

Concrete Storage

Many different contractors and engineers designed and installed concrete storage structures in Michigan. To be sure that the storage is functioning as designed, as-built documentation found in the producers' records or the NRCS operators file should verify that the storage was installed properly and that it meets technically sound engineering. This coupled with a thorough visual inspection is preferred. If as-built documentation is not available, a thorough visual inspection must be completed. If there is any indication of structural problems a qualified individual needs to be contacted. If the inspector feels that they are unqualified to make a visual inspection, a qualified individual needs to be contacted. The following review is acceptable for MAEAP farmstead verification and progressive planning; additional information may be needed for the completion of a CNMP.

Farmers die every year in confined spaces such as manure pits, silos, tank spreaders, below-ground storage pits, grain bins, dryers and others. Do not enter a confined space without proper training and equipment.

This worksheet reports the findings of the inspection based in terms of the information provided below. This investigation and evaluation is **not a certification** of the components, only an investigation of existing conditions. In order to be MAEAP verified under the farmstead system the component must meet the minimum requirements as noted by the highlighted boxes, and additional criteria as outlined in the introduction.

Concrete Storage Location Questions:	Yes	No	NA
Is subsurface field tile or drainage removed within 50ft of the structure? As Evidenced by: <input type="checkbox"/> As built documentation or <input type="checkbox"/> The producer and or contractor verify that there is no tile present			
Does the structure meet minimum State of Michigan well isolation distances? If not do they have a permit from the local health department or a Variance? As Evidenced By: <input type="checkbox"/> Meets isolation distance criteria as outlined in the Farm*A*Syst <input type="checkbox"/> Fits DEQ isolation distance criteria for public wells decision tree <input type="checkbox"/> Copy of permit showing variance to isolation distance criteria			
The structure is not built within a flood plane or is designed so as not to be inundated or damaged by a 25 year flood			
Is the bottom elevation of the structure no lower than the seasonal high water table , unless it is a perched water table and has been lowered (As Evidenced By): <input type="checkbox"/> A documented soils investigation (preferable) or <input type="checkbox"/> The producer and or contractor verify that there was no water evident during construction or <input type="checkbox"/> Known depth to the seasonal high water table.			

Concrete Storage Structure Questions	Yes	No	NA
Is there evidence of <u>extensive</u> cracking? (cracks you can fit a finger into or spider webs) If present it could be an indicator of poor construction or mix and may lead to structural problems			
Are the walls bowed or leaning?			
Is there <u>extensive</u> Honeycombing in the concrete? (looks like "glue" is gone and the aggregate is all that is left) If apparent it could indicate structural problems			
Does the structure contain rebar (steel bar reinforcement) in the concrete? If there is no rebar reinforcement in the concrete, and the structure holds liquids, it may not be structurally or technically sound, and should be looked at by a qualified individual.			
Is there unusual settlement in backfill areas around concrete? Significant settlement could be an indication of wall failure			
Concrete Storage Safety Questions	Yes	No	NA
Tanks and uncovered fabricated structures <u>for liquid or slurry storage</u> with walls or embankments less than 5ft above the ground surface are fenced and warning signs are posted.			
Covers and grating over openings (reception pits) are in place to prevent accidental entry.			
Adequate cable or fencing is in place at "push off" areas (manure transfer areas).			
Concrete Storage Maintenance Questions	Yes	No	NA
Structure is being used as designed and NOT for animal mortality, or human waste.			
Proper freeboard for liquid storage structures is maintained and measurable. Adequate freeboard is; 1foot + 25 year 24 hour rain event that falls onto or flows into the storage. Covered structures must maintain 0.5 ft of freeboard.			
Woody plant material is not growing near the storage facility or on the embankment and cannot compromise the structure			
Areas around transfer pumps are clean and free of leaks			
Runoff from the facility is adequately stored or treated (Solid storage areas or pads)			
Is the exterior free of burrowing animals (i.e. woodchucks)?			
A good vegetative cover is maintained on the earth embankment.			
Is the producer following an operation maintenance and record-keeping procedure?			
What is the procedure?			

Impermeable Membrane lined storage structures

Many different contractors and engineers designed and installed impermeable membrane lined storage structures in Michigan. To be sure that the storage is functioning as designed, as-built documentation found in the producers' records or the NRCS operators file should verify that the storage was installed properly and that it meets technically sound engineering. This coupled with a thorough visual inspection is preferred. If this is not available a thorough visual inspection must be completed. If there is any indication of structural problems a qualified individual needs to be contacted. If the inspector feels that they are unqualified to make a visual inspection, a qualified individual needs to be contacted. The following review is acceptable for MAEAP farmstead verification and progressive planning; additional information may be needed for the completion of a CNMP.

Farmers die every year in confined spaces such as manure pits, silos, tank spreaders, below-ground storage pits, grain bins, dryers and others. Do not enter a confined space without proper training and equipment.

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Basic 5 types of flexible membrane liners:

- HDPE = High Density Polyethylene - min. thickness criteria = 40 mil
- LLDPE = Linear Low Density Polyethylene – min. thickness criteria = 40 mil
- PVC = Poly Vinyl Chloride – min. thickness criteria = 30 mil
- EDPM = Synthetic Rubber Liner – min thickness criteria = 45 mil
- GCL = Geosynthetic Clay Liner – placement at 0.75 lb/sq.ft.

Type of Liner _____

Who Installed the Liner? _____

Impermeable Membrane Liner Location Questions:	Yes	No	NA
Is subsurface field tile or drainage removed within 50ft of the structure? As Evidenced by: <input type="checkbox"/> As built documentation or <input type="checkbox"/> The producer and or contractor verify that there is no tile present			
Does the structure meet minimum State of Michigan well isolation distances? If not do they have a permit from the local health department or a Variance? As Evidenced By: <input type="checkbox"/> Meets isolation distance criteria as outlined in the Farm*A*Syst <input type="checkbox"/> Fits DEQ isolation distance criteria for public wells decision tree <input type="checkbox"/> Copy of permit showing variance to isolation distance criteria			
The structure is not built within a flood plane or is designed so as not to be inundated or damaged by a 25 year flood			
Is the design bottom elevation a minimum of 2ft above the seasonal high water table? As Evidenced By: <input type="checkbox"/> A documented soils investigation (preferable) or <input type="checkbox"/> The producer and or contractor verify that there was no water evident during construction or <input type="checkbox"/> Known depth to the seasonal high water table.			
Impermeable Membrane Liner Structure Questions	Yes	No	NA
To meet acceptable standards is the flexible membrane liner the minimum thickness as identified above per the type of material used. If the liner does not meet this minimum requirement for thickness, it needs to be investigated by a qualified person. Minimum thickness ensures out-gassing does not occur, which can cause bubbling and liner failure.			
Is the liner UV resistant? If not, is there an adequate soil cover? (Minimum thickness of soil cover is 9 inches).			
Are gas bubbles present? Presence of bubbles beneath the liner indicates gas production is occurring under the liner material and could be an indication of a leak.			
Do pipe inlets have protection in place to prevent erosion on the interior?			
Are there tears visible in the liner?			
Impermeable Membrane Liner Safety Questions	Yes	No	NA
Tanks and uncovered fabricated structures for liquid or slurry storage with walls or embankments less than 5ft above the ground surface are fenced and warning signs are posted.			
Covers and grating over openings (reception pits) are in place to prevent accidental entry.			
Adequate cable or fencing is in place at "push off" areas (manure transfer areas).			

Impermeable Membrane Liner Maintenance Questions	Yes	No	NA
Structure is being used as designed and NOT for animal mortality, or human waste.			
Proper freeboard for liquid storage structures is maintained and measurable. Adequate freeboard is; 1foot + 25 year 24 hour rain event that falls onto or flows into the storage. Covered structures must maintain 0.5 ft of freeboard.			
Woody plant material is not growing near the storage facility or on the embankment and cannot compromise the structure			
Areas around transfer pumps are clean and free of leaks			
Is the exterior free of burrowing animals (i.e. woodchucks)?			
A good vegetative cover is maintained on the earth embankment.			
Is the producer following an operation maintenance and record-keeping procedure?			
What is the procedure?			

Earthen Storage Pond, Clay Lined

Many different contractors and engineers designed and installed Clay Lined Storage Ponds in Michigan. To be sure that the storage is functioning as intended As-built documentation is required. This documentation should verify that the storage was installed properly and that it meets technically sound engineering. There are two types of clay lined earthen storages, one is composed of a compacted clay material and the other is constructed in a “Natural Clay Base”.

Self-sealing storage ponds are not an acceptable means of storage (meaning a hole dug in the ground with the intention of it sealing itself)

A compacted clay lined storage pond should have a minimum of 1 foot of clay soils with a minimum permeability rate of 1×10^{-6} cm/sec or 0.0028 ft/day. Soils that typically meet this permeability rate are classified as CL, CH, MH, SC, or GC based on the Unified Soil Classification System. The compacted clay liner should also have at least 1 foot of soil cover over the compacted clay liner.

The “Natural Clay Base” liner should have a minimum thickness of 10 feet below the design bottom of the storage pond. The soil must meet the criteria for the Unified Soil Classification of CL, CH, MH, SC, or GC.

Due to the complexity of earthen lined or natural clay base storage pond(s) it is important to have the As-built documentation which may be found either in the producers’ records or the NRCS operators file. If shown in the as-built documentation that the liner criteria and soil classifications of the liner are met, and the facility passes a visual inspection, a more extensive review is not required for MAEAP verification. If there is a lack of as-built documentation or the inspector feels they are unqualified to make this evaluation a qualified individual needs to be contacted. The following review is acceptable for MAEAP farmstead verification and progressive planning; additional information may be needed for the completion of a CNMP.

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Earthen Storage Pond Location Questions:	Yes	No	NA
Is subsurface field tile or drainage removed within 50ft of the structure? As Evidenced by: <input type="checkbox"/> As built documentation or <input type="checkbox"/> The producer and or contractor verify that there is no tile present			
Does the structure meet minimum State of Michigan well isolation distances? If not do they have a permit from the local health department or a Variance? As Evidenced By: <input type="checkbox"/> Meets isolation distance criteria as outlined in the Farm*A*Syst <input type="checkbox"/> Fits DEQ isolation distance criteria for public wells decision tree <input type="checkbox"/> Copy of permit showing variance to isolation distance criteria			
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Earthen Storage Pond Structure Questions	Yes	No	NA
Does the facility meet the minimum thickness as identified above per the type of liner used? If the liner does not meet this minimum requirement for thickness it may not be structurally sound and a qualified individual needs to be contacted.			
Is the earthen embankment well kept and does not show signs of erosion on the interior or exterior?			
Is the exterior free of burrowing animals (i.e. woodchucks)?			
Is there any evidence of seepage from the embankments?			
Do pipe inlets have protection in place to prevent erosion on the interior?			
Earthen Storage Pond Safety Questions	Yes	No	NA
Tanks and uncovered fabricated structures <u>for liquid or slurry storage</u> with walls or embankments less than 5ft above the ground surface are fenced and warning signs are posted.			
Covers and grating over openings (reception pits) are in place to prevent accidental entry.			
Adequate cable or fencing is in place at "push off" areas (manure transfer areas).			

Earthen Storage Pond Maintenance Questions			
Structure is being used as designed and NOT for animal mortality, or human waste.			
Proper freeboard for liquid storage structures is maintained and measurable. Adequate freeboard is; 1foot + 25 year 24 hour rain event that falls onto or flows into the storage. Covered structures must maintain 0.5 ft of freeboard.			
Areas around transfer pumps are clean and free of leaks			
Woody plant material is not growing near the storage facility or on the embankment and cannot compromise the structure			
A good vegetative cover is maintained on the earth embankment.			
Is the producer following an operation maintenance and record-keeping procedure?			
What is the procedure?			

Slurry Store

Slurry Store structures are typically blue in color and are glass lined steel structures that are built by the Slurry Store Company. To be sure that the storage is functioning as designed, as-built documentation found in the producers' records or the NRCS operators file should verify that the storage was installed properly and that it meets technically sound engineering. This coupled with a thorough visual inspection is preferred. If this is not available a thorough visual inspection must be completed. If there is any indication of structural problems a qualified individual needs to be contacted. If the inspector feels that they are unqualified to make a visual inspection, a qualified individual needs to be contacted. The following review is acceptable for MAEAP farmstead verification and progressive planning; additional information may be needed for the completion of a CNMP.

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Slurry Store Location Questions:	Yes	No	NA
Is subsurface field tile or drainage removed within 50ft of the structure? As Evidenced by: <input type="checkbox"/> As built documentation or <input type="checkbox"/> The producer and or contractor verify that there is no tile present			
Does the structure meet minimum State of Michigan well isolation distances? If not do they have a permit from the local health department or a Variance? As Evidenced By: <input type="checkbox"/> Meets isolation distance criteria as outlined in the Farm*A*Syst <input type="checkbox"/> Fits DEQ isolation distance criteria for public wells decision tree <input type="checkbox"/> Copy of permit showing variance to isolation distance criteria			
The structure is not built within a flood plane or is designed so as not to be inundated or damaged by a 25 year flood			
Is the bottom elevation of the structure no lower than the seasonal high water table , unless it is a perched water table and has been lowered (As Evidenced By): <input type="checkbox"/> A documented soils investigation (preferable) or <input type="checkbox"/> The producer and or contractor verify that there was no water evident during construction or <input type="checkbox"/> Known depth to the seasonal high water table.			

Slurry Store Structure Questions	Yes	No	NA
Is there evidence of cracking or leaking?			
Are the walls bowed or leaning?			
Are the steel panels in good working condition (painted and without significant rusting)?			
Is there evidence of separation in the steel panels? If apparent it could be an indicator of potential structural problems.			
Is there unusual settlement or tilting?			
Slurry Store Safety Questions	Yes	No	NA
Tanks and uncovered fabricated structures <u>for liquid or slurry storage</u> with walls or embankments less than 5ft above the ground surface are fenced and warning signs are posted.			
Covers and grating over openings (reception pits) are in place to prevent accidental entry.			
Adequate cable or fencing is in place at "push off" areas (manure transfer areas).			
Slurry Store Maintenance Questions	Yes	No	NA
Structure is being used as designed and NOT for animal mortality, or human waste.			
Proper freeboard for liquid storage structures is maintained and measurable. Adequate freeboard is; 1foot + 25 year 24 hour rain event that falls onto or flows into the storage. Covered structures must maintain 0.5 ft of freeboard.			
Woody plant material is not growing near the storage facility or on the embankment and cannot compromise the structure			
Areas around transfer pumps are clean and free of leaks			
Is the exterior free of burrowing animals (i.e. woodchucks)?			
A good vegetative cover is maintained on the backfill around the structure.			
Is the producer following an operation maintenance and record-keeping procedure?			
What is the procedure?			