

Practice: 672 - Building Envelope Improvement

Scenario: #1 - Attic Insulation, Blown-In

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. Typical scenario assumes 2" of cellulose insulation will be added to the attic with typical dimensions 40'x500', thus yielding 3333 cubic feet.

Before Situation: An agricultural facility 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, attic insulation. Associated practices/activities: 122-AgEMP - HQ and 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.

Scenario Feature Measure: Cubic Feet of Attic Insulated

Scenario Unit: Cubic Foot

Scenario Typical Size: 3333

Total Scenario Cost: \$2,885.01

Scenario Cost/Unit: \$0.87

Cost Details

Component Name	Id	Description	Unit	Cost	Qty	Total
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Materials

Insulation material, cellulose	2272	Cellulose insulation. Unit is a measurement of the in-place volume after being blown. Includes materials only.	Cubic Foot	\$0.77	3333	\$2,569.24
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Labor

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	\$19.74	16	\$315.76
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Scenario: #2 - Building Envelope - Wall Insulation, Spray Foam

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 agricultural facility 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. Associated practices/activities: may include 122-AgEMP - HQ and 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.

Scenario Feature Measure: Area of Wall Insulated

Scenario Unit: Square Foot

Scenario Typical Size: 5770

Total Scenario Cost: \$12,295.48

Scenario Cost/Unit: \$2.13

Cost Details

Component Name	Id	Description	Unit	Cost	Qty	Total
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Materials

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	\$2.13	5770	\$12,295.48
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Scenario: #3 - Building Envelope - Wall Insulation, Batts

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 agricultural facility 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. Associated practices/activities: may include 122-AgEMP - HQ and 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.

Scenario Feature Measure: Area of Wall Insulated

Scenario Unit: Square Foot

Scenario Typical Size: 5770

Total Scenario Cost: \$10,656.08

Scenario Cost/Unit: \$1.85

Cost Details

Component Name	Id	Description	Unit	Cost	Qty	Total
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Materials

Insulation, Panel, R-11 with sheathing	1197	Insulated wall panel typically 3.5" fiberglass batts (R-11), vapor barrier and OSB sheathing, or equal, includes materials, equipment and labor to install.	Square Foot	\$1.85	5770	\$10,656.08
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Scenario: #5 - Building Envelope - thermal blankets, insulated curtains and screens for greenhouses

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: 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 and 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.

Scenario Feature Measure: Area of Screen

Scenario Unit: Square Foot

Scenario Typical Size: 25000

Total Scenario Cost: \$49,729.22

Scenario Cost/Unit: \$1.99

Cost Details

Component Name	Id	Description	Unit	Cost	Qty	Total
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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	\$30.84	16	\$493.49
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Materials

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	\$1.97	25000	\$49,235.73
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Practice: 672 - Building Envelope Improvement

Scenario: #6 - Insulated curtains and or sidewall curtains for poultry houses

Scenario Description: The energy screen system consists of a 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 loss of heat during day, 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: Heating and cooling of an existing poultry house, 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 poultry house is fitted with an insulated curtain 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.

Scenario Feature Measure: Area of Screen

Scenario Unit: Square Foot

Scenario Typical Size: 300

Total Scenario Cost: \$863.98

Scenario Cost/Unit: \$2.88

Cost Details

Component Name	Id	Description	Unit	Cost	Qty	Total
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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	\$30.84	8	\$246.75
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Materials

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 fibers and a vapor barrier. Does not include mounting accessories, assumes it is replacing a non-insulated curtain.	Square Foot	\$2.06	300	\$617.24
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Practice: 672 - Building Envelope Improvement

Scenario: #7 - Greenhouse - Insulate Unglazed Walls

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: 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. Associated practices/activities: may include 122-AgEMP - HQ and 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.

Scenario Feature Measure: Square Feet of insulation

Scenario Unit: Square Foot

Scenario Typical Size: 25000

Total Scenario Cost: \$7,578.19

Scenario Cost/Unit: \$0.30

Cost Details

Component Name	Id	Description	Unit	Cost	Qty	Total
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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	\$30.84	16	\$493.49
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Materials

Insulation, Greenhouse, Reflective Bubble	2410	Double bubble reflective insulation with aluminum foil on both sides. Includes materials and shipping only.	Square Foot	\$0.28	25000	\$7,084.70
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Practice: 672 - Building Envelope Improvement

Scenario: #69 - Wall Insulation, Rigid Foam Board

Scenario Description: Add 2" extruded polystyrene, rigid foam board (approximate R-10 value), insulation to the walls and ceiling of an existing tobacco barn. Typical barn dimensions are 10' high x 10' wide x 28' long. Total square footage to insulate the walls and ceiling would be 1,040 square feet.

Before Situation: An agricultural facility 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. Associated practices/activities: may include 128-AgEMP and 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.

Scenario Feature Measure: Area Insulated

Scenario Unit: Square Foot

Scenario Typical Size: 1040

Total Scenario Cost: \$2,216.17

Scenario Cost/Unit: \$2.13

Cost Details

Component Name	Id	Description	Unit	Cost	Qty	Total
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Materials

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	\$2.13	1040	\$2,216.17
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