#### 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 rulemaking 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
    - <sup>1</sup>/<sub>2</sub> 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 <u>ANY</u> 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!!!

# 06/15/2012





# **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 spacing

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# **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)





#### Honeycombing Defect



- Remove all loose stones
- Spread grout over affected area

#### Importance

Repair

- Structural
- Protects steel
- Protect against leakage











### Cracks

#### Defect



#### Repair

- Apply crack sealant compound
- Spread grout over affected area

- Protect against leakage
- Protect steel









# Exposed Rebar



#### Repair

- Apply sealant compound
- Spread grout over affected area

- Protect against leakage
- Protect steel
- Structural



## Mudballs

#### Repair

Defect

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

- Protect against leakage
- Protect steel
- Rule requires 5" thick floor















#### Unauthorized Penetration Defect Repair



• Plug with new concrete

- Protect against leakage
- Prohibited except manure transfer lines

#### Beam Spacing and Alignment Defect Repair



- Move Beams
- Grout joints
  - 1<sup>st</sup> 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**

<u>What to Be Aware of</u> <u>Pre-Construction</u>

- MN engineer has stamped the plans
- Pan-L-Bilt System
  - L-Panel system is <u>not</u> 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 3<sup>rd</sup> party



# **Earthen Basin Tidbits**

#### **Damage from Agitation**

#### **Protection Of Liner**

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



## 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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