

## COMMENTS RECEIVED FROM INDUSTRY REVIEW

\*\*\*\*\*



October 27, 2005

Mr. Duane F. Brautigam, P.E., State Specifications Engineer

Cc: Mr. Rick Renna, State Drainage Engineer  
Mr. David Sadler, State Construction Office  
Mr. Rodney Powers, District Materials Engineer

### Re: Proposed Specification Change: 4300480 – Final Pipe Inspection

Mr. Brautigam,

Thank you for the opportunity to review and comment to the proposed specification change to 4300480 – Final Pipe Inspection. The following comments are a summary of our position in the corrugated HDPE pipe industry with regards to the new proposed specification.

While we all can certainly agree on the importance of proper installation to ensure adequate performance of all piping materials, we feel that the new proposed specification has several shortcomings that need to be addressed. First, our experience with the laser profiling device and discussions with those who have used it indicate that it is a good tool for quality assurance on a periodic basis, but that it is quite time-consuming and may involve some extensive and time-consuming data analysis, which is unfair to installers, especially when there are other, less burdensome means to ensure proper installation. AASHTO guidelines for thermoplastic pipe require 100% video inspection and 10% deflection testing with a mandrel or other method capable of physically determining the deflection in the pipe. Deflection testing is also required on any areas that are questionable per the 100% video inspection. Our recommendation would be to adhere to the current AASHTO post-installation inspection requirements for your primary standard, and to further investigate the laser profiling device for quality assurance purposes and periodic spot checks where more information is necessary. At the last PAG meeting, it was our understanding that FDOT would adhere to the AASHTO guidelines unless there was technical justification to deviate. We don't see such justification.

The proposed specification and laser profiling technology seem to unfairly target thermoplastic pipe. For example, helically manufactured corrugated metal pipe likely cannot be tested with this method and will rely on the standard mandrel test to determine acceptance, while issues with rigid pipe (e.g. settling at the joints, cracks, etc) are not adequately addressed with this method due to apparent limitations with the laser technology as well as the timing with which such issues become apparent. A post-installation specification should address all pipe materials.

We would also like to outline some of our specific concerns with the current laser profiling inspection technology:

1. Sediment build-up, water, and other debris within the pipeline will cause false readings of the laser (i.e. they may appear as excessive deflections, when in reality the pipe is within specification). While the video may be used to verify whether each reading was a deflection or debris, this involves considerable post-inspection data analysis.
2. Skewed joints will cause false readings (excessive horizontal deflection) since the laser's orientation will be in a different plane than that normal to the pipe. It is imperative that the laser remains oriented properly throughout the entire length of the pipe.
3. The laser profiling device requires proper calibration and is subject to interpretation. This

will be site-specific and time consuming. Data analysis may take up to 2 weeks to complete (one must decipher "noise" from actual deflections by comparing the data to the video inspection). This is not fair to contractors and those installing the pipe. There are other methods available (e.g. mandrel, etc) that will provide immediate feedback and are much less cumbersome and time-consuming to use.

4. 4. The laser sighting may be disturbed, impeded or dispersed due to atmospheric density differences relating to fog or dew formations. These conditions are prevalent in much of Florida's pipe installations.

5. 5. The frequency of testing is not addressed in the specification. AASHTO requires 100% video inspection and 10% deflection testing. Given the complexity and time involved in the laser profiling data analysis, we recommend adhering to the AASHTO guidelines of 10% random deflection inspection, in addition to any areas that are questionable per the 100% video inspection.

In conclusion, while we recognize the importance of proper installation for all pipe materials, we feel that the new proposed specification unfairly targets thermoplastic pipe and adds an unnecessary degree of complexity and complication to the installation process. Data can be misconstrued to indicate poor installations when the installation is actually adequate. There are other methods available that are less cumbersome and will provide the State of Florida with the information needed to ensure adequate installations of their piping materials; these methods are detailed in AASHTO Section 30. Specifically, the 100% video inspection is a good tool to determine the overall condition of the installed pipe, and the mandrel (or other physical measurement) on 10% of the installed pipe is a quick and easy way to evaluate whether or not the deflection is within specification. The proposed laser profiling device may be a useful tool for further data analysis if necessary, but should not be implemented on 100% of installed pipe. We recommend that Florida DOT adhere to the post-installation guidelines of AASHTO Section 30 for thermoplastic pipe, which requires 100% video inspection and 10% deflection testing using a mandrel or other suitable means to verify the installation is in accordance with your specifications.

Sincerely,



Michael Pluimer Technical and Engineering Manager Plastics Pipe Institute – CPPA Division  
[mpluimer@plasticpipe.org](mailto:mpluimer@plasticpipe.org)  
202.462.9607 x26

\*\*\*\*\*

**Bob Burleson**

From: "Bob Burleson" [bburleson@FTBA.com]  
Sent: 10/31/2005 01:45 PM  
To: "Burnette, Bill" <burnetteb@contech-cpi.com>  
Subject: RE: Proposed Specification revision of 4300480 ? Final Pipe Inspection.

Bill,

Thanks for your comments. I don't believe most contractors will be performing this laser testing. My understanding is it will be done by the person hired by the contractor to do the video that is currently required. I am not real sure what imperfections this might show that aren't seen to some extent under the current video. The intent is primarily to

discover deflection problems. I don't believe it will lead to much more scrutiny on pipe than we currently have.

I will pass your comments along. Since we don't seem to have a big problem with pipe failures currently I don't believe this will create much problem.

Bob

**Bill Burnette**

From: Burnette, Bill [mailto:burnetteb@contech-cpi.com]

Sent: Monday, October 31, 2005 1:34 PM

To: Bob Burleson

Subject: RE: Proposed Specification revision of 4300480 – Final Pipe Inspection.

Bob,

We saw a presentation by the laser company at Friday's PAG meeting. This proposed new inspection procedure will show any pipe imperfection from deflections, cracks, joint gaps etc.. All pipe will be under intense scrutiny if this is utilized and although contractors may not now think they have a problem, they will when it is introduced.. Not only will they have to buy a \$25,000 piece of equipment but they will have to train their people to use an elaborate laser devise unlike those used for simple line and grade. Inspectors will now be equipped with a devise to pick out all imperfections even those that will not impact the piping performance. Comments are being received up to Friday of this week.

Bill

**Bob Burleson**

From: Bob Burleson [mailto:bburleson@FTBA.com]

Sent: Thursday, October 27, 2005 10:43 AM

To: Burnette, Bill

Subject: RE: Proposed Specification revision of 4300480 – Final Pipe Inspection.

Thanks for the comments, Bill. This spec doesn't seem to have much objection among contractors. The addition of the laser to the already required video is not that big a deal evidently. This will allow for discovery of possible pipe deflection without pulling a mandrel in most cases.

I believe we won't see any more of the D7 requirements on jobs.

Bob

**Bill Burnette**

From: Burnette, Bill [mailto:burnetteb@contech-cpi.com]

Sent: Wednesday, October 26, 2005 11:16 AM

To: Bob Burleson

Subject: FW: Proposed Specification revision of 4300480 – Final Pipe Inspection.

Bob,

This is another example of the FDOT taking things way too far on pipe inspections for contractors. They have fairly recently imposed TV requirements only to now propose the use of a laser. We don't know of any state that requires contractors to inspect pipe so precisely. We have District 7 requiring air testing of storm sewers and now lasers statewide .What next? I recall you saying at a recent District quarterly meeting that Florida contractors were staying away from DOT work in favor of private jobs that we more reasonable in their requirements. This latest revision in the spec will not help..

Bill

W. M. Burnette, P.E.  
General Manager, Contech- Southern Culvert

\*\*\*\*\*

**John Kurdziel**

From: John.Kurdziel@ads-pipe.com  
Proposed Specification revision of 4300480 – Final Pipe Inspection.

I can certainly see the appeal of an inspection procedure that appears to do everything at once, but there are some significant negatives associated with this technology for the type of applications we are intending to address. Before formally implementing this laser profiling technology, I would like to suggest we consider the following issues and their associated ramifications:

Sediment build-up or debris in the pipeline will provide false readings (excessive vertical deflections).

Open, or more specifically, skewed joints will provide false readings due to the laser's orientation (excessive horizontal deflections). Lines must be totally clean. Standing water will register false (excessive) deflection measures. Given the flat terrain in Florida, it may be very difficult to achieve this requirement.

Since CMP is helically manufactured, it will be impossible to obtain accurate deflection measurements with this equipment. Only a standard mandrel works for their product.

Calibration of these units is critical to obtain proper measures. This calibration is site and user specific, and therefore, open for some interpretation.

The laser sighting may be disturbed, impeded or dispersed due to atmospheric density differences relating to fog or dew formations.

The shortcomings associated with this technology are significant given the competitive nature of the pipe industry. I am afraid the resulting data can be misconstrued to indicate problems where none exist. It will also lead to numerous arguments on the interpretation of the data and the inspection procedures. Simple is always better given the environment in which we work. I would strongly suggest we stick with well known and readily available technology, such as the physical mandrel test. The mandrel is not subject to the type and degree of false readings associated with a laser ring. Furthermore, our inspectors and contractors know how to use the instruments, they are relatively inexpensive, durable, widely available and can be used on all flexible products regardless of the manufacturing technology or material.

Thank you for your consideration.

John

\*\*\*\*\*

**Bob Dion**

File: 4300480 – Final Pipe Inspection  
Username: Bob Dion  
UserEmail: bob\_dion@urscorp.com  
UserTel: 386-740-0665  
Date: Monday, October 03, 2005  
Time: 04:48:58 PM

Comments:

Suggest deleteing 'using a mandrel' in the 1st sentence of the 4th paragraph of 430-4.8. The next sentnece requires a mandrel be used for further testing.

Also delete 'If use of a mandrel is selected as the means of further testing' from the 4th sentence of the paragraph. Use of a manrel seems to be required if additional testing of pipe is required.

\*\*\*\*\*

**Jennifer Taylor**

File: 4300480 – Final Pipe Inspection  
Username: Jennifer Taylor  
UserEmail: jennifer.taylor@dot.state.fl.us  
UserTel: SC 373-3471  
Date: Friday, October 21, 2005  
Time: 08:03:09 AM

Comments:

Here are the comments that i received for the above referenced proposed spec changes:

1. Address a "re-video" of the pipe, following repairs. For example, if there is a problem discovered in the initial pipe video that needs to be repaired, the contractor needs to prove that this repair was made. This "re-video" could be at the discretion of the Engineer (depending on the number of locations and size of the pipe, it may be feasible to "manually" inspect the repairs).
2. found in the pipe videos. For example, the contractor may be ready to begin friction shortly after the pipe video is completed. If a time line is not established for both parties (FDOT and contractor) in addressing any issues regarding the pipe videos, the contractor may claim that the Department is delaying them from their work schedule.
3. The video camera should be equipped with some sort of scale in order to have a good prospective on the crack sizes and gap widths.
4. Digital cameras should be used, since VHS videos will be obsolete shortly.
5. Recording of the pipe should be done prior to the base being put down.
6. Is the last sentence on page 1 making reference to all of the requirements or just the mandrel requirements?

\*\*\*\*\*



November 4, 2005 via e-mail: [duane.brautigam@dot.state.fl.us](mailto:duane.brautigam@dot.state.fl.us)

Duane F. Brautigam, PE State Specifications Engineer Florida Department of Transportation 605  
Suwannee Street Tallahassee, FL 32399

Cc: Kevin Thibault, Ananth Prasad, Rick Renna, Rod Powers

**Re: PPI Comments to FDOT Proposed Specification Change: 4300480 (Sept. 30, 2005)**

Mr. Brautigam,

Please review the attached proposed Specification 4300480 with marked-up comments from the Plastics Pipe Institute and its constituents. Following is a brief explanation of the proposed changes.

Since the previous Pipe Advisory Group meeting on June 3, 2005, the Department has moved swiftly towards adopting innovative laser inspection technology aimed at quantifying misalignment and deflection of installed pipe. On October 28, 2005, the initial comment period deadline for the specification implementation, the Department and pipe industry became aware of significant NEW appurtenances to the lasers (the presenter referred to them as "non-contact video micrometers") which can truly identify and quantify the severity of cracks and joint separation, the key components that affect pipe performance and long-term function. It seems appropriate that the specification should therefore include the addition of these non-contact video micrometers that identify, quantify and measure all cracks and joints to ensure specification tolerance compliance.

As shown in the marked-up specification, we also made some recommendations with regards to the laser deflection measurements. The laser manufacturer has advised that any sediment and/or water in the pipe invert may inadvertently affect deflection readings. It is therefore suggested that deflection measurements of flexible pipes be taken horizontally at the springline of the pipe. Horizontal measurements will eliminate assumptions or problems with obtaining vertical deflection readings due to debris or water in the pipe. Also, measurement of actual deflection at the springline will correspond to the theoretical horizontal deflection calculations used in flexible pipe design. Should the technology prove reliable, laser readings of horizontal deflection in flexible pipe will eliminate the need for mandrel testing, except for disputed cases.

Finally, the late revelation of NEW beneficial checks via the video micrometer represents some significant changes to FDOT's proposed specification. As previously stated by the PPI, actual field use of this technology will bear its true merit and/or complications in readings and interpretations. Therefore, we suggest that the attached marked-up specification revision be implemented as a test program or supplemental specification. Throughout this special review period, the full capacity of the laser technology and its inspection capabilities can be assessed and evaluated relative to Department expectations and intentions. After this review period, it can be determined whether the tested procedure warrants formal specification.

Thank you for this opportunity to comment on the proposed final pipe inspection specification. We trust that these comments will assist the Department in launching a useful plan that meets its intentions of quality pipe installation assurance.

Sincerely,



Michael Pluimer  
Technical and Engineering Manager, Plastics Pipe Institute  
[mpluimer@plasticpipe.org](mailto:mpluimer@plasticpipe.org)  
202.462.9607 x26

**PPI Suggestions to FDOT Sept. 30, 2005 Proposed Specification Change: 4300480  
(For Clarification:  
all FDOT Proposed revisions are in BLUE;  
all PPI suggested changes are in RED)**

4300480.doc Item  
Nos 430- and 2430-2

## **FINAL PIPE INSPECTION.**

**(REV 9-30-05)**

SUBARTICLES 430-4.8 (of the Supplemental Specifications) is deleted and the following substituted:

**430-4.8 Final Pipe Inspection:** Based on Contract pavement type, upon completion of placement of concrete pavement or the placement of structural asphalt, but prior to placement of

asphalt friction course, dewater installed pipe and provide the Engineer with a video taping recording schedule. Provide the Engineer with a video tape of pipe 48 inches [1,200 mm] or less in diameter, for examination. The Engineer may waive this requirement for side drains and cross drains which are short enough to inspect from each end of the pipe. The Engineer will inspect pipe for line and grade, joint gaps, joint misalignment, leaks, damage, and for debris.

*For pipe 48 inches [1,200 mm] or less in diameter, provide the Engineer a video DVD and report using low barrel distortion video equipment with laser profile technology, non-contact video micrometer and associated software that provides:*

1. 1. *Actual recorded length and width measurements of all cracks within the pipe. Pipes with measured cracks in excess of requirements within Section 449-4.1 shall be removed and replaced.*
2. 2. *Actual recorded separation measurement of all pipe joints. Pipes with measured joint separation in excess of requirements within section 430-7.2 shall be removed and replaced.*
3. 3. *Pipe ovality report.*
4. 4. *Horizontal deflection measurements of the pipe springline and graphical diameter analysis of the horizontal report in terms of x and y axis.*
5. 5. *Flat analysis report.*
6. 6. *Representative diameter of the pipe.*
7. 7. *Pipe deformation measurements, leaks, debris, or other damage or defects.*
8. 8. *Deviation in pipe line and grade, joint gaps, and joint misalignment.*

*Laser profiling and measurement technology must be certified by the company performing the work to be in compliance with the calibration criteria posted at: <http://www.dot.state.fl.us/construction/ContractorIssues/Laser.htm>. Reports may be submitted in electronic media if approved by the Engineer. When For metal and plastic video recorded, laser profiled pipe that indicates horizontal deflection that appears to be in excess of that allowed by Specification for the*

**PPI Suggestions** to FDOT Sept. 30, 2005 Proposed Specification Change: 4300480  
(For Clarification: all FDOT Proposed revisions are in BLUE;  
all PPI suggested changes are in RED)

type of pipe installed, the Engineer will also inspect for deflection. The Engineer may require further testing of the pipe as a result of the inspection using a mandrel. If so directed by the Engineer, test pipe 36 inches [900 mm] and less in diameter using a mandrel. ~~The mandrel shall be pulled by hand and be approved by the Engineer prior to use.~~ For pipe larger than 36 inches [900 mm] in diameter, deflection shall be determined by a method approved by the Engineer. If use of a mandrel is selected as the means of further testing, ~~the mandrel's diameter, length, and other requirements shall conform to 430-4.8.2.~~ Replace pipe failing to meet the specific deflection requirements for the type of pipe installed, at no cost to the Department. Disputed cases of deflection measurements may be proven by hand pulling a mandrel conforming to Section 430-

4.8.2. Should the deflection test prove that the pipe met Specifications, the Department will bear the cost of the mandrel deflection testing.

*The Engineer may waive this requirement for side drains and cross drains which are short enough to inspect from each end of the pipe.*

**430-4.8.1 Video Taping Report:** Provide a high quality *VHS DVD in a MPEG2* format videotape with *a 460 lines of resolution standard resolution of 720 x 480*. Use a camera with lighting suitable to allow a clear picture of the entire periphery of the pipe. Center the camera in the pipe both vertically and horizontally and be able to pan and tilt to a 90 degree angle with the axis of the pipe and rotating 360 degrees. Use equipment to move the camera through the pipe that will not obstruct the camera's view or interfere with proper documentation of the pipe's condition.

The videotape image shall be clear, focused, and relatively free from roll, static, or other image distortion qualities that would prevent the reviewer from evaluating the condition of the pipe. *The tape speed shall be standard play*. The video tape will include an identification before each section of pipe filmed. The identification will include the project number, the structure number corresponding to the structure number on the set of plans for the project, size of pipe, the date and time, and indicate which pipe is being filmed if multiple pipes are connected to the structure. Notes should be taken during the video *taping/recording process*. Provide the Engineer with copies of these notes along with the video.

Move the camera through the pipe at a speed not greater than 30 feet per minute [10 meters per minute]. Mark the video tape with the distance down the pipe. The distance shall have an accuracy of one foot per 100 feet [300 mm in 328 meters]. Stop the camera and pan when necessary to document defects. Film the entire circumference at each joint.

**430-4.8.2 Mandrels:** Use mandrels which are rigid, nonadjustable, odd-numbered legged (minimum 9 legs) having a length not less than its nominal diameter. The diameter at any point shall not be less than the allowed percent deflection of the certified actual mean diameter of the pipe being tested. The mandrel shall be fabricated of metal, fitted with pulling rings at each end, stamped or engraved on some segment other than a runner with the nominal pipe size and mandrel outside diameter.

\*\*\*\*\*

**Rick J. Traylor**

Please see attached our response to the specification proposed changes to Section 430-4.8.

11/04/2005 06:07 PM

**FINAL PIPE INSPECTION.**  
(REV 9-30-05)

SUBARTICLES 430-4.8 (of the Supplemental Specifications) is deleted and the following substituted:

430-4.8 Final Pipe Inspection: Based on Contract pavement type, upon completion of placement of concrete pavement or the placement of structural asphalt, but prior to placement of asphalt friction course, dewater installed pipe and provide the Engineer with a video recording schedule.

For all pipe installed, provide the Engineer a video DVD of 100% of line length and report using laser profile technology and associated software that provides:

1. Pipe ovality report.
2. Deflection measurements and graphical diameter analysis report in terms x and y axis.
3. Flat analysis report.
4. Representative diameter of the pipe.
5. Pipe deformation measurements, leaks, debris, or other damage or defects.
6. Pipe line and grade, joint gaps, and joint misalignment.

Laser profiling technology must be certified by the company performing the work to be in compliance with the calibration criteria posted at:

<http://www.dot.state.fl.us/construction/ContractorIssues/Laser.htm>

Reports may be submitted in electronic media if approved by the Engineer.

Video recorded, laser profiled pipe that indicates deflection in excess of 5% of the certified actual mean diameter of the pipe at final inspection shall be removed and replaced at no cost to the Department. Before removal and replacement, the Engineer may require further testing of the pipe using a mandrel. The mandrel shall be pulled by hand and be approved by the Engineer prior to use. If use of a mandrel is used for further testing, the mandrel's diameter, length, and other requirements shall conform to 430-4.8.2. Remove, replace, and retest pipe failing to meet the 5% deflection requirement after laser ring and/or mandrel testing at no cost to the Department. Should the deflection test prove that the pipe met Specifications, the Department will bear the cost of the deflection testing.

The Engineer may waive this requirement for side drains which are short enough to inspect from each end of the pipe, provided, however, that in order to waive this requirement such drains shall not exceed 50 feet in length.

Thanks

Rick

<<FINAL PIPE INSPECTIONFCPI response to spec review.doc>>

[RTraylor@rinker.com](mailto:RTraylor@rinker.com)

\*\*\*\*\*

**Jeff Nelson**

**From:** Jeff Nelson [mailto:jnelson@nelson-construction.com]

**Sent:** Thursday, November 03, 2005 9:52 AM

4300480 – Final Pipe Inspection

Pipe Testing- This should be clarified that it does not apply to JPA work. Thanks,

Jeff

\*\*\*\*\*

# HUEY, GUILDAY, TUCKER, SCHWARTZ & WILLIAMS, P. A.

ATTORNEYS AND COUNSELORS AT LAW

P.O. BOX 12500

TALLAHASSEE, FLORIDA 32317-2500

www.hueylaw.com

TEL: (850) 224-7091

FAX: (850) 222-2593

GOVERNMENT PRACTICE GROUP OFFICE:

215 SOUTH MONROE STREET

SUITE 110

TALLAHASSEE, FLORIDA 32301

MAIN OFFICE:  
1983 CENTRE POINTE BOULEVARD  
SUITE 200  
TALLAHASSEE, FLORIDA 32308

October 20, 2005

**VIA HAND DELIVERY**

Robert Downie, Esq.  
General Counsel's Office  
Florida Department of Transportation  
605 Suwannee Street, MS-58  
Tallahassee, Florida 32399

Re: Proposed Revisions to Specification 430-4.8

Dear Mr. Downie:

On behalf of Florida Concrete Pipe Institute, Inc., I want to thank the Department of Transportation for affording us an opportunity to review and comment on the proposed revisions to Specification 430-4.8, Final Pipe Inspection. Attached hereto is our response to your proposed revision forwarded to me on September 30, 2005. To avoid confusion, we have indicated our proposed changes to your draft language by both underlining and printing our proposed language in red. We do not believe that our language changes violate either the substance or the spirit of your initial draft. Rather, our suggested changes serve simply to clarify what is required of the Engineer, and to specify the standards applicable in determining unacceptable pipe deflection and the consequences of that determination. Naturally, we will be happy to discuss our suggested changes with the Department.

We think that this product is fair for all parties, and addresses the common concerns of both the Department and FCPI. I look forward to hearing from you at your earliest convenience.

Very truly yours,



William E. Williams

WEW/lm  
Enclosures

05 OCT 20 PM 4:43  
DOT GENERAL COUNSEL  
REC'D LEGAL

**FINAL PIPE INSPECTION.**  
(REV 9-30-05)

SUBARTICLES 430-4.8 (of the Supplemental Specifications) is deleted and the following substituted:

430-4.8 Final Pipe Inspection: Based on Contract pavement type, upon completion of placement of concrete pavement or the placement of structural asphalt, but prior to placement of asphalt friction course, dewater installed pipe and provide the Engineer with a video recording schedule.

For all pipe installed, provide the Engineer a video DVD of 100% of line length and report using laser profile technology and associated software that provides:

1. Pipe ovality report.
2. Deflection measurements and graphical diameter analysis report in terms x and y axis.
3. Flat analysis report.
4. Representative diameter of the pipe.
5. Pipe deformation measurements, leaks, debris, or other damage or defects.
6. Pipe line and grade, joint gaps, and joint misalignment.

Laser profiling technology must be certified by the company performing the work to be in compliance with the calibration criteria posted at:

<http://www.dot.state.fl.us/construction/ContractorIssues/Laser.htm>

Reports may be submitted in electronic media if approved by the Engineer.

Video recorded, laser profiled pipe that indicates deflection in excess of 5% of the certified actual mean diameter of the pipe at final inspection shall be removed and replaced at no cost to the Department. Before removal and replacement, the Engineer may require further testing of the pipe using a mandrel. The mandrel shall be pulled by hand and be approved by the Engineer prior to use. If use of a mandrel is used for further testing, the mandrel's diameter, length, and other requirements shall conform to 430-4.8.2. Remove, replace, and retest pipe failing to meet the 5% deflection requirement after laser ring and/or mandrel testing at no cost to the Department. Should the deflection test prove that the pipe met Specifications, the Department will bear the cost of the deflection testing.

The Engineer may waive this requirement for side drains which are short enough to inspect from each end of the pipe, provided, however, that in order to waive this requirement such drains shall not exceed 50 feet in length.

FCPI  
language