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2012/ELOG-2050(df)

March 6, 2013

ENGINEERING AND POLICY MEMORANDUM NO. CEB-2-13

TO: ENGINEERS, DEVELOPERS, GOVERNMENT AGENCIES AND OTHER INTERESTED PARTIES

FROM: GEORGE I. ATTA, FAICP, LEED AP, CEI, DIRECTOR DESIGNATE
DEPARTMENT OF PLANNING AND PERMITTING

SUBJECT: APPROVAL OF HIGH-DENSITY POLYETHYLENE (HDPE) PIPES FOR STORM DRAINAGE APPLICATIONS

Effective June 1, 2013, the use of HDPE pipes is permitted as a standard drain pipe material for public works construction within the City and County of Honolulu, subject to the attached "*City and County of Honolulu Department of Planning and Permitting Standard Specifications for Public Works Construction High Density Polyethylene Smooth Interior Corrugated Drain Pipes*", dated March 1, 2013.

If there are any questions, please contact Don Fujii of the Site Development Division at 768-8107.

GIA:ky
[1022292]
Attachment

March 1, 2013

CITY AND COUNTY OF HONOLULU
DEPARTMENT OF PLANNING AND PERMITTING
STANDARD SPECIFICATIONS
FOR
PUBLIC WORKS CONSTRUCTION
HIGH DENSITY POLYETHYLENE
SMOOTH INTERIOR CORRUGATED DRAIN PIPES

SECTION 1 - DESCRIPTION

This work shall consist of furnishing, laying, jointing and testing High Density Polyethylene (HDPE) smooth interior corrugated pipes for storm drains and culverts to the established lines and grades, and including all connections and finishing.

SECTION 2 – MATERIALS

A. HDPE Pipe. HDPE pipes shall conform to AASHTO M294, "*Standard Specifications for Corrugated Polyethylene Pipe, 300-1500-mm (12- to 60-in.) Diameter*". A manufacturer's certificate of compliance shall be submitted to the Engineer for acceptance prior to installing HDPE pipes.

1) Pipe Type. HDPE pipes shall be Type S (full circular dual-wall cross section, with an outer corrugated pipe wall and a smooth inner liner) with a Manning's roughness coefficient of 0.012.

2) Allowable Pipe Sizes. The interior diameter of HDPE pipes shall not be less than 18-inches and shall not exceed 36-inches.

3) Joints. Joints shall be watertight per ASTM D3212, "*Standard Specifications for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals*" and utilize a bell and spigot design with a seal meeting ASTM F477, "*Standard Specifications for Elastomeric Seals (Gaskets) for Joining Plastic Pipe*".

4) Age of Pipes. HDPE pipes manufactured one year or more from the time of delivery to the job site shall be rejected unless the Contractor provides documentation from the manufacturer or its representative certifying that they have examined the pipes and have no objections to its use.

B. Grout. Grout shall be non-metallic and shall conform to ASTM C 1107, "*Standard Specifications for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)*".

C. Resilient Connectors. Flexible, watertight connectors conforming to ASTM F2510/F2510M, "*Standard Specifications for Resilient Connectors Between Reinforced Concrete Manhole Structures and Corrugated High Density Polyethylene Drainage Pipes*" shall be used to connect HDPE pipes to concrete structures.

D. Pipe Cushion Material. Material for pipe cushion may be sand, crushed limestone, graded crushed aggregate, or other select granular material approved by the Engineer.

All material shall pass the 1-inch sieve and not more than 5% by weight shall pass the No. 100 sieve.

E. Test. When requested, the Contractor shall furnish to the Engineer for testing one pipe length for each size of pipe used in the project. The pipe shall be selected at random by the Engineer.

F. Rejection. If the test specimen does not meet the required specifications or appears to be cracked, broken or defective, the Engineer may reject part or the entire order of pipes. Only pipes approved and marked by the Engineer shall be used for the job and the Contractor shall promptly remove all rejected pipes from the job site.

SECTION 3 – CONSTRUCTION DETAILS

A. General. The Contractor shall be trained and certified by the manufacturer before installing HDPE pipes. The contractor shall submit a copy of the training certification to the Engineer.

B. Pipe Transportation, Handling and Stockpiling. The Contractor shall follow the manufacturer's recommendations when transporting, handling and stockpiling HDPE pipes. Cracked, broken or defective pipes shall immediately be removed from the site and replaced at no cost to the City.

C. Trench Preparation. The trench shall be properly prepared as specified under Section 11, "Trench Excavation and Backfill," of the Standard Specifications for Public Works Construction, September 1986 and as shown on the plans.

After the trench has been excavated to a depth of 6 inches below the pipe barrel, except where the 6-inch depth is deemed unnecessary by the Engineer, the trench bottom shall be brought up to grade by backfilling with cushion material.

D. Pipe Laying. HDPE pipes shall be laid upgrade, unless otherwise permitted by the Engineer and shall rest firmly on the prepared bedding or cushion material so that its entire length will have full bearing.

No blocking of any kind shall be permitted for adjusting the pipe to grade except when used in embedment of concrete.

No pipe shall be laid directly on solid rock bed. Ledge rock or boulders shall be removed or excavated to provide a minimum clearance of 6 inches under the pipe. The excavation shall then be backfilled with cushion material and the pipe placed thereon.

In new embankment where HDPE pipes are to be installed, the embankment shall be constructed to a height of two diameters above the pipe invert or to a height as indicated in the detail drawing. The trench shall then be excavated and the pipe installed.

No pipe shall be laid in areas where the water table may cause flotation of the pipes. Flotation of the pipe shall be sufficient reason for rejecting the pipes affected.

No pipe shall be laid so as to be permanently exposed to ultra violet radiation.

No pipe shall be laid within City drainage easements located within private property unless approved by the Engineer.

E. Pipe Jointing. HDPE pipes shall be joined and assembled in accordance with the manufacturer's recommendations and ASTM D2321, "*Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and other Gravity-Flow Applications.*"

The Contractor shall inspect all elastomeric seals and replace any whenever the protective wrap placed on them is damaged or missing.

Joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly.

Reinforced concrete manholes shall be located at all changes in pipe size and changes in alignment or grade and at all junction points. The use of any fittings, including but not limited to adapters, couplers, tees, wyes, bends, reducers, manifolds or risers shall not be not allowed in lieu of reinforced concrete manholes.

Pipes of different materials shall not be joined together.

F. Pipe Cover. The minimum and maximum cover over HDPE pipes shall not be less than 3 feet and not greater than 8 feet in height respectively.

G. Pipe Connection to Concrete Structures. HDPE pipes shall be fitted with a flexible water-tight resilient connector when connecting to catch basins, drain manholes or drain inlets.

The flexible water-tight resilient connector shall be installed in accordance with the manufacturer's recommendations. The pipe section shall be carefully handled and controlled to avoid disturbing the connector and knocking it out of position or loading it with dirt or other foreign material. When deemed necessary by the Engineer, a grout collar shall be installed around the pipe to ensure a watertight connection.

The Contractor shall ensure that the HDPE pipes are properly backfilled and firmly held in place to prevent any differential settlement at the connection.

For cast-in-place connection, HDPE pipes shall be encased in the wall of the structure. For pre-cast connection into a preformed opening, grout shall be used to fill the annular space between the HDPE pipe and the pipe opening.

The maximum angle between the longitudinal axis of the HDPE pipe and the axis perpendicular to the concrete structure at the point of connection shall not exceed 30 degrees.

HDPE pipes shall be cut flush with the inside wall face of the concrete structures and any openings at the end of the pipe that expose the interior of the corrugations shall be filled with grout as directed by the Engineer.

H. Backfilling. Backfill work shall comply with Section 11, "Trench Excavation and Backfill," of the Standard Specifications for Public Works Construction, September 1986 and as shown on the plans, except that the backfill from the bottom of the pipe to 12 inches above the pipe barrel shall be done by mechanical compaction. Compaction by ponding and jetting is prohibited.

Backfilling work shall not commence until it has been inspected by the Engineer. Any pipe found to be out of alignment, unduly settled, or damaged shall be removed and replaced by the Contractor at his expense.

The Contractor shall exercise care so as not to cause any movement of the pipe sections. Any pipe that is laid which is not in true alignment or grade, or shows undue settlement, or is damaged, shall be removed and replaced by the Contractor at his own expense.

Every precaution shall be taken to prevent flooding of the trench before the backfill operation. Flotation of the pipe by water shall be sufficient reason for rejecting the pipes affected.

I. Finishing. The interior of the pipe shall be free from foreign material, mortar, concrete and dirt.

J. Installation Deflection. The Contractor shall conduct a "go/no-go" mandrel test on 100% of HDPE pipes installed. Testing shall be conducted no sooner than 30 days after the installation of the pipeline. The Contractor shall clean and inspect the pipeline for offsets and obstructions before testing and inspection.

The mandrel shall be rigid, nonadjustable, odd-numbered legged (minimum 9 legs), and have a length not less than the nominal diameter of the pipe being tested. The minimum diameter at any point shall be 5% less than the nominal diameter of the pipe being tested. A properly sized proving ring shall be used to check or test the mandrel for accuracy.

The mandrel shall be pulled through the pipeline by hand in the presence of the Engineer and shall pass freely through the line being tested.

HDPE pipes that fail the mandrel test shall be removed and replaced by the Contractor at his own expense.

SECTION 4 – MEASUREMENT

A. Pipe. The length of the pipe to be paid for shall be of the horizontal measurement in linear feet. Where the slope of the pipe exceeds 10%, the measurement shall be the actual length of pipe installed.

No payment will be made for pipe placed in excess of the length approved by the Engineer.

B. Cut-Off. Where pipes are cut-off flush with the interior face of the manhole or catch basin, no payment will be made for the cut-off portion.

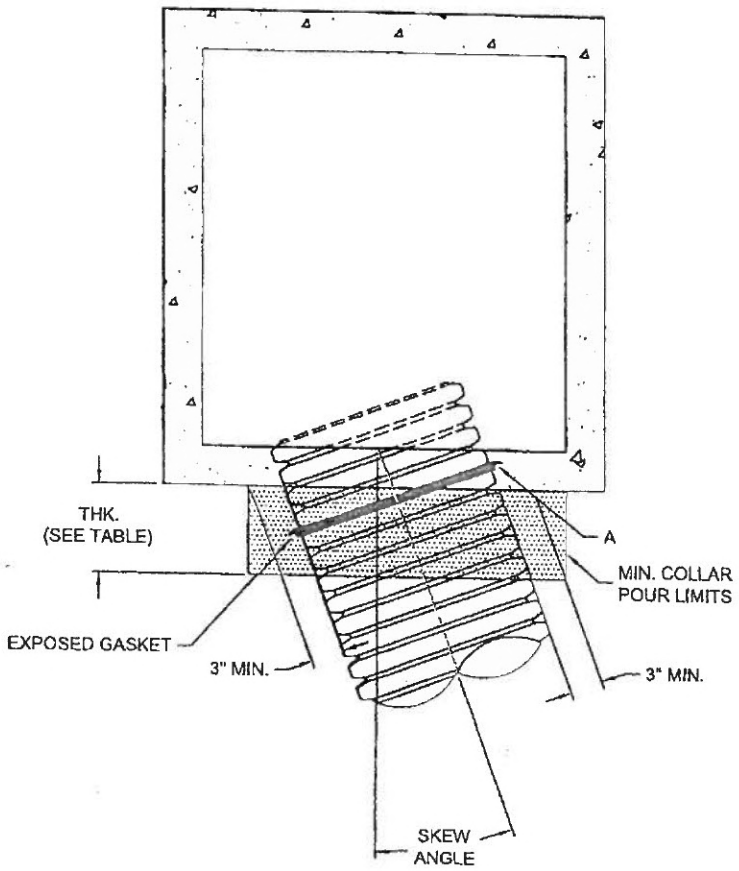
C. Other Items of Work. Excavation and backfill shall be measured and paid for as specified under Sections 11 and 15 of the Standard Specifications for Public Works Construction, September 1986, "*Trench Excavation and Backfill*" and "*Crushed Rock*" respectively.

D. Incidental Work. Compensation for all incidental work, such as furnishing and compacting the pipe cushion material, connections, jointing and testing shall be considered as included in the prices bid for HDPE drain pipes.

SECTION 5 – PAYMENT

HDPE pipes shall be paid for as measured above at the unit price bid per linear foot for the different sizes and shall be full compensation for furnishing material, labor, tools and equipment to construct the work, in place complete.

CAST IN PLACE STRUCTURE
(NOT TO SCALE)

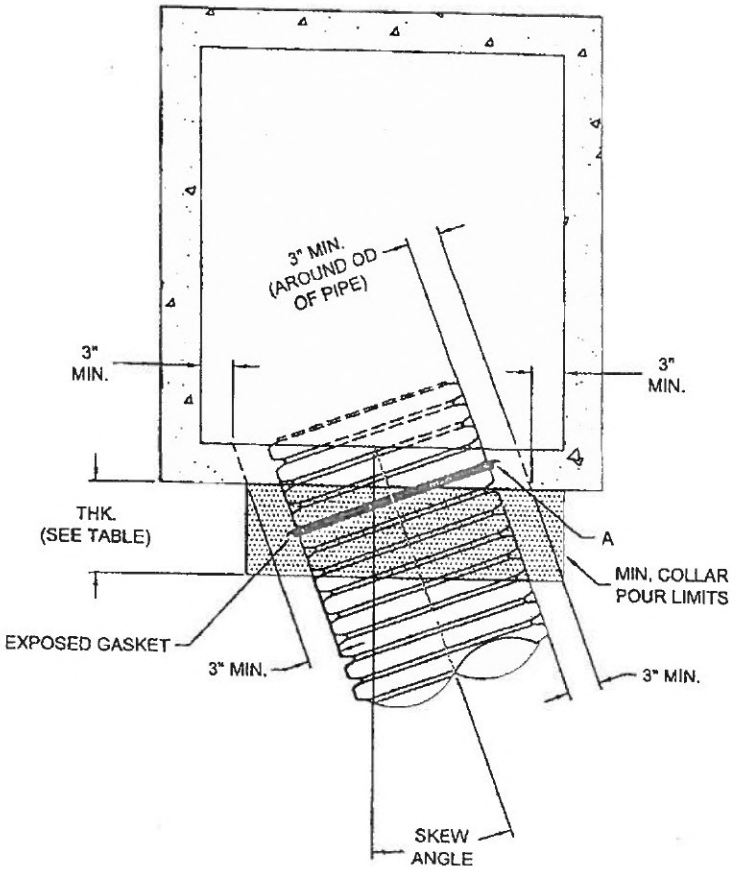


DETAILS FOR NON-SHRINK GROUT COLLAR FOR SKEWED HDPE PIPE TO STRUCTURE CONNECTIONS.

1. ENSURE THE SURFACES TO BE IN CONTACT WITH GROUT ARE CLEAN AND FREE OF OILS, DUST AND DIRT.
2. INSTALL WATER STOP GASKET IN CORRUGATION VALLEY SUCH THAT POINT "A" IS IN THE MIDDLE OF THE STRUCTURE CROSS SECTION.
3. IF GASKET IS EXPOSED ON OUTSIDE OF STRUCTURE OVER POUR NON-SHRINK GROUT COLLAR, ALL AROUND THE PIPE, PER THE DIMENSION DEFINED BY THE DRAWING AT LEFT AND THE TABLE BELOW AS APPLICABLE.
4. TRIM INSIDE PIPE FLAT WITH WALL AND FILL CORRUGATION HOLES WITH NON-SHRINK GROUT A MINIMUM OF 6" DEEP.
5. THE CONTRACTOR SHALL NOTIFY THE PROJECT ENGINEER IF THE COLLAR CANNOT BE INSTALLED AS SPECIFIED IN THE DETAIL.

MINIMUM COLLAR THICKNESS (THK.)			
	SKEW ANGLE (DEGREES)		
PIPE ID (OD)	≤ 15	≤ 20	≤ 30
18" (21")	6"	7"	11"
24" (28")	7"	10"	14"
30" (36")	10"	12"	18"
36" (42")	11"	15"	21"

PRECAST STRUCTURE
(NOT TO SCALE)



DETAILS FOR NON-SHRINK GROUT COLLAR FOR SKEWED HDPE PIPE TO STRUCTURE CONNECTIONS.

1. PRECAST OPENING SHOULD BE LARGE ENOUGH TO PROVIDE ACCESS TO GROUT GAP BETWEEN PIPE AND STRUCTURE WALL. 3" MINIMUM SPACE SHOULD BE PROVIDED AT LOCATIONS IDENTIFIED ON DIAGRAM.
2. ENSURE THE SURFACES TO BE IN CONTACT WITH GROUT ARE CLEAN AND FREE OF OILS, DUST AND DIRT.
3. INSTALL WATER STOP GASKET IN CORRUGATION VALLEY SUCH THAT POINT "A" IS IN THE MIDDLE OF THE STRUCTURE CROSS SECTION.
4. GROUT IN PIPE-STRUCTURE GAP USING NON-SHRINK GROUT.
5. IF GASKET IS EXPOSED ON OUTSIDE OF STRUCTURE OVER POUR NON-SHRINK GROUT COLLAR, ALL AROUND THE PIPE, PER THE DIMENSION DEFINED BY THE DRAWING AT LEFT AND THE TABLE BELOW AS APPLICABLE.
6. TRIM INSIDE PIPE FLAT WITH WALL AND FILL CORRUGATION HOLES WITH NON-SHRINK GROUT A MINIMUM OF 6" DEEP.
7. THE CONTRACTOR SHALL NOTIFY THE PROJECT ENGINEER IF THE COLLAR CANNOT BE INSTALLED AS SPECIFIED IN THE DETAIL.

MINIMUM COLLAR THICKNESS (THK.)			
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