

ASTM C 1840 – UPDATES & IMPROVEMENTS

STILL INCLUDES:

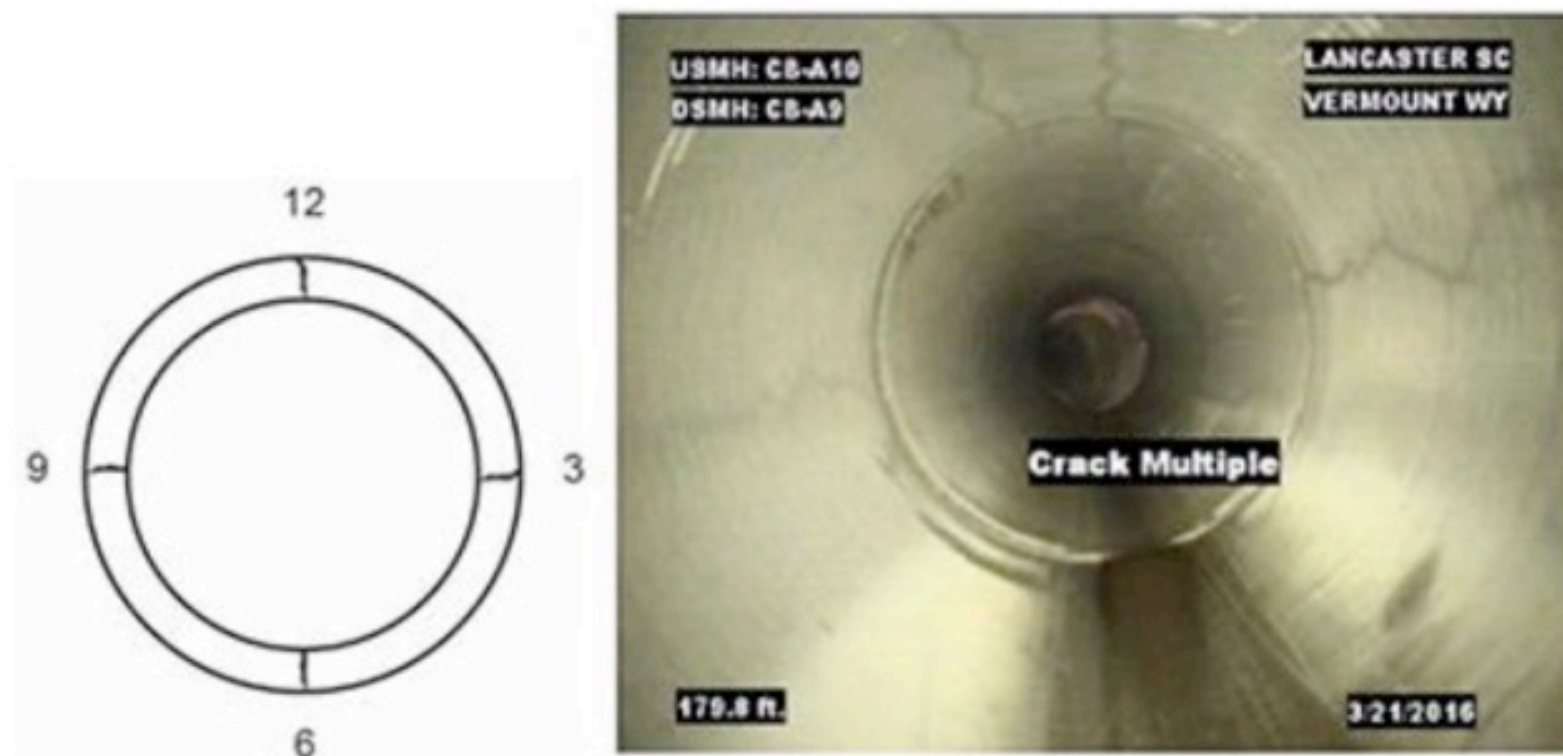


FIG. 7 Hinged Cracks (Multiple Longitudinal Cracks)

INSPECTION REPORT REQUIREMENTS

- PERSON ENTRY & REMOTE INSPECTION REPORTS
- RECORDED VIDEO & STILL IMAGES, ELECTRONIC MEDIA
- CRACK OBSERVATIONS:
 - LOCATION, LENGTH, WIDTH, ORIENTATION
 - MEASUREMENT < 0.5 IN. NOTED AS “< 0.05 IN. WIDTH”
- MEASURE JOINTS EXCEEDING MANUFACTURER RECOMMENDATION TO NEAREST 0.1 IN.



FIG. 1 Person Entry Inspection



FIG. 2 Remote Inspection Camera

EQUIPMENT & OPERATOR ACCURACY VERIFICATION

- DOCUMENTATION TO OWNER
- EQUIPMENT IN COMPLIANCE WITH SPECS.
- HUMAN OPERATORS ARE PROFICIENT WITH CALIBRATION, MEASUREMENTS ACCURATE AND REPEATABLE

This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

ASTM INTERNATIONAL Designation: C1840 - 17

Standard Practice for Inspection and Acceptance of Installed Reinforced Concrete Culvert, Storm Drain, and Storm Sewer Pipe¹

This standard is issued under the fixed designation C1840; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last approval. A superscript epsilon (ε) indicates an editorial change since the last revision or approval.

1. Scope

1.1 This practice covers the requirements for inspection and acceptance of installed reinforced concrete pipe by either person-entry, or remote inspection as shown in Figs. 1 and 2, respectively.

1.2 The scope of this specification is intended for installation related observations and assumes that pre-installation inspection has been completed.

1.3 The reinforced concrete culvert, storm drain and storm sewer pipe shall be manufactured in accordance with Specification C76, C506, C507, C655, or C1417 and accepted in accordance with AASHTO R073. This specification shall only be used for gravity, non-pressure storm drainage applications.

1.4 Person Entry shall be used unless extenuating circumstances preclude this type inspection. Remote inspection is acceptable for use for pipe diameters of 30 in. (750 mm) and smaller unless otherwise specified by owner or engineer.

1.5 Access of installed pipe for manual inspection shall follow OSHA 29 CFR PART 1926 SUBPART AA regulations for confined space entry. However, this standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

1.6 This practice does not cover deformation or deflection assessment. Concrete pipe is classified as a rigid structure because they do not bend or deflect appreciably under load before cracking. Due to these facts shape evaluation are of little or no value when evaluating concrete pipe.

1.7 The values stated in either Imperial/US or [SI] units are to be regarded separately as standard. The SI units are shown in brackets. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other.

1.8 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

2. Referenced Documents

2.1 *ASTM Standards:*
 C76 Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
 C506 Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
 C507 Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe
 C655 Specification for Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe
 C822 Terminology Relating to Concrete Pipe and Related Products
 C1417 Specification for Manufacture of Reinforced Concrete Sewer, Storm Drain, and Culvert Pipe for Direct Design
 D932 Practice for Filamentous Iron Bacteria in Water and Water-Formed Deposits

2.2 *AASHTO Standards:*
 AASHTO LRFD Bridge Design Specification
 AASHTO LRFD Bridge Construction Specification, Section 27
 AASHTO PP63 Standard Practice for Pipe Joint Selection for Highway Culvert and Storm Drains
 AASHTO R073 Standard Practice for Evaluation of Precast Concrete Drainage Products

2.3 *Occupational Safety and Health Standards:*
 OSHA 29 CFR Part 1926 Subpart AA for the Construction Industry

2.4 *ISO/IEC Standards:*
 ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories

3. Terminology

3.1 For definitions of other terms relating to concrete pipe not defined in this specification, see Terminology C822.

¹This test method is under the jurisdiction of ASTM Committee C13 on Concrete Pipe and is the direct responsibility of Subcommittee C13.05 on Special Projects.
 Current edition approved April 15, 2017. Published April 2017. DOI: 10.1520/C1840-17

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Project Name: Lyndam Hill Phase II
 Date: 3/1/2017 8:24:00 AM
 Location: Chynoweth Street
 Length Surveyed: 32.6
 Run Number:
 Pipe Size: 15

Asset ID:
 Upstream MH Number: D15
 Downstream MH Number: D14
 Direction Of Survey: Upstream
 Pipe Material: Reinforced Concrete Pipe

Distance	Fault Observation	Time	Picture
3.0	Start Inspection Severity: None Remarks: Inside pipe, pipe elevated in curb inlet D14	44	
8.6	General Observation Position: 5 Severity: None Remarks: Joint width is 0.12	01:50	
21.6	Cracks Position: 1 To 11 Severity: None Remarks: Crack width is 0.088	03:36	

IMPROVEMENTS COMING SOON:

3.2.9 LEAK RESISTANT JOINT — ~~ACCORDING TO AASHTO PP 63 AND FOR THE PURPOSE OF THIS SPECIFICATION,~~ A JOINT THAT LIMITS WATER LEAKAGE TO ~~AT~~ A MAXIMUM RATE OF 200 GALLONS/(INCH OF INTERNAL DIAMETER) (MILE OF PIPELINE) (24HR) FOR THE PIPELINE SYSTEM.

NOTE 2: CONFIRMATION OF LEAKAGE RATE CAN BE DETERMINED BY TEST WHEN CONDUCTED IN ACCORDANCE WITH ASTM C969.

X1 – SUMMARY OF CRACK EVALUATION CRITERIA

APPENDIX

(Nonmandatory Information)

X1. Summary of Crack Evaluation Criteria

Cracking	Width, in.	Maximum Length	Pattern, conditions	Section	Acceptance Criteria
longitudinal	≤ 0.01	entire pipe segment	N/A	8.2.1.1	not requiring remediation
	≤ 0.05		non-corrosive environment	8.2.1.2	
	0.01 < w < 0.05		hinge cracks more than 2 quadrants > 0.1 in. vertical offset across crack	8.2.2.1(1) 8.2.2.1(2)	
	0.05 < w ≤ 0.1	allowing entry of backfill	8.2.2.1(3)	requiring further engineer evaluation	
		corrosive environment	8.2.2.2(1)		
		hinge cracks more than one quadrant	8.2.2.2(2)		
> 0.1	N/A	any vertical offset across crack	8.2.2.2(3)		
		< 3ft	N/A	8.2.2.3	

X2 – SUMMARY OF JOINT EVALUATION CRITERIA

X2. Summary of Joint Evaluation Criteria

Joint Type	Condition	Section	Acceptance Criteria
silt and soil tight	separation < manuf requirements	8.3.1.1(1)	not requiring remediation
	cracks ≤ 0.10 on joint sealing surface	8.3.1.1(2)	
	< 0.75 offset	8.3.1.1(3)	
	allow entry of soil particles per section 3.2	8.3.1.1(4)	
	chips or spalls w/o exposed circumferential reinf	8.3.1.1(5)	
	show stain, level 1 or level 2 infiltration if 1-5 criteria are met	8.3.1.1(6)	
	exposed gasket or sealing material if 1-5 criteria are met	8.3.1.1(7)	
leak resistant	separation less than manuf reqmt	8.3.1.2(1)	
	cracks ≤ 0.05 on joint sealing surface	8.3.1.2(2)	
	< 0.75 offset	8.3.1.2(3)	
	chips or spalls w/o exposed gasket, sealing mat or circumferential reinf.	8.3.1.2(4)	
	show stain or level 1 infiltration	8.3.1.2(5)	

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APPENDIX

(Nonmandatory Information)

X1. Summary of Crack Evaluation Criteria

<u>Cracking</u>	<u>Width, in.</u>	<u>Maximum Length</u>	<u>Pattern, conditions</u>	<u>Section</u>	<u>Acceptance Criteria</u>
<u>longitudinal</u>	<u>≤ 0.01</u>	<u>entire pipe segment</u>	<u>N/A</u>	<u>8.2.1.1</u>	<u>not requiring remediation</u>
	<u>≤ 0.05</u>		<u>non-corrosive environment</u>	<u>8.2.1.2</u>	
	<u>0.01 < w < 0.05</u>		<u>hinge cracks more than 2 quadrants</u>	<u>8.2.2.1(1)</u>	<u>requiring further engineer evaluation</u>
			<u>> 0.1 in. vertical offset across crack</u>	<u>8.2.2.1(2)</u>	
			<u>allowing entry of backfill</u>	<u>8.2.2.1(3)</u>	
	<u>0.05 < w ≤ 0.1</u>		<u>corrosive environment</u>	<u>8.2.2.2(1)</u>	
			<u>hinge cracks more than one quadrant</u>	<u>8.2.2.2(2)</u>	
	<u>N/A</u>		<u>any vertical offset across crack</u>	<u>8.2.2.2(3)</u>	
	<u>> 0.1</u>		<u>< 3ft</u>	<u>N/A</u>	<u>8.2.2.3</u>
	<u>> 3ft</u>	<u>N/A</u>	<u>8.2.3.1</u>	<u>requiring remediation</u>	
<u>circumferential</u>	<u>≤ 0.10</u>	<u>full circumference</u>	<u>N/A</u>	<u>8.2.4.1</u>	<u>not requiring remediation</u>
	<u>> 0.10</u>	<u>> 50% of circumference</u>	<u>corrosive environment</u>	<u>8.2.5.1</u>	<u>requiring further engineer evaluation</u>
	<u>N/A</u>	<u>N/A</u>	<u>offset that impedes flow</u>	<u>8.2.5.2</u>	
	<u>N/A</u>	<u>N/A</u>	<u>allowing entry of backfill</u>	<u>8.2.6.1</u>	<u>requiring remediation</u>
<u>multi-directional</u>	<u>> 0.05</u>	<u>> 25% of circumference</u>	<u>more than one quadrant</u>	<u>8.2.7</u>	<u>requiring remediation</u>
<u>any</u>	<u>≤ 0.10</u>	<u>N/A</u>	<u>filled with calcium carbonate</u>	<u>8.2.8</u>	<u>not requiring remediation</u>
	<u>> 0.10</u>	<u>N/A</u>	<u>filled with calcium carbonate</u>	<u>8.2.8</u>	<u>requiring further engineer evaluation</u>

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X2. Summary of Joint Evaluation Criteria

<u>Joint Type</u>	<u>Condition</u>	<u>Section</u>	<u>Acceptance Criteria</u>
<u>silt and soil tight</u>	<u>separation < manuf requirements</u>	<u>8.3.1.1(1)</u>	<u>not requiring remediation</u>
	<u>cracks ≤ 0.10 on joint sealing surface</u>	<u>8.3.1.1(2)</u>	
	<u>< 0.75 offset</u>	<u>8.3.1.1(3)</u>	
	<u>allow entry of soil particles per section 3.2</u>	<u>8.3.1.1(4)</u>	
	<u>chips or spalls w/o exposed circumferential reinf</u>	<u>8.3.1.1(5)</u>	
	<u>show stain, level 1 or level 2 infiltration if 1-5 criteria are met</u>	<u>8.3.1.1(6)</u>	
	<u>exposed gasket or sealing material if 1-5 criteria are met</u>	<u>8.3.1.1(7)</u>	
<u>leak resistant</u>	<u>separation less than manuf reqmt</u>	<u>8.3.1.2(1)</u>	
	<u>cracks ≤ 0.05 on joint sealing surface</u>	<u>8.3.1.2(2)</u>	
	<u>< 0.75 offset</u>	<u>8.3.1.2(3)</u>	
	<u>chips or spalls w/o exposed gasket, sealing mat or circumferential reinf.</u>	<u>8.3.1.2(4)</u>	
	<u>show stain or level 1 infiltration</u>	<u>8.3.1.2(5)</u>	
<u>silt and soil tight</u>	<u>separation > manuf requirements</u>	<u>8.3.2.1(1)</u>	<u>requiring further engineer evaluation</u>
	<u>cracks > 0.10 on joint sealing surface</u>	<u>8.3.2.1(2)</u>	
	<u>> 0.75 offset</u>	<u>8.3.2.1(3)</u>	
	<u>infiltration of soil particles > defined in section 3.2</u>	<u>8.3.2.1(4)</u>	
	<u>level 3 infiltration and not meeting criteria 8.3.1.1</u>	<u>8.3.2.1(5)</u>	
<u>leak resistant</u>	<u>separation > manuf requirements</u>	<u>8.3.2.2(1)</u>	
	<u>cracks > 0.05 on joint sealing surface</u>	<u>8.3.2.2(3)</u>	
	<u>> 0.75 offset</u>	<u>8.3.2.2(1)</u>	
	<u>exposed gasket or sealing material</u>	<u>8.3.2.2(4)</u>	
	<u>level 2 infiltration and total line leakage rate > leak resistant joint requirements</u>	<u>8.3.2.2(5)</u>	
<u>silt and soil tight</u>	<u>chips or spalls in the sealing surface that expose structural reinf</u>	<u>8.3.3.1(1)</u>	
	<u>any joint separation that exposes the backfill material</u>	<u>8.3.3.1(2)</u>	
<u>leak resistant</u>	<u>chips or spalls in the sealing surface that expose structural reinf</u>	<u>8.3.3.2(1)</u>	<u>requiring remediation</u>
	<u>allow entry of any backfill</u>	<u>8.3.3.2(2)</u>	
	<u>level 3 infiltration</u>	<u>8.3.3.2(3)</u>	