

Pre- Installation Inspection

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Rinker Materials



AGENDA

- Importance of Inspection
- Inspect Milestones
- Inspection and Evaluation
- AASHTO R-73

Why Inspect?





Importance of Inspection



Safety



Quality



Accountability



Prevent Failures



Service Life

SAFETY



Make sure the product is in good condition

Does not pose a threat to workers

Smoother handling and installation

QUALITY

Performance

Get what you paid for



ACCOUNTABILITY



Producer



Owner



Contractor

PREVENT FAILURES



Could inspection prevent failures?



SERVICE LIFE

Make sure the pipe
meets its service life

When to inspect





Inspection Milestones

When to Inspect

- During Production
- Pre-Installation
- During Installation
- Post Installation

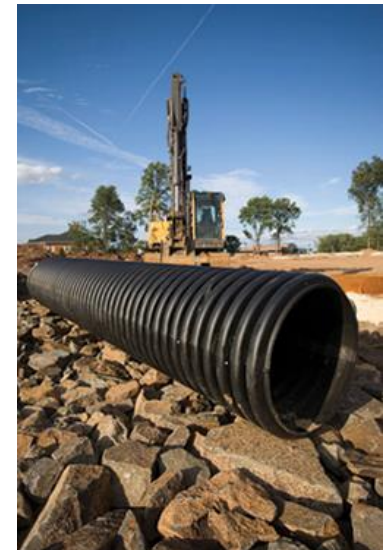
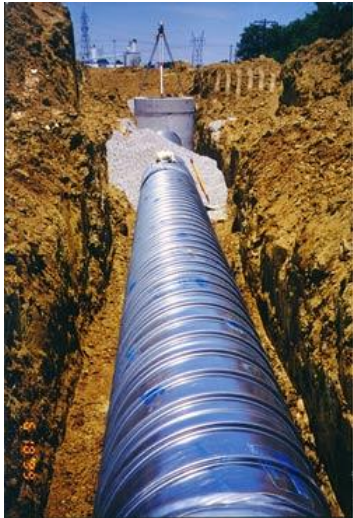
Important Inspection Milestones for Underground Infrastructure



CAUTION!!!!

Different Pipe = Different Processes

- Unique & Different Design
- Unique & Different Installation
- Unique & Different **Inspection & Evaluation Criteria**





Pre-Installation Inspection and Evaluation

Introduction

Pipe Inspection

Why Inspect Prior to Backfill,
During the Pre-Installation Phase?





Pre- Installation Inspection Reinforced Concrete Pipe



- Damaged Bells and Spigots (End Damage)
- Poor Consolidation of Concrete in Pipe Walls
- Cracks in the Pipe wall
- Exposed Steel in the Pipe Wall



Polling Question

In your experience what are the most common issues found in RCP prior to installation that may cause concern?

Damaged Bells and Spigots (End Damage)
Poor Consolidation of Concrete in Pipe Walls
Cracks in the Pipe wall
Exposed Steel in the Pipe Wall
Rough Surface on the interior of the Pipe

What to Look for in Pre-Installation Inspection of Flexible Pipe?

Corrugated Metal Pipe (CMP)

- Damage to Pipe
- Dents – Deformations in pipe wall
- Coatings missing or damaged
- Pipe deformed from shipping/tie down
- Damage to Pipe Ends

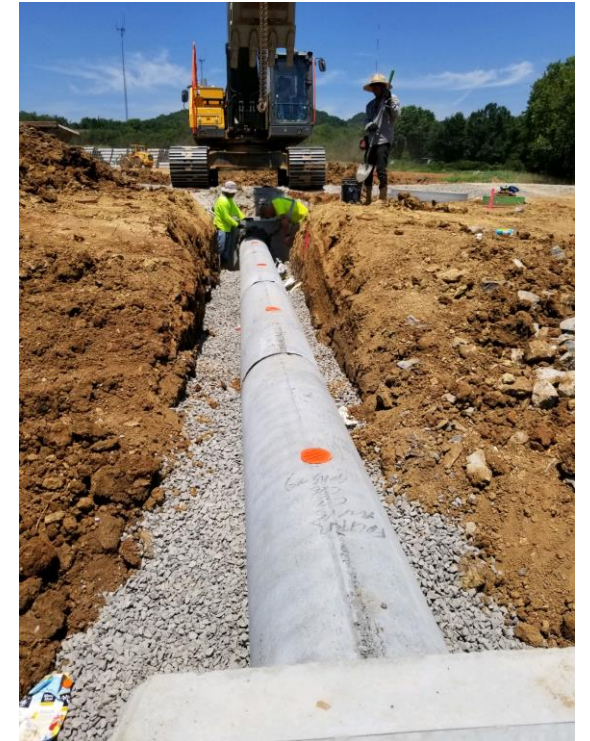
Thermoplastics

- Deformations
- Creases in wall
- White lines – stress
- Damage to ends



Call to Action!

Who Should Inspect Pipe for Damage On Job Site?





**HOW DO WE DECIDE
IF A PIPE IS**

**ACCEPTABLE
NEEDS REPAIR
REJECTED FOR USE**

Standard Practice for

**Evaluation of Precast Concrete
Drainage Products**

AASHTO Designation: R 73-16¹
Release: Group 2 (June 2016)

AASHTO

American Association of State Highway and Transportation Officials
444 North Capitol Street N.W., Suite 249
Washington, D.C. 20001

AASHTO R-73 National - Pre-Installation Inspection Standards for RCP



NOT JUST FOR RCP....

Standard Practice for

Evaluation of Precast Concrete Drainage Products

AASHTO Designation: R 73-16¹
Release: Group 2 (June 2016)

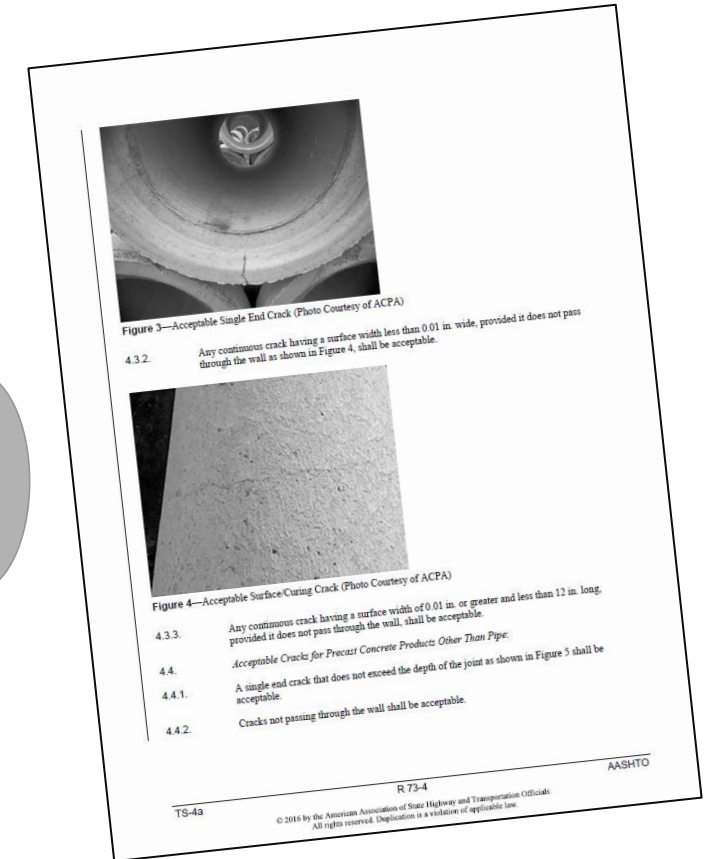
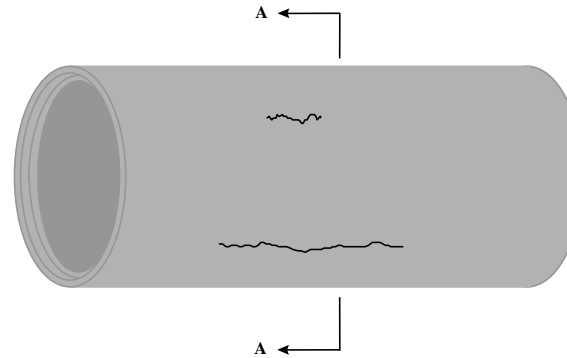
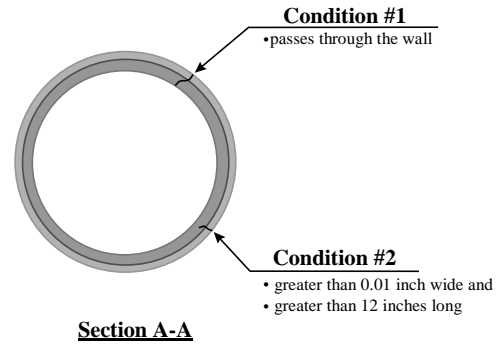
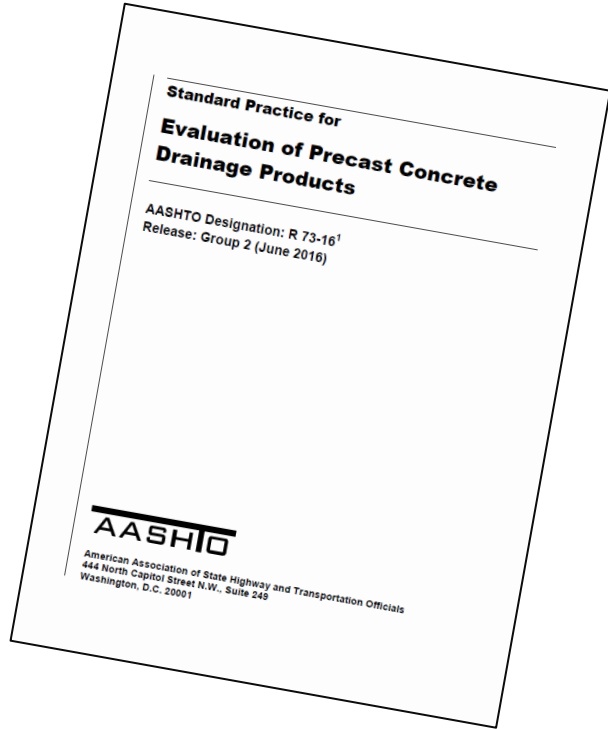
AASHTO

1. SCOPE

- 1.1. This standard practice describes the evaluation of precast concrete pipe, box culverts, manholes, and drainage inlets. This standard also describes criteria for acceptable products, repairable products, and the rejection of defective products. All repairs shall conform to the criteria found in this document or to contract documents as applicable.
- 1.2. This standard practice is applicable to storm water management precast concrete products, manufactured by both the wet cast and dry cast production methods, after curing and prior to installation.
- 1.3. This standard practice covers the inspection of finished products manufactured per M 86, M 170, M 199, M 206, M 207, M 242, M 259, and M 273; and ASTM C443, C858, C913, C985, C1417, C1433, C1504, and C1577.
- 1.4. *Evaluation guidelines are included for the following conditions:*
 - cracks,
 - manufacturing defects, and
 - damaged ends.
- 1.5. This standard practice is not intended for the evaluation of installed precast concrete pipe, box culverts, three-sided structures, manholes, drainage inlets, or other precast products.

Evaluation Criteria Explained

Written Word, Graphically, Photo Examples



AASHTO R-73

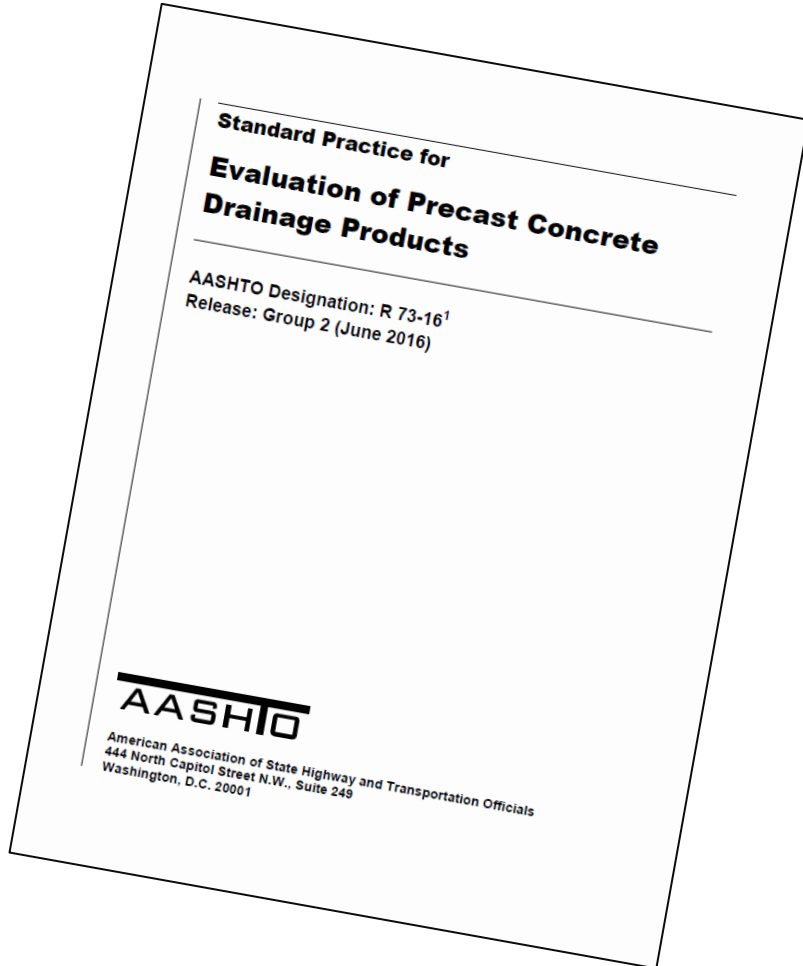
Life Changing Tool for Stakeholders

Inspection & Evaluation for **Pre-Installed Pipe**
Eval. Guidelines:

- Cracks
- Joints/Damaged Ends
- Manufacturing Defects

Gives Solutions:

- Acceptable
- Repairs Allowed/Required
- Not Acceptable for Use



Acceptable Conditions



Figure 3—Acceptable Single End Crack (Photo Courtesy of ACPA)

- 4.3.2. Any continuous crack having a surface width less than 0.01 in. wide, provided it does not pass through the wall as shown in Figure 4, shall be acceptable.



Figure 4—Acceptable Surface/Curing Crack (Photo Courtesy of ACPA)

- 4.3.3. Any continuous crack having a surface width of 0.01 in. or greater and less than 12 in. long, provided it does not pass through the wall, shall be acceptable.
- 4.4. *Acceptable Cracks for Precast Concrete Products Other Than Pipe:*
 - 4.4.1. A single end crack that does not exceed the depth of the joint as shown in Figure 5 shall be acceptable.
 - 4.4.2. Cracks not passing through the wall shall be acceptable.

4.5. *Acceptable Manufacturing Defects:*

- 4.5.1. Minor defects that do not affect the strength, durability, or function shall be acceptable. Examples include, but are not limited to: bug holes as shown in Figure 6 or imperfections as shown in Figure 7 inherent in the manufacturing process, or rifling as shown in Figure 8 less than $\frac{1}{4}$ in. in height. Acceptable cosmetic dimensions of bug holes may be determined by the owner. Bug holes more severe than a cosmetic defect shall be subject to criteria in Section 5.3.2.1 and Section 6.4.4.



Figure 6—Acceptable Bug Holes and Shallow Pitting (Photo Courtesy of ACPA)

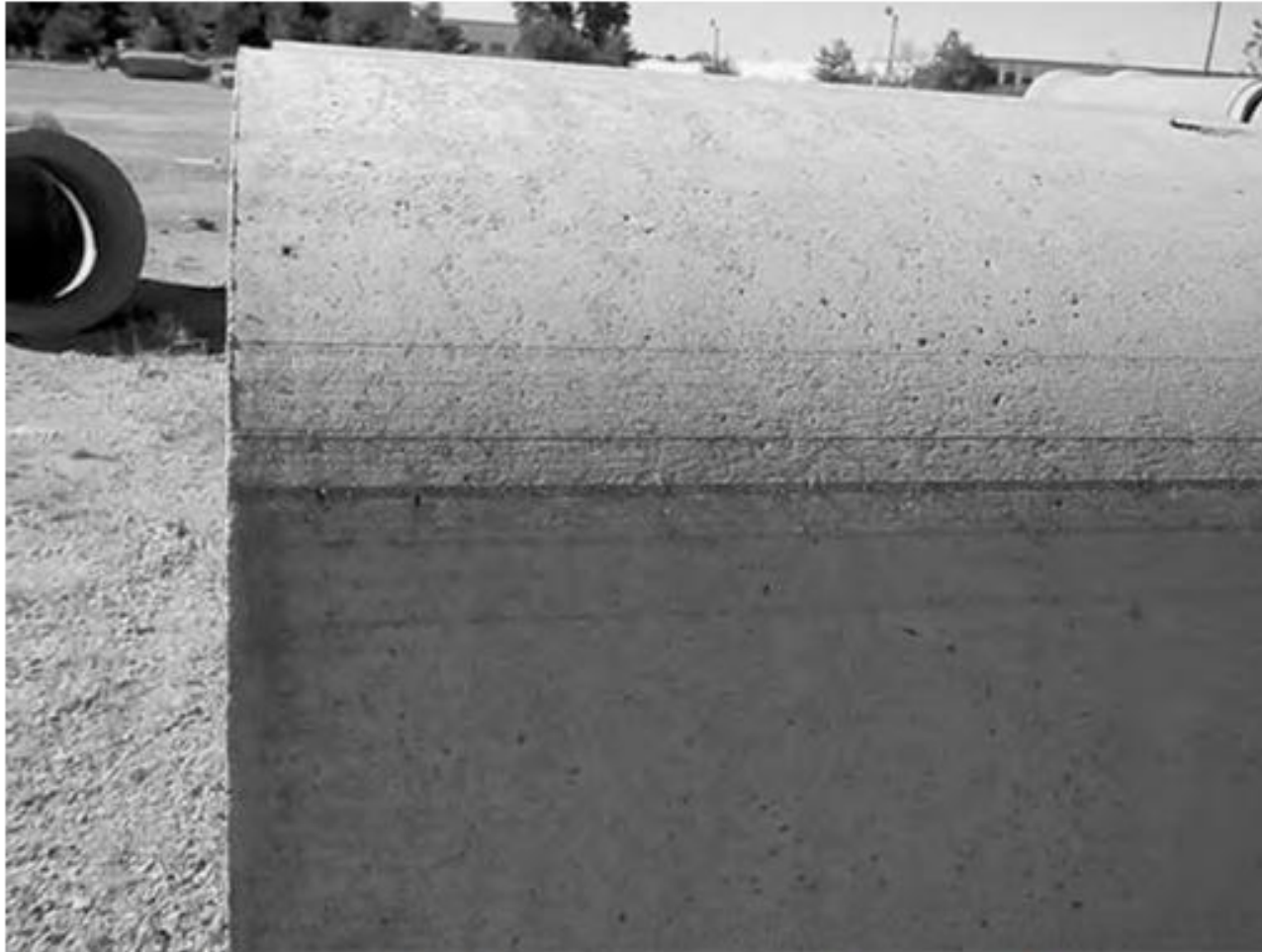


Figure 7—Acceptable Lines Caused by Form Jacket during Stripping (Photo Courtesy of ACPA)



Figure 9—Acceptable Chip on Bell End (Photo Courtesy of ACPA)

4.6. *Acceptable Damage and Chips to Ends of Non-Reinforced Pipe:*

4.6.1. A single fracture or spall in the joints not exceeding 3 in. around the circumference of the pipe, nor 2 in. in length into joint, unless these defects exist in more than 5 percent of the entire shipment or delivery, shall be acceptable.

4.7. *Acceptable Damage and Chips to Ends:*

4.7.1. Damage or chips to ends that do not affect the function of the joint as shown in Figure 9 shall be acceptable. This damage can include handling marks, chips, and spalls.

Repairable Conditions

5. REPAIRABLE DEFECTS IN PRECAST CONCRETE PRODUCTS

5.1. Defects which can affect the function or design life of the precast product that can be adequately repaired to meet specification requirements shall be acceptable for repair as described in Sections 5.2 to 5.4. Any repairs made must be performed such that the structural integrity is not compromised and does not change the dimensional requirements of the product. Repairs made using commercially approved materials must be performed in accordance with the manufacturer's recommendations.

5.2. *Repairable Cracks in Reinforced Products:*

5.2.1. Cracks can be repaired in accordance with Sections 5.2.2 and 5.2.3.

5.2.2. For pipe, cracks 0.01 in. or wider and longer than 12 in. that are not passing through the wall can be repaired with an approved repair material as described in the contract or approved by the owner.

5.2.3. For other products, cracks passing through the wall can be repaired with an approved repair material as described in the contract or approved by the owner.

5.3. *Repairable Uncured Manufacturing Defects:*

5.3.1. Repairs specific to uncured dry cast, packerhead, and semi-dry cast product for slab off areas extending to the reinforcing steel shall commence within 1 h of casting the product by trowel-applying batched concrete from the same mix design, or approved concrete mix into the slab off area.

5.3.2. *Repairs of Surface Defects in Cured Products:*

5.3.2.1. Honeycombing and bleedout surface conditions less severe than stated in Section 6.4.4, as shown in Figures 12, 13, and 14, are repairable. The repair area of any single defect must be less than 4 percent of the total external surface area. The cumulative repair area must be less than 10 percent of the external surface area in a product.

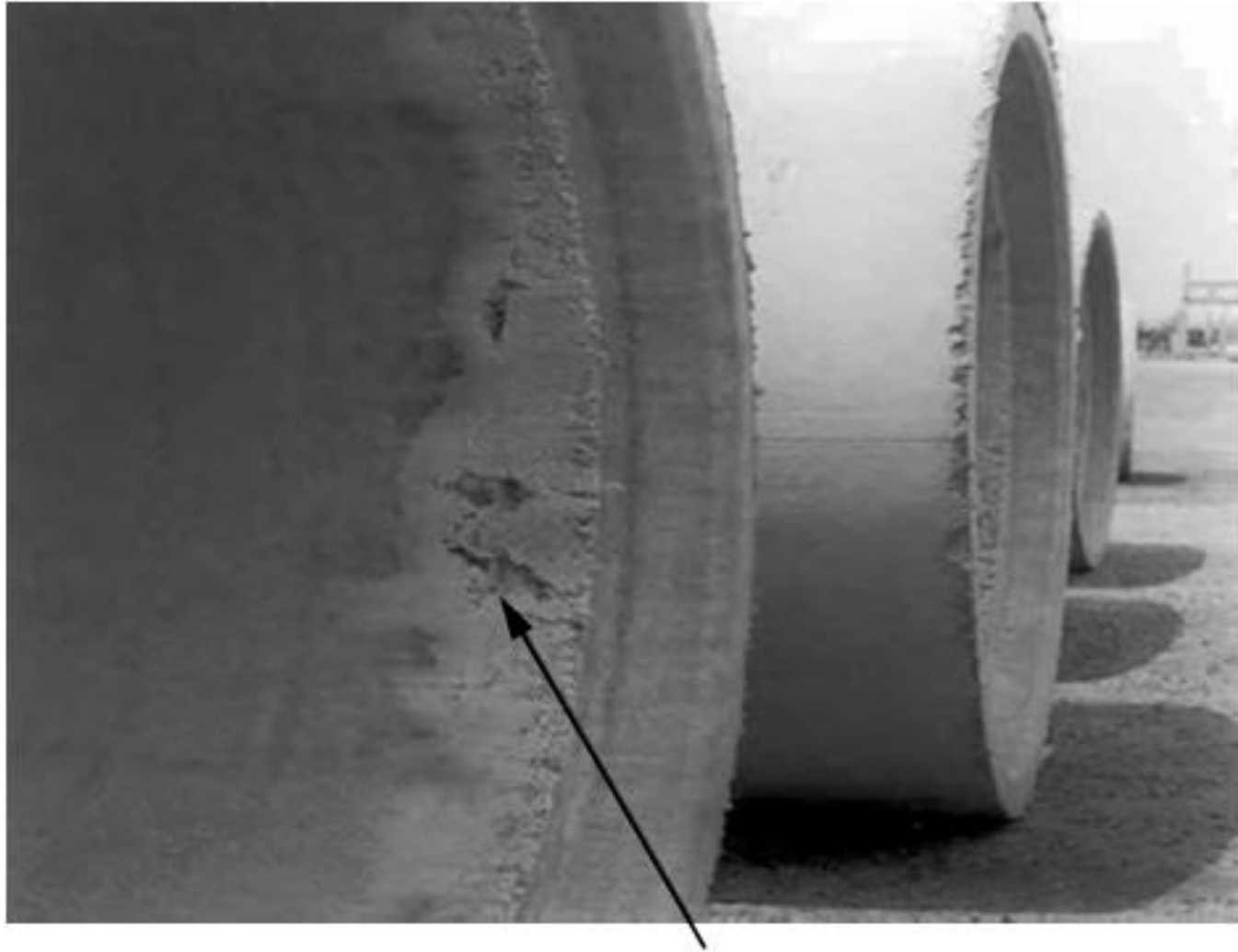


Figure 12—Repairable Honeycombing (Photo Courtesy of ACPA)

- 5.3.2.2. Form bleedout less severe than stated in Section 6.4.4, as shown in Figures 13 and 14, is repairable.



Before



After

Figure 13—Acceptable Repair of Form Bleed (Photos Courtesy of ACPA)

5.4.1. *Repair of Damaged or Chipped Ends for Non-Gasketed Joints:*

5.4.1.1. If the damage or chip is less than 1 in. in depth from the end of the pipe on the bell or spigot, then the total circumference of the structure can be repaired.

5.4.1.2. Damage or chips in round structures 1 in. and greater in depth from the end of the bell or spigot and not exceeding the depth of the joint can be repaired provided the total cumulative damage

50 percent c
) can be mo
nd 19.

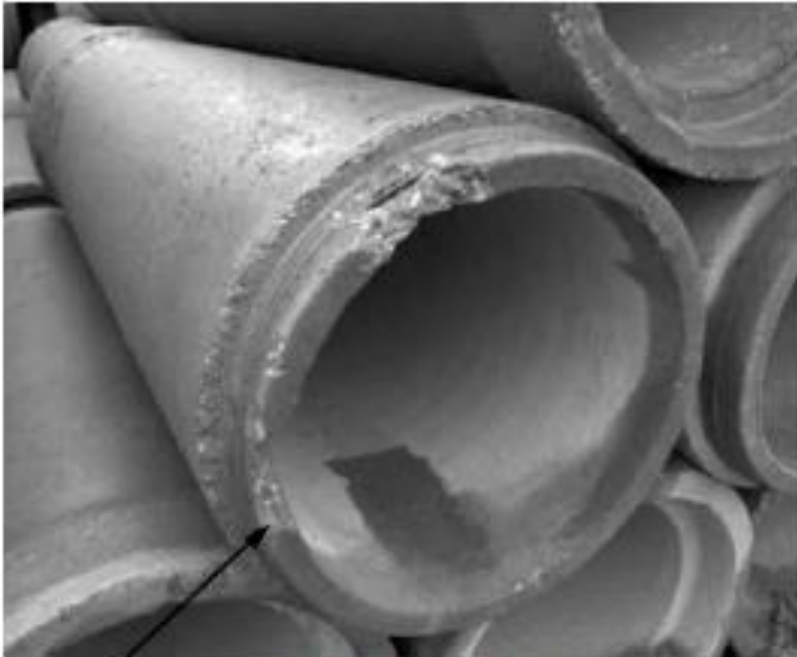


Figure 22—Repairable Chipped End of Spigot
(Photo Courtesy of ACPA)

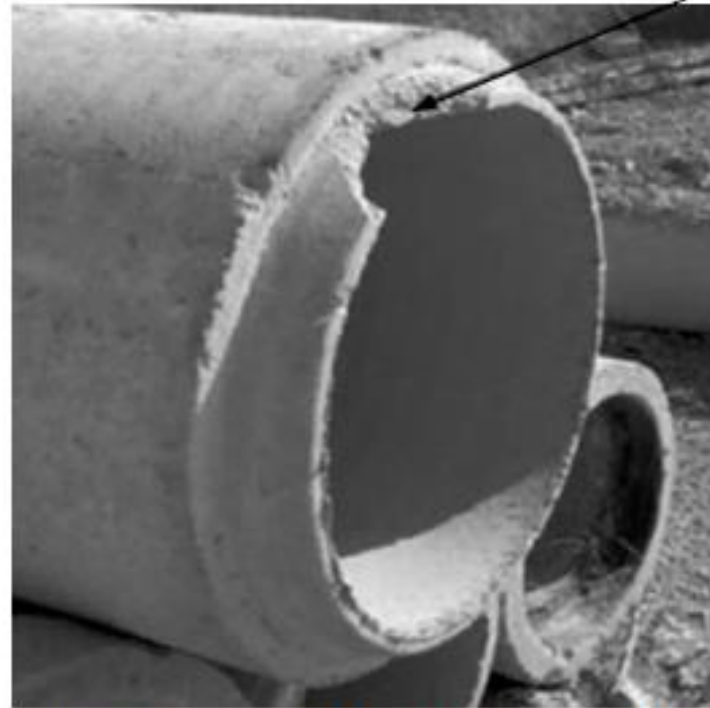


Figure 23—Repairable Chipped End of Spigot
(Photo Courtesy of ACPA)

Notes:

1. L1 + L2 +
2. L1, L2, or
3. See Appen



ted and gasketed
ted and gasketed



Figure 18—Repairable Chip on Bell End (Photo Courtesy of ACPA)

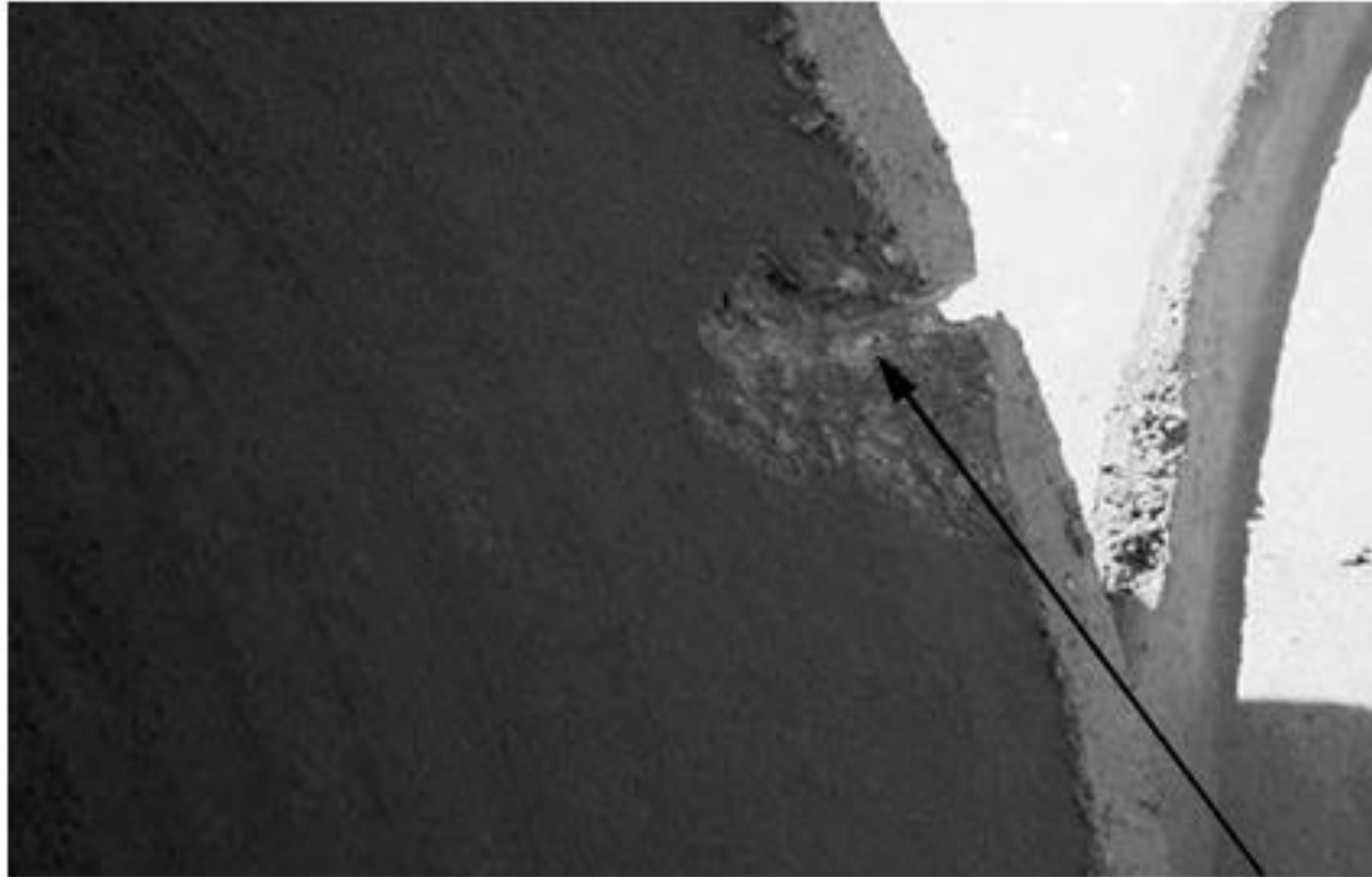
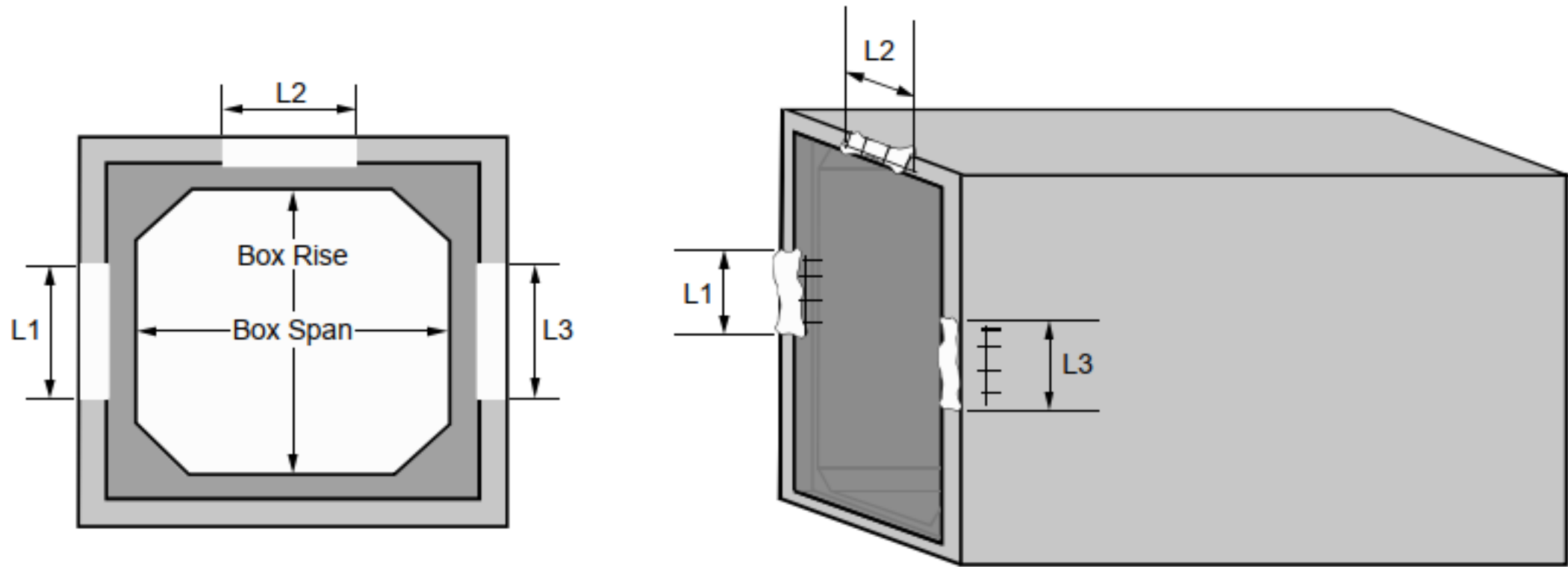


Figure 19—Repairable Chip on Spigot End (Photo Courtesy of ACPA)



Notes:

1. $L1 + L2 + L3$ cumulative damage length must not exceed 50 percent of the box span or rise.
2. $L1$, $L2$, or $L3$ (an individual damage length) must not exceed 25 percent of the box span or rise.

Figure 21—Damaged End—Groove End

Rejectable Conditions

6.3.2. Any crack that would prevent making a satisfactory joint is cause for rejection.

6.3.3. For pipe not installed or under load, any continuous crack that is 0.01 in. wide or greater at the surface and 12 in. or longer, regardless of position in the wall of the section when measured in accordance with Section 3.1 and shown in Figures 27 through 29, is cause for rejection.

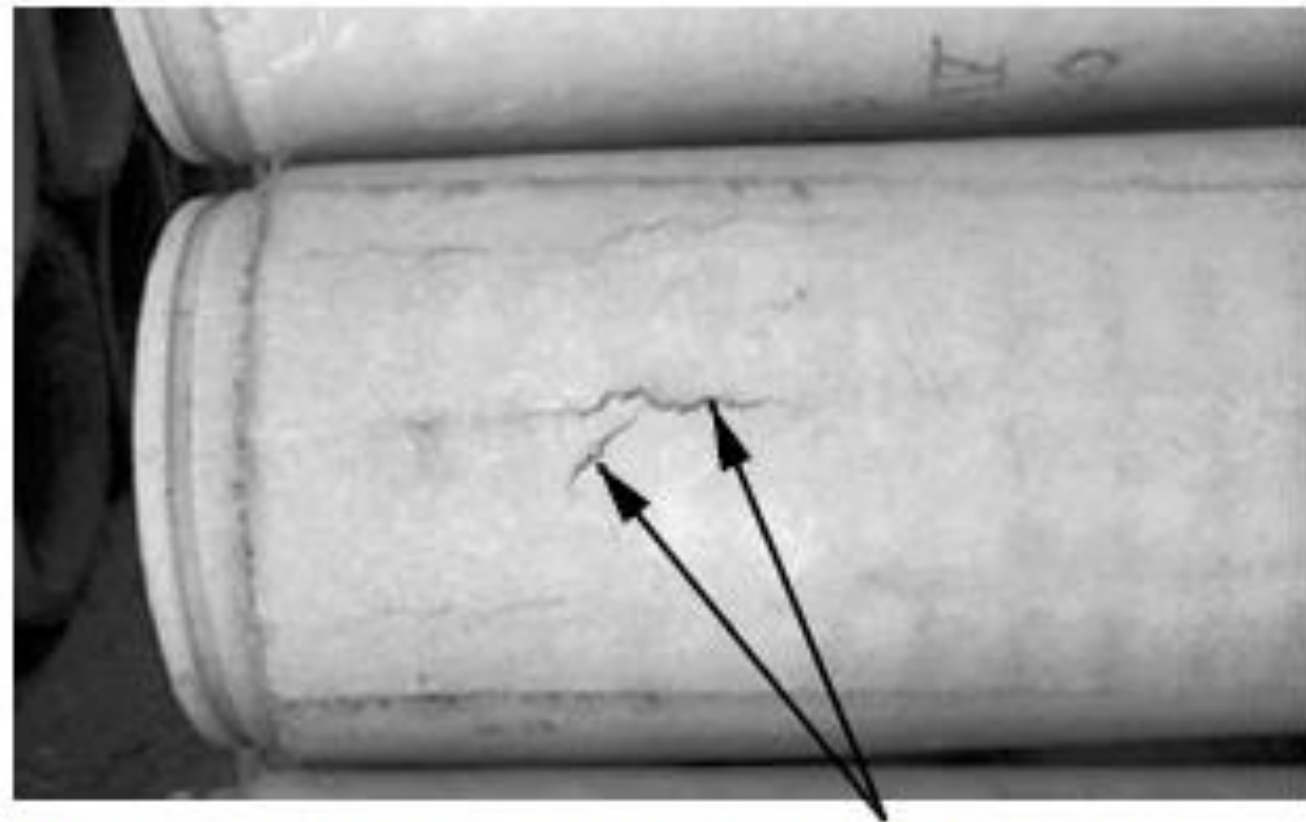
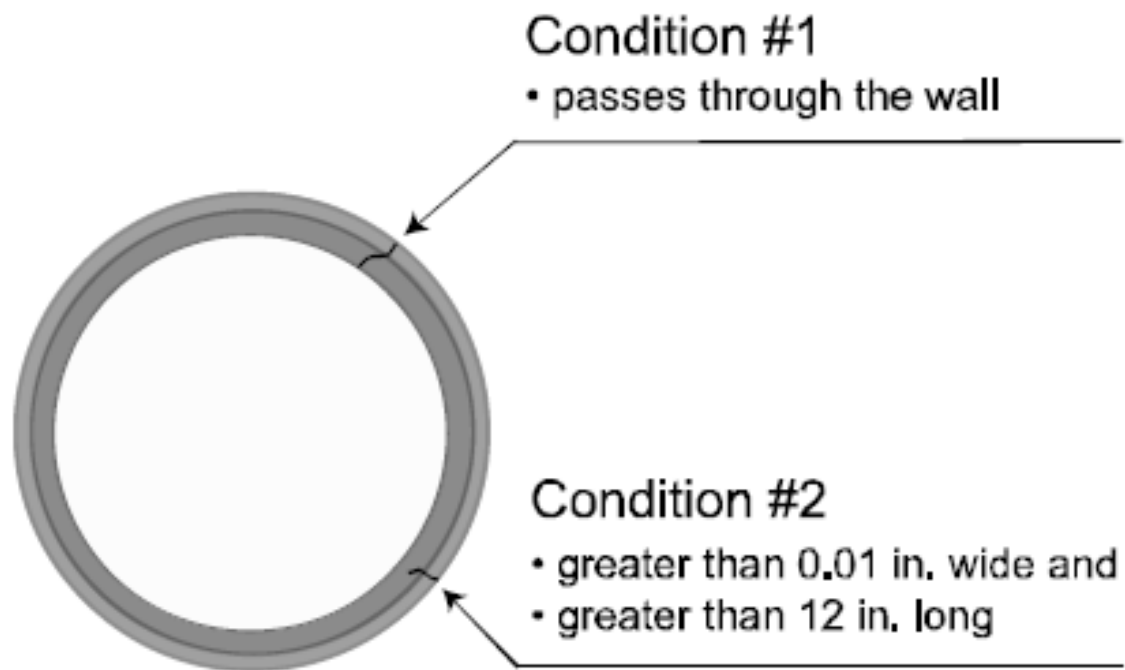
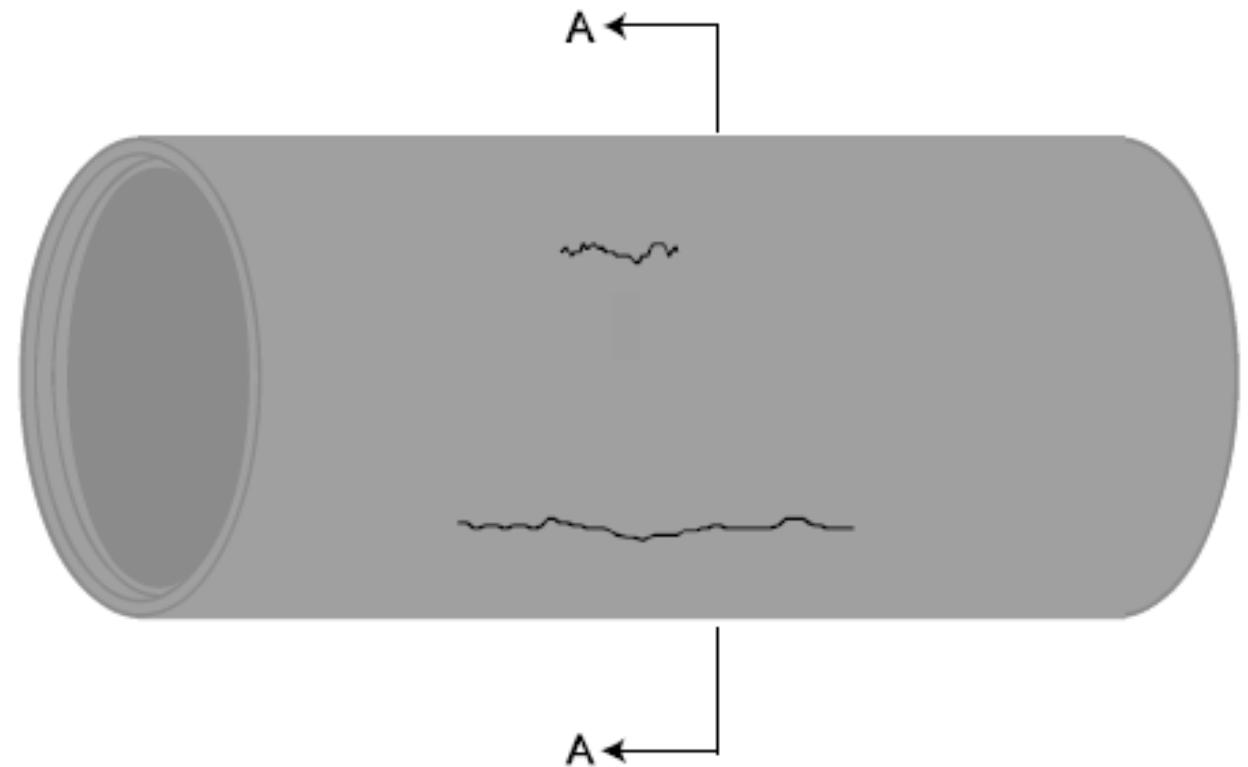


Figure 27—Rejectable Pipes with Cracks Passing through the Wall and Exceeding 0.01 in. in Width and 12 in. in Length (Photos Courtesy of ACPA)



Section A-A



Notes:

1. Condition #1—Any visible crack passing through the wall, regardless of length or width.
2. Condition #2—Crack is at least 0.01 in. wide and at least 12 in. long, even though it does not visibly pass through the wall.

- 6.4.3. Evidence of inadequate concrete cover over reinforcing steel, as shown in Figure 31, is cause for rejection.



- 6.4.4.1. Honeycomb or bleedout that extends to a depth greater than the size of the coarse aggregate and exposes reinforcing steel or causes concrete permeability beyond the project specification for leakage, which either occupies a single defect area greater than 4 percent or a cumulative area greater than 10 percent of the internal surface area of the product, as shown in Figure 32, shall not be repairable.

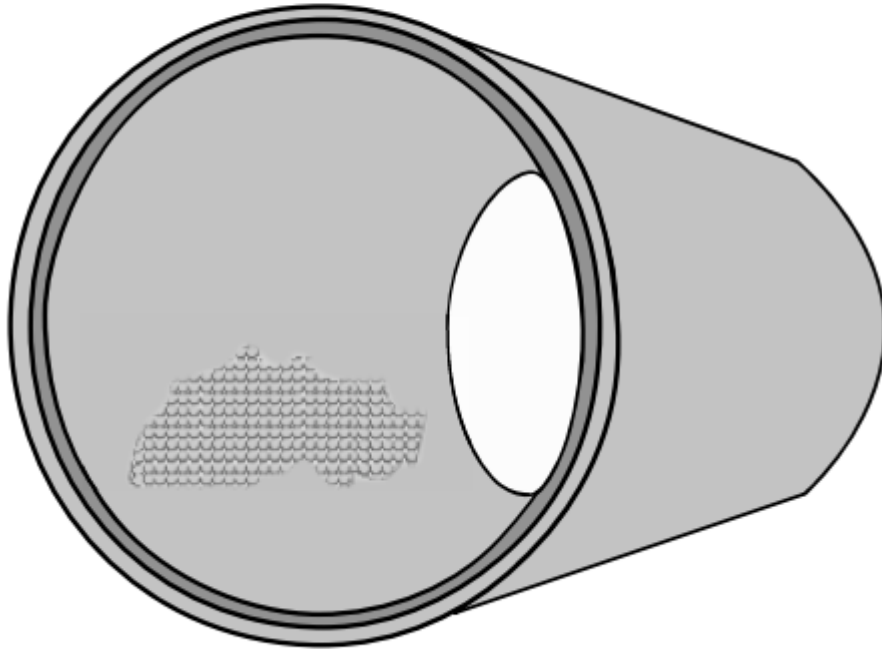


Figure 32—Rejectable Manufacturing Defect—Honeycombing (Courtesy of ACPA)

6.6.2. Any unrepaired damage that affects the seal of a gasketed product, as shown in Figure 34, is cause for rejection.



Figure 34—Rejectable Chipped and Damaged Spigot
(Photo Courtesy of ACPA)

APPENDIXES

(Nonmandatory Information)

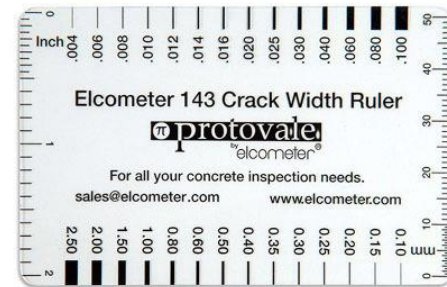
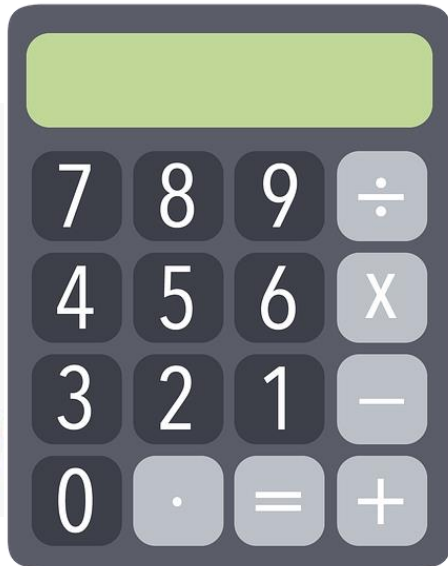
X1. PERMISSIBLE REPAIR CRITERIA FOR DAMAGED AND CHIPPED ENDS

Table X1.1—Permissible Repair Criteria for Non-Gasketed Joints (End Damage 1 in. and Greater in Depth within the Joint)

Pipe Size (in.) Designation	Permissible Cumulative Damage Length (in.) (50% Circumference Maximum)	Permissible Individual Damage Length (in.) (25% Circumference Maximum)
12	18 ¹ / ₂	9
15	23 ¹ / ₂	11 ³ / ₄
18	28 ¹ / ₄	14
24	37 ³ / ₄	19
27	42 ¹ / ₄	21 ¹ / ₄

Tools for Job Site Application of R-73

- Copy of AASHTO R-73 @ <https://store.transportation.org/Item/PublicationDetail?ID=2629>
- Tape Measure, Calculator, Crack Comparator or Feeler gage



PRACTICAL EXERCISE

PIPE SECTION #1



4.6. *Acceptable Damage and Chips to Ends of Non-Reinforced Pipe:*

4.6.1. A single fracture or spall in the joints not exceeding 3 in. around the circumference of the pipe, nor 2 in. in length into joint, unless these defects exist in more than 5 percent of the entire shipment or delivery, shall be acceptable.

4.7. *Acceptable Damage and Chips to Ends:*

4.7.1. Damage or chips to ends that do not affect the function of the joint as shown in Figure 9 shall be acceptable. This damage can include handling marks, chips, and spalls.

PIPE SECTION #2



5.4.2.

Repair of Damaged or Chipped Ends for Gasketed Joints:

5.4.2.1.

Damage or chips in gasketed round structures can be repaired provided the repaired sealing surface is free of spalls, cracks, or imperfections that would adversely affect the performance of the joint and the total cumulative damage or chip ($L1 + L2 + L3$) does not involve more than 50 percent of a round structure's circumference, and no individual damage or chip ($L1$, $L2$, or $L3$) can be more than 25 percent of a round structure's circumference as shown in Figure 17 and Figures 22 through 25.

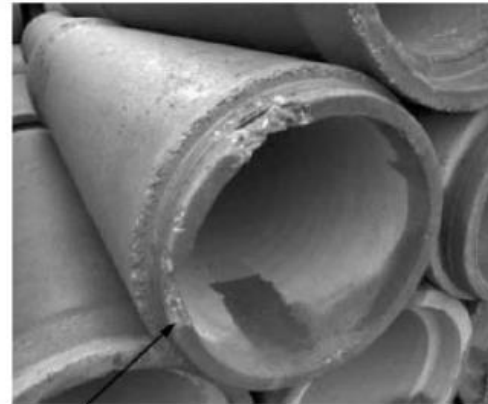


Figure 22—Repairable Chipped End of Spigot
(Photo Courtesy of ACPA)

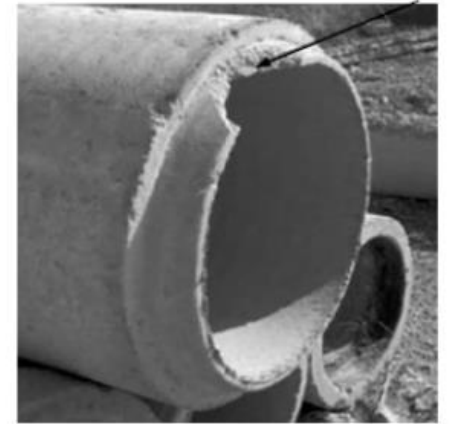
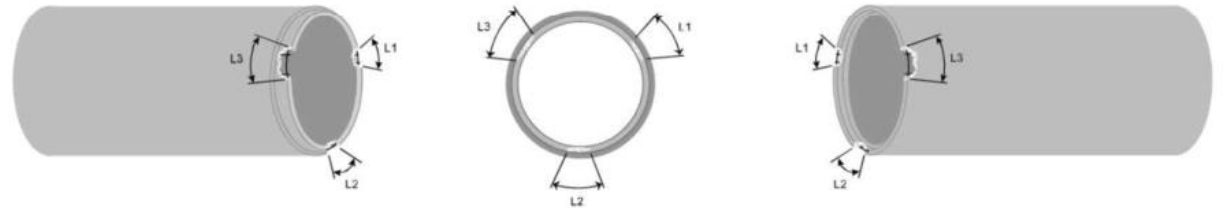


Figure 23—Repairable Chipped End of Spigot (Photo
Courtesy of ACPA)

PIPE SECTION #3



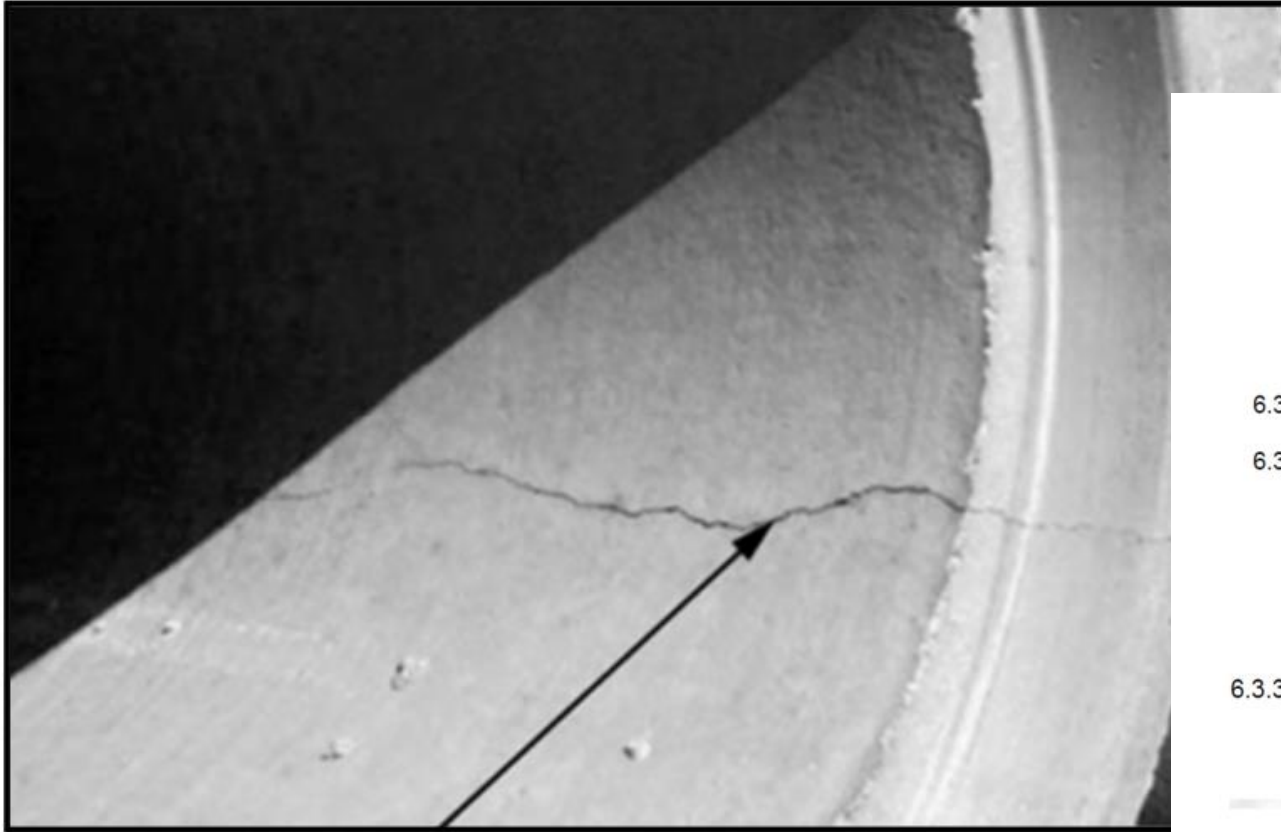
- 5.4.1.2. Damage or chips in round structures 1 in. and greater in depth from the end of the bell or spigot and not exceeding the depth of the joint can be repaired provided the total cumulative damage ($L1 + L2 + L3$) does not involve more than 50 percent of a round structure's circumference, and no individual damage or chip ($L1$, $L2$, or $L3$) can be more than 25 percent of a round structure's circumference as shown in Figures 17, 18, and 19.



Notes:

NOT Acceptable – Damage Exceeds Depth of Joint!

PIPE SECTION #4



REJECTED – Crack is through the wall, Possibly wider than 0.01” however, no need to confirm as crack appears to be through the wall – all through and all done...

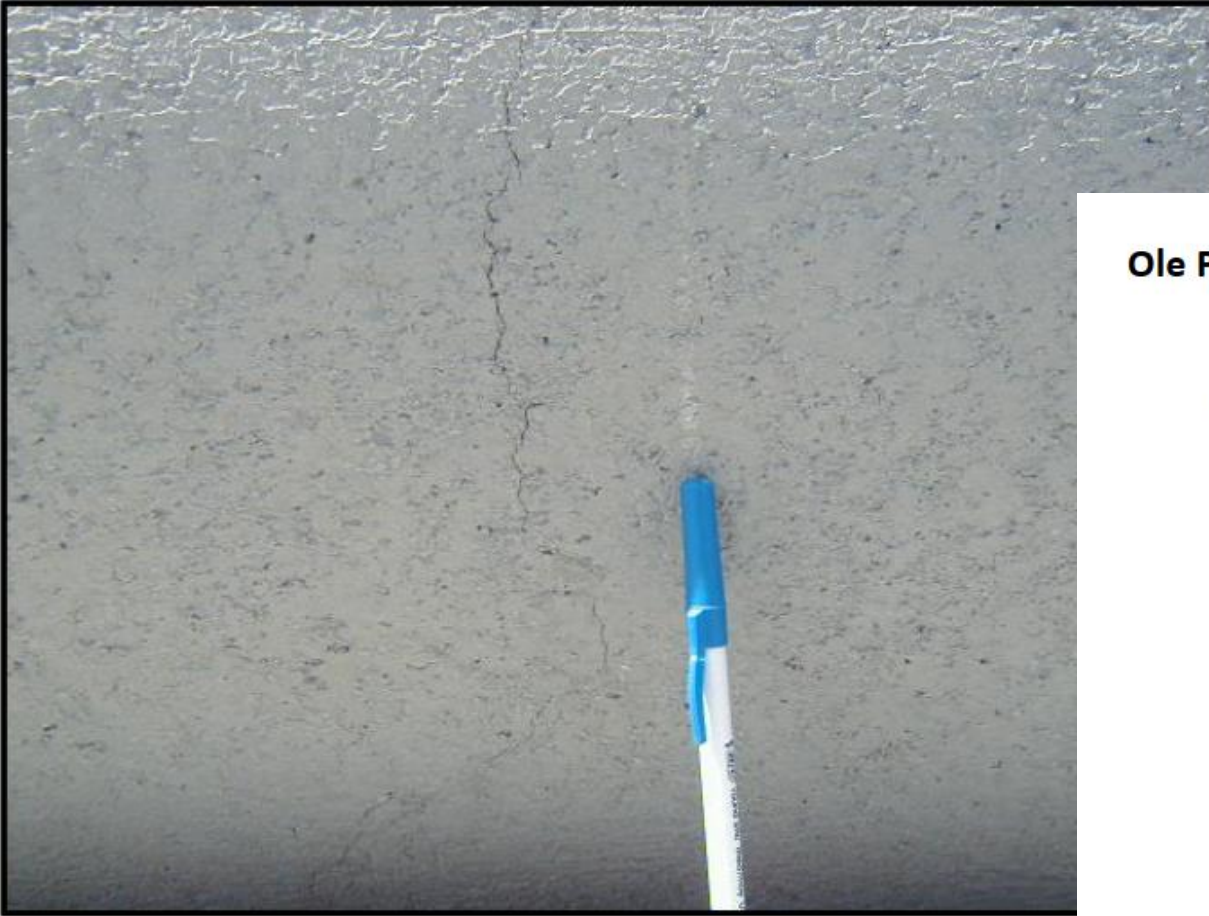
6.3. *Causes for Rejection Due to Cracks in Reinforced Products:*

- 6.3.1. Any crack that visibly passes through the wall of the product, except for a single end crack that does not exceed the depth of the joint, as shown in Figure 26, or not repaired in accordance with Section 5.2 is cause for rejection.

A ←

- 6.3.3. For pipe not installed or under load, any continuous crack that is 0.01 in. wide or greater at the surface and 12 in. or longer, regardless of position in the wall of the section when measured in accordance with Section 3.1 and shown in Figures 27 through 29, is cause for rejection.

PIPE SECTION #5



Ole Pipe #5 was a Trick Question...but these questions happen all the time

- 4.3.2. Any continuous crack having a surface width less than 0.01 in. wide, provided it does not pass through the wall as shown in Figure 4, shall be acceptable.

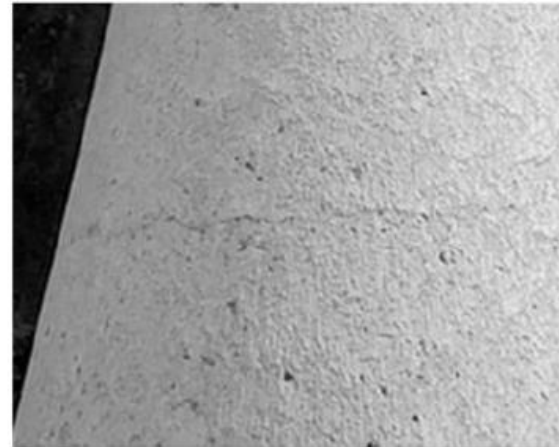


Figure 4—Acceptable Surface/Curing Crack (Photo Courtesy of ACPA)

- 4.3.3. Any continuous crack having a surface width of 0.01 in. or greater and less than 12 in. long, provided it does not pass through the wall, shall be acceptable.

BOX CULVERT SECTION #6

5.4.1.3.

Damage or chips in rectangular structures 1 in. and greater in depth from the end of the bell or spigot and not exceeding the depth of the joint can be repaired provided the total cumulative damage or chip ($L1 + L2 + L3$) does not involve more than 50 percent of the structure's span or rise, whichever is greater, and no individual damage or chip ($L1$, $L2$, or $L3$) can be more than 25 percent of a structure's span or rise, whichever is greater as shown in Figures 20 and 21.

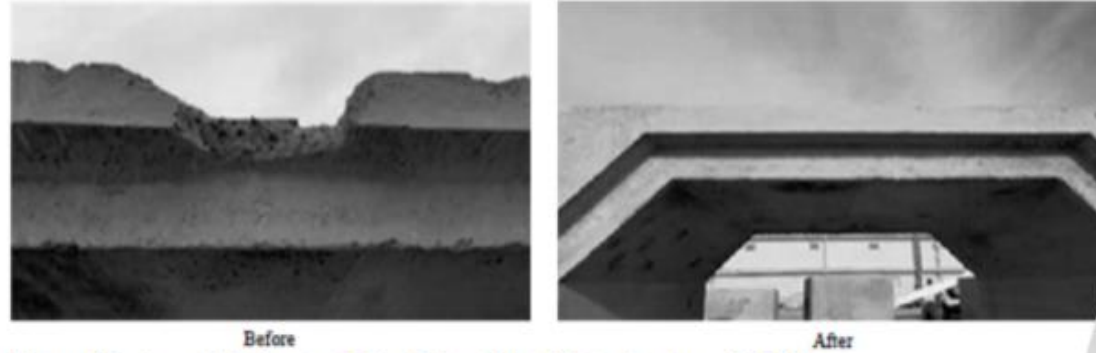
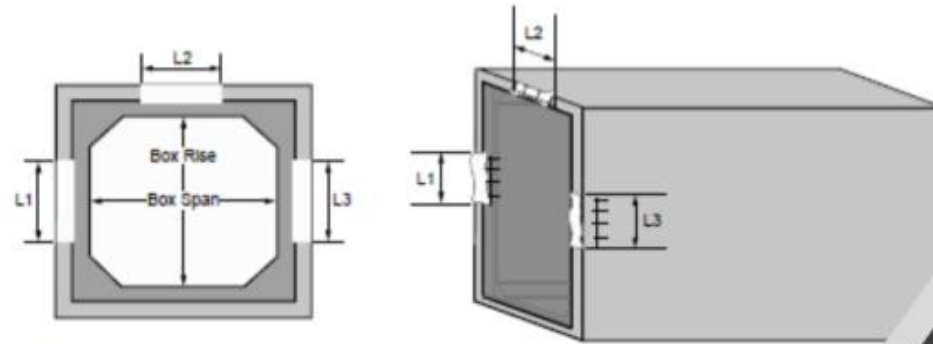


Figure 20—Acceptable Repair of a Box Culvert Joint (Photos Courtesy of ACPA)



Notes:

1. $L1 + L2 + L3$ cumulative damage length must not exceed 50 percent of the box span or rise.
2. $L1$, $L2$, or $L3$ (an individual damage length) must not exceed 25 percent of the box span or rise.

Figure 21—Damaged End—Groove End

BOX
CULVERT
SECTION #7

6.4.3. Evidence of inadequate concrete cover over reinforcing steel, as shown in Figure 31, is cause for rejection.



Figure 31—Rejectable Pipe, Conical Top, and Box Culvert with Exposed Reinforcement (Photo: Courtesy of ACPA)



BOX CULVERT
SECTION #7

Standard Practice for

**Evaluation of Precast Concrete
Drainage Products**

AASHTO Designation: R 73-16¹
Release: Group 2 (June 2016)

AASHTO

American Association of State Highway and Transportation Officials
444 North Capitol Street N.W., Suite 249
Washington, D.C. 20001

R73 = LIFE CHANGING

- Easy “Check-List” Application by Contractor, Inspectors, Owners, Industry!
- It IS a National Standard
- It is Technically Correct
- Industry Supports the use and Application of R -73 @ Plant and on Job Site
- Provides Consistent and Objective Evaluation of Pre-Installed PreCast Products!



_____ is the national standard that was developed to properly evaluate issues or concerns in pre-installed pipe and precast products.

- A. AASHTO C1840
- B. ASTM R73
- C. AASHTO R73
- D. ASTM C76



Aesthetic issues are acceptable and will not affect the pipe's _____ and operation over the expected life of the RCP

- A. beauty
- B. structural integrity
- C. surface area
- D. "n" value



An RCP found on the job site with a single chip or damaged spigot may be repaired if the damaged area is less than ___ of the circumference and the damage is less than the depth of the joint.

32%

25%

50%

75%

THANK YOU

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