

Practice: 367 - Roofs and Covers

Scenario: #1 - Flexible Roof

Scenario Description:

A flexible membrane or fabric-like roof placed on a steel truss hoop-like supports attached to an existing wall or with its own simple support system. Manure is stored as a liquid in basins, tanks, and as a solid on concrete and earthen surfaces. Excess precipitation can cause premature filling of storages or cause nutrients to leach from solid manure piles leading to uncontrolled runoff as well as odor issues.

Associated Practices: Animal Mortality Facility (316), Composting Facility (317), Heavy Use Area Protection (561), Roof Runoff Structure (558), Waste Storage Facility (313), and Waste Treatment (629).

Before Situation:

Applicable where the exclusion of precipitation from an animal waste storage and/or treatment facility will improve of an existing or planned system. Manure is stored as a liquid in basins, tanks, and as a solid on concrete and earthen surfaces. Excess precipitation can cause premature filling of storages or cause nutrients to leach from solid manure piles leading to uncontrolled runoff as well as odor issues.

After Situation:

A flexible membrane or fabric-like roof placed on a steel truss hoop-like supports and supporting foundation. Roof or cover will be engineered and installed in accordance with appropriate building codes and permits. Typical size is 40'x40 'square feet and is over an approved animal waste management facility as a component of a CNMP. It is designed to prevent precipitation to allow proper management of animal waste streams (manure or compost streams), thus mitigating the negative factors from the "before practice implementation".

Scenario Feature Measure: Footprint of the building

Scenario Unit: Square Foot

Scenario Typical Size: 1,600

Scenario Cost: \$10,807.64

Scenario Cost/Unit: \$6.75

Cost Details (by category):

| Component Name | ID | Component Description | Unit | Price (\$/unit) | Quantity | Cost |
|--|------|--|-------------|-----------------|----------|-------------|
| Materials | | | | | | |
| Roof, Hoop Truss Arch Structure, 30-60' wide | 1668 | Hoop Truss Arch Structure with fabric cover - 30' to 60' width, includes materials, equipment, and installation. Does not include foundation preparation. | Square Foot | \$6.71 | 1600 | \$10,736.00 |
| Mobilization | | | | | | |
| Mobilization, very small equipment | 1137 | Equipment that is small enough to be transported by a pick-up truck with typical weights less than 3,500 pounds. Can be multiple pieces of equipment if all hauled simultaneously. | Each | \$71.64 | 1 | \$71.64 |

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Scenario: #2 - Flexible Roof, complex foundation

Scenario Description:

A flexible membrane or fabric-like roof placed on a steel truss hoop-like supports and complex support system. Requires construction of anchor holes with concrete. Manure is stored as a liquid in basins, tanks, and as a solid on concrete and earthen surfaces. Excess precipitation can cause premature filling of storages or cause nutrients to leach from solid manure piles leading to uncontrolled runoff as well as odor issues.

Associated Practices: Animal Mortality Facility (316), Composting Facility (317), Heavy Use Area Protection (561), Roof Runoff Structure (558), Waste Storage Facility (313), and Waste Treatment (629).

Before Situation:

Applicable where the exclusion of precipitation from an animal waste storage and/or treatment facility will improve of an existing or planned system. Manure is stored as a liquid in basins, tanks, and as a solid on concrete and earthen surfaces. Excess precipitation can cause premature filling of storages or cause nutrients to leach from solid manure piles leading to uncontrolled runoff as well as odor issues.

After Situation:

A flexible membrane or fabric-like roof placed on a steel truss hoop-like supports and supporting foundation. Roof or cover will be engineered and installed in accordance with appropriate building codes and permits. Typical size is 40'x40 'square feet and support by 2 rows of treated posts. It is designed to prevent precipitation to allow proper management of animal waste streams (manure or compost streams), thus mitigating the negative factors from the "before practice implementation".

Scenario Feature Measure: Footprint of the building

Scenario Unit: Square Foot

Scenario Typical Size: 1,600

Scenario Cost: \$13,390.64

Scenario Cost/Unit: \$8.37

Cost Details (by category):

| Component Name | ID | Component Description | Unit | Price (\$/unit) | Quantity | Cost |
|--|------|--|-------------|-----------------|----------|-------------|
| Equipment/Installation | | | | | | |
| Skidsteer, 80 HP | 933 | Skidsteer loader with horsepower range of 60 to 90. Equipment and power unit costs. Labor not included. | Hour | \$43.79 | 8 | \$350.32 |
| Concrete, CIP, formless, non reinforced | 36 | Non reinforced concrete cast-in-placed without forms by chute placement. Typical strength is 3000 to 4000 psi. Includes materials, labor and equipment to transport, place and finish. | Cubic yard | \$159.97 | 3 | \$479.91 |
| Earthfill, Manually Compacted | 50 | Earthfill, manually compacted, includes equipment and labor | Cubic yard | \$5.77 | 12 | \$69.24 |
| Auger, Truck Mounted | 2049 | Truck mounted auger for large diameter excavation. Includes equipment and labor. | Hour | \$350.31 | 4 | \$1,401.24 |
| Labor | | | | | | |
| Equipment Operators, Light | 232 | Includes: Skid Steer Loaders, Hydraulic Excavators <50 HP, Trenchers <12", Ag Equipment <150 HP, Pickup Trucks, Forklifts, Mulchers | Hour | \$22.43 | 8 | \$179.44 |
| Materials | | | | | | |
| Roof, Hoop Truss Arch Structure, 30-60' wide | 1668 | Hoop Truss Arch Structure with fabric cover - 30' to 60' width, includes materials, equipment, and installation. Does not include foundation preparation. | Square Foot | \$6.71 | 1600 | \$10,736.00 |
| Mobilization | | | | | | |
| Mobilization, small equipment | 1138 | Equipment <70 HP but can't be transported by a pick-up truck or with typical weights between 3,500 to 14,000 pounds. | Each | \$174.49 | 1 | \$174.49 |

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Scenario: #3 - Timber Frame Roof, over small bins

Scenario Description:

A timber framed roof, non-truss, a combination of purlins and rafters covered with steel "sheet" roof used only over small multi-bin composting facilities. Anchor to existing facility located under roof. No foundation preparation. Limit maximum area to 1,500 SF. (All others use Timber Frame Roof scenario no. 4.) Excess precipitation can cause premature filling of storages or cause nutrients to leach from solid manure piles leading to uncontrolled runoff as well as odor issues.

Associated Practices: Animal Mortality Facility (316), Composting Facility (317), Heavy Use Area Protection (561), Roof Runoff Structure (558), Waste Storage Facility (313), and Waste Treatment (629).

Before Situation:

Applicable where the exclusion of precipitation from an animal waste storage and/or treatment facility will improve of an existing or planned system. Manure is stored as a liquid in basins, tanks, and as a solid on concrete and earthen surfaces. Excess precipitation can cause premature filling of storages or cause nutrients to leach from solid manure piles leading to uncontrolled runoff as well as odor issues.

After Situation:

A timber framed stick building with no truss, all supports by individual members with steel "sheet" roof and supporting foundation. Typically a roof over a multi-bin mortality facility sized at 16' x40'. Limit maximum area to 1,500 SF. Engineered and installed in accordance with appropriate building codes and permits. It is designed to prevent precipitation to allow proper management of animal waste streams (manure or compost streams), thus mitigating the negative factors from the "before practice implementation".

Scenario Feature Measure: Foot print of building

Scenario Unit: Square Foot

Scenario Typical Size: 640

Scenario Cost: \$8,407.52

Scenario Cost/Unit: \$13.14

Cost Details (by category):

| Component Name | ID | Component Description | Unit | Price (\$/unit) | Quantity | Cost |
|--|------|--|------------|-----------------|----------|------------|
| Equipment/Installation | | | | | | |
| Skidsteer, 80 HP | 933 | Skidsteer loader with horsepower range of 60 to 90. Equipment and power unit costs. Labor not included. | Hour | \$43.79 | 16 | \$700.64 |
| Labor | | | | | | |
| Equipment Operators, Light | 232 | Includes: Skid Steer Loaders, Hydraulic Excavators <50 HP, Trenchers <12", Ag Equipment <150 HP, Pickup Trucks, Forklifts, Mulchers | Hour | \$22.43 | 16 | \$358.88 |
| 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 | \$22.22 | 120 | \$2,666.40 |
| Materials | | | | | | |
| Corrugated Steel, 21 gauge | 224 | Corrugated or ribbed, galvanized, 21 gauge, includes fasteners, materials only. | sq ft | \$2.69 | 720 | \$1,936.80 |
| Dimension Lumber, Treated | 1044 | Treated dimension lumber with nominal thickness equal or less than 2". Includes lumber and fasteners | Board Foot | \$0.85 | 1091 | \$927.35 |
| Lumber, planks, posts and timbers, treated | 1609 | Treated dimension lumber with nominal thickness greater than 2". Includes lumber and fasteners. Does not include labor. | Board Foot | \$1.75 | 540 | \$945.00 |
| Mobilization | | | | | | |
| Mobilization, small equipment | 1138 | Equipment <70 HP but can't be transported by a pick-up truck or with typical weights between 3,500 to 14,000 pounds. | Each | \$174.49 | 5 | \$872.45 |

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Scenario: #4 - Timber Frame Roof

Scenario Description:

A timber framed building with a timber or steel "sheet" roof. Anchor to existing facility located under roof or simple supports in ground. Manure is stored as a liquid in basins, tanks, and as a solid on concrete and earthen surfaces. Excess precipitation can cause premature filling of storage es or cause nutrients to leach from solid manure piles leading to uncontrolled runoff as well as odor issues. Specified snowload and deadload on truss is less than 40 PSF.

Associated Practices: Animal Mortality Facility (316), Composting Facility (317), Heavy Use Area Protection (561), Roof Runoff Structure (558), Waste Storage Facility (313), and Waste Treatment (629).

Before Situation:

Applicable where the exclusion of precipitation from an animal waste storage and/or treatment facility will improve an existing or planned system. Manure is stored as a liquid in basins, tanks, and as a solid on concrete and earthen surfaces. Excess precipitation can cause premature filling of storages or cause nutrients to leach from solid manure piles leading to uncontrolled runoff as well as odor issues.

After Situation:

A timber framed building with a timber or steel "sheet" roof and supporting foundation by associated practice. Engineered and installed in accordance with appropriate building codes and permits. Typical size is 5,000 square feet and is over an approved animal waste management facility as a component of a CNMP. Specified snowload and deadload on truss is 30 PSF. It is designed to prevent precipitation to allow proper management of animal waste streams (manure or compost streams), thus mitigating the negative factors from the "before practice implementation".

Scenario Feature Measure: Footprint of building

Scenario Unit: Square Foot

Scenario Typical Size: 5,000

Scenario Cost: \$27,402.71

Scenario Cost/Unit: \$5.48

Cost Details (by category):

| Component Name | ID | Component Description | Unit | Price (\$/unit) | Quantity | Cost |
|--|------|---|-------------|-----------------|----------|-------------|
| Materials | | | | | | |
| Roof, Post Frame Building, 30' to 60' wide | 1676 | Post Frame Building, no sides, - 30' to 60' width. Building sites with expected snow loads up to 30 lbs per square foot and wind exposure in semi protected areas (wooded or terrain with numerous closely spaced obstructions). Includes materials, shipping | Square Foot | \$5.40 | 5000 | \$27,000.00 |
| Mobilization | | | | | | |
| Mobilization, very small equipment | 1137 | Equipment that is small enough to be transported by a pick-up truck with typical weights less than 3,500 pounds. Can be multiple pieces of equipment if all hauled simultaneously. | Each | \$71.64 | 2 | \$143.28 |
| Mobilization, medium equipment | 1139 | Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds. | Each | \$259.43 | 1 | \$259.43 |

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Scenario: #5 - Timber Frame Roof, Hvy Snow

Scenario Description:

A timber framed building with a timber or steel "sheet" roof. Anchor to existing facility located under roof or simple supports in ground. Manure is stored as a liquid in basins, tanks, and as a solid on concrete and earthen surfaces. Excess precipitation can cause premature filling of storage es or cause nutrients to leach from solid manure piles leading to uncontrolled runoff as well as odor issues. Specified snowload and deadload on truss is equal to or greater than 40 PSF. These are typically used in high snowfall areas of a county or state.

Associated Practices: Animal Mortality Facility (316), Composting Facility (317), Heavy Use Area Protection (561), Roof Runoff Structure (558), Waste Storage Facility (313), and Waste Treatment (629).

Before Situation:

Applicable where the exclusion of precipitation from an animal waste storage and/or treatment facility will improve an existing or planned system. Manure is stored as a liquid in basins, tanks, and as a solid on concrete and earthen surfaces. Excess precipitation can cause premature filling of storages or cause nutrients to leach from solid manure piles leading to uncontrolled runoff as well as odor issues.

After Situation:

A timber framed building with a timber or steel "sheet" roof and supporting foundation by associated practice. Engineered and installed in accordance with appropriate building codes and permits. Truss specified must handle a total combined snow and deadload of 50 PSF. Typical size is 5,000 square feet and is over an approved animal waste management facility as a component of a CNMP. It is designed to prevent precipitation to allow proper management of animal waste streams (manure or compost streams), thus mitigating the negative factors from the "before practice implementation".

Scenario Feature Measure: Footprint of building

Scenario Unit: Square Foot

Scenario Typical Size: 5,000

Scenario Cost: \$46,852.71

Scenario Cost/Unit: \$9.37

Cost Details (by category):

| Component Name | ID | Component Description | Unit | Price (\$/unit) | Quantity | Cost |
|--|------|---|-------------|-----------------|----------|-------------|
| Materials | | | | | | |
| Roof, Post Frame Building, 30' to 60' Wide, Hazardous Conditions | 2512 | Post Frame Building, no sides, - between 30' and 60' width. Hazardous building sites with snow loads exceeding 30 lbs per square foot and extreme wind exposure in areas of open terrain (flat open areas, grassland, shoreline, etc.). Includes materials, s | Square Foot | \$9.29 | 5000 | \$46,450.00 |
| Mobilization | | | | | | |
| Mobilization, medium equipment | 1139 | Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds. | Each | \$259.43 | 1 | \$259.43 |
| Mobilization, very small equipment | 1137 | Equipment that is small enough to be transported by a pick-up truck with typical weights less than 3,500 pounds. Can be multiple pieces of equipment if all hauled simultaneously. | Each | \$71.64 | 2 | \$143.28 |

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Scenario: #6 - Timber Frame Roof, complex foundation

Scenario Description:

A timber framed building with a timber or steel "sheet" roof and complex supporting foundation. Requires construction of anchor holes with concrete. Manure is stored as a liquid in basins, tanks, and as a solid on concrete and earthen surfaces. Excess precipitation can cause premature filling of storages or cause nutrients to leach from solid manure piles leading to uncontrolled runoff as well as odor issues. Specified snowload and deadload on truss is less than 40 PSF.

Associated Practices: Animal Mortality Facility (316), Composting Facility (317), Heavy Use Area Protection (561), Roof Runoff Structure (558), Waste Storage Facility (313), and Waste Treatment (629).

Before Situation:

Applicable where the exclusion of precipitation from an animal waste storage and/or treatment facility will improve of an existing or planned system. Manure is stored as a liquid in basins, tanks, and as a solid on concrete and earthen surfaces. Excess precipitation can cause premature filling of storages or cause nutrients to leach from solid manure piles leading to uncontrolled runoff as well as odor issues.

After Situation:

A timber framed building with a timber or steel "sheet" roof and supporting foundation. Engineered and installed in accordance with appropriate building codes and permits. Typical size is 5,000 square feet and is over an approved animal waste management facility as a component of a CNMP. Truss specified must handle a total combined snow and deadload of 30 PSF. It is designed to prevent precipitation to allow proper management of animal waste streams (manure or compost streams), thus mitigating the negative factors from the "before practice implementation".

Scenario Feature Measure: Footprint of building

Scenario Unit: Square Foot

Scenario Typical Size: 5,000

Scenario Cost: \$32,426.66

Scenario Cost/Unit: \$6.49

Cost Details (by category):

| Component Name | ID | Component Description | Unit | Price (\$/unit) | Quantity | Cost |
|--|------|---|-------------|-----------------|----------|-------------|
| Equipment/Installation | | | | | | |
| Concrete, CIP, formless, non reinforced | 36 | Non reinforced concrete cast-in-placed without forms by chute placement. Typical strength is 3000 to 4000 psi. Includes materials, labor and equipment to transport, place and finish. | Cubic yard | \$159.97 | 3 | \$479.91 |
| Auger, Truck Mounted | 2049 | Truck mounted auger for large diameter excavation. Includes equipment and labor. | Hour | \$350.31 | 8 | \$2,802.48 |
| Earthfill, Manually Compacted | 50 | Earthfill, manually compacted, includes equipment and labor | Cubic yard | \$5.77 | 9 | \$51.93 |
| Skidsteer, 80 HP | 933 | Skidsteer loader with horsepower range of 60 to 90. Equipment and power unit costs. Labor not included. | Hour | \$43.79 | 16 | \$700.64 |
| Labor | | | | | | |
| Equipment Operators, Light | 232 | Includes: Skid Steer Loaders, Hydraulic Excavators <50 HP, Trenchers <12", Ag Equipment <150 HP, Pickup Trucks, Forklifts, Mulchers | Hour | \$22.43 | 16 | \$358.88 |
| Supervisor or Manager | 234 | Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc. | Hour | \$42.74 | 16 | \$683.84 |
| Materials | | | | | | |
| Roof, Post Frame Building, 30' to 60' wide | 1676 | Post Frame Building, no sides, - 30' to 60' width. Building sites with expected snow loads up to 30 lbs per square foot and wind exposure in semi protected areas (wooded or terrain with numerous closely spaced obstructions). Includes materials, shipping | Square Foot | \$5.40 | 5000 | \$27,000.00 |
| Mobilization | | | | | | |
| Mobilization, small equipment | 1138 | Equipment <70 HP but can't be transported by a pick-up truck or with typical weights between 3,500 to 14,000 pounds. | Each | \$174.49 | 2 | \$348.98 |

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Scenario: #7 - Timber Frame Roof, Complex found, Hvy Snow

Scenario Description:

A timber framed building with a timber or steel "sheet" roof and complex supporting foundation. Requires construction of anchor holes with concrete. Manure is stored as a liquid in basins, tanks, and as a solid on concrete and earthen surfaces. Excess precipitation can cause premature filling of storages or cause nutrients to leach from solid manure piles leading to uncontrolled runoff as well as odor issues. Specified snowload and deadload on truss is equal to or greater than 40 PSF.

Associated Practices: Animal Mortality Facility (316), Composting Facility (317), Heavy Use Area Protection (561), Roof Runoff Structure (558), Waste Storage Facility (313), and Waste Treatment (629).

Before Situation:

Applicable where the exclusion of precipitation from an animal waste storage and/or treatment facility will improve of an existing or planned system. Manure is stored as a liquid in basins, tanks, and as a solid on concrete and earthen surfaces. Excess precipitation can cause premature filling of storages or cause nutrients to leach from solid manure piles leading to uncontrolled runoff as well as odor issues.

After Situation:

A timber framed building with a timber or steel "sheet" roof and supporting foundation. Engineered and installed in accordance with appropriate building codes and permits. Typical size is 5,000 square feet and is over an approved animal waste management facility as a component of a CNMP. Truss specified must handle a total combined snow and deadload of 50 PSF. It is designed to prevent precipitation to allow proper management of animal waste streams (manure or compost streams), thus mitigating the negative factors from the "before practice implementation".

Scenario Feature Measure: Footpring of building

Scenario Unit: Square Foot

Scenario Typical Size: 5,000

Scenario Cost: \$51,876.66

Scenario Cost/Unit: \$10.38

Cost Details (by category):

| Component Name | ID | Component Description | Unit | Price (\$/unit) | Quantity | Cost |
|--|------|---|-------------|-----------------|----------|-------------|
| Equipment/Installation | | | | | | |
| Auger, Truck Mounted | 2049 | Truck mounted auger for large diameter excavation. Includes equipment and labor. | Hour | \$350.31 | 8 | \$2,802.48 |
| Skidsteer, 80 HP | 933 | Skidsteer loader with horsepower range of 60 to 90. Equipment and power unit costs. Labor not included. | Hour | \$43.79 | 16 | \$700.64 |
| Earthfill, Manually Compacted | 50 | Earthfill, manually compacted, includes equipment and labor | Cubic yard | \$5.77 | 9 | \$51.93 |
| Concrete, CIP, formless, non reinforced | 36 | Non reinforced concrete cast-in-placed without forms by chute placement. Typical strength is 3000 to 4000 psi. Includes materials, labor and equipment to transport, place and finish. | Cubic yard | \$159.97 | 3 | \$479.91 |
| Labor | | | | | | |
| Supervisor or Manager | 234 | Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc. | Hour | \$42.74 | 16 | \$683.84 |
| Equipment Operators, Light | 232 | Includes: Skid Steer Loaders, Hydraulic Excavators <50 HP, Trenchers <12", Ag Equipment <150 HP, Pickup Trucks, Forklifts, Mulchers | Hour | \$22.43 | 16 | \$358.88 |
| Materials | | | | | | |
| Roof, Post Frame Building, 30' to 60' Wide, Hazardous Conditions | 2512 | Post Frame Building, no sides, - between 30' and 60' width. Hazardous building sites with snow loads exceeding 30 lbs per square foot and extreme wind exposure in areas of open terrain (flat open areas, grassland, shoreline, etc.). Includes materials, s | Square Foot | \$9.29 | 5000 | \$46,450.00 |
| Mobilization | | | | | | |
| Mobilization, small equipment | 1138 | Equipment <70 HP but can't be transported by a pick-up truck or with typical weights between 3,500 to 14,000 pounds. | Each | \$174.49 | 2 | \$348.98 |

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Scenario: #8 - Steel Frame with Roof

Scenario Description:

A steel framed building with steel "sheet" roof and simple supporting foundation or provided by associated practice. Manure is stored as a liquid in basins, tanks, and as a solid on concrete and earthen surfaces. Excess precipitation can cause premature filling of storages or cause nutrients to leach from solid manure piles leading to uncontrolled runoff as well as odor issues.

Associated Practices: Animal Mortality Facility (316), Composting Facility (317), Heavy Use Area Protection (561), Roof Runoff Structure (558), Waste Storage Facility (313), and Waste Treatment (629).

Before Situation:

Applicable where the exclusion of precipitation from an animal waste storage and/or treatment facility will improve of an existing or planned system. Manure is stored as a liquid in basins, tanks, and as a solid on concrete and earthen surfaces. Excess precipitation can cause premature filling of storages or cause nutrients to leach from solid manure piles leading to uncontrolled runoff as well as odor issues.

After Situation:

A steel framed building with steel "sheet" roof and supporting foundation provided by an associated practice. Engineered and installed in accordance with appropriate building codes and permits. Typical size is 10,000 square feet and is over an approved animal waste management facility as a component of a CNMP. It is designed to prevent precipitation to allow proper management of animal waste streams (manure or compost streams), thus mitigating the negative factors from the "before practice implementation".

Scenario Feature Measure: Footprint of building

Scenario Unit: Square Foot

Scenario Typical Size: 10,000

Scenario Cost: \$73,962.14

Scenario Cost/Unit: \$7.40

Cost Details (by category):

| Component Name | ID | Component Description | Unit | Price (\$/unit) | Quantity | Cost |
|---|------|--|-------------|-----------------|----------|-------------|
| Materials | | | | | | |
| Roof, Steel Frame Monoslope Building, greater than 60' wide | 1677 | Steel Frame Monoslope Building, greater than 60' width, includes materials, equipment, and installation. Does not include foundation preparation. | Square Foot | \$7.33 | 10000 | \$73,300.00 |
| Mobilization | | | | | | |
| Mobilization, very small equipment | 1137 | Equipment that is small enough to be transported by a pick-up truck with typical weights less than 3,500 pounds. Can be multiple pieces of equipment if all hauled simultaneously. | Each | \$71.64 | 2 | \$143.28 |
| Mobilization, medium equipment | 1139 | Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds. | Each | \$259.43 | 2 | \$518.86 |

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Scenario: #9 - Permeable Composite or Inorganic Cover

Scenario Description:

Permeable organic or inorganic cover applied to the liquid surface of a waste storage or treatment facility. Permeable organic or inorganic cover to reduce radiation and wind velocity over the surface of a manure storage to reduce transmission of odors and act as a medium for growth of microorganisms that utilize carbon, nitrogen, and sulfur to decompose odorous compounds.

Associated Practices: Waste Storage Facility (313).

Before Situation:

Applicable where the bio-treatment of emissions from an existing or planned waste storage or treatment facility will improve air quality.

After Situation:

Permeable composite or inorganic cover applied to the liquid surface of a waste storage or treatment facility.

Scenario Feature Measure: Storage Surface Area at Normal Full Level

Scenario Unit: Square Foot

Scenario Typical Size: 10,000

Scenario Cost: \$77,192.26

Scenario Cost/Unit: \$7.72

Cost Details (by category):

| Component Name | ID | Component Description | Unit | Price (\$/unit) | Quantity | Cost |
|--|------|--|-------------|-----------------|----------|-------------|
| Materials | | | | | | |
| Composite Cover, floating cover, > 5,000 square feet | 1860 | Composite material that is used to cover open storages with an area greater than 5,000 sf. Example, Hexa-Cover. Materials only. | Square Foot | \$7.67 | 10000 | \$76,700.00 |
| Mobilization | | | | | | |
| Mobilization, small equipment | 1138 | Equipment <70 HP but can't be transported by a pick-up truck or with typical weights between 3,500 to 14,000 pounds. | Each | \$174.49 | 2 | \$348.98 |
| Mobilization, very small equipment | 1137 | Equipment that is small enough to be transported by a pick-up truck with typical weights less than 3,500 pounds. Can be multiple pieces of equipment if all hauled simultaneously. | Each | \$71.64 | 2 | \$143.28 |

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Scenario: #11 - Flexible Membrane Cover

Scenario Description:

A fabricated rigid, semi-rigid, or flexible membrane over a waste storage or treatment facility. The membrane will cover the entire surface of a waste storage or treatment facility (e.g. waste treatment lagoon or anaerobic digester). Cover will exclude precipitation and/or capture biogas for controlled release for flaring or anaerobic digestion. Includes gas collection and flaring system.

Associated Practices: Animal Mortality Facility (316), Composting Facility (317), Heavy Use Area Protection (561), Roof Runoff Structure (558), Waste Storage Facility (313), and Waste Treatment (629).

Before Situation:

Applicable where the exclusion of precipitation from an animal waste storage or treatment lagoon will improve the management of an existing or planned system, capture and controlled release or flaring of emissions from an existing or planned agricultural waste storage to improve air quality, and/or biogas production and capture for energy use are part of the existing or planned animal waste management system.

After Situation:

A 50,000 SF fabricated rigid, semi-rigid, or flexible membrane over a waste storage or treatment facility. The membrane will cover the entire surface of a waste storage or treatment facility (e.g. waste treatment lagoon or anaerobic digester). Included will be a collection pipe for methane, a system of weighted tubes to create channels for rainwater collection and also keep membrane tight to surface. Methane collection pipe connected to flare with gas meter, flame arrestor and moisture control. Rainwater removal will be made under Pumping Plant (533). Payment based on surface area at top inside slope.

Scenario Feature Measure: Surface of Area of Storage Facility

Scenario Unit: Square Foot

Scenario Typical Size: 50,000

Scenario Cost: \$120,837.60

Scenario Cost/Unit: \$2.42

Cost Details (by category):

| Component Name | ID | Component Description | Unit | Price (\$/unit) | Quantity | Cost |
|--------------------------------------|------|--|-------------|-----------------|----------|-------------|
| Equipment/Installation | | | | | | |
| Track Loader, 95HP | 935 | Equipment and power unit costs. Labor not included. | Hour | \$89.84 | 40 | \$3,593.60 |
| Earthfill, Manually Compacted | 50 | Earthfill, manually compacted, includes equipment and labor | Cubic yard | \$5.77 | 90 | \$519.30 |
| Skidsteer, 80 HP | 933 | Skidsteer loader with horsepower range of 60 to 90. Equipment and power unit costs. Labor not included. | Hour | \$43.79 | 56 | \$2,452.24 |
| Trencher, 8" | 936 | Equipment and power unit costs. Labor not included. | Hour | \$91.20 | 16 | \$1,459.20 |
| Labor | | | | | | |
| Equipment Operators, Light | 232 | Includes: Skid Steer Loaders, Hydraulic Excavators <50 HP, Trenchers <12", Ag Equipment <150 HP, Pickup Trucks, Forklifts, Mulchers | Hour | \$22.43 | 96 | \$2,153.28 |
| 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 | \$22.22 | 80 | \$1,777.60 |
| 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 | \$39.79 | 40 | \$1,591.60 |
| Materials | | | | | | |
| Covered Lagoon Flare | 1666 | Flare excess gas to convert from methane to carbon dioxide. Includes labor and equipment. | Each | \$12,791.17 | 1 | \$12,791.17 |
| Covered Lagoon Gas Collection System | 1664 | Piping and collection system for biogas. Includes labor and equipment. | Each | \$39,705.31 | 1.3 | \$51,616.90 |
| Synthetic Liner, 40 mil | 1387 | Synthetic 40 mil HDPE, LLDPE, EPDM, etc membrane liner material. Includes materials and shipping only. | Square Yard | \$5.90 | 7200 | \$42,480.00 |
| Mobilization | | | | | | |
| Mobilization, medium equipment | 1139 | Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds. | Each | \$259.43 | 1 | \$259.43 |

Mobilization

| | | | | | | |
|------------------------------------|------|--|------|---------|---|----------|
| Mobilization, very small equipment | 1137 | Equipment that is small enough to be transported by a pick-up truck with typical weights less than 3,500 pounds. Can be multiple pieces of equipment if all hauled simultaneously. | Each | \$71.64 | 2 | \$143.28 |
|------------------------------------|------|--|------|---------|---|----------|