>
<td>$11,450.00</td>
<td>R40 (above deck) polyisocyanurate insulation.</td>
<td>5,000</td>
<td>S.F.</td>
<td>$3.75</td>
<td>$18,750.00</td>
<td>$7,300.00</td>
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<td>Insulated clear glass;</td>
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<td>Standard Aluminum frames.</td>
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<tr>
<td>Standard Aluminum frames.</td>
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<tr>
<td>Exterior Windows</td>
<td>370</td>
<td>S.F.</td>
<td>$41.00</td>
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<td>PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.</td>
<td>370</td>
<td>S.F.</td>
<td>$56.00</td>
<td>$20,720.00</td>
<td>$5,550.00</td>
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<tr>
<td>H.V.A.C.</td>
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<tr>
<td>System 1</td>
<td>1</td>
<td>EA.</td>
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<td>CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 3 ton.</td>
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<td>$7,500.00</td>
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<td>CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 5 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$7,500.00</td>
<td>$7,500.00</td>
<td>$1,000.00</td>
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## Nebraska-Specific Advanced Commercial Building Energy Code Study

### Building Type: Small Retail - Norfolk, Nebraska - 8% WWR

### Building Cost Consultants, Inc.
P.O. Box 278, Plattsmouth, NE 68048 Phone: (402) 298-8260 Fax: (402) 298-8290 bccdsieh@cox.net

**DESCRIPTION**

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<th>SYSTEM</th>
<th>DESCRIPTION</th>
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<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
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<td>System 3</td>
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<td>CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 2 ton.</td>
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<td><strong>ADDED (DELTA) COST TOTAL</strong></td>
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<td>$1,000.00</td>
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| System 4 | Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 6 ton. | 1 EA. | $6,500.00 | $6,500.00 |
|  | CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 5 ton. | 1 EA. | $7,500.00 | $7,500.00 |
|  | **ADDED (DELTA) COST TOTAL** | | | $1,000.00 |

| System 5 | Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 2 ton. | 1 EA. | $2,000.00 | $2,000.00 |
|  | CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 1 ton. | 1 EA. | $1,500.00 | $1,500.00 |
|  | **ADDED (DELTA) COST TOTAL** | | | ($500.00) |

**Lighting:**

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<td>T-8 Lamps.</td>
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**TOTALS =**

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<td><strong>BASELINE BUILDING</strong></td>
<td><strong>ALTERNATIVE (PROPOSED) BUILDING</strong></td>
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<td><strong>$105,780.00</strong></td>
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## Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Small Retail - Omaha, Nebraska - 8% WWR  
**BCC Project # 09-08-0120**  
**September 2, 2009**

### 2003 IECC BASELINE BUILDING

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exterior Wall System</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs without continuous rigid insulation.</td>
<td>4,620</td>
<td>S.F.</td>
<td>$3.50</td>
<td>$16,170.00</td>
</tr>
<tr>
<td>Exterior Roof System</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R19 (above deck) polyisocyanurate insulation.</td>
<td>5,000</td>
<td>S.F.</td>
<td>$2.29</td>
<td>$11,450.00</td>
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<tr>
<td>Exterior Windows</td>
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<td></td>
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<tr>
<td>Insulated clear glass; Standard Aluminum frames.</td>
<td>370</td>
<td>S.F.</td>
<td>$41.00</td>
<td>$15,170.00</td>
</tr>
<tr>
<td>H.V.A.C.</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>System 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 3 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$3,000.00</td>
<td>$3,000.00</td>
</tr>
<tr>
<td>System 2</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 6 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$6,500.00</td>
<td>$6,500.00</td>
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### ALTERNATIVE (PROPOSED) BUILDING

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<td>Exterior Wall System</td>
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<tr>
<td>R21 fiberglass batt insulation in 6-inch mtl. Studs plus R7.5 continuous rigid insulation.</td>
<td>4,620</td>
<td>S.F.</td>
<td>$5.50</td>
<td>$25,410.00</td>
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<tr>
<td>Exterior Roof System</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>R40 (above deck) polyisocyanurate insulation.</td>
<td>5,000</td>
<td>S.F.</td>
<td>$3.75</td>
<td>$18,750.00</td>
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<tr>
<td>Exterior Windows</td>
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</tr>
<tr>
<td>PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.</td>
<td>370</td>
<td>S.F.</td>
<td>$56.00</td>
<td>$20,720.00</td>
</tr>
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<td>H.V.A.C.</td>
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<tr>
<td>System 1</td>
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</tr>
<tr>
<td>CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 3 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$4,500.00</td>
<td>$4,500.00</td>
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<tr>
<td>System 2</td>
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<tr>
<td>CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 5 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$4,500.00</td>
<td>$4,500.00</td>
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### ADDED (DELTA) COST TOTAL

<p>| | | | | |</p>
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<td>R21 fiberglass batt insulation in 6-inch mtl. Studs plus R7.5 continuous rigid insulation.</td>
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Building Cost Consultants, Inc.  
P.O. Box 278, Plattsmouth, NE 68048  
Phone: (402) 298-8260  Fax: (402) 298-8290  
bccdsieh@cox.net
### Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Small Retail - Omaha, Nebraska - 8% WWR

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
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<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
</tr>
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<tbody>
<tr>
<td>System 3</td>
<td>Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 1 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$1,500.00</td>
<td>$1,500.00</td>
<td>CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 2 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$3,000.00</td>
<td>$3,000.00</td>
<td>$1,500.00</td>
</tr>
<tr>
<td>System 4</td>
<td>Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 6 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$6,500.00</td>
<td>$6,500.00</td>
<td>CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 5 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$7,500.00</td>
<td>$7,500.00</td>
<td>$1,000.00</td>
</tr>
<tr>
<td>System 5</td>
<td>Packaged rooftop single zone A/C unit with 80% AFUE gas fired heat - 2 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$2,000.00</td>
<td>$2,000.00</td>
<td>CEE Tier-1 - DX split system with residential (90% AFUE) gas-fired furnace - 1 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$1,500.00</td>
<td>$1,500.00</td>
<td>($500.00)</td>
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<tr>
<td>Lighting</td>
<td>T-8 Lamps.</td>
<td>130</td>
<td>EA.</td>
<td>$130.00</td>
<td>$16,900.00</td>
<td>T-8 Lamps.</td>
<td>130</td>
<td>EA.</td>
<td>$130.00</td>
<td>$16,900.00</td>
<td>$0.00</td>
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<tr>
<td><strong>TOTALS =</strong></td>
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<td><strong>$79,190.00</strong></td>
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<td><strong>$102,780.00</strong></td>
<td><strong>$23,590.00</strong></td>
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### Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Small Office - Chadron, Nebraska - 38% WWR

**September 2, 2009**

**BCC Project # 09-08-0120**

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</tr>
<tr>
<td><strong>Exterior Wall System</strong></td>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs plus R7 continuous rigid insulation.</td>
<td>5,834</td>
<td>S.F.</td>
<td>$3.97</td>
<td>$23,160.98</td>
<td>R21 fiberglass batt insulation in 6-inch mtl. Studs plus R7.5 continuous rigid insulation.</td>
<td>5,834</td>
<td>S.F.</td>
<td>$5.50</td>
<td>$32,087.00</td>
<td>$8,926.02</td>
</tr>
<tr>
<td><strong>Exterior Roof System</strong></td>
<td>R24 (above deck) polyisocyanurate insulation.</td>
<td>10,000</td>
<td>S.F.</td>
<td>$3.02</td>
<td>$30,200.00</td>
<td>R40 (above deck) polyisocyanurate insulation.</td>
<td>10,000</td>
<td>S.F.</td>
<td>$3.75</td>
<td>$37,500.00</td>
<td>$7,300.00</td>
</tr>
<tr>
<td><strong>Exterior Windows</strong></td>
<td>Interior clear glass; No thermal frames.</td>
<td>2,217</td>
<td>S.F.</td>
<td>$41.00</td>
<td>$90,897.00</td>
<td>PPG-Solarban 80 with thermally broken aluminum frames - U = 0.41 and SHGC = 0.24</td>
<td>2,217</td>
<td>S.F.</td>
<td>$63.00</td>
<td>$139,671.00</td>
<td>$48,774.00</td>
</tr>
<tr>
<td><strong>H.V.A.C.</strong></td>
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</tr>
<tr>
<td><strong>System 1</strong></td>
<td>Packaged rooftop single zone - 7 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$8,000.00</td>
<td>$8,000.00</td>
<td>Split system with dedicated E.R.V., 90% EFP furnace - 5 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$9,000.00</td>
<td>$9,000.00</td>
<td>$1,000.00</td>
</tr>
<tr>
<td><strong>System 2</strong></td>
<td>Packaged rooftop single zone - 4 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$4,500.00</td>
<td>$4,500.00</td>
<td>Split system with dedicated E.R.V., 90% EFP furnace - 3 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$5,500.00</td>
<td>$5,500.00</td>
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</tr>
<tr>
<td>System 3</td>
<td>Packaged rooftop single zone - 4 ton.</td>
<td>1 EA.</td>
<td>$4,500.00</td>
<td>$4,500.00</td>
<td></td>
<td>Split system with dedicated E.R.V., 90% EFP furnace - 3 ton.</td>
<td>1 EA.</td>
<td>$5,500.00</td>
<td>$5,500.00</td>
<td>$1,000.00</td>
<td></td>
</tr>
<tr>
<td>System 4</td>
<td>Packaged rooftop single zone - 4 ton.</td>
<td>1 EA.</td>
<td>$4,500.00</td>
<td>$4,500.00</td>
<td></td>
<td>Split system with dedicated E.R.V., 90% EFP furnace - 3 ton.</td>
<td>1 EA.</td>
<td>$5,500.00</td>
<td>$5,500.00</td>
<td>$1,000.00</td>
<td></td>
</tr>
<tr>
<td>System 5</td>
<td>Packaged rooftop single zone - 8 ton.</td>
<td>1 EA.</td>
<td>$8,500.00</td>
<td>$8,500.00</td>
<td></td>
<td>Split system with dedicated E.R.V., 90% EFP furnace - 7 ton.</td>
<td>1 EA.</td>
<td>$12,500.00</td>
<td>$12,500.00</td>
<td>$4,000.00</td>
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<tr>
<td></td>
<td>Heat Recovery Unit (total energy wheel type including supply and exhaust fans, controls and associated insulated ductwork) - 890 CFM.</td>
<td>1 EA.</td>
<td>$7,500.00</td>
<td>$7,500.00</td>
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<td></td>
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<td>$7,500.00</td>
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</tr>
<tr>
<td>Lighting:</td>
<td>LPD = 1.0 watts / S.F. T-8 lamps.</td>
<td>100 EA.</td>
<td>$100.00</td>
<td>$10,000.00</td>
<td></td>
<td>LPD = 0.8 watts / S.F. T-5 lamps.</td>
<td>100 EA.</td>
<td>$160.00</td>
<td>$16,000.00</td>
<td>$6,000.00</td>
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<td>$184,257.98</td>
<td>$270,758.00</td>
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<td>R24 (above deck) polyisocyanurate insulation.</td>
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<tr>
<td>Packaged rooftop single zone - 7 ton.</td>
<td>1 EA.</td>
<td>$8,000.00</td>
<td>$8,000.00</td>
<td></td>
<td>Split system with dedicated E.R.V., 90% EFP furnace - 5 ton.</td>
<td>1 EA.</td>
<td>$9,000.00</td>
<td>$9,000.00</td>
<td>$1,000.00</td>
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</tr>
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<td><strong>System 2</strong></td>
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<td>Packaged rooftop single zone- 4 ton.</td>
<td>1 EA.</td>
<td>$4,500.00</td>
<td>$4,500.00</td>
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<td>Split system with dedicated E.R.V., 90% EFP furnace - 3 ton.</td>
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<td><strong>System 3</strong></td>
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### Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Small Office - Norfolk, Nebraska - 38% WWR

#### DESCRIPTION

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<th>QTY</th>
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<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>System 4</td>
<td>Packaged rooftop single zone - 4 ton.</td>
<td>1 EA.</td>
<td>$4,500.00</td>
<td>$4,500.00</td>
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<tr>
<td></td>
<td>Split system with dedicated E.R.V., 90% EFP furnace - 3 ton.</td>
<td>1 EA.</td>
<td>$5,500.00</td>
<td>$5,500.00</td>
<td>$1,000.00</td>
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<td>System 5</td>
<td>Packaged rooftop single zone - 9 ton.</td>
<td>1 EA.</td>
<td>$9,000.00</td>
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<tr>
<td></td>
<td>Split system with dedicated E.R.V., 90% EFP furnace - 7 ton.</td>
<td>1 EA.</td>
<td>$12,500.00</td>
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<td>$3,500.00</td>
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<td></td>
<td>Heat Recovery Unit (total energy wheel type including supply and exhaust fans, controls and associated insulated ductwork) - 890 CFM.</td>
<td>1 EA.</td>
<td>$7,500.00</td>
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<td>Lighting:</td>
<td>LPD = 1.0 watts / S.F. T-8 lamps.</td>
<td>100 EA.</td>
<td>$100.00</td>
<td>$10,000.00</td>
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<td>LPD = 0.8 watts / S.F. T-5 lamps.</td>
<td>100 EA.</td>
<td>$160.00</td>
<td>$16,000.00</td>
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<td><strong>TOTALS</strong></td>
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Building Cost Consultants, Inc.  P.O. Box 278, Plattsmouth, NE 68048 Phone: (402) 298-8260 Fax: (402) 298-8290  bccdsieh@cox.net
<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
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</thead>
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<tr>
<td>General:</td>
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<td>Exterior Wall System</td>
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<td>5,834</td>
<td>S.F.</td>
<td>$2.62</td>
<td>$15,285.08</td>
<td>R21 fiberglass batt</td>
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<td>S.F.</td>
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<td>$16,801.92</td>
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<td>insulation in 4-inch</td>
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<td>insulation in 6-inch mtl.</td>
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<td></td>
<td>mtl. studs without</td>
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<td>Studs plus R7.5 continuous</td>
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<td>continuous rigid</td>
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<td>rigid insulation.</td>
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<tr>
<td></td>
<td>insulation.</td>
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<td>Exterior Roof System</td>
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<tr>
<td>Exterior Windows</td>
<td>Interior clear glass; No</td>
<td>2,217</td>
<td>S.F.</td>
<td>$41.00</td>
<td>$90,897.00</td>
<td>PPG-Solarban 80 with</td>
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<td>S.F.</td>
<td>$63.00</td>
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<td>thermally broken aluminum</td>
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<td></td>
<td>frames - U = 0.41 and SHGC = 0.24</td>
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<td>H.V.A.C.</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>System 1</td>
<td>Packaged rooftop single</td>
<td>1</td>
<td>EA.</td>
<td>$8,500.00</td>
<td>$8,500.00</td>
<td>Split system with dedicated E.R.V., 90% EFP furnace -</td>
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<td>EA.</td>
<td>$9,000.00</td>
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<tr>
<td></td>
<td>zone - 8 ton.</td>
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<td>5 ton.</td>
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<td>System 2</td>
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<td>EA.</td>
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<td>Split system with dedicated E.R.V., 90% EFP furnace -</td>
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<td>EA.</td>
<td>$5,500.00</td>
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<td>$1,000.00</td>
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<tr>
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<td>zone- 4 ton.</td>
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<td>3 ton.</td>
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</tbody>
</table>
### Nebraska-Specific Advanced Commercial Building Energy Code Study

**September 2, 2009**

**BCC Project # 09-08-0120**

**Building Type:** Small Office - Omaha, Nebraska - 38% WWR  
**Back to Summary**

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (Proposed) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>System 3</td>
<td>Packaged rooftop single zone - 5 ton.</td>
<td>1 EA.</td>
<td>$5,000.00</td>
<td>$5,000.00</td>
<td>Split system with dedicated E.R.V., 90% EFP furnace - 4 ton.</td>
<td>1 EA.</td>
<td>$7,500.00</td>
<td>$7,500.00</td>
<td>$2,500.00</td>
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<td>System 4</td>
<td>Packaged rooftop single zone - 4 ton.</td>
<td>1 EA.</td>
<td>$4,500.00</td>
<td>$4,500.00</td>
<td>Split system with dedicated E.R.V., 90% EFP furnace - 3 ton.</td>
<td>1 EA.</td>
<td>$5,500.00</td>
<td>$5,500.00</td>
<td>$1,000.00</td>
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</tr>
<tr>
<td>System 5</td>
<td>Packaged rooftop single zone - 9 ton.</td>
<td>1 EA.</td>
<td>$9,000.00</td>
<td>$9,000.00</td>
<td>Split system with dedicated E.R.V., 90% EFP furnace - 7 ton.</td>
<td>1 EA.</td>
<td>$12,500.00</td>
<td>$12,500.00</td>
<td>$3,500.00</td>
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</tr>
<tr>
<td></td>
<td>Heat Recovery Unit (total energy wheel type including supply and exhaust fans, controls and associated insulated ductwork) - 890 CFM.</td>
<td>1 EA.</td>
<td>$7,500.00</td>
<td>$7,500.00</td>
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<td>$7,500.00</td>
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</tr>
<tr>
<td>Lighting:</td>
<td>LPD = 1.0 watts / S.F. T-8 lamps.</td>
<td>100 EA.</td>
<td>$100.00</td>
<td>$10,000.00</td>
<td>LPD = 0.8 watts / S.F. T-5 lamps.</td>
<td>100 EA.</td>
<td>$160.00</td>
<td>$16,000.00</td>
<td>$6,000.00</td>
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<tr>
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<td><strong>TOTALS =</strong></td>
<td><strong>$177,882.08</strong></td>
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<td><strong>$272,758.00</strong></td>
<td><strong>$94,875.92</strong></td>
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</tbody>
</table>
### General:

- **Exterior Wall System**
  - R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.
  - QTY: 5,834 S.F.
  - Unit Cost: $3.50
  - Total: $20,419.00

- **Exterior Roof System**
  - R20 (above deck) polyisocyanurate insulation.
  - QTY: 10,000 S.F.
  - Unit Cost: $2.29
  - Total: $22,900.00

- **Exterior Windows**
  - Interior clear glass; No thermal frames.
  - QTY: 2,217 S.F.
  - Unit Cost: $41.00
  - Total: $90,897.00

- **H.V.A.C.**
  - **System 1**
    - Packaged rooftop single zone - 5 ton.
    - QTY: 1 EA.
    - Unit Cost: $9,000.00
    - Total: $9,000.00

  - **System 2**
    - Packaged rooftop single zone - 3 ton.
    - QTY: 1 EA.
    - Unit Cost: $3,000.00
    - Total: $3,000.00

### Alternative (Proposed) Building:

- **Exterior Wall System**
  - R21 fiberglass batt insulation in 6-inch mtl. Studs plus R7.5 continuous rigid insulation.
  - QTY: 5,834 S.F.
  - Unit Cost: $5.50
  - Total: $32,087.00

- **Exterior Roof System**
  - R40 (above deck) polyisocyanurate insulation.
  - QTY: 10,000 S.F.
  - Unit Cost: $3.75
  - Total: $37,500.00

- **Exterior Windows**
  - PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.
  - QTY: 2,217 S.F.
  - Unit Cost: $56.00
  - Total: $124,152.00

### Added (Delta) Cost:

- **Exterior Wall System**
  - Delta Cost: $11,668.00

- **Exterior Roof System**
  - Delta Cost: $14,600.00

- **Exterior Windows**
  - Delta Cost: $33,255.00

- **System 1**
  - Delta Cost: ($1,500.00)

- **System 2**
  - Delta Cost: $500.00
### Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Small Office - Chadron, Nebraska - 18% WWR

#### DESCRIPTION

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
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<tr>
<td>System 3</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$4,500.00</td>
<td>$4,500.00</td>
<td>Split system with dedicated E.R.V., 90% EFP furnace - 3 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$5,500.00</td>
<td>$5,500.00</td>
<td>$1,000.00</td>
</tr>
<tr>
<td>Packaged rooftop single zone - 4 ton.</td>
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<tr>
<td>System 4</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$3,000.00</td>
<td>$3,000.00</td>
<td>Split system with dedicated E.R.V., 90% EFP furnace - 2 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$3,500.00</td>
<td>$3,500.00</td>
<td>$500.00</td>
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<tr>
<td>Packaged rooftop single zone - 3 ton.</td>
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</tr>
<tr>
<td>System 5</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$8,500.00</td>
<td>$8,500.00</td>
<td>Split system with dedicated E.R.V., 90% EFP furnace - 7 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$12,500.00</td>
<td>$12,500.00</td>
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<tr>
<td>Packaged rooftop single zone - 8 ton.</td>
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</tr>
<tr>
<td>Heat Recovery Unit (total energy wheel type including supply and exhaust fans, controls and associated insulated ductwork) - 890 CFM.</td>
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<td></td>
<td>1</td>
<td>EA.</td>
<td>$7,500.00</td>
<td>$7,500.00</td>
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<td>Lighting:</td>
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<td>100</td>
<td>EA.</td>
<td>$100.00</td>
<td>$10,000.00</td>
<td>LPD = 0.8 watts / S.F. T-5 lamps.</td>
<td>100</td>
<td>EA.</td>
<td>$160.00</td>
<td>$16,000.00</td>
<td>$6,000.00</td>
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<tr>
<td>LPD = 1.0 watts / S.F. T-8 lamps.</td>
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$172,216.00

$249,739.00

$77,523.00
### Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Small Office - Norfolk, Nebraska - 18% WWR  
**BCC Project # 09-08-0120**

#### General:

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exterior Wall System</td>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.</td>
<td>5,834</td>
<td>S.F.</td>
<td>$3.50</td>
<td>$20,419.00</td>
</tr>
<tr>
<td>Exterior Roof System</td>
<td>R20 (above deck) polyisocyanurate insulation.</td>
<td>10,000</td>
<td>S.F.</td>
<td>$2.29</td>
<td>$22,900.00</td>
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<tr>
<td>Exterior Windows</td>
<td>Interior clear glass; No thermal frames.</td>
<td>2,217</td>
<td>S.F.</td>
<td>$41.00</td>
<td>$90,897.00</td>
</tr>
<tr>
<td>H.V.A.C. System 1</td>
<td>Packaged rooftop single zone - 5 ton.</td>
<td>1</td>
<td>EA.</td>
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<td>$9,000.00</td>
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<tr>
<td>H.V.A.C. System 2</td>
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#### Alternative (Proposed) Building:

<table>
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<tr>
<th>DESCRIPTION</th>
<th>QTY</th>
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<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exterior Wall System</td>
<td>R21 fiberglass batt insulation in 6-inch mtl. Studs plus R7.5 continuous rigid insulation.</td>
<td>5,834</td>
<td>S.F.</td>
<td>$5.50</td>
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<tr>
<td>Exterior Roof System</td>
<td>R40 (above deck) polyisocyanurate insulation.</td>
<td>10,000</td>
<td>S.F.</td>
<td>$3.75</td>
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<tr>
<td>Exterior Windows</td>
<td>PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.</td>
<td>2,217</td>
<td>S.F.</td>
<td>$56.00</td>
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<tr>
<td>H.V.A.C. System 1</td>
<td>Split system with dedicated E.R.V., 90% EFP furnace - 4 ton.</td>
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<td>EA.</td>
<td>$7,500.00</td>
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<td>H.V.A.C. System 2</td>
<td>Split system with dedicated E.R.V., 90% EFP furnace - 2 ton.</td>
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<td>EA.</td>
<td>$3,500.00</td>
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<table>
<thead>
<tr>
<th>ADDED (DELTA) COST TOTAL</th>
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<tbody>
<tr>
<td>$11,668.00</td>
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<tr>
<td>$14,600.00</td>
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<tr>
<td>$33,255.00</td>
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<td>($1,500.00)</td>
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<td>$500.00</td>
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<tr>
<td>DESCRIPTION</td>
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</tr>
<tr>
<td>System 3</td>
</tr>
<tr>
<td>System 4</td>
</tr>
<tr>
<td>System 5</td>
</tr>
<tr>
<td>Heat Recovery Unit (total energy wheel type including supply and exhaust fans, controls and associated insulated ductwork) - 890 CFM.</td>
</tr>
<tr>
<td>Lighting:</td>
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<tr>
<td><strong>TOTALS</strong></td>
</tr>
</tbody>
</table>
### Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Small Office - Omaha, Nebraska - 18% WWR  
**Back to Summary**

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General:</strong></td>
<td></td>
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</tr>
<tr>
<td><strong>Exterior Wall System</strong></td>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs without continuous rigid insulation.</td>
<td>5,834</td>
<td>S.F.</td>
<td>$2.62</td>
<td>$15,285.08</td>
<td>R21 fiberglass batt insulation in 6-inch mtl. Studs plus R7.5 continuous rigid insulation.</td>
<td>5,834</td>
<td>S.F.</td>
<td>$5.50</td>
<td>$32,087.00</td>
<td>$16,801.92</td>
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<tr>
<td><strong>Exterior Roof System</strong></td>
<td>R20 (above deck) polyisocyanurate insulation.</td>
<td>10,000</td>
<td>S.F.</td>
<td>$2.29</td>
<td>$22,900.00</td>
<td>R40 (above deck) polyisocyanurate insulation.</td>
<td>10,000</td>
<td>S.F.</td>
<td>$3.75</td>
<td>$37,500.00</td>
<td>$14,600.00</td>
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<tr>
<td><strong>Exterior Windows</strong></td>
<td>Interior clear glass; No thermal frames.</td>
<td>2,217</td>
<td>S.F.</td>
<td>$41.00</td>
<td>$90,897.00</td>
<td>PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.</td>
<td>2,217</td>
<td>S.F.</td>
<td>$56.00</td>
<td>$124,152.00</td>
<td>$33,255.00</td>
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<tr>
<td><strong>H.V.A.C.</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>System 1</strong></td>
<td>Packaged rooftop single zone - 5 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$9,000.00</td>
<td>$9,000.00</td>
<td>Split system with dedicated E.R.V., 90% EFP furnace - 4 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$7,500.00</td>
<td>$7,500.00</td>
<td>($1,500.00)</td>
</tr>
<tr>
<td><strong>System 2</strong></td>
<td>Packaged rooftop single zone- 3 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$3,000.00</td>
<td>$3,000.00</td>
<td>Split system with dedicated E.R.V., 90% EFP furnace - 2 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$3,500.00</td>
<td>$3,500.00</td>
<td>$500.00</td>
</tr>
</tbody>
</table>
## Nebraska-Specific Advanced Commercial Building Energy Code Study

BCC Project # 09-08-0120

**Building Type:** Small Office - Omaha, Nebraska - 18% WW

### System 3

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaged rooftop single zone - 4 ton.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$4,500.00</td>
<td>$4,500.00</td>
</tr>
</tbody>
</table>

### System 4

<table>
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<th>DESCRIPTION</th>
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<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaged rooftop single zone - 3 ton.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$3,000.00</td>
<td>$3,000.00</td>
</tr>
</tbody>
</table>

### System 5

<table>
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<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaged rooftop single zone - 9 ton.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$9,000.00</td>
<td>$9,000.00</td>
</tr>
</tbody>
</table>

### ALTERNATIVE (PROPOSED) BUILDING

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Split system with dedicated E.R.V., 90% EFP furnace - 3 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$5,500.00</td>
<td>$5,500.00</td>
</tr>
<tr>
<td>Split system with dedicated E.R.V., 90% EFP furnace - 2 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$3,500.00</td>
<td>$3,500.00</td>
</tr>
<tr>
<td>Heat Recovery Unit (total energy wheel type including supply and exhaust fans, controls and associated insulated ductwork) - 890 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$7,500.00</td>
<td>$7,500.00</td>
</tr>
</tbody>
</table>

### Lighting:

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPD = 1.0 with S.F. T-8 lamps.</td>
<td>100</td>
<td>EA.</td>
<td>$100.00</td>
<td>$10,000.00</td>
</tr>
<tr>
<td>LPD = 0.8 with S.F. T-5 lamps.</td>
<td>100</td>
<td>EA.</td>
<td>$160.00</td>
<td>$16,000.00</td>
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</tbody>
</table>

**TOTALS =**

- **2003 IECC BASELINE BUILDING:** $167,582.08
- **ALTERNATIVE (PROPOSED) BUILDING:** $249,739.00
- **ADDED (DELTA) COST TOTAL:** $82,156.92
# Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Large Office - Chadron, Nebraska - 38% WWR  
**Project #:** BCC Project # 09-08-0120

## Description

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exterior Wall System</td>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs plus R7 continuous rigid insulation.</td>
<td>21,600</td>
<td>S.F.</td>
<td>$3.97</td>
<td>$85,752.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>R13 fiberglass batt insulation in 4-inch mtl. Studs plus R3.8 continuous rigid insulation.</td>
<td>21,600</td>
<td>S.F.</td>
<td>$3.50</td>
<td>$75,600.00</td>
</tr>
</tbody>
</table>

**ADDED (DELTA) COST**

$10,152.00

| Exterior Roof System | R24 (above deck) polyisocyanurate insulation. | 20,000 | S.F. | $3.02 | $60,400.00 |

| R15 (above deck) polyisocyanurate insulation. | 20,000 | S.F. | $1.75 | $35,000.00 |

**ADDED (DELTA) COST**

$25,400.00

| Exterior Windows | Interior clear glass; No thermal frames. | 8,208 | S.F. | $41.00 | $336,528.00 |

| PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames. | 8,208 | S.F. | $56.00 | $459,648.00 |

**ADDED (DELTA) COST**

$123,120.00

| H.V.A.C. System 1 | Packaged rooftop single zone - 10 ton. | 1 | EA. | $10,000.00 | $10,000.00 |

| Packaged V.A.V. with electrical reheat system fans with V.S.D. - 48 ton. | 1 | EA. | $96,000.00 | $96,000.00 |

| V.A.V. Boxes - 3,393 CFM. | 1 | EA. | $3,400.00 | $3,400.00 |

| V.A.V. Boxes - 1,604 CFM. | 1 | EA. | $1,600.00 | $1,600.00 |

<p>| V.A.V. Boxes - 2,056 CFM. | 1 | EA. | $2,100.00 | $2,100.00 |</p>
<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>V.A.V. Boxes - 1,646 CFM.</td>
<td>1 EA.</td>
<td>$1,700.00</td>
<td>$1,700.00</td>
<td>$1,700.00</td>
<td></td>
</tr>
<tr>
<td>V.A.V. Boxes - 3,500 CFM.</td>
<td>2 EA.</td>
<td>$3,500.00</td>
<td>$7,000.00</td>
<td>$7,000.00</td>
<td></td>
</tr>
<tr>
<td>System 2</td>
<td>Packaged rooftop single zone- 5 ton.</td>
<td>1 EA.</td>
<td>$5,000.00</td>
<td>$5,000.00</td>
<td></td>
</tr>
<tr>
<td>V.A.V. Boxes - 2,100 CFM.</td>
<td>2 EA.</td>
<td>$2,100.00</td>
<td>$4,200.00</td>
<td>$4,200.00</td>
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</tr>
<tr>
<td>V.A.V. Boxes - 1,904 CFM.</td>
<td>1 EA.</td>
<td>$1,900.00</td>
<td>$1,900.00</td>
<td>$1,900.00</td>
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</tr>
<tr>
<td>V.A.V. Boxes - 2,390 CFM.</td>
<td>1 EA.</td>
<td>$2,400.00</td>
<td>$2,400.00</td>
<td>$2,400.00</td>
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</tr>
<tr>
<td>V.A.V. Boxes - 1,827 CFM.</td>
<td>1 EA.</td>
<td>$1,800.00</td>
<td>$1,800.00</td>
<td>$1,800.00</td>
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</tr>
<tr>
<td>V.A.V. Boxes - 3,500 CFM.</td>
<td>2 EA.</td>
<td>$3,500.00</td>
<td>$7,000.00</td>
<td>$7,000.00</td>
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<tr>
<td>System 3</td>
<td>Packaged rooftop single zone - 6 ton.</td>
<td>1 EA.</td>
<td>$6,500.00</td>
<td>$6,500.00</td>
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<tr>
<td>V.A.V. Boxes - 2,100 CFM.</td>
<td>1 EA.</td>
<td>$2,100.00</td>
<td>$2,100.00</td>
<td>$2,100.00</td>
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<tr>
<td>V.A.V. Boxes - 1,904 CFM.</td>
<td>1 EA.</td>
<td>$1,900.00</td>
<td>$1,900.00</td>
<td>$1,900.00</td>
<td></td>
</tr>
<tr>
<td>V.A.V. Boxes - 2,390 CFM.</td>
<td>1 EA.</td>
<td>$2,400.00</td>
<td>$2,400.00</td>
<td>$2,400.00</td>
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## DESCRIPTION

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### ALTERNATIVE (PROPOSED) BUILDING

<table>
<thead>
<tr>
<th>QTY</th>
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### ADDED (DELTA) COST TOTAL

<table>
<thead>
<tr>
<th>V.A.V. Boxes - 1,827 CFM.</th>
<th>1 EA.</th>
<th>$1,800.00</th>
<th>$1,800.00</th>
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</thead>
<tbody>
<tr>
<td>V.A.V. Boxes - 3,500 CFM.</td>
<td>2 EA.</td>
<td>$3,500.00</td>
<td>$7,000.00</td>
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</table>

<table>
<thead>
<tr>
<th>System 4</th>
<th>Packaged rooftop single zone - 5 ton.</th>
<th>1 EA.</th>
<th>$5,000.00</th>
<th>$5,000.00</th>
</tr>
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<tbody>
<tr>
<td>System 5</td>
<td>Packaged rooftop single zone - 17 ton.</td>
<td>1 EA.</td>
<td>$17,000.00</td>
<td>$17,000.00</td>
</tr>
<tr>
<td>System 6</td>
<td>Packaged rooftop single zone - 12 ton.</td>
<td>1 EA.</td>
<td>$12,000.00</td>
<td>$12,000.00</td>
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<tr>
<td>System 7</td>
<td>Packaged rooftop single zone - 6 ton.</td>
<td>1 EA.</td>
<td>$6,500.00</td>
<td>$6,500.00</td>
</tr>
<tr>
<td>System 8</td>
<td>Packaged rooftop single zone - 7 ton.</td>
<td>1 EA.</td>
<td>$8,000.00</td>
<td>$8,000.00</td>
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<tr>
<td>System 9</td>
<td>Packaged rooftop single zone - 6 ton.</td>
<td>1 EA.</td>
<td>$6,500.00</td>
<td>$6,500.00</td>
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<tr>
<td>System 10</td>
<td>Packaged rooftop single zone - 17 ton.</td>
<td>1 EA.</td>
<td>$17,000.00</td>
<td>$17,000.00</td>
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<tr>
<td>System 11</td>
<td>Packaged rooftop single zone - 13 ton.</td>
<td>1 EA.</td>
<td>$13,000.00</td>
<td>$13,000.00</td>
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<tr>
<td>DESCRIPTION</td>
<td>2003 IECC BASELINE BUILDING</td>
<td>QTY</td>
<td>UNIT</td>
<td>COST / UNIT</td>
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<tr>
<td>System 12</td>
<td>Packaged rooftop single zone - 6 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$6,500.00</td>
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<tr>
<td>System 13</td>
<td>Packaged rooftop single zone - 21 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$20,000.00</td>
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<tr>
<td>System 14</td>
<td>Packaged rooftop single zone - 6 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$6,500.00</td>
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<tr>
<td>System 15</td>
<td>Packaged rooftop single zone - 21 ton.</td>
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<td>$20,000.00</td>
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<tr>
<td>Lighting</td>
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<tr>
<td><strong>TOTALS =</strong></td>
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### Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Large Office - Norfolk, Nebraska - 38% WWR  
**Building Type:** Large Office - Norfolk, Nebraska - 38% WWR

<table>
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<th>DESCRIPTION</th>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Exterior Wall System</strong></td>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs plus R7 continuous rigid insulation.</td>
<td>21,600</td>
<td>S.F.</td>
<td>$3.97</td>
<td>$85,752.00</td>
</tr>
<tr>
<td><strong>Exterior Roof System</strong></td>
<td>R24 (above deck) polyisocyanurate insulation.</td>
<td>20,000</td>
<td>S.F.</td>
<td>$3.02</td>
<td>$60,400.00</td>
</tr>
<tr>
<td><strong>Exterior Windows</strong></td>
<td>Interior clear glass; No thermal frames.</td>
<td>8,208</td>
<td>S.F.</td>
<td>$41.00</td>
<td>$336,528.00</td>
</tr>
<tr>
<td><strong>H.V.A.C.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>System 1</strong></td>
<td>Packaged rooftop single zone - 11 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$11,000.00</td>
<td>$11,000.00</td>
</tr>
<tr>
<td></td>
<td>V.A.V. Boxes - 3,393 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$3,400.00</td>
<td>$3,400.00</td>
</tr>
<tr>
<td></td>
<td>V.A.V. Boxes - 1,604 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$1,600.00</td>
<td>$1,600.00</td>
</tr>
<tr>
<td></td>
<td>V.A.V. Boxes - 2,056 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$2,100.00</td>
<td>$2,100.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.</td>
<td>21,600</td>
<td>S.F.</td>
<td>$3.50</td>
<td>$75,600.00 ($10,152.00)</td>
</tr>
<tr>
<td>R15 (above deck) polyisocyanurate insulation.</td>
<td>20,000</td>
<td>S.F.</td>
<td>$1.75</td>
<td>$35,000.00 ($25,400.00)</td>
</tr>
<tr>
<td>PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.</td>
<td>8,208</td>
<td>S.F.</td>
<td>$56.00</td>
<td>$459,648.00 $123,120.00</td>
</tr>
<tr>
<td>Packaged V.A.V. with electrical reheat system fans with V.S.D. - 49 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$98,500.00</td>
<td>$98,500.00 $87,500.00</td>
</tr>
<tr>
<td>V.A.V. Boxes - 3,393 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$3,400.00</td>
<td>$3,400.00</td>
</tr>
<tr>
<td>V.A.V. Boxes - 1,604 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$1,600.00</td>
<td>$1,600.00</td>
</tr>
<tr>
<td>V.A.V. Boxes - 2,056 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$2,100.00</td>
<td>$2,100.00</td>
</tr>
</tbody>
</table>

**ADDED (DELTA) COST TOTAL:**

- $10,152.00
- $25,400.00
- $123,120.00
- $87,500.00
- $3,400.00
- $1,600.00
- $2,100.00
<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
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<th>QTY</th>
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<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>V.A.V. Boxes - 1,646 CFM.</td>
<td>1 EA.</td>
<td>$1,700.00</td>
<td>$1,700.00</td>
<td>$1,700.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V.A.V. Boxes - 3,500 CFM.</td>
<td>2 EA.</td>
<td>$3,500.00</td>
<td>$7,000.00</td>
<td>$7,000.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>System 2</td>
<td>Packaged rooftop single zone - 5 ton.</td>
<td>1 EA.</td>
<td>$5,000.00</td>
<td>$5,000.00</td>
<td>Packaged V.A.V. with electrical reheat system fans with V.S.D. - 57 ton.</td>
<td>1 EA.</td>
<td>$106,000.00</td>
<td>$106,000.00</td>
<td>$101,000.00</td>
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<tr>
<td>V.A.V. Boxes - 2,100 CFM.</td>
<td>2 EA.</td>
<td>$2,100.00</td>
<td>$4,200.00</td>
<td>$4,200.00</td>
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</tr>
<tr>
<td>V.A.V. Boxes - 1,904 CFM.</td>
<td>1 EA.</td>
<td>$1,900.00</td>
<td>$1,900.00</td>
<td>$1,900.00</td>
<td></td>
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</tr>
<tr>
<td>V.A.V. Boxes - 2,390 CFM.</td>
<td>1 EA.</td>
<td>$2,400.00</td>
<td>$2,400.00</td>
<td>$2,400.00</td>
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<tr>
<td>V.A.V. Boxes - 1,827 CFM.</td>
<td>1 EA.</td>
<td>$1,800.00</td>
<td>$1,800.00</td>
<td>$1,800.00</td>
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<tr>
<td>V.A.V. Boxes - 3,500 CFM.</td>
<td>2 EA.</td>
<td>$3,500.00</td>
<td>$7,000.00</td>
<td>$7,000.00</td>
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<td>System 3</td>
<td>Packaged rooftop single zone - 7 ton.</td>
<td>1 EA.</td>
<td>$8,000.00</td>
<td>$8,000.00</td>
<td>Packaged V.A.V. with electrical reheat system fans with V.S.D. - 57 ton.</td>
<td>1 EA.</td>
<td>$114,000.00</td>
<td>$114,000.00</td>
<td>$106,000.00</td>
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<tr>
<td>V.A.V. Boxes - 2,100 CFM.</td>
<td>2 EA.</td>
<td>$2,100.00</td>
<td>$4,200.00</td>
<td>$4,200.00</td>
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<tr>
<td>V.A.V. Boxes - 1,904 CFM.</td>
<td>1 EA.</td>
<td>$1,900.00</td>
<td>$1,900.00</td>
<td>$1,900.00</td>
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<td>V.A.V. Boxes - 2,390 CFM.</td>
<td>1 EA.</td>
<td>$2,400.00</td>
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<td>System 4</td>
<td>Packaged rooftop single zone - 5 ton.</td>
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<td>System 5</td>
<td>Packaged rooftop single zone - 20 ton.</td>
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<td>$19,000.00</td>
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<td>System 6</td>
<td>Packaged rooftop single zone - 13 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$13,000.00</td>
<td>$13,000.00</td>
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<tr>
<td>System 7</td>
<td>Packaged rooftop single zone - 6 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$6,500.00</td>
<td>$6,500.00</td>
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<tr>
<td>System 8</td>
<td>Packaged rooftop single zone - 7 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$8,000.00</td>
<td>$8,000.00</td>
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<td>System 9</td>
<td>Packaged rooftop single zone - 6 ton.</td>
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<td>$6,500.00</td>
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<td>System 10</td>
<td>Packaged rooftop single zone - 20 ton.</td>
<td>1</td>
<td>EA.</td>
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<tr>
<td>System 11</td>
<td>Packaged rooftop single zone - 14 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$14,000.00</td>
<td>$14,000.00</td>
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<tr>
<th>DESCRIPTION</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
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<tbody>
<tr>
<td>V.A.V. Boxes - 1,827 CFM.</td>
<td>1 EA.</td>
<td>$1,800.00</td>
<td>$1,800.00</td>
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<tr>
<td>V.A.V. Boxes - 3,500 CFM.</td>
<td>2 EA.</td>
<td>$3,500.00</td>
<td>$7,000.00</td>
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</table>

ADDED (DELTA) COST TOTAL:

- V.A.V. Boxes - 1,827 CFM: $1,800.00
- V.A.V. Boxes - 3,500 CFM: $7,000.00
## Large Office - Norfolk, Nebraska - 38% WWR

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
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<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
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<th>ADDED (DELTA) COST TOTAL</th>
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<tbody>
<tr>
<td>System 12</td>
<td>Packaged rooftop single zone - 7 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$8,000.00</td>
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<tr>
<td>System 13</td>
<td>Packaged rooftop single zone - 8 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$8,500.00</td>
<td>$8,500.00</td>
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<tr>
<td>System 14</td>
<td>Packaged rooftop single zone - 6 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$6,500.00</td>
<td>$6,500.00</td>
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<tr>
<td>System 15</td>
<td>Packaged rooftop single zone - 23 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$22,000.00</td>
<td>$22,000.00</td>
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<tr>
<td>Lighting</td>
<td>None</td>
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<tr>
<td><strong>TOTALS</strong></td>
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<td>$939,148.00</td>
<td>$296,468.00</td>
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TOTALS = $642,680.00

Back to Summary
<table>
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<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
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<tr>
<td>General</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Exterior Wall System</td>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs without continuous rigid insulation.</td>
<td>21,600</td>
<td>S.F.</td>
<td>$2.62</td>
<td>$56,592.00</td>
<td>R13 fiberglass batt insulation in 4-inch mtl. Studs plus R3.8 continuous rigid insulation.</td>
<td>21,600</td>
<td>S.F.</td>
<td>$3.50</td>
<td>$75,600.00</td>
<td>$19,008.00</td>
</tr>
<tr>
<td>Exterior Roof System</td>
<td>R24 (above deck) polyisocyanurate insulation.</td>
<td>20,000</td>
<td>S.F.</td>
<td>$3.02</td>
<td>$60,400.00</td>
<td>R15 (above deck) polyisocyanurate insulation.</td>
<td>20,000</td>
<td>S.F.</td>
<td>$1.75</td>
<td>$35,000.00</td>
<td>($25,400.00)</td>
</tr>
<tr>
<td>Exterior Windows</td>
<td>Interior clear glass; No thermal frames.</td>
<td>8,208</td>
<td>S.F.</td>
<td>$41.00</td>
<td>$336,528.00</td>
<td>PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.</td>
<td>8,208</td>
<td>S.F.</td>
<td>$56.00</td>
<td>$459,648.00</td>
<td>$123,120.00</td>
</tr>
<tr>
<td>H.V.A.C.</td>
<td></td>
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</tr>
<tr>
<td>System 1</td>
<td>Packaged rooftop single zone - 11 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$11,000.00</td>
<td>$11,000.00</td>
<td>Packaged V.A.V. with electrical reheat system fans with V.S.D. - 49 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$98,500.00</td>
<td>$98,500.00</td>
<td>$87,500.00</td>
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<td></td>
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<td></td>
<td>V.A.V. Boxes - 3,393 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$3,400.00</td>
<td>$3,400.00</td>
<td>$3,400.00</td>
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<tr>
<td></td>
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<td></td>
<td>V.A.V. Boxes - 1,604 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$1,600.00</td>
<td>$1,600.00</td>
<td>$1,600.00</td>
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<td></td>
<td>V.A.V. Boxes - 2,056 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$2,100.00</td>
<td>$2,100.00</td>
<td>$2,100.00</td>
</tr>
</tbody>
</table>
### Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Large Office - Omaha, Nebraska - 38% WWR

**Description:**

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>ADDED (DELTA) COST TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packaged rooftop single zone- 5 ton.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 EA.</td>
<td>$5,000.00</td>
<td>$5,000.00</td>
<td>$106,000.00</td>
</tr>
<tr>
<td>V.A.V. Boxes - 1,646 CFM.</td>
<td>1 EA.</td>
<td>$1,700.00</td>
<td>$1,700.00</td>
</tr>
<tr>
<td>V.A.V. Boxes - 3,500 CFM.</td>
<td>2 EA.</td>
<td>$3,500.00</td>
<td>$7,000.00</td>
</tr>
<tr>
<td><strong>System 3</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packaged rooftop single zone - 7 ton.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 EA.</td>
<td>$8,000.00</td>
<td>$8,000.00</td>
<td>$114,000.00</td>
</tr>
<tr>
<td>V.A.V. Boxes - 2,100 CFM.</td>
<td>2 EA.</td>
<td>$2,100.00</td>
<td>$4,200.00</td>
</tr>
<tr>
<td>V.A.V. Boxes - 1,904 CFM.</td>
<td>1 EA.</td>
<td>$1,900.00</td>
<td>$1,900.00</td>
</tr>
<tr>
<td>V.A.V. Boxes - 2,390 CFM.</td>
<td>1 EA.</td>
<td>$2,400.00</td>
<td>$2,400.00</td>
</tr>
<tr>
<td>V.A.V. Boxes - 1,827 CFM.</td>
<td>1 EA.</td>
<td>$1,800.00</td>
<td>$1,800.00</td>
</tr>
<tr>
<td>V.A.V. Boxes - 3,500 CFM.</td>
<td>2 EA.</td>
<td>$3,500.00</td>
<td>$7,000.00</td>
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## Building Type: Large Office - Omaha, Nebraska - 38% WWR

### DESCRIPTION

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
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</thead>
<tbody>
<tr>
<td>V.A.V. Boxes - 1,827 CFM.</td>
<td>1 EA.</td>
<td>$1,800.00</td>
<td>$1,800.00</td>
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<tr>
<td>V.A.V. Boxes - 3,500 CFM.</td>
<td>2 EA.</td>
<td>$3,500.00</td>
<td>$7,000.00</td>
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</tbody>
</table>

| System 4 | Packaged rooftop single zone - 5 ton. | 1 EA. | $5,000.00 | $5,000.00 |
| System 5 | Packaged rooftop single zone - 22 ton. | 1 EA. | $21,000.00 | $21,000.00 |
| System 6 | Packaged rooftop single zone - 13 ton. | 1 EA. | $13,000.00 | $13,000.00 |
| System 7 | Packaged rooftop single zone - 6 ton. | 1 EA. | $6,500.00 | $6,500.00 |
| System 8 | Packaged rooftop single zone - 8 ton. | 1 EA. | $8,000.00 | $8,000.00 |
| System 9 | Packaged rooftop single zone - 6 ton. | 1 EA. | $6,500.00 | $6,500.00 |
| System 10 | Packaged rooftop single zone - 22 ton. | 1 EA. | $21,000.00 | $21,000.00 |
| System 11 | Packaged rooftop single zone - 14 ton. | 1 EA. | $13,000.00 | $13,000.00 |
## Nebraska-Specific Advanced Commercial Building Energy Code Study

**September 2, 2009**  
**BCC Project # 09-08-0120**

**Building Type:** Large Office - Omaha, Nebraska - 38% WWR  
[Back to Summary]

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
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<tbody>
<tr>
<td>System 12</td>
<td>Packaged rooftop single zone - 7 ton.</td>
<td>1 EA.</td>
<td>$8,000.00</td>
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<tr>
<td>System 13</td>
<td>Packaged rooftop single zone - 8 ton.</td>
<td>1 EA.</td>
<td>$8,000.00</td>
<td>$8,000.00</td>
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<tr>
<td>System 14</td>
<td>Packaged rooftop single zone - 6 ton.</td>
<td>1 EA.</td>
<td>$6,500.00</td>
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<tr>
<td>System 15</td>
<td>Packaged rooftop single zone - 24 ton.</td>
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<td><strong>Lighting:</strong></td>
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<td>$939,148.00</td>
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Building Cost Consultants, Inc.  
P.O. Box 278, Plattsmouth, NE 68048  
Phone: (402) 298-8260  
Fax: (402) 298-8290  
bccdsieh@cox.net
<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
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<th>UNIT</th>
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<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELA) COST TOTAL</th>
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</thead>
<tbody>
<tr>
<td>Exterior Wall System</td>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.</td>
<td>21,600</td>
<td>S.F.</td>
<td>$3.50</td>
<td>$75,600.00</td>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.</td>
<td>21,600</td>
<td>S.F.</td>
<td>$3.50</td>
<td>$75,600.00</td>
<td>$0.00</td>
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<tr>
<td>Exterior Roof System</td>
<td>R20 (above deck) polyisocyanurate insulation.</td>
<td>20,000</td>
<td>S.F.</td>
<td>$2.29</td>
<td>$45,800.00</td>
<td>R30 (above deck) polyisocyanurate insulation.</td>
<td>20,000</td>
<td>S.F.</td>
<td>$2.85</td>
<td>$57,000.00</td>
<td>$11,200.00</td>
</tr>
<tr>
<td>Exterior Windows</td>
<td>Interior clear glass; No thermal frames.</td>
<td>8,208</td>
<td>S.F.</td>
<td>$41.00</td>
<td>$336,528.00</td>
<td>PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.</td>
<td>8,208</td>
<td>S.F.</td>
<td>$56.00</td>
<td>$459,648.00</td>
<td>$123,120.00</td>
</tr>
<tr>
<td>H.V.A.C.</td>
<td>Packaged rooftop single zone - 7 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$8,000.00</td>
<td>$8,000.00</td>
<td>Packaged V.A.V. with electrical reheat system fans with V.S.D. - 34 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$69,000.00</td>
<td>$69,000.00</td>
<td>$61,000.00</td>
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<tr>
<td></td>
<td>V.A.V. Boxes - 2,589 CFM.</td>
<td>1</td>
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<td>$2,600.00</td>
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<td>V.A.V. Boxes - 1,182 CFM.</td>
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<td>$1,200.00</td>
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<td>V.A.V. Boxes - 1,803 CFM.</td>
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<td>$1,800.00</td>
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<td>V.A.V. Boxes - 1,803 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$1,800.00</td>
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<td>$1,800.00</td>
</tr>
</tbody>
</table>
## Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Large Office - Chadron Nebraska - 18% WWR

### System 2
- **Packaged rooftop single zone- 3 ton.**
  - QTY: 1 EA.
  - **Base Building Cost:** $3,000.00
  - **Proposed Alternative Cost:** $82,500.00
  - **Added (Delta) Cost:** $79,500.00

### System 3
- **Packaged rooftop single zone - 5 ton.**
  - QTY: 1 EA.
  - **Base Building Cost:** $5,000.00
  - **Proposed Alternative Cost:** $89,500.00
  - **Added (Delta) Cost:** $84,500.00

---

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>V.A.V. Boxes - 1,300 CFM.</td>
<td>1 EA.</td>
<td>$1,300.00</td>
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<td>$1,300.00</td>
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<td>V.A.V. Boxes - 3,800 CFM.</td>
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<td>Packaged V.A.V. with electrical reheat system fans with V.S.D. - 37 ton.</td>
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<td>$82,500.00</td>
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<td>$79,500.00</td>
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<td>V.A.V. Boxes - 3,113 CFM.</td>
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<td>$3,100.00</td>
<td>$3,100.00</td>
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<tr>
<td>V.A.V. Boxes - 1,385 CFM.</td>
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<td>V.A.V. Boxes - 2,133 CFM.</td>
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<td>$2,200.00</td>
<td>$2,200.00</td>
<td>$2,200.00</td>
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<td>V.A.V. Boxes - 1,483 CFM.</td>
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<td>$1,500.00</td>
<td>$1,500.00</td>
<td>$1,500.00</td>
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<tr>
<td>V.A.V. Boxes - 3,100 CFM.</td>
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<td>Packaged V.A.V. with electrical reheat system fans with V.S.D. - 40 ton.</td>
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<tr>
<td>V.A.V. Boxes - 3,113 CFM.</td>
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<td>$3,100.00</td>
<td>$3,100.00</td>
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<tr>
<td>V.A.V. Boxes - 1,385 CFM.</td>
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<td>$1,400.00</td>
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<td>$1,400.00</td>
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<tr>
<td>V.A.V. Boxes - 2,133 CFM.</td>
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<td>$2,200.00</td>
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</table>
### Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Large Office - Chadron Nebraska - 18% WWR

#### 2003 IECC BASELINE BUILDING

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
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</thead>
<tbody>
<tr>
<td>Packaged rooftop single zone - 4 ton.</td>
<td>1</td>
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<td>$4,500.00</td>
<td>$4,500.00</td>
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<td>Packaged rooftop single zone - 8 ton.</td>
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<tr>
<td>Packaged rooftop single zone - 4 ton.</td>
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<tr>
<td>Packaged rooftop single zone - 4 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$4,500.00</td>
<td>$4,500.00</td>
</tr>
<tr>
<td>Packaged rooftop single zone - 5 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$5,000.00</td>
<td>$5,000.00</td>
</tr>
<tr>
<td>Packaged rooftop single zone - 4 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$4,500.00</td>
<td>$4,500.00</td>
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<tr>
<td>Packaged rooftop single zone - 17 ton.</td>
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<td>$17,000.00</td>
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#### ALTERNATIVE (PROPOSED) BUILDING

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<th>DESCRIPTION</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>V.A.V. Boxes - 1,483 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$1,500.00</td>
<td>$1,500.00</td>
</tr>
<tr>
<td>V.A.V. Boxes - 3,800 CFM.</td>
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<td>EA.</td>
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<td>$7,600.00</td>
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</table>

#### ADDED (DELTA) COST TOTAL

- $1,500.00
- $7,600.00
## Nebraska-Specific Advanced Commercial Building Energy Code Study

### Building Type: Large Office - Chadron Nebraska - 18% WWR

#### DESCRIPTION

<table>
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<tr>
<th>Description</th>
<th>2003 IECC Baseline Building</th>
<th>QTY</th>
<th>Unit</th>
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<th>Total</th>
<th>Alternative (Proposed) Building</th>
<th>QTY</th>
<th>Unit</th>
<th>Cost / Unit</th>
<th>Total</th>
<th>Added (Delta) Cost Total</th>
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<tr>
<td>System 13</td>
<td>Packaged rooftop single zone - 6 ton.</td>
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<td>$6,500.00</td>
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<td>System 14</td>
<td>Packaged rooftop single zone - 4 ton.</td>
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<tr>
<td>System 15</td>
<td>Packaged rooftop single zone - 21 ton.</td>
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<td>EA.</td>
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<tr>
<td><strong>Lighting:</strong></td>
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<td>None</td>
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**TOTALS**

<table>
<thead>
<tr>
<th></th>
<th>2003 IECC Baseline Building</th>
<th>Alternative (Proposed) Building</th>
<th>Added (Delta) Cost Total</th>
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<tbody>
<tr>
<td></td>
<td>$579,428.00</td>
<td>$877,948.00</td>
<td>$298,520.00</td>
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Building Cost Consultants, Inc.  
P.O. Box 278, Plattsmouth, NE 68048  
Phone: (402) 298-8260  
Fax: (402) 298-8290  
bccdsieh@cox.net
<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
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<tbody>
<tr>
<td>General:</td>
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</tr>
<tr>
<td>Exterior Wall System</td>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs plus R3.8 continuous rigid insulation.</td>
<td>21,600</td>
<td>S.F.</td>
<td>$3.50</td>
<td>$75,600.00</td>
<td>R13 fiberglass batt insulation in 4-inch mtl. Studs plus R3.8 continuous rigid insulation.</td>
<td>21,600</td>
<td>S.F.</td>
<td>$3.50</td>
<td>$75,600.00</td>
<td>$0.00</td>
</tr>
<tr>
<td>Exterior Roof System</td>
<td>R20 (above deck) polyisocyanurate insulation.</td>
<td>20,000</td>
<td>S.F.</td>
<td>$2.29</td>
<td>$45,800.00</td>
<td>R30 (above deck) polyisocyanurate insulation.</td>
<td>20,000</td>
<td>S.F.</td>
<td>$2.85</td>
<td>$57,000.00</td>
<td>$11,200.00</td>
</tr>
<tr>
<td>Exterior Windows</td>
<td>Interior clear glass; No thermal frames.</td>
<td>8,208</td>
<td>S.F.</td>
<td>$41.00</td>
<td>$336,528.00</td>
<td>PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.</td>
<td>8,208</td>
<td>S.F.</td>
<td>$56.00</td>
<td>$459,648.00</td>
<td>$123,120.00</td>
</tr>
<tr>
<td>H.V.A.C.</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>System 1</td>
<td>Packaged rooftop single zone - 7 ton.</td>
<td>1</td>
<td>EA.</td>
<td>$8,000.00</td>
<td>$8,000.00</td>
<td>Packaged V.A.V. with electrical reheat system fans with V.S.D. - 41 ton.</td>
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<td>EA.</td>
<td>$83,500.00</td>
<td>$83,500.00</td>
<td>$75,500.00</td>
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<tr>
<td></td>
<td>V.A.V. Boxes - 2,355 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$2,300.00</td>
<td>$2,300.00</td>
<td>V.A.V. Boxes - 2,355 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$2,300.00</td>
<td>$2,300.00</td>
<td>$2,300.00</td>
</tr>
<tr>
<td></td>
<td>V.A.V. Boxes - 1,182 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$1,200.00</td>
<td>$1,200.00</td>
<td>V.A.V. Boxes - 1,182 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$1,200.00</td>
<td>$1,200.00</td>
<td>$1,200.00</td>
</tr>
<tr>
<td></td>
<td>V.A.V. Boxes - 1,762 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$1,700.00</td>
<td>$1,700.00</td>
<td>V.A.V. Boxes - 1,762 CFM.</td>
<td>1</td>
<td>EA.</td>
<td>$1,700.00</td>
<td>$1,700.00</td>
<td>$1,700.00</td>
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</table>
### Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Large Office - Norfolk, Nebraska - 18% WW

**September 2, 2009**

**BCC Project # 09-08-0120**

#### System 2

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>V.A.V. Boxes - 1,154 CFM.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$1,100.00</td>
<td>$1,100.00</td>
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<tr>
<td>V.A.V. Boxes - 3,600 CFM.</td>
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<td>2</td>
<td>EA.</td>
<td>$3,600.00</td>
<td>$7,200.00</td>
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**System 3**

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>V.A.V. Boxes - 2,806 CFM.</td>
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<td>1</td>
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<tr>
<td>V.A.V. Boxes - 1,357 CFM.</td>
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<td>V.A.V. Boxes - 2,015 CFM.</td>
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<tr>
<td>V.A.V. Boxes - 1,292 CFM.</td>
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<td>1</td>
<td>EA.</td>
<td>$1,300.00</td>
<td>$1,300.00</td>
</tr>
<tr>
<td>V.A.V. Boxes - 3,600 CFM.</td>
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<td>2</td>
<td>EA.</td>
<td>$4,300.00</td>
<td>$8,600.00</td>
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**ALTERNATIVE (PROPOSED) BUILDING**

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaged V.A.V. with electrical reheat system fans with V.S.D. - 44 ton.</td>
<td>1</td>
<td>EA.</td>
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<td>$93,500.00</td>
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<tr>
<td>Packaged V.A.V. with electrical reheat system fans with V.S.D. - 46 ton.</td>
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<td>$103,500.00</td>
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**ADDED (DELTA) COST TOTAL**

<table>
<thead>
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<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
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</thead>
<tbody>
<tr>
<td>V.A.V. Boxes - 1,154 CFM.</td>
<td></td>
<td>1</td>
<td>EA.</td>
<td>$1,100.00</td>
<td>$1,100.00</td>
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<tr>
<td>V.A.V. Boxes - 3,600 CFM.</td>
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<td>2</td>
<td>EA.</td>
<td>$3,600.00</td>
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**System 2**

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<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
</tr>
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<tr>
<td>V.A.V. Boxes - 2,806 CFM.</td>
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<td>1</td>
<td>EA.</td>
<td>$2,600.00</td>
<td>$2,600.00</td>
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<tr>
<td>V.A.V. Boxes - 1,357 CFM.</td>
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<td>EA.</td>
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<tr>
<td>V.A.V. Boxes - 2,015 CFM.</td>
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<td>1</td>
<td>EA.</td>
<td>$1,900.00</td>
<td>$1,900.00</td>
</tr>
<tr>
<td>V.A.V. Boxes - 1,292 CFM.</td>
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<td>1</td>
<td>EA.</td>
<td>$1,300.00</td>
<td>$1,300.00</td>
</tr>
<tr>
<td>V.A.V. Boxes - 3,600 CFM.</td>
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<td>2</td>
<td>EA.</td>
<td>$4,300.00</td>
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**System 3**

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<th>DESCRIPTION</th>
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<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
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- System 4: Packaged rooftop single zone - 4 ton. 1 EA. $4,500.00 $4,500.00
- System 5: Packaged rooftop single zone - 20 ton. 1 EA. $19,000.00 $19,000.00
- System 6: Packaged rooftop single zone - 9 ton. 1 EA. $9,000.00 $9,000.00
- System 7: Packaged rooftop single zone - 4 ton. 1 EA. $4,500.00 $4,500.00
- System 8: Packaged rooftop single zone - 6 ton. 1 EA. $6,500.00 $6,500.00
- System 9: Packaged rooftop single zone - 4 ton. 1 EA. $4,500.00 $4,500.00
- System 10: Packaged rooftop single zone - 20 ton. 1 EA. $19,000.00 $19,000.00
- System 11: Packaged rooftop single zone - 10 ton. 1 EA. $10,000.00 $10,000.00
## Nebraska-Specific Advanced Commercial Building Energy Code Study

**Building Type:** Large Office - Norfolk, Nebraska - 18% WWR  
**September 2, 2009**  
**BCC Project #:** 09-08-0120

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<th>QTY</th>
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Building Cost Consultants, Inc.  
P.O. Box 278, Plattsmouth, NE 68048  
Phone: (402) 298-8260  Fax: (402) 298-8290  
bccdsieh@cox.net
### Nebraska-specific Advanced Commercial Building Energy Code Study

**September 2, 2009**  
BCC Project # 09-08-0120

**Building Type:** Large Office - Omaha, Nebraska - 18% WWR  
[Back to Summary]

<table>
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<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
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</tr>
<tr>
<td>Exterior Wall System</td>
<td>R13 fiberglass batt insulation in 4-inch mtl. studs without continuous rigid insulation.</td>
<td>21,600</td>
<td>S.F.</td>
<td>$2.62</td>
<td>$56,592.00</td>
<td>R13 fiberglass batt insulation in 4-inch mtl. Studs plus R3.8 continuous rigid insulation.</td>
<td>21,600</td>
<td>S.F.</td>
<td>$3.50</td>
<td>$75,600.00</td>
<td>$19,008.00</td>
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<tr>
<td>Exterior Roof System</td>
<td>R20 (above deck) polyisocyanurate insulation.</td>
<td>20,000</td>
<td>S.F.</td>
<td>$2.29</td>
<td>$45,800.00</td>
<td>R30 (above deck) polyisocyanurate insulation.</td>
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<td>S.F.</td>
<td>$2.85</td>
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<td>Exterior Windows</td>
<td>Interior clear glass; No thermal frames.</td>
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<td>S.F.</td>
<td>$41.00</td>
<td>$159,408.00</td>
<td>PPG-Solarban (70XL (2) Starphire) insulated glass w/ thermally-broken aluminum frames.</td>
<td>3,888</td>
<td>S.F.</td>
<td>$56.00</td>
<td>$217,728.00</td>
<td>$58,320.00</td>
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<tr>
<td>System 1</td>
<td>Packaged rooftop single zone - 8 ton.</td>
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<td>$8,500.00</td>
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<td>$1,700.00</td>
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</tbody>
</table>

Building Cost Consultants, Inc.  
P.O. Box 278, Plattsmouth, NE 68048  
Phone: (402) 298-8260  
Fax: (402) 298-8290  
bccdsieh@cox.net
<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>2003 IECC BASELINE BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ALTERNATIVE (PROPOSED) BUILDING</th>
<th>QTY</th>
<th>UNIT</th>
<th>COST / UNIT</th>
<th>TOTAL</th>
<th>ADDED (DELTA) COST TOTAL</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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<td>V.A.V. Boxes - 1,159 CFM.</td>
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<td>V.A.V. Boxes - 3,500 CFM.</td>
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<td>$4,500.00</td>
<td>Packaged V.A.V. with electrical reheat system fans with V.S.D. - 47 ton.</td>
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<td>$94,500.00</td>
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<td>$2,800.00</td>
<td>$2,800.00</td>
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<td>$1,300.00</td>
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<td>V.A.V. Boxes - 2,005 CFM.</td>
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<td>$2,000.00</td>
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<td>$1,300.00</td>
<td>$1,300.00</td>
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<td>V.A.V. Boxes - 3,500 CFM.</td>
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<td>$2,000.00</td>
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<td>DESCRIPTION</td>
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<tr>
<td>V.A.V. Boxes - 1,283 CFM.</td>
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<td>V.A.V. Boxes - 3,500 CFM.</td>
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<p>| System 4 | Packaged rooftop single zone - 4 ton. | 1 EA. | $4,500.00 | $4,500.00 |
| System 5 | Packaged rooftop single zone - 22 ton. | 1 EA. | $21,000.00 | $21,000.00 |
| System 6 | Packaged rooftop single zone - 9 ton. | 1 EA. | $9,000.00 | $9,000.00 |
| System 7 | Packaged rooftop single zone - 4 ton. | 1 EA. | $4,500.00 | $4,500.00 |
| System 8 | Packaged rooftop single zone - 7 ton. | 1 EA. | $8,000.00 | $8,000.00 |
| System 9 | Packaged rooftop single zone - 4 ton. | 1 EA. | $4,500.00 | $4,500.00 |
| System 10 | Packaged rooftop single zone - 22 ton. | 1 EA. | $21,000.00 | $21,000.00 |
| System 11 | Packaged rooftop single zone - 10 ton. | 1 EA. | $10,000.00 | $10,000.00 |</p>
<table>
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<th>DESCRIPTION</th>
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## Preventative (Recurring) and Non-Recurring Maintenance Costs (2009)

### General Preventative Maintenance

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<th>Frequency</th>
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<th>Parts Cost</th>
<th>Incurred Cost</th>
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<td>5.5-20 Ton</td>
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<td>25-30 Ton</td>
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<td>-</td>
<td>-</td>
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<tr>
<td></td>
<td>35-40 Ton</td>
<td>1800</td>
<td>-</td>
<td>-</td>
<td>$1,800.00</td>
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<tr>
<td></td>
<td>45-60 Ton</td>
<td>2400</td>
<td>-</td>
<td>-</td>
<td>$2,400.00</td>
</tr>
<tr>
<td></td>
<td>65-95 Ton</td>
<td>3300</td>
<td>-</td>
<td>-</td>
<td>$3,300.00</td>
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<tr>
<td></td>
<td>100-125 Ton</td>
<td>4600</td>
<td>-</td>
<td>-</td>
<td>$4,600.00</td>
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### Packaged Single Zone AC & Heat Pump Unit

<table>
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<th>Frequency</th>
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<th>Parts Cost</th>
<th>Incurred Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 5 Ton</td>
<td>1</td>
<td>900</td>
<td>-</td>
<td>-</td>
<td>$900.00</td>
</tr>
<tr>
<td>5.5-20 Ton</td>
<td>1</td>
<td>1200</td>
<td>-</td>
<td>-</td>
<td>$1,200.00</td>
</tr>
<tr>
<td>25-30 Ton</td>
<td>1</td>
<td>1500</td>
<td>-</td>
<td>-</td>
<td>$1,500.00</td>
</tr>
<tr>
<td>35-40 Ton</td>
<td>1</td>
<td>1800</td>
<td>-</td>
<td>-</td>
<td>$1,800.00</td>
</tr>
<tr>
<td>45-60 Ton</td>
<td>1</td>
<td>2400</td>
<td>-</td>
<td>-</td>
<td>$2,400.00</td>
</tr>
<tr>
<td>65-95 Ton</td>
<td>1</td>
<td>3300</td>
<td>-</td>
<td>-</td>
<td>$3,300.00</td>
</tr>
<tr>
<td>100-125 Ton</td>
<td>1</td>
<td>4600</td>
<td>-</td>
<td>-</td>
<td>$4,600.00</td>
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### Complete System Replacement

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<th>Approx. Hours</th>
<th>Labor Cost</th>
<th>Parts Cost</th>
<th>Incurred Cost</th>
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<tbody>
<tr>
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### Compressor Replacements (Assume Rotary)

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<th>Incurred Cost</th>
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<tr>
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<td>16 to 20 Ton Units (2 @ 10 TR each)</td>
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<td>21 to 25 Ton Units (2 @ 10 TR + 5TR)</td>
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<td>26 to 30 Ton Units (2 @ 15 TR each)</td>
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<td>31 to 35 Ton Units (3 @ 10 TR + 5TR)</td>
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<tr>
<td>36 to 40 Ton Units (4 @ 10 TR each)</td>
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<td>41 to 45 Ton Units (3 @ 15 TR each)</td>
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<td>46 to 50 Ton Units (3 @ 15 TR + 5TR)</td>
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### VFD (Variable Frequency Drives)

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### Notes

- Refer to BCC Estimates
- See Note (a)
- See Note (b)

### Preventative (Recurring) and Non-Recurring Maintenance Costs (2009)

OMAHA NORFOLK CHADRON

<table>
<thead>
<tr>
<th>Notes</th>
<th>設備</th>
<th>Frequency</th>
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<tr>
<td>6 to 15 tons</td>
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<td>-</td>
<td>-</td>
<td>$2,600.00</td>
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</tr>
<tr>
<td>16 to 20 tons</td>
<td>18</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>&gt;20 tons</td>
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<tr>
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<tr>
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<td>-</td>
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<td></td>
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<td>25</td>
<td>-</td>
<td>$1,435.50</td>
<td></td>
</tr>
<tr>
<td>VFD (Variable Frequency Drives)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>$3,500.00</td>
<td></td>
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</tbody>
</table>

### Equipment Replacement/Frequency

- **Packaged Single Zone AC & Heat Pump Unit**
- **DX Split System**
- **Gas Fired Furnace**
- **Single Packaged Rooftop A/C Units**
- **Compressor Replacements**
- **VFD (Variable Frequency Drives)**
# Preventative (Recurring) and Non-Recurring Maintenance Costs (2009)

**OMAHA**

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Replacement/ Maintenance Frequency</th>
<th>Approx. Labor Cost</th>
<th>Approx. Parts Cost</th>
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<tr>
<td>CRV</td>
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<td>$229.68 $</td>
<td>229.68 $</td>
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<td>$2,114.84 $</td>
<td>2,114.84 $</td>
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<td>Motor Replacement (3 hp)</td>
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<td>$344.52 $</td>
<td>344.52 $</td>
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<tr>
<td>fans</td>
<td></td>
<td>$107.20 $</td>
<td>102.16 $</td>
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<tr>
<td>1 to 5 Ton Refrigeration Units</td>
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<td>$1,800.00 $</td>
<td>1,715.40 $</td>
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<tr>
<td>Belts</td>
<td>1 50.00</td>
<td>$50.00 $</td>
<td>47.65 $</td>
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<tr>
<td>Evap fan motor</td>
<td>8 300.00</td>
<td>$300.00 $</td>
<td>285.90 $</td>
</tr>
<tr>
<td>(1 each) Cond fan motor</td>
<td>8 200.00</td>
<td>$200.00 $</td>
<td>190.60 $</td>
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<td>7.5-20 Ton Refrigeration Units</td>
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<td>Belts</td>
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<td>(2 each) Cond fan motor</td>
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<td>$500.00 $</td>
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<td>Belts</td>
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<td>857.70 $</td>
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<td>(3 each) Cond fan motor</td>
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<td>$1,200.00 $</td>
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<tr>
<td>35-40 Ton Refrigeration Units</td>
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<td>Belts</td>
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<td>$150.00 $</td>
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<td>(4 each) Cond fan motor</td>
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<td>$1,800.00 $</td>
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<td>45-60 Ton Refrigeration Units</td>
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<tr>
<td>Belts</td>
<td>1 200.00</td>
<td>$200.00 $</td>
<td>190.60 $</td>
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<td>(6 each) Cond fan motor</td>
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<td>(8 each) Cond fan motor</td>
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<tr>
<td>Evap fan motor</td>
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<td>(12 each) Cond fan motor</td>
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<td>Parallel Fan-Powered Gas Motors</td>
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<td>Lighting (per 1,000 SF Area)</td>
<td>Fluorescent Lamp Replacements (ave. life @ 12 hrs/day use)</td>
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## Preventative (Recurring) and Non-Recurring Maintenance Costs (2009)

### 11 September 2009

### Equipment Replacement/Maintenance Frequency

<table>
<thead>
<tr>
<th>Equipment Category</th>
<th>Replacement/ Maintenance Frequency</th>
<th>Approx. Parts Cost</th>
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<tr>
<td>Each Occurrence</td>
<td>(Years)</td>
<td>[$/]</td>
<td>[hours]</td>
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</tbody>
</table>

### Notes

- **Note (a):** Including periodic inspection, lubrication, burner/condenser coil cleaning maintenance.
- **Note (b):** Local Area Maintenance Labor Cost Index Adjustment Factors related to labor are as follows with adjustments from nearest city published data.

#### General Parameters & Assumptions

- **Life Cycle Period (years):** 20
- **Labor Rate (HVAC Tech) (Note b):** $57.42 (Omaha) Source: The Whitestone Building Maintenance and Repair Cost Reference 2008-2009; pg. 18
- **Labor Rate (Electrician) (Note b):** $50.99 (Omaha) Source: The Whitestone Building Maintenance and Repair Cost Reference 2008-2009; pg. 18

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#### Major Equipment Average Serviceable Life (Note x) (Years)

- **Packaged S2 Rooftop A/C & Heat Pump Units**
  - Under 5 tons: 12
  - 5 to 15 tons: 15
  - 16 to 20 tons: 18
  - >20 tons: 20

- **DX Split System Condensing Units**
  - Under 5 tons: 12
  - 5 to 15 tons: 15

- **Variable Frequency Drives**
  - 15

- **Total Energy Wheel-based Heat Recovery Units**
  - 25

- **Circulating Pumps**
  - 25

- **Gas-fired Hot Water Boilers**
  - 30 +%

- **VAV Terminal Units (all types)**
  - 25

- **Electric Motors (for RTAC equip. & condensing units)**
  - 8

- **Electric Motors (indoor HVAC fan/pump equipment)**
  - 22 +%

- **Refrigeration Compressors (except as noted)**
  - 10 +%

### Equipment Replacement Costs (2009)

<table>
<thead>
<tr>
<th>Equipment Category</th>
<th>Equipment Type</th>
<th>OMAHA</th>
<th>NORFOLK</th>
<th>CHADRON</th>
<th>Times Cost Incurred During 20 Year LCCA</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment Replacement/ Maintenance Frequency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>(Years)</td>
<td>[$/]</td>
<td>[hours]</td>
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<td></td>
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<td></td>
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<td>(Years)</td>
<td>[$/]</td>
<td>[hours]</td>
<td>[$/]</td>
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<td>[$/]</td>
</tr>
</tbody>
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#### General Parameters & Assumptions

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  - Under 5 tons: 12
  - 5 to 15 tons: 15

- **Variable Frequency Drives**
  - 15

- **Total Energy Wheel-based Heat Recovery Units**
  - 25

- **Circulating Pumps**
  - 25

- **Gas-fired Hot Water Boilers**
  - 30 +%

- **VAV Terminal Units (all types)**
  - 25

- **Electric Motors (for RTAC equip. & condensing units)**
  - 8

- **Electric Motors (indoor HVAC fan/pump equipment)**
  - 22 +%

- **Refrigeration Compressors (except as noted)**
  - 10 +%

### Equipment Replacement Costs (2009)

<table>
<thead>
<tr>
<th>Equipment Category</th>
<th>Equipment Type</th>
<th>OMAHA</th>
<th>NORFOLK</th>
<th>CHADRON</th>
<th>Times Cost Incurred During 20 Year LCCA</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment Replacement/ Maintenance Frequency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Each Occurrence</td>
<td>(Years)</td>
<td>[$/]</td>
<td>[hours]</td>
<td>[$/]</td>
<td>[$/]</td>
<td>[$/]</td>
</tr>
</tbody>
</table>

### Notes:

- **(a):** Including periodic inspection, lubrication, burner/condenser coil cleaning maintenance.
- **(b):** Local Area Maintenance Labor Cost Index Adjustment Factors related to labor are as follows with adjustments from nearest city published data.

#### General Parameters & Assumptions

- **Life Cycle Period (years):** 20
- **Labor Rate (HVAC Tech) (Note b):** $57.42 (Omaha) Source: The Whitestone Building Maintenance and Repair Cost Reference 2008-2009; pg. 18
- **Labor Rate (Electrician) (Note b):** $50.99 (Omaha) Source: The Whitestone Building Maintenance and Repair Cost Reference 2008-2009; pg. 18

### Notes:

- **(a):** Including periodic inspection, lubrication, burner/condenser coil cleaning maintenance.
- **(b):** Local Area Maintenance Labor Cost Index Adjustment Factors related to labor are as follows with adjustments from nearest city published data.

#### Major Equipment Average Serviceable Life (Note x) (Years)

- **Packaged S2 Rooftop A/C & Heat Pump Units**
  - Under 5 tons: 12
  - 5 to 15 tons: 15
  - 16 to 20 tons: 18
  - >20 tons: 20

- **DX Split System Condensing Units**
  - Under 5 tons: 12
  - 5 to 15 tons: 15

- **Variable Frequency Drives**
  - 15

- **Total Energy Wheel-based Heat Recovery Units**
  - 25

- **Circulating Pumps**
  - 25

- **Gas-fired Hot Water Boilers**
  - 30 +%

- **VAV Terminal Units (all types)**
  - 25

- **Electric Motors (for RTAC equip. & condensing units)**
  - 8

- **Electric Motors (indoor HVAC fan/pump equipment)**
  - 22 +%

- **Refrigeration Compressors (except as noted)**
  - 10 +%
NIST BLCC 5.3-09: Comparative Analysis
Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A
Base Case: 2003 IECC Base Case
Alternative: 30% Alternative Design

General Information
File Name: C:\Program Files (x86)\BLCC5\projects\Completed\Large Office 38WWR Omaha Residual Value.xml
Date of Study: Thu Oct 01 16:33:47 CDT 2009
Project Name: Large Office 38% WWR - Omaha
Project Location: Nebraska
Analysis Type: FEMP Analysis, Energy Project
Analyst: SM Cherney
Base Date: October 1, 2009
Service Date: October 1, 2009
Study Period: 20 years 0 months (October 1, 2009 through September 30, 2029)
Discount Rate: 3%
Discounting Convention: End-of-Year

Comparison of Present-Value Costs
PV Life-Cycle Cost

<table>
<thead>
<tr>
<th></th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Investment Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$617,020</td>
<td>$939,148</td>
<td>-$322,128</td>
</tr>
<tr>
<td><strong>Future Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Consumption Costs</td>
<td>$756,782</td>
<td>$663,630</td>
<td>$93,152</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$709,111</td>
<td>$491,658</td>
<td>$217,453</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$160,000</td>
<td>$0</td>
<td>$160,000</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$288,906</td>
<td>-$281,744</td>
<td>-$7,162</td>
</tr>
<tr>
<td></td>
<td>$1,336,988</td>
<td>$873,544</td>
<td>$463,443</td>
</tr>
<tr>
<td><strong>Subtotal (for Future Cost Items)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$1,954,008</td>
<td>$1,812,692</td>
<td>$141,315</td>
</tr>
</tbody>
</table>

Net Savings from Alternative Compared with Base Case

|                                |           |             |                          |
| PV of Non-Investment Savings   | $310,605  |             |                          |
| - Increased Total Investment   | $169,290  |             |                          |
| **Net Savings**                |           |             | $141,315                 |

Savings-to-Investment Ratio (SIR)
SIR = 1.83

Adjusted Internal Rate of Return
AIRR = 6.17%
Payback Period
Estimated Years to Payback (from beginning of Service Period)
Simple Payback occurs in year 14
Discounted Payback occurs in year 16

Energy Savings Summary
Energy Savings Summary (in stated units)
<table>
<thead>
<tr>
<th>Energy</th>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>654,545.0 kWh</td>
<td>608,474.0 kWh</td>
<td>46,071.0 kWh</td>
<td>921,293.9 kWh</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>7,008.0 Therm</td>
<td>0.0 Therm</td>
<td>7,008.0 Therm</td>
<td>140,140.8 Therm</td>
<td></td>
</tr>
</tbody>
</table>

Energy Savings Summary (in MBtu)
<table>
<thead>
<tr>
<th>Energy</th>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>2,233.4 MBtu</td>
<td>2,076.2 MBtu</td>
<td>157.2 MBtu</td>
<td>3,143.6 MBtu</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>700.8 MBtu</td>
<td>0.0 MBtu</td>
<td>700.8 MBtu</td>
<td>14,014.1 MBtu</td>
<td></td>
</tr>
</tbody>
</table>

Emissions Reduction Summary
<table>
<thead>
<tr>
<th>Energy</th>
<th>Type</th>
<th>CO2</th>
<th>SO2</th>
<th>NOx</th>
<th>CO2</th>
<th>SO2</th>
<th>NOx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td></td>
<td>685,137.71 kg</td>
<td>1,268.86 kg</td>
<td>1,381.02 kg</td>
<td>636,913.40 kg</td>
<td>1,179.55 kg</td>
<td>1,283.81 kg</td>
</tr>
<tr>
<td>Natural Gas</td>
<td></td>
<td>37,018.74 kg</td>
<td>298.75 kg</td>
<td>28.84 kg</td>
<td>37,018.74 kg</td>
<td>298.75 kg</td>
<td>28.84 kg</td>
</tr>
<tr>
<td>Total:</td>
<td></td>
<td>722,156.44 kg</td>
<td>1,567.61 kg</td>
<td>1,409.86 kg</td>
<td>636,913.40 kg</td>
<td>1,179.55 kg</td>
<td>1,283.81 kg</td>
</tr>
</tbody>
</table>
**NIST BLCC 5.3-09: Comparative Analysis**

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

**Base Case: 2003 IECC Base Case**

**Alternative: 30% Alternative Design**

**General Information**

- **File Name:** C:\Program Files (x86)\BLCC5\projects\Large Office 38WWR Norfolk Residual Value.xml
- **Date of Study:** Thu Oct 01 17:26:50 CDT 2009
- **Project Name:** Large Office 38% WWR - Norfolk
- **Project Location:** Nebraska
- **Analysis Type:** FEMP Analysis, Energy Project
- **Analyst:** SM Cherney
- **Base Date:** October 1, 2009
- **Service Date:** October 1, 2009
- **Study Period:** 20 years 0 months (October 1, 2009 through September 30, 2029)
- **Discount Rate:** 3%
- **Discounting Convention:** End-of-Year

**Comparison of Present-Value Costs**

**PV Life-Cycle Cost**

<table>
<thead>
<tr>
<th></th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Investment Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$642,680</td>
<td>$939,148</td>
<td>-$296,468</td>
</tr>
<tr>
<td><strong>Future Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Consumption Costs</td>
<td>$789,950</td>
<td>$663,526</td>
<td>$126,424</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$669,112</td>
<td>$469,324</td>
<td>$199,788</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$152,480</td>
<td>$0</td>
<td>$152,480</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$291,725</td>
<td>-$281,744</td>
<td>-$9,981</td>
</tr>
<tr>
<td>Subtotal (for Future Cost Items)</td>
<td>$1,319,817</td>
<td>$851,105</td>
<td>$468,712</td>
</tr>
<tr>
<td><strong>Total PV Life-Cycle Cost</strong></td>
<td>$1,962,497</td>
<td>$1,790,253</td>
<td>$172,244</td>
</tr>
</tbody>
</table>

**Net Savings from Alternative Compared with Base Case**

- **PV of Non-Investment Savings** | $326,213  |
- **- Increased Total Investment** | $153,969  |

**Net Savings** | $172,244  |

**Savings-to-Investment Ratio (SIR)**

\[ SIR = 2.12 \]

**Adjusted Internal Rate of Return**

\[ AIRR = 6.94\% \]
Payback Period
Estimated Years to Payback (from beginning of Service Period)
Simple Payback occurs in year 13
Discounted Payback occurs in year 16

Energy Savings Summary

Energy Savings Summary (in stated units)

<table>
<thead>
<tr>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>671,895.0 kWh</td>
<td>614,453.0 kWh</td>
<td>57,442.0 kWh</td>
<td>1,148,682.7 kWh</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>6,899.0 Therm</td>
<td>0.0 Therm</td>
<td>6,899.0 Therm</td>
<td>137,961.1 Therm</td>
</tr>
</tbody>
</table>

Energy Savings Summary (in MBtu)

<table>
<thead>
<tr>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>2,292.6 MBtu</td>
<td>2,096.6 MBtu</td>
<td>196.0 MBtu</td>
<td>3,919.5 MBtu</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>689.9 MBtu</td>
<td>0.0 MBtu</td>
<td>689.9 MBtu</td>
<td>13,796.2 MBtu</td>
</tr>
</tbody>
</table>

Emissions Reduction Summary

<table>
<thead>
<tr>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Reduction</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>703,298.63 kg</td>
<td>643,171.85 kg</td>
<td>60,126.78 kg</td>
<td>1,202,370.89 kg</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>36,442.96 kg</td>
<td>0.00 kg</td>
<td>36,442.96 kg</td>
<td>728,759.40 kg</td>
</tr>
</tbody>
</table>

Total:

<table>
<thead>
<tr>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Reduction</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2</td>
<td>739,741.59 kg</td>
<td>643,171.85 kg</td>
<td>96,569.73 kg</td>
<td>1,931,130.29 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>1,596.60 kg</td>
<td>1,191.14 kg</td>
<td>405.46 kg</td>
<td>8,108.08 kg</td>
</tr>
<tr>
<td>NOx</td>
<td>1,446.02 kg</td>
<td>1,296.43 kg</td>
<td>149.59 kg</td>
<td>2,991.34 kg</td>
</tr>
</tbody>
</table>
NIST BLCC 5.3-09: Comparative Analysis
Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A
Base Case: 2003 IECC Base Case
Alternative: 30% Alternative Design

General Information
File Name: C:\Program Files (x86)\BLCC5\projects\Large Office 38WWR Chadron Residual Value.xml
Date of Study: Fri Oct 02 08:22:49 CDT 2009
Project Name: Large Office 38% WWR - Chadron
Project Location: Nebraska
Analysis Type: FEMP Analysis, Energy Project
Analyst: SM Cherney
Base Date: October 1, 2009
Service Date: October 1, 2009
Study Period: 20 years 0 months (October 1, 2009 through September 30, 2029)
Discount Rate: 3%
Discounting Convention: End-of-Year

Comparison of Present-Value Costs
PV Life-Cycle Cost

<table>
<thead>
<tr>
<th></th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Investment Costs:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$642,180</td>
<td>$934,548</td>
<td>-$292,368</td>
</tr>
<tr>
<td>Future Costs:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Consumption Costs</td>
<td>$726,995</td>
<td>$572,037</td>
<td>$154,958</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$617,156</td>
<td>$432,168</td>
<td>$184,988</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$140,640</td>
<td>$0</td>
<td>$140,640</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$283,894</td>
<td>-$280,364</td>
<td>-$3,530</td>
</tr>
<tr>
<td>Subtotal (for Future Cost Items)</td>
<td>$1,200,897</td>
<td>$723,841</td>
<td>$477,056</td>
</tr>
<tr>
<td>Total PV Life-Cycle Cost</td>
<td>$1,843,077</td>
<td>$1,658,389</td>
<td>$184,688</td>
</tr>
</tbody>
</table>

Net Savings from Alternative Compared with Base Case

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PV of Non-Investment Savings</td>
<td>$339,946</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Increased Total Investment</td>
<td>$155,258</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net Savings</td>
<td></td>
<td></td>
<td>$184,688</td>
</tr>
</tbody>
</table>

Savings-to-Investment Ratio (SIR)
SIR = 2.19

Adjusted Internal Rate of Return
AIRR = 7.12%
## Payback Period

### Estimated Years to Payback (from beginning of Service Period)

- Simple Payback occurs in year 13
- Discounted Payback occurs in year 15

## Energy Savings Summary

### Energy Savings Summary (in stated units)

<table>
<thead>
<tr>
<th>Energy</th>
<th>-----Average-----</th>
<th>Annual Consumption</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Base Case</td>
<td>Alternative</td>
<td>Savings</td>
</tr>
<tr>
<td>Electricity</td>
<td>654,984.0 kWh</td>
<td>576,617.0 kWh</td>
<td>78,367.0 kWh</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>3,734.0 Therm</td>
<td>0.0 Therm</td>
<td>3,734.0 Therm</td>
</tr>
</tbody>
</table>

### Energy Savings Summary (in MBtu)

<table>
<thead>
<tr>
<th>Energy</th>
<th>-----Average-----</th>
<th>Annual Consumption</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Base Case</td>
<td>Alternative</td>
<td>Savings</td>
</tr>
<tr>
<td>Electricity</td>
<td>2,234.9 MBtu</td>
<td>1,967.5 MBtu</td>
<td>267.4 MBtu</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>373.4 MBtu</td>
<td>0.0 MBtu</td>
<td>373.4 MBtu</td>
</tr>
</tbody>
</table>

## Emissions Reduction Summary

### Emissions Reduction Summary

<table>
<thead>
<tr>
<th>Energy</th>
<th>-----Average-----</th>
<th>Annual</th>
<th>Emissions</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Base Case</td>
<td>Alternative</td>
<td>Reduction</td>
<td>Reduction</td>
</tr>
<tr>
<td>Electricity</td>
<td></td>
<td>CO2 685,597.23 kg</td>
<td>603,567.44 kg</td>
<td>82,029.79 kg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SO2 1,269.71 kg</td>
<td>1,117.79 kg</td>
<td>151.92 kg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NOx 1,381.94 kg</td>
<td>1,216.60 kg</td>
<td>165.35 kg</td>
</tr>
<tr>
<td>Natural Gas</td>
<td></td>
<td>CO2 19,724.31 kg</td>
<td>0.0 kg</td>
<td>19,724.31 kg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SO2 159.18 kg</td>
<td>0.0 kg</td>
<td>159.18 kg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NOx 15.37 kg</td>
<td>0.0 kg</td>
<td>15.37 kg</td>
</tr>
<tr>
<td>Total:</td>
<td></td>
<td>CO2 705,321.53 kg</td>
<td>603,567.44 kg</td>
<td>101,754.10 kg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SO2 1,428.89 kg</td>
<td>1,117.79 kg</td>
<td>311.10 kg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NOx 1,397.31 kg</td>
<td>1,216.60 kg</td>
<td>180.71 kg</td>
</tr>
</tbody>
</table>
NIST BLCC 5.3-09: Comparative Analysis
Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case
Alternative: 30% Alternative Design

General Information
File Name: C:\Program Files (x86)\BLCC5\projects\Large Office 18\WWR Omaha Residual Value.xml
Date of Study: Fri Oct 02 15:29:46 CDT 2009
Project Name: Large Office 18% WWR - Omaha
Project Location: Nebraska
Analysis Type: FEMP Analysis, Energy Project
Analyst: A B Skillman
Base Date: October 1, 2009
Service Date: October 1, 2009
Study Period: 20 years 0 months (October 1, 2009 through September 30, 2029)
Discount Rate: 3%
Discounting Convention: End-of-Year

Comparison of Present-Value Costs
PV Life-Cycle Cost

<table>
<thead>
<tr>
<th>Initial Investment Costs:</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$405,800</td>
<td>$674,828</td>
<td>-$269,028</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Future Costs:</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Consumption Costs</td>
<td>$685,122</td>
<td>$566,936</td>
<td>$118,186</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$570,356</td>
<td>$503,740</td>
<td>$66,616</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$144,000</td>
<td>$0</td>
<td>$144,000</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$208,700</td>
<td>-$202,448</td>
<td>-$6,252</td>
</tr>
</tbody>
</table>

Subtotal (for Future Cost Items) | $1,190,778 | $868,227 | $322,551 |

Total PV Life-Cycle Cost | $1,596,578 | $1,543,055 | $53,523 |

Net Savings from Alternative Compared with Base Case
PV of Non-Investment Savings | $184,802 |
- Increased Total Investment | $131,280 |

Net Savings | $53,523 |

Savings-to-Investment Ratio (SIR) | 1.41 |

Adjusted Internal Rate of Return | 4.78% |

Payback Period
**Estimated Years to Payback (from beginning of Service Period)**

Simple Payback occurs in year 16
Discounted Payback occurs in year 16

**Energy Savings Summary**

**Energy Savings Summary (in stated units)**

<table>
<thead>
<tr>
<th>Energy</th>
<th>-----Average</th>
<th>Annual</th>
<th>Consumption</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Base Case</td>
<td>Alternative</td>
<td>Savings</td>
<td>Savings</td>
</tr>
<tr>
<td>Electricity</td>
<td>595,022.0 kWh</td>
<td>523,513.0 kWh</td>
<td>71,509.0 kWh</td>
<td>1,429,984.2 kWh</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>5,934.0 Therm</td>
<td>0.0 Therm</td>
<td>5,934.0 Therm</td>
<td>118,663.8 Therm</td>
</tr>
</tbody>
</table>

**Energy Savings Summary (in MBtu)**

<table>
<thead>
<tr>
<th>Energy</th>
<th>-----Average</th>
<th>Annual</th>
<th>Consumption</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Base Case</td>
<td>Alternative</td>
<td>Savings</td>
<td>Savings</td>
</tr>
<tr>
<td>Electricity</td>
<td>2,030.3 MBtu</td>
<td>1,786.3 MBtu</td>
<td>244.0 MBtu</td>
<td>4,879.3 MBtu</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>593.4 MBtu</td>
<td>0.0 MBtu</td>
<td>593.4 MBtu</td>
<td>11,866.4 MBtu</td>
</tr>
</tbody>
</table>

**Emissions Reduction Summary**

<table>
<thead>
<tr>
<th>Energy</th>
<th>-----Average</th>
<th>Annual</th>
<th>Emissions</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Base Case</td>
<td>Alternative</td>
<td>Reduction</td>
<td>Reduction</td>
</tr>
<tr>
<td>Electricity</td>
<td>CO2 622,832.67 kg</td>
<td>547,981.42 kg</td>
<td>74,851.25 kg</td>
<td>1,496,820.10 kg</td>
</tr>
<tr>
<td>SO2 1,153.47 kg</td>
<td>1,014.85 kg</td>
<td>138.62 kg</td>
<td>2,772.07 kg</td>
<td></td>
</tr>
<tr>
<td>NOx 1,255.43 kg</td>
<td>1,104.55 kg</td>
<td>150.88 kg</td>
<td>3,017.11 kg</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>CO2 31,345.49 kg</td>
<td>0.00 kg</td>
<td>31,345.49 kg</td>
<td>626,823.93 kg</td>
</tr>
<tr>
<td>SO2 252.97 kg</td>
<td>0.00 kg</td>
<td>252.97 kg</td>
<td>5,058.67 kg</td>
<td></td>
</tr>
<tr>
<td>NOx 24.42 kg</td>
<td>0.00 kg</td>
<td>24.42 kg</td>
<td>488.34 kg</td>
<td></td>
</tr>
<tr>
<td>Total:</td>
<td>CO2 654,178.16 kg</td>
<td>547,981.42 kg</td>
<td>106,196.74 kg</td>
<td>2,123,644.03 kg</td>
</tr>
<tr>
<td>SO2 1,406.44 kg</td>
<td>1,014.85 kg</td>
<td>391.59 kg</td>
<td>7,830.74 kg</td>
<td></td>
</tr>
<tr>
<td>NOx 1,279.85 kg</td>
<td>1,104.55 kg</td>
<td>175.30 kg</td>
<td>3,505.44 kg</td>
<td></td>
</tr>
</tbody>
</table>
NIST BLCC 5.3-09: Comparative Analysis
Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A
Base Case: 2003 IECC Base Case
Alternative: 30% Alternative Design

General Information
File Name: C:\Program Files (x86)\BLCC5\projects\Large Office 18WWR Norfolk Residual Value.xml
Date of Study: Fri Oct 02 17:13:02 CDT 2009
Project Name: Large Office 18% WWR - Norfolk
Project Location: Nebraska
Analysis Type: FEMP Analysis, Energy Project
Analyst: A B Skillman
Base Date: October 1, 2009
Service Date: October 1, 2009
Study Period: 20 years 0 months (October 1, 2009 through September 30, 2029)
Discount Rate: 3%
Discounting Convention: End-of-Year

Comparison of Present-Value Costs
PV Life-Cycle Cost

<table>
<thead>
<tr>
<th></th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Investment Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$592,428</td>
<td>$916,448</td>
<td>-$324,020</td>
</tr>
<tr>
<td><strong>Future Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Consumption Costs</td>
<td>$673,163</td>
<td>$521,774</td>
<td>$151,389</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$544,438</td>
<td>$476,553</td>
<td>$67,885</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$134,000</td>
<td>$0</td>
<td>$134,000</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$258,158</td>
<td>-$274,934</td>
<td>$16,776</td>
</tr>
<tr>
<td><strong>Subtotal (for Future Cost Items)</strong></td>
<td>$1,093,442</td>
<td>$723,393</td>
<td>$370,050</td>
</tr>
<tr>
<td><strong>Total PV Life-Cycle Cost</strong></td>
<td>$1,685,870</td>
<td>$1,639,841</td>
<td>$46,030</td>
</tr>
</tbody>
</table>

Net Savings from Alternative Compared with Base Case

- PV of Non-Investment Savings: $219,274
- Increased Total Investment: $173,244

Net Savings: $46,030

Savings-to-Investment Ratio (SIR)
SIR = 1.27

Adjusted Internal Rate of Return
AIRR = 4.22%
### Payback Period

**Estimated Years to Payback (from beginning of Service Period)**

- **Simple Payback:** 16 years
- **Discounted Payback:** 18 years

### Energy Savings Summary

**Energy Savings Summary (in stated units)**

<table>
<thead>
<tr>
<th>Energy</th>
<th>-----Average-----</th>
<th>Annual Consumption</th>
<th>-----Life-Cycle-----</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Base Case</td>
<td>Alternative</td>
<td>Savings</td>
</tr>
<tr>
<td><strong>Electricity</strong></td>
<td>567,561.0 kWh</td>
<td>523,513.0 kWh</td>
<td>44,048.0 kWh</td>
</tr>
<tr>
<td><strong>Natural Gas</strong></td>
<td>6,216.0 Therm</td>
<td>0.0 Therm</td>
<td>6,216.0 Therm</td>
</tr>
</tbody>
</table>

**Energy Savings Summary (in MBtu)**

<table>
<thead>
<tr>
<th>Energy</th>
<th>-----Average-----</th>
<th>Annual Consumption</th>
<th>-----Life-Cycle-----</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Base Case</td>
<td>Alternative</td>
<td>Savings</td>
</tr>
<tr>
<td><strong>Electricity</strong></td>
<td>1,936.6 MBtu</td>
<td>1,786.3 MBtu</td>
<td>150.3 MBtu</td>
</tr>
<tr>
<td><strong>Natural Gas</strong></td>
<td>621.6 MBtu</td>
<td>0.0 MBtu</td>
<td>621.6 MBtu</td>
</tr>
</tbody>
</table>

### Emissions Reduction Summary

**Emissions Reduction Summary**

<table>
<thead>
<tr>
<th>Energy</th>
<th>-----Average-----</th>
<th>Annual Consumption</th>
<th>-----Life-Cycle-----</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Base Case</td>
<td>Alternative</td>
<td>Reduction</td>
</tr>
<tr>
<td><strong>Electricity</strong></td>
<td>CO2</td>
<td>594,088.17 kg</td>
<td>547,981.42 kg</td>
</tr>
<tr>
<td></td>
<td>SO2</td>
<td>1,100.24 kg</td>
<td>1,014.85 kg</td>
</tr>
<tr>
<td></td>
<td>NOx</td>
<td>1,197.49 kg</td>
<td>1,104.55 kg</td>
</tr>
<tr>
<td><strong>Natural Gas</strong></td>
<td>CO2</td>
<td>32,835.11 kg</td>
<td>0.00 kg</td>
</tr>
<tr>
<td></td>
<td>SO2</td>
<td>264.99 kg</td>
<td>0.00 kg</td>
</tr>
<tr>
<td></td>
<td>NOx</td>
<td>25.58 kg</td>
<td>0.00 kg</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td>CO2</td>
<td>626,923.28 kg</td>
<td>547,981.42 kg</td>
</tr>
<tr>
<td></td>
<td>SO2</td>
<td>1,365.23 kg</td>
<td>1,014.85 kg</td>
</tr>
<tr>
<td></td>
<td>NOx</td>
<td>1,223.07 kg</td>
<td>1,104.55 kg</td>
</tr>
</tbody>
</table>
## NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

### Base Case: 2003 IECC Base Case

### Alternative: 30% Alternative Design

### General Information

- **File Name:** C:\Program Files (x86)\BLCC5\projects\Large Office 18WWR Chadron Residual Value.xml
- **Date of Study:** Sat Oct 03 08:48:40 CDT 2009
- **Project Name:** Large Office 18% WWR - Chadron
- **Project Location:** Nebraska
- **Analysis Type:** FEMP Analysis, Energy Project
- **Analyst:** A B Skillman
- **Base Date:** October 1, 2009
- **Service Date:** October 1, 2009
- **Study Period:** 20 years 0 months (October 1, 2009 through September 30, 2029)
- **Discount Rate:** 3%
- **Discounting Convention:** End-of-Year

### Comparison of Present-Value Costs

#### PV Life-Cycle Cost

<table>
<thead>
<tr>
<th></th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Investment Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$579,428</td>
<td>$877,948</td>
<td>-$298,520</td>
</tr>
<tr>
<td><strong>Future Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Consumption Costs</td>
<td>$628,994</td>
<td>$485,664</td>
<td>$143,331</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$422,462</td>
<td>$383,389</td>
<td>$39,073</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$121,500</td>
<td>$0</td>
<td>$121,500</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$243,163</td>
<td>-$263,384</td>
<td>$20,221</td>
</tr>
<tr>
<td><strong>Subtotal (for Future Cost Items)</strong></td>
<td>$929,793</td>
<td>$605,668</td>
<td>$324,124</td>
</tr>
<tr>
<td><strong>Total PV Life-Cycle Cost</strong></td>
<td>$1,509,221</td>
<td>$1,483,616</td>
<td>$25,604</td>
</tr>
</tbody>
</table>

### Net Savings from Alternative Compared with Base Case

- **PV of Non-Investment Savings:** $182,403
- **- Increased Total Investment:** $156,799

**Net Savings:** $25,604

### Savings-to-Investment Ratio (SIR)

- **SIR:** 1.16

### Adjusted Internal Rate of Return (AIRR)

- **AIRR:** 3.78%
**Payback Period**

Estimated Years to Payback (from beginning of Service Period)

Simple Payback occurs in year 16

Discounted Payback occurs in year 20

**Energy Savings Summary**

Energy Savings Summary (in stated units)

<table>
<thead>
<tr>
<th>Type</th>
<th>Energy</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>kWh</td>
<td>553,904.0</td>
<td>485,033.0</td>
<td>68,871.0 kWh</td>
<td>1,377,231.4 kWh</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>Therm</td>
<td>4,139.0</td>
<td>0.0 Therm</td>
<td>4,139.0 Therm</td>
<td>82,768.7 Therm</td>
</tr>
</tbody>
</table>

Energy Savings Summary (in MBtu)

<table>
<thead>
<tr>
<th>Type</th>
<th>Energy</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>MBtu</td>
<td>1,890.0</td>
<td>1,655.0 MBtu</td>
<td>235.0 MBtu</td>
<td>4,699.3 MBtu</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>MBtu</td>
<td>413.9 MBtu</td>
<td>0.0 MBtu</td>
<td>413.9 MBtu</td>
<td>8,276.9 MBtu</td>
</tr>
</tbody>
</table>

**Emissions Reduction Summary**

Energy −−−−− Average Annual Emissions−−−−− Life-Cycle

<table>
<thead>
<tr>
<th>Type</th>
<th>Energy</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Reduction</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>kg</td>
<td>579,792.86 kg</td>
<td>507,702.90 kg</td>
<td>72,089.95 kg</td>
<td>1,441,601.71 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>kg</td>
<td>1,073.76 kg</td>
<td>940.25 kg</td>
<td>133.51 kg</td>
<td>2,669.81 kg</td>
</tr>
<tr>
<td>NOx</td>
<td>kg</td>
<td>1,168.68 kg</td>
<td>1,023.37 kg</td>
<td>145.31 kg</td>
<td>2,905.81 kg</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>kg</td>
<td>21,863.66 kg</td>
<td>0.00 kg</td>
<td>21,863.66 kg</td>
<td>437,213.39 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>kg</td>
<td>176.45 kg</td>
<td>0.00 kg</td>
<td>176.45 kg</td>
<td>3,528.45 kg</td>
</tr>
<tr>
<td>NOx</td>
<td>kg</td>
<td>17.03 kg</td>
<td>0.00 kg</td>
<td>17.03 kg</td>
<td>340.62 kg</td>
</tr>
<tr>
<td>Total:</td>
<td>kg</td>
<td>601,656.52 kg</td>
<td>507,702.90 kg</td>
<td>93,953.62 kg</td>
<td>1,878,815.10 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>kg</td>
<td>1,250.21 kg</td>
<td>940.25 kg</td>
<td>309.96 kg</td>
<td>6,198.26 kg</td>
</tr>
<tr>
<td>NOx</td>
<td>kg</td>
<td>1,185.71 kg</td>
<td>1,023.37 kg</td>
<td>162.34 kg</td>
<td>3,246.42 kg</td>
</tr>
</tbody>
</table>
NIST BLCC 5.3-09: Comparative Analysis
Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case Omaha
Alternative: 30% Alternative Case Omaha

General Information

File Name: C:\Program Files (x86)\BLCC5\projects\Small Office 38 WWR Omaha Residual Value.xml
Date of Study: Fri Oct 02 10:28:05 CDT 2009
Project Name: Small Office 38% WWR - Omaha
Project Location: Nebraska
Analysis Type: FEMP Analysis, Energy Project
Analyst: A B Skillman
Base Date: October 1, 2009
Service Date: October 1, 2009
Study Period: 20 years 0 months (October 1, 2009 through September 30, 2029)
Discount Rate: 3%
Discounting Convention: End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

<table>
<thead>
<tr>
<th>Item</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Investment Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$177,882</td>
<td>$272,758</td>
<td>-$94,876</td>
</tr>
<tr>
<td><strong>Future Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Consumption Costs</td>
<td>$117,661</td>
<td>$88,298</td>
<td>$29,362</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$154,919</td>
<td>$122,072</td>
<td>$32,848</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$31,500</td>
<td>$30,000</td>
<td>$1,500</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$69,710</td>
<td>-$96,977</td>
<td>$27,268</td>
</tr>
<tr>
<td>Subtotal (for Future Cost Items)</td>
<td>$234,370</td>
<td>$143,392</td>
<td>$90,978</td>
</tr>
<tr>
<td><strong>Total PV Life-Cycle Cost</strong></td>
<td>$412,253</td>
<td>$416,150</td>
<td>-$3,898</td>
</tr>
</tbody>
</table>

Net Savings from Alternative Compared with Base Case

<table>
<thead>
<tr>
<th>Item</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV of Non-Investment Savings</td>
<td>$62,210</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Increased Total Investment</td>
<td>$66,108</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Net Savings</strong></td>
<td></td>
<td></td>
<td>-$3,898</td>
</tr>
</tbody>
</table>

Savings-to-Investment Ratio (SIR)

\[ SIR = 0.94 \]

SIR is lower than 1.0; project alternative is not cost effective.

Adjusted Internal Rate of Return

AIRR = 26.9%
AIRR = 2.69%

AIRR is lower than your discount rate; project alternative is not cost effective.

Payback Period
Estimated Years to Payback (from beginning of Service Period)
Discounted Payback never reached during study period.

Simple Payback occurs in year 20

Energy Savings Summary
Energy Savings Summary (in stated units)

<table>
<thead>
<tr>
<th>Type</th>
<th>Average Annual Consumption</th>
<th>Life-Cycle Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>84,844.0 kWh 70,015.0 kWh 14,829.0 kWh 296,539.4 kWh</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>1,513.0 Therm 810.0 Therm 703.0 Therm 14,058.1 Therm</td>
<td></td>
</tr>
</tbody>
</table>

Energy Savings Summary (in MBtu)

<table>
<thead>
<tr>
<th>Type</th>
<th>Average Annual Consumption</th>
<th>Life-Cycle Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>289.5 MBtu 238.9 MBtu 50.6 MBtu 1,011.8 MBtu</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>151.3 MBtu 81.0 MBtu 70.3 MBtu 1,405.8 MBtu</td>
<td></td>
</tr>
</tbody>
</table>

Emissions Reduction Summary

<table>
<thead>
<tr>
<th>Type</th>
<th>Average Annual Emissions</th>
<th>Life-Cycle Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>CO2 88,809.51 kg 73,287.42 kg 15,522.09 kg 310,399.32 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SO2 164.47 kg 135.73 kg 28.75 kg 574.85 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NOx 179.01 kg 147.72 kg 31.29 kg 625.67 kg</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>CO2 7,992.20 kg 4,278.71 kg 3,713.49 kg 74,259.73 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SO2 64.50 kg 34.53 kg 29.97 kg 599.30 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NOx 6.23 kg 3.33 kg 2.89 kg 57.85 kg</td>
<td></td>
</tr>
<tr>
<td>Total:</td>
<td>CO2 96,801.72 kg 77,566.13 kg 19,235.59 kg 384,659.05 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SO2 228.97 kg 170.26 kg 58.72 kg 1,174.15 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NOx 185.24 kg 151.06 kg 34.18 kg 683.52 kg</td>
<td></td>
</tr>
</tbody>
</table>
NIST BLCC 5.3-09: Comparative Analysis
Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case Norfolk
Alternative: 30% Alternative Case Norfolk

General Information

File Name: C:\Program Files (x86)\BLCC5\projects\Small Office 38% WWR Norfolk Residual Value.xml
Date of Study: Fri Oct 02 11:19:40 CDT 2009
Project Name: Small Office 38% WWR - Norfolk
Project Location: Nebraska
Analysis Type: FEMP Analysis, Energy Project
Analyst: A B Skillman
Base Date: October 1, 2009
Service Date: October 1, 2009
Study Period: 20 years 0 months (October 1, 2009 through September 30, 2029)
Discount Rate: 3%
Discounting Convention: End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

<table>
<thead>
<tr>
<th></th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Investment Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$183,258</td>
<td>$274,258</td>
<td>-$91,000</td>
</tr>
<tr>
<td><strong>Future Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Consumption Costs</td>
<td>$114,904</td>
<td>$90,178</td>
<td>$24,725</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$147,638</td>
<td>$116,326</td>
<td>$31,313</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$29,000</td>
<td>$28,590</td>
<td>$410</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$70,327</td>
<td>-$96,715</td>
<td>$26,388</td>
</tr>
<tr>
<td>Subtotal (for Future Cost Items)</td>
<td>$221,215</td>
<td>$138,379</td>
<td>$82,836</td>
</tr>
<tr>
<td><strong>Total PV Life-Cycle Cost</strong></td>
<td>$404,473</td>
<td>$412,637</td>
<td>-$8,164</td>
</tr>
</tbody>
</table>

Net Savings from Alternative Compared with Base Case

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PV of Non-Investment Savings</td>
<td>$56,038</td>
</tr>
<tr>
<td>- Increased Total Investment</td>
<td>$64,202</td>
</tr>
<tr>
<td><strong>Net Savings</strong></td>
<td>-$8,164</td>
</tr>
</tbody>
</table>

Savings-to-Investment Ratio (SIR)

\[
SIR = \frac{-\text{Net Savings}}{\text{Increased Total Investment}} = \frac{-8,164}{64,202} = 0.87
\]

SIR is lower than 1.0; project alternative is not cost effective.

Adjusted Internal Rate of Return
Adjusted Internal Rate of Return

\[ \text{AIRR} = 2.30\% \]

AIRR is lower than your discount rate; project alternative is not cost effective.

**Payback Period**

Estimated Years to Payback (from beginning of Service Period)

Discounted Payback never reached during study period.

Simple Payback occurs in year 20

**Energy Savings Summary**

**Energy Savings Summary (in stated units)**

<table>
<thead>
<tr>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>82,236.0 kWh</td>
<td>68,667.0 kWh</td>
<td>13,569.0 kWh</td>
<td>271,342.9 kWh</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>1,673.0 Therm</td>
<td>946.0 Therm</td>
<td>727.0 Therm</td>
<td>14,538.0 Therm</td>
</tr>
</tbody>
</table>

**Energy Savings Summary (in MBtu)**

<table>
<thead>
<tr>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>280.6 MBtu</td>
<td>234.3 MBtu</td>
<td>46.3 MBtu</td>
<td>925.9 MBtu</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>167.3 MBtu</td>
<td>94.6 MBtu</td>
<td>72.7 MBtu</td>
<td>1,453.8 MBtu</td>
</tr>
</tbody>
</table>

**Emissions Reduction Summary**

<table>
<thead>
<tr>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Reduction</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>86,079.62 kg</td>
<td>71,876.42 kg</td>
<td>14,203.20 kg</td>
<td>284,025.11 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>159.42 kg</td>
<td>133.11 kg</td>
<td>26.30 kg</td>
<td>526.01 kg</td>
</tr>
<tr>
<td>NOx</td>
<td>173.51 kg</td>
<td>144.88 kg</td>
<td>28.63 kg</td>
<td>572.50 kg</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>8,837.38 kg</td>
<td>4,997.11 kg</td>
<td>3,840.27 kg</td>
<td>76,794.91 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>71.32 kg</td>
<td>40.33 kg</td>
<td>30.99 kg</td>
<td>619.76 kg</td>
</tr>
<tr>
<td>NOx</td>
<td>6.88 kg</td>
<td>3.89 kg</td>
<td>2.99 kg</td>
<td>59.83 kg</td>
</tr>
<tr>
<td>Total:</td>
<td>94,917.00 kg</td>
<td>76,873.53 kg</td>
<td>18,043.47 kg</td>
<td>360,820.02 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>230.74 kg</td>
<td>173.44 kg</td>
<td>57.30 kg</td>
<td>1,145.77 kg</td>
</tr>
<tr>
<td>NOx</td>
<td>180.39 kg</td>
<td>148.77 kg</td>
<td>31.62 kg</td>
<td>632.33 kg</td>
</tr>
</tbody>
</table>
**NIST BLCC 5.3-09: Comparative Analysis**
Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

**Base Case: 2003 IECC Base Case Chadron**
**Alternative: 30% Alternative Case Chadron**

**General Information**
- **File Name:** C:\Program Files (x86)\BLCC5\projects\Small Office 38 WWR Chadron Residual Value.xml
- **Date of Study:** Fri Oct 02 13:14:57 CDT 2009
- **Project Name:** Small Office 38% WWR - Chadron
- **Project Location:** Nebraska
- **Analysis Type:** FEMP Analysis, Energy Project
- **Analyst:** A B Skillman
- **Base Date:** October 1, 2009
- **Service Date:** October 1, 2009
- **Study Period:** 20 years 0 months (October 1, 2009 through September 30, 2029)
- **Discount Rate:** 3%
- **Discounting Convention:** End-of-Year

### Comparison of Present-Value Costs

<table>
<thead>
<tr>
<th></th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Investment Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$184,258</td>
<td>$270,758</td>
<td>-$86,500</td>
</tr>
<tr>
<td><strong>Future Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Consumption Costs</td>
<td>$124,634</td>
<td>$95,013</td>
<td>$29,620</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$136,174</td>
<td>$107,293</td>
<td>$28,881</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$30,000</td>
<td>$26,370</td>
<td>$3,630</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$70,787</td>
<td>-$94,544</td>
<td>$23,757</td>
</tr>
<tr>
<td><strong>Subtotal (for Future Cost Items)</strong></td>
<td>$220,020</td>
<td>$134,132</td>
<td>$85,889</td>
</tr>
<tr>
<td><strong>Total PV Life-Cycle Cost</strong></td>
<td>$404,278</td>
<td>$404,890</td>
<td>-$612</td>
</tr>
</tbody>
</table>

**Net Savings from Alternative Compared with Base Case**
- PV of Non-Investment Savings $58,502
- Increased Total Investment $59,113

**Net Savings** $-612

**Savings-to-Investment Ratio (SIR)**
- **SIR = 0.99**

SIR is lower than 1.0; project alternative is not cost effective.

**Adjusted Internal Rate of Return**
Adjusted Internal Rate of Return

AIRR = 2.95%

AIRR is lower than your discount rate; project alternative is not cost effective.

Payback Period

Estimated Years to Payback (from beginning of Service Period)
Discounted Payback never reached during study period.
Simple Payback occurs in year 20

Energy Savings Summary

Energy Savings Summary (in stated units)

<table>
<thead>
<tr>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>87,863.0 kWh</td>
<td>68,491.0 kWh</td>
<td>19,372.0 kWh</td>
<td>387,387.0 kWh</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>1,132.0 Therm</td>
<td>744.0 Therm</td>
<td>388.0 Therm</td>
<td>7,758.9 Therm</td>
</tr>
</tbody>
</table>

Energy Savings Summary (in MBtu)

<table>
<thead>
<tr>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>299.8 MBtu</td>
<td>233.7 MBtu</td>
<td>66.1 MBtu</td>
<td>1,321.8 MBtu</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>113.2 MBtu</td>
<td>74.4 MBtu</td>
<td>38.8 MBtu</td>
<td>775.9 MBtu</td>
</tr>
</tbody>
</table>

Emissions Reduction Summary

<table>
<thead>
<tr>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Reduction</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>91,969.62 kg</td>
<td>71,692.19 kg</td>
<td>20,277.43 kg</td>
<td>405,493.00 kg</td>
</tr>
<tr>
<td>CO2</td>
<td>170.33 kg</td>
<td>132.77 kg</td>
<td>37.55 kg</td>
<td>750.96 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>185.38 kg</td>
<td>144.51 kg</td>
<td>40.87 kg</td>
<td>817.34 kg</td>
</tr>
<tr>
<td>NOx</td>
<td>4.66 kg</td>
<td>3.06 kg</td>
<td>1.60 kg</td>
<td>31.93 kg</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>5,979.62 kg</td>
<td>3,930.07 kg</td>
<td>2,049.55 kg</td>
<td>40,985.45 kg</td>
</tr>
<tr>
<td>CO2</td>
<td>48.26 kg</td>
<td>31.72 kg</td>
<td>16.54 kg</td>
<td>330.77 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>4.66 kg</td>
<td>3.06 kg</td>
<td>1.60 kg</td>
<td>31.93 kg</td>
</tr>
<tr>
<td>NOx</td>
<td>5,979.62 kg</td>
<td>3,930.07 kg</td>
<td>2,049.55 kg</td>
<td>40,985.45 kg</td>
</tr>
<tr>
<td>Total:</td>
<td>97,949.24 kg</td>
<td>75,622.26 kg</td>
<td>22,326.98 kg</td>
<td>446,478.45 kg</td>
</tr>
<tr>
<td>CO2</td>
<td>218.58 kg</td>
<td>164.49 kg</td>
<td>54.09 kg</td>
<td>1,081.73 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>190.04 kg</td>
<td>147.57 kg</td>
<td>42.47 kg</td>
<td>849.27 kg</td>
</tr>
</tbody>
</table>
NIST BLCC 5.3-09: Comparative Analysis
Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case Omaha
Alternative: 30% Alternative Case Omaha

General Information
File Name: J:\002-10106-000\E Design SD-DD-CD\05 Engineering Calculations\Mechanical\2009 10 01 FINAL SUBMITTAL DOCS\BLCC Files\Small Office 18 WWR Omaha Residual Value.xm
Date of Study: Fri Oct 02 17:34:51 CDT 2009
Project Name: Small Office 18% WWR - Omaha
Project Location: Nebraska
Analysis Type: FEMP Analysis, Energy Project
Analyst: A B Skillman
Base Date: October 1, 2009
Service Date: October 1, 2009
Study Period: 20 years 0 months (October 1, 2009 through September 30, 2029)
Discount Rate: 3%
Discounting Convention: End-of-Year

Comparison of Present-Value Costs
PV Life-Cycle Cost

<table>
<thead>
<tr>
<th></th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Investment Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$167,582</td>
<td>$249,739</td>
<td>-$82,157</td>
</tr>
<tr>
<td><strong>Future Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Consumption Costs</td>
<td>$104,822</td>
<td>$81,333</td>
<td>$23,489</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$138,899</td>
<td>$122,062</td>
<td>$16,837</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$28,500</td>
<td>$30,000</td>
<td>-$1,500</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$62,740</td>
<td>-$90,072</td>
<td>$27,332</td>
</tr>
<tr>
<td><strong>Subtotal (for Future Cost Items)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$209,481</td>
<td>$143,323</td>
<td>$66,158</td>
<td></td>
</tr>
<tr>
<td><strong>Total PV Life-Cycle Cost</strong></td>
<td>$377,064</td>
<td>$393,062</td>
<td>-$15,999</td>
</tr>
</tbody>
</table>

Net Savings from Alternative Compared with Base Case

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PV of Non-Investment Savings</td>
<td>$40,326</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Increased Total Investment</td>
<td>$56,325</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Net Savings: -$15,999

Savings-to-Investment Ratio (SIR)

SIR = 0.72

SIR is lower than 1.0; project alternative is not cost effective.

Adjusted Internal Rate of Return
Adjusted Internal Rate of Return
\[ \text{AIRR} = 1.29\% \]

AIRR is lower than your discount rate; project alternative is not cost effective.

Payback Period
Estimated Years to Payback (from beginning of Service Period)
Discounted Payback never reached during study period.

Simple Payback occurs in year 20

Energy Savings Summary

<table>
<thead>
<tr>
<th>Type</th>
<th>Energy Consumption</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>75,349.0 kWh</td>
<td>66,117.0 kWh</td>
<td>9,232.0 kWh</td>
<td>184,614.7 kWh</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>1,378.0 Therm</td>
<td>629.0 Therm</td>
<td>749.0 Therm</td>
<td>14,977.9 Therm</td>
<td></td>
</tr>
</tbody>
</table>

Energy Savings Summary (in MBtu)

<table>
<thead>
<tr>
<th>Type</th>
<th>Energy Consumption</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>257.1 MBtu</td>
<td>225.6 MBtu</td>
<td>31.5 MBtu</td>
<td>629.9 MBtu</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>137.8 MBtu</td>
<td>62.9 MBtu</td>
<td>74.9 MBtu</td>
<td>1,497.8 MBtu</td>
<td></td>
</tr>
</tbody>
</table>

Emissions Reduction Summary

<table>
<thead>
<tr>
<th>Type</th>
<th>Energy Emissions</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Reduction</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>CO2 78,870.73 kg</td>
<td>69,207.24 kg</td>
<td>9,663.49 kg</td>
<td>193,243.41 kg</td>
<td></td>
</tr>
<tr>
<td>SO2</td>
<td>146.07 kg</td>
<td>128.17 kg</td>
<td>17.90 kg</td>
<td>357.88 kg</td>
<td></td>
</tr>
<tr>
<td>NOx</td>
<td>158.98 kg</td>
<td>139.50 kg</td>
<td>19.48 kg</td>
<td>389.52 kg</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>CO2 7,279.08 kg</td>
<td>3,322.60 kg</td>
<td>3,956.48 kg</td>
<td>79,118.83 kg</td>
<td></td>
</tr>
<tr>
<td>SO2</td>
<td>58.74 kg</td>
<td>26.81 kg</td>
<td>31.93 kg</td>
<td>638.51 kg</td>
<td></td>
</tr>
<tr>
<td>NOx</td>
<td>5.67 kg</td>
<td>2.59 kg</td>
<td>3.08 kg</td>
<td>61.64 kg</td>
<td></td>
</tr>
<tr>
<td>Total:</td>
<td>CO2 86,149.81 kg</td>
<td>72,529.84 kg</td>
<td>13,619.98 kg</td>
<td>272,362.24 kg</td>
<td></td>
</tr>
<tr>
<td>SO2</td>
<td>204.81 kg</td>
<td>154.98 kg</td>
<td>49.83 kg</td>
<td>996.40 kg</td>
<td></td>
</tr>
<tr>
<td>NOx</td>
<td>164.65 kg</td>
<td>142.09 kg</td>
<td>22.56 kg</td>
<td>451.16 kg</td>
<td></td>
</tr>
</tbody>
</table>
NIST BLCC 5.3-09: Comparative Analysis
Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A
Base Case: 2003 IECC Base Case Norfolk
Alternative: 30% Alternative Case Norfolk

General Information
File Name: J:\002-10106-000\E Design SD-DD-CD\05 Engineering Calculations\Mechanical\2009 10 01\FINAL SUBMITTAL DOCS\BLCC Files\Small Office 18 WWR Norfolk Residual Value.xm
Date of Study: Fri Oct 02 17:43:13 CDT 2009
Project Name: Small Office 18% WWR - Norfolk
Project Location: Nebraska
Analysis Type: FEMP Analysis, Energy Project
Analyst: A B Skillman
Base Date: October 1, 2009
Service Date: October 1, 2009
Study Period: 20 years 0 months (October 1, 2009 through September 30, 2029)
Discount Rate: 3%
Discounting Convention: End-of-Year

Comparison of Present-Value Costs
PV Life-Cycle Cost

<table>
<thead>
<tr>
<th></th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Investment Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$172,716</td>
<td>$249,739</td>
<td>-$77,023</td>
</tr>
<tr>
<td><strong>Future Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Consumption Costs</td>
<td>$103,828</td>
<td>$82,769</td>
<td>$21,059</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$132,371</td>
<td>$116,326</td>
<td>$16,046</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$28,500</td>
<td>$28,590</td>
<td>-$90</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$64,280</td>
<td>-$89,360</td>
<td>$25,080</td>
</tr>
<tr>
<td>Subtotal (for Future Cost Items)</td>
<td>$200,419</td>
<td>$138,325</td>
<td>$62,094</td>
</tr>
<tr>
<td><strong>Total PV Life-Cycle Cost</strong></td>
<td>$373,135</td>
<td>$388,064</td>
<td>-$14,929</td>
</tr>
</tbody>
</table>

Net Savings from Alternative Compared with Base Case

|                      |           |             |                          |
| PV of Non-Investment Savings | $37,105 | |                          |
| - Increased Total Investment | $52,033 | |                          |
| **Net Savings** | -$14,929 | |                          |

Savings-to-Investment Ratio (SIR)

**SIR = 0.71**
SIR is lower than 1.0; project alternative is not cost effective.

Adjusted Internal Rate of Return
Adjusted Internal Rate of Return

\[
\text{AIRR} = 1.27\%
\]

AIRR is lower than your discount rate; project alternative is not cost effective.

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Discounted Payback never reached during study period.

Simple Payback occurs in year 20

Energy Savings Summary

Energy Savings Summary (in stated units)

<table>
<thead>
<tr>
<th>Energy Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>72,652.0 kWh</td>
<td>64,652.0 kWh</td>
<td>8,000.0 kWh</td>
<td>159,978.1 kWh</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>1,593.0 Therm</td>
<td>721.0 Therm</td>
<td>872.0 Therm</td>
<td>17,437.6 Therm</td>
</tr>
</tbody>
</table>

Energy Savings Summary (in MBtu)

<table>
<thead>
<tr>
<th>Energy Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>247.9 MBtu</td>
<td>220.6 MBtu</td>
<td>27.3 MBtu</td>
<td>545.9 MBtu</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>159.3 MBtu</td>
<td>72.1 MBtu</td>
<td>87.2 MBtu</td>
<td>1,743.8 MBtu</td>
</tr>
</tbody>
</table>

Emissions Reduction Summary

<table>
<thead>
<tr>
<th>Energy Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Reduction</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>76,047.67 kg</td>
<td>67,673.76 kg</td>
<td>8,373.91 kg</td>
<td>167,455.30 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>140.84 kg</td>
<td>125.33 kg</td>
<td>15.51 kg</td>
<td>310.12 kg</td>
</tr>
<tr>
<td>NOx</td>
<td>153.29 kg</td>
<td>136.41 kg</td>
<td>16.88 kg</td>
<td>337.54 kg</td>
</tr>
</tbody>
</table>

Natural Gas

| CO2             | 8,414.79 kg | 3,808.58 kg | 4,606.21 kg | 92,111.64 kg |
| SO2             | 67.91 kg | 30.74 kg | 37.17 kg | 743.37 kg |
| NOx             | 6.56 kg | 2.97 kg | 3.59 kg | 71.76 kg |

Total:

| CO2             | 84,462.46 kg | 71,482.34 kg | 12,980.12 kg | 259,566.94 kg |
| SO2             | 208.75 kg | 156.07 kg | 52.68 kg | 1,053.49 kg |
| NOx             | 159.84 kg | 139.38 kg | 20.47 kg | 409.30 kg |
Comparison of Present-Value Costs

PV Life-Cycle Cost

<table>
<thead>
<tr>
<th>Initial Investment Costs:</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$172,716</td>
<td>$249,739</td>
<td>-$77,023</td>
</tr>
</tbody>
</table>

Future Costs:

<table>
<thead>
<tr>
<th>Energy Consumption Costs</th>
<th>$94,598</th>
<th>$77,694</th>
<th>$16,904</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$122,093</td>
<td>$103,255</td>
<td>$18,837</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$28,000</td>
<td>$26,370</td>
<td>$1,630</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$63,945</td>
<td>-$88,239</td>
<td>$24,294</td>
</tr>
</tbody>
</table>

Subtotal (for Future Cost Items) | $180,746 | $119,081 | $61,666 |

Total PV Life-Cycle Cost | $353,462 | $368,820 | -$15,357 |

Net Savings from Alternative Compared with Base Case

<table>
<thead>
<tr>
<th>PV of Non-Investment Savings</th>
<th>$35,742</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Increased Total Investment</td>
<td>$51,099</td>
</tr>
</tbody>
</table>

Net Savings | -$15,357 |

Savings-to-Investment Ratio (SIR)

SIR = 0.70

SIR is lower than 1.0; project alternative is not cost effective.
Adjusted Internal Rate of Return

AIRR = 1.18%

AIRR is lower than your discount rate; project alternative is not cost effective.

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Discounted Payback never reached during study period.

Simple Payback occurs in year 20

Energy Savings Summary

Energy Savings Summary (in stated units)

<table>
<thead>
<tr>
<th>Energy</th>
<th>Type</th>
<th>Base Case</th>
<th>Annual Consumption</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>71,216.0 kWh</td>
<td>64,711.0 kWh</td>
<td>6,505.0 kWh</td>
<td>130,082.2 kWh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>1,231.0 Therm</td>
<td>561.0 Therm</td>
<td>670.0 Therm</td>
<td>13,398.2 Therm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Energy Savings Summary (in MBtu)

<table>
<thead>
<tr>
<th>Energy</th>
<th>Type</th>
<th>Base Case</th>
<th>Annual Consumption</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>243.0 MBtu</td>
<td>220.8 MBtu</td>
<td>22.2 MBtu</td>
<td>443.9 MBtu</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>123.1 MBtu</td>
<td>56.1 MBtu</td>
<td>67.0 MBtu</td>
<td>1,339.8 MBtu</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Emissions Reduction Summary

<table>
<thead>
<tr>
<th>Energy</th>
<th>Type</th>
<th>Base Case</th>
<th>Annual Emissions</th>
<th>Alternative</th>
<th>Reduction</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>CO2</td>
<td>74,544.56 kg</td>
<td>67,735.52 kg</td>
<td>6,809.04 kg</td>
<td>136,162.09 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SO2</td>
<td>138.05 kg</td>
<td>125.44 kg</td>
<td>12.61 kg</td>
<td>252.17 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NOx</td>
<td>150.26 kg</td>
<td>136.53 kg</td>
<td>13.72 kg</td>
<td>274.46 kg</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>CO2</td>
<td>6,502.58 kg</td>
<td>2,963.40 kg</td>
<td>3,539.18 kg</td>
<td>70,773.85 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SO2</td>
<td>52.48 kg</td>
<td>23.92 kg</td>
<td>28.56 kg</td>
<td>571.17 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NOx</td>
<td>5.07 kg</td>
<td>2.31 kg</td>
<td>2.76 kg</td>
<td>55.14 kg</td>
<td></td>
</tr>
<tr>
<td>Total:</td>
<td>CO2</td>
<td>81,047.13 kg</td>
<td>70,698.92 kg</td>
<td>10,348.21 kg</td>
<td>206,935.94 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SO2</td>
<td>190.53 kg</td>
<td>149.36 kg</td>
<td>41.17 kg</td>
<td>823.34 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NOx</td>
<td>155.32 kg</td>
<td>138.84 kg</td>
<td>16.48 kg</td>
<td>329.60 kg</td>
<td></td>
</tr>
</tbody>
</table>
NIST BLCC 5.3-09: Comparative Analysis
Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case
Alternative: Alternative 30% Better

General Information
File Name: C:\Program Files (x86)\BLCC5\projects\Small Retail 8% WWR Omaha Residual Value.xml
Date of Study: Mon Oct 05 14:23:41 CDT 2009
Project Name: Small Retail 8% WWR - Omaha
Project Location: Nebraska
Analysis Type: FEMP Analysis, Energy Project
Analyst: NR Decker
Base Date: October 1, 2009
Service Date: October 1, 2009
Study Period: 20 years 0 months (October 1, 2009 through September 30, 2029)
Discount Rate: 3%
Discounting Convention: End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

<table>
<thead>
<tr>
<th>Initial Investment Costs:</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$79,190</td>
<td>$102,780</td>
<td>-$23,590</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Future Costs:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Consumption Costs</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
</tr>
<tr>
<td>Water Costs</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
</tr>
<tr>
<td>Capital Replacements</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
</tr>
</tbody>
</table>

| Subtotal (for Future Cost Items) | $249,794 | $181,646 | $68,148 |

| Total PV Life-Cycle Cost | $328,984 | $284,426 | $44,558 |

Net Savings from Alternative Compared with Base Case

| PV of Non-Investment Savings | $67,941 |
| Increased Total Investment | $23,383 |

Net Savings | $44,558 |

Savings-to-Investment Ratio (SIR)
SIR = 2.91

Adjusted Internal Rate of Return
AIRR = 8.64%

Payback Period
**Estimated Years to Payback (from beginning of Service Period)**

Simple Payback occurs in year 8

Discounted Payback occurs in year 9

**Energy Savings Summary**

**Energy Savings Summary (in stated units)**

<table>
<thead>
<tr>
<th>Energy</th>
<th>Type</th>
<th>Base Case Consumption</th>
<th>Alternative Consumption</th>
<th>Savings</th>
<th>Savings Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Electricity</td>
<td>76,114.0 kWh</td>
<td>63,277.0 kWh</td>
<td>12,837.0 kWh</td>
<td>256,704.9 kWh</td>
</tr>
<tr>
<td></td>
<td>Natural Gas</td>
<td>2,504.0 Therm</td>
<td>1,237.0 Therm</td>
<td>1,267.0 Therm</td>
<td>25,336.5 Therm</td>
</tr>
</tbody>
</table>

**Energy Savings Summary (in MBtu)**

<table>
<thead>
<tr>
<th>Energy</th>
<th>Type</th>
<th>Base Case Consumption</th>
<th>Alternative Consumption</th>
<th>Savings</th>
<th>Savings Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Electricity</td>
<td>259.7 MBtu</td>
<td>215.9 MBtu</td>
<td>43.8 MBtu</td>
<td>875.9 MBtu</td>
</tr>
<tr>
<td></td>
<td>Natural Gas</td>
<td>250.4 MBtu</td>
<td>123.7 MBtu</td>
<td>126.7 MBtu</td>
<td>2,533.7 MBtu</td>
</tr>
</tbody>
</table>

**Emissions Reduction Summary**

<table>
<thead>
<tr>
<th>Energy</th>
<th>Type</th>
<th>Base Case Consumption</th>
<th>Alternative Consumption</th>
<th>Reduction</th>
<th>Reduction Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Electricity</td>
<td>79,671.48 kg</td>
<td>66,234.50 kg</td>
<td>13,436.99 kg</td>
<td>268,702.95 kg</td>
</tr>
<tr>
<td></td>
<td>CO2</td>
<td>79,671.48 kg</td>
<td>66,234.50 kg</td>
<td>13,436.99 kg</td>
<td>268,702.95 kg</td>
</tr>
<tr>
<td></td>
<td>SO2</td>
<td>147.55 kg</td>
<td>122.66 kg</td>
<td>24.88 kg</td>
<td>497.63 kg</td>
</tr>
<tr>
<td></td>
<td>NOx</td>
<td>160.59 kg</td>
<td>133.51 kg</td>
<td>27.08 kg</td>
<td>541.62 kg</td>
</tr>
<tr>
<td></td>
<td>Natural Gas</td>
<td>13,227.01 kg</td>
<td>6,534.27 kg</td>
<td>6,692.74 kg</td>
<td>133,836.52 kg</td>
</tr>
<tr>
<td></td>
<td>CO2</td>
<td>13,227.01 kg</td>
<td>6,534.27 kg</td>
<td>6,692.74 kg</td>
<td>133,836.52 kg</td>
</tr>
<tr>
<td></td>
<td>SO2</td>
<td>106.75 kg</td>
<td>52.73 kg</td>
<td>54.01 kg</td>
<td>1,080.10 kg</td>
</tr>
<tr>
<td></td>
<td>NOx</td>
<td>10.30 kg</td>
<td>5.09 kg</td>
<td>5.21 kg</td>
<td>104.27 kg</td>
</tr>
</tbody>
</table>

Total:

<table>
<thead>
<tr>
<th>Energy</th>
<th>Type</th>
<th>Base Case Consumption</th>
<th>Alternative Consumption</th>
<th>Reduction</th>
<th>Reduction Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CO2</td>
<td>92,898.50 kg</td>
<td>72,768.77 kg</td>
<td>20,129.73 kg</td>
<td>402,539.48 kg</td>
</tr>
<tr>
<td></td>
<td>SO2</td>
<td>254.30 kg</td>
<td>175.40 kg</td>
<td>78.90 kg</td>
<td>1,577.73 kg</td>
</tr>
<tr>
<td></td>
<td>NOx</td>
<td>170.90 kg</td>
<td>138.60 kg</td>
<td>32.30 kg</td>
<td>645.89 kg</td>
</tr>
</tbody>
</table>
NIST BLCC 5.3-09: Comparative Analysis
Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A
Base Case: 2003 IECC Base Case
Alternative: Alternative 30% Better

General Information
File Name: C:\Program Files (x86)\BLCC5\projects\Small Retail 8WWR Norfolk Residual Value.xml
Date of Study: Mon Oct 05 14:30:01 CDT 2009
Project Name: Small Retail 8% WWR - Norfolk
Project Location: Nebraska
Analysis Type: FEMP Analysis, Energy Project
Analyst: NR Decker
Base Date: October 1, 2009
Service Date: October 1, 2009
Study Period: 20 years 0 months (October 1, 2009 through September 30, 2029)
Discount Rate: 3%
Discounting Convention: End-of-Year

Comparison of Present-Value Costs
PV Life-Cycle Cost

<table>
<thead>
<tr>
<th></th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Investment Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$79,690</td>
<td>$105,780</td>
<td>-$26,090</td>
</tr>
<tr>
<td><strong>Future Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Consumption Costs</td>
<td>$123,269</td>
<td>$89,251</td>
<td>$34,018</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$140,859</td>
<td>$108,106</td>
<td>$32,753</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$17,154</td>
<td>$28,590</td>
<td>-$11,436</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$33,456</td>
<td>-$46,172</td>
<td>$12,716</td>
</tr>
<tr>
<td><strong>Subtotal (for Future Cost Items)</strong></td>
<td>$247,826</td>
<td>$179,776</td>
<td>$68,051</td>
</tr>
<tr>
<td><strong>Total PV Life-Cycle Cost</strong></td>
<td>$327,516</td>
<td>$285,556</td>
<td>$41,961</td>
</tr>
</tbody>
</table>

Net Savings from Alternative Compared with Base Case

| PV of Non-Investment Savings | $66,771 |
| Increased Total Investment  | $24,810 |
| **Net Savings**             | $41,961 |

Savings-to-Investment Ratio (SIR)

$SIR = 2.69$

Adjusted Internal Rate of Return

$AIRR = 8.23\%$
## Payback Period

**Estimated Years to Payback (from beginning of Service Period)**

- Simple Payback occurs in year 9
- Discounted Payback occurs in year 10

## Energy Savings Summary

### Energy Savings Summary (in stated units)

<table>
<thead>
<tr>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electricity</strong></td>
<td>73,359.0 kWh</td>
<td>60,668.0 kWh</td>
<td>12,691.0 kWh</td>
<td>253,785.3 kWh</td>
</tr>
<tr>
<td><strong>Natural Gas</strong></td>
<td>2,972.0 Therm</td>
<td>1,443.0 Therm</td>
<td>1,529.0 Therm</td>
<td>30,575.8 Therm</td>
</tr>
</tbody>
</table>

### Energy Savings Summary (in MBtu)

<table>
<thead>
<tr>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electricity</strong></td>
<td>250.3 MBtu</td>
<td>207.0 MBtu</td>
<td>43.3 MBtu</td>
<td>866.0 MBtu</td>
</tr>
<tr>
<td><strong>Natural Gas</strong></td>
<td>297.2 MBtu</td>
<td>144.3 MBtu</td>
<td>152.9 MBtu</td>
<td>3,057.6 MBtu</td>
</tr>
</tbody>
</table>

## Emissions Reduction Summary

### Emissions Reduction Summary

<table>
<thead>
<tr>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Reduction</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electricity</strong></td>
<td>76,787.72 kg</td>
<td>63,503.56 kg</td>
<td>13,284.16 kg</td>
<td>265,646.90 kg</td>
</tr>
<tr>
<td>CO2</td>
<td>142.21 kg</td>
<td>117.61 kg</td>
<td>24.60 kg</td>
<td>491.97 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>154.78 kg</td>
<td>128.00 kg</td>
<td>26.78 kg</td>
<td>535.46 kg</td>
</tr>
<tr>
<td>NOx</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Natural Gas</strong></td>
<td>15,699.16 kg</td>
<td>7,622.44 kg</td>
<td>8,076.72 kg</td>
<td>161,512.27 kg</td>
</tr>
<tr>
<td>CO2</td>
<td>126.70 kg</td>
<td>61.52 kg</td>
<td>65.18 kg</td>
<td>1,303.45 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>12.23 kg</td>
<td>5.94 kg</td>
<td>6.29 kg</td>
<td>125.83 kg</td>
</tr>
<tr>
<td>NOx</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong>:</td>
<td>92,486.87 kg</td>
<td>71,125.99 kg</td>
<td>21,360.88 kg</td>
<td>427,159.16 kg</td>
</tr>
<tr>
<td>CO2</td>
<td>268.91 kg</td>
<td>179.12 kg</td>
<td>89.78 kg</td>
<td>1,795.43 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>167.01 kg</td>
<td>133.94 kg</td>
<td>33.07 kg</td>
<td>661.29 kg</td>
</tr>
</tbody>
</table>
NIST BLCC 5.3-09: Comparative Analysis
Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case
Alternative: Alternative 30% Better

General Information

File Name: C:\Program Files (x86)\BLCC5\projects\Small Retail 8WWR Chadron Residual Value.xml

Date of Study: Mon Oct 05 14:33:07 CDT 2009
Project Name: Small Retail 8% WWR - Chadron
Project Location: Nebraska
Analysis Type: FEMP Analysis, Energy Project
Analyst: NR Decker
Base Date: October 1, 2009
Service Date: October 1, 2009
Study Period: 20 years 0 months (October 1, 2009 through September 30, 2029)
Discount Rate: 3%
Discounting Convention: End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

<table>
<thead>
<tr>
<th></th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Investment Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$73,690</td>
<td>$99,780</td>
<td>-$26,090</td>
</tr>
<tr>
<td><strong>Future Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Consumption Costs</td>
<td>$109,611</td>
<td>$78,102</td>
<td>$31,509</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$116,192</td>
<td>$99,712</td>
<td>$16,480</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$15,822</td>
<td>$26,370</td>
<td>-$10,548</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$29,121</td>
<td>-$43,251</td>
<td>$14,129</td>
</tr>
<tr>
<td></td>
<td>$212,503</td>
<td>$160,933</td>
<td>$51,570</td>
</tr>
<tr>
<td><strong>Subtotal (for Future Cost Items):</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total PV Life-Cycle Cost</td>
<td>$286,193</td>
<td>$260,713</td>
<td>$25,480</td>
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</tbody>
</table>

Net Savings from Alternative Compared with Base Case

<table>
<thead>
<tr>
<th></th>
<th>PV of Non-Investment Savings</th>
<th>Increased Total Investment</th>
<th>Net Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$47,989</td>
<td>$22,509</td>
<td>$25,480</td>
</tr>
</tbody>
</table>

Savings-to-Investment Ratio (SIR)

SIR = 2.13

Adjusted Internal Rate of Return

AIRR = 6.97%
Payback Period
Estimated Years to Payback (from beginning of Service Period)
Simple Payback occurs in year 11
Discounted Payback occurs in year 11

Energy Savings Summary
Energy Savings Summary (in stated units)
<table>
<thead>
<tr>
<th>Energy</th>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>70,223.0 kWh</td>
<td>58,030.0 kWh</td>
<td>12,193.0 kWh</td>
<td>243,826.6 kWh</td>
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</tr>
<tr>
<td>Natural Gas</td>
<td>2,343.0 Therm</td>
<td>1,055.0 Therm</td>
<td>1,288.0 Therm</td>
<td>25,756.5 Therm</td>
<td></td>
</tr>
</tbody>
</table>

Energy Savings Summary (in MBtu)
<table>
<thead>
<tr>
<th>Energy</th>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>239.6 MBtu</td>
<td>198.0 MBtu</td>
<td>41.6 MBtu</td>
<td>832.0 MBtu</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>234.3 MBtu</td>
<td>105.5 MBtu</td>
<td>128.8 MBtu</td>
<td>2,575.7 MBtu</td>
<td></td>
</tr>
</tbody>
</table>

Emissions Reduction Summary
<table>
<thead>
<tr>
<th>Energy</th>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Reduction</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>CO2</td>
<td>73,505.15 kg</td>
<td>60,742.26 kg</td>
<td>12,762.89 kg</td>
<td>255,222.80 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>136.13 kg</td>
<td>112.49 kg</td>
<td>23.64 kg</td>
<td>472.67 kg</td>
<td></td>
</tr>
<tr>
<td>NOx</td>
<td>148.16 kg</td>
<td>122.44 kg</td>
<td>25.73 kg</td>
<td>514.45 kg</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>CO2</td>
<td>12,376.55 kg</td>
<td>5,572.88 kg</td>
<td>6,803.67 kg</td>
<td>136,054.81 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>99.88 kg</td>
<td>44.97 kg</td>
<td>54.91 kg</td>
<td>1,098.01 kg</td>
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</tr>
<tr>
<td>NOx</td>
<td>9.64 kg</td>
<td>4.34 kg</td>
<td>5.30 kg</td>
<td>106.00 kg</td>
<td></td>
</tr>
<tr>
<td>Total:</td>
<td>CO2</td>
<td>85,881.70 kg</td>
<td>66,315.14 kg</td>
<td>19,566.56 kg</td>
<td>391,277.61 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>236.01 kg</td>
<td>157.47 kg</td>
<td>78.54 kg</td>
<td>1,570.67 kg</td>
<td></td>
</tr>
<tr>
<td>NOx</td>
<td>157.80 kg</td>
<td>126.78 kg</td>
<td>31.03 kg</td>
<td>620.44 kg</td>
<td></td>
</tr>
</tbody>
</table>
NIST BLCC 5.3-09: Comparative Analysis
Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case Omaha
Alternative: 30% Alternative Case Omaha

General Information

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>File Name</td>
<td>C:\Program Files (x86)\BLCC5\projects\Strip Retail Omaha Residual Value.xml</td>
</tr>
<tr>
<td>Date of Study</td>
<td>Mon Oct 05 13:58:26 CDT 2009</td>
</tr>
<tr>
<td>Project Name</td>
<td>Strip Retail - Omaha</td>
</tr>
<tr>
<td>Project Location</td>
<td>Nebraska</td>
</tr>
<tr>
<td>Analysis Type</td>
<td>FEMP Analysis, Energy Project</td>
</tr>
<tr>
<td>Analyst</td>
<td>A B Skillman</td>
</tr>
<tr>
<td>Base Date</td>
<td>October 1, 2009</td>
</tr>
<tr>
<td>Service Date</td>
<td>October 1, 2009</td>
</tr>
<tr>
<td>Study Period</td>
<td>20 years 0 months(October 1, 2009 through September 30, 2029)</td>
</tr>
<tr>
<td>Discount Rate</td>
<td>3%</td>
</tr>
<tr>
<td>Discounting Convention</td>
<td>End-of-Year</td>
</tr>
</tbody>
</table>

Comparison of Present-Value Costs

PV Life-Cycle Cost

<table>
<thead>
<tr>
<th>Initial Investment Costs:</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$208,042</td>
<td>$320,837</td>
<td>-$112,795</td>
</tr>
</tbody>
</table>

Future Costs:

<table>
<thead>
<tr>
<th>Future Costs:</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Consumption Costs</td>
<td>$582,795</td>
<td>$331,310</td>
<td>$251,485</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$483,518</td>
<td>$479,690</td>
<td>$3,828</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$83,000</td>
<td>$122,500</td>
<td>-$39,500</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$105,103</td>
<td>-$158,726</td>
<td>$53,623</td>
</tr>
<tr>
<td>Subtotal (for Future Cost Items)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$1,044,211</td>
<td>$774,774</td>
<td>$269,437</td>
</tr>
</tbody>
</table>

Total PV Life-Cycle Cost

| Total PV Life-Cycle Cost                               | $1,252,253    | $1,095,611    | $156,642                 |

Net Savings from Alternative Compared with Base Case

<table>
<thead>
<tr>
<th>Net Savings from Alternative Compared with Base Case</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PV of Non-Investment Savings</td>
<td>$255,314</td>
</tr>
<tr>
<td>- Increased Total Investment</td>
<td>$98,671</td>
</tr>
<tr>
<td>------------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Net Savings</td>
<td>$156,642</td>
</tr>
</tbody>
</table>

Savings-to-Investment Ratio (SIR)

SIR = 2.59

Adjusted Internal Rate of Return

AIRR = 8.02%

Payback Period
Estimated Years to Payback (from beginning of Service Period)

Simple Payback occurs in year 8
Discounted Payback occurs in year 9

Energy Savings Summary

<table>
<thead>
<tr>
<th>Energy</th>
<th>Average Consumption</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Base Case</td>
<td>Alternative</td>
</tr>
<tr>
<td>Electricity</td>
<td>331,272.0 kWh</td>
<td>261,254.0 kWh</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>10,438.0 Therm</td>
<td>5,905.0 Therm</td>
</tr>
</tbody>
</table>

Energy Savings Summary (in MBtu)

<table>
<thead>
<tr>
<th>Energy</th>
<th>Average Consumption</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Base Case</td>
<td>Alternative</td>
</tr>
<tr>
<td>Electricity</td>
<td>1,130.3 MBtu</td>
<td>891.4 MBtu</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>1,043.8 MBtu</td>
<td>590.5 MBtu</td>
</tr>
</tbody>
</table>

Emissions Reduction Summary

<table>
<thead>
<tr>
<th>Energy</th>
<th>Average Emissions</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Base Case</td>
<td>Alternative</td>
</tr>
<tr>
<td>Electricity</td>
<td>346,755.29 kg</td>
<td>273,464.72 kg</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>55,137.21 kg</td>
<td>31,192.30 kg</td>
</tr>
<tr>
<td>Total:</td>
<td>401,892.49 kg</td>
<td>304,657.02 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>642.18 kg</td>
<td>506.45 kg</td>
</tr>
<tr>
<td>NOx</td>
<td>698.95 kg</td>
<td>551.22 kg</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>444.97 kg</td>
<td>251.73 kg</td>
</tr>
<tr>
<td>Total:</td>
<td>42.96 kg</td>
<td>24.30 kg</td>
</tr>
<tr>
<td>Total:</td>
<td>401,892.49 kg</td>
<td>304,657.02 kg</td>
</tr>
</tbody>
</table>
**Comparison of Present-Value Costs**

**PV Life-Cycle Cost**

<table>
<thead>
<tr>
<th></th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Investment Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$206,325</td>
<td>$313,637</td>
<td>-$107,312</td>
</tr>
<tr>
<td><strong>Future Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Consumption Costs</td>
<td>$495,775</td>
<td>$349,703</td>
<td>$146,072</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$460,793</td>
<td>$457,155</td>
<td>$3,638</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$75,000</td>
<td>$116,742</td>
<td>-$41,742</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$100,928</td>
<td>-$153,630</td>
<td>$52,702</td>
</tr>
<tr>
<td><strong>Subtotal (for Future Cost Items)</strong></td>
<td>$930,641</td>
<td>$769,971</td>
<td>$160,670</td>
</tr>
<tr>
<td><strong>Total PV Life-Cycle Cost</strong></td>
<td>$1,136,966</td>
<td>$1,083,607</td>
<td>$53,358</td>
</tr>
</tbody>
</table>

**Net Savings from Alternative Compared with Base Case**

- PV of Non-Investment Savings $149,710
- Increased Total Investment $96,352

**Net Savings** $53,358

**Savings-to-Investment Ratio (SIR)**

SIR = 1.55

**Adjusted Internal Rate of Return**

AIRR = 5.30%

**Payback Period**
### Estimated Years to Payback (from beginning of Service Period)

- Simple Payback occurs in year 11
- Simple Payback is negated in year 13
- Simple Payback occurs in year 16
- Discounted Payback occurs in year 16
- Discounted Payback is negated in year 17
- Discounted Payback occurs in year 20

### Energy Savings Summary

#### Energy Savings Summary (in stated units)

<table>
<thead>
<tr>
<th>Energy</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electricity</strong></td>
<td>316,618.0 kWh</td>
<td>249,062.0 kWh</td>
<td>67,556.0 kWh</td>
<td>1,350,935.0 kWh</td>
</tr>
<tr>
<td><strong>Natural Gas</strong></td>
<td>12,007.0 Therm</td>
<td>6,527.0 Therm</td>
<td>5,480.0 Therm</td>
<td>109,585.0 Therm</td>
</tr>
</tbody>
</table>

#### Energy Savings Summary (in MBtu)

<table>
<thead>
<tr>
<th>Energy</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electricity</strong></td>
<td>1,080.3 MBtu</td>
<td>849.8 MBtu</td>
<td>230.5 MBtu</td>
<td>4,609.6 MBtu</td>
</tr>
<tr>
<td><strong>Natural Gas</strong></td>
<td>1,200.7 MBtu</td>
<td>625.7 MBtu</td>
<td>548.0 MBtu</td>
<td>10,958.5 MBtu</td>
</tr>
</tbody>
</table>

### Emissions Reduction Summary

#### Emissions Reduction Summary

<table>
<thead>
<tr>
<th>Energy</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Reduction</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electricity</strong></td>
<td>331,416.37 kg</td>
<td>260,702.88 kg</td>
<td>70,713.49 kg</td>
<td>1,414,076.25 kg</td>
</tr>
<tr>
<td><strong>Natural Gas</strong></td>
<td>63,425.22 kg</td>
<td>34,477.92 kg</td>
<td>28,947.30 kg</td>
<td>578,866.72 kg</td>
</tr>
</tbody>
</table>

#### Total:

<table>
<thead>
<tr>
<th>Energy</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Reduction</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electricity</strong></td>
<td>394,841.60 kg</td>
<td>295,180.80 kg</td>
<td>99,660.79 kg</td>
<td>1,992,942.97 kg</td>
</tr>
<tr>
<td><strong>SO2</strong></td>
<td>1,125.64 kg</td>
<td>761.06 kg</td>
<td>364.57 kg</td>
<td>7,290.47 kg</td>
</tr>
<tr>
<td><strong>NOx</strong></td>
<td>717.44 kg</td>
<td>552.35 kg</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Comparison of Present-Value Costs
PV Life-Cycle Cost

<table>
<thead>
<tr>
<th>Initial Investment Costs:</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$197,325</td>
<td>$299,237</td>
<td>-$101,912</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Future Costs:</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Consumption Costs</td>
<td>$446,046</td>
<td>$321,998</td>
<td>$124,047</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$410,931</td>
<td>$314,451</td>
<td>-$3,520</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$66,000</td>
<td>$107,678</td>
<td>-$41,678</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$86,418</td>
<td>-$144,687</td>
<td>$58,269</td>
</tr>
</tbody>
</table>

| Subtotal (for Future Cost Items) | $836,559 | $699,440 | $137,119 |

| Total PV Life-Cycle Cost | $1,033,884 | $998,677 | $35,208 |

Net Savings from Alternative Compared with Base Case

<table>
<thead>
<tr>
<th>PV of Non-Investment Savings</th>
<th>$120,528</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Increased Total Investment</td>
<td>$85,320</td>
</tr>
</tbody>
</table>

Net Savings | $35,208 |

Savings-to-Investment Ratio (SIR)  
SIR = 1.41

Adjusted Internal Rate of Return  
AIRR = 4.79%

Payback Period
### Estimated Years to Payback (from beginning of Service Period)
- Simple Payback occurs in year 15
- Simple Payback is negated in year 17
- Simple Payback occurs in year 20
- Discounted Payback occurs in year 16
- Discounted Payback is negated in year 17
- Discounted Payback occurs in year 20

### Energy Savings Summary

#### Energy Savings Summary (in stated units)

<table>
<thead>
<tr>
<th>Energy</th>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>299,472.0 kWh</td>
<td>239,742.0 kWh</td>
<td>59,730.0 kWh</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>9,533.0 Therm</td>
<td>5,206.0 Therm</td>
<td>4,327.0 Therm</td>
<td></td>
</tr>
</tbody>
</table>

#### Energy Savings Summary (in MBtu)

<table>
<thead>
<tr>
<th>Energy</th>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>1,021.8 MBtu</td>
<td>818.0 MBtu</td>
<td>203.8 MBtu</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>953.3 MBtu</td>
<td>520.6 MBtu</td>
<td>432.7 MBtu</td>
<td></td>
</tr>
</tbody>
</table>

### Emissions Reduction Summary

<table>
<thead>
<tr>
<th>Energy</th>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>CO2</td>
<td>313,468.99 kg</td>
<td>250,947.28 kg</td>
<td>62,521.71 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>580.54 kg</td>
<td>464.75 kg</td>
<td>115.79 kg</td>
<td></td>
</tr>
<tr>
<td>NOx</td>
<td>631.85 kg</td>
<td>505.83 kg</td>
<td>126.02 kg</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>CO2</td>
<td>50,356.68 kg</td>
<td>27,499.93 kg</td>
<td>22,856.74 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>406.39 kg</td>
<td>221.93 kg</td>
<td>184.46 kg</td>
<td></td>
</tr>
<tr>
<td>NOx</td>
<td>39.23 kg</td>
<td>21.42 kg</td>
<td>17.81 kg</td>
<td></td>
</tr>
<tr>
<td>Total:</td>
<td>CO2</td>
<td>363,825.67 kg</td>
<td>278,447.21 kg</td>
<td>85,378.46 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>986.93 kg</td>
<td>686.68 kg</td>
<td>300.25 kg</td>
<td></td>
</tr>
<tr>
<td>NOx</td>
<td>671.08 kg</td>
<td>527.25 kg</td>
<td>143.83 kg</td>
<td></td>
</tr>
</tbody>
</table>

---

Energy Savings Summary

<table>
<thead>
<tr>
<th>Energy Type</th>
<th>Average Consumption</th>
<th>Annual Consumption</th>
<th>Life-Cycle Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>299,472.0 kWh</td>
<td>239,742.0 kWh</td>
<td>59,730.0 kWh</td>
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Energy Savings Summary (in MBtu)

<table>
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<tr>
<th>Energy Type</th>
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<th>Life-Cycle Savings</th>
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</thead>
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<td>1,021.8 MBtu</td>
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<td>203.8 MBtu</td>
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<tr>
<td>Natural Gas</td>
<td>953.3 MBtu</td>
<td>520.6 MBtu</td>
<td>432.7 MBtu</td>
</tr>
</tbody>
</table>

Emissions Reduction Summary

<table>
<thead>
<tr>
<th>Energy Type</th>
<th>Average Emissions</th>
<th>Annual Emissions</th>
<th>Life-Cycle Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2</td>
<td>313,468.99 kg</td>
<td>250,947.28 kg</td>
<td>62,521.71 kg</td>
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<td>SO2</td>
<td>580.54 kg</td>
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<tr>
<td>Total:</td>
<td>363,825.67 kg</td>
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<td>CO2</td>
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<td>27,499.93 kg</td>
<td>22,856.74 kg</td>
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<tr>
<td>SO2</td>
<td>406.39 kg</td>
<td>221.93 kg</td>
<td>184.46 kg</td>
</tr>
<tr>
<td>NOx</td>
<td>39.23 kg</td>
<td>21.42 kg</td>
<td>17.81 kg</td>
</tr>
<tr>
<td>Total:</td>
<td>363,825.67 kg</td>
<td>278,447.21 kg</td>
<td>85,378.46 kg</td>
</tr>
</tbody>
</table>
NIST BLCC 5.3-09: Comparative Analysis
Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A
Base Case: 2003 IECC Base Case
Alternative: Alternative 30% Better

General Information

File Name: C:\Program Files\BLCC5\projects\Residual Values\Large Big Box Retail 2WWR Omaha\Residual Value.xml
Date of Study: Thu Oct 08 10:14:24 CDT 2009
Project Name: Large Big Box Retail 2% WWR - Omaha
Project Location: Nebraska
Analysis Type: FEMP Analysis, Energy Project
Analyst: NR Decker
Base Date: October 1, 2009
Service Date: October 1, 2009
Study Period: 20 years 0 months (October 1, 2009 through September 30, 2029)
Discount Rate: 3%
Discounting Convention: End-of-Year
Comparison of Present-Value Costs

PV Life-Cycle Cost

<table>
<thead>
<tr>
<th></th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Investment Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$1,026,390</td>
<td>$834,420</td>
<td>$191,970</td>
</tr>
<tr>
<td><strong>Future Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Consumption Costs</td>
<td>$1,577,707</td>
<td>$1,294,389</td>
<td>$283,318</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$1,197,125</td>
<td>$1,297,310</td>
<td>-$100,184</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$0</td>
<td>$49,000</td>
<td>-$49,000</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$307,917</td>
<td>-284,976</td>
<td>-$22,941</td>
</tr>
<tr>
<td><strong>Subtotal (for Future Cost Items)</strong></td>
<td>$2,466,915</td>
<td>$2,355,723</td>
<td>$111,193</td>
</tr>
<tr>
<td><strong>Total PV Life-Cycle Cost</strong></td>
<td>$3,493,305</td>
<td>$3,190,143</td>
<td>$303,163</td>
</tr>
</tbody>
</table>

Net Savings from Alternative Compared with Base Case

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PV of Non-Investment Savings</td>
<td>$183,134</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Increased Total Investment</td>
<td>-$120,029</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Net Savings</strong></td>
<td>$303,163</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE: Meaningful SIR, AIRR and Payback can not be computed unless incremental savings and total savings are both positive

Energy Savings Summary

Energy Savings Summary (in stated units)
## Energy Savings Summary (in MBtu)

<table>
<thead>
<tr>
<th>Energy</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>3,810.7 MBtu</td>
<td>4,373.9 MBtu</td>
<td>-563.2 MBtu</td>
<td>-11,262.4 MBtu</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>3,050.4 MBtu</td>
<td>453.8 MBtu</td>
<td>2,596.6 MBtu</td>
<td>51,925.1 MBtu</td>
</tr>
</tbody>
</table>

## Emissions Reduction Summary

<table>
<thead>
<tr>
<th>Energy</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Reduction</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>CO2</td>
<td>1,169,004.27 kg</td>
<td>1,341,775.85 kg</td>
<td>-3,454,958.60 kg</td>
</tr>
<tr>
<td></td>
<td>SO2</td>
<td>2,164.97 kg</td>
<td>2,484.94 kg</td>
<td>-6,398.50 kg</td>
</tr>
<tr>
<td></td>
<td>NOx</td>
<td>2,356.34 kg</td>
<td>2,704.59 kg</td>
<td>-6,964.08 kg</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>CO2</td>
<td>161,132.92 kg</td>
<td>23,971.32 kg</td>
<td>2,742,856.46 kg</td>
</tr>
<tr>
<td></td>
<td>SO2</td>
<td>1,300.39 kg</td>
<td>193.46 kg</td>
<td>22,135.72 kg</td>
</tr>
<tr>
<td></td>
<td>NOx</td>
<td>135.19 kg</td>
<td>18.68 kg</td>
<td>2,329.97 kg</td>
</tr>
<tr>
<td>Total:</td>
<td>CO2</td>
<td>1,330,137.19 kg</td>
<td>1,365,747.18 kg</td>
<td>-712,102.14 kg</td>
</tr>
<tr>
<td></td>
<td>SO2</td>
<td>3,465.36 kg</td>
<td>2,678.39 kg</td>
<td>15,737.22 kg</td>
</tr>
<tr>
<td></td>
<td>NOx</td>
<td>2,491.53 kg</td>
<td>2,723.26 kg</td>
<td>-4,634.12 kg</td>
</tr>
</tbody>
</table>
**NIST BLCC 5.3-09: Comparative Analysis**

**Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A**

**Base Case: 2003 IECC Base Case**

**Alternative: Alternative 30% Better**

**General Information**

- **File Name:** C:\Program Files\BLCC5\projects\Residual Values\Large Big Box Retail 2WWR Norfolk\Residual Value.xml
- **Date of Study:** Thu Oct 08 10:17:08 CDT 2009
- **Project Name:** Large Big Box Retail 2% WWR - Norfolk
- **Project Location:** Nebraska
- **Analysis Type:** FEMP Analysis, Energy Project
- **Analyst:** NR Decker
- **Base Date:** October 1, 2009
- **Service Date:** October 1, 2009
- **Study Period:** 20 years 0 months (October 1, 2009 through September 30, 2029)
- **Discount Rate:** 3%
- **Discounting Convention:** End-of-Year

**Comparison of Present-Value Costs**

**PV Life-Cycle Cost**

<table>
<thead>
<tr>
<th>Initial Investment Costs</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$1,073,520</td>
<td>$857,420</td>
<td>$216,100</td>
</tr>
</tbody>
</table>

**Future Costs**

<table>
<thead>
<tr>
<th>Description</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Consumption Costs</td>
<td>$1,545,021</td>
<td>$1,415,188</td>
<td>$129,833</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$1,140,861</td>
<td>$1,068,767</td>
<td>$72,093</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$0</td>
<td>$57,000</td>
<td>$-57,000</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$322,056</td>
<td>-$297,896</td>
<td>-$24,160</td>
</tr>
</tbody>
</table>

| Subtotal (for Future Cost Items) | $2,363,825 | $2,243,059 | $120,766 |

**Total PV Life-Cycle Cost**

| | $3,437,345 | $3,100,479 | $336,866 |

**Net Savings from Alternative Compared with Base Case**

- **PV of Non-Investment Savings** $201,926
- **- Increased Total Investment** $134,940

| Total Net Savings | $336,866 |

**NOTE:** Meaningful SIR, AIRR and Payback can not be computed unless incremental savings and total savings are both positive.

**Energy Savings Summary**

**Energy Savings Summary (in stated units)**

- **Energy**
  - **Average Annual Consumption**
  - **Life-Cycle**
### Energy Savings Summary (in MBtu)

<table>
<thead>
<tr>
<th>Energy</th>
<th>Average Consumption</th>
<th>Life-Cycle Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td><strong>Base Case</strong></td>
<td><strong>Alternative</strong></td>
</tr>
<tr>
<td>Electricity</td>
<td>3,610.9 MBtu</td>
<td>4,504.4 MBtu</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>3,258.9 MBtu</td>
<td>504.9 MBtu</td>
</tr>
</tbody>
</table>

### Emissions Reduction Summary

<table>
<thead>
<tr>
<th>Energy</th>
<th>Average Emissions</th>
<th>Annual Emissions</th>
<th>Life-Cycle Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td><strong>Base Case</strong></td>
<td><strong>Alternative</strong></td>
<td><strong>Reduction</strong></td>
</tr>
<tr>
<td>Electricity</td>
<td>1,107,711.43 kg</td>
<td>1,381,809.43 kg</td>
<td>-274,098.00 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>2,051.45 kg</td>
<td>2,559.08 kg</td>
<td>-507.62 kg</td>
</tr>
<tr>
<td>NOx</td>
<td>2,232.79 kg</td>
<td>2,785.28 kg</td>
<td>-552.49 kg</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>172,146.63 kg</td>
<td>26,670.60 kg</td>
<td>145,476.02 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>1,389.28 kg</td>
<td>215.24 kg</td>
<td>1,174.04 kg</td>
</tr>
<tr>
<td>NOx</td>
<td>144.43 kg</td>
<td>20.78 kg</td>
<td>123.65 kg</td>
</tr>
<tr>
<td>Total:</td>
<td>1,279,858.06 kg</td>
<td>1,408,480.03 kg</td>
<td>-128,621.98 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>3,440.73 kg</td>
<td>2,774.32 kg</td>
<td>666.41 kg</td>
</tr>
<tr>
<td>NOx</td>
<td>2,377.22 kg</td>
<td>2,806.06 kg</td>
<td>-428.84 kg</td>
</tr>
</tbody>
</table>
## NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

**Base Case: 2003 IECC Base Case**

**Alternative: Alternative 30% Better**

### General Information

- **File Name:** C:\Program Files\BLCC5\projects\Residual Values\Large Big Box Retail 2% WWR Chadro
- **Residual Value.xml**
- **Date of Study:** Thu Oct 08 10:18:10 CDT 2009
- **Project Name:** Large Big Box Retail 2% WWR - Chadron
- **Project Location:** Nebraska
- **Analysis Type:** FEMP Analysis, Energy Project
- **Analyst:** NR Decker
- **Base Date:** October 1, 2009
- **Service Date:** October 1, 2009
- **Study Period:** 20 years 0 months (October 1, 2009 through September 30, 2029)
- **Discount Rate:** 3%
- **Discounting Convention:** End-of-Year

### Comparison of Present-Value Costs

#### PV Life-Cycle Cost

<table>
<thead>
<tr>
<th></th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Investment Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$1,184,420</td>
<td>$803,420</td>
<td>$381,000</td>
</tr>
<tr>
<td><strong>Future Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Consumption Costs</td>
<td>$1,427,701</td>
<td>$1,299,232</td>
<td>$128,468</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$1,025,188</td>
<td>$948,361</td>
<td>$76,827</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$0</td>
<td>$47,000</td>
<td>-$47,000</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$355,326</td>
<td>-$274,996</td>
<td>-$80,330</td>
</tr>
<tr>
<td><strong>Subtotal (for Future Cost Items):</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$2,097,563</td>
<td>$2,019,597</td>
<td>$77,965</td>
<td></td>
</tr>
<tr>
<td><strong>Total PV Life-Cycle Cost:</strong></td>
<td>$3,281,983</td>
<td>$2,823,017</td>
<td>$458,965</td>
</tr>
</tbody>
</table>

#### Net Savings from Alternative Compared with Base Case

- **PV of Non-Investment Savings:** $205,295
- **Increased Total Investment:** -$253,670
- **Net Savings:** $458,965

**NOTE:** Meaningful SIR, AIRR and Payback can not be computed unless incremental savings and total savings are both positive

### Energy Savings Summary

- **Energy Savings Summary (in stated units)**
  - **Energy Average Annual Consumption... Life-Cycle**
### Energy Savings Summary (in MBtu)

<table>
<thead>
<tr>
<th>Energy</th>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>3,445.4 MBtu</td>
<td>2,676.3 MBtu</td>
<td>779.1 MBtu</td>
<td>47,045.7 MBtu</td>
<td></td>
</tr>
</tbody>
</table>

### Emissions Reduction Summary

<table>
<thead>
<tr>
<th>Energy</th>
<th>Type</th>
<th>CO2</th>
<th>SO2</th>
<th>NOx</th>
<th>CO2</th>
<th>SO2</th>
<th>NOx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>Base Case</td>
<td>1,056,941.45 kg</td>
<td>1,957.43 kg</td>
<td>2,130.45 kg</td>
<td>-232,469.19 kg</td>
<td>-430.53 kg</td>
<td>-468.58 kg</td>
</tr>
<tr>
<td>Alternative</td>
<td>1,289,410.65 kg</td>
<td>2,387.96 kg</td>
<td>2,599.04 kg</td>
<td>-430.53 kg</td>
<td>-8,609.36 kg</td>
<td>-9,370.38 kg</td>
<td></td>
</tr>
<tr>
<td>Savings</td>
<td>-232,469.19 kg</td>
<td>-430.53 kg</td>
<td>-468.58 kg</td>
<td>-4,648,747.40 kg</td>
<td>-8,609.36 kg</td>
<td>-9,370.38 kg</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Natural Gas</th>
<th>CO2</th>
<th>SO2</th>
<th>NOx</th>
<th>CO2</th>
<th>SO2</th>
<th>NOx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Case</td>
<td>141,371.64 kg</td>
<td>1,140.91 kg</td>
<td>118.61 kg</td>
<td>124,272.66 kg</td>
<td>20,055.65 kg</td>
<td>2,105.48 kg</td>
</tr>
<tr>
<td>Alternative</td>
<td>17,098.98 kg</td>
<td>137.99 kg</td>
<td>13.32 kg</td>
<td>1,002.92 kg</td>
<td>20,055.65 kg</td>
<td>2,105.48 kg</td>
</tr>
<tr>
<td>Savings</td>
<td>124,272.66 kg</td>
<td>1,002.92 kg</td>
<td>105.29 kg</td>
<td>2,485,112.88 kg</td>
<td>20,055.65 kg</td>
<td>2,105.48 kg</td>
</tr>
</tbody>
</table>

**Total:**

<table>
<thead>
<tr>
<th>CO2</th>
<th>SO2</th>
<th>NOx</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,198,313.09 kg</td>
<td>3,098.34 kg</td>
<td>2,249.06 kg</td>
</tr>
<tr>
<td>-108,196.54 kg</td>
<td>572.39 kg</td>
<td>-363.29 kg</td>
</tr>
<tr>
<td>-2,163,634.53 kg</td>
<td>11,446.28 kg</td>
<td>-7,264.89 kg</td>
</tr>
</tbody>
</table>
Comparison of Present-Value Costs

PV Life-Cycle Cost

<table>
<thead>
<tr>
<th></th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Investment Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$558,615</td>
<td>$741,030</td>
<td>-$182,415</td>
</tr>
<tr>
<td><strong>Future Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Consumption Costs</td>
<td>$881,423</td>
<td>$609,927</td>
<td>$271,496</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$782,682</td>
<td>$924,376</td>
<td>-$141,694</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$240,500</td>
<td>$240,500</td>
<td>$0</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$319,879</td>
<td>-$374,604</td>
<td>$54,725</td>
</tr>
<tr>
<td><strong>Subtotal (for Future Cost Items)</strong></td>
<td>$1,584,726</td>
<td>$1,400,199</td>
<td>$184,527</td>
</tr>
<tr>
<td><strong>Total PV Life-Cycle Cost</strong></td>
<td>$2,143,341</td>
<td>$2,141,229</td>
<td>$2,112</td>
</tr>
</tbody>
</table>

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings | $129,802
- Increased Total Investment | $127,691

Net Savings | $2,112

Savings-to-Investment Ratio (SIR)

SIR = 1.02

Adjusted Internal Rate of Return

AIRR = 3.08%
**Payback Period**

Estimated Years to Payback (from beginning of Service Period)

- Simple Payback occurs in year 20
- Discounted Payback occurs in year 20

**Energy Savings Summary**

Energy Savings Summary (in stated units)

<table>
<thead>
<tr>
<th>Energy</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>769,399.0 kWh</td>
<td>568,060.0 kWh</td>
<td>201,339.0 kWh</td>
<td>4,026,228.8 kWh</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>1,535.0 Therm</td>
<td>0.0 Therm</td>
<td>1,535.0 Therm</td>
<td>30,695.8 Therm</td>
</tr>
</tbody>
</table>

Energy Savings Summary (in MBtu)

<table>
<thead>
<tr>
<th>Energy</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>2,625.3 MBtu</td>
<td>1,938.3 MBtu</td>
<td>687.0 MBtu</td>
<td>13,738.1 MBtu</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>153.5 MBtu</td>
<td>0.0 MBtu</td>
<td>153.5 MBtu</td>
<td>3,069.6 MBtu</td>
</tr>
</tbody>
</table>

**Emissions Reduction Summary**

<table>
<thead>
<tr>
<th>Energy</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Reduction</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>CO2 805,359.86 kg</td>
<td>594,610.49 kg</td>
<td>210,749.36 kg</td>
<td>4,214,410.23 kg</td>
</tr>
<tr>
<td>SO2 1,491.51 kg</td>
<td>1,101.20 kg</td>
<td>390.30 kg</td>
<td>7,804.98 kg</td>
<td></td>
</tr>
<tr>
<td>NOx 1,623.35 kg</td>
<td>1,198.54 kg</td>
<td>424.80 kg</td>
<td>8,494.90 kg</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>CO2 8,108.41 kg</td>
<td>0.00 kg</td>
<td>8,108.41 kg</td>
<td>162,146.06 kg</td>
</tr>
<tr>
<td>SO2 65.44 kg</td>
<td>0.00 kg</td>
<td>65.44 kg</td>
<td>1,308.57 kg</td>
<td></td>
</tr>
<tr>
<td>NOx 6.32 kg</td>
<td>0.00 kg</td>
<td>6.32 kg</td>
<td>126.32 kg</td>
<td></td>
</tr>
<tr>
<td>Total:</td>
<td>CO2 813,468.27 kg</td>
<td>594,610.49 kg</td>
<td>218,857.77 kg</td>
<td>4,376,556.29 kg</td>
</tr>
<tr>
<td>SO2 1,556.94 kg</td>
<td>1,101.20 kg</td>
<td>455.74 kg</td>
<td>9,113.55 kg</td>
<td></td>
</tr>
<tr>
<td>NOx 1,629.66 kg</td>
<td>1,198.54 kg</td>
<td>431.12 kg</td>
<td>8,621.22 kg</td>
<td></td>
</tr>
</tbody>
</table>
NIST BLCC 5.3-09: Comparative Analysis
Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case
Alternative: 30% Alternative Design

General Information

File Name: J:\002-10106-000\E Design SD-DD-CD\05 Engineering Calculations\Mechanical\2009 10 01 FINAL SUBMITTAL DOCS\BLCC Files\Elementary 18WWR Norfolk Residual Value.xm

Date of Study: Thu Nov 05 13:39:01 CST 2009
Project Name: Elementary 18% WWR - Norfolk
Project Location: Nebraska
Analysis Type: FEMP Analysis, Energy Project
Analyst: SM Cherney
Base Date: October 1, 2009
Service Date: October 1, 2009
Study Period: 20 years 0 months (October 1, 2009 through September 30, 2029)
Discount Rate: 3%
Discounting Convention: End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

Initial Investment Costs:
Capital Requirements as of Base Date $527,630 $698,130 -$170,500

Future Costs:
Energy Consumption Costs $742,285 $535,439 $206,846
Energy Demand Charges $0 $0 $0
Energy Utility Rebates $0 $0 $0
Water Costs $0 $0 $0
Recurrent and Non-Recurring OM&R Costs $745,896 $886,890 $-140,994
Capital Replacements $229,196 $229,196 $0
Residual Value at End of Study Period $-303,426 $-354,576 $51,150

Subtotal (for Future Cost Items) $1,413,951 $1,296,949 $117,002

Total PV Life-Cycle Cost $1,941,581 $1,995,079 $-53,498

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings $65,852
Increased Total Investment $119,350

Net Savings $-53,498

Savings-to-Investment Ratio (SIR) SIR = 0.55
SIR is lower than 1.0; project alternative is not cost effective.

Adjusted Internal Rate of Return
Adjusted Internal Rate of Return

AIRR = -0.02%

AIRR is lower than your discount rate; project alternative is not cost effective.

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Discounted Payback never reached during study period.

Simple Payback occurs in year 20

Energy Savings Summary

Energy Savings Summary (in stated units)

<table>
<thead>
<tr>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>771,978.0 kWh</td>
<td>562,433.0 kWh</td>
<td>209,545.0 kWh</td>
<td>4,190,326.3 kWh</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>1,580.0 Therm</td>
<td>0.0 Therm</td>
<td>1,580.0 Therm</td>
<td>31,595.7 Therm</td>
</tr>
</tbody>
</table>

Energy Savings Summary (in MBtu)

<table>
<thead>
<tr>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>2,634.1 MBtu</td>
<td>1,919.1 MBtu</td>
<td>715.0 MBtu</td>
<td>14,298.0 MBtu</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>158.0 MBtu</td>
<td>0.0 MBtu</td>
<td>158.0 MBtu</td>
<td>3,159.6 MBtu</td>
</tr>
</tbody>
</table>

Emissions Reduction Summary

<table>
<thead>
<tr>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Reduction</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>CO2</td>
<td>808,059.40 kg</td>
<td>588,720.49 kg</td>
<td>219,338.90 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>1,496.51 kg</td>
<td>1,090.30 kg</td>
<td>406.21 kg</td>
<td>8,123.09 kg</td>
</tr>
<tr>
<td>NOx</td>
<td>1,628.79 kg</td>
<td>1,186.67 kg</td>
<td>442.12 kg</td>
<td>8,841.12 kg</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>CO2</td>
<td>8,346.12 kg</td>
<td>0.00 kg</td>
<td>8,346.12 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>67.36 kg</td>
<td>0.00 kg</td>
<td>67.36 kg</td>
<td>1,346.93 kg</td>
</tr>
<tr>
<td>NOx</td>
<td>6.50 kg</td>
<td>0.00 kg</td>
<td>6.50 kg</td>
<td>130.03 kg</td>
</tr>
<tr>
<td>Total:</td>
<td>CO2</td>
<td>816,405.51 kg</td>
<td>588,720.49 kg</td>
<td>227,685.02 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>1,563.86 kg</td>
<td>1,090.30 kg</td>
<td>473.57 kg</td>
<td>9,470.02 kg</td>
</tr>
<tr>
<td>NOx</td>
<td>1,635.29 kg</td>
<td>1,186.67 kg</td>
<td>448.62 kg</td>
<td>8,971.15 kg</td>
</tr>
</tbody>
</table>
NIST BLCC 5.3-09: Comparative Analysis
Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A
Base Case: 2003 IECC Base Case
Alternative: 30% Alternative Design

General Information
File Name: J:\002-10106-000\E Design SD-DD-CD\05 Engineering Calculations\Mechanical\2009 10 01 FINAL SUBMITTAL DOCS\BLCC Files\Elementary 18WWR Chadron Residual Value.xm
Date of Study: Thu Nov 05 13:33:01 CST 2009
Project Name: Elementary 18% WWR - Chadron
Project Location: Nebraska
Analysis Type: FEMP Analysis, Energy Project
Analyst: SM Cherney
Base Date: October 1, 2009
Service Date: October 1, 2009
Study Period: 20 years 0 months (October 1, 2009 through September 30, 2029)
Discount Rate: 3%
Discounting Convention: End-of-Year

Comparison of Present-Value Costs
PV Life-Cycle Cost

<table>
<thead>
<tr>
<th>Initial Investment Costs:</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$502,930</td>
<td>$673,430</td>
<td>-$170,500</td>
</tr>
<tr>
<td>Future Costs:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Consumption Costs</td>
<td>$603,999</td>
<td>$473,458</td>
<td>$130,541</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$691,063</td>
<td>$812,526</td>
<td>-$121,463</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$211,399</td>
<td>$211,399</td>
<td>$0</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$284,746</td>
<td>-$335,896</td>
<td>$51,150</td>
</tr>
<tr>
<td>Subtotal (for Future Cost Items)</td>
<td>$1,221,715</td>
<td>$1,161,487</td>
<td>$60,228</td>
</tr>
</tbody>
</table>

| Total PV Life-Cycle Cost | $1,724,645 | $1,834,917 | -$110,272 |

Net Savings from Alternative Compared with Base Case
PV of Non-Investment Savings | $9,078 |
- Increased Total Investment | $119,350 |
-----------------------------|----------|
Net Savings | -$110,272 |

Savings-to-Investment Ratio (SIR)
SIR = 0.08
SIR is lower than 1.0; project alternative is not cost effective.

Adjusted Internal Rate of Return
Adjusted Internal Rate of Return
AIRR = -9.45%
AIRR is lower than your discount rate; project alternative is not cost effective.

Payback Period
Estimated Years to Payback (from beginning of Service Period)
Simple Payback never reached during study period.
Discounted Payback never reached during study period.

Energy Savings Summary
Energy Savings Summary (in stated units)

<table>
<thead>
<tr>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>623,655.0 kWh 498,133.0 kWh</td>
<td>125,522.0 kWh</td>
<td>2,510,096.3 kWh</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>1,574.0 Therm</td>
<td>0.0 Therm</td>
<td>1,574.0 Therm</td>
<td>31,475.7 Therm</td>
</tr>
</tbody>
</table>

Energy Savings Summary (in MBtu)

<table>
<thead>
<tr>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>2,128.0 MBtu 1,699.7 MBtu</td>
<td>428.3 MBtu</td>
<td>8,564.8 MBtu</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>157.4 MBtu</td>
<td>0.0 MBtu</td>
<td>157.4 MBtu</td>
<td>3,147.6 MBtu</td>
</tr>
</tbody>
</table>

Energy Savings Summary (in MBtu)

Emissions Reduction Summary

<table>
<thead>
<tr>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Reduction</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>652,803.94 kg 521,415.18 kg</td>
<td>131,388.76 kg</td>
<td>2,627,415.46 kg</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>8,314.42 kg</td>
<td>0.00 kg</td>
<td>8,314.42 kg</td>
<td>166,265.73 kg</td>
</tr>
</tbody>
</table>

Total:

<table>
<thead>
<tr>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Reduction</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>661,118.37 kg 521,415.18 kg</td>
<td>139,703.18 kg</td>
<td>2,793,681.19 kg</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>1,276.08 kg</td>
<td>965.65 kg</td>
<td>310.43 kg</td>
<td>6,207.72 kg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Reduction</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>1,322.32 kg</td>
<td>1,051.01 kg</td>
<td>271.31 kg</td>
<td>5,425.56 kg</td>
</tr>
</tbody>
</table>

Total:
NIST BLCC 5.3-09: Comparative Analysis
Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: 2003 IECC Base Case
Alternative: Alternative 30% Better

General Information

File Name: C:\Program Files\BLCC5\projects\Residual Values\Secondary School 18WWR Omaha Residual Value.xml

Date of Study: Fri Oct 16 16:36:27 CDT 2009
Project Name: Secondary School 18% WWR - Omaha
Project Location: Nebraska
Analysis Type: FEMP Analysis, Energy Project
Analyst: NR Decker
Base Date: October 1, 2009
Service Date: October 1, 2009
Study Period: 20 years 0 months (October 1, 2009 through September 30, 2029)
Discount Rate: 3%
Discounting Convention: End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

<table>
<thead>
<tr>
<th></th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Investment Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$1,115,914</td>
<td>$1,135,488</td>
<td>-$19,574</td>
</tr>
<tr>
<td><strong>Future Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Consumption Costs</td>
<td>$1,261,670</td>
<td>$919,391</td>
<td>$342,279</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$885,829</td>
<td>$1,781,733</td>
<td>-$895,904</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$0</td>
<td>$309,400</td>
<td>-$309,400</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$334,774</td>
<td>-$547,372</td>
<td>$212,598</td>
</tr>
<tr>
<td>Subtotal (for Future Cost Items)</td>
<td>$1,812,725</td>
<td>$2,463,152</td>
<td>-$650,427</td>
</tr>
<tr>
<td><strong>Total PV Life-Cycle Cost</strong></td>
<td>$2,928,638</td>
<td>$3,598,640</td>
<td>-$670,001</td>
</tr>
</tbody>
</table>

Net Savings from Alternative Compared with Base Case

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PV of Non-Investment Savings</td>
<td>-$553,625</td>
</tr>
<tr>
<td>- Increased Total Investment</td>
<td>$116,376</td>
</tr>
<tr>
<td><strong>Net Savings</strong></td>
<td>-$670,001</td>
</tr>
</tbody>
</table>

NOTE: Meaningful SIR, AIRR and Payback can not be computed unless incremental savings and total savings are both positive

Energy Savings Summary

Energy Savings Summary (in stated units)
### Energy Average Annual Consumption Life Cycle

<table>
<thead>
<tr>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>1,129,525.0 kWh</td>
<td>847,767.0 kWh</td>
<td>281,758.0 kWh</td>
<td>5,634,388.6 kWh</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>3,095.0 Therm</td>
<td>0.0 Therm</td>
<td>3,095.0 Therm</td>
<td>61,891.5 Therm</td>
</tr>
</tbody>
</table>

### Energy Savings Summary (in MBtu)

<table>
<thead>
<tr>
<th>Energy</th>
<th>-----Average-----</th>
<th>Annual</th>
<th>Consumption-----</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Base Case</td>
<td>Alternative</td>
<td>Savings</td>
<td>Savings</td>
</tr>
<tr>
<td>Electricity</td>
<td>3,854.1 MBtu</td>
<td>2,892.7 MBtu</td>
<td>961.4 MBtu</td>
<td>19,225.3 MBtu</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>309.5 MBtu</td>
<td>0.0 MBtu</td>
<td>309.5 MBtu</td>
<td>6,189.2 MBtu</td>
</tr>
</tbody>
</table>

### Emissions Reduction Summary

<table>
<thead>
<tr>
<th>Energy</th>
<th>-----Average-----</th>
<th>Annual</th>
<th>Emissions-----</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Base Case</td>
<td>Alternative</td>
<td>Reduction</td>
<td>Reduction</td>
</tr>
<tr>
<td>Electricity</td>
<td>CO2 1,182,317.75 kg</td>
<td>887,390.69 kg</td>
<td>294,927.06 kg</td>
<td>5,897,733.66 kg</td>
</tr>
<tr>
<td></td>
<td>SO2 2,189.62 kg</td>
<td>1,643.43 kg</td>
<td>546.20 kg</td>
<td>10,922.45 kg</td>
</tr>
<tr>
<td></td>
<td>NOx 2,383.17 kg</td>
<td>1,788.69 kg</td>
<td>594.48 kg</td>
<td>11,887.93 kg</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>CO2 16,348.89 kg</td>
<td>0.0 kg</td>
<td>16,348.89 kg</td>
<td>326,932.94 kg</td>
</tr>
<tr>
<td></td>
<td>SO2 131.94 kg</td>
<td>0.0 kg</td>
<td>131.94 kg</td>
<td>2,638.45 kg</td>
</tr>
<tr>
<td></td>
<td>NOx 12.74 kg</td>
<td>0.0 kg</td>
<td>12.74 kg</td>
<td>254.70 kg</td>
</tr>
<tr>
<td>Total:</td>
<td>CO2 1,198,666.63 kg</td>
<td>887,390.69 kg</td>
<td>311,275.94 kg</td>
<td>6,224,666.60 kg</td>
</tr>
<tr>
<td></td>
<td>SO2 2,321.56 kg</td>
<td>1,643.43 kg</td>
<td>678.14 kg</td>
<td>13,560.91 kg</td>
</tr>
<tr>
<td></td>
<td>NOx 2,395.91 kg</td>
<td>1,788.69 kg</td>
<td>607.21 kg</td>
<td>12,142.64 kg</td>
</tr>
</tbody>
</table>
**NIST BLCC 5.3-09: Comparative Analysis**

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

**Base Case: 2003 IECC Base Case**

**Alternative: Alternative 30% Better**

### General Information

- **File Name:** `C:\Program Files\BLCC5\projects\Residual Values\Secondary School 18WWR Norfolk Residual Value.xml`
- **Date of Study:** Fri Oct 16 16:32:35 CDT 2009
- **Project Name:** Secondary School 18% WWR - Norfolk
- **Project Location:** Nebraska
- **Analysis Type:** FEMP Analysis, Energy Project
- **Analyst:** NR Decker
- **Base Date:** October 1, 2009
- **Service Date:** October 1, 2009
- **Study Period:** 20 years 0 months (October 1, 2009 through September 30, 2029)
- **Discount Rate:** 3%
- **Discounting Convention:** End-of-Year

### Comparison of Present-Value Costs

#### PV Life-Cycle Cost

<table>
<thead>
<tr>
<th></th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Investment Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$1,059,304</td>
<td>$1,050,988</td>
<td>$8,316</td>
</tr>
<tr>
<td><strong>Future Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Consumption Costs</td>
<td>$1,113,794</td>
<td>$814,616</td>
<td>$299,178</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$702,307</td>
<td>$1,552,363</td>
<td>-$850,057</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$0</td>
<td>$235,300</td>
<td>-$235,300</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$317,791</td>
<td>-$449,079</td>
<td>$131,288</td>
</tr>
<tr>
<td><strong>Subtotal (for Future Cost Items)</strong></td>
<td>$1,498,309</td>
<td>$2,152,300</td>
<td>-$654,890</td>
</tr>
<tr>
<td><strong>Total PV Life-Cycle Cost</strong></td>
<td>$2,557,614</td>
<td>$3,204,188</td>
<td>-$646,574</td>
</tr>
</tbody>
</table>

### Net Savings from Alternative Compared with Base Case

- PV of Non-Investment Savings: -$550,878
- Increased Total Investment: $95,695

**Net Savings:** -$646,574

**NOTE:** Meaningful SIR, AIRR and Payback can not be computed unless incremental savings and total savings are both positive

### Energy Savings Summary

#### Energy Savings Summary (in stated units)

<p>| Energy | Average Annual Consumption | Life Cycle |</p>
<table>
<thead>
<tr>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>1,129,818.0 kWh</td>
<td>839,385.0 kWh</td>
<td>290,433.0 kWh</td>
<td>5,807,864.8 kWh</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>3,154.0 Therm</td>
<td>0.0 Therm</td>
<td>3,154.0 Therm</td>
<td>63,071.4 Therm</td>
</tr>
</tbody>
</table>

**Energy Savings Summary (in MBtu)**

<table>
<thead>
<tr>
<th>Energy</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>3,855.1 MBtu</td>
<td>2,864.1 MBtu</td>
<td>991.0 MBtu</td>
<td>19,817.3 MBtu</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>315.4 MBtu</td>
<td>0.0 MBtu</td>
<td>315.4 MBtu</td>
<td>6,307.2 MBtu</td>
</tr>
</tbody>
</table>

**Emissions Reduction Summary**

<table>
<thead>
<tr>
<th>Energy</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Reduction</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2</td>
<td>1,182,624.44 kg</td>
<td>878,616.92 kg</td>
<td>304,007.52 kg</td>
<td>6,079,318.00 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>2,190.19 kg</td>
<td>1,627.18 kg</td>
<td>563.01 kg</td>
<td>11,258.74 kg</td>
</tr>
<tr>
<td>NOx</td>
<td>2,383.79 kg</td>
<td>1,771.01 kg</td>
<td>612.78 kg</td>
<td>12,253.95 kg</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>16,660.54 kg</td>
<td>0.00 kg</td>
<td>16,660.54 kg</td>
<td>333,165.26 kg</td>
</tr>
<tr>
<td>CO2</td>
<td>134.46 kg</td>
<td>0.00 kg</td>
<td>134.46 kg</td>
<td>2,688.75 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>12.98 kg</td>
<td>0.00 kg</td>
<td>12.98 kg</td>
<td>259.56 kg</td>
</tr>
<tr>
<td>NOx</td>
<td>1,199,284.98 kg</td>
<td>878,616.92 kg</td>
<td>320,668.06 kg</td>
<td>6,412,483.26 kg</td>
</tr>
<tr>
<td>CO2</td>
<td>2,324.65 kg</td>
<td>1,627.18 kg</td>
<td>697.47 kg</td>
<td>13,947.49 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>2,396.77 kg</td>
<td>1,771.01 kg</td>
<td>625.76 kg</td>
<td>12,513.51 kg</td>
</tr>
<tr>
<td>Total:  CO2</td>
<td>2,324.65 kg</td>
<td>1,627.18 kg</td>
<td>697.47 kg</td>
<td>13,947.49 kg</td>
</tr>
<tr>
<td>Total:  SO2</td>
<td>2,396.77 kg</td>
<td>1,771.01 kg</td>
<td>625.76 kg</td>
<td>12,513.51 kg</td>
</tr>
</tbody>
</table>
NIST BLCC 5.3-09: Comparative Analysis
Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A
Base Case: 2003 IECC Base Case
Alternative: Alternative 30% Better
General Information

| File Name: | C:\Program Files\BLCC5\projects\Residual Values\Secondary School 18WWR Chadron\Residual Value.xml |
| Date of Study: | Fri Oct 16 16:22:37 CDT 2009 |
| Project Name: | Secondary School 18% WWR - Chadron |
| Project Location: | Nebraska |
| Analysis Type: | FEMP Analysis, Energy Project |
| Analyst: | NR Decker |
| Base Date: | October 1, 2009 |
| Service Date: | October 1, 2009 |
| Study Period: | 20 years 0 months (October 1, 2009 through September 30, 2029) |
| Discount Rate: | 3% |
| Discounting Convention: | End-of-Year |

Comparison of Present-Value Costs
PV Life-Cycle Cost

<table>
<thead>
<tr>
<th>Initial Investment Costs:</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$1,035,804</td>
<td>$1,084,788</td>
<td>-$48,984</td>
</tr>
</tbody>
</table>

| Future Costs: |
|-----------------|-----------|-------------|--------------------------|
| Energy Consumption Costs | $992,862 | $763,946 | $228,917 |
| Energy Demand Charges | $0 | $0 | $0 |
| Energy Utility Rebates | $0 | $0 | $0 |
| Water Costs | $0 | $0 | $0 |
| Recurring and Non-Recurring OM&R Costs | $719,712 | $1,505,527 | -$785,815 |
| Capital Replacements | $0 | $265,200 | -$265,200 |
| Residual Value at End of Study Period | -$310,741 | -$488,976 | $178,235 |

Subtotal (for Future Cost Items) | $1,401,833 | $2,045,696 | -$643,863 |

Total PV Life-Cycle Cost | $2,437,637 | $3,130,484 | -$692,847 |

Net Savings from Alternative Compared with Base Case

| PV of Non-Investment Savings | -$556,898 |
| Increased Total Investment | $135,948 |

Net Savings | -$692,847 |

NOTE: Meaningful SIR, AIRR and Payback can not be computed unless incremental savings and total savings are both positive

Energy Savings Summary
Energy Savings Summary (in stated units)

---
<table>
<thead>
<tr>
<th>Type</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>993,452.0 kWh</td>
<td>780,976.0 kWh</td>
<td>212,476.0 kWh</td>
<td>4,248,938.3 kWh</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>3,150.0 Therm</td>
<td>0.0 Therm</td>
<td>3,150.0 Therm</td>
<td>62,991.4 Therm</td>
</tr>
</tbody>
</table>

### Energy Savings Summary (in MBtu)

<table>
<thead>
<tr>
<th>Energy</th>
<th>-----Average-----</th>
<th>Annual Consumption-----</th>
<th>-----</th>
<th>Life-Cycle-----</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Base Case</td>
<td>Alternative</td>
<td>Savings</td>
<td>Savings</td>
</tr>
<tr>
<td>Electricity</td>
<td>3,389.8 MBtu</td>
<td>2,664.8 MBtu</td>
<td>725.0 MBtu</td>
<td>14,498.0 MBtu</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>315.0 MBtu</td>
<td>0.0 MBtu</td>
<td>315.0 MBtu</td>
<td>6,299.2 MBtu</td>
</tr>
</tbody>
</table>

### Emissions Reduction Summary

<table>
<thead>
<tr>
<th>Energy</th>
<th>-----Average-----</th>
<th>Annual</th>
<th>Emissions-----</th>
<th>Life-Cycle-----</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Base Case</td>
<td>Alternative</td>
<td>Reduction</td>
<td>Reduction</td>
</tr>
<tr>
<td>Electricity</td>
<td>CO2</td>
<td>1,039,884.84 kg</td>
<td>817,477.95 kg</td>
<td>222,406.89 kg</td>
</tr>
<tr>
<td></td>
<td>SO2</td>
<td>1,925.84 kg</td>
<td>1,513.95 kg</td>
<td>411.89 kg</td>
</tr>
<tr>
<td></td>
<td>NOx</td>
<td>2,096.07 kg</td>
<td>1,647.77 kg</td>
<td>448.30 kg</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>CO2</td>
<td>16,639.41 kg</td>
<td>0.00 kg</td>
<td>16,639.41 kg</td>
</tr>
<tr>
<td></td>
<td>SO2</td>
<td>134.29 kg</td>
<td>0.00 kg</td>
<td>134.29 kg</td>
</tr>
<tr>
<td></td>
<td>NOx</td>
<td>12.96 kg</td>
<td>0.00 kg</td>
<td>12.96 kg</td>
</tr>
<tr>
<td>Total:</td>
<td>CO2</td>
<td>1,056,524.26 kg</td>
<td>817,477.95 kg</td>
<td>239,046.31 kg</td>
</tr>
<tr>
<td></td>
<td>SO2</td>
<td>2,060.13 kg</td>
<td>1,513.95 kg</td>
<td>546.18 kg</td>
</tr>
<tr>
<td></td>
<td>NOx</td>
<td>2,109.04 kg</td>
<td>1,647.77 kg</td>
<td>461.26 kg</td>
</tr>
</tbody>
</table>
### NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

**Base Case: 2003 IECC Base Case**

**Alternative: 30% Alternative Design**

### General Information

<table>
<thead>
<tr>
<th>File Name</th>
<th>C:\Program Files (x86)\BLCC5\projects\Warehouse WWR Omaha Residual Value.xml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of Study</td>
<td>Mon Oct 05 13:37:31 CDT 2009</td>
</tr>
<tr>
<td>Project Name</td>
<td>Warehouse WWR - Omaha</td>
</tr>
<tr>
<td>Project Location</td>
<td>Nebraska</td>
</tr>
<tr>
<td>Analysis Type</td>
<td>FEMP Analysis, Energy Project</td>
</tr>
<tr>
<td>Analyst</td>
<td>SM Cherney</td>
</tr>
<tr>
<td>Base Date</td>
<td>October 1, 2009</td>
</tr>
<tr>
<td>Service Date</td>
<td>October 1, 2009</td>
</tr>
<tr>
<td>Study Period</td>
<td>20 years 0 months (October 1, 2009 through September 30, 2029)</td>
</tr>
<tr>
<td>Discount Rate</td>
<td>3%</td>
</tr>
<tr>
<td>Discounting Convention</td>
<td>End-of-Year</td>
</tr>
</tbody>
</table>

### Comparison of Present-Value Costs

#### PV Life-Cycle Cost

<table>
<thead>
<tr>
<th>Initial Investment Costs:</th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$200,341</td>
<td>$397,980</td>
<td>-$197,639</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Future Costs:</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Consumption Costs</td>
<td>$327,111</td>
<td>$254,692</td>
<td>$72,419</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$210,589</td>
<td>$205,963</td>
<td>$4,626</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$14,500</td>
<td>$16,000</td>
<td>-$1,500</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$68,877</td>
<td>-$129,924</td>
<td>$61,047</td>
</tr>
</tbody>
</table>

Subtotal (for Future Cost Items)                | $483,323  | $346,731    | $136,592                 |

Total PV Life-Cycle Cost                       | $683,664  | $744,711    | -$61,048                 |

#### Net Savings from Alternative Compared with Base Case

- PV of Non-Investment Savings: $77,045
- Increased Total Investment: $138,092

Net Savings: -$61,048

#### Savings-to-Investment Ratio (SIR)

\[
\text{SIR} = \frac{\text{Net Savings}}{\text{Increased Total Investment}} = 0.56
\]

SIR is lower than 1.0; project alternative is not cost effective.

#### Adjusted Internal Rate of Return

\[
\text{AIRR} = 0.04\%
\]
AIRR is lower than your discount rate; project alternative is not cost effective.

Payback Period
Estimated Years to Payback (from beginning of Service Period)
Discounted Payback never reached during study period.
Simple Payback occurs in year 20

Energy Savings Summary

Energy Savings Summary (in stated units)

<table>
<thead>
<tr>
<th>Type</th>
<th>Energy</th>
<th>Average Consumption</th>
<th>Annual Consumption</th>
<th>Life-Cycle Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>217,351.0 kWh</td>
<td>741.6 MBtu</td>
<td>675.7 MBtu</td>
<td>2,014.7 MBtu</td>
</tr>
<tr>
<td></td>
<td>201,700.0 kWh</td>
<td>688.2 MBtu</td>
<td>3,025.0 MBtu</td>
<td>1,781.8 MBtu</td>
</tr>
<tr>
<td></td>
<td>15,651.0 kWh</td>
<td>53.4 MBtu</td>
<td>373.2 MBtu</td>
<td>1,131.2 MBtu</td>
</tr>
</tbody>
</table>

Energy Savings Summary (in MBtu)

<table>
<thead>
<tr>
<th>Type</th>
<th>Energy</th>
<th>Average Consumption</th>
<th>Annual Consumption</th>
<th>Life-Cycle Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>741.6 MBtu</td>
<td>688.2 MBtu</td>
<td>53.4 MBtu</td>
<td>1,067.9 MBtu</td>
</tr>
<tr>
<td></td>
<td>675.7 MBtu</td>
<td>302.5 MBtu</td>
<td>373.2 MBtu</td>
<td>7,463.0 MBtu</td>
</tr>
</tbody>
</table>

Emissions Reduction Summary

<table>
<thead>
<tr>
<th>Type</th>
<th>Energy</th>
<th>Average Emissions</th>
<th>Annual Emissions</th>
<th>Life-Cycle Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>CO2 227,509.74 kg</td>
<td>211,127.23 kg</td>
<td>16,382.51 kg</td>
<td>327,605.35 kg</td>
</tr>
<tr>
<td></td>
<td>SO2 421.34 kg</td>
<td>391.00 kg</td>
<td>30.34 kg</td>
<td>606.72 kg</td>
</tr>
<tr>
<td></td>
<td>NOx 458.59 kg</td>
<td>425.56 kg</td>
<td>33.02 kg</td>
<td>660.35 kg</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>CO2 35,692.86 kg</td>
<td>15,979.12 kg</td>
<td>19,713.74 kg</td>
<td>394,220.92 kg</td>
</tr>
<tr>
<td></td>
<td>SO2 288.05 kg</td>
<td>128.96 kg</td>
<td>159.10 kg</td>
<td>3,181.49 kg</td>
</tr>
<tr>
<td></td>
<td>NOx 27.81 kg</td>
<td>12.45 kg</td>
<td>15.36 kg</td>
<td>307.12 kg</td>
</tr>
</tbody>
</table>

Total:
CO2 263,202.61 kg 227,106.35 kg 36,096.25 kg 721,826.27 kg
SO2 709.40 kg 519.96 kg 189.44 kg 3,788.20 kg
NOx 486.39 kg 438.01 kg 48.38 kg 967.47 kg
### NIST BLCC 5.3-09: Comparative Analysis

**Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A**

**Base Case: 2003 IECC Base Case**

**Alternative: 30% Alternative Design**

**General Information**

- **File Name:** C:\Program Files (x86)\BLCC5\projects\Completed\Warehouse WWR Norfolk Residual Value.xml
- **Date of Study:** Mon Oct 05 15:20:16 CDT 2009
- **Project Name:** Warehouse WWR - Norfolk
- **Project Location:** Nebraska
- **Analysis Type:** FEMP Analysis, Energy Project
- **Analyst:** SM Cherney
- **Base Date:** October 1, 2009
- **Service Date:** October 1, 2009
- **Study Period:** 20 years 0 months (October 1, 2009 through September 30, 2029)
- **Discount Rate:** 3%
- **Discounting Convention:** End-of-Year

### Comparison of Present-Value Costs

#### PV Life-Cycle Cost

<table>
<thead>
<tr>
<th></th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Investment Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$214,280</td>
<td>$397,980</td>
<td>-$183,700</td>
</tr>
<tr>
<td><strong>Future Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Consumption Costs</td>
<td>$334,533</td>
<td>$258,368</td>
<td>$76,164</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$200,691</td>
<td>$196,283</td>
<td>$4,408</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$13,818</td>
<td>$15,248</td>
<td>-$1,430</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$72,647</td>
<td>-$129,429</td>
<td>$56,783</td>
</tr>
<tr>
<td><strong>Subtotal (for Future Cost Items)</strong></td>
<td>$476,396</td>
<td>$340,470</td>
<td>$135,926</td>
</tr>
<tr>
<td><strong>Total PV Life-Cycle Cost</strong></td>
<td>$690,676</td>
<td>$738,450</td>
<td>-$47,774</td>
</tr>
</tbody>
</table>

**Net Savings from Alternative Compared with Base Case**

- **PV of Non-Investment Savings:** $80,573
- **- Increased Total Investment:** $128,347

**Net Savings:** -$47,774

**Savings-to-Investment Ratio (SIR)**

\[ SIR = \frac{\text{Net Savings}}{\text{Increased Total Investment}} = \frac{-$47,774}{$128,347} = 0.63 \]

SIR is lower than 1.0; project alternative is not cost effective.

**Adjusted Internal Rate of Return**
Adjusted Internal Rate of Return

AIRR = 0.63%

AIRR is lower than your discount rate; project alternative is not cost effective.

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Discounted Payback never reached during study period.

Simple Payback occurs in year 20

Energy Savings Summary

Energy Savings Summary (in stated units)

<table>
<thead>
<tr>
<th>Energy</th>
<th>-----Average</th>
<th>Annual Consumption-----</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Base Case</td>
<td>Alternative</td>
<td>Savings</td>
</tr>
<tr>
<td>Electric</td>
<td>217,497.0 kWh 202,052.0 kWh</td>
<td>15,445.0 kWh</td>
<td>308,857.7 kWh</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>8,025.0 Therm 3,637.0 Therm</td>
<td>4,388.0 Therm</td>
<td>87,748.0 Therm</td>
</tr>
</tbody>
</table>

Energy Savings Summary (in MBtu)

<table>
<thead>
<tr>
<th>Energy</th>
<th>-----Average</th>
<th>Annual Consumption-----</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Base Case</td>
<td>Alternative</td>
<td>Savings</td>
</tr>
<tr>
<td>Electric</td>
<td>742.1 MBtu 689.4 MBtu</td>
<td>52.7 MBtu</td>
<td>1,053.9 MBtu</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>802.5 MBtu 363.7 MBtu</td>
<td>438.8 MBtu</td>
<td>8,774.8 MBtu</td>
</tr>
</tbody>
</table>

Emissions Reduction Summary

<table>
<thead>
<tr>
<th>Energy</th>
<th>-----Average</th>
<th>Annual</th>
<th>Emissions-----</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Base Case</td>
<td>Alternative</td>
<td>Reduction</td>
<td>Reduction</td>
</tr>
<tr>
<td>Electric</td>
<td>CO2</td>
<td>227,662.57 kg 211,495.69 kg</td>
<td>16,166.88 kg</td>
<td>323,293.38 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>421.63 kg 391.68 kg</td>
<td>29.94 kg</td>
<td>598.73 kg</td>
<td></td>
</tr>
<tr>
<td>NOx</td>
<td>458.89 kg 426.31 kg</td>
<td>32.59 kg</td>
<td>651.66 kg</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>CO2</td>
<td>42,390.89 kg 19,211.92 kg</td>
<td>23,178.97 kg</td>
<td>463,515.91 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>342.11 kg 155.05 kg</td>
<td>187.06 kg</td>
<td>3,740.72 kg</td>
<td></td>
</tr>
<tr>
<td>NOx</td>
<td>33.03 kg 14.97 kg</td>
<td>18.06 kg</td>
<td>361.11 kg</td>
<td></td>
</tr>
<tr>
<td>Total:</td>
<td>CO2</td>
<td>270,053.46 kg 230,707.61 kg</td>
<td>39,345.85 kg</td>
<td>786,809.29 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>763.73 kg 546.73 kg</td>
<td>217.00 kg</td>
<td>4,339.45 kg</td>
<td></td>
</tr>
<tr>
<td>NOx</td>
<td>491.92 kg 441.27 kg</td>
<td>50.65 kg</td>
<td>1,012.76 kg</td>
<td></td>
</tr>
</tbody>
</table>
## NIST BLCC 5.3-09: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

### Base Case: 2003 IECC Base Case

### Alternative: 30% Alternative Design

### General Information

- **File Name:** C:\Program Files (x86)\BLCC5\projects\Completed\Warehouse WWR Chadron Residual Value.xml
- **Date of Study:** Mon Oct 05 13:59:35 CDT 2009
- **Project Name:** Warehouse WWR - Chadron
- **Project Location:** Nebraska
- **Analysis Type:** FEMP Analysis, Energy Project
- **Analyst:** SM Cherney
- **Base Date:** October 1, 2009
- **Service Date:** October 1, 2009
- **Study Period:** 20 years 0 months (October 1, 2009 through September 30, 2029)
- **Discount Rate:** 3%
- **Discounting Convention:** End-of-Year

### Comparison of Present-Value Costs

#### PV Life-Cycle Cost

<table>
<thead>
<tr>
<th></th>
<th>Base Case</th>
<th>Alternative</th>
<th>Savings from Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Investment Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Requirements as of Base Date</td>
<td>$214,280</td>
<td>$397,980</td>
<td>-$183,700</td>
</tr>
<tr>
<td><strong>Future Costs:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Consumption Costs</td>
<td>$312,573</td>
<td>$245,481</td>
<td>$67,091</td>
</tr>
<tr>
<td>Energy Demand Charges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Energy Utility Rebates</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Water Costs</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Recurring and Non-Recurring OM&amp;R Costs</td>
<td>$185,107</td>
<td>$181,042</td>
<td>$4,066</td>
</tr>
<tr>
<td>Capital Replacements</td>
<td>$12,746</td>
<td>$14,064</td>
<td>-$1,318</td>
</tr>
<tr>
<td>Residual Value at End of Study Period</td>
<td>-$71,997</td>
<td>-$128,650</td>
<td>$56,653</td>
</tr>
<tr>
<td><strong>Subtotal (for Future Cost Items)</strong></td>
<td>$438,429</td>
<td>$311,937</td>
<td>$126,491</td>
</tr>
<tr>
<td><strong>Total PV Life-Cycle Cost</strong></td>
<td>$652,709</td>
<td>$709,917</td>
<td>-$57,209</td>
</tr>
</tbody>
</table>

### Net Savings from Alternative Compared with Base Case

- **PV of Non-Investment Savings:** $71,157
- **Increased Total Investment:** $128,366

**Net Savings:** -$57,209

### Savings-to-Investment Ratio (SIR)

\[ \text{SIR} = 0.55 \]

SIR is lower than 1.0; project alternative is not cost effective.

### Adjusted Internal Rate of Return
**Adjusted Internal Rate of Return**

\[ \text{AIRR} = 0.01\% \]

AIRR is lower than your discount rate; project alternative is not cost effective.

**Payback Period**

Estimated Years to Payback (from beginning of Service Period)

Discounted Payback never reached during study period.

Simple Payback occurs in year 20

**Energy Savings Summary**

Energy Savings Summary (in stated units)

<table>
<thead>
<tr>
<th>Energy</th>
<th>Type</th>
<th>Base Case</th>
<th>Annual Consumption</th>
<th>Alternative</th>
<th>Savings</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>216,764.0 kWh</td>
<td>201,729.0 kWh</td>
<td>15,035.0 kWh</td>
<td>300,658.8 kWh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>6,420.0 Therm</td>
<td>2,835.0 Therm</td>
<td>3,585.0 Therm</td>
<td>71,690.2 Therm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Energy Savings Summary (in MBtu)

<table>
<thead>
<tr>
<th>Energy</th>
<th>Type</th>
<th>Base Case</th>
<th>Annual Consumption</th>
<th>Alternative</th>
<th>Savings</th>
<th>Life-Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>739.6 MBtu</td>
<td>688.3 MBtu</td>
<td>51.3 MBtu</td>
<td>1,025.9 MBtu</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>642.0 MBtu</td>
<td>283.5 MBtu</td>
<td>358.5 MBtu</td>
<td>7,169.0 MBtu</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Emissions Reduction Summary**

<table>
<thead>
<tr>
<th>Energy</th>
<th>Type</th>
<th>CO2</th>
<th>Annual Emissions</th>
<th>Reduction</th>
<th>Reduciton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>226,895.31 kg</td>
<td>211,157.59 kg</td>
<td>15,737.72 kg</td>
<td>314,711.30 kg</td>
<td></td>
</tr>
<tr>
<td>SO2</td>
<td>420.20 kg</td>
<td>391.06 kg</td>
<td>29.15 kg</td>
<td>582.84 kg</td>
<td></td>
</tr>
<tr>
<td>NOx</td>
<td>457.35 kg</td>
<td>425.63 kg</td>
<td>31.72 kg</td>
<td>634.36 kg</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>33,912.71 kg</td>
<td>14,975.47 kg</td>
<td>18,937.24 kg</td>
<td>378,692.92 kg</td>
<td></td>
</tr>
<tr>
<td>SO2</td>
<td>273.69 kg</td>
<td>120.86 kg</td>
<td>152.83 kg</td>
<td>3,056.17 kg</td>
<td></td>
</tr>
<tr>
<td>NOx</td>
<td>26.42 kg</td>
<td>11.67 kg</td>
<td>14.75 kg</td>
<td>295.03 kg</td>
<td></td>
</tr>
</tbody>
</table>

Total:

<table>
<thead>
<tr>
<th>Energy</th>
<th>CO2</th>
<th>Annual Emissions</th>
<th>Reduction</th>
<th>Reduciton</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2</td>
<td>260,808.02 kg</td>
<td>226,133.06 kg</td>
<td>34,674.96 kg</td>
<td>693,404.22 kg</td>
</tr>
<tr>
<td>SO2</td>
<td>693.89 kg</td>
<td>511.92 kg</td>
<td>181.98 kg</td>
<td>3,639.01 kg</td>
</tr>
<tr>
<td>NOx</td>
<td>483.77 kg</td>
<td>437.29 kg</td>
<td>46.48 kg</td>
<td>929.38 kg</td>
</tr>
</tbody>
</table>
# Nebraska Climate Zone Comparison Chart

## Zone 13b (2003 IECC) .vs. Zone 5 (2006 IECC)

<table>
<thead>
<tr>
<th>Component</th>
<th>2003 IECC</th>
<th>2006 IECC</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Envelope</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>0-10%; R-13</td>
<td>R-13 + R-3.8 c.i., U-Value = 0.084</td>
<td>Metal Framed</td>
</tr>
<tr>
<td></td>
<td>10.1-25%; R-13</td>
<td></td>
<td>c.i. = Continuous</td>
</tr>
<tr>
<td></td>
<td>25.1-40%; R-13</td>
<td></td>
<td>Insulation</td>
</tr>
<tr>
<td></td>
<td>40.1-50%; R-13</td>
<td></td>
<td>#-#% = Window to Wall</td>
</tr>
<tr>
<td><strong>Roof</strong></td>
<td>Metal Joist/Truss</td>
<td>Insulation Entirely Above Deck R-20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0-10%; R-19 c.i.</td>
<td>U-Value = 0.048</td>
<td>Ratio (WWR)</td>
</tr>
<tr>
<td></td>
<td>10.1-25%; R-20 c.i.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>25.1-40%; R-24 c.i.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>40.1-50%; R-24 c.i.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Window; WWR% shown</strong></td>
<td>0-10%; U=Any, SHGC=Any</td>
<td>40% Max of Above Grade Wall, Metal Framing with/without thermal breaks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.1-25%; U=0.50, SHGC=0.50</td>
<td>Curtain Wall/Storefront; U=0.45, SHGC=0.40</td>
<td>Assuming PF &lt; 0.25</td>
</tr>
<tr>
<td></td>
<td>25.1-40%; U=0.50, SHGC=0.40</td>
<td>Entrance Door; U=0.80, SHGC=0.40</td>
<td></td>
</tr>
<tr>
<td></td>
<td>40.1-50%; U=0.40, SHGC=0.40</td>
<td>All Other; U=0.55, SHGC=0.40</td>
<td></td>
</tr>
<tr>
<td><strong>Lighting</strong></td>
<td>Space Dependent</td>
<td>Space Dependent</td>
<td></td>
</tr>
<tr>
<td><strong>HVAC System</strong></td>
<td>Unitary A/Cs, cond. units, and Heat Pumps</td>
<td>Unitary A/Cs, cond. units, and Heat Pumps</td>
<td>No changes to code</td>
</tr>
<tr>
<td><strong>Cooling Efficiency</strong></td>
<td>Same</td>
<td>Same</td>
<td>No changes to code</td>
</tr>
<tr>
<td><strong>Heating Efficiency</strong></td>
<td>Same</td>
<td>Same</td>
<td>No changes to code</td>
</tr>
</tbody>
</table>
# Nebraska Climate Zone Comparison Chart

## Zone 14b (2003 IECC) vs. Zone 5 (2006 IECC)

<table>
<thead>
<tr>
<th>Component</th>
<th>2003 IECC</th>
<th>2006 IECC</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Envelope</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>0-10%; R-13 + R-3 c.i. 10.1-25%; R-13 + R-3 c.i. 25.1-40%; R-13 + R-3 c.i. 40.1-50%; R-13 + R-7 c.i.</td>
<td>R-13 + R-3.8 c.i., U-Value = 0.084</td>
<td>Metal Framed c.i. = Continuous Insulation #-#% = Window to Wall Ratio (WWR)</td>
</tr>
<tr>
<td><strong>Roof</strong></td>
<td>Metal Joist/Truss 0-10%; R-20 c.i. 10.1-25%; R-20 c.i. 25.1-40%; R-24 c.i. 40.1-50%; R-24 c.i.</td>
<td>Insulation Entirely Above Deck R-20 U-Value = 0.048</td>
<td></td>
</tr>
<tr>
<td><strong>Window; WWR% shown</strong></td>
<td>0-10%; U=0.7, SHGC=Any 10.1-25%; U=0.50, SHGC=0.50 25.1-40%; U=0.50, SHGC=0.40 40.1-50%; U=0.40, SHGC=0.40</td>
<td>40% Max of Above Grade Wall, Metal Framing with/without thermal breaks Curtain Wall/Storefront; U=0.45, SHGC=0.40 Entrance Door; U=0.80, SHGC=0.40 All Other; U=0.55, SHGC=0.40</td>
<td>SHGC = Solar Heat Gain Coefficient Assuming PF &lt; 0.25</td>
</tr>
<tr>
<td><strong>Lighting</strong></td>
<td>Space Dependent</td>
<td>Space Dependent</td>
<td></td>
</tr>
<tr>
<td><strong>HVAC System</strong></td>
<td>Unitary A/Cs, cond. units, and Heat Pumps</td>
<td>Unitary A/Cs, cond. units, and Heat Pumps</td>
<td></td>
</tr>
<tr>
<td><strong>Cooling Efficiency</strong></td>
<td>Same</td>
<td>Same</td>
<td>No changes to code</td>
</tr>
<tr>
<td><strong>Heating Efficiency</strong></td>
<td>Same</td>
<td>Same</td>
<td>No changes to code</td>
</tr>
</tbody>
</table>
# Nebraska Climate Zone Comparison Chart

## Zone 15 (2003 IECC) vs. Zone 5 (2006 IECC)

<table>
<thead>
<tr>
<th>Component</th>
<th>2003 IECC</th>
<th>2006 IECC</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Envelope</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>0-10%; R-13 + R-3 c.i. 10.1-25%; R-13 + R-3 c.i. 25.1-40%; R-13 + R-3 c.i. 40.1-50%; R-13 + R-7 c.i.</td>
<td>R-13 + R-3.8 c.i., U-Value = 0.084</td>
<td>Metal Framed c.i. = Continuous Insulation #-% = Window to Wall Ratio (WWR)</td>
</tr>
<tr>
<td><strong>Roof</strong></td>
<td>Metal Joist/Truss 0-10%; R-20 c.i. 10.1-25%; R-20 c.i. 25.1-40%; R-24 c.i. 40.1-50%; R-24 c.i.</td>
<td>Insulation Entirely Above Deck R-20 U-Value = 0.048</td>
<td></td>
</tr>
<tr>
<td><strong>Window; WWR% shown</strong></td>
<td>0-10%; U=0.7, SHGC=Any 10.1-25%; U=0.50, SHGC=0.50 25.1-40%; U=0.50, SHGC=0.40 40.1-50%; U=0.40, SHGC=0.40</td>
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<td>SHGC = Solar Heat Gain Coefficient Assuming PF &lt; 0.25</td>
</tr>
<tr>
<td><strong>Lighting</strong></td>
<td>Space Dependent</td>
<td>Space Dependent</td>
<td></td>
</tr>
<tr>
<td><strong>HVAC System</strong></td>
<td>Unitary A/Cs, cond. units, and Heat Pumps</td>
<td>Unitary A/Cs, cond. units, and Heat Pumps</td>
<td></td>
</tr>
<tr>
<td><strong>Cooling Efficiency</strong></td>
<td>Same</td>
<td>Same</td>
<td>No changes to code</td>
</tr>
<tr>
<td><strong>Heating Efficiency</strong></td>
<td>Same</td>
<td>Same</td>
<td>No changes to code</td>
</tr>
</tbody>
</table>
## Nebraska Climate Zone Comparison Chart

**Zone 13b (2003 IECC) vs. Zone 5 (ASHRAE Std. 90.1-2004)**

<table>
<thead>
<tr>
<th>Component</th>
<th>2003 IECC</th>
<th>ASHRAE 90.1-2004 Baseline Building</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Envelope</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Wall</strong></td>
<td>Metal framing</td>
<td>R-13 + R-3.8 ci, steel framed U-Value = 0.084</td>
<td>ci = Continuous Insulation</td>
</tr>
<tr>
<td></td>
<td>0-10%; R-13</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.1-25%; R-13</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>25.1-40%; R-13</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Roof</strong></td>
<td>0-10%; R-19 c.i.</td>
<td>R-15 Entirely above deck U-Value = 0.063</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.1-25%; R-20 c.i.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>25.1-40%; R-24 c.i.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Window; WWR% shown</strong></td>
<td>Assuming PF &lt; 0.25 0-10%; U=Any, SHGC=Any 10.1-25%; U=0.5, SHGC=0.5 25.1-40%; U=0.5, SHGC=0.4</td>
<td>0-10%; U=0.57, SHGC=0.49 10.1-40%; U=0.57, SHGC=0.39</td>
<td>SHGC = Solar Heat Gain Coefficient</td>
</tr>
<tr>
<td><strong>Lighting</strong></td>
<td>1.2 W/sf</td>
<td>1.2 W/sf</td>
<td></td>
</tr>
<tr>
<td><strong>HVAC System</strong></td>
<td>Unitary A/Cs, cond. units, and Heat Pumps</td>
<td>Unitary A/Cs, cond. units, and Heat Pumps</td>
<td></td>
</tr>
<tr>
<td><strong>Cooling Efficiency</strong></td>
<td>&lt;65kBtuh: Split-10 SEER &lt;65kBtuh: SP-9.7 SEER</td>
<td>&lt;65kBtuh: Split-12 SEER &lt;65kBtuh: SP-12 SEER</td>
<td>90.1-2004 provides both electric and non-electric heating efficiencies (03 IECC does not). It also provides a few other configurations.</td>
</tr>
<tr>
<td><strong>Heating Efficiency</strong></td>
<td>&lt;65kBtuh: Split-6.8 HSPF &lt;65kBtuh: SP-6.6 HSPF</td>
<td>&lt;65kBtuh: Split-7.4 HSPF &lt;65kBtuh: SP-7.4 HSPF</td>
<td>90.1-2004 provides ratings for 47/43F and 17/15F ambient (03 IECC only provides 47/43)</td>
</tr>
</tbody>
</table>
# Nebraska Climate Zone Comparison Chart

## Zone 14b (2003 IECC) vs. Zone 5 (ASHRAE Std. 90.1-2004)

<table>
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<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>Metal framing</td>
<td>R-13 + R-3.8 ci, steel framed U-Value = 0.084</td>
<td>ci = Continuous Insulation</td>
</tr>
<tr>
<td></td>
<td>0-10%; R-13 + R-3 ci</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.1-25%; R-13 + R-3 ci</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>25.1-40%; R-13 + R-7 ci</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Roof</strong></td>
<td>0-10%; R-20 ci</td>
<td>R-15 Entirely above deck U-Value = 0.063</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.1-25%; R-20 ci</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>25.1-40%; R-24 ci</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Window; WWR% shown</strong></td>
<td>Assuming PF &lt; 0.25</td>
<td>0-10%; U=0.57, SHGC=0.49</td>
<td>SHGC = Solar Heat Gain Coefficient</td>
</tr>
<tr>
<td></td>
<td>0-10%; U=0.7, SHGC=Any</td>
<td>10.1-40%; U=0.57, SHGC=0.39</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.1-25%; U=0.5, SHGC=0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>25.1-40%; U=0.5, SHGC=0.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Lighting</strong></td>
<td>1.2 W/sf</td>
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<td></td>
</tr>
<tr>
<td><strong>HVAC System</strong></td>
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<tr>
<td></td>
<td>&lt;65kBtuh: SP-9.7 SEER</td>
<td>&lt;65kBtuh: SP-12 SEER</td>
<td></td>
</tr>
<tr>
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<td>&lt;65kBtuh: SP-7.4 HSPF</td>
<td></td>
</tr>
</tbody>
</table>
# Nebraska Climate Zone Comparison Chart

## Zone 15 (2003 IECC) vs. Zone 5 (ASHRAE Std. 90.1-2004)

<table>
<thead>
<tr>
<th>Component</th>
<th>2003 IECC</th>
<th>ASHRAE 90.1-2004 Baseline Building</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Envelope</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>Metal framing 0-10%; R-13 + R-3 ci 10.1-25%; R-13 + R-3 ci 25.1-40%; R-13 + R-7 ci</td>
<td>R-13 + R-3.8 ci, steel framed U-Value = 0.084</td>
<td>ci = Continuous Insulation</td>
</tr>
<tr>
<td>Roof</td>
<td>0-10%; R-20 ci 10.1-25%; R-20 ci 25.1-40%; R-24 ci</td>
<td>R-15 Entirely above deck U-Value = 0.063</td>
<td></td>
</tr>
<tr>
<td>Window; WWR% shown</td>
<td>Assuming PF &lt; 0.25 0-10%; U=0.7, SHGC=Any 10.1-25%; U=0.5, SHGC=0.5 25.1-40%; U=0.4, SHGC=0.5</td>
<td>0-10%; U=0.57, SHGC=0.49 10.1-40%; U=0.57, SHGC=0.39</td>
<td>SHGC = Solar Heat Gain Coefficient</td>
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<td>Lighting</td>
<td>1.2 W/sf</td>
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<td></td>
</tr>
<tr>
<td>HVAC System</td>
<td>Unitary A/Cs, cond. units, and Heat Pumps</td>
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</tr>
</tbody>
</table>
GENERAL SERVICE RATE SCHEDULE

(Name of Schedule)

AVAILABLE: In the retail distribution service territory of the District.

APPLICABLE: To commercial and nonresidential establishments for lighting, heating, and power purposes where all service is taken through a single meter at one location, and where the Customer's peak demand does not exceed 100 kW during any two summer months or 200 kW in any two months of a 12 consecutive month period. However, any commercial Customer with a load factor of at least 250 kWh/kW and either: (1) a demand greater than 50 kW, or (2) consumption greater than 15,000 kWh during any three months of a 12 consecutive month period shall have the option of being billed under the General Service Demand Rate Schedule.

CHARACTER OF SERVICE: AC, 60 hertz, single-phase or three-phase, at any of the District's standard primary and secondary distribution voltages.

BASE RATE:

Subject to application of Retail Production Cost Adjustment (PCA) Rate Schedule.

General Service (Rate Codes 27 & 52):

Customer Charge:  
- Single-phase  
  $15.50 per month
- Three-phase  
  $19.00 per month

Energy Charge:

<table>
<thead>
<tr>
<th></th>
<th>Summer</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.57¢</td>
<td>7.45¢</td>
<td>per kilowatt-hour for the first 1,000 kilowatt-hours used per month.</td>
</tr>
<tr>
<td>8.42¢</td>
<td>5.90¢</td>
<td>per kilowatt-hour for the next 2,000 kilowatt-hours used per month.</td>
</tr>
<tr>
<td>8.42¢</td>
<td>5.45¢</td>
<td>per kilowatt-hour for all additional use.</td>
</tr>
</tbody>
</table>

Summer:

The summer rate shall apply to the Customer's prorated use from June 1 through September 30.

Winter:

The winter rate shall apply to the Customer's prorated use from October 1 through May 31.

TAX CLAUSE: In the event of the imposition of any new or increased tax or any payment in lieu thereof, in excess of that provided for under Article VIII, Section 11 of the Nebraska Constitution, by any lawful authority on the production, transmission, or sale of electricity, the rate provided herein may be increased to reflect the amount of such tax or in lieu of tax increase.

Effective: January 1, 2009

Approved: 11/14/08  Resolution No: 08-145  Issued by: [Signature]
BASE RATE ADJUSTMENT:

Customers who are served from distribution facilities for which the District has a Lease Payment (LP) or Debt Service (DS) obligation and/or a 5% Gross Revenue Tax (GRT) obligation will have the Base Rate (excluding PCA but including applicable primary service discount) adjusted to include such obligations as shown in the following table:

<table>
<thead>
<tr>
<th>Applicable Adjustment</th>
<th>Rate Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Base Rates</td>
</tr>
<tr>
<td>Gross Revenue Tax (GRT) Only</td>
<td>Base Rates ÷ 0.95</td>
</tr>
<tr>
<td>Lease Payment (LP) or Debt Service (DS) Only</td>
<td>Base Rates ÷ 0.88</td>
</tr>
<tr>
<td>LP/DS and GRT</td>
<td>Base Rates ÷ 0.83</td>
</tr>
</tbody>
</table>

In addition, for Customers served from distribution facilities for which the District has a 5% GRT obligation, the PCA will be adjusted to include such obligation by the following formula: PCA ÷ 0.95.

MINIMUM BILL: Customer Charge, subject to applicable Base Rate Adjustment.

PRIMARY SERVICE DISCOUNT: A discount of two percent (2%) of the total bill (excluding applicable PCA and Base Rate Adjustment) is applicable where:

1. The Customer takes service from the District's standard primary distribution voltage,

2. The Customer owns and maintains, or pays for all capital costs and all costs for repairs, renewals, improvements and additions, for all transformation from primary distribution voltage to Customer secondary utilization voltage and other distribution facilities beyond the primary voltage delivery point, and

3. Both the point of measurement and the point of delivery are located at the same point on the District's primary voltage distribution line.

TAX CLAUSE: In the event of the imposition of any new or increased tax or any payment in lieu thereof, in excess of that provided for under Article VIII, Section 11 of the Nebraska Constitution, by any lawful authority on the production, transmission, or sale of electricity, the rate provided herein may be increased to reflect the amount of such tax or in lieu of tax increase.

Effective: January 1, 2009

Approved: 11/14/08  Resolution No: 08-145  Issued by: [Signature]
TERMS AND CONDITIONS:

1. Service will be furnished under the District's Retail Service Rules and Regulations.

2. Extensions made for service under this rate schedule are subject to the provisions of the District's "General Extension Policy for Retail Electric Services and Facilities".

3. The District's General Customer Service Charges Rate Schedule shall apply.

4. Usage shall be fractionalized on the actual days of service for application of a change in rate or changing from summer to winter or from winter to summer rates.

5. The Customer shall provide, if requested, suitable space on the Customer's premises for location of the District's transformation and any switching or capacitor equipment that may be required.

6. For billing purposes, energy usage shall be normalized to 30 days when actual days of service is less than 27 days or exceeds 35 days in any given billing period.

7. The District retains and reserves the right, power and authority to modify, revise, amend, replace, repeal or cancel this rate schedule, at any time and in whole or in part, by resolution adopted by the District's Board of Directors.

TAX CLAUSE: In the event of the imposition of any new or increased tax or any payment in lieu thereof, in excess of that provided for under Article VIII, Section 11 of the Nebraska Constitution, by any lawful authority on the production, transmission, or sale of electricity, the rate provided herein may be increased to reflect the amount of such tax or in lieu of tax increase.

Effective: January 1, 2009

Approved: 11/14/08 Resolution No: 08-145 Issued by: [Signature]
SCHEDULE NO. 231

GENERAL SERVICE – SMALL DEMAND

Availability:

To all Consumers throughout the District's Service Area.

The single phase, or three phase if available, alternating current, electric service will be supplied at the District's standard voltages, for all uses, when all the Consumer's service at one location is measured by one kilowatthour meter with a demand register, unless a Consumer takes emergency or special service as required by the District's Service Regulations. Not applicable to shared or resale service.

This rate is not available to those Consumers taking Irrigation Service as identified in Rate Schedule No. 226.

Net Monthly Rate:

A Basic Service Charge of:  $ 16.75 plus

A Demand Charge of:
$ 81.00 for the first 18 kilowatts of demand, and
$  4.50 per kilowatt for all additional kilowatts of demand; plus

An Energy Charge of:
Summer  5.44 cents per kilowatthour for the first 300 kilowatthours per kilowatt of demand, and
3.34 cents per kilowatthour for all additional kilowatthours.

The summer rate will be applicable June 1 through September 30.

Winter  4.35 cents per kilowatthour for the first 300 kilowatthours per kilowatt of demand, and
2.28 cents per kilowatthour for all additional kilowatthours.

The winter rate will be applicable October 1 through May 31.

The provisions of Rate Schedule No. 461A – Fuel and Transportation Cost Adjustment apply to this rate schedule.

Minimum Monthly Bill:

$ 97.75

Gross Monthly Bill:

The net monthly bill, computed in accordance with the Net Monthly Rate; plus an amount of 4%, which amount will be deducted if the bill is paid on or before the gross date thereon.

Determination of Demand:

Demand, for any billing period, shall be the kilowatts as shown by or...
SCHEDULE NO. 231

GENERAL SERVICE – SMALL DEMAND

computed from the readings of the District's kilowatthour meter with a demand register, for the 15-minute period of Consumer's greatest use during such billing period.

If the demand, so determined, however, is less than 85% of the Consumer's highest 15-minute kilovoltampere demand, the kilowatt demand will be increased for the purposes of this schedule by 50% of the difference between 85% of the kilovoltampere demand and the demand as determined above.

Such demand must be equal to or greater than the larger of the following:

- 85% of the highest 15-minute power factor adjusted demand during the summer billing months of the preceding 11 months, or
- 60% of the highest 15-minute power factor adjusted demand during the winter billing months of the preceding 11 months, or
- 18 kilowatts.

Schedule Duration:

A minimum of one year.

Reconnection Charge:

If a Consumer whose service has been terminated has such service reconnected within 12 months of such termination, a reconnection charge equal to the minimum monthly charge for the preceding 12 months, or any part thereof, shall be collected by the District.

Service Regulations:

The District's Service Regulations form a part of this schedule.

District Level Payment Plan:

For Consumers meeting the eligibility requirements specified in the District's Service Regulations, the Consumer may elect to be billed on the District's Level Payment Plan.

Special Conditions:

Consumer shall furnish, if requested, suitable space on the Consumer's premises for the District's transforming equipment, and if required, suitable space for switching and/or capacitor equipment.

District shall not be required to furnish duplicate service hereunder.
SCHEDULE F
FIXED RATE GAS SERVICE
EFFECTIVE JANUARY 2, 2007
(Supersedes Schedule F, effective January 2, 2005)

AVAILABILITY

This rate schedule is available to customers contracting for the purchase of fixed quantities of natural gas at a fixed price for up to a 36-month period.

1. Customer must be purchasing gas under one of the following commercial or industrial gas rate schedules.
   • Schedule B, Commercial or Industrial Firm Gas Service
   • Schedule C, Large Volume Firm Gas Service
   • Schedule No. 3, Interruptible Gas Service
   • Schedule CS – 1, Contract Gas Service

2. Customer must have total gas requirements of not less than 200 decatherms per day. (Multiple meters/sites may be combined to meet this requirement.)

3. Remote automatic meter reading facilities must be installed to District specifications for each meter combined under the contract. Installation will be at customer expense.

4. Customer must have authorized personnel available during normal working hours who can accept or reject the fixed price offered upon notice from the District. (The Energy Acquisitions Department will solicit offers from gas marketers and other suppliers for packages of gas to meet the customers’ requests. Energy Acquisitions will advise customers of the best offer available and of the window available for acceptance.)

RATE – MONTHLY BILLING

The contract “unit cost of gas” (UCOG) purchased by the District for this service will displace the variable “weighted-average cost of gas” (WACOG) included in the commodity charge of District rate schedules as adjusted by the monthly GCA (gas cost adjustment). All other charges in the applicable rate schedules will apply to this service. A monthly administrative charge will also apply.

The District reserves the right to pass on any additional tax or surcharge that may be imposed on the sale or transportation of gas under this rate schedule by any governmental or regulatory body during the course of the contract year.

Administrative charges will be applied per month per contract. Monthly charges for billing purposes by rate schedule:

Schedule B:
   • Basic administrative charge (one delivery point) $ 98.00
   • Additional administrative charge per each additional delivery point 49.00
   • Schedule B service charge – per meter 16.66
   • Schedule B commodity charges (excluding commodity WACOG) to be added to the contract UCOG:
     
     |--------------------|-------------|-------------|
     | $ 1.316/Dth        | $ 0.806/Dth |
     | Over 250 Dth       | 1.218        | 0.708        |
Schedule C:

- Basic administrative charge (one delivery point) $ 98.00
- Additional administrative charge per each additional delivery point 49.00
- Schedule C demand charge $6.8132/Dth/max day
- Schedule C commodity charge to be added to the contract UCOG $0.3506/Dth

(Note: Firm rates are subject to adjustment for changes in pipeline/marketer reservation/surcharges.)

Schedule No. 3:

- Basic administrative charge (one delivery point) $ 98.00
- Additional administrative charge per each additional delivery point 49.00
- Schedule No. 3 service charge – per meter $1,078.00
- Non gas component of Schedule 3 commodity charge to be added to the contract UCOG:
  - First 5,000 Dth per month $0.4271/Dth
  - Over 5000 Dth per month 0.3506

Schedule CS – 1:

- Basic administrative charge (one delivery point) $ 98.00
- Additional administrative charge per each additional delivery point 49.00
- Other charges as contracted plus UCOG contract price.

ADDITIONAL CHARGES

Actual volumes purchased will be balanced to contract quantities. Additional charges may apply:

- If actual volumes used are less than contract volumes for the billing month and the contract UCOG is greater than the system WACOG for the month, an additional charge equal to the contract UCOG minus the system WACOG per decatherm will apply to the variance of actual volumes from contract volumes. If a variance is caused by District curtailment, no additional charges will apply.

- If actual volumes used are greater than contract volumes for the billing month, actual volumes in excess of contract volumes will be billed at the customer’s applicable underlying rate schedule, i.e., rate schedule B, C, No. 3, or CS-1.

STATUTORY PAYMENT TO CITIES

Under Sections 14-2138 and 2139, R.R.S.1997, the District is required to pay to each city or village two (2) percent of retail sales of gas. Two (2) percent has not been included in the above rate. Therefore, the rate for all customers residing inside corporate limits is 2 percent greater than the rate indicated above. The UCOG contract price will also be adjusted to include two (2) percent for city or village when applicable.

OTHER TERMS AND CONDITIONS

All terms and conditions of the customers’ applicable underlying rate schedules that are not modified by the above shall apply to gas service rendered under this rate schedule.
## MUD - Commodity Charge

<table>
<thead>
<tr>
<th>Date</th>
<th>Commodity Charge (0-2500 Th)</th>
<th>Commodity Charge (2500+ Th)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/2/2009</td>
<td>0.4393</td>
<td>0.4295</td>
</tr>
<tr>
<td>3/2/2009</td>
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<td>2/2/2009</td>
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<tr>
<td>5/2/2008</td>
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</table>

Average: 0.811691667 0.80205
RANGE SCHEDULE - TSS
TRADITIONAL SALES SERVICE

1. AVAILABILITY: Service under this rate schedule is available only to residential and commercial customers located within the municipal boundaries and surrounding rural areas of Rate Areas I, II, and III.

2. APPLICABILITY AND CHARACTER OF SERVICE: This rate schedule shall apply to firm gas service for customers whose normal requirements do not exceed 500 Therms on a peak day and such service shall not be subject to interruption.

3. RATE INFORMATION: RATE AREA I, RATE AREA II, & RATE AREA III

   Pipelines:
   - Northern Natural Gas Company
   - Natural Gas Pipeline Company of America (NGPL)
   - Kinder Morgan, Inc (Rate Area III only)

<table>
<thead>
<tr>
<th></th>
<th>Residential</th>
<th>Commercial</th>
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<tbody>
<tr>
<td>Customer Charge:</td>
<td>$12.00 per month</td>
<td>$17.00 per month</td>
</tr>
<tr>
<td>Delivery Charge (Base Rate)</td>
<td>$.15406 per Therm</td>
<td>$.17561 per Therm</td>
</tr>
</tbody>
</table>

   Minimum monthly bill shall be the Customer Charge.

4. ADJUSTMENT FOR PURCHASE OF GAS: The Commodity Charge (Cost of Gas Supply) is in addition to the Delivery Charge shown above. The Commodity Charge will be adjusted monthly for changes in the cost of gas, in accordance with Original Index No. 8.

5. DUE DATE: Bills will be due 20 days after Black Hills Energy’s Mailing Date. Late payment Penalty: One percent (1%) of balance not paid on or before due date.

6. FRANCHISE FEE: A franchise fee will be added to the monthly bill computed on this rate schedules when appropriate.

7. REGULATORY ASSESSMENT AND TAXES: Regulatory Assessment or other taxes, fees, or charges required by a governmental authority will be added to the monthly bill.
BLACK HILLS ENERGY

NEBRASKA FIRM COMMERCIAL/INDUSTRIAL RATES
12-MONTH HISTORY

<table>
<thead>
<tr>
<th>Month</th>
<th>Volumetric Billing Rates ($/Therm)</th>
<th>Monthly Charges ($/Customer)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Metro</td>
<td>Lincoln</td>
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<tr>
<td>Apr-09</td>
<td>0.70796</td>
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<tr>
<td>Mar-09</td>
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<tr>
<td>Feb-09</td>
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<td>Jul-08</td>
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<td>Jun-08</td>
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<tr>
<td>May-08</td>
<td>1.25227</td>
<td>1.29042</td>
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Copies of the official tariff sheets are available at offices providing service under the tariffs, and at the governing local or national commission offices. The information available here attempts to be materially the same, but should there be any discrepancies, in all cases the official tariffs on file with the governing commission will hold over these documents.

Unoffical copy via www.blackhillsenergy.com
SOURCE GAS

<table>
<thead>
<tr>
<th>Future</th>
<th>Historical</th>
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<tr>
<td>Month</td>
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<td>Jun-09</td>
<td>$4.31</td>
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<tr>
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<td>Sep-09</td>
<td>$4.59</td>
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<tr>
<td>Oct-09</td>
<td>$4.72</td>
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<tr>
<td>Nov-09</td>
<td>$5.38</td>
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<tr>
<td>Dec-09</td>
<td>$6.07</td>
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<tr>
<td>Jan-10</td>
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<tr>
<td>Feb-10</td>
<td>$6.39</td>
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<tr>
<td>Mar-10</td>
<td>$6.34</td>
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<tr>
<td>Apr-10</td>
<td>$6.13</td>
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<tr>
<td>May-10</td>
<td>$6.18</td>
</tr>
</tbody>
</table>

$0.55 $0.71

*1MMBtu = 10 Therms

Energy Calculator
Calculate your Savings

Step 3
Do you wish to use average area pricing for Natural Gas?

- [ ] Yes
- [ ] No

Average Price:
Natural Gas: $0.966 per therm or ccf
IV. PROJECT DESCRIPTION AND SCOPE OF WORK

The bidder must provide the following information in response to this Request for Proposal.

A. PROJECT OVERVIEW
This project will consist of the development, analysis and publication of an energy study that quantifies the economic, energy and environmental benefits to the State of Nebraska of the adoption of an Advanced Commercial Building Energy Code that exceeds by 30% the building and lighting requirements of the 2006 International Energy Conservation Code (IECC) and the American Society of Heating Refrigeration and Air-Conditioning Engineers (ASHRAE) 90.1-2004 Standard.

B. SCOPE OF WORK
The successful bidder will complete and provide to the Nebraska Energy Office a Nebraska-Specific Advanced Commercial Building Energy Code (NABEC) Energy Study that includes each of the following:

1. Energy modeling of ten (10) typical Nebraska commercial building types.
   a. A Small Office Building with an 18% window-to-wall ratio
   b. A Small Office Building with a 38% window-to-wall ratio
   c. A Large Office Building with an 18% window-to-wall ratio
   d. A Large Office Building with a 38% window-to-wall ratio
   e. A Small Retail Building
   f. A Retail Strip Mall
   g. A Large Big Box Retail Building
   h. An Elementary Education Building
   i. A Secondary Education Building
   j. A Warehouse

Each building will be energy modeled as per the following building energy codes or advanced building energy standards:

a. The Small Office Buildings with an 18% window-to-wall ratio
   i. 2003 IECC – Zone 13 (Omaha)
   ii. 2003 IECC – Zone 14 (Norfolk)
   iii. 2003 IECC – Zone 15 (Chadron)
   iv. 2006 IECC – Zone 5 (Nebraska)
   v. ASHRAE Advanced Energy Guideline for Small Office Buildings plus ASHRAE 90.1-2004

b. The Small Office Buildings with a 38% window-to-wall ratio
   i. 2003 IECC – Zone 13 (Omaha)
   ii. 2003 IECC – Zone 14 (Norfolk)
   iii. 2003 IECC – Zone 15 (Chadron)
   iv. 2006 IECC – Zone 5 (Nebraska)
   v. ASHRAE Advanced Energy Guideline for Small Office Buildings plus ASHRAE 90.1-2004
c. The Large Office Building with an 18% window-to-wall ratio
   i. 2003 IECC – Zone 13 (Omaha)
   ii. 2003 IECC – Zone 14 (Norfolk)
   iii. 2003 IECC – Zone 15 (Chadron)
   iv. 2006 IECC – Zone 5 (Nebraska)
   v. 30% Better than 2006 IECC building and lighting requirements (based on a COMcheck analysis) and mechanical system requirements of the Energy Star® program or the Consortium for Energy Efficiency’s High Efficiency Commercial Air Conditioning and Heat Pump Initiatives.

d. The Large Office Building with a 38% window-to-wall ratio
   i. 2003 IECC – Zone 13 (Omaha)
   ii. 2003 IECC – Zone 14 (Norfolk)
   iii. 2003 IECC – Zone 15 (Chadron)
   iv. 2006 IECC – Zone 5 (Nebraska)
   v. 30% Better than 2006 IECC building and lighting requirements (based on a COMcheck analysis) and mechanical system requirements of the Energy Star® program or the Consortium for Energy Efficiency’s High Efficiency Commercial Air Conditioning and Heat Pump Initiatives.

e. The Small Retail Building
   i. 2003 IECC – Zone 13 (Omaha)
   ii. 2003 IECC – Zone 14 (Norfolk)
   iii. 2003 IECC – Zone 15 (Chadron)
   iv. 2006 IECC – Zone 5 (Nebraska)
   v. ASHRAE Advanced Energy Guideline for Small Retail Buildings plus ASHRAE 90.1-2004

f. The Retail Strip Mall
   i. 2003 IECC – Zone 13 (Omaha)
   ii. 2003 IECC – Zone 14 (Norfolk)
   iii. 2003 IECC – Zone 15 (Chadron)
   iv. 2006 IECC – Zone 5 (Nebraska)
   v. 30% Better than 2006 IECC building and lighting requirements (based on a COMcheck analysis) and mechanical system requirements of the Energy Star® program or the Consortium for Energy Efficiency’s High Efficiency Commercial Air Conditioning and Heat Pump Initiatives.

g. The Large Big Box Retail Building
   i. 2003 IECC – Zone 13 (Omaha)
   ii. 2003 IECC – Zone 14 (Norfolk)
   iii. 2003 IECC – Zone 15 (Chadron)
   iv. 2006 IECC – Zone 5 (Nebraska)
   v. 30% Better than 2006 IECC building and lighting requirements (based on a COMcheck analysis) and mechanical system requirements of the Energy Star® program or the Consortium for Energy Efficiency’s High Efficiency Commercial Air Conditioning and Heat Pump Initiatives.
h. The Elementary Education Building
   i. 2003 IECC – Zone 13 (Omaha)
   ii. 2003 IECC – Zone 14 (Norfolk)
   iii. 2003 IECC – Zone 15 (Chadron)
   iv. 2006 IECC – Zone 5 (Nebraska)
   v. ASHRAE Advanced Energy Guideline for K-12 Schools plus ASHRAE 90.1-2004

i. The Secondary Education Building
   i. 2003 IECC – Zone 13 (Omaha)
   ii. 2003 IECC – Zone 14 (Norfolk)
   iii. 2003 IECC – Zone 15 (Chadron)
   iv. 2006 IECC – Zone 5 (Nebraska)
   v. ASHRAE Advanced Energy Guideline for K-12 Schools plus ASHRAE 90.1-2004

j. The Warehouse
   i. 2003 IECC – Zone 13 (Omaha)
   ii. 2003 IECC – Zone 14 (Norfolk)
   iii. 2003 IECC – Zone 15 (Chadron)
   iv. 2006 IECC – Zone 5 (Nebraska)
   v. ASHRAE Advanced Energy Guideline for Warehouses and Self Storage Buildings plus ASHRAE 90.1-2004

2. An analysis of the construction costs impact of the improved building energy components based on the latest RS Means Construction Costs data available and quotes from local vendors and suppliers, or their wholesalers. Only the costs for building components that differ between the specified energy codes or standards shall be included in the construction costs analysis. The total price for each component shall include the purchase price, installation, overhead and profit. This total price may then be adjusted based on the RS Means Adjustment factors to determine the local cost for Omaha, Norfolk and Chadron. In the case of the 2006 IECC and the advanced standards the local costs for Omaha shall be used.

3. Incorporate into each building energy model the current utility rates charged by Nebraska’s utilities for each of the specified locations. In the case of the 2006 IECC and the advanced standards the utility costs for Omaha shall be used. The following utilities serve the specified communities:

<table>
<thead>
<tr>
<th>City</th>
<th>Gas Supplier</th>
<th>Electric Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Omaha</td>
<td>Metropolitan Utilities District</td>
<td>Omaha Public Power District</td>
</tr>
<tr>
<td>Norfolk</td>
<td>Black Hills Energy</td>
<td>Nebraska Public Power District</td>
</tr>
<tr>
<td>Chadron</td>
<td>Source Gas</td>
<td>Nebraska Public Power District</td>
</tr>
</tbody>
</table>

4. A Life Cycle Cost (LCC) analysis per building type that utilizes the methodology published by the U.S. Department of Energy for the Life Cycle Cost analysis of energy conservation projects. This methodology forms the basis for the National Institute of Standards and Technology (NIST) Building Life Cycle Cost (BLCC) program, which is used to calculate life cycle costs for government projects. The LCC analyses for each of the buildings in the analysis will be performed over a 20 year period.
5. The completed study will include a section that generalizes the economic impact on the state of updating the state-wide energy code from the 2003 IECC to either the 2006 IECC or a Standard that is 30% Better than the 2006 IECC or ASHRAE 90.1-2004 or the Advanced Energy Guidelines. The impact will be evaluated based on commercial building construction start data from each of the three communities and their associated 2003 IECC weather zones.

6. An Analysis Summary Section that quantifies for building in each community constructed under each code/standard the:
   b. Electrical and natural gas loads for heating, cooling, water heating and lighting
   c. Additional mortgage payment costs (2006 IECC and 30% Better Standard Only)
   d. Annual energy costs in 2009 dollars
   e. First year mortgage cost – energy costs savings for upgrade to the 2006 IECC
   f. First year mortgage cost – energy cost savings for upgrade to the 30% Better Standard
   g. Life cycle cost in 2009 dollars

7. A Project Summary Section that quantifies for the entire state the impact of building upgrading the state wide code to meet the minimum code/standard. This section shall include:
   a. The Incremental construction cost in 2008 dollars (2006 IECC and 30% Better Standards Only)
   b. Electrical and natural gas loads for heating, cooling, water heating and lighting
   c. Additional mortgage payment costs (2006 IECC and 30% Better Standard Only)
   d. Annual energy costs in 2009 dollars
   e. First year mortgage cost – energy costs savings for upgrade to the 2006 IECC
   f. First year mortgage cost – energy cost savings for upgrade to the 30% Better Standard
   g. Life cycle cost in 2009 dollars

The Energy modeling of ten (10) typical Nebraska commercial building types shall be based on the following building descriptions.

8. a & b) Small Office Buildings – a (18% window-to-wall ratio) & b (38% window-to-wall ratio)
   a. Building Envelope: 10,000 square foot, 1 floor, rectangular footprint, 75’ x 133’-4”, 14 ft exterior wall height, metal roof joists with above deck continuous insulation, CMU block exterior walls with metal interior framing and batt insulation, slab-on-grade construction
   b. HVAC: Forced air gas furnaces, split system air conditioning units, ducts within the conditioned space, outdoor air economizer
   c. Water Heating: Natural gas storage type system
   d. Lighting: Fluorescent fixtures used for general lighting throughout the building with minimal task lighting in the enclosed offices and for open office area work stations. Utilize Entire/Whole Building Lighting Power Densities. Assume lighting levels from exterior lighting requirements for building facade, entrance and exiting doors lighting.
9. c & d) Large Office Buildings – c (18% window-to-wall ratio) & d (38% window-to-wall ratio)
   a. Building Envelope: 60,000 square foot, 3 floors, rectangular footprint, 100’ x 200’, 12 ft floor-to-floor height, 38 ft totals exterior wall height, metal roof joists with above deck continuous insulation, metal framed exterior walls with cavity batt insulation, slab-on-grade construction
   b. HVAC: Gas-fired rooftop units, roof-top air conditioning units, outdoor air economizer
   c. Water Heating: Electric storage type system (1 unit per floor)
   d. Lighting: Fluorescent fixtures used for general lighting throughout the building with minimal task lighting in the enclosed offices and for open office area work stations. Utilize Entire/Whole Building Lighting Power Densities. Assume lighting levels from exterior lighting requirements for building facade, entrance and exiting doors lighting.

10. e) Small Retail Building
    a. Building Envelope: 5,000 square foot, 8% window-to-wall ratio, 1 floor, rectangular footprint, 40’ x 125’, 14 ft exterior wall height, wood roof joists with 2” insulation on the roof and additional cavity batt insulation, metal framed exterior walls with exterior rigid insulation and additional fiberglass batt cavity insulation, slab-on-grade construction, 1/3 of the square footage used for product storage area including a 120 sq. ft. office and support area,
    b. HVAC: Forced air gas furnaces, split system air conditioning units, ducts within the conditioned space, outdoor air economizer.
    c. Water Heating: Natural gas storage type system.
    d. Lighting: Fluorescent fixtures used for general lighting throughout the building. Utilize Entire/Whole Building Lighting Power Densities including display area lighting. Exterior security lighting at both entries and to light signage at the store front.

11. f) Retail Strip Mall
    a. Building Envelope: 13,500 total square feet in six bays of 2,183 square foot each, 1 floor, rectangular footprint, 75’ x 180’, 14 ft exterior wall height, metal roof joists with batt insulation installed between joists, CMU block exterior walls with metal interior framing and batt insulation on three walls and one 180’ face with store front glazing, slab-on-grade construction. One bay houses a restaurant, one bay houses an auto supply store, one bay houses a medical supply store and the remaining three bays house retail space. 30% of the floor area in each bay is utilized for office and storage or kitchen area.
    b. HVAC: Gas-fired rooftop units, roof-top air conditioning units, outdoor air economizer.
    c. Water Heating: Electric storage type system (1 unit per bay).
    d. Lighting: Fluorescent fixtures used for general lighting throughout the entire building. Utilize Entire/Whole Building Lighting Power Densities with display lighting included for product merchandizing in 20% of the floor area in the three (3) retail spaces. Assume lighting levels from exterior lighting requirements for building facade, entrance and exiting doors lighting.
12. g) Large Big Box Retail Building  
   a. Building Envelope: 100,000 square foot, 2% window-to-wall ratio, 1 floor, rectangular footprint, 250’ x 400’, 20 ft exterior wall height, metal roof joists with continuous insulation, CMU block exterior walls with metal interior framing and batt insulation, slab-on-grade construction, 10% of the building floor area houses offices, support areas and storage areas, 2 dock doors to the storage area, two walk doors for exiting and main storefront door. 6,000 square foot of the floor area houses office, support and restroom areas and 14,000 square foot houses product storage. Two dock doors enter into the storage area with four additional walk doors (excluding the main entry) included in the plan.  
   b. HVAC: Gas-fired rooftop units, roof-top air conditioning units, outdoor air economizer.  
   c. Water Heating: Natural gas storage type system.  
   d. Lighting: High bay fluorescent fixtures used for general lighting throughout the retail and storage areas. Utilize Tenant Area or Portion of Building Lighting Power Densities with display lighting included for product merchandizing in 4,000 square foot of the floor area. Standard fluorescent fixtures to be used in the office and support areas located in a dropped ceiling. Assume lighting levels from exterior lighting requirements for building façade, entrance and exiting doors lighting.

13. h) Education – Elementary  
   a. Building Envelope: 50,000 square foot, 18% window-to-wall ratio, number of floors 1, rectangular footprint, 150’ x 333’-4”, 14 ft exterior wall height, metal roof joists with continuous insulation, CMU block exterior walls with metal interior framing and batt insulation, slab-on-grade construction. 20% of the square footage houses the facility’s gymnasium/multi-purpose room and cafeteria. An additional 10% of the facility square footage houses the media center and office/support areas. The remaining 70% is utilized for classrooms.  
   b. HVAC: Packaged air-to-air heat pumps, ducts within the conditioned space, outdoor air economizer.  
   c. Water Heating: Electric storage type units with individual units located throughout the facility.  
   d. Lighting: Fluorescent fixtures used for general lighting throughout the facility excluding high bay high pressure sodium fixtures in the gymnasium. Assume lighting levels from exterior lighting requirements for building facade, entrance and exiting doors lighting.

14. i) Education – Secondary School  
   a. Building Envelope: 80,000 square foot, 18% window-to-wall ratio, number of floors 1, U-shaped footprint with bottom of U 166’-8” x 300’ and two sides 100’ x 150’, 14 ft exterior wall height, metal roof joists with continuous insulation, CMU block exterior walls with metal interior framing and batt insulation, slab-on-grade construction. 20% of the square footage houses gymnasiums, locker areas and a cafeteria. An additional 10% of the facility square footage houses the library, media center and office/support areas. The remaining 70% is utilized for classrooms.  
   b. HVAC: Packaged air-to-air heat pumps, ducts within the conditioned space, outdoor air economizer.  
   c. Water Heating: Electric storage type units with individual units located throughout the facility.
d. Lighting: Fluorescent fixtures used for general lighting throughout the facility excluding high bay high pressure sodium fixtures in the gymnasiums and cafeterias. Assume lighting levels from exterior lighting requirements for building facade, entrance and exiting doors lighting.

15. j) Warehouse
   a. Building Envelope: 48,000 square foot, 0% window-to-wall ratio, number of floors 1, rectangular footprint, 200’ x 240’ (40’ bays), 18 ft exterior wall height, metal roof joists with continuous insulation, CMU block exterior walls with metal interior framing and batt insulation, slab-on-grade construction, 20’x20’ office/support area, three dock doors and three additional walk doors,
   b. HVAC: Natural gas fired, tube type infrared heaters in warehouse area, natural gas fired furnace in office/support area, split system air conditioning unit in office/support area, ducts within the conditioned space, outdoor air economizer.
   c. Water Heating: Natural gas storage type system
   d. Lighting: High Pressure Sodium standard bay fixtures in the warehouse area, fluorescent lighting in the office/support area. Minimal exterior security lighting around the building, including at all walk and dock doors.

C. PROVIDE POST IMPLEMENTATION SUPPORT
Appropriate staff members of the successful bidding company/association will provide post analysis support to the Nebraska Energy Office and members of the Nebraska Legislature:

1. at a legislative interim study hearing to introduce the Nebraska-Specific Advanced Commercial Building Energy Code (NABEC) Energy Study and provide information regarding the study process and the energy use impact on the state of updating its commercial building energy code.

2. as needed, electronically or via telephone, to the Nebraska Energy Office during the study review process and following the dissemination of the report to the public, the states utility industry, project stakeholders and other members of Nebraska’s construction industry.

D. DELIVERABLES
The completed Nebraska specific Advanced Commercial Building Energy Code (NABEC) Energy Study including the requirements/specifications herein described must be submitted to the Nebraska Energy Office in the following formats on or before October 1, 2009:

1. Hard Copy Form – suitable for copying and distribution to members and staff of the Nebraska Legislature and other interested members of Nebraska’s construction industry.

2. Electronic Form – suitable for inclusion on the Nebraska Energy Office website, distribution as requested to interested members of Nebraska’s construction industry and distribution to the U.S. Department of Energy and other State and Territory Energy Offices.
3. Payment Schedule:

<table>
<thead>
<tr>
<th>Deliverable to be submitted</th>
<th>Submittal Date</th>
<th>Maximum Payment Distribution %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy modeling design parameters and results for all specified building energy codes or advanced building energy standards on:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Small Office Building – 18% Window-to-Wall Ratio</td>
<td>06/22/2009</td>
<td>35%</td>
</tr>
<tr>
<td>2. Small Office Building – 38% Window-to-Wall Ratio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Large Office Building – 18% Window-to-Wall Ratio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Large Office Building – 38% Window-to-Wall Ratio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Small Retail Building</td>
<td></td>
<td></td>
</tr>
<tr>
<td>for review and approval by the Nebraska Energy Office</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>08/18/2009</td>
<td>30%</td>
</tr>
<tr>
<td>Energy modeling design parameters and results for all specified building energy codes or advanced building energy standards on:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Retail Strip Mall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Large Big Box Retail Building</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Elementary Education Building</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Secondary Education Building</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Warehouse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>for review and approval by the Nebraska Energy Office</td>
<td>09/01/2009</td>
<td>20%</td>
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<tr>
<td>Preliminary study including the required Analysis Summary Section for review and approval by the Nebraska Energy Office</td>
<td></td>
<td></td>
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<tr>
<td>The final Nebraska specific Advanced Commercial Building Energy Code Energy Study in hard copy and electronic form.</td>
<td>10/01/2009</td>
<td>10%</td>
</tr>
<tr>
<td>Provide post analysis support.</td>
<td>11/20/2009</td>
<td>5%</td>
</tr>
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<td>Equipment Type</td>
<td>Size Category</td>
<td>Sub-Category</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>---------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Air Conditioners, Air Cooled (Cooling Mode)</td>
<td>&lt;65,000 Btu/h</td>
<td>Split System</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Single Package</td>
</tr>
<tr>
<td></td>
<td>≥65,000 Btu/h and &lt;135,000 Btu/h</td>
<td>Split System and Single Package</td>
</tr>
<tr>
<td></td>
<td>≥135,000 Btu/h and &lt;240,000 Btu/h</td>
<td>Split System and Single Package</td>
</tr>
<tr>
<td></td>
<td>≥240,000 Btu/h and &lt;760,000 Btu/h</td>
<td>Split System and Single Package</td>
</tr>
<tr>
<td></td>
<td>≥760,000 Btu/h</td>
<td>Split System and Single Package</td>
</tr>
<tr>
<td>Air Conditioners, Water and Evaporatively Cooled</td>
<td>&lt;65,000 Btu/h</td>
<td>Split System and Single Package</td>
</tr>
<tr>
<td></td>
<td>≥65,000 Btu/h and &lt;135,000 Btu/h</td>
<td>Split System and Single Package</td>
</tr>
<tr>
<td></td>
<td>≥135,000 Btu/h</td>
<td>Split System and Single Package</td>
</tr>
</tbody>
</table>

SEER – Seasonal Energy Efficiency Ratio  
EER – Energy Efficiency Ratio  
IPLV – Integrated Part Load Value

*At this time, CEE is not establishing higher tier levels for this equipment size due to limited availability.

NOTES:
1. For electrical resistance heating section types, increase required minimum EER by 0.2.
2. Integrated Partial Load Values will be revised at a future date as new test procedures come into effect on January 1, 2010.
## CEE UNITARY HEAT PUMP SPECIFICATION

CEE periodically revises its specifications. See www.cee1.org for the most recent version.
For Terms and Conditions of these specifications, see www.cee1.org/terms.php3

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Size Category</th>
<th>Sub-Category</th>
<th>CEE Tier 1</th>
<th>CEE Tier 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Cooled (Cooling Mode)</td>
<td>&lt;65,000 Btu/h</td>
<td>Split System</td>
<td>14.0 SEER</td>
<td>15.0 SEER</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Single Package</td>
<td>14.0 SEER 12.0 EER</td>
<td>15.0 SEER 12.5 EER</td>
</tr>
<tr>
<td></td>
<td>≥65,000 and &lt;135,000 Btu/h</td>
<td>Split System and Single Package</td>
<td>11.5 EER 11.9 IPLV</td>
<td>12.0 EER 12.4 IPLV</td>
</tr>
<tr>
<td></td>
<td>≥135,000 and &lt;240,000 Btu/h</td>
<td>Split System and Single Package</td>
<td>11.5 EER 11.9 IPLV</td>
<td>12.0 EER 12.4 IPLV</td>
</tr>
<tr>
<td></td>
<td>≥240,000 and &lt;760,000 Btu/h</td>
<td>Split System and Single Package</td>
<td>10.5 EER 10.9 IPLV</td>
<td>10.8 EER 12.0 IPLV</td>
</tr>
<tr>
<td></td>
<td>≥65,000 and &lt;135,000 Btu/h</td>
<td>47°F db/43°Fwb Outdoor Air</td>
<td>3.4 COP</td>
<td>No specification*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17°F db/15°Fwb Outdoor Air</td>
<td>2.4 COP</td>
<td>No specification*</td>
</tr>
<tr>
<td></td>
<td>≥135,000 Btu/h</td>
<td>47°F db/43°Fwb Outdoor Air</td>
<td>3.2 COP</td>
<td>No specification*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17°F db/15°Fwb Outdoor Air</td>
<td>2.1 COP</td>
<td>No specification*</td>
</tr>
<tr>
<td>Water Source (Cooling Mode)</td>
<td>&lt;135,000 Btu/h</td>
<td>85° Entering Water</td>
<td>14.0 EER</td>
<td>No specification*</td>
</tr>
<tr>
<td>Water Source (Heating Mode)</td>
<td>&lt;135,000 Btu/h</td>
<td>70° Entering Water</td>
<td>4.6 COP</td>
<td>No specification*</td>
</tr>
</tbody>
</table>

SEER – Seasonal Energy Efficiency Ratio  
EER – Energy Efficiency Ratio  
HSPF – Heating Seasonal Performance Factor  
IPLV – Integrated Part Load Value  
COP – Coefficient of Performance

*At this time, CEE is not establishing higher tier levels for this equipment size due to limited availability.

**NOTES:**

1. For electrical resistance heating section types, increase required minimum EER by 0.2.
2. Integrated Partial Load Values will be revised at a future date as new test procedures come into effect on January 1, 2010.

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Annual Supplement to NIST Handbook 135 and NBS Special Publication 709

Amy S. Rushing
Barbara C. Lippiatt

U.S. DEPARTMENT OF COMMERCE
Technology Administration
National Institute of Standards and Technology

Prepared for United States Department of Energy
Federal Energy Management Program

May 2009

This report, which is updated annually, provides the current DOE and OMB discount rates, projected energy price indices, and corresponding discount factors needed to estimate the present values of future energy and non-energy-related project costs. Request the latest edition when ordering.

(3)  *NIST "Building Life-Cycle Cost" (BLCC) Computer Programs, BLCC 5.3*, National Institute of Standards and Technology. This program uses as default values the same discount factors and energy price projections that underlie the discount factor tables in the Annual Supplement. Use version BLCC 5.3-09 for the period from April 1, 2009 to March 31, 2010. It is available for Windows and Linux.

BLCC 5.3 provides comprehensive economic analysis capabilities for the evaluation of proposed capital investments that are expected to reduce the long-term operating costs of buildings and building systems. It computes the LCC for project alternatives, compares project alternatives in order to determine which has the lowest LCC, performs annual cash flow analysis, and computes net savings (NS), savings-to-investment ratio (SIR), and adjusted internal rate of return (AIRR) for project alternatives over their designated study period. The BLCC program can be used to perform economic analysis of capital investment projects undertaken by federal, state, and local government agencies. In the application to federal energy conservation and renewable energy projects, BLCC5 is consistent with NIST Handbook 135, and the federal life-cycle cost methodology and procedures described in 10 CFR 436A and OMB Circular A-94.

The BLCC5 User’s Guide is part of its Help system. BLCC 5.3 has six modules, all of them consistent with the life-cycle cost methodology of 10 CFR 436A, but programmed to include default inputs and nomenclature for specific uses:

- **FEMP Analysis, Energy Project** for energy and water conservation and renewable energy projects under the FEMP rules, agency-funded;

- **Federal Analysis, Financed Project** for federal projects financed through Energy Savings Performance Contracts (ESPC) or Utility Energy Services Contracts (UESC) as authorized by Executive Order 13123 (6/99);

- **OMB Analysis, Federal Analysis, Projects subject to OMB Circular A-94** for projects subject to OMB Circular A-94 (most other, non-energy, federal government construction projects, but not water resource projects);

- **MILCON Analysis, Energy Project** for energy and water conservation and renewable energy projects in military construction, agency-funded;

- **MILCON Analysis, ECIP Project** for energy and water conservation projects under the Energy Conservation Investment Program (ECIP).
INTRODUCTION

This report provides tables of present-value factors for use in the life-cycle cost analysis of capital investment projects for federal facilities. It also provides energy price indices based on Department of Energy (DOE) forecasts from 2009 to 2039. The factors and indices presented in this report are useful for determining the present value of future project-related costs, especially those related to operational energy costs. Discount factors included in this report are based on two different federal sources: (1) the DOE discount rate for projects related to energy conservation, renewable energy resources, and water conservation; and (2) Office of Management and Budget (OMB) discount rates from Circular A-94 for use with most other capital investment projects in federal facilities.

The DOE discount and inflation rates for 2009 are as follows:

<table>
<thead>
<tr>
<th>Rate Description</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real rate (excluding general price inflation):</td>
<td>3.0%</td>
</tr>
<tr>
<td>Nominal rate (including general price inflation):</td>
<td>4.2%</td>
</tr>
<tr>
<td>Implied long-term average rate of inflation:</td>
<td>1.2%</td>
</tr>
</tbody>
</table>

The DOE nominal discount rate is based on long-term Treasury bond rates averaged over the 12 months prior to the preparation of this report. The nominal, or market, rate is converted to a real rate to correspond with the constant-dollar analysis approach used in most federal life-cycle cost (LCC) analyses. The method for calculating the real discount rate from the nominal discount rate is described in 10 CFR 436 and uses the projected rate of general inflation published in the most recent Report of the President’s Economic Advisors, Analytical Perspectives. The procedure would result in a discount rate for 2009 lower than the 3.0% floor prescribed in 10 CFR 436. Thus the 3.0% floor is used as the real discount rate for FEMP analyses in 2009. The implied long-term average rate of inflation was calculated as 1.2%. Federal agencies and contractors to federal agencies are required by 10 CFR 436 to use the DOE discount rates when conducting LCC analyses related to energy conservation, renewable energy resources, and water conservation projects for federal facilities.

The nominal and real discount rates applicable to general (non-energy or water) capital investments are published annually in OMB Circular A-94, Appendix C. OMB has specified two basic types of discount rates: (1) a discount rate for public investment and regulatory analyses; and (2) a discount rate for cost-effectiveness, lease-purchase, and related analyses. Only discount rates for the second type of analyses are included in this Annual Supplement, since the primary purpose of this report is to support cost-effectiveness studies related to the design and operation of federal facilities.

OMB discount rates for cost-effectiveness and lease-purchase studies are based on interest rates on Treasury Notes and Bonds with maturities ranging from 3 to 30 years. Currently (as of January 2009) five maturities have been specifically identified by OMB, and are shown here with the corresponding real interest rate to be used as the discount rate for studies subject to OMB Circular A-94:

<table>
<thead>
<tr>
<th>Maturity:</th>
<th>3-year</th>
<th>5-year</th>
<th>7-year</th>
<th>10-year</th>
<th>30-year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate:</td>
<td>0.9%</td>
<td>1.6%</td>
<td>1.9%</td>
<td>2.4%</td>
<td>2.7%</td>
</tr>
</tbody>
</table>

OMB suggests that the actual discount rate for an economic analysis be interpolated from these maturities and rates, based on the study period used in the analysis. Due to limitations on the size of this Annual Supplement, discount factors for only two of these maturities are presented: factors for short term analyses (up to 10 years) based on the 7-year real rate (1.9%), and factors for long-term...
16

Elec
----0.94
1.87
2.78
3.68
4.57
5.44
6.29
7.12
7.93
8.73
9.51
10.27
11.02
11.74
12.44
13.11
13.77
14.41
15.03
15.64
16.24
16.83
17.39
17.94
18.48
19.01
19.52
20.01
20.50
20.97

RESIDENTIAL
Dist
LPG
----- ----0.72
0.88
1.47
1.80
2.30
2.80
3.18
3.84
4.10
4.93
5.06
6.05
6.05
7.19
7.04
8.33
8.04
9.48
9.03 10.61
10.00 11.71
10.96 12.80
11.89 13.86
12.80 14.89
13.70 15.90
14.56 16.88
15.41 17.83
16.24 18.75
17.05 19.67
17.85 20.56
18.64 21.43
19.42 22.29
20.20 23.14
20.96 23.97
21.71 24.79
22.45 25.59
23.18 26.38
23.90 27.16
24.62 27.93
25.32 28.69
NtGas
----0.96
1.92
2.84
3.74
4.60
5.44
6.27
7.09
7.90
8.70
9.51
10.31
11.09
11.85
12.57
13.28
13.97
14.65
15.33
16.01
16.68
17.34
18.00
18.64
19.28
19.90
20.52
21.13
21.73
22.32

Elec
----0.90
1.78
2.63
3.46
4.27
5.07
5.85
6.63
7.39
8.14
8.88
9.60
10.32
11.01
11.69
12.34
12.98
13.60
14.21
14.80
15.39
15.96
16.52
17.07
17.60
18.12
18.63
19.13
19.61
20.09

COMMERCIAL
Dist
Resid
----- ----0.70
1.39
1.44
3.20
2.28
5.16
3.19
7.24
4.15
9.39
5.16 11.63
6.18 13.90
7.22 16.17
8.27 18.44
9.31 20.69
10.33 22.90
11.33 25.07
12.31 27.19
13.27 29.27
14.21 31.30
15.12 33.24
16.01 35.14
16.88 36.99
17.73 38.82
18.58 40.60
19.41 42.35
20.23 44.08
21.04 45.79
21.84 47.47
22.63 49.14
23.41 50.78
24.18 52.40
24.95 54.00
25.70 55.58
26.44 57.14

See p. 14 for instructions on use; page xiii for abbreviations.

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NtGas
----0.96
1.92
2.86
3.76
4.63
5.49
6.34
7.19
8.02
8.86
9.69
10.52
11.34
12.12
12.88
13.61
14.33
15.05
15.76
16.47
17.18
17.88
18.57
19.25
19.92
20.58
21.24
21.88
22.52
23.14

Coal
----0.95
1.89
2.82
3.72
4.62
5.50
6.36
7.19
8.01
8.79
9.56
10.31
11.03
11.73
12.41
13.07
13.72
14.35
14.96
15.56
16.15
16.73
17.28
17.83
18.35
18.86
19.36
19.85
20.32
20.77

Elec
----0.87
1.70
2.51
3.29
4.06
4.81
5.55
6.29
7.01
7.72
8.43
9.12
9.80
10.47
11.11
11.74
12.35
12.94
13.53
14.10
14.67
15.22
15.76
16.29
16.81
17.31
17.81
18.29
18.76
19.22

Dist
----0.70
1.45
2.30
3.23
4.21
5.23
6.27
7.32
8.37
9.42
10.46
11.47
12.45
13.42
14.36
15.27
16.17
17.04
17.90
18.75
19.58
20.41
21.22
22.02
22.81
23.59
24.36
25.12
25.87
26.61

INDUSTRIAL
Resid NtGas
----- ----1.33
0.92
3.03
1.88
4.87
2.82
6.82
3.73
8.85
4.64
10.95
5.55
13.08
6.45
15.22
7.35
17.35
8.25
19.47
9.15
21.55 10.06
23.58 10.96
25.58 11.85
27.53 12.70
29.43 13.52
31.26 14.31
33.04 15.09
34.78 15.86
36.50 16.64
38.17 17.42
39.82 18.20
41.44 18.98
43.05 19.75
44.63 20.51
46.19 21.26
47.73 22.01
49.26 22.75
50.76 23.48
52.24 24.21
53.71 24.93

Census Region 2 (Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota,
Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin)

Discount Rate = 3.0 % (DOE)

Coal
----0.95
1.90
2.83
3.74
4.64
5.52
6.37
7.20
8.00
8.79
9.55
10.29
11.02
11.71
12.40
13.06
13.70
14.34
14.95
15.56
16.15
16.73
17.29
17.83
18.36
18.88
19.38
19.87
20.34
20.80

TRANSPORT
Gasln
----0.93
1.97
3.09
4.25
5.43
6.64
7.87
9.10
10.33
11.55
12.76
13.95
15.10
16.24
17.34
18.40
19.45
20.46
21.45
22.44
23.40
24.34
25.26
26.17
27.06
27.94
28.81
29.66
30.50
31.32

Table Ba-2. FEMP UPV* Discount Factors adjusted for fuel price escalation, by end-use sector and fuel type.

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Table Ca-2. Projected fuel price indices (excluding general inflation), by end-use sector and fuel type.

<table>
<thead>
<tr>
<th>Census Region 2 (Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projected April 1 Fuel Price Indices (April 1, 2009 = 1.00)</td>
</tr>
<tr>
<td>Residential</td>
</tr>
<tr>
<td>Electricity</td>
</tr>
<tr>
<td>Distillate Oil</td>
</tr>
<tr>
<td>LPG</td>
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<tr>
<td>Natural Gas</td>
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<tr>
<td>Commercial</td>
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<tr>
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</tr>
<tr>
<td>Distillate Oil</td>
</tr>
<tr>
<td>Residual Oil</td>
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<tr>
<td>Natural Gas</td>
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<tr>
<td>Coal</td>
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<tr>
<td>Industrial</td>
</tr>
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<tr>
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<tr>
<td>Residual Oil</td>
</tr>
<tr>
<td>Natural Gas</td>
</tr>
<tr>
<td>Coal</td>
</tr>
<tr>
<td>Transportation</td>
</tr>
<tr>
<td>Motor Gasoline</td>
</tr>
</tbody>
</table>
Table Ca-2, continued. Projected fuel price indices (excluding general inflation), by end-use sector and fuel type.

<table>
<thead>
<tr>
<th>Census Region 2 (Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projected April 1 Fuel Price Indices (April 1, 2009 = 1.00)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>Residential</td>
</tr>
<tr>
<td>Electricity</td>
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<tr>
<td>Distillate Oil</td>
</tr>
<tr>
<td>LPG</td>
</tr>
<tr>
<td>Natural Gas</td>
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<tr>
<td>Commercial</td>
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<tr>
<td>Coal</td>
</tr>
<tr>
<td>Transportation</td>
</tr>
<tr>
<td>Motor Gasoline</td>
</tr>
</tbody>
</table>
Table Cb-2. Projected average fuel price escalation rates, excluding general inflation, by end-use sector and fuel type.

Census Region 2 (Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin)

<table>
<thead>
<tr>
<th>Sector and Fuel</th>
<th>Percentage change compounded annually</th>
<th>2009</th>
<th>2014</th>
<th>2019</th>
<th>2024</th>
<th>2029</th>
<th>2034</th>
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<tbody>
<tr>
<td>Residential</td>
<td></td>
<td>2014</td>
<td>2019</td>
<td>2024</td>
<td>2029</td>
<td>2034</td>
<td>2039</td>
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<td>0.8</td>
<td>0.3</td>
<td>0.3</td>
<td>0.4</td>
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<tr>
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<td>4.5</td>
<td>1.0</td>
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<td>1.7</td>
<td>1.7</td>
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<tr>
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<td>4.7</td>
<td>3.8</td>
<td>0.8</td>
<td>0.4</td>
<td>1.3</td>
<td>1.4</td>
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<tr>
<td>Natural Gas</td>
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<td>1.6</td>
<td>0.9</td>
<td>1.6</td>
<td>1.7</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Commercial</td>
<td></td>
<td>2014</td>
<td>2019</td>
<td>2024</td>
<td>2029</td>
<td>2034</td>
<td>2039</td>
</tr>
<tr>
<td>Electricity</td>
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<td>1.4</td>
<td>0.9</td>
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<td>0.7</td>
<td>0.6</td>
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<td>1.8</td>
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<td>1.0</td>
<td>1.7</td>
<td>1.8</td>
<td>1.6</td>
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<tr>
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<td>0.5</td>
<td>0.4</td>
<td>0.1</td>
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<tr>
<td>Industrial</td>
<td></td>
<td>2014</td>
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<td>2024</td>
<td>2029</td>
<td>2034</td>
<td>2039</td>
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<tr>
<td>Electricity</td>
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<td>0.9</td>
<td>0.6</td>
<td>0.8</td>
<td>0.7</td>
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</tr>
<tr>
<td>Distillate Oil</td>
<td>2.7</td>
<td>4.3</td>
<td>0.8</td>
<td>1.0</td>
<td>1.4</td>
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<td>1.7</td>
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<tr>
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<td>1.0</td>
<td>2.0</td>
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<td>0.2</td>
<td>0.5</td>
<td>0.4</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Transportation</td>
<td></td>
<td>2014</td>
<td>2019</td>
<td>2024</td>
<td>2029</td>
<td>2034</td>
<td>2039</td>
</tr>
<tr>
<td>Motor Gasoline</td>
<td>6.5</td>
<td>3.7</td>
<td>0.9</td>
<td>0.8</td>
<td>0.9</td>
<td>1.4</td>
<td></td>
</tr>
</tbody>
</table>
Emission Reduction Calculator

Find out how much money you can save and the pollution you can reduce by investing in energy efficiency in your home or workplace!

Calculators

A/C Size | Carbon Footprint | Home Appliances | Emission Reduction | Pollution from Electricity | Your Diet & the Environment

Find out how much money you can save and the pollution you can reduce by investing in energy efficiency in your home or workplace!

You can save yourself money and help clean up the environment by reducing your energy consumption with easy-to-do energy efficiency measures.

Enter Your Estimated Annual Electricity Reduction (kWh): 1000

Enter Your Estimated Annual Natural Gas Reduction (therms): 1000

Enter fuel use increases as negative numbers for fuel switching measures (To convert MMBtu to therms, multiply MMBtu by 10).

Select Your Customer Type: Commercial

Select Your State: Nebraska

Emission Reduction and Cost Savings Results:

Your Estimated Annual Cost Savings: $ 1079

(Calculated using eGRID2006 Version 2.1 State File (Year 2004 Data) average electric generation emission factors and average electricity rate by customer type from U.S. DOE's Electric Sales, Revenue, and Average Price 2005 and Natural Gas Monthly May 2007 for the selected state)

Your Energy Efficiency Efforts Will Also Result in the Following Pollution Reductions:

<table>
<thead>
<tr>
<th>Type of Pollution</th>
<th>Amount of Reduction per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenhouse Gases (CO₂)</td>
<td>14164 Pounds</td>
</tr>
<tr>
<td>Nitrogen Oxides (NO₂)</td>
<td>20 Pounds</td>
</tr>
<tr>
<td>Sulfur Dioxide (SO₂)</td>
<td>9 Pounds</td>
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<tr>
<td>Toxic Metals Pollution</td>
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</tr>
<tr>
<td>Mercury (Hg)</td>
<td>21 Milligrams</td>
</tr>
</tbody>
</table>

More Stories

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10 Everyday Pollution Solutions | The History of Earth Day
Environmental Shopping Tips | Wise Water Use - Kentucky American Water