

Attention: Tom Lubozynski, PE

Date: May 27, 2011

Job No: 195-97785-002

To: Florida Department of Environmental Protection
Central District
3319 Maguire Blvd, Suite 232
Orlando, FL 32803

RECEIVED
JUN 01 2011
DEP Central Dist.

Regarding: Volusia County – Tomoka Farms Road Landfill
North Cell Toe Drain & Temporary Runoff Containment Berm Certification of Construction Completion

We are sending you:

☒ Attached

☐ Under separate cover via _____ the following items

☐ Shop drawings

☐ Prints

☐ Plans

☐ Samples

☐ Specifications

☐ Copy of letter

☐ Change Order

☒ Other Report

Copies	Date	No.	Description
4	5/27/2011	1	Certification of Construction Completion Report

These are transmitted as checked below:

☐ For approval

☐ Approved as submitted

☐ Resubmit _____ copies for approval

☐ For your use

☐ Approved as noted

☐ Submit _____ copies for distribution

☒ As requested

☐ Returned for corrections

☐ Return _____ corrected prints

☐ For review/comment

☐ Other

☐ For bids due _____

☐ Prints returned after loan to us

Remarks Please find attached, four copies of the Certification of Construction Completion report for the Toe Drain and Temporary Runoff Containment Berm construction project.

Copy to Volusia County, file

Signed Ashley Evans

If enclosures are not as noted, please notify us at once

C:\Documents and Settings\cdagle\My Documents\Work Files\Project Management\Forms\Transmittal.doc

WACS# 27540



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May 27, 2011

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JUN 01 2011

DEP Central Dist.

Mr. Tom Lubozynski, P.E.
Waste Management
Florida Department of Environmental Protection
Central District
3319 Maguire Blvd, Suite 232
Orlando, FL 32803

RE: Volusia County – Tomoka Farms Road Landfill
Class I – North Cell Toe Drain and Temporary Runoff Containment Berm
Certification of Construction Completion
Permit Number: SF64-0078767-027

Dear Mr. Lubozynski:

On behalf of the Volusia County Solid Waste Division, HDR Engineering, Inc. is pleased to submit the Class I – North Cell Toe Drain and Temporary Runoff Containment Berm Certification of Construction Completion report for the Tomoka Farms Road Landfill. Enclosed with this letter is the certification report and supporting information.

If you have any questions, please contact me at (904) 598-8941.

Sincerely,

Ashley Evans, PE
Project Engineer

Cc: Lenny Marion, Volusia County Solid Waste Director
Mark Roberts, P.E.

Certification of Construction Completion Report
April 4, 2011 – April 14, 2011

**TOE DRAIN AND TEMPORARY RUNOFF CONTAINMENT BERM CONSTRUCTION ON CLASS I - NORTH CELL
TOMOKA FARMS ROAD LANDFILL**

Prepared for:

Volusia County Solid Waste Division
3151 East New York Avenue
DeLand, Florida 32724

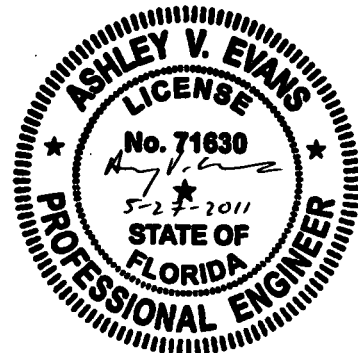
RECEIVED

JUN 01 2011

DEP Central Dist.

Prepared by:

HDR Engineering, Inc.
200 W Forsyth St., Suite 800
Jacksonville, Florida 32202



Ashley V. Evans, P.E.
Florida Registration No. 71630

May 27, 2011

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Project Summary

This report provides certification of construction of the toe drain and temporary runoff containment berm at the Tomoka Farms Road Class I North Cell landfill. The Florida Department of Environmental Protection (FDEP) submitted an inspection report of the landfill dated January 24, 2011. This report resulted in a Non-compliance Letter dated February 18, 2011 to Volusia County for a leachate seep on the south sideslope of the Class I North Cell. A meeting between Volusia County and FDEP Central District on March 16, 2011 at the FDEP office discussed the leachate seep issue and plan to remediate the seep with the installation of a toe drain and temporary runoff containment berm. The primary purpose of this construction was to ensure leachate in this area is properly drained and collected. Additionally, this toe drain is intended to be part of the North Cell Closure Sequence Construction. The construction efforts included locating the base liner anchor berm, locating the waste limits, cut and capping the existing gas pipeline, installing the toe drain trench and toe drain leachate collection pipe, connecting the toe drain pipe to the existing leachate collection cleanout riser pipe, and reconstructing the berm surrounding the toe drain trench. The construction event described above was carried out from April 4, 2011 through April 14, 2011, at the Tomoka Farms Road Landfill and meets the requirements of the leachate containment construction permit.

Site Background

Tomoka Farms Road Landfill (Landfill) is an active municipal solid waste landfill that is owned and operated by Volusia County. It is located at 1990 Tomoka Farms Road, Volusia County, Florida. SCS Engineers, Inc. designed and permitted the North Cell landfill closure. HDR Engineering, Inc. (HDR) modified the permitted closure for the North Cell and provided a closure sequence plan. The toe drain is to comply with the closure permit and will be incorporated into the Sequence 1 final closure. HDR provided the construction oversight for this toe drain and runoff containment berm. Shaw Environmental and Infrastructure, Inc. (Shaw) is the primary construction contractor. The landfill also has a gas to energy plant onsite operated by Fortistar Methane Group which is the primary combustion device for the collected landfill gas.

Contract Documents

The modified closure for the North Cell landfill was permitted in December 2010. The toe drain and temporary runoff containment berm constructed for the leachate seep violation was constructed as part of the permitted closure design. Any modifications to the permitted closure design will be recorded and submitted to the FDEP.

Contact List

The parties involved in this project are listed below:

Owner

Volusia County Solid Waste Division
3151 East New York Avenue
DeLand, Florida 32724
(386) 943-7889

Facility

Tomoka Farms Road Landfill
1990 Tomoka Farms Road
Port Orange, Florida 32128
(386) 947-2952

North Cell Design Engineer

HDR Engineering, Inc.
200 W. Forsyth St., Suite 800
Jacksonville, FL 32202
(904) 598-8900

SCS Engineers
4041 Park Oaks Blvd., Suite 100
Tampa, Florida 33610
(800) 569-9702

Construction Contractor

Shaw Environmental and Infrastructure, Inc.
9143 Phillips Highway, Suite 400
Jacksonville, Florida 32256
(904) 367-6025

CQA and Record Documentation

HDR Engineering, Inc.
200 W Forsyth St., Suite 800
Jacksonville, Florida 32202
(904) 598-8900

Surveyor

Sliger & Associates, Inc.
3921 Nova Road
Port Orange, Florida 32127
(386) 761-5385

Gas to Energy Developer

Fortistar Methane Group
1990 Tomoka Farms Road
Daytona Beach, Florida 32124

Summary of Construction

Toe Drain

The construction of the toe drain commenced on April 4, 2011 and was deemed substantially completed on April 14, 2011. The existing run-off containment berm was dewatered into the leachate collection system over a timeframe of two days. Meanwhile, three points along the base liner system anchor berm were located to determine the minimum horizontal location of the toe drain trench. Volusia County staff had staked out the recorded limits of liner prior to construction. These stakes ran directly along the top of the existing run-off containment berm. The first liner reference point was located approximately 125 feet east of the leachate cleanout riser #3 (LCO3), the second reference point was located approximately 130 feet west of LCO3, and the third reference point was located adjacent to the LCO3 pipe. An excavator was used to dig to the sand layer just above the liner then hand shovels were used to locate the liner. The top of the liner anchor berm was fully exposed at the outer two reference points to determine the inner berm edge before the liner slopes downward toward the landfill base. Survey tubes were inserted at the inner berm reference points. Once the survey tubes were in place, the sand above the liner was replaced, followed by the excavated soil until the berm was restored to its original shape. The center reference point was located but a survey tube was not inserted until additional work in the area was completed.

The soil surrounding LCO3 was excavated from the top of the riser pipe to approximately 6 feet past the existing gas pipe tie-in point along the LCO3 pipe. The excavator was used until the sand layer was discovered, which was within a foot or two of the pipe and liner, then hand shovels were used to expose the liner around the LCO3 pipe. Fortistar was informed of the construction activities and shut off the gas extraction system in the area of the construction. The existing gas pipe line that extracted gas from the LCO3 pipe to the lateral subheader gas pipeline located due north (upslope) of LCO3, was cut and capped just before the junction at LCO3. Soil surrounding the decommissioned gas pipe was excavated back to expose the gas pipeline, where it was cut and capped again approximately 40 feet from the first cut and the segment of disconnected pipe was removed. A permanent cap was installed on the upslope end of the decommissioned gas pipeline using an electrofusion weld.

The existing LCO3 riser was originally constructed using a combination of HDPE and CPP piping. This riser was replaced with an HDPE pipe with two pre-welded (machine welded) tie-in junctions; the upper junction is permanently capped and will be available to reconnect the gas extraction pipe in the future. The lower junction was installed to connect the leachate collected in the toe drain to the leachate collection system. Approximately 24.5 feet of riser was replaced and connected to the existing CPP pipe using a CPP coupling joint just past the lower tie-in junction. The outside of the HDPE pipe connection end was wrapped twice with rubber tape, inserted inside the coupling joint, and cinched with three stainless steel band clamps for a tighter fit into the coupling joint. A stainless steel band clamp was cinched around the CPP pipe end of the coupling joint for a more secure fit to the CPP pipe. The inner edge of the base liner anchor berm, adjacent to the LCO3 riser pipe (center reference point), was re-exposed and a survey tube inserted at the inner berm point for surveyors.

The surveyors arrived and recorded the available survey points. All three liner reference points were surveyed as well as points along the new LCO3 riser pipe, including the riser access cap, upper tie-in junction, lower tie-in junction, and HDPE to CPP connection point.

An excavator was used to locate the limits of waste. The trench design specified a minimum distance of 10 feet from the liner reference points and parallel to the liner. Waste was discovered approximately 20 feet from the center liner anchor berm reference point. The center (low point) of the toe drain trench was started approximately 28 feet due north from the center liner anchor berm reference point at a surface elevation of approximately 29.5 feet. An excavator created a 2.5 ft wide by 2 ft deep trench within waste from the center point to approximately 125 feet due east, at a 0.7% upward slope. Slope was established using an electronic laser surveyor tool programmed at 0.7% slope. Excavated waste was hauled to the active landfill face for disposal while soil free of debris was stockpiled nearby.

After the eastern trench was fully excavated, 6 oz. woven geotextile (12 ft width) was installed with the lengthwise center line of the geotextile lying on the center bottom of the trench. Next, 6 inches of FDOT #57 non-calcareous stone was placed into the eastern trench over the geotextile using an excavator. The stone was then spread until the 0.7% slope was achieved. Pre-welded (machine welded) 6-inch SDR 17 HDPE pipe with three rows of 5/8-inch holes along the two sides and bottom of the pipe was installed in the eastern trench. A HDPE tee fitting at the center low point end with 6-inch SDR 17 HDPE solid piping attached for connection to LCO3 and a 5 ft solid HDPE riser pipe with a permanent cap was installed at the east end of the toe drain pipe. More stone was placed until it was uniformly 1 foot (minimum) above the top of the toe drain pipe. Survey tubes were placed at the center low point, eastern middle, and eastern end of the top of toe drain pipe. The geotextile was then folded over the top of the stone; first the southern geotextile flap was laid down then the northern flap was overlapped on the southern flap so that no stone was exposed. In areas where the flaps could not cover the stone entirely, additional strips of geotextile were laid across the top of the stone before folding the flaps.

An excavator was used to dig the western toe drain trench from the center low point due west approximately 125 ft at a 0.7% upward slope. Slope was established using an electronic laser surveyor tool programmed at 0.7% slope. Excavated waste was hauled to the active landfill face for disposal while soil free of debris was stockpiled nearby. Waste was not at a uniform depth so to construct in waste, the western trench jogged north approximately 2 ft in two locations, 35 ft and 82 ft west of the center low point.

After the western trench was fully excavated, 6 oz. woven geotextile (12 ft width) was installed with the lengthwise center line of the geotextile lying on the center bottom of the trench. Next, 6 inches of FDOT #57 non-calcareous stone was placed into the western trench over the geotextile using an excavator. The stone was then spread until the 0.7% slope was achieved. Pre-welded (machine welded) 6-inch SDR 17 HDPE pipe with three rows of 5/8-inch holes along the two sides and bottom of the pipe was installed in the western trench. A 5 ft solid HDPE riser pipe with a permanent cap was installed at the west end of the toe drain pipe. The western toe drain pipe was then electrofused to the eastern toe drain pipe at the tee fitting.

More stone was placed until it was uniformly 1 foot (minimum) above the top of the toe drain pipe. Survey tubes were placed at the western middle and western end of the top of toe drain pipe. The geotextile was then folded over the top of the stone; first the southern geotextile flap was laid down then the northern flap was overlapped on the southern flap so that no stone was exposed. In areas where the flaps could not cover the stone entirely, additional strips of geotextile were laid across the top of the stone before folding the flaps.

The HDPE pipe connecting the toe drain to LCO3 was electrofused at the lower tie-in junction on LCO3 so that the toe drain system was complete and leachate collected by the toe drain could begin draining

into the leachate collection system. The toe drain trench was left exposed, thus allowing surface runoff from the leachate seepage area to be captured and percolate into the toe drain.

The area surrounding LCO3 was covered with sand then backfilled with clean soil to the permitted grades.

Temporary Runoff Containment Berm

After completing the toe drain trench and connection to LCO3, the temporary runoff containment berm was reconstructed. The existing berm was shortened on both ends to just contain the runoff from the 250 ft toe drain trench area, where the leachate seepage was occurring prior to installing the toe drain. The ends of the shortened berm were then tied into the landfill sideslopes, maintaining the appropriate berm height to contain surface runoff.

The top of the runoff containment berm was moved north and reshaped to run adjacent and parallel to the toe drain trench with a 3:1 slope on the south side and a 2:1 slope on the north side where stormwater runoff is to be contained. The base of the containment ditch is the toe drain trench itself and is at an elevation 4 ft below the top of the temporary berm height. The landfill side slope (north of the toe drain trench) was shaped to the permitted grades. Disturbed areas were resodded for erosion control.

The surveyor returned to record the points along the toe drain trench and temporary runoff containment berm. The center line along the top of the containment berm was surveyed as well as the toe of slope on the southern side of the containment berm. The north and south edges of the containment ditch were also surveyed. All survey tubes were then removed.

Closing

The toe drain trench was installed and connected to LCO3 and the temporary runoff containment berm was reshaped to collect only the runoff along the 250 ft length of the toe drain trench in accordance with the construction permit and associated construction drawings and specifications. Any deviations have been noted within this report. The construction was delayed one day due to storms. Delays also occurred from an unexpected amount of excess soil above the waste and liner that required additional time and resources to remove.

Appendix A

Daily Field Reports



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DAILY SITE LOGS

Project Name: Toe Drain & Berm Construction
Project Site: Tomoka Farms Road Landfill
Project Location: Volusia County, Florida

Date: 4/5/2011

Contractor: Shaw Environmental
CQA Firm: HDR Engineering, Inc.
CQA Associate: Teri Liermann

Temp: 75 °F Max
50 °F Min

Weather: Thunderstorms

Contractor Staff

Title

Equipment Used (Specific)

Ken Hagofsky
Marvin Contreras
Eleazar Sabillon

Shaw crew chief
Shaw crew
Shaw crew

Wacker 3" pump - Honda GX240

Work Performed and Notes:

Shaw began dewatering leachate catchment ditch. Teri Liermann and Ashley Evans of HDR met with Volusia County construction manager, Chet Purves, and Shaw crew chief, Ken Hagofsky at 8am to review project construction details. Stopped work due to weather conditions at 10am.



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DAILY SITE LOGS

Project Name: Toe Drain & Berm Construction
Project Site: Tomoka Farms Road Landfill
Project Location: Volusia County, Florida

Date: 4/6/2011

Contractor: Shaw Environmental
CQA Firm: HDR Engineering, Inc.
CQA Associate: Teri Liermann

Temp: 71 °F Max
47 °F Min

Weather: Sunny

Contractor Staff	Title	Equipment Used (Specific)
<u>Ken H.</u>	<u>Shaw crew chief</u>	<u>John Deere 200C LC excavator</u>
<u>Marvin C.</u>	<u>Shaw crew</u>	<u>Wacker 3" pump - Honda GX240</u>
<u>Eleazar S.</u>	<u>Shaw crew</u>	
<u>Roger</u>	<u>VC hired labor</u>	
<u>Jim</u>	<u>VC hired labor</u>	

Work Performed and Notes:

Arrived on site at 7:20am, Shaw already dewatering ditch and excavating to locate 1st reference point on the liner at eastern end of proposed trench. Volusia County hired labor arrived at 8:15am to help locate and expose the liner. Jeff, Jason, and Chris of Volusia County staff helped locate liner. Hit a dead head 6" PVC solid pipe surrounded by gravel sloping away from liner. Found and exposed the flat berm area of liner at an elevation of approximately 26 ft. Volusia County supplied 4" solid PVC pipe for survey tubes on the inside edge of liner berm. Lunch break from 11:30a to 12:30pm. Began locating 2nd reference point on liner at western end of proposed trench, finished locating western liner point at 1:30pm. Western liner point was at ~25.6 ft elevation; placed a survey tube at inside edge of liner berm. Next, exposed inside edge of liner berm at Leachate Cleanout pipe riser #3. Cleared an additional 6 ft around leachate cleanout riser pipe below gas pipe tie-in point. Cut and capped the gas pipe just before tee tie-in to leachate cleanout riser pipe. Stopped work at 5:00pm.



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DAILY SITE LOGS

Project Name: Toe Drain & Berm Construction
Project Site: Tomoka Farms Road Landfill
Project Location: Volusia County, Florida

Date: 4/7/2011

Contractor: Shaw Environmental
CQA Firm: HDR Engineering, Inc.
CQA Associate: Teri Liermann

Temp: 79 °F Max
54 °F Min

Weather: cloudy

Contractor Staff	Title	Equipment Used (Specific)
<u>Ken H.</u>	<u>Shaw crew chief</u>	<u>John Deere 200C LC excavator</u>
<u>Marvin C.</u>	<u>Shaw crew</u>	<u>GENERAC XP8000E generator</u>
<u>Eleazar S.</u>	<u>Shaw crew</u>	<u>McElroy pipe fusion</u>
<u>Kenny Wilson</u>	<u>Shaw crew</u>	
		<u>VC - CAT 330C excavator</u>
<u>Roger</u>	<u>VC hired labor</u>	<u>VC - D8R dozer</u>
<u>Jim</u>	<u>VC hired labor</u>	

Work Performed and Notes:

Arrived on site at 7:30am. Shaw was already digging out area surrounding leachate cleanout riser #3, prepping for tee installation and second gas pipe cut. Shaw crew worked on pipe fusion for tee installation while Ken H. located actual limits of waste. Waste was located ~25 ft from inside edge of liner berm at an elevation of ~30 ft. Volusia County staff arrived at 9am to work on removing excess soil above waste in the proposed trench area. Shaw worked on a 24.4 ft. replacement leachate cleanout riser pipe; replaced from toe drain tie-in tee to cap. All 6" HDPE SDR-17 pipe with two tees, one for future gas pipe tie-in and the other for toe drain tie-in. Lunch break from 11:30am to 12:30pm. Cut gas pipe at 2nd point above proposed trench line and capped end. Removed old leachate cleanout riser pipe and installed new HDPE pipe. Fitted new HDPE pipe to existing corrugated pipe using 6" coupling for corrugated pipe. HDPE end supplemented with two layers of 2" rubber tape from Home Depot and cinched with 3 metal hose clamps. Kenny Wilson of Shaw arrived to receive project details since he will take over for Ken Hagofsky as crew chief tomorrow. Placed survey tubes at the 3 liner reference points and backfilled the outer two points. Permanently capped the gas pipe using electrofusion. Prepped the work area for trenching the toe drain. Ended work at 6:15pm.



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DAILY SITE LOGS

Project Name: Toe Drain & Berm Construction
Project Site: Tomoka Farms Road Landfill
Project Location: Volusia County, Florida

Date: 4/8/2011

Contractor: Shaw Environmental
CQA Firm: HDR Engineering, Inc.
CQA Associate: Teri Liermann

Temp: 87 °F Max
64 °F Min

Weather: Sunny

Contractor Staff	Title	Equipment Used (Specific)
<u>Kenny Wilson</u>	<u>Shaw crew chief</u>	<u>John Deere 200C LC excavator</u>
<u>Marvin C.</u>	<u>Shaw crew</u>	<u>John Deere 250D hauler truck</u>
<u>Eleazar S.</u>	<u>Shaw crew</u>	<u>Spectra Precision Laser GL412</u>
		<u>McElroy pipe fusion</u>
		<u>VC - CAT 330 excavator</u>
<u>Roger</u>	<u>VC hired labor</u>	<u>VC - D6R dozer</u>
<u>Jim</u>	<u>VC hired labor</u>	

Work Performed and Notes:

Arrived on site at 7:30am. Shaw preparing the toe drain trench area. Started trenching toe drain at 8:00am from low point eastward, 28 ft. from liner reference point to southern edge of trench. Dug out line for connection pipe from toe drain low point to leachate cleanout riser tee tie-in. Trenched eastward 125 ft. at a 0.7% slope upward. Meanwhile, Volusia County staff continuing to remove excess soil from proposed western trench area. Sliger Surveyors arrived on site at approximately 12pm. Surveyed in liner reference markers and leachate cleanout pipe tee tie-in points. Sliger surveyors will return early next week to complete survey of toe drain and berm. Finished digging eastern trench at 1:45pm. Laid down woven geotextile in eastern trench, followed by 6" rock at 0.7% slope. Drain pipe has 3 rows of 5/8" holes, 1 row center bottom and 2 rows 90 degrees on either side. Toe drain pipe was hard fusion welded by McElroy machine; low point tee, pipe segments, and end riser all hard fusion welded before install into trench. Installed pipe in eastern trench then laid 1 ft rock over top of pipe and overlaid geotextile wrapping over rock. Survey tubes were set on top of pipe at 62.5 ft. from low point and at end of eastern trench pipe. Prepped western trench area. Ended at 7:00pm.



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DAILY SITE LOGS

Project Name: Toe Drain & Berm Construction
Project Site: Tomoka Farms Road Landfill
Project Location: Volusia County, Florida

Date: 4/9/2011

Contractor: Shaw Environmental
CQA Firm: HDR Engineering, Inc.
CQA Associate: Teri Liermann

Temp: 88 °F Max
65 °F Min

Weather: Sunny

Contractor Staff	Title	Equipment Used (Specific)
<u>Ken Hagofsky</u>	<u>Shaw crew chief</u>	<u>John Deere 200C LC excavator</u>
<u>Marvin Contreras</u>	<u>Shaw crew</u>	<u>John Deere 250D hauler truck</u>
<u>Eleazar Sabillon</u>	<u>Shaw crew</u>	<u>Spectra Precision Laser</u>
<u>Kenny Wilson</u>	<u>Shaw crew chief</u>	<u>GENERAC XP8000E generator</u>
<u>Rob Darr</u>	<u>Shaw crew</u>	<u>VC - CAT 725 hauler truck</u>
<u> </u>	<u> </u>	<u>VC - CAT D6 dozer</u>
<u> </u>	<u> </u>	<u>McElroy pipe fusion</u>
<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>

Work Performed and Notes:

Arrived on site at 7:30am. Shaw prepping western trench work area. Started digging western trench at 8:30am. Western trench started at 28 ft from liner reference point but 35 ft back along trench from low point, shifted 2 ft toward landfill in order to achieve trench in waste. Trench being sloped at 0.7% upward. Another 2 ft shift toward landfill at 82 ft from lowpoint along trench in order to achieve trench being in waste. Finished digging western trench at 10:40am. Laid out woven geotextile in trench. Lunch break from 11:15am to 12:15pm. Laid 6" rock in trench at 0.7% slope. Western toe drain pipe segments and end riser pipe hard fusion welded using McElroy machine. Pipe installed in trench and electrified to low point tee. Added 1 ft rock above top of pipe in western trench. Ran out of rock before completing western trench. Rock complete up to 50 ft from low point tee, then only 6-8" above top of pipe the remaining 75 ft to end of pipe. Temporarily closed geotextile over rock and placed survey tubes on top of pipe at low point tee, 62.5 ft west of low point tee, and the end of the western pipe. Connected toe drain pipe to leachate cleanout pipe using electrofusion weld. Finished at 3:00pm.



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DAILY SITE LOGS

Project Name: Toe Drain & Berm Construction
Project Site: Tomoka Farms Road Landfill
Project Location: Volusia County, Florida

Date: 4/11/2011

Contractor: Shaw Environmental
CQA Firm: HDR Engineering, Inc.
CQA Associate: Ashley Evans, PE

Temp: 84 °F Max
64 °F Min

Weather: Partly Cloudy**Contractor Staff****Title****Equipment Used (Specific)**

<u>Ken Hagofsky</u>	<u>Shaw crew chief</u>
<u>Marvin Contreras</u>	<u>Shaw crew</u>
<u>Eleazar Sabillon</u>	<u>Shaw crew</u>
<u>Kenny Wilson</u>	<u>Shaw crew chief</u>
<u>Rob Darr</u>	<u>Shaw crew</u>
<u>Roger</u>	<u>VC hired labor</u>
<u>Jim</u>	<u>VC hired labor</u>

<u>John Deere 200C LC excavator</u>
<u>John Deere 250D hauler truck</u>
<u>Spectra Precision Laser</u>
<u>GENERAC XP8000E generator</u>
<u>VC - CAT 725 hauler truck</u>
<u>VC - CAT D6 dozer</u>
<u>McElroy pipe fusion</u>

Work Performed and Notes:

Arrived on site at 10:30am. Surveyors had completed survey of toe drain and liner using survey tubes and had left the site. Shaw was awaiting gravel delivery and took lunch 10:30am-11:30am. Evans met with Chet Perves to discuss toe drain installation and achieving permitted grade elevations. During this meeting the gravel arrived onsite. At 12:30, Evans, Hagofsky, and Perves preformed visual inspection and discussion of work completed thus far and disucssion of work to proceed. A low flow of runoff was bypassing the trench where the lateral pipe connects the toe drain to the leachate cleanout. Since the flow was low it was determined that once the lateral pipe was covered the preferential pathway would no longer be the open trench but the toe drain. The trench containing the lateral pipe connecting the toe drain to the leachate pipe was then filled with clean backfill. At 1:30pm the remaining 1 foot of gravel over top of pipe was placed in western trench and overlaid geotextile wrapping over rock. Construction of the containment berm began by first excavating around the survey tubes locating the base liner system, 4 feet of cover remained above base liner system, grade remain constant from the inside edge of the liner to 6 feet inside the landfill foot print at which point a 3:1 slope was started until it met with the 2:1 inside slope of the containment berm. The containment berm was shaped at either end to tie into the existing landfill grades. Finished work at 5:30pm.



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DAILY SITE LOGS

Project Name: Toe Drain & Berm Construction
Project Site: Tomoka Farms Road Landfill
Project Location: Volusia County, Florida

Date: 4/14/2011

Contractor: Shaw Environmental
CQA Firm: HDR Engineering, Inc.
CQA Associate: Ashley Evans, PE

Temp: 80 °F Max
55 °F Min

Weather: Partly Cloudy

Contractor Staff	Title	Equipment Used (Specific)
<u>Ken Hagofsky</u>	<u>Shaw crew chief</u>	<u>John Deere 200C LC excavator</u>
<u>Marvin Contreras</u>	<u>Shaw crew</u>	<u>John Deere 250D hauler truck</u>
<u>Eleazar Sabillon</u>	<u>Shaw crew</u>	<u>Spectra Precision Laser</u>
<u>Kenny Wilson</u>	<u>Shaw crew chief</u>	<u>GENERAC XP8000E generator</u>
<u>Rob Darr</u>	<u>Shaw crew</u>	<u>VC - CAT 725 hauler truck</u>
<u> </u>	<u> </u>	<u>VC - CAT D6 dozer</u>
<u> </u>	<u> </u>	<u>McElroy pipe fusion</u>
<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>

Work Performed and Notes:

HDR arrived on site at 10:45am. Shaw had completed construction of containment berm and grading of upgradient slope. Slopes were being sodded by County contractor. Shaw was relocating excess dirt for area south of anchor trench berm to various locations to promote stormwater away from landfill and into the drainage swale areas. HDR left site at 12:00pm.

Appendix B

Construction Photographs



4/6/2011: Locating liner reference points and dewatering existing ditch, looking West.



4/6/2011: Exposing liner reference point 2 (west).



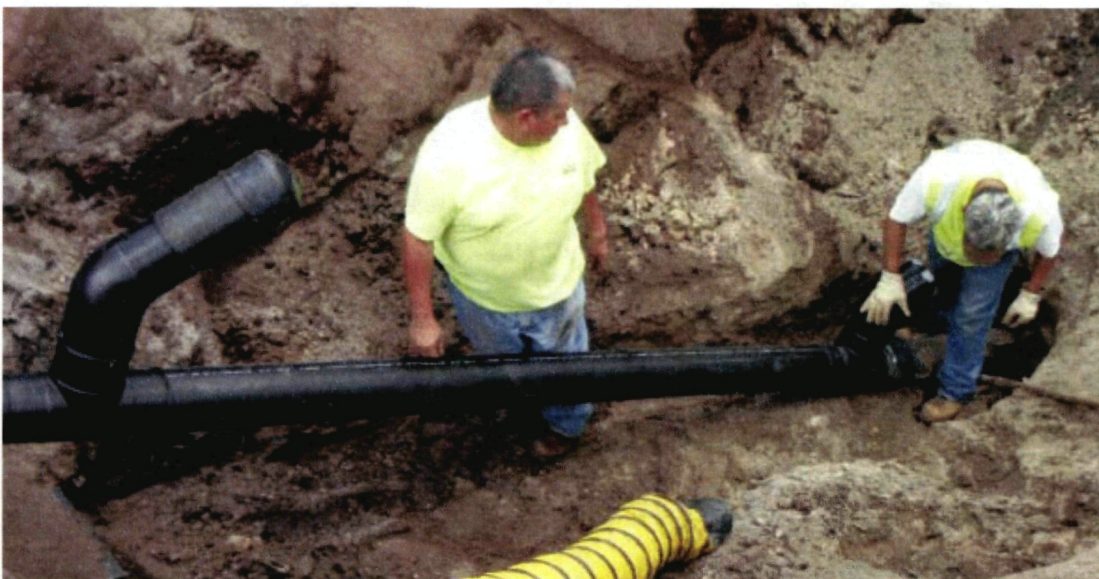
4/7/2011: Exposing existing LCO3 riser and cut & capped gas pipe line.



4/7/2011: Exposing gas pipe line for second cut and permanent cap and locating waste limits, looking North. Orange paint on gas pipe indicates 20 ft from center liner reference point.



4/7/2011: Replacement 6" HDPE SDR 17 LCO3 riser with 6" CPP coupling joint.



4/7/2011: Connecting replacement HDPE LCO3 riser pipe to existing CPP LCO3. Upper tie-in for future gas pipe line connection and lower tie-in for toe drain connection.



4/7/2011: Replacement HDPE LCO3 riser pipe with gas pipe tie-in for future connection.



4/8/2011: Eastern toe drain trench excavation and slope identification equipment, looking East.



4/8/2011: Eastern toe drain trench in at least 2 ft of waste, looking East.



4/8/2011: Geotextile being installed into eastern toe drain trench, looking East.



4/8/2011: Placing 6" #57 stone at 0.7% slope over geotextile in eastern toe drain trench, looking East.



4/8/2011: 6" HDPE SDR 17 toe drain pipe with #57 stone being placed 1' above top of pipe in eastern toe drain trench, looking East.



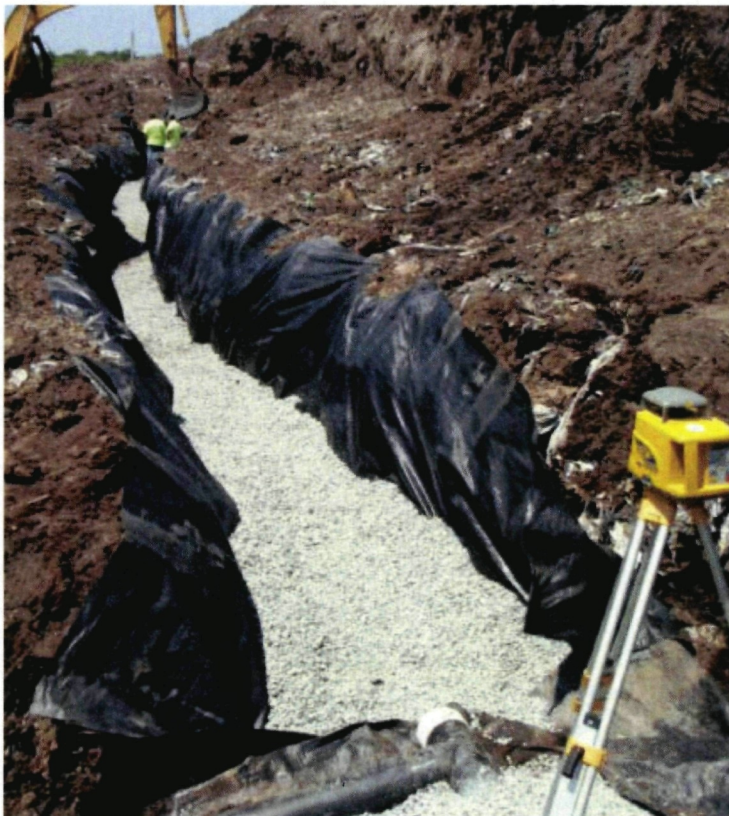
4/8/2011: Overlapping geotextile flaps over eastern toe drain trench. Survey tubes at mid- and end-points of top of pipe along eastern toe drain trench, looking East.



4/9/2011: Completed eastern toe drain trench and start of western toe drain trench excavation, looking West.



4/9/2011: Excavating western toe drain trench at 0.7% slope in 2 ft waste, looking West.



4/9/2011: Placing 6" of #57 stone over geotextile at 0.7% slope in western toe drain trench, looking West.



4/9/2011: Electrofusion welding west toe drain pipe to east toe drain pipe, looking North.



4/9/2011: Overlapping geotextile flaps over western toe drain trench with survey tubes at mid- and end-points of top of pipe along western toe drain trench and at the tie-in center low point of toe drain trench, looking West.



4/9/2011: Toe drain connection pipe electrofusion welded to replacement HDPE LCO3 riser pipe tie-in point, looking North.



4/14/2011: Completed temporary run-off containment berm, looking West. Left side survey tubes mark the liner reference points, right side survey tubes mark the toe drain pipe.



4/14/2011: Toe drain trench with survey tubes and completed temporary run-off containment berm, looking West. Rolled sod for erosion control being placed atop landfill side slope (north of trench). Volusia County staff are standing next to the replacement LCO3 riser pipe.



4/14/2011: Toe drain trench and temporary run-off containment berm, looking East. Sod still being placed on landfill side slope (north of trench). Excavator accidentally slid down landfill side slope onto toe drain trench near west end of the toe drain trench (disturbed soil over trench and berm).



4/14/2011: Completing landfill side slope sodding for erosion control, looking Northwest.

Appendix D

Materials Data Sheets

HDPE Pipe
Stone

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DEP Central Dist.



JMM HIGH DENSITY POLYETHYLENE (HDPE) PE3408/PE3608 PRODUCT SPECIFICATION

Description:

JMM manufactures High Density Polyethylene (HDPE) water pressure pipes for municipal and industrial transmission systems. Our pressure pipe is used in many types of applications such as: potable water, sewer, drain, mining, irrigation, slip lining, and reclaimed water.

Materials:

JMM HDPE pressure pipes are manufactured with premium, highly engineered PE3408/PE3608 resin that provides maximum performance benefits to service today's municipal and industrial water needs. The PE3408/PE3608 material conforms to ASTM D3350 with the cell classification of 345464C/E and is listed with the Plastic Pipe Institute's (PPI) TR4. It is formulated with carbon black and/or ultraviolet stabilizer for maximum protection against UV rays for added assurance.

Size	Type	DR	Standard (If Applicable)
4" – 63"	IPS / DIPS	7 – 41	ASTM F714, AWWA C906, NSF
½" – 3"	IPS	7 – 32.5	ASTM D3035, AWWA C901, NSF

Quality Assurance:

JMM takes great pride in the quality and workmanship of all of our products. JMM quality control programs encompass three critical aspects of the manufacturing process: the incoming raw material, pipe production, and the finished goods. Incoming material is inspected and tested to ensure the material meets all applicable requirements for production. During production, the pipe will be examined and pipe samples will be collected for physical verification and testing for compliance. The finished product is subjected to further visual inspection to ensure it has met all the appropriate specifications and packaging requirements. Without exception, our pipes are constantly monitored throughout the entire manufacturing process to validate that they are in accordance with all applicable specifications. Certificates of Compliance are available upon request.

Lengths & Bending Radius:

Standard laying lengths of HDPE pressure water pipe is 40/50 foot lengths. Pipe sizes under 6" may be coiled at continuous longer lengths upon request.

Marking:

Our standard markings printed on JMM pipes generally consist of the JMM logo, nominal size and OD base, material code, dimension ratio, pressure class, current AWWA C906 (if applicable), ASTM F714 (if applicable), and production date (day, month, & year).



PE 3408/PE 3608 JMM HDPE Typical Primary Properties

Property	Unit	Test Procedure	Typical Value
Material Designation	---	PPI-TR4	PE 3408/PE3608
Cell Classification	---	ASTM D3350	** 345464C
Density [3]	g/cm ³	ASTM D1505	0.955
Melt Index [4]	g/10 minutes	ASTM D1238	<0.15
Flexural Modulus [5]	psi	ASTM D790	110,000 to <160,000
Tensile Strength [4]	psi	ASTM D638	3,000 – 3,500
SCG (PENT) [6]	Hours	ASTM F1473	>100
HDB @ 73.4°F (23°C)[4]	psi	ASTM D2837	1600
HDB @ 140°F (60°C)	psi	ASTM D2837	800
Color; UV Stabilize [C]	---	---	Black with minimum 2% carbon black
Brittleness Temperature	°F	ASTM D746	<-130
Hardness	Shore D	ASTM D2240	> 60

** Note: Cell Classification is 345464E for all Blue / Green / Gray Polyethylene Pipes.



		DR 15.5 (110 psi)				DR 17 (100 psi)			DR 19 (90 psi)			DR 21 (80 psi)			DR 26 (64 psi)			DR 32.5 (50 psi)		
Pipe Size	Avg OD	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	
1/2	0.840	0.054	0.73	0.07	0.062	0.71	0.07	0.044	0.75	0.05	0.062	0.71	0.07	0.062	0.71	0.07	0.062	0.71	0.07	
3/4	1.050	0.068	0.91	0.09	0.062	0.92	0.08	0.055	0.93	0.08	0.062	0.92	0.08	0.062	0.92	0.08	0.062	0.92	0.08	
1	1.315	0.085	1.14	0.14	0.077	1.15	0.13	0.069	1.17	0.12	0.063	1.18	0.11	0.062	1.18	0.11	0.062	1.18	0.11	
2	2.375	0.153	2.05	0.47	0.140	2.08	0.43	0.125	2.11	0.39	0.113	2.14	0.35	0.091	2.18	0.29	0.073	2.22	0.23	
3	3.500	0.226	3.02	1.02	0.206	3.06	0.93	0.184	3.11	0.84	0.167	3.15	0.77	0.135	3.21	0.63	0.108	3.27	0.50	
4	4.500	0.290	3.88	1.68	0.265	3.94	1.54	0.237	4.00	1.39	0.214	4.05	1.26	0.173	4.13	1.03	0.138	4.21	0.83	
5 3/8	5.375	0.347	4.64	2.40	0.316	4.71	2.20	0.283	4.78	1.98	0.256	4.83	1.80	0.207	4.94	1.47	0.165	5.03	1.18	
5	5.563	0.359	4.80	2.57	0.327	4.87	2.35	0.293	4.94	2.12	0.265	5.00	1.93	0.214	5.11	1.57	0.171	5.20	1.27	
6	6.625	0.427	5.72	3.63	0.390	5.80	3.34	0.349	5.89	3.01	0.315	5.96	2.73	0.255	6.08	2.23	0.204	6.19	1.80	
7	7.125	0.460	6.15	4.21	0.419	6.24	3.86	0.375	6.33	3.48	0.340	6.40	3.16	0.274	6.54	2.58	0.219	6.66	2.08	
8	8.625	0.556	7.45	6.16	0.507	7.55	5.65	0.454	7.66	5.10	0.411	7.75	4.64	0.332	7.92	3.79	0.265	8.06	3.05	
10	10.750	0.694	9.28	9.58	0.632	9.41	8.88	0.566	9.55	7.92	0.512	9.66	7.21	0.413	9.87	5.87	0.331	10.05	4.75	
12	12.750	0.823	11.01	13.48	0.750	11.16	12.36	0.671	11.33	11.14	0.607	11.46	10.13	0.490	11.71	8.26	0.392	11.92	6.67	
14	14.000	0.903	12.09	16.24	0.824	12.25	14.91	0.737	12.44	13.43	0.667	12.59	12.22	0.538	12.86	9.96	0.431	13.09	8.05	
16	16.000	1.032	13.81	21.21	0.941	14.01	19.46	0.842	14.21	17.54	0.762	14.38	15.96	0.615	14.70	13.01	0.492	14.96	10.50	
18	18.000	1.161	15.54	26.84	1.059	15.75	24.64	0.947	15.99	22.20	0.857	16.18	20.20	0.692	16.53	16.47	0.554	16.83	13.30	
20	20.000	1.290	17.26	33.14	1.176	17.51	30.41	1.053	17.77	27.41	0.952	17.98	24.93	0.769	18.37	20.34	0.615	18.70	16.41	
24	24.000	1.548	20.72	47.72	1.412	21.01	43.81	1.263	21.32	39.47	1.143	21.58	35.91	0.923	22.04	29.30	0.738	22.44	23.62	
26	26.000	1.677	22.44	56.00	1.529	22.76	51.39	1.368	23.10	46.32	1.238	23.38	42.14	1.000	23.88	34.39	0.800	24.30	27.74	
28	28.000	1.806	24.17	64.95	1.647	24.51	59.62	1.474	24.88	53.72	1.333	25.17	48.86	1.077	25.72	39.88	0.862	26.17	32.19	
30	30.000	1.935	25.90	74.56	1.765	26.26	68.45	1.579	26.65	61.66	1.429	26.97	56.12	1.154	27.55	45.79	0.923	28.04	36.93	
32	32.000	2.065	27.62	84.87	1.882	28.01	77.86	1.684	28.43	70.16	1.542	28.73	63.84	1.231	29.39	52.10	0.985	29.91	42.04	
34	34.000	2.194	29.35	95.81	2.000	29.76	87.91	1.790	30.21	79.20	1.619	30.57	72.06	1.308	31.23	58.81	1.046	31.78	47.43	
36	36.000	2.323	31.08	107.41	2.118	31.51	98.57	1.895	31.98	88.80	1.714	32.37	80.78	1.385	33.06	65.94	1.108	33.65	53.20	

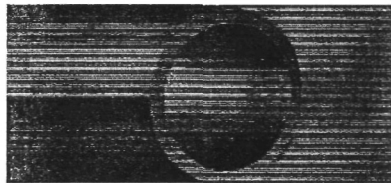
HDPE IRON PIPE SIZE (IPS) PRESSURE PIPE PE3408/PE3608

		DR 17 (100 psi)			DR 19 (90 psi)			DR 21 (80 psi)			DR 26 (64 psi)			DR 32.5 (50 psi)			DR 41 (40 psi)		
Pipe Size	Avg OD	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft	Min Wall	Avg ID	Weight lb/ft
36	36.000	2.118	31.510	98.57	1.895	31.983	88.80	1.714	32.366	80.78	1.385	33.064	65.94	1.108	33.651	53.20	0.878	34.139	42.4517
42	42.000	2.471	36.761	134.16	2.211	37.314	120.86	2.000	37.760	109.97	1.615	38.576	89.71	1.292	39.261	72.37	1.024	39.830	57.7632
48	48.000	2.824	42.013	175.23	2.526	42.644	157.86	2.286	43.154	143.65	1.846	44.086	117.18	1.477	44.869	94.56	1.171	45.517	75.4906
54	54.000	3.177	47.265	221.71	2.842	47.975	199.79	2.571	48.549	181.75	2.077	49.597	148.33	1.622	50.477	119.70	1.317	51.208	95.5163
63	63.000							3.000	56.640	247.42	2.423	57.863	201.88	1.938	58.891	162.84	1.537	59.742	130.0154

HDPE DUCTILE IRON PIPE SIZE (DIPS) PRESSURE PIPE PE3408/PE3608

J-M Manufacturing Company, Inc.
building essentials for a better tomorrow™

IPS Fittings Fabricated 22.5° Elbows

IPS
HDPE
Fittings

Pressure Rating is based on miter angle, pipe DR (Wall thickness), and resin properties.

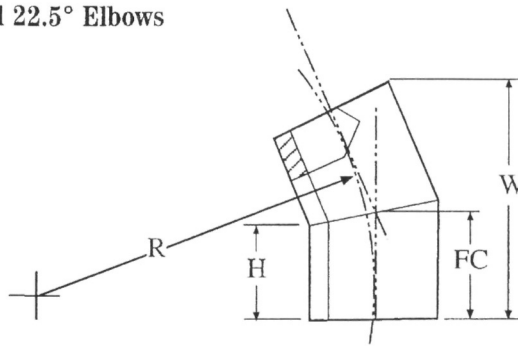
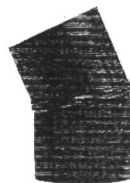
Ratings based on 3608 resin/11.25 angle:	
DR	Pressure Rating
7	219 psi
9	160 psi
11	128 psi
13.5	100 psi
15.5	82 psi
17	73 psi
21	57 psi
26	44 psi
32.5	34 psi

Ratings based on 4710 resin/11.25 angle:	
DR	Pressure Rating
7	274 psi
9	202 psi
11	161 psi
13.5	126 psi
15.5	103 psi
17	92 psi
21	72 psi
26	55 psi
32.5	42 psi

Note: Size/DR listings shown are commonly requested. Many DR options not listed are available. Please consult an ISCO representative for availability.

1-800-345-ISCO

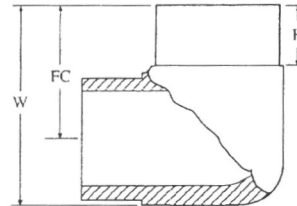
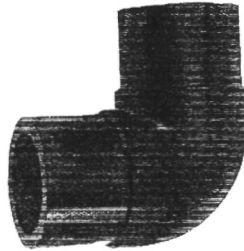
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IPS Fittings Fabricated 22.5° Elbows

Nominal Pipe Size(in)	DR	Part #	Dimensions				Weight (lbs)	Shipping Method
			R (in)	H (in)	FC (in)	W (in)		
2	2.375	07 ISFF220207IPS	13.125	4	4.25	8.6	1	FedEx
		09 ISFF220209IPS	"	"	"	"	1	"
		11 ISFF220211IPS	"	"	"	"	1	"
3	3.5	07 ISFF220307IPS	13.625	4	4.375	9.03	2	FedEx
		09 ISFF220309IPS	"	"	"	"	1	"
		11 ISFF220311IPS	"	"	"	"	1	"
		17 ISFF220317IPS	"	"	"	"	1	"
4	4.5	07 ISFF220407IPS	14.25	5	5.5	11.34	3	FedEx
		09 ISFF220409IPS	"	"	"	"	3	"
		11 ISFF220411IPS	"	"	"	"	2	"
		17 ISFF220417IPS	"	"	"	"	1	"
6	6.625	07 ISFF220607IPS	15.25	6	6.625	14.08	8	FedEx
		09 ISFF220609IPS	"	"	"	"	7	"
		11 ISFF220611IPS	"	"	"	"	6	"
		17 ISFF220617IPS	"	"	"	"	4	"
	32.5	ISFF2206325IPS	"	"	"	"	2	"
8	8.625	07 ISFF220807IPS	16.25	6.5	7.375	15.81	15	FedEx
		09 ISFF220809IPS	"	"	"	"	12	"
		11 ISFF220811IPS	"	"	"	"	10	"
		17 ISFF220817IPS	"	"	"	"	6	"
	32.5	ISFF2208325IPS	"	"	"	"	3	"
10	10.75	07 ISFF221007IPS	17.25	6.5	7.625	16.62	24	FedEx
		09 ISFF221009IPS	"	"	"	"	20	"
		11 ISFF221011IPS	"	"	"	"	17	"
		17 ISFF221017IPS	"	"	"	"	11	"
	32.5	ISFF2210325IPS	"	"	"	"	6	"
12	12.75	07 ISFF221207IPS	19.5	8	9.25	20.27	42	FedEx
		09 ISFF221209IPS	"	"	"	"	34	"
		11 ISFF221211IPS	"	"	"	"	28	"
		17 ISFF221217IPS	"	"	"	"	19	"
	32.5	ISFF2212325IPS	"	"	"	"	10	"
14	14	07 ISFF221407IPS	21	8	9.375	20.75	51	FedEx
		09 ISFF221409IPS	"	"	"	"	41	"
		11 ISFF221411IPS	"	"	"	"	35	"
		17 ISFF221417IPS	"	"	"	"	23	"
	32.5	ISFF2214325IPS	"	"	"	"	12	"

IPS Fittings Molded 90° Ell

IPS
HDPE
Fittings

Pressure Rating of Molded Fittings
are equal to pipe of same DR.

Molded Fittings from 3608 resin:	
DR	Pressure Rating
7	267 psi
9	200 psi
11	160 psi
13.5	128 psi
15.5	110 psi
17	100 psi
21	80 psi
26	64 psi
32.5	51 psi

Molded Fittings from 4710 resin:	
DR	Pressure Rating
7	336 psi
9	252 psi
11	202 psi
13.5	161 psi
15.5	139 psi
17	126 psi
21	101 psi
26	81 psi
32.5	64 psi

Note: Size/DR listings shown
are commonly requested. Many
DR options not listed are avail-
able. Please consult an ISCO
representative for availability.

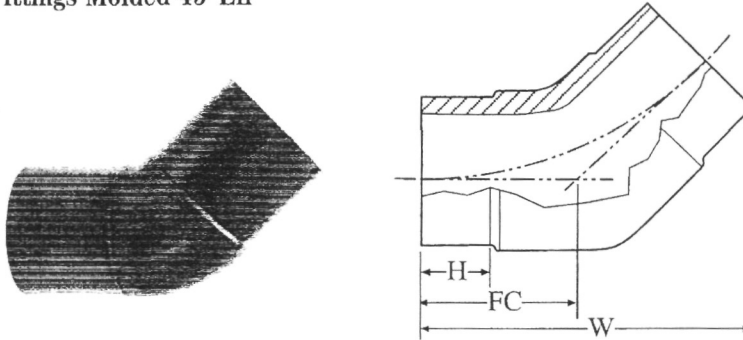
IPS Fittings Molded 90° Ell

Nominal Size(in)	Pipe OD(in)	DR	Part #	Dimensions			Weight (lbs)	Shipping Method
				H (in)	FC (in)	W (in)		
3/4	1.05	11	ISMF9007511IPS	2.05	2.68	3.2	0.05	FedEx
1	1.315	11	ISMF9001111IPS	2.17	2.91	3.57	0.1	FedEx
1-1/4	1.66	11	ISMF9012511IPS	2.44	3.35	4.18	0.15	FedEx
1-1/2	1.9	11	ISMF901511IPS	2.64	3.7	4.65	0.22	FedEx
2	2.375	09	ISMF900209IPS	2.5	4.25	5.815	0.5	FedEx
		11	ISMF900211IPS	"	"	"	0.43	"
3	3.5	09	ISMF900309IPS	3	5.25	7.4	1.5	FedEx
		11	ISMF900311IPS	"	"	"	1.2	"
		17	ISMF900317IPS	"	"	"	0.8	"
4	4.5	09	ISMF900409IPS	3	5.875	8.25	3	FedEx
		11	ISMF900411IPS	"	"	"	2.4	"
		17	ISMF900417IPS	"	"	"	1.6	"
6	6.625	09	ISMF900609IPS	4.125	8	12.5	7	FedEx
		11	ISMF900611IPS	"	"	"	6.7	"
		17	ISMF900617IPS	"	"	"	4.8	"
8	8.625	11	ISMF900811IPS	6	12	16.5	15	FedEx
		17	ISMF900817IPS	"	"	"	10	"
10	10.75	11	ISMF901011IPS	6	13.25	18.875	27	FedEx
		17	ISMF901017IPS	"	"	"	18	"
12	12.75	11	ISMF901211IPS	7.5	15.88	22.555	41	FedEx
		17	ISMF901217IPS	"	"	"	27	"

1-800-345-ISCO

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IPS Fittings Molded 45° Ell



IPS Fittings Molded 45° Ell								
Nominal Pipe Size (in)	DR	Part #	Dimensions			Weight (lbs)	Shipping Method	
	OD (in)		H (in)	FC (in)	W (in)			
3/4	1.05	11	ISM4507511IPS	2.05	2.28	4.29	0.05	FedEx
1	1.315	11	ISM450111IPS	2.17	2.48	4.69	0.08	FedEx
1-1/4	1.66	11	ISM45012511IPS	2.44	2.83	5.31	0.14	FedEx
1-1/2	1.9	11	ISM4501511IPS	2.64	3.07	5.91	0.21	FedEx
2	2.375	11	ISM450211IPS	2.64	3.23	6.38	0.35	FedEx
3	3.5	09	ISM450309IPS	3.125	5.25	10.20	2.5	FedEx
		11	ISM450311IPS	"	"	"	1.5	"
		17	ISM450317IPS	"	"	"	1	"
4	4.5	09	ISM450409IPS	3.125	5	10.13	3	FedEx
		11	ISM450411IPS	"	"	"	2	"
		17	ISM450417IPS	"	"	"	2	"
6	6.625	09	ISM450609IPS	4.125	9	17.70	6	FedEx
		11	ISM450611IPS	"	"	"	5.5	"
		17	ISM450617IPS	"	"	"	5	"
8	8.625	11	ISM450811IPS	6	11	21.8	12	FedEx
		17	ISM450817IPS	"	"	"	11	"
10	10.75	11	ISM451011IPS	6	13.25	26.42	22	FedEx
		17	ISM451017IPS	"	"	"	20	"
12	12.75	11	ISM451211IPS	7.5	15.75	31.39	32	FedEx
		17	ISM451217IPS	"	"	"	29	"

IPS
HDPE
Fittings

Pressure Rating of Molded Fittings are equal to pipe of same DR.

Molded Fittings from 3608 resin:	
DR	Pressure Rating
7	267 psi
9	200 psi
11	160 psi
13.5	128 psi
15.5	110 psi
17	100 psi
21	80 psi
26	64 psi
32.5	51 psi

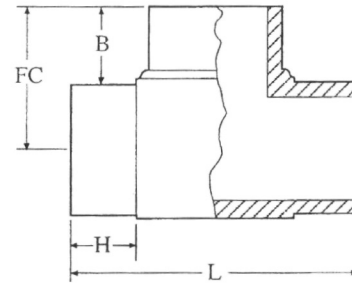
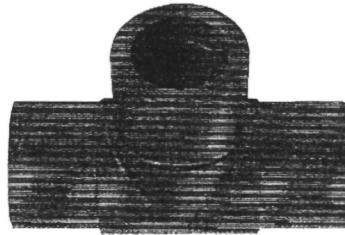
Molded Fittings from 4710 resin:	
DR	Pressure Rating
7	336 psi
9	252 psi
11	202 psi
13.5	161 psi
15.5	139 psi
17	126 psi
21	101 psi
26	81 psi
32.5	64 psi

Note: Size/DR listings shown are commonly requested. Many DR options not listed are available. Please consult an ISCO representative for availability.

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IPS Fittings Molded Tees

IPS
HDPE
Fittings

Pressure Rating of Molded Fittings
are equal to pipe of same DR.

Molded Fittings from 3608 resin:	
DR	Pressure Rating
7	267 psi
9	200 psi
11	160 psi
13.5	128 psi
15.5	110 psi
17	100 psi
21	80 psi
26	64 psi
32.5	51 psi

Molded Fittings from 4710 resin:	
DR	Pressure Rating
7	336 psi
9	252 psi
11	202 psi
13.5	161 psi
15.5	139 psi
17	126 psi
21	101 psi
26	81 psi
32.5	64 psi

Note: Size/DR listings shown
are commonly requested. Many
DR options not listed are avail-
able. Please consult an ISCO
representative for availability.

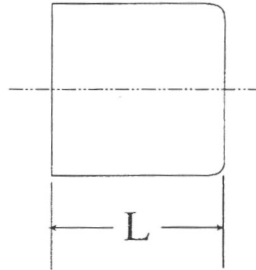
IPS Fittings Molded Tees

Nominal Pipe Size(in)	OD(in)	DR	Part #	Dimensions				Weight (lbs)	Shipping Method
				L(in)	H(in)	FC(in)	B(in)		
3/4	1.05	11	ISMFT07511IPS	5	1.77	2.5	1.98	0.1	FedEx
1	1.315	11	ISTETE0111IPS	5.67	1.77	2.83	2.17	0.17	FedEx
1-1/4	1.66	11	ISMFT012511IPS	6.61	2.01	3.31	2.48	0.3	FedEx
1-1/2	1.9	11	ISMFT01511IPS	7.99	2.52	4	3.05	0.47	FedEx
2	2.375	09	ISMFT0209IPS	8.5	2.5	4.26	3.07	1	FedEx
		11	ISMFT0211IPS	"	"	"	"	0.82	"
3	3.5	09	ISMFT0309IPS	11.375	3	5.75	4	2.3	FedEx
		11	ISMFT0311IPS	"	"	"	"	2.15	"
		17	ISMFT0317IPS	"	"	"	"	1.45	"
4	4.5	09	ISMFT0409IPS	12.25	3	6.25	4	4	FedEx
		11	ISMFT0411IPS	"	"	"	"	3.8	"
		17	ISMFT0417IPS	"	"	"	"	2.58	"
6	6.625	09	ISMFT0609IPS	16.25	4	8.25	4.94	11	FedEx
		11	ISMFT0611IPS	18	4.5	9	5.69	10	"
		17	ISMFT0617IPS	"	"	"	"	7	"
8	8.625	11	ISMFT0811IPS	23.75	5.85	11.9	7.59	25	FedEx
		17	ISMFT0817IPS	"	"	"	"	17	"
10	10.75	11	ISMFT1011IPS	27	6.15	13.5	8.13	43	FedEx
		17	ISMFT1017IPS	"	"	"	"	29	"
12	12.75	11	ISMFT1211IPS	31.6	7.5	15.9	9.53	67	FedEx
		17	ISMFT1217IPS	"	"	"	"	46	"

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IPS Fittings Cap



IPS Fittings Cap						
Nominal Size(in)	Pipe OD(in)	DR	Part #	Dimensions L (in)	Weight (lbs)	Shipping Method
3/4	1.05	11	ISMFCP07511IPS	2.375	0.05	FedEx
1	1.315	11	ISMFCP01111IPS	2.375	0.1	FedEx
1 1/4	1.66	11	ISMFCP012511IPS	2.25	0.1	FedEx
1 1/2	1.9	11	ISMFCP015111IPS	2.83	0.25	FedEx
2	2.375	09	ISMFCP0209IPS	3.25	0.3	FedEx
		11	ISMFCP0211IPS	"	"	"
3	3.5	09	ISMFCP0309IPS	3.25	0.8	FedEx
		11	ISMFCP0311IPS	"	"	"
4	4.5	09	ISMFCP0409IPS	5.5	2	FedEx
		11	ISMFCP0411IPS	"	"	"
6	6.625	09	ISMFCP0609IPS	4.5	3	FedEx
		11	ISMFCP0611IPS	"	"	"
8	8.625	11	ISMFCP0811IPS	4.75	4.4	FedEx
10	10.75	11	ISMFCP1011IPS	4	13	FedEx
12	12.75	11	ISMFCP1211IPS	4	18	FedEx
14	14.00	7	ISFFCP1407IPS	4	21	FedEx
		11	ISFFCP1411IPS	"	21	"
		7	ISFFCP1407IPSLG	16	53	FedEx
		11	ISFFCP1411IPSLG	"	44	"
16	16.00	7	ISFFCP1607IPS	5	35	FedEx
		11	ISFFCP1611IPS	4	28	"
		7	ISFFCP1607IPSLG	16	76	FedEx
		11	ISFFCP1611IPSLG	"	57	"
18	18.00	7	ISFFCP1807IPS	5	44	FedEx
		11	ISFFCP1811IPS	5	44	"
		7	ISFFCP1807IPSLG	16	96	FedEx
		11	ISFFCP1811IPSLG	"	81	"
20	20.00	7	ISFFCP2007IPS	6	65	FedEx
		11	ISFFCP2011IPS	5	55	"
		7	ISFFCP2007IPSLG	16	130	LTL
		11	ISFFCP2011IPSLG	"	100	"
22	22.00	7	ISFFCP2207IPS	6	79	FedEx
		11	ISFFCP2211IPS	5	66	"
		7	ISFFCP2207IPSLG	16	157	LTL
		11	ISFFCP2211IPSLG	"	121	"
24	24.00	11	ISFFCP2411IPS	6	94	FedEx
		11	ISFFCP2411IPSLG	16	159	LTL

IPS
HDPE
Fittings

Pressure Rating of Caps are equal to pipe of same DR.

Caps from 3608 resin:	
DR	Pressure Rating
7	267 psi
9	200 psi
11	160 psi
13.5	128 psi
15.5	110 psi
17	100 psi
21	80 psi
26	64 psi
32.5	51 psi

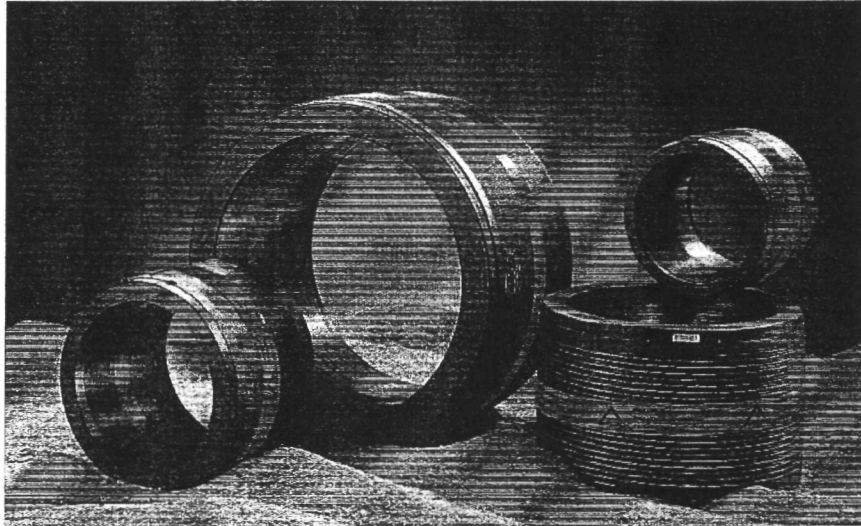
Cap from 4710 resin:	
DR	Pressure Rating
7	336 psi
9	252 psi
11	202 psi
13.5	161 psi
15.5	139 psi
17	126 psi
21	101 psi
26	81 psi
32.5	64 psi

Note: Size/DR listings shown are commonly requested. Many DR options not listed are available. Please consult an ISCO representative for availability.

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Frialen® Safety Electrofusion Couplings



IPEX Friatec Products is a world leader in electrofusion technology. The fittings are made of polyethylene with heating coils located at the surface. This design allows direct heating of the interface between the pipe and the fitting. This feature works with the flexibility of the universal bar code fusion unit, Friamat® to provide unique advantages.

The Frialen® design offers excellent heat transfer to the pipe, gap closing capabilities, shorter cooling times and the fastest, most secure connections.

Couplings work with HDPE Pipe in DRs 9.33 to 17 at full pressure rating up to 20" pipe. Pipe larger than 20" may have reduced pressure rating, see each coupling chart for DR equivalent rating.

The unique features of Frialen® couplers:

- Economical
- Suitable for tough building site conditions
- No alignment or clamping tools necessary
- Generous pipe guidance
- Bar code labeled for automatic fusion
- Can be re-fused up to three times in case of electrical power interruption
- Pop-up melt indicator provides visual fusion verification

IPEX Friatec Products offers in-house, hands-on training seminars, on-site training and technical support to meet your training needs.

Contact ISCO to schedule your Friatec training.

Friatec
Electrofusion
Products

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FRIALEN® IPS Electrofusion Couplings

Small Sizes

Nominal Pipe OD & DR	ID Min.	ID Max.	OD	B	L	t	z	h	x	Fusion Time/Sec @ 73°F	Cooling Time/Min. ※ / ※※ / ※※※
1/2" CTS DR 11	0.622	0.634	1.102	1.732	2.283	1.142	0.079	0.591	0.23	27	05/08/10
3/4" IPS DR 11	1.047	1.059	1.575	2.165	2.598	1.260	0.079	0.728	.027	28	05/08/10
1" CTS DR 11	1.122	1.134	1.654	2.244	3.071	1.535	0.079	0.787	0.31	28	05/08/10
1" IPS DR 11	1.311	1.323	1.850	2.460	3.071	1.496	0.079	0.787	0.31	28	05/08/10
1-1/4" IPS DR 11	1.654	1.679	2.244	2.835	3.346	1.634	0.079	0.945	0.39	34	10/15/25
1-1/2" IPS DR 11	1.902	1.917	2.480	3.130	3.858	1.870	0.079	1.060	0.46	34	10/15/25
2" IPS DR 11	2.374	2.390	3.142	3.657	4.449	2.205	0.079	1.205	0.51	54	10/15/25
3" IPS DR 11	3.496	3.516	4.606	4.980	5.472	2.717	0.079	1.417	0.59	100	10/30/40
4" IPS DR 11	4.492	4.516	5.827	6.173	6.260	3.110	0.079	1.689	0.67	151	10/30/40
6" IPS DR 11	6.610	6.634	8.543	8.740	7.992	3.976	0.079	2.295	0.79	440	20/60/75

Standard Sizes

Nominal Pipe OD & DR	ID Min.	ID Max.	OD	L	t	h	x	Fusion Time/Sec @ 73°F	Cooling Time/Min. ※ / ※※ / ※※※
8" IPS DR 11	8.626	8.665	11.029	9.448	4.724	2.953	1.063	540	20/60/75
10" IPS DR 11	10.748	10.787	13.975	11.811	5.275	3.149	1.063	500 ea. side	30/75/100
12" IPS DR 11	12.748	12.787	15.746	11.219	5.610	2.679	1.142	550 ea. side	30/75/100
14" IPS DR 11	13.976	14.016	17.716	11.811	5.905	3.500	1.260	580 ea. side	30/75/100

Large IPS - Special Training Required

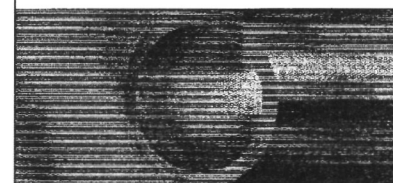
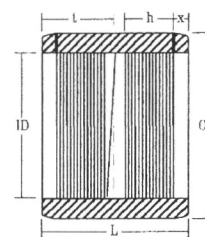
Nominal Pipe OD & DR	ID Min.	ID Max.	OD	L	t	h	x	Fusion Time/Sec @ 73°F	Cooling Time/Min. ※ / ※※ / ※※※
**16" IPS DR 11	15.969	16.008	19.685	12.598	6.299	3.748	1.260	870/730 ea. side	45/95/120
**18" IPS DR 11	17.969	18.008	22.047	13.386	6.693	3.346	1.260	870/870 ea. side	45/95/120
**20" IPS DR 11	19.961	20.016	24.803	14.173	7.086	3.622	1.260	870/720 ea. side	45/95/120
**22" IPS DR 17	21.961	22.016	24.803	14.566	7.283	3.291	1.260	870/720 ea. side	45/95/120
**24" IPS DR 13.5	24.000	24.039	27.952	15.748	7.874	4.095	1.420	870/850 ea. side	45/95/120
**28" IPS DR 17	27.992	28.031	31.496	15.748	7.874	6.062	1.614	850/850 ea. side	99/120/160

****16" - 28" IPS Couplings have pre-warm cycle and require special training.**

FRIALEN® Safety fittings can be fused to all PE pipes within Melt Index Groups 003-050 and Pipe DR ranges 9.33 through 17.6. For Pipe DR 21 and up, contact the ISCO Fusion Hotline at 1-800-345-ISCO ext. 4790 for reduced fusion times. PE Pipes of different Melt Index Groups can be joined.

Legend:

- ※ Pipe can be moved after indicated cooling time (handling).
- ※※ Pipe can be pressurized after indicated cooling time (pressure < 90 PSI).
- ※※※ Pipe can be pressurized after indicated cooling time (pressure > 90 PSI).



Friatec
Electrofusion
Products

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Quality Test Report

Plant 21207-Junction City

Product 0570-#57 CONCRETE (FLDOT 10)

Specification FLDOT 57



1616678350

Sample Information

Sample No 1616678350
Date Sampled 11/01/2010 15:24
Date Completed 11/01/2010 15:24
Sampled By Noah Teat
Tested By Noah Teat
Type Shipping
Method Belt-Cut
Location
Process
Ledge
Other

Weather Sunny
Temp
Split Sample ☐
Resample ☐
Lot / Sublot
Quad / Quantity
Sequence Code

Test Note

Gradation Results

Unit	Moist Mass	Dry Mass	Wash Mass	Moisture %	Wash Loss %	Procedure		
g		10250.00						
Sieve	Mass Retained	Cum Mass Retained	Ind % Retained	% Retained	% Passing	Target	Specification	Comment
1 1/2" (37.5mm)	0.0	0.0	0.0	0.0	100.0		100-100	
1" (25mm)	155.0	155.0	1.5	1.5	98.5		95-100	
1/2" (12.5mm)	6085.0	6240.0	59.4	60.9	39.1		25-60	
#4 (4.75mm)	3945.0	10185.0	38.5	99.4	0.6		0-10	
#8 (2.36mm)	20.0	10205.0	0.2	99.6	0.4		0-5	
PAN (0um)	45.0	10250.0	0.44	100.00	0.00			

Other Test Results

Test Name	Date	Result	Unit	Target	Specification	Comment
	Procedure	Lab			Tested By	
-#200 (75um)	11/01/2010 07:30	0.22	%		0-2.5	
					Noah Teat	
FM	11/01/2010 15:24	7.99				
		Junction City			Noah Teat	