Liquid Manure Storage Structure Construction Inspections

Concrete Liner Construction Inspections and Stormwater Basics
How Does 7090 (Stormwater Rule) Apply to Feedlots?

- At this point in time feedlots are not required to obtain a separate stormwater permit
  - CAFO’s
    - The stormwater requirements are contained within the NPDES feedlot permit
  - Non-CAFO’s
    - Follow Construction BMP’s

Note: Future SDS permit coverage option may require feedlots to apply for a stormwater permit separately
**CAFO’s & Stormwater Basics**

- If disturbing 1 acre or more of land then a Stormwater Pollution Prevention Plan (SWPPP) is required to be developed.
  - required submittal with permit app if disturbing 3 or more acres

- If replacing existing pervious surface with 1 or more acres of impervious surface the SWPPP must contain a permanent stormwater management system
  - Ponds, infiltration area, filtration, etc.
Non-CAFO’s & Stormwater Basics

- Previous and Current Practice
  - Follow the BMP’s laid out in the fact sheet then no additional requirements
    - based on a 2004 memo during the stormwater rule-making process
Construction BMP’s (All Sites)

- Minimize size of the disturbed area
  - Common Sense requirement
  - Don’t disturb soil where you don’t have to
- Control tracking of soil onto roadways
  - Rock construction entrances
- Provide energy dissipation where stormwater leaves the site
  - Rip-rap to prevent erosion
Construction BMP’s (All Sites)

- **Sediment Controls**
  - Use a combination of buffers and/or silt fences or properly keyed and staked hay bales to protect surface waters and tile inlets.
  - Established controls on down gradient perimeters of the feedlot or manure storage area before beginning construction activities that disturb the up gradient soil.
Sediment Control Examples
Construction BMP’s (All Sites)

- Slope Protection
  - No unbroken slope of length greater than 75 feet for slopes of 3:1 or steeper.
  - Slopes (not actively worked) within 200 feet of a surface water must have a permanent cover within the following timeframe based on slope:
    - Steeper than 3:1 - 7 days
    - 10:1 to 3:1 - 14 days
    - Flatter than 10:1 - 21 days
Silt Fence

Note: Remove sediment when 1/3 height of silt fence
CAFO Stormwater

- Must follow all construction BMP’s
- Permanent system required when creating one acre of impervious surface
  - Do not count any impervious surface constructed before (not cumulative)
  - Must replace pervious surface to count towards the one acre
    - Replacing a concrete lot with a building does not count as new impervious area
  - Gravel roads are impervious surfaces
Permanent Stormwater System

- Designed to treat/store ½ inch of runoff from the new impervious surface
  - Does not need to collect all the runoff from new impervious surface
    - ½ inch of runoff may be accomplished by collecting one portion of an impervious surface (roof)
    - The rest of the runoff can leave largely uncontrolled
      - Use some common sense if the runoff goes directly to a lake, stream, etc.

- Does not need to be designed by a P.E.
I got a SWPPP, now what?

- Hopefully they used our form
  - Fill out the blanks, answer the questions, do the drawings, and the SWPPP should be complete

- Personally – I have a hard time scrutinizing the SWPPP too much as typically there is a field tile intake taking in all kinds of sediment right next to the construction site
  - Not the official view of the MPCA!!!
Stormwater Summary

- **CAFO’s**
  - Develop SWPPP if disturbing 1 acre or more
  - Submit SWPPP with permit app if disturbing 3 acre or more
  - Permanent system required if one acre of new impervious surface

- **Non-CAFO’s**
  - Follow BMP’s then no additional requirements
CONSTRUCTION INSPECTIONS
Pre-Construction Meetings

- **MPCA/CFO Role**
  - Attendance is recommended, not required
    - Meeting can happen without you
  - “By-stander” to answer questions
    - Owner/engineer should control the meeting
    - Not for our benefit
  - Let the owner/contractor know about required notifications and points during construction which you would like to see
    - Change Orders
Construction Inspections of LMSA’s

Inspections of LMSA’s

- Inspector must be
  - Design Engineer or person working under their direction
  - Qualified NRCS staff person
  - If concrete liner – ACI or MNDOT certified level I and II

- What to observe
  - Subgrade conditions – moisture, frozen soils, etc.
  - Location of perimeter tile and monitoring port
  - Repair of construction defects
  - Liner penetrations
Construction Inspections

When do we want to do them?

- Key Points of Construction
  - Subgrade preparation
  - Liner installation
    - Footings/Floor, Rebar config for walls, Wall pour
  - Post construction
    - Check for defects
- Request from CFO, Owner, Engineer
- Complaints
Rule Requirements for LMSA’s

- Construction and Notification Requirements
  - If **ANY** changes are proposed to the approved design, it must be approved by MPCA/CFO
  - Notify the MPCA/CFO three business days prior to commencing construction and within three business days following completion of construction
    - Three business days prior to backfilling concrete walls
  - Construction report from design engineer within 60 days of construction completion
    - Construction Inspection form signed by design engineer
Construction Inspections

What do we take on an inspection?

- Identification
- Camera
- Boots
- Ladder
- Paint/Marking pen
- Tape Measure
- Copy of the plans
Construction Inspections

What should we be aware of?

● Safety First!!!
  – Watch out for construction equipment
    ● Walk in front of any machinery
  – If it looks unstable, it probably is, stay out
  – Do not enter a pit when beams/slats are being set

● Park your vehicle out of the way

● Stay out of the construction crews’ way to the extent possible
Do **NOT** enter the pit when slats and/or beams are being set
Typical Construction Process

Excavation

What to look for:

- Proper size hole
- Water table
- Old building debris
- Intercepted tile lines
- Subgrade condition
  - Too wet, dry, lumpy, etc.
- Sufficient room for tile installation
- Soil removed for footings, pumpouts, etc.
Typical Construction Process

Prior to Floor Pouring

What to look for:

- Subgrade condition
- Soil removed for wall footings, pumpouts, and column footings
- Reinforcement
  - Footings & floor
- Forms
  - At least a 5” floor
- Pumpout formed as part of floor
- Construction joint forming
Typical Construction Process.

Prior to Floor Pouring

Typical Wall Footing Reinforcement

Typical Column Footing Reinforcement
Typical Construction Process Cont.

Floor Pouring

What to look for:

- Subgrade condition
  - Too wet, lumpy, etc.
- Reinforcement
  - Placed at proper vertical location in floor/footing
- Keyway being formed
- Connection to wall steel
  - Stab or bent rebar
- Construction Pace
  - Too fast, slow, etc.
This is TOO wet to pour concrete!!!
Typical Construction Process

Prior to Wall Pour

What to look for:

- Reinforcement
  - Proper spacing vertical and horizontal
  - Proper number & type
- Keyway is clean
- Water stop in place
- Rebar free of oil, dirt, rust
- Correct wall thickness
- Construction joint forms
- Rebar overlap and corners
Water stop and keyway into forms
Rebar inside forms with proper cover
Rebar cage for pumpout
(bent bars around corners – no butt joints in corner)
Rebar spacing
Typical Construction Process

Wall Pouring

What to look for:

- Reinforcement
  - Proper spacing
  - Proper number & type
  - Proper location in wall
    - Horizontal - 2” from edge
    - Vertical – according to plan
- Forms oiled and clean
- Vibration being used
- Construction Pace
  - Too fast, slow, etc.
Typical Construction Process

Perimeter Tile

What to look for:

- Placement
  - One foot horizontal from footing
  - Below floor level
- Sump or daylight
- Dedicated monitoring port
- Type of envelope material
- Around all sides of barn
- Damage during construction
- Pre-Tiled?
Typical Construction Process

Columns, Beams, & Slats

What to look for:

- Reinforcement for columns
  - Consistent with design
- Reinforcement for beams
  - Extra rebar in beam pockets
- Beams rest securely on columns
  - First three beams touch or grouted
- Slats rest securely on slat ledge and splices fall securely on beams
Typical Construction Process

Other Items

What to look for:

- Engineer/Inspector on site
- Testing
  - Cylinders being poured
  - Air testing, slump, etc.
- How many concrete trucks on site waiting
- Enough crew members to keep up
- Water being added to concrete
- Concrete truck washout area
- Other practices/items that seem out of place
Concrete Testing Equipment

Test Cylinders
Concrete Testing Equipment

Slump Cone
Concrete Testing Equipment

Air Content (Recommended)
Post Construction Defects & Repair

Honeycombing

Defect

Repair

- Remove all loose stones
- Spread grout over affected area

Importance

- Structural
- Protects steel
- Protect against leakage
Post Construction Defects & Repair

Cracks

Defect

Repair

- Apply crack sealant compound
- Spread grout over affected area

Importance

- Protect against leakage
- Protect steel
Epoxy fix
(seepage from water above top of wall elevation)
### Post Construction Defects & Repair

#### Exposed Rebar

<table>
<thead>
<tr>
<th>Defect</th>
<th>Repair</th>
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<tbody>
<tr>
<td></td>
<td>• Apply sealant compound</td>
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<tr>
<td></td>
<td>• Spread grout over affected area</td>
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**Importance**

- Protect against leakage
- Protect steel
- Structural
Post Construction Defects & Repair

Mudballs

Defect

Repair

- Patch with new concrete
  - Only isolated occurrences
- 3” overlay over affected area

Importance

- Protect against leakage
- Protect steel
- Rule requires 5” thick floor
PLACE 3/8"x3/4" BENTONITE WATERSTOP AROUND PERIMETER OF OVERLAY

5" CONCRETE OVERLAY, CLEAN EXISTING CONCRETE SURFACE, SPRAY WITH BONDING AGENT PRIOR TO PLACING OVERLAY

FOOTINGS TO BE REMOVED 24" WIDTH MINIMUM.

PUMPOUTS TO BE CUT OUT AND REMOVED COMPLETELY, SEE DETAIL FOR REPLACEMENT METHODS

DIMENSIONS ON PLAN MAY VARY, VISIT SITE MEASUREMENTS. MAKE SAW CUTS BASED ON MEASUREMENTS MARKED ON PLAN.
Post Construction Defects & Repair

Unauthorized Penetration

Defect

Repair

- Plug with new concrete

Importance

- Protect against leakage
- Prohibited except manure transfer lines
Post Construction Defects & Repair

Beam Spacing and Alignment

Defect

Repair

- Move Beams
- Grout joints
  - 1st 3 beam segments grout or touch

Importance

- Structural
Concrete patio blocks should not be used as shims for beams.

(The hollow cinder block was used as a form in this case)
Precast Concrete LMSA’s

Weiser Manure Storage Structures

What to Be Aware of Pre-Construction

- MN engineer has stamped the plans
- Pan-L-Bilt System
  - L-Panel system is not OK
  - Full Spec Book is included
- Type 3 floor is proposed
- Soil borings have been done and P-tile need addressed
  - typically done by third party
Precast Concrete LMSA’s

Weiser Manure Storage Structures

What to Be Aware of

During Construction

- Type 3 floor is installed
- Waterstop is placed at all wall panel joints
  - Still debating the need in wall/floor joint
- P-Tile is installed
  - Done by a 3rd party
Earthen Basin Tidbits

Protection Of Liner

- Concrete pumpout ramps
  - 16 ft wide min.
- Concrete pumpout pads
  - 20’ x 20’
  - Sump design is best

Damage from Agitation
Why is there concern???
MPCA/CFO role in construction inspection process

- **Check the checker**
  - Technically not required by rule to be out at sites
  - Recommended to get out at least once as this is the time to discover and fix problems

- **When can the LMSA be used**
  - As soon as it is completed
    - No need to wait for MPCA/CFO approval
      - Provided proper notices are given
How to handle major problems

- Typically the engineer is willing to fix issues
  - Acceptance of construction report by MCPA/CFO requires repair of all defects
    - If construction report is not adequate may need to remove manure for additional investigation/repairs
      - This has happened recently

- Should I stop the construction process?
  - Rarely needed – consult with MPCA engineers
    - Fixes can be done later on, just may be more costly
    - Could be needed if sub-standard material is being used
Other LMSA Technical Items

- **Finished**
  - Concrete Pit Review Checklist
  - Concrete Pit Design Guidance Document

- **Nearly Finished**
  - Earthen Basin Design Guidance Document

- **Planned**
  - Earthen Basin Review Checklist
  - Synthetic Liner Design Guidance Document
  - Synthetic Liner Review Checklist
  - LMSA Construction Inspection Checklist
Questions?

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