



# RoofSense Life Cycle Savings Report

**Project:** Hope Church  
**Scenario:** Existing vs Proposed  
**Prepared By:** SDeaton  
**Date:** 11/17/2015 8:27:01 AM

## Roof Project Summary

### Customer Data

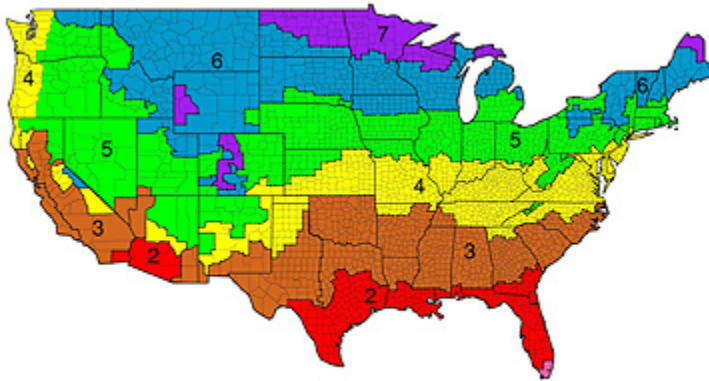
**Customer:** Ernest Arnesen, Energy Roofing Solutions  
**Address:**  
**Phone:** 214-770-1459

### Project Information

**Location:** 1750 Beach Street, FORT WORTH, TX  
**Term of Analysis:** 20 Years  
**Roof Area:** 63,000 sq. ft.  
**Facility Type:** Religious

### Regional Weather Summary

ASHRAE Station: Fort Worth  
■ Heating Degree Days: 2400  
■ Cooling Degree Days: 2448



### RoofSense Weather Data

Regional weather data, Heating Degree Days (HDD) and Cooling Degree Days (CDD) are based on 30 year historical data from National Oceanic and Atmospheric Administration (NOAA). <http://cdo.ncdc.noaa.gov/CDO/cdo>

The map shown here shows ASHRAE U.S. Climate Zones, for the United States. Climate Zones are based on ASHRAE standard 90.1-2004 with zone 1 being the hottest zone and zone 8 being the coldest zone.

## ASHRAE Alert

### Minimum Insulation Levels:

The 2007 version of the ASHRAE 90.1 standard contained updated R-values for commercial roofs. This new updated value mandates a 33% increase from the 2004 ASHRAE Standard 90.1 in climate zones 2 through 7.

Many regulatory agencies will be adopting this increase as the minimum standard for all new construction design projects. Most buildings will be required to upgrade the levels of insulation used in their proposed roof systems during new construction or re-roofing operations where insulation is being removed to comply with the new ASHRAE minimum standards.

In light of the ASHRAE increases, the Polyisocyanurate Insulation Manufacturers Association (PIMA) has taken the initiative of publishing recommended R-values categorized by ASHRAE zones for use to reach beyond the new ASHRAE minimum standards.



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## Roof Details

### Roof Assembly

The following items were included in the roof assembly structure as a part of the life cycle cost comparison. The R values are shown for each included component of the assembly. Components in the assembly are present in the baseline roof as well as the proposed roof.

<u>Assembly Item</u>	<u>R Value</u>
Outside Air	0.17
Membrane	0
Cover Board	0
Roof Insulation	0
Vapor Retarder	0
Base Board	0
Deck	0
Air Space	0.94
Batt Insulation	0
Ceiling Tile	1.5
Inside Air	0.61
Total Assembly R:	3.22

### What is R-Value?

R-Value is a measure of apparent thermal conductivity, and thus describes the rate that heat energy is transferred through a material or assembly item, regardless of the heat source.

Higher R Value indicates a higher resistance to heat transfer. R values provided are from manufacturer specification or provided as scientific constants unless otherwise noted.

### Roof Membrane and Insulation:

The following section details the roof membrane and insulation for the baseline and proposed roof systems being observed in the life cycle cost comparison.

Baseline Roof A:  
**2 Ply Base Sheet, Coated**

Roof Surface Type:  
Off-White, Coated or Gravel

Existing Assembly Insulation R: 0  
Insulation R to be Added: 5.6  
Layer 1: 2 inches of Wood Fiber  
Layer 2: n/a

Total Insulation R: 5.6

Proposed Roof B:  
**TPO**

Roof Surface Type:  
TPO White

Existing Assembly Insulation R: 5.6  
Insulation R to be Added: 5.7  
Layer 1: 1 inch Polyiso  
Layer 2: n/a

Total Insulation R: 11.3



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## Energy Cost Summary

### Heating and Cooling Data:

The heating and cooling load is referred to as the cost to heat and cool the facility. Following are the details of the buildings system efficiency, fuel type and associated cost used in the energy load calculation.

#### Cooling Data

Fuel Type: Electricity  
 System Efficiency: 10 S.E.E.R or E.E.R  
 Fuel Cost: \$0.083 /Kwh  
 Fuel Inflation Rate: 2.1% per yr



#### Heating Data

Fuel Type: Natural Gas  
 System Efficiency: 75%  
 Fuel Cost: \$6.82 /1000 CF  
 Fuel Inflation Rate: 2.4% per yr

### Estimated Energy Cost:

The energy model within RoofSense compares the estimated energy cost of two roof systems over the term of analysis. Fuel cost and inflation, interior temperature, climate, roof surface type and color, and the amount of insulation utilized are included in the energy cost formulas. The following are estimated energy costs.

#### **A** 2 Ply Base Sheet, Coated Estimated Energy Cost:



Cooling: \$187,727.33   
 Heating: \$106,475.98 

**Total: \$294,203.32**

#### Environmental Emissions:

CO2 Carbon Dioxide 3986.49 Tons  
 CH4 Methane 42.05 LBS  
 NOx Nitrogen Oxides 79.73 LBS

#### **B** TPO Estimated Energy Cost:

Cooling: \$79,121.32   
 Heating: \$64,677.56 

**Total: \$143,798.88**

#### Environmental Emissions:

CO2 Carbon Dioxide 2171.3 Tons  
 CH4 Methane 22.9 LBS  
 NOx Nitrogen Oxides 43.43 LBS




### Energy Cost Savings

**\$150,404.43** **51.12%**  
 less dollars

### Carbon Reduction:

**1815.2** **45.53%**  
 less tons

### Savings is equivalent to:

-  **7261** Trees planted
-  **2778054** Airplane miles
-  **366** Less cars on road

### Energy Savings Notes:

The RoofSense energy savings model is based on the LC4 Life Cycle cost analysis tool developed by Pat Downey of Merik Professional Roofing Services in the late 1990's. The LC4 energy calculations and formulas are taken from the "1989 ASHRAE Fundamentals Handbook". Also used was the "Guide for Estimating Difference in Building Heating and Cooling Energy due to Change in Solar Reflectance of a Low-Sloped Roof", Oak Ridge National Laboratory publication ORNL-6527 and the "NRCA Energy Manual" third edition, National Roofing Contractors Association, Chicago, IL. Adjustments to the formula and reflectance have been made as a result of a benchmarking study completed using Carrier's "Hourly Analysis Program" (HAP) and ASHRAE's standards on building simulation. Carrier's HAP is approved by the government for studies done for the Tax Policy Act of 2005. Historic energy cost data, when used, has been obtained from the Energy Information Agency (EIA) [www.eia.doe.gov](http://www.eia.doe.gov).