SONISCOPE INVESTIGATION OF THE TURKEY POINT PLANT, UNIT NO. 3 CONTAINMENT MAT

INTRODUCTION

In accordance with an agreement for consulting services between the undersigned and Bechtel Corporation, Soniscope tests have been performed on Section 6-1 of the containment mat of the No. 3 Unit of the Turkey Point Plant, located near Homestead, Florida. All testing was accomplished on Monday, May 26, 1969.

In a previous report to Bechtel, dated April 30, 1968, describing the original testing of the containment mat of the No. 3 Unit of this plant, the test equipment and procedure used in performing these tests were described in detail. The report also provided information concerning the extent of, and limitations of, usefulness of this testing approach, and described procedures for analysing the data collected during such tests. For such information, the reader is referred to that report.

The same notations were employed for identifying test positions during the testing described herein as were used to identify test positions during the original tests of this unit. Testing was limited to horizontal tests from the wall of the reactor pit liner to the outer wall of the containment mat. A total of 180 tests are described herein.

TEST RESULTS

The results of all tests performed are tabulated in Table I and shown graphically in Figures 1 and 2.

Figure 1 shows the results of horizontal measurements from the wall of the reactor pit to the outer wall of the containment mat in which the transmitting transducer was moved successively in two degree increments around the outer wall of the mat. During these tests the receiver, held against the inner wall of the reactor pit, occupied only three different positions. Tests were made at elevations 3 ft., 4 ft., 5 ft., 7 ft., and 9 ft. A successful test was accomplished at each position occupied.

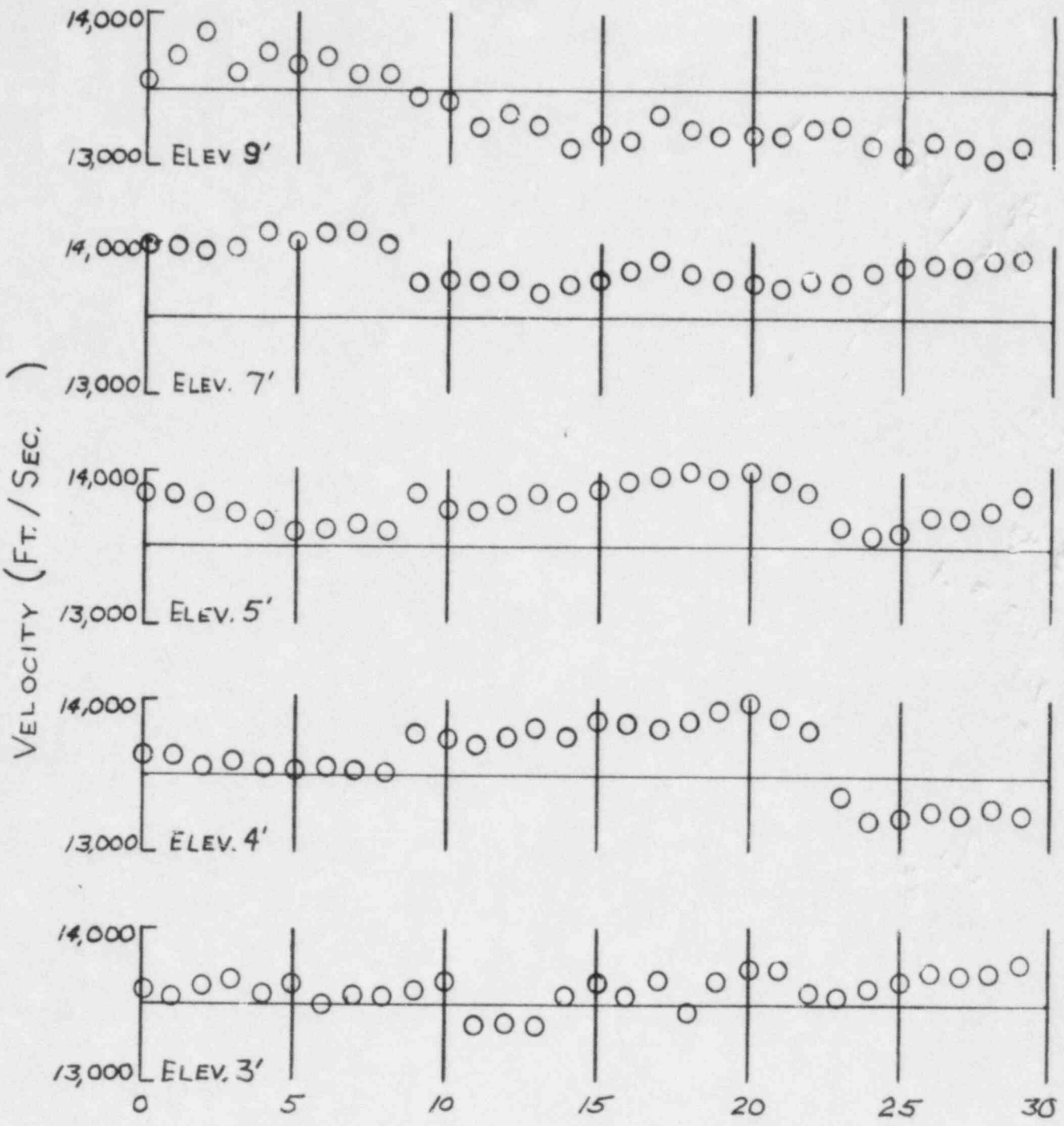


FIG. 1.

HORIZONTAL MEASUREMENTS OF PULSE VELOCITY THROUGH SECTION 6-1, AT INDICATED ELEVATIONS

Reference to the original report will show that in the earlier tests on the section at elevation 3 ft.there were two positions (61-3 and 61-12) at which no signal was received and fifteen positions at which the received signal was too weak to be interpreted. In the tests made on May 26, 1969 all received signals were of adequate strength and the average velocity measured throughout the elevation was slightly greater than the average of those velocities measured in April, 1968.

In the original tests at elevation 4 ft., no signal was received at test position 61-1 and at position 61-22 the received signal was too weak to be interpreted. Signals of adequate strength were received at all positions during the more recent tests. Velocities measured at positions from 61-1 through 61-21 were the same or a little higher than those measured in April, 1968. A larger than average difference between adjacent readings occurred as the transmitting transducer was moved from position 61-22 to position 61-23, and the velocities measured from position 61-23 through 61-29 were slightly lower than those measured in 1968. It should be noted that the receiving transducer, held against the wall of the reactor pit, was moved 30 degrees around the wall between tests involving position 61-22 and position 61-23, and remained at the latter position through the remainder of the tests on the section. It is believed that the reduction in velocities noted from position 61-23 through position 61-29 at elevation 4 ft. may be attributed to a slight lessening of bond between the reactor pit liner and the containment mat at position 61-30 on the reactor pit liner. Some substantiation of this belief will be pointed out on Figure 2.

In the original tests at elevation 5 ft., unreadably weak signals were received at test positions 61-22 through 61-29. Adequate signals were received at all of these positions during the more recent tests. Velocities measured through the section were about the same or slightly higher at this elevation when measured in May, 1969 than when measured in April, 1968.

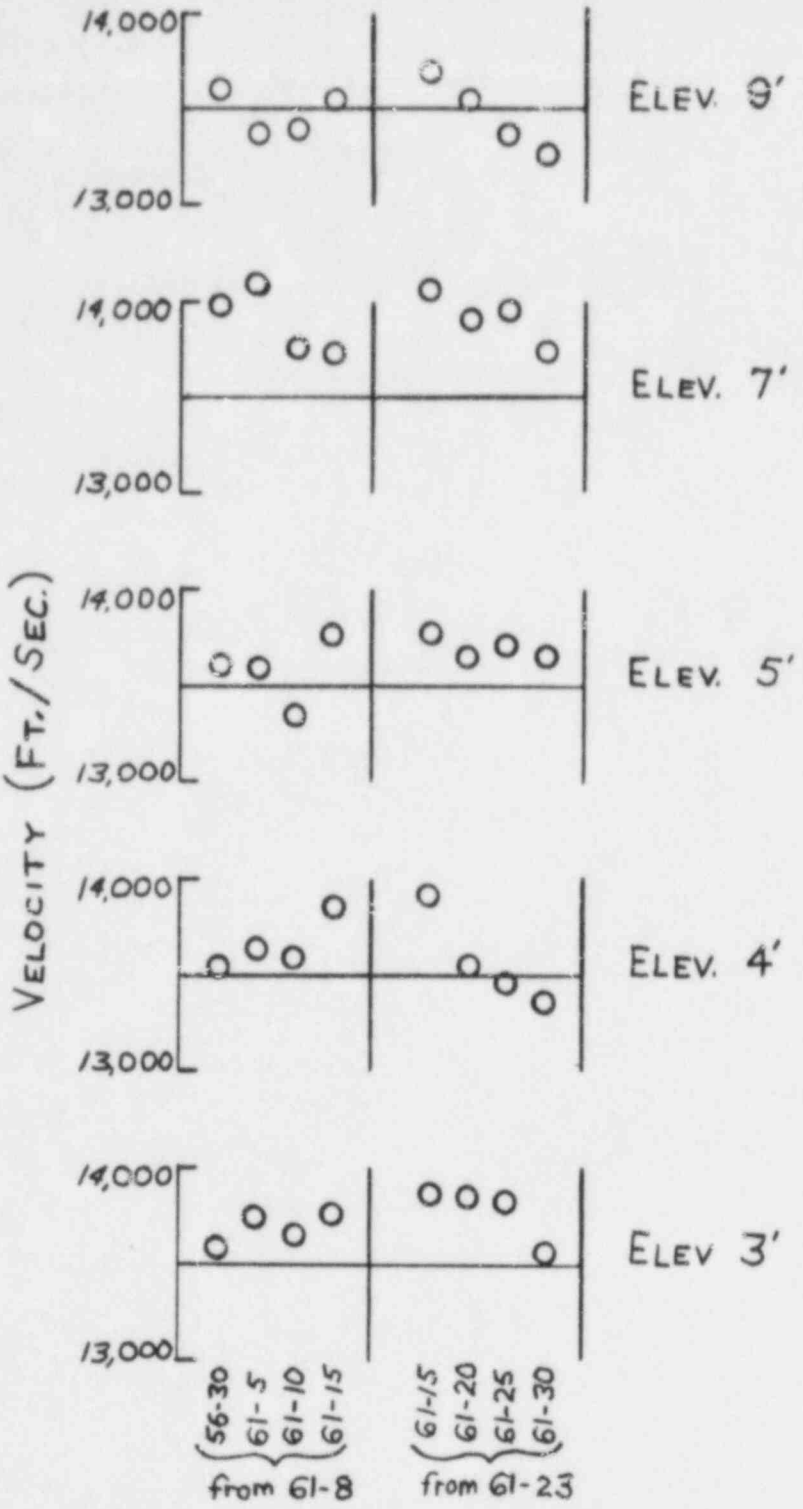
At the 7 ft. elevation, adequate signals were received and high velocities measured at all positions tested in the most recent tests, as was the case in the

original tests at this eleveation. No unusual variations in velocity were found.

In the original tests at elevation 9 ft., no signal was received at test positions 61-2, 61-5, 61-8, 61-14, 61-15, 61-18, 61-19, 61-20, 61-21, and 61-22, and unreadably weak signals were received at eight other test positions. Successful tests were made at only twelve of the thirty test positions. In the recently completed tests, readings were completed at all thirty positions. Signals observed in these were, however, weaker than those observed in tests at the other four elevations, and the average velocity measured in the thirty tests, 13,380 ft. per second, was somewhat lower than that measured at the other elevations (13,630 ft. per second at elevation 3 ft., 13,620 ft. per second at 4 ft., 13,760 ft. per second at 5 ft., and 13,850 ft. per second at 7 ft.).

In the original report, the difficulties associated with achieving adequate test results at the 9 ft. elevation were attributed to the presence in the slab of a shear key into which the wall would subsequently be erected. It was noted that the shear key was approximately 4 ft. deep throughout most of the section, beginning at about position 61-7, and was of sufficient depth to intercept the test signal. With the erection of the wall, the shear key has been filled with concrete and a continuous path should be available for the test signal. This construction would result, however, in two vertical construction joints which would intercept the signal path, each of which would be expected to result in some attenuation of the signal. It may be noted that the velocities measured through test position 61-6 are of approximately the same level as those measured at other elevations. At test positions beyond 61-6 the velocity began to fall off and remained lower throughout the remainder of the section. It is believed that this decrease is attributable to the presence of the two vertical construction joints in the signal path. The uniformity of the velocity measured over a large portion of the slab at the 9 ft. elevation after the general decrease in velocity had occurred suggests adequate uniformity of the concrete.

Figure 2 shows the results of supplemental horizontal tests in which the transmitting transducer was held at only two positions on the outer wall of the mat and the receiving transducer was moved through a succession of ten degree intervals



TEST POSITIONS ALONG INNER WALL OF REACTOR PIT

FIG. 2

HORIZONTAL MEASUREMENTS OF PULSE VELOCITY REFERENCED TO POSITIONS ON REACTOR PIT LINER, AT INDICATED ELEVATIONS.

against the liner to the reactor pit wall. Successful tests were accomplished at all locations. In general, velocities were about the same or a little higher than those measured in April, 1968 and variability of the readings was about the same. One difference occurred at elevation 4 ft. involving test positions 61-20, 61-25, and 61-30. In the recent tests, the velocities measured at these positions were somewhat lower than those measured earlier, and increased as the transducer was moved away from position 61-30, reaching a high level of velocity by the time the transducer reached position 61-15. Attention is redirected to the horizontal tests at elevation 4 ft. in which all tests made to the outer wall (positions 61-23 through 61-29) for which the receiving transducer was held at position 61-30 against the reactor pit liner showed lower readings than average for that elevation. It is believed that these results substantiate the conclusion that there has been some lessening of the intimacy of bond between the reactor liner and the mat at and near position 61-30 at elevation 4 ft.

CONCLUSIONS

On the basis of the testing described above and of the test results enumerated in this report, together with a comparison of the results reported under date of April 30, 1968, the following conclusions have been drawn:

(1) The degree of uniformity of the concrete throughout Section 6-1 of the containment mat is materially greater than it was at the time of the initial tests.

(2) No significant evidence of lack of uniformity, as evidenced by inability to obtain a test signal, an unreadably weak test signal, or abnormal variations in velocities, was discovered during these tests.

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TABLE I

PULSE VELOCITIES MEASURED HORIZONTALLY THROUGH CONTAINMENT SLAB

Transducer Positions							
Wall of reactor pit	Outer face of slab	Path length (ft.)	Pulse Velocity (ft./sec.)				
			Elev. 3 ft.	Elev. 4 ft.	Elev. 5 ft.	Elev. 7 ft.	Elev. 9 ft.
56-30	56-30	55.0	13,600	13,630	13,850	13,990	13,550
	61- 1	55.1	13,550	13,620	13,840	13,980	13,710
	2	55.1	13,620	13,550	13,790	13,930	13,880
	3	55.1	13,660	13,590	13,720	13,970	13,600
	4	55.2	13,580	13,560	13,680	14,050	13,730
	5	55.2	13,630	13,530	13,600	13,990	13,660
	6	55.3	13,500	13,550	13,620	14,050	13,710
	7	55.4	13,550	13,530	13,650	14,060	13,600
	8	55.5	13,590	13,520	13,600	13,980	13,600
61-15	61- 9	54.8	13,720	13,770	13,860	13,730	13,450
	61-10	54.7	13,660	13,760	13,760	13,740	13,420
	11	54.6	13,370	13,700	13,740	13,750	13,250
	12	54.6	13,380	13,770	13,790	13,750	13,320
	13	54.6	13,370	13,810	13,860	13,680	13,270
	14	54.5	13,560	13,760	13,800	13,710	13,120
	15	54.5	13,640	13,870	13,890	13,730	13,210
	16	54.5	13,570	13,850	13,940	13,810	13,180
	17	54.6	13,680	13,820	13,980	13,880	13,330
	18	54.6	13,450	13,860	14,000	13,790	13,240

TABLE 1 (Continued)

PULSE VELOCITIES MEASURED HORIZONTALLY THROUGH CONTAINMENT SLAB

Transducer Positions			Pulse Velocity (ft./sec.)				
Wall of reactor pit	Outer face of slab	Path length (ft.)	Elev. 3 ft.	Elev. 4 ft.	Elev. 5 ft.	Elev. 7 ft.	Elev. 9 ft.
61-15	61-19	54.6	13,650	13,930	13,960	13,750	13,200
	20	54.7	13,740	13,990	13,990	13,730	13,210
	21	54.8	13,730	13,890	13,940	13,700	13,200
	22	54.8	13,580	13,800	13,870	13,750	13,240
61-30	61-23	54.4	13,550	13,330	13,630	13,720	13,270
	24	54.3	13,610	13,210	13,590	13,800	13,150
	25	54.2	13,670	13,220	13,600	13,830	13,090
	26	54.2	13,720	13,270	13,720	13,860	13,160
	27	54.1	13,700	13,260	13,710	13,820	13,120
	28	54.1	13,710	13,290	13,750	13,890	13,040
	29	54.0	13,780	13,240	13,830	13,900	13,120
61-25	61-23	54.2	13,810	13,450	13,700	13,950	13,350
61-20		54.4	13,820	13,530	13,620	13,900	13,520
61-15		54.9	13,850	13,900	13,780	14,060	13,690
61-15	61- 8	54.9	13,740	13,830	13,780	13,710	13,540
61-10		54.7	13,620	13,590	13,340	13,730	13,390
61- 5		54.9	13,730	13,610	13,590	14,090	13,380