

Practice: 672 - Building Envelope Improvement

Scenario #1 - Building Envelope, Attic Insulation

Scenario Description:

Install a minimum R-7 insulation in addition to existing attic or ceiling to reduce heat transfer. Increased insulation reduces seasonal heat loss and heat gain which reduces the respective need for heating and cooling equipment to operate. Based on a 40' x 500' poultry house.

Before Situation:

An on-farm energy audit has identified a poultry house with an inefficient building envelope due to limited attic insulation.

After Situation:

A more effective and efficient building envelope can be created through addition of, or increased, attic insulation. Associated practices/activities: 122-AgEMP - HQ, 672-Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Feature Measure: Area of Attic Insulated

Scenario Unit:: Square Foot

Scenario Typical Size: 20000

Total Scenario Cost: \$13,000.00

Scenario Cost/Unit: \$0.65

Cost Details:

| Component Name | ID | Description | Unit | Cost | QTY | Total |
|----------------|----|-------------|------|------|-----|-------|
|----------------|----|-------------|------|------|-----|-------|

Materials

| | | | | | | |
|---|------|--|-------------|--------|-------|-------------|
| Insulation, Fiberglass or cellulose, R-15 | 1196 | Fiberglass or cellulose insulation R-15, includes materials, equipment and labor to install. | Square Foot | \$0.65 | 20000 | \$13,000.00 |
|---|------|--|-------------|--------|-------|-------------|

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Scenario #2 - Building Envelope, Wall Insulation

Scenario Description:

Enclose both sidewalls and endwalls from ceiling to floor in one of two manners: 1) metal exterior, 3.5" fiberglass batts (R-11), vapor barrier, & interior plywood or OSB sheathing, or 2) closed-cell polyurethane foam application (minimum 1" thickness (R-7) of 2.5 lbs/cu.ft. or higher density, (3.0 or higher density preferred) with a form of physical protective barrier on lower 2' (may be 6 lbs/cu.ft. or higher density 1/8" thick foam, or treated lumber). Based on a 40' x 400' poultry house.

Before Situation:

An on-farm energy audit has identified a poultry house with an inefficient building envelope due to limited wall insulation.

After Situation:

A more effective and efficient building envelope can be created through addition of, or increased, insulation. Associated practices/activities: may include 122-AgEMP - HQ, 672-Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Feature Measure: Area of Wall Insulated

Scenario Unit:: Square Foot

Scenario Typical Size: 4500

Total Scenario Cost: \$8,235.00

Scenario Cost/Unit: \$1.83

Cost Details:

| Component Name | ID | Description | Unit | Cost | QTY | Total |
|---|------|---|-------------|--------|------|------------|
| Materials | | | | | | |
| Insulation, polyurethane, R-7, with sheathing skirt | 1198 | Closed-cell polyurethane foam insulation (minimum 1" thickness (R-7) with a protective sheeting barrier on lower 2 feet of wall height. Includes materials, equipment and labor to install. | Square Foot | \$1.83 | 4500 | \$8,235.00 |

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Scenario #3 - Building Envelope, Sealant

Scenario Description:

A typical scenario is sealing the gaps between walls, gables, ceiling, etc. in a poultry house or greenhouse. Sealing is performed by a professional contractor, not merely use of spray foam from a can. The unit basis of payment in this scenario is each house based on 60' x 500' poultry house with an assumed need of sealant to seal 2750 linear feet of gap.

Before Situation:

An on-farm energy audit has identified an agricultural facility with an inefficient building envelope due to gaps between walls, ceiling, etc.

After Situation:

A more effective and efficient building envelope can be created through interior sealing of the exterior walls at the footer plate, eaves, ridge cap, and gable ends. The sealant reduces seasonal heat loss and heat gain due to infiltration which reduces the respective need for heating and cooling equipment to operate. Associated practices/activities: may include 122-AgEMP - HQ, 672-Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Feature Measure: Gap Length to be Sealed

Scenario Unit:: Foot

Scenario Typical Size: 2750

Total Scenario Cost: \$3,767.50

Scenario Cost/Unit: \$1.37

Cost Details:

| Component Name | ID | Description | Unit | Cost | QTY | Total |
|------------------|------|--|------|--------|------|------------|
| Materials | | | | | | |
| Sealant | 1150 | Greenhouse and building gap sealant. Performed by a professional contractor spraying the areas with an approved sealant for poultry production facilities. Includes materials, equipment and labor to install. | Foot | \$1.37 | 2750 | \$3,767.50 |

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Scenario #4 - Building Envelope, Greenhouse Screens

Scenario Description:

The mechanical energy screen system consists of a drive motor, support cables, controls, and shade material, which may be woven, knitted, or non-woven strips of aluminum fiber, polyethylene, nylon or other synthetic material. The screen provides a means to better control solar heat gain and heat transfer during night or cold weather conditions to reduce energy use. Screens and similar devices may also be used to divide internal areas and allow for differentiated heating, ventilation, or cooling system operation to reduce energy use.

Before Situation:

An on-farm energy audit has identified that the heating and cooling of an existing greenhouse, or similar structure with conditioned spaces, is inefficient due to poorly regulated heat transfer. A need to regulate an entire space for uniform conditions when some portions have differing, intermittent requirements can also reduce efficiency.

After Situation:

The greenhouse is fitted with a mechanically controlled energy screen installed truss-to-truss or gutter-to-gutter, with side screens as necessary, reducing heat loss in the greenhouse. Associated practices/activities: may include 122-AgEMP - HQ, 672-Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Feature Measure: Area of Screen

Scenario Unit:: Square Foot

Scenario Typical Size: 4900

Total Scenario Cost: \$10,963.64

Scenario Cost/Unit: \$2.24

Cost Details:

| Component Name | ID | Description | Unit | Cost | QTY | Total |
|--|------|---|-------------|---------|------|-------------|
| Labor | | | | | | |
| Skilled Labor | 230 | Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc. | Hour | \$26.79 | 16 | \$428.64 |
| Materials | | | | | | |
| Thermal blanket, <= 10,000 square foot | 1147 | Thermal blanket greenhouse screens: mechanical energy screen system consists of a drive motor, support cables, controls, and shade material, which may be woven, knitted, or non-woven. Size range is less than 10,000 square feet. Materials only. | Square Foot | \$2.15 | 4900 | \$10,535.00 |

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Scenario #5 - Building Envelop, Greenhouse Insulation

Scenario Description:

A typical scenario is the installation insulation in green house to address energy loss. The insulation can be either of the cellulose or bubble type (or equivalent). The increased insulation reduces seasonal heat loss and heat gain which reduces the respective need for heating and cooling equipment to operate.

Before Situation:

Greenhouse with standard glazing, plastic or polycarbonate walls and no insulation. An on-farm energy audit has identified that the heating and cooling of an existing greenhouse is inefficient due to excessive heat loss.

After Situation:

The greenhouse is fitted with insulation installed truss-to-truss or gutter-to-gutter and/or non glazed endwalls and/or sidewalls, reducing heat loss and gain in the greenhouse. Associated practices/activities: may include 122-AgEMP - HQ, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Feature Measure: Square Feet of Insulation

Scenario Unit:: Square Foot

Scenario Typical Size: 1380

Total Scenario Cost: \$1,629.24

Scenario Cost/Unit: \$1.18

Cost Details:

| Component Name | ID | Description | Unit | Cost | QTY | Total |
|-------------------------------|------|---|-------------|---------|------|------------|
| Labor | | | | | | |
| Skilled Labor | 230 | Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc. | Hour | \$26.79 | 16 | \$428.64 |
| Materials | | | | | | |
| Insulation, Greenhouse, Solid | 2411 | Solid insulation board with aluminum foil on both sides. 1" X 4' X 8' or 32 sq.ft. Includes materials and shipping only. | Square Foot | \$0.87 | 1380 | \$1,200.60 |