

**Practice: 672 - Building Envelope Improvement**

**Scenario: #1 - Building Envelope - Attic Insulation**

**Scenario Description:**

Install a minimum R-7 insulation in an 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. Payment includes materials, equipment and labor to install.

**Before Situation:**

An agriculture house with an inefficient building envelope with limited attic insulation.

**After Situation:**

A more effective and efficient building envelope can be created through addition of, or increased, attic insulation. 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.

Associated practices/activities: 122-AgEMP - HQ, 670- Lighting System Improvement, and 374-Farmstead Energy Improvement.

**Scenario Feature Measure:** Area of Attic Insulated

**Scenario Unit:** Square Foot

**Scenario Typical Size:** 20,000

**Scenario Cost:** \$15,600.00

**Scenario Cost/Unit:** \$0.78

**Cost Details (by category):**

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
<i>Materials</i>						
Insulation, Fiberglass or cellulose, R-15	1196	Fiberglass or cellulose insulation R-15, includes materials, equipment and labor to install.	Square Foot	\$0.78	20000	\$15,600.00

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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). Payment includes materials, equipment and labor to install.

**Before Situation:**

An agriculture house with an inefficient building envelope with limited wall insulation.

**After Situation:**

A more effective and efficient building envelope can be created through addition of, or increased, insulation in a 40' x 400' poultry house. 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.

Associated practices/activities: may include 122-AgEMP - HQ, 670- Lighting System Improvement, and 374-Farmstead Energy Improvement.

**Scenario Feature Measure:** Area of Wall Insulated

**Scenario Unit:** Square Foot

**Scenario Typical Size:** 4,500

**Scenario Cost:** \$8,595.00

**Scenario Cost/Unit:** \$1.91

**Cost Details (by category):**

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
<i>Materials</i>						
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	\$1.91	4500	\$8,595.00

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**Scenario: #3 - Building Envelope - Sealant**

**Scenario Description:**

Seal the gaps between walls, gables, ceiling, etc. in a poultry house or greenhouse. Payment includes materials, equipment and labor performed by a professional contractor.

**Before Situation:**

An agricultural facility with an inefficient building envelope with gaps between walls, ceiling, etc. for a total of 2400 linear feet.

**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. 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 2400 linear feet of gap. 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.

Associated practices/activities: may include 122-AgEMP - HQ, 670- Lighting System Improvement, and 374-Farmstead Energy Improvement.

**Scenario Feature Measure:** Perimeter of heated structure

**Scenario Unit:** Foot

**Scenario Typical Size:** 2,400

**Scenario Cost:** \$3,960.00

**Scenario Cost/Unit:** \$1.65

**Cost Details (by category):**

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
<i>Materials</i>						
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	\$1.65	2400	\$3,960.00

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**Scenario: #4 - Building Envelope - Greenhouse Screens**

**Scenario Description:**

Installation of a mechanical energy screen system associated with a greenhouse consisting 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. Payment includes materials and labor to install.

**Before Situation:**

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. 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.

Associated practices/activities: may include 122-AgEMP - HQ, 670- Lighting System Improvement, and 374-Farmstead Energy Improvement.

**Scenario Feature Measure:** Area of Screen

**Scenario Unit:** Square Foot

**Scenario Typical Size:** 25,000

**Scenario Cost:** \$47,543.20

**Scenario Cost/Unit:** \$1.90

**Cost Details (by category):**

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
<b>Labor</b>						
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	\$33.95	16	\$543.20
<b>Materials</b>						
Thermal blanket 10,001 - 50,000 square foot	1148	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 10,001 to 50,000 square feet. Materials only.	Square Foot	\$1.88	25000	\$47,000.00

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**Scenario: #5 - Building Envelope - Greenhouse Unglazed Wall Insulation**

**Scenario Description:**

Installation of insulation in greenhouse 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. Payment includes materials and labor to install.

**Before Situation:**

Green house with standard glazing, plastic or polycarbonate walls and no insulation. 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. 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.

Associated practices/activities: may include 122-AgEMP - HQ, 670- Lighting System Improvement, and 374-Farmstead Energy Improvement.

**Scenario Feature Measure:** Square Feet of insulation

**Scenario Unit:** Square Foot

**Scenario Typical Size:** 25,000

**Scenario Cost:** \$7,293.20

**Scenario Cost/Unit:** \$0.29

**Cost Details (by category):**

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
<b>Labor</b>						
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	\$33.95	16	\$543.20
<b>Materials</b>						
Insulation, Greenhouse, Reflective Bubble	2410	Double bubble reflective insulation with aluminum foil on both sides. Includes materials and shipping only.	Square Foot	\$0.27	25000	\$6,750.00

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**Scenario: #6 - Building Envelope - Insulated Door Upgrade**

**Scenario Description:**

Replace an existing door with an insulated door, such as but not limited to a steel roll up door in a poultry building. Increased insulation reduces seasonal heat loss and heat gain which reduces the respective need for heating and cooling equipment to operate. Payment includes materials and labor to install.

**Before Situation:**

Agriculture building's existing door is inefficient

**After Situation:**

A 20 gauge 12' x 12' rolling service insulated steel door is installed as a replacement for an existing less efficient door on a poultry building. 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.

Associated practices/activities may include: 122-AgEMP - HQ, 670- Lighting System Improvement, and 374-Farmstead Energy Improvement.

**Scenario Feature Measure:** Square foot

**Scenario Unit:** Square Foot

**Scenario Typical Size:** 144

**Scenario Cost:** \$1,525.84

**Scenario Cost/Unit:** \$10.60

**Cost Details (by category):**

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
<b>Labor</b>						
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	\$33.95	8	\$271.60
<b>Materials</b>						
Door, Insulated, Roll-up	2392	Rolling service insulated steel door, 20 gauge. Includes hardware required to install. Used to replace non insulated door in buildings. Materials only.	Square Foot	\$8.71	144	\$1,254.24

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**Scenario: #7 - Building Envelope - Insulated Curtain Upgrade**

**Scenario Description:**

Replacement of an existing non-insulated curtain with a seven layer insulated curtain with an R- value of 3 for a livestock building. The curtain's two outer layers are vinyl and polyethylene and the five inner layers are composed of insulating materials with air trapping fibers and a vapor barrier. Payment includes curtain and labor to install. Payment does not includes mounting accessories because the scenario assumes the curtain is replacing a non-insulated curtain.

**Before Situation:**

Existing livestock curtain is inefficient.

**After Situation:**

A 7 layer insulated curtain is installed as a replacement for an existing less efficient curtain on a livestock building. 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.

Associated practices/activities may include: 122-AgEMP - HQ, 670- Lighting System Improvement, and 374-Farmstead Energy Improvement.

**Scenario Feature Measure:** Square Foot

**Scenario Unit:** Square Foot

**Scenario Typical Size:** 1,080

**Scenario Cost:** \$2,681.60

**Scenario Cost/Unit:** \$2.48

**Cost Details (by category):**

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
<b>Labor</b>						
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	\$33.95	16	\$543.20
<b>Materials</b>						
Curtain , 7-Layer, R3 Insulated	2427	Seven layer insulated curtain with an R-value of 3 for a livestock building. Typical curtain size is 4' x 270'. The curtain's two outer layers are vinyl and polyethylene and the five inner layers are composed of insulating materials with air trapping fi	Square Foot	\$1.98	1080	\$2,138.40

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**Scenario: #8 - Building Envelope - Curtain Wall Conversion**

**Scenario Description:**

Converting part or all of a curtain wall to solid insulated wall by installation of an insulated metal cover in a livestock building. Payment includes materials and labor for the installation of a weather proof exterior such as, but not limited to, corrugated steel, and insulation such as, but not limited to polyurethane R-7. Payment does not include upgrade to ventilation.

**Before Situation:**

Existing livestock curtain is inefficient.

**After Situation:**

An insulated metal wall is installed as a replacement for an existing less efficient curtain on a livestock building. Conversion is for an building that requires 3040 sq ft of wall to replace the curtains. 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.

Associated practices/activities may include: 122-AgEMP - HQ, 670- Lighting System Improvement, and 374-Farmstead Energy Improvement.

**Scenario Feature Measure:** Square Foot

**Scenario Unit:** Square Foot

**Scenario Typical Size:** 3,040

**Scenario Cost:** \$11,309.30

**Scenario Cost/Unit:** \$3.72

**Cost Details (by category):**

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
<b>Labor</b>						
General Labor	231	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$22.31	30	\$669.30
<b>Materials</b>						
Insulation, polyurethane, R-7, with sheathing skirt	1198	Closed-cell polyurethane foam insulation (minimum 1" thickness (R-7) with a protective sheathing barrier on lower 2 feet of wall height. Includes materials, equipment and labor to install.	Square Foot	\$1.91	3040	\$5,806.40
Corrugated Steel, 28 gage	223	Corrugated or ribbed, galvanized, 28 gauge, includes fasteners, materials only.	sq ft	\$1.59	3040	\$4,833.60