WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

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March 10, 1969

MR. LARRY CHING
Highway Construction Co., Ltd.
720 Umi Street
Honolulu, Hawaii

Dear Mr. Ching:

RE: No-Joint Concrete Pipe Test
Field Demonstration: Strength of 24-In. Pipe
At Mililani Subdivision, Honolulu, Hawaii

In accordance with your request, a field demonstration of the strength of the No-Joint pipe was observed by us at the Mililani residential subdivision project. The test procedure and results are described in this report.

TEST SETUP

Three parallel trenches about 30 ft in length were excavated at about 20 ft on centers. In each of the trenches were laid 20 to 24 ft of 24-in. pipes.

The first trench contained a No-Joint cast-in pipe.

The second trench contained a Class IV, 24-in. diameter reinforced concrete pipe; and the third trench, a 24-in. diameter, 12-gage corrugated metal pipe. The trench width for both the precast concrete and metal pipes were ±44 in. wide with a 6-in. crushed rock bed placed at the bottom of each of the trenches. The rock was graded from 3/4-in. to 1/4-inch. The pipes were placed on the rock beds and backfilled with on-site soils and lightly tamped in accordance with the local practice of pipe installation and backfilling. A 12-in. cover of soil was placed over the pipes.

To observe the deflection of the crown and sidewall of the pipes, dial gages mounted on supports driven into the subgrade were installed in the No-Joint pipe and the reinforced concrete pipe at about 5 ft inward from one end of each pipe, presumably under the path of the wheel of the test load that would be crossing over the pipes.

LOADING METHOD

To test the strength of the pipes, a 30 cu. yd tractor-scraper was filled with soil. The estimated gross weight of the equipment was 150 kips and the largest wheel load over the section of pipe where dial gages were installed was estimated at 45 kips.

The tractor-scraper passed over each of the pipes at intermittent intervals. Deflections of the dial gages were observed in both the No-Joint and the extra strength reinforced concrete pipe to detect deflections in the pipes in both the horizontal and vertical directions.

Subsequent tests consisted of reducing the cover over the pipes to 6 in. and then to 0 inch and placing the rear wheel of the tractor-scraper over the pipes. Dial gage readings were also observed to detect deflections or diameter changes in the No-Joint and extra strength pipes.

CONCRETE DATA

The No-Joint pipe was cast with concrete furnished by Pacific Concrete and Rock Company, Limited. The concrete was in place 7 days at the time of the field demonstration.

Concrete cylinder strength tests were performed by the concrete supplier. The compressive strength for a 7-day old cylinder was 3292 p.s.i.

DEFLECTION OBSERVATIONS

Under both 12 and 6 in. of covers, the No-Joint pipe crown deflected about 5/1000 of an inch with no noticeable horizontal change in diameter. Under no cover, the downward deflection was 6/1000 of an inch and a horizontal deflection for one sidewall of the pipe was 2/1000 of an inch.

Under both a 6 and 0 in. of cover, the extra strength reinforced concrete pipe deflected about 4/100 of an inch vertically and 3/100 in. horizontally under the wheel load of the tractor-scraper.

For the corrugated metal pipes, the deflections vertically, laterally and longitudinally were very noticeable by eye. Because of the magnitude of the deflections, dial gages were not installed in this pipe.

CONCLUSIONS

Both the No-Joint and the extra strength concrete pipe can sustain wheel loads of about 35 kips with 12-in. to 0 in. of cover for the field conditions and the period the test was conducted.

The extra strength pipe deflected about 8 to 10 times more than the No-Joint pipe during the test period for the pipe installation conditions at the test site.

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

Walter Lum

Walter Lum
Professional Engineer
Hawaii No. 619

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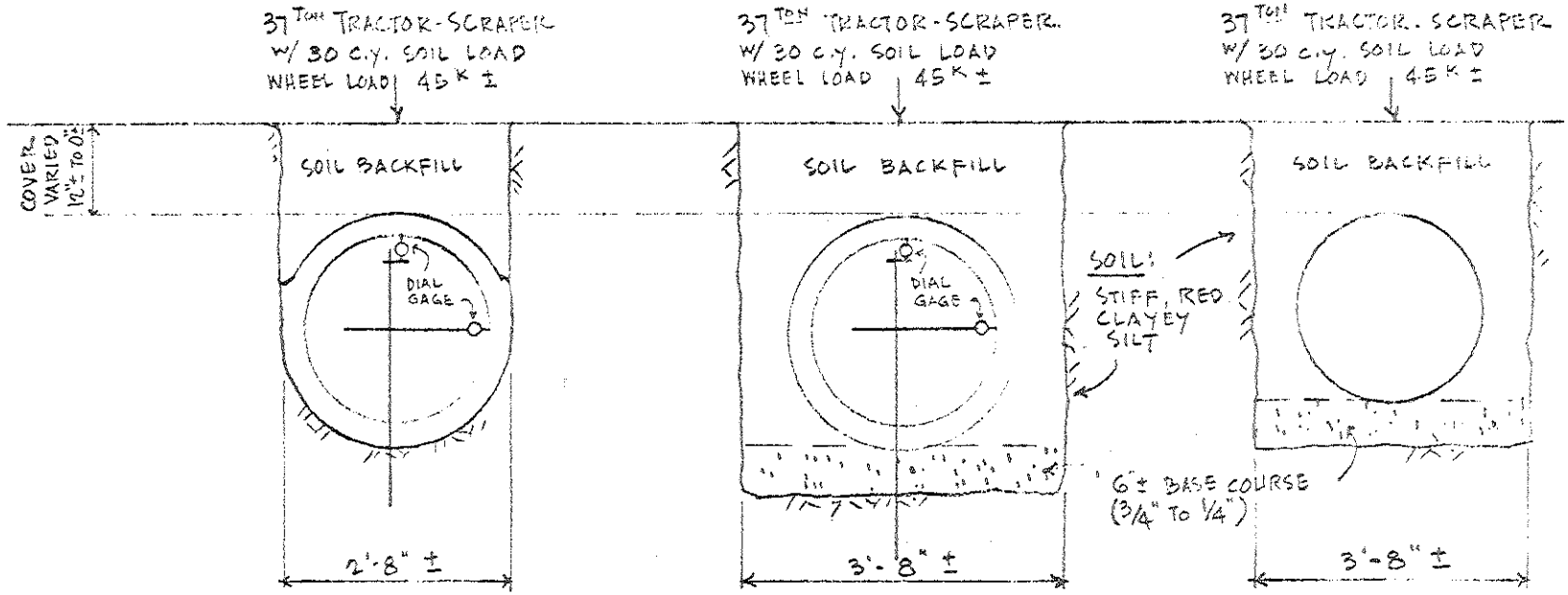

	NO-JOINT CONCRETE PIPE	REINFORCED CONCRETE PIPE (CLASS IV)	CORRUGATED METAL PIPE (12 GAGE)
	12"± COVER	12"± COVER	12"± COVER
VERTICAL DEFLECTION	0.003" TO 0.005" DOWNWARD	NOT MEASURED	NOT MEASURED (DEFLECTION NOTICEABLE TO NAKED EYE)
LATERAL DEFLECTION	NIL		
	6"± COVER	6"± COVER	12"± COVER OVER PIPE WAS NOT REMOVED.
VERTICAL DEFLECTION	0.003" TO 0.005" DOWNWARD	0.045"± DOWNWARD } GAGES STARTED AT ZERO DID NOT REBOUND TO ZERO	
LATERAL DEFLECTION	NIL	0.035"± OUTWARD }	
	0"± COVER	0"± COVER	
VERTICAL DEFLECTION	0.006"± DOWNWARD	0.038"± DOWNWARD } GAGES STARTED AT ZERO REBOUNDED CLOSE TO ZERO	
LATERAL DEFLECTION	0.002"± OUTWARD	0.025"± OUTWARD }	

LOAD-DEFLECTION OBSERVATIONS

E.K. MARCH 6, 1969

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