



Photographs:  
Acceptable, Unacceptable, and Unacceptably Repaired Precast Concrete  
Products

A Visual Aid For:  
Bureau of Materials and Physical Research's (BMPR) Policy Memorandum,  
"Quality Control/Quality Assurance Program for Precast Concrete Products"

## Revision History and Document Control

Photographs: Acceptable, Unacceptable, and Unacceptably Repaired Products will be reviewed by the Concrete Products Engineer annually and updated as necessary to reflect current policy. Updates are made to the electronic file as needed and hard copies are uncontrolled. Archive versions are available to examine in the Bureau of Materials and Physical Research (BMPR).

Revision Date	Description	Approval
1/1/10	Revised annotations to existing photos.	JAB
1/1/10	Added approximately 30 new photos with annotations.	JAB
3/15/13	Added 2 new photos with annotations.	JAB
3/15/13	Revised annotations to existing photos.	JAB
3/7/14	Revised annotations to existing photos.	JAB



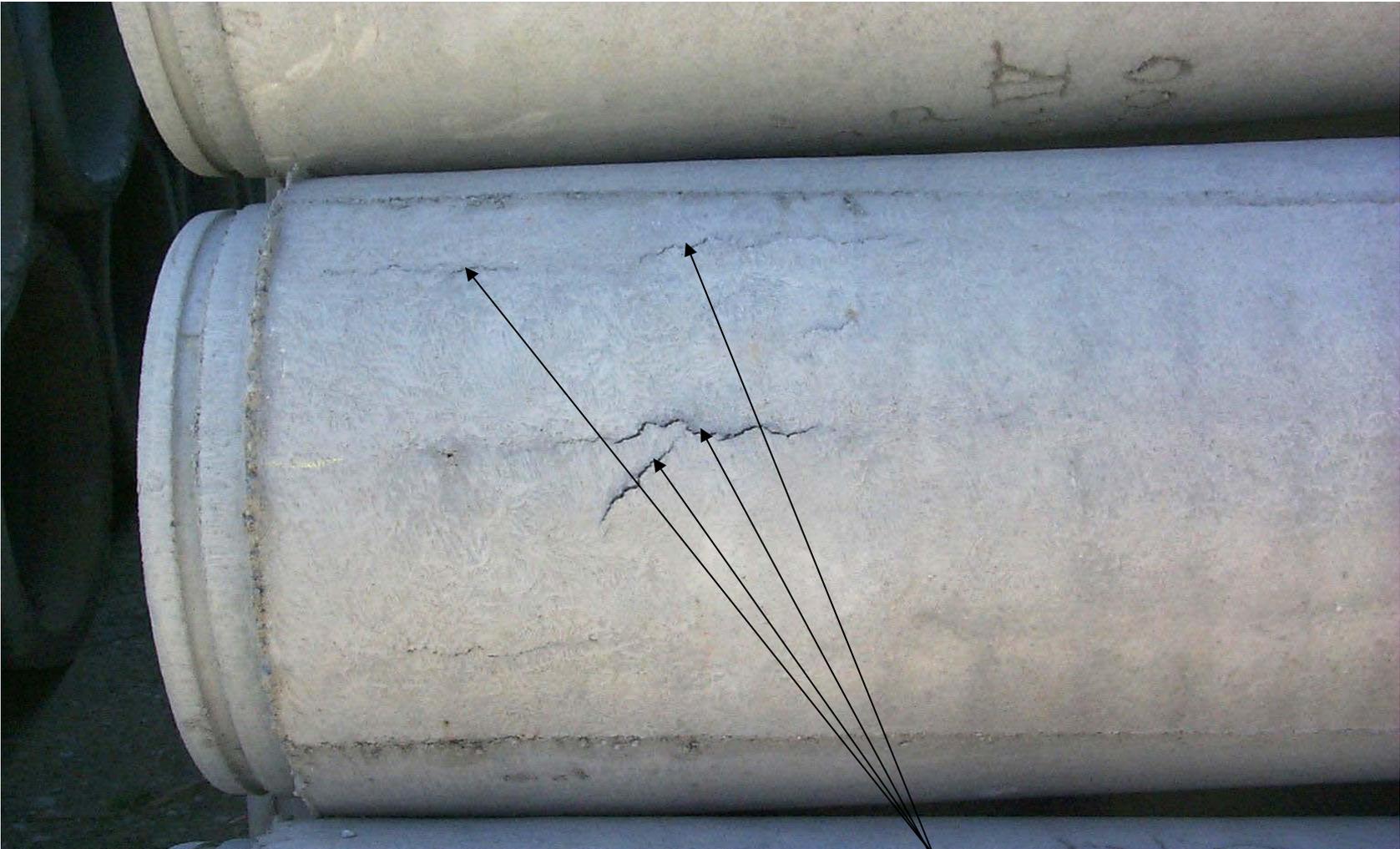
**REINFORCED CONCRETE PIPE - CRACKS**

**Unacceptable Product:** Cracks passes entirely through wall of pipe. See BMPR Policy Memo, Section 23, Point 2.a.



**REINFORCED CONCRETE PIPE – CRACKS**

**Unacceptable Product:** Width of surface crack in pipe is 0.01 in. (0.30 mm) or greater and exceeds 12 in. (300 mm) in length. See BMPR Policy Memo, Section 23, Point 2.c.



**REINFORCED CONCRETE PIPE – CRACKS**

**Unacceptable Product:** Width of surface cracks in pipe are 0.01 in. (0.30 mm) or greater and summation of crack lengths exceed 24 in. (600 mm) in length. See BMPR Policy Memo, Section 23, Point 2.c.

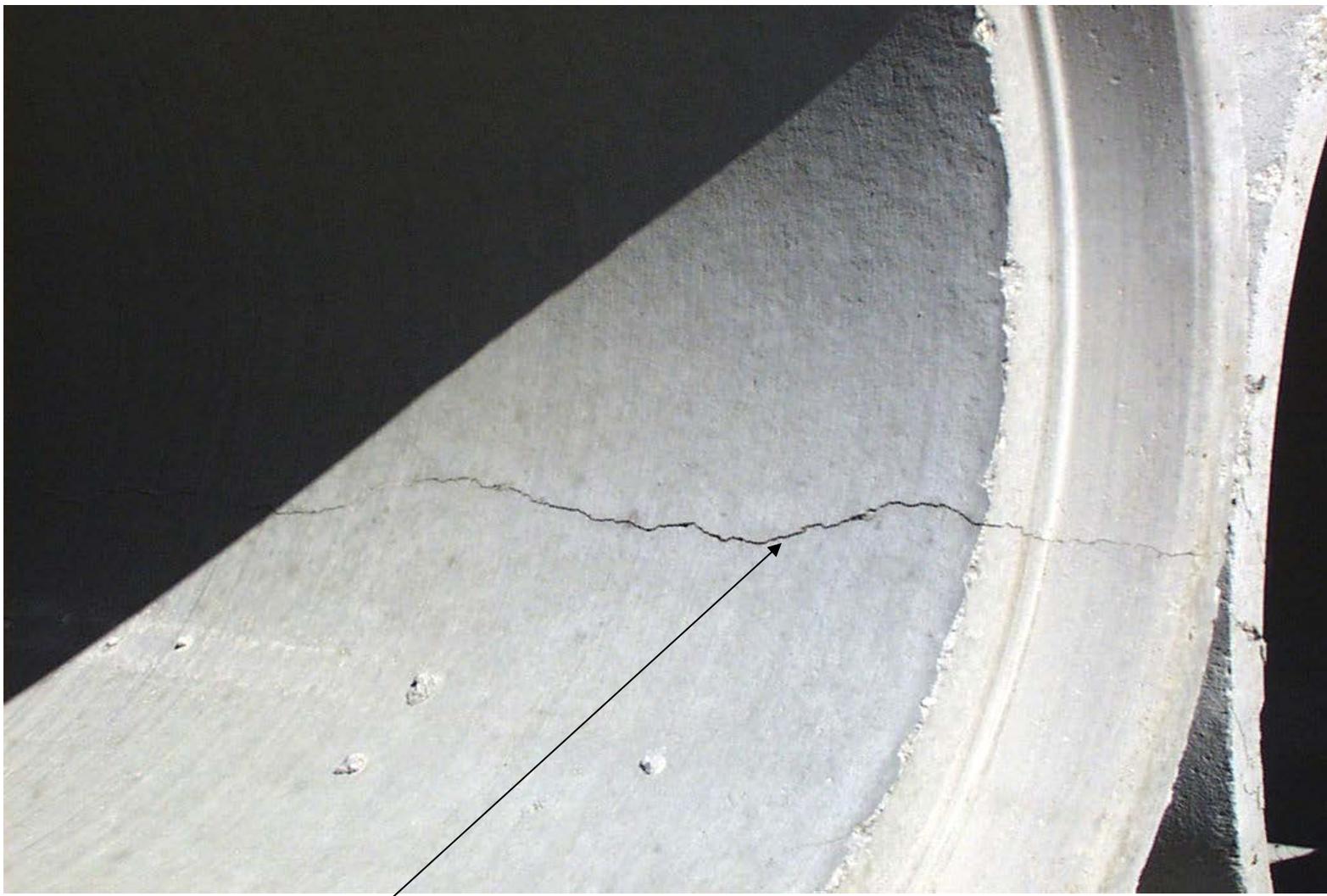


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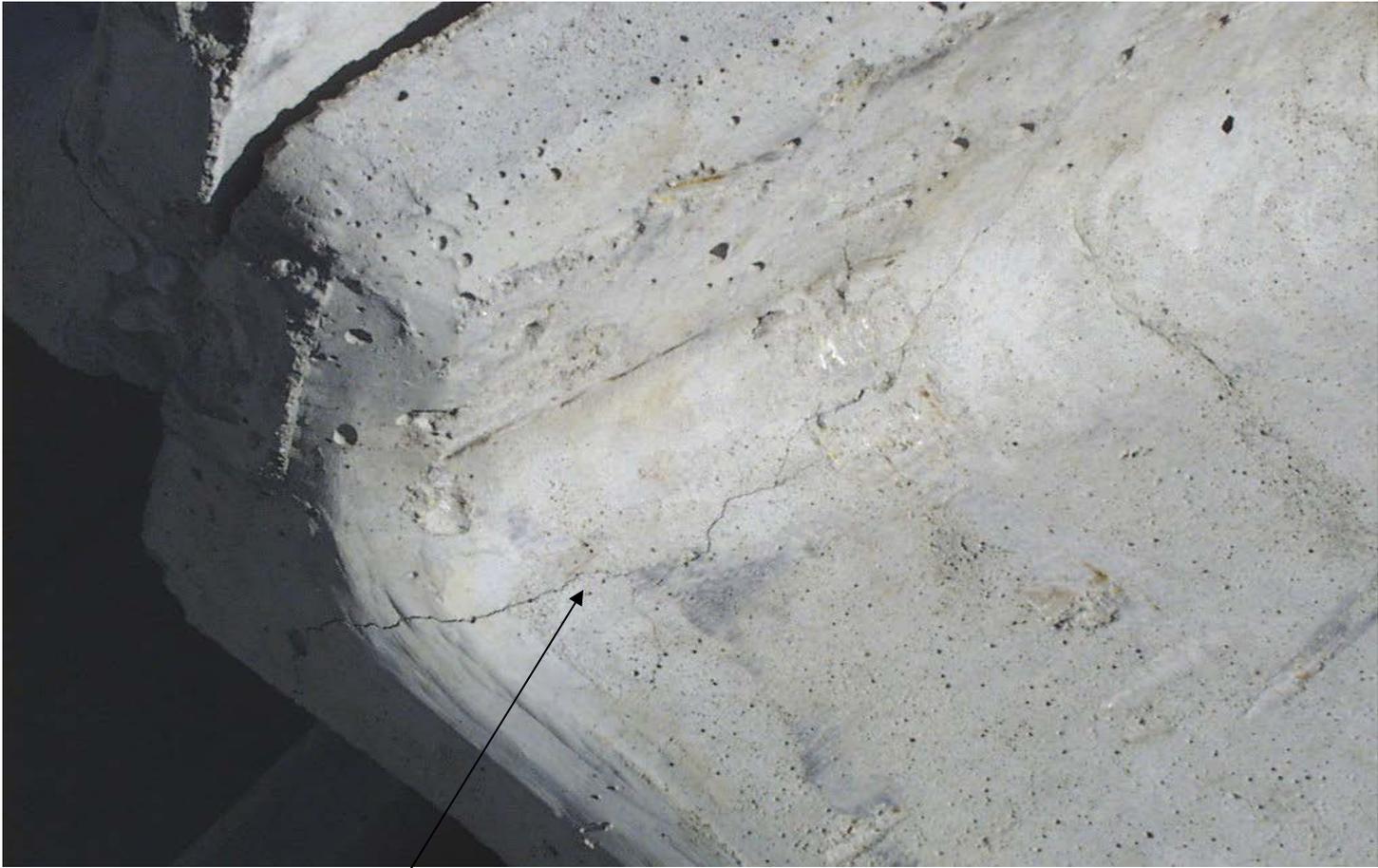
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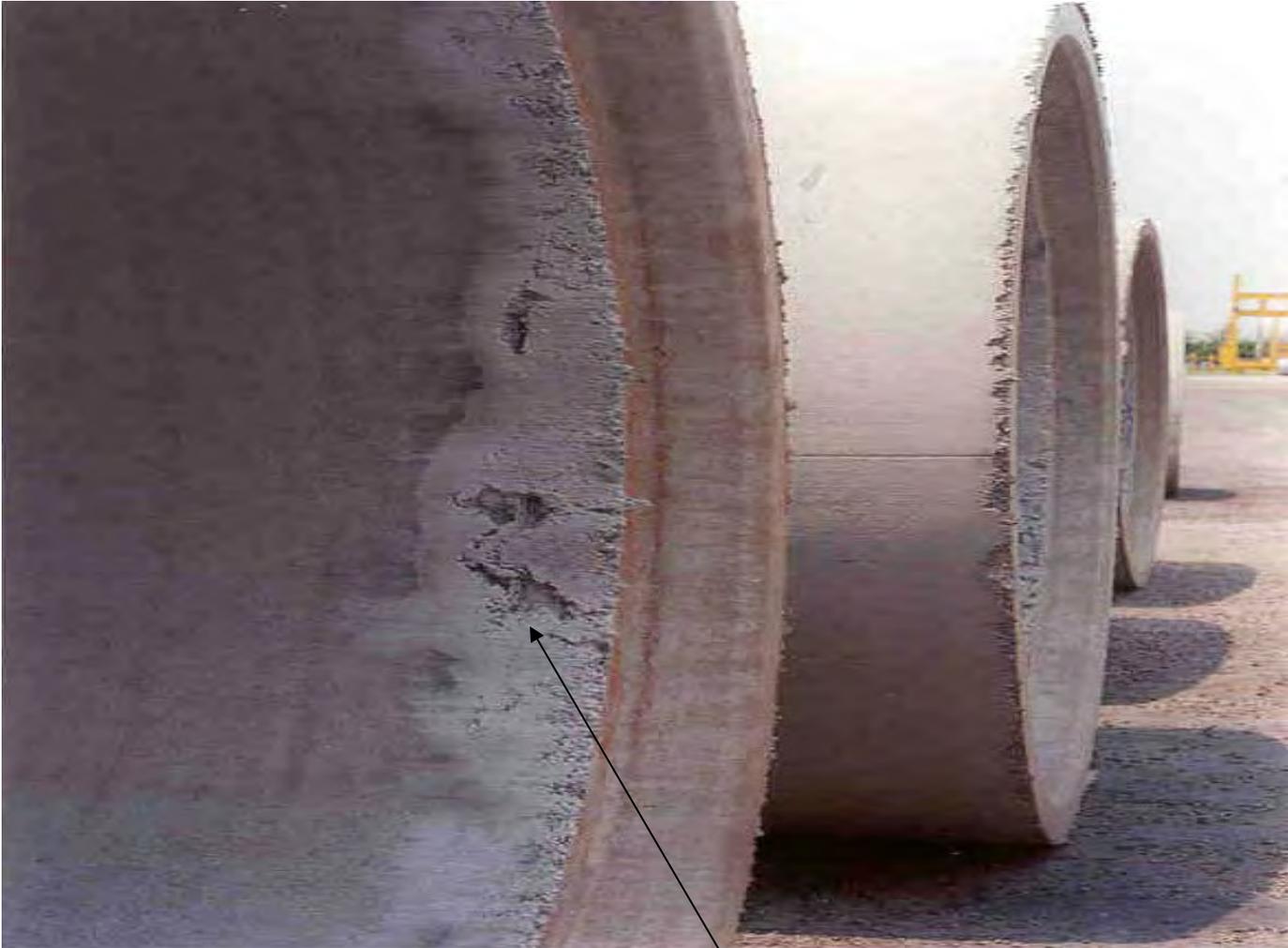
**FLARED END SECTION OF CULVERT - CRACKS**

**Unacceptable Product:** Crack passes entirely through wall of end section. See BMPR Policy Memo, Section 23, Point 2.a.



**REINFORCED CONCRETE PIPE – HONEYCOMB (Outside)**

**Unacceptable Product:** Honeycomb or voids are deeper than 3/4 the depth of the coarse aggregate and exceeds 5 percent of the surface area of the pipe. See BMPR Policy Memo, Section 23, Point 3.



**REINFORCED CONCRETE PIPE - HONEYCOMB (Inside)**

**Unacceptable Product:** Pipe with honeycomb or voids on the inside. See BMPR Policy Memo, Section 23, Point 3.



**REINFORCED CONCRETE PRODUCT – IMPROPER REINFORCEMENT PLACEMENT**

**Unacceptable Product:** Reinforcement is exposed on exterior of pipe. See BMPR Policy Memo, Section 23, Point 5.



**REINFORCED CONCRETE PIPE – IMPROPER REINFORCEMENT PLACEMENT**

**Unacceptable Product:** Reinforcement is exposed on exterior of pipe. See BMPR Policy Memo, Section 23, Point 5.



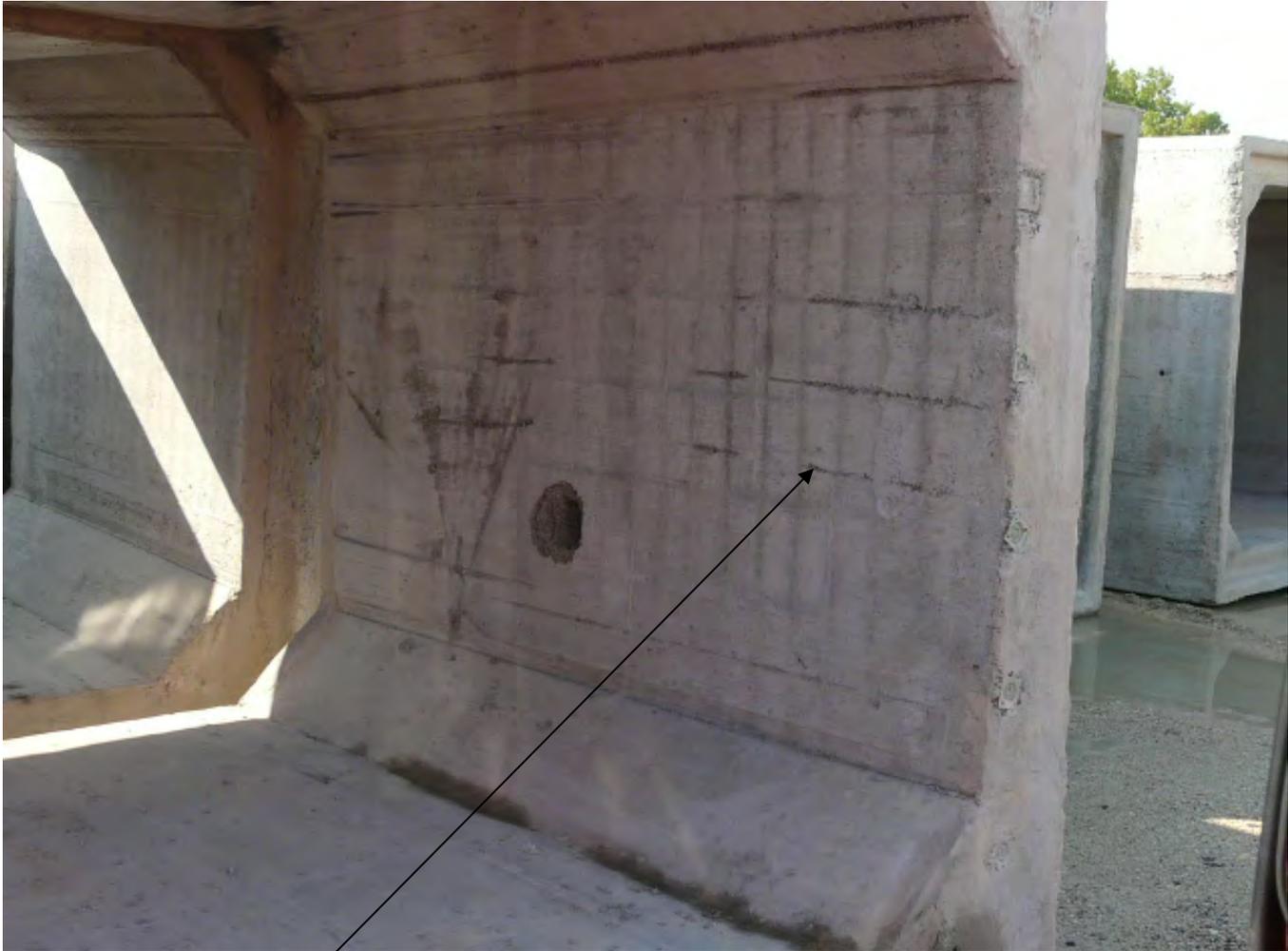
**REINFORCED CONCRETE PIPE – IMPROPER REINFORCEMENT PLACEMENT**

**Unacceptable Product:** Shadowing (ghosting) may indicate insufficient concrete cover over reinforcement. Further investigation of this pipe determined that the depth of cover did not meet the **Specification** requirements. One method to verify adequate cover is to remove the concrete and expose the reinforcement at one location. See BMPR Policy Memo, Section 23, Point 5.



**REINFORCED CONCRETE PIPE – IMPROPER REINFORCEMENT PLACEMENT**

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**REINFORCED CONCRETE BOX CULVERT – IMPROPER REINFORCEMENT PLACEMENT**

**Unacceptable Product:** Reinforcement is exposed on inside of culvert. See BMPR Policy Memo, Section 23, Point 5.



**MANHOLE CONE – IMPROPER REINFORCEMENT PLACEMENT**

**Unacceptable Product:** Reinforcement is exposed on outside of manhole cone. See BMR Policy Memo, Section 23, Point 5.



**REINFORCED CONCRETE PIPE – IMPROPER REINFORCEMENT PLACEMENT**

**Unacceptable Product:** Reinforcement is exposed on inside of pipe. See BMPR Policy Memo, Section 23, Point 5.



**REINFORCED CONCRETE PIPE – PROPER REINFORCEMENT PLACEMENT**

**Acceptable Product:** The exposed ends of longitudinal steel, stirrups, lift holes, or spacers used to position the reinforcement (cage) during concrete placement is not a cause for rejection of this pipe. See BMPR Policy Memo, Section 23, Point 5.



**REINFORCED CONCRETE PIPE – CHIPPED OR DAMAGED ENDS**

**Unacceptable Product:** The damage is more than halfway into the pipe joint and has a length more than 10 percent of the end circumference or perimeter. See BMPR Policy Memo, Section 23, Point 6.



**REINFORCED CONCRETE PIPE -  
CHIPPED OR DAMAGED ENDS**

**Unacceptable Product:** The damage is more than halfway into the pipe joint and has a length more than 10 percent of the end circumference or perimeter. See BMPR Policy Memo, Section 23, Point 6.



**REINFORCED CONCRETE PIPE -  
CHIPPED OR DAMAGED ENDS**

**Repairable Product:** The damage is more than halfway into the joint, but the length is less than 10 percent of the end circumference or perimeter. See BMPR Policy Memo, Section 23, Point 6.



**REINFORCED CONCRETE PIPE – CHIPPED OR DAMAGED ENDS**

**Repairable Product:** The damage is more than halfway into the joint, but the length is less than 10 percent of the end circumference or perimeter. See BMPR Policy Memo, Section 23, Point 6.



**REINFORCED CONCRETE PIPE – CHIPPED OR DAMAGED ENDS**

**Repairable Product:** The length of the damage is more than 10 percent of the end circumference or perimeter but is less than halfway into the joint. See BMPR Policy Memo, Section 23, Point 6.



**REINFORCED CONCRETE PIPE – CHIPPED OR DAMAGED ENDS**

**Repairable Product:** The damage is more than halfway into the joint but has a length of less than 10 percent of the end circumference or perimeter. See BMPR Policy Memo, Section 23, Point 6.



**REINFORCED CONCRETE PIPE – OTHER DEFECTS**

**Unacceptable Product:** Concrete fell off of reinforcement due to too wet of a mixture. See BMPR Policy Memo, Section 23, Point 9.



**REINFORCED CONCRETE PIPE - OTHER DEFECTS**

**Unacceptable Product:** Example of concrete defect. See BMPR Policy Memo, Section 23, Point 9.



**REINFORCED CONCRETE PIPE - OTHER DEFECTS**  
**Unacceptable Product:** Example of concrete defect. See BMPR Policy Memo, Section 23, Point 9.



**OFFSET MANHOLE CONES – OTHER DEFECTS**

**Unacceptable Product:** This is known as a “blow out” – concrete sticking to interior form or falling out during form removal. See BMPR Policy Memo, Section 23, Point 9.



**FLARED END SECTION OF CULVERT – OTHER DEFECTS**

**Repairable Product** : Damaged end section may be repaired. See BMPR Policy Memo, Section 23, Point 9.



**REINFORCED CONCRETE PIPE – PHYSICAL MEASUREMENTS**

**Unacceptable Product:** Overpacking is excess material being present in the bell end due to concrete pipe equipment problems. See BMPR Policy Memo, Section 23, Point 1.



**REINFORCED CONCRETE PIPE – PHYSICAL MEASUREMENTS**

**Unacceptable Product:** Example of overpacking and featheredge. Excess material is present in bell end of pipe caused by mix packed past the end of barrel during production. See BMPR Policy Memo, Section 23, Point 1.



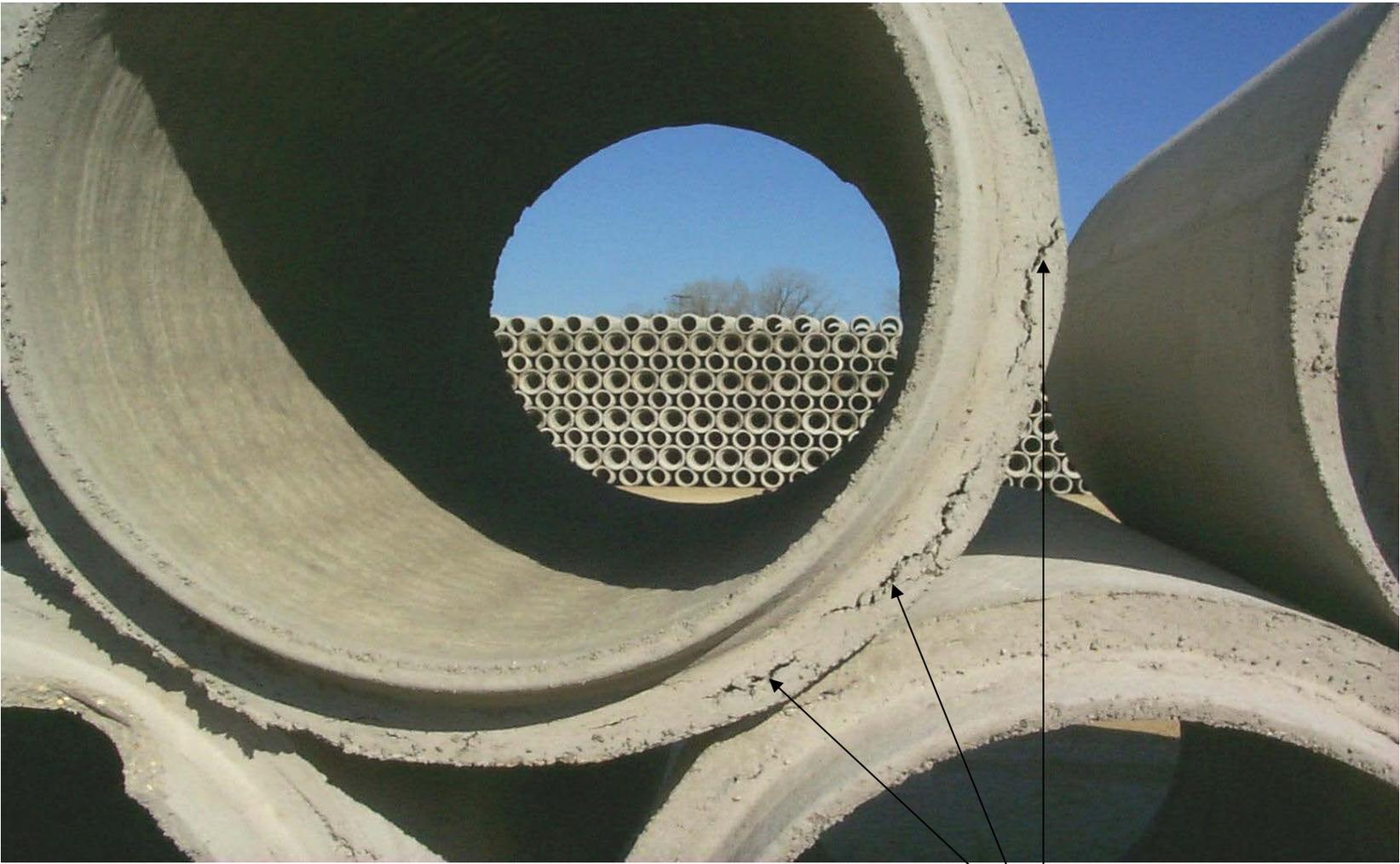
**REINFORCED CONCRETE PIPE – PHYSICAL MEASUREMENTS**

**Unacceptable Product:** Pipe spigot is out of round and does not meet dimensions or dimensional tolerances. See BMPR Policy Memo, Section 23, Point 1.



**REINFORCED CONCRETE PIPE – PHYSICAL MEASUREMENTS**

**Unacceptable Product:** Pipe exhibits interior delamination. In this case, also called blow out of concrete. See BMPR Policy Memo, Section 23, Point 1.



**REINFORCED CONCRETE PIPE –PHYSICAL MEASUREMENTS**  
**Unacceptable Product:** Pipe exhibits delamination. See BMPR Policy Memo, Section 23, Point 1.



**REINFORCED CONCRETE PIPE – SMOOTHNESS**

**Acceptable Product:** Rough interior of pipe is caused by dry casting moisture levels not at optimum. Voids may be approaching exceedance of 1 percent of the interior surface area. Very borderline on being substantially free from surface roughness. In this case, however, inspector can accept product. See BMPR Policy Memo, Section 23, Points 3 and 4.



**REINFORCED CONCRETE PIPE – SMOOTHNESS**

**Unacceptable Product:** Interior of pipe is not substantially free from surface roughness. See BMPR Policy Memo, Section 23, Point 4.



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**Unacceptable Product:** Interior of pipe is not substantially free from surface roughness. See BMPR Policy Memo, Section 23, Point 4.



**REINFORCED CONCRETE PIPE - SMOOTHNESS AND OTHER DEFECTS**

**Unacceptable Product:** Example of unacceptable workmanship of pipe tee collar. See BMPR Policy Memo, Section 23, Points 4 and 9. Other Defects for this case include mortar used in joint contaminated with a foreign substance. The pipe tee collar looked acceptable when it arrived on jobsite but became unacceptable when mortar in joint of pipe tee collar expanded after being buried and exposed to ground moisture.



**REINFORCED CONCRETE PIPE - ELBOW**  
**Acceptable Product:** Example of good workmanship on elbow.



**REINFORCED CONCRETE PIPE - ELBOW**  
**Acceptable Product:** Example of good workmanship on elbow.



**REINFORCED CONCRETE PIPE - ELBOW**

**Unacceptable Product:** Concrete material failure in joint resulting in cracks that pass entirely through wall of pipe. See BMPR Policy Memo, Section 23, Point 2.a.



**REINFORCED CONCRETE PRODUCT - FLARED END SECTION OF CULVERT**  
**Acceptable Product:** Example of an acceptable flared end section with grate and toe wall.



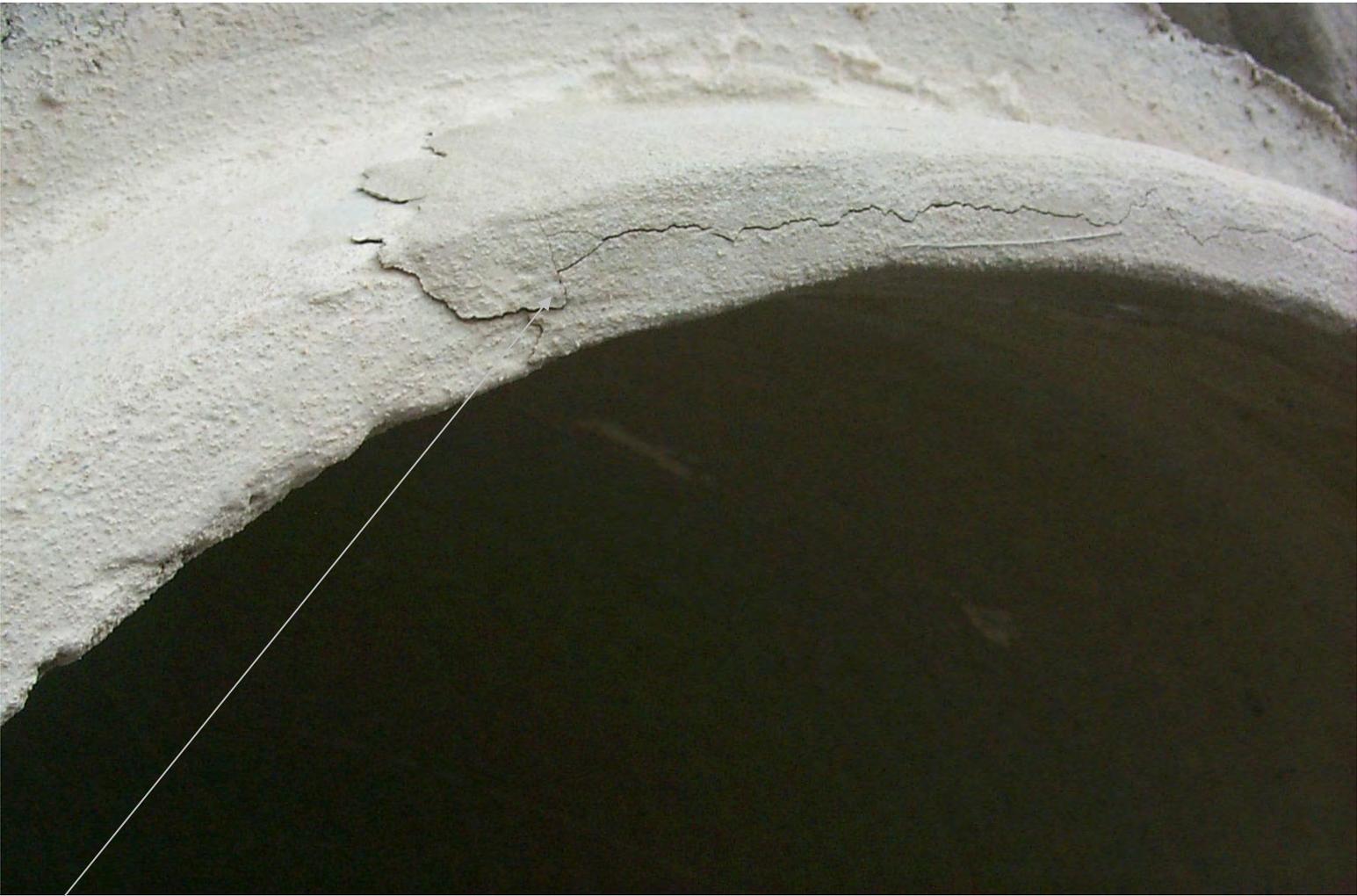
**TEMPORARY CONCRETE BARRIER -  
CONNECTION DETAIL**

**Acceptable Joint:** Example of IDOT's joint design detail for temporary concrete barrier. See Highway Standard 704001-06.



**REINFORCED CONCRETE PIPE -  
REPAIRS**

**Acceptable Repair:** Pipe joint repair shows good bond and conformance with physical dimensions. See BMPR Policy Memo, Section 24, Points 2 and 4.



**REINFORCED CONCRETE PIPE – REPAIRS**

**Unacceptable Repair:** Pipe joint repair indicates a poor bond and cracking. See BMPR Policy Memo, Section 24, Points 2 and 4.

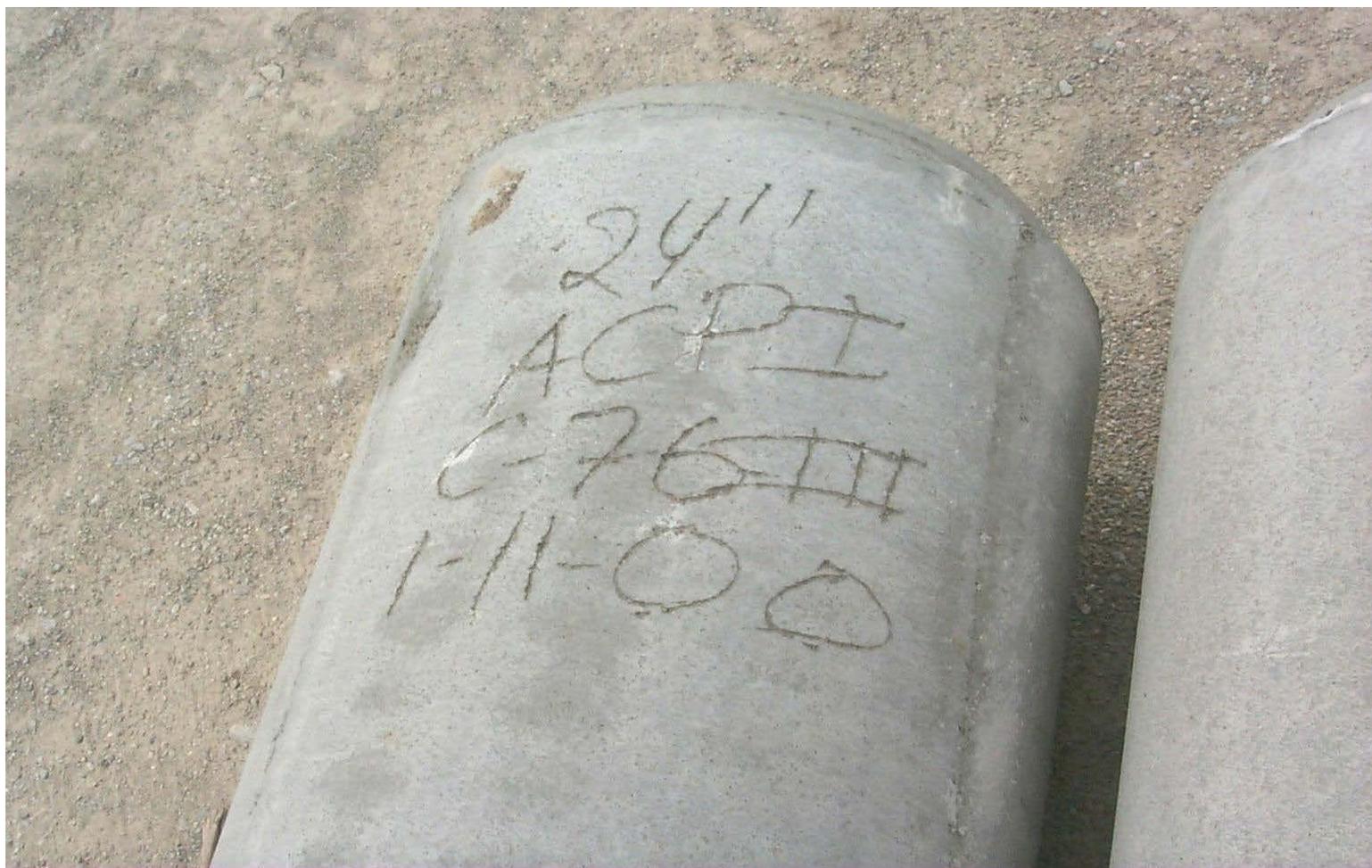


**REINFORCED CONCRETE PIPE – REPAIRS**  
**Acceptable Repair:** Example of acceptable patch. See BMPR Policy Memo, Section 24, Points 2 and 4.



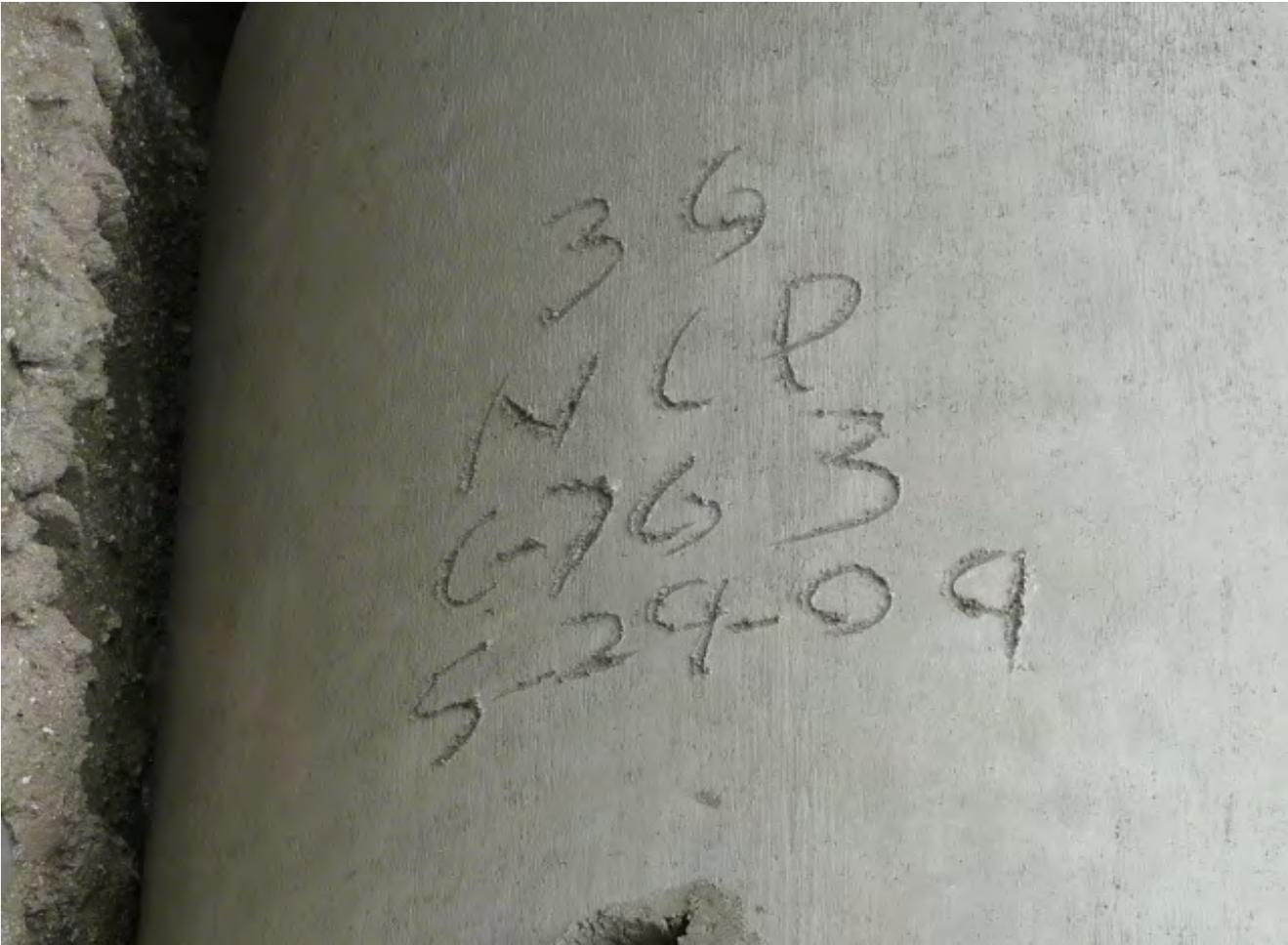
**REINFORCED CONCRETE PIPE – REPAIRS**

**Acceptable Repair:** Example of acceptable patch. See BMPR Policy Memo, Section 24, Points 2 and 4.



**REINFORCED CONCRETE PIPE - IDENTIFICATION MARKINGS**

**Acceptable Markings:** Example of complete and legible identification markings. Read pipe diameter (24"), producer mark (ACPI), specification (C 76), class (III) and date (1-11-00). Reject product if the identification markings are not legible or absent. See BMPR Policy Memo, Section 19.5, Section 23 - Point 7 and Attachment C.



**REINFORCED CONCRETE PIPE – IDENTIFICATION MARKINGS**

**Acceptable Markings:** Example of complete and legible identification markings. Read pipe diameter (36”), producer mark (NCP), specification (C 76), class (3) and date (5-29-09). Reject product if the identification markings are not legible or are absent. See BMPR Policy Memo, Section 19.5, Section 23 - Point 7 and Attachment C.



#### MANHOLE CONES - IDENTIFICATION MARKINGS

**Acceptable Markings:** Example of complete and legible identification markings. Read producer mark (MBM), specification (M 199), pipe diameter (48"), and date (4-22-00). Reject product if the identification markings are not legible or are absent. See BMPR Policy Memo, Section 19.5, Section 23 - Point 7 and Attachment C.



**TEMPORARY CONCRETE BARRIER - IDENTIFICATION MARKINGS**

**Unacceptable Markings:** Example of illegible markings for barrier. See BMPR Policy Memo, Section 19.5, Section 23 - Point 7 and Attachment C.



**REINFORCED CONCRETE PRODUCT – REJECTED PRODUCT MARKINGS**  
**Acceptable Practice:** Example of acceptable rejected product markings. See BMPR Policy Memo, Section 2.3.



**REINFORCED CONCRETE PRODUCT – REJECTED PRODUCT MARKINGS**  
**Acceptable Practice:** Example of acceptable rejected product markings. See BMPR Policy Memo, Section 2.3.



**REINFORCED CONCRETE PIPE – PRODUCT STORAGE**  
**Acceptable Practice:** Pipe storage yard. See BMPR Policy Memo, Section 21.



**REINFORCED CONCRETE PIPE – PRODUCT STORAGE**

**Poor Practice:** Example of poor practice. Excessively high pipe stacking can cause damage. See BMPR Policy Memo, Section 21.



**REINFORCED CONCRETE PIPE – PRODUCT STORAGE**  
**Acceptable Practice:** Example of acceptable pipe stacking. See BMPR Policy Memo, Section 21.



**MANHOLE CONES - PRODUCT STORAGE**  
**Acceptable Practice:** Good yard stacking with gravel base. See BMPR Policy Memo, Section 21.



**RISER COLLARS – PRODUCT STORAGE**  
**Acceptable Practice:** Example of assembled stack of riser collars. See BMPR Policy Memo, Section 21.



**CATCH BASINS – PRODUCT STORAGE**  
**Acceptable Practice:** Good yard stacking with gravel base. See BMPR Policy Memo, Section 21.



**TEMPORARY CONCRETE BARRIERS – PRODUCT STORAGE**

**Acceptable Practice:** Example of temporary concrete barrier yard. See BMPR Policy Memo, Section 21.



**TEMPORARY CONCRETE BARRIERS – PRODUCT STORAGE**  
**Acceptable Practice:** Example of temporary concrete barrier yard. See BMPR Policy Memo, Section 21.