

**Practice:** 367 - Roofs and Covers

**Scenario:** #1 - Roof Structure, less than 33 feet Wide

**Scenario Description:** A timber or steel framed roof structure with a wood sheathing, steel "sheet" or fabric-like roof. Scenario does not include foundation costs. 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 include Waste Storage Facility (313), Animal Mortality Facility (316), Composting Facility (317), Obstruction Removal (500), Roof Runoff Structure (558), 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 or steel framed roof structure with a wood sheathing, steel "sheet" or fabric-like roof. Roof or cover will be engineered and installed in accordance with appropriate building codes and permits. Typical size is 1000 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:** Roof Area

**Scenario Unit:** Square Foot

**Scenario Typical Size:** 1000

**Total Scenario Cost:** \$9,188.61

**Scenario Cost/Unit:** \$9.19

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**Mobilization**

Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$251.62	1	\$251.62
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	\$69.48	1	\$69.48

**Materials**

Roof, Post Frame Building , less than 30' wide	1672	Post Frame Building, no sides, - less than 30' 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, equipment, and installation. Does not include foundation preparation.	Square Foot	\$8.87	1000	\$8,867.50
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**Practice:** 367 - Roofs and Covers

**Scenario:** #2 - Roof Structure, 33 feet to 60 feet Wide

**Scenario Description:** A timber or steel framed roof structure with a wood sheathing, steel "sheet" or fabric-like roof. Scenario does not include foundation costs. 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 include Waste Storage Facility (313), Animal Mortality Facility (316), Composting Facility (317), Obstruction Removal (500), Roof Runoff Structure (558), 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 or steel framed roof structure with a wood sheathing, steel "sheet" or fabric-like roof. Engineered and installed in accordance with appropriate building codes and permits. Typical size is 7,500 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:** Roof Area

**Scenario Unit:** Square Foot

**Scenario Typical Size:** 7500

**Total Scenario Cost:** \$63,771.11

**Scenario Cost/Unit:** \$8.50

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**Mobilization**

Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$251.62	1	\$251.62
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	\$69.48	1	\$69.48

**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, equipment, and installation. Does not include foundation preparation.	Square Foot	\$8.46	7500	\$63,450.00
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**Practice:** 367 - Roofs and Covers

**Scenario:** #3 - Roof Structure, more than 60 feet Wide

**Scenario Description:** A timber or steel framed roof structure with a wood sheathing, steel "sheet" or fabric-like roof. Scenario does not include foundation costs. 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 include Waste Storage Facility (313), Animal Mortality Facility (316), Composting Facility (317), Obstruction Removal (500), Roof Runoff Structure (558), 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 or steel framed roof structure with a wood sheathing, steel "sheet" or fabric-like roof. Engineered and installed in accordance with appropriate building codes and permits. Typical size is 24,000 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:** Roof Area

**Scenario Unit:** Square Foot

**Scenario Typical Size:** 24000

**Total Scenario Cost:** \$118,001.10

**Scenario Cost/Unit:** \$4.92

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**Mobilization**

Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$251.62	1	\$251.62
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	\$69.48	1	\$69.48

**Materials**

Roof, Post Frame Building, greater than 60' wide	1673	Post Frame Building, no sides, - greater than 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, equipment, and installation. Does not include foundation preparation.	Square Foot	\$4.90	24000	\$117,679.99
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**Practice:** 367 - Roofs and Covers

**Scenario:** #4 - Roof structure with foundation

**Scenario Description:** A timber or steel framed roof structure with a wood sheathing or steel "sheet" roof. Scenario includes foundation costs. Roof support is separate from associated manure storage structure, or roof structure may be used to cover an existing feed lot to eliminate runoff from rainfall events. 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 include Waste Storage Facility (313), Animal Mortality Facility (316), Composting Facility (317), Agrichemical Handling Facility (309), Obstruction Removal (500), Roof Runoff Structure (558), 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 or steel framed roof structure with a timber or steel "sheet" roof and supporting foundation. Engineered and installed in accordance with appropriate building codes and permits. Typical size is 7,500 square feet and is over an approved animal waste management facility or feedlot 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:** Roof Area

**Scenario Unit:** Square Foot

**Scenario Typical Size:** 7500

**Total Scenario Cost:** \$75,180.26

**Scenario Cost/Unit:** \$10.02

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**Equipment Installation**

Auger, Post driver attachment	934	Auger or post driver attachment to a tractor or skidsteer. Does not include power unit. Labor not included.	Hour	\$7.19	5	\$35.95
Concrete, CIP, formed reinforced	38	Steel reinforced concrete formed and cast-in-placed in formed structures such as walls or suspended slabs by chute placement. Typical strength is 3000 to 4000 psi. Includes materials, labor and equipment to transport, place and finish.	Cubic Yard	\$368.92	29	\$10,698.68
Skidsteer, 80 HP	933	Skidsteer loader with horsepower range of 60 to 90. Equipment and power unit costs. Labor not included.	Hour	\$43.87	10	\$438.67

**Labor**

Equipment Operators, Light	232	Includes: Skid Steer Loaders, Hydraulic Excavators <50 HP, Trenchers <12", Ag Equipment <150 HP, Pickup Trucks, Forklifts, Mulchers	Hour	\$23.59	10	\$235.85
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**Mobilization**

Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$251.62	1	\$251.62
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	\$69.48	1	\$69.48

**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, equipment, and installation. Does not include foundation preparation.	Square Foot	\$8.46	7500	\$63,450.00
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**Practice:** 367 - Roofs and Covers

**Scenario:** #5 - Flexible Membrane Cover with gas collection

**Scenario Description:** A fabricated rigid, semi-rigid, or flexible membrane covering the entire surface of a waste storage or treatment facility (e.g. waste treatment lagoon or anaerobic digester) with typical size of one acre. Cover will exclude precipitation and capture biogas for controlled release or flaring, to improve air quality and enable the production of renewable energy. Not to be used with 366-Covered Lagoon scenario. Associated practices include Waste Storage Facility (313), Waste Treatment Lagoon (359), Anaerobic Digester (366), Animal Mortality Facility (316), Composting Facility (317), Roof Runoff Structure (558), Pumping Plant (533), and Waste Treatment (629).

**Before Situation:** A waste storage or treatment facility is uncovered, emitting significant quantities of methane and volatile organic compounds which contribute to climate change and cause odor problems. Rainfall on the surface of the impoundment increases the volume of contaminated liquid that needs to be stored and/or treated. The energy potential of the biogas is untapped.

**After Situation:** A fabricated rigid, semi-rigid, or flexible membrane over a waste storage or treatment facility. Rainfall is excluded, minimizing the volume of contaminated liquid to be stored and/or treated. Air quality in the vicinity of the facility is improved, and the biogas is collected and made available for potential use as heat or energy generation.

**Scenario Feature Measure:** Surface Area of Facility Covered

**Scenario Unit:** Square Foot

**Scenario Typical Size:** 43560

**Total Scenario Cost:** \$338,889.57

**Scenario Cost/Unit:** \$7.78

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**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	\$116.90	287	\$33,550.16
Earthfill, Roller Compacted	49	Earthfill, roller or machine compacted, includes equipment and labor	Cubic Yard	\$4.08	430	\$1,752.65
Excavation, Common Earth, side cast, small equipment	48	Bulk excavation and side casting of common earth with hydraulic excavator with less than 1 CY capacity. Includes equipment and labor.	Cubic Yard	\$2.16	717	\$1,546.37

**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	\$31.88	1200	\$38,254.12
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	\$39.23	150	\$5,885.00

**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	\$169.24	1	\$169.24
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	\$69.48	4	\$277.93

**Materials**

Access Hatch	2433	Flotation and finishing details for sealable opening to allow access of mixing or sampling equipment through geomembrane floating cover. Includes materials and shipping only.	Each	\$5,332.59	5	\$26,662.94
Ballast tube	2436	Ballast tube filled with sand or concrete slurry installed at regular intervals on geomembrane floating cover to provide weight to tension the cover, protect against wind damage, control rainwater and facilitate walkway access. Includes materials and shipping	Foot	\$37.79	1880	\$71,047.15

		only.				
Covered Lagoon Flare	1666	Flare excess gas to convert from methane to carbon dioxide. Includes labor and equipment.	Each	\$12,910.72	1	\$12,910.72
Covered Lagoon Gas Collection System	1664	Piping and collection system for biogas. Includes labor and equipment.	Each	\$40,076.39	1	\$40,076.39
Float, Encapsulated Foam	2434	Flotation pocket with closed cell foam to be installed at regular intervals on geomembrane floating cover to transfer biogas to perimeter and facilitate walkway access. Includes materials and shipping only.	Foot	\$10.76	2068	\$22,244.07
Relief Vent	2435	Emergency biogas relief vent (burp valve) to be installed at selected locations on geomembrane floating cover. Includes materials and shipping only.	Each	\$800.49	22	\$17,610.73
Synthetic Liner, 60 mil	2109	Synthetic 60 mil HDPE, LLDPE, EPDM, etc membrane liner material. Includes materials and shipping only.	Square Foot	\$1.14	58564	\$66,902.11

**Practice:** 367 - Roofs and Covers

**Scenario:** #6 - Flexible Membrane Cover

**Scenario Description:** A fabricated rigid, semi-rigid, or flexible membrane covering the entire surface of a waste storage or treatment facility (e.g. waste treatment lagoon or anaerobic digester) with typical size of one acre. Cover will exclude precipitation and improve air quality. Associated practices include Waste Storage Facility (313), Waste Treatment Lagoon (359), Anaerobic Digester (366), Animal Mortality Facility (316), Composting Facility (317), Roof Runoff Structure (558), Pumping Plant (533), and Waste Treatment (629).

**Before Situation:** A waste storage or treatment facility is uncovered, emitting significant quantities of methane and volatile organic compounds which contribute to climate change and cause odor problems. Rainfall on the surface of the impoundment increases the volume of contaminated liquid that needs to be stored and/or treated.

**After Situation:** A fabricated rigid, semi-rigid, or flexible membrane over a waste storage or treatment facility. Rainfall is excluded, minimizing the volume of contaminated liquid to be stored and/or treated. Air quality in the vicinity of the facility is improved.

**Scenario Feature Measure:** Surface Area of Facility Covered

**Scenario Unit:** Square Foot

**Scenario Typical Size:** 43560

**Total Scenario Cost:** \$210,556.90

**Scenario Cost/Unit:** \$4.83

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**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	\$116.90	287	\$33,550.16
Earthfill, Roller Compacted	49	Earthfill, roller or machine compacted, includes equipment and labor	Cubic Yard	\$4.08	430	\$1,752.65
Excavation, Common Earth, side cast, small equipment	48	Bulk excavation and side casting of common earth with hydraulic excavator with less than 1 CY capacity. Includes equipment and labor.	Cubic Yard	\$2.16	717	\$1,546.37

**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	\$31.88	960	\$30,603.29
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	\$39.23	120	\$4,708.00

**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	\$169.24	1	\$169.24
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	\$69.48	4	\$277.93

**Materials**

Ballast tube	2436	Ballast tube filled with sand or concrete slurry installed at regular intervals on geomembrane floating cover to provide weight to tension the cover, protect against wind damage, control rainwater and facilitate walkway access. Includes materials and shipping only.	Foot	\$37.79	1880	\$71,047.15
Synthetic Liner, 60 mil	2109	Synthetic 60 mil HDPE, LLDPE, EPDM, etc membrane liner material. Includes materials and shipping only.	Square Foot	\$1.14	58564	\$66,902.11

**Practice:** 367 - Roofs and Covers

**Scenario:** #7 - Modular Floating Cover

**Scenario Description:** A permeable floating composite cover is deployed on the liquid surface of a 70 foot diameter waste storage facility. The permeable composite cover utilizes fabricated shapes or tiles that fit together to cover a minimum of 90% of the liquid surface of a waste storage facility. The waste storage volume must be documented in the CNMP as adequate to store the waste product and rainfall on the surface of the facility for the intended period without any credit for evaporative loss. Installation of the practice will address air quality by reducing emissions of odors and ammonia. Associated practices include Waste Storage Facility (313), and Waste Treatment Lagoon (359)

**Before Situation:** Applicable where an existing or planned animal waste storage or treatment lagoon is creating significant air quality concerns due to odor problems and the release of ammonia as a fine particulate matter precursor. Installation will improve the management of an existing or planned system to control the release of odors as well as ammonia to improve air quality as part of the existing or planned animal waste management system.

**After Situation:** A permeable modular cover over an animal waste storage or treatment facility. Installation of the modular floating tiles will improve air quality by reducing emissions of odors and ammonia. The typical waste storage structure treated has a liquid surface area of 70 foot diameter, or 3,848 square feet. Associated practices include Waste Storage Facility (313) and Waste Treatment Lagoon (359).

**Scenario Feature Measure:** Surface Area of Liquid Manure Storage Tank

**Scenario Unit:** Square Foot

**Scenario Typical Size:** 3848

**Total Scenario Cost:** \$25,254.04

**Scenario Cost/Unit:** \$6.56

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**Labor**

Equipment Operators, Light	232	Includes: Skid Steer Loaders, Hydraulic Excavators <50 HP, Trenchers <12", Ag Equipment <150 HP, Pickup Trucks, Forklifts, Mulchers	Hour	\$23.59	2	\$47.17
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**Equipment Installation**

Tractor, agricultural, 120 HP	962	Agricultural tractor with horsepower range of 90 to 140. Equipment and power unit costs. Labor not included.	Hour	\$56.75	2	\$113.51
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**Materials**

Composite Cover, floating tile, <= 5,000 square foot	1683	Composite material that is used to cover open storages with an area less than 5,000 sf. Example, Hexa-Cover. Materials only.	Square Foot	\$6.52	3848	\$25,093.36
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