

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

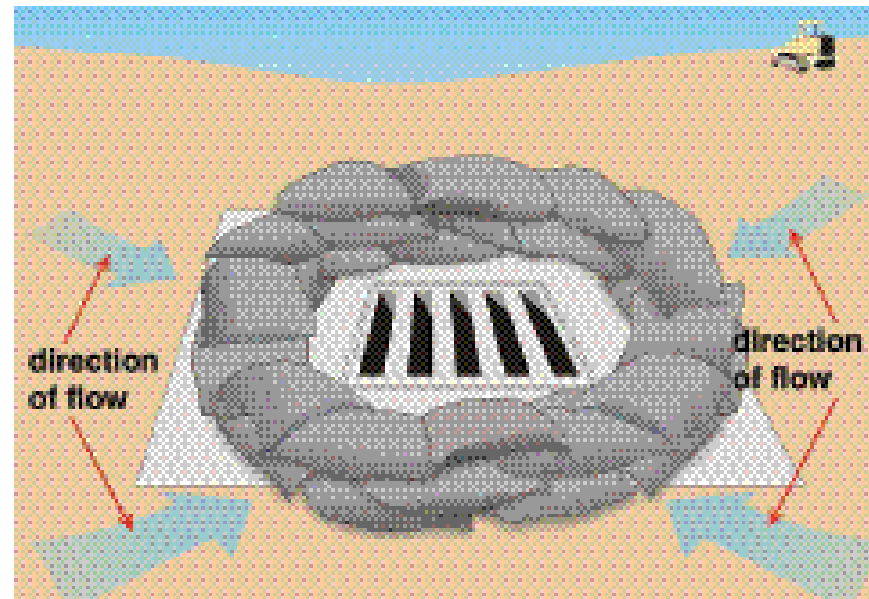
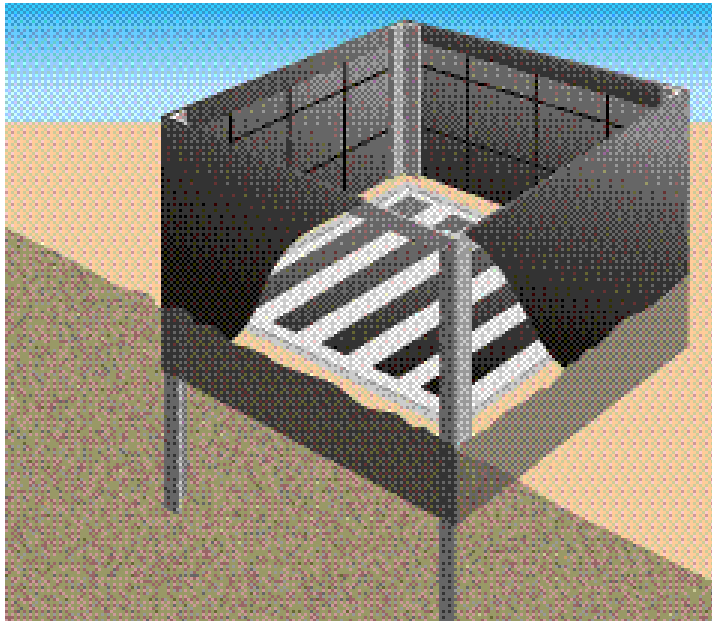
Construction BMP's (All Sites)

- 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.

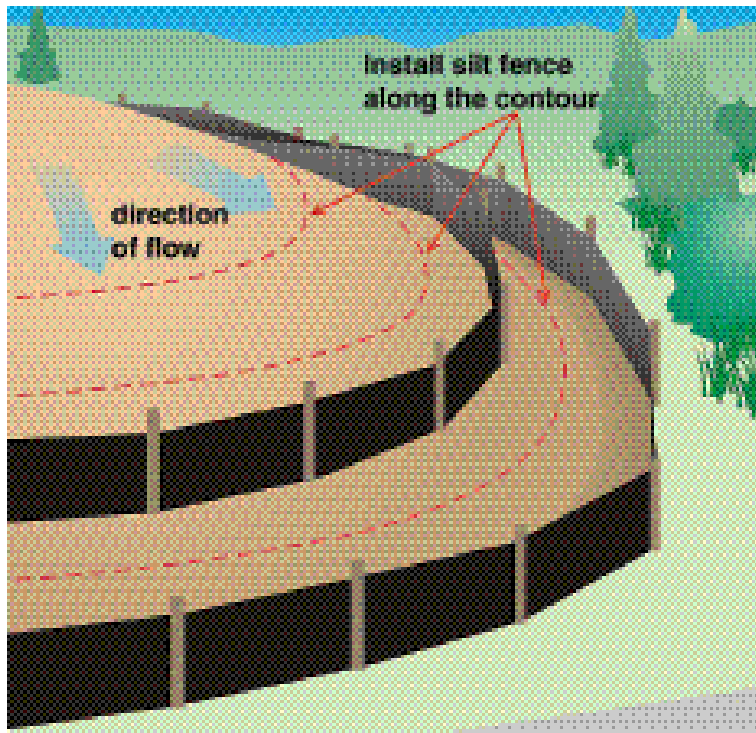
Sediment Control Examples



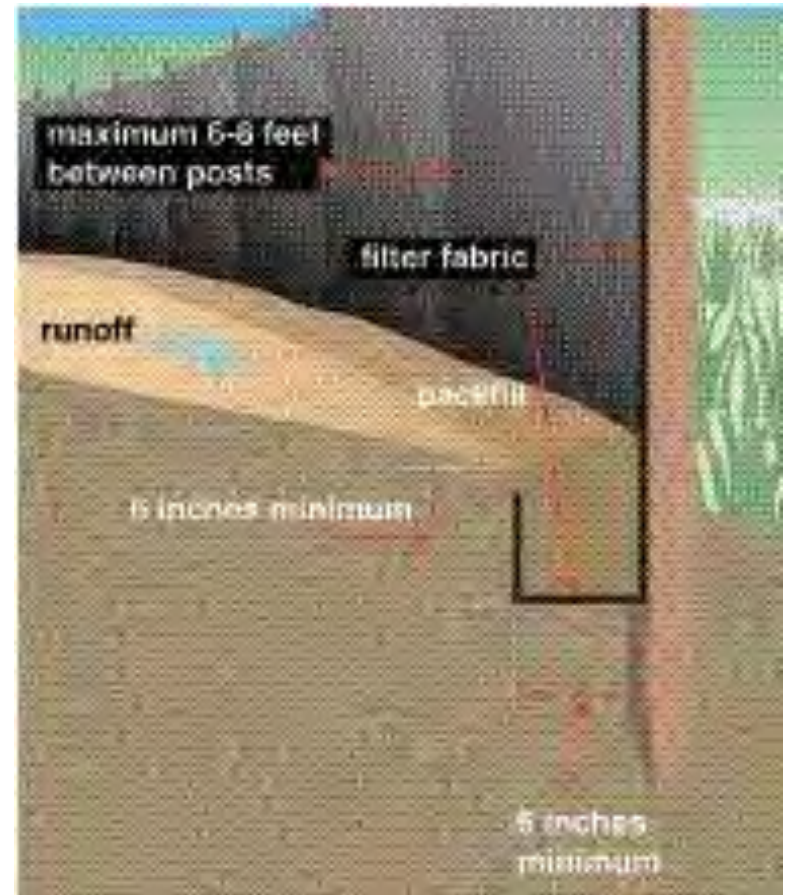
Construction BMP's (All Sites)

- 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 $\frac{1}{2}$ inch of runoff from the new impervious surface
 - Does not need to collect all the runoff from new impervious surface
 - $\frac{1}{2}$ 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:

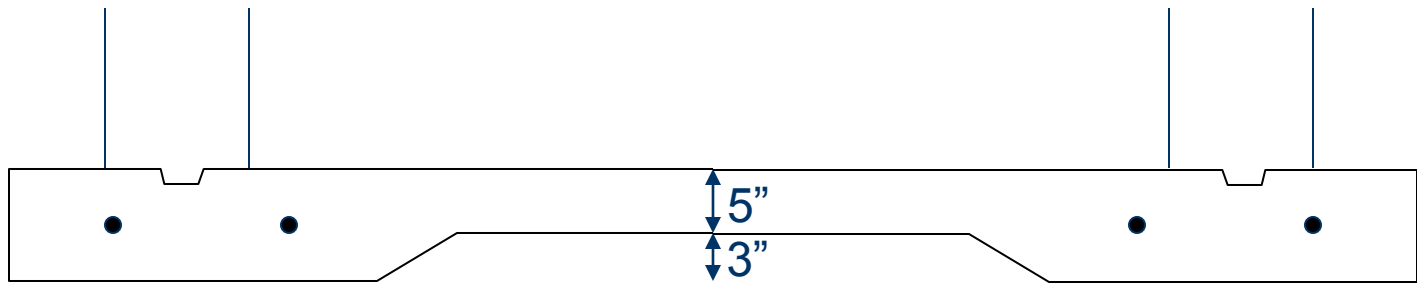
- Subgrade condition
- Soil removed for wall footings, pumpouts, and **column footings**
- Reinforcement
 - Footings & floor
- Forms
 - At least a 5" floor
- Pumpout formed as part of floor
- Construction joint forming



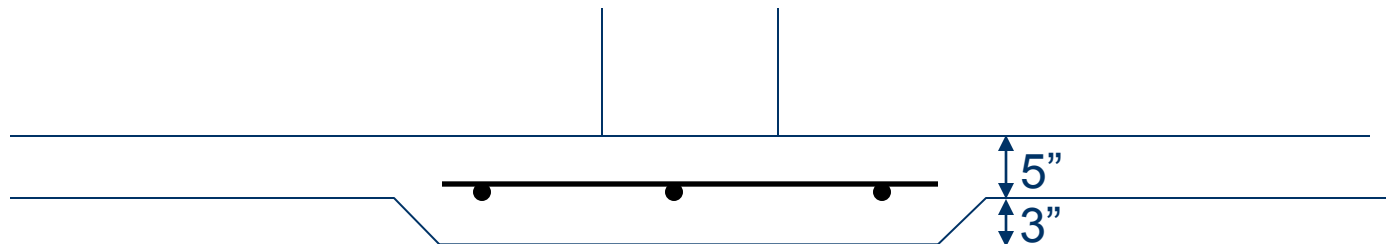
Typical Construction Process.

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!!!



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Typical Construction Process

Prior to Wall Pour

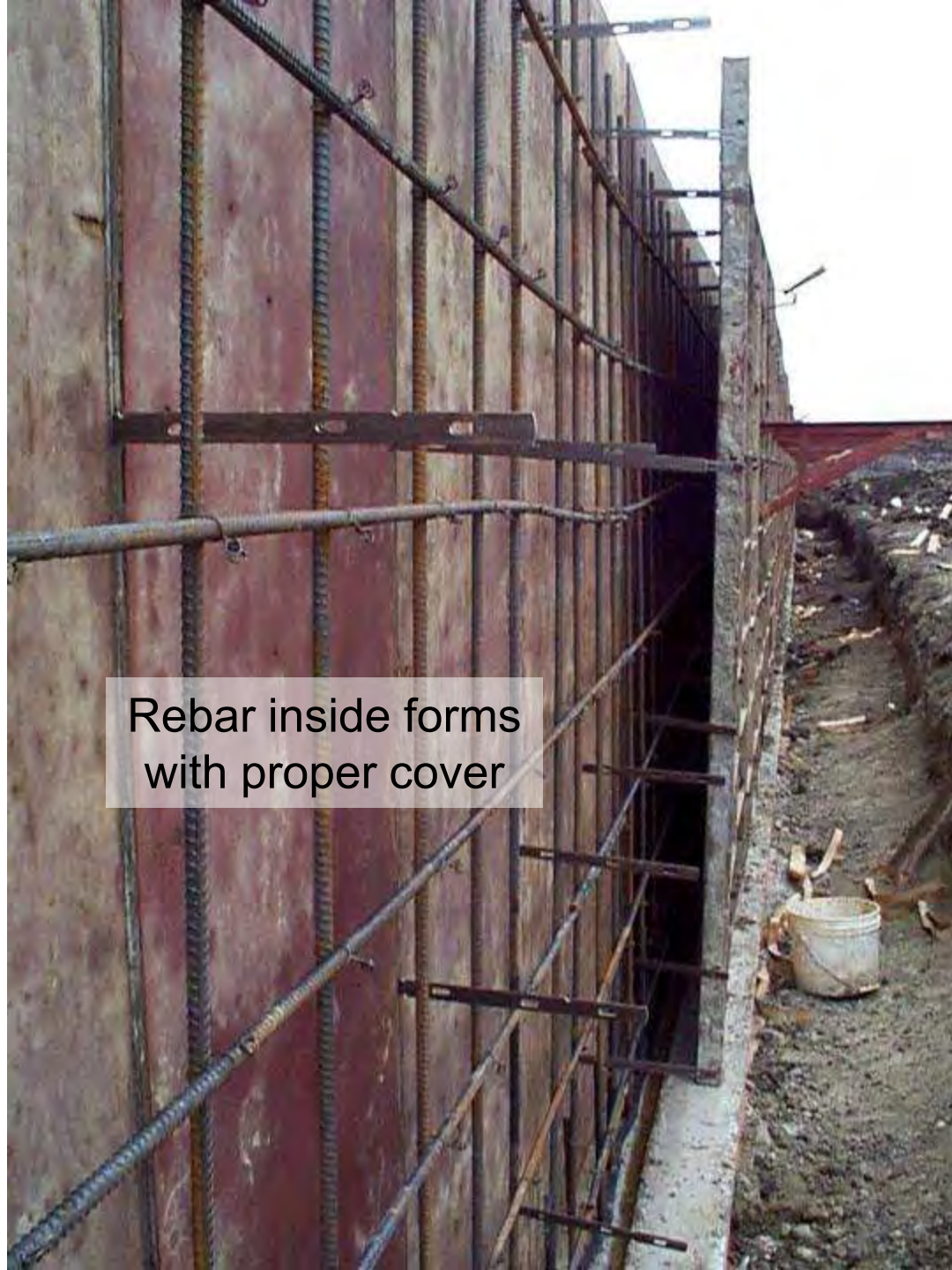
What to look for:

- 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

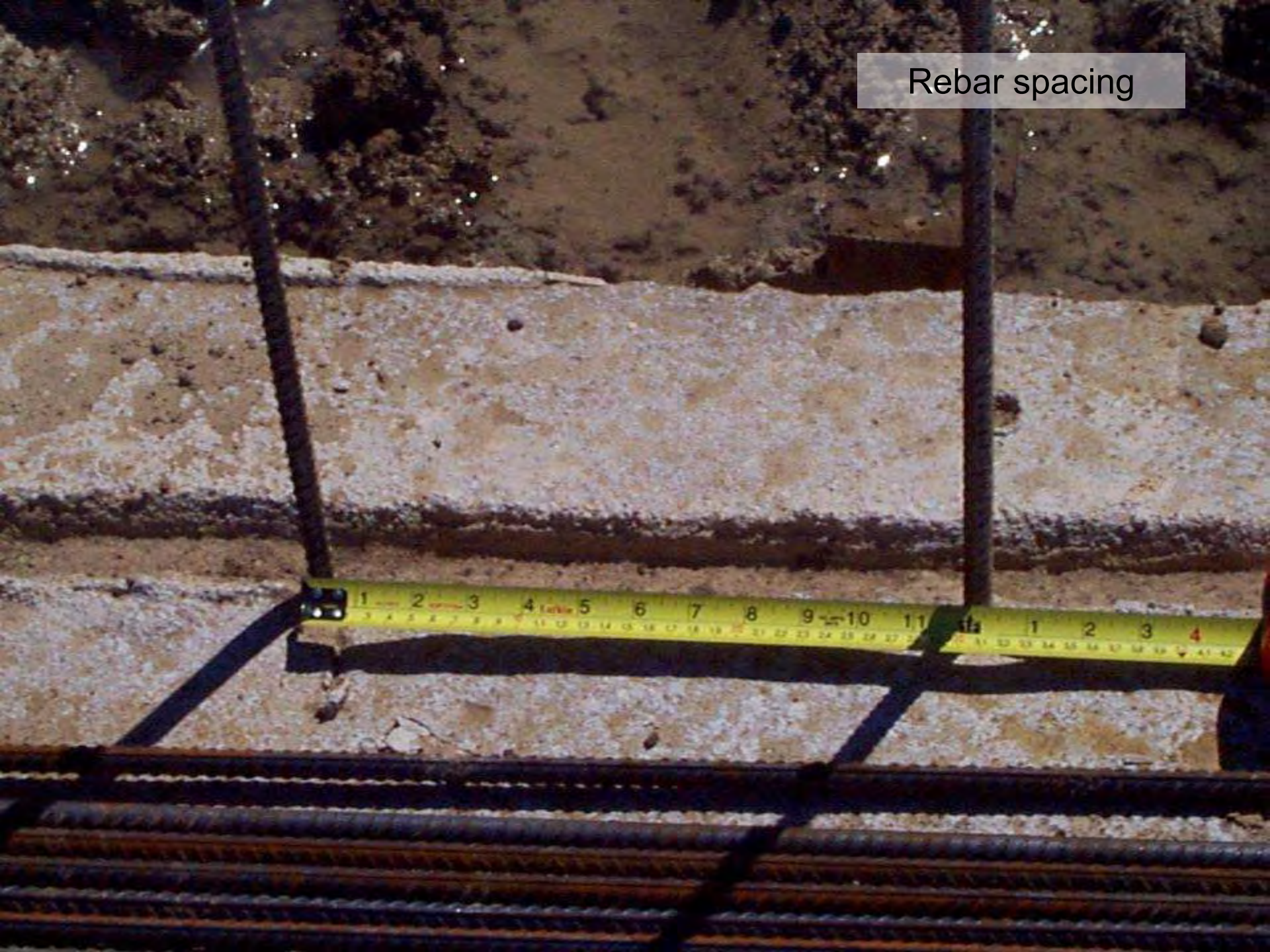


Rebar inside forms
with proper cover

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

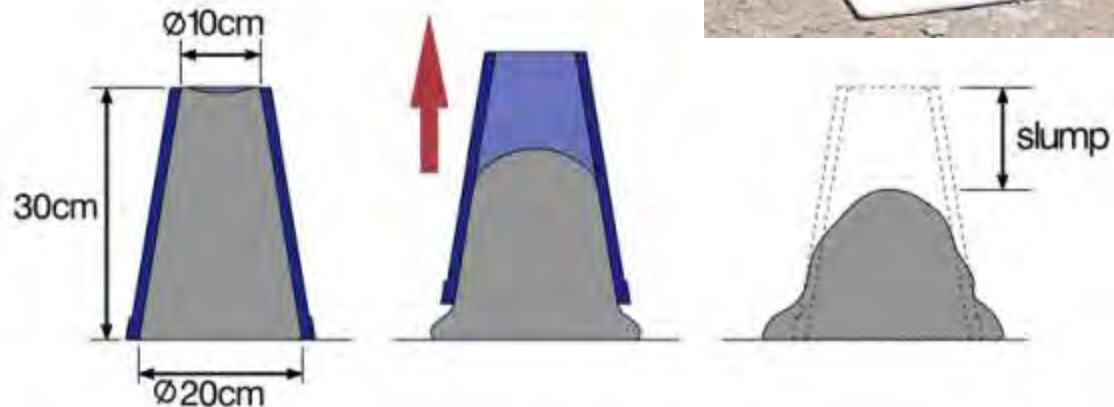
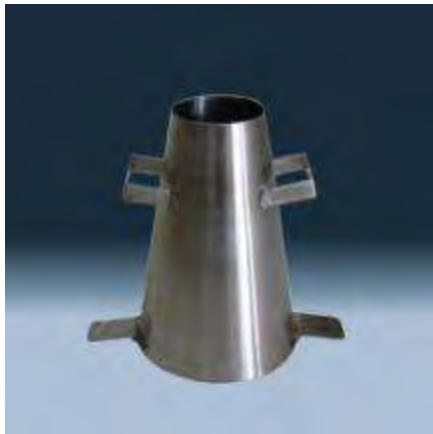
Concrete Testing Equipment

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







Grout fix



Epoxy fix



Post Construction Defects & Repair

Cracks

Defect



Repair

- Apply crack sealant compound
- Spread grout over affected area

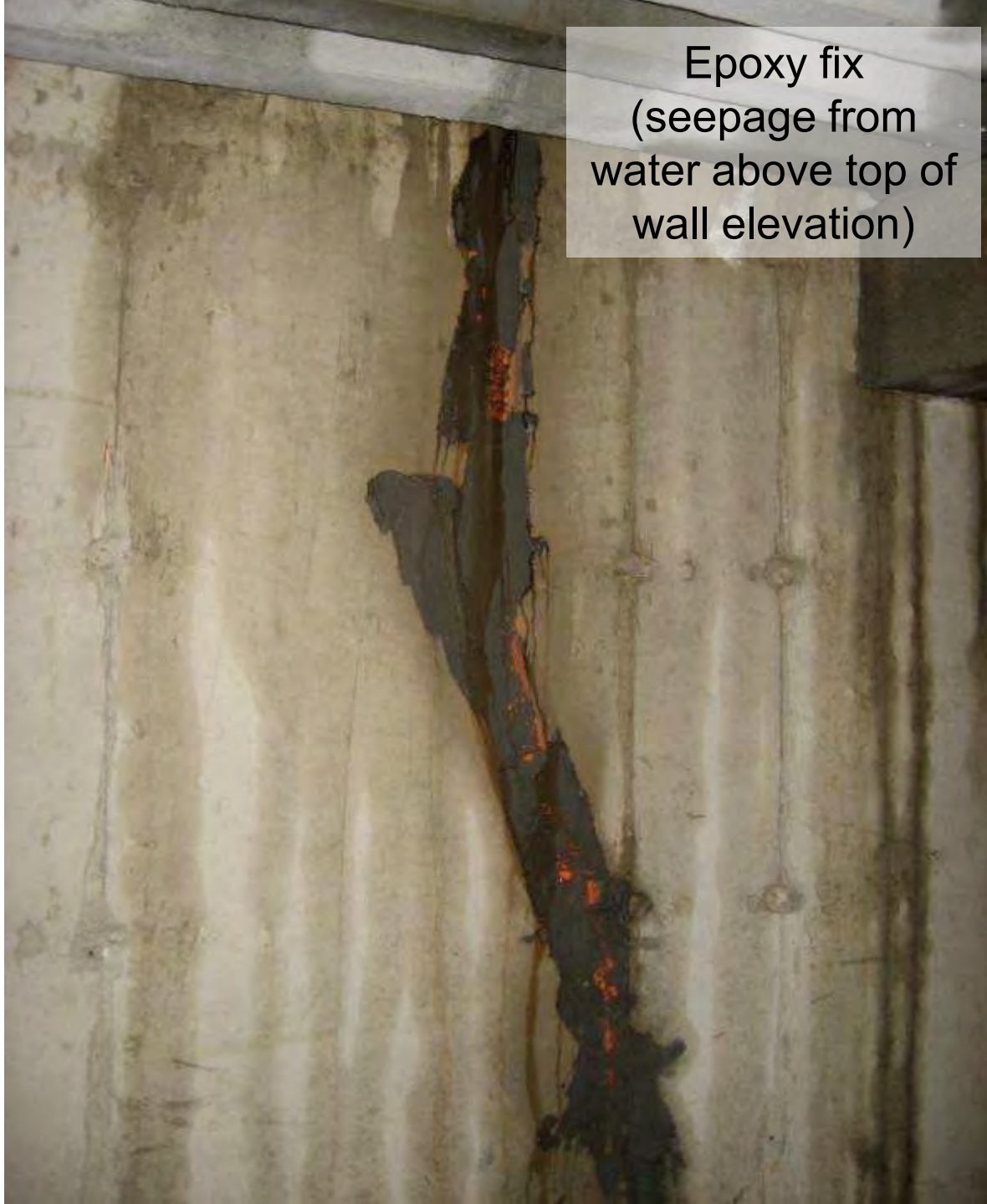
Importance

- Protect against leakage
- Protect steel





Epoxy fix
(see page from
water above top of
wall elevation)



Grout fix



Post Construction Defects & Repair

Exposed Rebar

Defect



Repair

- Apply sealant compound
- Spread grout over affected area

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





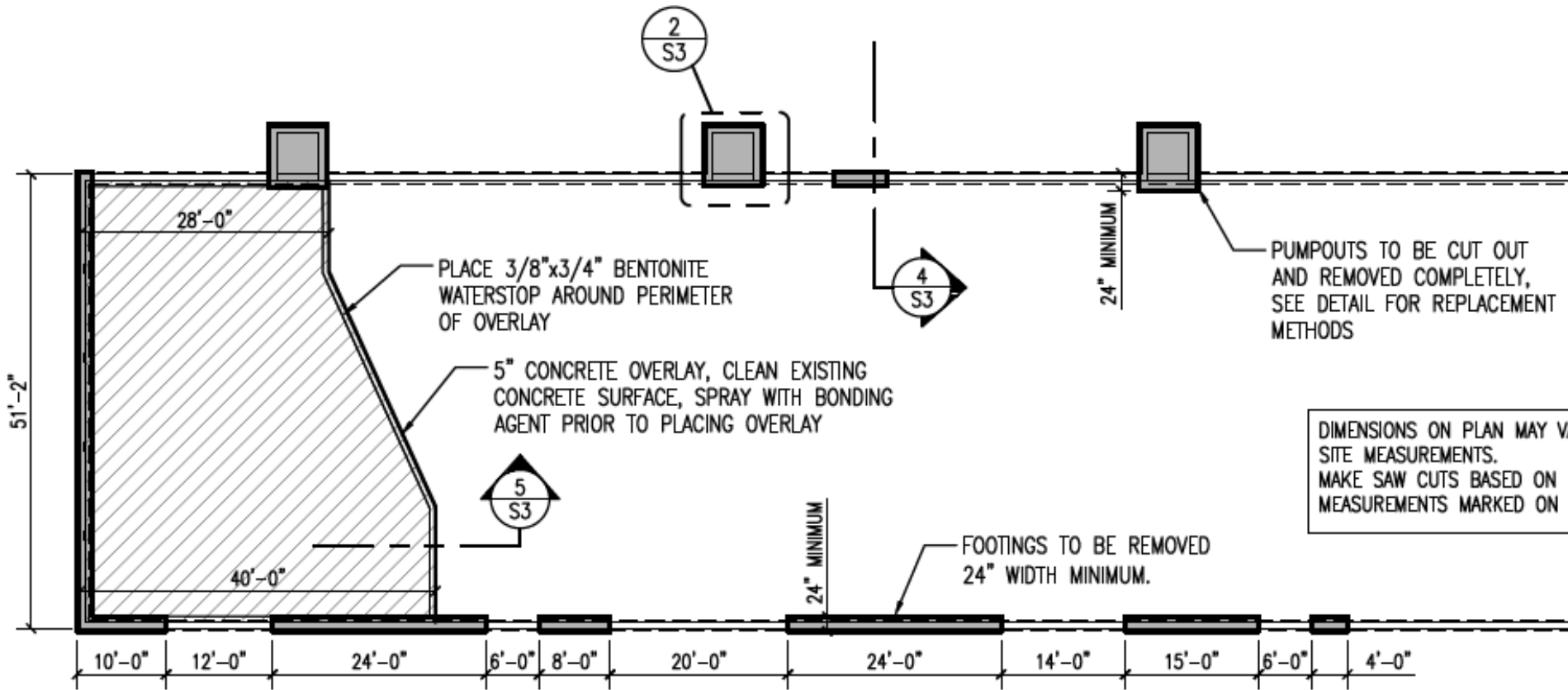
Overlay fix











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

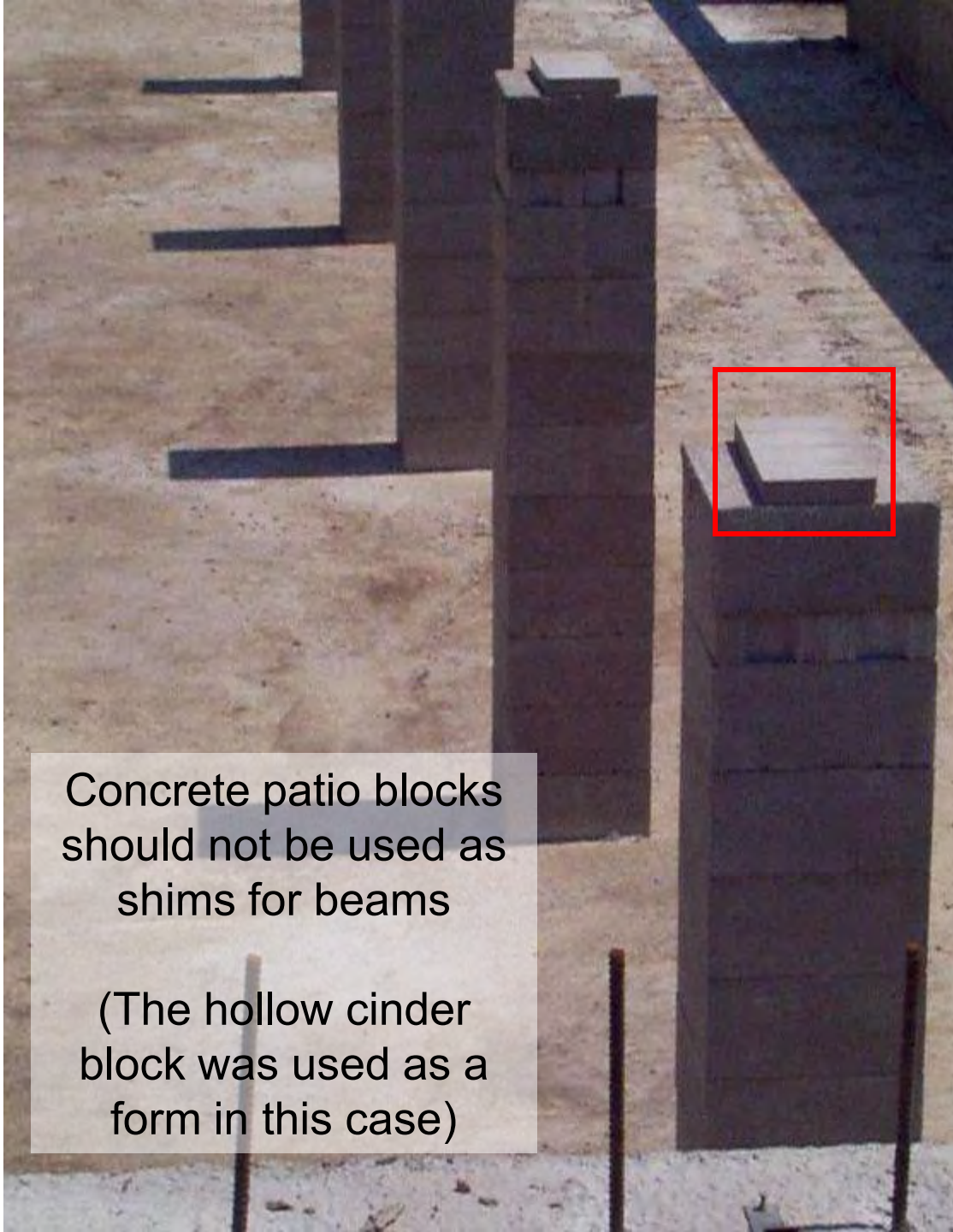


- Move Beams
- Grout joints
 - 1st 3 beam segments grout or touch

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

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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