



# Investigative Energy Audit For Larsen Bay Medical Clinic



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Prepared For  
**Larsen Bay Tribal Council**

Prepared By  
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**August 30, 2017**

**Prepared By:**

**ANTHC-DEHE  
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## PREFACE

The purpose of this report is to provide guidance in reducing facility operating costs and enhance the sustainability of this community. The report assess the current energy usage of the facility, provide options for reducing the amount of energy used, and evaluate the cost vs. benefit of each option.

Discussions of site specific concerns, financing options, general facility information, and an Energy Efficiency Action Plan are also included in this report.

## ACKNOWLEDGMENTS

The Energy Projects Group gratefully acknowledges the assistance of the Larsen Bay Tribal Council’s President, Susan Malutin and Clinic Health Aide, Dave Shortland.

## OVERVIEW

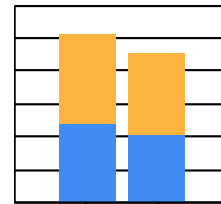
This report was prepared for the Larsen Bay Tribal Council. The scope of the audit focused on the Community Health Clinic and includes an analysis of building occupancy schedules, building shell, heating systems, heating and ventilations systems, domestic hot water, lighting, and other electrical loads. The Clinic is approximately 2,464 square feet. The building consists of the original structure built around 2003. Data was based on a site survey and interviews with the building staff.

## ENERGY BASELINE

Based on unsubsidized electricity and fuel oil prices in effect at the time of the audit, the total predicted energy costs are \$10,270 per year. This includes \$4,822 for electricity and \$5,388 for #1 fuel oil.

Table 1 lists the predicted annual energy usage before and after the proposed retrofits.

**Annual Energy Costs By Fuel**



**Table 1: Predicted Annual Energy Use**

| Predicted Annual Energy Use |                   |                         |                      |                    |
|-----------------------------|-------------------|-------------------------|----------------------|--------------------|
| Fuel Use                    | Existing Building | With Proposed Retrofits | Total Energy Savings | Total Cost Savings |
| Electricity                 | 12,900 kWh        | 10,100 kWh              | 2800 kWh             | \$ 1,100           |
| #1 Oil                      | 1,500 gallons     | 1,400 gallons           | 100 gallons          | \$ 360             |

## PROPOSED ENERGY EFFICIENCY MEASURES (EEM)

Table 2 below summarizes the energy efficiency measures analyzed for the Building. Listed are the estimates of the annual savings, installed costs, and two different financial measures of investment return.

**Table 2: Priority List – Energy Efficiency Measures**

| Priority     | Feature   | Improvement Description  | Cost Estimate Basis  | Annual Energy Savings | Installed Cost | Savings to Investment Ratio, SIR <sup>1</sup> | Simple Payback (Years) <sup>2</sup> |
|--------------|---|--|--|-----------------------|----------------|---|-------------------------------------|
| 1            | Interior T8 LED Lighting Retrofit (4-bulb fixtures) | Replace existing interior T8 fluorescent light bulbs with LED and bypass existing fluorescent ballasts   | 2 bulb/fixture @ \$10/bulb<br>1/2hr per fixture @ \$50/hr<br>10 fixtures   | \$226                 | \$650          | 2.77  | 2.9                                 |
| 2            | Air Tightening (Note 1)                             | Perform air sealing to reduce air leakage by 30%.  | 1 bulb/fixture @ \$60/bulb<br>1 hr per fixture @ \$50/hr<br>Approx. 12 fixtures  | \$301                 | \$1,000        | 2.75  | 3.3                                 |
| 3            | Interior T8 LED Lighting Retrofit (2-bulb fixtures) | Replace existing interior T8 fluorescent light bulbs with LED and bypass existing fluorescent ballasts   | 2 bulb/fixture @ \$10/bulb<br>1/2hr per fixture @ \$50/hr<br>15 fixtures   | \$170                 | \$675          | 3.33  | 4.0                                 |
| 4            | Standard Light Bulb LED Replacement                 | Replace existing standard screw-in light bulbs with LED type bulbs.                                      | \$5 per bulb<br>Approx. 12 bulbs   | \$15                  | \$60           | 1.47  | 4.1                                 |
| 5            | Crawlspace Insulation                               | Install R-14 foam insulation on outside of basement walls and remove existing wet fiberglass insulation. | Estimate \$4.35 per square foot (Cost is relatively low as it is assumed to be installed during excavation for foundation moisture and frost protection project) | \$501                 | \$3,896        | 2.95  | 7.8                                 |
| <b>TOTAL</b> |   |  |  | <b>\$1,212</b>        | <b>\$6,281</b> | <b>2.93</b>                                   | <b>5.2</b>                          |

|                    |
|--------------------|
| Highly Recommended |
| Recommended        |
| Not Cost Effective |

*Note 1: Before sealing duct joints and insulating duct in crawlspace, it is highly recommended that the crawlspace first be made water tight as the leaking heated air from the duct is likely helping to dry the excess ground moisture and helping reduce mold/rot in the building.*

<sup>1</sup> Savings to Investment Ratio (SIR) is a life-cycle cost measure calculated by dividing the total savings over the life of a project (expressed in today's dollars) by its investment costs. The SIR is an indication of the profitability of a measure; the higher the SIR, the more profitable the project. An SIR greater than 1.0 indicates a cost-effective project (i.e. more savings than cost). Remember that this profitability is based on the position of that Energy Efficiency Measure (EEM) in the overall list and assumes that the measures above it are implemented first.

<sup>2</sup> Simple Payback (SP) is a measure of the length of time required for the savings from an EEM to payback the investment cost, not counting interest on the investment and any future changes in

energy prices. It is calculated by dividing the investment cost by the expected first-year savings of the EEM.

## **FACILITY DESCRIPTION**

### **Building Occupancy Schedules**

The clinic is normally occupied between 8am and 5pm Monday through Friday by 2 medical staff and an occasional patient. At the time of the site survey, the clinic was staffed by a health aid living in the clinic's apartment. This allowed for most of the clinic lights and computers to be turned off after hours, but did not allow for significant setback on the heating system as the clinic and attached apartment were on a single zone. Visiting medical specialists periodically visit the clinic and add an additional 2 staff to the clinic occupancy for several days at a time. The clinic has an attached apartment that serves as housing for visiting medical staff.

### **Building Shell**

The exterior walls are 2x6 wood-framed construction with fiberglass batt insulation.

The roof of the building is supported with rafters. The attic space is kept cold with approximately 9.5 inches of fiberglass batt insulation between the attic and interior. The attic is missing a vapor barrier, and there is significant room for improvement in sealing penetrations between the attic and building interior.

The crawlspace consists of a 4 foot high wood stem wall insulated with fiberglass batt insulation that is severely damaged from moisture and is deteriorating significantly in places.

All windows were double pane windows. There are approximately 145 square feet of window surface area.

There are 4 entrances into the building. The weather-sealing around the entrances was in excellent condition and did not require any improvements. Some doors and hardware were rusting significantly and are in need of replacement or repair.

### **Heating Systems**

The heating system used in the building is:

#### **Furnace 1**

|                          |                |
|--------------------------|----------------|
| Fuel Type:               | #1 Oil         |
| Input Rating:            | 148,000 BTU/hr |
| Steady State Efficiency: | 80 %           |
| Estimated Idle Loss:     | 0 %            |
| Heat Distribution Type:  | Forced Air     |
| Furnace Operation:       | 12 Months/Year |

### **Space Heating Distribution Systems**

The building is heated by a furnace that distributes heated through supply and return air ducting.

### **Building Ventilation Systems**

The building relies on operable windows and exhaust fans for ventilation.

### **Domestic Hot Water System**

Domestic hot water for the building is provided by a fuel-fired hot water heater with an approximate capacity of 5 gallons.

### **Lighting**

The interior space is lit with a combination of T8 lighting fixtures and standard screw-in light bulbs. The exterior is lit with flood lamps. The lights use an estimated 5,000 kWh annually.

### **Other Electrical Loads**

The, medical equipment, refrigerators, IT computer equipment, personal computers, television, oven/range, and microwave contribute to the electrical load as well.

### **Major Equipment**

**Table 3: Major Electrical Equipment**

| <b>Equipment</b>     | <b>Rating (Watts)</b> | <b>Approx. Annual Usage (kWh)</b> |
|----------------------|-----------------------|-----------------------------------|
| Med Dispenser        | ~540                  | ~880                              |
| Personal Computers   | ~90                   | ~140                              |
| IT Equipment         | ~350                  | ~1,800                            |
| Microwave            | ~1,000                | ~120                              |
| Flat Screen TV       | ~110                  | ~258                              |
| Clothes Dryer        | ~3,400                | ~270                              |
| Oven / Cooking Range | ~1,000 per burner     | ~78                               |

## **PROJECT FINANCING**

The total estimated cost of the EEM's \$6,300. The payback for the implemented EEM's is approximately 5.2 years. ANTHC is willing to assist the community with acquiring funds to complete the scope of work recommended in this energy audit.

There are several options for financing energy efficiency projects within the State of Alaska. These include the use of grants, loans, and other funding opportunities. Below is some information on potential funding opportunities.

**Energy Efficiency Revolving Loan Program** – This is a loan administered by the Alaska Housing Finance Corporation (AHFC) for use by any applicant who is also the owner of the building where the work will take place. It provides a loan for permanent energy-efficiency projects with a completion window of one year.

**Sustainable Energy Transmission and Supply Program** – This is a loan administered by the Alaska Energy Authority (AEA) for a government, business, or other organized body of people. It provides a loan for energy-efficiency or power transmission or distribution projects.

**USDA-RD Communities Facilities Direct Loan & Grant Program** - This is a loan or grant provided by the US Department of Agriculture – Rural Development (USDA-RD) for any essential community facility in a rural area. It provides a loan or grant to develop essential community facilities with upgrades or equipment for improvement.

## **MEASUREMENT AND VERIFICATION**

The results of these recommended measures can be measured through the collection of energy use data through the monthly bills provided by the local electric utility and the local fuel oil supplier. Collecting data and performing a historical comparison is the simplest method of validating the energy and cost savings seen by the measures. Additionally, active remote monitoring systems are available that can collect and store data regarding energy and fuel usage. These systems allow the user to track the usage in real time and can be shared more easily with partners across the state.

# APPENDICES

## Appendix A – Scanned Energy Billing Data

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Accrual Basis

### NATIVE VILLAGE OF LARSEN BAY Transaction Detail By Account January through December 2016

| Type            | Date       | Num   | Name                | Memo              | Class  | Clr | Split           | Amount   | Balance  |
|-----------------|------------|-------|---------------------|-------------------|--------|-----|-----------------|----------|----------|
| Utilities       |            |       |                     |                   |        |     |                 |          |          |
| Check           | 01/08/2016 | 17997 | CITY OF LARSEN B... | Clinic LBUC I...  | Clinic |     | General Account | 320.45   | 320.45   |
| Check           | 01/08/2016 | 17997 | CITY OF LARSEN B... | Clinic W/S inv... | Clinic |     | General Account | 66.34    | 386.79   |
| Check           | 01/08/2016 | 17997 | CITY OF LARSEN B... | Clinic garbag...  | Clinic |     | General Account | 10.00    | 396.79   |
| Check           | 01/13/2016 | 18004 | CITY OF LARSEN B... | Clinic LBUC I...  | Clinic |     | General Account | 238.80   | 635.59   |
| Check           | 01/13/2016 | 18004 | CITY OF LARSEN B... | Clinic W/S inv... | Clinic |     | General Account | 66.34    | 701.93   |
| Check           | 01/13/2016 | 18004 | CITY OF LARSEN B... | Clinic garbag...  | Clinic |     | General Account | 10.00    | 711.93   |
| Check           | 02/11/2016 | 18030 | CITY OF LARSEN B... | Clinic LBUC I...  | Clinic |     | General Account | 254.40   | 966.33   |
| Check           | 02/11/2016 | 18030 | CITY OF LARSEN B... | Clinic W/S inv... | Clinic |     | General Account | 66.34    | 1,032.67 |
| Check           | 02/11/2016 | 18030 | CITY OF LARSEN B... | Clinic garbag...  | Clinic |     | General Account | 10.00    | 1,042.67 |
| Check           | 03/16/2016 | 18045 | CITY OF LARSEN B... | Clinic LBUC I...  | Clinic |     | General Account | 265.50   | 1,308.17 |
| Check           | 03/16/2016 | 18045 | CITY OF LARSEN B... | Clinic W/S inv... | Clinic |     | General Account | 65.80    | 1,373.97 |
| Check           | 03/16/2016 | 18045 | CITY OF LARSEN B... | Clinic garbag...  | Clinic |     | General Account | 10.00    | 1,383.97 |
| Check           | 04/11/2016 | 18069 | CITY OF LARSEN B... | Clinic LBUC I...  | Clinic |     | General Account | 340.13   | 1,724.10 |
| Check           | 04/11/2016 | 18069 | CITY OF LARSEN B... | Clinic W/S inv... | Clinic |     | General Account | 65.80    | 1,789.90 |
| Check           | 04/11/2016 | 18069 | CITY OF LARSEN B... | Clinic garbag...  | Clinic |     | General Account | 10.00    | 1,799.90 |
| Check           | 05/16/2016 | 18102 | CITY OF LARSEN B... | Clinic LBUC I...  | Clinic |     | General Account | 360.63   | 2,160.53 |
| Check           | 05/16/2016 | 18102 | CITY OF LARSEN B... | Clinic W/S inv... | Clinic |     | General Account | 65.80    | 2,226.33 |
| Check           | 05/16/2016 | 18102 | CITY OF LARSEN B... | Clinic garbag...  | Clinic |     | General Account | 10.00    | 2,236.33 |
| Check           | 06/08/2016 | 18121 | CITY OF LARSEN B... | Clinic LBUC I...  | Clinic |     | General Account | 261.00   | 2,497.33 |
| Check           | 06/08/2016 | 18121 | CITY OF LARSEN B... | Clinic W/S inv... | Clinic |     | General Account | 65.80    | 2,563.13 |
| Check           | 06/08/2016 | 18121 | CITY OF LARSEN B... | Clinic garbag...  | Clinic |     | General Account | 10.00    | 2,573.13 |
| Check           | 07/07/2016 | 18143 | CITY OF LARSEN B... | Clinic LBUC I...  | Clinic |     | General Account | 250.34   | 2,823.47 |
| Check           | 07/07/2016 | 18143 | CITY OF LARSEN B... | Clinic W/S inv... | Clinic |     | General Account | 85.80    | 2,889.27 |
| Check           | 07/07/2016 | 18143 | CITY OF LARSEN B... | Clinic garbag...  | Clinic |     | General Account | 10.00    | 2,899.27 |
| Check           | 08/08/2016 | 18185 | CITY OF LARSEN B... | Clinic LBUC I...  | Clinic |     | General Account | 270.02   | 3,169.29 |
| Check           | 08/08/2016 | 18185 | CITY OF LARSEN B... | Clinic W/S inv... | Clinic |     | General Account | 65.80    | 3,235.09 |
| Check           | 08/08/2016 | 18185 | CITY OF LARSEN B... | Clinic garbag...  | Clinic |     | General Account | 10.00    | 3,245.09 |
| Check           | 09/29/2016 | 18263 | CITY OF LARSEN B... | Clinic LBUC I...  | Clinic |     | General Account | 274.94   | 3,520.03 |
| Check           | 09/29/2016 | 18263 | CITY OF LARSEN B... | Clinic W/S inv... | Clinic |     | General Account | 65.80    | 3,585.83 |
| Check           | 09/29/2016 | 18263 | CITY OF LARSEN B... | Clinic garbag...  | Clinic |     | General Account | 10.00    | 3,595.83 |
| General Journal | 09/30/2016 | 140   |                     | 9/30/16 A/P a...  | Clinic |     | Lease           | 407.32   | 4,003.15 |
| General Journal | 10/01/2016 | 140R  |                     | 9/30/16 A/P a...  | Clinic |     | Lease           | -407.32  | 3,595.83 |
| Check           | 10/06/2016 | 18273 | CITY OF LARSEN B... | Clinic LBUC I...  | Clinic |     | General Account | 331.62   | 3,927.35 |
| Check           | 10/06/2016 | 18273 | CITY OF LARSEN B... | Clinic W/S inv... | Clinic |     | General Account | 65.80    | 3,993.15 |
| Check           | 10/06/2016 | 18273 | CITY OF LARSEN B... | Clinic garbag...  | Clinic |     | General Account | 10.00    | 4,003.15 |
| Check           | 12/06/2016 | 18330 | CITY OF LARSEN B... | Clinic LBUC I...  | Clinic |     | General Account | 830.73   | 4,833.88 |
| Check           | 12/06/2016 | 18330 | CITY OF LARSEN B... | Clinic W/S inv... | Clinic |     | General Account | 131.60   | 4,965.48 |
| Check           | 12/06/2016 | 18330 | CITY OF LARSEN B... | Clinic garbag...  | Clinic |     | General Account | 20.00    | 4,985.48 |
| Total Utilities |            |       |                     |                   |        |     |                 | 4,985.48 | 4,985.48 |
| TOTAL           |            |       |                     |                   |        |     |                 | 4,985.48 | 4,985.48 |

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Accrual Basis

### NATIVE VILLAGE OF LARSEN BAY Transaction Detail By Account January through December 2016

| Type       | Date       | Num   | Name                | Memo               | Class  | Clr | Split           | Amount   | Balance  |
|------------|------------|-------|---------------------|--------------------|--------|-----|-----------------|----------|----------|
| Fuel       |            |       |                     |                    |        |     |                 |          |          |
| Check      | 01/08/2016 | 17997 | CITY OF LARSEN B... | Clinic fuel inv#   | Clinic |     | General Account |          | 0.00     |
| Check      | 01/13/2016 | 18004 | CITY OF LARSEN B... | Clinic fuel inv#   | Clinic |     | General Account |          | 0.00     |
| Check      | 02/11/2016 | 18030 | CITY OF LARSEN B... | Clinic fuel inv... | Clinic |     | General Account | 2,837.61 | 2,837.61 |
| Check      | 03/16/2016 | 18045 | CITY OF LARSEN B... | Clinic fuel inv... | Clinic |     | General Account | 434.35   | 3,271.96 |
| Check      | 04/11/2016 | 18069 | CITY OF LARSEN B... | Clinic fuel inv... | Clinic |     | General Account | 976.00   | 4,247.96 |
| Check      | 05/16/2016 | 18102 | CITY OF LARSEN B... | Clinic fuel inv#   | Clinic |     | General Account |          | 4,247.96 |
| Check      | 06/08/2016 | 18121 | CITY OF LARSEN B... | Clinic fuel inv... | Clinic |     | General Account | 966.48   | 5,204.44 |
| Check      | 07/07/2016 | 18143 | CITY OF LARSEN B... | Clinic fuel inv#   | Clinic |     | General Account |          | 5,204.44 |
| Check      | 08/08/2016 | 18185 | CITY OF LARSEN B... | Clinic fuel inv#   | Clinic |     | General Account |          | 5,204.44 |
| Check      | 09/29/2016 | 18263 | CITY OF LARSEN B... | Clinic fuel inv#   | Clinic |     | General Account |          | 5,204.44 |
| Check      | 10/06/2016 | 18273 | CITY OF LARSEN B... | Clinic fuel inv#   | Clinic |     | General Account |          | 5,204.44 |
| Check      | 12/06/2016 | 18330 | CITY OF LARSEN B... | Clinic fuel inv... | Clinic |     | General Account | 424.56   | 5,629.00 |
| Total Fuel |            |       |                     |                    |        |     |                 | 5,629.00 | 5,629.00 |
| TOTAL      |            |       |                     |                    |        |     |                 | 5,629.00 | 5,629.00 |



## Appendix B – Energy Audit Report – Project Summary

| ENERGY AUDIT REPORT – PROJECT SUMMARY                          |  |
|--|--|
| General Project Information                                    |  |
| <b>PROJECT INFORMATION</b>                                     | <b>AUDITOR INFORMATION</b>   |
| <b>Building:</b> Larsen Bay Medical Clinic                     | <b>Auditor Company:</b> ANTHC  |
| <b>Address:</b> Larsen Bay, AK                                 | <b>Auditor Name:</b> Curtis Boudreau   |
| <b>City:</b> Larsen Bay  | <b>Auditor Address:</b> 4500 Diplomacy Drive   |
| <b>Client Name:</b> Larsen Bay Tribal Council                  |  |
| <b>Client Address:</b> P.O. Box 50<br>Larsen Bay, Alaska 99624 | <b>Auditor Phone:</b> (907) 729-3528   |
| <b>Client Phone:</b> (907) 847-2207                            | <b>Auditor FAX:</b>  |
| <b>Client FAX:</b>   | <b>Auditor Comment:</b>  |
| Design Data  |  |
| <b>Building Area:</b> 2,464 square feet                        | <b>Design Space Heating Load:</b> Design Loss at Space: 27,808 Btu/hour<br>with Distribution Losses: 37,077 Btu/hour<br>Plant Input Rating assuming 82.0% Plant Efficiency and 25% Safety Margin: 56,521 Btu/hour<br>Note: Additional Capacity should be added for DHW and other plant loads, if served. |
| <b>Typical Occupancy:</b> 0 people                             | <b>Design Indoor Temperature:</b> 68 deg F (building average)  |
| <b>Actual City:</b> Larsen Bay                                 | <b>Design Outdoor Temperature:</b> 11.4 deg F  |
| <b>Weather/Fuel City:</b> Larsen Bay                           | <b>Heating Degree Days:</b> 8,813 deg F-days   |
|  |  |
| Utility Information  |  |
| <b>Electric Utility:</b> Larsen Bay Electric - Commercial - Sm | <b>Natural Gas Provider:</b> None  |
| <b>Average Annual Cost/kWh:</b> \$0.410/kWh                    | <b>Average Annual Cost/ccf:</b> \$0.000/ccf  |

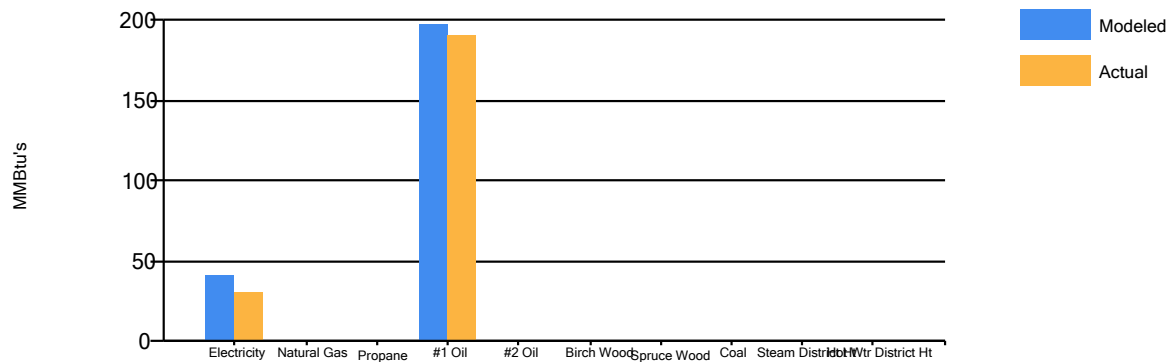
| Annual Energy Cost Estimate |               |               |               |                  |          |               |                  |              |                 |
|-----------------------------|---------------|---------------|---------------|------------------|----------|---------------|------------------|--------------|-----------------|
| Description                 | Space Heating | Space Cooling | Water Heating | Ventilation Fans | Lighting | Refrigeration | Other Electrical | Service Fees | Total Cost      |
| Existing Building           | \$5,447       | \$0           | \$824         | \$323            | \$1,992  | \$283         | \$1,400          | \$0          | <b>\$10,270</b> |
| With Proposed Retrofits     | \$4,889       | \$0           | \$824         | \$323            | \$1,339  | \$283         | \$1,400          | \$0          | <b>\$9,058</b>  |
| Savings                     | \$559         | \$0           | \$0           | \$0              | \$653    | \$0           | \$0              | \$0          | <b>\$1,212</b>  |

| Building Benchmarks  |                      |                             |                    |
|--|----------------------|-----------------------------|--------------------|
| Description  | EUI<br>(kBtu/Sq.Ft.) | EUI/HDD<br>(Btu/Sq.Ft./HDD) | ECI<br>(\$/Sq.Ft.) |
| Existing Building  | 96.7                 | 10.97                       | \$4.17             |
| With Proposed Retrofits  | 87.2                 | 9.89                        | \$3.68             |
| EUI: Energy Use Intensity - The annual site energy consumption divided by the structure's conditioned area.<br>EUI/HDD: Energy Use Intensity per Heating Degree Day.<br>ECI: Energy Cost Index - The total annual cost of energy divided by the square footage of the conditioned space in the building. |                      |                             |                    |

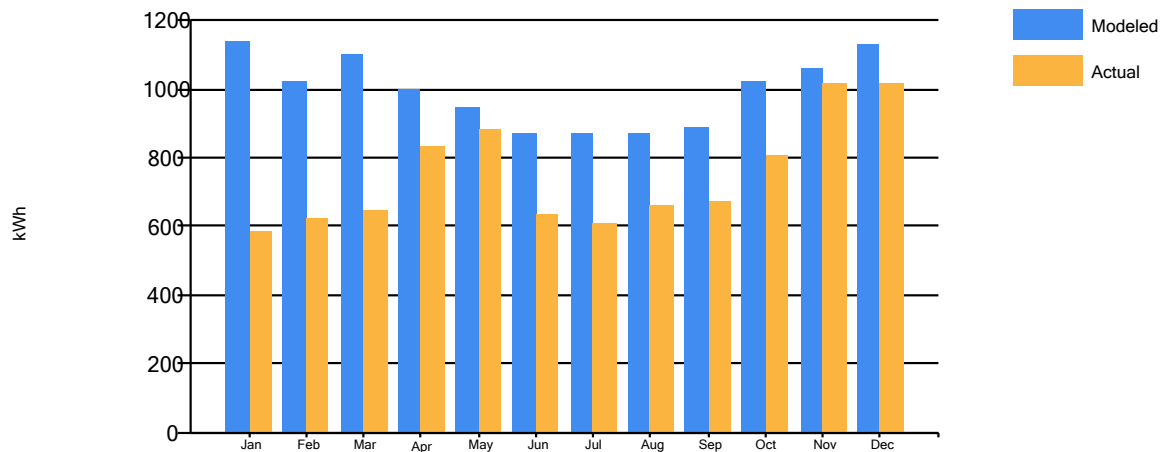
## Appendix C – Actual Fuel Use versus Modeled Fuel Use

The graphs below show the modeled energy usage results of the energy audit process compared to the actual energy usage report data. The model was completed using AkWarm modeling software. The orange bars show actual fuel use, and the blue bars are AkWarm’s prediction of fuel use.

### Annual Energy Use



### Electricity Use



## Appendix D - EUI Calculation Details

The Local Utility provides electricity to the residents of Larsen Bay.

The average cost for each type of fuel used in this building is shown below in Table 4. This figure includes all surcharges, subsidies, and utility customer charges:

**Table 4: Energy Cost Rates for each Fuel Type.**

| Average Energy Cost |                     |
|---------------------|---------------------|
| Description         | Average Energy Cost |
| Electricity         | \$ 0.410/kWh        |
| #1 Oil              | \$ 3.60/gallons     |

Table 5 shows the calculated results for the building Energy Use Index (EUI), which determines the total energy usage for a type of building for comparison with other buildings of the same type. This allows the user to determine the relative energy use of a building in relation to others of the same type or use.

**Table 5: EUI Calculations**

| Energy Type  | Building Fuel Use per Year | Site Energy Use per Year, kBTU | Source/Site Ratio | Source Energy Use per Year, kBTU |
|--|----------------------------|--------------------------------|-------------------|----------------------------------|
| Electricity  | 11,908 kWh                 | 40,643                         | 3.340             | 135,747                          |
| #1 Oil   | 1,497 gallons              | 197,550                        | 1.010             | 199,525                          |
| Total  |                            | 238,192                        |                   | 335,272                          |
|  |                            |                                |                   |                                  |
| BUILDING AREA  |                            | 2,464                          | Square Feet       |                                  |
| BUILDING SITE EUI  |                            | 97                             | kBTU/Ft²/Yr       |                                  |
| BUILDING SOURCE EUI  |                            | 136                            | kBTU/Ft²/Yr       |                                  |
| * Site – Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued March 2011. |                            |                                |                   |                                  |

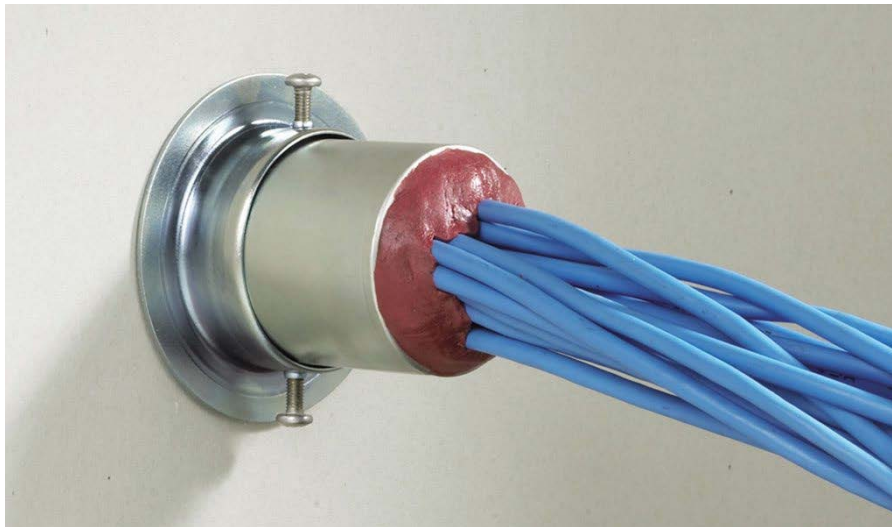
Table 6 shows information on common energy use benchmarks used to characterize the efficiency of a building.

**Table 6: Energy Efficiency Benchmarks for Building**

| Building Benchmarks  |                      |                             |                    |
|--|----------------------|-----------------------------|--------------------|
| Description  | EUI<br>(kBtu/Sq.Ft.) | EUI/HDD<br>(Btu/Sq.Ft./HDD) | ECI<br>(\$/Sq.Ft.) |
| Existing Building  | 96.7                 | 10.97                       | \$4.17             |
| With Proposed Retrofits  | 87.2                 | 9.89                        | \$3.68             |
| EUI: Energy Use Intensity - The annual site energy consumption divided by the structure's conditioned area.<br>EUI/HDD: Energy Use Intensity per Heating Degree Day.<br>ECI: Energy Cost Index - The total annual cost of energy divided by the square footage of the conditioned space in the building. |                      |                             |                    |

## Appendix F – Materials Specifications

### Permanently Flexible Putty Sealant (For Sealing Communication Cable Conduit in IT Closet Ceiling)



# LED T8 Light Bulb

**THINKLUX**  
LIGHTING

**4 FOOT**  
Fluorescent Replacement



**DIRECT WIRE**  
Ballast Bypass

**High Output**  
**LED**  
T8 | T12



## Performance Specifications

|                       |                                   |
|-----------------------|-----------------------------------|
| REPLACEMENT FOR:      | T8 OR T12 4 FOOT FLUORESCENT TUBE |
| BRIGHTNESS (LUMENS):  | 2400                              |
| COLOR TEMPERATURE:    | 4000K   5000K                     |
| COLOR ACCURACY (CRI): | 80                                |
| DIMENSIONS            | 1.02" X 47.2"                     |
| POWER CONSUMPTION:    | 18 WATTS                          |
| VOLTAGE:              | 120-277 VOLTS                     |
| DIMMABLE:             | NO                                |

## Dimensions / Additional Data

|                     |  |
|---------------------|--|
| CERTIFICATIONS:     | UL, DESIGNLIGHTS (DLC)                                 |
| PRODUCT/ORDER CODE: | 4000K - 18WT8P-4F-40K-BYP<br>5000K - 18WT8P-4F-50K-BYP |

## Lifespan / Cost To Run

|                               |            |
|-------------------------------|------------|
| PROJECTED LIFE:<br>@3 HRS/DAY | 50,000 HRS |
|-------------------------------|------------|

|  |        |
|--|--------|
| YEARLY ENERGY COST:<br>3 HRS/DAY @ .11 KWH | \$2.17 |
|--|--------|

|                 |  |
|-----------------|--|
| <b>WARRANTY</b> | 5 YEAR THINKLUX LIGHTING LIMITED WARRANTY<br>EARTHLED PRODUCT PROTECTION PLAN IS AVAIL |
|-----------------|--|

# LED T8 Tube - Hybrid

Ballast-compatible & line voltage bypass retrofit

**THINKLUX**  
LIGHTING

## Installation Instructions

Please read through this installation guide before beginning the installation of the THINKLUX Lighting HYB Series LED T8 tube. This LED tube is a combination T8 tube which can be installed as a direct plug-in, ballast-compatible tube, or as a ballast-bypass retrofit bulb where the luminaire must first be modified prior to LED bulb installation. Page 1 of this installation manual is for installing the LED bulb as a direct-replacement, and pages 2 and 3 are for installation as a ballast bypass configuration.

### Cautions and Warnings - Direct Plug-in, Ballast Compatible

These LED lamps are intended to replace fluorescent T8 tube lamps with an ANSI designation of 32W/48T8.

**WARNING: RISK OF ELECTRIC SHOCK - DISCONNECT POWER AT THE SOURCE BEFORE INSTALLATION.**

**WARNING:** risk of fire or electric shock. Do not alter, relocate, or remove wiring, lampholders, power supply, or any other electrical component.

SUITABLE FOR DAMP LOCATIONS

SUITABLE FOR USE IN TOTALLY ENCLOSED LUMINAIRES.

THIS DEVICE IS NOT INTENDED FOR USE WITH EMERGENCY EXITS.

**NOTE:** If installing multiple LED T8 tubes into a single fixture, the maximum number of tubes per fixture is 4

DIRECT REPLACEMENT FOR 32W/48T8 LAMPS ONLY

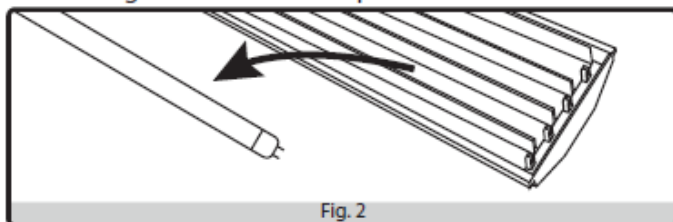
**CAUTION - IF THE LAMP OR LUMINAIRE EXHIBITS UNDESIRABLE OPERATION (BUZZING, FLICKERING, ETC.), IMMEDIATELY TURN OFF POWER, REMOVE LAMP FROM LUMINAIRE AND CONTACT MANUFACTURER.**

**CAUTION - RISK OF FIRE - IF INSTALLING THIS LAMP IN A PRE-HEAT LUMINAIRE, REMOVE THE AUTOMATIC STARTERS FROM THEIR HOLDERS BEFORE INSTALLING LAMP.**

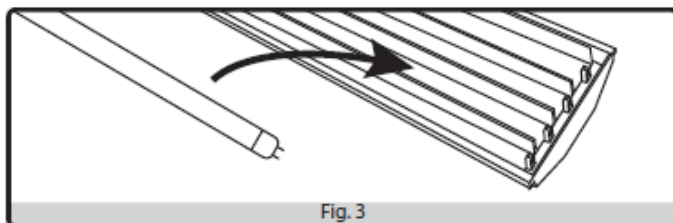
THIS LAMP ONLY OPERATES ON MAGNETIC OR ELECTRONIC BALLASTS. IF LAMP DOES NOT LIGHT WHEN THE LUMINAIRE IS ENERGIZED, REMOVE LAMP FROM LUMINAIRE AND CONTACT LAMP MANUFACTURER OR QUALIFIED ELECTRICIAN.

### Installation - Direct Plug-in, Ballast-Compatible

1. Switch off power supply before installation. Remove the fixture diffuser if necessary.
2. Remove existing fluorescent T8 lamp from fixture



3. Install the LED T8 tube



4. Switch on power supply and ensure that LED bulb(s) are operating properly. Replace the fixture diffuser if necessary.

[www.aethlux.com](http://www.aethlux.com)

Page 1 of 3



# LED T8 Tube - Hybrid

Ballast-compatible & line voltage bypass retrofit



This part of the installation manual (pages 2-3) is only intended for the installation of the LED T8 lamp as LED retrofit kit, where modification of the luminaire will be required prior to installation of the LED bulb.

Please read and understand all cautions and warnings, and installation steps before beginning the installation process.

## Cautions and Warnings - Ballast Bypass Retrofit

**WARNING:** Risk of fire or electric shock. LED Retrofit Kit installation requires knowledge of luminaires electrical systems. If not qualified, do not attempt installation. Contact a qualified electrician.

**WARNING:** Risk of fire or electric shock. Install this kit only in the luminaires that have the construction features and dimensions shown in the photographs and/or drawings and where the input rating of the retrofit kit does not exceed the input rating of the luminaire.

**WARNING:** Risk of fire or electric shock. The electrical rating of this product is 120-277 Vac, the installer must determine whether they have 120-277 Vac at the luminaire before installation.

**WARNING:** RISK OF FIRE OR ELECTRIC SHOCK. DO NOT ALTER, RELOCATE, OR REMOVE WIRING, LAMPHOLDERS, POWER SUPPLY, OR ANY OTHER ELECTRICAL COMPONENT.

THE RETROFIT ASSEMBLY IS ACCEPTED AS A COMPONENT OF A LUMINAIRE WHERE THE SUITABILITY OF THE COMBINATION SHALL BE DETERMINED BY UL OR AUTHORITIES HAVING JURISDICTION.

**WARNING:** To avoid potential fire or shock hazard, do not use this retrofit kit in luminaires employing shunted bi-pin lampholders. Note: Shunted lampholders are found only in fluorescent luminaires with Instant-Start ballasts. Instant-start ballasts can be identified by the words "Instant Start" or "I.S." marked on the ballast. This designation may be in the form of a statement pertaining to the ballast itself, or may be combined with the marking for the lamps with which the ballast is intended to be used, for example F40T12/IS. For more information, contact the LED luminaire retrofit kit manufacturer. See figure below.

**WARNING:** To prevent wiring damage or abrasion, do not expose wiring to edges of sheet metal or other sharp objects.

Do not make or alter any open holes in an enclosure of wiring or electrical components during kit installation.

Installers should not disconnect existing wires from lamp holder terminals to make new connections at lamp holder terminals. Instead installers should cut existing lamp holder leads away from the lamp holder and make new electrical connections to lamp holder lead wires by employing applicable connectors.

**NOTE:** If installing multiple LED T8 tubes into a single fixture, the maximum number of tubes per fixture is 4.

SUITABLE FOR DAMP LOCATIONS

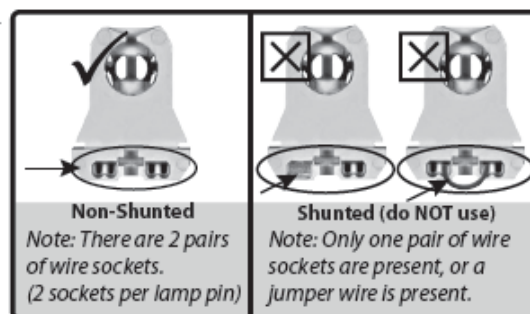
NOT FOR USE WITH DIMMERS.

SUITABLE FOR USE IN TOTALLY ENCLOSED LUMINAIRES.

THIS DEVICE IS NOT INTENDED FOR USE WITH EMERGENCY EXITS.

SUITABLE FOR 50°C AMBIENT.

**WARNING:** RISK OF ELECTRIC SHOCK - DISCONNECT POWER AT THE SOURCE BEFORE INSTALLATION.



# LED T8 Tube - Hybrid

Ballast-compatible & line voltage bypass retrofit

**THINKLUX**  
LIGHTING

## Wiring and Installation - Ballast Bypass Retrofit

1. Switch off power supply before installation. Remove diffuser (if applicable) and all fluorescent tube lamps from luminaire.

Identify which ballast and wiring setup is used in the luminaire as shown in Fig. 1 and Fig. 2.

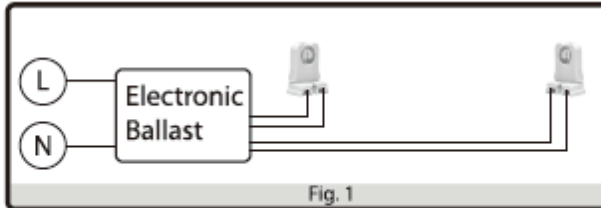


Fig. 1

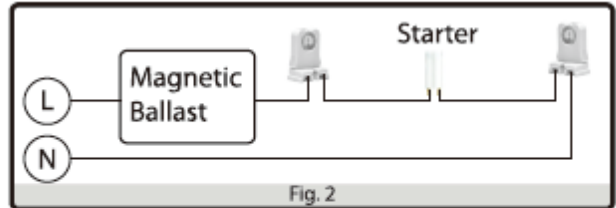


Fig. 2

2. Cut all wires leading into and out of the ballast and starter (if applicable), as shown in Fig. 3 and Fig. 4.

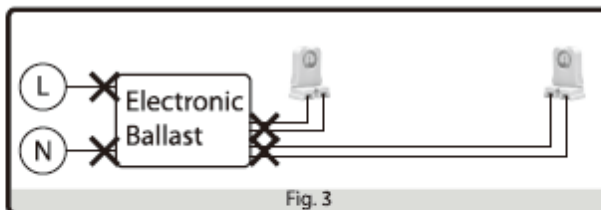


Fig. 3

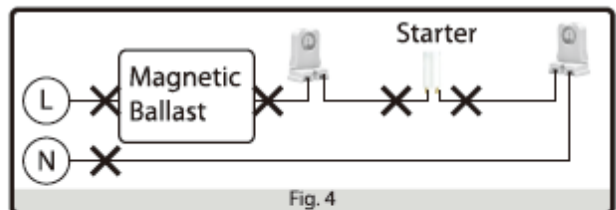


Fig. 4

3. Connect the input supply lines to the lampholder as shown in Fig. 5.

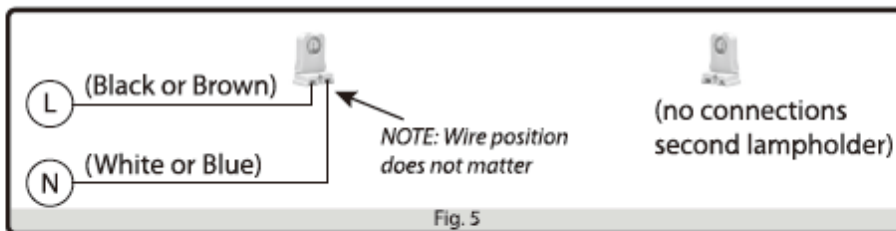


Fig. 5

4. Apply the retrofit warning label on fixture in a location that will be readily visible during normal maintenance.

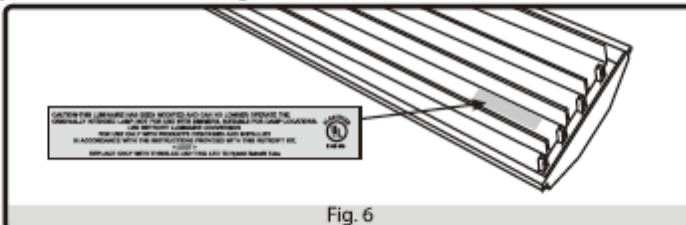


Fig. 6

5. Locate the end of the LED T8 Tube where the LIVE END label is printed and ensure that this end of the tube is plugged into the LIVE lampholder socket as shown in Fig. 6. Turn the bulb in the direction such that the heat sink strip faces up into the fixture.



Fig. 7



## Flood Light LED Replacement Bulb, 90 Watt Equivalent Model # 468025



# LED Standard Light Bulb

## ULTRA LED™ A-line Lamps

Omnidirectional



### Key Features & Benefits

- Dimmable down to 10%\*
- Long life: up to 15,000 hours (L<sub>70</sub>)
- UV and IR free
- Mercury and lead free
- RoHS compliant
- Available in 2700K, 3000K, 3500K and 5000K color temperatures
- Suitable for indoor/outdoor environments
- Reduces energy consumption up to 85%
- Last up to 20 times longer than incandescent lamps
- No warm-up time, instant-on with full light output and stable color

\* Performance may vary depending on dimmer used in application. Please refer to Dimmer Compatibility List (RETRO-DIM) for a list of compatible dimmers or visit [www.SYLVANIA.com/LED Retrofit](http://www.SYLVANIA.com/LED Retrofit)



Rated up to 15,000 hours at 70% lumen maintenance, SYLVANIA ULTRA LED A-line omnidirectional lamps offer years of service and reduce energy and maintenance costs. SYLVANIA ULTRA LED lamps are environmentally preferred products. They are RoHS compliant and contain no mercury, lead or other hazardous materials. They emit no UV or IR radiation. A CRI of 80 ensures good color definition and 2700K, 3000K, 3500K and 5000K color temperatures, these lamps can be used in many applications in both homes and businesses.

### Product Offering

| Ordering Abbreviation | Wattage | Color Temperature           | Typical Lumens |
|-----------------------|---------|-----------------------------|----------------|
| LED5.5W A19           | 5.5     | 2700K, 3000K, 3500K & 5000K | 450            |
| LED9W A19             | 9       | 2700K, 3000K, 3500K & 5000K | 800            |
| LED12W A19            | 12      | 2700K, 3500K & 5000K        | 1100           |
| LED16W A21            | 16      | 2700K, 3500K & 5000K        | 1600           |
| LED25W A21            | 25      | 2700K                       | 2550           |

### Energy Savings

| Basic Product Description | LED Life (hrs.) | LED Lumens | Similar Incandescent | Incandescent Life (hrs.) | Incandescent Lumens | Watts Saved | Energy Savings* | LED Life vs. Incandescent |
|---------------------------|-----------------|------------|----------------------|--------------------------|---------------------|-------------|-----------------|---------------------------|
| LED5.5A19                 | 15,000          | 450        | 40W A19              | 1500                     | 465                 | 34.5        | \$56            | 10x                       |
| LED9A19                   | 15,000          | 800        | 60W A19              | 1000                     | 850                 | 51          | \$84            | 15x                       |
| LED12A19                  | 15,000          | 1100       | 75W A19              | 750                      | 1170                | 63          | \$103           | 20x                       |
| LED16A21                  | 15,000          | 1600       | 100W A19             | 750                      | 1600                | 84          | \$138           | 20x                       |
| LED25A21                  | 15,000          | 2550       | 150W A21             | 750                      | 2670                | 125         | \$165           | 20x                       |

\*Energy savings over life of lamp calculated at \$0.11/kWh

# Vapor Barrier Materials

## Vapor Barrier Sheeting SilverBack 12 mil Reinforced Poly Sheeting



## Caulk to Seal Vapor Barrier to Foundation

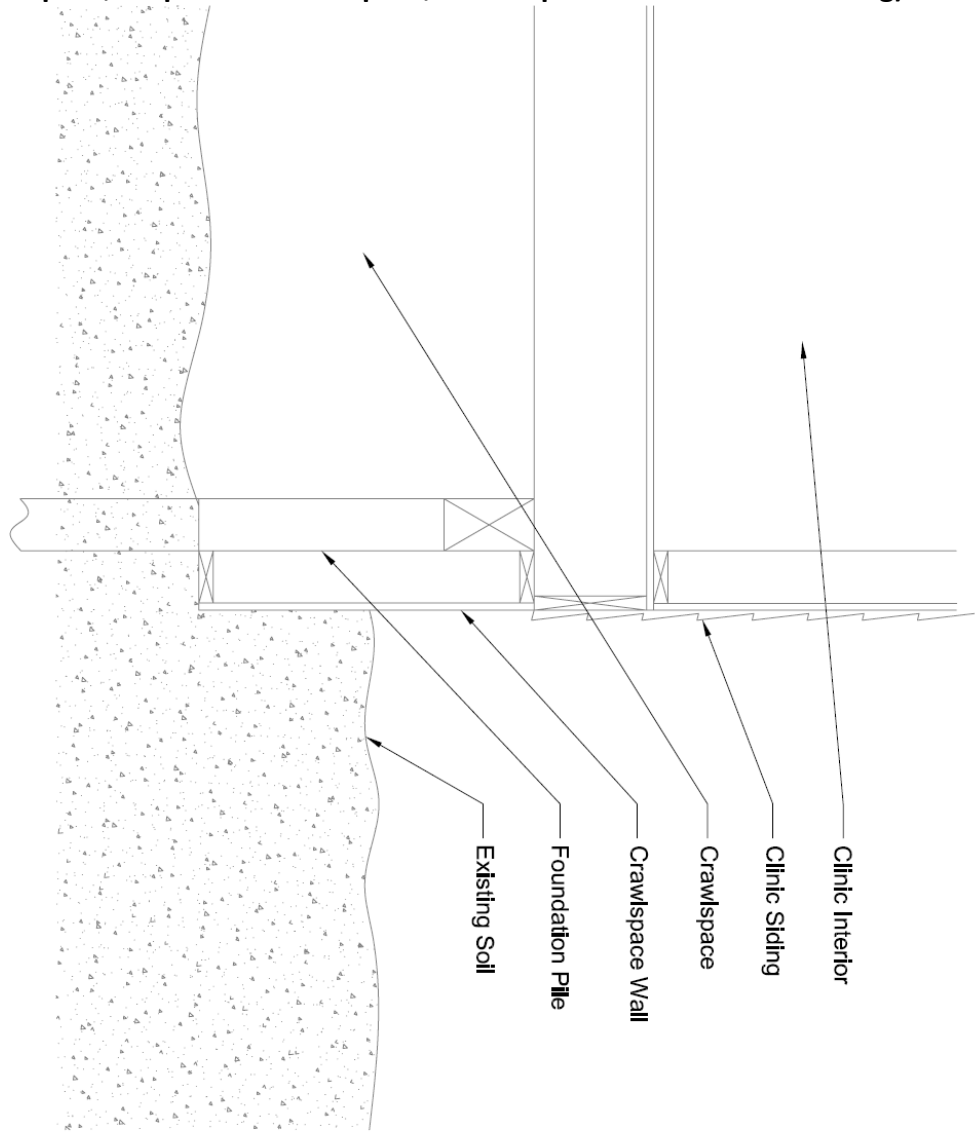


## Vapor Barrier Waterproof Seam Tape Part Number WST-180

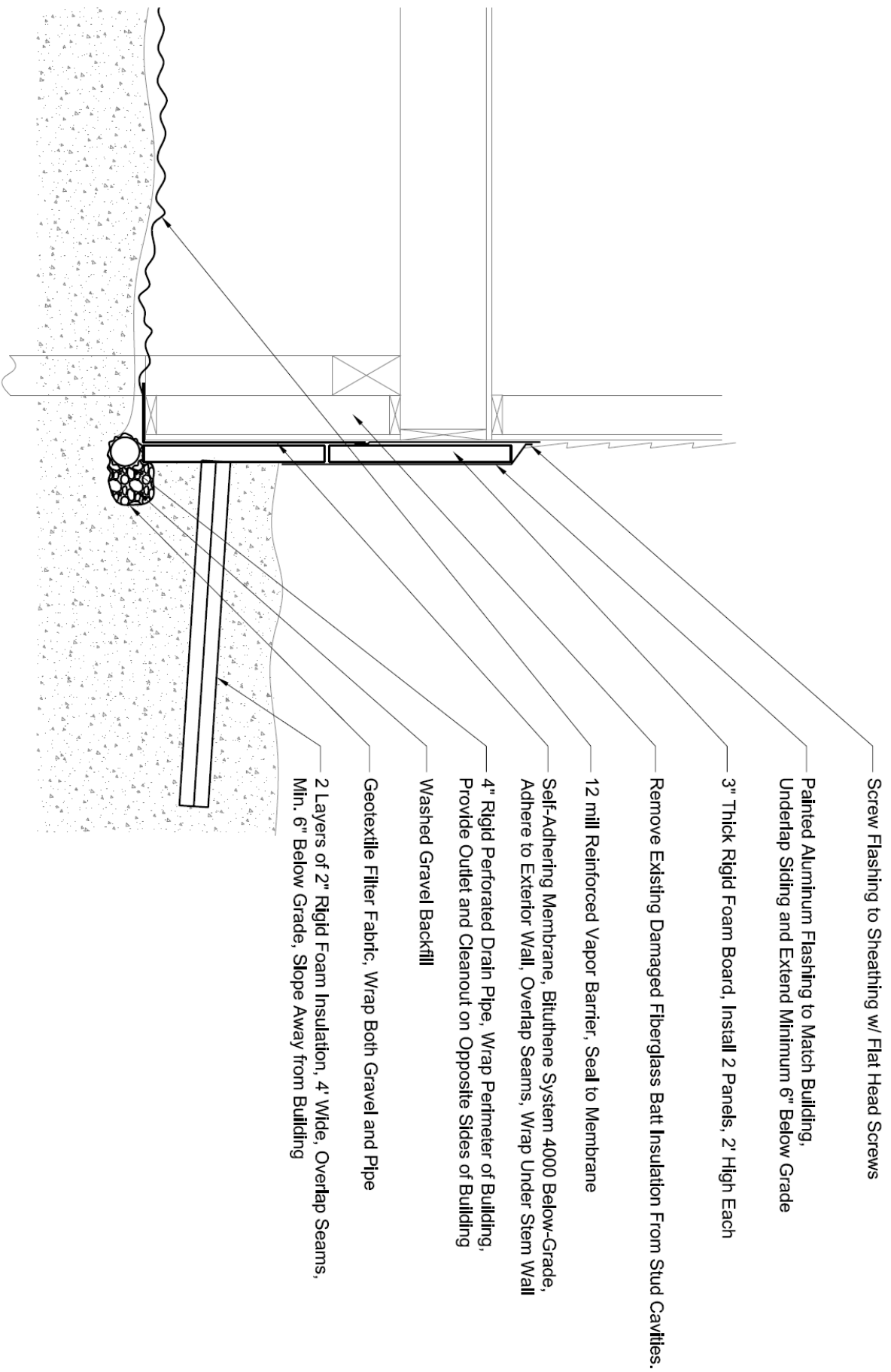


## Foundation Insulation Conceptual Illustration

(Insulate Space, Stop Rot in CrawlSpace, and Stop Foundation Frost Jacking)



Existing Construction



New Work