Hamilton Kent
Sealing Your Connection

Report on The Testing of Hamilton Kent's Tylox® Mechanically Installed, Resilient Rubber, Boot Connector – Model 12-2-8

Objective:
To evaluate the performance of Hamilton Kent's 12-2-8, mechanically installed Adjustable and Cobra-style boot connectors with regards to the performance standards detailed in ASTM C923, Section 7.

Test Apparatus

The test apparatus consists of a 45" square, 5 3/4" thick concrete slab with a 12" nominal diameter cored hole running horizontally through its center. (Fig. 1)
Bolted to the rear of the slab is a cast iron pressure vessel. A rubber gasket is used to seal between the pressure vessel and the concrete slab. (Fig. 2)

Fig. 1

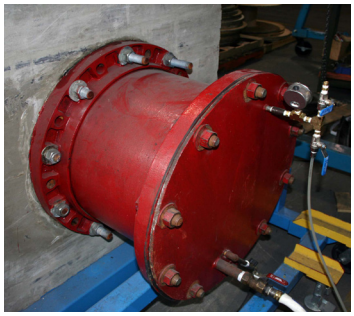


Fig. 2

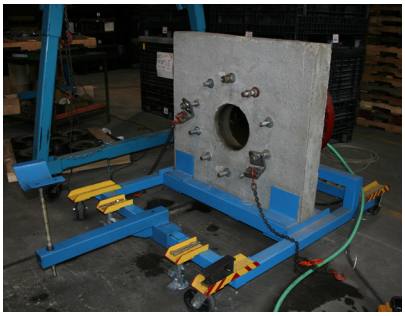


Fig. 3

The pressure vessel has two threaded ports at the bottom, and a threaded port at the top. The top port is connected to a tee, with one branch of the tee connected to a calibrated pressure gauge, and the other branch vented to atmosphere via an isolation ball valve and/or a second isolation valve and a length of Nylon hose which leads to a floor drain. One of the lower ports is connected to a water supply via an isolation ball valve. The second lower port is open to atmosphere via an isolation valve and a length of garden hose which leads to a floor drain.

The complete assembly is bolted, with the slab face vertical into a steel support frame. (Fig. 3) The frame has an extension at the front of the assembly to which is attached to a vertical, threaded steel post located in line with the horizontal centerline of the formed hole, and 48" outboard of the face of the concrete slab. Attached to the post is a steel support saddle. By moving the support post up, or down, vertical displacement of the saddle is possible. (Fig. 4)

Fig. 4

Fig.5

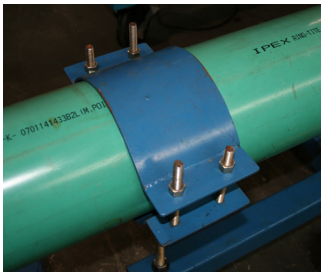


Fig. 6

A hydraulic jack is mounted between the horizontal extension and the PVC pipe directly below the horizontal centerline of the formed hole, and 24" outboard of the face of the concrete slab. The jack can be raised or lowered by means of a hydraulic hand pump. Pressure on the jack is measured by means of a gauge on the hand-pump. (Fig. 5)
A vertical-thrust collar is available to place across the top of the pipe, and be bolted to the saddle, on either side of the pipe. (Fig. 6)
A 6ft length of 8" SDR 35, PVC pipe, c/w one end capped, is capable of being inserted horizontally into the rubber connector, with one end supported on the saddle.
A steel lateral-thrust cap is available to be placed over the end of the pipe, and then connected, via chains and eyebolts, to tension adjustment rings fastened to the concrete slab. (Fig. 7)
A spacer piece 3" long and 2" wide is available to sit between the pipe and the saddle, on the rear half of the saddle. Spacer is tapered along its top end. Front face is 6.75" tall and rear face is 7.17" tall, to give an 8° slope, front to rear. (Fig. 8)

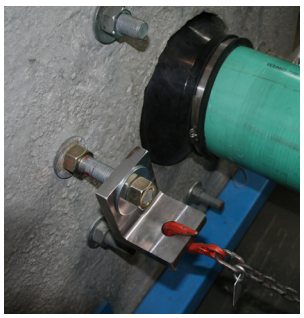


Fig. 7a

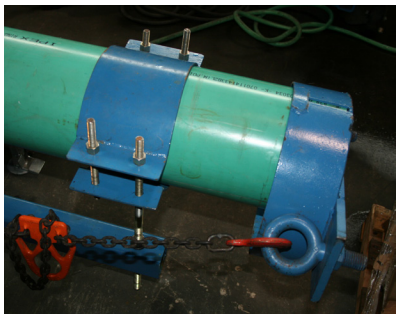


Fig. 7b

Fig. 8

Method

A 12-2-8 boot connector, with a "Toggle" style hoop expansion mechanism, was installed in the hole in the concrete slab, in accordance with the procedure outlined in Hamilton Kent's Installation Instruction Sheet; except that the hoop adjustment mechanism was located diametrically opposite to the position stated therein.
The length of PVC pipe was inserted horizontally, capped end first, into the connector, to a depth of 1 ft.
The support collar was adjusted vertically, via means of the support post and lock-nut A, until a bubble-level indicated the pipe was horizontal, and lock-nut B was then tightened.
The clamp on the boot connector was then tightened to a torque of 60 lb.in.
The thrust cap was fitted to the pipe, and the chains adjusted until a minimum amount of slack was available.
The drain valve and water inlet valves were closed, and then city water was connected to the inlet.
The boot connector was then tested for leakage, in accordance with the 3 test conditions detailed in ASTM C932, Section 7:

7.2.1 Straight alignment of the pipe subjected to a hydrostatic pressure of 13 psig (30 ft head) for 10 minutes.
With the vent valves open, the water-inlet valve was opened, and the system filled with water. With the system almost full, the atmospheric vent valve was closed and the final stages of filling allowed to vent to the floor drain. Completion of filling was indicated by a continuous water flow into the floor drain, at which time both the vent valve and the water inlet valve, in turn, were closed.
The water-inlet valve was then cracked open, and the system hydrostatic pressure allowed to build until13 psig (30 ft head) was read on the test pot gauge, at which time the water-inlet valve was closed.
The system was allowed to sit, at pressure, for 10 minutes, while visual observation was made for any leaks.
The floor-drain vent valve was then opened to bleed off the hydrostatic pressure.

7.2.2 Deflection of the pipe. The pipe shall be axially deflected at least 7° in any direction and subjected to a 10 psig (23 ft) hydrostatic pressure for 10 min.

The thrust collar was removed from the pipe, and the pipe was deflected 8° by insertion of the pre-formed spacer piece between the saddle and the clamp.

Test methodology as outlined for Section 7.2.1, above, was employed, with the hydrostatic pressure adjusted to 10 psig.

7.2.3 When the pipe is loaded in shear and subjected to 10 psig (23 ft head) hydrostatic pressure for 10 min.

The pipe was returned to the horizontal position by removing the spacer block from between the saddle and the pipe.

The thrust collar was placed on top of the pipe, over the saddle, and bolted in place, to rigidly retain the pipe.

Utilizing the hand-pump, the hydraulic jack was raised and a load applied to the pipe until the hydraulic gauge read 1530 psig.

Test methodology as outlined for Section 7.2.1, above, was employed, with the hydrostatic pressure adjusted to 10 psig.

The hydraulic jack pressure was then relieved.

The main drain valve was then opened and the system allowed to drain down.

The above test methodology was subsequently repeated for connectors with the "Cobra" and the "Adjustable" hoop expansion mechanism

Comments

The boot connector was installed with the hoop adjustment mechanism diametrically opposite the designated field installed position, in order to retain the correct orientation for the application of the simulated earth/live load, Section 7.2.3, which in this apparatus is applied from beneath the PVC pipe.

Calculations

Section 7.2.1 – None

Section 7.2.2

Distance from face of concrete slab to centerline of saddle		= 48"
Distance from face of concrete slab to rear of saddle		= 51"
Angular deflection required (7° minimum – ASTM C923)		= 8°
Vertical height change at center to achieve 8° deflection	= Tan 8 x 48"	= 6.75"
Vertical height change at rear to achieve 8° deflection	= Tan 8 x 51"	= 7.17""

Section 7.2.3

a) Shear requirement	= 150 lb per inch of pipe dia.	
Pipe diameter		= 8"
Shear Load	= 8in x 150lb/in	= 1200 lb
b) Hydraulic Jack, piston diameter		= 1 in
Hydraulic Jack, piston area	= (1 in x 1 in x Pi)/4	= 0.785 sq.in.
Load required		= 1200 lb
Hydraulic pressure to achieve load	= 1200 lb / 0.785 sq.in.	= 1530 lb./sq.in.

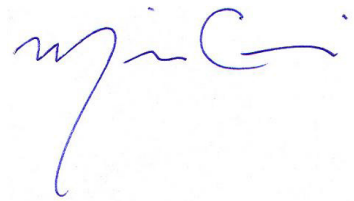
Results

Test Condition	Hoop Mechanism Adjustment	Clamp Torque (lb.in)	Hydrostatic Pressure (PSIG)	Deflection (Degrees)	Load (lb)	Duration (Minutes)	Leakage
"Toggle" Style Hoop Adjustment Mechanism							
7.2.1	Over-Center	60	13	0	0	10	Zero
7.2.2	Over-Center	60	10	8	0	10	Zero
7.2.3	Over-Center	60	10	0	1200	10	Zero
"Cobra" Style Hoop Adjustment Mechanism							
7.2.1	12 lb.ft.	60	13	0	0	10	Zero
7.2.2	12 lb.ft.	60	10	8	0	10	Zero
7.2.3	12 lb.ft.	60	10	0	1200	10	Zero
"Adjustable" Style Hoop Adjustment Mechanism							
7.2.1	3rd Notch	60	13	0	0	10	Zero
7.2.2	3rd Notch	60	10	8	0	10	Zero
7.2.3	3rd Notch	60	10	0	1200	10	Zero

Conclusion

That the 12-2-8 boot connector, as manufactured by Hamilton Kent, meets the performance criteria of ASTM C923.

Tested By:



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Date : November 1st, 2007