MIDLAND UNITS 1 & 2
JOB NO. 7220

DRAFT

REVIEW OF U.S. TESTING
FIELD AND LABORATORY CONSTRUCTION
TEST DATA ON SOILS USED AS FILL

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PREPARED BY
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SB 01585

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REVIEW OF U. S. TESTING
FIELD AND LABORATORY CONSTRUCTION
TEST DATA ON SOILS USED AS FILL

This review of the quality control tests of the earth fill at the Midland Site was made as a result of settlement of the diesel generator building in excess of that predicted. Soil samples obtained in borings indicated that soil conditions beneath the structures are not compatible with the quality of fill indicated by the control tests made by U. S. Testing Company. All fill was accepted as it was being placed based on the results of the field tests performed by U. S. Testing Company.

The review showed many discrepancies in the test results as outlined in the following paragraphs. Review comments are based on the technical specifications and subcontract documents agreed to by U. S. Testing Company. The ability of the personnel to do the testing work was judged on the basis of personnel resumes and previous documented work experience of U. S. Testing Company.

1. Use of Laboratory Test Compaction Curves

Table 9-1 of specification 7220-C-208, Page 14B required one field density and moisture content test be taken for each 500 cubic yards of fill placed. It also required one compaction, grain size, and specific gravity for each 10,000 cubic yards of material. This gives a ratio of 20 field density tests to 1 laboratory compaction test. Although 20:1 is not a strict upper limit, it is a guideline; should density tests be taken more frequently than one per 500 cubic yards of fill the ratio could be higher. ~~This method of increasing the ratio seems to have been done very infrequently.~~ The actual ratio is shown in Table A attached. In fact, some of the laboratory compaction tests were used to determine percent compaction for several hundred field density tests taken over a period exceeding two years. Even though no time requirements for the period of use of laboratory tests are specified, it is unlikely that any borrow source in this area would be of such uniform character that such extended use of a compaction curve, truly representative of a large quantity of material, would be applicable. Listed below are selected laboratory test data results indicating the wide range of soil properties that were encountered.

confined areas ould be 1:100 to 1:1000 ield : lab)

TEST	MIN. DENSITY (lbs/Ft^3)	MAX. DENSITY (lbs/ft^3)	OPT. MOISTURE (percent)
*BMP269		127.3	10
*BMP278		117.0	15.2
*BMP279		140.8	5.7
**RD24	100.9	119.2	
**RD35	90.2	109.7	
**RD61	109.3	125.0	

*BMP referes to proctor type test.
**RD refers to relative density test run by dry method.

2. Questionable Retests

A field test that fails to meet standards dictated by the selected laboratory test data must normally be cleared by another field test made in the same area after corrective action has been taken. In the procedure adopted by U. S. Testing Company, this test result would then be compared to the appropriate laboratory compaction curve. Bechtel QC determined which failing tests had been cleared by subsequent retests.

In some cases the clearing of a failed density test was apparently resolved by using another laboratory compaction curve with lower maximum density which resulted in the percent compaction being increased sufficiently to meet the requirements of the specification. The poss bility exists that soil was removed after a failing test and replaced by different material, but the records do not indicate this. In other cases, tests labeled "failed" were incorrectly "cleared" though the same laboratory standard was referenced. For example, in some cases retests to clear a "failed" test were not taken in the same area or at the approximate same elevation. Many retests were over 20 feet from the failed test location and some were over 200 feet from the original test location. In general, if after a failing test the whole area is reworked, the retest location is not too critical assuming that the correct laboratory curve is used for comparison. However, in the plant area, work areas were relatively small, and soil characteristics and properties showed considerable variation necessitating retest in the immediate vicinity (within 10 ft) of the failing test. Retests should be taken in the same lift or soil layer that had previously failed. In some cases retests were taken at elevation differences up to 10 ft. from the failed test. It should be noted that Bechtel field personnel gave the locations and prepared the test areas for retesting. This was not a U. S. Testing responsibility. It is a probability that there were errors in recording dates for testing or retesting since some retests were dated three weeks prior to the time the original test failed. Some failing tests were marked as "non Q" and never recorded cleared by a passing test.

Table B is a compilation of notes relative to questionable clearing of failed tests.

3. Test Results Plot Above Zero-Air-Voids Curve on Compaction Data Plots

Soils cannot be more than 100 percent saturated; therefore, all field test data points, when plotted as dry density versus moisture content, must be below the zero air voids curve as defined by the specific gravity of the material. Specifications do not require examination of the zero air voids curve, but it is considered fundamental soil mechanics relative to compaction plots. There are numerous cases in the U. S. Testing Company data where points plot above the zero air voids curve. Figure 1 attached shows a typical laboratory compaction test curve with field test results plotted on it. Many of the field test results plot above the zero air voids curve. Provided the specific gravity is correct this is not possible so that all such points must represent erroneous data. The fact that a large number of test results plot above the zero air voids curve tends to make all test results questionable.

Also, referring to Figure 1 it would appear that soil density varied widely. Specifications called for compactive effort results as defined by ASTM D 1557 which is 56,255 ft-lb/ft^3 energy. This was modified to a laboratory test compactive effort of about 20,000 ft-lbs/ft^3 energy, often referred to as Bechtel Modified Proctor (BMP). Laboratory compaction test curves should be related to the same effort as that called for in the field for use in comparing with field density tests. According to plots of field data shown on Figure 1, density varied from about 108 lbs/ft^3 to about 130 lbs/ft^3. It is doubtful that the soil classification or other properties would be similar for such a wide variation in density. It is noted that 100 percent of modified Proctor (ASTM D 1557) which is difficult to obtain, is rated at 56,255 ft-lbs/ft^3 energy. The curve plotted on Figure 1 is at about 20,000 ft-lbs/ft^3 energy. For comparative purposes it was determined by U. S. Testing in 1974 that 100 percent of specified effort (20,000 ft-lbs/ft^3) is approximately equal to 95 percent of the maximum density as determined by ASTM D 1557 (56.255 ft-lbs/ft^3) Reference Figure 3. This means that a density up to 5 percent greater (dry density of 123.2 lbs/ft^3) than that specified (dry density of 117.0 lbs/ft^3) could be possible. However, some points shown on Figure 1 give an apparent density up to 11 percent above that specified.

There were a significant number of arithmetic errors on calculation sheets even though there are signatures on the sheets indicating they had been checked. Over 100 errors were found in calculations of relative density from 8/15/75 through 12/78 (not all of these errors have harmful consequences). Also, several specific gravity calculations are in error, such as for BMP 273 and 274. In the case of BMP 273, the zero air voids curve passes through the laboratory compaction curve. In another example, BMP 297, the laboratory compaction curve is invalid due to calculation errors, yet was referenced by field density tests 22 times.

4. Reported use of Questionable Laboratory Test Data

Some laboratory compaction test data were used repeatedly even though they continued to show suspect field test results. This could be indicative of questionable laboratory data or the fact that soil was not being placed or compacted according to specifications. At any rate there should have been cause for concern. Subcontract 7220-C-208 Exhibit C, Page 17 of 47 No. 2 states "You (U. S. Testing) are to immediately report data that indicates material that does not comply to specifications or procedures."

Table C is a compilation of notes relative to questionable test data.

5. Limits of Accuracy and Acceptability for Test Data

Figures 1 through 7 attached will be referenced in discussing limits of accuracy or acceptability for field test results as compared to laboratory test data. This is BMP 278 which is typical of all test results.

Specified laboratory compactive effort was 20,000 ft-lbs/ft^3 and field compaction effort was originally specified at 56,255 ft-lbs/ft^3 but was changed by Revision 5, dated 7/8/75, specification 7220-C-210, Section 13.7, Page 57 to also be equal to about 20,000 ft-lbs/ft^3.

The specified 20,000 ft-lbs/ft^3 effort establishes a compaction curve relating moisture and density for a specific soil. Moisture was specified for field placed fill to be within $\pm$ 2 percent of optimum moisture as determined by this effort. Density was specified to be greater than 95 percent of the maximum density. Once field compaction is such that the fill density is significantly higher than about 105 percent of maximum, the specified tolerance from optimum moisture content in the laboratory compaction test may no longer be applicable for field control. As compactive effort is increased, maximum density will be increased and optimum moisture content will decrease in the laboratory test. This change can only occur in the field to the extent that the field moisture content will permit it. Therefore, to benefit from the increased compactive effort the field moisture content must be lowered. As this indicates, the location of the compaction curve changes with a corresponding change in range of acceptable moisture content relative to optimum. A $\pm$ 2 percent numerical value of moisture content acceptable at the specified compactive effort would be too wet at a higher effort indicating that higher densities for that soil cannot be achieved. Therefore, if the record shows high densities for such material, the data are in error. This was apparently overlooked.

Plots of field data for compaction test BMP 278 are shown on Figures 1 through 6. The title of each figure gives the assumptions made in plotting data for the figure. In comparing figures 3 and 4 it is seen that a majority of field tests were made using the nuclear device. The two test results shown on Figure 4 for the sand cone method indicates one test result on each side of the zero air voids curve. The one falling above the zero air voids curve (shown on Figure 4) is designated by U. S. Testing Company as the only passing sand cone test (shown on Figure 6)

For a field test result to be valid as well as "Passing' it must fall within a well defined area on the plot containing the laboratory compaction curve. This area or window of acceptability is shown for a hypothetical compaction curve on Figure 7a that would meet requirements of Specification 7220-C-210. It is defined by horizontal lines at 95 percent and 105 percent of specified density, vertical lines through $\pm$ 2 percent of optimum moisture content, and a line parallel to the zero voids line indicating saturation about half way between the compaction curve and 100 percent saturation (zero air voids curve). The upper limit of 105 percent of specified density is not defined in the specifications. It was arbitrarily chosen as an upper limit since engineers knowledgeable in soil compaction have observed that numbers greater than this give increasingly invalid comparisons between field test results and the specified laboratory test curve. Therefore, if all data points fall within the defined window there would be no reason to assume that they are wrong. However, when many data points fall outside the designated area there is something wrong with the information and then all data points become suspect. A review of all data indicates that about 25 percent of the cohesive soil test results fall within this area.

Data to the left of the "window" and below 95% would be identified as failing tests and retests would be made. Does not indicate errors.

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Figure 7B shows an area where field test results would be acceptable, in theory even though not in strict accordance with the specifications. Figure 7B was arrived at by expanding Figure 7a to include test results up to a compactive effort related to ASTM D 1557 (56, 255 ft.-lbs/ft.^{3}) which is considered to be a practical upper limit. About 40 percent of all cohesive soil test results would plot in this area.

6. Accuracy of Test Equipment

Almost all (over 95%) field density tests on cohesive soils were made using the Nuclear Density device. Specification 7220-C-210 section 12.4.2 page 42 indicates this to be acceptable for moisture content determination provided that the results are compatible with those obtained by ASTM D 2216. Similarly, section 12.4.4 says density determined by the nuclear device is acceptable when results are compatible with density as determined by ASTM D 1556.

Project Engineering gave permission to use nuclear equipment based on data evaluation. Errors were considered "conservative" (~ 1974)

In a letter from U. S. Testing to Bechtel (dated May 30, 1974), the average deviation of the nuclear device from oven-dry moistures was +.12% for a set of 30 tests. However, the standard deviation is 1.77% for the data with the range of differences being from - 3.2% to +3.9%. Thus, accuracy of the nuclear device is questionable, and could translate into errors of roughly ±4 pcf in the dry density calculation. (It should be noted that errors in the moisture content tend to shift the position of test results on a moisture density plot approximately parallel to the zero air voids curve, assuming the in-place wet density is correct, and thus do not explain the large number of points which plot outside this limit. See Figure 9).

Even with the range of possible error for nuclear-determined moisture values shown above, it appears that the controlling factor was selection of the appropriate laboratory test curve rather than the type of field test method used. In most cases where the test result plots outside the acceptable zone defined in section 5, the difference between nuclear and sand cone methods would not have made the test result acceptable had a sand cone method been used. Therefore, it must be concluded that the wrong laboratory compaction curve was used.

7. Relative Density Tests

Cases were noted where densities in material classified on the data sheet as zone 3 (sand) was compared to the maximum density in proctor type tests and other cases where densities in clay soils were compared to the maximum density in relative density tests. An error exists in the record in such cases either in the classification of the soil on the data sheet or in comparing field test results to inappropriate laboratory test data. In general, it appears that relative density tests were used in controlling density of sand fill.

ASTM D 2049 section 7.1.2 Wet Method states: "Note 2 - While the dry method is preferred from the standpoint of securing results in a shorter period of time, the highest maximum density is obtained for some soils in a saturated state. At the beginning of a laboratory test program, or when

Wet and dry max. densities were rerun in February, 1976. Data available - Dry densities were used as maximum in conformance with Note 2 of ASTM D 2049.

this was done. - see privious page

a radical change of materials occurs, the maximum density test should be performed on both wet and dry soil to determine which method results in the higher maximum densities, (in excess of one percent) it shall be followed in succeeding tests." An example of wet and dry relative density is shown on Figure 10. ~~U. S. Testing Company did not do this.~~ As a consequence many field density test results exceed 100 percent of maximum dry laboratory relative density. As an example, for laboratory test RD55 a total of 566 field tests were made. Of this total, 364 tests showed greater than 100 percent compaction. The highest relative density found was 142.2 percent with the majority of tests over 100 percent falling in the range of 100 percent to about 130 percent. Since the difference in maximum density between wet and dry methods is about 4 to 5 lbs/cu. ft. (based on recent data) any test result greater than about 115 percent (based on the dry method) is suspect.

e

1974 and 2/76

Even if the wet laboratory test method data were available for all sands, it appears an unacceptably high number of field test results would have greatly exceed 115 percent.

8. Summary

see comment in section 5

In summary, as discussed in section 5, about 25 percent of the field test results fall within an area that is defined by the specifications, soil mechanics experience, or are possible based on the compaction characteristics of soil. About 40 percent of all data points fall in an area considered possible for the given soil as defined by an obtainable compactive effort of 100 percent of ASTM D 1557. Refer to Figures 7A and 7B and Section 5 of the text for determination of the areas defined as acceptable.

Since more than one half of the test results for relative density and percent compaction fall outside the possible theoretical comparison limits, it must be concluded that these test results are suspect and should not be used alone for acceptance of plant area fill. Therefore, other means of testing have been established and employed for acceptance of the fill.

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TABLE A

Listing of All Classifications Referenced in Plant Area Fill Soil Test Records Which were Used for 20 or More Field Density Tests

Classification	No. of Tests
B200	90
B251	31
B252	22
B254	42
B255	57
B260	68
B261	36
B262	165
B269	227
B270	226
B271	141
B274	37
B276	21
B277	15[illegible]
B278	82
B297	22
R015	20
R016	61
R024	248
R030	54
R035	59
R038	39
R039	28
R040	35
R041	69
R042	103
R043	48
R044	71
R045	43
R049	63
R054	118
R055	566
R059	65
R061	559
R063	42
R065	59

Note: Spec. 7220-C-209 gives a ratio of approximately 20 field tests to each laboratory test.

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TABLE B

Notes on Questionable Clearing of Failed Tests

1. Test number MD 245 fails due to high moisture. Cleared by MD 246 which references a proctor with higher optimum moisture content (OMC) such that the ±2% of optimum requirement is met.

2. MD 205 fails with moisture content 6% above the OMC. Cleared by MD 215, which references a relative density lab standard, and is itself still 6% away from the OMC of the proctor referenced by MD 205.

3. MD 223 fails because of high moisture. Cleared by MD 228 which has actually a higher moisture content and lower density, but references a different proctor; the retest passes and clears the failure.

4. Both MD 844 and 886 fail because of high moisture and low density. They are cleared by MD 888 which references a new proctor with lower maximum density and higher OMC than the first.

5. MD 251 fails due to moisture being too high. Cleared by MD 253 which uses a higher OMC proctor.

6. MD 668 clears MDR 634, but the two tests show no correspondence in location, moisture, density, or lab standard.

7. MD 771 failed, being too dry. Cleared by MD 782, which has almost identical moisture content and dry density but uses a new BMP with lower optimum moisture.

8. MD 2384 clears MD 2342, referencing a different proctor with an OMC which fits the in-situ conditions. However, the dry density of MD 2384 is way too high to fit the original soil classification, and in addition, it falls outside of the zero air voids curve for the classification which it has been changed to.

9. MD 556 clears MD 554 by using a BMP with lower moisture requirements. The field densities differ by 24 pcf and would seem to be different material.

10. MD 558 clears MD 555 but has too high a density to be the same soil as MD 555. It also uses a different proctor.

11. MD 566 and 568, classified as BMP 262 cohesive soils, are cleared by MD 569 which is classified as RD 33 and has totally different soil properties than the two failures.

12. MD 1317, 18, 19 and 20 fail and are all cleared by MD 1477 taken over 5 weeks later. There is poor correspondence in the soil properties and the proctor is different from failing to passing test.

13. MD 2965 clears MD 2963 with a different proctor through the test results would have been passing with the original BMP.

14. MD 1388, classified as BMP 278, is cleared by MD 1461, classified as RD 55.

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15. MD 170, classified as RD 24 is cleared by MD 173, classified as BMP 234.

16. MDR 287 fails with a relative density of 77%. Cleared by MDR 291 which has .1 pcf lower density but arbitrarily rounds up the relative density to 80%; it passes and clears the failure.

17. In all of the following field density tests on sand, the passing test has approximately the same or lower density than the failures, but references a lower maximum density RD lab standard:

MDR 343	clears	MDR 339
MDR 514	clears	MDR 507
MDR 513	clears	MDR 508
MDR 515	clears	MDR 509
MDR 516	clears	MDR 510
MDR 522A	clears	MDR 521
MDR 558	clears	MDR 556, 557
MDR 480	clears	MDR 473
MDR 555	clears	MDR 525, 527, 534
MDR 533	clears	MDR 526, 530, 531

18. MD 2384 clears MD 2342, but is at 7' lower elevation.

19. MD 123 clears MD 122, but is at 10.5' lower elevation.

20. MD 149 clears MD 142, but is at 10' higher elevation.

21. MD 1694 clears MD 1693 but is 43' away from the site of the first test.

22. MD 3114 clears MD 3102, but the two tests are 68' apart.

23. MD 186 clears MD 183 though it is 110' away.

24. MD 1209 clears MD 1207 and MD 1205, yet is 183 ft. away from the failures.

25. MD 1097, dated August 4, 1977, cleared by MD 1048 dated July 16, 1977.

Note: This table gives typical observations and is not meant to be all-inclusive.

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TABLE C

Notes on Questionable Test Data

1. The first field density test to reference RD 24 (5/75) has a relative density of 170.6%. The standard continued to be used, however, with relative densities greater than 100% occuring repeatedly.

2. Similarly for RD 30, the first two tests (9/75) have 114% and 122% relative densities, yet the standard was used for 10 months, 54 tests, with 52% of the results over 100%.

3. During the first two weeks of use (7/76), RD 41 was referenced 22 times with 12 tests over 100% relative density (6 tests over 110% and 3 over 120%). The standard was used for 5 months, however, with over 40% of the results over 100%.

4. The first test using RD 55 (8/76) has a relative density of 119%, with the field test being made the same day as the standard and, thus, assumedly the same material. These results would throw doubt on the lab standard, yet it was used for two full years and 566 tests, with 64% of the results over 100% relative density.

5. Even high density structural backfill standards such as RD 61 (maximum density of 125.3 pcf), used 593 times, show over 25% of the tests having greater than 100% relative density.

6. The first seven tests referencing BMP 269 (scattered over a two month period around 7/76) <u>all</u> fall outside the zero air voids curve. This classification was used for 1 1/2 years, referenced 227 times.

7. The first two tests referencing BMP 270 (7/76) fall 6 pcf above the zero air voids curve. Continued use of this proctor for over 2 years resulted in 226 tests with 82 outside the theoretical maximum.

8. For the first month (4/77) all BMP 278 tests fell on or outside the zero air voids curve. For the next month, over half the tests did the same, or have greater than 105% compaction. The standard was used over half a year, with [illegible] out of a total of 52 tests outside the zero air voids curve.

Note: This table gives typical observations and is not meant to be all-inclusive.

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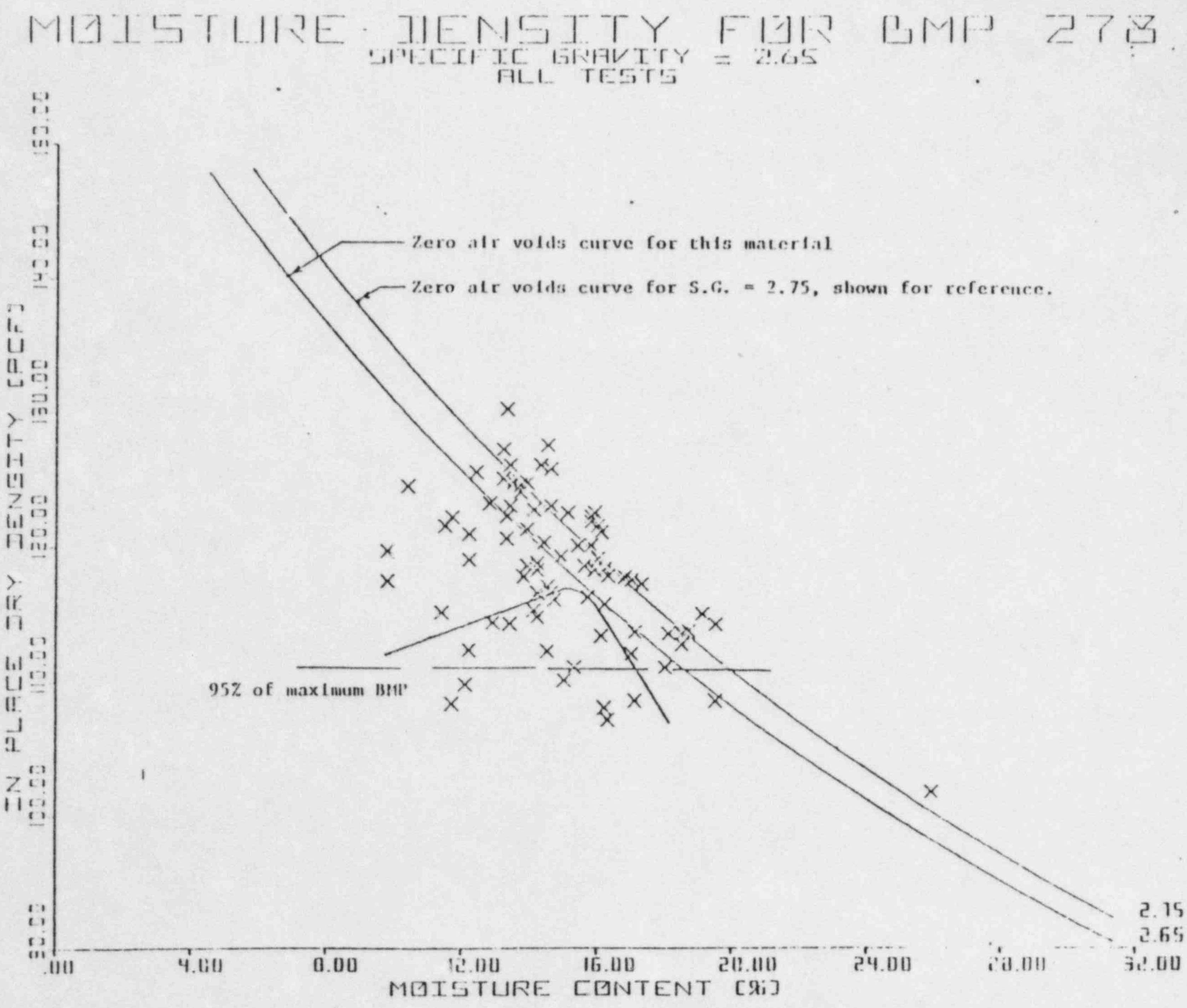


FIGURE 1

SB 01537

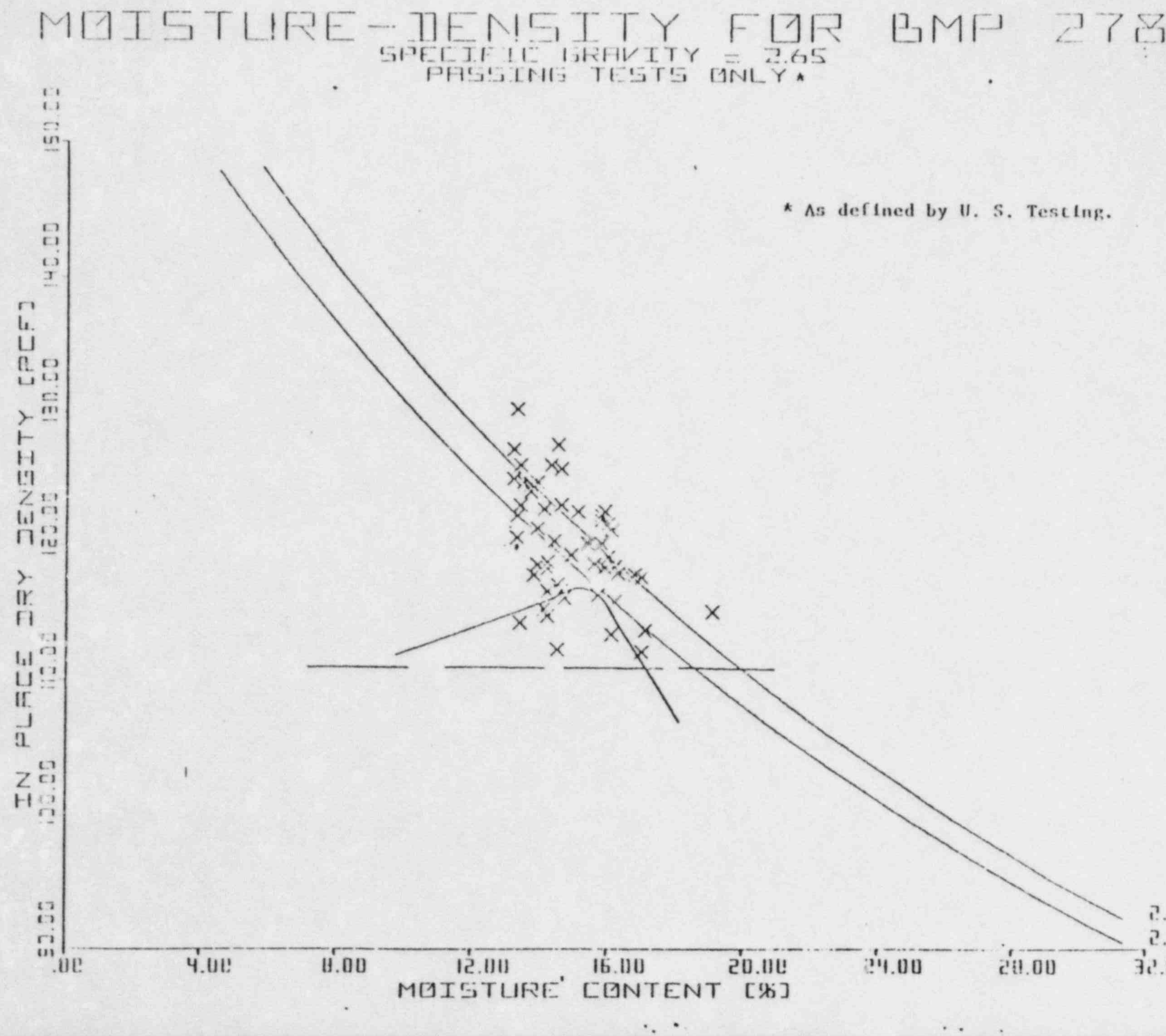
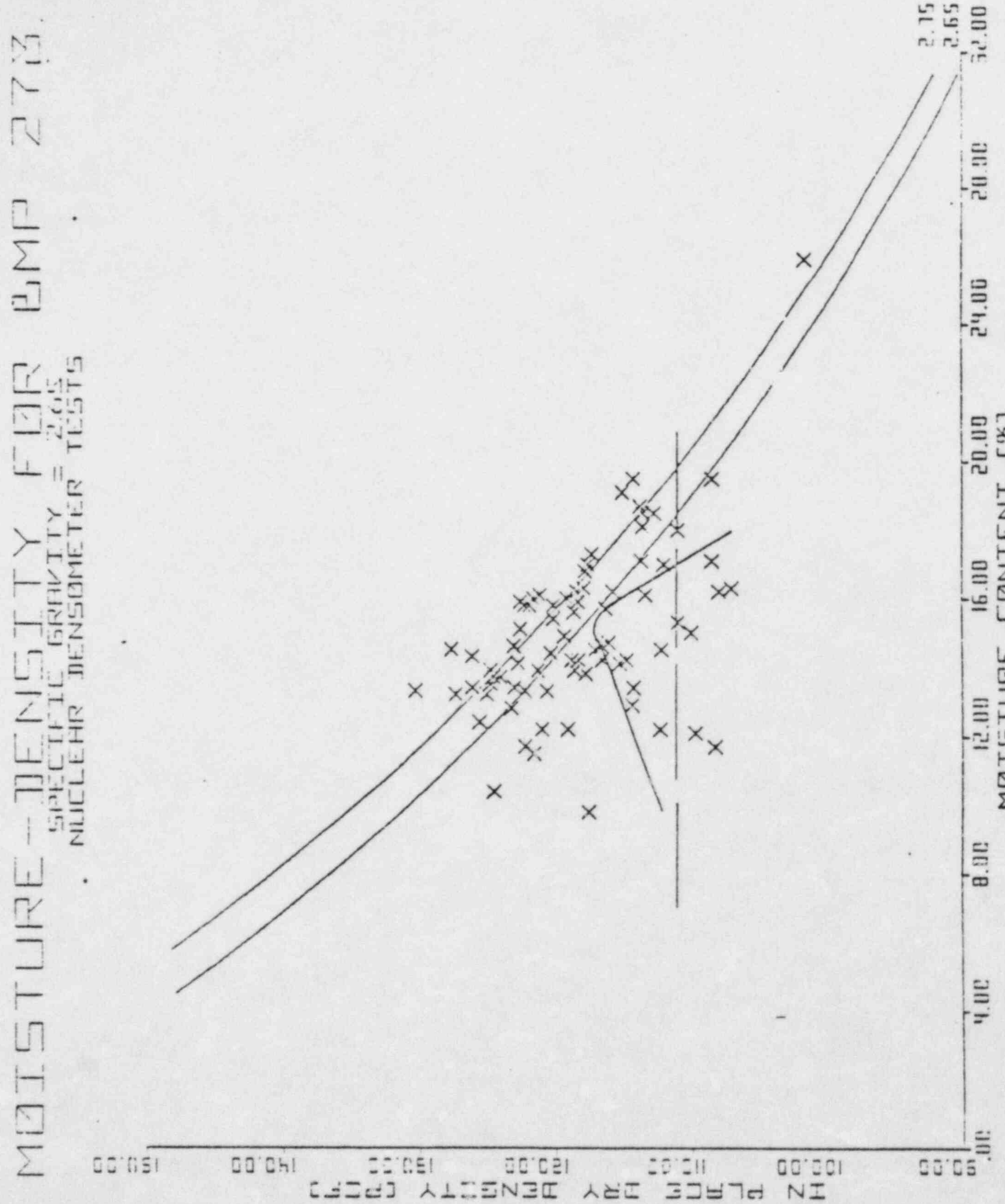


FIGURE 2

SB 01598



SB 01509

FIGURE 3

MOISTURE-DENSITY FOR BMP 278
SPECIFIC GRAVITY = 2.65
SAND-CONE TESTS

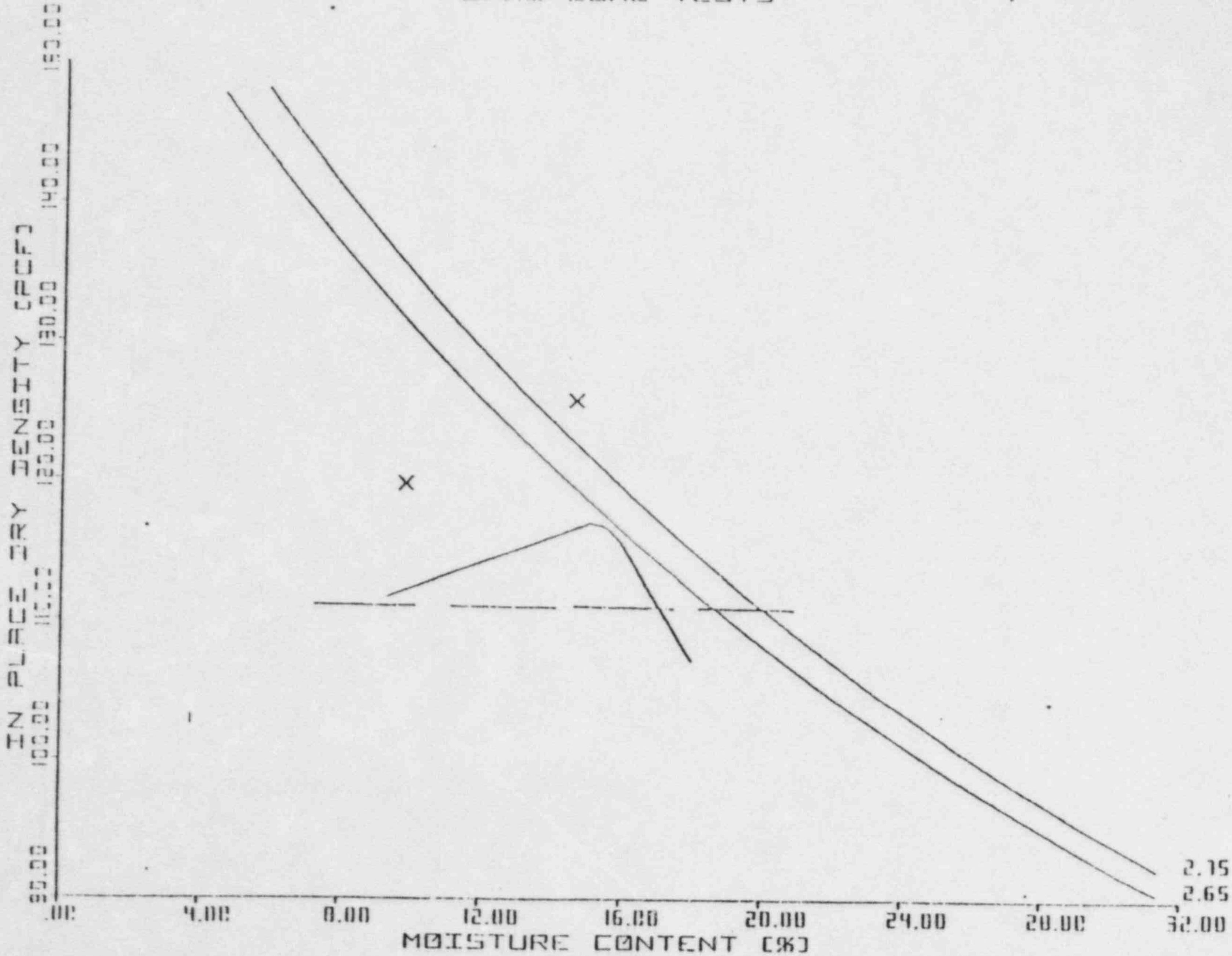


FIGURE 4

SB 01600

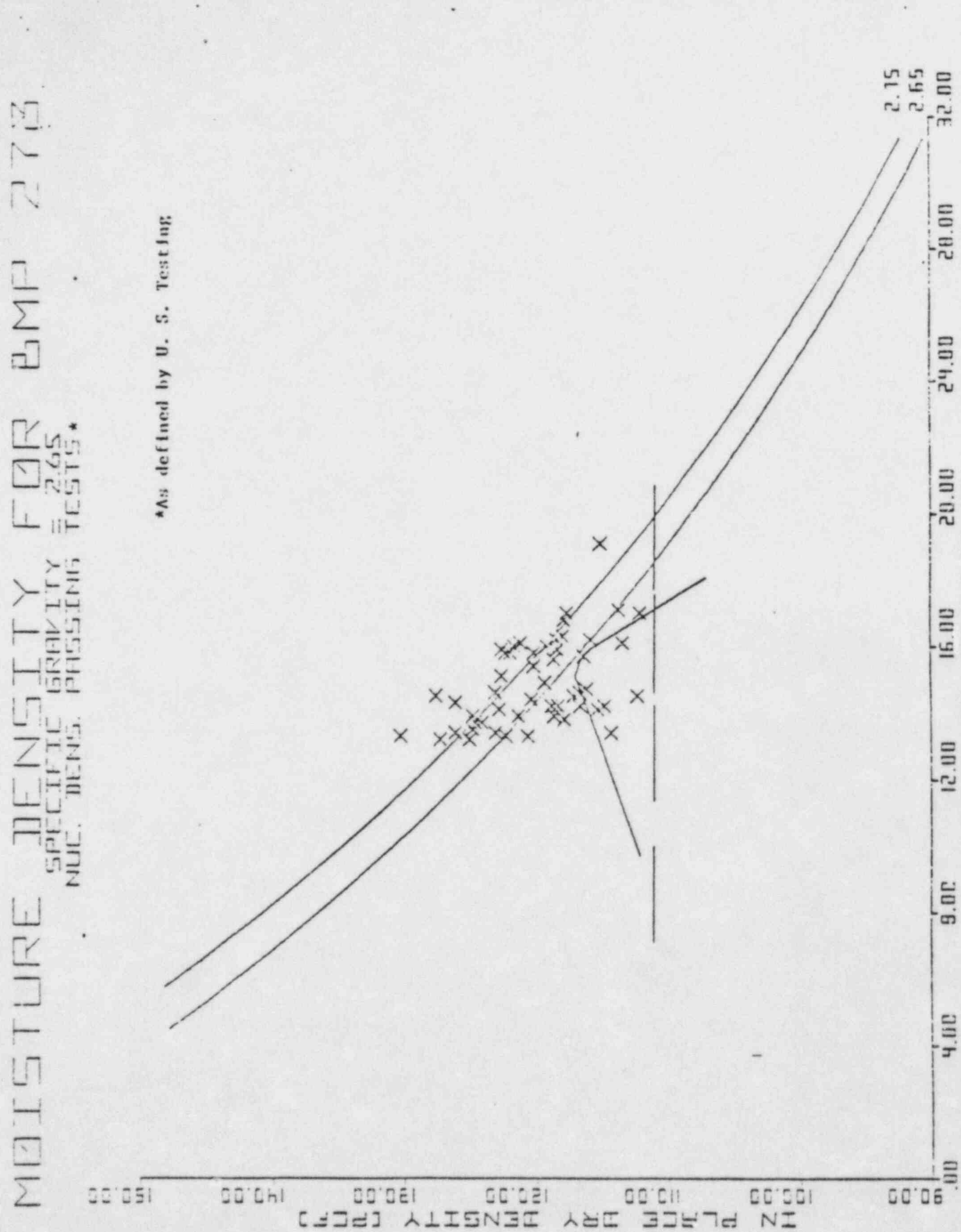


FIGURE 5

SB 01601

MOISTURE-DENSITY FOR BMP 278
SPECIFIC GRAVITY = 2.65
SAND-CONE PASSING TESTS *

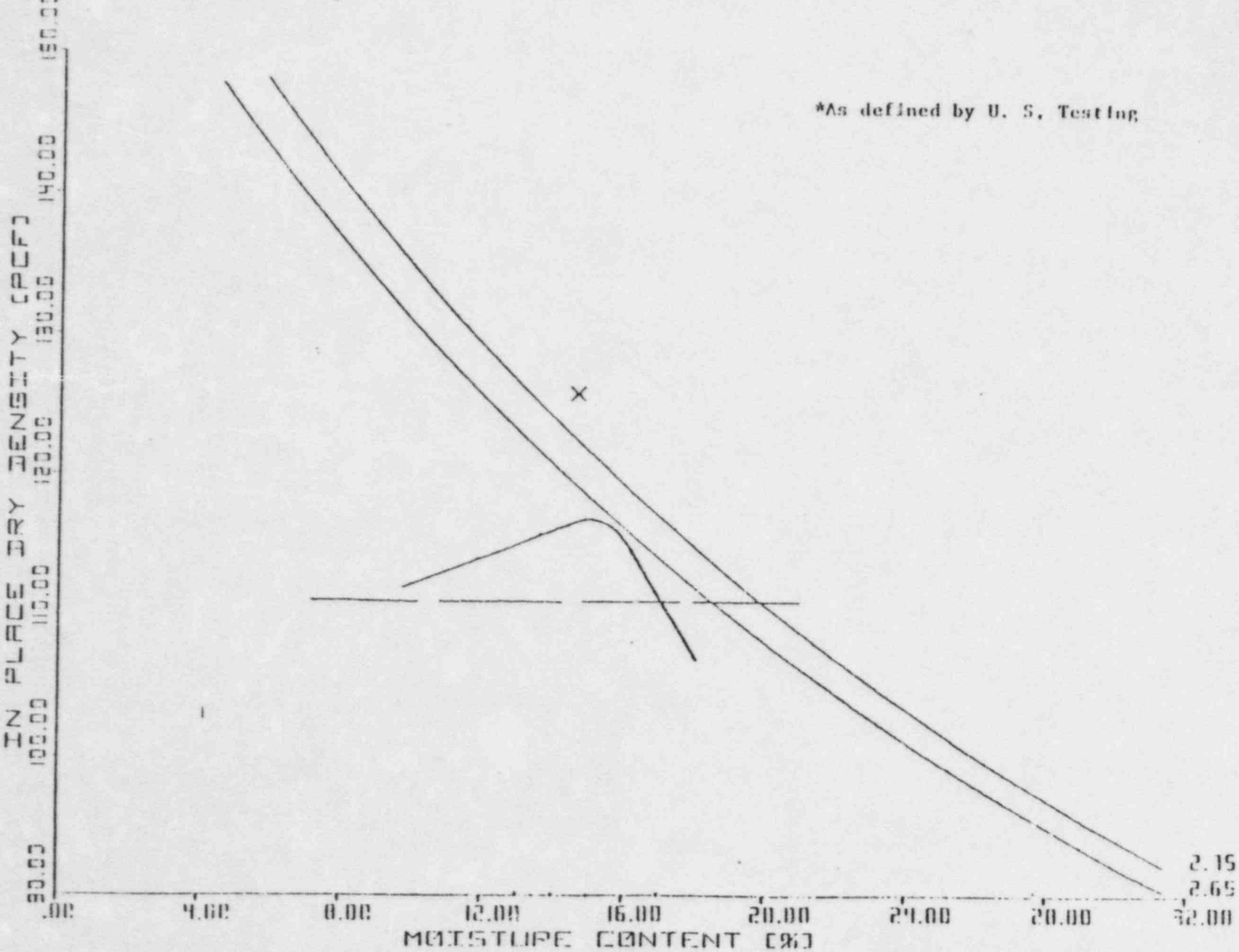


FIGURE 6

SB 01602

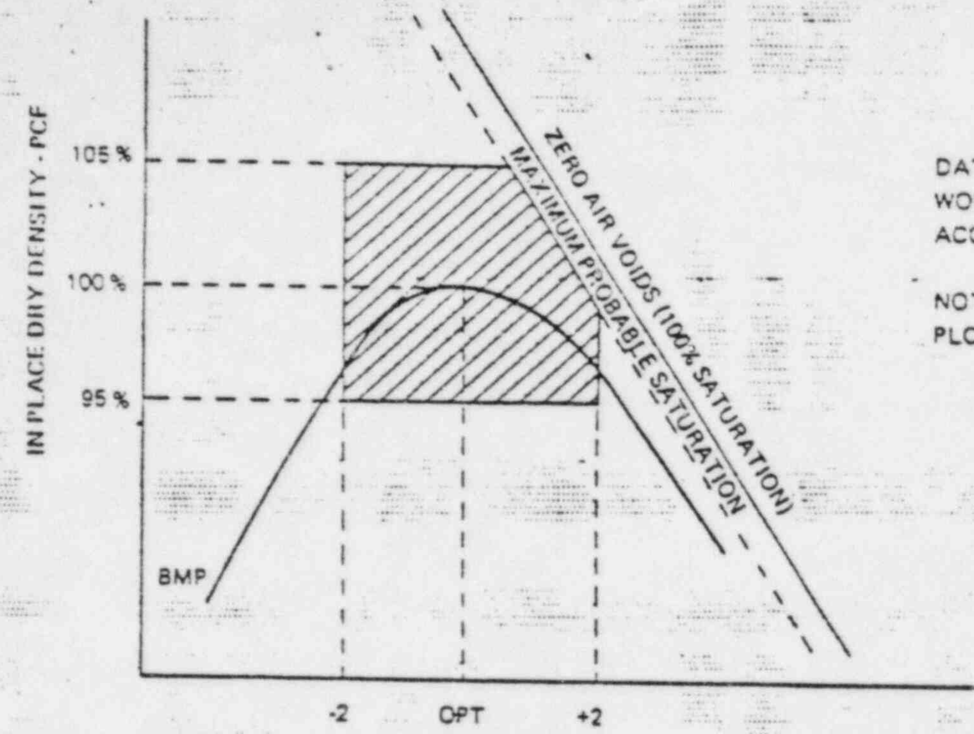


FIGURE 7-A-

DATA POINTS THAT PLOT IN SHADED AREA WOULD BE GENERALLY ACCEPTABLE ACCORDING TO SPECIFICATIONS

NOTE: ABOUT 25% OF ALL FIELD DATA PLOTS IN THE SHADED AREA

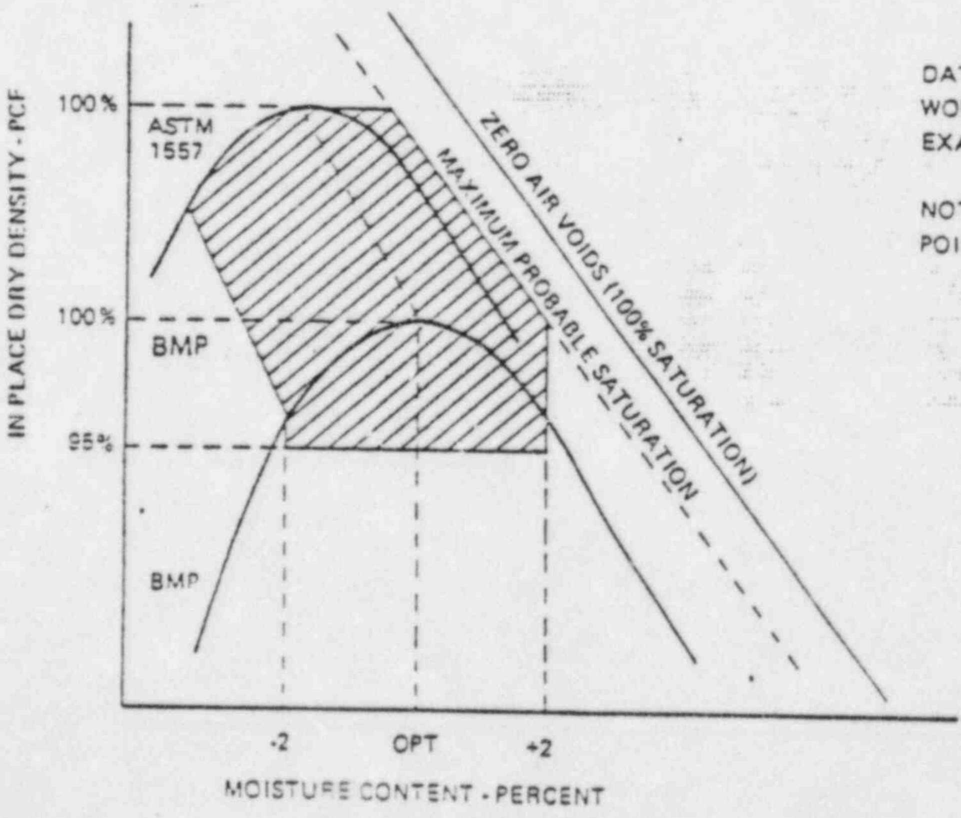


FIGURE 7-B-

DATA POINTS THAT PLOT IN SHADED AREA WOULD BE ACCEPTABLE REGARDLESS OF EXACT SPECIFICATION WORDING

NOTE: ABOUT 40% OF ALL FIELD DATA POINTS PLOT IN THE SHADED AREA

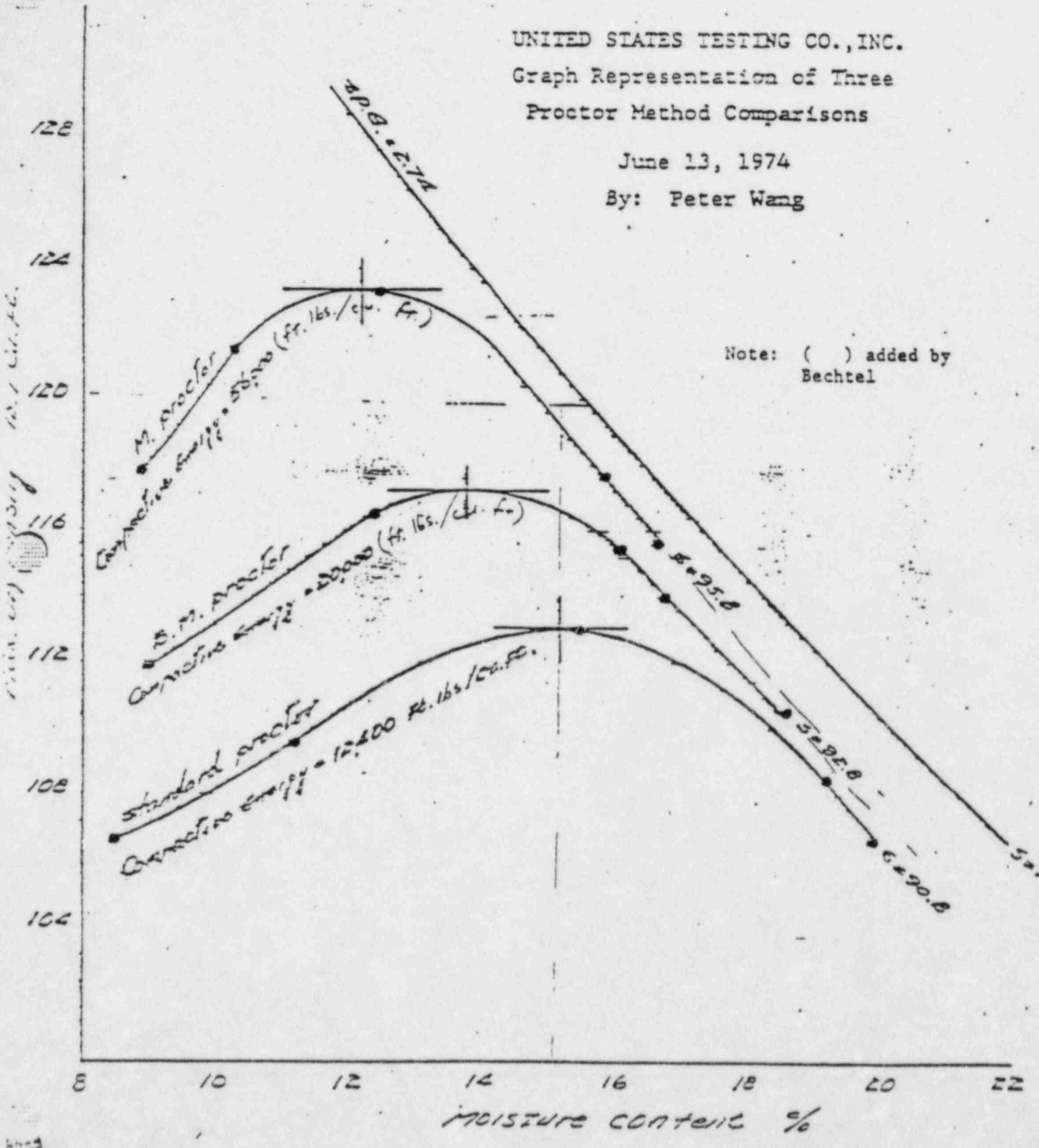
SB 01603

FIGURE 7: WINDOWS OF ACCEPTABILITY (A) BASED ON BMP SPECIFICATION (B) REGARDLESS OF EXACT WORDING OF SPECIFICATION

UNITED STATES TESTING CO., INC.
Graph Representation of Three
Proctor Method Comparisons

June 13, 1974

By: Peter Wang



Note: ( ) added by Bechtel

TABLE 8

SB 01604

MOISTURE-DENSITY FOR BMP 278

SPECIFIC GRAVITY = 2.65
ALL TESTS

3.5% Subtracted from Moisture Content, Dry Density Recalculated

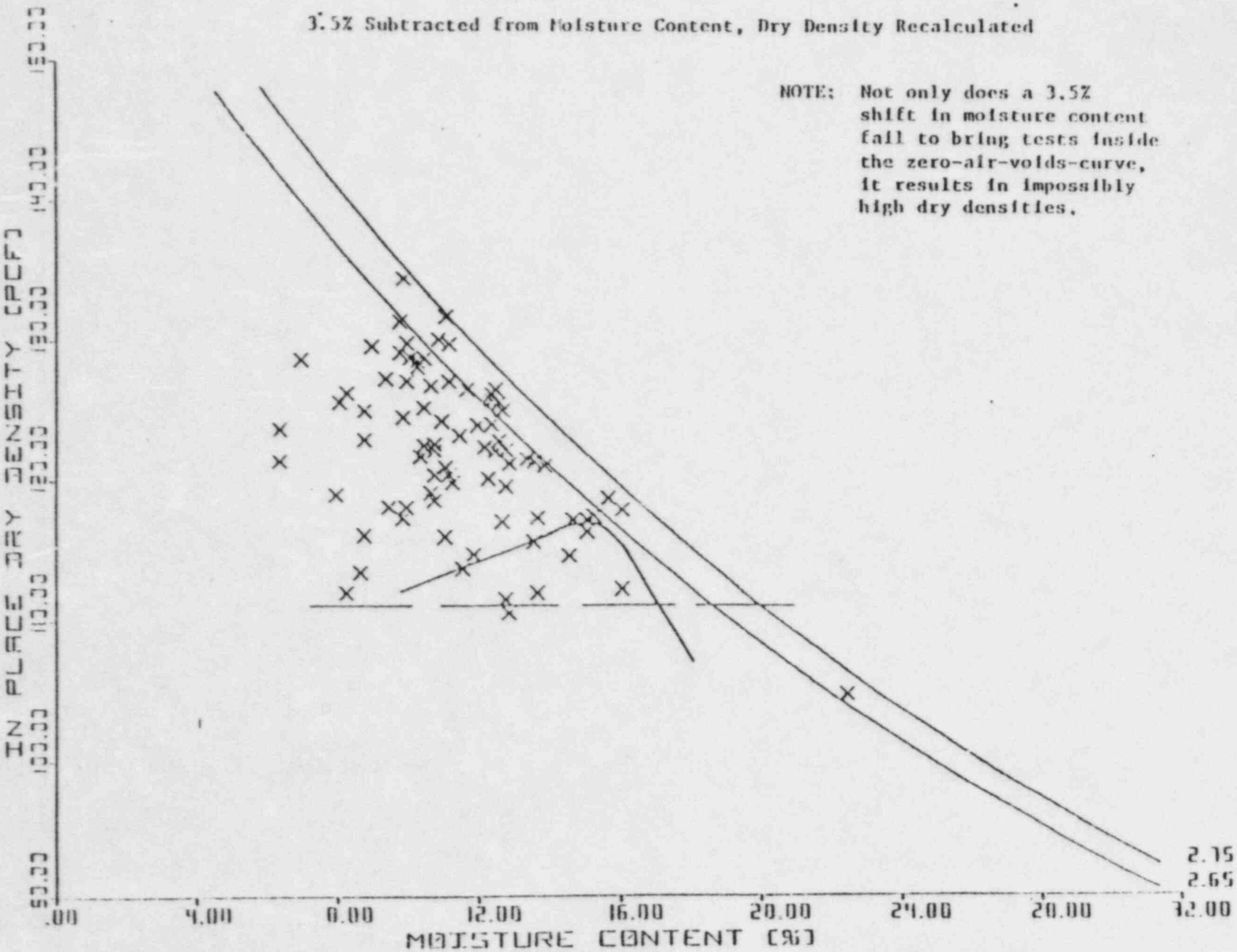
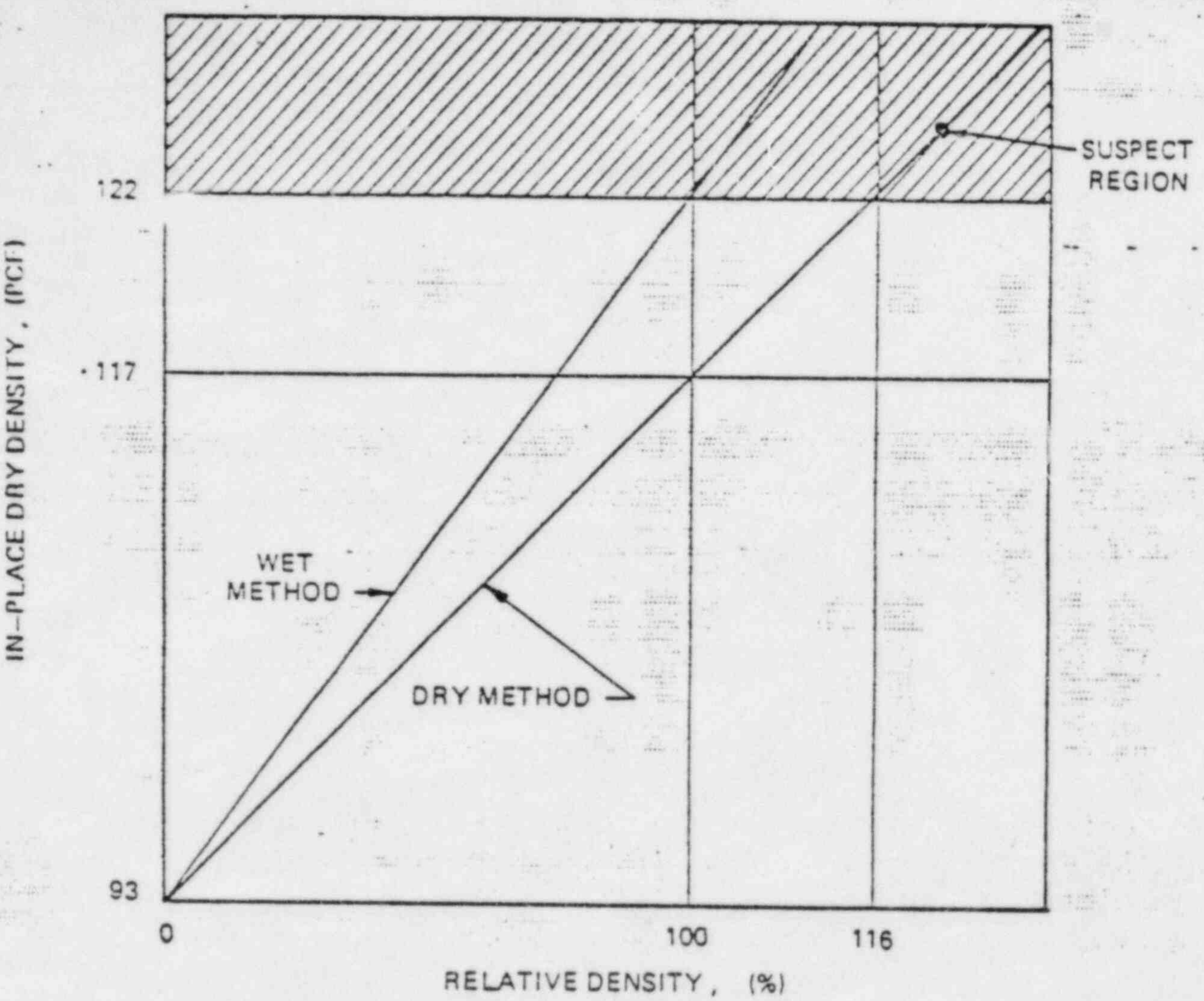


FIGURE 6

SB 01605



NOTE: VALUES FOR DRY DENSITY ARE TYPICAL OF A RANDOM FILL SAND. ANY TESTS SHOWING MORE THAN 117% RELATIVE DENSITY WOULD BE SUSPECT IN THIS EXAMPLE. STRUCTURAL SANDS TEND TO SHOW ONLY 2 OR 3 PCF INCREASE IN MAXIMUM DENSITY AND THUS RESULTS AT MUCH LOWER RELATIVE DENSITY WOULD BE SUSPECT, SAY 105 – 110 PERCENT

FIGURE 10

CHANGE IN RELATIVE DENSITY SCALE FROM DRY TO WET METHODS OF OBTAINING MAXIMUM DENSITY , BASED ON RECENT LAB RESULTS

DRAFT

ANALYSIS OF MIDLAND PLANT AREA FILL

SOIL TEST RECORD:

FINDINGS TO DATE

Prepared by: T. Nehil

The following report is a brief summary of initial findings in the investigation of the Midland Plant Area Fill Soil Test records. The analysis has been conducted by T. Nehil and J. O. Wanzeck. Though a computer aided analysis is being prepared which will be far more extensive, the present findings were obtained merely by scanning the records.

Geotech/ Soils Engrs

Dwg?

8

Most glaring is the departure from Spec. C 208 regarding frequency of soil TESTING ~~classification~~. According to this spec., Bechtel Modified Proctor and Relative Density classifications were to be established one per every ~~10,000 cubic~~ yards of fill, with field density tests being made every ~~500 c.y.~~ Thus approximately ~~twenty tests~~ should be made under any one classification.

1. RD 24 is referenced 196 times
2. RD 55 is referenced 491 times
3. RD 61 is referenced 574 times   Σ = 1,261

4. BMP 270 is referenced 210 times
5. BMP 271 is referenced 135 times
6. BMP 269 is referenced 217 times
7. BMP 277 is referenced 148 times
8. BMP 278 is referenced 81 times   Σ = 791

TOTAL 2,052   AVERAGE $\frac{2052}{8}$ = 256 TESTS

SB 01511

Thus a relatively small number of classifications were used to represent vast quantities of fill placed. Furthermore, the time span over which a classification was used has been found to be as much as 24 months.

Does? It is assumed that no single stockpile of a uniform soil type was available for borrow for two years straight. This is supported by the [redacted] which result in field relative densities exceeding 100%.

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For example, 9% of the RD 24 tests show relative densities greater than 105% with the highest value being 131%. RD 61 tests over 105% represent 15% of the total 574, with the highest value obtained being 137%. RD 55 tests with over 105% relative density comprise 51% of the 491 test, i.e., this classification was misapplied more than half the time. The highest relative density obtained under this class was 142%.

what's this mean? Compaction of cohesive soils at times exceeded 105%. In addition, many tests on cohesive soils show combinations of inplace dry density and moisture content which place them outside the zero-air-voids curve for their assigned classification.

6

The following table illustrates the trend to misapplication of the BMP test classifications:

Soil Classification Number	% of tests over 105% Compaction	% of tests outside zero-air-voids curve
BMP 278	22	51
BMP 277	11	49
BMP 269	1	12
BMP 271	2	30
BMP 270	4	30

SB 01512

There is a tendency for obvious misuse of a classification to appear very early and yet not be flagged. The very first field density test referencing RD 55 shows 119% relative density, throwing doubt on both the in-situ soil and the classification itself. Another, BMP 278, was first used on 4/1/77. All tests in 4/77 were invalid (i.e. outside sero air voids curve or 105% compaction), as were 57% of the tests made in 5/77. Yet the classification was referenced 52 more times over the next 5 months.

Similar patterns are revealed for the other BMP's referenced above, where discrepancies in the use of a classification were apparent almost immediately, yet QC continued to accept all test results.

Doc 7.

11

The wrong pass-fail criterion was used for non-cohesive soils at various times. From the fall of 1974 to the fall of 1975 all relative density calculations were made by dividing the in-place dry density by the maximum lab dry density. Many of the tests which passed by the above method fail when properly calculated.

For ex ample MD 215 references RD 24 and show a compaction fo 95%, calculated by the wrong method. When recalculated, the relative density turns out to be 72%, failing. This test was used to clear four other failing tests. None of the bad calculations were ever flagged.

NOTES ON PROCTOR DENSITY

The moisture density curve is a result of plotting to suitable scales the dry densities obtained at various moisture contents used for the trials. It shows that the range of increasing and decreasing densities are due to the water content of the soil. The highest density indicated by this curve for any moisture content is the standard or proctor density; the water content at which this occurs is the optimum water content.

The <u>zero air void curve</u> may be drawn as soon as the specific gravity of the soil is known or estimated. This curve represents graphically the theoretical maximum density that can be produced under a given moisture content.

We reconize the fact that the density obtained by the standard technique is not an absolute maximum, explains the occurrence of field densities higher than this value obtained during construction. Such densities must be secured below the optimum. However, <u>a</u> density that approaches the zero air voids value might theoretically be obtained, but with much more compactive effort.

<u>Example</u>   Specific gravity = 2.63

A cubic foot volume containing 120 lbs. of dry soil is occupied entirely by soil and water. Then the soil occupies 120/62.4 x 2.63 = 0.73 cubic feet. The remainder 1.00 - 0.73 = 0.27^3 must be the volume of water. This water will weigh 0.27 x 62.4 = 16.85 lbs., which when expressed as a percentage of dry soil weight = 16.85/120 = 14.0%. This represents one point on the zero air void curve.

SB 01514

JOW/cf

Bechtel Associates Professional Corporation

Inter-office Memorandum

To	R. L. Castleberry	Date	10 January 1979
Subject	Midland Units 1 & 2-Job 7220-001 Plant Area Fill	From	S. S. Afifi
		Of	Geotechnical Services
Copies to	S. L. Blue H. H. Burke/W. R. Ferris w/a P. Martinez w/a J. O. Wanzeck w/a K. Wiedner w/a 1320, 3410	At	Ann Arbor 10(D)5 7220-79-5

RECEIVED
JAN 1 9 1979
KARL WIEDNER

Attached you will find J. O. Wanzeck's memo in reference to plant area fill placement records.

We feel that further evaluation of these records would be in the best interest of the project. It is possible that some commitments may not have been met. The matter was discussed with K. Wiedner today and it was agreed the task force will work on the subject.

S. S. Afifi

JOW/lap
Attachment

JAN 1 6 1979

JOB 7220

	ACT.	INFO.		INIT.
PROJ. ENGR.		2		
ASST. P. E. T		7		
ASST. P. E. T				
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P.D.				
ARCH.				
QC				
FIELD				
CONST.				
K Wiedner			KC	
FILED	0170			

SB 01515

Bechtel Associates Professional Corporation

Inter-office Memorandum

To	S. S. Afifi	Date	10 January 1979
Subject	Midland Units 1 & 2-Job 7220-001 Plant Area Fill	From	J. O. Wanzeck
		Of	Geotechnical Services
Copies to	S. L. Blue 1310, 3410	At	Ann Arbor 10(D)5

I have made a simple review of the plant area quality control records and the following is a brief summary of this review.

Under specification C-210 as monitored by the field testing specification C-208, the following is offered for further evaluation.

12 1. Relative density test results were used for density control on Zone 1 soil. Zone 1 is classified as cohesive; relative density is used for granular soils.

13 2. Maximum density as determined by the relative test was used as a basis for arriving at 95% of proctor density (i.e., $\frac{109.0 \text{ Field}}{114.0 \text{ Rd max.}} = 95.6\%$. In terms of relative density, this would be about 40-50%.

14 3. Failing tests as determined above were also cleared using the same erroneous procedure.

15 4. RD #55 (γmax. = 109.7 #lbs^3) was used in many cases to check densities. This may have appeared to be the material described, but in many cases, the maximum density was more than 109.7 lbs per cubic foot as evident by other tests and many cases of relative densities exceeding 100%.

16 5. Some relative density standards along with BMP standards were changed and passing results were obtained (i.e., MD 858, RD #49 @ 66% was cleared by MD 872, RD #41 @ 110%).

17 On specification C-211 structural backfill, the major fault I can see at this time is that Zone 3 material was used for structural fill. This material (Zone 3) was specified for the sand chimney in the dikes and has a different gradation than was called for in C-211. I believe that this material is suitable, but it may have a conflict as far as the FSAR is concerned.

We can see from these observations that the findings from the administration building may hold true for other areas of the plant fill. It also indicates the testing lab may not have always had qualified supervision.

I have not yet completed all studies that I am doing but I want to keep you aware of my progress.

SB 01516

JOWanzeck

J. O. Wanzeck

Bechtel Power Corporation

Inter-office Memorandum

To	J. A. Rutgers	Date	November 28, 1979
Subject	US Testing Company's Response to Bechtel Report of Test Data on Soils Used as Fill - Midland Units 1 & 2 - Job 7220	From	J. Milandin
		Of	Quality Assurance
Copies to	P. Becnel, L. Dreisbach, R. Rixford, K. Wiedman, R. Simanek, E. Rumbaugh, S. Blue, S. Heisler, D. R. Johnson, T. E. Johnson	At	Ann Arbor

The subject report is attached with seventeen (17) mark-up comments by G. L. Richardson. As you recall, Gary conducted several audits of US Testing operations, was the Lead Quality Assurance Engineer at the site during the time most of this work was in process, headed up the Quality Assurance effort in the Plant Fill Task Force and assisted in the preparation of our initial response to the NRC 50.54(f) report. Gary's comments are annotated 1 through 17 in the report and identifies areas where Geo-Tech should provide technical comments.

Generally, the opinion of Gary is that the response is defensive and does not address basic cause for many of the problems reported by the Bechtel Test Data Review.

I would suggest that Geo-Tech and Qualit y Control provide comments for the US Testing response.

John Milandin

J. Milandin

JM/le
JM-79-121

File: AAO-QAR-79-66
Attachment

SB 01521

Bechtel Power Corporation

Interoffice Memorandum 002265

To	J. Rutgers	File No	
Subject	Job 7220 Midland Project Subcontract 7220-C-208 U. S. Testing Comments of Bechtel Geo-Technical "Review of U. S. Testing Field and Laboratory Tests on Soils" BCBM-521-R	Date	October 29, 1979
		From	L. E. Davis
		Of	Construction
Copies to		At	Midland, MI Ext

Attached is a report submitted by U. S. Testing commenting on Bechtel Geo-Tech's review of test procedures dated July, 1979.

If we can be of further assistance, please contact us.

for L. E. Davis

LED/JWL/km

RECEIVED
ANN ARBOR
QUALITY ASSURANCE

NOV 5 - '79

Route	Info.	Act.

This responds to Chron 001719

Please annotate any remarks on this and discuss w/ me by 11/30/79

QAR is pulling alert on Soils Testing and copy of Cover letter in my follow-up file

SB 01522

United States Testing Company, Inc.
Power Generation Services Division
1415 PARK AVENUE
HOBOKEN, NEW JERSEY 07030 (201) 792-2400 (212) 943-6461

002289

001434

inspection
nondestructive testing
environmental evaluation
training programs

File: C-208-222/1015.900
October 1, 1979

RECEIVED
OCT 9 1979
BECHTEL POWER CORP.
JOB 7220
FER 565(E) C-208

Bechtel Power Corporation
P. O. Box 2167
Midland, Michigan 48640

Attention: Mr. J. F. Newgen

Subject: Midland Project Job 7220
Subcontract 7220-C-208
U.S. Testing's Response to "Geotech Review of U.S. Testing Field and Laboratory Tests on Soils

Dear Mr. Newgen:

Please find attached United States Testing's response to the Bechtel report "Review of U. S. Testing Field and Laboratory Tests on Soils" dated July 1979.

You requested that we respond solely to the summary contained in Section 8, however, we feel it is necessary to respond to all the sections, which in itself details Section 8.

Our response appendices the Bechtel report in so far that it closely follows its logic, answering questions or making statements on each particular point. This U. S. Testing report is not meant to point fingers in any direction but only to indicate, to Bechtel, some of the problems and concerns we faced.

If you have any questions, do not hesitate to contact me.

Very truly yours,

UNITED STATES TESTING COMPANY, INC.

M. Anselmo

M. Anselmo
Project Engineer

MA:hg
Attachments

SB 01523

002265

001434

UNITED STATES TESTING COMPANY'S

Response to the Bechtel Report

"Review of U. S. Testing Field
and Laboratory Construction
Test Data on Soils Uses as Fill"

Midland Units 1 & 2
Job No. 7220

Note: This U. S. Testing report must be read in connection with the Bechtel report in so far that it will provide clarification and rebut statements contained therein.

SB 01524

1. Use of Laboratory Test Compaction Curves

This section of the Bechtel report is concerned with the implied ratio of Field Density Tests to Laboratory Compaction Tests (Ratio 20:1) given in Table 9-1 of Specification 7220-C-208 and the period of time lapse between Laboratory Tests vs. Field Tests.

It is the position of U. S. Testing that Bechtel was then and is now responsible for the monitoring, determining and communicating with U. S. Testing on the fill yardage for use in performing Lab Density Tests. In fact, there were more Lab Density Tests performed by U. S. Testing Technicians (who were double checking results) than directed by Bechtel. It should also be noted that, in most cases, our only Bechtel interface in the field was a labor foreman.

LEGAL ?

GR1

CAN UST BACK THIS STATEMENT WITH FACTS

NRC WILL BACK THIS UP.

GR2

The testing of soil will yield the same densities no matter what time lapse has expired between original testing and subsequent re-tests as long as the material re-tested is representative of the original tests and the test method has not changed. The actual volume of soil that may be represented by any one compaction curve has not been nor can it now be determined. In addition, Bechtel did not control excavated material as required by their specifications and drawings (documented in report on Admin. Bldg.) and it would be likely that any given cubic yard of soil was not only placed several times but tested several times, i.e., the same proctor values would be employed each time a yard of that particular soil was placed.

GR3

THIS RESPONSE DOES NOT ADDRESS THE "OVERUSE OF CURVE" OR THE LACK OF PROCEDURES TO CONTROL" THE SELECTION OF THE PROCTOR CURVE.

Visual proctor selection was many times backed-up by pounding a new proctor, in fact, most proctors on the job were generated in this manner as opposed to Bechtel maintaining a frequency list.

THERE ARE NO RECORD TO SUP THIS

GR-4

During the original submittal of U. S. Testing QA Manual, Bechtel (Project Engineering & Subcontracts) removed the provisions for performing one-point proctor tests for each Field Density Test.

TRUE

GR-5

2. Questionable Retests

The statement "A Field Density Test that fails to meet requirements of the specification should have been reported to Bechtel..." is incorrect. All failing test results were reported to either Q.C. or our field interface. However, it has become apparent that our field interface may not have been responsible for making these decisions. Any test U. S. Testing dispositioned as "clearing" was done so at the direction of Bechtel. The clearing of failing tests still is a Bechtel responsibility and on the occasions where U. S. Testing noted clearing tests, the report was a mode of conveying information from our interface. The Bechtel Report mentions three (3) cases where failing tests were cleared, one was "apparently resolved by merely using another Laboratory Compaction Curve...", another "tests labeled 'failed' were incorrectly cleared though the same laboratory standard was referenced.", and the third "two retests were dated prior to the time the original test failure." In fact,

GR-2

THIS SHOULD BE VERIFIED BY QC

these 'clearings' were the action of Bechtel employees who were also in the habit of marking up U. S. Testing reports. It appears that the standard Bechtel procedure for the dispositioning of failures was to scan reports looking for passing results in the same general area. The direction of U. S. Testing to a test area and provisions for test locations is the responsibility of Bechtel, on those occasions where the Bechtel interface could not relate specific locations the suggestion may have been made by U. S. Testing personnel.

HEARSAY ?

We agree with the Bechtel assumption that it was possible to encounter different soils in the same location, however, it is more likely that the different soils were encountered as a result of the non-control of excavated materials as opposed to the removal and replacement subsequent to a test failure.

U. S. Testing responsibility on this project is to perform testing not control its placement, and in fact, U. S. Testing was excluded from being involved in placement control.

TRUE

3. Theoretically Impossible Test Results

Any given soil has individual components that cover a broad spectrum of specific gravity values. The major factor contributing to specific gravity values determined by the test method Bechtel requested (ASTM-D854) results from a 25 gram sample and thus the specific gravity values resulting there from should be interpreted with that in mind. The application of the likely

GR6 DISAGREE A MUCH BAND ... BE ABOUT BECHTEL SHOULD QUESTION

band of specific gravity values represented in the Bechtel report figure 1 results in a 49 percent reduction of theoretically impossible results. The remainder of these test points falling above zero-voids line will be discussed in Section 6. However, specific gravity values from 2.57 to 2.82 for soil fractions are documented for material on this project.

The comment regarding the doubtfullness of the variation of soil properties is likely to be discounted by an examination of the data of the current soils evaluation program.

4. Repeated usr of Questionable Laboratory Test Data

Although "...the fact that soil was not being placed or compacted according to specifications" was a major cause for concern. It is evident that another area of concern existed. Errors in calculations went unnoticed thru a good checking system. It is unfortunate that Bechtel's checking system simultaneously experienced difficulty. — AGREE

COULD NOT HAVE BEEN A GOOD SYST

SR9

5. Limits of Accuracy and Acceptability for Test Data

Although Bechtel statements conclude that only 25 to 40 percent of all clay tests represent compliance to specification, it should not be construed to represent the percentage of valid test data. The envelop of reasonably encountered test values would encompass the vast majority of test data. It has been demonstrated that the nominal scattering of data that may not have been anticipated was well within the statical variance that would be applied to this data.

SR1 BECH SHOU COMM

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6. Accuracy of Test Equipment

The average deviation of the nuclear device from oven-dry moistures was +.12 % for a set of 30 tests. The range of differences was approximately from -3 % to + 4 %. It was the assumption of U. S. Testing that Bechtel Engineering was appropriately applying this data to placement tests.

GR-11

UST IS RESPONSIBLE [illegible] TESTING ACCURACY

Contrary to the assumption regarding figure 9 with its "impossibly high dry densities" current test data closely resembles this graphical representation.

GR-12

DOES UST HAVE BACKUP?

The use of the nuclear device was employed at the consent of Bechtel to facilitate production. TRUE

GR-13

TRUE

7. Relative Density Tests

Some of the specification 7220-C-210 zone numbers are an area of concern because of the overlapping soil classifications, i.e., clay could be either zone 1 or 2. The inherent nomenclatural difficulties that plagued the Bechtel Organization in providing data was not addressed in the limited potential problem areas. A re-evaluation of test data, with this third concern in mind, would probably change Bechtel conclusions.

Regarding calculation errors of relative densities and assuming the validity of these errors, it is again unfortunate that our checking systems broke-down. !

SB 01529

0014̶3̶4̶ 002265

The re-evaluation of maximum density by the wet method was in response to a relatively recent innovation of Bechtel assigning a geotechnical engineer to oversee the soils operation, here-to-fore there have been no "radical changes" or Bechtel material controls that would serve to flag the need for maximum density method re-determinations. Subsequent to this, the comparison of maximum density methods have been done routinely by U. S. Testing in response to material changes that were identifiable by newly instituted material controls and routine communication with assigned geotechnical representatives. These current comparisons have yielded maximum density variations that result in relative density changes from minimal, to 20 %. The acceptability of high relative density results should have been evaluated as part of Bechtel process control that did not exist.

Summary

The Bechtel request that U. S. Testing respond to items 1 thru 5 has been detailed in this report.

The closing remarks of the Bechtel report makes the statement that "...on many occasions the inplace density was divided by the maximum density from the relative density test to get percent compaction..." is true. However, the report fails to mention that this method of calculation was a specific Bechtel directive.

SB 01530

In conclusion, the problems and concerns attributed to U. S. Testing results from a lack of proper soil identification and material quantities normally covered in inspection and placement responsibilities, none of which are contractually the responsibility of the U. S. Testings scope of operations. We are the testing arm of Bechtel. Our function is the reporting of data not its evaluation.

GR17

1. UST LACKED PROCEDURES

2. UST FAILED TO RECOGNIZE OBVIOUS FLAWS IN THEIR TEST PROGRAM

3 UST FAILED TO RAISE CONCERNS TO MANAGEMENT LEVELS AND OBTAIN ACTION

4. UST FAILED TO I.D. MANY PROBLEMS IN THEIR OPERATIONS AS IS EVIDENCED BY MANY BECHTEL & CPCO FINDINGS

5. NO CLEAR DESCRIPTION OF UST/BECHTEL INTERFACE/RESPONSIBILITIES.

DISTRIBUTION INFORMATION FOR INCOMING COMMUNICATIONS

PROJECT NAME MIDLAND JOB NO. 7220 002265

COMMUN. CONTROL NO. ______ WRITTEN RESPONSE REQUIRED? YES ___ NO ✓

DATE RECEIVED OCT 31 1979 DATE DUE ______

Entity/Group	Resp. Code	Responsible	Information	Attachment	Addt'l Distr.
ADMINISTRATIVE SERVICES	( )				
CONSTRUCTION COORDINATOR	( )				
ENGINEERING			✓		L.H. CURTIS
PROJECT ENGINEER	( )				
ASSISTANT PROJECT ENGINEERS	( )				
______	( )				
______	( )				
QUALITY ENGINEER	( )				
CONTRACTS ENGINEER	( )				
ENGINEERING PLANNER	( )				
COST TREND ENGINEER	( )				
ARCHITECTURAL	( )				
CIVIL	( )				
CONTROL SYSTEMS	( )				
ELECTRICAL	( )				
MECHANICAL	( )				
PLANT DESIGN	( )				
PROCUREMENT					
PROCUREMENT MANAGER	( )				
PURCHASING	( )				
EXPEDITING	( )				
SUPPLIER QUALITY	( )				
S/C SPECIALIST	( )				
QUALITY ASSURANCE	( )		✓		L. DREISBACH
SERVICES					
SUPERVISOR	( )				
COST ENGINEER	( )				
PLANNING & SCHEDULING	( )				
STARTUP	( )				
FIELD	( )				
CLIENT	( )				
TO PROJECT MANAGEMENT - JAR	( )		✓	✓	
			✓		~~[illegible]~~
			✓		P. Becnel
			✓		K. Wiedner
			✓		S. BLUE
			✓		J. WANZECK
			✓		T.E. Johnson

CHRONOLOGICAL FILE ______ FILE CODE 2816 SPEC/PO ______

Chron: ① Please also copy & Staple chron 001719 to the

GENERAL above Additional Distribution, with this IOM.

The distribution form is completed by PDCC for incoming/ internal communications. Further distribution within the entity/group is the responsibility of the entity/group. Changes and additions to standard distributions should be brought to the attention of the PDCC supervisor.

AAG-082478 ② Please return this package to J.A. Rutgers on Monday, Nov. 5.

P.P.

SB 01532 REV 1

J. Milandin w/Att
P. A. Becnel w/Att
K. Wiedner w/o
S. L. Blue w/o
R. Hermeston w/Att
J. O. Wanzeck w/o
J. F. Newgen w/Att
L. A. Dreisbach w/Att
T. E. Johnson w/Att
R. L. Castleberry w/o

001719

August 10, 1979

BLC-7993

Consumers Power Company
Mr. G. S. Keeley
Project Manager
1945 West Parnall Road
Jackson, Michigan 49201

Midland Units 1 and 2
Consumers Power Company
Bechtel Job 7220
REVIEW of U. S. TESTING FIELD AND LABORATORY TESTS ON SOILS
Files ~~0614~~/2801

Dear Mr. Keeley:

Attached for your records is the completed report dated July 1979, entitled "Review of U. S. Testing Field and Laboratory Construction Test Data on Soils Used As Fill."

This report includes resolutions to the questions raised by Consumers Power personnel on the earlier draft report.

The report will now be sent to the subcontractor, United States Testing Company, Inc., for their response to the findings.

Very truly yours,

/S/

P. A. Martinez
Project Manager

PAM/pp

SB 01533

001719

MIDLAND UNITS 1 & 2
JOB NO. 7220

REVIEW OF U.S. TESTING
FIELD AND LABORATORY CONSTRUCTION
TEST DATA ON SOILS USED AS FILL

BECHTEL ASSOCIATES PROFESSIONAL CORPORATION
July 1979

2288

SB 01534

~~8106040636~~

FIELD AND LABORATORY CONSTRUCTION
TEST DATA ON SOILS USED AS FILL

001719

This review of the quality control tests of the earth fill at the Midland Site was made as a result of settlement of the fill supported diesel generator building in excess of that predicted. Soil samples obtained in borings indicated that soil conditions beneath the plant structures are not compatible with the quality of fill that could be expected based on the results of the control tests made by U. S. Testing Company. All fill was accepted as it was being placed based on the results of the field tests performed by U. S. Testing Company.

The review showed many discrepancies in the test results as outlined in the following paragraphs. Review comments are based on the requirements of the technical specifications for fill placement and to subcontract entered into by U. S. Testing Company.

1. Use of Laboratory Test Compaction Curves

Table 9-1 of specification 7220-C-208, Page 14B required one field density and moisture content test be taken for each 500 cubic yards of fill placed. It also required one compaction, grain size, and specific gravity for each 10,000 cubic yards of material. This gives a ratio of 20 field density tests to 1 laboratory compaction test. Although 20:1 is not a strict upper limit, it is a guideline; should density tests be taken more frequently than one per 500 cubic yards of fill the ratio could be higher. The actual ratio is shown in Table A attached. In fact, some of the laboratory compaction tests were used to determine percent compaction for several hundred field density tests taken over a period exceeding two years. Even though no time requirements for the period of use of laboratory tests are specified, it is unlikely that any borrow source in this area would be of such uniform character that such extended use of a compaction curve, truly representative of a large quantity of material, would be applicable. Listed below are selected laboratory test data results indicating the wide range of soil properties that were reported. Such a wide range is typical for soils of the kind used in the fill making prediction of maximum density, based on visual inspection extremely difficult if not impossible without testing.

TEST	MIN. DENSITY (lbs/Ft^3)	MAX. DENSITY (lbs/ft^3)	OPT. MOISTURE (percent)
*BMP269		127.3	10
*BMP278		117.0	15.2
*BMP279		140.8	5.7
**RD24	100.9	119.2	–
**RD55	90.2	109.7	
**RD61	109.3	125.3	

*BMP refers to proctor type test.
**RD refers to relative density test run by dry method.

SB 01536

2. <u>Questionable Retests</u>

A field density test that fails to meet requirements of the specification should have been reported to Bechtel who then would have required reworking of the area and retesting.

Of the 668 "failing" tests which were marked "cleared" by another test, in over 10% (72 tests) of the results, the clearing of the "failed" density test was apparently resolved by merely using another laboratory compaction curve with either lower maximum density, which resulted in in the percent compaction being increased sufficiently, or different optimum moisture content which caused the fill to meet the requirements of the specification. The possibility exists that soil was removed after a "failing" test and replaced by different material, but the records do not indicate this and it is not possible from the record to determine if a new density test was made. In other cases, tests labeled "failed" were incorrectly cleared though the same laboratory standard was referenced. For example, in some cases retests to clear a "failed" test were not taken in the same area or at the approximate same elevation. More than 40 retests were over 20 feet from the "failed" test location (as recorded in the test reports) and some were over 200 feet from the original test location. In general, if after a "failing" test the whole area is reworked, the density test location is not too critical assuming that the correct laboratory compaction curve is used for comparison. However, in the plant fill work areas were relatively small, and soil characteristics showed considerable variation necessitating retesting in the immediate vicinity of the "failing" test. Retest should be taken in the lift or soil layer that has been reworked. Almost 50 retests were taken at different elevations, some up to 10 ft. from the "failed" test. It should be noted that Bechtel field personnel gave the locations for retesting. This was not a U. S. Testing responsibility. Two retests were dated prior to the time the original test "failed". Over 130 "failing" tests were marked as ("non Q") and never recorded cleared, as they were outside the saftey related area.

Table B is a compilation of notes relative to questionable clearing of failed tests.

3. <u>Theoretically Impossible Test Results</u>

Soils cannot be more than 100 percent saturated; therefore, all field density test data points, when plotted as dry density versus moisture content, must be below the zero air voids curve as defined by the specific gravity of the material. Specifications do not require examination of the zero air voids curve, but it is considered common practice relative to compaction plots. There are numerous cases in the U. S. Testing Company data where points plot above the zero air voids-curve. Figure 1 attached shows a typical laboratory compaction test curve with field test results plotted on it. Many of the field test results are to determine percent compaction plot above the zero air voids curve. Provided the specific gravity is correct this is not possible so that all such points must represent erroneous data.

The fact that a large number of test results plot above the zero air voids curve tends to make all test results questionable.

001719

Also, referring to Figure 1 it would appear that soil density varied widely. Specifications called for compactive effort results as defined by ASTM D 1557 which is 56,255 ft-lb/ft^3 energy. This was modified to a laboratory test compactive effort of about 20,000 ft-lbs/ft^3 energy, often referred to as Bechtel Modified Proctor (BMP). Laboratory compaction test curves should be related to the same effort as that called for in the field for use in comparing with field density tests to determine percent compaction. According to plots of field data shown on Figure 1, density varied from about 108 lb/ft^3 to about 130 lb/ft^3. It is doubtful that the soil classification or other properties would be similar for such a wide variation in density. It is noted that 100 percent of modified Proctor (ASTM D 1557) which is difficult to obtain, is rated at 56,255 ft-lb/ft^3 energy. The curve plotted on Figure 1 is at about 20,000 ft-lb/ft^3 energy. For comparative purposes it was determined by U. S. Testing in 1974 that 100 percent of specified effort (20,000 ft-lb/ft^3) is approximately equal to 95 percent of the maximum density as determined by ASTM D 1557 (56,255 ft-lb/ft^3) Reference Figure 8.

4. Repeated use of Questionable Laboratory Test Data

Some laboratory compaction test data were used repeatedly even though they continued to show suspect field test results. This could be indicative of questionable laboratory data or the fact that soil was not being placed or compacted according to specifications. Either case is a cause for concern.

Several specific gravity calculations are in error, such as for BMP 273 and 274. In the case of BMP 273, the zero air voids curve passes through the laboratory compaction curve. In another example, BMP 297, the laboratory compaction curve is invalid due to calculation errors, yet was referenced by field density tests 22 times.

Table C is a compilation of notes relative to questionable test data.

5. Limits of Accuracy and Acceptability for Test Data

Figures 1 through 7 attached will be referenced in discussing limits of accuracy of acceptability for field test results as compared to laboratory test data. The figures show plots of compaction data for BMP 278 which are typical of all test results.

Specified laboratory compactive effort was 20,000 ft-lbs/ft^3 and field compaction effort was originally specified at 56,255 ft-lbs/ft^3 but was changed by Revision 5, dated 7/8/75, specification 7220-C-210, Section 13.7, Page 57 to also be equal to about 20,000 ft-lbs/ft^3.

The specified 20,000 ft-lbs/ft^3 effort establishes a compaction curve relating moisture and density for a specific soil. Moisture was specified for field placed fill to be within $\pm$ 2 percent of optimum moisture as determined by this effort. Density was specified to be greater than 95 percent of the maximum density. As compactive effort is increased in the laboratory test, maximum density will be increased and optimum moisture content will decrease. This change can only occur in the field to the extent that the field moisture content will permit it. Once field compaction is such that the fill density is significantly higher than about 105 percent of maximum, the specified tolerance from optimum moisture content in the laboratory compaction test may no longer be applicable for field control. A + 2 percent numerical value of moisture content acceptable at the specified compactive effort would be too wet at a higher effort since the zero air voids curve defines the absolute maximum that can be achieved, indicating that higher densities for that soil are impossible. Therefore, if the record shows high densities for such material, the data are in error. This was apparently overlooked.

Plots of field data for compaction test BMP 278 are shown on Figures 1 through 6. The title of each figure gives the assumptions made in plotting data for the figure. In comparing figures 3 and 4 it is seen that a majority of field tests were made using the nuclear device. The two test results shown on Figure 4 for the sand cone method indicates one test result on each side of the zero air voids curve. The one falling above the zero air voids curve (shown on Figure 4) is designated by U. S. Testing Company as the only passing sand cone test (shown on Figure 6).

For a field test result to be valid as well as "Passing" it must fall within a well defined area on the plot containing the laboratory compaction curve. This area or window of acceptability is shown for a hypothetical compaction curve on Figure 7a that would meet requirements of Specification 7220-C-210. It is defined by horizontal lines at 95 percent and 105 percent of specified density, vertical lines through $\pm$ 2 percent of optimum moisture content, and a line parallel to the zero voids line indicating saturation about half way between the compaction curve and 100 percent saturation (zero air voids curve). The practical upper limit of 105 percent of specified density is not defined in the specifications. It was arbitrarily chosen as numbers greater than this give increasingly invalid comparisons between field test results and the specified laboratory compaction test curve. Therefore, if all data points fall within the defined window there would be no reason to assume that they are wrong. However, when many data points fall outside the designated area there is something wrong with the information and then all data points become suspect. A review of all data indicates that about 25 percent of the cohesive soil test results fall within this area.

Figure 7B shows an area where field test results would be acceptable, in theory even though not in strict accordance with the specifications. Figure 7B was arrived at by expanding Figure 7a to include test results up to a compactive effort related to ASTM D 1557 (56,255 ft-lb/ft^3). which is considered to be a practical upper limit. About 40 percent of all cohesive soil test results would plot in this area.

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6. Accuracy of Test Equipment

Almost all (over 95%) field density tests on cohesive soils were made using the Nuclear Density device. Specification 7220-C-210 section 12.4.2 page 42 indicates this to be acceptable for moisture content determination provided that the results are compatible with those obtained by ASTM D 2216. Similarly, section 12.4.4 says density determined by the nuclear device is acceptable when results are compatible with density as determined by ASTM D 1556.

In a letter from U. S. Testing to Bechtel (dated May 30, 1974), the average deviation of the nuclear device from oven-dry moistures was +.12% for a set of 30 tests. However, the standard error of estimate is 1.8% for the data with the range of differences being from - 3.2% to +3.9%. Thus, accuracy of the nuclear device is questionable, and could translate into errors of about ± 4 pcf in the dry density calculation. (It should be noted that errors in the moisture content tend to shift the position of test results on a moisture density plot approximately parallel to the zero air voids curve, assuming the in-place wet density is correct, and thus do not explain the large number of points which plot outside the zero air voids. Compare Figures 1 and 9).

No reliable correlation between sand cone and nuclear density tests were carried out therefore there is no basis for determining if U. S. Testing would have performed better using the sand cone procedure.

However, it is clear that a large number of the nuclear density tests are wrong. This can be explained by considering the wet unit weight may have been wrong or both the moisture content and unit weight may have been wrong. A reliable correlation with properly conducted sand cone tests should have revealed this, but it was not apparently done.

7. Relative Density Tests

Cases were noted where densities in material classified on the data sheet as zone 3 (sand) were compared to the maximum densities in proctor type tests and other cases where densities in clay soils were compared to the maximum density in relative density tests. An error must exist in the record in such cases either in the classification of the soil on data sheet or in comparing field test results to inappropriate laboratory test data. In general, it appears that relative density tests were used in controlling density of sand fill. There were a significant number of arithmetic errors on calculation sheets even though there are signatures on the sheets indicating they had been checked. Over 100 errors were found in calculations, of relative density from 8/15/79 through 12/78 (not all of these errors change the acceptability of the test results).

ASTM D 2049 section 7.1.2 Wet Method states: "Note 2 - While the dry method is preferred from the standpoint of securing results in a shorter period of time, the highest maximum density is obtained for some soils in a saturated state. At the beginning of a laboratory test program, or when a radical change of materials occurs, the maximum density test should be performed on both wet and dry soil to determine which method results in the higher maximum density. If the wet method produces higher maximum densities (in excess of one percent) it shall be followed in succeeding tests." An example of wet and dry relative density is shown on Figure 10. U. S. Testing Company apparently did not do this frequently enough, or on a broad enough range of non-cohesive soil types. As a consequence many field density test results exceed 100 percent of maximum dry laboratory relative density. As an example, for laboratory test RD55 a total of 566 field tests were made. Of this total, 364 tests were greater than 100 percent compaction. The highest relative density found was 142.2 percent with the majority of tests over 100 percent falling in the range of 100 percent to about 130 percent. Since the difference in maximum density between wet and dry methods is about 4 to 5 lbs/c. ft. (based on recent data) any test result greater than about 115 percent (based on the dry method) is suspect.

Even if the wet laboratory test method data were available for all sands, it appears an unacceptably high number of field test results would greatly exceed 105 percent relative density even based on the wet maximum.

8. Summary

In summary, there are five major faults contained in the Midland Compacted Fill Density Test Reports as follows:

1. erroneous field density test data.
2. incorrect soil identification
3. incorrect (or questionable) laboratory test data.
4. calculation errors
5. improper or incomplete clearing of "failed" tests.

Items 4 and 5 represent existing faults in the data which could be corrected. However, as a result of items 1 through 3, there is no rational means of determining which test results are valid and which are not. Since more than one half of the test results for relative density and percent compaction fall outside the possible theoretical comparison limits, it must be concluded that these test results are suspect and should not be used alone for acceptance of plant area fill. Therefore, other means of testing have been established and employed to determine if the fill in any given area is acceptable.

Also in item 4 it should be noted that on many occassions the inplace density was divided by the maximum density from the relative density test to get percent compaction, these tests were also used to clear other pricing tests.

TABLE A

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Listing of All Classifications Referenced in Plant Area Fill Soil Test Records Which were Used for 20 or More Field Density Tests

Classification	No. of Tests
B200	90
B251	31
B252	22
B254	42
B255	57
B260	68
B261	36
B262	165
B269	227
B270	226
B271	141
B274	37
B276	21
B277	158
B278	82
B297	22
R015	20
R016	61
R024	248
R030	54
R035	59
R038	39
R039	28
R040	35
R041	69
R042	103
R043	48
R044	71
R045	43
R049	63
R054	118
R055	566
R059	65
R061	589
R063	42
R065	59

Note: Spec. 7220-C-208 gives a ratio of approximately 20 field tests to each laboratory test.

TABLE B

Notes on Questionable Clearing of Failed Tests

1. Test number MD 245 fails due to high moisture. Cleared by MD 246 which references a proctor with higher optimum moisture content (OMC) such that the $\pm 2\%$ of optimum requirement is met.

2. MD 205 fails with moisture content 6% above the OMC. Cleared by MD 215, which references a relative density lab standard, and is itself still 6% away from the OMC of the proctor referenced by MD 205.

3. MD 223 fails because of high moisture. Cleared by MD 228 which has actually a higher moisture content and lower density, but references a different proctor; the retest passes and clears the failure.

4. Both MD 844 and 886 fail because of high moisture and low density. They are cleared by MD 888 which references a new proctor with lower maximum density and higher OMC than the first.

5. MD 251 fails due to moisture being too high. Cleared by MD 253 which uses a higher OMC proctor.

6. MD 668 clears MDR 634, but the two tests show no correspondence in location, moisture, density, or lab standard.

7. MD 771 failed, being too dry. Cleared by MD 782, which has almost identical moisture content and dry density but uses a new BMP with lower optimum moisture.

8. MD 2384 clears MD 2342, referencing a different proctor with an OMC which fits the in-situ conditions. However, the dry density of MD 2384 is way too high to fit the original soil classification, and in addition, it falls outside of the zero air voids curve for the classification which it has been changed to.

9. MD 556 clears MD 554 by using a BMP with lower moisture requirements. The field densities differ by 24 pcf and would seem to be different material.

10. MD 558 clears MD 555 but has too high a density to be the same soil as MD 555. It also uses a different proctor.

11. MD 566 and 568, classified as BMP 262 cohesive soils, are cleared by MD 569 which is classified as RD 33 and has totally different soil properties than the two failures.

12. MD 1317, 18, 19 and 20 fail and are all cleared by MD 1477 taken over 5 weeks later. There is poor correspondence in the soil properties and the proctor is different from failing to passing test.

13. MD 2965 clears MD 2963 with a different proctor through the test results would have been passing with the original BMP.

14. MD 1388, classified as BMP 278, is cleared by MD 1461, classified as RD 55.

15. MD 170, classified as RD 24 is cleared by MD 173, classified as BMP 234.

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16. MDR 287 fails with a relative density of 77%. Cleared by MDR 291 which has .1 pcf lower density but arbitrarily rounds up the relative density to 80%; it passes and clears the failure.

17. In all of the following field density tests on sand, the passing test has approximately the same or lower density than the failures, but references a lower maximum density RD lab standard:

MDR 343	clears	MDR 339
MDR 514	clears	MDR 507
MDR 513	clears	MDR 508
MDR 515	clears	MDR 509
MDR 516	clears	MDR 510
MDR 522A	clears	MDR 521
MDR 558	clears	MDR 556, 557
MDR 480	clears	MDR 473
MDR 555	clears	MDR 525, 527, 534
MDR 533	clears	MDR 526, 530, 531

18. MD 2384 clears MD 2342, but is at 7' lower elevation.

19. MD 123 clears MD 122, but is at 10.5' lower elevation.

20. MD 149 clears MD 142, but is at 10' higher elevation.

21. MD 1694 clears MD 1693 but is 43' away from the site of the first test.

22. MD 3114 clears MD 3102, but the two tests are 68' apart.

23. MD 186 clears MD 183 though it is 110' away.

24. MD 1209 clears MD 1207 and MD 1205, yet is 183 ft. away from the failures.

25. MD 1097, dated August 4, 1977, cleared by MD 1048 dated July 16, 1977.

Note: This table gives typical observations and is not meant to be all-inclusive.

TABLE C

Notes on Questionable Test Data

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1. The first field density test to reference RD 24 (5/75) has a relative density of 170.6%. The standard continued to be used, however, with relative densities greater than 100% occuring repeatedly.

2. Similarly for RD 30, the first two tests (9/75) have 114% and 122% relative densities, yet the standard was used for 10 months, 54 tests, with 52% of the results over 100%.

3. During the first two weeks of use (7/76), RD 41 was referenced 22 times with 12 tests over 100% relative density (6 tests over 110% and 3 over 120%). The standard was used for 5 months, however, with over 40% of the results over 100%.

4. The first test using RD 55 (8/76) has a relative density of 119%, with the field test being made the same day as the standard and, thus, assumedly the same material. These results would throw doubt on the lab standard, yet it was used for two full years and 566 tests, with 64% of the results over 100% relative density.

5. Even high density structural backfill standards such as RD 61 (maximum density of 125.3 pcf), used 593 times, show over 25% of the tests having greater than 100% relative density.

6. The first seven tests referencing BMP 269 (scattered over a two month period around 7/76) all fall outside the zero air voids curve. This classification was used for 1 1/2 years, referenced 227 times.

7. The first two tests referencing BMP 270 (7/76) fall 6 pcf above the zero air voids curve. Continued use of this proctor for over 2 years resulted in 226 tests with 82 outside the theoretical maximum.

8. For the first month (4/77) all BMP 278 tests fell on or outside the zero air voids curve. For the next month, over half the tests did the same, or have greater than 105% compaction. The standard was used over half a year, with 43 out of a total of 82 tests outside the zero air voids curve.

Note: This table gives typical observations and is not meant to be all-inclusive.

SB 01545

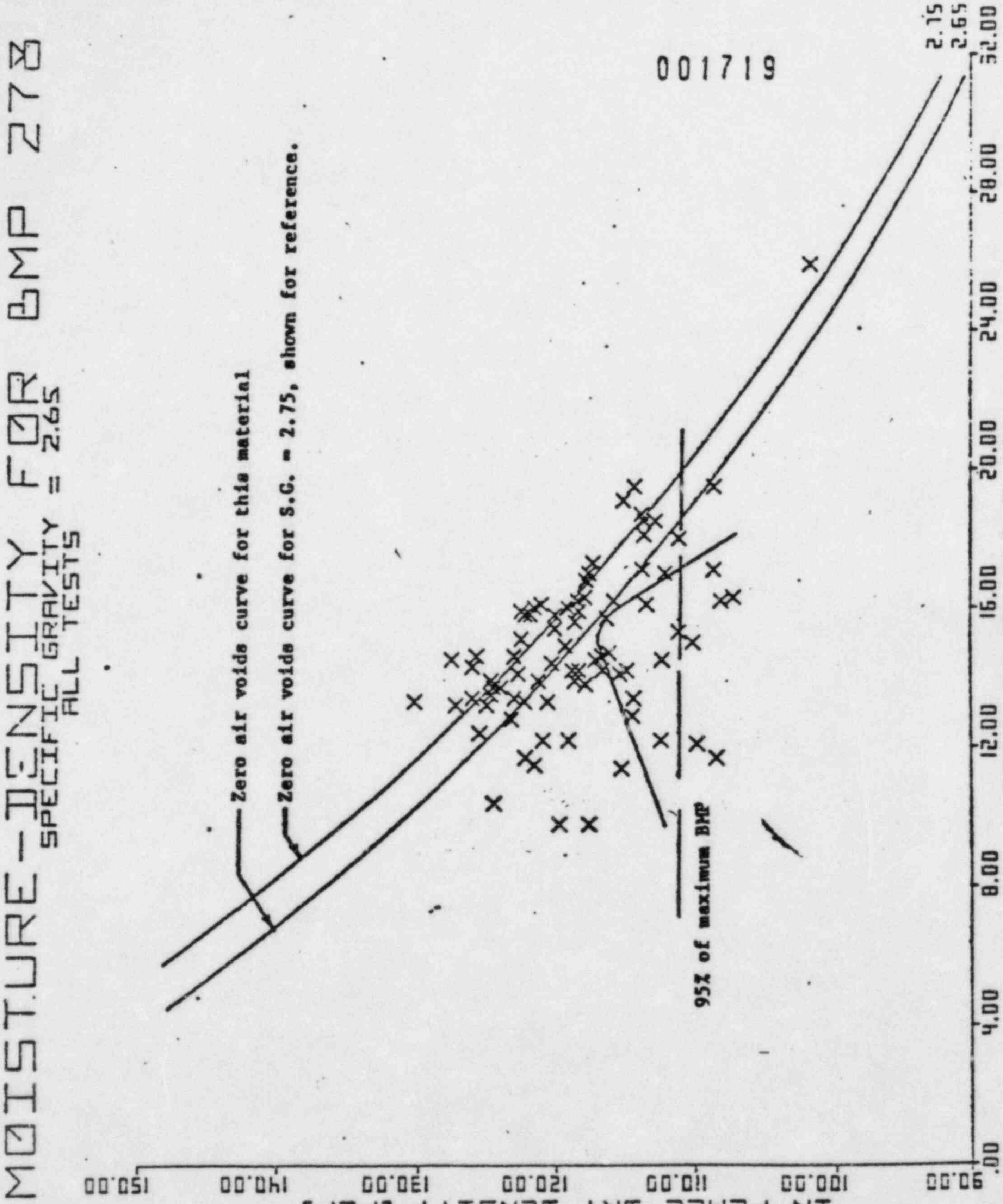

FIGURE 1

SB 01546

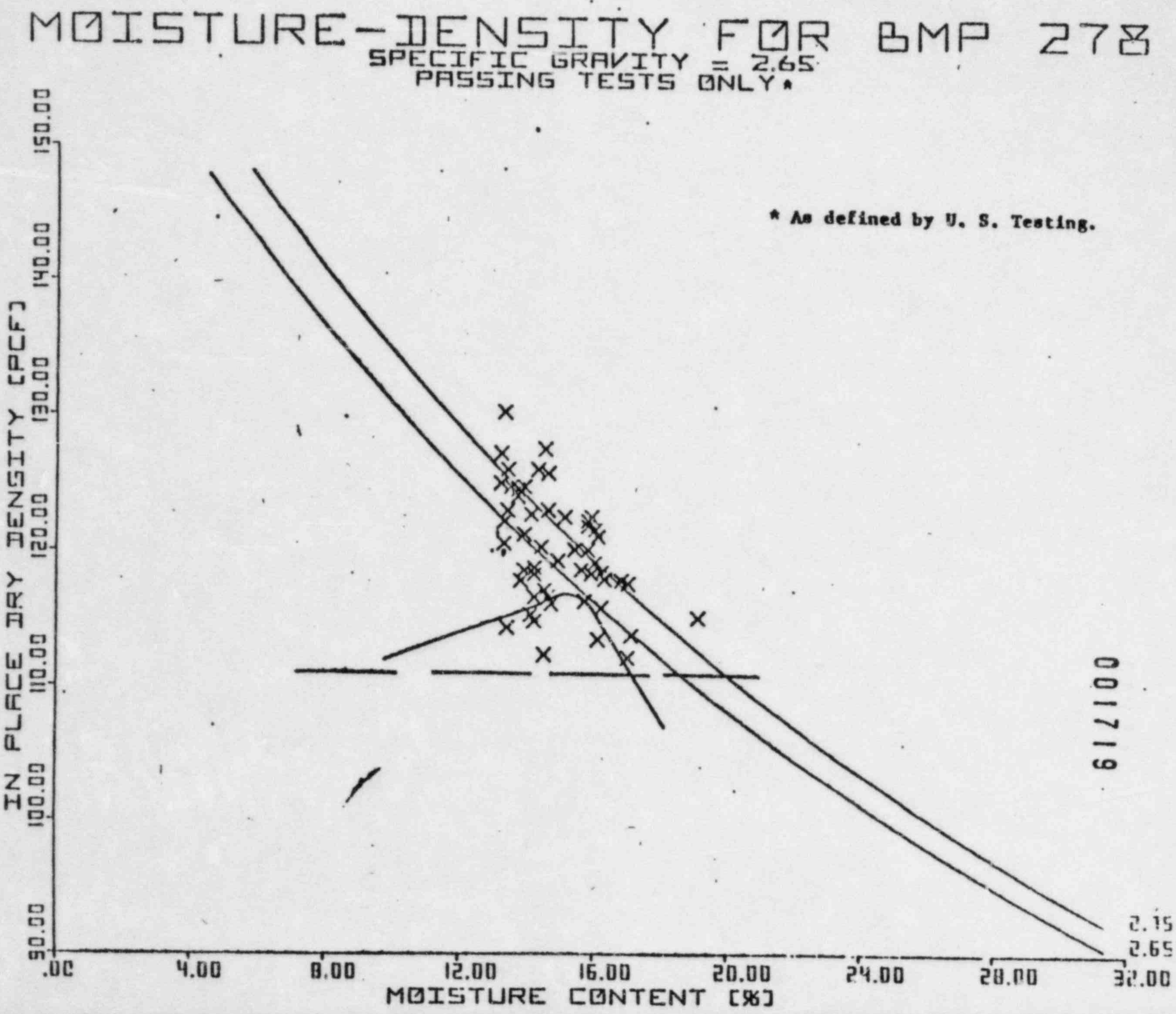

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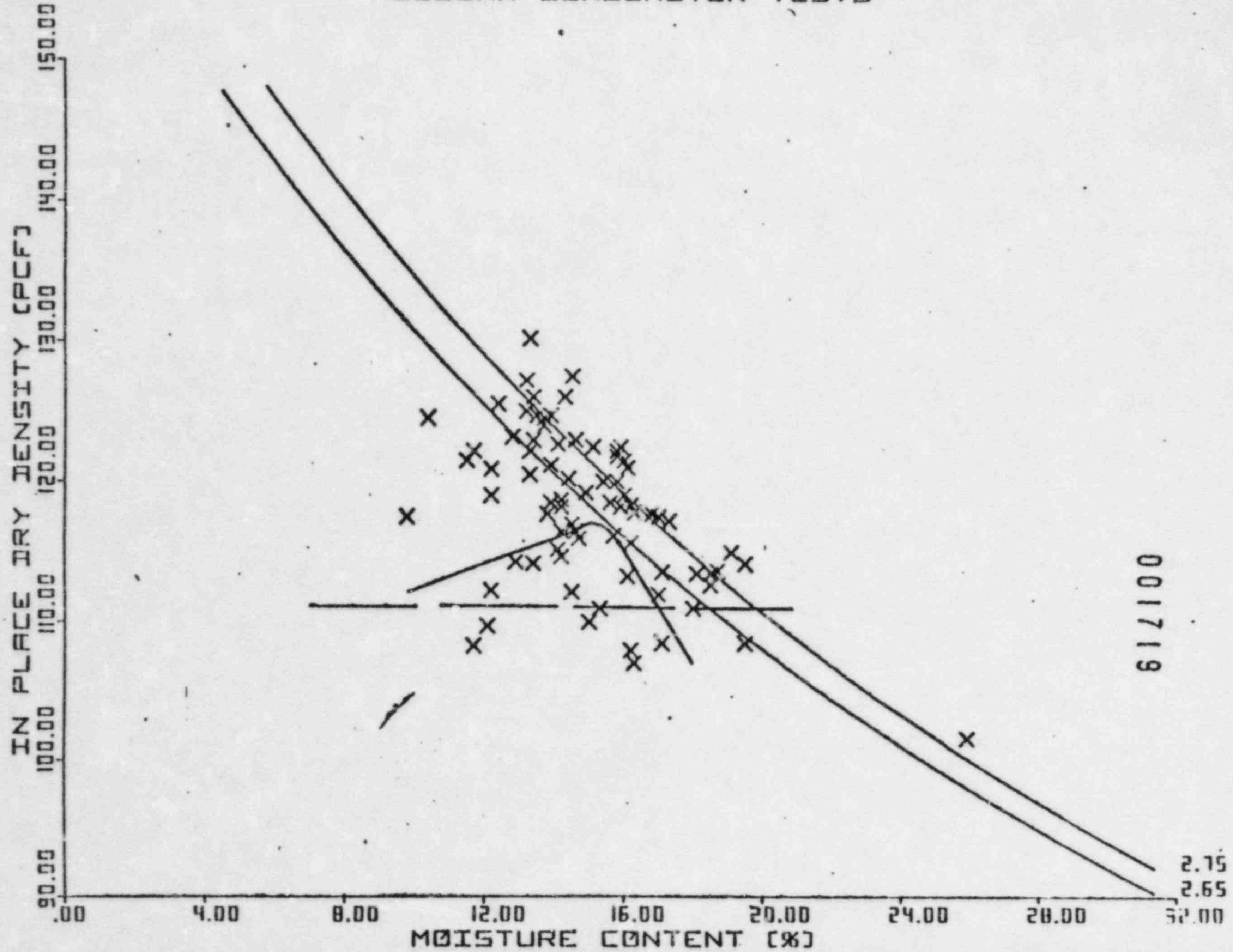
FIGURE 2

SB 01547

MØISTURE-DENSITY FØR BMP 278

SPECIFIC GRAVITY = 2.65
NUCLEAR DENSØMETER TESTS



001719

FIGURE 3

SB 01548

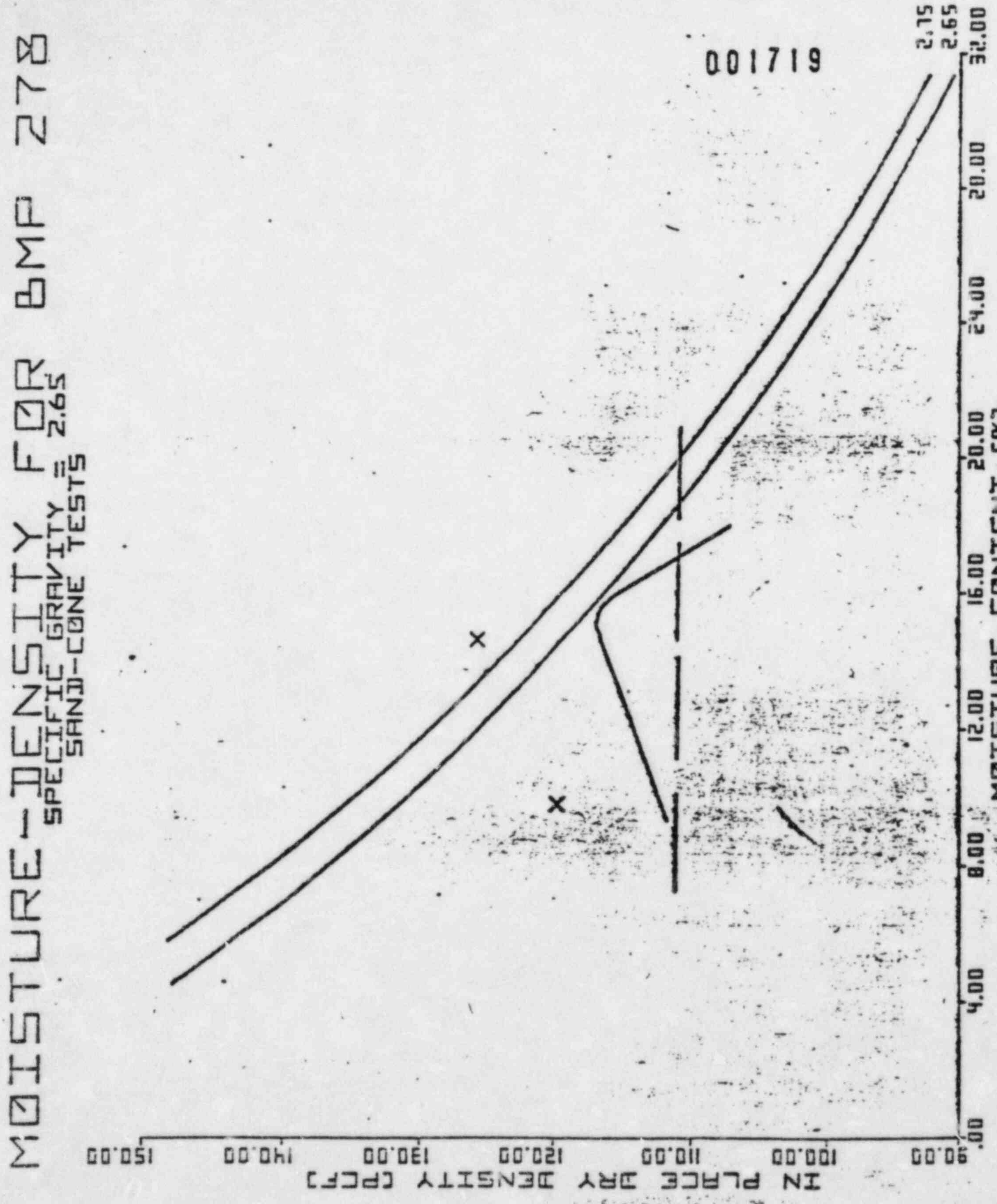


FIGURE 4

SB 01519

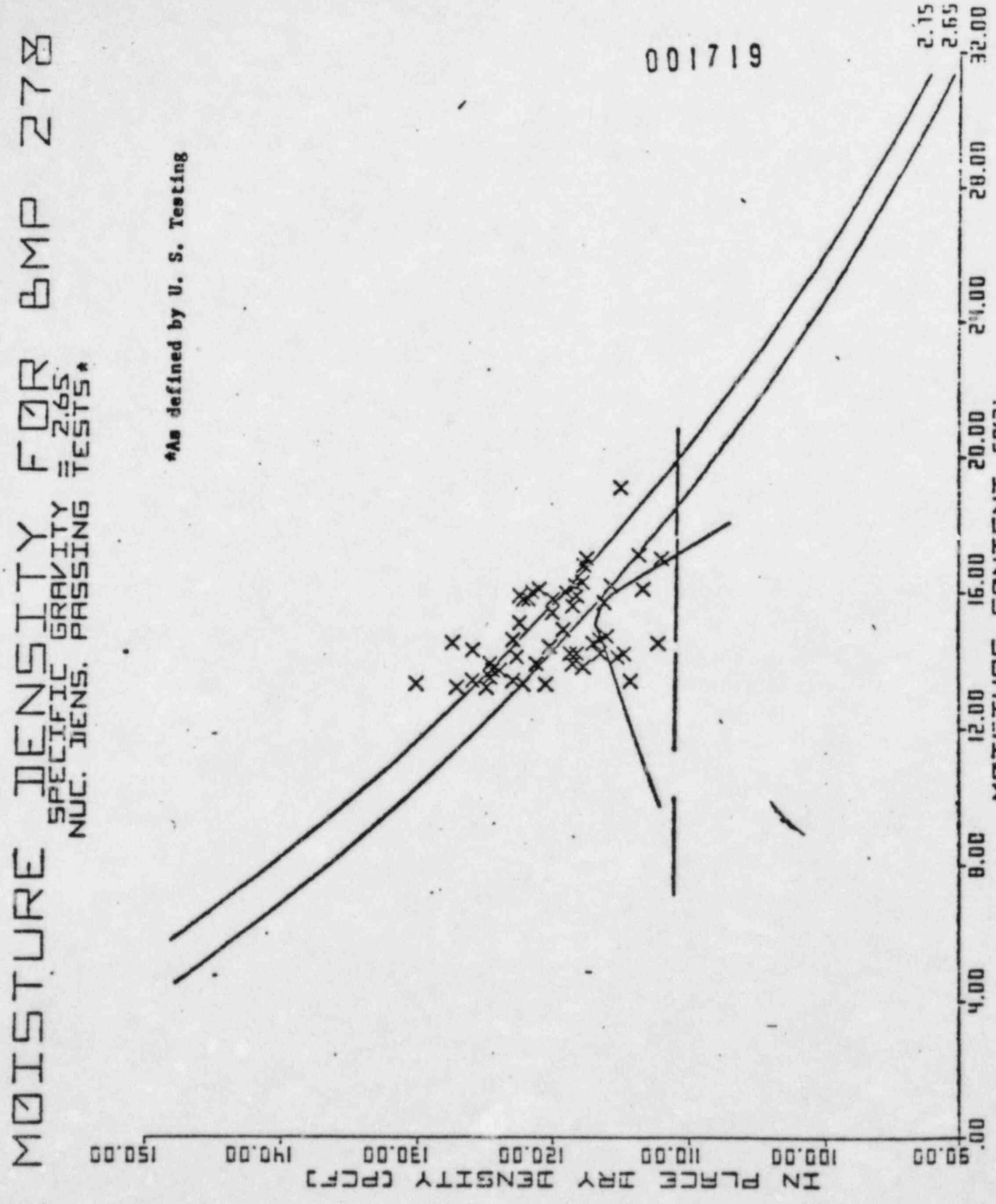

MOISTURE DENSITY FOR BMP 278
SPECIFIC GRAVITY = 2.65
NUC. DENS. PASSING TESTS*
*As defined by U. S. Testing
001719
2.75
2.65
150.00
140.00
130.00
120.00
110.00
100.00
90.00
IN PLACE DRY DENSITY (PCF)
.00
4.00
8.00
12.00
16.00
20.00
24.00
28.00
32.00
MOISTURE CONTENT (%)

FIGURE 5

MØISTURE-DENSITY FØR BMP 278

SPECIFIC GRAVITY = 2.65
SAND-CONE PASSING TESTS*

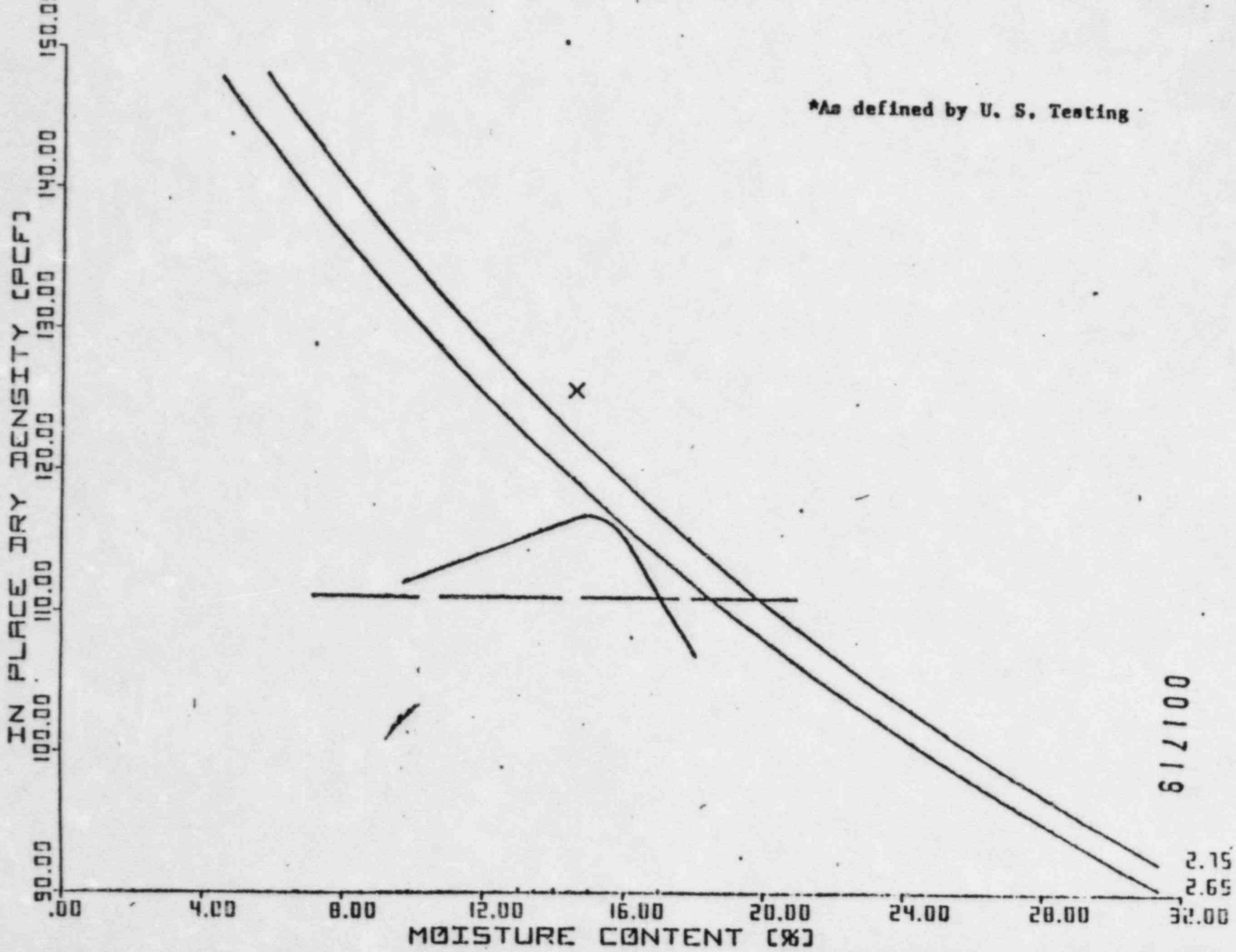
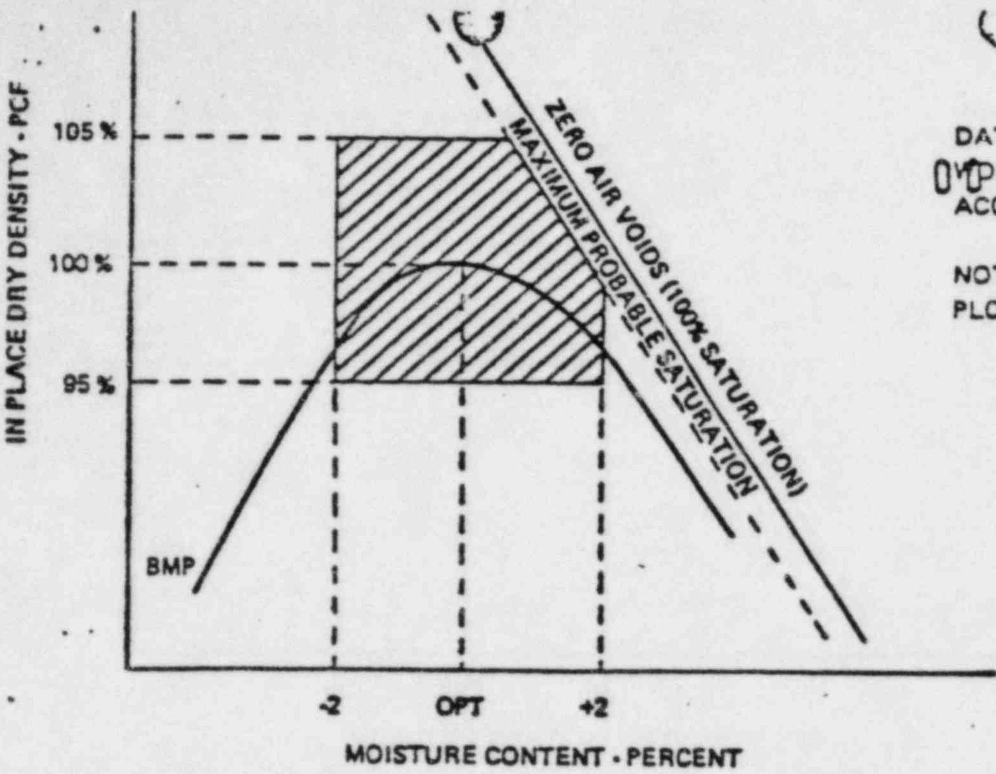


FIGURE 6

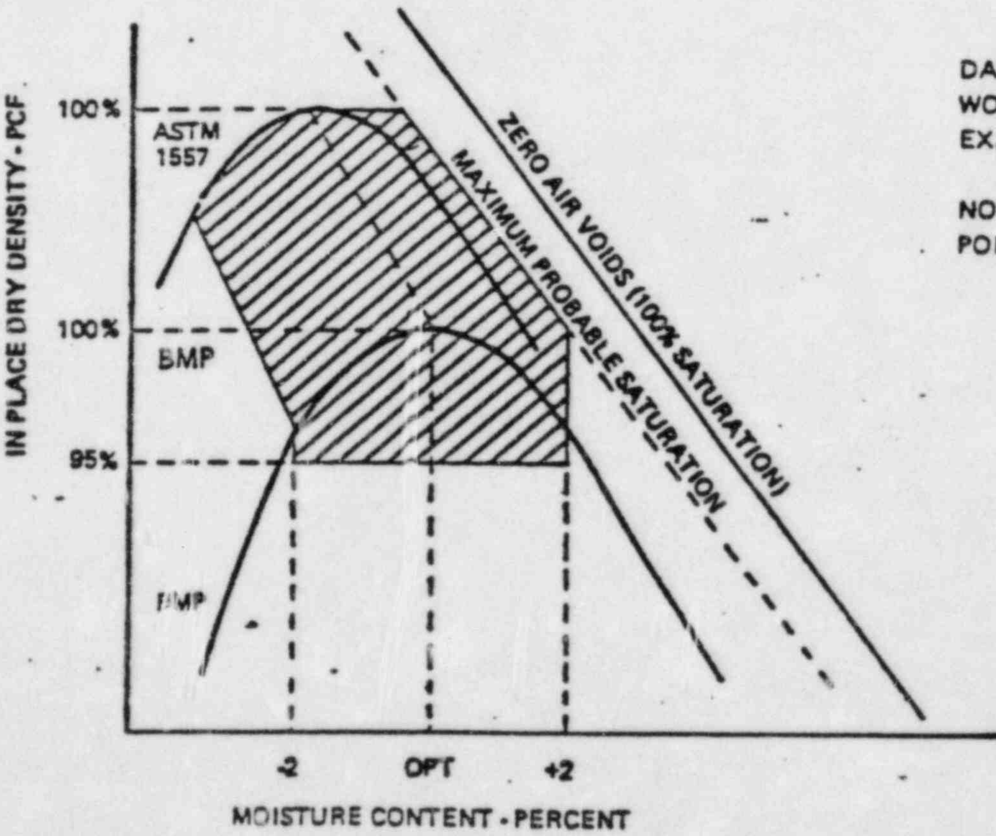
SB 01551



DATA POINTS THAT PLOT IN SHADED AREA WOULD BE GENERALLY ACCEPTABLE ACCORDING TO SPECIFICATIONS

NOTE: ABOUT 25% OF ALL FIELD DATA PLOTS IN THE SHADED AREA

FIGURE 7-A-



DATA POINTS THAT PLOT IN SHADED AREA WOULD BE ACCEPTABLE REGARDLESS OF EXACT SPECIFICATION WORDING

NOTE: ABOUT 40% OF ALL FIELD DATA POINTS PLOT IN THE SHADED AREA

FIGURE 7-B-

SB 01552

FIGURE 7: WINDOWS OF ACCEPTABILITY (A) BASED ON BMP SPECIFICATION (B) REGARDLESS OF EXACT WORDING OF SPECIFICATION

UNITED STATES TESTING CO., INC. 0017L9

Graph Representation of Three Proctor Method Comparisons

June 13, 1974

By: Peter Wang

Note: ( ) added by Bechtel

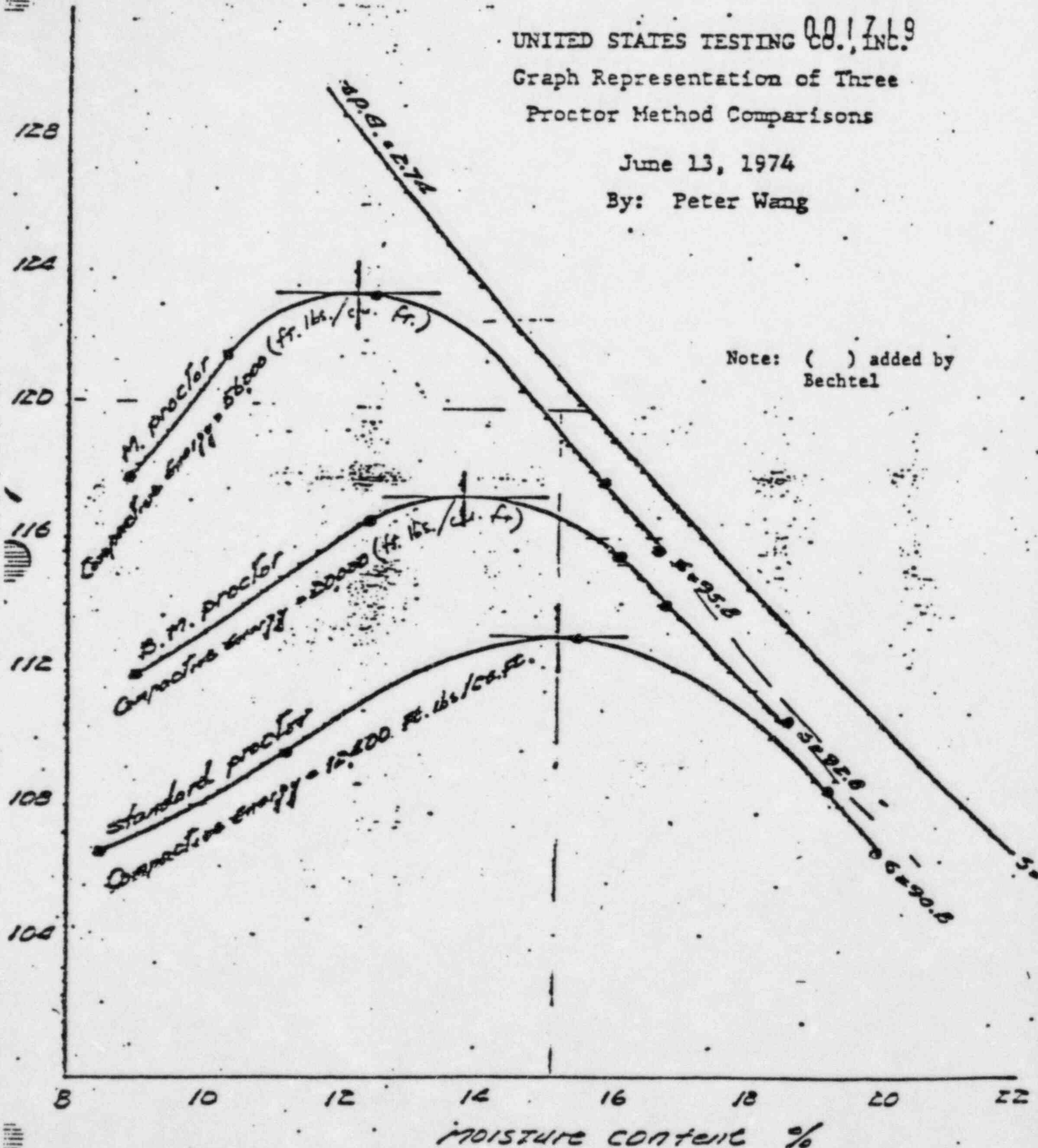


FIGURE 8

SB 01553

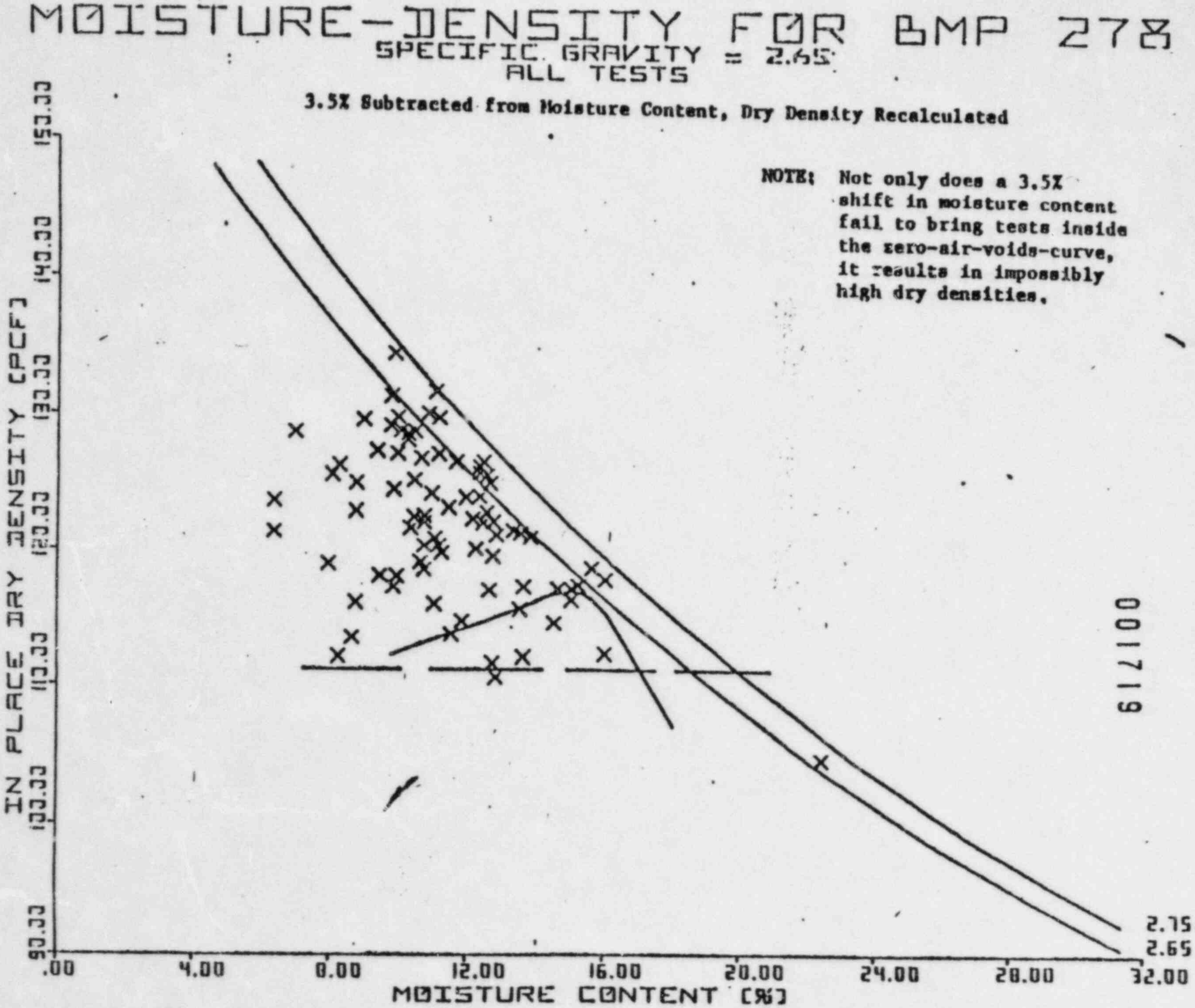
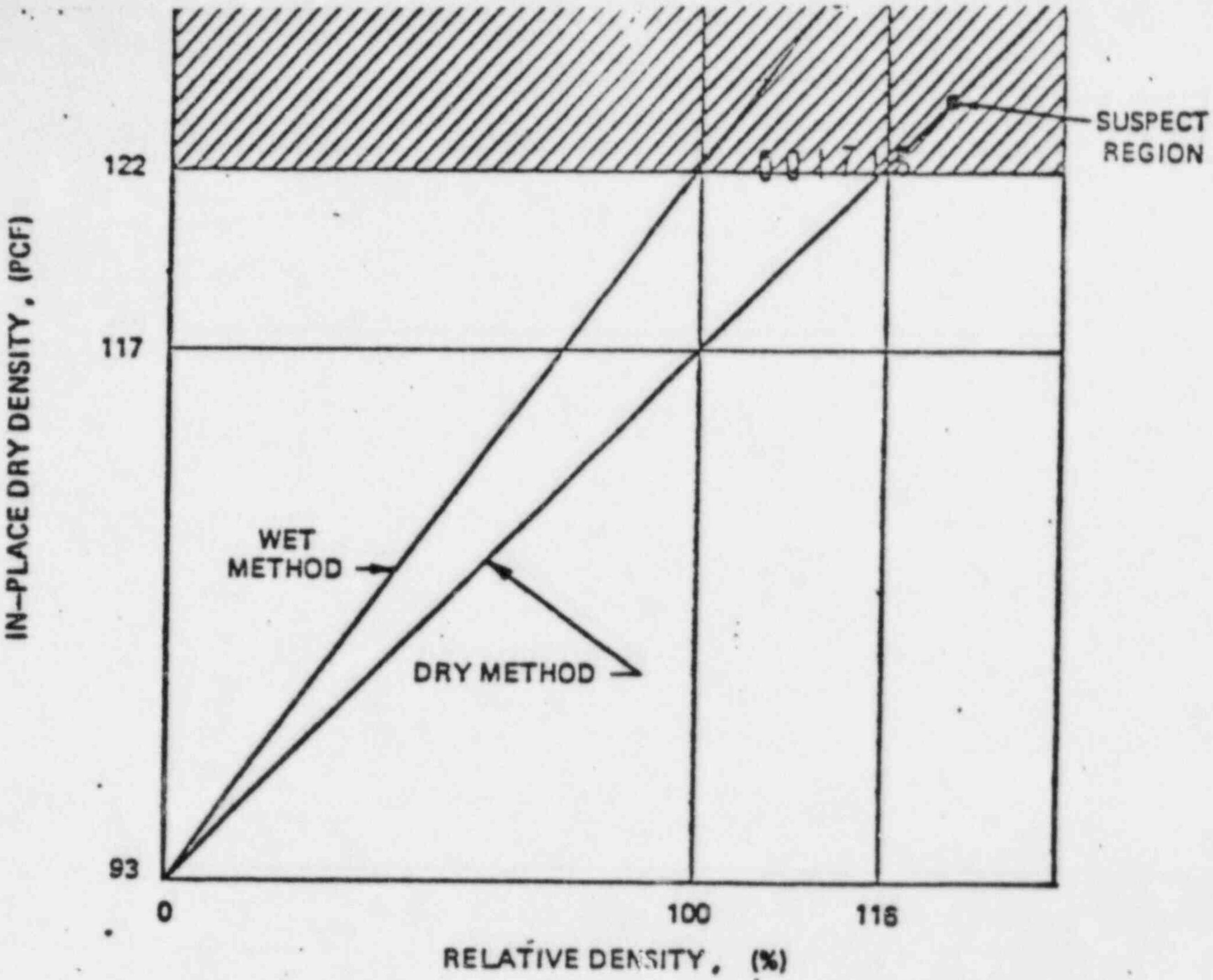


FIGURE 9

SB 01554

001719



NOTE: VALUES FOR DRY DENSITY ARE TYPICAL OF A RANDOM FILL SAND. ANY TESTS SHOWING MORE THAN 117% RELATIVE DENSITY WOULD BE SUSPECT IN THIS EXAMPLE. STRUCTURAL SANDS TEND TO SHOW ONLY 2 OR 3 PCF INCREASE IN MAXIMUM DENSITY AND THUS RESULTS AT MUCH LOWER RELATIVE DENSITY WOULD BE SUSPECT, SAY 105 – 110 PERCENT

FIGURE 10

CHANGE IN RELATIVE DENSITY SCALE FROM DRY TO WET METHODS OF OBTAINING MAXIMUM DENSITY , BASED ON RECENT LAB RESULTS

Bechtel Power Corporation

Inter-office Memorandum

To	P.A. Martinez	Date	June 14, 1979
Subject	Construction QC Comments on DRAFT Review of Soil Test Data Job 7220	From	R.A. Simanek
		Of	Construction Quality Control
Copies to	D.R. Johnson W.L. Barclay R. Hermeston	At	Ann Arbor

Construction Quality Control has reviewed the DRAFT Report of the Soils Test Data as requested in your June 12, 1979 memorandum. A copy of that report has been marked up with QC comments and is attached for your use.

RASimanek

R.A. Simanek
Project Quality Control Supervisor

Attachment

RAS/js

AAC/AA/3316

SB 01583

Doug Jinnett 6/19/79
Comments Stu Kirker of
by: Quality Control

Bechtel Power Corporation

Inter-office Memorandum

To H. H. Burke
P. K. Hansen
J. Milandin
E. A. Rumbaugh
R. A. Simanek

Date June 12, 1979

Subject Midland Units 1 and 2
Consumers Power Company
Bechtel Job 7220
REVIEW of UNITED STATES TESTING
SOILS TESTS RESULTS

From P. A. Martinez

Of Project Management

At Ann Arbor Office

File 0614

Copies to
L. A. Dreisbach
J. F. Newgen
R. L. Castleberry
D. W. Halligan
R. K. Vassar
H. W. Wahl
K. Wiedner
P. A. Becnel
H. B. Friend
M. G. Johnson
S. L. Blue
J. H. Allen

Attached for your information and comment is the final draft report by H&CF on the U. S. Testing field and laboratory test data on soils used as plant area fill.

The report, which covers only the plant area fill, concludes that all soil test results are suspect and should not be used alone for acceptance of the fill. Acceptance of the plant area fill will be achieved by borings, blow count evaluations, test pits, and load tests as explained in the 50.54(f) response to the NRC.

It should be noted that acceptance of the cooling pond dikes was based on four passes of a specified roller, and not on test results. There is, therefore, no concern about the adequacy of the compaction of the dikes.

Your comments on this final draft are requested by June 20, 1979. After finalization this report will be sent to Consumers Power Company to obtain their agreement to send it to U. S. Testing for their review and comment.

P. A. Martinez

PAM/pp

All with Attachment: DRAFT REVIEW OF U. S. TESTING FIELD AND LABORATORY CONSTRUCTION TEST DATA ON SOILS USED AS FILL, June 12, 1979

SB 01584

25

Bechtel Power Corporation

Inter-office Memorandum

To: H. H. Burke
P. K. Hansen
J. Milandin
E. A. Rumbaugh
R. A. Simanek

Date: June 12, 1979

Subject: Midland Units 1 and 2
Consumers Power Company
Bechtel Job 7220
REVIEW of UNITED STATES TESTING
SOILS TESTS RESULTS

From: P. A. Martinez

Of: Project Management

At: Ann Arbor Office

File: 0614

Copies to:
L. A. Dreisbach
J. F. Newgen
R. L. Castleberry
D. W. Halligan
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H. W. Wahl
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P. A. Martinez

PAM/pp

All with Attachment: DRAFT REVIEW OF U. S. TESTING FIELD AND LABORATORY CONSTRUCTION TEST DATA ON SOILS USED AS FILL, June 12, 1979.

S8 01607

MIDLAND UNITS 1 & 2
JOB NO. 7220

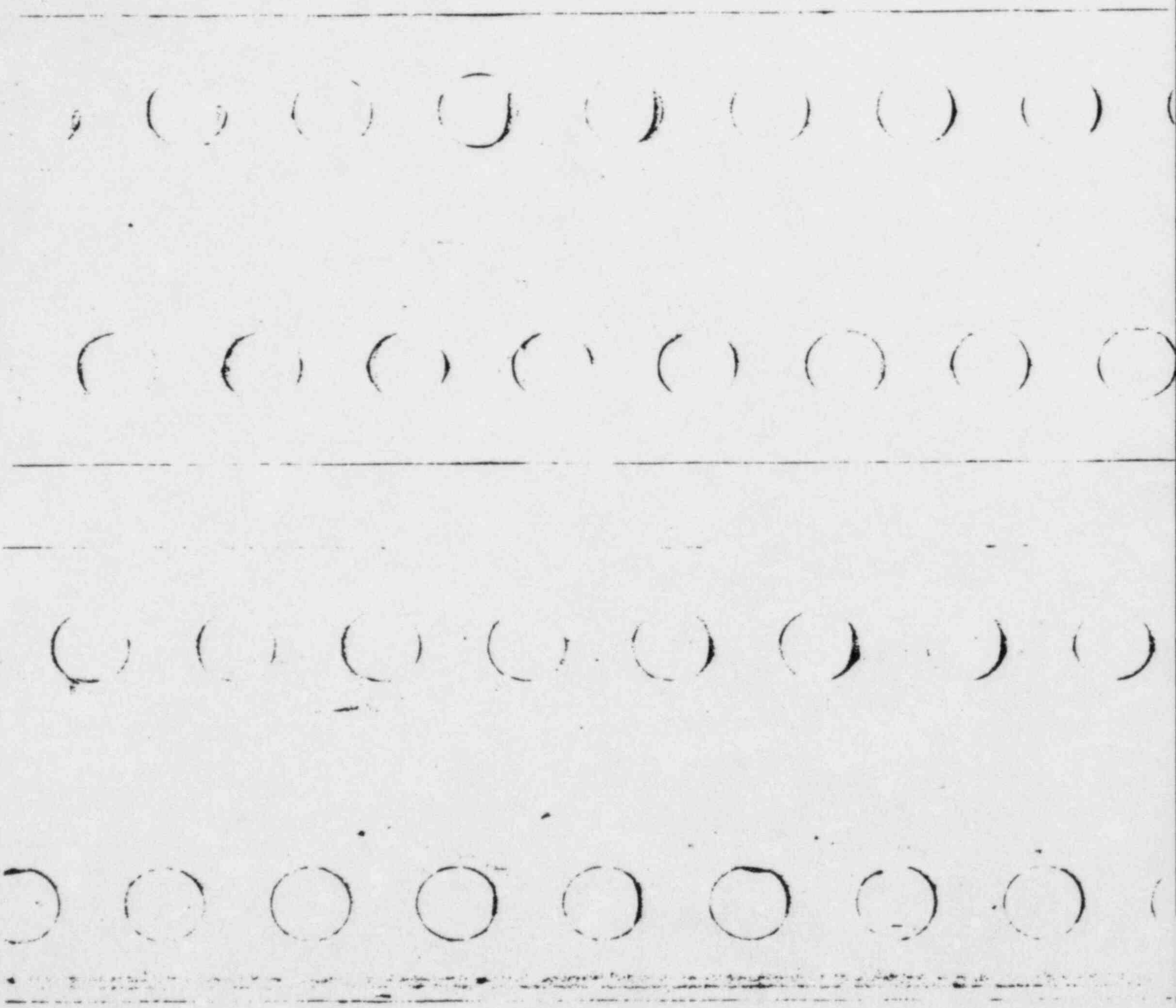
DRAFT

REVIEW OF U.S. TESTING
FIELD AND LABORATORY CONSTRUCTION
TEST DATA ON SOILS USED AS FILL

DRAFT
PREPARED BY
BECHTEL POWER CORPORATION
JUNE 12, 1979

SB 01608

Dupe of 8405260086



REVIEW OF U. S. TESTING
FIELD AND LABORATORY CONSTRUCTION
TEST DATA ON SOILS USED AS FILL

This review of the quality control tests of the earth fill at the Midland Site was made as a result of settlement of the diesel generator building in excess of that predicted. Soil samples obtained in borings indicated that soil conditions beneath the structures are not compatible with the quality of fill indicated by the control tests made by U. S. Testing Company. All fill was accepted as it was being placed based on the results of the field tests performed by U. S. Testing Company.

The review showed many discrepancies in the test results as outlined in the following paragraphs. Review comments are based on the technical specifications and subcontract documents agreed to by U. S. Testing Company. The ability of the personnel to do the testing work was judged on the basis of personnel resumes and previous documented work experience of U. S. Testing Company.

1. Use of Laboratory Test Compaction Curves

Table 9-1 of specification 7220-C-208, Page 14B required one field density and moisture content test be taken for each 500 cubic yards of fill placed. It also required one compaction, grain size, and specific gravity for each 10,000 cubic yards of material. This gives a ratio of 20 field density tests to 1 laboratory compaction test. Although 20.1 is not a strict upper limit, it is a guideline; should density tests be taken more frequently than one per 500 cubic yards of fill the ratio could be higher. This method of increasing the ratio seems to have been done very infrequently. The actual ratio is shown in Table A attached. In fact, some of the laboratory compaction tests were used to determine percent compaction for several hundred field density tests taken over a period exceeding two years. Even though no time requirements for the period of use of laboratory tests are specified, it is unlikely that any borrow source in this area would be of such uniform character that such extended use of a compaction curve, truly representative of a large quantity of material, would be applicable. Listed below are selected laboratory test data results indicating the wide range of soil properties that were encountered.

TEST	MIN. DENSITY (lbs/Ft^3)	MAX. DENSITY (lbs/ft^3)	OPT. MOISTURE (percent)
*BMP269		127.3	10
*BMP278		117.0	15.2
*BMP279		140.8	5.7
**RD24	100.9	119.2	
**RD55	90.2	109.7	
**RD61	109.3	125.3	

*BMP referes to proctor type test.
**RD refers to relative density test run by dry method.

SB 01610

2. Questionable Retests

A field test that fails to meet standards dictated by the selected laboratory test data must normally be cleared by another field test made in the same area after corrective action has been taken. In the procedure adopted by U. S. Testing Company, this test result would then be compared to the appropriate laboratory compaction curve. Bechtel QC determined which failing tests had been cleared by subsequent retests.

In some cases the clearing of a failed density test was apparently resolved by using another laboratory compaction curve with lower maximum density which resulted in the percent compaction being increased sufficiently to meet the requirements of the specification. The possibility exists that soil was removed after a failing test and replaced by different material, but the records do not indicate this. In other cases, tests labeled "failed" were incorrectly "cleared" though the same laboratory standard was referenced. For example, in some cases retests to clear a "failed" test were not taken in the same area or at the approximate same elevation. Many retests were over 20 feet from the failed test location and some were over 200 feet from the original test location. In general, if after a failing test the whole area is reworked, the retest location is not too critical assuming that the correct laboratory curve is used for comparison. However, in the plant area, work areas were relatively small, and soil characteristics and properties showed considerable variation necessitating retest in the immediate vicinity (within 10 ft) of the failing test. Retests should be taken in the same lift or soil layer that had previously failed. In some cases retests were taken at elevation differences up to 10 ft. from the failed test. It should be noted that Bechtel field personnel gave the locations and prepared the test areas for retesting. This was not a U. S. Testing responsibility. It is a probability that there were errors in recording dates for testing or retesting since some retests were dated three weeks prior to the time the original test failed. Some failing tests were marked as "non Q" and never recorded cleared by a passing test.

Table B is a compilation of notes relative to questionable clearing of failed tests.

3. Test Results Plot Above Zero-Air-Voids Curve on Compaction Data Plots

Soils cannot be more than 100 percent saturated; therefore, all field test data points, when plotted as dry density versus moisture content, must be below the zero air voids curve as defined by the specific gravity of the material. Specifications do not require examination of the zero air voids curve, but it is considered fundamental soil mechanics relative to compaction plots. There are numerous cases in the U. S. Testing Company data where points plot above the zero air voids curve. Figure 1 attached shows a typical laboratory compaction test curve with field test results plotted on it. Many of the field test results plot above the zero air voids curve. Provided the specific gravity is correct this is not possible so that all such points must represent erroneous data. The fact that a large number of test results plot above the zero air voids curve tends to make all test results questionable.

Also, referring to Figure 1 it would appear that soil density varied widely. Specifications called for compactive effort results as defined by ASTM D 1557 which is 56,255 ft-lb/ft^3 energy. This was modified to a laboratory test compactive effort of about 20,000 ft-lbs/ft^3 energy, often referred to as Bechtel Modified Proctor (BMP). Laboratory compaction test curves should be related to the same effort as that called for in the field for use in comparing with field density tests. According to plots of field data shown on Figure 1, density varied from about 108 lbs/ft^3 to about 130 lbs/ft^3. It is doubtful that the soil classification or other properties would be similar for such a wide variation in density. It is noted that 100 percent of modified Proctor (ASTM D 1557) which is difficult to obtain, is rated at 56,255 ft-lbs/ft^3 energy. The curve plotted on Figure 1 is at about 20,000 ft-lbs/ft^3 energy. For comparative purposes it was determined by U. S. Testing in 1974 that 100 percent of specified effort (20,000 ft-lbs/ft^3) is approximately equal to 95 percent of the maximum density as determined by ASTM D 1557 (56.255 ft-lbs/ft^3) Reference Figure 8. This means that a density up to 5 percent greater (dry density of 123.2 lbs/ft^3) than that specified (dry density of 117.0 lbs/ft^3) could be possible. However, some points shown on Figure 1 give an apparent density up to 11 percent above that specified.

There were a significant number of arithmetic errors on calculation sheets even though there are signatures on the sheets indicating they had been checked Over 100 errors were found in calculations of relative density from 8 15/75 through 12/78 (not all of these errors have harmful consequences). Also, several specific gravity calculations are in error, such as for BMP 273 and 274. In the case of BMP 273, the zero air voids curve passes through the laboratory compaction curve. In another example, BMP 297, the laboratory compaction curve is invalid due to calculation errors, yet was referenced by field density tests 22 times.

4. Reported use of Questionable Laboratory Test Data

Some laboratory compaction test data were used repeatedly even though they continued to show suspect field test results. This could be indicative of questionable laboratory data or the fact that soil was not being placed or compacted according to specifications. At any rate there should have been cause for concern. Subcontract 7220-C-208 Exhibit C, Page 17 of 47 No. 2 states "You (U. S. Testing) are to immediately report data that indicates material that does not comply to specifications or procedures."

Table C is a compilation of notes relative to questionable test data.

5. Limits of Accuracy and Acceptability for Test Data

Figures 1 through 7 attached will be referenced in discussing limits of accuracy or acceptability for field test results as compared to laboratory test data. This is BMP 278 which is typical of all test results.

Specified laboratory compactive effort was 20,000 ft-lbs/ft^3 and field compaction effort was originally specified at 56,255 ft-lbs/ft^3 but was changed by Revision 5, dated 7/8/75, specification 7220-C-210, Section 13.7, Page 57 to also be equal to about 20 000 ft-lbs/ft^3.

The specified 20,000 ft-lbs/ft^3 effort establishes a compaction curve relating moisture and density for a specific soil. Moisture was specified for field placed fill to be within $\pm$ 2 percent of optimum moisture as determined by this effort. Density was specified to be greater than 95 percent of the maximum density. Once field compaction is such that the fill density is significantly higher than about 105 percent of maximum, the specified tolerance from optimum moisture content in the laboratory compaction test may no longer be applicable for field control. As compactive effort is increased, maximum density will be increased and optimum moisture content will decrease in the laboratory test. This change can only occur in the field to the extent that the field moisture content will permit it. Therefore, to benefit from the increased compactive effort the field moisture content must be lowered. As this indicates, the location of the compaction curve changes with a corresponding change in range of acceptable moisture content relative to optimum. A $\pm$ 2 percent numerical value of moisture content acceptable at the specified compactive effort would be too wet at a higher effort indicating that higher densities for that soil cannot be achieved. Therefore, if the record shows high densities for such material, the data are in error. This was apparently overlooked.

Plots of field data for compaction test BMP 278 are shown on Figures 1 through 6. The title of each figure gives the assumptions made in plotting data for the figure. In comparing figures 3 and 4 it is seen that a majority of field tests were made using the nuclear device. The two test results shown on Figure 4 for the sand cone method indicates one test result on each side of the zero air voids curve. The one falling above the zero air voids curve (shown on Figure 4) is designated by U. S. Testing Company as the only passing sand cone test (shown on Figure 6)

For a field test result to be valid as well as "Passing' it must fall within a well defined area on the plot containing the laboratory compaction curve. This area or window of acceptability is shown for a hypothetical compaction curve on Figure 7a that would meet requirements of Specification 7220-C-210. It is defined by horizontal lines at 95 percent and 105 percent of specified density, vertical lines through $\pm$ 2 percent of optimum moisture content, and a line parallel to the zero voids line indicating saturation about half way between the compaction curve and 100 percent saturation (zero air voids curve). The upper limit of 105 percent of specificed density is not defined in the specifications. It was arbitrarily chosen as an upper limit since engineers knowledgeable in soil compaction have observed that numbers greater than this give increasingly invalid comparisons between field test results and the specified laboratory test curve. Therefore, if all data points fall within the defined window there would be no reason to assume that they are wrong. However, when many data points fall outside the designated area there is something wrong with the information and then all data points become suspect. A review of all data indicates that about 25 percent of the cohesive soil test results fall within this area.

Figure 7B shows an area where field test results would be acceptable, in theory even though not in strict accordance with the specifications. Figure 7B was arrived at by expanding Figure 7a to include test results up to a compactive effort related to ASTM D 1557 (56, 255 ft.-lbs/ft.^{3}) which is considered to be a practical upper limit. About 40 percent of all cohesive soil test results would plot in this area.

6. Accuracy of Test Equipment

Almost all (over 95%) field density tests on cohesive soils were made using the Nuclear Density device. Specification 7220-C-210 section 12.4.2 page 42 indicates this to be acceptable for moisture content determination provided that the results are compatible with those obtained by ASTM D 2216. Similarly, section 12.4.4 says density determined by the nuclear device is acceptable when results are compatible with density as determined by ASTM D 1556.

In a letter from U. S. Testing to Bechtel (dated May 30, 1974), the average deviation of the nuclear device from oven-dry moistures was +.12% for a set of 30 tests. However, the standard deviation is 1.77% for the data with the range of differences being from - 3.2% to +3.9%. Thus, accuracy of the nuclear device is questionable, and could translate into errors of roughly ±4 pcf in the dry density calculation. (It should be noted that errors in the moisture content tend to shift the position of test results on a moisture density plot approximately parallel to the zero air voids curve, assuming the in-place wet density is correct, and thus do not explain the large number of points which plot outside this limit. See Figure 9).

Even with the range of possible error for nuclear-determined moisture values shown above, it appears that the controlling factor was selection of the appropriate laboratory test curve rather than the type of field test method used. In most cases where the test result plots outside the acceptable zone defined in section 5, the difference between nuclear and sand cone methods would not have made the test result acceptable had a sand cone method been used. Therefore, it must be concluded that the wrong laboratory compaction curve was used.

7. Relative Density Tests

Cases were noted where densities in material classified on the data sheet as zone 3 (sand) was compared to the maximum density in proctor type tests and other cases where densities in clay soils were compared to the maximum density in relative density tests. An error exists in the record in such cases either in the classification of the soil on the data sheet or in comparing field test results to inappropriate laboratory test data. In general, it appears that relative density tests were used in controlling density of sand fill.

ASTM D 2049 section 7.1.2 Wet Method states: "Note 2 - While the dry method is preferred from the standpoint of securing results in a shorter period of time, the highest maximum density is obtained for some soils in a saturated state. At the beginning of a laboratory test program, or when a radical change of materials occurs, the maximum density test should be performed on both wet and dry soil to determine which method results in the higher maximum densities, (in exeess of one percent) it shall be followed in succeeding tests." An example of wet and dry relative density is shown on Figure 10. U. S. Testing Company did not do this. As a consequence many field density test results exceed 100 percent of maximum dry laboratory relative density. As an example, for laboratory test RD55 a total of 566 field tests were made. Of this total, 364 tests showed greater than 100 percent compaction. The highest relative density found was 142.2 percent with the majority of tests over 100 percent falling in the range of 100 percent to about 130 percent. Since the difference in maximum density between wet and dry methods is about 4 to 5 lbs/cu. ft. (based on recent data) any test result greater than about 115 percent (based on the dry method) is suspect.

Even if the wet laboratory test method data were available for all sands, it appears an unacceptably high number of field test results would have greatly exceed 115 percent.

8. Summary

In summary, as discussed in section 5, about 25 percent of the field test results fall within an area that is defined by the specifications, soil mechanics experience, or are possible based on the compaction characteristics of soil. About 40 percent of all data points fall in an area considered possible for the given soil as defined by an obtainable compactive effort of 100 percent of ASTM D 1557. Refer to Figures 7A and 7B and Section 5 of the text for determination of the areas defined as acceptable.

Since more than one half of the test results for relative density and percent compaction fall outside the possible theoretical comparison limits, it must be concluded that these test results are suspect and should not be used alone for acceptance of plant area fill. Therefore, other means of testing have been established and employed for acceptance of the fill.

TABLE A

Listing of All Classifications Referenced in Plant Area Fill Soil Test Records Which were Used for 20 or More Field Density Tests

Classification	No. of Tests
B200	90
B251	31
B252	22
B254	42
B255	57
B260	68
B261	36
B262	165
B269	227
B270	226
B271	141
B274	37
B276	21
B277	158
B278	82
B297	22
R015	20
R016	61
R024	248
R030	54
R035	59
R038	39
R039	28
R040	35
R041	69
R042	103
R043	48
R044	71
R045	43
R049	63
R054	118
R055	566
R059	65
R061	589
R063	42
R065	59

Note: Spec. 7220-C-208 gives a ratio of approximately 20 field tests to each laboratory test.

TABLE B

Notes on Questionable Clearing of Failed Tests

1. Test number MD 245 fails due to high moisture. Cleared by MD 246 which references a proctor with higher optimum moisture content (OMC) such that the ±2% of optimum requirement is met.

2. MD 205 fails with moisture content 6% above the OMC. Cleared by MD 215, which references a relative density lab standard, and is itself still 6% away from the OMC of the proctor referenced by MD 205.

3. MD 223 fails because of high moisture. Cleared by MD 228 which has actually a higher moisture content and lower density, but references a different proctor; the retest passes and clears the failure.

4. Both MD 844 and 886 fail because of high moisture and low density. They are cleared by MD 888 which references a new proctor with lower maximum density and higher OMC than the first.

5. MD 251 fails due to moisture being too high. Cleared by MD 253 which uses a higher OMC proctor.

6. MD 668 clears MDR 634, but the two tests show no correspondence in location, moisture, density, or lab standard.

7. MD 771 failed, being too dry. Cleared by MD 782, which has almost identical moisture content and dry density but uses a new BMP with lower optimum moisture.

8. MD 2384 clears MD 2342, referencing a different proctor with an OMC which fits the in-situ conditions. However, the dry density of MD 2384 is way too high to fit the original soil classification, and in addition, it falls outside of the zero air voids curve for the classification which it has been changed to.

9. MD 556 clears MD 554 by using a BMP with lower moisture requirements. The field densities differ by 24 pcf and would seem to be different material.

10. MD 558 clears MD 555 but has too high a density to be the same soil as MD 555. It also uses a different proctor.

11. MD 566 and 568, classified as BMP 262 cohesive soils, are cleared by MD 569 which is classified as RD 33 and has totally different soil properties than the two failures.

12. MD 1317, 18, 19 and 20 fail and are all cleared by MD 1477 taken over 5 weeks later. There is poor correspondence in the soil properties and the proctor is different from failing to passing test.

13. MD 2965 clears MD 2963 with a different proctor through the test results would have been passing with the original BMP.

14. MD 1388, classified as BMP 278, is cleared by MD 1461, classified as RD 55.

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15. MD 170, classified as RD 24 is cleared by MD 173, classified as BMP 234.

16. MDR 287 fails with a relative density of 77%. Cleared by MDR 291 which has .1 pcf lower density but arbitrarily rounds up the relative density to 80%; it passes and clears the failure.

17. In all of the following field density tests on sand, the passing test has approximately the same or lower density than the failures, but references a lower maximum density RD lab standard:

MDR 343	clears	MDR 339
MDR 514	clears	MDR 507
MDR 513	clears	MDR 508
MDR 515	clears	MDR 509
MDR 516	clears	MDR 510
MDR 522A	clears	MDR 521
MDR 558	clears	MDR 556, 557
MDR 480	clears	MDR 473
MDR 555	clears	MDR 525, 527, 534
MDR 533	clears	MDR 526, 530, 531

18. MD 2384 clears MD 2342, but is at 7' lower elevation.

19. MD 123 clears MD 122, but is at 10.5' lower elevation.

20. MD 149 clears MD 142, but is at 10' higher elevation.

21. MD 1694 clears MD 1693 but is 43' away from the site of the first test.

22. MD 3114 clears MD 3102, but the two tests are 68' apart.

23. MD 186 clears MD 183 though it is 110' away.

24. MD 1209 clears MD 1207 and MD 1205, yet is 183 ft. away from the failures.

25. MD 1097, dated August 4, 1977, cleared by MD 1048 dated July 16, 1977.

Note: This table gives typical observations and is not meant to be all-inclusive.

TABLE C

Notes on Questionable Test Data

1. The first field density test to reference RD 24 (5/75) has a relative density of 170.6%. The standard continued to be used, however, with relative densities greater than 100% occuring repeatedly.

2. Similarly for RD 30, the first two tests (9/75) have 114% and 122% relative densities, yet the standard was used for 10 months, 54 tests, with 52% of the results over 100%.

3. During the first two weeks of use (7/76), RD 41 was referenced 22 times with 12 tests over 100% relative density (6 tests over 110% and 3 over 120%). The standard was used for 5 months, however, with over 40% of the results over 100%.

4. The first test using RD 55 (8/76) has a relative density of 119%, with the field test being made the same day as the standard and, thus, assumedly the same material. These results would throw doubt on the lab standard, yet it was used for two full years and 566 tests, with 64% of the results over 100% relative density.

5. Even high density structural backfill standards such as RD 61 (maximum density of 125.3 pcf), used 593 times. show over 25% of the tests having greater than 100% relative density.

6. The first seven tests referencing BMP 269 (scattered over a two month period around 7/76) all fall outside the zero air voids curve. This classification was used for 1 1/2 years, referenced 227 times.

7. The first two tests referencing BMP 270 (7/76) fall 6 pcf above the zero air voids curve. Continued use of this proctor for over 2 years resulted in 226 tests with 82 outside the theoretical maximum.

8. For the first month (4/77) all BMP 278 tests fell on or outside the zero air voids curve. For the next month, over half the tests did the same, or have greater than 105% compaction. The standard was used over half a year, with 43 out of a total of 62 tests outside the zero air voids curve.

Note: This table gives typical observations and is not meant to be all-inclusive.

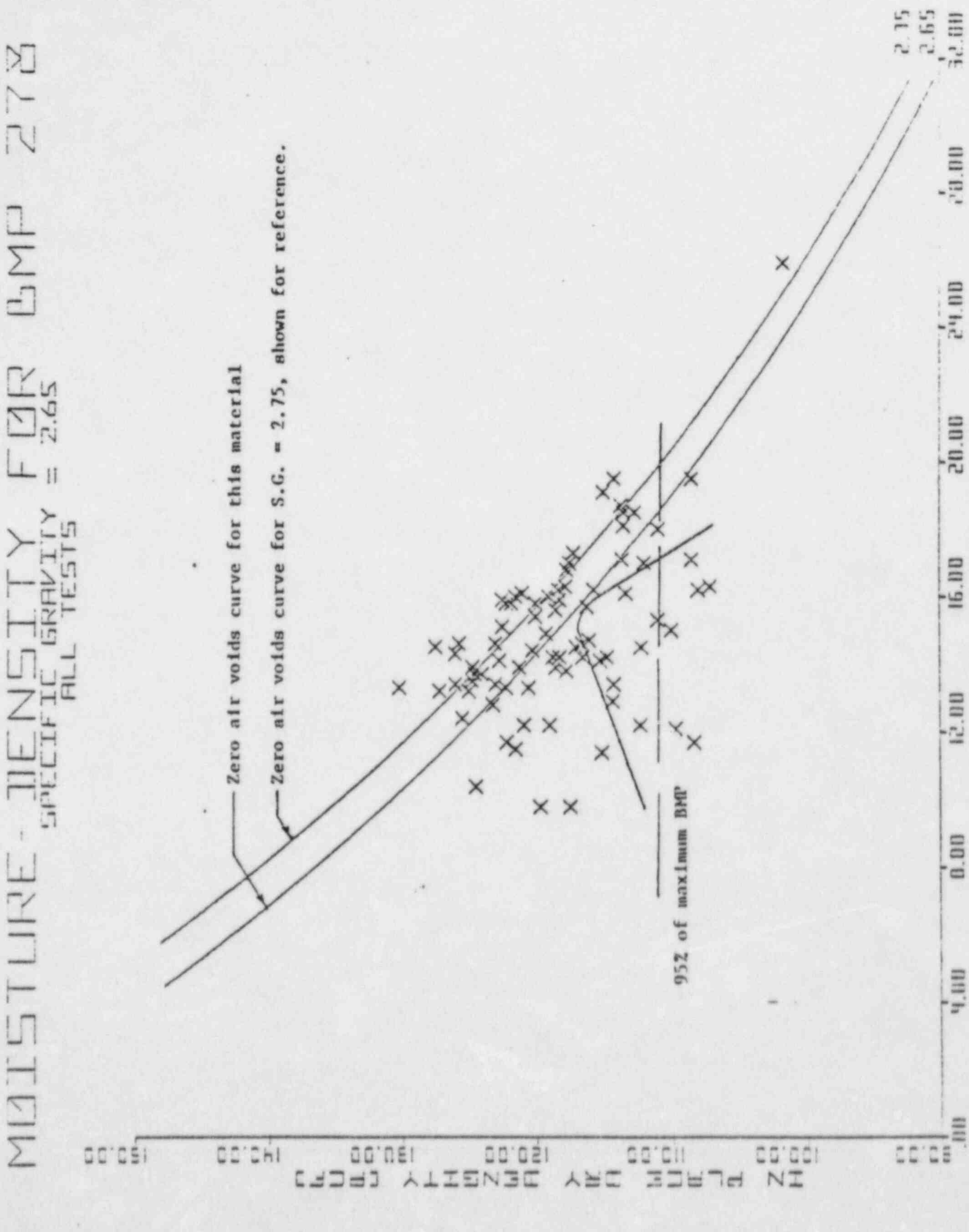


FIGURE 1

SB 01620

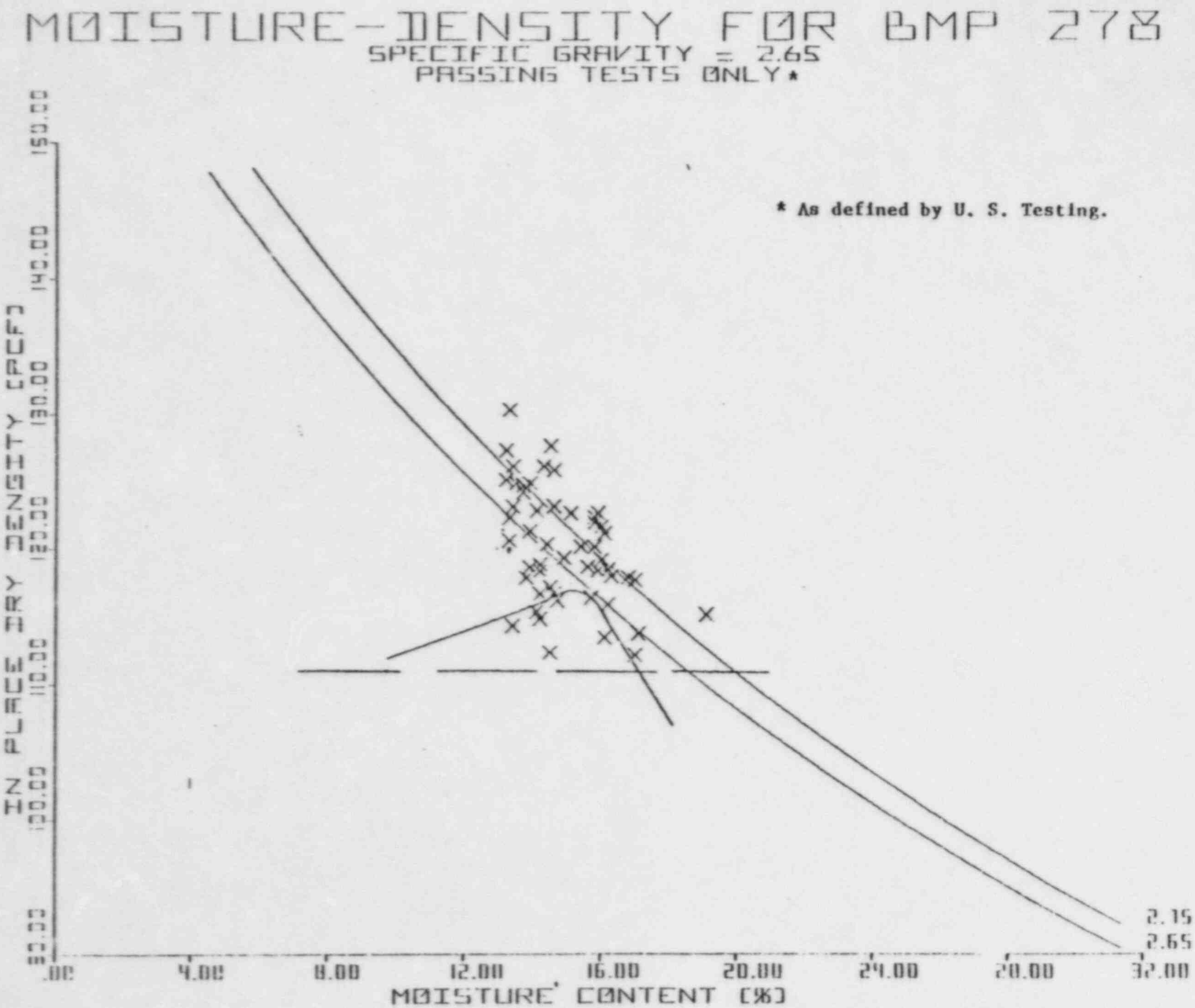


FIGURE 2

Sd 01621

MOISTURE-DENSITY FOR BMP 278

SPECIFIC GRAVITY = 2.65

NUCLEAR DENSOMETER TESTS

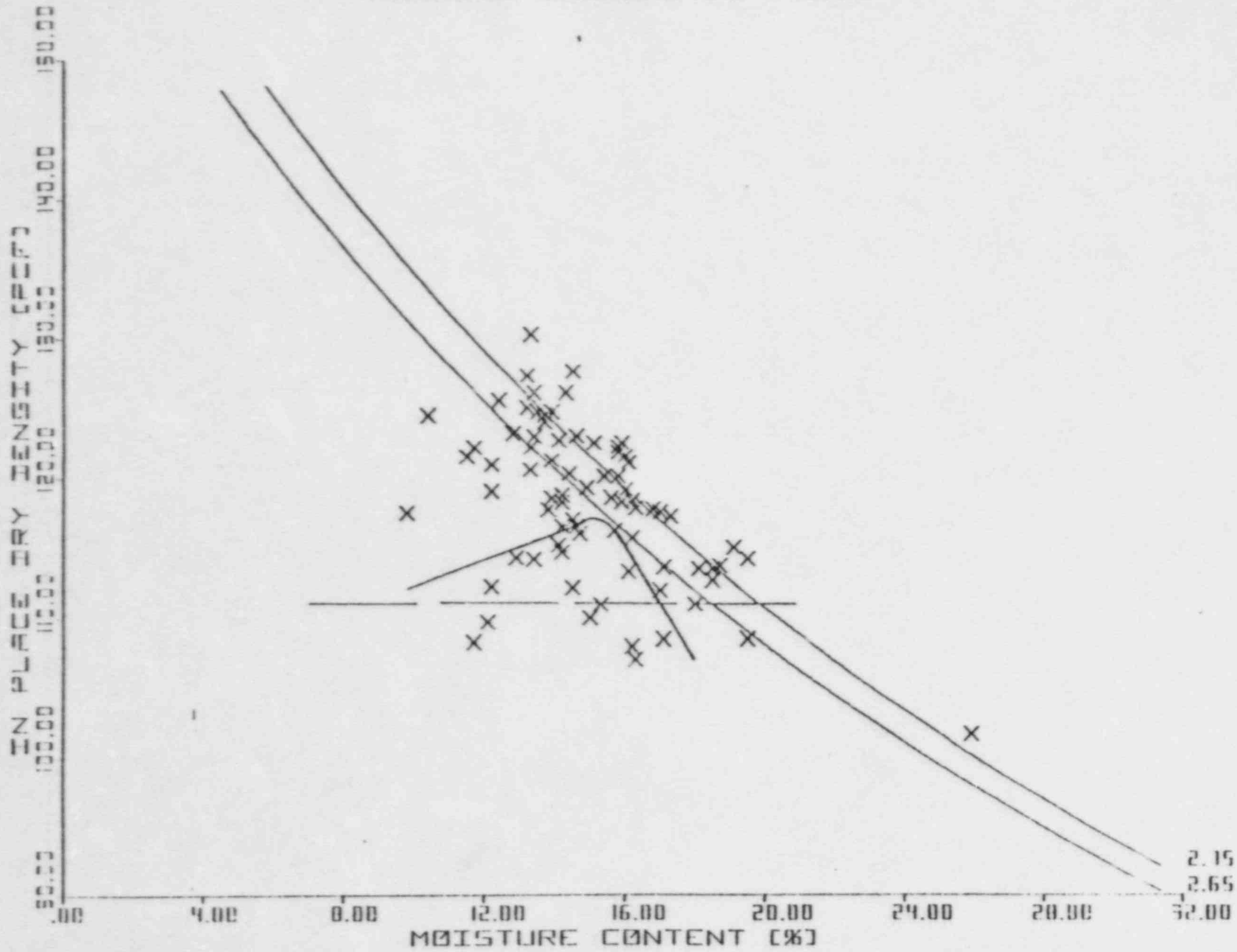


FIGURE 3

SB 01622

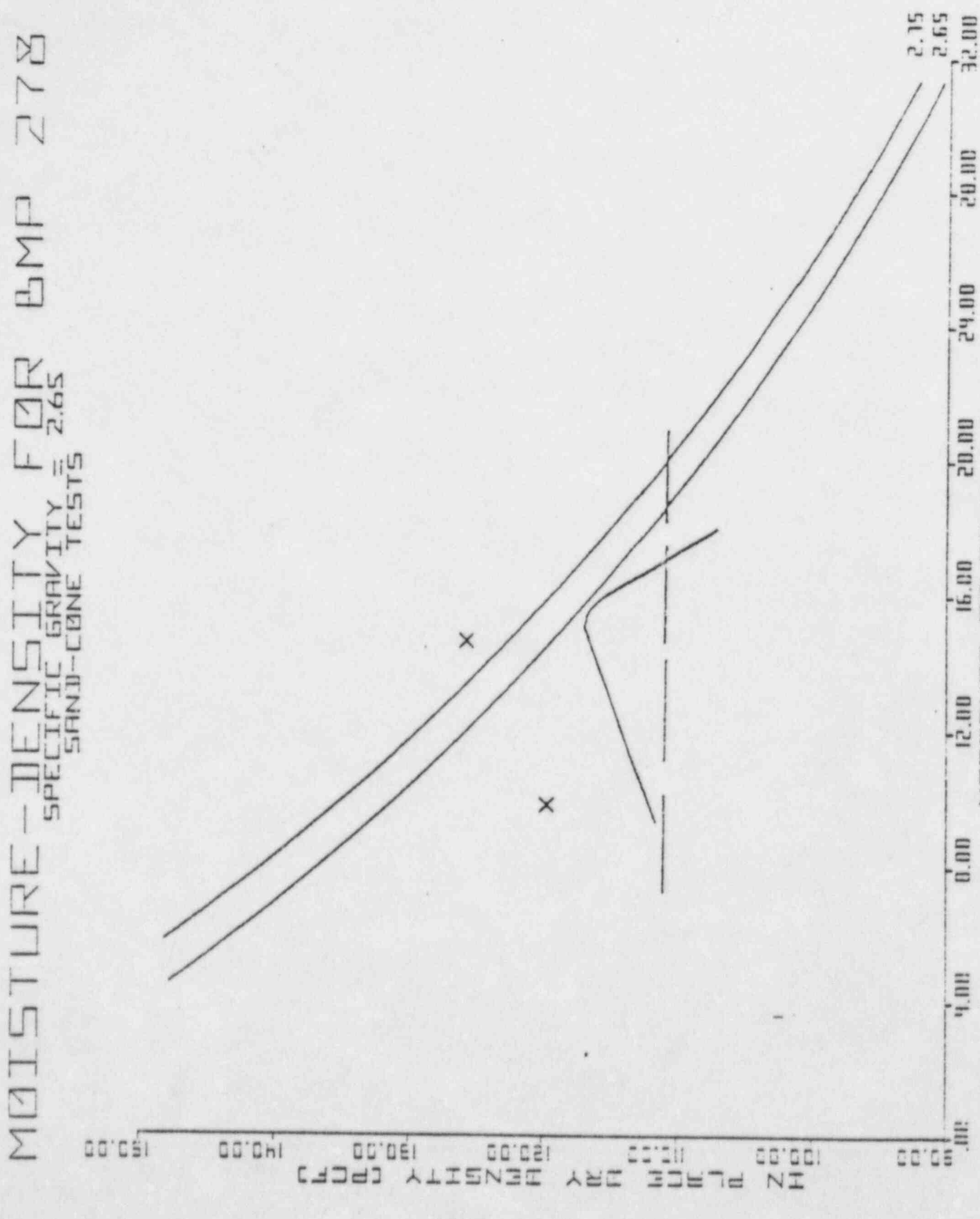


FIGURE 4

SB 01623

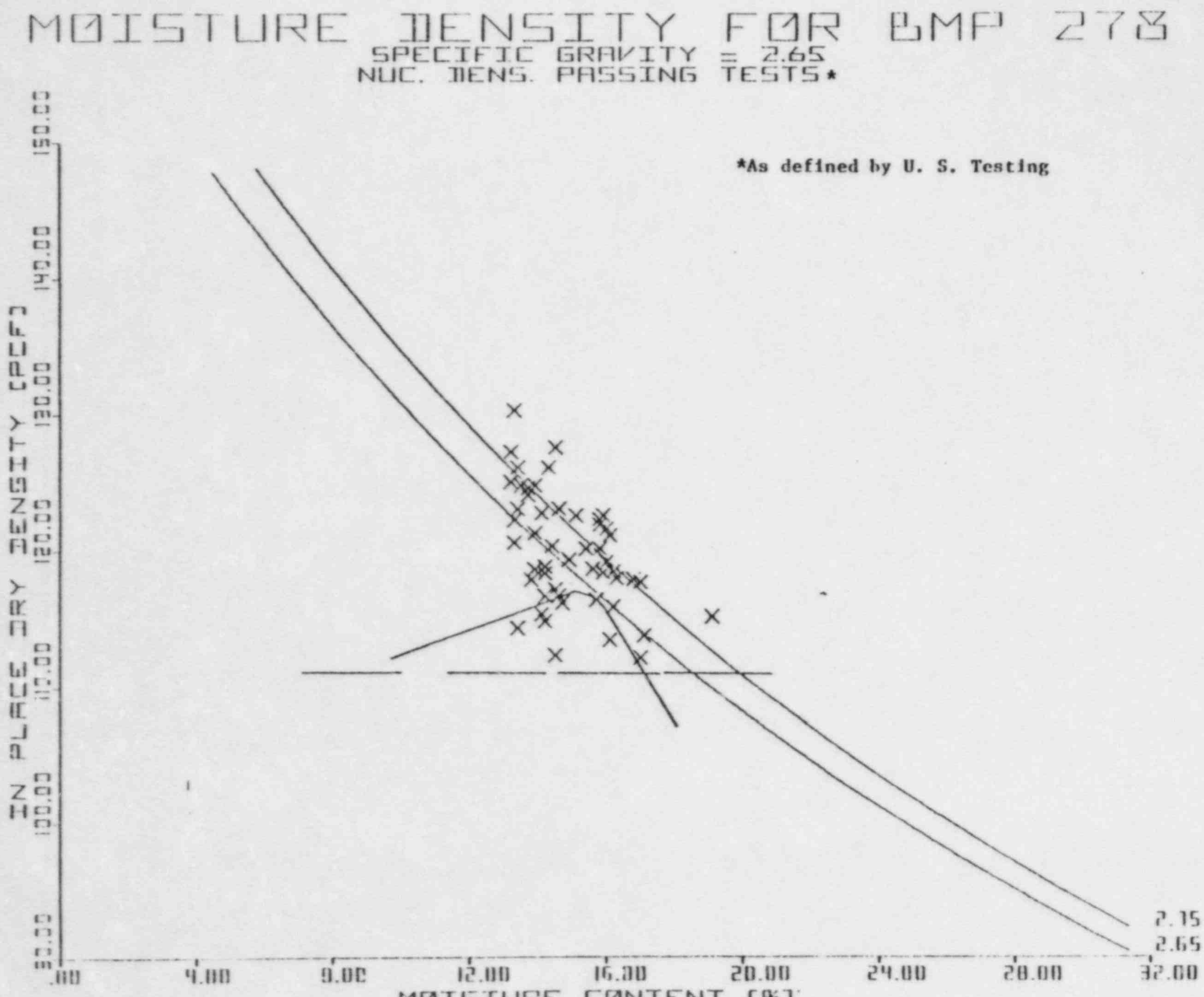


FIGURE 5

SB 01624

MOISTURE-DENSITY FOR BMP 278

SPECIFIC GRAVITY = 2.65

SAND-CONE PASSING TESTS *

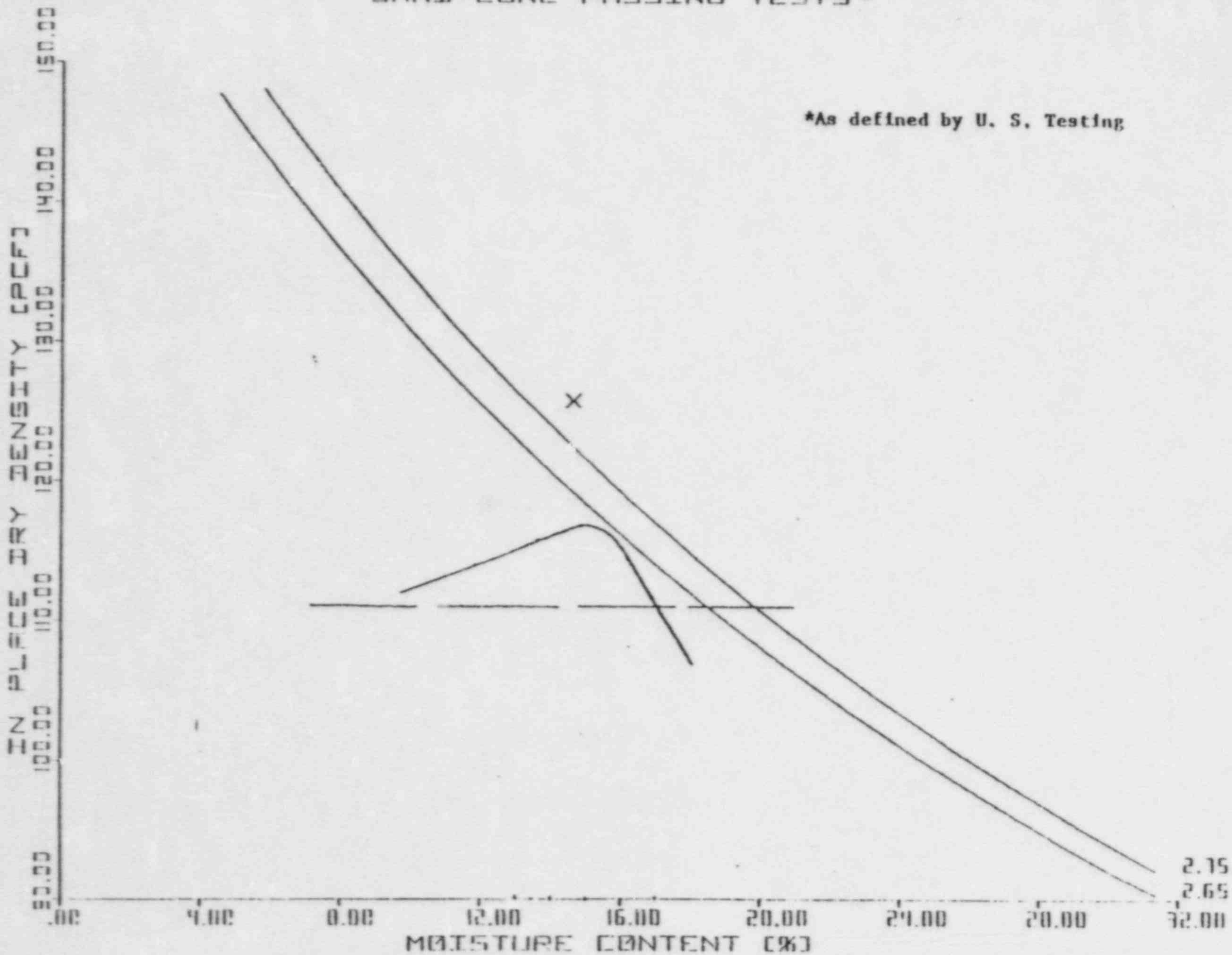


FIGURE 6

SB 01625

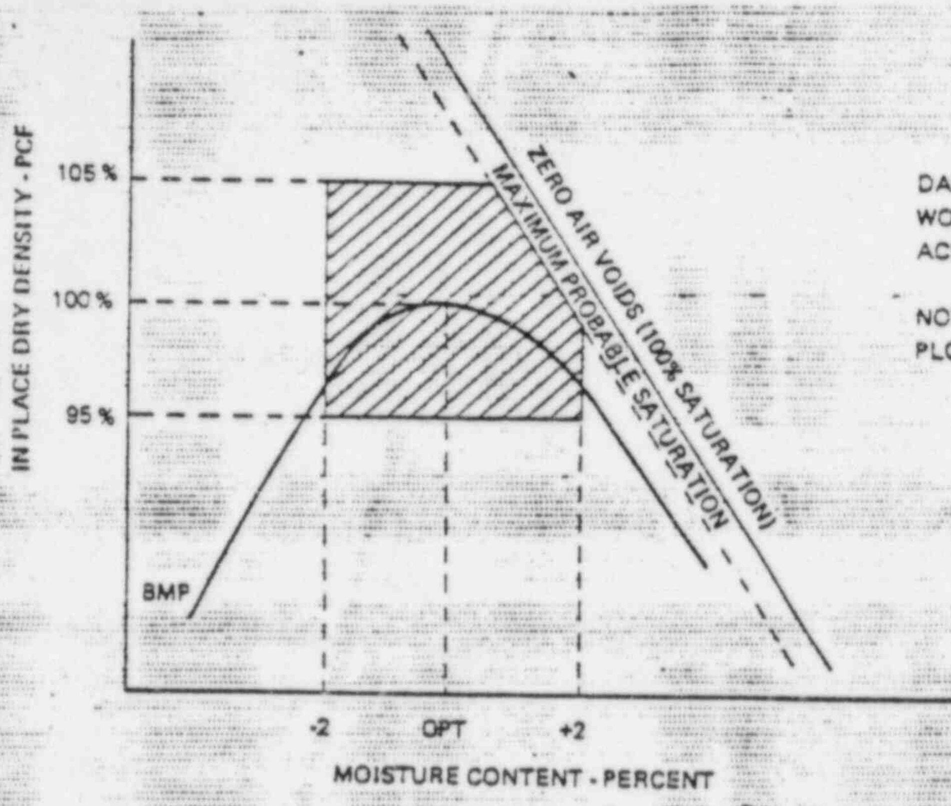


FIGURE 7-A-

DATA POINTS THAT PLOT IN SHADED AREA WOULD BE GENERALLY ACCEPTABLE ACCORDING TO SPECIFICATIONS

NOTE: ABOUT 25% OF ALL FIELD DATA PLOTS IN THE SHADED AREA

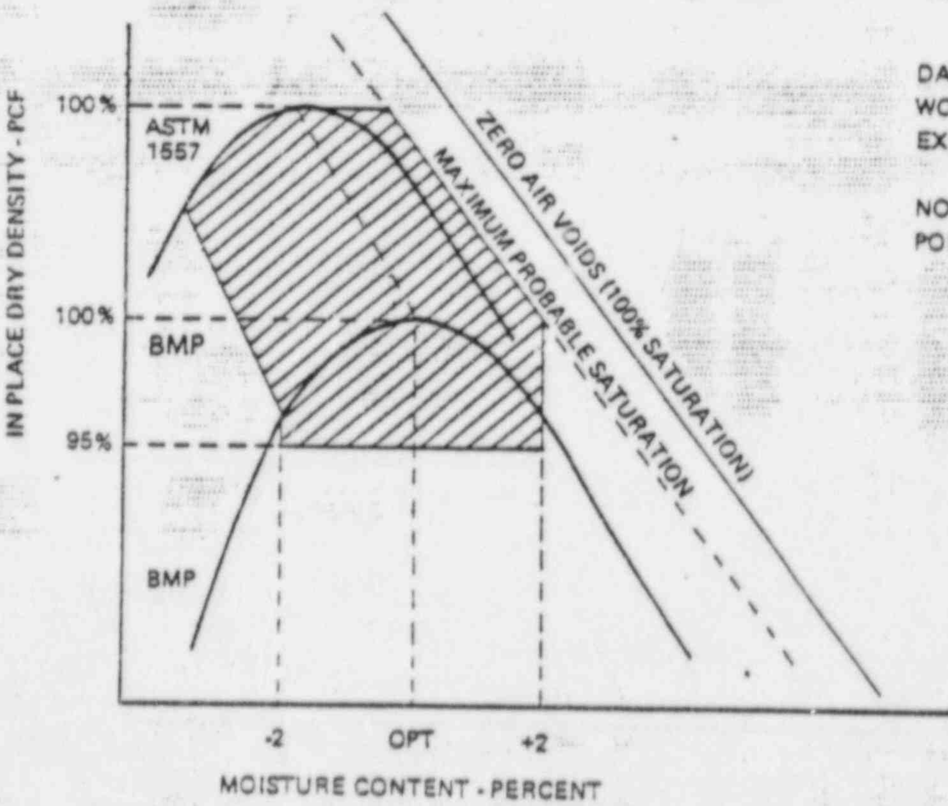


FIGURE 7-B-

DATA POINTS THAT PLOT IN SHADED AREA WOULD BE ACCEPTABLE REGARDLESS OF EXACT SPECIFICATION WORDING

NOTE: ABOUT 40% OF ALL FIELD DATA POINTS PLOT IN THE SHADED AREA

FIGURE 7: WINDOWS OF ACCEPTABILITY (A) BASED ON BMP SPECIFICATION (B) REGARDLESS OF EXACT WORDING OF SPECIFICATION

S8 01626

UNITED STATES TESTING CO., INC.
Graph Representation of Three
Proctor Method Comparisons

June 13, 1974

By: Peter Wang

Note: ( ) added by Bechtel

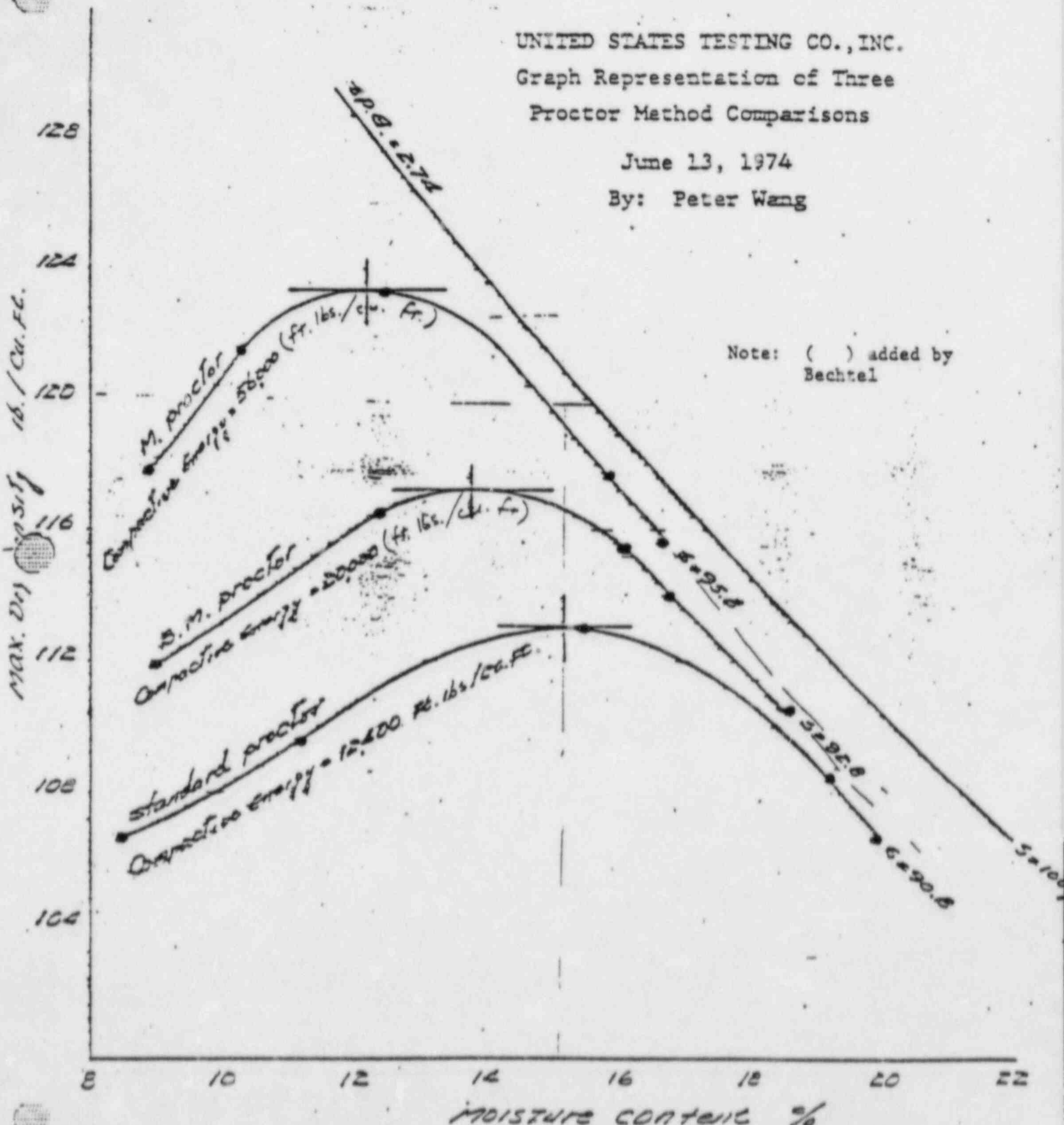


TABLE 8

S8 01627

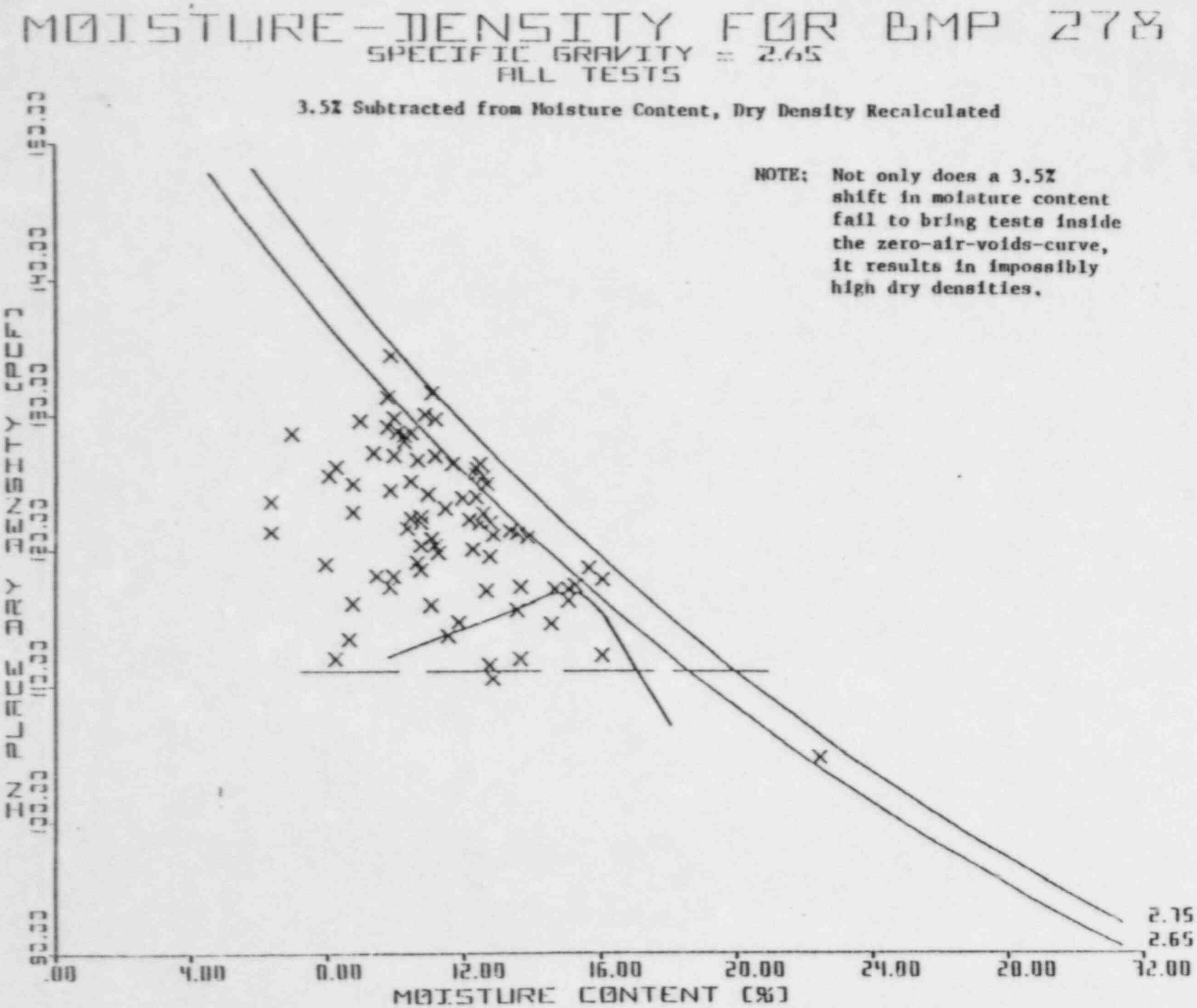
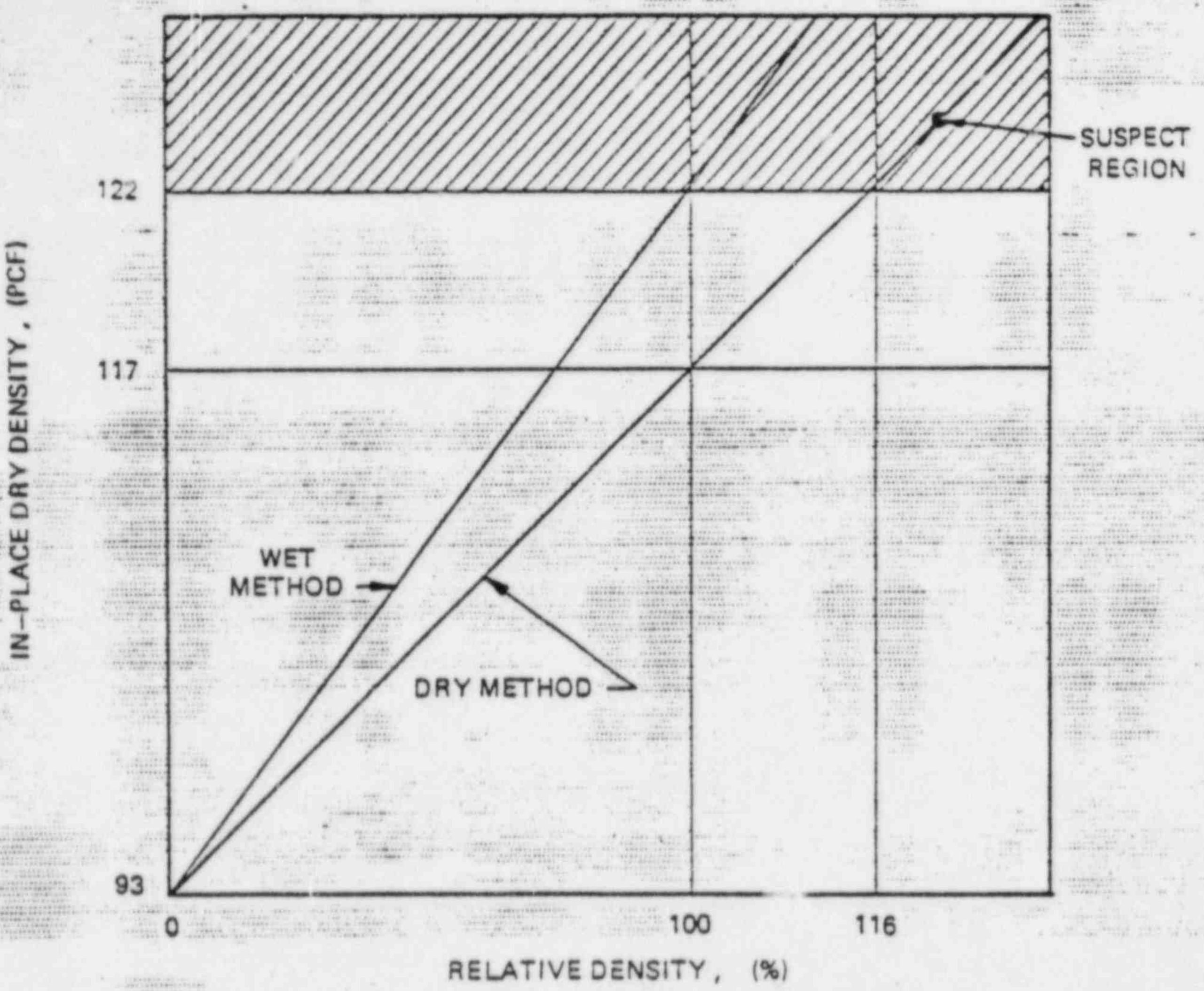


FIGURE 9

SR 01628



NOTE: VALUES FOR DRY DENSITY ARE TYPICAL OF A RANDOM FILL SAND. ANY TESTS SHOWING MORE THAN 117% RELATIVE DENSITY WOULD BE SUSPECT IN THIS EXAMPLE. STRUCTURAL SANDS TEND TO SHOW ONLY 2 OR 3 PCF INCREASE IN MAXIMUM DENSITY AND THUS RESULTS AT MUCH LOWER RELATIVE DENSITY WOULD BE SUSPECT, SAY 105 – 110 PERCENT

FIGURE 10
CHANGE IN RELATIVE DENSITY SCALE FROM DRY TO WET METHODS OF OBTAINING MAXIMUM DENSITY, BASED ON RECENT LAB RESULTS

SB 01629

B. Simanek

Received 6/1/79 from Midland QC copy given to Geotech 6/1/79 RFS

MEMO FROM

P. A. MARTINEZ

TO:

DATE 5-24

J. Milandin
R. Castleberry
J. Newgen (via C. Choy-Hee)
R. Simanek

Your comments, please, on this draft on May 25.

PAM/pp

SB 01630

CONFIDENTIAL

DRAFT

REVIEW OF U. S. TESTING

FIELD AND LABORATORY CONSTRUCTION

TEST DATA ON SOILS USED AS FILL

This review of the quality control tests of the earth fill at the Midland site was made as a result of settlement of the diesel generator building in excess of that predicted. Soil samples obtained in borings indicated that soil conditions beneath the structures are not compatible with the quality of fill indicated by the control tests made by U. S. Testing Company. All fill was accepted as it was being placed based on the results of the field tests performed by U. S. Testing Company.

The review showed a large number of discrepancies in the test results as outlined in the following paragraphs. Review comments are based on the technical specifications and subcontract documents agreed to by U. S. Testing Company. The ability of the personnel to do the testing work was judged on the basis of personnel resumes and previous documented work experience of U. S. Testing Company.

1. Overuse of Laboratory Test Compaction Curves.

Table 9-1 of specification 7220-C-208, Page 14B required one field density and moisture content test be taken for each 500 cubic yards of fill placed. It also required one compaction, grain size, and specific gravity for each 10,000 cubic yards of material. This gives a ratio of 20 field density tests to 1 laboratory compaction test. The actual ratio ranged from this as shown in Table A attached. In fact, some of the laboratory compaction tests were used to determine percent compaction for serveral hundred field density tests taken over a period exceeding two years. Even though no time requirements

The possibity exists that soil was removed after failure and different type of material replaced

for the period of use of laboratory tests are [illegible] fied, it is unlikely that any borrow source in this area would be of such uni[illegible]rm character that such extended use of a compaction curve, truly represen[illegible] [illegible]e of a large quantity of material, would be applicable. Listed below are selected laboratory test data results indicating the wide range of soil properties that were encountered.

TEST	MIN DENSITY Lbs/FT³	MAX. DENSITY (Lbs/FT³).	OPT. MOISTURE (PERCENT)
BMP* B 269		127.3	10.0
BMP B 278		117.0	15.2
BMP B 279		140.8	5.7
** RD 24	100.9	119.2	
RD 55	90.2	109.7	
RD 61	109.3	125.3	

*BMP B refers to proctor type
** RD refers to relative density run by dry method.

2. Questionable Retests.

A field test that fails to meet standards dictated by the selected laboratory test data must normally be cleared by another field test made in the same area after corrective action has been taken. In the procedure adopted by U. S. Testing Company this test result would then be compared to the appropriate laboratory compaction curve. In some cases the clearing of a failed density test was resolved by using another laboratory compaction curve with lower maximum density so that the apparent percent compaction was increa ed sufficient to meet the requirements of the specification. In other cases tests labeled "failed" were incorrectly "cleared" related to the same laboratory test. An example of this is shown on Table B attached. As shown on Table B test No. 372 failed at 69.5 percent compaction. A note on Test 376 indicates that it was used to clear test 372. However, Test 376 gives a lower percent compaction than did test 372. It should also be noted that test results for Test 376 contain arithmetical errors which, in fact, gives about 56 percent compaction

Location for TEST 376 was retested by Test 383

SB 01632

Field personnel gave loca and prepared test areas for retests, Not U.S.T's responsibility.

rather than 38.3 which is still unacceptable.

Com- using data available on QCF2

In some cases, retests to clear a "failed" test were taken in the same area or at the approximate same elevation. Many retests were over 20 feet from the failed test location and some were over 200 feet from the original test location. In general, if after a failing test, the whole area is reworked, the retest location is not too critical assuming that the correct laboratory curve is used for comparison. However, in this area, work areas were relatively small, and soil characteristics and properties showed considerable variation necessitating retest in the immediate vicinity of the failing test. Retests should be taken in the same lift or soil layer that had previously failed. In some cases retests were taken at elevation differences up to 10 feet from the failed test.

Table C is a compilation of notes relative to questionable clearing of failed tests.

It is a probability that there were errors in recording dates for ~~xxxxxx~~ testing or retesting since some retests were dated three weeks prior to the time the original test failed. Some failing tests were marked as "NON Q and never cleared by a passing test.

3. <u>Test Results Plot Above Zero-Air-Voids ~~line~~ Curve on Compaction Data Plots</u>.

Soils cannot be more than 100 percent saturated; therefore, all field test data points, when plotted as dry density versus moisture content, must be below the zero air voids curve as defined by the specific gravity of the material. There are numerous cases in the U. S. Testing Company data where points plot above the zero air voids curve. Figure 1 attached shows a typical laboratory compaction test curve with field test results plotted on it. Many of the field test results plotted above the zero air voids curve, Provided the specific gravity is correct this is not possible so that all such points must represent erroneous data. The fact that a large number of test results plot above the zero air

SB 01633

F.E. to talk to Tried!

currently running comparisons of troxler vs sand cone. Preliminary results show troxler reading 3% h...

if this 3% proves true very few if any tests will plot right of the zero air voids line

SB 01634

voids curve tends to make all test results que: able.

Also referring to figure 1 it would appear that so: ' ensity varied widely or that compactive effort varied widely. Specifications called for compactive effort results as defined by ASTM D 1557 which is slightly over 56,000 ft-lb/f energy. This was modified to a laboratory test compactive effort of about 20,0 ft-lbs/ft^3 energy, ~~hereafter~~ often referred to as Bechtel Modified Proctor (BMP). Laboratory compaction test curves should be related to the same effort as that called for in the field for use in comparing with field density tests. According to plots of field data shown on Figure 1, density varied from about 108 lbs/ft^3 to about 130 lbs/ft^3. It is doubtful that the soil classification or other properties would be similar for such a wide variation in density. It is noted that 100 percent of modified Proctor (ASTM D 1557) which is difficult to obtain, is rated at slightly over 56,000 ft-lbs/ft^3 energy. The curve plotted on Figure 1 is at about 20,000 ft-lbs/ft^3 energy. For comparative purposes it was determined by ~~Bechtel~~ U.S. Testing in 1974 that 100 percent of specified effort (20,000 ft-lbs/ft^3) is approximately equal to ~~94~~ 95 percent of the maximum density as determined by ASTM D-1557 (56,255 ft-lbs/ft^3). Ref. Fig. This means that a density up to ~~6~~ 5 percent greater (dry density of ~~124.5~~ 123.2 lbs/ft^3) than that specified (dry density of 117.0 lbs/ft^3) could be possible. However, some points shown on Figure 1 give~~s~~ an apparent density up to 11 percent above that specified. They are assuming that not more than 56,000 ft.lbs/ft^3 of energy was exerted.

There were a significant number of arithmetic errors on calculation sheets even through there are signatures on the sheets indicating they had been checked. Over 100 ~~errors~~ errors were found in calculations of relative density, ~~from~~ from 9/15/75 thru 12/78. We would like the test numbers of these errors to check them out.

SB 01635

4. Reported use of Questionable Laboratory T[illegible] ata.

Some laboratory compaction test data were used repeatedly even though they continued to show suspect field test results. Thi could be indicative of questionable laboratory data or the fact that soil was not being placed or compacted according to specifications. At any rate there should have been cause for concern. Subcontract 7220-C-208 Exhibit C, page 17 of 47, No. 2 states "You (U. S. Testing) are to immediately report data that indicates material that does not comply to specifications or procedures."

Table D is a compilation of notes relative to questionable test data.

5. Limits of Accuracy and Acceptibility for Test Data.

Figures ~~2~~ 1 through 7 attached will be referenced in ussing limits of accuracy or acceptability for field test results as compared to aboratory test data. This is ~~test number~~ BMP 278 which is reasonably representat e of all test results.

Specified laboratory compactive effort was 20,000 ft-lbs/ft^3 and field compaction effort was originally specified at about 56,000 ft-lbs/ft^3 but was changed by Revision 5, dated 7/8/75, specification 7220-C-210, Section 13.7, Page 57 to also be euqal to about 20,000 ft-lbs/ft^3.

The specified 20,000 ft-lbs/ft^3 effort establishes a compaction curve relating moisture and density for a ~~speicif~~ specific soils. Moisture was specified for field placed fill to be within $\pm$2 percent of optimum moisture as determined by this effort. Density was specified to be greater than 95 percent of the maximum density. Once field compaction is such that the fill density is significatly higher than about 105 percent of maximum, the specified tolerance from optimum moisture content in the laboratory compaction test may no longer be applicable for field control. As compactive effort is increased, maximum density will be increased and optimum moisutre content will decrease in the laboratory test. This change can only occur in the field to the extent that the field moisture content will permit it. Therefore, to benefit from the increased compactive effort the field moisture content must be lowered. As this indicates, the location of the compaction curve changes with a corresponding change in range of acceptable moisture content relative to optimum. A $\div$2 percent numerical value of moisture content acceptable at the specified compactive effort would be too wet at a higher effort indicating that higher densities for that soil cannot be achieved. Therefore, if the record shows high densities for such material the data ~~re~~ are in error. This was ~~apparently~~ apparently overlooked by U. S. Testing Company. Plots of field data for compaction test BMP278 are shown

See note at further comparisons

SB 01637

on figures ~~2~~ through 6. The title of each figure gives the assumptions made in plotting data for that figure. In comparing es 3 and 4 it is seen that a majority of field tests were made using the nuclear device. The two test results shown on figure 4 for the sand cone meth indicates one test result on each side of the zero air voids curve. Ironically, the one falling above the zero air voids curve (shown on figure 4) is designated as the only passing sand cone test (shown on figure 6) - by U-S Testing Company.

Plotting zero air voids was never part of soils program

For a field test result to be classified as "Passing" it must fall within a well defined area on the plot containing the laboratory compaction curve. This area or window of acceptability is shown for a hypothetical compaction curve on figure 7a that would meet requirements of Specification 7220-C-210. It is defined by horizontal lines at 95 percent and 105 percent of specified density, vertical lines through ±2 percent of optimum moisture content, and a line parallel to the zero air voids line indicating saturation about half way between the compaction curve and 100 percent saturation (zero air voids curve). If all data points fall within this area there would be no reason to assume that they are wrong. However, when many data points fall outside the designated area there is something wrong with the information and then all data points become suspect. A review of all data indicates that only about 25 percent of the (cohesive soil) test results fall within this area.

?

Figure 7b shows an area where field test results would be acceptable even though not in strict accordance with the specifications. Figure 7b was arrived at by expanding figure 7a to include test results up to a compactive effort related to ASTM D 1557 (56, 255 ft.-lbs./ft.^{3}) which is considered to be a practical upper limit. About 40 percent of all field test results would plot in this area.

SB 01638

6. Accuracy of Test Equipment.

Almost all field density tests on cohesive soils were made using the Nuclear Density device. Specification 7220-C-210 section 12.4.2 page 42 indicates this to be acceptable for moisture content determination provided that the results are compatible with those obtained by ASTM D 2216. Similarly section 12.4.4 says density determined by the nuclear device is acceptable when results are compatible with density as determined by ASTM D 1556.

In many cases such a correlation was not made. There are many laboratory compaction curves used where only data from the nuclear device was used for field control.

Comparison Data was performed by U.S.T. and Project gave permission for the use of the Troxler. We do agree that possibly the results yielded by the troxler were not compatible with those obtained by A.S.T.M D 2216.

Probably wrong zone on test report

7. Relative Density Tests.

Cases were noted where densities in material c fied on the data sheet as zone 3 (sand) was compared to the maximum density in proctor type tests and other cases where densities in clay soils were comp ed to the maximum density in relative density tests. An error exists in such cases in the record either in the classification of the soil on the data sheet or in comparing field test results to the inappropriate laboratory test data. In general, it appears that relative density tests were used in determining density of sand fill.

My first month here I ran these comparisons and the dry method yielded higher results (about 2/76) I was told this had been done prior to my request but could not find paperwork.

ASTM D 2049 section 7.1.2 Wet Method states: "Note 2 - While the dry method is preferred from the standpoint of securing results in a shorter period of time, the highest maximum density is obtained for some soils in a saturated state. At the beginning of a laboratory test program, or when a radical change of materials occurs, the maximum density test should be performed on both wet and dry soil to determine which method results in the higher maximum density. If the wet method produces higher maximum densities, (in excess of one percent) it shall be followed in succeeding tests." U. S. Testing Company did not do this. As a consequence many field density test results exceeded 100 percent of maximum dry laboratory relative density. As an example, for laboratory test ~~R55~~ RD55 a total of 566 field tests were made. Of this total, 364 tests showed greater than 100 percent compaction. The highest density ~~recorded~~ found was 211.2 percent (erroneously recorded by U.S. Testing as 119) with the majority of tests over 100 percent falling in the range of 100 percent to about 130 percent.

Even by using the wet laboratory test method an unacceptably high number of field test results would have greatly exceeded 100 percent. This assumes that the wet test method would increase maximum relative density by 4 or 5 percent which appears reasonable based on some recent wet test results run on comparable material.

SB 01640

7. Conclusions.

In summary, only about 25 percent of the field test results fall within an area that is defined by the specifications and is possible based on the compaction characteristics of soil. About 40 percent of all data points fall in an area considered possible for the given soil as defined by an obtainable compactive effort of 100 percent of ASTM D 1557. Refer to figures 7a and 7b for determination of the areas defined as acceptable.

Since no reliable conclusions can be drawn to clearly define reliable data from unreliable data, all points must be considered suspect and, thus, all of the soils testing data points determined by U. S. Testing Company should be discarded as totally unreliable.

JA/cf

TABLE A

****

LISTING OF ALL CLASSIFICATIONS REFERENCED IN PLANT AREA FILL SOIL TEST RECORDS WHICH WERE USED FOR 20 OR MORE FIELD DENSITY TESTS

****

CLASSIFICATION	NO. OF TESTS
B200	90
B251	31
B252	22
B254	42
B255	57
B260	68
B261	36
B262	165
B269	227
B270	226
B271	141
B274	37
B276	21
B277	158
B278	82
B297	22
R015	20
R016	61
R024	248
R030	54
R035	59
R038	39
R039	28
R040	35
R041	69
R042	103
R043	48
R044	71
R045	43
R049	63
R054	118
R055	566

NOTE: Spec. 7220-C-208 gives a ratio of 20 field tests to each laboratory test.

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COUNT OF CLASSIFICATIONS AND TESTS .CONT...

CLASSIFICATION	NO. OF TESTS
R059	65
R061	589
R063	42
R065	59

SB 01643

QC ACCEPT. ... DA
3 ... C-2 ...
CONTROL NO. FILE

COMPACTED FILL DENSI... TEST REPORT
*CORRECTED COPY

1. PROJECT NO. 7220 2. DATE 6-18-76 PAGE 1 OF 1

4. SPEC. NO. 7220-C-208 6. Structural 8. TESTED WEEK OF

7. DATE TAKEN	8. TEST NO. MDR	9. TESTED BY	10. LOCATION	11. ELEV. OF TEST	12. DEPTH BELOW FINAL GRADE (FT.)	13. IN PLACE WET DENSITY (LB./C.F.)	14. MOISTURE CONTENT (%)	15. IN PLACE DRY DENSITY (LB./C.F.)	16. SOIL CLASSIFICATION RD	OMC	Zone	17. MAX. LAB. DRY DENSITY (LB./C.F.)	18. PERCENT COMPACTION	19. REMARKS
6-17-76	372	RS	36'W.of 7.4 30"N.of A	617	0 -	131.5	8.9	120.8	44	N/A	N/A	26.0 / 110.4	69.5	Failed
	373		12'E.of 4.55 5'W.of Aa	610	0 -	138.4	9.4	126.5					102.8	Pass
	374		5'W.of 4.55 3'N.of Aa	611	0 -	132.3	9.1	121.3					72.6	Failed
	375		14'S.of A 30"W.of 4.55	603	.0 -	133.3	7.6	123.8					87.4	Pass
	376		33'W. of 7.4 30"N.of A	617	0 -	125.7	8.5	115.9				???	38.3	Pass *Clears 372
	377		3'N.of Aa 3'W.of 4.55	611	0 -	135.7	8.4	125.2					95.5	Pass *Clears 374 37

* Location changed! 372, 375, 376 from 30' to 30" to read correctly.

*Added tests that were cleared

SB 01644

7-6-76
6-23-76
7/7/76
6/24/76

UST Jul-78

TABLE C

1. Test number MD 245 fails due to high moisture. ared by MD 246 which references a proctor with higher optimum moisture content (OMC) so that the ±2% of optimum requirement can be met.

Possibly removed and differen
Material used to rework

2. MD 205 fails with moisture content 6% above the OMC. Cleared by MD 215, which references a relative density lab standard, and is itself still 6% away from the OMC of the proctor referenced by MD 205.

probably removed
and backfilled fai
area with sa

3. MD 223 fails because of high moisture. Cleared by MD 228 which has actually a higher moisture content and lower density, but references a different proctor so that the retest passes and clears the failure.

Possibly re
and different
material u
in rew

4. Both MD 844 and 886 fail because of high moisture and low density. They are cleared by MD 888 which references a new proctor with lower maximum density and higher OMC than the first.

5. MD 251 fails due to mositure being too high. Cleared by MD 253 which uses a higher OMC proctor.

6. MD 668 clears MD 634, but the two tests show no correspondence in location, elevation, moisture, density, or lab standard.

same

within 30'

7. MD 771 failed, being too dry. Cleared by MD 782, which has almost identical moisture content and dry density but uses a new BMP with lower optimum moisture.

SB 01645

8. MD 2384 clears MD 2342 by referencing a differ proctor with an OMC which will fit the in-situ conditions. However, the dry density of MD 2384 is way too high to fit the original soil classificatio. and in addition, it falls outside of the zero air voids curve for the classification which it has been changed to. Differ Materi Possi

9. MD 556 clears MD 554 by using a BMP with lower moisture requirements. The field densities differ by 24 pcf and would seem to be different material. Same Rema (S

10. MD 558 clears MD 555 but has too high a density to be the same soil as MD 555. It also uses a different proctor. SR

11. MD 566 and 568, cohesive soils, are cleared by MD 569 which is classified as RD 33 and has totally different soil properties than the two failures. SR

12. MD 1317, 18, 19 and 20 fail and are all cleared by MD 1477. There is poor correspondence in the soil properties and the proctor is different from failing to passing test. SR

13. MD 2965 clears MD 2963 with a different proctor though the test results would have been passing with the original BMP. SR

14. MD 1388, classified as BMP 278, is cleared by MD 1461, classified as RD 55. SR

15. MD 170, classified as RD 24 is cleared by MD 173, classified as BMP 234. SR

16. MD 287 fails with a relative density of 77%. Cleared by MD 291 which

SB 01646

has .1 pcf lower density but arbitrarily rounds up the relative density to 80% in order to pass and clear the failure. SR

17. In all of the following field density tests on sand, the passing test has approximately the same or lower density thatn the failures, but references a lower maximum density RD lab standard:

SR

MDR 343	clears	MDR 339
MDR 514	clears	MDR 507
MDR 513	clears	MDR 508
MDR 515	clears	MDR 509
MDR 516	clears	MDR 510
MDR 522A	clears	MDR 521
MDR 558	clears	MDR 556, 557
MDR 480	clears	MDR 473
MDR 555	clears	MDR 525, 527, 534
MDR 533	clears	MDR 526, 530, 531

18. MD 2384 clears MD 2342, but is at 7' lower elevation.

19. MDR 123 clears MDR 122, but is at 10.5' lower elevation.

20. MDR 149 clears MDR 142 but is at 10' higher elevation.

21. MD 1694 clears MD 1693 but is 43' away from the site of the first test.

22. MD 3114 cleats MD 3102, but the two tests are 68' apart.

Was field Responsibility

SB 01647

23. MDR 186 clears MDR 183 though it is 110' away.

24. MDR 1267 clears MDR 1266 yet is 21_' away from th failure (as best as can be determined by the trst site descriptions given in the test reports).

TABLE D

1. The first field density test to reference RD 24 has a relative density of 170.6%. The standard continued to be used, however, with relative densities greater than 100% occuring repeatedly.

2. Similarly for RD 30, the first two tests have 114% and 122% relative densities, yet the standard was used for 10 months, 54 tests, with 52% of the results over 100%.

3. During the first two weeks of use, RD 41 was referenced 22 times with 12 tests over 100% relative denisty (6 tests over 110% and 3 over 120%). The standard was used for 5 months, however, with over 40% of the results over 100%.

4. The first test using RD 55 has a relative density of 119%, with the field test being made the same day as the standard and thus assumedly the same material. These results would throw doubt on the lab standard, yet it was used for two full years and 566 tests, with 64% of the results over 100% relative density and in one case over 200%.

5. Even high density structural backfill standards such as RD 61 (maximum density of 125.3 pcf), used 593 times, show over 25% of the tests having greater than 100% relative density.

6. The first seven tests referencing BMP 269 (scattered over a two month period) <u>all</u> fall outside the zero air voids curve. This classification was used for 1 1/2 years, referenced 227 times.

SB 01649

7. The first two tests referencing BMP 270 fall [illegible] above the zero air voids curve. Continued use of this proctor for over 2 years resulted in 226 tests with 82 outside the theoretical maximum.

8. For the first month (4/77) all BMP 278 tests fell on or outside the zero air voids curve. For the next month, over half the tests did the same, or have greater than 105% compaction. The standard was used over half a year, with 43 out of a total of 82 tests outside the zero air voids curve.

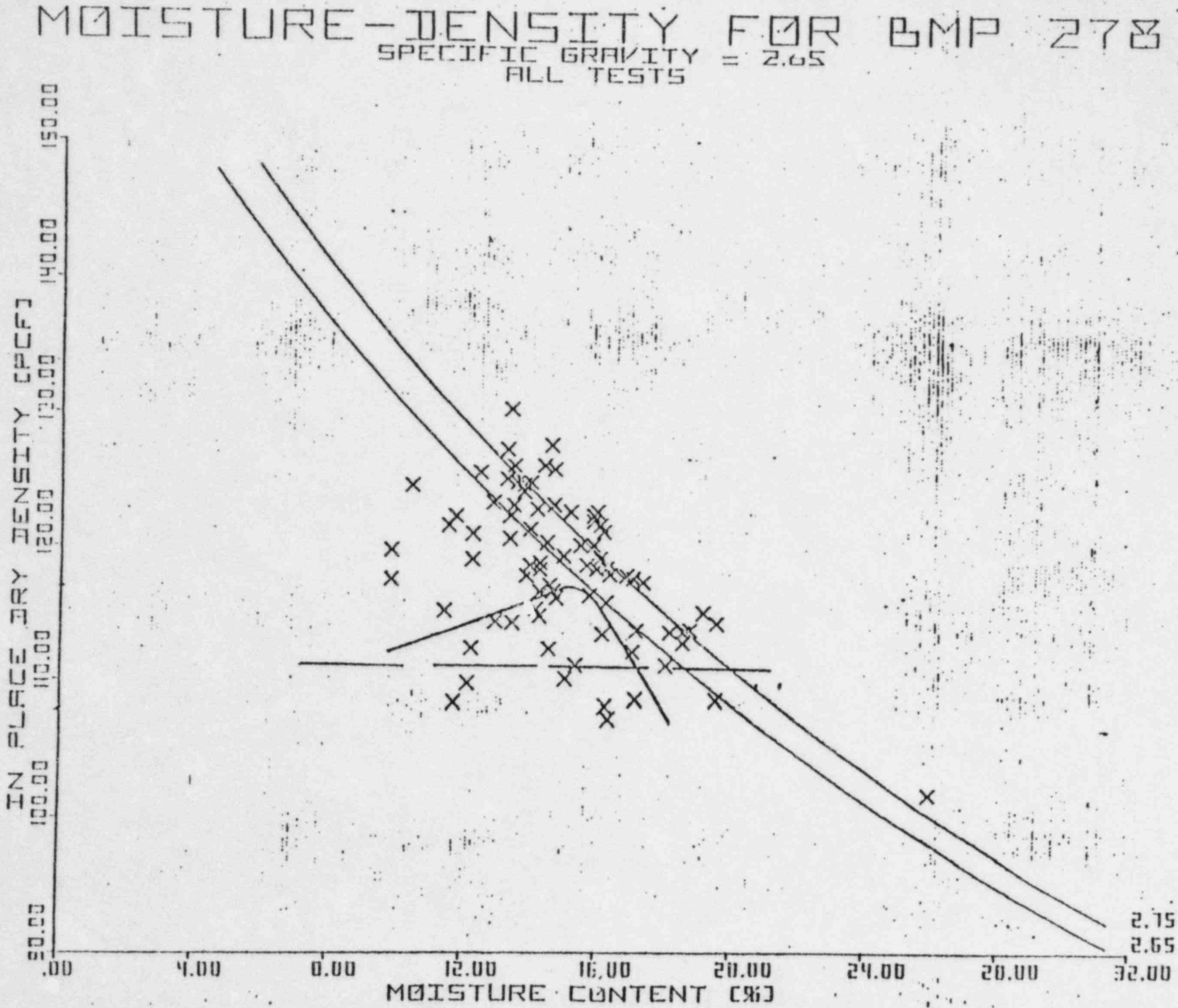


FIG. 1

SB 01651

MØISTURE-DENSITY FØR BMP 278

SPECIFIC GRAVITY = 2.65
PASSING TESTS ØNLY

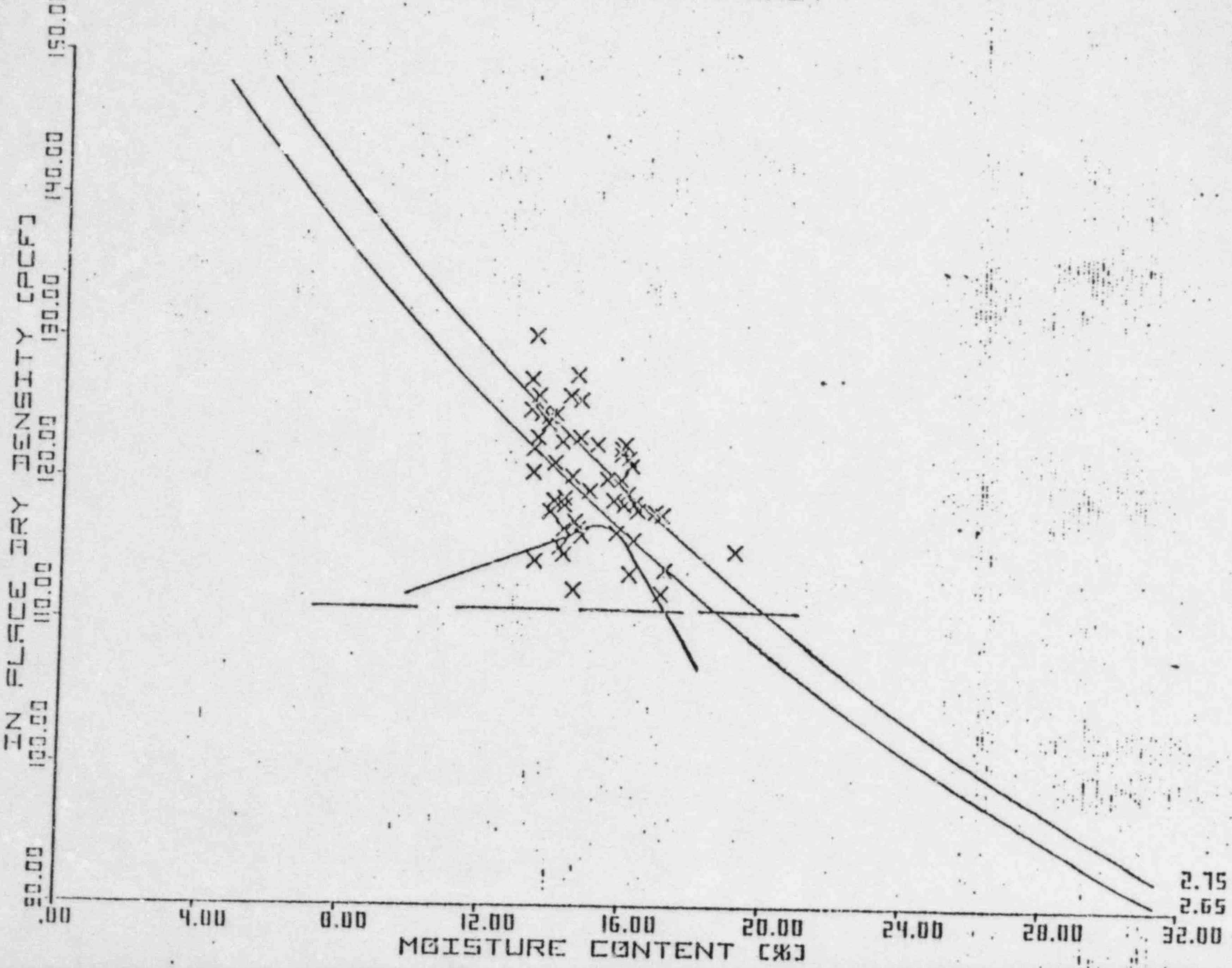


FIG. 2

SB 01652

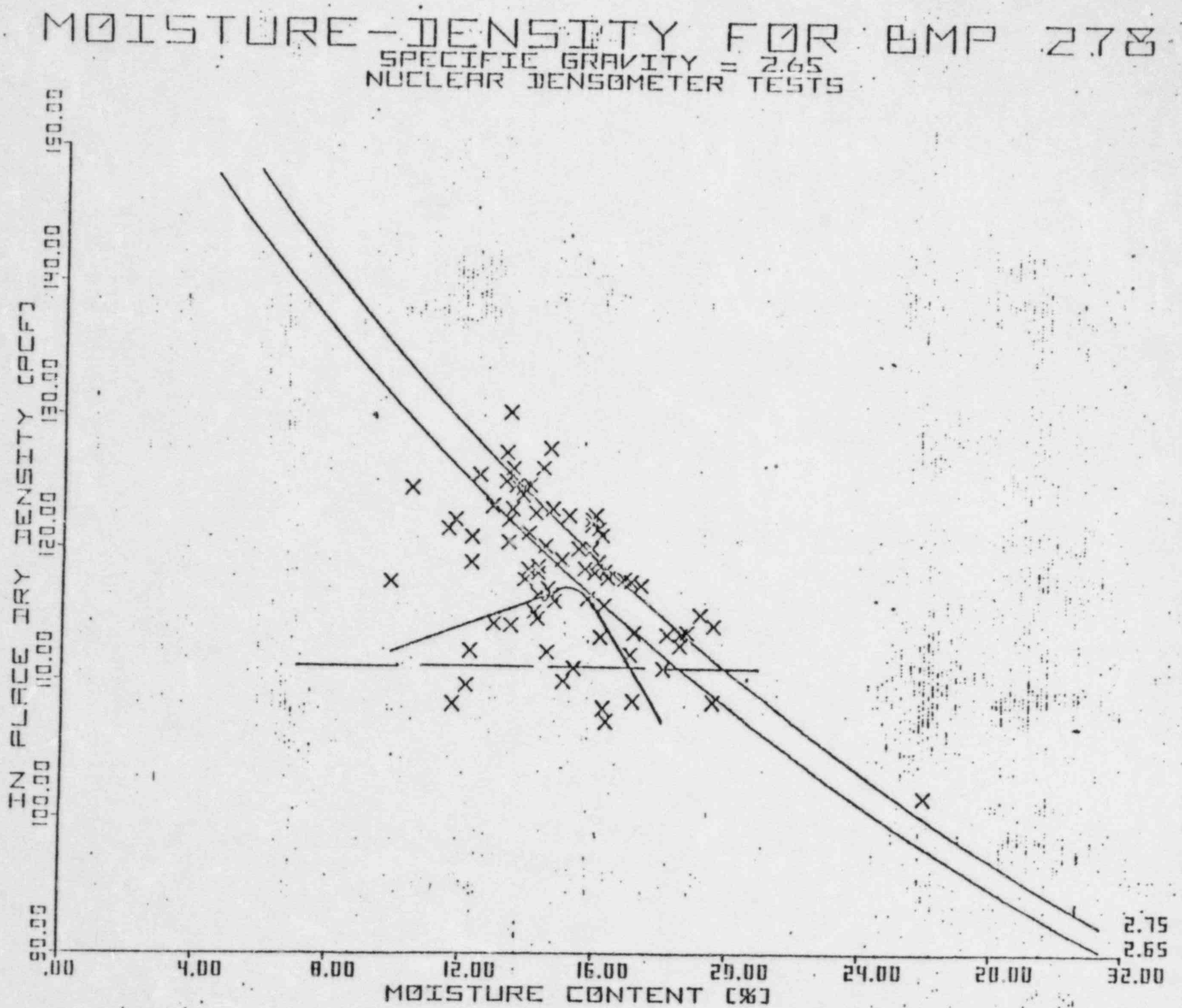


FIG. 3

SB 01653

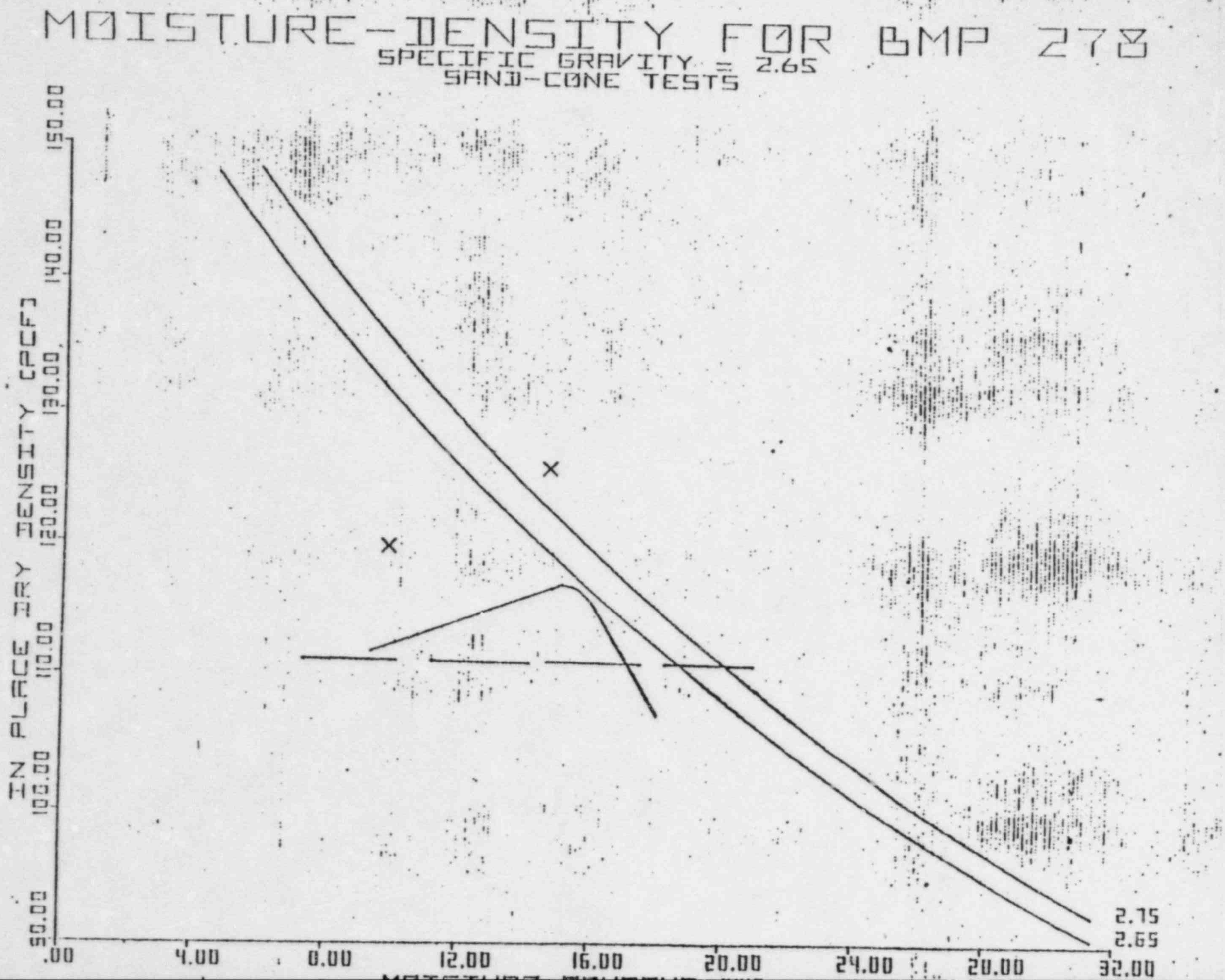


FIG 4

SB 01654

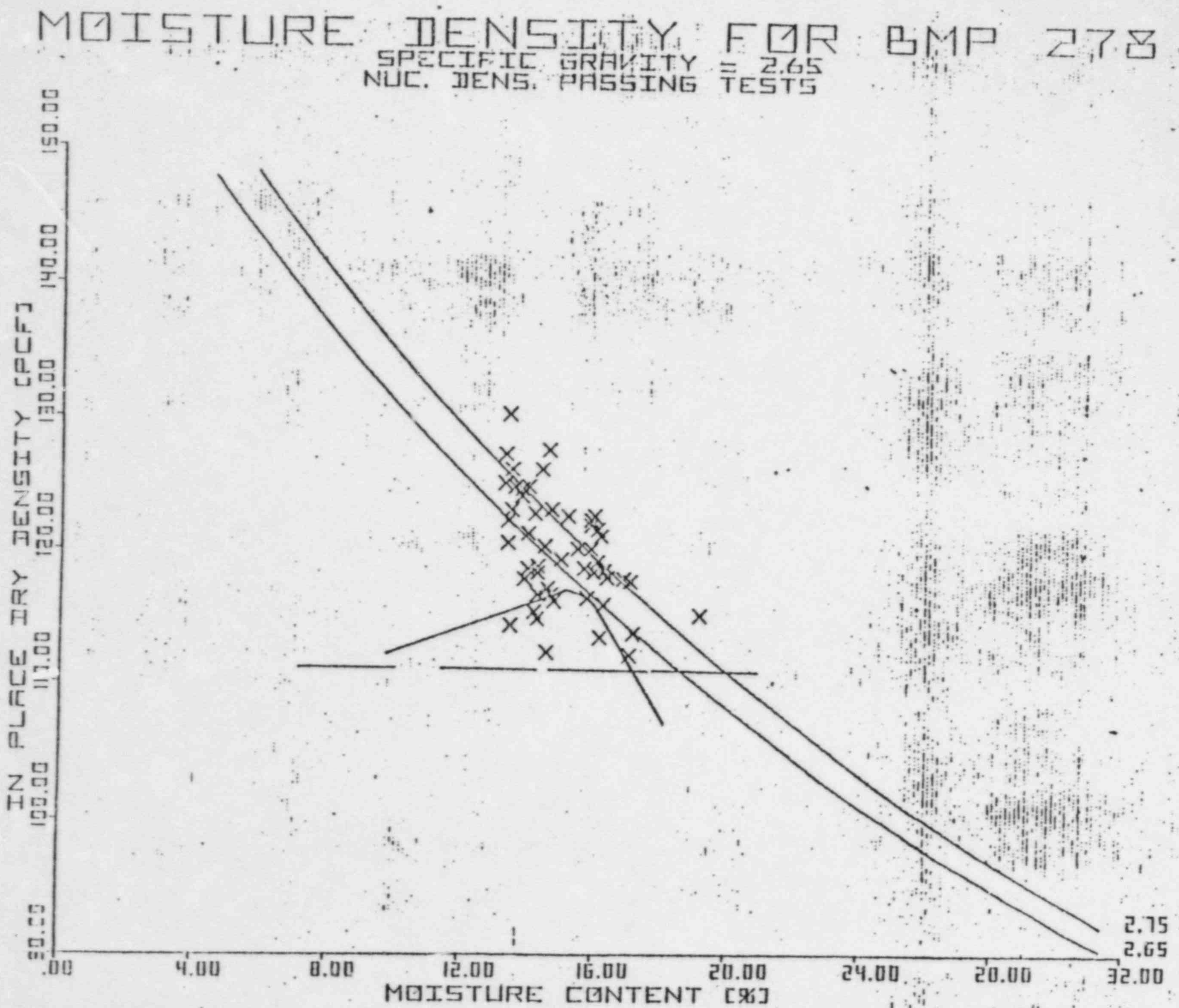


FIG. 5

SB 01655

MØISTURE-DENSITY FØR BMP 278

SPECIFIC GRAVITY = 2.65
SANJ-CONE PASSING TESTS

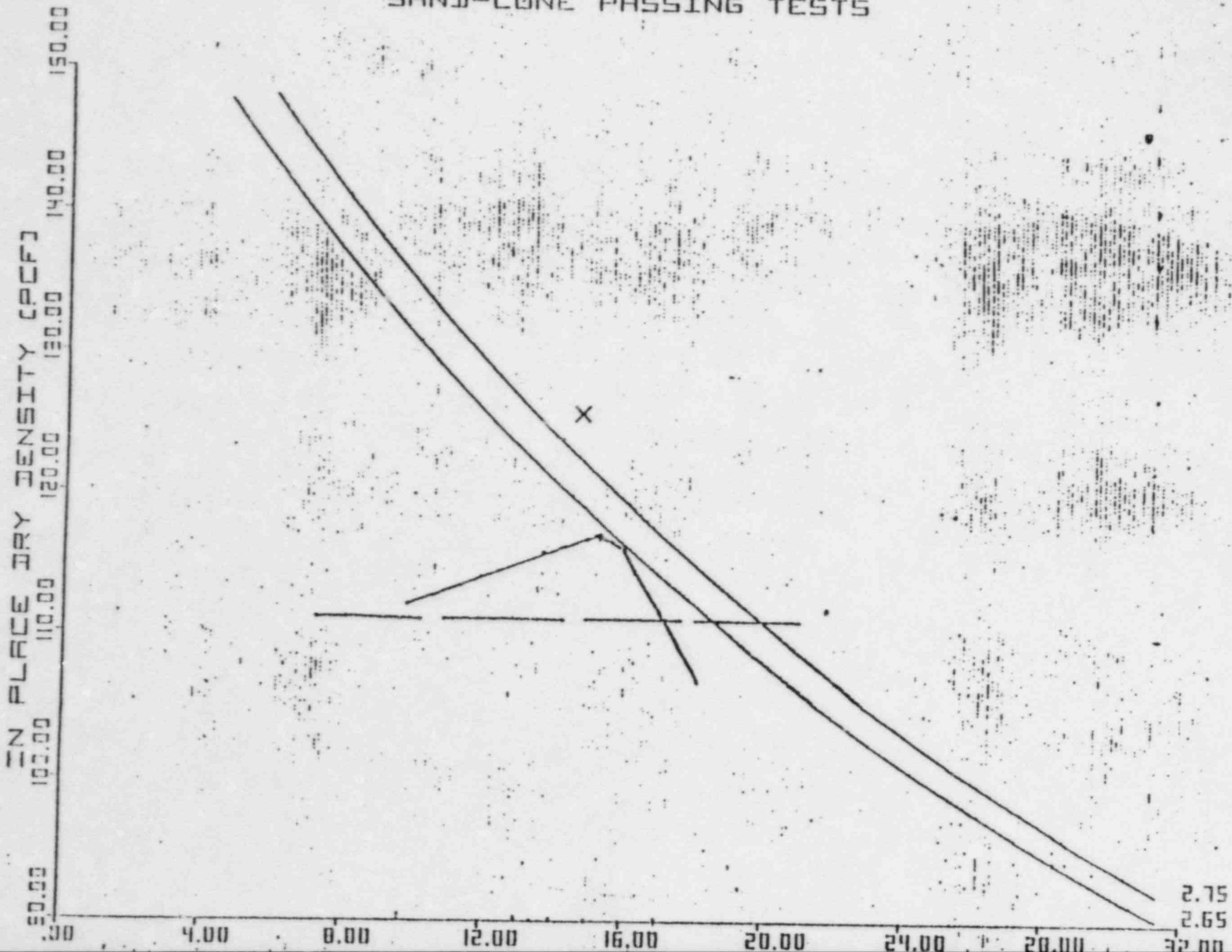


FIG. 8

SB 01656

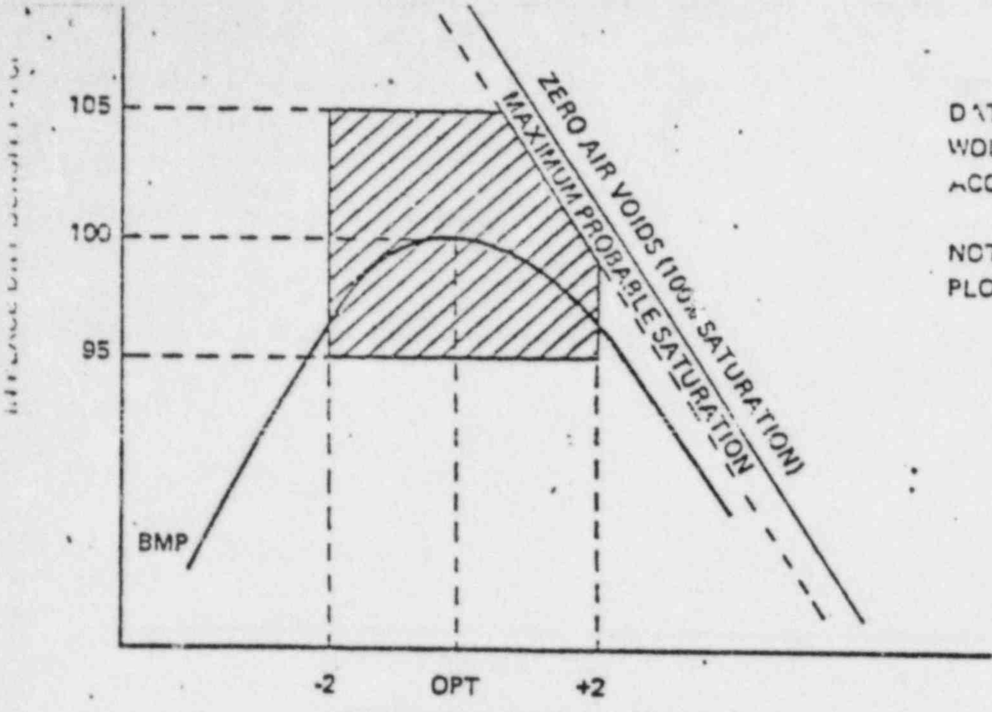


FIGURE 7-A-

DATA . O' NTS THAT PLOT IN SHADED AREA WOULD BE .. ENERALLY ACCEPTABLE ACCORDI! C TO SPECIFICATIONS

NOTE: ABOUT 25% OF ALL FIELD DATA PLOTS IN THE SHADED AREA

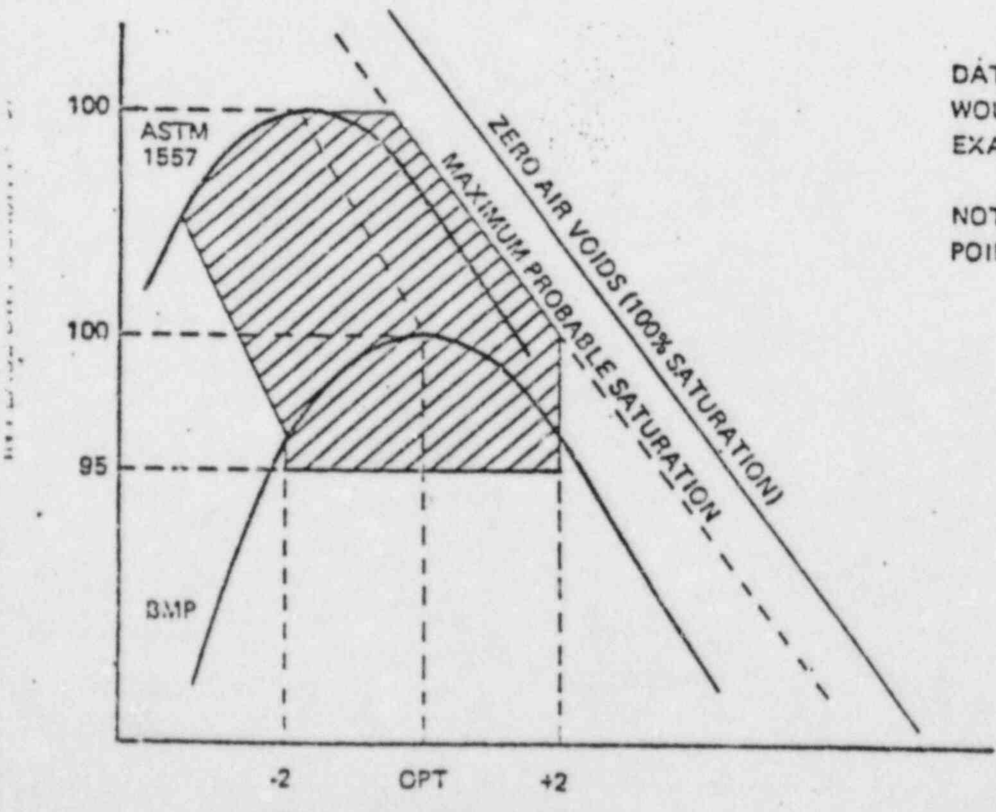


FIGURE 7-B-

DATA POINTS THAT PLOT IN SHADED AREA WOULD BE ACCEPTABLE REGARDLESS OF EXACT SPECIFICATION WORDING

NOTE: ABOUT 40% OF ALL FIELD DATA POINTS PLOT IN THE SHADED AREA

SB 01657

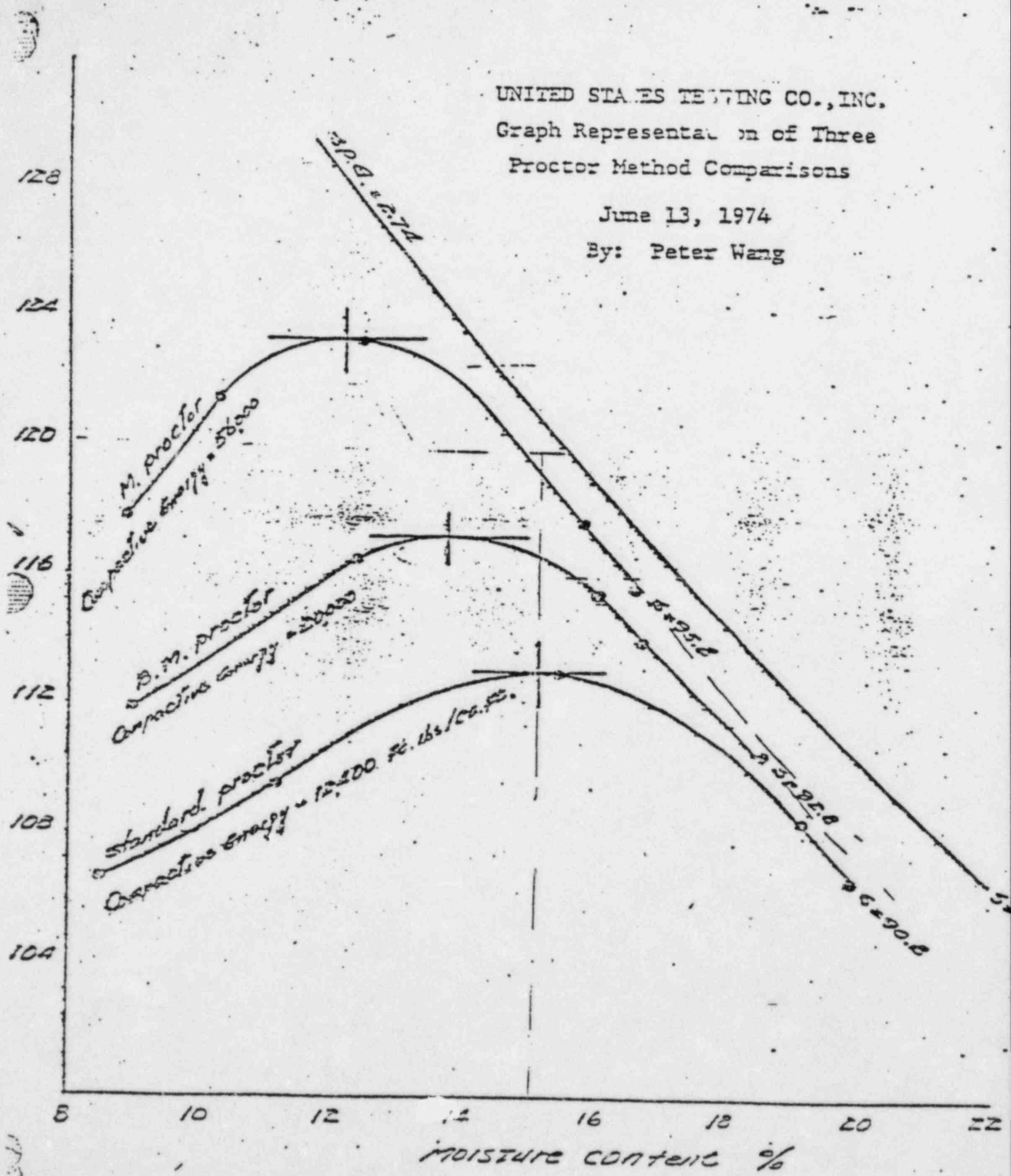


FIG 3

SB 01658

Don Jinnett

DAS
6/6/79

errors in report 5/24/79

① implied ratio is not true
fld engr to establish 1 in 60 or 1 in 100 confined areas
1 in 100 to 1 in 1000

② focus in on 1 test later retest clears
recalculated & test is ok
over 100 calc errors but did not define type

③ should prompt investigation into field density data adjustment

④ QC looking into it

⑤ percent comparison wrong increase area of acceptance
should be 75% & not 40%

⑦ did look at wet&dry twice beginning & 2/26 & close day

Conclusions → data can be used in correction mode,
shouldn't publish it
shouldn't use visual comparisons

SB 01659

lead in ~~2 pages~~

then put in specifics

DRAFT report ~~says~~ eludes to this

spec says this

SB 01660

Construction Quality Control Comments on Engineering approach to DG BLDG Settlement

prepared by Rick Simanek After discussions with Stu Kirker & Tom Leib Monday 6/4/79 1:30 pm Midland

AFTER DISCUSSION 2 DOCUMENTS,

DRAFT REVIEW OF US Testing Field & LAB Const Test Data on Soils 5/2…

MEETING NOTES DG BLDG POSSIBLE CAUSES & Action Item 5/30/7…

QC Comments:

① For the material specified (RANDOM FILL), the control necessary to obtain "properly compacted" soils was not called out in the specifications. Items such as frost protection, pond fill (high design water level), use of nuclear densitometer (data scatter), flooding of trenches (use of SAND around pipe which provides path for pond water travel), allowance of 12" lifts by spec — all gave enough looseness in spec to allow problems with fill.

② control of compaction was specified to be by contractor testing — from ① above either contractor did not perform well OR approved methods & equipment (BMP & nuclear densitometer) were not acceptable to obtain good tests & results

SB 01661

6/4/79

Page 2 of 2

③ information on hand would suggest that A methods specification would have been more appropriate that a testing spec for this Application of material and work methods

Remark

④ the inspection provided by Canonie or Bechtel does not change compaction – the more "intense" inspection by Canonie is not a fact Although A daily systematic record of Canonie work is available – this was partically the result of Canonie working under ~~A methods~~ a methods spec for the dike work and then going to a testing spec for ~~Canonie~~ work (whos work may have problems in ~~[illegible]~~ plant compaction in the tank farm area) & A testing spec for Bechtel work (without dike work experience)

wording should [illegible]

⑤ the engineering analysis of test reports AND soils activities have need to be more specific in the discrepancy findings for QC / Const to properly ADDRESS.

Rick Semiarck

SB 01662

RAS
6/4/79

Constevction Quality Control Comments on Engineering Approach to DG BLDG SETTLEMENT

prepared by: Rick Simanek
Stu Kirker
Tom Leib

Monday 12^30 pm
Midland Site

Comments: Engr/Geotech Report on US Testing Activities

Introduction → OK

#1 → spec requires 1 proctor every 10,000 cy placed
→ & does not mention 20:1 ratio of
spec requires 1 fld dens & moisture every 500 cy placed

Table A → could take more than 1 test every 500 cy
can verify proctor every 10,000 & use it for more if material remains the same

#2 → can clear fail test by choosing proper soil type — may indeed be a lower max dens

need precise examples

Table B reference is partially incorrect —
recheck could clean up a problem
locations given by Const & not US Testing —
not a US Test problem — Answer given in paragraph → test can still close it out

Some were non-Q

#3 → not in spec to analyze
data uncertainty from equipment may cause scatter

SB 01663

page 4 BS.

no requirement for method of compaction -
no method spec all different

significant amount of errors
8/75 → 12/78 a long time 100 errors / $\bar{2}$000 tests
point them out

4 → what is inconsistent data
need to analyze each case
different material

5 → assumptions & theory 25% is good - 40% may be

6 → Troxler approved & used

7 → used dry because it was higher & faster →
did what was required once

7 & 8 conclusion → Analyze the scatter → use the data

written from a theoretical point with assumptions.
has incomplete background info
& does not demonstrate understand or construction
view

5/30/79 Possible Causes

note

① ok ← POND FILL — difficult material to work

② lift thickness yes ok — poor design to have pond around

moisture control (possible → testing → wrong moisture) → wrong densities

comp equip yes — not a method spec

type of material (yes) → random fill

comp eff yes

③ theory dens yes →

④ spec yes

frost part yes

flooding of trench → path for water

⑤ yes → methods & equipment

⑥ enough tests

⑦ yes on placement methods

A lot of Canonie

⑧ contribution different material

⑨ yes

⑩ no

⑪

⑫ no

⑬ no

⑭ no

⑮ Canonie isp no better → documented better interface poor word

yes on test results

⑯ personnel no

⑰ no

SB 01665

View

fore choice of material → random fill

the specs did not require sufficient control of activities

too difficult to get properly uniformly compacted soils with testing spec —

should have been method spec

SB 01666

Comments

Ras

Site

SPO Doug 6/6/79

5-31-79
G. RICHARDSO

MEETING NOTES NO.
MIDLAND PLANT UNITS 1 & 2
CONSUMERS POWER COMPANY
BECHTEL JOB 7220-101

FOR YOUR COMMENTS

CC S. AFIFI
S. DHAR

DATE: May 30, 1979

PLACE: Ann Arbor, Michigan

SUBJECT: Diesel Generator Building Possible Causes and Action Items

ATTENDEES:

Bechtel	Consumers
K. Wiedner	D. Sibbald
J. Hook	R. Wheeler
G. Tuveson	D. Horn
J. Hink (part time)	T. Thiruvengadam
C. McConnel (part time)	C. Hunt
J. Wanzeck	
A. Boos	
G. Richardson	
R. Simanek	

PURPOSE: The meeting was held in the office to discuss the action items and possible causes appended to Meeting Notes No. 934 dated March 12, 1979 as Attachments 1 and 2.

ITEMS DISCUSSED:

A. Review of the status of the action items listed in Attachment 1 to Meeting Notes No. 934.

1. Confirm material compatibility adequacy

J. Wanzeck stated that placement of sand in trenches is not a problem if the material has been properly placed.

ACTION: Geotech will provide an ICM to close out this item.

2. Confirm low blow count on radwaste building

Three additional borings inside the radwaste building resulted in no low blow counts. This item is closed.

3. Confirm electrical duct banks in the yard

Two additional borings near duct banks between the service water structure and the turbine building and other borings have established

SB 01667

the soil conditions. Any further items will be tracked by the response to the 50.54F request. This item is closed.

4. <u>Tabulated list of test results</u>

   Geotech has tabulated all test results and has issued a preliminary report for inhouse review.

   <u>ACTION</u>: Geotech to issue draft report for CPCo review by June 11, 1979.

5. <u>Check water level around site</u>

   Installed piezometers around the site indicate an average water level of about 625.5 feet. This item is closed.

6. <u>Evaluate who placed fill (Wheeler study) under all seismic Category I structures</u>

   This is completed for the diesel generator building and service water structure. Review of other areas is in progress.

   <u>ACTION</u>: Construction/CPCo complete study by June 8, 1979.

7. <u>Check 1977 stockpile and rain data</u>

   Review of rainfall data indicates summer of 1977 was normal and not a dry year. This item is closed.

8. <u>What fill was placed during winter of 1976</u>

   This item is being completed with Item 6.

9. <u>Review work and testing in the time frame below elevation 615'</u>

   This item is being completed with Item 6.

B. Review of the preliminary possible causes described in Attachment 2 to Meeting Notes No. 934 was accomplished. This resulted in revisions to the list. The revised list of preliminary possible causes is attached.

Prepared by: BR

Reviewed by: KW

SB 01668

Attachment 1 to
Meeting Notes No.____

PRELIMINARY POSSIBLE CAUSES

Distinction or Change	Possible Cause	Comment
1. Time difference between placement of fill and construction of facility.	No	Cannot cause insufficient compaction.
2. Placement method		
- lift thickness	Yes	Preliminary tests indicate some equipment may not be capable of compacting a 12" lift. Investigation continuin ACTION: Geotech
- moisture control	No	Material placed during period when moisture control was not implemented is generally in the top two feet of fill.
- compaction equipment	Yes	Equipment used to be evaluated for 4" lifts to original standards. ACTION: Geotech
- types of materials takes extraordinary effort to work some	No	Materials have shown to be compactable in test fills.
Doug - compactive effort	Yes	To be evaluated with lift thickness and equipment.
3. Theoretical comparison of BMP compaction vs. settlement	Yes	Compare effects of different compaction levels. ACTION: GEO-TECH

SB 01669 when Douc

Distinction or Change	Possible Causes	C mment
4. Specification C-211		
- general	Yes	Inc.ude with Action 2
- frost protection omitted	Yes	Investigate impact (refer to Part A, No. 8 of this report)
- flooding of trenches	Yes	Possible cause in localized areas of sand fill areas - not a cause in clay fill.
5. Testing		
- methods	Yes	Investigate impact.
Doug. Sand Density versus Nuclear		ACTION: Geotech
- equipment		
- results/reports		
- retests		
- reviews/evaluations		
- personnel		
6. Increased test frequency and location for small areas.	Yes	Investigation of frequency/ distribution in process. ACTION: Construction/CPCo
7. Different contractors		
- personnel qualifications	No	Refer to No. 16
- different inspection methods	Yes	Refer to No. 15
- placement methods	Yes	Refer to No. 2
8. Extensively reexcavated area	No	Additional investigation indicates similar problems in areas where reexcavation was not accomplished.

SB 01670

Distinction or Change	Possible Causes	Comment
9. Moisture intrusion in ground	Yes/No	Not a problem if properly compacted - possible problem if undercompacted and dry of optimum.
Doug → If Nuclear is 3% HIGH, then material was dry & intrusion is problem		
10. Lean concrete fill	No	
11. Pond filled March 1978	No	See No. 9
12. Stockpiled material - weathering - drying out	No	See No. 13
13. 1977 dry year	No	1977 was not a dry year.
14. Own weight settlement (calcs).	No	Cannot cause poor compaction.
15. Inspection procedures after 3/17	Yes	Investigation into inspection procedures used by Bechtel and Canonie indicate that inspection of Bechtel operations was not as intense as for Canonie operations, especially after 10/76. Inspection callout was surveillance and relied heavily on the test results to assure proper placement.
Doug → Better documentation maybe but inspection ok		
16. Personnel	No	Review of personnel qualifications for Bechtel, Canonie and U.S. Testing indicates the personnel probably had sufficient education, experience and training to carry out the tasks assigned to them.

SB 01671

Acceptance

ROS
7/9/80

QCIR

16 → Completed Inspection Records Reviewed & Accepted by

5.1 & 5.2 all tasks performed with no exceptions open

PSP 6.1 Rev 4 1/16/78

4.0 i Review & approval of the completeness and correctness of the completed IR

8.6 activities described in PQCI shall be inspected for conformance to the referenced inspection criteria by QCEs certified level I & II in applicable discipline

8.9 QCE responsible for performing insp activity shall confirm his acceptance of the activity by initialing & dating ~~the~~ IR block

8.10 Each completed IR shall be reviewed & signed off to signify completeness and acceptance of ~~the~~ its recorded data by a Level II QCE.

SB 02559

RAS
7/10/80

Soils exit meeting 7[15] AM MIDLAND Site

① in place density / max. density LAB. Bechtel objected to Audit Finding plan by 7/18/8

② agree - fix report 7/14/80
QC mistake in review function

③ object
④ object
⑨ Bechtel objected plan by 7/18/80
⑤ object
⑩ agree

⑤ objected plan by 7/18/80
⑥ objected

tomorrow 7:30 continue maybe

SB 02560

QC

Handout 7/10/80

DRAFT

Consumers Power Company

PROJECTS, ENGINEERING AND CONSTRUCTION - QUALITY ASSURANCE DEPARTMENT

AUDIT FINDING REPORT

"AS IS" CONDITION VERSUS "AS REQUIRED" / "AS NEEDED" CONDITION WITH REFERENCES:

1. PQCI SC-1.05, Rev 9, Activity Task 2.2a9 states, "Field density tests resulting in 105% and over of maximum laboratory density of proctors and/or relative densities, retested". This is a "witness" point. Contrary to this requirement, SC-1.05-18- was signed off NA for activity 2.2a9 on 6/9/80 - 6/13/80 scoped for 6/9/80 - 6/13/80. Test 6182 and 6184 had 108.1 and 106.6 percent relative density respectively, and was signed off by a QC engineer on 6/11/80.

AFR SER NO: M-01- -0-01

PROJ/DEPT AUDITED: Bechtel QC & GeoTech

DATE OF ORIGINATION: 7/9/80

FILE NUMBER: 18.4.3.6

DISTRIBUTION:

RECOMMENDED CORRECTIVE ACTION:

Prior to the completion of the audit, Bechtel QC wrote NCR 3041 to cover the above situation. SC-1.05 plan has been revised for clarification of Activity Task 2.2a9. Project Engineering is dispositioning the NCR.

CORRECTIVE ACTION COMMITMENT:

DATE OF C/A COMPLETION:

DATE OF C/A EFFECTIVENESS:

ORG. RESP FOR C/A: Bechtel QC

PERSON MAKING C/A COMMITMENT:

METHOD OF VERIFICATION:

IS AF REPORTABLE PER 50.55(e)? YES ☐ NO ☐

IF "YES", DATE OF REPORT TO NRC:

IF "YES", TIME OF REPORT TO NRC:

IF "YES", NAME OF NRC OFFICIAL TO WHOM REPORTED:

IF "YES", WHO MADE REPORT:

AFR ORIGINATOR'S SIGNATURE:

SUPERVISOR'S SIGNATURE:

C/A VERIFICATION SIGNATURE:

VERIFICATION DATE:

SB 02561

Bechtel objected plan by 7/18/80

Consumers Power Company

AUDIT FINDING REPORT

PROJECTS, ENGINEERING AND CONSTRUCTION - QUALITY ASSURANCE DEPARTMENT

AS IS CONDITION VERSUS AS REQUIRED / AS NEEDED CONDITION WITH REFERENCES:

2. Specification C-211 Revision 10 Section 8.10 states in part, "All density test locations shall be within ± 3 feet in plan and ± 3 inches in elevation." Also PQCI C-1.02 Revision 4 Section 3.1 states in part, "Review and sign the Laboratory Test Reports verifying...e. Correct location and elevation of tests."

Contrary to this requirement, QCIR No C-1.02-140 dated 1/2/80 for the first shift, Area "E" indicates test 6083 was taken at elevation 626.5. Contrary to this, Compacted Fill Density Test Report for 6083 indicates elevation 627.5.

AFR SER NO: M-01- -0-02

PROJ/DEPT AUDITED: Bechtel QC & GeoTech

DATE OF ORIGINATION: 7/9/80

FILE NUMBER: 18.4.3.6

DISTRIBUTION:

RECOMMENDED CORRECTIVE ACTION:

Investigate which elevation is in error, and correct the documents according to Bechtel procedures.

CORRECTIVE ACTION COMMITMENT:

DATE OF C/A COMPLETION:

DATE OF C/A EFFECTIVENESS:

ORG. RESP FOR C/A: Bechtel QC

PERSON MAKING C/A COMMITMENT:

METHOD OF VERIFICATION:

IS AF REPORTABLE PER 50.55(e)? YES ☐ NO ☐

IF "YES", DATE OF REPORT TO NRC:

IF "YES", TIME OF REPORT TO NRC:

IF "YES", NAME OF NRC OFFICIAL TO WHOM REPORTED:

IF "YES", WHO MADE REPORT:

AFR ORIGINATOR'S SIGNATURE:

SUPERVISOR'S SIGNATURE:

C/A VERIFICATION SIGNATURE:

VERIFICATION DATE:

SB 02562

Bechtel Ageeed Fix by 7/14/80

Consumers Power Company

AUDIT FINDING REPORT

PROJECTS, ENGINEERING AND CONSTRUCTION - QUALITY ASSURANCE DEPARTMENT

AFR SER NO: M-01- -0-03

PROJ/DEPT AUDITED: Bechtel QC & GeoTech

DATE OF ORIGINATION: 7/9/80

FILE NUMBER: 18.4.3.6

DISTRIBUTION:

"AS IS" CONDITION VERSUS "AS REQUIRED"/"AS NEEDED" CONDITION WITH REFERENCES:

3. Instruction No. 5 for the preparation of the "Daily Soil Placement Report" states in part, "Enter... the approximate length and width of the placement, the coordinates and actual frequency taken." The following are examples of discrepancies between length and width of placements and the coordinates. Daily Soil Placement Report for C-1.02-140 dated 12/31/79 (first shift), Area "A" indicates coordinates South 5035 to 5056. Contrary to this, it only indicates the width to be 8 feet ±.

   For Area "B", the East coordinates 255 to 295 does not correspond with the length of 36 feet ±.

   Area "C" has East coordinate 295 to 335. Contrary to this, a length of 36 feet ± is given.

   For Area "D" South coordinates are given as 5165 to 5185. Contrary to this, the width indicated is only 12 feet ±. East coordinates are 345 to 390, but the length indicated is only 32 feet ±.

(see page 2)

RECOMMENDED CORRECTIVE ACTION:

It is recommended that prior to placing backfill, the QC Engineer and the on-site GeoTechnical Engineer agree on the coordinates of the backfill area in order that the Daily Soil Placement Report and the GeoTech Field Engineers Report are in agreement, and that the width and length dimensions agree with the coordinates.

CORRECTIVE ACTION COMMITMENT:

DATE OF C/A COMPLETION:

DATE OF C/A EFFECTIVENESS:

ORG. RESP FOR C/A: Bechtel QC

PERSON MAKING C/A COMMITMENT:

METHOD OF VERIFICATION:

IS AF REPORTABLE PER 50.55(e)? YES ☐ NO ☐

IF "YES", DATE OF REPORT TO NRC:

IF "YES", TIME OF REPORT TO NRC:

IF "YES", NAME OF NRC OFFICIAL TO WHOM REPORTED:

IF "YES", WHO MADE REPORT:

AFR ORIGINATOR'S SIGNATURE:

SUPERVISOR'S SIGNATURE:

C/A VERIFICATION SIGNATURE:

VERIFICATION DATE:

SB 02563

Bechtel objected

Consumers Power Company

AUDIT FINDING REPORT

PROJECTS, ENGINEERING AND CONSTRUCTION QUALITY ASSURANCE DEPARTMENT

CONTINUATION SHEET:

"AS IS" CONDITION VERSUS "AS REQUIRED" CONDITION WITH REFERENCES (CONTINUED):

For Area "E", South coordinates are 5140 to 5156. Contrary to this, the width is given as 12 feet ±. East coordinates are 330 to 390. Contrary to this, the length is given as 58 feet ±. It was noted on various Field Engineers Reports that the description of the location of backfill area was inconclusive on the boundaries of the backfill area.

RECOMMENDED CORRECTIVE ACTION (CONTINUED):

CORRECTIVE ACTION (CONTINUED):

AFR ORIGINATOR'S SIGNATURE:	SUPERVISOR'S SIGNATURE: SB 256

Consumers Power Company

AUDIT FINDING REPORT

PROJECTS, ENGINEERING AND CONSTRUCTION - QUALITY ASSURANCE DEPARTMENT

AS IS CONDITION VERSUS AS REQUIRED / AS NEEDED CONDITION WITH REFERENCES:

4. Instruction No 8 for the preparation of the "Daily Soil Placement Report" states in part, "Check the method used to compact soil--hand operated and/or motorized roller equipment...and number of passes required as indicated by the onsite Geotechnical Engineer, actual no. of passes used." Contrary to this, Daily Soil Placement Report dated 12/31/79 (first shift), QCIR No C-1.02-140 for Area "A" indicates two lifts were placed and only one series of 8 passes observed. Area "D" indicates two lifts were placed and only one series of 8 passes was observed for two pieces of equipment. Area "E" same as area "D" above.

   Daily Placement Soil Report dated 1/4/80 (first shift) for QCIR No's C-1.02-140, area "C" indicates four lifts placed and only one observed for 8 passes. Area "D" same as area "C" above.

AFR SER NO: M-01- -0-

PROJ/DEPT AUDITED: Bechtel QC & GeoTech

DATE OF ORIGINATION: 7/9/80

FILE NUMBER: 18.4.3.6

DISTRIBUTION:

RECOMMENDED CORRECTIVE ACTION:

It is recommended that on the Daily Soil Placement Report the QC Engineer indicate that the number of passes observed, Block 8, correlates with the lifts indicated in Block 9, "Lift Thickness Checks," and, if lift thicknesses were not observed, state the elevation of the material being compacted.

CORRECTIVE ACTION COMMITMENT:

DATE OF C/A COMPLETION:

DATE OF C/A EFFECTIVENESS:

ORG. RESP FOR C/A:

PERSON MAKING C/A COMMITMENT:

METHOD OF VERIFICATION:

IS AF REPORTABLE PER 50.55(e): YES ☐ NO ☐

IF "YES", DATE OF REPORT TO NRC:

IF "YES", TIME OF REPORT TO NRC:

IF "YES", NAME OF NRC OFFICIAL TO WHOM REPORTED:

IF "YES", WHO MADE REPORT:

AFR ORIGINATOR'S SIGNATURE:

SUPERVISOR'S SIGNATURE:

QA VERIFICATION SIGNATURE:

VERIFICATION DATE:

SB 02565

Bechtel objected

Consumers Power Company

AUDIT FINDING REPORT

PROJECTS, ENGINEERING AND CONSTRUCTION
QUALITY ASSURANCE DEPARTMENT

"AS IS" CONDITION VERSUS "AS REQUIRED" / "AS NEEDED" CONDITION WITH REFERENCES:

5. Project Special Provision G-6.1 Section 9.2 states in part, "Inspection Record is controlled by the Quality Control Engineer responsible for performing the inspection. Upon completion of the inspections the Quality Control Engineer responsible for performing the inspection returns the Inspection Record to a Level II Quality Control Engineer other than the Quality Control Engineer who performed the inspections in the appropriate technical discipline for final acceptance and signoff." Contrary to this, C-1.02 plans are not being signed off by a Level II in a timely manner. C-1.02-118 scoped 8/2/79 - 8/4/79 through C-1.02-163 scoped 6/9/80 - 6/14/80 have not been signed off by a Level II.

Point 6

AFR SER NO: M-01- -0-

PROG/DEPT AUDITED: Bechtel QC & GeoTech

DATE OF ORIGINATION: 7/9/80

FILE NUMBER: 18.4.3.6

DISTRIBUTION:

RECOMMENDED CORRECTIVE ACTION:

It is recommended that Bechtel QC develop and maintain a program to make scheduled checks on IR's that are complete, but not reviewed by a Level II, and assure the IR's are closed out in a timely manner.

CORRECTIVE ACTION COMMITMENT:

DATE OF C/A COMPLETION:

DATE OF C/A EFFECTIVENESS:

ORG. RESP FOR C/A: Bechtel QC

PERSON MAKING C/A COMMITMENT:

METHOD OF VERIFICATION:

IS AF REPORTABLE PER 50.55(e)? YES ☐ NO ☐

IF "YES", DATE OF REPORT TO NRC:

IF "YES", TIME OF REPORT TO NRC:

IF "YES", NAME OF NRC OFFICIAL TO WHOM REPORTED:

IF "YES", WHO MADE REPORT:

AFR ORIGINATOR'S SIGNATURE:

SUPERVISOR'S SIGNATURE:

QA VERIFICATION SIGNATURE:

VERIFICATION DATE:

SB 02566

Bechtel objected

Consumers Power Company

AUDIT FINDING REPORT

PROJECTS, ENGINEERING AND CONSTRUCTION - QUALITY ASSURANCE DEPARTMENT

"AS IS" CONDITION VERSUS "AS REQUIRED" "AS NEEDED" CONDITION WITH REFERENCES:

6. Instruction No 5 for the preparation of the "Daily Soil Placement Report" states in part, "Enter the Test Frequency as designated by the onsite Geotechnical Soils Engineer... and actual frequency taken." Contrary to this, Daily Soil Placement Report for 4/14/80 first shift for Area "A", QCIR No C-1.02-155 on line 5 indicates test frequency required. One per backfill location and indicates the actual as "none taken." It was observed that on many other QCIR's, the "Test Frequency" was given, but the "Actual" was given as none taken.

   Even though a test may have been taken at a later date, the report itself is not indicative of the requirements.

Prain 8

AFR SER NO: M-01- -0-

PROJ/DEPT AUDITED: Bechtel QC & GeoTech

DATE OF ORIGINATION: 7/9/80

FILE NUMBER: 18.4.3.6

DISTRIBUTION:

RECOMMENDED CORRECTIVE ACTION:

It is recommended that Bechtel QC implement the requirement.

CORRECTIVE ACTION COMMITMENT:

DATE OF C/A COMPLETION:

DATE OF C/A EFFECTIVENESS:

ORG. RESP FOR C/A: Bechtel QC

PERSON MAKING C/A COMMITMENT:

METHOD OF VERIFICATION:

IS AF REPORTABLE PER 50.55(e)? YES ☐ NO ☐

IF "YES", DATE OF REPORT TO NRC:

IF "YES", TIME OF REPORT TO NRC:

IF "YES", NAME OF NRC OFFICIAL TO WHOM REPORTED:

IF "YES", WHO MADE REPORT:

AFR ORIGINATOR'S SIGNATURE:

SUPERVISOR'S SIGNATURE:

C/A VERIFICATION SIGNATURE:

VERIFICATION DATE

SB 02567

Bechtel objected

Consumers Power Company

AUDIT FINDING REPORT

PROJECTS, ENGINEERING AND CONSTRUCTION - QUALITY ASSURANCE DEPARTMENT

"AS IS" CONDITION VERSUS "AS REQUIRED", "AS NEEDED" CONDITION WITH REFERENCES:

7. Spec C-211 Rev 10, Section 8.12 states:

"FAILING TEST

All material represented by failing tests are to be reworked until the specified density and/or moisture is obtained. No material shall be placed on any known failing material until satisfactory tests are obtained."

Also PQCI C-1.02 Rev 4 Section ? 2 states, "All material represented by failing test results have been reworked and retested or removed."

Period 13

Contrary to these requirements, it appears that the top of the existing fill is reworked, but not all of the material reprosented by the failing tests is reworked.

AFR SER NO: M-01- -0-

PROJ./DEPT AUDITED: Bechtel QC & GeoTech

DATE OF ORIGINATION: 7/9/80

FILE NUMBER: 18.4.3.6

DISTRIBUTION:

RECOMMENDED CORRECTIVE ACTION:

Implement the specification requirement. Review QCIR's for past placements represented by failing tests and verify that all material represented by the failed test was reworked or provide Project Engineering disposition of the material these failing tests represent.

CORRECTIVE ACTION COMMITMENT:

DATE OF C/A COMPLETION:

DATE OF C/A EFFECTIVENESS:

ORG. RESP FOR C/A: Bechtel QC

PERSON MAKING C/A COMMITMENT:

METHOD OF VERIFICATION:

IS AF REPORTABLE PER 50.55(e)? YES ☐ NO ☐

IF "YES", DATE OF REPORT TO NRC:

IF "YES", TIME OF REPORT TO NRC:

IF "YES", NAME OF NRC OFFICIAL TO WHOM REPORTED:

IF "YES", WHO MADE REPORT:

AFR ORIGINATOR'S SIGNATURE:

SUPERVISOR'S SIGNATURE:

C/A VERIFICATION SIGNATURE:

VERIFICATION DATE:

SB 02568

Bechtel objected plm by 7/18/80

Consumers Power Company

AUDIT FINDING REPORT

PROJECTS, ENGINEERING AND CONSTRUCTION
QUALITY ASSURANCE DEPARTMENT

AS IS CONDITION VERSUS "AS REQUIRED" / "AS NEEDED" CONDITION WITH REFERENCES:

8. Field Engineer Report dated 5/14/80 states in part, "backfill in progress, pipe excavation south of oily waste bldg and tank from S 4665 E 405 to S 4665 E 500." Contrary to this, the Daily Soil Placement Report for 5/14/80 indicated on line 13 "No 'Q' Backfill Placed Today."

Field Engineer Report dated 5/21/80 indicated soil placement E of Oily Waste @ S 4673 E 510 to S 4673 E 550. Contrary to this, the Daily Soil Placement Report for 5/21/80 indicated soil placement South 4556 $\pm$ to 4680 $\pm$, East 515$\pm$ to 540 $\pm$ Length 25'$\pm$ Width 12'$\pm$.

Priority

Field Engineer Report dated 5/6/80 indicated soil placement south of Turbine Building bounded by S 5035 to 5042 E 320 to E 379.

Contrary to this, the Daily Soil Placement Report for 5/6/80 indicated on line 13 "No 'Q' Backfill Placed Today."

AFR SER NO: M-01- -0-

ORG./DEPT AUDITED: Bechtel QC & GeoTech

DATE OF ORIGINATION: 7/9/80

FILE NUMBER: 18.4.3.6

DISTRIBUTION:

RECOMMENDED CORRECTIVE ACTION:

It is recommended that the records be reviewed and determine why Field Engineering's records indicate "Q" fill placed and QC records indicate no "Q" fill placed. Make corrections to records per Bechtel procedures. Also, any "Q" placements not covered by QC inspection, Project Engineering to disposition.

CORRECTIVE ACTION COMMITMENT:

DATE OF C/A COMPLETION:

DATE OF C/A EFFECTIVENESS:

ORG. RESP FOR C/A: Bechtel QC & GeoTech

PERSON MAKING C/A COMMITMENT:

METHOD OF VERIFICATION:

IS AF REPORTABLE PER 50.55(e)? YES ☐ NO ☐

IF "YES", DATE OF REPORT TO NRC:

IF "YES", TIME OF REPORT TO NRC:

IF "YES", NAME OF NRC OFFICIAL TO WHOM REPORTED:

IF "YES", WHO MADE REPORT:

AFR ORIGINATOR'S SIGNATURE:

SUPERVISOR'S SIGNATURE:

C/A VERIFICATION SIGNATURE:

VERIFICATION DATE:

SB 02569

Bechtel objected

Consumers Power Company

AUDIT FINDING REPORT

PROJECTS, ENGINEERING AND CONSTRUCTION - QUALITY ASSURANCE DEPARTMENT

"AS IS" CONDITION VERSUS "AS REQUIRED" / "AS NEEDED" CONDITION WITH REFERENCES:

9. Specification C-211 Rev 10 Section 8.6 states:

"8.6 COMPACTION EFFORT

The onsite geotechnical soils engineer shall verify that the equipment used for compacting the backfill material is capable of obtaining the desired results and obtaining the same acceptable compaction effort achieved in the test pad area. This verification shall include, but not be limited to, the following:

8.6.1 Number of passes
8.6.2 Speed
8.6.3 Revolutions per minute (frequency)
8.6.4 Overlap per pass
8.6.5 Lift thickness requirements and uniformity"

Contrary to this requirement, there is no evidence in the Field Engineer Reports that this compaction effort has been verified.

Prai 11

AFR SER NO: M-01- -C-

PROJ/DEPT AUDITED: Bechtel QC & GeoTech

DATE OF ORIGINATION: 7/9/80

FILE NUMBER: 18.4.3.6

DISTRIBUTION:

RECOMMENDED CORRECTIVE ACTION:

Provide Project Engineering clarification of the intent of this section and revise the specification accordingly. Also evaluate previous soil placements after June 27, 1979 based on this clarification.

CORRECTIVE ACTION COMMITMENT:

DATE OF C/A COMPLETION:

DATE OF C/A EFFECTIVENESS:

ORG. RESP FOR C/A: Bechtel QC

PERSON MAKING C/A COMMITMENT:

METHOD OF VERIFICATION:

IS AF REPORTABLE PER 50.55(e)? YES ☐ NO ☐

IF "YES", DATE OF REPORT TO NRC:

IF "YES", TIME OF REPORT TO NRC:

IF "YES", NAME OF NRC OFFICIAL TO WHOM REPORTED:

IF "YES", WHO MADE REPORT:

AFR ORIGINATOR'S SIGNATURE:

SUPERVISOR'S SIGNATURE:

C/A VERIFICATION SIGNATURE:

VERIFICATION DATE:

SB 02570

Bechtel objected - plan by 7/18/80

DRAFT

Consumers Power Company

AUDIT FINDING REPORT

PROJECTS, ENGINEERING AND CONSTRUCTION - QUALITY ASSURANCE DEPARTMENT

AS IS CONDITION VERSUS "AS REQUIRED", AS NEEDED CONDITION WITH REFERENCES:

10. Specification C-211 Rev 10, paragraph 8.11 states in part, "The onsite geotechnical soils engineer shall review and approve each soils test report." Contrary to the above, there is no objective evidence that the geotechnical soils engineer "reviews and approves" each soils test report.

Pen 12

AFR SER NO: M-01- -0-

PROJ/DEPT AUDITED: Bechtel QC & GeoTech

DATE OF ORIGINATION: 7/9/80

FILE NUMBER: 18.4.3.6

DISTRIBUTION:

RECOMMENDED CORRECTIVE ACTION:

It is racommended that all soils test reports, the on-site Geotechnical engineer "reviews and approves," be documented on the Field Engineers Report Form. Determine what steps are to be taken to verify that past records have been "reviewed and ~~verified~~ approved.

6/29/79

CORRECTIVE ACTION COMMITMENT:

DATE OF C/A COMPLETION:

DATE OF C/A EFFECTIVENESS:

ORG. RESP FOR C/A: Geo-Tech

PERSON MAKING C/A COMMITMENT:

METHOD OF VERIFICATION:

IS AF REPORTABLE PER 50.55(e)? YES ☐ NO ☐

IF "YES", DATE OF REPORT TO NRC:

IF "YES", TYPE OF REPORT TO NRC:

IF "YES", NAME OF NRC OFFICIAL TO WHOM REPORTED:

IF "YES", WHO MADE REPORT:

AFR ORIGINATOR'S SIGNATURE:

SUPERVISOR'S SIGNATURE:

QA VERIFICATION SIGNATURE:

VERIFICATION DATE:

SB 02571

Bechtel agreed

DRAFT

OBSERVATIONS

1. Paragraph 6.0 Foundation Preparation states, "No fill shall be placed on any foundation until the onsite geotechnical soils engineer has approved the foundation and reviewed the applicable tests."

   It is not clear what the "applicable tests" are. It is recommended that "and reviewed the applicable tests" be more definitive and, if documents are reviewed, it should be documented or, if the statement is superfluous to the specifications, then it should be removed.

2. Paragraph 8.3.4 states in part, "This benching into the previously placed material shall be a minimum of the maximum lift thickness, or as determined by the onsite geotechnical soils engineer."

   It is recommended that if the benching requirement is waived by the soils engineer, then it be documented on the Field Engineer's Report Form.

3. Paragraph 8.10 states in part, "All density test locations shall be...± 3" in elevation." Based on discussion, it is highly doubtful that these tolerances are met.

SB 02572

4. Testing frequency (actual) on the PQCI/IR's seem erroneous.

5. The Daily Soil Placement Reports do not indicate what elevation the placement began at and what the final elevation of the placement was at the end of each shift.

6. Daily Soil Placement Report for Area "D" dated 1/16/80, first shift, for QCIR No C-1.02-142 states on lines 6, "Subgrade was removed to suitable material, moistened and compacted with 8 passes prior to start of backfill." However, this does not state the elevation at which the subgrade was removed.

7. QC inspection assignment record for C-1.02-153 on line 3 indicates 3/31/80 through 2/28/80. This should be 3/31/80 through 4/4/80.

DESIGN BY C.E.W. DATE 2-27-79 CHECKED BY ______ DATE ______ SHEET NO. ______

PROJECT elev checks JOB NO. ______

SUBJECT ______ CALCULATION NO. ______ FILE NO. ______

	ORIG. Elev	elev -2-27-79
Scribe on Col M-11	639.50	639.50
" " " L8-9	639.50	639.50
scribe on Wall approx 7.9+K	638.00	637.99
" " " " 7.8+2'N. of J	640.00	639.99
" on Col Fx -7.79"	639.50	639.49
" " " Ex -7.79	639.50	639.505
" on wall approx 5.1+9'S. of B	639.50	639.49
" on Col Ex +5.31	639.50	639.50
" on wall approx G +3'E. of 5.6	638.00	638.00
" on wall approx. K +2'W. of 5	641.00	640.97
" on Col Kc +5.0	639.50	639.47
" on Col Lc +3.0	639.50	639.47

as a considerable number of the columns are now in conc. or block walls., we obtained elev's on some of the scribes that were placed on the walls as they were poured. The above Table is the result.

SBC09830

TELECOPY COVER SHEET

Date: 3-1-79 (ch.r.t)

Destination: Ann Arbor
City State

ATTENTION: John Hink

No Pages 1

From: Chuck Wilson

Subject:

Job 7220 Midland Project

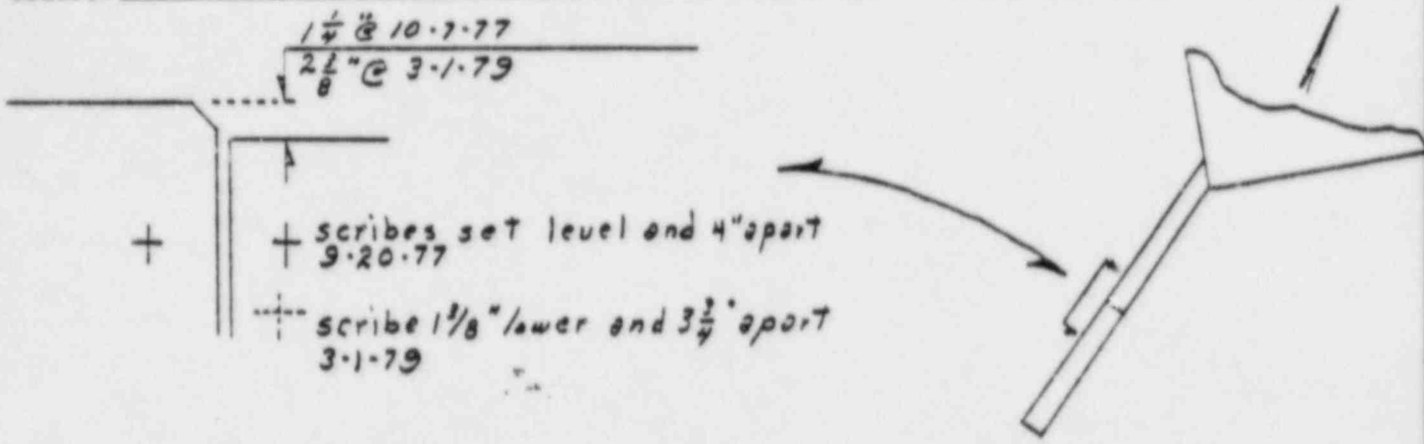
BECHTEL

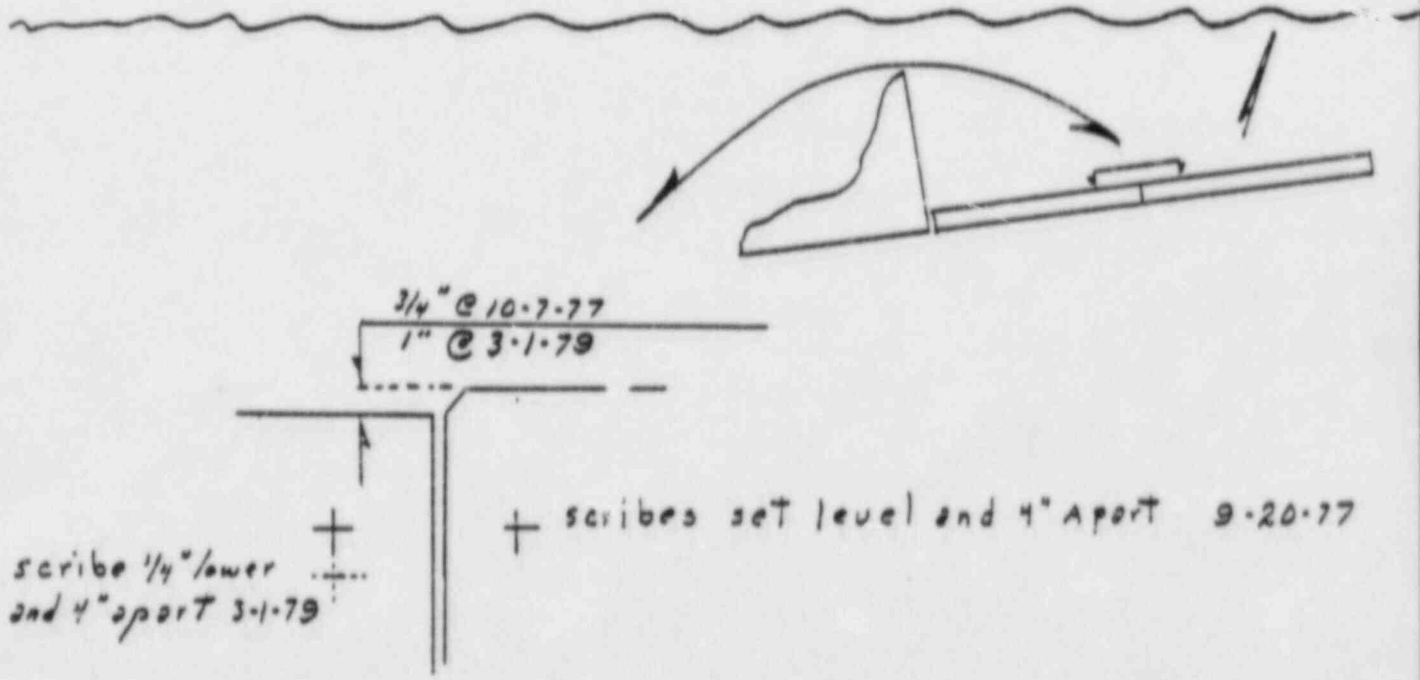
DATE

DESIGN BY C.E.W. DATE 3-1-79 CHECKED BY SHEET NO.

PROJECT settlement of circ. & serv. water retaining walls JOB NO.

SUBJECT CALCULATION NO FILE NO.





SB(00931

0+00	639.49		639.49	Screw
		4.970		
[illegible] 4.53	573.06[illegible]		634.52	TP
		0.060		
			573.00[illegible]	[illegible]
		0.057		
			573.010	2 [illegible]
		0.062		
			573.005	[illegible]
		0.060		
			573.00[illegible]	4 [illegible]
		0.068		
			572.99[illegible]	7 [illegible]
		0.058		
			573.00[illegible]	8 [illegible]
		0.057		
			573.010	3 [illegible]
		+61.452		
4.467	639.45[illegible]		634.51[illegible]	7[illegible]

3-2-79 BM C-435 71

[illegible]

[illegible] 9-0518

[illegible]

SBC09832

CALCULATION SHEET

BECHTEL

DESIGN BY C.E.H. DATE 2-27-79 CHECKED BY ____ DATE ____ SHEET NO. ____

PROJECT elev checks JOB NO. ____

SUBJECT ____ CALCULATION NO. ____ FILE NO. ____

	ORIG. Elev	elev - 2-27-79
scribe on col M-11	639.50	639.50
" " " L8-9	639.50	639.50
scribe on Wall approx 7.8 + "K"	638.00	637.99
" " " " 7.8 + 2'W. of "J"	640.00	639.99
" on Col Fx "7.79"	639.50	639.49
" " " Ex "7.79"	639.50	639.505
" on wall approx 5.1 + 9'S. of "B"	639.50	639.49
" on Col Ex + "5.31"	639.50	639.50
" on wall approx "G" + 3'E. of "S."	638.00	638.00
" on wall approx. "K" + 2'w of "5"	641.00	640.97
" on Col Kc + "5.0"	639.50	639.47
" on Col L8 + "3.0"	639.50	639.47

as a considerable number of the columns are now in conc. or block walls, we obtained elev's on some of the scribes that were placed on the walls as they were poured. The above Table is the result

SBC00833

CALCULATION SHEET

DATE ______

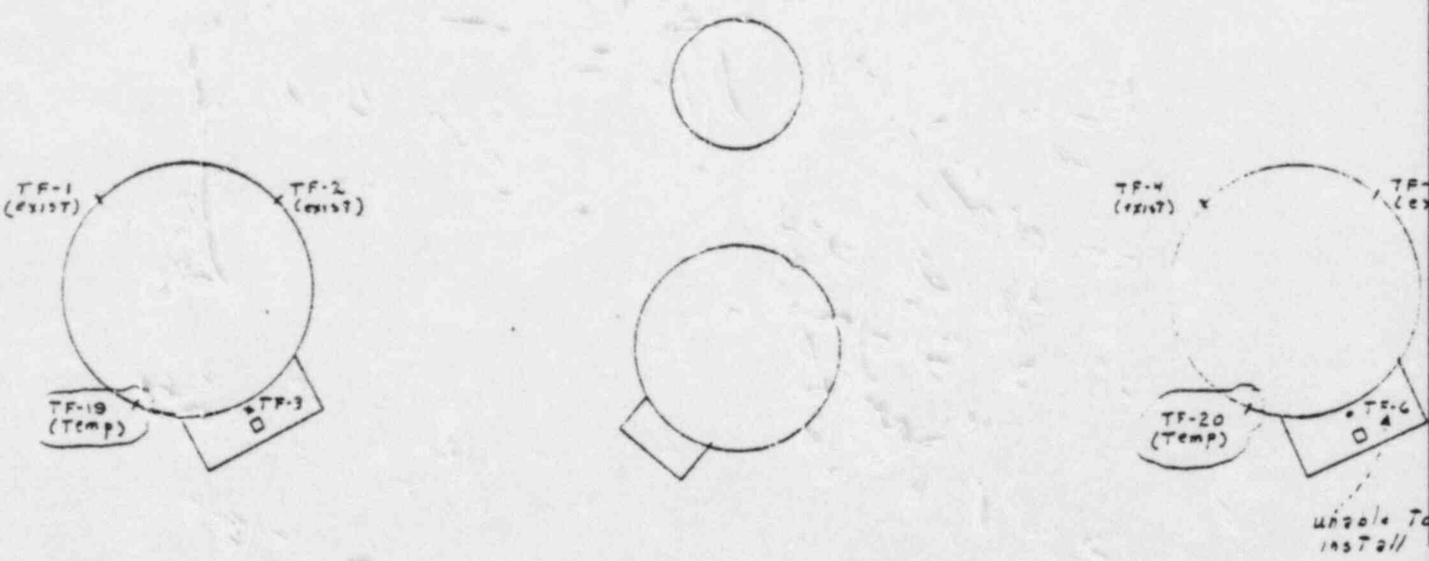
DESIGN BY C.E.V.J. DATE 2-27-79 CHECKED BY ______ SHEET NO. ______

PROJECT Possible settlement in PiT #1 - Tank Farm JOB NO. ______

SUBJECT ______ CALCULATION NO. ______ FILE NO. ______

On 2-23-79, while setting elevations for the filters in piT #1, the elevation of the frame around the opening in the piT roof appea[red] to be low. Subsequent checking confirmed this and also identifi[ed] that the sleeves through the pit walls were also low compared to the as-set condition.

To check this possible settlement, TF 3 was installed and also two additional settlement points were set as indicat[ed] below on 2-26-79. Preliminary elevations will be taken on these points as of 2-27-79 and read weekly until we ascertain the problem, if one exists.



SB009834

DESIGN BY CEW DATE ______ CHECKED BY ______ DATE ______ SHEET NO. ______

PROJECT Comparison study between T-13 & DG-3 JOB NO. ______

SUBJECT ______ CALCULATION NO. ______ FILE NO. ______

7-7	0.151	9-26	0.221
7-15	0.158	9-30	0.226
7-25	0.168	10-7	0.224
8-4	0.172	10-10	0.227
8-11	0.181	10-12	0.232
8-15	0.183	10-19	0.236
8-16	0.192	10-27	0.237
8-18	0.195	11-13	0.245
8-19	0.198	11-16	0.247
8-23	0.201	11-17 AM	0.284
8-29	0.202	11-20	0.294
9-1	0.207	11-24	.303
9-7	0.212	12-15	.339
9-15	0.216	12-16	.348
9-22	0.218	[illegible]	.363

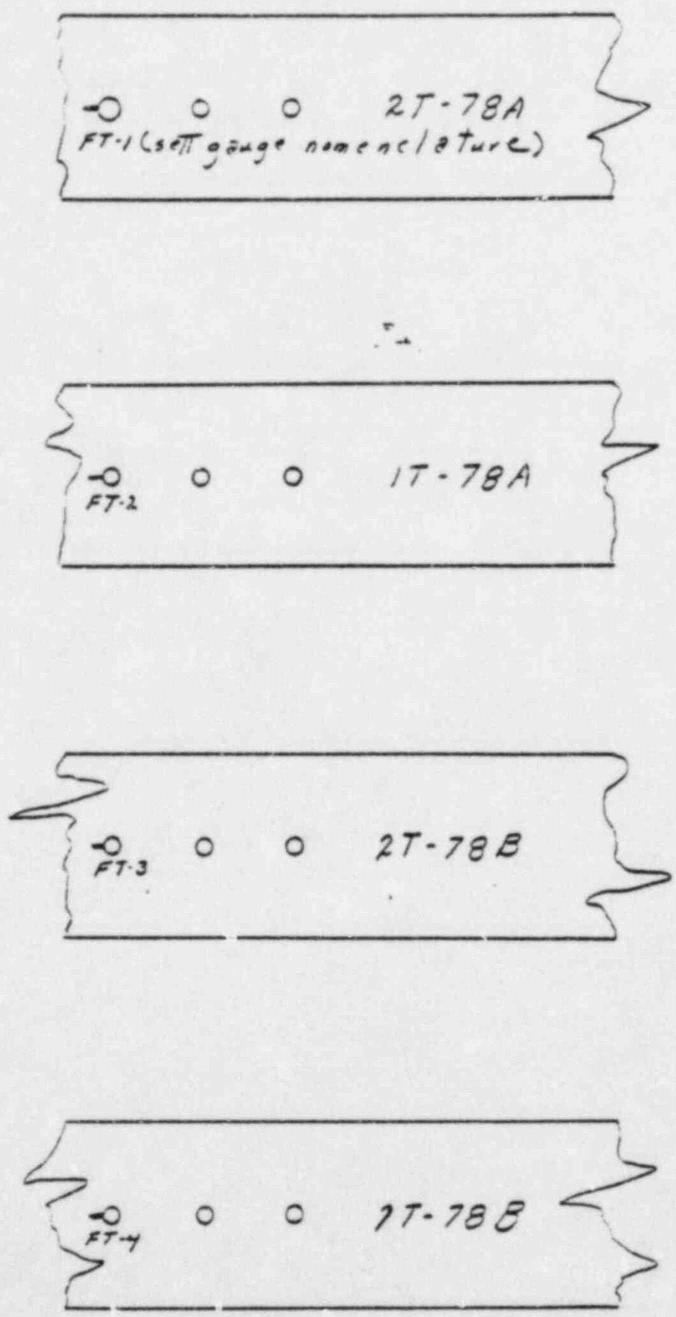
SB009835

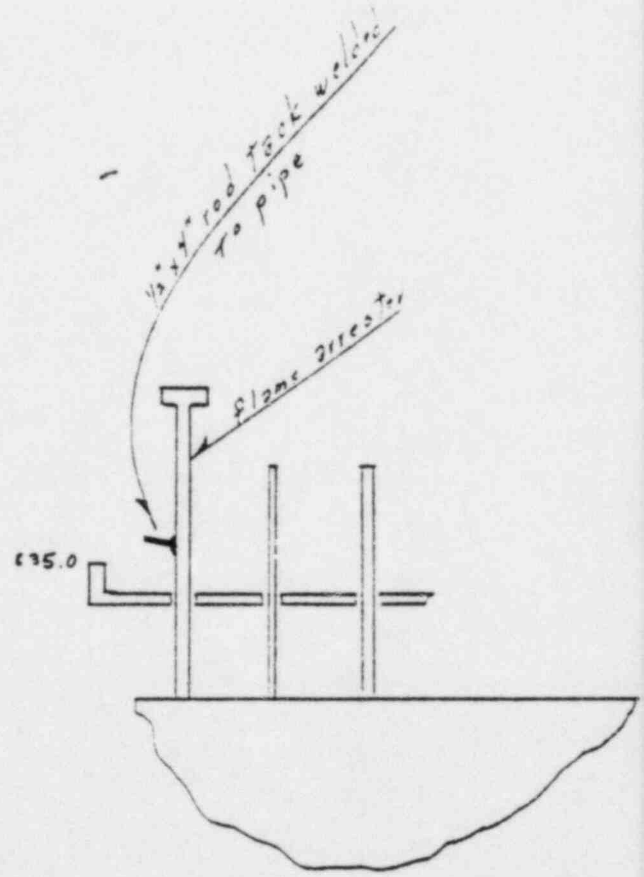
DATE

DESIGN BY C.E.W. DATE 3-1-79 CHECKED BY SHEET NO.

PROJECT add sett. gauges to dies fuel tank JOB NO.

~~SUBJECT~~ flame arrester piping CALCULATION NO. FILE NO.





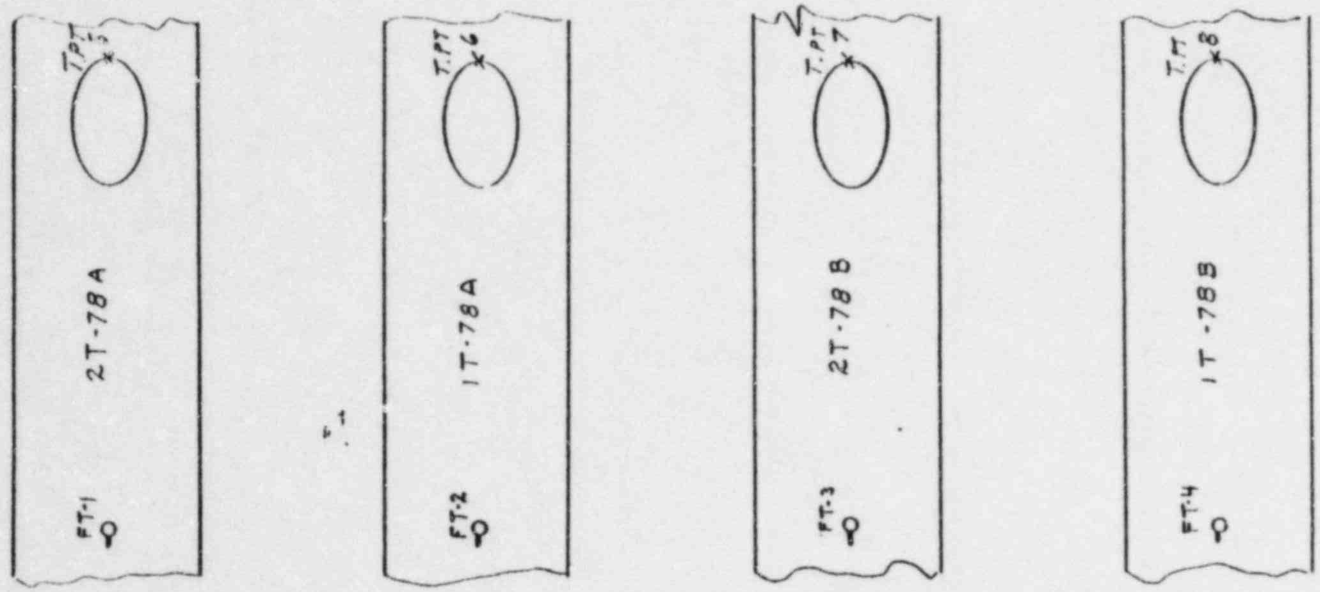
SB009836

DESIGN BY C.E.W. DATE ____ CHECKED BY ____ SHEET NO. ____ DATE ____

PROJECT Hydro-Test Dies. Fuel Tanks JOB NO. ____

SUBJECT ____ CALCULATION NO. ____ FILE NO. ____

FT-1	636.118	.118	.119	.120	.120	.121	.118	.120	.119	.119	.119	.119	.119	.113
" 2	636.140	.140	.141	.141	.142	.144	.142	.142	.142	.143	.141	.142	.141	.139
" 3	636.009	.009	.010	.014	.012	.015	.011	.014	.014	.013	.014	.012	.011	.009
" 4	635.874	.874	.873	.877	.877	.877	.879	.877	.877	.876	.876	.876	.875	.873
T.PT. 5	632.978	.979	.980	.982	.982	.983	.983	.982	.981	.980	.981	.982	.981	.981
" 6	633.017	.017	.019	.021	.021	.023	.021	.021	.022	.021	.021	.021	.020	.019
" 7	633.024	.023	.025	.027	.027	.029	.027	.029	.029	.027	.028	.027	.026	.026
" 8	632.990	.987	.988	.990	.992	.994	.991	.994	.993	.992	.993	.991	.991	.989



SB009837

DATE ______

DESIGN BY ______ DATE ______ CHECKED BY ______ SHEET NO. ______

PROJECT ______ JOB NO. ______

SUBJECT ______ CALCULATION NO. ______ FILE NO. ______

		3-22	3-29	4-11	4-27	5-8-79	5-16-79	5-18-79	5-25-79	6-1-79	6-8-79	6-14-79	6-20-79	[illegible]
FT-1	1	.113	.117	.119	.118	.117	.119	.118	.118	.116	.116	.111	.117	.117
	2	.135	.141	.137	.139	.128	.134	.134	.133	.131	.130	.133	.132	.133
	3	.006	.012	.010	.011	.009	.016	.016	.015	.013	.011	.012	.010	.021
	4	.869	.875	.875	.876	.873	.882	.881	.880	.877	.876	.879	.877	.879
Tp1	5	.974	.979				.982	.982	.981	.981	.979	.961	.982	.981
	6	.014	.020				.021	.020	.018	.018	.016	.018	.018	.017
	7	.022	.027				.028	.025	.024	.023	.021	.027	.021	.021
	8	.985	.992				.994	.993	.991	.989	.987	.989	.990	.989

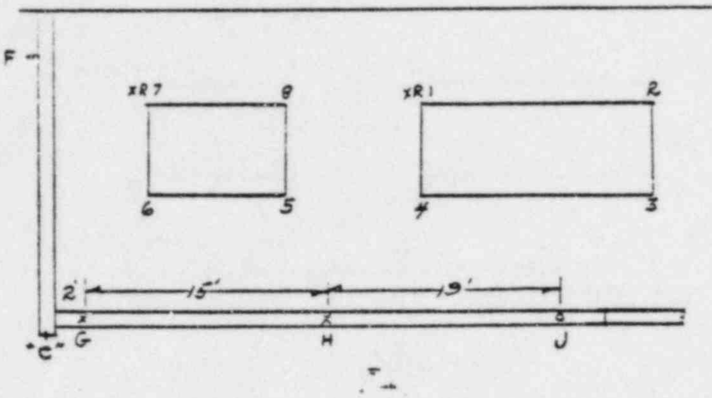
		7-13
FT	1	.116
	2	.131
	3	.019
	4	.876
TPT	5	.982
	6	.027
	7	.023
	8	.988

SBC09838

DESIGN BY C.E.W. DATE 5-23-79 CHECKED BY ______ DATE ______ SHEET NO. ______

PROJECT surcharge of unit 1 transf. area JOB NO. ______

SUBJECT [illegible] CALCULATION NO. ______ FILE NO. ______



	Prior To fill 5-23-79	AFTER Fill 6-1-79	6-7-79	6-14-79	6-21-79	6-28-79	7-5-79	7-13-79	7-19	7-27	8-2	8-9	8
XR 1	634.106	.092	.082	.082	.083	.080	.084	.079	.079	.077	.075	.077	[illegible]
2	633.992	.994	.984	.984	.985	.983	.984	.981	.981	.979	.973	.978	[illegible]
3	633.917	.916	.905	.906	.906	.904	.907	.899	.902	.900	.898	.900	[illegible]
4	634.060	.040	.029	.027	.030	.026	C.I	.021	.023	.021	.020	.022	[illegible]
5	634.256	.252	.244	C.I.	.247	.243	C.I	.243	.239	.239	.240	.242	[illegible]
6	634.175	.168	.163	.161	.163	.160	.164	.158	.159	.156	.155	.156	[illegible]
7	634.281	.279	.273	.272	.273	.269	.274	.270	.272	.268	.265	.267	[illegible]
XR 8	634.204	.204	.196	.198	.196	.195	.199	.195	.196	.194	.192	.194	[illegible]
"C"	636.429	.420	.420	.417	.418	.415	.414	.409	.409	.407	.406	.408	[illegible]
"F"	633.420	.415	.416	.413	.414	.413	.413	.408	.410	.410	.409	.412	[illegible]
Hilti "G"	634.198	.193	.186	.187	.187	.183	.187	.182	.182	.179	.178	.182	[illegible]
Hilti "H"	634.235	.224	.216	.216	.215	.214	.216	.211	.211	.205	.207	.203	[illegible]
Top Bolt "J"	634.514	.499	.489	.489	.488	.485	.490	.485	.484	.481	.482	.483	[illegible]

SHC 09839

7-10-78 8-31-78 9-8-78 9-11-78 9-15-78 9-19-78 9-22-78 9-29-78 9-29-78

10-3-78 10-6-78 10-10-78 10-13-78 10-17-78 10-20-78 10-24-78 10-27-78

DESIGN BY C.E.W. DATE

CHECKED BY DATE

PROJECT Dies Gen Bldg scribe surv. Program SHEET NO.

SUBJECT elevs are plant data JOB NO

CALCULATION NO. FILE NO.

SBDGS #1

	10-31-78	11-3-78	11-10-78	11-16-78	11-18-78PM	11-20-78	11-24-78	2-23-79
1	639.459	.459	.461	.454	.377	.351	.289	
2	.279	.277	.273	.272	.234	.228	.218	
4		.338	.334	.329	.311	.310	.298	
5		.427	.426	.420	.388	.377	.330	
6		.337	.333		.327	.330	.322	
7		.373	.370	.369		.359	.346	
8	.300	.301	.296	.299	.293	.296	.285	
9	.346	.347	.342	.337	.277	.273	.247	
10		.409	.409	.404	.339	.319	.273	
11		.295	.290	.288	.253	.247	.235	
12		.418	.419	.410	.366	.350	.305	.202
13		.401	.401	.391		.339	.299	.188
14		.377	.376	.366		.321	.291	
15		.349	.347	.341	.311	.302	.281	.158
16		.438	.439	.433	.372	.352	.295	.194
17	.321	.320	.317	.313	.286	.282	.268	
18		.422	.421	.420		.409	.357	.261
19		.403	.402	.401		.392	.349	
20		.383	.383	.381		.372	.336	
21	.345	.344	.340	.339	.327	.328	.317	
22		.403	.403	.399	.380	.376	.345	.203
23		.329	.324	.326	.318	.321	.316	
24		.386	.384	.385	.	.378	.364	
25		.346	.343	.347	.347	.348	.345	
26		.327	.323	.327	.325	.327	.324	639.250

DATE ______ SHEET NO. 2 JOB NO. ______ FILE NO. ______

DESIGN BY C.F.W. DATE ______ CHECKED BY ______ CALCULATION NO. ______

PROJECT Dies Gen Bldg scribe surv. program

SUBJECT elev's are plant el.

SB003542

1	639.452	.454	.454	.459	.453	.458	.458	.458
2	.293	.293	.290	.284	.281	.282	.281	.280
4		.350		.345		.340		.335
5		.433		.427		.423		.422
6		.346		.342		.339		.341
7		.383		.376		.372		.373
8	.312	.313	.309	.306	.297	.308	.300	.302
9	.352	.354	.351	.349	.343	.348	.346	.347
10		.409		.409		.408		.408
11		.308		.298		.297		.293
12		.424		.422		.416		.414
13		.406		.404		.401		.399
14		.384		.378		.374		.373
15		.358		.354		.349		.348
16		.436		.436		.434		
17	.337	.333	.329	.325	.319	.322	.321	.318
18		.423		.422		.420		.422
19		.411		.407		.403		.403
20		.392		.386		.384		.383
21	.360	.355	.351	.346	.344	.344	.346	.342
22		.413		.406		.402		.403
23		.342		.341		.329		.330
24		.403		.394		.389		.390
25		.368		.355		.350		.350
26		.343		.338		.331		.331
DG 3	633.994	633.993	633.990	633.984	633.981	633.981	633.980	633.980

DESIGN BY [illegible] DATE ____ CHECKED BY ____ DATE ____ SHEET NO. 1 of [illegible]

PROJECT Dies Gen Bldg. scribe surveillance program JOB NO. [illegible]

SUBJECT ____ CALCULATION NO. ____ FILE NO. ____

		8-31-78							
1	633.437	633.439	.441	.449	.449	.453	.450	.453	.452
2	.368	.308	.305	.306	.303	.303	.300	.298	.293
3	[illegible]	.305	.305		DELETED				
4	.404	.369	.364		.361		.360		.352
5	.444	.425	.426		.426		.430		.422
6	.404	.367	.363		.361		.361		.352
7	.414	.387	.383		.390		.388		.384
8	.394	.336	.331	.336	.332	.332	.329	.326	.312
9	.389	.360	.358	.360	.358	.358	.355	.354	.353
10	.417	.411	.409		.410		.410		.410
11	.370	.324	.321		.318		.314		.310
12	.430	.420	.418		.421		.421		Testing
13	.420	.409	.407		.409		.409		
14	.410	.390	.388		.384		.386		int
15	.401	.370	.368		.366		.366		
16	.430	.428	.426		.431		.431		
17	.390	.349	.345	.349	.342	.343	.339	.336	.334
18	.437	.427	.426		.426		.425		.417
19	.427	.414	.414		.411		.411		.408
20	.422	.396	.399		.396		.395		.392
21	.404	.372	.373	.372	.366	.369	.363	.363	.358
22	.429	.408	.406		.411		.409		.409
23	.400	.358	.355		.358		.354		.348
24	.420	.401	.398		.403		.409		.402
25	.410	.371	.370		.373		.374		.368
26	.400	.356	.356		.356		.358		.351
DG-3				634.007	634.001	634.003	633.998	633.996	633.995

SB009543

MEMORANDUM

Brent Voss — Cons. oper

C.E.W - Bechtel Survey — DATE 9-4 19 79

settlement markes - New — 07220

and re-set

C-7 & CT-6 have been placed and are ready for initial elevations. In addition, The following points were destroyed: DG-5; DG-8; DG-9; DG-12; DG-13. These points were replaced on 8-28-79 & new elevations taken on 8-29-79. These elevations are as follows:

DG-5 - 634.065
DG-8 - 634.076
DG-9 - 634.160
DG-12 - 633.991
DG-13 - 633.909

Your sub contract surveyors should update their reporting sheet accordingly.

SB009913

MCAR-24
INTERIM REPORT

Stephen H. Howell
Senior Vice President

General Offices: 1945 West Parnall Road, Jackson, Michigan 49201 • (517) 788 0453

November 2, 1979
Howe-284-79

Mr J G Keppler, Regional Director
Office of Inspection and Enforcement
US Nuclear Regulatory Commission
Region III
799 Roosevelt Road
Glen Ellyn, IL 60137

File MCAR-24

MIDLAND NUCLEAR PLANT -
UNIT NO 1, DOCKET NO 50-329
UNIT NO 2, DOCKET NO 50-330
SETTLEMENT OF DIESEL GENERATOR
FOUNDATIONS AND BUILDING -
File 0485.16 SERIAL Howe-284-79

References: S H Howell letters to J G Keppler; Midland Nuclear Plant; Unit No 1, Docket No 50-329; Unit No 2, Docket No 50-330; Settlement of Diesel Generator Foundations and Building:

a. Serial Howe-183-78; dated September 29, 1978
b. Serial Howe-230-78; dated November 7, 1978
c. Serial Howe-267-78; dated December 21, 1978
d. Serial Howe-1-79; dated January 5, 1979
e. Serial Howe-58-79; dated February 23, 1979
f. Serial Howe-132-79; dated April 3, 1979
g. Serial Howe-174-79; dated June 25, 1979
h. Serial Howe-218-79; dated August 10, 1979
i. Serial Howe-233-79; dated September 5, 1979

This letter, as were the referenced letters, is an interim 50.55(e) report on the settlement of the diesel generator foundations and building.

Enclosure 1 provides an update of the status of the actions previously discussed, the remedial work in progress or planned, and results of recent investigations.

SB 06981

~~7911070378~~

Another interim report will be sent on or before February 22, 1980.

WRB/lr

Enclosure 1: Letter, Bechtel (JARutgers) to CPCo (GSKeeley), MCAR-24, Interim Report 8, BLC 8370, dated October 29, 1979 with Interim Report 8 dated October 19, 1979 as an attachment

CC: Director, Office of Inspection & Enforcement
Att: Mr Victor Stello, USNRC (15)

Director, Office of Management
Information and Program Control, USNRC (1)

Director of Nuclear Reactor Regulation
Att: Mr Domenic Vassallo, Acting Director
Division of Project Management, USNRC
Washington, DC 20555

Mr William Lawhead
US Corps of Engineers
NCEED-T
477 Michigan Ave, 7th Floor
Detroit, MI 48226

BCC: JLBacon, M-1085A
WRBird, JSC-216B
TCCooke, Midland
JLCorley, Midland
LHCurtis, Bechtel AA
LEDavis, Bechtel-Midland
LADreisbach, Bechtel-Midland
DEHorn, Midland
CAHunt, P14-209B
GSKeeley, P14-408B
MJKoschik, M-890A
EWMarguglio, JSC-220A
DEMiller, Midland
JARutgers, Bechtel AA
HEGibbs, ILAB
Route: EWM/STH/File: 0.4.9.20
NJSaari, Saginaw

SB 06982

Return to R... Midland Site

Bechtel Associates Professional Corporation

Inter-office Memorandum

To	DISTRIBUTION	Date	August 20, 1979
Subject	Midland Diesel Generator Task Group Meeting Notes Job 7220-101	From	~~Karl Wiedner~~
		Of	Engineering
Copies to	P. Becnel, w/a	At	Ann Arbor

S. Blue, w/a
P. Hansen/R. Hermeston, w/a
T. Johnson, w/a
P. Martinez/L. Curtis, w/a
J. Newgen, w/a
H. Wahl, wo/a

Attached for your information, record and further action are the meeting notes #1018 of the diesel generator task group meeting held [redacted]. By copy of this memo, Phil Martinez is requested to forward copies of these meeting notes to Consumers Power for their dissemination to their attendees.

for K L Bailey
Karl Wiedner

KW/cf

Attachment

ATTENDEES

J. Betts
A. Boos
P. Chen
B. Dhar
W. Kinzer
S. Kirker
J. Lillywhite
C. McConnel
W. Paris
D. Reeves
[redacted]
J. Wanzeck

Action items 50.54(f) attached as part of response as of 7/31/79.

SB 06997

Bechtel Associates Professional Corporation

777 East Eisenhower Parkway
Ann Arbor, Michigan

Mail Address: P.O. Box 1000, Ann Arbor, Michigan 48106

MEETING NOTES NO. 1018

MIDLAND PLANT UNITS 1 AND 2

CONSUMERS POWER COMPANY

BECHTEL JOB 7220-101

DATE: [redacted]

PLACE: Midland, Michigan

SUBJECT: Meeting of the Diesel Generator Building Task Group

FILE: 0279, C-2645 w/a

ATTENDEES:

Bechtel		CPCo
J. Betts	C. McConnel	D. Horn
A. Boos	W. Paris*	D. Sibbald
P. Chen	D. Reeves	T. Thiruvengadam
B. Dhar	R. Rixford	R. Wheeler
W. Kinzer*	J. Smith	
S. Kirker	J. Wanzeck	
J. Lillywhite*	K. Wiedner	

*Part-time

PURPOSE: The meeting was held at the Midland jobsite to discuss the items in relation to the diesel generator building settlement and other Seismic Category I structures on plant fill.

ITEMS DISCUSSED:

A) Review of Prior Action Items

The current status of action items identified in the previous meeting held on June 25, 1979, is as follows.

1) Action Item 6 of Meeting Notes No. 976

This item is closed. The data and drawings concerning separation of Canonie's work from Bechtel work by construction have been forwarded to geotechnical services for review.

SB 06998

2) [redacted]

[redacted].

3) Action Item 8 of Meeting Notes No. 976

This item is closed. Surveillance requirements for Q-listed duct banks were established in Bechtel Letter BEBC-3053 dated June 27, 1979.

4) Action Item 9 of Meeting Notes No. 976

This item is closed as far as the July commitment. Additional information on time settlement will be incorporated into the FSAR after evaluation of rebound measurements and will be tracked as an action item to the NRC's 10 CFR 50.54(f) questions.

5) Action Item 10 of Meeting Notes No. 976

This item is closed. Drawing 7220-C-998, Rev 3, showing the design of the flexible pipe connections to the condensate tanks, was issued on May 25, 1979.

6) Action Item 11 of Meeting Notes No. 976

This item is closed. Review of differential settlement for pipes between structures will be reviewed on a case-by-case basis in accordance with Bechtel letter BEBC-3134 was sent on July 27, 1979.

7) Action Item 12 of Meeting Notes No. 976

This item is closed. Both condensate tanks are almost finished.

8) Action Item 13 of Meeting Notes No. 976

This item is closed. The response to Question 6 of the NRC's 10 CFR 50.54(f) was amended on May 31, 1979, to state that piping connections to the borated water storage tanks will be made before the load tests are complete.

9) [redacted]

[redacted]

10) Action Item 15 of Meeting Notes No. 976

This item is closed. Project engineering has passed the comments for FSAR Section 2.5 on to geotechnical services.

11) [redacted]

[redacted]

12) Action Item 17 of Meeting Notes No. 976

This item is closed. An FSAR amendment was issued to incorporate all the changes known at that time. However, geotechnical services has further comments. See Action Item 8 of these meeting notes.

13) [redacted]

[redacted]

14) Action Item 20 of Meeting Notes No. 976

This item is closed. Identification of Q-listed portions of remedial work has been incorporated into the respective specifications.

15) Action Item 23 of Meeting Notes No. 976

This item is closed. The response to Question 12 of the NRC's 10 CFR 50.54(f) was included in Revision 1, issued on May 31, 1979.

16) Action Item 24 of Meeting Notes No. 976

This item is closed. The dewatering contract package was issued for bids on June 12, 1979, and a contract for temporary dewatering was awarded on July 13, 1979.

17) Action Item 25 of Meeting Notes No. 976

This item is closed. The requirement for chemical grouting has been deleted.

18) Action Item 26 of Meeting Notes No. 976

This item is closed. The requirement for chemical grouting has been deleted.

19) Action Item 27 of Meeting Notes No. 976

This item is closed. Specification 7220-C-95(Q) (underpinning) was issued for bids on August 2, 1979. The bid package will be transmitted by August 8, 1979.

20) Action Item 28 of Meeting Notes No. 976

This item is closed. The requirement for a temporary support for the auxiliary building has been deleted.

21) Action Item 29 of Meeting Notes No. 976

This item is closed. The requirement for a temporary support for the auxiliary building has been deleted.

22) Action Item 30 of Meeting Notes No. 976

This item is closed. The permanent dewatering system will eliminate the liquefaction potential of the sands under the diesel generator building and other plant structures.

23) Action Item 31 of Meeting Notes No. 976

This item is closed. The requirement for chemical grouting has been deleted.

24) Action Item 32 of Meeting Notes No. 976

This item is closed. The sixth interim report for MCAR 24 was issued on June 11, 1979.

25) Action Item 33 of Meeting Notes No. 976

This item is closed. The report on U.S. Testing's density tests has been completed and forwarded to project engineering.

26) Action Items 2 and 4 of Meeting Notes No. 1000

These items are closed. A TWX was sent to Goldberg-Zoino-Dunnicliff & Associates (GZD) on July 17, 1979, defining the areas that required further surveying. GZD has completed the additional survey and has forwarded preliminary information to project engineering.

27) [redacted]

[redacted]

28) Action Item 5 of Meeting Notes No. 1000

This item is closed. Operation of the diesel generators for 2 months after their installation to vibrate the pedestals and the monitoring of settlements during this period will be incorporated into the technical specifications.

29) Action Item 6 of Meeting Notes No. 1000

This item is closed. Specification 7220-C-211, Rev 7 (structural backfill) was issued on June 27, 1979.

30) Action Item 7 of Meeting Notes No. 1000

This item is closed. The temporary dewatering contract package was issued for bids on June 12, 1979, and the contract was awarded on July 13, 1979.

31) Action Item 8 of Meeting Notes No. 1000

This item is closed. Specification 7220-C-95 (underpinning) was issued for bids on August 2, 1979. The bid package will be transmitted by August 8, 1979.

32) Action Item 9 of Meeting Notes No. 1000

This item is closed. The requirement for chemical grouting has been deleted.

33) [redacted]

[redacted]

B) <u>Status of Site Activities</u>

1) Compaction Tests and Backfill Operation

a. Sand

Geotechnical services and construction reported that they have tested several pieces of compaction equipment and [redacted]. They have been placing non-Q fill for the past month and, [redacted].

b. Clay

Geotechnical services and construction reported that they are having trouble qualifying compaction equipment for clay. They can obtain 95% BMP and 90% ASTM D 1557 100% of the time. [redacted].

Project engineering agreed to review the Dames and Moore recommendations to see if the compaction requirements can be reduced in certain areas specified by construction to 90% ASTM D 1557.

2) Effect of Temporary Air Line Leak on Existing Backfill

Geotechnical services reported that four soil borings, one inspection pit, and two plate load tests had been done in the area of the air line leak. No significant difference was noted between these soil borings and previous soil borings in the area. [redacted] Geotechnical services will write a report, including R. Peck's letter, concerning the air line leak documenting the acceptance of this fill area.

3) Test Pits and Borings

Data from test pits and soil borings in the tank farm area for evaluation of the fill near the air line leak shall be transmitted to project engineering and geotechnical services by August 3, 1979. [redacted]. A summary shall be included in the FSAR.

C) Status of Response to 10 CFR 50.54(f) Questions

For the status of the responses to the NRC's 10 CFR 50.54(f) questions, see Attach . 1 to these meeting notes.

D) Contracts for Remedial Work

1) **Temporary Dewatering**

Approximately 60 to 100 holes through the turbine building base slab will be required for dewatering. The holes will be drilled from the floor at elevation 634'-0" to reduce the number of times that the drill rig must be dismantled. The drilling will be done on a cost plus basis. The additional estimated cost for the dewatering is $580,000. M. Rung (Extension 425) will be in charge of the subcontract. All contact with the subcontractor will be made through him.

2) [redacted]

Laughney Dewatering Inc. will submit a preliminary design and scope of work for the dewatering by August 15, 1979. Project engineering will issue the bid package by November 1979 and award it by February 1980. [redacted] A team made up of people from each discipline will be assembled to do this specialized work. [redacted] A plan will be developed to determine the drawdown and recharge rates and quantity of ground water. A yard lighting power source might be used as a backup supply for the dewatering system. Construction is to determine the proper terminology to be used for this work. This determination is to consider appropriate union jurisdictions.

3) [redacted]

[redacted] It will be sent to CPCo for review and to Spencer and White and to Mergentime corporation for bids.

4) [redacted]

Construction recommended that the service water building piling contract be made part of the bridge contract. Recommendations as to where it should be kept separate will be provided to construction by August 10, 1979. The package will be issued for bids in September 1979. [redacted].

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E) <u>Results of July 18 Meeting with the NRC and Resulting Action Items</u>

Some of the questions that were asked by the NRC during the July 18, 1979, meeting were discussed, and it was decided that a review of all existing reports and responses would be made to verify that all of the subject areas had been adequately covered. Any relevant subjects or questions not answered would be covered in the next MCAR 24 report.

F) <u>Discussions on any Additional Agenda Items</u>

Construction brought up the subject of service water line turnover. The valves would be installed as soon as the profiling was complete. If the lines needed to be reprofiled, then the valves would be removed again later. It was suggested that the service water lines be plugged at the location of the future meter pits between the service water building and the valve pits. This would allow the service water lines to the auxiliary building to be used without affecting work in the diesel generator building area.

[redacted]

G) [redacted]

It was decided that details on dewatering and piles will be touched only briefly in the next MCAR report. More detailed information will be provided in a future interim report. A revised schedule should be included in the next interim MCAR report.

When diesel generator building settlement evaluation is complete, all of the revised information and reports will be incorporated at one time into the FSAR.

ACTION ITEMS:

Project Engineering	1)	Analyze the flexibility of piping connected to the borated water storage tanks, assuming 4 inches of differential settlement. Also [redacted]. [redacted] 1979.

Geotechnical Services/ Project Engineering	2)	Prepare an FSAR change to incorporate comments on FSAR Section 2.5 by August 25, 1979.
Project Engineering	3)	Complete crack mapping in the areas of the railroad bay, feedwater isolation valve pit, and borated water storage tanks by August 17, 1979.
Project Engineering	4)	Evaluate stress conditions in the resurveyed pipes by August 25, 1979.
Project Engineering	5)	Issue specification and drawings for piling subcontract by August 24, 1979.
Project Engineering	6)	Issue program for release of borated water storage tanks for construction, including load test and water chemistry for the water to be used in the load test by September 1, 1979.
Project Engineering	7)	Review latest response to Question 6 of the NRC's 10 CFR 50.54(f) for a conflict between the first and second paragraphs on pipe connections.
Geotechnical Services/ Project Engineering	8)	Resolve comments by geotechnical services on engineering response to FSAR Q&R 362.15 by September 1, 1979.
Construction	9)	Provide engineering with proposed locations of backfill to be compacted to 90% of ASTM D 1557.
Geotechnical Services/ Project Engineering	10)	Review Dames and Moore recommendations to see if compaction requirements can be reduced to 90% ASTM D 1557 in the locations proposed by construction.
Geotechnical Services	11)	Finish report on results of soil test program for air line leak in tank farm by August 6, 1979. Include summary of R. Peck's letter.
Project Engineering	12)	Incorporate air line leak report into next MCAR report. Detailed data from test program will be included in subsequent MCAR reports.

Laughney Dewatering Inc.	13)	Submit preliminary design and scope of work for permanent dewatering by August 15, 1979.
Project Engineering	14)	Issue bid package for permanent dewatering by November 1979.
Project Engineering	15)	Award contract for permanent dewatering by February 1980.
Project Engineering	16)	Determine Q-listed items of permanent dewatering system by September 1, 1979. Assemble a team of people from each discipline to review the system, and prepare a schedule for this activity.
Project Engineering	17)	Review NRC regulations with respect to permanent dewatering.
Project Engineering	18)	Licensing group to do docket search for information on permanent dewatering at other plants.
Project Engineering	19)	Estimate costs for all Q and part Q (instrumentation or monitoring) dewatering systems.
Project Engineering	20)	Review construction recommendation to include service water building piles in bridge contract by August 10, 1979.
Project Engineering	21)	Evaluate piling bids and send to CPCo for review by September 1979.
Construction	22)	Determine terminology to be used for dewatering with respect to union jurisdictions.
Project Engineering	23)	Issue underpinning package to CPCo for review, and to Spencer and White and to Mergentime corp. for bids.
Construction	24)	Review insurance requirements concerning underground work associated with underpinning, Specification 7220-C-95.

Geotechnical Se.vices/ Project Engineer.ng	25) Review diesel fuel tank settlements and investigate removing water by September 1, 1979.
Project Engineering	26) Verify that the technical specification for diesel generators allows for operation of the diesel generators for 2 months after installation to vibrate the pedestals and for realignment in conjunction with results from settlement surveillance program.
Construction	27) Investigate using diesel generator building surcharge sand as fill materials for Q areas.
Project Engineering	28) Pile stiffnesses for service water building to be finalized by August 15, 1979.
Geotechnical Services	29) Resolve comments noted in questions of July 18, 1979, NRC meeting on removal of 3 to 4 feet of fill from the tank farm.
Construction	30) Grout temporary air line in the tank farm.
Project Engineering	31) Incorporate a summary of data from test pits and soil borings into the FSAR.
Construction/ Geotechnical Services/ Project Engineering	32) Develop a plan to determine permanent dewatering system parameters, drawdown and recharge rates, quantity of ground water, and recharge time.
Geotechnical Services/ Project Engineering	33) Review questions asked at the meeting with the NRC on July 18, 1979. All items relevant to the MCAR scope that have not been covered in previous reports will be answered in the next MCAR report. (next MCAR report is due August 24, 1979)
Project Engineering	34) Provide a schedule and procedure for the removal of the surcharge by August 15, 1979.
Construction	35) [redacted] by August 3, 1979.

M.D. Reeves

MDR/js
8/7/3

SB 07008

To File

From TCCooke/RMM

Date August 6, 1979

Subject MIDLAND PROJECT GWO 7020
GENERAL MEETING WITH CONSULTANTS
File: B3.0.3 Serial: CSC-4255 UFI#-00234-S

Consumers Power Company

Internal Correspondence

cc Attendees
GSKeeley, P14-408B
DBMiller
KCBrooks (2)

Attendees:

Karl Wiedner, Bechtel
Phil Martinez, Bechtel
Sherif Afifi, Bechtel
Bimal Dhar, Bechtel
Al Boos, Bechtel
Art Arnold, Bechtel
Dr. Ralph Peck, Consultant
Dr. A. Hendron, Jr., Consultant
Dr. M. T. Davisson, Consultant
Chuck Gould, Consultant
Dick Loughney, Consultant
Tom Cooke, Consumers Power Co.
Don Sibbald, Consumers Power Co.
Don Horn, Consumers Power Co.
Thiru Thiruvengadam, Consumers Power Co.

Introduction

P. A. Martinez noted that this meeting was being held to finalize the consultants' recommendations for information to be sent to the NRC on July 6 in preparation for the July 18 meeting. Mr. Martinez also stated that liquefaction and treatment of material below the Class I structures were the main topics and he briefly reviewed the discussion of the previous evening.

Liquefaction Potential and Sand Backfill around Category I Containment Structures

There is no problem with dewatering since the till can easily support the containment load of 10KSF. Containment Building diameter change of approximately 1/4" due to pre-stressing is too trivial to consider and should be deleted from any concerns. The consultants stated that the permanent dewatering system should be designed to do the job regardless of site conditions (dike locations). After completion of the conceptual design, the initial wells should be installed and dewatering should quickly determine (a few weeks after start of pumping) what is required for the minimum practical design. The permanent dewatering system should contain sufficient redundancy, with more units than required for maintenance purposes. Routine maintenance and renovation over the years will take up a certain number of wells. Total system redundancy would not be required because there would be a time lag from the cessation of pumping before water in an area could rise to a critical level. It would probably be a good idea to have some standby (non-Q) power available for the pumps. To be practical, all power block areas should be dewatered whether problems are known or not. It was noted that Regulatory Guides overlooked the pumping of fines, however, this was thought to be key point and wells generally should be kept 50' minimum from structures on the permanent dewatering system. Continuous sand zones in till would be advantageous for drainage.

16309

however, that condition cannot be assured. Mr. Loughney stated that we should put a ring of wells around the power block. The wells should extend to the clay till. Some of the temporary dewatering wells should be made permanent to allow draining of any crown water (rain, etc). It was again noted that the water would take a week or two to return to the power block area if the system stopped pumping. Since we would have time to make repairs or shut the plant down, only the piezometers need to be Q-listed. Mr. Loughney estimated that the wells should be at about 12' centers with sand vertical drains possibly to help drain crown and perched water tables and some wells in the middle for balance (critical area). The designer would have to plan his systems so as to prevent fines extraction (proper screens and/or distance). For an area of 600' x 500', Mr. Loughney estimated that 250 to 300 wells maximum with submersible pumps would be required on the perimeter. They could be of the type that has heavy wall plastic well screen which would be good for about 40 years. The pumps would normally have a five-year life and cost about $300 each. It could be assumed that about 20 to 30 pumps would go out each year. Timers would be required for the pumps and 440V would be the best voltage The total well cost would be approximately $3,000 per well. Added to that would have to be the piezometers (Q-listed) and temporary or observations wells. Non-Q standby generators, if desired, could be purchased and installed for about $40,000. The cost of that, the piping and the electrical should be around $2 Million. It was estimated that $25,000 to $35,000 a year maintenance cost would be required after, say, 25 wells go out, and to take care of acid treatment of the wells at three-month intervals. A chemical grout curtain in sand around some pipes could be considered at a later date. However, this should not be a problem. If local clay areas are encountered, the wells should still remain at 12' intervals. The additional settlement due to the dewatering would be in the range of 0-1/2". The design changes required for a wet versus dry fill would be primarily administrative in nature in the FSAR below Elevation 618'. The bearing capacity and sliding friction would be enhanced. The settlement calculations have to be revised in any event. Wells should extend down to till. It was noted that the wells would be much more positive than grouting to prevent liquefaction. It would not be possible to ensure the grouting effectiveness. Dewatering totally eliminates the liquefaction problem.

Removal of Surcharge

The consultants noted that it would take approximately eight weeks of accurate readings prior to removal of the surcharge to obtain required evidence, even though an accurate prediction could probably be made at this time by bracketing the residual settlement expected. Although rebound is independent of long-term settlement, the data will be useful. The consultants need to see the trend on the settlement fir Dewatering of the Auxiliary Building would change the trend conditions slightly. That would be the earliest time (present schedule) to remove the surcharge with dependable information. It was noted that about 0.032" has been the maximum deflection in the last three weeks, however, all of the data needs to have temperature correctio applied. Goldberg-Zoino-Dunnicliff are working on correcting the data for temperature It was also noted that due to long-term settlement, some flexibility in the utilities may have to be designed into the connections based on the settlement predictions which could include differential settlement.

Chemical Grouting

Art Arnold noted that because of verification problems with chemical grout, it would not be necessary unless a very permeable trench was encountered during dewatering. Silica grout in the sand may be acceptable for that situation. It can be deleted as a remedial action from the responses because it is too much of a problem to prove to everyone's satisfaction that adequate grouting has been performed.

Need for Removal of Loose Sands Under the Diesel-Generator Structures

This requirement disappears with Option 5, however, settlement of sand due to vibration has to be calculated. The diesel generator should be started as soon as possible to induce the maximum settlement due to vibration. It is expected that this will be in the range 1/2 to 1" and take place in a few weeks. It would be better for predicting long-term settlement if the water table was not lowered. No other vibratory means approach the use of the diesel generator for pre-vibrating the foundations. Mr. Davisson noted that he needed the diesel generator rpm for his information. Mr. Afifi noted that the running of the generators would also help the seismic calculations. The exact amount of settlement will be determined at a later date based on refined data. At present, a refined calculation is needed because old calculations were based on saturated sand. Mr. Davisson noted that we should look hard at connections of utilities to the diesel generator and the building and that allowance should be made for a maximum of one-foot movement in any direction. This allowance would be over kill for any potential problems. The problem was further complicated because of the fact that there is sand on the north side of the foundation and clay on the south side of the foundation. The pre-load would predict an additional long-term settlement of the clay, then after the diesel generator run, any settlement due to vibration could be determined. We could then add seismic settlement of sand from the earthquake motion and dewatering settlement.

Need for Removal of Loose Sands and/or Soft Clays under Electrical Penetration Areas of FW Valve Pits

B. Dhar summarized the Auxiliary Building electrical penetration areas analysis. He included static and dynamic loads, horizontal and torsional loads. Mr. Dhar noted that the horizontal shear of approximately 1,200 to 1,300 Kips would be transferred to the soil and possibly through the soil to the Turbine Building and/or Containment Building which are analyzed as separate structures. It was noted that the upper floors of the Auxiliary Building wingwalls have a two-inch styrofoam cushion between the two floors and the Containment Building. The shear modulus is calculated from a composite 1,200 foot per second shear wave velocity. The cantilever portion of the structure is probably resting partially on the till and some load is being taken up by the structure. Based on preliminary analysis, a deflection of 1/4" to 1/2" is anticipated based on an uncracked section and ACI 381 "E" Value. The steel would reach a tensile stress of 50 KSI. 1,500 Kips vertical support at the end of wingwall would eliminate any serious cracking problem. This assumes that the soil would be taking zero load. If the structure is required to take the total moment load, two areas would be over-stressed. One would be the wall framing at the southwest area of the control tower and the other would be at the diaphram wall. At 3,000

SB 16311

Kips, there would be zero deflection in the structure (3,000 Kips vertical support applied at the end of the wingwall). A detailed analysis is in progress which will take approximately two to three weeks. The wingwalls could be tied to the Turbine Building slab for the horizontal support. We would also have to change the Auxiliary Building seismic analysis model to some extent. Chuck Gould then outlined the options for taking care of the Auxiliary Building electrical penetration areas problem as follows:

a. Temporary support of valve pit

b. Possible sky hook for the 1,500 Kip load contingent on further structure analysis

c. Excavate 7' beyond the bottom of the slab

d. Grout the loose sand to stabilize the working face

e. Start temporary Turbine Building slab support

f. After stabilizing, start work on five 4' diameter jacking caissons

g. Transfer the load from the sky hook and move to Unit 2

h. Install the remaining caissons for the 3,000 Kip load

i. Possibly drift east and soldier pile to support the excavation when the mass is removed (also serves as bearing support for the Turbine Building)

j. Excavate the fill

k. Fill the material back with lean concrete and then dry pack or grout afterwards. The maximum depth of lean concrete would be about 29'. It would take a long time to dry pack. The possibility of caissons settling would be discussed.

It was noted that the work could stop at Step h. Davisson then discussed some other options to include using the valve pit for access, removal of the soil under the valve pit to the till, and a tie to the electrical penetration area for horizontal shear. Possibly tying into the access gallery or mining valve pit fill, filling with concrete and tying in for horizontal loads would be a way to proceed. It was decided that we should install the caissons and transfer the horizontal load to the valve pit or Turbine Building slab with mining the balance of material under the electrical penetration area only if required by analysis.

The meeting then broke to allow the consultants time to write their preliminary report, a copy of which is attached. This report was briefly discussed following the break.

pp

SB 16312

SB1[illegible]

~~Permanent Dewatering System~~ ~~Preliminary~~

An exterior deepwell dewatering system can be used to dewater the plantsite, with a ~~[illegible]~~ dewatering system being used to remove the crown of the ground water within the dewatered area.

Sufficient redundancy can be provided to assure that the ground water will remain within the desired levels in the event of a disruption or failure of any part of the system.

It is anticipated that ~~after~~ the dewatering system has been operational for over six months that the system could be down from 1 to 2 weeks without the groundwater rising above a critical level.

The nature of the site, existing soil and backfilled soil is such that after the initial dewatering of the site, the quantity of flow entering into the dewatered area would be ~~about~~ less than ~~500~~ 400 gpm.

As determined ~~by~~ during the [illegible] dewatering installation the spacing of the dewatering wells ~~could~~ would be adopted to compensate for any unforseen soil conditions encountered and/or any sources of recharge from the backfill placed around pipe lines extending to the pond and or any source of ~~water~~ recharge water from leaky

SR 16313

operational pipes located at critical points

Any equipment used to mop up the water within the exterior dewatering system would be left in place.

The required observation wells would be installed with the necessary controls at the proper locations to ascertain that the ~~[illegible]~~ desired dewatered conditions are being obtained. The observational system would be Q, but because of the built-in conservatism, the dewatering system would not.

~~Daily~~ Frequent monitoring of the ground water levels and the operating deepwells would be scheduled.

Repair, or replacement of non functioning pumps would be done when sufficient pumps are down.

Scheduled cleaning of the well screens would be performed about every 3 to 6 month period

Assuming a perimeter of 3000 feet the rough estimated cost of an exterior deepwell system complete with the ~~[illegible]~~ necessary discharge, electrical controls and wiring and standby generators would be about $1,200000. This assumes 250-300 deepwells.

To this should be added the cost of the interior mopup system, the observation wells and their controls, (probably $20000) and the yearly maintenance cost.

The estimated yearly ~~[illegible]~~ maintenance cost for treating the wells and repairing and or replacing the deepwell pumps is about $55000.

To the above the cost of the monitoring should be added.

[signature]

SB 16314

2) Liquefaction Potential

Liquefaction analyses have been conducted by Bechtel, on the basis of Standard Penetration Tests, of the compacted sands below the Diesel Generator Building and various portions of the Auxiliary Building. These analyses have shown that the sands are not dense but do have a Factor of Safety against liquefaction of about 1.5 for an SSE with a maximum ground acceleration of 0.12g. Nevertheless, due to the erratic nature of the backfill, there is the possibility that some loose pockets could liquefy under the

SB-16315

SSE of 0.12g and if the SSE were raised

to a higher level, ~~0.20g~~, then liquefaction of mu

of the sand backfill would be a problem.

General areal dewatering is recomm

to eliminate the liquefaction potential. Th

goal would be to lower the piezometr

levels from the present ones to

somewhere near the top of the till.

Dewatering is a more positive fix than

chemical grouting because the process

be positively monitored by piezometer

whereas it may never be possible to

positively prove the beneficial effects of

grouting.

SB-16316

Even though liquefaction of loose sands is eliminated by dewatering, the seismic shakedown will result in some residual settlement after an earthquake. The magnitude of these settlements should be estimated by Bechtel, and should account for the effect of capillary stresses above the free water surface.

SB 16317

SB1~~????~~6

~~Memo Re:~~ Agenda Item # 5
Support of Auxiliary Building

Date: 28 June 1979 Denver Holiday Inn Airport
By: M.T. Davisson - C. H. Gould

Information (approximate) furnished to consultants is listed below:

1. Containment analyzed as though free of other structures
2. Auxiliary " " " " " "
3. Turbine " " " " " "
4. Peak single amplitude of ~~an~~ auxiliary structure at cg is 0.38 in. for 0.12 g.
5. Auxiliary wings figure OK on uncracked section, but steel stress is 40 ksi on ~~un~~ cracked section
6. 1500 K at E & W ends of wings relieves overstress
7. 3000 K " " " " " restores original ~~to~~ zero deflection
8. Horizontal force in each wing is 1250 K

Methods of fix considered by consultants are:

SB 16316

A. Remove ~~& replace~~ unsuitable material and replace with mass conc. under valve pits and wings and permanently support K line of Turbine building on jack piles. ~~Temporary~~ Support of wings with caissons at E & W ends up to 3000 kips each.

B. Permanent support by caissons of E & W ends of wings with 3000 kips each end. Remove unsuitable material under valve pit and replace with mass concrete. Support K-line of Turbine Build- with jack piles as required. Options are:

(1) Tie auxiliary building to Turbine mat for lateral seismic resistance

(2) Tie auxiliary building to valve pit and the concrete fill beneath it. Option is:

(a) Also tie valve pit to buttress access shafts for additional lateral resistance.

Construction procedures for jacked caissons have been thoroughly reviewed ~~by~~ in prior meetings. However, concept B above calls for permanent Category I caissons; jack piles are not recommended. The following items are pertinent ~~Category I jacked caissons~~ to jacked caissons:

SB-16319

3/4

1. Steel casing is ignored for permanent load carrying.

2. Concrete is now Q

3. Till is the supporting material.

4. Design pressure on till is twice that under the PSAR commitment. This is offset by following advantages:

   a. Proof load test to 1.5 times working load greatly exceeds the 1.12 (perhaps more) times working load in a seismic event. Analyses shows bearing value has adequate factor of safety exceeding 2.5.

   b. Procedure calls for rejacking piles to assure proper load sharing, as with temporary caissons.

We feel that solution B(1) above represents sound engineering. However, if NRC requirements dictate solution B(2) involves tying Category I to Category I

SB 320

~~Question~~ The consultants request the answers to the following:

1. Static deflection configuration of auxiliary wings under full cantilever treatment, cracked and uncracked.

2. Seismic analysis of auxiliary building with deflection configuration, accelerations at each floor level, edge forces due to rocking, horizontal forces to be resisted and locations.

3. Analysis of auxiliary wing stresses and deflections with 1500k and 3000k ea at E and W ends.

~~4. Available Time history analysis~~

M.T. Davisson
C.H. Gould
A.J. Hendron, Jr
R. Lou,hney
R.B. Peck

SB 16321

3. <u>Diesel Generator Building</u>

<u>Removal of Surcharge</u>. The longer the full surcharge can remain on the area, the more reliable will be the prediction of the clay-seated portion of the long-term settlement. For this reason, we would prefer to maintain constant conditions as long as ~~possible~~ practicable. We realize, however, that practical considerations do not permit an indefinite delay in surcharge removal. If a suitable means for making reliable temperature corrections to the readings of the precise settlement gages could be [illegible], we believe that removal could, if necessary, begin ~~by~~ in August.

To this end, we suggest the fabrication and use of possibly four dummy gages, each consisting of a pair of rods in a ~~the~~ casing of the same type as that in the actual gages. One rod of each pair would be of identical size and material to that in the ~~and~~ actual gages, and the other of invar of the same dimensions. Each ~~The~~ assembly would terminate in a block of concrete placed on top of the fill ~~adjacent to~~ inside the building, adjacent to an active gage. The locations would be selected to

(over)

SB 16322

provide a range in length of dummy gages corresponding to the maximum range of the active gages in the building.

In addition, ~~we would~~ all readings should be interpreted carefully and corrected for thermal effects. To the extent possible, readings should be made under constant conditions, as in the early morning.

Loose sands beneath the building will not compromise the static bearing capacity or lead to settlement under static loads applied after surcharge removal. Some settlement must be expected due to vibration of the ~~[illegible]~~ diesel engines; this should preferably be induced by operating the machines before general dewatering of the area, whereupon the settlement will be correspondingly reduced during use of the machines in the future. Earthquake-induced settlements are discussed under Liquefaction Potential.

5) Need for Removal of Soft Sands Under Diesel Generator Structure

If general, permanent dewatering is adopted, there is no need to excavate the loose sands under the diesel generator building. Their static stiffness and bearing capacity is fully adequate for the static and dynamic bearing pressures. The connections of pipes and the building or equipment within the building must be capable of taking the differential settlements arising from the fact that the sands on the north side of the Diesel generator building will undergo some seismic shakedown settlement whereas the south

SB 16324

soil of the structure supported on cohesive

backfill is not likely to settle significantly

under the seismic loading.

SB 16325
SB192304

(-1) ~~Tank Farm liquefaction potential. problem disappears if permanent dewatering is adopted~~

7. Service Water Structure

(-2) Service water structure underpinning with driven piles and a cortel is a positive solution. Even if liquefaction occurs, the piles maintain their buckling load as a minimum. The analysis of the structure should treat ~~the~~ piles in the normal manner; if the buckling load is ~~[illegible]~~ lower bound, the analysis should treat the piles as applying an upward load equal to the buckling load to the structure. The horizontal forces due to

[illegible]

SB 16026

main portion of the structure.

To: File

From: TCCooke/RMW

Date: August 8, 1979

Subject: MIDLAND PROJECT GWO 7020 - MEETING TO DISCUSS CONSULTANTS' REVISED PROPOSAL - CHANGE TO PERMANENT DEWATERING - JUNE 22, 1979
File: B3.0.3 UFI#-00234 Serial: CSC-4297

CC: Attendees
KCBrooks (2)

Consumers Power Company

INTERNAL CORRESPONDENCE

Attendees

Consumers Power Company	Bechtel Power Corporation
T. C. Cooke	S. Afifi
G. S. Keeley	R. L. Rixford
D. B. Miller	G. L. Richardson
W. R. Bird	L. A. Dreisbach
B. W. Marguglio	J. Milandin
D. E. Horn	G. Tuveson
T. R. Thiruvengadam	A. J. Boos
D. E. Sibbald	D. Jinnett
K. R. Kline	R. Simanek
	P. A. Martinez
	W. Jones
	J. Wanzeck
	S. Blue
	T. Johnson

After lunch at a meeting in Ann Arbor on June 19, 1979, the consultants got together and decided that there may be some advantages to the Project in installing a permanent dewatering system as an alternative to some of the fixes transmitted to the NRC in conjunction with the 50.54f. questions. In the opinion of the consultants, this revised scheme would resolve all questions for potential liquefaction; and, therefore, eliminate the problems associated with the chemical grout. The consultants had noted that the chemical grout in the area of the Diesel Generator Building would not be completed until June or July 1980 at the earliest. They also discussed the problems with the grout penetrating building cracks, utilities, etc. The railroad bay grouting is not required and no longer needs to be considered. The consultants also requested that the need for complete mining below the Auxiliary Building wings be re-evaluated if liquefaction problems are eliminated.

They stated there is a possibility the remaining work would include shear velocity testing underneath the Auxiliary Building electrical penetration areas to estimate contact stresses with possible grouting of local void areas. Profiling of pipes before and after dewatering and duct bank checks and verification would also have to be made. The piling solution for the service water structures will remain

SB 16328

unaffected. Resolution of whether or not permanent dewatering system would have to be a safety system and structure, the possibility of combining the permanent system with the temporary system, installation of Q-list monitoring wells, and a system to monitor the effluent for fines would be required. At the meeting on June 22, 1979, Mr. Tuveson also noted that he would have to recheck his design calculations on the buildings to see whether or not the removal of the buoyant forces would have any effect on the 40-year life of the structures.

The consultants apparently believe that the dewatering system would be easier to defend to the NRC and that it is a less complicated fix for liquefaction.

It was noted on June 22, 1979 that the consultants possibly did not consider the structural recheck required without the buoyant support or the FSAR revisions, which were primarily administrative in nature. W. Jones noted that the cost of total dewatering would be in the neighborhood of $10 to $15 Million with required redundancies. This was for a cased well with permanent submersible pumps considered. Dewatering for the Diesel Generator only would cost approximately $2 Million. This would be balanced by a savings of $2 Million for grouting, $2.2 Million for underpinning, $750,000 for dewatering, with nothing allowed for elimination of tie-up of the Diesel Generator area or mining obstructions.

As a sidelight, I&E Report 79-10 discussing Air Bubbles in the Tank Farm, was also suggested as a topic for the July 10 meeting with the NRC in Washington. Prior to the Thursday meeting with the consultants in Denver (June 28), a matrix should be drawn to show the advantages and disadvantages of various methods proposed to date. This would include not only our responses to the 50.54f. items and the consultants' latest proposal, but also some of the earlier alternates used which were previously discarded for one reason or another, since conditions have changed. These items will be discussed prior to the Thursday meeting with the consultants in Denver and at a meeting in Ann Arbor at 8:00 AM on June 27. It was also decided to send the MCAR 6 Interim Report with a copy letter noting that there are other evaluations being made at this time and mentioning the dewatering option.

pp

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ANO. 8405260086

NO. OF PAGES 1

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FIELD ENGINEER'S REPORT FORM

MIDLAND UNITS 1 & 2

JOB 7220 DATE 11/8/78 PAGE 1 OF 1

ITEM NO.	INSPECTION DESCRIPTION	ACTION REQUIRED/TAKEN
1.	TWO SOIL TESTS TAKEN DURING DAY SHIFT.	
	1A) TK FARM SOUTH OF EAST RING	(1A) WET DENSITY OF 123.3
	ELEV 628	INDICATES FAILING TEST. RE
	CORD: E-320, S-4660	TO BE TAKEN DURING 2ND
	W/D - 123.3	SHIFT.
	LOG# 3177 (RETEST OF 3175)	
	1B) NORTH OF COOLING TOWER SLAB	(1B) LOG# 3178 IS A RETEST
	ELEV. 633	# 3116, 3119, 3121, 3131 & 3137 T
	CORD: E-640, S-4450	MATERIAL REPRESENTED BY THES
	W/D - 144.7	TEST HAS BEEN REMOVED; NE
	LOG# 3178	MATERIAL WAS PLACED & COMPAC
		& TESTED BY # 3178. W/D [redacted]
		144.7 APPEARS TO BE A PASSING
		TEST.

REMARKS:

CLAY STOCKPILE MOISTURE TAKEN 11/7/78 @ 2200 HRS = 8.0%.

ROUTE

SIGNATURE

FILE

SB 05401

Project No. ____
Boring No. NA
Source - STOCKPILE
Hammer weight 10 LB.
Drop distance 18"
No. Layers 5 (METHOD D)
No. Blows 56 (METHOD D)
No. Layers 4 (BMP)
No. Blows 25 (BMP)

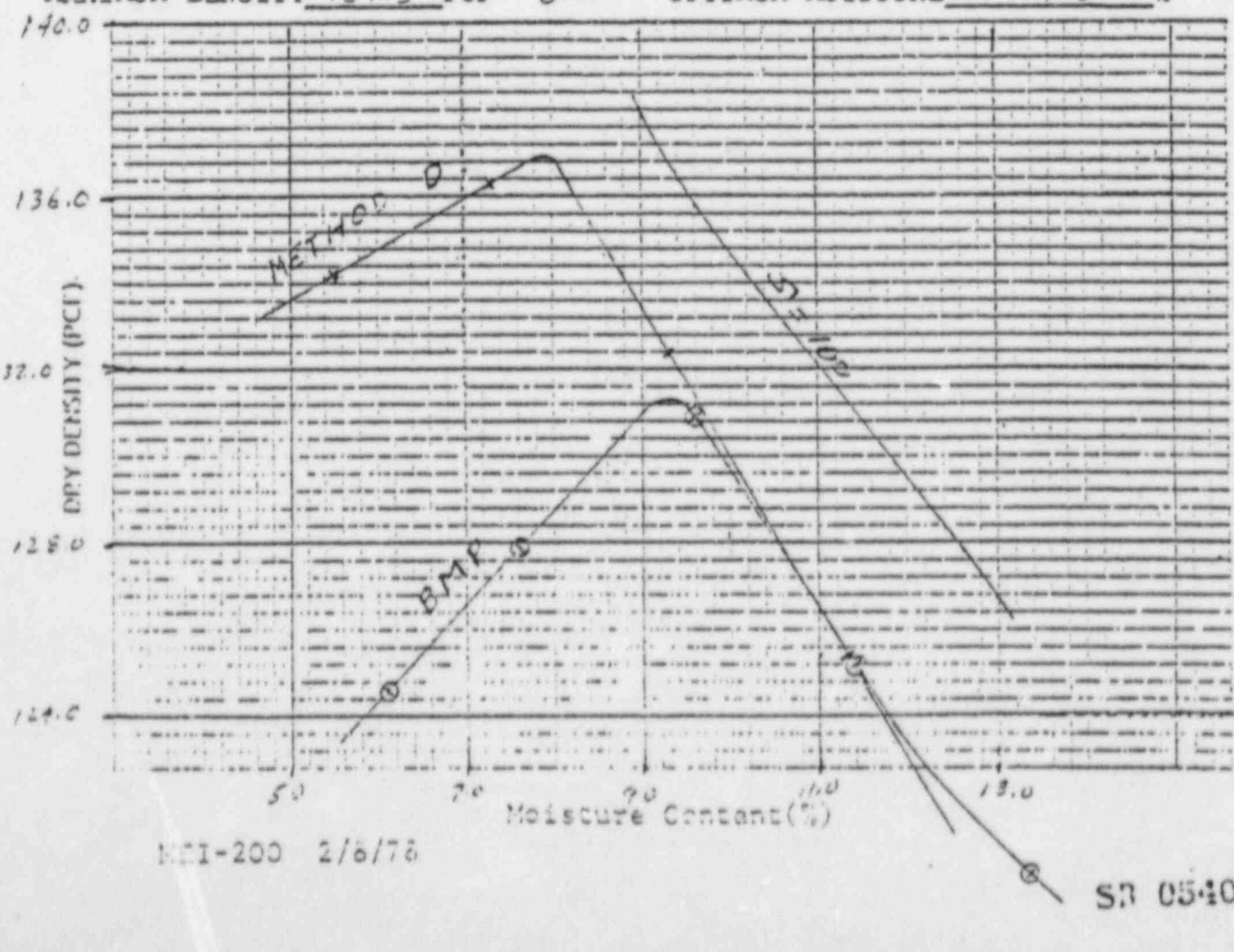
Compaction Test

ASTM D 1557-70

Lab. No. ____
Date 9-15-78
Initials NM JS
Type of test COMPACTION
Mold size 6"

TEST DATA							
Mold No.							
Wt. wet sample + Mold ( )							
Wt. of Mold ( )							
Wt. of wet sample ( )							
Vol. of sample ( )							
Wet Unit Weight (lb. /cu.ft.)							
Can No.							
Wt. wet sample + Can (gm.)							
Wt. Dry sample + Can (gm.)							
Wt. water (gm.)							
Wt. can (gm.)							
Wt. dry sample (gm.)							
Moisture Content %							
Average Moisture Content %							
Dry Unit Weight (lb. /cu.ft.)							

MAXIMUM DENSITY 137.0 PCF METHOD D / 131.3 PCF BMP OPTIMUM MOISTURE 7.9 % / 9.3 %



KCI-200 2/8/78

SB 05402

COMPACTED FILL DENSITY TEST REPORT

QC ACCEPTANCE ________ DATE ________

CONTROL NO. ________ FILE ID. ________

(1) PROJECT NO. 7220 (2) DATE ________ (3) PAGE 1 OF 1

SPEC. NO. 7220-C-208 (5) ~~DRAWING NO.~~ STRUCTURAL (6) TESTED WEEK OF 10/7/78 to 10/14/78

(7) DATE TAKEN	(8) TEST NO.	(9) TEST MADE BY	(10) LOCATION	(11) ELEV.	(12) DEPTH BELOW FINAL GRADE	(13) IN PLACE WET DEN. (LB/CF)	(14) MOISTURE CONTENT (%)	(15) IN PLACE DRY DEN. (LB/CF)	(16) SOIL CLASS. RD#	(17) MAX LAB DRY DEN. (LB/CF) min/max	(18) % COMPT.	(19) REMARKS
[illegible]/5	2723	Nm	E-190 S-4575	626.0	—	121.5	4.8	115.9	134	101.5 / 124.2	68.0	Failed-QC Notified
[illegible]/6	2727	RC/Dm	E-190 S-4575	625.0	—	127.8	5.7	120.9	135	102.0 / 133.3	90.5	Passed
[illegible]/8	2728	RC/Dm	E-240 S-456.0	630.0	—	129.4	5.1	123.1	136	101.4 / 124.2	96.0	Passed
[illegible]/8	2731	Nm	E-240 S-456.0	631.0	—	123.9	5.0	118.0	137	102.0 / 124.3	75.6	Failed-QC Notified
[illegible]/8	2742	Nm	E-40 S-46.00	626.0	—	124.7	4.8	119.0	138	100.5 / 122.8	85.6	Passed
[illegible]/8	2743	Nm	E-20 S-46.00	626.0	—	125.0	4.8	119.3	139	101.2 / 124.1	82.2	Passed

TEST FAILURE

Q.C. Rep. Notified D. Check
Time & Date of Notification [illegible]
Reporting Person T. Spelts
2723

TEST FAILURE

Q.C. Rep. Notified S. Kinker
Time & Date of Notification [illegible]
Reporting Person E. Darner
2731

(20) PREPARED BY (SIGNATURE) ________ DATE ________ (21). RESPONSIBLE ENGR ________ DATE ________

COMPACTED FILL DENSITY TEST REPORT

QC ACCEPTANCE ______ DATE ______

______ CONTROL NO. ______ FILE NO. ______

① PROJECT NO. 7220 ② DATE ______ ③ PAGE 2 OF 11

SPEC. NO. 7220-C-208 ⑤ ~~DRAWING NO.~~ STRUCTURAL ⑥ TESTED WEEK OF 10/7/78 to 10/14/78

E... Eil	⑧ TEST NO.	⑨ TEST MADE BY	⑩ LOCATION	⑪ ELEV.	⑫ DEPTH BELOW FINAL GRADE	⑬ IN PLACE WET DEN. (LB/CF)	⑭ MOISTURE CONTENT (%)	⑮ IN PLACE DRY DEN. (LB/CF)	⑯ SOIL CLASS. RD#	⑰ MAX LAB DRY DEN. (LB/CF) min/max	⑱ % COMPT.	⑲ REMARKS
/78	2744	NM	E-3 S-4600	626.0	—	125.6	4.6	120.1	140	102.1 / 123.4	86.8	Passed
/78	2750	NM	E-20 S-4558.5	627.0	—	127.4	5.9	120.3	141	100.5 / 124.7	84.9	Passed
/78	2751	DM	E-230 S-4525	627.0	—	125.2	5.0	119.2	142	102.0 / 123.9	81.6	Passed
/78	2756	NM	E-220 S-4560	630.0	—	122.4	4.9	116.7	143	105.0 / 123.7	68.2	Failed - QC Notified
/78	2790	RC/DM	E-215 S-4520	630.0	—	128.4	4.3	123.1	144	102.2 / 123.6	98.1	Passed
/78	2818	RC	E-875 S-5050	630.0	—	125.5	4.0	120.7	145	105.2 / 124.3	83.6	Passed

TEST FAILURE

Q.C. Rep. Notified A.J. DuHon

Time & Date of Notification 2:00/10-19-78

Reporting Person N. Wise

T. 2756

PREPARED BY (SIGNATURE) ______ DATE ______ ㉑. RESPONSIBLE ENGR ______ DATE ______

COMPACTED FILL DENSITY TEST REPORT

QC ACCEPTANCE ______ DATE ______

CONTROL NO. ______ FILE NO. ______

① PROJECT NO. 7220 ② DATE ______ ③ PAGE 3 OF 11

SPEC. NO. 7220-C-208 ⑤ ~~DRAWING NO.~~ STRUCTURAL ⑥ TESTED WEEK OF 10/2/78 to 10/16/78

⑦ TE[ST] [GI]VEN	⑧ TEST NO.	⑨ TEST MADE BY	⑩ LOCATION	⑪ ELEV.	⑫ DEPTH BELOW FINAL GRADE	⑬ IN PLACE WET DEN. (LB/CF)	⑭ MOISTURE CONTENT (%)	⑮ IN PLACE DRY DEN. (LB/CF)	⑯ SOIL CLASS. RD#	⑰ MAX LAB DRY DEN. (LB/CF) min/max	⑱ % COMPT.	⑲ REMARKS
[illegible]	2819	RC	E-20 S-4587	627.0	—	131.0	5.9	123.8	146	102.6 / 123.7	100.4	Passed
[illegible]	2826	Nm	E-240 S-4560	633.0	—	134.5	5.8	127.1	147	104.7 / 124.7	102.9	Passed
[illegible]	2830	Nm	E-10 S-5056	630.0	—	121.1	8.1	112.0	148	98.6 / 122.1	62.2	Failed-QC Notified
[illegible]	2831	Nm	E-120 S-4630	630.0	—	124.5	4.4	119.3	149	102.2 / 123.4	83.0	Passed
[illegible]	2840	RC/Dm	E-130 S-4600	631.0	—	125.2	4.2	120.2	150	102.8 / 123.5	86.4	Passed
[illegible]	2842	RC/Dm	E-875 S-5050	630.0	—	128.1	4.5	122.6	151	105.3 / 124.0	93.6	Passed

TEST FAILURE

Q.C Rep. Notified S. Galbraith

Time & Date of Notification [illegible]

Reporting Person E. Thompson

2830

PREPARED BY(SIGNATURE) ______ DATE ______ ㉑. RESPONSIBLE ENGR ______ DATE ______

COMPACTED FILL DENSITY TEST REPORT

QC ACCEPTANCE ____ DATE ____

CONTROL NO. ____ FILE NO. ____

① PROJECT NO. 7220 ② DATE ____ ③ PAGE 4 OF 11

④ SPEC. NO. 7220-C-208 ⑤ ~~DRAWING NO.~~ STRUCTURAL ⑥ TESTED WEEK OF 10/2/78 to 10/16/78

⑦ DATE TAKEN	⑧ TEST NO.	⑨ TEST MADE BY	⑩ LOCATION	⑪ ELEV.	⑫ DEPTH BELOW FINAL GRADE	⑬ IN PLACE WET DEN. (LB/CF)	⑭ MOISTURE CONTENT (%)	⑮ IN PLACE DRY DEN. (LB/CF)	⑯ SOIL CLASS. RD#	⑰ MAX LAB DRY DEN. (LB/CF) min/max	⑱ % COMPT.	⑲ REMARKS
[illegible]/10/78	2844	Dm	E-190 S-5025	630.0	—	124.8	6.7	117.0	152	100.0 / 124.9	72.9	Failed-QC Notified
[illegible]/10/78	2853	Nm	E-150 S-4575	631.0	—	124.4	3.7	120.0	153	103.9 / 124.9	79.8	Failed-QC Notified
[illegible]/78	2857	Nm	E-155 S-4640	627.0	—	122.5	4.8	116.9	154	101.6 / 125.0	69.7	Failed-QC Notified
[illegible]/78	2861	RC	E-20 S-4587	632.0	—	129.1	4.9	123.1	155	103.9 / 123.3	99.1	Passed
[illegible]	2862	RC	E-220 S-5050	631.0	-	124.2	4.7	118.6	156	101.7 / 124.4	78.1	Failed-QC Notified
[illegible]/11/78	2870	DM/RC	E-125 S-4600	631.0	—	125.5	3.2	121.6	157	103.6 / 124.9	86.8	Passed

TEST FAILURE TEST FAILURE TEST FAILURE

Q.C. Rep. Notified S. Gelnett
Time & Date of Notification 1415/10-18-78
Reporting Person B. Thompson
2844

Q.C. Rep. Notified S. Kicker
Time & Date of Notification 1330/10-20-78
Reporting Person N. Wise
2853, 2857

Q.C. Rep. Notified S. Gelnett
Time & Date of Notification 1215/11-2-78
Reporting Person N. Wise
2862

⑳. PREPARED BY(SIGNATURE) ____ DATE ____ ㉑. RESPONSIBLE ENGR ____ DATE ____

COMPACTED FILL DENSITY TEST REPORT

QC ACCEPTANCE ______ DATE ______

CONTROL NO. ______ FILE NO. ______

① PROJECT NO. 7220 ② DATE ______ ③ PAGE 5 OF 11

④ SPEC. NO. 7220-C-208 ⑤ ~~DRAWING NO.~~ STRUCTURAL ⑥ TESTED WEEK OF 10/2/78 to 10/6/78

⑦ DATE TAKEN	⑧ TEST NO.	⑨ TEST MADE BY	⑩ LOCATION	⑪ ELEV.	⑫ DEPTH BELOW FINAL GRADE	⑬ IN PLACE WET DEN. (LB/CF)	⑭ MOISTURE CONTENT (%)	⑮ IN PLACE DRY DEN. (LB/CF)	⑯ SOIL CLASS. RD#	⑰ MAX LAB DRY DEN. (LB/CF) min/max	⑱ % COMPT.	⑲ REMARKS
10/2/78	2871	DM/RC	E-220 S-4650	636.0	—	127.3	3.8	122.6	158	104.6 / 124.0	93.8	Passed
10/2/78	2872	DM	E-200 S-5050	630.0	—	130.7	5.4	124.0	159	104.7 / 125.3	94.7	Passed
10/2/78	2873	DM	E-175 S-5050	631.0	—	130.6	5.3	124.0	160	103.6 / 124.1	99.6	Passed
10/2/78	2874	DM	E-20 S-4680	631.0	—	120.5	6.7	112.9	161	93.3 / 118.3	82.2	Passed
10/4/78	2877	NM	E-230 S-4630	627.0	—	124.0	5.8	117.2	162	104.3 / 124.2	68.7	Failed QC Notified
10/4/78	2882	NM	E-285 S-4600	630.0	—	125.5	3.9	120.8	163	105.1 / 125.0	81.6	Passed

TEST FAILURE

Q.C. Rep. Notified S. Gelwell

Time & Date of Notification 10/5/78 2:28

Retesting Person R. Wise

2877

⑳ PREPARED BY (SIGNATURE) ______ DATE ______ ㉑. RESPONSIBLE ENGR ______ DATE ______

BD5407

COMPACTED FILL DENSITY TEST REPORT

QC ACCEPTANCE ______ DATE ______

CONTROL NO. ______ FILE NO. ______

① PROJECT NO. 7220 ② DATE ______ ③ PAGE 6 OF 11

SPEC. NO. 7220-C-20P ⑤ ~~DRAWING NO.~~ STRUCTURAL ⑥ TESTED WEEK OF 10/2/78 to 10/16/78

⑦ DATE TAKEN	⑧ TEST NO.	⑨ TEST MADE BY	⑩ LOCATION	⑪ ELEV.	⑫ DEPTH BELOW FINAL GRADE	⑬ IN PLACE WET DEN. (LB/CF)	⑭ MOISTURE CONTENT (%)	⑮ IN PLACE DRY DEN. (LB/CF)	⑯ SOIL CLASS. RD#	⑰ MAX LAB DRY DEN. (LB/CF) min/max	⑱ % COMPT.	⑲ REMARKS
[illegible]	2883	Nm	E-220 S-4626	628.0	–	126.3	4.9	120.4	164	105.8 / 124.9	79.3	Failed-QC Notified
[illegible]	2884	Nm	F-150 S-4550	633.0	–	124.5	4.2	119.5	165	104.6 / 124.6	79.7	CLEARED Failed QC Notified
[illegible]	2887	RC	E-20 S-4579	628.0	–	131.2	6.5	123.2	166	103.9 / 124.4	95.1	Passed
[illegible]	2901	Dm	E-235 S-4560	634.0	–	126.3	6.0	119.2	168	103.7 / 124.5	77.8	CLEARED Failed-QC Notified
[illegible]	2900	Nm	E-175 S-5075	632.0	–	126.5	4.7	120.8	167	100.5 / 124.5	97.2	Passed
[illegible]	2902	Dm	E-230 S-4610	632.0	–	130.2	7.0	121.7	169	99.0 / 123.5	94.0	Passed

TEST FAILURE

Q.C. Rep. Notified S. Gelnett

Time & Date of Notification 1115/11-2-78

Reporting Person N. Wise

2883, 2901

TEST FAILURE

Q.C. Rep. Notified Ed Dutko

Time & Date of Notification 1324/11-6-78

Reporting Person N. Wise

2884

⑳ PREPARED BY(SIGNATURE) ______ DATE ______ ㉑ RESPONSIBLE ENGR ______ DATE ______

8 0 5 4 0 8

COMPACTED FILL DENSITY TEST REPORT

QC ACCEPTANCE ______ DATE ______

______ CONTROL NO. ______ FILE NO. ______

① PROJECT NO. 7220 ② DATE ______ ③ PAGE 7 OF 11

SPEC. NO. 7220-C-208 ⑤ ~~DRAWING NO.~~ STRUCTURAL ⑥ TESTED WEEK OF 10/7/78 to 10/14/78

DATE TAKEN	⑧ TEST NO.	⑨ TEST MADE BY	⑩ LOCATION	⑪ ELEV.	⑫ DEPTH BELOW FINAL GRADE	⑬ IN PLACE WET DEN. (LB/CF)	⑭ MOISTURE CONTENT (%)	⑮ IN PLACE DRY DEN. (LB/CF)	⑯ SOIL CLASS. RD#	⑰ MAX LAB DRY DEN. (LB/CF) min/max	⑱ % COMPT.	⑲ REMARKS
10/1/78	2903	Dm	E-325 S-4620	630.0	—	129.9	5.0	123.7	170	99.7 / 124.4	97.1	Passed
10/7/78	2908	NE	E-200 S-4580	632.0	—	129.1	6.2	121.6	171	103.0 / 124.9	87.2	Passed
10/7/78	2909	Nm	E-230 S-4620	630.0	—	130.6	6.1	123.1	172	107.1 / 125.5	88.7	Passed
10/7/78	2911	Nm	E-20 S-4595	631.0	—	131.1	7.5	122.0	173	105.9 / 124.1	90.0	Passed
10/7/78	2913	Nm	E-235 S-4610	631.0	—	125.7	7.8	116.6	174	105.8 / 123.9	62.7	Failed - QC Notified
10/7/78	2915	Nm	E-285 S-4580	631.0	—	125.1	4.2	120.1	175	102.4 / 124.0	84.6	Passed

TEST FAILURE

Q.C. Rep. Notified S. Kirker

Time & Date of Notification 2:50/11-7-78

Reporting Person B. Harmer

2913

PREPARED BY(SIGNATURE) ______ DATE ______ ㉑. RESPONSIBLE ENGR ______ DATE ______

COMPACTED FILL DENSITY TEST REPORT

QC ACCEPTANCE	DATE
CONTROL NO.	FILE NO.

(1) PROJECT NO. 7220 (2) DATE ______ (3) PAGE 8 OF 11

SPEC. NO. 7220-C-208 (5) DRAWING NO. STRUCTURAL (6) TESTED WEEK OF 10/2/78 to 10/6/78

DATE TAKEN	(8) TEST NO.	(9) TEST MADE BY	(10). LOCATION	(11). ELEV.	(12). DEPTH BELOW FINAL GRADE	(13). IN PLACE WET DEN. (LB/CF)	(14). MOISTURE CONTENT (%)	(15). IN PLACE DRY DEN. (LB/CF)	(16). SOIL CLASS. RD#	(17). MAX LAB DRY DEN. (LB/CF) min/max	(18). % COMPT.	(19). REMARKS
[illegible]	2919	RC/DS	E-150 S-4575	631.0	—	125.4	5.0	119.4	176	104.1/124.3	79.3	Failed-QC Notified
[illegible]	2920	RC/DS	E-236 S-4620	630.0	—	124.1	4.2	119.1	177	103.4/124.3	78.4	Failed-QC Notified
[illegible]	2921	RC/DS	E-230 S-4630	633.0	—	131.0	7.9	121.4	178	104.2/124.6	86.5	Passed
[illegible]	2924	RC/DS	E-50 S-4750	628.0	—	124.2	3.6	119.9	179	104.6/123.8	82.3	Passed
[illegible]	2927	DM	E-20 S-4586	632.0	—	126.2	4.4	120.9	180	102.7/124.2	87.0	Passed
[illegible]	2928	DM	E-260 S-5050	630.0	—	127.5	5.2	121.2	181	105.0/124.3	86.1	Passed

TEST FAILURE TEST FAILURE

Q.C. Rep. Notified S. Kirker	Q.C. Rep. Notified Ed Dutton
Time & Date of Notification [illegible] 78	Time & Date of Notification [illegible]/11-8-78
Reporting Person T. [illegible]	Reporting Person N. [illegible]
2919	2920

PREPARED BY(SIGNATURE) ______ DATE ______ (21). RESPONSIBLE ENGR ______ DATE ______

COMPACTED FILL DENSITY TEST REPORT

QC ACCEPTANCE ______ DATE ______

CONTROL NO. ______ FILE NO. ______

① PROJECT NO. 7220 ② DATE ______ ③ PAGE 9 OF 11

SPEC. NO. 7220-C-208 ⑤ DRAWING NO. STRUCTURAL ⑥ TESTED WEEK OF 10/?/78 to 10/?/78

DATE TAKEN	⑧ TEST NO.	⑨ TEST MADE BY	⑩ LOCATION	⑪ ELEV.	⑫ DEPTH BELOW FINAL GRADE	⑬ IN PLACE WET DEN. (LB/CF)	⑭ MOISTURE CONTENT (%)	⑮ IN PLACE DRY DEN. (LB/CF)	⑯ SOIL CLASS. RD#	⑰ MAX LAB DRY DEN. (LB/CF) min/max	⑱ % COMPT.	⑲ REMARKS
?/3/78	2930	Dm	E-240 S-4580	632.0	–	128.1	4.3	122.8	182	105.1 / 123.7	95.9	Passed
?/3/78	2931	Dm	E-236 S-4620	634.0	–	125.7	6.9	117.6	183	104.7 / 124.1	70.2	Failed - QC Notified
?/4/78	2936	Dm	E-250 S-5040	629.5	–	129.1	5.2	122.1	184	105.0 / 125.4	86.7	Passed
?/4/78	2937	Dm	E-36 S-4590	622.0	–	130.6	5.3	124.0	95	104.9 / 123.8	100.9	Retest of 2631 Passed
?/4/78	2938	Dm	E-36 S-4590	627.0	–	131.2	5.1	124.8	98	104.0 / 123.7	104.6	Retest of 2639 Passed
?/4/78	2939	Dm	E-475 S-5255	630.0	–	132.6	4.1	127.4	120	102.8 / 125.8	105.6	Retest of 2683 Passed
?/4/78	2940	Nm	E-480 S-5760	613.0	–	127.5	4.7	121.8	92	105.0 / 125.7	83.8	Retest of 2626 Passed

TEST FAILURE

QC Rep. Notified Ed Dalton

Time & Date of Notification 2:20/11-?-78

Reporting Person Al [illegible]

2931

PREPARED BY (SIGNATURE) ______ DATE ______ ㉑. RESPONSIBLE ENGR ______ DATE ______

SB 05411

COMPACTED FILL DENSITY TEST REPORT   QC ACCEPTANCE

CONTROL NO. ______ FILE NO. ______

① PROJECT NO. 7220   ② DATE ______   ③ PAGE 10 OF 11

④ SPEC. NO. 7220-C-208   ⑤ ~~DRAWING NO.~~ STRUCTURAL   ⑥ TESTED WEEK OF 10/4/78 to 10/16/78

⑦ DATE TAKEN	⑧ TEST NO.	⑨ TEST MADE BY	⑩ LOCATION	⑪ ELEV.	⑫ DEPTH BELOW FINAL GRADE	⑬ IN PLACE WET DEN. (LB/CF)	⑭ MOISTURE CONTENT (%)	⑮ IN PLACE DRY DEN. (LB/CF)	⑯ SOIL CLASS. RD#	⑰ MAX LAB DRY DEN. (LB/CF) min/max	⑱ % COMPT.	⑲ REMARKS
10/14/78	2941	Nm	E-150 S-4620	628.0	–	127.8	4.2	122.6	185	103.0 / 125.3	89.8	Passed
10/14/78	2942	Nm	E-250 S-4280	630.0	–	131.1	5.7	124.0	186	104.3 / 124.3	98.7	Passed
10/14/78	2943	Nm	E-270 S-5040	632.0	–	123.4	4.5	118.1	187	104.5 / 124.6	71.4	CLEARED BY 2944 Failed-QC Notified
10/14/78	2944	Nm	E-270 S-5040	632.0	–	129.6	5.5	122.8	187	104.5 / 124.6	92.4	Retest of 2943 Passed
10/14/78	2945	Nm	E-250 S-4285	632.0	–	128.3	4.2	123.1	188	105.7 / 125.0	91.5	Passed
10/14/78	2946	Nm	E-140 S-4610	629.0	–	124.7	4.8	119.0	189	104.1 / 124.8	75.5	Failed-QC Notified
10/16/78	2950	Dm	E-315 S-4625	625.0	–	130.5	6.4	122.5	190	104.4 / 124.7	90.8	Passed

TEST FAILURE TEST FAILURE

SR C5412

Q.C. Rep. Notified S. Kelnett
Time & Date of Notification 1137/11-11-78
Reporting Person B Thompson
2943

Q.C. Rep. Notified Ed Dutton
Time & Date of Notification 950/11-14-78
Reporting Person N. Wise
2946

⑳. PREPARED BY(SIGNATURE) ______ DATE ______   ㉑. RESPONSIBLE ENGR ______ DATE ______

COMPACTED FILL DENSITY TEST REPORT — QC ACCEPTANCE

CONTROL NO. ______ FILE NO. ______

① PROJECT NO. 7220 ② DATE ______ ③ PAGE 11 OF 11

④ SPEC. NO: 7220-C-208 ⑤ ~~DRAWING NO.~~ STRUCTURAL ⑥ TESTED WEEK OF 10/1/78 to 10/16/78

⑦ DATE TAKEN	⑧ TEST NO.	⑨ TEST MADE BY	⑩ LOCATION	⑪ ELEV.	⑫ DEPTH BELOW FINAL GRADE	⑬ IN PLACE WET DEN. (LB/CF)	⑭ MOISTURE CONTENT (%)	⑮ IN PLACE DRY DEN. (LB/CF)	⑯ SOIL CLASS. RD#	⑰ MAX LAB DRY DEN. (LB/CF) min/max	⑱ % COMPT.	⑲ REMARKS
[illegible]	1952	DM	E-45 S-4560	628.0	—	128.1	3.8	123.4	191	103.9 / 124.8	94.7	Passed
10/16/78	1953	RC	E-100 S-4775	628.0	—	128.3	5.0	122.2	192	104.1 / 124.7	89.7	Passed
10/16/78	1954	RC	E-710 S-4490	630.5	—	126.7	3.6	122.3	193	102.8 / 124.7	90.8	Passed
10/16/78	1958	NM	E-310 S-4620	626.0	—	131.2	6.6	123.1	194	105.2 / 124.1	95.5	Passed
10/16/78	1960	NM	E-305 S-4620	627.0	—	126.2	4.7	120.5	195	105.0 / 124.3	82.8	Passed
10/16/78	1961	NM/DS	E-705 S-4485	631.5	—	123.1	4.3	118.0	196	104.9 / 124.5	70.5	Failed - QC Notified

TEST FAILURE

Q.C. Rep. Notified S. Cotnell

Time & Date of Notification 4:12 10-17-78

Reporting Person R. Thompson

1961

SB 5413

⑳. PREPARED BY (SIGNATURE) ______ DATE ______ ㉑. RESPONSIBLE ENGR ______ DATE ______

BECHTEL

#	Locations			Area	
2756	E220	S4560	El. 630	A	
2844	E190	S 5025	El. 630	Di	
2853	E 150	S4575	El. 631	A	& 2919
2857	E 155	S4640	El. 627	A	
2862	E 220	S 5050	El. 631	Di	
2877	E230	S4630	El. 627	A	
2883	E 220	S 4626	El 628	A	
2913	E 235	S4610	El. 631	A	
2920	E 230	S4620	El. 630	A	
2931	E230	S4620	El 634	A	
2943	E270	S 5040	El. 632	D	— cleared by 2944
2946	E 140	S4610	El. 629	A	
2918	E175	S 5050	El. 632'-6"	D	— cleared by 2929
2919	E 150	S4575	El. 631'	A	

X-tra Copy of D.S.T. density failing test, week of 10-7 thru 10

SB 0511·1

c E220 S5050 D

d E230 S4630 A

e E220 S4626 A

f. E230 S4625 A

g E230 S4620 A

h E140 S4610 A

i E775 S5000

SB05415

DISCREPANCY REPORT

(2) QCIR NO. C-1.02-94, 95, 96, 98, 99, 100
(1) PAGE NO. 1 OF 2

(3) ACT NO.	(4) AREA/ LOCATION	(5) ITEM/ DISCREPANCY	(6) QCE INT/DATE	(7) LEAD QCE INT/DATE	(8) REWORK DESCRIPTION	(9) QCE ACCEPT INT/DATE
2.4	TANK FARM AREA - WEST HALF	COMPACTION TESTS FAILED ON SAND @ VARIOUS LOCATIONS SEE TEST #'S #2625 EW. 627 #2612 EW. 626 #2618 EW. 620 #2628 EW. 617 #2622 EW. 624 SEE ATTACHED SKETCH	10/12/78	10/12/78	SB 05416	
2.4	TANK FARM AREA - WEST HALF	COMPACTION TEST FAILED ON SAND @ VARIOUS LOCATIONS SEE TESTS #2678 EW. 628' #2684 EW. 624' #2720 EW. 625' #2731 EW. 631' #2723 EN. 626'	10/16/78.	10/16/78		
2.4	Misc. Yard Areas	a. #3147 El. 631 b. #3146 El. 630 c. 2862 El. 631' ✓ d. 2877 El. 627' ✓ e. 2883 El. 628' ✓ f. 2920 El. 630' ✓ g. 2931 El. 634' ✓ h. 2946 El. 630' ✓ I 3218 El. 628	59 11/3/78	11/3/78	a, b cleared 11/6/78 59	

FORM QC-DR-1 Rev. 3

INSTRUCTIONS FOR PREPARING DISCREPANCY REPORT (FORM QC-DR-1)

BLOCK NO.	ENTRY INFORMATION
1	ENTER THE PAGE NUMBER OF THE DISCREPANCY REPORT. (THIS INFORMATION IS ALSO ENTERED ON THE QCIR).
2	ENTER THE QCIR NUMBER TO COVER THE DISCREPANT ITEMS.
3	ENTER THE ACT. NO. THE QC-DR-1 IS WRITTEN AGAINST.
4	ENTER THE AREA/LOCATION OF THE DISCREPANCY.
5	ENTER A BRIEF DESCRIPTION OF THE ITEM AND A CLEAR DESCRIPTION OF THE DISCREPANT CONDITION.
6	QCE SHALL INT/DATE AT THE TIME THE QC-DR-1 IS WRITTEN.
7	THE LEAD QCE SHALL INT/DATE PRIOR TO DISTRIBUTION OF THE QC-DR-1, INDICATING HIS CONCURRENCE WITH THE WRITE-UP.
8	ENTER THE TYPE REWORK PERFORMED TO CORRECT THE DISCREPANCY.
9	ENTER THE INT/DATE OF THE QCE ACCEPTING THE REWORK.
10	ENTER THE DISCREPANCY REPORT LOG NUMBER UPON INITIATION.

NOTES

1 A SINGLE QC-DR-1 REPORT, UPON INITIATION, MAY HAVE MULTIPLE ENTRIES. EACH ENTRY MUST HAVE A UNIQUE NUMBER USING THE LOG NO. WITH AN ALPHA SUFFIX (i.e. A, B, etc.). THIS UNIQUE NUMBER SHALL BE RECORDED IN BLOCK 5 UPPER LEFT CORNER. SUBSEQUENT DISCREPANCIES WILL BE REPORTED ON A NEW DR FORM AS THEY OCCUR TO FACILITATE THE LOGGING SYSTEM.

2 THE DISTRIBUTION OF THE QC-DR-1 SHALL BE AS FOLLOWS:
a. ONE COPY TO THE RESPONSIBLE FIELD ENGINEER.
b. ONE COPY TO THE DISCIPLINE LEAD QCE.
c. ONE COPY (ORIGINAL) TO BE KEPT WITH THE QCIR.
d. ONE COPY TO THE LEAD QUALITY ASSURANCE ENGINEER.

3. WHEN MORE THAN ONE DISCIPLINE IS INVOLVED, THE LEAD QCE OF THE DISCIPLINE ISSUING THE QC-DR-1 FORM SHALL BE RESPONSIBLE FOR THE NECESSARY COORDINATION WITH THE APPROPRIATE QC DISCIPLINE.

4 UPON CLOSEOUT OF THE DISCREPANT CONDITION, ENTER THE CLOSEOUT DATE IN THE DISCREPANCY REPORT LOG.

5 THE DISCIPLINE LEAD QCE SHALL BE RESPONSIBLE FOR THE DISTRIBUTION OF THE COMPLETED DR-1 FORM AS FOLLOWS:
a. PROJECT SUPT.
b. LEAD QUALITY ASSURANCE ENGINEER.

COMPACTED FILL DENSITY TEST REPORT

QC ACCEPTANCE ____ DATE ____

CONTROL NO. ____ FILE NO. ____

① PROJECT NO. 7220 ② DATE 10-21-78 ③ PAGE 1 OF 14

SPEC. NO. 7220-C-208 ⑤ ~~DRAWING NO.~~ PLANT ⑥ TESTED WEEK OF 10/7/78 to 10/16/78

TE KEN	⑧ TEST NO.	⑨ TEST MADE BY	⑩ LOCATION	⑪ ELEV.	⑫ DEPTH BELOW FINAL GRADE	⑬ IN PLACE WET DEN. (LB/CF)	⑭ MOISTURE CONTENT (%)	⑮ IN PLACE DRY DEN. (LB/CF)	⑯ SOIL CLASS. USTM / O.M.C. / ZONE	⑰ MAX LAB DRY DEN. (LB/CF)	⑱ % COMPT.	⑲ REMARKS
/78	2226	RC	E-380 S-4180	633.0	—	140.1	10.6	126.7	10/9.0/1	132.5	95.6	Passed
/78	A 2229	RC/RS/DM	ZERO S-4603	624.6	—	145.2	10.1	131.9	11/8.3/1	134.8	97.8	Passed
/78	B 2229	RC/RS/DM	W-4 S-4603	624.6	—	135.6	10.1	123.2	11/8.3/1	134.8	91.4	Failed-Q.C. Notified
/78	A 2230	RC/RS/DM	E-40 S-4603	624.6	—	138.4	9.7	126.2	12/7.7/1	136.5	92.5	Failed-Q.C. Notified
/78	B 2230	RC/RS/DM	E-44 S-4603	624.6	—	141.2	9.6	128.8	12/7.7/1	136.5	94.4	Failed-Q.C. Notified
/78	A 2232	NM	E-2 S-4587	624.6	—	139.6	10.0	126.9	13/7.6/1	136.0	93.3	Failed-Q.C. Notified.
/78	B 2232	NM	E-2 S-4587	624.6	—	142.5	10.0	129.5	13/7.6/1	136.0	95.2	Passed

TEST FAILURE TEST FAILURE

C. Rep. Notified R. Dalton — Q.C. Rep. Notified S. Kirker

Time & Date of Notification CSCC/10-12-78 — Time & Date of Notification 1215/10-16-78

Reporting Person B. Varner — Reporting Person B. Varner

2229B — 2230A, 2230B, 2232A

SR 03618

PREPARED BY(SIGNATURE) ____ DATE ____ ㉑. RESPONSIBLE ENGR ____ DATE ____

COMPACTED FILL DENSITY TEST REPORT

QC ACCEPTANCE ____ DATE ____

CONTROL NO. ____ FILE NO. ____

① PROJECT NO. 7220 ② DATE 10-21-78 ③ PAGE 2 OF 14

SPEC. NO. 7220-C-208 ⑤ ~~DRAWING NO.~~ PLANT ⑥ TESTED WEEK OF 10/2/78 to 10/16/78

DATE TAKEN	⑧ TEST NO.	⑨ TEST MADE BY	⑩. LOCATION	⑪. ELEV.	⑫. DEPTH BELOW FINAL GRADE	⑬. IN PLACE WET DEN. (LB/CF)	⑭. MOISTURE CONTENT (%)	⑮. IN PLACE DRY DEN. (LB/CF)	⑯. SOIL CLASS. USTM / O.M.C. / ZONE	⑰. MAX LAB DRY DEN. (LB/CF)	⑱. % COMPT.	⑲. REMARKS
/78	A 2733	NM	E-42 S-4587	624.6	—	143.7	10.5	130.0	14/7.8/1	134.2	96.9	Passed
/78	B 2733	NM	E-42 S-4587	624.6	—	141.0	9.0	129.4	14/7.8/1	134.2	96.4	Passed
/78	2740	NM	E-190 S-4575	626.0	—	147.2	8.6	135.5	15/8.0/1	136.8	99.0	Passed
/78	A 2745	RC/DM	ZERO S-4563	624.6	—	127.4	9.3	116.6	16/8.1/1	135.6	86.0	Failed-QC Notified
/78	B 2745	RC/DM	W-4 S-4563	624.6	—	125.5	9.4	114.7	16/8.1/1	135.6	84.6	Failed-QC Notified
/78	A 2746	RC/DM	E-45 S-4563	624.6	—	143.8	10.2	130.5	17/8.9/1	135.4	96.4	Passed
/78	B 2746	RC/DM	E-49 S-4563	624.6	—	122.2	9.9	111.2	17/8.9/1	135.4	82.1	Failed-QC Notified

TEST FAILURE

Q.C. Rep. Notified S. Kirker
Time & Date of Notification 1435/10-16-78
Reporting Person J. Speltz
2745A, 2745B

TEST FAILURE

Q.C. Rep. Notified S. Kirker
Time & Date of Notification 0930/10-18-78
Reporting Person N. Wise
2746 B

SB 05419

⑳. PREPARED BY(SIGNATURE) ____ DATE ____ ㉑. RESPONSIBLE ENGR. ____ DATE ____

COMPACTED FILL DENSITY TEST REPORT

QC ACCEPTANCE ______ DATE ______

CONTROL NO. ______ FILE NO. ______

(1) PROJECT NO. 7220 (2) DATE 10-21-78 (3) PAGE 3 OF 14

(4) SPEC. NO. 7220-C-208 (5) ~~DRAWING NO.~~ PLANT (6) TESTED WEEK OF 10/7/78 to 10/14/78

(7) DATE TAKEN	(8) TEST NO.	(9) TEST MADE BY	(10) LOCATION	(11) ELEV.	(12) DEPTH BELOW FINAL GRADE	(13) IN PLACE WET DEN. (LB/CF)	(14) MOISTURE CONTENT (%)	(15) IN PLACE DRY DEN. (LB/CF)	(16) SOIL CLASS. USTS/O.M.C./Zone	(17) MAX LAB DRY DEN. (LB/CF)	(18) % COMPT.	(19) REMARKS
/78	A 2747	RC/DM	E-45 S-4579	625.0	—	129.1	9.1	118.3	18/7.3/1	137.1	86.3	Failed-Q.C. Notified
/78	B 2747	RC/DM	E-49 S-4579	625.0	—	135.6	9.3	124.1	18/7.3/1	137.1	90.5	Failed-Q.C. Notified
/78	A 2748	RC/DM	ZERO S-4579	625.0	—	142.7	8.3	131.8	19/7.8/1	136.8	96.3	Passed
/78	B 2748	RC/DM	W-4 S-4579	625.0	—	139.5	9.1	127.9	19/7.8/1	136.8	93.5	Failed - Q.C. Notified
/78	A 2749	RC	W-5 E-4595	625.0	—	140.0	10.4	126.8	20/7.4/1	137.4	92.3	Failed-Q.C. Notified
/78	B 2749	RC	ZERO S-4595	625.0	—	139.1	9.8	126.7	20/7.4/1	137.4	92.2	Failed-Q.C. Notified
/78	A 2752	RC	E-42 S-4595	625.0	—	156.3	9.6	142.6	21/9.5/1	137.3	103.9	Passed
/78	B 2752	RC	E-46 S-4595	625.0	—	131.5	8.9	120.8	21/9.5/1	137.3	88.0	Failed-Q.C. Notified

TEST FAILURE TEST FAILURE TEST FAILURE

Q.C. Rep. Notified S. Kirker
Time & Date of Notification 0930/10-18-78
Reporting Person W. Wise
2747A, 2747B, 2748B

Q.C. Rep. Notified Candy Laiser
Time & Date of Notification 0815/10-19-78
Reporting Person W. Wise
2749A, 2749B

Q.C. Rep. Notified John Moyers
Time & Date of Notification 0830/10-20-78
Reporting Person W. Wise
2752B

(20). PREPARED BY (SIGNATURE) ______ DATE ______ (21). RESPONSIBLE ENGR ______ DATE ______

(3)

COMPACTED FILL DENSITY TEST REPORT

QC ACCEPTANCE ______ DATE ______

CONTROL NO. ______ FILE NO. ______

(1) PROJECT NO. 7220 (2) DATE 10-21-78 (3) PAGE 4 OF 14

PEC. NO. 7220-C-208 (5) ~~DRAWING NO.~~ PLANT (6) TESTED WEEK OF 10/7/78 to 10/16/78

(8) TEST NO.	(9) TEST MADE BY	(10) LOCATION	(11) ELEV.	(12) DEPTH BELOW FINAL GRADE	(13) IN PLACE WET DEN. (LB/CF)	(14) MOISTURE CONTENT (%)	(15) IN PLACE DRY DEN. (LB/CF)	(16) SOIL CLASS. USTP/O.M.C./Zone	(17) MAX LAB DRY DEN. (LB/CF)	(18) % COMP	(19) REMARKS
A 2754	Nm	E-42 S-4611	625.0	–	143.9	10.2	130.6	22/7.4/1	138.5	94.3	Failed-QC Notified
B 2754	Nm	E-42 S-4611	625.0	–	140.8	8.2	129.5	22/7.4/1	138.5	93.5	Failed-QC Notified
A 2755	NM	E-2 S-4611	625.0	–	142.4	8.4	131.4	23/7.3/1	137.1	95.8	Passed
B 2755	NM	E-2 S-4611	625.0	–	143.5	10.3	130.1	23/7.3/1	137.1	94.9	Failed-QC Notified
2757	NM	E-200 S-4580	629.0	–	143.7	6.8	134.6	24/7.9/1	136.8	98.4	Passed
2758	NM	E-475 S-5255	632.0	–	147.4	8.3	136.1	25/7.5/1	139.0	97.9	Passed

TEST FAILURE

Q.C. Rep. Notified S. Kirker

Time & Date of Notification [illegible] 10-21-78

Reporting Person N. Wise

2754A, 2754B

TEST FAILURE

Q.C. Rep. Notified S. Gelzett

Time & Date of Notification [illegible] 10-19-78

Reporting Person N. Wise

2755B

PREPARED BY(SIGNATURE) ______ DATE ______ (21). RESPONSIBLE ENGR ______ DATE ______

COMPACTED FILL DENSITY TEST REPORT

QC ACCEPTANCE	DATE
CONTROL NO.	FILE NO.

① PROJECT NO. 7220 ② DATE ______ ③ PAGE 5 OF 14

SPEC. NO. 7220-C-208 ⑤ -DRAWING NO. PLANT ⑥ TESTED WEEK OF 10/7/78 to 10/14/78

E KEN	⑧ TEST NO.	⑨ TEST MADE BY	⑩ LOCATION	⑪ ELEV.	⑫ DEPTH BELOW FINAL GRADE	⑬ IN PLACE WET DEN. (LB/CF)	⑭ MOISTURE CONTENT (%)	⑮ IN PLACE DRY DEN. (LB/CF)	⑯ SOIL CLASS. USTC/O.M.C./Zone	⑰ MAX LAB DRY DEN. (LB/CF)	⑱ % COMPT.	⑲ REMARKS
/1/78	A 2759	Nm	E-42 S-4571	625.8	—	142.4	7.7	132.2	26/7.3/1	137.9	95.9	Passed
/1/78	B 2759	Nm	E-42 S-4571	625.8	—	142.0	7.0	132.7	26/7.3/1	137.9	96.2	Passed
/1/78	A 2760	Nm	E-2 S-4571	625.8	—	144.9	7.7	134.5	27/6.4/1	137.6	97.7	Passed
/1/78	B 2760	Nm	E-2 S-4571	625.8	—	143.7	8.7	132.2	27/6.4/1	137.6	96.1	Passed
/1/78	A 2763	RL/Dm	E-46 S-4603	625.8	—	141.8	8.2	131.1	28/6.8/1	138.2	94.9	Failed-QC Notified
/1/78	B 2763	RL/Dm	E-50 S-4603	625.8	—	144.1	8.8	132.4	28/6.8/1	138.2	95.8	Passed

TEST FAILURE
[illegible]

Q.C. Rep. Notified S. Gethrett
Time & Date of Notification 10/1/78 20:25
Reporting Person V. Wise
2763 A

PREPARED BY(SIGNATURE) ______ DATE ______ ㉑. RESPONSIBLE ENGR ______ DATE ______

22

COMPACTED FILL DENSITY TEST REPORT

QC ACCEPTANCE ________ DATE ________

CONTROL NO. ________ FILE NO. ________

① PROJECT NO. 7220 ② DATE ________ ③ PAGE 6 OF 14

SPEC. NO. 7220-C-208 ⑤ ~~DRAWING NO.~~ PLANT ⑥ TESTED WEEK OF 10/2/78 to 10/16/78

(TE)(KEN)	⑧ TEST NO.	⑨ TEST MADE BY	⑩ LOCATION	⑪ ELEV.	⑫ DEPTH BELOW FINAL GRADE	⑬ IN PLACE WET DEN. (LB/CF)	⑭ MOISTURE CONTENT (%)	⑮ IN PLACE DRY DEN. (LB/CF)	⑯ SOIL CLASS. USCS/O.M.C./Zone	⑰ MAX LAB DRY DEN. (LB/CF)	⑱ % COMPT.	⑲ REMARKS
9/28	A 2764	RC/Dm	Zero S-4603	625.8	—	139.2	9.1	127.6	29/1.4/1	135.5	94.2	Failed-QC Notified
9/13	B 2764	RC/Dm	W-4 S-4603	625.8	—	146.1	9.2	133.8	29/1.4/1	135.5	98.7	Passed
9/21	2789	Dm	E-120 S-4580	629.0	—	148.5	9.5	135.6	30/1.8/1	137.5	98.6	Passed
/25	A 2792	RC/Dm	E-46 S-4571	625.8	—	141.8	8.6	130.6	31/1.1/1	137.8	94.8	Failed-QC Notified
9/13	B 2792	RC/Dm	E-49 S-4571	625.8	—	145.6	8.9	133.7	31/1.1/1	137.8	97.0	Passed

TEST FAILURE

C. Rep. Notified J. Meyer

Time & Date of Notification [illegible] 78

Responsible Person N. Wise

2764A

S-[illegible]-223

PREPARED BY(SIGNATURE) ________ DATE ________ ㉑. RESPONSIBLE ENGR ________ DATE ________

COMPACTED FILL DENSITY TEST REPORT

QC ACCEPTANCE ______ DATE ______

CONTROL NO. ______ FILE NO. ______

(1) PROJECT NO. 7220 (2) DATE ______ (3) PAGE 7 OF 14

(4) SPEC. NO. 7220-C-208 (5) ~~DRAWING NO.~~ PLANT (6) TESTED WEEK OF 11/7/78 to 11/14/78

(7) DATE TAKEN	(8) TEST NO.	(9) TEST MADE BY	(10) LOCATION	(11) ELEV.	(12) DEPTH BELOW FINAL GRADE	(13) IN PLACE WET DEN. (LB/CF)	(14) MOISTURE CONTENT (%)	(15) IN PLACE DRY DEN. (LB/CF)	(16) SOIL CLASS.	(17) MAX LAB DRY DEN. (LB/CF)	(18) % COMPT.	(19) REMARKS
11/1/78	A 2793	RC/ Dm	2+10 S-4571	625.8	—	147.2	10.1	133.7	32/7.7/1	138.2	96.7	Passed
11/1/78	B 2793	RC/ Dm	W-3 S 4571	625.8	—	146.2	8.2	135.6	32/7.7/1	138.2	98.1	Passed
11/1/78	2820	Dm	E-160 S-4510	629.5	—	139.7	8.6	128.6	33/7.3/1	138.3	93.0	Failed - QC Notified
11/1/78	A 2827	Nm	E-42 S-4611	626.6	.5 NW 11-2-78 —	131.5	9.1	120.5	34/7.8/1	135.0	89.0	Failed - QC Notified
11/1/78	B 2827	Nm	E-42 S-4611	626.5	—	133.5	8.7	122.8	34/7.8/1	135.0	91.0	Failed - QC Notified

TEST FAILURE

Q.C. Rep. Notified S. Kicker

Time & Date of Notification 1005/11-26-78

Reporting Person N. Wise

2820

ST C3521

(20). PREPARED BY(SIGNATURE) ______ DATE ______ (21). RESPONSIBLE ENGR ______ DATE ______

COMPACTED FILL DENSITY TEST REPORT

QC ACCEPTANCE | DATE

CONTROL NO. | FILE NO.

① PROJECT NO. 7220 ② DATE ③ PAGE 8 OF 14

SPEC. NO. 7220-C-208 ⑤ ~~DRAWING NO.~~ PLANT ⑥ TESTED WEEK OF 10/7/78 to 10/16/78

⑦ DATE TAKEN	⑧ TEST NO.	⑨ TEST MADE BY	⑩ LOCATION	⑪ ELEV.	⑫ DEPTH BELOW FINAL GRADE	⑬ IN PLACE WET DEN. (LB/CF)	⑭ MOISTURE CONTENT (%)	⑮ IN PLACE DRY DEN. (LB/CF)	⑯ SOIL CLASS. USI/O.M.C./Zone	⑰ MAX LAB DRY DEN. (LB/CF)	⑱ % COMPT.	⑲ REMARKS
[illegible]/78	A 2828	NM	E-2 S-4611	626.5	—	148.0	8.1	136.9	35/8.1/1	136.4	100.4	Passed
[illegible]/78	B 2828	NM	E-2 S-4611	626.5	—	137.3	9.5	125.4	35/8.1/1	136.4	91.9	Failed-QC Notified
[illegible]/78	A 2834	RC/DM	Zero S-4587	626.5	—	142.0	8.4	131.0	36/6.5/1	137.3	95.4	Passed
[illegible]/78	B 2834	RC/DM	W-4 S-4587	626.5	—	140.9	9.6	128.6	36/6.5/1	137.[illegible]	93.7	Failed-QC Notified
[illegible]/78	2835	RC/DM	E-130 S-4550	630.0	—	144.7	10.0	131.5	37/8.0/1	137.0	96.0	Passed

TEST FAILURE

Q.C. Rep. Notified S. Gelnett

Time & Date of Notification 1500/10-20-78

Reporting Person N. Wein[illegible]

2828B

TEST FAILURE

Q.C. Rep. Notified S. Gelnett

Time & Date of Notification 12[illegible]/10-28-78

Reporting Person B. Thompson

2834B

PREPARED BY(SIGNATURE) DATE ㉑. RESPONSIBLE ENGR DATE

COMPACTED FILL DENSITY TEST REPORT

QC ACCEPTANCE ______ DATE ______

______ CONTROL NO. ______ FILE NO. ______

(1) PROJECT NO. 7220 (2) DATE ______ (3) PAGE 9 OF 14

SPEC. NO. 7220-C-208 (5) ~~DRAWING NO.~~ PLANT (6) TESTED WEEK OF 10/7/78 to 10/16/78

DATE TAKEN	(8) TEST NO.	(9) TEST MADE BY	(10) LOCATION	(11) ELEV.	(12) DEPTH BELOW FINAL GRADE	(13) IN PLACE WET DEN. (LB/CF)	(14) MOISTURE CONTENT (%)	(15) IN PLACE DRY DEN. (LB/CF)	(16) SOIL CLASS.	(17) MAX LAB DRY DEN. (LB/CF)	(18) % COMPT.	(19) REMARKS
/10/78	A 2839	RC/DM	E-44 S-4587	626.5	–	143.5	8.4	132.4	38/7.7/1	139.1	95.2	Passed
/10/78	B 2839	RC/DM	E-48 S-4587	626.5	–	116.2	8.9	106.7	38/7.7/1	139.1	76.7	Failed-QC Notified
/10/78	A 2841	RC/DM	Zero S-4571	626.5	–	139.6	9.3	127.7	59/7.8/1	135.8	94.0	Failed-QC Notified
/10/78	B 2841	RC/DM	W-4 S-4571	626.5	–	141.5	8.6	130.3	39/7.8/1	135.8	95.9	Passed
/10/78	A 2843	RC/DM	E-46 S-4571	626.5	–	145.1	9.1	133.0	40/7.0/1	139.0	95.7	Passed
/10/78	B 2843	RC/DM	E-50 S-4571	626.5	–	145.4	8.4	134.1	40/7.0/1	139.0	96.5	Passed

TEST FAILURE
Q.C. Rep. Notified S. Cornell
Time & Date of Notification [illegible]
Reporting Person B. Thompson
2839B

TEST FAILURE
Q.C. Rep. Notified J. Kirker
Time & Date of Notification 1320/10-30-78
Reporting Person [illegible]
2841B

S.? 05123

PREPARED BY(SIGNATURE) ______ DATE ______ (21). RESPONSIBLE ENGR ______ DATE ______

COMPACTED FILL DENSITY TEST REPORT

QC ACCEPTANCE ____ DATE ____

CONTROL NO. ____ FILE NO. ____

① PROJECT NO. 7220 ② DATE ____ ③ PAGE 10 OF 14

④ SPEC. NO. 7220-C-208 ⑤ ~~DRAWING NO.~~ PLANT ⑥ TESTED WEEK OF 10/7/78 to 10/16/78

⑦ DATE TAKEN	⑧ TEST NO.	⑨ TEST MADE BY	⑩ LOCATION	⑪ ELEV.	⑫ DEPTH BELOW FINAL GRADE	⑬ IN PLACE WET DEN. (LB/CF)	⑭ MOISTURE CONTENT (%)	⑮ IN PLACE DRY DEN. (LB/CF)	⑯ SOIL CLASS. USF/O.M.C./Zone	⑰ MAX LAB DRY DEN. (LB/CF)	⑱ % COMPT.	⑲ REMARKS
10/10/78	A 2847	RC/DM	Zero S-4595	627.5	—	134.4	8.4	124.0	41/7.5/1	138.3	89.7	Failed-QC Notified
10/10/78	B 2847	RC/DM	W-3 S-4595	627.5	—	140.7	8.9	129.2	41/7.5/1	138.3	93.4	Failed-QC Notified
10/11/78	A 2848	RC/DM	E-44 S-4595	627.5	—	141.6	11.1	127.5	43/7.3/1	136.2	93.6	Failed-QC Notified
10/11/78	B 2848	RC/DM	E-48 S-4595	627.5	—	139.9	11.4	125.6	43/7.3/1	136.2	92.2	Failed-QC Notified
10/16/78	A 2851	DM/DS	W-2 S-4579	627.5	—	140.0	9.9	127.4	43/9.0/1	134.1	95.0	Passed
10/16/78	B 2851	DM/DS	W-2 S-4579	627.5	—	143.8	8.3	132.8	43/9.0/1	134.1	99.0	Passed

TEST FAILURE

Q.C. Rep. Notified S. Gelnett
Time & Date of Notification 1200/10-28-78
Reporting Person B. Thompson
2847A, 2847B

TEST FAILURE

Q.C. Rep. Notified S. Kirber
Time & Date of Notification 1330/10-30-78
Reporting Person D. Wise
2848A, 2848B

C55227

⑳. PREPARED BY(SIGNATURE) ____ DATE ____ ㉑. RESPONSIBLE ENGR ____ DATE ____

COMPACTED FILL DENSITY TEST REPORT

QC ACCEPTANCE DATE

CONTROL NO. FILE NO.

① PROJECT NO. 7220 ② DATE ③ PAGE 11 OF 14

) SPEC. NO. 7220-C-208 ⑤ ~~DRAWING NO.~~ PLANT ⑥ TESTED WEEK OF 10/7/78 to 10/16/78

DATE TAKEN	⑧ TEST NO.	⑨ TEST MADE BY	⑩ LOCATION	⑪ ELEV.	⑫ DEPTH BELOW FINAL GRADE	⑬ IN PLACE WET DEN. (LB/CF)	⑭ MOISTURE CONTENT (%)	⑮ IN PLACE DRY DEN. (LB/CF)	⑯ SOIL CLASS. USE/OMC/Zone	⑰ MAX LAB DRY DEN. (LB/CF)	⑱ % COMPT.	⑲ REMARKS
10/10/78	A 2852	DM/DS	E-46 S-4579	627.5	–	139.7	9.1	128.0	44/8.3/1	136.5	93.8	Failed-QC Notified
10/10/78	B 2852	DM/DS	E-44 S-4579	627.5	–	137.8	8.9	126.5	44/8.3/1	136.5	92.7	Failed-QC Notified
10/10/78	2854	NM	E-120 S-4608	630.0	–	145.3	9.6	132.6	45/8.0/1	134.9	98.3	Passed
10/10/78	A 2855	NM	W-2 S-4553	627.5	–	139.7	9.2	127.9	46/9.1/1	136.5	93.7	Failed-QC Notified
10/10/78	B 2855	NM	W-2 S-4553	627.5	–	143.6	9.8	130.8	46/9.1/1	136.5	95.8	Passed

TEST FAILURE

Q.C. Rep. Notified S. Kirk
Time & Date of Notification 1330/10-30-78
Reporting Person A. Wise
2852A, 2852B

TEST FAILURE

Q.C. Rep. Notified S. Gelnett
Time & Date of Notification 1027/11-3-78
Reporting Person D. Wise
2855A

S3 C542

⑳. PREPARED BY(SIGNATURE) DATE ㉑. RESPONSIBLE ENGR DATE

COMPACTED FILL DENSITY TEST REPORT

QC ACCEPTANCE	DATE
CONTROL NO.	FILE NO.

① PROJECT NO. 7220 ② DATE ____ ③ PAGE 12 OF 14

④ SPEC. NO. 7220-C-208 ⑤ ~~DRAWING~~ NO. PLANT ⑥ TESTED WEEK OF 10/2/78 to 10/16/78

⑦ DATE TAKEN	⑧ TEST NO.	⑨ TEST MADE BY	⑩ LOCATION	⑪ ELEV.	⑫ DEPTH BELOW FINAL GRADE	⑬ IN PLACE WET DEN. (LB/CF)	⑭ MOISTURE CONTENT (%)	⑮ IN PLACE DRY DEN. (LB/CF)	⑯ SOIL CLASS. USTD/OMC/ZONE	⑰ MAX LAB DRY DEN. (LB/CF)	⑱ % COMPT.	⑲ REMARKS
10/10/78	A 2856	Nm	E-46 S-4553	627.5	—	141.4	10.2	128.3	47/8.2/1	136.5	94.0	Failed-QC Notified
10/10/78	B 2856	Nm	E-46 S-4553	627.5	—	143.6	11.0	129.4	47/8.2/1	136.5	94.8	Failed-QC Notified
10/11/78	2863	Dm/RC	E-125 S-4520	630.0	—	146.9	9.0	134.8	48/7.2/1	137.9	97.8	Passed
10/11/78	2866	Dm	E-110 S-4560	633.0	—	143.8	8.9	132.0	49/7.9/1	134.7	98.0	Passed
10/11/78	2878	Nm	E-20 S-4620	618.5	—	141.4	11.6	126.7	50/8.6/1	133.7	94.8	Failed-QC Notified
10/11/78	2881	Nm	E-150 S-4556	633.0	—	149.0	10.3	135.1	51/7.1/1	135.6	99.6	Passed

TEST FAILURE

Q.C. Rep. Notified S. Kirker
Time & Date of Notification 1330/10-30-78
Reporting Person N. Wise
2856A, 2856B

S C5423

TEST FAILURE

Q.C. Rep. Notified S. Gelnett
Time & Date of Notification 9/10/11-3-78
Reporting Person N. Wise
2878

⑳. PREPARED BY(SIGNATURE) ____ DATE ____ ㉑. RESPONSIBLE ENGR ____ DATE ____

COMPACTED FILL DENSITY TEST REPORT — QC ACCEPTANCE

CONTROL NO. ______ FILE NO. ______

① PROJECT NO. 2220 ② DATE ______ ③ PAGE 13 OF 14

④ SPEC. NO. 2220-C-208 ⑤ ~~DRAWING NO.~~ PLANT ⑥ TESTED WEEK OF 10/2/78 to 10/16/78

⑦ DATE TAKEN	⑧ TEST NO.	⑨ TEST MADE BY	⑩ LOCATION	⑪ ELEV.	⑫ DEPTH BELOW FINAL GRADE	⑬ IN PLACE WET DEN. (LB/CF)	⑭ MOISTURE CONTENT (%)	⑮ IN PLACE DRY DEN. (LB/CF)	⑯ SOIL CLASS.	⑰ MAX LAB DRY DEN. (LB/CF)	⑱ % COMPT.	⑲ REMARKS
10/11/78	2888	RC	E-20 S-4560	629.0	—	144.2	9.4	131.8	52/7.0/1	136.1	96.7	Passed
10/11/78	2889	Dm	E-550 S-4460	632.0	—	146.7	12.4	130.5	53/7.1/1	137.6	94.8	Failed QC Notified
10/12/78	2904	RC	E-28 S-4555	630.0	—	141.0	10.2	127.9	54/7.4/1	135.7	94.3	Failed-QC Notified
10/12/78	2910	NM	ZERO S-46.03	631.0	—	144.3	12.8	127.9	55/8.2/1	137.8	92.8	Failed-QC Notified
10/13/78	2918	RC/DS	E-175 S-5050	632.5	—	126.4	9.2	115.8	57/9.1/1	134.1	86.4	Failed-QC Notified
10/13/78	2921	NM	E-200 S-4590	633.0	—	147.5	10.4	133.6	56/9.0/1	134.8	99.1	Passed

TEST FAILURE
Q.C. Rep. Notified Ed Dutton
Time & Date of Notification 1/11/10-11-78
Reporting Person N. Wise
2889

TEST FAILURE
Q.C. Rep. Notified Ed Dutton
Time & Date of Notification 725/10-8-78
Reporting Person N. Wise
2904

TEST FAILURE
Q.C. Rep. Notified S. Kicker
Time & Date of Notification 12:25/10-13-78
Reporting Person N. Wise
2918

TEST FAILURE
Q.C. Rep. Notified S. Kicker
Time & Date of Notification 25/10-12-78
Reporting Person N. Wise
2910

05430

⑳. PREPARED BY(SIGNATURE)______ DATE______ ㉑. RESPONSIBLE ENGR______

COMPACTED FILL DENSITY TEST REPORT QC ACCEPTANCE

CONTROL NO. FILE NO.

① PROJECT NO. 7220 ② DATE ③ PAGE 14 OF 14

④ SPEC. NO. 7220-C-208 ⑤ ~~DRAWING NO.~~ PLANT ⑥ TESTED WEEK OF 10/7/78 to 10/14/78

⑦ DATE TAKEN	⑧ TEST NO.	⑨ TEST MADE BY	⑩ LOCATION	⑪ ELEV.	⑫ DEPTH BELOW FINAL GRADE	⑬ IN PLACE WET DEN. (LB/CF)	⑭ MOISTURE CONTENT (%)	⑮ IN PLACE DRY DEN. (LB/CF)	⑯ SOIL CLASS Vst/O.M.C./Zone	⑰ MAX LAB DRY DEN. (LB/CF)	⑱ % COMPT.	⑲ REMARKS
10/13/78	2925	RC/DS	W-5 S-4585	631.0	—	139.4	12.5	123.9	58/9.3/1	133.2	93.0	Failed-Q.C. Notified
10/13/78	2926	DM	E-60 S-4675	633.0	—	145.9	11.2	131.2	59/7.8/1	137.6	95.3	Passed
10/13/78	2929	DM	E-175 S-5050	632.5	—	142.8	9.6	130.5	60/8.5/1	134.4	96.9	Passed
10/14/78	2935	DM	E-28 S-4544	631.0	—	146.0	11.9	130.5	61/8.8/1	134.3	97.2	Passed

TEST FAILURE

Q.C. Rep. Notified E/Dutton

Time & Date of Notification 225/11-3-78

Reporting Person N Wise

2925

SS 03431

⑳. PREPARED BY(SIGNATURE) DATE ㉑. RESPONSIBLE ENGR DATE

FIELD INSPECTION REPORT

BECHTEL

3. RECORD CONTROL
CONTROL NO. ______
FILE NO. ______

1. PROJECT NO. 7220   2. DATE 9/30/78   PAGE ____ OF ____

4. ITEM INSPECTED
1. Digging of hole and sampling of clay density.
2. Removal of clay samples.
3. Backfilling of excavated hole with lean concrete.
4. Sampling and testing of Concrete by U.S.T.

5. LOCATION Diesel Generator Bldg. North End Bay #4
El. 632 to 618±

6. TYPE OF INSPECTION Visual

7. STANDARD / CODE / PROCEDURE / DRAWING / SPECIFICATION NCR #1482 & correspondences
Spec C-211 (2) Spec C-208 (14)

8. INSPECTION EQUIPMENT USED
Sand Cone
Air Meter
Slump Cone
Thermometer
Scale
Unit Weight Container

9. RESULTS OF INSPECTION: SATISFACTORY ☒ UNSATISFACTORY ☐

10. ACTION TAKEN IF UNSATISFACTORY

SB 05432

Distribution:
White – QC Files
Canary – Originator

11. ENGINEER Stephen D. [illegible]

2514 (7-73)   QC-G1-1

MEMORANDUM

DARYLE OSBORNE
GARY COASTER 5-3-78
FAILING SOILS TEST 7220

THE FOLLOWING IS A LIST OF FAILING SOILS TEST REQUIRING RETEST. OR AN EXISTING PASSING TEST IN THE SAME AR

MDR - 1350	MD - 1434
MDR - 1351	MD - 1386
MD - 2464	MD - 1387
MD - 2462	MD - 1388
MD - 2442	MD - 1392
MD - 2462	MD - 1393
MD - 041	MD - 1395
MD - 2380	MD - 1398
MD - 2359	MD - 1402
MD - 2373	MD - 1412
MD - 2461	MD - 1413
MD - 1871	
MD - 1875	
MDR - 919	
MDR - 921	
MDR - 914	
MDR - 925	

SEVERAL OF THE ABOVE HAVE CLEARING TESTS BUT ARE NOT CLEARLY INDICATED.

8005335

0501 (1-68)

Failing Tests

MD 2249

2253

0502 (10-67)

DIESEL GENERATOR
FILL DENSITY TESTS TAKEN
AT THE FOLLOWING * ELEVATION

Elev*		MOISTURE DENSITY TESTS				
597	MD 590	ORIGINAL GROUND				
598						
599	599					
600	641					
601						
602	643	675				
603						
604	644					
605	676					
606	667	1301	1302			
607	671	677	753			
608	761	1074	1259	1294		
609	1251	1279	1306			
610	1296	1303	1309			
611	1267	1268	1281	1307	1308	
612	1297	1343				
613	12.80	1310	1311			
614	1551					
615	1643					
616	1285	1288	1766			
617	1461	1550				
618	1353	1644				
619	1768					
620	1354	1563	1772	1906		
621	1560	1891				
622	1414	1567	1570			
623	1572	1704	1797			
624	1718	1778	2428			
625	1547	1595	1779	2150		
626	1593	1719	1820	2458		
627	1741	1798	1802	1809	2435	
628	1726	1808	1907	1941		
629	1729	1760	1852	2183	2457	
630	2184	1909	2242	2460	2475	
631	1807	2191	2195	2211	2459	
632	1840	2243	2255	2356	2477	2497

SJ 05337

BMP	OHC	MDD	ZONE
251	9.2	130.6	2
255	14.4	117.4	2
260	10.6	129.8	1
262	11.8	123.9	1
263	9.1	131.7	1
264	8.2	131.7	1
269	10.0	127.3	1
270	11.1	124.6	1
271	10.1	126.6	1
274	10.4	124.8	1
277	13.4	121.0	1
278	15.2	117.0	1
297	9.0	131.6	1

RD	MAX	MIN	ZONE
30	108.5	91.5	2
41	108.7	89.6	1
43	110.5	90.8	2
55	109.7	90.2	2

Two - 9/8
Four - 8/30
Daily Placement Reports
Sai
PCR 2545
Schulman Sent.

BEDC 3162 8/7

Get INFO
For Rau
Call 8:30

S3 05213

book RE 9-27-79

NONCONFORMANCE REPORT

S/U - NONTESTABLE UNIT

C

1. PROJECT NAME MIDLAND		JOB NO. 07220		19. NO. 2545	20. PAGE 1 OF 2
2. UNIT(S) COMMON	3. DRAWING/PART NO. N/A	REV N/A	4. ITEM DESCRIPTION BACKFILL – COMPACTION EQUIP.		5. ITEM LOCATION SEE BCK #16
6. ~~P.O. OR~~ SPEC NO. C-211	7. SERIAL NO. N/A	8. REPLACEMENT PART P/N N/A REV N/A SER NO. N/A	9. SOURCE CONSTRUCTION	10. CONTRACTOR/SUPPLIER N/A	
11. INSPECTION CRITERIA ( ) DWG (X) SPEC ( ) OTHER IR NO. C-1.02-122, 123 NO. C-211 REV. 7		12. ASME AUTHORIZED INSPECTION REQ'D ( ) YES (X) NO	13. SKETCH ATTACHED ( ) YES (X) NO	14. Discovered During ( )Rec'g (X)Const ( )Test	15. Equip Furnished By. ( )Client ( )Eng (X)FLD

16. NONCONFORMING CONDITION: SPEC. C-211 REV. 7 SECTION 8.5.1 STATES IN PART ... SELECTION AND APPROVAL OF ALL PROPOSED COMPACTION EQUIPMENT SHALL BE ON THE BASIS OF DEMONSTRATED ABILITY TO ACCOMPLISH ADEQUATE COMPACTION ..... CONTRARY TO THE ABOVE A "POGO STICK" HAND HELD COMPACTOR WAS USED & IN SMALL AREA'S IN THE TANK FARM (IN THE CORNERS

SEE PG. 2

17. REPORTED BY	DATE	18. VALIDATED BY	DATE
[signature]	9/14/79	K. Barclay	9-15-79

21. ROUTING: (X) TO FIELD ENGINEERING ( ) TO OTHERS (SPECIFY)

22. ( ) Field Engineering Disposition (X) Field Engineering Recommended Disposition to Project Engineering

The "pogo stick" as referenced above is used only in areas that are inaccessible to other compaction equipment. Since the areas listed above were closely monitored by the on site geotechnical engineer, the field recommends to "use as is." J Betts 9/25/79

(continued on page 2)

23. PROJECT ENGINEERING DISPOSITION

24. DISPOSITION CONCURRENCE

rework	reject	repair	use as is

PROJECT FIELD ENGINEER DATE

PROJECT ENGINEER DATE

PROJ CONSTR QC ENGINEER DATE

AUTHORIZED INSPECTOR DATE

25. DISPOSITION RESULTS

26. QC ACCEPTANCE

QC ENGINEER DATE

AUTHORIZED INSPECTOR DATE

~~83-05214~~

BLK 16 CONTINUED

BETWEEN THE VALVE PIT OF TANK 2T60 AND ELECTRICAL DUCT BANK STUBUPS 2NA284, 2NA285 & 2NA286) AND AT THE PIPE AND IN THE CAVITATED AREAS ON THE SIDES OF THE EXCAVATION AT THE S.W. CORNER OF THE DIESEL GE[illegible] BLDG., COORDINATES - S. 5143 TO 5159 / E. 163 TO 177.
HOLD FOR ENG. DISPOSITION, "Q" LISTED 1.002, 2 HOLD TAGS ISSUED.

Blk.16 cont.) A conditional release is granted to continue placing backfill above t[illegible] nonconforming area in the tank farm. Corrections or removal can be accomplished without causing damage or contamination to associa[illegible] plant equipment or structure.

J.J. [illegible] / [illegible] 9/25/79 & J.E. Russell / WLB 9/25/7[illegible]
PFE Date PFQCE Da[te]

LAQ [illegible] 9-25-79
PQAE Date

Blk 22 cont.) Note: In tank farm area, the QCIR documents that the backfill was placed with a maximum of 4" lifts and compacted with 8 passes of the "pogo stick."
[illegible] 9/25/79

Two - 9/8
Four - 8/30

DAILY PLACEMENT Reports
Sai

PCR 2545
SCHULMAN Sent.

BEBC 3162 8/7

Get INFO
FOR RAU
CALL 8:30

S3 05213

book RE 9-27-79

C

BECHTEL

NONCONFORMANCE REPORT

S/U - NONTESTABLE UNIT

1. PROJECT NAME: MIDLAND — JOB NO.: 07220 — 19. NO. 2545 — 20. PAGE 1 OF 2

2. UNIT(S): COMMON — 3. DRAWING/PART NO.: N/A — REV: N/A — 4. ITEM DESCRIPTION: BACKFILL – COMPACTION EQUIP. — 5. ITEM LOCATION: SEE BCK #16

6. P.O. OR SPEC NO.: C-211 — 7. SERIAL NO.: N/A — 8. REPLACEMENT PART P/N N/A REV N/A SER NO. N/A — 9. SOURCE: CONSTRUCTION — 10. CONTRACTOR/SUPPLIER: N/A

11. INSPECTION CRITERIA ( ) DWG (X) SPEC ( ) OTHER — IR NO. C-102-122, 123 NO. C-211 REV. 7 — 12. ASME AUTHORIZED INSPECTION REQ'D ( ) YES (X) NO — 13. SKETCH ATTACHED ( ) YES (X) NO — 14. Discovered During ( ) Rec'g (X) Const ( ) Test — 15. Equip Furnished By ( ) Client ( ) Eng (X) FLD

16. NONCONFORMING CONDITION: SPEC. C-211 REV. 7 SECTION 8.5.1 STATES IN PART ... SELECTION AND APPROVAL OF ALL PROPOSED COMPACTION EQUIPMENT SHALL BE ON THE BASIS OF DEMONSTRATED ABILITY TO ACCOMPLISH ADEQUATE COMPACTION ..... CONTRARY TO THE ABOVE A "POGO STICK" HAND HELD COMPACTOR WAS USED $ IN SMALL AREAS IN THE TANK FARM (IN THE CORNERS

SEE PG. 2

17. REPORTED BY: [signature] — DATE: 9/14/79 — 18. VALIDATED BY: K. Barclay — DATE: 9-15-79

21. ROUTING: (X) TO FIELD ENGINEERING ( ) TO OTHERS (SPECIFY)

22. ( ) Field Engineering Disposition (X) Field Engineering Recommended Disposition to Project Engineering

The "pogo stick" as referenced above is used only in areas that are inaccessible to other compaction equipment. Since the areas listed above were closely monitored by the on site geotechnical engineer, the field recommends to "use as is." [signature] 9/25/79

(continued on page 2)

23. PROJECT ENGINEERING DISPOSITION

24. DISPOSITION CONCURRENCE

rework	reject	repair	use as is

PROJECT FIELD ENGINEER — DATE

PROJECT ENGINEER — DATE

PROJ CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

25. DISPOSITION RESULTS

26. QC ACCEPTANCE

QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

~~83-05214~~

BLK 16 CONTINUED

BETWEEN THE VALVE PIT OF TANK 2T60 AND ELECTRICAL DUCT BANK STUBUPS 2NA284, 2NA285 & 2NA286) AND AT THE PIPE AND IN THE CAVITATED AREAS ON THE SIDES OF THE EXCAVATION AT THE S.W. CORNER OF THE DIESEL GE[N] BLDG., COORDINATES - S. 5143 TO 5159 / E. 163 TO 177.
HOLD FOR ENG. DISPOSITION, "Q" LISTED 1.002, 2 HOLD TAGS ISSUED.

Blk.16 cont.) A conditional release is granted to continue placing backfill above th[e] nonconforming area in the tank farm. Corrections or removal can be accomplished without causing damage or contamination to associa[ted] plant equipment or structure.

J.J. [signature] /ATB 9/25/79   J.E. Russell / WLB 9/25/7[9]
PFE   Date   PFQCE   Da[te]

LAD [signature] 9-25-79
PQAE   Date

Blk 22 cont.) Note: In tank farm area, the QC IR documents that the backfill was placed with a maximum of 4" lifts and compacted with 8 passes of the "pogo stick."
[initials] 9/25/79

S3 05215

Bechtel Associates Professional Corporation

Inter-office Memorandum

BEBC-3944

To	L.E. Davis	Date	April 25, 1980
Subject	Midland Plant Units 1 and 2 Bechtel Job 7220 Soils-Related NCR	From	L.H. Curtis
		Of	Engineering
Copies to	[redacted] P.J. Corcoran L.A. Dreisbach J.O. Wanzeck	At	Ann Arbor
		File	0274, C-211PR, C-0465

References A) CPCo NCR M-01-5-9-012
B) BCBE-2185, BCBE-2216 and BCBE-2482A
C) BEBC-3163, BEBC-3197 and BEBC-3335

The following is a complete response to the referenced Consumers Power Company NCR (Reference A). Reference B also transmitted various tests to be dispositioned in conjunction with the Consumers Power Company NCR. The following dispositions, along with those recommended in Reference C, should complete the input from project engineering to close out the Consumers Power Company NCR.

Project engineering has reviewed all of the remaining tests and has elected to disposition the failing tests that are located within the Q-listed area or in the close proximity (approximately 10 feet) of the Q-listed boundary lines as indicated on Drawing 7220-C-45. It should be noted that no safety-related structure and/or system will be located in the areas represented by the other failing tests in the non-Q area. The proposed dewatering system would encompass most of the Q-listed area. Therefore, the failing tests in the non-Q area would not have adverse effect on the Q-listed areas.

The following tests are above elevation 630' and foundations of safety-related structures would have to extend to at least elevation 629.5'. Therefore, the failing tests above elevation 630' would not have an adverse impact on the integrity of the structures and systems that are safety-related. The proposed plant dewatering system eliminates the possibility of liquefaction. Based on this, the following tests can be accepted.

Bechtel Associates Professional Corporation

IOM
Page 2

Test	Elevation (feet)	Remarks
2253	632	
2498	633	
2501	633	
2979	632	
3000	632	
3043	632	
3059	633	
3071	632	
3075	633	
3082	633	
3088	634	At Grade
3103	634	At Grade
3105	634	At Grade
3109	636	2 feet above finish grade
3110	638	4 feet above finish grade
3114	633	
3127	632	

This completes the evaluation of the referenced Consumers Pow... Company NCR.

M. Elgaaly
For: L.H. Curtis

BD/RAO/ht
4/22/13

RECEIVED
APR 30 1980
QUALITY CONTROL
BECHTEL JOB 7220
SIGNATURE JK

ROUTE	QC 07220	INIT.
1	BARCLAY	
2	NEWMAN	
3	RUSSELL	
	THOMPSON	
4	CIVIL	
	ELECT.	
	PIPING	
	MECH.	
	WELDING	
6	DOC.	
	RECEIVING	
	ACM ASST	
5	Matls. Test Lab Super.	
	T/O	

OPEN LOOP
☐ YES ☐ NO
DATE ____

Response Requested: No

SB 05217

Bill Barclay

Bechtel Associates Professional Corporation

Inter-office Memorandum

To L. H. Curtis

Subject Midland Units 1&2 - Job 7220-001
Compaction Equipment

Copies to S. L. Blue
B. Dhar
J. O. Wanzeck
~~J. Newgen~~
J. Betts
K. D. Bailey
1320, 3410

Date 4 September 1979

From S. S. Afifi

Of Geotechnical Services

At Ann Arbor 10 D 5
7220-79-180

RECEIVED
SEP 1 1979
BECHTEL POWER CORP
JOB 7220
PER 3211(6)(E) 0270

The following compaction equipment is qualified for use based on test fills and field results as monitored by Geotech.

[redacted]

1. [redacted]
   (a) all area [redacted]
   (b) 4" lifts and 8 passes

[redacted]

1[redacted]
   (a) all areas requiring [redacted]
   (b) 5"-6" lifts and 8 passes
   (c) this equipment is capable of getting 95%, 1557, but with much more compactive effort

[redacted]
   (a) all areas requiring [redacted]
   (b) 4" lifts and 6 passes per lift
   (c) this equipment is capable of getting 95% 1557, but with additional compactive effort.

[redacted]
   (a) all areas requiring [redacted]
   (b) 5" lifts and 6 passes [redacted]

[redacted]
   (a) all areas requiring [redacted]
   (b) 4" lifts and 6 passes [redacted]

QC 07220 INIT.
PFQCE
A. PFQCE
CIVIL
ELECT.
PIPING
MECH.
WELDING
DOC.
RECEIVING
ADM ASST
Matls. Test Lab Super.
E. Newman
OPEN LOOP
☐ YES ☐ NO
DATE.........

JOB 7220 ROUTING
Site Mgr.
Proj. Supt.
Serv. Supt.
P.F. Engr.
APF. Eng. 1
APF. Eng. 2
S.U. Turnover
Cost-Sche.
Inst. Engr.
Civ. Sup.
Civ. Eng.
Mech. Sup.
Mech. Eng.
Pipe Sup.
Elec. Eng.
Weld Eng.
Ch. Plt.
F & A
Q.C.
Purch.
Sub Con.
Cost Con.

RECEIVED
SEP 12 1979
QUALITY CONTROL

This equipment is in addition to that which has already been transmitted on July 27, 1979. (See IOM S. S. Afifi to R. L. Castleberry, dated July 27, 1979).

If there are any questions, please call J. O. Wanzeck of this office.

JOWanzeck / For SSA
S. S. Afifi

JOW
JOW/nm

Stinker 11-07-77

Corrected Copy

S3 05223

NONCONFORMANCE REPORT

1. PROJECT NAME Midland	JOB NO. 7220	19. NO. 1004	20. PAGE 1 of 2
2. UNIT(S) Common	3. DRAWING/PART NO. N/A	REV N/A	4. ITEM DESCRIPTION Soil	5. ITEM LOCATION Plant Area
6. P.O. OR SPEC NO. N/A	7. SERIAL NO. N/A	8. REPLACEMENT PART P/N N/A REV N/A SER NO. N/A	9. SOURCE Construction	10. CONTRACTOR/SUPPLIER N/A
11. INSPECTION CRITERIA ( ) DWG (X) SPEC ( ) OTHER	IR NO. N/A NO. C-210 R5/C-211 R4	12. ASME AUTHORIZED INSPECTION REQ'D ( ) YES (X) NO	13. SKETCH ATTACHED ( ) YES (X) NO	14. Discovered During ( ) Rec'g ( )Const ( ) Test	15. Equip Furnished By ( )Client ( )Mfg ( ) FLD

16. NONCONFORMING CONDITION: Specifications C-210 Rev. 5 and C-211 Rev. 4 states in part.... "That the density requirements of cohesive soils is 95% Bechtel Modified Proctor and 80% Relative Density." Contrary to the above, the following density tests are failing with no retests taken:

(CONTINUED ON PAGE 2)

17. REPORTED BY [signature] DATE 10/26/77

18. VALIDATED BY [signature] Barclay DATE 10-26-77

21. ROUTING: (X) TO FIELD ENGINEERING ( ) TO OTHERS (SPECIFY)

22. ( ) Field Engineering Disposition (X) Field Engineering Recommended Disposition to Project Engineering

DISPOSITION REQUIRED BY 11-11-77

ROUTE TO PROJECT ENGINEERING FOR EVALUATION AND DISPOSITION

J Dean 10/27/77

D. Annadley 2/15/79

23. PROJECT ENGINEERING DISPOSITION

Project engineering has reviewed the NCR 1004 (corrected copy dated 2-15-79) and notes the following:

Test No. MDR 685-- is accepted by test MDR 690, located near MDR 685 and about the same elevation.

Test No. MDR 686-- is acceptable based on the evaluation of the boring SWS-5. This boring is located in the vicinity MDR 686 and indicates high blow counts at elevation between 594 and 599.

24. DISPOSITION CONCURRENCE

rework	reject	repair	use as is
			X

PROJECT FIELD ENGINEER [signature] DATE 10-25-77

PROJECT ENGINEER McRothwell DATE 10-24-77

PROJ CONST'N QC ENGINEER Barclay DATE 10-29-77

AUTHORIZED INSPECTOR DATE

25. DISPOSITION RESULTS

26. QC ACCEPTANCE

QC ENGINEER [signature] DATE 10/31/77

AUTHORIZED INSPECTOR DATE

Sent 10-31-77

AREA	ELEV.	DATE OF TEST	DENSITY TEST NO.	PERCENT COMPACTION	METHOD OF TEST
STR. BACKFILL					
35' E of Wall Line	582.7'	10/14/76	MDR-621 ✓	42%	R.D.
15' off "6.0" 30" South of "Q"	613'	11/12/76	MDR-671 ✓	74.8%	R.D.
SWPS-11' S of N. Wall, 3' off W Wall	582.5'	11/23/76	MDR-672 ✓	75.4%	R.D.
SWPS-13' W of E. Wall, 30" off N Wall	589'	11/24/76	MDR-685 ✓	56.2%	R.D.
SWPS-13' N of N. Wall, 30" E of E Wall	596'	11/24/76	MDR-686 ✓	70.9%	R.D.
SWPS-2' W of E. Wall, 9' off N. Wall	595'	11/24/76	MDR-691 ✓	62.0%	R.D.
NORTH DIKE					
~~0 + 80 100' E Center Line~~	~~629'~~	~~7/31/74~~	~~MD-360~~	~~86.4%~~	~~B.M.P.~~ N/A 2/14/79

DENSITY TEST MD360 WAS TRANSMITTED TO Q.C. FROM U.S. TESTING WITH A TYPO OF 113 BMP - THIS SHOULD HAVE BEEN BMP 118, GIVING A % COMPACTION OF 96.4 - NOT 86.4% 2/14/79

Hold for Engineering Disposition. No Hold Tags Applied. "Q"-List #1.002 & 1.004.

Barclay
2-15-79

Block 23 Contd:

Test No. MDR 691-- is acceptable based on the evaluation of the boring SWP-1 & SW-13. This boring reveals high blow counts between elevation 587 and 608.

Test No. MDR 671-- is acceptable based on the evaluation of boring DG-20 and DG-23. These borings indicate high blow counts at elevation 613.

Test No. MDR 621 and 672--are acceptable based on evaluation of borings SWP-1, SW-8, SW-3, SW-5 and SW-7. These borings indicate high blow counts at elevation 582.5 and 582.7 feet.

This completes the evaluation of NCR 1004 by project engineering.

[signatures] 10-5-79 10/5/79 10-5-79 10/5/79

Bechtel Power Corporation

Post Office Box 2167
Midland, Michigan 48640

June 26, 1979

U.S. Testing
1415 Park Ave.
Hoboken, New Jersey 07030

Attention: Mike Anselno

Job 7220 Midland Project
Subcontract No. 7220-C-208
Soils Testing
C-208-2-(0)

Dear Mr. Anselno;

To confirm earlier conversations with your on-site laboratory chief, you are hereby directed to check all field density tests against a zero-air-voids curve, using an assumed specific gravity of 2.65. A suggested method is:

Plot a zero-air-voids curve on the same graph as used for ASTM D1557 reporting.
Plot the field density test result on the graph.
Any field test result which plots on, or to the right of the zero-air-voids curve shall be regarded as suspect and cause for retest. Report all such field tests immediately to Quality Control.

Please implement the above immediately.

If there are any questions concerning this direction contact W. L. Barclay at the Midland jobsite.

Very truly yours,

J. F. Newgen
Project Superintendent
Bechtel Power Corporation
Agents for Consumers Power Co.

JFN/WLB/vmm

RECEIVED

JUN 26 1979

QUALITY CONTROL
BECHTEL JOB 7220

SIGNATURE

OPEN LOOP
YES NO
DATE.........

S3 05225

Skinner

NONCONFORMANCE REPORT

S/U Non Testable

05225

JWP 10/3

see pg. 3 for concurrence

1. PROJECT NAME: Midland
JOB NO.: 7220
19. NO. 2192
20. PAGE 1 OF 3

2. UNIT(S): Common
3. DRAWING/PART NO.: C-45
REV: 3
4. ITEM DESCRIPTION: Structural "Q" listed Backfill
5. ITEM LOCATION: Diesel Generator Bldg

6. P.O. OR SPEC NO.: N/A
7. SERIAL NO.: N/A
8. REPLACEMENT PART P/N: N/A REV SER NO.
9. SOURCE: Const.
10. CONTRACTOR/SUPPLIER: N/A

11. INSPECTION CRITERIA ( ) DWG (✓) SPEC ( ) OTHER
IR NO. C-102-123 NO. Spec C-211/2
12. ASME AUTHORIZED INSPECTION REQ'D ( ) YES (✓) NO
13. SKETCH ATTACHED (✓) YES ( ) NO
14. Discovered During ( ) Rec'g (✓) Const ( ) Test
15. Equip Furnished By ( ) Client ( ) Eng (✓) FLD

16. NONCONFORMING CONDITION: Spec C-211, sec. B.5.1 states in part that... "Selection & approval of all proposed compaction equipment shall be on the basis of demonstrated ability to accomplish adequate compaction." Also TWX 5283 lists equipment which is qualified for "Q" & non-"Q" listed areas. Contrary to the above, a hand held compactor (Po-Go-Stick) was used to compact an area that was under-placed approx. 6'x2'x1.5'. Also used was a "Ground Pounder" compactor that is not listed on TWX 5283. (1) Hold tag applied, "Q" list 1.002, hold for Eng. [illegible]

identifiable to

17. REPORTED BY: [signature]
DATE: 8/30/79
18. VALIDATED BY: [signature] Barclay
DATE: 8-30-79

21. ROUTING: (✓) TO FIELD ENGINEERING ( ) TO OTHERS (SPECIFY)

22. ( ) Field Engineering Disposition (X) Field Engineering Recommended Disposition to Project Engineering

This is not a non-conforming condition
1) Geo-Tech during qualification of equipment has stated that the pogo-stick" need not be qualified because of its limited use.
2) TWX 5283 contained a misprint. Equipment identified as GP 1000 should have been stated as GP-1000. Qualification records & process which Q.C. surveilled [illegible] verify that equip. GP1000 was in fact qualified.
[signature] 8/30/79

23. PROJECT ENGINEERING DISPOSITION

Project Engineering Disposition

Project Engineering has evaluated the Rammer type compactor (Pogo Stick) RV4B and has determined that it is qualified for use as noted in TWX BEBC-3301.

For Project Engineering disposition concerning the area compacted using said equipment prior to qualification, see NCR #2545. REM No. C-2401, J.W. Daly 10/18/79

No DWG REV. REQ'D. RS 10/17/79

24. DISPOSITION CONCURRENCE N/A

rework	reject	repair	use as is

[signature] 8/30/79
PROJECT FIELD ENGINEER DATE

PROJECT ENGINEER: [signature] Barclay 8-30-79
PROJ CONSTR QC ENGINEER DATE

AUTHORIZED INSPECTOR DATE

25. DISPOSITION RESULTS

[signature] 10/31/79

26. QC ACCEPTANCE [signature]
QC ENGINEER 11/9/79 DATE

AUTHORIZED INSPECTOR DATE

RECEIVED SEP 28 1979

BECHTEL MIDL

BECHTEL ARB
810-223-6032 CLG 510-226-9497
TWX 5560 9-28-79 17:39

ATTN: J. F. NEWGEN

BEBC- 3301

SUBJECT:
CPCO/MIDLAND PLANT - JOB 7220
SIOLS WORK COMPACTION
FILE: 0274, C-211, C-210, C-0465

REFERENCE: QUALITY ASSURANCE STOP WORK REPORT 6

THIS IS A COMPLETE RESPONSE TO THE REFERENCED Q/A STOPWORK REPORT 6. THE RAMMER-TYPE COMPACTOR (POGO STICK) RV4B HAS BEEN SATISFACTORILY QUALIFIED FOR USE IN COMPACTING SILS REQUIRING THE FOLLOWING:

1) 80% AND 85% DENSITY FOR STRUCTURAL BACKFILL SAND AND RANDOM SANDS WITH 4 INCH LAYERS AND 8 PASSES.

2) 90% AND 95% DENSITY DETERMINED IN ACCORDANCE WITH ASTM D1557 METHOD D FOR CLAYEY SILS WITH 4 INCH LAYERS AND 8 PASSES.

THE TEST FILLS FOR QUALIFYING THE RAMMER-TYPE COMPACTOR WERE MONITORED BY THE ONSITE GEOTECHNICAL ENGINEER.

M VELASTEGUI, FOR
L H CURTIS
ANN ARBOR/ 7220-001/JS

S3 03227

Pg. 2 of 3
NCR No. 2992

BECHTEL MIDL

NONCONFORMANCE REPORT (CONT'D)

20. PAGE 3 OF 3

19. NCR NO 3492

SB 05228

24. Disposition Concurrence Item

REWORK	REJECT	REPAIR	USE AS IS
			X

[signature] 10/22/79
PROJECT FIELD ENGINEER — DATE

[signature] /LHC 10-22-79
PROJECT ENGINEER — DATE

[signature] 10-25-79
PROJECT CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

24. Disposition Concurrence Item

REWORK	REJECT	REPAIR	USE AS IS

PROJECT FIELD ENGINEER — DATE

PROJECT ENGINEER — DATE

PROJECT CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

24. Disposition Concurrence Item

REWORK	REJECT	REPAIR	USE AS IS

PROJECT FIELD ENGINEER — DATE

PROJECT ENGINEER — DATE

PROJECT CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

24. Disposition Concurrence Item

REWORK	REJECT	REPAIR	USE AS IS

PROJECT FIELD ENGINEER — DATE

PROJECT ENGINEER — DATE

PROJECT CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

24. Disposition Concurrence Item

REWORK	REJECT	REPAIR	USE AS IS

PROJECT FIELD ENGINEER — DATE

PROJECT ENGINEER — DATE

PROJECT CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

24. Disposition Concurrence Item

REWORK	REJECT	REPAIR	USE AS IS

PROJECT FIELD ENGINEER — DATE

PROJECT ENGINEER — DATE

PROJECT CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

24. Disposition Concurrence Item

REWORK	REJECT	REPAIR	USE AS IS

PROJECT FIELD ENGINEER — DATE

PROJECT ENGINEER — DATE

PROJECT CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

24. Disposition Concurrence Item

REWORK	REJECT	REPAIR	USE AS IS

PROJECT FIELD ENGINEER — DATE

PROJECT ENGINEER — DATE

PROJECT CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

24. Disposition Concurrence Item

REWORK	REJECT	REPAIR	USE AS IS

PROJECT FIELD ENGINEER — DATE

PROJECT ENGINEER — DATE

PROJECT CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

24. Disposition Concurrence Item

REWORK	REJECT	REPAIR	USE AS IS

PROJECT FIELD ENGINEER — DATE

PROJECT ENGINEER — DATE

PROJECT CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

24. Disposition Concurrence Item

REWORK	REJECT	REPAIR	USE AS IS

PROJECT FIELD ENGINEER — DATE

PROJECT ENGINEER — DATE

PROJECT CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

24. Disposition Concurrence Item

REWORK	REJECT	REPAIR	USE AS IS

PROJECT FIELD ENGINEER — DATE

PROJECT ENGINEER — DATE

PROJECT CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

Corrected Copy

NONCONFORMANCE REPORT

1. PROJECT NAME	JOB NO.	19. NO.	20. PAGE
Midland	7220	1004	1 OF 2

2. UNIT(S)	3. DRAWING/PART NO.	REV	4. ITEM DESCRIPTION	5. ITEM LOCATION
Common	N/A	N/A	Soil	Plant Area

6. P.O. OR SPEC NO.	7. SERIAL NO.	8. REPLACEMENT PART	9. SOURCE	10. CONTRACTOR/SUPPLIER
N/A	N/A	P/N N/A REV N/A SER NO. N/A	Construction	N/A

11. INSPECTION CRITERIA	IR NO.	12. ASME AUTHORIZED INSPECTION REQ'D	13. SKETCH ATTACHED	14. Discovered During	15. Equip Furnished By
( ) DWG (X) SPEC ( ) OTHER	N/A C-210 R5/C-211 R4	( ) YES (X) NO	( ) YES (X) NO	( ) Rec'g (X) Const ( ) Test	( ) Client (N/A) ( ) FLD

16. NONCONFORMING CONDITION: Specifications C-210 Rev. 5 and C-211 Rev. 4 states in part.... "That the density requirements of cohesive soils is 95% Bechtel Modified Proctor and 80% Relative Density." Contrary to the above, the following density tests are failing with no retests taken:

(CONTINUED ON PAGE 2)

17. REPORTED BY: D L Osler DATE 10/24/77

18. VALIDATED BY: W K Barclay DATE 10-26-77

21. ROUTING: (X) TO FIELD ENGINEERING ( ) TO OTHERS (SPECIFY)

22. ( ) Field Engineering Disposition (X) Field Engineering Recommended Disposition to Project Engineering

DISPOSITION REQUIRED BY 11-11-77

ROUTE TO PROJECT ENGINEERING FOR EVALUATION AND DISPOSITION

J Dixon 10/27/77

D. Annunziata 2/15/79

23. PROJECT ENGINEERING DISPOSITION

Project engineering has reviewed the NCR 1004 (corrected copy dated 2-15-79) and notes the following:

Test No. MDR 685-- is accepted by test MDR 690, located near MDR 685 and about the same elevation.

Test No. MDR 686-- is acceptable based on the evaluation of the boring SWS 5. This boring is located in the vicinity MDR 686 and indicates high blow counts at elevation between 594 and 599.

24. DISPOSITION CONCURRENCE

rework	reject	repair	use as is
			X

J Dixon 10-25-77 — PROJECT FIELD ENGINEER — DATE

M Rothwell 10-24-77 — PROJECT ENGINEER — DATE

for W K Barclay 10-27-77 — PROJ CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

25. DISPOSITION RESULTS

26. QC ACCEPTANCE

QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

SB 05229

AREA	ELEV.	DATE OF TEST	DENSITY TEST NO.	PERCENT COMPACTION	METHOD OF TEST
STR. BACKFILL					
35' E of Wall Line	582.7'	10/14/76	MDR-621 ✓	42%	R.D.
15' off "6.0" 30" South of "Q"	613'	11/12/76	MDR-671 ✓	74.8%	R.D.
SWPS-11' S of N. Wall, 3' off W Wall	582.5'	11/23/76	MDR-672 ✓	75.4%	R.D.
SWPS-13' W of E. Wall, 30" off N Wall	589'	11/24/76	MDR-685 ✓	56.2%	R.D.
SWPS-13' N of N. Wall, 30" E of E Wall	596'	11/24/76	MDR-686 ✓	70.9%	R.D.
SWPS-2' W of E. Wall, 9' off N. Wall	595'	11/24/76	MDR-691 ✓	62.0%	R.D.
NORTH DIKE					
~~0 + 80 180' L Center Line~~	~~629'~~	~~7/31/74~~	~~MD-360~~	~~86.4%~~	~~B.H.P.~~ N/A 3/14/79

DENSITY TEST MD360 WAS TRANSMITTED TO Q.C. FROM U.S. TESTING WITH A TYPO OF 113 BMP - THIS SHOULD HAVE BEEN BMP 118, GIVING A % COMPACTION OF 96.4 - NOT 86.4% 3/14/79

Hold for Engineering Disposition. No Hold Tags Applied. "Q"-List #1.002 & 1.004.

Barclay
2-15-79

Block 23 Contd:

Test No. MDR 691-- is acceptable based on the evaluation of the boring SWP-1. & SW-13. This boring reveals high blow counts between elevation 587 and 608.

Test No. MDR 671== is acceptable based on the evaluation of boring DG-20 and DG-23. These borings indicate high blow counts at elevation 613.

Test No. MDR 621 and 672--are acceptable based on evaluation of borings SWP-1, SW-8, SW-3, SW-5 and SW-7. These borings indicate high blow counts at elevation 582.5 and 582.7 feet.

This completes the evaluation of NCR 1004 by project engineering.

[signatures] 10-5-79 10/5/79 10-5-79 10/5/79

SB 05230

MIDLAND PROJECT

RESIDENT ENGINEER MEMORANDUM

RE- C-[illegible]

DATE [illegible]

YARD STRUCT., TANK FARM AREA
SUBJECT: FAILED SOIL TESTS

REF: [illegible]

AAC COORDINATION: Date /Time /AAC Contact

SEE ATTACHED NCR FOR PROJECT ENGINEERING'S PARTIAL DISPOSITION.

ATTACHMENT: NCR

RECEIVED
SEP 10 1979
QUALITY CONTROL
BECHTEL JOB 7220
SIGNATURE

ROUTE	QC 07220	INIT.
	PFQCE	
	A. PFQCE	
	CIVIL	
	ELECT.	
	PIPING	
	MECH.	
	WELDING	
	DOC.	
	RECEIVING	
	ADM ASST	
	Matls. Test Lab Super.	

OPEN LOOP
☐ YES ☐ NO
DATE........

RESIDENT ENGINEER

AAC Review: Group Supervisor ~~S3 05231~~

Date:

NONCONFORMANCE REPORT

S3 05232

Project engineering to evaluate.

23. PROJECT ENGINEERING DISPOSITION: Interim Disposition:

Project Engineering has reviewed the failing test results and recommends the following (Based on references noted):

From GEBC-1126:

Test No. 2946- - -Rework

Test No's. 2720, 2731, 2756, - - - - -Report

Test No's. 2722, 2877, 2883, 2913, 2920, 2931, - - - - Report

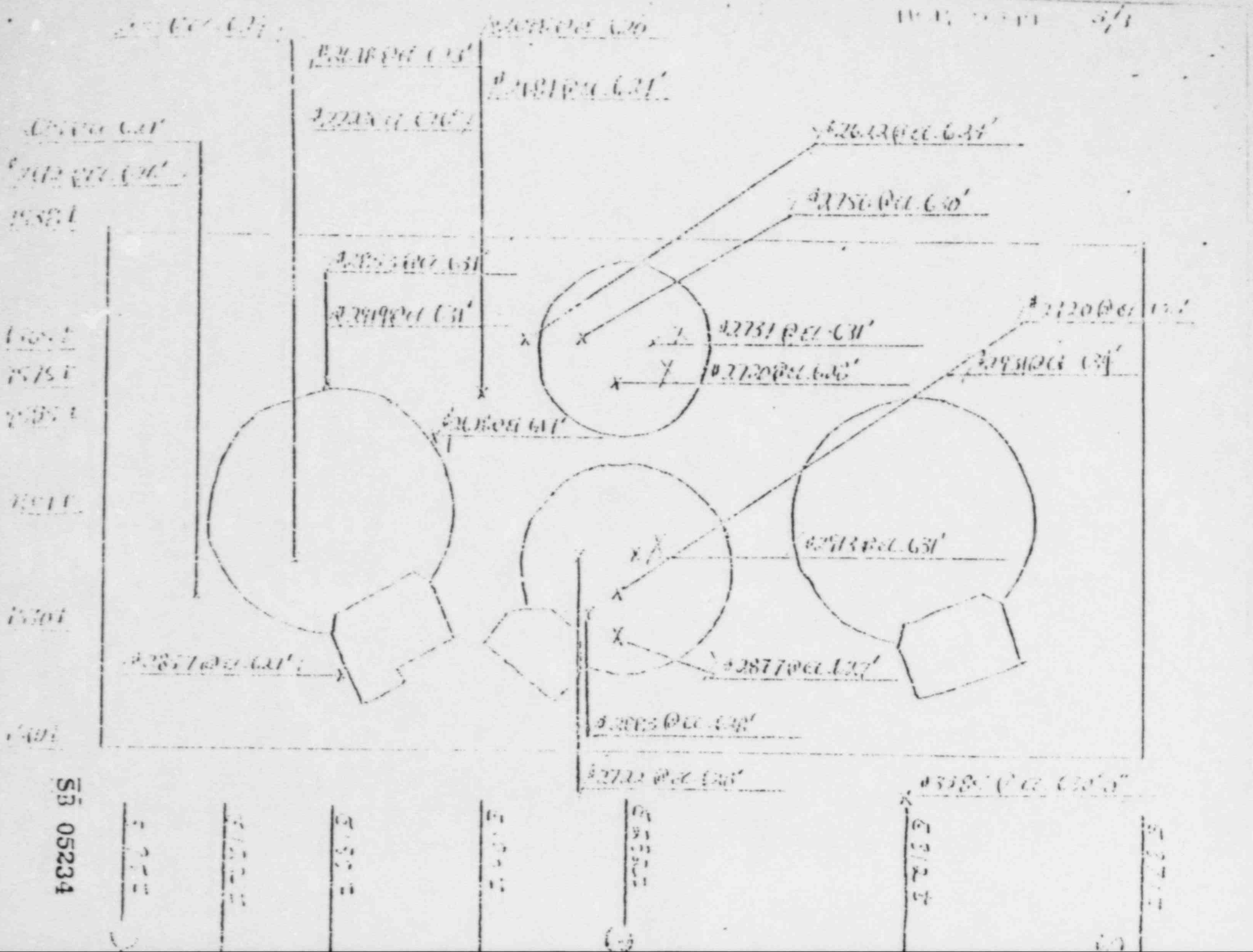
Continued From Block 23.

From BERC-3197:

Test No's. 2625, 2857, ——Rework

Test No's. 2612, 2353, 2919, 2644, 2678, 2684, 2723, 2622, 2628 —— [illegible]

RSM No. C-3749
[illegible] W. Daily
8-31-79



SB 05234

Bechtel Associates Professional Corporation

Interoffice Memorandum

To: [illegible]

Subject: Midland Plant Units 1 & 2
Job 7220
Nonconformance Reports Related to Soils Work

Copies to: File: 0274, C-211, C-0465
W. Barclay
L. Dadlucki
J. Betts
S. Blue
L. Curtis
L. Dreisbach
J. Wanzeck
Com Log

Date: October 17, 1979

From: L.H. Curtis

Of: Engineering

At: Ann Arbor

References:
1) BEBC-3197, 8/17/79
2) BEBC-3140, 7/31/79
3) BEBC-3126, 7/25/79

The following are project engineering responses to the nonconformance reports (NCRs) indicated below.

1) NCR 2294

Project engineering recommends that the material represented by Test 3385 be removed to el.630' and the area be backfilled in accordance with the specified criteria. This completes the evaluation of NCR 2294 by project engineering. The other tests included in the NCR have been dispositioned by References 1, 2, and 3.

2) CPCo NCR M-01-5-9-012

a. The following tests have been evaluated by project engineering, which recommends that the material represented by these tests be "used as is." This is based on the acceptable density and the fact that these tests fall within the zero air void curve.

SB 05235

Bechtel Associates Professional Corporation

IOM to J.F. Davis
[illegible] 3235
Page 2

Test	Elevation	Moisture Content - Percent Above the +2% of Optimum
2283	627.0	0.1
2471	623.0	0.6
2486	629.0	1.6
2492	631.0	1.3
2508	633.0	0.2
2509	619.0	1.4
2517	633.0	1.1
2531	633.0	0.8
2537	630.0	0.9 - Mathematical error was discovered
2539	631.0	0.2
2547	628.0	0.5
2954	628.0	1.5
2957	626.0	0.3
2959	628.0	0.6
2962	628.0	0.5
2965	630.0	0.8
3013	633.0	1.0
3030	633.0	0.9 - Falls over the zero air voids but acceptable because it is near the surface
3065	633.0	0.6
3060	632.0	1.0
3068	633.5	0.6
3070	633.5	1.0
3074	624.0	0.2
3144	634.0	0.8
3156	634.0	0.1
2561	633.0	0.2
2733A	624.5	0.9

b. Project engineering recommends that the in-place density at the locations of the following tests be rechecked. If the in-place densities are acceptable, the material represented by the tests should be used as is. If the in-place densities are not acceptable, the material represented by those tests should be removed and replaced to the specified criteria.

S3 05236

Bechtel Associates Professional Corporation

IOM to L.F. Davis
BAPC- [illegible]
Page 3

Tests	Elevation (feet)
2497	632.0
2499	633.0
2540	634.0
3076	633.0
3034	633.5
3035	632.0
3037	633.0
3042	632.0
3111	631.0
3134	632.0
3127	632.0

c. Project engineering recommends acceptance of *Tests 2479 and* 2742 as is, based on low moisture and high density.

d. Project engineering recommends acceptance of Test 2473 as is, based on the evaluation of borings DF-7, DF-4, DF-5, and test pit 3.

3) NCR 2307

a. Project engineering recommends that the material represented by the following be accepted as is, based on the evaluation of various borings in the vicinity of the tests.

Test	Elevation (feet)
RO 366	611.0
RO 367	611.0
RO 368	610.0
RO 369	610.0
RO 370	610.0
785	607.0
523	614.0
Sa 744	588.0
Sa 746	588.0

b. Project engineering recommends that the in-place density at the locations of the following tests be rechecked. If the in-place density is acceptable, the material represented by these tests should be used as is. If the in-place density is not acceptable, the material represented by these tests should be removed and recompacted to the specified criteria.

Test	Elevation (feet)
2844	630.0
2862	631.0
Sa 2029	633.0
Sa 2233	632.0

SB 05237

for L.H. Curtis

Consumers Power Company

NONCONFORMANCE REPORT

PROJECTS, ENGINEERING AND CONSTRUCTION - QUALITY ASSURANCE DEPARTMENT

6. PROJECT NAME: Midland 1 & 2

7. NONCONFORMING PART NO: NA

8. NONCONFORMING PART NAME: Plant Area Soils

1. NCR SERIAL NO: M-01-3-9-012

2. DATE: 2-6-79

3. SERIAL NUMBER: NA

10. ORG. COMMITTING NC: Bechtel Project Engr, Bechtel Field Engr, Bechtel QC Engr

11. AREA/LOC. OF NC: Plant Area Fill

3. DATE OF REV: NA

4. FILE NO: 16.3.1, 16.3.4, 16.3

12. "AS IS" NONCONFORMING CONDITION VERSUS "AS REQUIRED" CONDITION WITH REFS:

Section 13.6 of Specification C-210, Revision 6 states, "Moisture control of the plant area and berm material shall conform to Section 12.6". Section 12.6.1 states in part, "Water content during compaction shall not be more than two percentage points below optimum moisture content and shall not be more than two percentage points above optimum moisture content..." Project Engineering stated in a meeting held at the site February 5, 1979 that the intent of "during compaction" is to be at the time of the density/ moisture tests.

(Contd on Page 3)

5. DISTRIBUTION

ACTION COPY:

LADreisbach

INFO COPY:

WLBarclay, WRBird, TCCooke, JLCorley, RHermeston, SHHowell, DRJohnson, GSKeeley, BWMarguglio, PAMartinez, JMilandin, DBMiller, WMoring, JFNewgen, ERumbaugh, RASimanek, DATaggart

13. QA RECOMMENDATION FOR PART QA:

a) Review all moisture density test reports from the time of accepting moisture contents at the stockpile instead of at the placements through to date for similar deficiencies.

(Contd on Page 5)

DESIGN/PROJECT ENG. DISPOSITION REQUIRED [X] NOT REQUIRED [ ]

14. HOLD TAGS APPLIED: YES [ ] NO [X] NUMBER, LOCATION & TYPE OF HOLD TAGS APPLIED: NA

15. IN PROCESS QA REQUIRED: YES [X] NO [ ] IF NO, ENTER JUSTIFICATION BELOW:

16. DOES NC AFFECT Q-LIST ITEM: YES [X] NO [ ]

17. IS NC REPORTABLE PER 50.55(e): YES [ ] NO [X]

18. IS NC REPORTABLE FOR PART 21: YES [ ] NO [X]

19. IF YES, DATE & TIME OF REPORT TO NRC: NA

20. IF YES, WHO MADE REPORT TO NRC: NA

21. IF YES, NAME OF NRC OFFICIAL TO WHOM REPORTED: NA

22. NCR ORIGINATED BY: Donald E. Horn

23. WRITTEN REPLY REQUIRED BY: 2-20-79 TO ESTABLISH QA COMPLETION DATE

24. SUPERVISOR'S SIGNATURE/DATE: Donald E. Horn 2/6/79

25. PART QA DISPOSITION, JUSTIFICATION & COMPLETION DATE:

26. DESIGN/PROJECT ENG. AUTH. DISP.:

27. PMO ENG. AUTH. DISP.:

28. PROCUREMENT ENG. AUTH. DISP.: NA

29. SIG. OF QAD. AUTH. FOR ...:

30. FAB/CONST. SIG. AUTH. IMP. DISP.:

31. SIG. OF TEST GROUP AUTHOR. CONDITION: NA

32. FOR NAMED ... - FLD. SUPT. SIG. AUTH. DISP.: NA

33. QA AUTH. SIG. TO IMPLEMENT DISP.:

34. METHOD OF PART QA VERIFICATION:

35. SIG. OF ... FOR PART QA VERIFYING COMPLETION:

36. SIG. VERIFYING PART QA & HOLD TAG REMOVAL DATE:

37. NCR CLOSED BY/DATE: (PART & PROCESS QA COMPLETE)

S3 05234

Consumers Power Company

NONCONFORMANCE REPORT
PROCESS CORRECTIVE ACTION

PROJECTS, ENGINEERING AND CONSTRUCTION - QUALITY ASSURANCE DEPARTMENT

NCR SERIAL NUMBER: M-01-5-9-012

38. QA ASSESSMENT OF ROOT CAUSE(S):

Unknown, to be determined.

39. ACTUAL ROOT CAUSE(S), IF DIFFERENT FROM ABOVE (TO BE COMPLETED BY ORG. RESPONSIBLE FOR PROCESS CA):

40. PROCESS CA REQUIRED FROM:

DESIGN [X] FABRICATION [ ] CONSTRUCTION [X] PROCUREMENT [ ] INSPECTION [X]

OTHER ______

41. QA RECOMMENDATION FOR PROCESS CA:

Unknown, to be determined.

42. PROCESS CA TO BE TAKEN BY ORG(S) CHECKED IN BLOCK 40 & DATE OF COMPLETION:

43. METHOD OF PROCESS CA VERIFICATION:

44. SIG. OF ORG. RESPONSIBLE FOR PROCESS CA CERTIFYING COMPLETION:

45. PROCESS CA COMPLETION VERIFIED BY/DATE:

SB 05255

NCR SERIAL NO: M-01-5-9-012
DATE: 2-6-79
DATE OF REV: NA
FILE NO: 16.3.1, 16.3.4, 16.3.6

12. "AS IS" NONCONFORMING CONDITION VERSUS "AS REQUIRED" CONDITION WITH REFS:

(Contd from Page 1)

Contrary to these requirements, the following tests had moisture content in excess of the plus or minus two percentage points of optimum moisture content.

Test No MD	Date Test Taken	Moisture Content (%)	Optimum Moisture Content (%)	Difference MC - OMC Positive
2471	3-29-78	10.8	8.2	+ 2.6
2473	3-29-78	12.3	8.2	+ 4.1
2476	3-31-78	14.2	9.1	+ 5.1
2479	4-01-78	11.6	9.1	+ 2.5
2482	4-01-78	13.5	9.1	+ 4.4
2486	4-08-78	11.8	8.2	+ 3.6
2488	4-08-78	13.8	8.2	+ 5.6
2492	4-08-78	11.5	8.2	+ 3.3
2496	4-10-78	11.0	8.2	+ 2.8
2497	4-11-78	12.7	8.2	+ 4.5
2498	4-11-78	13.5	8.2	+ 5.3
2499	4-11-78	12.1	8.2	+ 3.9
2501	4-12-78	13.2	8.2	+ 5.0
2506	4-17-78	13.5	11.1	+ 2.4
2507	4-17-78	14.1	11.1	+ 3.0
2508	4-17-78	13.3	11.1	+ 2.2
2509	4-17-78	14.5	11.1	+ 3.4
2510	4-17-78	13.2	11.1	+ 2.1
2517	4-19-78	14.2	11.1	+ 3.1
2522	4-19-78	14.6	11.1	+ 3.5
2531	4-27-78	12.9	10.1	+ 2.8
2537	4-28-78	14.0	11.1	+ 3.9
2539	6-20-78	15.6	13.4	+ 2.2
2540	6-21-78	15.5	13.4	+ 2.1
2547	6-23-78	15.9	13.4	+ 2.5
2549	6-29-78	14.1	10.1	+ 4.0
2550	6-29-78	12.9	10.1	+ 2.8
2954	7-01-78	13.6	10.1	+ 3.5
2956	7-03-78	12.8	10.1	+ 2.7
2957	7-03-78	12.4	10.1	+ 2.3
2958	7-03-78	15.0	10.1	+ 4.9
2959	7-03-78	12.7	10.1	+ 2.6
2962	7-05-78	12.5	11.1	+ 2.4
2965	7-06-78	12.9	10.1	+ 2.8
2979	7-11-78	12.9	9.1	+ 3.8
2992	7-17-78	14.3	11.1	+ 3.2
3000	7-18-78	13.1	10.1	+ 3.0
3013	7-21-78	13.1	10.1	+ 3.0
3026	7-25-78	17.2	11.8	+ 5.4
3028	7-25-78	16.9	11.8	+ 5.1

NCR SERIAL NO: M-01-5-9-012
DATE: 2-6-79
DATE OF REV: NA
FILE NO: 16.3.1, 16.3.4, 16.3.6

12. "AS IS" NONCONFORMING CONDITION VERSUS "AS REQUIRED" CONDITION WITH REFS:

(Contd)

Test No MD	Date Test Taken	Moisture Content (%)	Optimum Moisture Content (%)	Difference MC - OMC Positive
3030	7-25-78	13.0	10.1	+ 2.9
3034	7-26-78	13.3	11.1	+ 2.2
3035	7-26-78	15.2	11.1	+ 4.1
3037	7-27-78	12.7	10.1	+ 2.6
3042	7-28-78	14.5	11.1	+ 3.4
3043	7-28-78	14.6	11.1	+ 3.5
3045	7-29-78	12.7	10.1	+ 2.6
3059	8-03-78	15.0	10.1	+ 4.9
3060	8-03-78	13.1	10.1	+ 3.0
3068	8-05-78	12.7	10.1	+ 2.6
3070	8-07-78	13.1	10.1	+ 3.0
3071	8-07-78	12.3	10.1	+ 2.2
3074	8-07-78	12.3	10.1	+ 2.2
3075	8-08-78	13.8	10.1	+ 3.7
3076B	8-08-78	14.2	10.1	+ 4.1
3082	8-10-78	14.0	10.1	+ 3.9
3087	8-11-78	14.5	10.1	+ 4.4
3088	8-12-78	13.1	10.1	+ 3.0
3100	8-16-78	14.8	10.1	+ 4.7
3103	8-17-78	14.2	10.1	+ 4.1
3105	8-17-78	12.7	10.1	+ 2.6
3106	8-17-78	12.8	10.1	+ 2.7
3107	8-17-78	14.3	10.1	+ 4.2
3108	8-17-78	13.7	10.1	+ 3.6
3109	8-17-78	14.3	10.1	+ 4.2
3110	8-17-78	13.9	10.1	+ 3.8
3111	8-17-78	17.6	10.1	+ 7.5
3112	8-17-78	12.5	10.1	+ 2.4
3114	8-18-78	13.0	10.1	+ 2.9
3115	8-18-78	12.5	10.1	+ 2.4
3130	8-28-78	13.1	10.1	+ 3.0
3132	8-28-78	13.9	10.1	+ 3.8
3134	8-29-78	13.1	10.1	+ 3.0
3141	9-01-78	12.7	10.1	+ 2.6
3143	9-01-78	14.7	10.1	+ 4.6
3144	9-01-78	12.9	10.1	+ 2.8
3145	9-01-78	15.9	10.1	+ 5.8
3156	9-07-78	12.2	10.1	+ 2.1
3158	9-08-78	13.0	10.1	+ 2.9
3159	9-12-78	16.5	10.1	+ 6.4
2561	9-30-78	13.5	11.3	+ 2.2
2563	9-30-78	10.0	7.5	+ 2.5

S3 05257

NCR SERIAL NO: M-01-5-9-012
DATE: 2-6-79
DATE OF REV: NA
FILE NO: 16.3.1, 16.3.4, 16.3.6

13. QA RECOMMENDATION FOR PART CA:

(Contd from Page 1)

b) Send Project Engineering/Geo Tech all the test reports from the test failures in this NCR and any found in the review a) above.

c) Receive a Project Engineering/Geo Tech evaluation of the acceptability of the material these test failures represent and any found in the review a) above.

Bechtel Power Corporation

Interoffice Memorandum

To R. L. Castleberry

Date February 20,1979

Subject Job 7220 Midland Project
Units 1 & 2
Consumers Power Co. NCR
M-01-5-9-012
BCBE-2185

From J. F. Newgen

Of Construction

At Midland, MI

Copies to

L. A. Dreisbach
W. L. Barclay

Subject Consumers Power Co. NCR Section 13C recommends a Project Engineering/Geo Tech evaluation of the acceptability of the material found exceeding the 2% tolerance difference allowed for actual moisture content as to optimum moisture content. Attached is a list of non-conforming tests along with test reports, please forward this evaluation when complete

Signed
J. F. Newgen

JFN/WLB/vmm

Attachments

RECEIVED
FEB 20 1979
QUALITY CONTROL
BECHTEL JOB 7220
SIGNATURE

ROUTE	QC 07220	INIT.
	PFQCE	
	A. PFQCE	
2	CIVIL	
	ELECT.	
	PIPING	
	MECH.	
	WELDING	
4	DOC.	
	RECEIVING	
	ADM ASST	
	Matls. Test Lab Super.	
3	Sple	

OPEN LOOP
☐ YES ☑ NO
DATE

S3 05259

5024 (10-72)

NCR SERIAL NO: M-01-5-9-012
DATE: 2-6-79
DATE OF REV: NA
FILE NO: 16.3.1, 16.3.4, 16.3.6

12. "AS IS" NONCONFORMING CONDITION VERSUS "AS REQUIRED" CONDITION WITH REFS:

(Contd from Page 1)

Contrary to these requirements, the following tests had moisture content in excess of the plus or minus two percentage points of optimum moisture content.

Test No MD	Date Test Taken	Moisture Content (%)	Optimum Moisture Content (%)	Difference MC - OMC Positive
2471	3-29-78	10.8	8.2	+ 2.6
2473	3-29-78	12.3	8.2	+ 4.1
2476	3-31-78	14.2	9.1	+ 5.1
2479	4-01-78	11.6	9.1	+ 2.5
2482	4-01-78	13.5	9.1	+ 4.4
2486	4-08-78	11.8	8.2	+ 3.6
2488	4-08-78	13.8	8.2	+ 5.6
2492	4-08-78	11.5	8.2	+ 3.3
2496	4-10-78	11.0	8.2	+ 2.8
2497	4-11-78	12.7	8.2	+ 4.5
2498	4-11-78	13.5	8.2	+ 5.3
2499	4-11-78	12.1	8.2	+ 3.9
2501	4-12-78	13.2	8.2	+ 5.0
2506	4-17-78	13.5	11.1	+ 2.4
2507	4-17-78	14.1	11.1	+ 3.0
2508	4-17-78	13.3	11.1	+ 2.2
2509	4-17-78	14.5	11.1	+ 3.4
2510	4-17-78	13.2	11.1	+ 2.1
2517	4-19-78	14.2	11.1	+ 3.1
2522	4-19-78	14.6	11.1	+ 3.5
2531	4-27-78	12.9	10.1	+ 2.8
2537	4-28-78	14.0	11.1	+ 3.9
2539	6-20-78	15.6	13.4	+ 2.2
2540	6-21-78	15.5	13.4	+ 2.1
2547	6-23-78	15.9	13.4	+ 2.5
2549	6-29-78	14.1	10.1	+ 4.0
2550	6-29-78	12.9	10.1	+ 2.8
2954	7-01-78	13.6	10.1	+ 3.5
2956	7-03-78	12.8	10.1	+ 2.7
2957	7-03-78	12.4	10.1	+ 2.3
2958	7-03-78	15.0	10.1	+ 4.9
2959	7-03-78	12.7	10.1	+ 2.6
2962	7-05-78	12.5	11.1	+ 2.4
2965	7-06-78	12.9	10.1	+ 2.8
2979	7-11-78	12.9	9.1	+ 3.8
2992	7-17-78	14.3	11.1	+ 3.2
3000	7-18-78	13.1	10.1	+ 3.0
3013	7-21-78	13.1	10.1	+ 3.0
3026	7-25-78	17.2	11.8	+ 5.4
3028	7-25-78	16.9	11.8	5.1

S3 05260

NCR SERIAL NO: M-01-5-9-012
DATE: 2-6-79
DATE OF REV: NA
FILE NO: 16.3.1, 16.3.4, 16.3.6

12. "AS IS" NONCONFORMING CONDITION VERSUS "AS REQUIRED" CONDITION WITH REFS:

(Contd)

Test No MD	Date Test Taken	Moisture Content (%)	Optimum Moisture Content (%)	Difference MC - OMC Positive
3030	7-25-78	13.0	10.1	+ 2.9
3034	7-26-78	13.3	11.1	+ 2.2
3035	7-26-78	15.2	11.1	+ 4.1
3037	7-27-78	12.7	10.1	+ 2.6
3042	7-28-78	14.5	11.1	+ 3.4
3043	7-28-78	14.6	11.1	+ 3.5
3045	7-29-78	12.7	10.1	+ 2.6
3053	8-03-78	15.0	10.1	+ 4.9
3060	8-03-78	13.1	10.1	+ 3.0
3068	8-05-78	12.7	10.1	+ 2.6
3070	8-07-78	13.1	10.1	+ 3.0
3071	8-07-78	12.3	10.1	+ 2.2
3074	8-07-78	12.3	10.1	+ 2.2
3075	8-08-78	13.8	10.1	+ 3.7
3076B	8-08-78	14.2	10.1	+ 4.1
3082	8-10-78	14.0	10.1	+ 3.9
3087	8-11-78	14.5	10.1	+ 4.4
3088	8-12-78	13.1	10.1	+ 3.0
3100	8-16-78	14.8	10.1	+ 4.7
3103	8-17-78	14.2	10.1	+ 4.1
3105	8-17-78	12.7	10.1	+ 2.6
3106	8-17-78	12.8	10.1	+ 2.7
3107	8-17-78	14.3	10.1	+ 4.2
3108	8-17-78	13.7	10.1	+ 3.6
3109	8-17-78	14.3	10.1	+ 4.2
3110	8-17-78	13.9	10.1	+ 3.8
3111	8-17-78	17.6	10.1	+ 7.5
3112	8-17-78	12.5	10.1	+ 2.4
3114	8-18-78	13.0	10.1	+ 2.9
3115	8-18-78	12.5	10.1	+ 2.4
3130	8-28-78	13.1	10.1	+ 3.0
3132	8-28-78	13.9	10.1	+ 3.8
3134	8-29-78	13.1	10.1	+ 3.0
3141	9-01-78	12.7	10.1	+ 2.6
3143	9-01-78	14.7	10.1	+ 4.6
3144	9-01-78	12.9	10.1	+ 2.8
3145	9-01-78	15.9	10.1	+ 5.8
3156	9-07-78	12.2	10.1	+ 2.1
3158	9-08-78	13.0	10.1	+ 2.9
3159	9-12-78	16.5	10.1	+ 6.4
2561	9-30-78	13.5	11.3	+ 2.2
2563	9-30-78	10.0	7.5	+ 2.5

S3 05261

NCR SERIAL NO: M-01-5-9-012
DATE: 2-6-79
DATE OF REV: NA
FILE NO: 16.3.1, 16.3.4, 16.3.6

13. QA RECOMMENDATION FOR PART CA:

(Contd from Page 1)

b) Send Project Engineering/Geo Tech all the test reports from the test failures in this NCR and any found in the review a) above.

c) Receive a Project Engineering/Geo Tech evaluation of the acceptability of the material these test failures represent and any found in the review a) above.

No. MD	Date Test Taken	Content %	Moisture Content %	MC-OMC
2565	9/30/78	10.0	7.5	+2.5
2568	9/30/78	10.7	8.0	+2.7
2598	10/02/78	12.3	8.9	+3.4
A 2733	10/07/78	10.5	7.6	+2.9
A 2749	10/08/78	10.4	7.4	+3.0
B 2749	10/08/78	9.8	7.4	+2.4
A 2754	10/08/78	10.2	7.4	+2.8
B 2755	10/08/78	10.3	7.7	+2.6
B 2760	10/08/78	8.7	6.4	+2.3
A 2763	10/09/78	10.1	7.7	+2.4
B 2834	10/10/78	9.6	6.5	+3.1
2835	10/10/78	10.0	7.9	+2.1
A 2843	10/10/78	9.1	7.0	+2.1
A 2848	10/10/78	11.1	7.3	+3.8
B 2848	10/10/78	11.4	7.3	+4.1
2856 B	10/10/78	11.0	8.2	+2.8
2878	10/11/78	11.6	8.6	+3.0
2881	10/11/78	10.3	7.5	+2.8
2888	10/12/78	9.4	7.0	+2.4
2889	10/12/78	12.4	7.1	+5.3
2904	10/12/78	10.2	7.9	+2.3
2910	10/12/78	12.8	8.2	+4.6
2925	10/13/78	12.5	9.3	+3.2
2926	10/13/78	11.2	7.8	+3.4
2935	10/14/78	11.9	8.8	+3.1
2977	10/17/78	11.1	8.4	+2.7
3017	10/19/78	11.1	8.6	+2.5
3026	10/20/78	11.8	8.1	+3.7
2978	10/17/78	11.6	8.0	+3.6
3035	10/21/78	11.7	8.1	+3.6
3036	10/21/78	10.9	8.1	+2.8
3040	10/21/78	9.6	7.3	+2.3
3056	10/23/78	10.8	8.3	+2.5
3066	10/24/78	9.0	6.8	+2.2
3078	10/26/78	8.9	7.4	+2.5
3139	11/01/78	9.8	7.6	+2.2
3160	11/04/78	9.6	7.1	+2.5
3164	11/04/78	10.1	7.9	+2.2
3165	11/06/78	10.0	7.9	+2.1
3213	11/20/78	10.4	6.9	+3.5

Bechtel Associates Professional Corporation

777 East Eisenhower Parkway
Ann Arbor, Michigan

Mail Address: P.O. Box 1000, Ann Arbor, Michigan 48106

MEETING NOTES NO. 1018

MIDLAND PLANT UNITS 1 AND 2

CONSUMERS POWER COMPANY

BECHTEL JOB 7220-101

DATE: August 1, 1979

PLACE: Midland, Michigan

SUBJECT: Meeting of the Diesel Generator Building Task Group

FILE: 0279, C-2645 w/a

ATTENDEES:

Bechtel		CPCo
J. Betts	C. McConnel	D. Horn
A. Boos	W. Paris*	D. Sibbald
P. Chen	D. Reeves	T. Thiruvengadam
B. Dhar	R. Rixford	R. Wheeler
W. Kinzer*	J. Smith	
S. Kirker	J. Wanzeck	
J. Lillywhite*	K. Wiedner	

*Part-time

PURPOSE: The meeting was held at the Midland jobsite to discuss the items in relation to the diesel generator building settlement and other Seismic Category I structures on plant fill.

ITEMS DISCUSSED:

A) Review of Prior Action Items

The current status of action items identified in the previous meeting held on June 25, 1979, is as follows.

1) Action Item 6 of Meeting Notes No. 976

This item is closed. The data and drawings concerning separation of Canonie's work from Bechtel work by construction have been forwarded to geotechnical services for review.

S3 05274

BECHTEL
ANN ARBOR

MEMO FROM

RICK SIMANEK

DATE 6/26/79

TO:

Bill Barcley & Gang

Here's the final
Geo-tech Report on
US Testing for
info & use

Rick

SB 05149

bc w/Att:
K. Wiedner
L. A. Dreisbach
R. L. Castleberry
S. L. Blue
D. R. Johnson
R. A. Simanek
J. F. Newgen
J. Milandin
P. K. Hansen/R. Hennestou
H. H. Burke
P. A. Becnel
J. H. Allen (Houston)
J. O. Wanzeck

ELC-7791

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JUN 29 1979
QUALITY CONTROL
BECHTEL JOB 7220
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ROUTE	QC 07220	INIT.
	PFQCE	
1	A. PFQCE	
2	CIVIL	
	ELECT.	
	PIPING	
	MECH.	
	WELDING	
5	DOC.	
	RECEIVING	
	ADM ASST	
3	Matls. Test Lab Super.	
4	S.ple	
	OPEN LOOP ☐ YES ☐ NO DATE........	

June 25, 1979

REF. TO 105%
CH 7.A

Consumers Power Company
Mr. G. S. Keeley
Project Manager
1945 West Parnall Road
Jackson, Michigan 49201

Midland Units 1 and 2
Consumers Power Company
Bechtel Job 7220
U. S. TESTING FIELD AND LABORATORY
TEST DATA ON SOILS USED AS FILL
File 0614/2801

Dear Mr. Keeley:

Attached for your review prior to forwarding to U. S. Testing are two copies of the subject report dated June 1979. To expedite your review, copies of this report were handed to Consumers Power representatives on the diesel generator task force on June 25, 1979.

Please advise your formal comments by July 6. Informal questions should be addressed to Jim Wanzeck.

Very truly yours,

P. A. Martinez
Project Manager

PAM/pp
cc: Mr. W. R. Bird w/Att
Mr. T. C. Cooke w/Att
Mr. D. B. Miller w/Att

SB 05150

MIDLAND UNITS 1 & 2
JOB NO. 7220

REVIEW OF U.S. TESTING
FIELD AND LABORATORY CONSTRUCTION
TEST DATA ON SOILS USED AS FILL

BECHTEL ASSOCIATES PROFESSIONAL CORPORATION
JUNE 1979

TABLE OF CONTENTS

REVIEW OF U. S. TESTING
FIELD AND LABORATORY CONSTRUCTION
TEST DATA ON SOILS USED AS FILL

This review of the quality control tests of the earth fill at the Midland Site was made as a result of settlement of the fill supported diesel generator building in excess of that predicted. Soil samples obtained in borings indicated that soil conditions beneath the plant structures are not compatible with the quality of fill that would be expected based on the results of the control tests made by U. S. Testing Company. All fill ~~was accepted~~ as it was being placed based on the results of the field tests preformed by U. S. Testing Company.

The review showed many discrepancies in the test results as outlined in the following paragraphs. Review comments are based on the requirements of the technical specifications for fill placement and the subcontract entered into by U. S. Testing Company.

1. Use of Laboratory Test Compaction Curves

Table 9-1 of specification 7220-C-208, Page 14B required one field density and moisture content test be taken for each 500 cubic yards of fill placed. It also required one compaction, grain size, and specific gravity for each 10,000 cubic yards of material. This gives a ratio of 20 field density tests to 1 laboratory compaction test. Although 20:1 is not a strict upper limit, it is a guideline; should density tests be taken more frequently than one per 500 cubic yards of fill the ratio could be higher. The actual ratio is shown in Table A attached. In fact, some of the laboratory compaction tests were used to determine percent compaction for several hundred field density tests taken over a period exceeding two years. Even though no time requirements for the period of use of laboratory tests are specified, it is unlikely that any borrow source in this area would be of such uniform character that such extended use of a compaction curve, truly representative of a large quantity of material, would be applicable. Listed below are selected laboratory test data results indicating the wide range of soil properties that were reported. Such a wide range is typical for soils of the kind used in the fill making prediction of maximum density, based on visual inspection extremely difficult if not impossible without testing.

TEST	MIN DENSITY (lbs/Ft³)	MAX. DENSITY (lbs/ft³)	OPT. MOISTURE (percent)
*BMP269		127.3	10
*BMP278		117.0	15.2
*BMP279		140.8	5.7
**RD24	100.9	119.2	
**RD55	90.2	109.7	
**RD61	109.3	125.3	

*BMP refers to proctor type test.
**RD refers to relative density test run by dry method.

S3 03153

2. Questionable Retests

A field density test that fails to meet standards dictated by the selected laboratory test data must normally be cleared by another field test made in the same area after corrective action has been taken. In the procedure adopted by U. S. Testing Company, this test result would be compared to the appropriate laboratory compaction curve. Bechtel QC determined which "failing" tests had been cleared by subsequent retest.

Of the 668 "failing" tests which were marked "cleared" by another test, in over 10% (72 tests) of the results, the clearing of the "failed" density test was apparently resolved by using another laboratory compaction curve with either lower maximum density, which resulted in the percent compaction being increased sufficiently, or different optimum moisture content which caused the fill to meet the requirements of the specification. The possibility exists that soil was removed after a "failing" test and replaced by different material, but the records do not indicate this. In other cases, tests labeled "failed" were incorrectly cleared though the same laboratory standard was referenced. For example, in some cases retests to clear a "failed" test were not taken in the same area or at the approximate same elevation. More than 40 retests were over 20 feet from the "failed" test location (as recorded in the test reports) and some were over 200 feet from the original test location. In general, if after a "failing" test the whole area is reworked, the retest location is not too critical assuming that the correct laboratory compaction curve is used for comparison. However, in the plant fill work areas were relatively small, and soil characteristics showed considerable variation necessitating re-testing in the immediate vicinity of the "failing" test. Retest should be taken in the lift or soil layer that has been reworked. Almost 50 retests were taken at different elevations, some up to 10 ft. from the "failed" test. It should be noted that Bechtel field personnel gave the locations for retesting. This was not a U. S. Testing responsibility. Two retests were dated prior to the time the original test "failed". Over 130 "failing" tests were marked as "non Q" and never recorded cleared by a passing test.

Table B is a compilation of notes relative to questionable clearing of failed tests.

3. Theoretically Impossible Test Results

Soils cannot be more than 100 percent saturated; therefore, all field density test data points, when plotted as dry density versus moisture content, must be below the zero air voids curve as defined by the specific gravity of the material. Specifications do not require examination of the zero air voids curve, but it is considered fundamental soil mechanics relative to compaction plots. There are numerous cases in the U. S. Testing Company data where points plot above the zero air voids curve. Figure 1 attached shows a typical laboratory compaction test curve with field test results plotted on it. Many of the field test results plot above the zero air voids curve. Provided the specific gravity is correct this is not possible so that all such points must represent erroneous data.

The fact that a large number of test results plot above the zero air voids curve tends to make all test results questionable.

Also, referring to Figure 1 it would appear that soil density varied widely. Specifications called for compactive effort results as defined by ASTM D 1557 which is 56,255 ft-lb/ft^3 energy. This was modified to a laboratory test compactive effort of about 20,000 ft-lbs/ft^3 energy, often referred to as Bechtel Modified Proctor (BMP). Laboratory compaction test curves should be related to the same effort as that called for in the field for use in comparing with field density tests to determine percent compaction. According to plots of field data shown on Figure 1, density varied from about 108 lb/ft^3 to about 130 lb/ft^3. It is doubtful that the soil classification or other properties would be similar for such a wide variation in density. It is noted that 100 percent of modified Proctor (ASTM D 1557) which is difficult to obtain, is rated at 56,255 ft-lb/ft^3 energy. The curve plotted on Figure 1 is at about 20,000 ft-lb/ft^3 energy. For comparative purposes it was determined by U. S. Testing in 1974 that 100 percent of specified effort (20,000 ft-lb/ft^3) is approximately equal to 95 percent of the maximum density as determined by ASTM D 1557 (56,255 ft-lb/ft^3) Reference Figure 8.

4. Repeated use of Questionable Laboratory Test Data

Some laboratory compaction test data were used repeatedly even though they continued to show suspect field test results. This could be indicative of questionable laboratory data or the fact that soil was not being placed or compacted according to specifications. Either case is a cause for concern. Subcontract 7220-C-208 Exhibit C, Page 17 of 47 No. 2 states "You (U.S. Testing) are to immediately report data that indicates material that does not comply to specifications or procedures."

Several specific gravity calculations are in error, such as for BMP 273 and 274. In the case of BMP 273, the zero air voids curve passes through the laboratory compaction curve. In another example, BMP 297, the laboratory compaction curve is invalid due to calculation errors, yet was referenced by field density tests 22 times.

Table C is a compilation of notes relative to questionable test data.

5. Limits of Accuracy and Acceptability for Test Data

Figures 1 through 7 attached will be referenced in discussing limits of accuracy of acceptability for field test results as compared to laboratory test data. The figures show plots of compaction data for BMP 278 which are typical of all test results.

Specified laboratory compactive effort was 20,000 ft-lbs/ft^3 and field compaction effort was originally specified at 56,255 ft-lbs/ft^3 but was changed by Revision 5, dated 7/8/75, specification 7220-C-210, Section 13.7, Page 57 to also be equal to about 20,000 ft-lbs/ft^3.

The specified 20,000 ft-lbs/ft^3 effort establishes a compaction curve relating moisture and density for a specific soil. Moisture was specified for field placed fill to be within $\pm$ 2 percent of optimum moisture as determined by this effort. Density was specified to be greater than 95 percent of the maximum density. As compactive effort is increased in the laboratory test, maximum density will be increased and optimum moisture content will decrease. This change can only occur in the field to the extent that the field moisture content will permit it. Once field compaction is such that the fill density is significantly higher than about 105 percent of maximum, the specified tolerance from optimum moisture content in the laboratory compaction test may no longer be applicable for field control. A + 2 percent numerical value of moisture content acceptable at the specified compactive effort would be too wet at a higher effort since the zero air voids curve defines the absolute maximum that can be achieved, indicating that higher densities for that soil are impossible. Therefore, if the record shows high densities for such material, the data are in error. This was apparently overlooked.

Plots of field data for compaction test BMP 278 are shown on Figures 1 through 6. The title of each figure gives the assumptions made in plotting data for the figure. In comparing figures 3 and 4 it is seen that a majority of field tests were made using the nuclear device. The two test results shown on Figure 4 for the sand cone method indicates one test result on each side of the zero air voids curve. The one falling above the zero air voids curve (shown on Figure 4) is designated by U. S. Testing Company as the only passing sand cone test (shown on Figure 6).

NOTE:

[redacted] Therefore, if all data points fall within the defined window there would be no reason to assume that they are wrong. However, when many data points fall outside the designated area there is something wrong with the information and then all data points become suspect. A review of all data indicates that about 25 percent of the cohesive soil test results fall within this area.

[redacted] shows an area where field test results would be acceptable, in theory even though not in strict accordance with the specifications. Figure 7B was arrived at by expanding Figure 7a to include test results up to a compactive effort related to ASTM D 1557 (56,255 ft-lb/ft^3) which is considered to be a practical upper limit. About 40 percent of all cohesive soil test results would plot in this area.

6. Accuracy of Test Equipment

Almost all (over 95%) field density tests on cohesive soils were made using the Nuclear Density device. Specification 7220-C-210 section 12.4.2 page 42 indicates this to be acceptable for moisture content determination provided that the results are compatible with those obtained by ASTM D 2216. Similarly, section 12.4.4 says density determined by the nuclear device is acceptable when results are compatible with density as determined by ASTM D 1556.

In a letter from U. S. Testing to Bechtel (dated May 30, 1974), the average deviation of the nucelar device from oven-dry moistures was +.12% for a set of 30 tests. However, the stand error of estimate is 1.8% for the data with the range of differences being from - 3.2% to +3.9%. Thus, accuracy of the nuclear device is questionable, and could translate into errors of about ± 4 pcf in the dry density calculation. (It should be noted that errors in the moisture content tend to shift the position of test results on a moisture density plot approximately parallel to the zero air voids curve, assuming the in-place wet density is correct, and thus do not explain the large number of points which plot outside the zero air voids. Compare Figures 1 and 9).

Even with the range of possible error for nuclear-determined moisture values shown above, it appears that the controlling factors resulting in erroneously reported degrees of compaction were selection of the appropriate laboratory test curve as well as erroneous test data (revealed by points plotted right of the zero air voids curve indicating specific gravities in excess of 2.80, 2.90, and even 3.00) rather than the type of field test method used. In most cases where the test result plots outside the acceptable zone defined in section 5, the difference between nuclear and sand cone methods would not have made the test result acceptable had a sand cone method been used.

7. Relative Density Tests

Cases were noted where densities in material classified on the data sheet as zone 3 (sand) were compared to the maximum densities in proctor type tests and other cases where densities in clay soils were compared to the maximum density in relative density tests. An error must exist in the record in such cases either in the classification of the soil on the data sheet or in compring field test results to inappropriate laboratory test data. In general, it appears that relative density tests were used in controlling density of sand fill. There were a significant number of arithmetic errors on calculation sheets even though there are signatures on the sheets indicating they had been checked. Over 100 errors were found in calculations, of relative density from 8/15/75 through 12/78 (not all of these errors change the acceptability of the test results).

S3 05157

ASTM D 2049 section 7.1.2 Wet Method states: "Note 2 - While the dry method is preferred from the standpoint of securing results in a shorter period of time, the highest maximum density is obtained for some soils in a saturated state. At the beginning of a laboratory test program, or when a radical change of materials occurs, the maximum density test should be performed on both wet and dry soil to determine which method results in the higher maximum density. If the wet method produces higher maximum densities (in excess of one percent) it shall be followed in succeeding tests." An example of wet and dry relative density is shown on Figure 10. U. S. Testing Company apparently did not do this frequently enough, or on a broad enough range of non-cohesive soil types. As a consequence many field density test results exceed 100 percent of maximum dry laboratory relative density. As an example, for laboratory test RD55 a total of 566 field tests were made. Of this total, 364 tests whosed greater than 100 percent compaction. The highest relative density found was 142.2 percent with the majority of tests over 100 percent falling in the range of 100 percent to about 130 percent. Since the difference in maximum density between wet and dry methods is about 4 to 5 lbs/c. ft. (based on recent data) any test result greater than about 115 percent (based on the dry method) is suspect.

Even if the wet laboratory test method data were available for all sands, it appears an unacceptably high number of field test results would greatly exceed 105 percent relative density even based on the wet maximum.

8. Summary

In summary, there are five major faults contained in the Midland Compacted Fill Density Test Reports as follows:

1. erroneous field density test data.
2. incorrect soil identification
3. incorrect (or questionable) laboratory test data.
4. calculation errors
5. improper or incomplete clearing of "failed" tests.

Items 4 and 5 represent existing faults in the data which could be corrected. However, as a result of items 1 through 3, there is no rational means of determining which test results are valid and which are not. Since more than one half of the test results for relative density and percent compaction fall outside the possible theoretical comparison limits, it must be concluded that these test results are suspect and should not be used alone for acceptance of plant area fill. Therefore, other means of testing have been established and employed to determine if the fill in any given area is acceptable.

TABLE A

Listing of All Classifications Referenced in Plant Area Fill Soil Test Records Which were Used for 20 or More Field Density Tests

Classification	No. of Tests
B200	90
B251	31
B252	22
B254	42
B255	57
B260	68
B261	36
B262	165
B269	227
B270	226
B271	141
B274	37
B276	21
B277	158
B278	82
B297	22
R015	20
R016	61
R024	248
R030	54
R035	59
R038	39
R039	28
R040	35
R041	69
R042	103
R043	48
R044	71
R045	43
R049	63
R054	118
R055	566
R059	65
R061	589
R063	42
R065	59

Note: Spec. 7220-C-208 gives a ratio of approximately 20 field tests to each laboratory test.

TABLE B

Notes on Questionable Clearing of Failed Tests

1. Test number MD 245 fails due to high moisture. Cleared by MD 246 which references a proctor with higher optimum moisture content (OMC) such that the $\pm 2\%$ of optimum requirement is met.

2. MD 205 fails with moisture content 6% above the OMC. Cleared by MD 215, which references a relative density lab standard, and is itself still 6% away from the OMC of the proctor referenced by MD 205.

3. MD 223 fails because of high moisture. Cleared by MD 228 which has actually a higher moisture content and lower density, but references a different proctor; the retest passes and clears the failure.

4. Both MD 844 and 886 fail because of high moisture and low density. They are cleared by MD 888 which references a new proctor with lower maximum density and higher OMC than the first.

5. MD 251 fails due to moisture being too high. Cleared by MD 253 which uses a higher OMC proctor.

6. MD 668 clears MDR 634, but the two tests show no correspondence in location, moisture, density, or lab standard.

7. MD 771 failed, being too dry. Cleared by MD 782, which has almost identical moisture content and dry density but uses a new BMP with lower optimum moisture.

8. MD 2384 clears MD 2342, referencing a different proctor with an OMC which fits the in-situ conditions. However, the dry density of MD 2384 is way too high to fit the original soil classification, and in addition, it falls outside of the zero air voids curve for the classification which it has been changed to.

9. MD 556 clears MD 554 by using a BMP with lower moisture requirements. The field densities differ by 24 pcf and would seem to be different material.

10. MD 558 clears MD 555 but has too high a density to be the same soil as MD 555. It also uses a different proctor.

11. MD 566 and 568, classified as BMP 262 cohesive soils, are cleared by MD 569 which is classified as RD 33 and has totally different soil properties than the two failures.

12. MD 1317, 18, 19 and 20 fail and are all cleared by MD 1477 taken over 5 weeks later. There is poor correspondence in the soil properties and the proctor is different from failing to passing test.

13. MD 2965 clears MD 2963 with a different proctor through the test results would have been passing with the original BMP

14. MD 1388, classified as BMP 278, is cleared by MD 1461, classified as RD 55.

15. MD . 170, classified as RD 24 is cleared by MD 173, classified as BMP 234.

16. MDR 287 fails with a relative density of 77%. Cleared by MDR 291 which has .1 pcf lower density but arbitrarily rounds up the relative density to 80%; it passes and clears the failure.

17. In all of the following field density tests on sand, the passing test has approximately the same or lower density than the failures, but references a lower maximum density RD lab standard:

MDR 343	clears	MDR 339
MDR 514	clears	MDR 507
MDR 513	clears	MDR 508
MDR 515	clears	MDR 509
MDR 516	clears	MDR 510
MDR 522A	clears	MDR 521
MDR 558	clears	MDR 556, 557
MDR 480	clears	MDR 473
MDR 555	clears	MDR 525, 527, 534
MDR 533	clears	MDR 526, 530, 531

18. MD . 2384 clears MD 2342, but is at 7' lower elevation.

19. MD 123 clears MD 122, but is at 10.5' lower elevation.

20. MD 149 clears MD 142, but is at 10' higher elevation.

21. MD 1694 clears MD 1693 but is 43' away from the site of the first test.

22. MD 3114 clears MD 3102, but the two tests are 68' apart.

23. MD 186 clears MD 183 though it is 110' away.

24. MD 1209 clears MD 1207 and MD 1205, yet is 183 ft. away from the failures.

25. MD 1097, dated August 4, 1977, cleared by MD 1048 dated July 16, 1977.

Note: This table gives typical observations and is not meant to be all-inclusive.

TABLE C

Notes on Questionable Test Data

1. The first field density test to reference RD 24 (5/75) has a relative density of 170.6%. The standard continued to be used, however, with relative densities greater than 100% occuring repeatedly.

2. Similarly for RD 30, the first two tests (9/75) have 114% and 122% relative densities, yet the standard was used for 10 months, 54 tests, with 52% of the results over 100%.

3. During the first two weeks of use (7/76), RD 41 was referenced 22 times with 12 tests over 100% relative density (6 tests over 110% and 3 over 120%). The standard was used for 5 months, however, with over 40% of the results over 100%.

4. The first test using RD 55 (8/76) has a relative density of 119%, with the field test being made the same day as the standard and, thus, assumedly the same material. These results would throw doubt on the lab standard, yet it was used for two full years and 536 tests, with 64% of the results over 100% relative density.

5. Even high density structural backfill standards such as RD 61 (maximum density of 125.3 pcf), used 593 times, show over 25% of the tests having greater than 100% relative density.

6. The first seven tests referencing BMP 269 (scattered over a two month period around 7/76) all fall outside the zero air voids curve. This classification was used for 1 1/2 years, referenced 227 times.

7. The first two tests referencing BMP 270 (7/76) fall 6 pcf above the zero air voids curve. Continued use of this proctor for over 2 years resulted in 226 tests with 82 outside the theoretical maximum.

8. For the first month (4/77) all BMP 278 tests fell on or outside the zero air voids curve. For the next month, over half the tests did the same, or have greater than 105% compaction. The standard was used over half a year, with 43 out of a total of 82 tests outside the zero air voids curve.

Note: This table gives typical observations and is not meant to be all-inclusive.

S3 05162

MØISTURE-DENSITY FØR BMP 278

SPECIFIC GRAVITY = 2.65
ALL TESTS

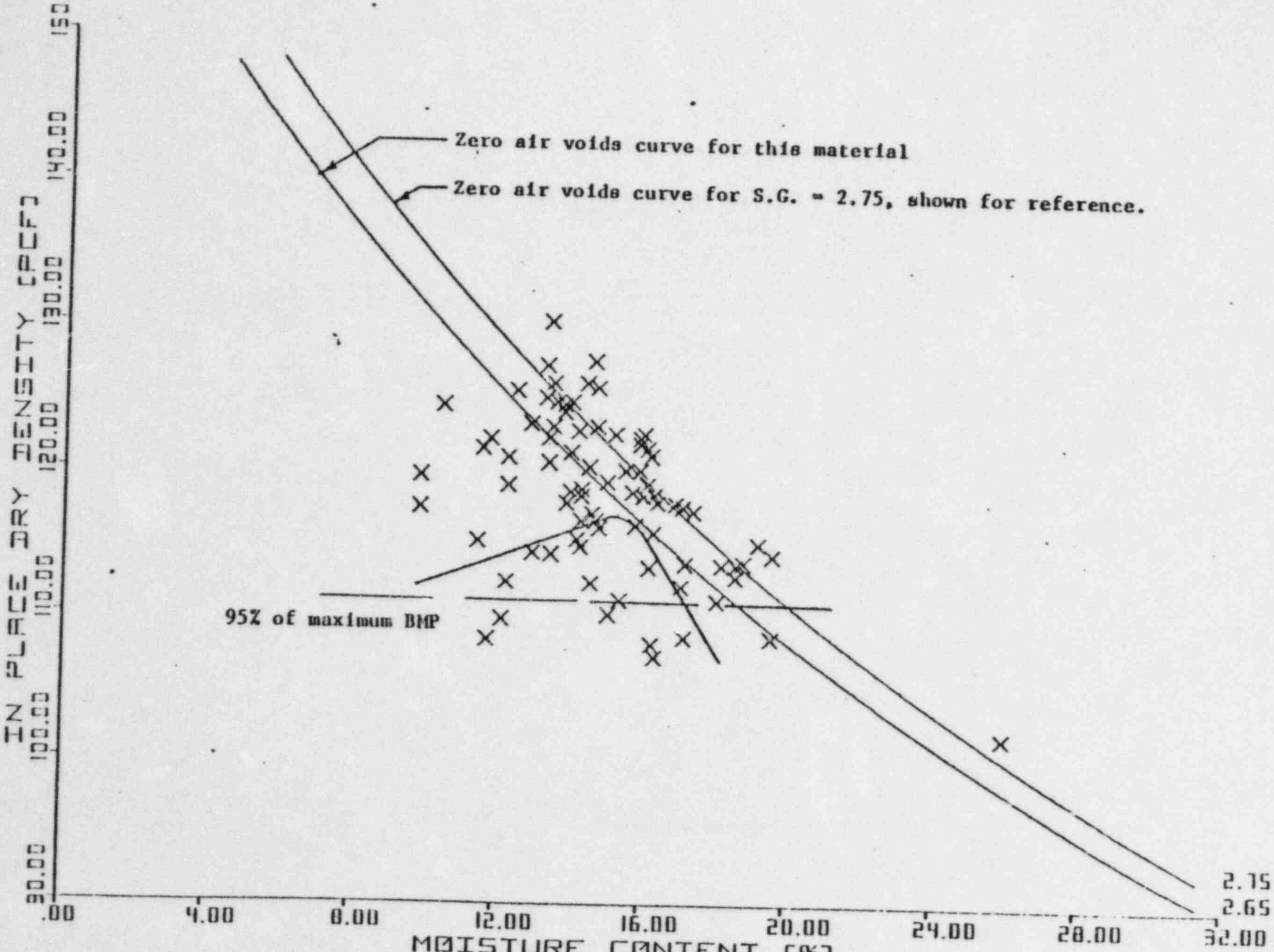


FIGURE 1

S3 05163

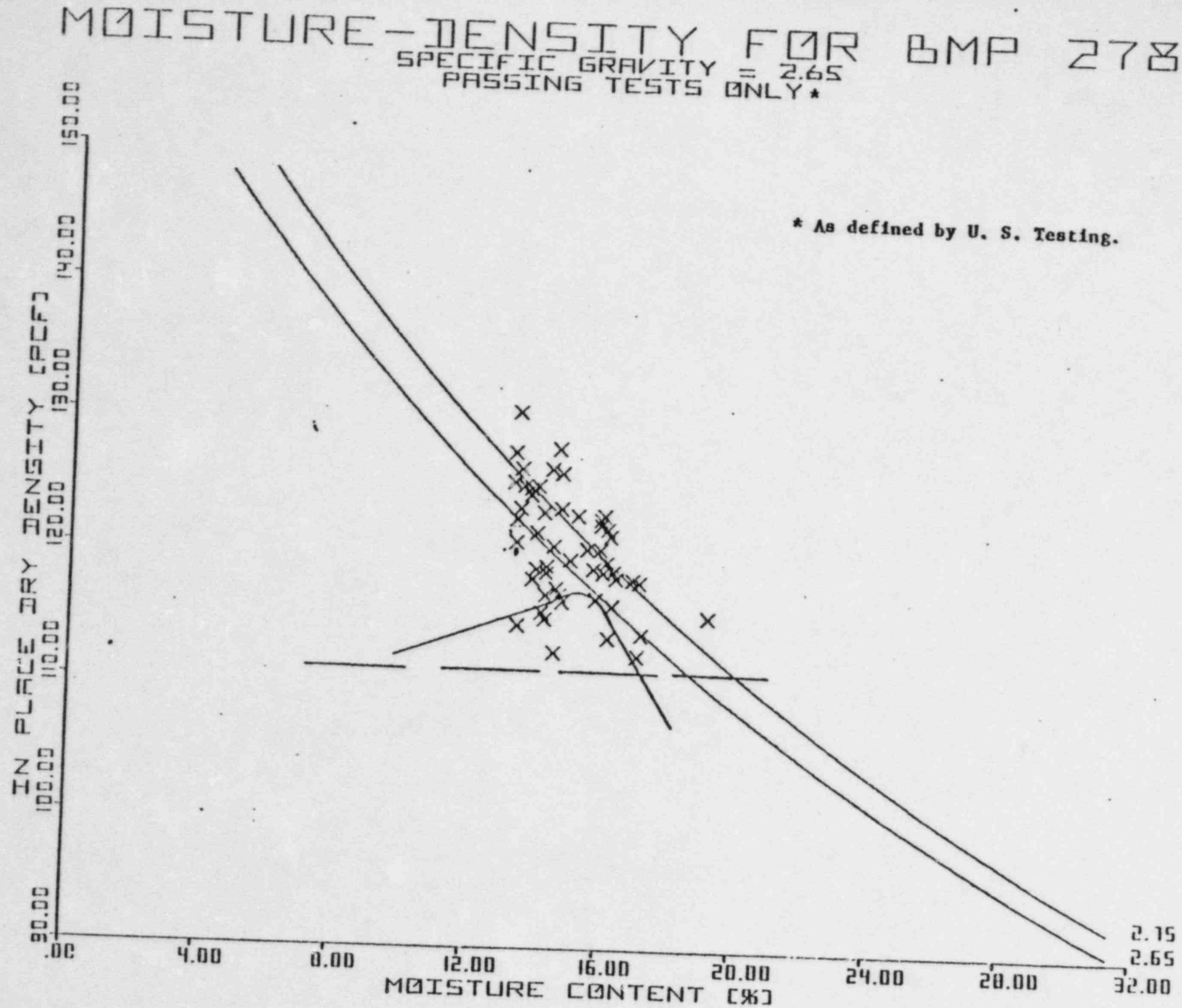


FIGURE 2

SJ 05164

MØISTURE-DENSITY FØR BMP 278

SPECIFIC GRAVITY = 2.65
NUCLEAR DENSØMETER TESTS

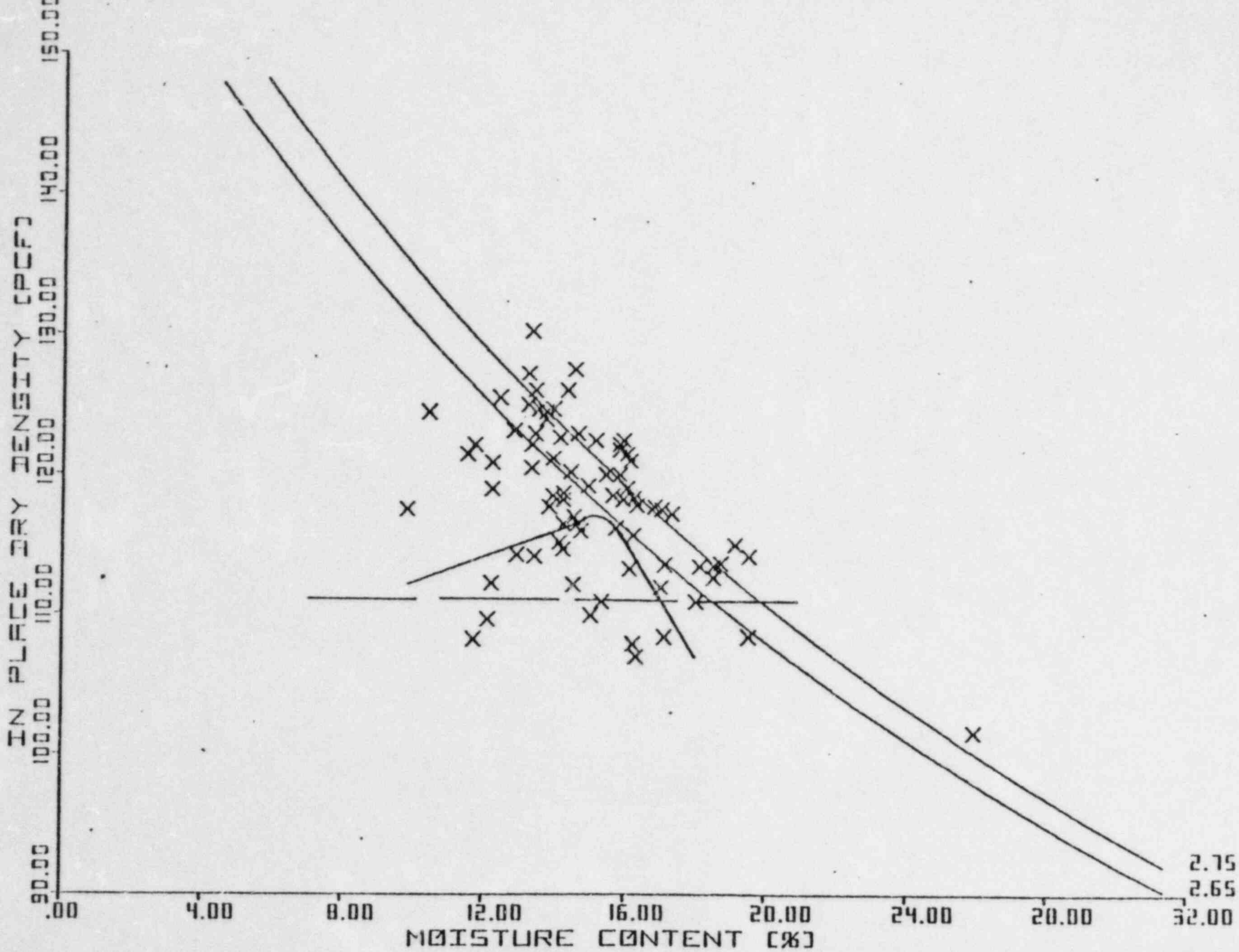


FIGURE 3

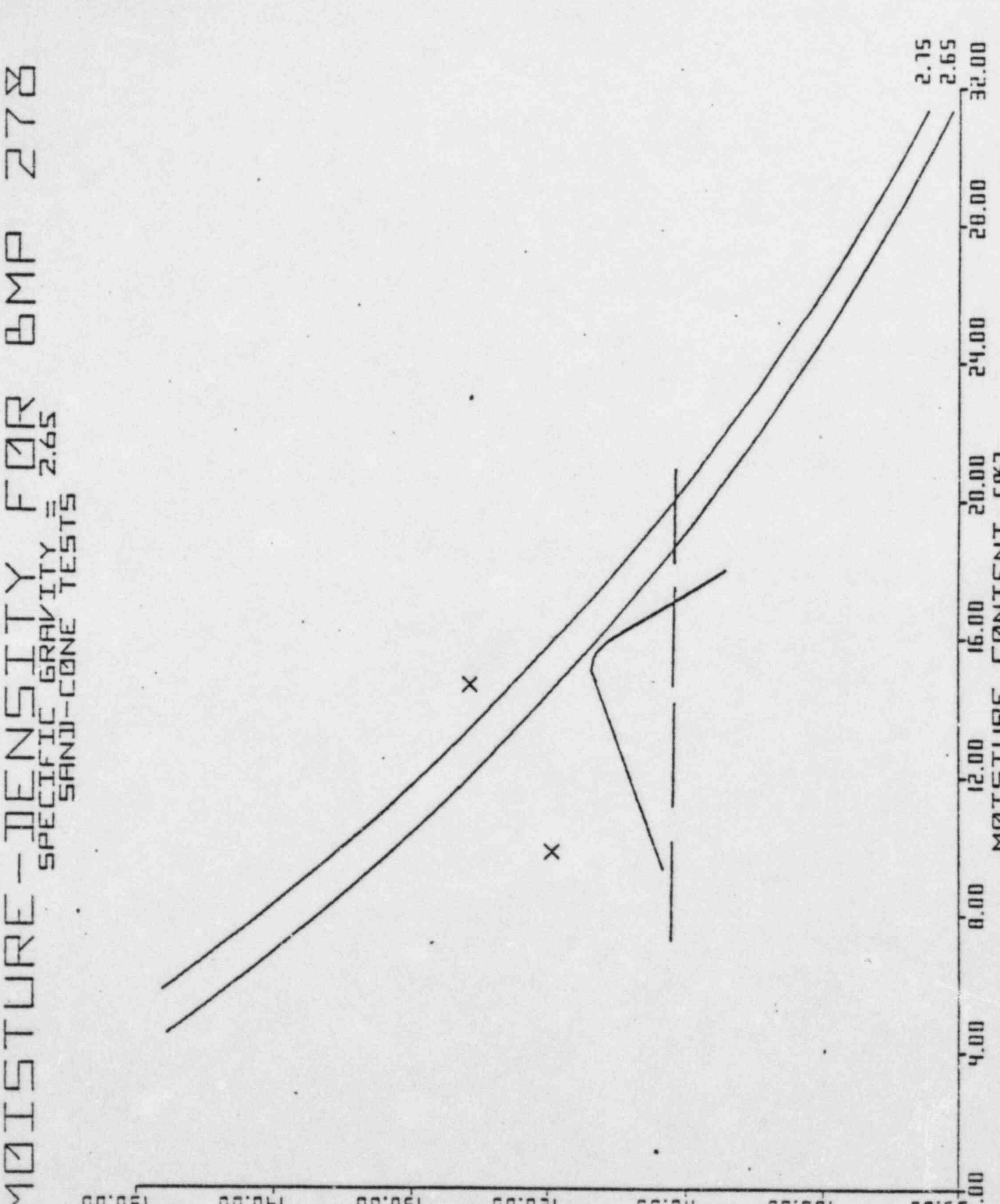


FIGURE 4

SJ C5166

MØISTURE DENSITY FØR BMP 278

SPECIFIC GRAVITY = 2.65
NUC. DENS. PASSING TESTS*

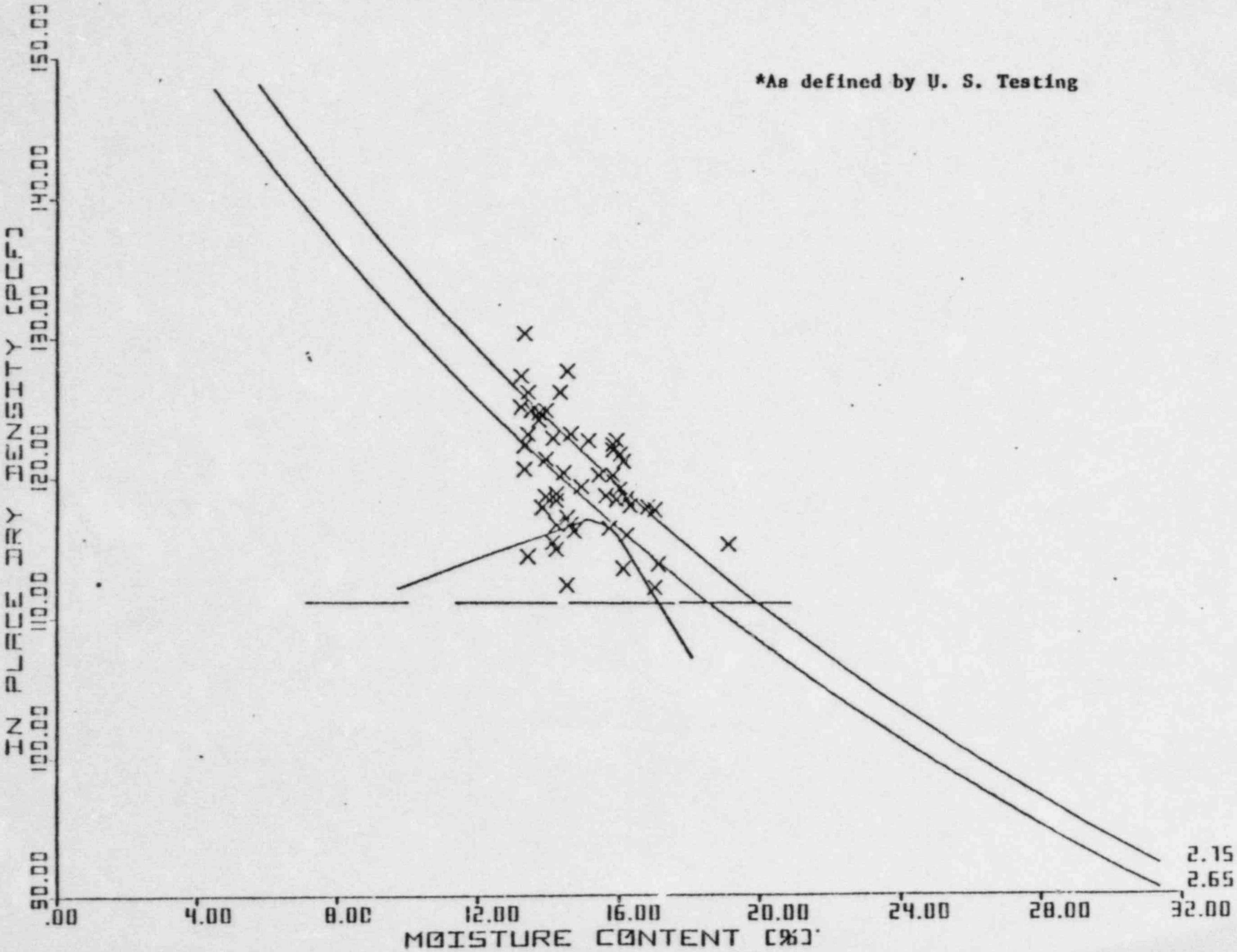


FIGURE 5

S3 [illegible]167

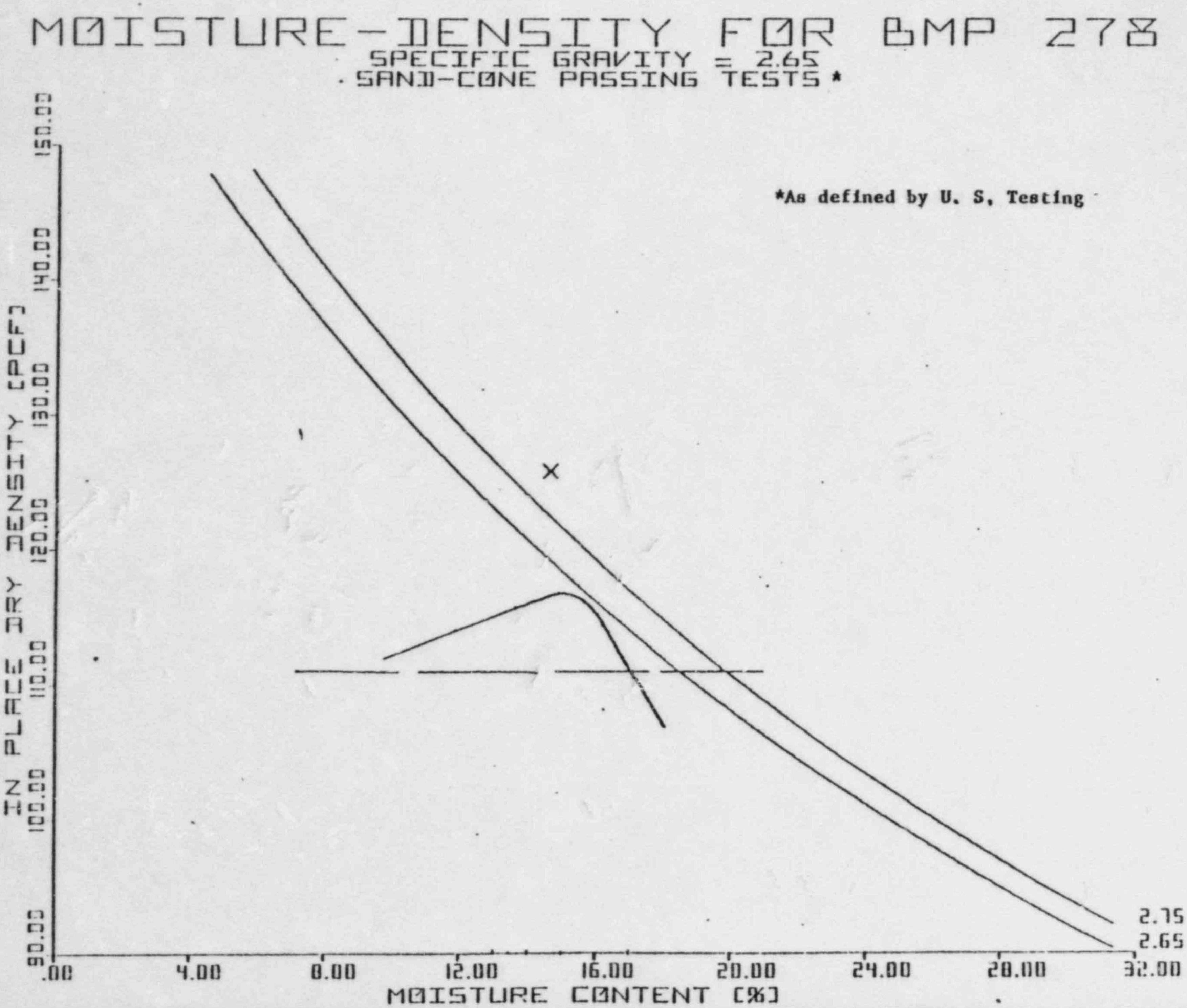


FIGURE 6

S3 05168

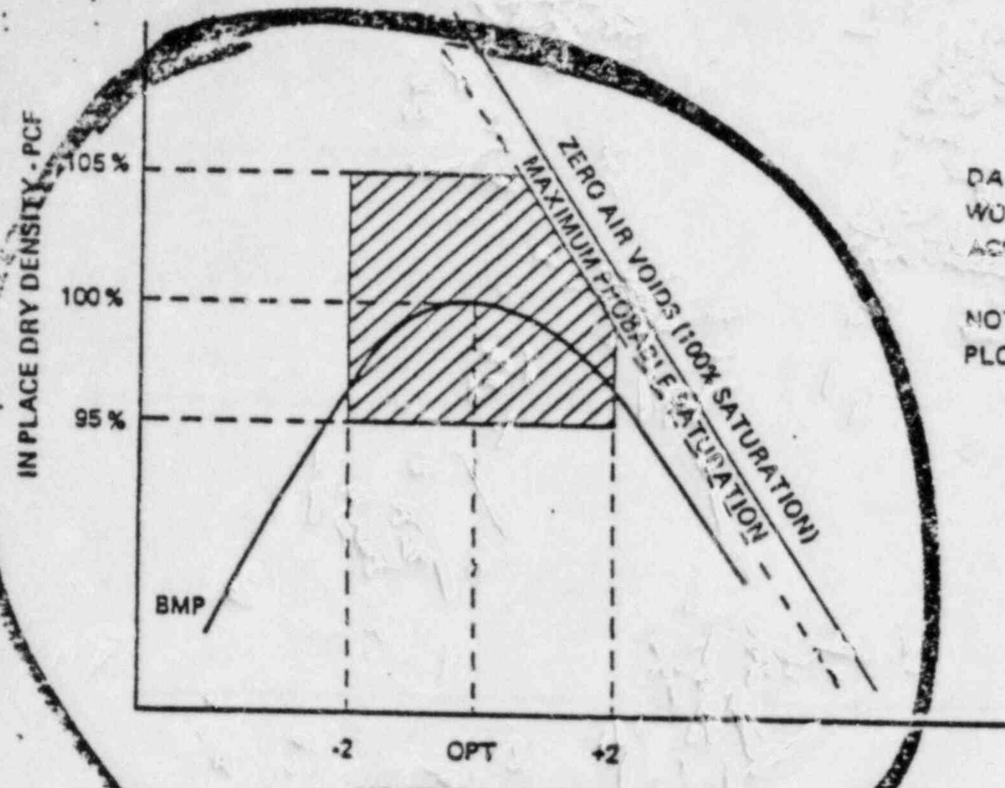


FIGURE 7-A-

DATA POINTS THAT PLOT IN SHADED AREA WOULD BE GENERALLY ACCEPTABLE ACCORDING TO SPECIFICATIONS

NOTE: ABOUT 25% OF ALL FIELD DATA PLOTS IN THE SHADED AREA

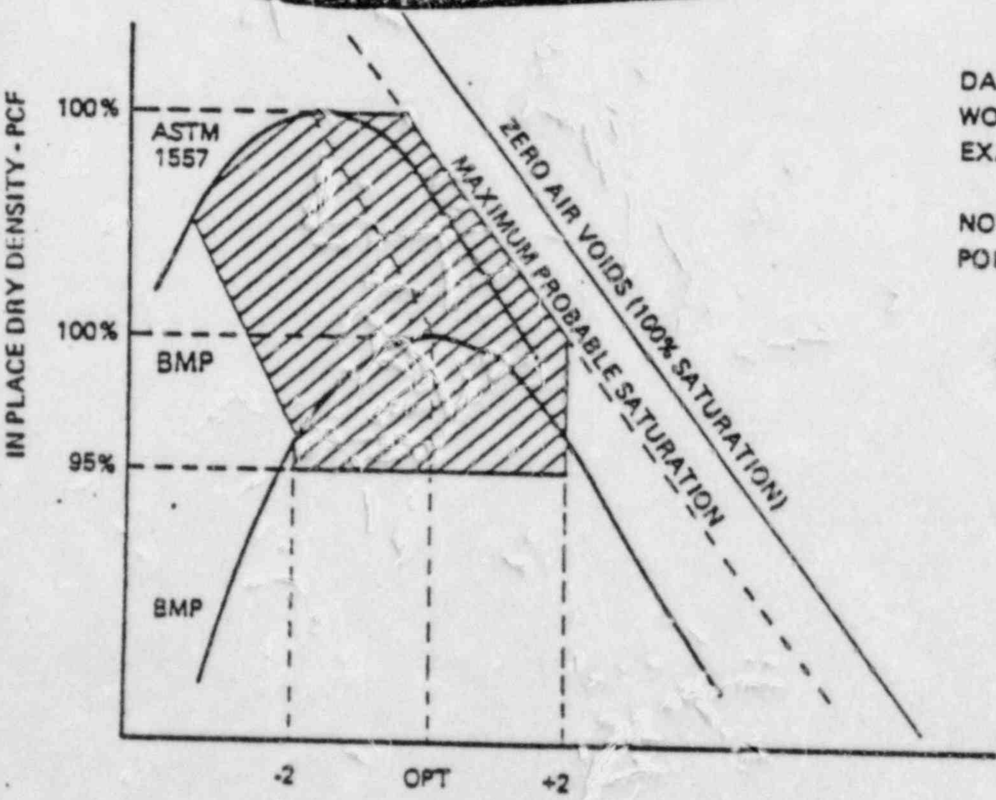


FIGURE 7-B-

DATA POINTS THAT PLOT IN SHADED AREA WOULD BE ACCEPTABLE REGARDLESS OF EXACT SPECIFICATION WORDING

NOTE: ABOUT 40% OF ALL FIELD DATA POINTS PLOT IN THE SHADED AREA

SC 05169

FIGURE 7: WINDOWS OF ACCEPTABILITY (A) BASED ON BMP SPECIFICATION (B) REGARDLESS OF EXACT WORDING OF SPECIFICATION

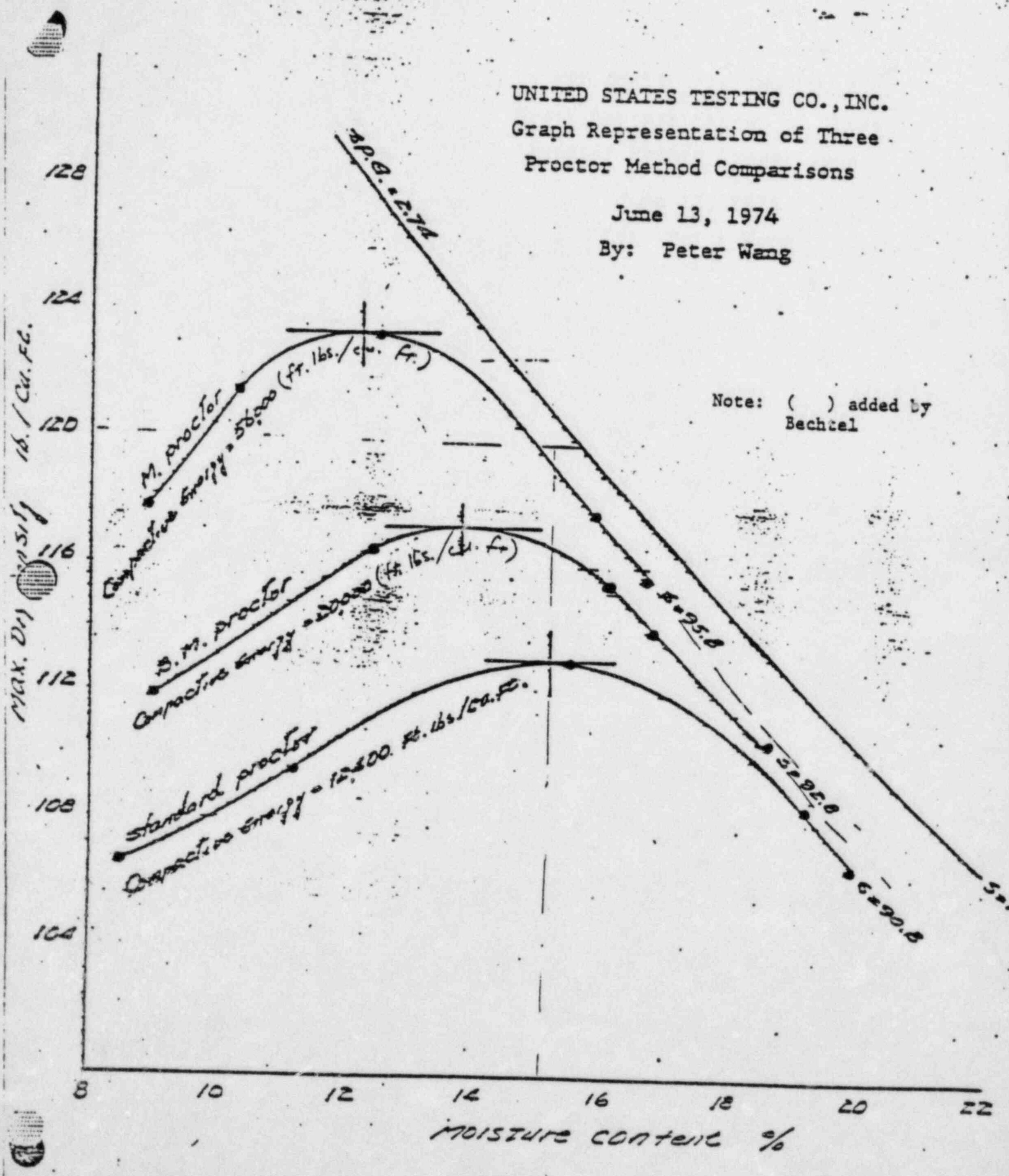


FIGURE 8

S3 05170

BECHTEL

MEMORANDUM

TO: BEN CHESK LOCATION: Q.C.

FROM: JIM WASYLEWSKI DATE: OCT 14 1978

SUBJECT: TEMPORARY BACKFILL JOB NO. 7220

FILE:

ATTACHED IS A MARKED UP COPY OF DRAWING 7220-C-3 THAT DESIGNATES THE TEMPORARY BACKFILL AREAS AROUND PLANT SITE.

THESE AREAS WERE INSTALLED EITHER TO FACILITATE CONSTRUCTIO[N] OR FOR WINTER PROTECTION OF BURIED FACILITIES AND WERE NOT INSTALLED IN ACCORDANCE WITH SPECIFICATIONS C-210 OR C-211.

IN THE SPRING WHEN BACKFILL OPERATIONS START UP AGAIN THE AREAS NOW DESIGNATED AS TEMPORARY WILL BE STRIPPED BACK TO GOOD MATERIAL, THEN BACKFILLED IN ACCORDANCE WITH THE SPECIFICATIONS.

ATTACHMENT.

COPY OF DWG 7220-C-3

Jim Wasylewski

SB 05115

BECHTEL

MEMORANDUM

TO: R. K. Fiple LOCATION:

FROM: B. T. Check DATE: 9-29 - 19 78

SUBJECT: Soils Testing JOB NO. 7220

- Plant Area Fill - FILE

CC W. L. Barclay
J. Betts
A. Marshall

Per direction of Project Engineering Meeting 9-28-7 and discussion with Messrs J. Betts, A. Marshall and B. Check the followings tests are to be performed for the plant area fill.

* Structural Backfill (Sand)

1. In-Place Density per Nuclear Device ASTM D 2922
2. In-Place Density per ASTM D-1556
3. Relative Density per ASTM D 2049 for each in-place density test.

SB 05116

* Random Fill (Clay)

1. In-Place Density per Nuclear Device ASTM D 292
2. In-Place Density per ASTM D-1556

Note - When excavating material for in-place te retain enough material to perform a one point proctor @ in-place moisture and

3. Lab Density per ASTM D-1557 Method D for each in-place density test -
Note - the one point proctor may be used in this case

* The location and test frequency will be as directed by Bechtel - Geotech

If you have any questions please contact me x 389

[signature]

SB 05117

BECHTEL

ANN ARBOR

RECEIVED 1/3
MAY 27 1976
BECHTEL POWER CORP.
JOB 7220
PER C-211 (27)

MEMORANDUM

TO: Jim Desmond LOCATION: Midland

FROM: Dick Grote DATE: May 24, 1976

SUBJECT: Structural Backfill JOB NO. 7220

c.c. Frank Teig FILE: C-211

Recently, you have raised the following questions concerning Spec. C-211:

1) Did I receive Project Engineering approval for backfill materials placed in areas inaccessible to motorized rollers?

At the time, I question Project Engineering on this specification requirement and they agreed that such approval was neither necessary or practical. Consequently, they drafted BEBC-805 (attached) that approves material that meets backfill material requirements for the contiguous area. In most cases, when not in the dike section, this means that Zone 2 is acceptable material for areas inaccessible to motorized rollers.

I am surprised that this memo is not included in the C-211 correspondence file.

BECHTEL
ANN ARBOR

MEMORANDUM

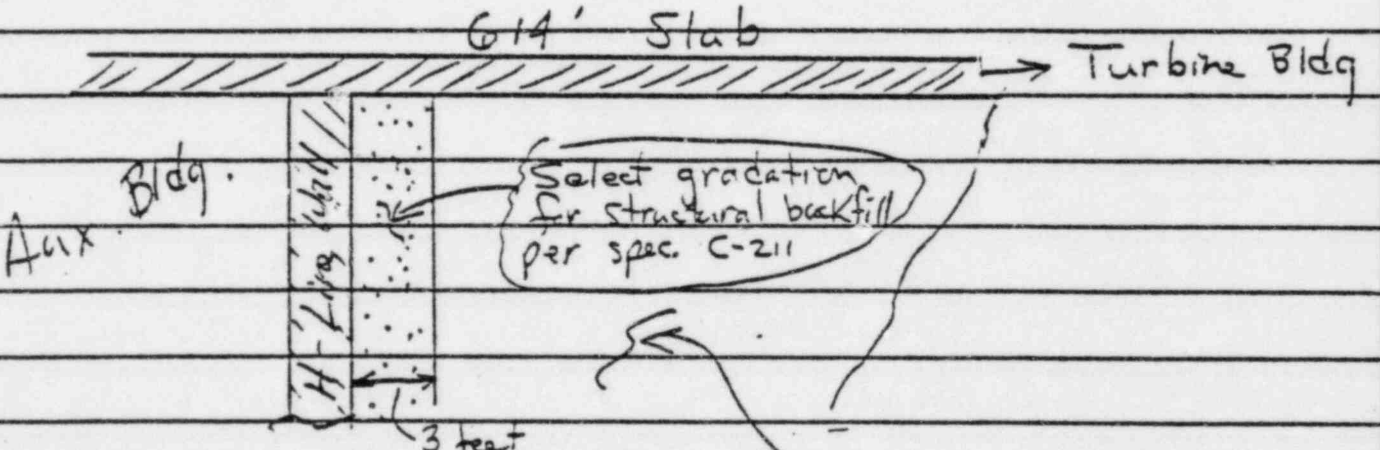
TO ____ LOCATION ____

FROM ____ DATE ____ 19 ____

SUBJECT ____ JOB NO. ____

FILE ____

2. Why is structural backfill material only req'd. within 3 feet of a bldg. wall and not under a structure? For example:



what mat'l is

Answ.: In most cases Zone 2 ⟶ req'd. in this area?

You questioned this because it "didn't make sense". At the time, I felt the same w[ay] and questioned Project Engineering. They confirm[ed] that only the 3 feet needed structural grad[ation] material. I confirmed what they told me in BCBE-370. They sent BEBC-456 back stating that our understanding was correct. I have not included copies. If you can't find

ANN ARBOR

MEMORANDUM

TO: LOCATION:

FROM: DATE: , 19

SUBJECT: JOB NO.

FILE:

them, let me know.

I have also attached copies of two items I ~~note~~ in the file that you should be aware of. I think I gave you and Bill O'Dell each 1 copies of BE-BC-829 before I left. But just in case, here is another copy. I didn't agree with all that they required, but got no relieve in my first cut @ arguing with them.

I hope that items 1 & 2 clear up the questions you had. If not, do not ~~hesitate~~ hesitate to give me a call.

Dick

C-211 PK

BECHTEL

Telephone call

ROUTE RLR

GT

xc R. Grote

BY John Hinke OF B A²

TO Richard Grote OF B Field

DATE 7-18 19 75 TIME 2:30

SUBJECT structural backfill JOB NO. 7220

1. During a discussion with R. Grote about Palisades, Dick asked a question about Midland backfill spec C-211 which requires sand within 3 feet of a wall. Specifically, he described a backfill area near the NE corner of Unit 2 Turbine Pedestal mat. He asked if it was necessary to use sand in this area?

2. I noted that we had placed sand requirement to be consistent with surcharge loads used in the structural wall design. Because this backfill in question was against a foundation mat and not a wall, there was no need to place sand in the area described.

J G Hinke

0046 (12-67)

SB C5043

RECEIVED
AUG - 8 1974
BECHTEL POWER CORP.
JOB 7220
PER SCCBC 363

Consumers Power Company

P.O. Box 1963
Midland, Michigan 48640
August 7, 1974

Midland Project GWO 7020
Structural Backfill
File: 1122, C-211 Serial: 393

Mr. E. E. Felton
Bechtel Power Corporation
P.O. Box 2167
Midland, Michigan 48640

Dear Mr. Felton:

In the area between the Auxiliary Building, the Turbine Building backfill concrete has been placed to elevation 584' to facilitate the tower crane. From elevation 584' to 614', we feel that the placement of backfill concrete is no longer economically feasible. Bechtel's Focus substantiates the economic advantage of structural backfill sand:

	Manhours per cy
1. Concrete Cost	.9
2. Sand Cost	.25

In terms of material costs structural backfill sand is approximately 9 times cheaper than concrete. Therefore, we feel that structural backfill sand is more economically attractive than concrete.

In that this project has had little experience with structural backfill sand to date, we would like to pose the following questions:

1. Do you expect any water problems in the above mentioned area? If so, how will this problem be resolved?

2. Is the compaction required under C-211 adequate for structural sand backfill? If not, what do you suggest?

3. Do you plan on utilizing any structural backfill material other than sand? If so, please specify and illustrate the economic value of it.

SB 05055

Please answer these questions as expeditiously as possible and inform us of your plans in regards to structural backfill.

Very truly yours,

T. C. Cooke
Project Superintendent

TCC/RMW/cf

Dick
Grote

Bechtel Power Corporation

Interoffice Memorandum

To QC Files

Date October 2, 1974

Subject M/D and Proctor Test Frequencies

From L. V. Hendry

Of Quality Control

Copies to

At Midland, Michigan
Job No. 7220

On May 23, 1974 construction of the "Q" areas of the cooling pond dikes recommenced, all work performed was under constant quality control surveillance by both Bechtel QC Engineers and the Subcontractors QA/QC Engineer. All Field Moisture Density Tests, Bechtel modified Proctor Tests and the Subcontractors QA/QC Daily Reports are reviewed on a continuing basis by Bechtel QC Engineers.

Attached is a summary of M/D and BMP Test frequencies based on these reviews to September 14, 1974. All earthwork quantities are based on load counts supplied by the Subcontractor. It has been noted that the earthwork quantities reported by the Subcontractors QA/QC Engineer differ from the earthwork quantities reported by the Bechtel QC Engineer. The difference is less than five per cent of the total and does not appreciably affect the testing frequency. Better communication has been established and future reports should show less deviation.

L. V. Hendry

L. V. Hendry

LVH/jmw

Attachments

SR C5C77

SUMMARY OF MOISTURE/DENSITY AND BECHTEL MODIFIED PROCTER TEST FREQUENCIES
Northeast Dike, North Plant Dike, 100' Wide Berm "Q" Listed Areas
Zone 1 & 2 Material
Based on the Daily Reports of Canonie Construction Companies QA/QC Engineer

Week Ending	Cum. Yardage Placed	Cum. Total M/D Tests	M/D Test Freq.	Cum. BMP Tests	BMP Test Freq.
5/25/74	3,990	40	1 @ 100 Yds^3	5	1 @ 798 Yds^3
6/8/74	29,697	89	1 @ 334 Yds^3	8	1 @ 3,712 Yds^3
8/9/74	55,442	129	1 @ 430 Yds^3	9	1 @ 6,160 Yds^3
6/15/74	55,442	130	1 @ 426 Yds^3	9	1 @ 6,160 Yds^3
6/22/74	55,442	143	1 @ 388 Yds^3	10	1 @ 5,544 Yds^3
6/29/74	70,737	192	1 @ 368 Yds^3	13	1 @ 5,441 Yds^3
7/6/74	70,737	197	1 @ 359 Yds^3	13	1 @ 5,441 Yds^3
7/13/74	88,901	272	1 @ 327 Yds^3	13	1 @ 6,839 Yds^3
7/20/74	115,026	338	1 @ 340 Yds3	13	1 @ 8,848 Yds^3
7/27/74	133,399	358	1 @ 373 Yds ^{3}	18	1 @ 7,411 Yds^3
8/3/74	158,517	396	1 @ 400 Yds^3	18	1 @ 8,807 Yds^3
8/10/74	172,862	455	1 @ 380 Yds^3	20	1 @ 8,643 Yds^3
8/17/74	225,568	581	1 @ 388 Yds^3	23	1 @ 9,807 Yds^3
8/24/74	254,907	644	1 @ 396 Yds^3	26	1 @ 9,804 Yds^3
8/31/74	262,355	648	1 @ 404 Yds^3	28	1 @ 9,369 Yds^3
9/7/74	262, 355	668	1 @ 393 Yds^3	28	1 @ 9,369 Yds^3
9/14/74	273,816	696	1 @ 393 Yds^3	28	1 @ 9,782 Yds^3

SUMMARY OF MOISTURE/DENSITY AND BECHTEL MODIFIED PROCTER TEST FREQUENCIES
Northeast Dike, North Plant Dike, 100' Wide Berm "Q" Listed Areas
Zone 1 & 2 Material
Based on Bechtel QC Daily Observations and Test Reviews

Week Ending	Cum. Yardage Placed	Cum. Total M/D Tests	M/D Test Freq.	Cum. BMP Tests	BMP Test Freq.
5/25/74	3,780	40	1 @ 95 Yds^3	5	1 @ 756 Yds
6/1/74	29,298	89	1 @ 329 Yds^3	8	1 @ 3,662 Y
6/8/74	45,183	129	1 @ 350 Yds^3	9	1 @ 5,020 Y
6/15/74	45,183	130	1 @ 348 Yds^3	9	1 @ 5,020 Y
6/22/74	45,183	143	1 @ 316 Yds^3	10	1 @ 4,518 Y
6/29/74	59,623	192	1 @ 310 Yds^3	13	1 @ 4,593 Y
7/6/74	59,623	197	1 @ 303 Yds^3	13	1 @ 4,593 Y
7/13/74	81,891	272	1 @ 301 Yds^3	13	1 @ 6,299 Y
7/20/74	104,206	338	1 @ 308 Yds^3	13	1 @ 8,015 Y
7/27/74	122,560	358	1 @ 342 Yds^3	18	1 @ 6,253 Y
8/3/74	147,678	396	1 @ 373 Yds^3	18	1 @ 8,204 Y
8/10/74	163,240	455	1 @ 359 Yds^3	20	1 @ 8,162 Y
8/17/74	214,425	581	1 @ 369 Yds^3	23	1 @ 9,322 Y
8/24/74	242,411	644	1 @ 376 Yds^3	26	1 @ 9,323 Y
8/31/74	249,859	648	1 @ 385 Yds^3	28	1 @ 9,209 Yd
9/7/74	249,859	668	1 @ 374 Yds^3	28	1 @ 9,209 Yd
9/14/74	261,320	696	1 @ 375 Yds^3	28	1 @ 9,618 Yd

SUMMARY OF MOISTURE/DENSITY AND BECHTEL MODIFIED PROCTER TEST FREQUENCIES
Northeast Dike, North Plant Dike, 100' Wide Berm "Q" Listed Areas
Zone 1 & 2 Material
Based on Bechtel QC Daily Observations and Test Reviews

Week Ending	Cum. Yardage Placed	Cum. Total M/D Tests	M/D Test Freq.	Cum. BMP Tests	BMP Test Freq.
5/25/74	3,780	40	1 @ 95 Yds^3	5	1 @ 756 Yds
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6/8/74	45,183	129	1 @ 350 Yds^3	9	1 @ 5,020 Y
6/15/74	45,183	130	1 @ 348 Yds^3	9	1 @ 5,020 Y
6/22/74	45,183	143	1 @ 316 Yds^3	10	1 @ 4,518 Y
6/29/74	59,623	192	1 @ 310 Yds^3	13	1 @ 4,593 Y
7/6/74	59,623	197	1 @ 303 Yds^3	13	1 @ 4,593 Y
7/13/74	81,891	272	1 @ 301 Yds^3	13	1 @ 6,299 Y
7/20/74	104,206	338	1 @ 308 Yds^3	13	1 @ 8,015 Y
7/27/74	122,560	358	1 @ 342 Yds^3	18	1 @ 6,253 Y
8/3/74	147,678	396	1 @ 373 Yds^3	18	1 @ 8,204 Y
8/10/74	163,240	455	1 @ 359 Yds^3	20	1 @ 8,162 Y
8/17/74	214,425	581	1 @ 369 Yds^3	23	1 @ 9,322 Y
8/24/74	242,411	644	1 @ 376 Yds^3	26	1 @ 9,323 Y
8/31/74	249,859	648	1 @ 385 Yds^3	28	1 @ 9,209 Yd
9/7/74	249,859	668	1 @ 374 Yds^3	28	1 @ 9,209 Yd
9/14/74	261,320	696	1 @ 375 Yds^3	28	1 @ 9,618 Yd

Bechtel Power Corporation

Inter-office Memorandum

To	Distribution	Date	January 25, 1979
Subject	Possible Causes of Diesel Generator Building Settlement	From	G. L. Richardson
		Of	QA Staff
Copies to		At	Ann Arbor

Attached is a draft of possible causes for the settlement of the Diesel Generator Building. This list was agreed upon in the last Task Group meeting as a starting point and describes the possible causes that I am aware of at this time.

Possible deletions, additions, changes and comments will be part of the agenda for the next meeting.

G. L. Richardson

G. L. Richardson

GLR/le
attachment
GLR-79-5

Distribution: K. Wiedner
A. Boos
B. Dhar
W. Jones
S. Afifi

SB 04957

DIESEL GENERATOR BUILDING

Possible Cause

I. MATERIAL

1. Material used not from approved borrow area.
2. Material from borrow not per spec C-210 Table 12-1
3. Testing performed at borrow to determine MC & gradation not correct (Spec C-210 para. 12.4.1.)
4. Lack of specified testing frequency for borrow testing
5. Initial site investigation not adequate.
6. Structural backfill source not adequate.
7. Structural backfill material not per spec C-211
8. Testing of structural backfill at receipt not adequate.
9. INADEQUATE CONCERN FOR PLACEMENT OF BACKFILL MATERIALS BY ALL INVOLVED

SB 04958

DIESEL GENERATOR BUILDING

Possible Cause

II. FOUNDATION PREPARATION

1. Foundation not prepared per spec C-210 and C-211

2. Natural loose sands not removed.

3. Foundation not protected after preparation and prior to being covered by fill.

4. Foundation testing not correct.

DIESEL GENERATOR BULDING

Possible Cause

III. MATERIAL PLACEMENT

1. Moisture content of material placed not within specified limits.

2. Material not homogeneous when placed - Not mixed to assure uniform moisture and material.

3. Lift thickness not properly controlled/lifts not uniform.

4. Compaction not performed uniformly.

5. Compaction equipment not adequate.

6. Material not compacted to required density.

7. Specification requirements not adequate to result in acceptable fill.

    a. Moisture control
    b. Lift thickness
    c. Material type (random fill)
    d. Use of lean concrete
    e. Compaction requirements

8. Confined areas/hand compacted areas not adequately compacted.

9. Construction sequence resulted in soft areas.

10. Placement of fill during rain periods.

SB 04960

DIESEL GENERATOR BUILDING

<u>Possible Cause</u>

IV. INSPECTION

1. Subcontractor inspection not adequate

   a. Material control - uniformity & type
   b. Moisture control
   c. Lift thickness control
   d. Corrective action

2. Bechtel Inspection/Inspection Planning not adequate to assure produce compliance.

   a. Type of inspection callout
   b. Degree of inspection/depth of inspection

DIESEL GENERATOR BUILDING

Possible Cause

V. TESTING

1. Spec C-210 & C-208 not clear as to proper tests to run.

2. Wrong Lab Max Control Test used (ASTM vs BMP)

3. Lab Techs not properly trained/qualified.

4. Testing Techniques not followed properly

   a. Obtaining field density
   b. Selection of right proctor curve
   * c. Updating family of curves or curves not representative of material placed.

2 5. Testing equipment not adequate for results required. Specifically use of densitometer.

6. Use of family of curves for control not adequate. (Specification adequacy)

Bill 7. Testing frequency in immediate area of DGB not adequate.

8. QC surveillance of testing not adequate to assure proper techniques, including selection of proper proctor curves.

9. No plots of tests or frequencies kept to assure uniform testing coverage.

10. No weekly/monthly reports of testing results - No graphs - charts - statistical data -

    a. Results in no awareness of P.E./Geo-Tech/FE/QC/Subcontractor Lab of adequacy of soils placement.

11. Location of tests not accurately obtained to assure failing test areas could be relocated.

12. Testing in the rain.

SB 04962

VI. RECORDS

1. Review of records not adequate to I.D. ~~filling~~ failing tests.

2. See item V-10

SB04963

VII. GENERAL

1. Geo-tech not adequately involved with development of Spec C-210, C-211, C-208 and with actual field operations.

2. Engineering coordination of specifications not adequate.

3. Design/calculations in error.

FIELD ENGINEER'S REPORT FORM

MIDLAND UNITS 1 & 2

JOB 7220 DATE 12-12-78 PAGE 1 OF 1

ITEM NO.	INSPECTION DESCRIPTION	ACTION REQUIRED/TAKEN
	DIESEL GENERATOR BUILDING - BACKFILLING INSIDE THE BUILDING	
1	IN ACCORDANCE WITH SECTION 5.2.2 OF SPECIFICATION 7220-C-211, THE AREA INSIDE BAY #3 OF THE D/G BLDG, BASED ON CLEANLINESS AND FREE FROM ICE, WAS INSPECTED FOR ACCEPTANCE OF SUBGRADE. THE CLEAN UP IS WORKING DIRECTLY IN FRONT OF BACKFILLING AND HEATERS HAVE BEEN INSTALLED, RAISING THE TEMPERATURE SUFFICIENTLY TO MELT THE ICE.	BASED ON THE WORK BEING DONE PRIOR TO BACKFILLING, HEATERS & CLEAN UP, THE SUBGRADE IS ACCEPTABLE IN BAY #3

REMARKS: CC: BEN CHEEK LCQE.

ROUTE

CHB JIM BETTS

AL BOOS

SB C5005

Jim Wasylewski

SIGNATURE

FILE

FIELD ENGINEER'S REPORT FORM

MIDLAND UNITS 1 & 2

JOB 7220 DATE 12-13-78 PAGE 1 OF 1

ITEM NO.	INSPECTION DESCRIPTION	ACTION REQUIRED/TAKEN
	DIESEL GENERATOR BLDG.	
1	BACKFILLING IN BAY # 4 STARTED 12-13-78. APPROXIMATELY 36 CY OF STRUCTURAL BACKFILL SAND WAS INSTALLED. AREA WAS VISUALLY INSPECTED FOR ACCEPTANCE AND WAS FOUND ACCEPTABLE.	MATERIAL IS BEING INSTALLE IN ACCORDANCE WITH SPECIFICATIONS [redacted] 7220-C-211.
2	BACKFILLING IN BAY # 3 IS CONTINUING. APPROXIMATELY 27 CY OF STRUCTURAL BACKFILL SAND WAS INSTALLED	SEE ITEM 1 FOR ACTION TAKEN
3.	DUCTBANK EXCAVATIONS IN BAYS 1, 2, & 3 WERE BACKFILLED, WITH A HIGH SLUMP PEA GRAVEL CONCRETE MIX, ON 12-13-78 PORTIONS OF THE SUCK LINES, USED TO PUMP THE CONCRETE, WERE ABANDONED IN THE PLACEMENTS AS THE CONCRETE FILL BURIED THEM.	VISUAL INSPECTION OF THE BACKFILLING INDICATE THAT THE EXCAVATIONS WERE F. LED AND THE AREAS AROUND THE DUCT-BANKS APPEAR TO HAVE SEALED.
4.	LINE DRILLING, OF THE MUDMAT, ALONG THE NORTH AND EAST WALLS OF BAY #1 IS CONTINUING.	

REMARKS:

ROUTE
JIM BETTS
AL BOOS

SB 05006

Jim Wasylewski

FIELD ENGINEER'S REPORT FORM

MIDLAND UNITS 1 & 2

JOB 7220 DATE 12-18-78 PAGE 1 OF 1

ITEM NO.	INSPECTION DESCRIPTION	ACTION REQUIRED/TAKEN
	DIESEL GENERATOR BLDG.	
1	BACKFILLING IN BAYS #3 AND #4 IS CONTINUING. APPROXIMATELY 60 CY WERE PLACED IN BAY #3 AND 38 CY WERE PLACED IN BAY #4	MATERIAL IS BEING INSTALLED IN ACCORDANCE WITH SPEC. 7220-C-211.
2	BACKFILLING IN BAY #2 STARTED 12-18-78. THE AREA WAS INSPECTED FOR CLEANLINESS, PRIOR TO BACKFILLING, AND FOUND ACCEPTABLE. APPROXIMATELY 15 CY WERE INSTALLED IN BAY #2.	SEE ACTION TAKEN IN ITEM #1.
3.	CORE DRILLING, OF ADDITIONAL HOLES, IN THE NORTH WALL OF BAYS 1 AND 4 WAS COMPLETED 12-16-78. VISUAL INSPECTION, FOR DAMAGED REINFORCING STEEL, WAS PERFORMED 12-18-78. NO DAMAGED REINFORCING STEEL WAS FOUND IN THE ADDITIONAL HOLES. (REF. DWG. 7220-FSK-CY-203 SH1 REV 2 FOR LOCATION)	SINCE NO ADDITIONAL REINFORCING WAS DAMAGED, NO ACTION IS REQUIRED
4.	CORE DRILLING OF THE ADDITIONAL TIE BACK HOLES IN THE TURBINE WALL WAS COMPLETED 12-16-78.	NO ACTION TAKEN

REMARKS:

ROUTE

JIM BETTS

AL BOOS

SB 45907

[signature]

FIELD ENGINEER'S REPORT FORM

MIDLAND UNITS 1 & 2

JOB 7220 DATE 12-26-78 PAGE 1 OF 1

ITEM NO	INSPECTION DESCRIPTION	ACTION REQUIRED/TAKEN
	DIESEL GENERATOR BUILDING	
1.	BACKFILL IN BAY #2 IS CONTINUING. APPROXIMATELY 4 CY WERE INSTALLED.	MATERIAL IS BEING PLACED IN ACCORDANCE WITH SPEC. 7220-C-211.
2.	BACKFILL IN BAY # 1 STARTED 12-26-78. APPROXIMATELY 8 CY WERE INSTALLED. HOWEVER BAY #1 HAD NOT BEEN INSPECTED FOR CLEAN UP PRIOR TO BACKFILLING. [redacted]	CLEAN UP INSPECTION FOUND THE AREA ACCEPTABLE. BACKFILLING STARTED AGAIN IN ACCORDANCE WITH SPEC. 7220-C-211.

REMARKS:

ROUTE

JIM BETTS
AL BOOS

SB 05008

Bechtel Power Corporation

Interoffice Memorandum

To R. L. Castleberry

File No.

Subject Job 7220 Midland Project
Units 1 & 2
Soils, Density/Moisture Tests
BCBE-2216

Date March 8, 1979

From J. F. Newgen

Of Construction

At Midland, MI Ext. 200

Copies to
W. L. Barclay
L. A. Dreisbach

Reference: A) BCBE # 2185, dated 2/20/79, from J. F. Newgen to R. L. Castleberry

An additional review was performed on soils, density/moisture tests. Please add the following list of results, for your evaluation, to the referenced memo previously transmitted to you.

TEST NO.	DATE	MOISTURE CONTENT%	OPTIMUM MOISTURE CONTENT %	DIFFERENCE
2008 *	9/12/77	20.2	11.1	9.1
2176 *	10/05/77	17.7	13.4	4.3
2249	10/15/77	9.7	14.5	-4.8
2253	10/16/77	13.0	10.1	2.9
2283	10/19/77	9.0	11.1	-2.1
2297	10/21/77	13.8	10.7	3.1
2300	10/21/77	12.6	10.1	2.5
2359 *	10/28/77	13.6	10.1	3.5
2373 *	10/29/77	13.6	10.7	2.9
2444 **	10/28/77	4.6	9.0	-4.4
2462 **	3/02/78	21.3	15.2	6.1
2464 **	3/06/78	20.7	9.8	10.9
2465 **	3/15/78	17.6	15.2	2.4

* Identified on test reports as Non-Q.

**Identified on test reports as Info. tests for Field Engineering location Temporary Reactor Vessel Laydown area north of Warehouse #1.

J. F. Newgen

JFN/WLB/TRL/vmm

SB 04834

BCBE 2185

Bechtel Power Corporation

Interoffice Memorandum

To R. L. Castleberry

Date February 20, 1979

Subject Job 7220 Midland Project
Units 1 & 2
Consumers Power Co. NCR
M-01-5-9-012
BCBE-2185

From J. F. Newgen

Of Construction

At Midland, MI

Copies to

L. A. Dreisbach
W. L. Barclay

Subject Consumers Power Co. NCR Section 13C recommends a Project Engineering/Geo Tech evaluation of the acceptability of the material found exceeding the 2% tolerance difference allowed for actual moisture content as to optimum moisture content. Attached is a list of non-conforming tests along with test reports, please forward this evaluation when complete

J. F. Newgen

JFN/WLB/vmm

Attachments

SB 04835

NCR SERIAL NO: M-01-5-9-G12
DATE: 2-6-79
DATE OF REV: NA
FILE NO: 16.3.1, 16.3.4, 16.3.6

12. "AS IS" NONCONFORMING CONDITION VERSUS "AS REQUIRED" CONDITION WITH REFS:

(Contd from Page 1)

Contrary to these requirements, the following tests had moisture content in excess of the plus or minus two percentage points of optimum moisture content.

Test No MD	Date Test Taken	Moisture Content (%)	Optimum Moisture Content (%)	Difference MC - OMC Positive
2471	3-29-78	10.8	8.2	+ 2.6
2473	3-29-78	12.3	8.2	+ 4.1
2476	3-31-78	14.2	9.1	+ 5.1
2479	4-01-78	11.6	9.1	+ 2.5
2482	4-01-78	13.5	9.1	+ 4.4
2486	4-08-78	11.8	8.2	+ 3.6
2488	4-08-78	13.8	8.2	+ 5.6
2492	4-08-78	11.5	8.2	+ 3.3
2496	4-10-78	11.0	8.2	+ 2.8
2497	4-11-78	12.7	8.2	+ 4.5
2498	4-11-78	13.5	8.2	+ 5.3
2499	4-11-78	12.1	8.2	+ 3.9
2501	4-12-78	13.2	8.2	+ 5.0
2506	4-17-78	13.5	11.1	+ 2.4
2507	4-17-78	14.1	11.1	+ 3.0
2508	4-17-78	13.3	11.1	+ 2.2
2509	4-17-78	14.5	11.1	+ 3.4
2510	4-17-78	13.2	11.1	+ 2.1
2517	4-19-78	14.2	11.1	+ 3.1
2522	4-19-78	14.6	11.1	+ 3.5
2531	4-27-78	12.9	10.1	+ 2.8
2537	4-28-78	14.0	11.1	+ 3.9
2539	6-20-78	15.6	13.4	+ 2.2
2540	6-21-78	15.5	13.4	+ 2.1
2547	6-23-78	15.9	13.4	+ 2.5
2549	6-29-78	14.1	10.1	+ 4.0
2550	6-29-78	12.9	10.1	+ 2.8
2954	7-01-78	13.6	10.1	+ 3.5
2956	7-03-78	12.8	10.1	+ 2.7
2957	7-03-78	12.4	10.1	+ 2.3
2958	7-03-78	15.0	10.1	+ 4.9
2959	7-03-78	12.7	10.1	+ 2.6
2962	7-05-78	12.5	10.1	+ 2.4
2965	7-06-78	12.9	11.1	+ 2.8
2979	7-11-78	12.9	10.1	+ 2.8
2992	7-17-78	14.3	9.1	+ 3.2
3000	7-18-78	13.1	11.1	+ 3.0
3013	7-21-78	13.1	10.1	+ 3.0
3026	7-25-78	17.2	10.1	+ [illegible]
3028	7-25-78	16.9	11.8	+ [illegible]
			11.8	

SB 04836

NCR SERIAL NO: M-01-5-9-012
DATE: 2-6-79
DATE OF REV: NA
FILE NO: 16.3.1, 16.3.4, 16.3.6

12. "AS IS" NONCONFORMING CONDITION VERSUS "AS REQUIRED" CONDITION WITH REFS:

(Contd)

Test No MD	Date Test Taken	Moisture Content (%)	Optimum Moisture Content (%)	Difference MC - OMC Positive
3030 ✓	7-25-78	13.0	10.1	+ 2.9
3034 ✓	7-26-78	13.3	11.1	+ 2.2
3035 —	7-26-78	15.2	11.1	+ 4.1
3037 ✓	7-27-78	12.7	10.1	+ 2.6
3042	7-28-78	14.5	11.1	+ 3.4
3043 ✓	7-28-78	14.6	11.1	+ 3.5
3045 ✓	7-29-78	12.7	10.1	+ 2.6
3059 ✓	8-03-78	15.0	10.1	+ 4.9
3060 ✓	8-03-78	13.1	10.1	+ 3.0
3068 ✓	8-05-78	12.7	10.1	+ 2.6
3070 ✓	8-07-78	13.1	10.1	+ 3.0
3071 ✓	8-07-78	12.3	10.1	+ 2.2
3074 ✓	8-07-78	12.3	10.1	+ 2.2
3075	8-08-78	13.8	10.1	+ 3.7
3076B ✓	8-08-78	14.2	10.1	+ 4.1
3082	8-10-78	14.0	10.1	+ 3.9
3087 —	8-11-78	14.5	10.1	+ 4.4
3088 ✓	8-12-78	13.1	10.1	+ 3.0
3100	8-16-78	14.8	10.1	+ 4.7
3103	8-17-78	14.2	10.1	+ 4.1
3105 —	8-17-78	12.7	10.1	+ 2.6
3106 ✓	8-17-78	12.8	10.1	+ 2.7
3107 ✓	8-17-78	14.3	10.1	+ 4.2
3108 ✓	8-17-78	13.7	10.1	+ 3.6
3109 ✓	8-17-78	14.3	10.1	+ 4.2
3110 —	8-17-78	13.9	10.1	+ 3.8
3111	8-17-78	17.6	10.1	+ 7.5
3112 ✓	8-17-78	12.5	10.1	+ 2.4
3114 ✓	8-18-78	13.0	10.1	+ 2.9
3115 ✓	8-18-78	12.5	10.1	+ 2.4
3130 ✓	8-28-78	13.1	10.1	+ 3.0
3132 ✓	8-28-78	13.9	10.1	+ 3.8
3134 ✓	8-29-78	13.1	10.1	+ 3.0
3141 ✓	9-01-78	12.7	10.1	+ 2.6
3143 ✓	9-01-78	14.7	10.1	+ 4.6
3144 ✓	9-01-78	12.9	10.1	+ 2.8
3145 ✓	9-01-78	15.9	10.1	+ 5.8
3156 ✓	9-07-78	12.2	10.1	- 2.1
3158 ✓	9-08-78	13.0	10.1	+ 2.9
[illegible] ✓	9-12-78	16.5	10.1	+ 6.4
2561 ✓	9-30-78	13.5	11.3	+ 2.2
2563 ✓	9-30-78	10.0	7.5	+ 2.5

NCR SERIAL NO: M-01-5-9-012
DATE: 2-6-79
DATE OF REV: NA
FILE NO: 16.3.1, 16.3.4, 16.3.6

13. QA RECOMMENDATION FOR PART CA:

(Contd from Page 1)

b) Send Project Engineering/Geo Tech all the test reports from the test failures in this NCR and any found in the review a) above.

c) Receive a Project Engineering/Geo Tech evaluation of the acceptability of the material these test failures represent and any found in the review a) above.

Test No. MD	Date Test Taken	Moisture Content %	Optimum Moisture Content %	Difference MC-OMC
2565	9/30/78	10.0	7.5	+2.5
2568	9/30/78	10.7	8.0	+2.7
2598	10/02/78	12.3	8.9	+3.4
2733 A	10/07/78	10.5	7.6	+2.9
2749 A	10/08/78	10.4	7.4	+3.0
2749 B	10/08/78	9.8	7.4	+2.4
2754 A	10/08/78	10.2	7.4	+2.8
2755 B	10/08/78	10.3	7.7	+2.6
2760 B	10/08/78	8.7	6.4	+2.3
2763 A	10/09/78	10.1	7.7	+2.4
2834 B	10/10/78	9.6	6.5	+3.1
2835	10/10/78	10.0	7.9	+2.1
2843 A	10/10/78	9.1	7.0	+2.1
2848 A	10/10/78	11.1	7.3	+3.8
2848 B	10/10/78	11.4	7.3	+4.1
2856 B	10/10/78	11.0	8.2	+2.8
2878	10/11/78	11.6	8.6	+3.0
2881	10/11/78	10.3	7.5	+2.8
2888	10/12/78	9.4	7.0	+2.4
2889	10/12/78	12.4	7.1	+5.3
2904	10/12/78	10.2	7.9	+2.3
2910	10/12/78	12.8	8.2	+4.6
2925	10/13/78	12.5	9.3	+3.2
2926	10/13/78	11.2	7.8	+3.4
2935	10/14/78	11.9	8.8	+3.1
2977	10/17/78	11.1	8.4	+2.7
3017	10/19/78	11.1	8.6	+2.5
3026	10/20/78	11.8	8.1	+3.7
2978	10/17/78	11.6	8.0	+3.6
3035	10/21/78	11.7	8.1	+3.6
3036	10/21/78	10.9	8.1	+2.8
3040	10/21/78	9.6	7.3	+2.3
3056	10/23/78	10.8	8.3	+2.5
3066	10/24/78	9.0	6.8	+2.2
3078	10/26/78	8.9	7.4	+2.5
3139	11/01/78	9.8	7.6	+2.2
3160	11/04/78	9.6	7.1	+2.5
3164	11/04/78	10.1	7.9	+2.2
3165	11/06/78	10.0	7.9	+2.1
3213	11/20/78	10.4	6.9	+3.5

SB- 04839

S. Keiler

BECHTEL

NONCONFORMANCE REPORT

S/U - NON TESTABLE UNIT

SB 04963

1. PROJECT NAME: MIDLAND

JOB NO.: 07220

19. NO. 2307

20. PAGE 1 OF 2

2. UNIT(S): COMMON

3. DRAWING/PART NO.: N/A

REV: N/A

4. ITEM DESCRIPTION: YARD AREA SOILS TESTS

5. ITEM LOCATION: VARIOUS YARD AREAS

6. P.O. OR SPEC NO.: N/A

7. SERIAL NO.: N/A

8. REPLACEMENT PART P/N N/A REV N/A SER NO. N/A

9. SOURCE: CONSTRUCTION

10. CONTRACTOR/SUPPLIER

11. INSPECTION CRITERIA (X) DWG (X) SPEC ( ) OTHER

IR NO. SPEC. C-211 (6) DWG. C-45 (3)

12. ASME AUTHORIZED INSPECTION REQ'D ( ) YES (X) NO

13. SKETCH ATTACHED ( ) YES (X) NO

14. Discovered During ( ) Rec'g (X) Const ( ) Test

15. Equip Furnished By ( ) Client ( ) Eng (X) FLD

16. NONCONFORMING CONDITION: SPEC. C-211 REV. 6 SECTION 8.10 STATES IN PART... "ALL FAILING TESTS ARE TO BE REWORKED UNTIL THE SPECIFIED DENSITY AND/OR MOISTURE IS OBTAINED. CONTRARY TO THE ABOVE THE FOLLOWING TESTS HAVE FAILED TO MEET SPECIFICATION BECAUSE OF LOW DENSITIES OR MOISTURE CONTENTS OUTSIDE THE ± 2% OPTIMUM MOISTURE RANGE.

CONTINUED ON PG. 2.

17. REPORTED BY: [signature] DATE: 6/25/79

18. VALIDATED BY: B. Barclay DATE: 6-27-79

21. ROUTING: ( ) TO FIELD ENGINEERING ( ) TO OTHERS (SPECIFY)

22. ( ) Field Engineering Disposition ( ) Field Engineering Recommended Disposition to Project Engineering

23. PROJECT ENGINEERING DISPOSITION

24. DISPOSITION CONCURRENCE

rework	reject	repair	use as is

PROJECT FIELD ENGINEER DATE

PROJECT ENGINEER DATE

PROJ CONSTR QC ENGINEER DATE

AUTHORIZED INSPECTOR DATE

25. DISPOSITION RESULTS

26. QC ACCEPTANCE

QC ENGINEER DATE

AUTHORIZED INSPECTOR DATE

SB 0496.1

BLOCK 16 CONTINUED

TEST NO.	REASON FOR FAILURE	TEST NO.	REASON FOR FAILURE
DO163	93.4% COMPACTION	RO308	77.0% COMPACTION
DO164A	94.6% "	RO319	63.0% "
DO166A	92.9% "	RO322	67.0% "
DO166B	93.6% "	RO366	50.0% "
DO164B	94.6% "	RO367	38.0% "
DO165B	94.5% "	RO368	74.0% "
DO515	12.6% MOISTURE	RO369	58.0% "
DO518	13.4% "	RO370	51.0% "
DO523	50.0% COMPACTION	RO499	54.2% "
DO520	14.9% MOISTURE	RO532	73.0% "
DO909	75.0% COMPACTION	RO604	77.5% "
D1546	3026 CLEAR 3046 67.0% "	RO607	60.2% "
D2249	/ / 9.7% MOISTURE	RO737	41.9% "
2253	13.0% "	RO739	70.6% "
3029	3014 3003 2964 100.5 9.6% 8.4% OPT	RO741	77.8% "
RO019	49.0% COMPACTION	RO744	56.2% "
RO015	75.4% "	RO746	54.9% "
RO016	57.7% "	RO785	69.3% "
RO017	66.7% "	RO843	66.8% "
RO020	50.2% "	RO920	79.8% "
RO022	54.5% "	2844	72.9% "
RO024	71.1% "	2862	78.1% "
RO059	71.9% "	2901	77.8% "
RO214	65.0% "	2964	79.6% "
RO255	44.0% "		

J. BRULTE

HOLD FOR ENG. DISPOSITION, "Q" LISTED 1.002, NO HOLD TAGS APPLIED.

11C51 [illegible]

U = CLAY

INFORMATION CONCERNING FAILING TESTS

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TEST NO.	DATE	EAST	SOUTH	ELEV.	MOISTURE CONTENT	IN-SITU DRY DENSITY	CLASSIFICATION
? D0017	08/21/74 320 10' R WALL			0585	0006	000115	F005
D0163	06/09/75	367	4710 Q	0588	0004	000111	F024 - 93.4% Com[illegible]
D0164A	06/10/75 - 26'E/8.7 & ℄ "A"		Q	0589	0005	000113	F024 - 94.6% (S[illegible]
D0166A	06/10/75 - 30'N/A" & 18'E of 7.4		Q	0588	0005	000111	F024 - 93.9% (C[illegible]
D0164B	06/10/75 - 26'E/8.7 & ℄ of "A"		Q	0589	0007	000113	F024 - 94.6% (S[illegible]
D0165B	06/10/75 - ℄ 8.7 & 25'N of "A"		Q	0588	0005	000113	F024 - 94.5% (Test[illegible]
D0166B	06/10/75 - 30'N/A" & 18'E/7.4		Q	0588	0005	000112	F024 - 93.6% (Test[illegible]
D0178	07/02/75	306	4686 Q	0592	0017	000102 cleared by D0179	B170 - 92% Comp
D0202	07/08/75	365	4674 Q	0595	0014	000110 [illegible]-324	B170 - 13.6% (16.7
D0201	07/08/75	250	4692 Q	0593	0018	000103 cleared by D0203	B170 - 92% Comp
D0309	10/02/75	186	4972 NON Q	0602	0009	000103	F030
† D0372	10/18/75 - 310° C#1/55' off WALL		NON Q	0604	0018	000114	B255
D0373	10/18/75 - 327° C#1/26' off WALL		Q	0603	0013	000124 soils	B260 - 13.3% (10.[illegible]
D0371	10/18/75 - 345° C#1/46' off CONT.		Q	0606	0013	000127 removed	B260 - 12.4% (10.[illegible]
D0370	10/18/75 - 355° C#1/22' off CONT.		Q	0604	0012	000131 from [illegible]	B263 - 11.5% (9.[illegible]
D0374	10/18/75 - 327° C#1/26' off WALL		Q	0603	0012	000112	B262 - 90% Com[illegible]
D0512	11/13/75	490	4715 Q	0610	0014	000125	B261 - 14.2% (9.8% [illegible]
D0513	11/13/75	466	4667 NON Q	0615	0014	000125	B261
D0516	11/14/75	396	4625 NON Q	0618	0013	000128	B261
D0515	11/14/75 - 105' N/A line/℄ 7.6 line		Q	0621	0013	000127	B261 - 12.7% (9.8[illegible]
D0518	11/14/75	488	4705 Q	0613	0013	000121	B261 - 12.4% (9.8[illegible]
D0517	11/14/75	472	4650 NON Q	0616	0013	000128	B261
D0526	11/17/75	351	4625 Q	0624	0015	000118	B261 - 16.4% (9.8%) [illegible]
D0525	11/17/75	270	4635 Q	0627	0015	000124	B261 - 15.2% (9.8[illegible]
D0524	11/17/75	214	4620 Q	0630	0014	000123	B261 - 14.4% (9.8[illegible]
D0527	11/17/75	470	4655 NON Q	0619	0015	000124	B261
D0523	11/14/75	340	5036 Q	0614	0007	000119	F040 - 50% Comp
D0520	11/14/75	341	5121 Q	0614	0015	000123	B262 - 14.9% (11.[illegible]
D0532	11/18/75	319	4602 Q	0628	0017	000112	B220 - 16.6% (13.7
D0534	11/18/75	351	4642 Q	0624	0017	000116	B220 - 16.9% (13.7
D0539	11/19/75	492	4713 Q	0615	0012	000123	B261 - 11.9% (9.8%)
D0537	11/18/75	526	4825 NON Q	0610	0015	000121	B261
D0536	11/18/75	490	4715 Q	0615	0015	000120	B261 - 15.1% (9.8%)
D0535	11/18/75	451	4675 Q	0620	0015	000124	B261 - 14.8% (9.8%)
D0531	11/18/75	220	4622 Q	0632	0014	000125	B261 - 14.8% (9.8%)
D0530	11/18/75	146	4632 Q	0633	0014	000123	B261 - 13.9% (9.8%)
D0533	11/18/75	351	4623 Q	0624	0015	000122	B261 - 14.5% (9.8%)
D0873	08/11/76	234	4592 Q	0630	0016	000113 cleared by D0875	B200 - 15.7% (13.4
D0909	08/19/76	515	4963 Q	0602	0009	000105	F043 - 75% Comp.
D0938	08/24/76	52	5000 NON Q	0610	0010	000124	B279
D1032	09/03/76	585	4878 NON Q	0620	0013	000121	B271
D1050	09/08/76	518	5064 NON Q	0603	0004	000102	F037
D1116	10/06/76	479	5048 NON Q	0610	0006	000104	F041
D1153	10/21/76 - E. 527/S. 4900 - NON Q			0624	0011	000102	F043
D1155	10/21/76 - E. 527/S. 4898 - NON Q			0622	0010	000105	F043
D1194	11/02/76 ? 5' W of 2/S. of Sonovid - NON Q			0596	0004	000117	F058
D1191	11/03/76 ? 5' W of 3/S. of Sonovid - NON Q			0596	0007	000117	F058
D1321	05/09/77 25' N/S [illegible]		NON-Q	0604	0011	000117	B262
D1337	05/17/77	294	5236 NON-Q	0609	0012	000126	B278
D1398	06/03/77	414	5305 NON-Q	0619	0011	000123	B277
D1393	06/03/77	37	5067 NON-Q	0626	0011	000116	B277
D1404	06/03/77 5' N/N wall Stm Tun/24' w/1.0		NON-Q	0623	0010	000116	B277
D1415	06/07/77 5' S/N wall Stm Tun/22' w/1.0		NON-Q	0623	0010	000121	B277
D1498	06/15/77 8'E/[illegible]/6'E/E Stm wall		NON-Q	0617	0015	000112	B269
D1491	06/15/77 8'E/E Stm Tun wall/46'N/N Stm		NON-Q	0618	0012	000113	B269
D1509	06/16/77 20'N/[illegible]/E/E Stm Tun wall		NON-Q	0622	0013	000114	B278
D1546	06/21/77 [illegible]			0616	0006	000102	F055 - [illegible]

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(26)

SB 278 865

TEST #	DATE	C.	S.	ELEV.	CONTENT	DENSITY	CLASSIFICATION
D1871	08/15/77	177	5298 NON Q	0610	0007	000102	R055
D1875	08/16/77	181	5312 NON Q	0610	0007	000105	R055
? D1897	08/16/77?	200'S/Q", 100'W of MH812		0626	0007	000101	R055
D1949	08/29/77	20'N/K line/4'E/E stm tun	NON Q	0627	0007	000099	R055
D2008	09/12/77	W.1'/17'N of K line stm tun	NON Q	0621	0020	000113	E270
D2079	09/22/77	R.0.4 FA/W. Edge of Footing	ADD'N BLD.		0013	000128	E269
D2078	09/22/77	R.0.4 FA/E Edge of Footing	ADD'N BLD.		0017	000119	E270
D2176	10/05/77	W.41'-15'S/FF W. of stm	NON Q	0617	0018	000115	E277
D2249	10/15/77	324	5155 Q	0630	0010	000119	E255 -9.7% (14.5%)
D2253	10/16/77	280	5163 Q	0632	0013	000125	E271 -3.0% (10.1
D2359	10/28/77	E.1 10'N/FE/E of stm	NON Q	0632	0014	000120	E271
D2373	10/29/77	104	5406 NON Q	0630	0014	000127	E276
D2380	10/31/77	40'N/Q line/5'E/W stm tun	NON Q	0631	0012	000104	R055
D2461	12/29/77	15' off SW corner of stm tun	NON Q	0632	0011	000116	E270
D3029	07/25/78	210	5165 Q	0633	0016	000112	E271?
D3160	09/20/78	30	4680 NON Q	0630	0018	000116	E271
R0019	09/24/74	99	4814 Q	0584	0008	000111	R011 -49.0% Comp
R0015	09/27/74	128	4770 Q	0586	0011	000113 Cleared by MDR 26	R015 -75.4% Comp
R0016	09/27/74	119	4776 Q	0587	0009	000109 MDR 27	R015 -57.7% Comp
R0017	09/27/74	96	4837 Q	0587	0013	000111 MDR 28	R015 -66.7% Comp
R0020	09/24/74	111	4867 Q	0584	0007	000111	R011 -50.2% Comp
R0022	09/26/74	118	4876 Q	0586	0013	000108 Cleared by MDR 18	R015 -54.5% Comp
R0024	09/27/74	111	4867 Q	0586	0014	000112 "	R015 -71.1% Comp
R0059	12/13/74	330	4711 Q	0583	0013	000113	R016 -71.9% Comp
R0214	09/12/75	3'N/A line @ 7.5 line	Q	0597	0007	000112	R024 -65% Comp
R0255	10/01/75	10'W/5.3 line/2'S/HK line	Q	0593	0009	000108	R024 -44% Comp.
R0308	10/23/75	224	4872 Q	0602	0009	000123	R040 -77% Comp
R0319	10/28/75	199	4878 Q Aux.	0608	0008	000121	R040 -63% Comp
R0322	10/29/75	133	4750 Q	0603	0008	000122	R040 -67% Comp
R0365	06/15/76	185	4675 Q	0611	0007	000118	R044 -50% Comp
R0367	06/16/76	184	4676 Q	0611	0009	000116	R044 -38% Comp
R0368	06/16/76	194	4676 Q	0610	0008	000132	R044 -74% Comp
R0369	06/16/76	30'W/4.55 159 2'S/A	4721 Q	0608	0008	000119	R044 -58% Comp
R0370	06/16/76	8'N/AA? 183	5'E/4.55 0 Q	0610	0009	000118	R044 -51% Comp
R0404	06/28/76	460	4839 Q	0613	0008	000120	R044 -65% Comp
R0468	07/23/76	103	5034 NON Q	0600	0006	000119	R052
R0466	07/23/76	108	5034 NON Q	0600	0007	000121	R052
R0467	07/23/76	98	5034 NON Q	0602	0008	000118	R052
R0469	07/23/76	100	5034 NON Q	0600	0009	000122	R052
R0470	07/23/76	108	5034 NON Q	0602	0010	000119	R052
R0496	08/11/76	428	4769 Q	0623	0008	000118	R045 -54.2% Comp
R0532	09/02/76	422	4777 Q	0633	0005	000121	R054 -73% Comp
R0535	09/02/76	30'S of HA line/30' off Wall	Q	0622	0009	000119	R054 -59% Comp
R0604	10/04/76	231	5043 Q	0605	0006	000116	R042 -77.5% Comp
R0607	10/08/76	+168	5011 Q	0611	0006	000100 voided	R037 -46.2% Comp
? R0608	10/08/76	5'N. Elect Manhole Q		0634	0008	000097	R037 -46.3% Comp
R0625	10/12/76	123	5041 NON Q	0611	0006	000117	R045
R0667	11/11/76	46	4936 NON Q	0628	0007	000120	R054
R0664	11/11/76	46	4916	0629	0005	000121	R054
R0663	11/11/76	46	4936	0628	0005	000118	R054
R0682	11/24/76	46	4951	0630	0007	000120	R054
R0680	11/23/76	46	4951	0630	0003	000119	R054
R0688	11/24/76	46	4948	0630	0006	000121	R054
R0736	03/18/77	685	5098 NON Q	0601	0005	000122	R054
R0737	03/18/77	758	5053 Q	0601	0007	000116	R054 -41.9% Comp
R0738	03/18/77	685	5098 NON Q	0601	0006	000121	R054
R0739	03/18/77	758	5053 Q	0601	0007	000120	R054 -73.2% Comp
R0734	03/17/77	30'S/S end of...	NON Q	0599	0005	000114	R059
R0740	03/18/77	685	5098 NON Q	0601	0006	000120	R054
R0741	03/21/77	758	5053 Q	0601	0005	000122	R054 -77.8% Comp

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SB 04566

TEST#	DATE	E.	D.	ELEV.	CONTENT	DENSITY	CLASSIFICATIO[N]
F0744	03/21/77	588	5114Q	0599	0005	000118	F054 56.2% Co
F0746	03/21/77	588	5114Q	0599	0005	000118	F054 54.9% Co
F0768	03/30/77	42'N/7line/30" off wall TWI	Q	0608	0005	000120	F054 66.9% Co
F0785	04/07/77	18'S/Q line between 96' Ope	Q	0607	0006	000120	F054 [illegible]
F0799	04/12/77	87	5001 NONQ	0629	0005	000122	F059
F0826	04/19/77	86'W/12line/2'S/Q1 line	NONQ	0613	0006	000120	F061
F0843	04/28/77	721	5001Q	0612	0005	000120	F061 66.8% C
F0845	04/29/77	8'W/E TWI wall/30'N	5001 NONQ	0612	0005	000120	F061
F0869	05/13/77	428	5001 NONQ	0624	0003	000118	F061
F0914	05/24/77	2'N/North Turn wall/25'	[illegible]	0615	0009	000126	B262
F0922	05/26/77	358	5001 NONQ	0604	0008	000121	F061
F0920	05/25/77	* 634	5001Q	0620	0003	000122	F061 79.8% C
F0925	05/27/77	11	5001 NONQ	0617	0011	000115	B278
F0938	06/08/77	145	5001 NONQ	0615	0005	000118	F061
F0993	06/25/77	428	5001 NONQ	0624	0003	000118	F061
F1146	08/31/77	248	5001 NONQ	0624	0005	000120	F061
F1148	08/31/77	248	5001	0624	0005	000119	F061
F1149	09/01/77	248	5001	0621	0006	000121	F061
F1150	09/01/77	248	5001	0621	0005	000121	F061
F1252	10/07/77	41	5001 (NONQ)	0623	0004	000121	F061
F1477A	09/27/78	550	4375 NONQ	0629	0012	000110	F066
F1477B	09/27/78	550	4375 NONQ	0629	0006	000118	F066
F1478B	09/28/78	160	4280 NONQ	0629	0005	000120	F067
F1478A	09/28/78	160	4280 NONQ	0629	0012	000111	F067
F1479A	09/28/78	140	4290 NONQ	0631	0010	000109	F068
F1480B	09/28/78	520	4300 NONQ	0632	0005	000121	F069
F1480A	09/28/78	520	4300 NONQ	0632	0007	000115	F069
F1481A	09/29/78	475	4275 NONQ	0632	0008	000117	F070
F1482A	09/29/78	250	4280 NONQ	0630	0008	000116	F071
F1483A	09/29/78	160	4280 NONQ	0631	0006	000115	F072
F3057	08/03/78	320	4630 Q	0624	0006	000109	F065 71.0% Co
2500	09/27/78	550	4375 NONQ	0629	0008	000118	F066 ZONE
2525	09/28/78	160	4280 NONQ	0629	0005	000120	F067
2538	09/28/78	520	4300 NONQ	0632	0005	000121	F069
2549	09/29/78	E1000	4700 NON Q	0631	0014	000119	U001
2562	09/30/78	E2000	4690 NON Q	0631	0011	000126	U003 ZONE
2565	09/30/78	40	4720 NONQ	0631	0010	000129	U005
2568	09/30/78	40	4720	0633	0011	000126	U006
2598	10/02/78	40	4720	0633	0012	000118	U007
2608	10/02/78	480	5260 NONQ	0619	0005	000119	F080
2609	10/02/78	300	4280 NONQ	0629	0006	000116	F081
2612	10/02/78	120	4620Q	0626	0004	000119	F084
2614	10/02/78	480	5260 NONQ	0621	0005	000118	F086
2617	10/03/78	80	4600 NONQ	0623	0006	000113	F088
2622	10/03/78	200	4560Q	0624	0005	000118	F089
2623	10/03/78	470	5250 NONQ	0620	0006	000120	F090
2625	10/03/78	120	4620Q	0627	0005	000118	F091
2626	10/03/78	480	5260 NONQ	0623	0004	000118	F092
2627	10/03/78	80	4600 NONQ	0622	0006	000119	F093 ZON[E]
2628	10/03/78	180	4585Q	0617	0005	000116	F094
2631	10/04/78	37	4587 NONQ	0627	0009	000119	F095
2639	10/04/78	20	4587 NONQ	0627	0005	000119	F098
2647	10/04/78	80	4600 NONQ	0622	0008	000119	F103
2648	10/04/78	190	4575Q	0620	0006	000118	F104
2650	10/04/78	330	4280 NONQ	0629	0009	000118	F106
2677	10/05/78	475	5255 NONQ	0629	0004	000119	F115
2678	10/05/78	190	4575Q	0623	0007	000120	F116
2680	10/05/78	50	4600 NONQ	0623	0005	000121	F118
2681	10/05/78	30	4600 NONQ	0623	0006	000121	F119
2683	10/06/78	475	5255 NONQ	0630	0005	000120	F120

Missing Pg. on [illegible]

SB D[illegible]SG7

[illegible]	DATE	E.	S.	ELEV.	WATER	DENSITY	CLASSIFICAT	
2684	10/06/78	190	4525 Q	0624	0005	000119	F121	
2717	10/06/78	50	4600 NON Q	0625	0005	000119	F128	
2718	10/06/78	30	4600 NON Q	0625	0005	000119	F129	
2720	10/06/78	230	4575 Q	0628	0004	000119	F131	
2721	10/06/78	475	5255 NON Q	0630	0006	000119	F132	
2722	10/06/78	220	4610 Q	0628	0004	000118	F133	
2723	10/07/78	190	4575 Q	0626	0005	000116	F134	— STRUC
2729B	10/07/78	W? W4	4603 NON Q	0625	0010	000123	U011	
2730A	10/07/78	40	4603 NON Q	0625	0010	000126	U012	
2730B	10/07/78	44	4603 NON Q	0625	0010	000129	U012	
2731	10/07/78	640	4560 Q	0631	0005	000118	F137	— STRUC
2732A	10/07/78	? 2	4587 NON Q	0625	0010	000127	U013	
2732B	10/07/78	2	4587 NON Q	0625	0010	000130	U013	
2745A	10/08/78	0	4563 NON Q	0625	0009	000117	U016	
2745B	10/08/78	W? W4	4563 NON Q	0625	0009	000115	U016	
2746B	10/08/78	49	4563 NON Q	0625	0010	000111	U017	
2747B	10/08/78	49	4579	0625	0009	000124	U018	
2747A	10/08/78	45	4579	0625	0009	000118	U018	
2748B	10/08/78	W ?W4	4579 NON Q	0625	0009	000128	U019	
2749A	10/08/78	W? W5	4595 NON Q	0625	0010	000127	U020	
2749B	10/08/78	0	4595 NON Q	0625	0010	000127	U020	
2752B	10/08/78	46	4595 NON Q	0625	0009	000121	U021	
2754A	10/08/78	42	4611	0625	0010	000131	U022	
2754B	10/08/78	42	4611	0625	0009	000130	U022	
2756	10/08/78	220	4560 Q	0630	0005	000117	F143	— STRUC
2763A	10/09/78	46	4603 NON Q	0626	0008	000131	U028	
2764A	10/09/78	? 0	4603 NON Q	0626	0009	000128	U029	
2792A	10/09/78	46	4571 NON Q	0626	0009	000131	U031	
2820	10/09/78	160	4510 NON Q	0630	0009	000129	U033	
2827B	10/09/78	42	4611	0627	0009	000123	U034	
2827A	10/09/78	42	4611	0627	0009	000121	U034	
2828B	10/09/78	? 2	4611 NON Q	0627	0010	000125	U035	
2834B	10/10/78	W? W4	4587 NON Q	0627	0010	000129	U036	
2839B	10/10/78	48	4587 NON Q	0627	0009	000107	U038	
2841A	10/10/78	? 0	4571 NON Q	0627	0009	000128	U039	
2844	10/10/78	190	5025 Q	0630	0007	000117	F152	— STRUC
2847B	10/10/78	W? W3	4595 NON Q	0628	0009	000129	U041	
2847A	10/10/78	? 0	4595 NON Q	0628	0008	000124	U041	
2848B	10/10/78	48	4595 NON Q	0628	0011	000126	U042	
2848A	10/10/78	44	4595	0628	0011	000128	U042	
2852A	10/10/78	46	4579	0628	0009	000128	U044	
2852B	10/10/78	44	4579	0628	0009	000127	U044	
2853	10/10/78	150	4575 Q	0631	0004	000120	F153	— STRUC
2855A	10/10/78	W? W2	4553 NON Q	0628	0009	000128	U046	
2856A	10/10/78	46	4553 NON Q	0628	0010	000128	U047	
2856B	10/10/78	46	4553	0628	0011	000129	U047	
2857	10/10/78	155	4640 Q	0627	0005	000117	F154	STRUC
2862	10/11/78	200	5050 Q	0631	0005	000119	F156	STRUC
2877	10/11/78	230	4630 Q	0627	0006	000117	F162	STRUC
2878	10/11/78	20	4620 NON Q	0629	0012	000127	U050	
2883	10/11/78	220	4626 Q	0628	0005	000120	F164	— STRU
2889	10/12/78	550	4400 NON Q	0632	0012	000131	U053	
2901	10/12/78	235	4560 Q	0634	0006	000119	F168	— STRU
2904	10/12/78	28	4555 NON Q	0630	0010	000128	U054	
2910	10/12/78	? 0	4603 NON Q	0631	0013	000128	U055	
2913	10/12/78	235	4610 Q	0631	0006	000117	F174	STRU
2919	10/13/78	150	4575 Q	0631	0005	000119	F176	STRU
2920	10/13/78	230	4620 Q	0630	0004	000119	F177	STRU
2925	10/13/78	W? W5	4585 NON Q	0631	0013	000124	U058	
2931	10/13/78	230	4620 Q	0634	0007	000118	[illegible]	— STRU

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TEST #	DATE	E.	S.	ELEV.	WATER	DENSITY	CLASSIFICATION	
2946	10/14/78	140	4610 Q	0629	0005	000119	F189	STRU
2961	10/16/78	705	4485 NONQ	0632	0004	000118	F196	
2964	10/17/78	310	4615 Q	0628	0006	000[illegible]	F197	
3003	10/18/78	250	4275 NONQ	0631	0007	00[illegible]119	F202	
3035	10/21/78	925	4675 NONQ	0622	0012	000124	U068	
3036	10/21/78	925	4650 NONQ	0622	0011	000116	U068	
3054	10/23/78	940	4680 NONQ	0625	0010	000128	U074	
3078	10/26/78	925	4595	0630	0009	000132	U079	
3087	10/27/78	935	4700	0631	0009	000131	U080	
3105	10/28/78	283	4440 NONQ	0630	0004	000119	F234	— STRUC.
3110	10/30/78	65	4665 NONQ	0632	0008	000131	U082	
3118	10/30/78	280	4640 Q	0628	0005	000120	F239	— STRUC
3120	10/31/78	40	4670 NONQ	0631	0008	000131	U085	
3123	10/31/78	40	4670	0631	0008	000131	U085	
3136	11/01/78	940	4680	0633	0010	000128	U087	
3213	11/20/78	W? W5	4400 NINQ	0634	0010	000126	U097	

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TOTAL: 253

SB C4563

NCIC # 2

INFORMATION CONCERNING FAILING TESTS

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C = CLAY

TEST NO.	DATE	EAST	SOUTH	ELEV.	MOISTURE CONTENT	IN-SITU DRY DENSITY	CLASSIFICA	
D0017	09/21/74			0585	0006	000115	F005	
D0163	06/09/75	367	4710 Q	0588	0004	000111	FC24	
D0164A	06/10/75			0589	0005	000113	FC24	
D0166A	06/10/75			0588	0005	000111	FC24	
D0164B	06/10/75			0589	0007	000113	FC24	
D0165B	06/10/75			0588	0005	000113	FC24	
D0166B	06/10/75			0588	0005	000112	FC24	
D0178	07/02/75	306	4686 Q	0592	0017	000102	B170	
D0202	07/08/75 324' (D)	365	4674 Q	0595	0014	000110	B170	Low Moist.
D0201	07/08/75 324' (202)	250	4692 Q	0593	0018	000103	B170	Complete Ti
D0309	10/02/75	186	4972 NON Q	0602	0009	000103	F030	
D0372	10/18/75			0604	0018	000114	B255	
D0373	10/18/75			0603	0013	000124	B260	
D0371	10/18/75			0606	0013	000127	B260	
D0370	10/18/75			0604	0012	000131	B263	
D0374	10/18/75			0603	0012	000112	B262	
D0512	11/13/75 421'	490	4715 Q	0610	0014	000125	B261	High Moi
~~D0513~~	~~11/13/75 421'~~	[illegible]	~~4667 NON Q~~	~~0615~~	~~0014~~	~~000125~~	~~B261~~	"
D0516	11/14/75	396	4625 NON Q	0618	0013	000128	B261	
D0515	11/14/75			0621	0013	000127	B261	
D0518	11/14/75	488	4705 Q	0613	0013	000121	B261	
D0517	11/14/75	472	4650 NON Q	0616	0013	000128	B261	
D0526	11/17/75 421'	351	4625 Q	0624	0016	000118	B261	High Moi
D0525	11/17/75 421'	270	4635 Q	0627	0015	000124	B261	"
D0524	11/17/75 421'	214	4620 Q	0630	0014	000123	B261	"
~~D0527~~	~~11/17/75~~	[illegible]	~~4655 NON Q~~	[illegible]	~~0015~~	~~000124~~	~~B261~~	
D0523	11/14/75	340	5036 Q	0614	0007	000119	F040	
D0520	11/14/75	341	5121 Q	0614	0015	000123	B262	
D0532	11/18/75 421'	319	4602 Q	0628	0017	000112	B220	High Moi
D0534	11/18/75 421'	351	4642 Q	0624	0017	000116	B220	"
D0539	11/19/75 421'	492	4713 Q	0615	0012	000123	B261	"
~~D0537~~	~~11/18/75~~	~~526~~	~~4825 NON Q~~	~~0610~~	~~0015~~	~~000121~~	~~B261~~	
D0536	11/18/75 421'	490	4715 Q	0615	0015	000120	B261	High Moist,
D0535	11/18/75 421'	451	4675 Q	0620	0015	000124	B261	High Moi
D0531	11/18/75 421'	220	4622 Q	0632	0014	000125	B261	"
D0530	11/18/75 421'	146	4632 Q	0633	0014	000123	B261	"
D0533	11/18/75 421'	351	4623 Q	0624	0015	000122	B261	"
D0873	08/11/76	234	4592 Q	0630	0016	000113	B200	
D0909	08/19/76	515	4963 Q	0602	0009	000105	F043	
D0938	08/24/76	52	5000 NON Q	0610	0010	000124	B279	
D1032	09/03/76	585	4878 NON Q	0620	0013	000121	B271	
D1050	09/08/76	518	* 5064 NON Q	0603	0004	000102	FC37	
D1116	10/05/76	479	5048 NON Q	0610	0006	000104	F041	
D1153	10/21/76			0624	0011	000102	F043	
D1155	10/21/76			0622	0010	000105	F043	
D1194	11/02/76			0596	0004	000117	F058	
D1191	11/03/76			0596	0007	000117	F058	
D1321	05/09/77	? 1	0	0604	0011	000117	B262	
D1337	05/17/77	294	5236 NON-Q	0609	0012	000126	B278	
D1398	06/03/77	414	5305 NON-Q	0619	0011	000123	B277	
D1393	06/03/77	37	5067 NON-Q	0626	0011	000116	B277	
D1404	06/03/77			0623	0010	000116	B277	
D1415	06/07/77			0623	0010	000121	B277	
D1498	06/15/77			0617	0015	000112	B269	
D1491	06/15/77			0616	0012	000113	B269	
D1509	06/16/77			0622	0013	000114	B278	
D1546	06/21/77			0616	0006	000102		

NCR TOTAL = 17
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SEP 64870

TEST #	DATE	C.	S.	ELEV.	[illegible]	DENSITY	
D1871	08/15/77	177	5298 NON Q	0610	0007	000102	F055
D1875	08/16/77	181	5312 NON Q	0610	0007	000105	F055
D1897	08/16/77			0626	0007	000101	F055
D1949	08/29/77			0627	0007	000099	F055
D2008	09/12/77			0621	0020	000113	E270
D2079	09/22/77			0613	0013	000128	E269
D2078	09/22/77			0613	0017	000119	E270
D2176	10/05/77			0617	0018	000115	E277
D2249	10/15/77	324	5155 Q	0630	0010	000119	E255
D2253	10/16/77	280	5163 Q	0632	0013	000125	E271
D2359	10/28/77			0632	0014	000120	E271
D2373	10/29/77	104	5406 NON Q	0630	0014	000127	E276
D2380	10/31/77			0631	0012	000104	F055
D2461	12/29/77			0632	0011	000116	E270
D3029	07/25/78	210	5165 Q	0633	0016	000112	E271
D3160	09/20/78	30	4680 NON Q	0630	0018	000116	E271
R0019	09/24/74	99	4814 Q	0584	0008	000111	R011
R0015	09/27/74	128	4770 Q	0586	0011	000113	R015
R0016	09/27/74	119	4776 Q	0587	0009	000109	R015
R0017	09/27/74	96	4837 Q	0587	0013	000111	R015
R0020	09/24/74	111	4867 Q	0584	0007	000111	R011
R0022	09/26/74	118	4876 Q	0586	0013	000108	R015
R0024	09/27/74	111	4867 Q	0586	0014	000112	R015
R0059	12/13/74	330	4711 Q	0583	0013	000113	R016
R0214	09/12/75			0597	0007	000112	R024
R0255	10/01/75			0593	0009	000108	R024
R0308	10/23/75	224	4872 Q MX.	0602	0008	000123	R040
R0319	10/28/75	199	4878 Q MX.	0608	0008	000121	R040
R0322	10/29/75	133	4750 Q	0603	0008	000122	R040
R0366	06/15/76	185	4675 Q	0611	0007	000118	R044
R0367	06/16/76	184	4676 Q	0611	0009	000116	R044
R0368	06/16/76	194	4676 Q	0610	0008	000132	R044
R0369	06/16/76	? 159	4721 Q RECAP	0608	0008	000119	R044
R0370	06/16/76	? 183	0	0610	0009	000118	R044
R0404	06/28/76 510	460	4839 Q	0613	0008	000120	R044
R0468	07/23/76	103	5034 NON Q	0600	0008	000119	R052
R0466	07/23/76	108	5034 NON Q	0600	0007	000121	R052
R0467	07/23/76	98	5034 NON Q	0602	0008	000118	R052
R0469	07/23/76	100	5034 NON Q	0600	0009	000122	R052
R0470	07/23/76	108	5034 NON Q	0602	0010	000119	R052
R0498	08/11/76	428	4769 Q	0623	0008	000118	R045
R0532	09/02/76	422	4777 Q	0633	0005	000121	R054
R0535	09/02/76	? 1	0	0622	0009	000119	R054
R0604	10/04/76	231	5043 Q	0605	0006	000116	R042
R0607	10/08/76	+ 168	5011 Q	0611	0008	000100	R037
R0608	10/08/76			0634	0008	000097	R037
R0625	10/12/76	123	5041 NON Q	0611	0006	000117	R045
R0667	11/11/76	46	4936 NON Q	0626	0007	000120	R054
R0664	11/11/76	46	4916	0629	0005	000121	R054
R0663	11/11/76	46	4936	0628	0005	000118	R054
R0682	11/24/76	46	4951	0630	0007	000120	R054
R0680	11/23/76	46	4951	0630	0003	000119	R054
R0688	11/24/76	46	4948	0630	0006	000121	R054
R0736	03/18/77	685	5098 NON Q	0601	0005	000122	R054
R0737	03/18/77	758	5053 Q	0601	0007	000116	R054
R0738	03/18/77	685	5098 NON Q	0601	0006	000121	R054
R0739	03/18/77	758	5053 Q	0601	0007	000120	R054
R0734	03/17/77	? 1	0	0599	0005	000114	R059
R0740	03/18/77	685	5098 NON Q	0601	0006	000120	R054
R0741	03/21/77	758	5053 Q	0601	0005	000122	R054

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TEST #	DATE	E.	S.	ELEV.	H_2O CONTENT	DRY DENSITY	CLASSIFICATION	
F0744	03/21/77	588	5114Q	0599	0005	000118	F054	
F0746	03/21/77	588	5114Q	0599	0005	000118	F054	
F0768	03/30/77			0608	0005	000120	F054	
F0785	04/07/77	? 1	0	0607	0006	000120	F054	
F0799	04/12/77	87	5001 NONQ	0629	0005	000122	F059	
F0826	04/19/77			0613	0006	000120	F061	
F0843	04/28/77	721	5001Q	0612	0005	000120	F061	
F0845	04/29/77	? 1	5001	0612	0005	000120	F061	
F08[illegible]	05/13/77	428	5001 NONQ	0624	0003	000116	F061	
F0914	05/24/77	? 0	5001	0615	0009	000126	E262	
F0922	05/26/77	358	5001 NONQ	0604	0008	000121	F061	
F0920	05/25/77	* 634	5001Q	0620	0003	000122	F061	
F0925	05/27/77	11	5001 (NONQ)	0617	0011	000115	E278	
F0938	06/08/77	145	5001 NONQ	0615	0005	000118	F061	
F0993	06/25/77	428	5001 NONQ	0624	0003	000118	F061	
F1146	08/31/77	248	5001 NONQ	0624	0005	000120	F061	
F1148	08/31/77	248	5001	0624	0005	000119	F061	
F1149	09/01/77	248	5001	0621	0006	000121	F061	
F1150	09/01/77	248	5001	0621	0005	000121	F061	
F1252	10/07/77	41	5001 (NONQ)	0623	0004	000121	F061	
F1477A	09/27/78			0629	0012	000110	F066	
F1477B	09/27/78			0629	0008	000118	F066	
F1478B	09/28/78			0629	0005	000120	F067	
F1478A	09/28/78			0629	0012	000111	F067	
R1479A	09/28/78			0631	0010	000109	F068	
R1480B	09/28/78			0632	0005	000121	F069	
R1480A	09/28/78			0632	0007	000115	F069	
R1481A	09/29/78			0632	0008	000117	F070	
R1482A	09/29/78			0630	0008	000116	R071	
F1483A	09/29/78			0631	0006	000115	F072	
R3057	08/03/78			0624	0006	000109	R065	
2500	09/27/78	550	4375 NONQ	0629	0008	000118	F066	
2525	09/28/78	160	4280 NONQ	0629	0005	000120	F067	ZONE 3
2538	09/28/78	520	4300 NONQ	0632	0005	000121	F069	
2549	09/29/78 CPCO 012	? · 0	4700	0631	0014	000119	U001	+ 4% moist
2562 012	09/30/78	? 0	4690	0631	0011	000126	U003	ZONE 1
~~2565~~ 012	~~09/30/78~~	[illegible]	[illegible]	[illegible]	~~0010~~	~~000129~~	[illegible]	
~~2568~~ 012	~~09/30/78~~ 012	[illegible]	~~4720 NONQ~~	[illegible]	[illegible]	~~000126~~	[illegible]	
~~259[illegible]~~ 012	[illegible]	[illegible]	[illegible]	[illegible]	~~0012~~	~~000118~~	[illegible]	
2608	10/02/78	480	5260 NONQ	0619	0005	000119	F080	
2609	10/02/78	300	4280 NONQ	0629	0006	000116	F081	
2612 ✓DR	10/02/78	120	4620Q	0626	0004	000119	F084	
614	10/02/78	480	5260 NONQ	0621	0005	000118	F086	
617	10/03/78	80	4600 NONQ	0623	0006	000113	F088	
622 DR	10/03/78	200	4560Q	0624	0005	000118	F089	
623	10/03/78	470	5250 NONQ	0620	0006	000120	F090	
625 DR	10/03/78	120	4620Q	0627	0005	000118	F091	
526	10/03/78	480	5260 NONQ	0623	0004	000118	F092	
527	10/03/78	80	4600 NONQ	0622	[illegible]	000119	F093	ZONE 3
528 DR	10/03/78	180	4585Q	0617	[illegible]	000116	F094	
531	10/04/78	37	4587 NONQ	0627	0009	000119	F095	
39	10/04/78	20	4587 NONQ	0627	0005	000119	F098	
47	10/04/78	80	4600 NONQ	0622	0006	000119	F103	
48 DR	10/04/78	190	4575Q	0620	0006	000118	F104	
50	10/04/78	330	4280 NONQ	0629	0009	000118	F106	
7	10/05/78	475	5255 NONQ	0629	0004	000119	F115	
	10/05/78	190	4575Q	0623	0007	000120	F116	
	10/05/78	50	4600 NONQ	0623	0005	000121	F118	
	10/05/78	30	4600 NONQ	0623	0006	000121	F119	
	10/06/78	475	5255 NONQ	0630	[illegible]			

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—2684 DR	10/06/78	190	4525 Q	0624	0005	000119	F121	
—2717	10/06/78	50	4600 NON Q	0625	0005	000119	F128	
—2718	10/06/78	30	4600 NON Q	0625	0005	000119	F129	
—2720 DR	10/06/78	230	4575 Q	0628	0004	000119	F131	
—2721	10/06/78	475	5255 NON Q	0630	0006	000119	F132	
—2722 DR	10/06/78	220	4610 Q	0628	0004	000118	F133	
—2723 DR	10/07/78	190	4575 Q	0626	0005	000116	F134	— STRUC
—2729B	10/07/78	? 4	4603	0625	0010	000123	U011	
—2730A	10/07/78	40	4603 NON Q	0625	0010	000126	U012	
—2730B	10/07/78	44	4603 NON Q	0625	0010	000129	U012	
—2731 DR	10/07/78			0631	0005	000118	F137	— STRUC.
—2732A	10/07/78	? 2	4587	0625	0010	000127	U013	
—2732B	10/07/78	2	4587	0625	0010	000130	U013	
—2745A	10/08/78	0	4563	0625	0009	000117	U016	
—2745B	10/08/78	4	4563	0625	0009	000115	U016	
—2746B	10/08/78	49	4563 NON Q	0625	0010	000111	U017	
—2747B	10/08/78	49	4579	0625	0009	000124	U018	
—2747A	10/08/78	45	4579	0625	0009	000118	U018	
—2748B	10/08/78	? 4	4579	0625	0009	000128	U019	
—2749A—	10/08/78 012	5 2.4%	4595	0625	0010	000127	U020	
—2749B—	10/08/78 -012	0 3.0%	4595	0625	0010	000127	U020	
—2752B	10/08/78	46	4595 NON Q	0625	0009	000121	U021	
[redacted]								
—2754B	10/08/78 012	42 2.8%	4611	0625	0009	000130	U022	
—2756 DR	10/08/78	220	4560 Q	0630	0005	000117	F143	— STRUC.
[redacted]								
—2764A	10/09/78	? 0	4603	0626	0009	000128	U029	
—2792A	10/09/78	46	4571 NON Q	0626	0009	000131	U031	
—2820	10/09/78	160	4510 NON Q	0630	0009	000129	U033	
—2827B	10/09/78	42	4611	0627	0009	000123	U034	
—2827A	10/09/78	42	4611	0627	0009	000121	U034	
—2828B	10/09/78	? 2	4611	0627	0010	000125	U035	
—2834B —012	10/10/78 012	? 4 +3.1%	4587	0627	0010	000129	U036	
—2839B	10/10/78	48	4587 NON Q	0627	0009	000107	U038	
—2841A	10/10/78	? 0	4571	0627	0009	000128	U039	
—2844 DR	10/10/78	190	5025 Q	0630	0007	000117	F152	— STRUC
—2847B	10/10/78	? 3	4595	0628	0009	000129	U041	
—2847A	10/10/78	? 0	4595	0628	0008	000124	U041	
[redacted]								
—2852A	10/10/78	46	4579	0628	0009	000128	U044	
—2852B	10/10/78	44	4579	0628	0009	000127	U044	
—2853 DR	10/10/78	150	4575 Q	0631	0004	000120	F153	— STRUC
—2855A	10/10/78	? 2	4553	0628	0009	000128	U046	
—2856A	10/10/78	46	4553 NON Q	0628	0010	000128	U047	
[redacted]								
—2857 DR	10/10/78	155	4640 Q	0627	0005	000117	F154	STRUC
—2862 DR	10/11/78	200	5050 Q	0631	0005	000119	F156	
—2877 DR	10/11/78	230	4630 Q	0627	0006	000117	F162	
[redacted]								
—2883 DR	10/11/78	220	4626 Q	0628	0005	000120	F164	— STRUC
[redacted]								
—2901	10/12/78	235	4560 Q	0634	0006	000119	F168	— STRUC
[redacted]								
—2910 —012	10/12/78	? 0	4603	0631	0013	000128	U055	
—2913 DR	10/12/78	235	4610 Q	0631	0006	000117	F174	STRUC
—2919 DR	10/13/78	150	4575 Q	0631	0005	000119	F176	
—2920 DR	10/13/78	230	4620 Q	0630	0004	000119	F177	
[redacted]								
—2931 DR	10/13/78	230	4620 Q	0634	0007	000116	F183	— STRUC

TOTAL WAR 13 − 9 = 4

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2684 DR	10/06/78	190	4525 Q	0624	0005	000119	F121	
2717	10/06/78	50	4600 NON Q	0625	0005	000119	F128	
2718	10/06/78	30	4600 NON Q	0625	0005	000119	F129	
2720 DR	10/06/78	230	4575 Q	0628	0004	000119	F131	
2721	10/06/78	475	5255 NON Q	0630	0006	000119	F132	
2722 DR	10/06/78	220	4610 Q	0628	0004	000118	F133	
2723 DR	10/07/78	190	4575 Q	0626	0005	000118	F134	— STRUC
2729B	10/07/78	? 4	4603	0625	0010	000123	U011	
2730A	10/07/78	40	4603 NON Q	0625	0010	000126	U012	
2730B	10/07/78	44	4603 NON Q	0625	0010	000129	U012	
2731 DR	10/07/78			0631	0005	000118	F137	— STRUC
2732A	10/07/78	? 2	4587	0625	0010	000127	U013	
2732B	10/07/78	2	4587	0625	0010	000130	U013	
2745A	10/08/78	0	4563	0625	0009	000117	U016	
2745B	10/08/78	4	4563	0625	0009	000115	U016	
2746B	10/08/78	49	4563 NON Q	0625	0010	000111	U017	
2747B	10/08/78	49	4579	0625	0009	000124	U018	
2747A	10/08/78	45	4579	0625	0009	000118	U018	
2748B	10/08/78	? 4	4579	0625	0009	000128	U019	
2749A —	10/08/78 012	5 2.4%	4595	0625	0010	000127	U020	
2749B —	10/08/78 -012	0 3.0%	4595	0625	0010	000127	U020	
2752B	10/08/78	46	4595 NON Q	0625	0009	000121	U021	
~~[illegible]~~ -012	~~[illegible]~~							
2754B	10/08/78 012	42 2.8%	4611	0625	0009	000130	U022	
2756 DR	10/08/78	220	4560 Q	0630	0005	000117	F143	— STRUC.
~~[illegible]~~ -012	~~[illegible]~~							
2764A	10/09/78	? 0	4603	0626	0009	000128	U029	
2792A	10/09/78	46	4571 NON Q	0626	0009	000131	U031	
2820	10/09/78	160	4510 NON Q	0630	0009	000129	U033	
2827B	10/09/78	42	4611	0627	0009	000123	U034	
2827A	10/09/78	42	4611	0627	0009	000121	U034	
2828B -012	10/09/78	? 2	4611	0627	0010	000125	U035	
2834B -012	10/10/78 012	? 4 +3.1%	4587	0627	0010	000129	U036	
2839B	10/10/78	48	4587 NON Q	0627	0009	000107	U038	
2841A	10/10/78	? 0	4571	0627	0009	000128	U039	
2844 DR	10/10/78	190	5025 Q	0630	0007	000117	F152	— STRUC
2847B	10/10/78	? 3	4595	0628	0009	000129	U041	
2847A	10/10/78	? 0	4595	0628	0008	000124	U041	
~~[illegible]~~ -012	~~[illegible]~~							
~~[illegible]~~ -012	~~[illegible]~~							
2852A	10/10/78	46	4579	0628	0009	000128	U044	
2852B	10/10/78	44	4579	0628	0009	000127	U044	
2853 DR	10/10/78	150	4575 Q	0631	0004	000120	F153	— STRUC
2855A	10/10/78	? 2	4553	0628	0009	000128	U046	
2856A	10/10/78	46	4553 NON Q	0628	0010	000128	U047	
~~[illegible]~~	~~[illegible]~~							
2857 DR	10/10/78	155	4640 Q	0627	0005	000117	F154	STRUC
2862 DR	10/11/78	200	5050 Q	0631	0005	000119	F156	
2877 DR	10/11/78	230	4630 Q	0627	0006	000117	F162	
~~[illegible]~~ -012	~~[illegible]~~							
2883 DR	10/11/78	220	4626 Q	0628	0005	000120	F164	— STRU
~~[illegible]~~ -012	~~[illegible]~~							
2901	10/12/78	235	4560 Q	0634	0006	000119	F168	— STRUC
~~[illegible]~~	~~[illegible]~~							
2910 -012	10/12/78	? 0	4603	0631	0013	000128	U055	
2913 DR	10/12/78	235	4610 Q	0631	0006	000117	F174	STRUC
2919 DR	10/13/78	150	4575 Q	0631	0005	000119	F176	
2920 DR -012	10/13/78	230	4620 Q	0630	0004	000119	F177	
~~[illegible]~~	~~[illegible]~~							
2931 DR	10/13/78	230	4620 Q	0634	0007	000118	F183	— STRUC

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TOTAL NR 13 - 9 = 4

IEDI II	DATE	E.	S.	ELEV.	WATER	DENSITY	CLASSIFICATI
2946 DR	10/14/78	140	4610 Q	0629	0005	000119	F189 } STR
2961	10/16/78	705	4485 NON Q	0632	0004	000118	F196 } STR
2964	10/17/78	310	4615 Q	0628	0006	000119	F197 } STR
3003	10/18/78	250	4275 NON Q	0631	0007	000119	F202 } STR
~~[illegible] 012~~	~~[illegible]~~	~~[illegible]~~	~~[illegible] NON Q~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~
~~3036 012~~	~~10/21/78~~	~~[illegible]~~	~~[illegible] NON Q~~	~~0622~~	~~[illegible]~~	~~000116~~	~~U068~~
3054	10/23/78	940	4680 NON Q	0625	0010	000128	U074
~~3072 012~~	~~10/26/78~~	~~925~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~
~~3087 012~~	~~10/27/78~~	~~[illegible]~~	~~[illegible]~~	~~0631~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~
~~3105 DR~~	~~10/28/78 + 27/9~~	~~[illegible]~~	~~[illegible] NON Q~~	~~0630~~	~~[illegible]~~	~~[illegible]~~	~~F23[illegible]~~ — STRU
~~3110 012~~	~~10/30/78 + 3/6/~~	~~[illegible]~~	~~[illegible] NON Q~~	~~0652~~	~~[illegible]~~	~~000131~~	~~[illegible]~~
3118	10/30/78	280	4640 Q	0628	0005	000120	F239 — STRU
3120	10/31/78	40	4670 NON Q	0631	0008	000131	U085
3123	10/31/78	40	4670	0631	0008	000131	U085
3136	11/01/78	940	4680	0633	0010	000128	U087
~~[illegible] 012~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~

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TOTAL NCR

7 - 7 = 0

20 NCR'S Q̈ ARRAS

42 TOTAL NCR'S ALL PARRS

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R? STRUAN

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INFORMATION CONCERNING FAILING TESTS

TEST NO.	DATE	EAST	SOUTH	ELEV.	MOISTURE CONTENT	IN-SITU DRY DENSITY	CLASSIFICATI
✓D0017	08/21/74			0585	0006	000115	F005
✓D0163	06/09/75	367	4710 Q	0588	0004	000111	F024
✓D0164A	06/10/75			0569	0005	000113	F024
✓D0166A	06/10/75			0588	0005	000111	F024
✓D0164B	06/10/75			0589	0007	000113	F024
✓D0165B	06/10/75			0586	0005	000113	F024
✓D0166B	06/10/75			0588	0005	000112	F024
✓D0176	07/02/75	306	4686 Q	0592	0017	000102	E170
✓D0202	07/08/75	365	4674 Q	0595	0014	000110	E170
✓D0201	07/08/75	250	4692 Q	0593	0018	000103	E170
XD0309	10/02/75	186	4972 NON Q	0602	0009	000103	F030
✓D0372	10/18/75			0604	0018	000114	E255
✓D0373	10/18/75			0603	0013	000124	E260
✓D0371	10/18/75			0606	0013	000127	E260
✓D0370	10/18/75			0604	0012	000131	E263
✓D0374	10/18/75			0603	0012	000112	E262
✓D0512	11/13/75	490	4715 Q	0610	0014	000125	E261
XD0513	11/13/75	466	4667 NON Q	0615	0014	000125	E261
XD0516	11/14/75	396	4625 NON Q	0618	0013	000128	E261
✓D0515	11/14/75			0621	0013	000127	E261
✓D0518	11/14/75	488	4705 Q	0613	0013	000121	F261
XD0517	11/14/75	472	4650 NON Q	0616	0013	000128	E261
✓D0526	11/17/75	351	4625 Q	0624	001?	000118	F261
✓D0525	11/17/75	270	4635 Q	0627	0015	000124	E261
✓D0524	11/17/75	214	4620 Q	0630	0014	000123	E261
XD0527	11/17/75	470	4655 NON Q	0619	0015	000124	E261
✓D0523	11/14/75	340	5036 Q	0614	0007	000119	F040
✓D0520	11/14/75	341	5121 Q	0614	0015	000123	E262
✓D0532	11/18/75	319	4602 Q	0628	0017	000112	E220
✓D0534	11/18/75	351	4642 Q	0624	0017	000116	E220
✓D0539	11/19/75	492	4713 Q	0615	0012	000123	E261
XD0537	11/18/75	526	4825 NON Q	0610	0015	000121	E261
✓D0536	11/18/75	490	4715 Q	0615	0015	000120	E261
✓D0535	11/18/75	451	4675 Q	0620	0015	000124	F261
✓D0531	11/18/75	220	4622 Q	0632	0014	000125	E261
✓D0530	11/18/75	146	4632 Q	0633	0014	000123	F261
✓D0533	11/18/75	351	4623 Q	0624	0015	000122	E261
✓D0873	08/11/76	234	4592 Q	0630	0016	000113	E200
✓D0909	08/19/76	515	4963 Q	0602	0009	000105	F043
XD0936	08/24/76	52	5000 NON Q	0610	0010	000124	F279
✓D1032	09/03/76	565	4878 NON Q	0620	0013	000121	E271
✓D1050	09/08/76	518	(*) 5064 NON Q	0603	0004	000102	F037
XD1116	10/06/76	479	5048 NON Q	0610	0006	000104	F041
✓D1153	10/21/76			0624	0011	000102	F043
✓D1155	10/21/76			0622	0010	000105	F043
✓D1194	11/02/76			0596	0004	000117	F058
✓D1191	11/03/76			0596	0007	000117	F058
✓D1321	05/09/77	? 1	0	0604	0011	000117	E262
XD1337	05/17/77	294	5236 NON-Q	0609	0012	000126	F278
XD1396	06/03/77	414	5305 NON-Q	0619	0011	000123	E277
XD1393	06/03/77	37	5067 NON-Q	0626	0011	000116	E277
✓D1404	06/03/77			0623	0010	000116	F277
✓D1415	06/07/77			0623	0010	000121	E277
✓D1498	06/15/77			0617	0015	000112	E269
✓D1491	06/15/77			0618	0012	000113	F269
✓D1509	06/16/77			0632	0013	000114	E27?
✓D1546	06/21/77			0616	0006	000102	F0[illegible]

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TEST #	DATE	E.	S.	ELEV.	WATER CONTENT	DRY DENSITY	CLASSIFICATION
D1871	08/15/77	177	5298 NON Q	0610	0007	000102	F055
D1875	08/16/77	161	5312 NON Q	0610	0007	000103	F055
D1897	08/16/77			0626	0007	000101	F055
D1949	08/29/77			0627	0007	000099	F055
D2006	09/12/77			0621	0020	000113	E270
D2079	09/22/77			0613	0013	000128	E269
D2078	09/22/77			0613	0017	000119	E270
D2176	10/05/77			0617	0016	000115	E277
D2249	10/15/77	324	5155Q	0630	0010	000119	E255
D2253	10/16/77	280	5163Q	0632	0013	000125	E271
D2359	10/28/77			0632	0014	000120	E271
D2373	10/29/77	104	5406 NON Q	0630	0014	000127	E276
D2380	10/31/77			0631	0012	000104	F055
D2461	12/29/77			0632	0011	000116	E270
D3029	07/25/78	210	5165 Q	0633	0016	000112	E271
D3160	09/20/78	30	4680 NON Q	0630	0018	000116	E271
F0019	09/24/74	99	4814 Q	0584	0008	000111	F011
F0015	09/27/74	128	4770Q	0586	0011	000113	F015
F0016	09/27/74	119	4776 Q	0587	0009	000109	F015
F0017	09/27/74	96	4837Q	0587	0013	000111	F015
F0020	09/24/74	111	4867 Q	0584	0007	000111	F011
F0022	09/26/74	118	4876 Q	0586	0013	000108	F015
F0024	09/27/74	111	4867 Q	0586	0014	000112	F015
F0059	12/13/74	330	4711 Q	0583	0013	000113	F016
F0214	09/12/75			0597	0007	000112	F024
F0255	10/01/75			0593	0009	000108	F024
F0309	10/23/75	224	4872 Q	0602	0009	000123	F040
F0319	10/28/75	199	4878 Q MX.	0608	0008	000121	F040
F0322	10/29/75	133	4750 Q	0603	0008	000122	F040
F0366	06/15/76	185	4675 Q	0611	0007	000118	F044
F0367	06/16/76	184	4676 Q	0611	0009	000116	F044
F0368	06/16/76	194	4676 Q	0610	0008	000132	F044
F0369	06/16/76	? 159	4721Q	0608	0008	000119	F044
F0370	06/16/76	? 183	0	0610	0009	000118	F044
F0404	06/28/76	460	4839Q	0613	0008	000120	F044
F0468	07/23/76	103	5034 NON Q	0600	0008	000119	F052
F0466	07/23/76	108	5034 NON Q	0600	0007	000121	F052
F0467	07/23/76	98	5034 NON Q	0602	0008	000118	F052
F0469	07/23/76	100	5034 NON Q	0600	0009	000122	F052
F0470	07/23/76	108	5034 NON Q	0602	0010	000119	F052
F0498	08/11/76	428	4769 Q	0623	0008	000118	F045
F0532	09/02/76	422	4777Q	0633	0005	000121	F054
F0535	09/02/76	? 1	0	0622	0009	000119	F054
F0604	10/04/76	231	5043 Q	0605	0005	000118	F042
F0607	10/08/76	+ 168	5011 Q	0611	0008	000100	F037
F0608	10/08/76			0634	0008	000097	F037
F0625	10/12/76	123	5041 NON Q	0611	0008	000117	F045
F0667	11/11/76	46	4936 NON Q	0628	0007	000120	F054
F0664	11/11/76	46	4916	0629	0005	000121	F054
F0663	11/11/76	46	4936	0628	0005	000118	F054
F0682	11/24/76	46	4951	0630	0007	000120	F054
F0680	11/23/76	46	4951	0630	0003	000119	F054
F0688	11/24/76	46	4948	0630	0008	000121	F054
F0736	03/18/77	685	5098 NON Q	0601	0005	000122	F054
F0737	03/19/77	758	5053 Q	0601	0007	000118	F054
F0738	03/18/77	685	5098 NON Q	0601	0006	000121	F054
F0739	03/19/77	758	5053 Q	0601	0007	000120	F054
F0734	03/17/77	? 1	0	0599	0005	000114	F059
F0740	03/18/77	685	5098 NON Q	0601	0008	000120	F054
F0741	03/21/77	758	5053 Q	0601	0005	000122	F054

SB 04876

Missing Pg. 04 From SD-140

TEST #	DATE	E.	S.	ELEV.	H_2O CONTENT	DRY DENSITY	CLASSIFICATION	
F0744	03/21/77	588	5114Q	0599	0005	000118	F054	
F0746	03/21/77	588	5114Q	0599	0005	000118	F054	
F0768	03/30/77			0608	0005	000120	F054	
F0785	04/07/77	? 1	0	0607	0006	000120	F054	
F0799	04/12/77	? 87	5001 NONQ	0629	0005	000122	F059	
F0826	04/19/77			0613	0005	000120	F061	
F0843	04/28/77	721	5001Q	0612	0005	000120	F061	
F0845	04/29/77	? 1	5001	0612	0005	000120	F061	
F0869	05/13/77	428	5001 NONQ	0624	0003	000118	F061	
F0914	05/24/77	? 0	5001	0615	0009	000126	E262	
F0922	05/26/77	358	5001 NONQ	0604	0008	000121	F061	
F0920	05/25/77	* 634	5001Q	0620	0003	000122	F061	
F0925	05/27/77	11	5001 (NONQ)	0617	0011	000115	E278	
F0938	06/08/77	145	5001 NONQ	0615	0005	000118	F061	
F0993	06/25/77	428	5001 NONQ	0624	0003	000118	F061	
F1146	08/31/77	248	5001 NONQ	0624	0005	000120	F061	
F1148	08/31/77	248	5001	0624	0005	000119	F061	
F1149	09/01/77	248	5001	0621	0006	000121	F061	
F1150	09/01/77	248	5001	0621	0005	000121	F061	
F1252	10/07/77	41	5001 (NONQ)	0623	0004	000121	F061	
F1477A	09/27/78			0629	0012	000110	F066	
F1477B	09/27/78			0629	0006	000118	F066	
F1478B	09/28/78			0629	0005	000120	F067	
F1478A	09/28/78			0629	0012	000111	F067	
F1479A	09/28/78			0631	0010	000109	F068	
F1480B	09/28/78			0632	0005	000121	F069	
F1480A	09/28/78			0632	0007	000115	F069	
F1481A	09/29/78			0632	0008	000117	F070	
F1482A	09/29/78			0630	0008	000116	F071	
F1483A	09/29/78			0631	0008	000115	F072	
F3057	08/03/78			0624	0005	000109	F065	
2500	09/27/78	550	4375 NONQ	0629	0008	000118	F066	ZONE
2525	09/28/78	160	4280 NONQ	0629	0005	000120	F067	
2538	09/28/78	520	4300 NONQ	0632	0005	000121	F069	
2549	09/29/78	? * 0	4700	0631	0014	000119	U001	ZONE
2562	09/30/78	? 0	4690	0631	0011	000126	U003	
2565	09/30/78	40	4720 NONQ	0631	0010	000129	U005	
2568	09/30/78	40	4720	0633	0011	000128	U006	
2598	10/02/78	40	4720	0633	0012	000118	U007	
2608	10/02/78	480	5260 NONQ	0619	0005	000119	F080	ZONE
2609	10/02/78	300	4280 NONQ	0629	0006	000116	F081	
2612	10/02/78	120	4620Q	0626	0004	000119	F084	
2614	10/02/78	480	5260 NONQ	0621	0005	000118	F086	
2617	10/03/78	90	4600 NONQ	0623	0008	000113	F088	
2622	10/03/78	200	4560Q	0624	0005	000118	F089	
2623	10/03/78	470	5250 NONQ	0620	0006	000120	F090	
2625	10/03/78	120	4620Q	0627	0005	000118	F091	
2626	10/03/78	480	5260 NONQ	0623	0004	000118	F092	
2627	10/03/78	60	4600 NONQ	0622	0006	000119	F093	
2628	10/03/78	180	4585Q	0617	0005	000116	F094	
2631	10/04/78	37	4587 NONQ	0627	0009	000119	F095	
2639	10/04/78	20	4587 NONQ	0627	0005	000119	F096	
2647	10/04/78	80	4600 NONQ	0622	0008	000119	F103	
2648	10/04/78	190	4575Q	0620	0008	000118	F104	
2650	10/04/78	330	4280 NONQ	0629	0009	000118	F106	
2677	10/05/78	475	5255 NONQ	0629	0004	000119	F115	
2678	10/05/78	190	4575Q	0623	0007	000120	F116	
2680	10/05/78	50	4600 NONQ	0623	0005	000121	F118	
2681	10/05/78	30	4600 NONQ	0623	0006	000121	F119	
2683	10/06/78	475	5255 NONQ	0630	0005	000120	[illegible]	

SB 04877

TEST #	DATE	E.	S.	(4/ ELEV.	% WATER	DRY DENSITY	CLASSIFICAT	
2684	10/06/78	190	4525 Q	0624	0005	000119	F121	
2717	10/06/78	50	4600 NON Q	0625	0005	000119	F128	
2718	10/06/78	30	4600 NON Q	0625	0005	000119	F129	
2720	10/06/78	230	4575 Q	0628	0004	000119	F131	
2721	10/06/78	475	5255 NON Q	0630	0006	000119	F132	
2722	10/06/78	220	4610 Q	0628	0004	000116	F133	
2723	10/07/78	190	4575 Q	0626	0005	000116	F134	— STRU
2729B	10/07/78	? 4	4603	0625	0010	000123	U011	
2730A	10/07/78	40	4603 NON Q	0625	0010	000126	U012	
2730B	10/07/78	44	4603 NON Q	0625	0010	000129	U012	
2731	10/07/78			0631	0005	000118	F137	— STRUC
2732A	10/07/78	? 2	4587	0625	0010	000127	U013	
2732B	10/07/78	2	4587	0625	0010	000130	U013	
2745A	10/08/78	0	4563	0625	0009	000117	U016	
2745B	10/08/78	4	4563	0625	0007	000115	U016	
2746B	10/08/78	49	4563 NON Q	0625	0010	000111	U017	
2747B	10/08/78	49	4579	0625	0009	000124	U018	
2747A	10/08/78	45	4579	0625	0009	000118	U018	
2748B	10/08/78	? 4	4579	0625	0009	000128	U019	
2749A	10/08/78	5	4595	0625	0010	000127	U020	
2749B	10/08/78	0	4595	0625	0010	000127	U020	
2752B	10/08/78	46	4595 NON Q	0625	0009	000121	U021	
2754A	10/08/78	42	4611	0625	0010	000131	U022	
2754B	10/08/78	42	4611	0625	0009	000130	U022	
2756	10/08/78	220	4560 Q	0630	0005	000117	F143	— STRUC
2763A	10/09/78	46	4603 NON Q	0626	0008	000131	U028	
2764A	10/09/78	? 0	4603	0626	0009	000128	U029	
2792A	10/09/78	46	4571 NON Q	0626	0009	000131	U031	
2820	10/09/78	160	4510 NON Q	0630	0009	000129	U033	
2827B	10/09/78	42	4611	0627	0009	000123	U034	
2827A	10/09/78	42	4611	0627	0009	000121	U034	
2828B	10/09/78	? 2	4611	0627	0010	000125	U035	
2834B	10/10/78	? 4	4587	0627	0010	000129	U036	
2839B	10/10/78	48	4587 NON Q	0627	0009	000107	U038	
2841A	10/10/78	? 0	4571	0627	0009	000128	U039	
2844	10/10/78	190	5025 Q	0630	0007	000117	F152	— STRU
2847B	10/10/78	? 3	4595	0628	0009	000129	U041	
2847A	10/10/78	? 0	4595	0628	0008	000124	U041	
2848B	10/10/78	48	4595 NON Q	0628	0011	000126	U042	
2849A	10/10/78	44	4595	0628	0011	000128	U042	
2852A	10/10/78	46	4579	0628	0009	000128	U044	
2852B	10/10/78	44	4579	0628	0009	000127	U044	
2853	10/10/78	150	4575 Q	0631	0004	000120	F153	— STRU
2855A	10/10/78	? 2	4553	0628	0009	000128	U046	
2856A	10/10/78	46	4553 NON Q	0628	001[illegible]	000128	U047	
2856B	10/10/78	46	4553	0628	0011	000129	U047	
2857	10/10/78	155	4640 Q	0627	0005	000117	F154	STRU
2862	10/11/78	200	5050 Q	0631	0005	000119	F156	
2877	10/11/78	230	4630 Q	0627	0006	000117	F162	
2878	10/11/78	20	4620 NON Q	0629	001[illegible]	000127	U050	
2883	10/11/78	220	4626 Q	0626	0005	000120	F164	— STRU
2899	10/12/78	550	4400 NON Q	0632	0012	000131	U053	
2901	10/12/78	235	4560 Q	0634	0006	000119	F168	— STRU
2904	10/12/78	28	4555 NON Q	0630	0010	000128	U054	
2910	10/12/78	? 0	4603	0631	0013	000128	U055	
2913	10/12/78	235	4610 Q	0631	0006	000117	F174	STRU
2919	10/13/78	150	4575 Q	0631	0005	000119	F176	
2920	10/13/78	230	4620 Q	0630	0004	000119	F177	
2925	10/13/78	? 5	4585	0631	0013	000124	U056	
2931	10/13/78	230	4620 Q	0634	0007	000116	F183	— STRU

SB [illegible]

TEST #	DATE	E.	S.	ELEV.	WATER	DENSITY	CLASSIFICATION	
2946	10/14/78	140	4610 Q	0629	0005	000119	F189	STRUC
2961	10/16/78	705	4425 NONQ	0632	0004	000118	F196	
2964	10/17/78	310	4615 Q	0628	0006	000119	F197	
3003	10/18/78	250	4275 NONQ	0631	0007	000119	F202	
3035	10/21/78	925	4675 NONQ	0622	0012	000124	U066	
3036	10/21/78	925	4650 NONQ	0627	0011	000116	U068	
3054	10/23/78	940	4680 NONQ	0625	0010	000128	U074	
3078	10/26/78	925	4695	0630	0009	000132	U079	
3087	10/27/78	935	4700	0631	0009	000131	U080	
3105	10/28/78	283	4440 NONQ	0630	0004	000119	F234	— STRUC
3110	10/30/78	65	4665 NONQ	0632	000[illegible]	000131	U082	
3118	10/30/78	280	4640 Q	0628	0005	000120	F239	— STRUC
3120	10/31/78	40	4670 NONQ	0631	0008	000131	U085	
3123	10/31/78	40	4670	0631	0008	000131	U085	
3136	11/01/78	940	4680	0633	0010	000128	U087	
3213	11/20/78	? 5	4400	0634	0010	000128	U097	

EOFEOF

Copies:
[redacted]
* Valenzano
* File C-95-Q
* Holman

Bechtel Power Corporation

Interoffice Memorandum

To J. W. Lillywhite

File No.

Subject Job 7220 Midland Project Subcontract 7220-C-95 "Q" Underpinning - Report on December 6, 1979 A^2 Bid Clarification Meeting With Mergentime Corporation

Date December 18, 1979

From D. A. Pattee

Of Subcontracts

Copies to

At Midland, MI

Ext.

Attachments: Meeting Agenda
Attendance List
Meeting Agenda (abbreviated)

Meeting opened with discussion on the requirements of The Michigan Professional Engineering Statute. Mergentime said that their engineering firm, which will be doing the engineering, design, and drawings, would be Hanson Engineers Incorporated out of Springfield, Ill. D. L. Barlett, Hanson Engineers, stated their firm was registered in the State of Michigan and will verify. Mergentime and Hanson stated they would assure everything performed would be per the law. Consumers Power saw no problem.

The available sheet pile sheets at the jobsite would not suit Mergentime's purpose and, therefore, could not be used. Mergentime explained their tentative manloading schedule and sequence of events and will submit their plan in detail if awarded. They plan on a one shift, five day, eight hour per day operation for the first month onsite. Unit # 2 will start first and Unit # 1 will follow approximately two weeks later. After the first month, they would then shift to a multiple shift operation, only after they start beneath the structure, and possibly each shift, day and swing, would go to a ten (10) hour day. No weekend work is anticipated. Mergentime submitted the names and resumes of their intended jobsite personnel. Five people are assigned as superintendents and a crew size of 15-35 men.

Mergentime submitted their Q.A. Chart and will be forwarded with Ann Arbor issued meeting notes.

Mergentime indicated they had not actually included a time period in their bid schedule for engineering and document package submittals and all indications presented by Bechtel would show at least two (2) months added to the schedule prior to jobsite mobilization. Mergentime stated they would submit their intended schedule of document submittals to Bechtel A^2 by December 14, 1979. Bechtel engineering said they would try their best to turn around drawings more quickly.

SB 10085

Hanson Engineers and Bechtel discussed Item 6.a for technical clarification and determined Mergentime to be correct in their understanding of Section 6.2.1 of Specification C-95.

Clarification to Section 7.2.4 was that Mergentime was going to test caissons as required by Specification at every 500 design tons of resistance.

Clarification of change to Section 10.9.1. No objection from Mergentime to change word "initial" contact to "intimate" contact.

Explanation of mud mat removal: Mergentime is intending to remove mud mat to waterproof membrane and anything that could be a safety hazard. Cost was included in their price already.

There remains still a problem on ground loss due to dewatering wells now installed within the effected zone of influence. Mergentime was planning on grouting to stabilize.

Mergentime is intending to use "Siroc" grout and will submit data on material.

New soil data will be forwarded to both bidders and were requested to review for potential cost impact.

Mergentime was agreeable to modify their proposed sequence of caisson installation to insure adequate protection from loss of control of building while excavating and installing the caissons. Mergentime explained their proposed monitoring of building to satisfaction of Bechtel.

Mergentime explained sequence of events for placement of lean concrete, use of wet blankets, and pressure grouting to ensure positive contact to satisfaction of Bechtel and Consumers.

Brief clarification to Specification change to Sections 1.1.3 c; 1.1.3 i; added 1.1.3 l; rewrote 8.1.

Area access by dewatering Subcontractor developed into where project must re-evaluate the scope of the underpinning and possible re-bid.

Mergentime agreed to extend their bid proposal to January 14, 1980.

Meeting adjourned.

Dave

Dave Pattee

DAP/km

Attachment

SB 16986

MEETING AGENDA

MIDLAND UNITS 1 & 2

BECHTEL/CONSUMERS POWER/MERGENTINE CORP.

DATE: December 6, 1979

TIME & DURATION: 9:30 A.M. to 3:30 P.M. (5 Hrs.)

LOCATION: Ann Arbor Office, Conference Room 5B3

SUBJECT: Bid Clarification Meeting for Underpinning, Excavation and Placing of Concrete (7220-C-95(Q))

PURPOSE: Clarify commercial and technical bid items

REFERENCE: TWX to Mergentine, dated 11/30/79

TOPICS:

1.	Contractor furnished sheet piles, 125 pieces.	Mergentine
2.	Manloading schedule.	"
3.	Personnel resumes.	"
4.	Field Organization chart with QA interface.	"
* 5.	Current schedule for mobilization, procedures, construction start.	"
6.	Technical	
a)	Spec., Section 6.2.1 - Sketch 7220-M-3 shows caisson outside 3 feet E-W Centroidal axis. Clarify!	"
b)	Spec., Section 7.2.4 - Sketch 7220-M-8, Note 2 shows test load at end of installation not after every 500 design tons of resistance. Clarify!	"
c)	Spec., Section 10.9.1 - How will "initial contact" be ensured? intimate	"
d)	Spec., Section 6.1.7 - Mud Mat - (1) Extent of Mud Mat removal. (2) Support of Mud Mat if not removed. (3) Unit price per sq. ft. of exposed surface for mud mat removal.	"
e)	Tangent cassion - How is ground loss to be prevented under turbine building?	"
f)	Grout - (a) Type. (b) Clay backfill penetration & reaction.	"
g)	Soil Data on de-watering wells availability.	Bechtel
h)	Caisson support of wings after excavation	Mergentine
i)	Spec., Section 11.3.K - Subcontractor monitoring of buildings settlement.	"
j)	Lean concrete backfill - How will tolerence $\pm$ 3" be met, effect of water curing, and "positive contact" maintenance.	"

SB 10987

add'l

k) Spec. clarifications of Sections 1.1.3.C, 1.1.3.i, 1.1.3.1 4.2.4, 8.1. #2 — Mergentine

l) Area access by de-watering subcontractor — "

7. Action Item Assignment & Summarization.

MEETING NOTICE

DAVE PATTEE ①

BECHTEL JOB NO. 7220 - 101

PROJECT MIDLAND PLANT UNITS 1 & 2

SUBJECT OF THE MEETING

UNDERPINNING SUBCONTRACT

4.2.4, 3.1

1) Area access by de-watering subcontractor

7. Action Item Assignment & Summarization.

OCT 5 1979

BECHTEL POWER CORP.

JOB 7220

IREV C-95

DAY THURSDAY DECEMBER 6, 1979

TIME 10:30 TO 3:00

LOCATION 5(B)3

ATTENDEES

BECHTEL AAO

S. AFIFI
P. CHEN
B. DHAR
J. HOOK
J. JEFFERS
C. MCCONNEL
S. LO
W. PARIS
M. ROTHWELL
B. TORRES
K. WIEDNER
J. WANZECK
G. TUVESON

BECHTEL FIELD

~~A. BOOS~~
J. BETTS
M. RUNG

CPCO

J. STRAHL
B. WHEELER
D. SIBBALD

CONSULTANTS

C. GOULD
D. LOUGHNEY

MERGENTIME

C. MERGENTIME
+ 2 REPRESENTATIVES

The addressee, checked above, if unable to attend, is requested to:

☐ NOTIFY CHAIRPERSON ☐ SEND REPRESENTATION

PURPOSE OF THE MEETING

TO REVIEW AND RESOLVE COMMENTS ON MERGENTIME'S PROPOSAL

☒ AGENDA ATTACHED ☒ MEETING NOTES WILL BE DISTRIBUTED

CHAIRPERSON	PHONE	DATE
J. HOOK	7493	11/30/79

SB 16089

AAO-910

②

AGENDA

FOR

PRESENTATION OF MERGENTIME'S PROPOSAL

SPECIFICATION 7220-C-95(Q)

GENERAL

The Michigan Professional Engineering Statute requires engineering and construction to be performed by different companies. This may or may not be applicable but you are requested to look into this matter.

One hundred and twenty-five pieces of straight profile type sheet pile, 16 inches by 17 feet, manufactured by U.S. Steel (old designation MP101, new designation PS28), are available to be used by the subcontractor for the installation of the access shaft. Would this be acceptable and what cost adjustments would there be?

COMMERCIAL

Provide a preliminary manloading schedule for the proposed sequence of work (this should address the intended work basis, five 8-hour days, shift work, schedule or casual overtime requirements, etc).

Send for our review the resumes of the project superintendent and project engineers that, if awarded the subcontract, will be assigned to the project.

Provide a typical field organization chart with quality assurance (QA) interface.

Provide a current schedule indicating how soon mobilization, submitting of procedures, and actual construction will start if awarded the subcontract.

TECHNICAL

As indicated in Section 6.2.1 of the subject specification, the allowable eccentricity of the underpinning support system during construction is 3 feet with respect to the east-west centroidal axis. Sketch 7220-M-3 shows the first caisson installed outside this limit.

As indicated in Section 7.2.4 of the subject specification, a test load is to be performed after every 500 design tons of resistance is installed and not at the end of the installation as indicated on Sketch 7220-M-8, Note 2.

SB 16990

3

As indicated in Section 10.9.1 of the subject specification, the use of grout is to ensure intimate contact with soil and structure in the zone of influence. How will the statement "intimate contact" be implemented.

Does the removal of the mud mat apply for the entire area or just the area above the caissons? If the mud mat is not be removed, how will the mud mat be supported (reference Section 6.1.7)? If it is requested by the contractor that the mud mat be removed, what would the unit price per square foot of exposed surface be?

When installing the tangent caissons under the turbine building and subsequent excavation in that area, no ground loss is required. Therefore, because the tangent caissons may not be in full contact, welding or grouting may be required.

What type of grout will be used (chemical or cement, manufacturer)? How will the proposed grout penetrate and react to the clay backfill material in the general area?

The subcontractor should be aware that dewatering wells are in very close proximity to the area being grouted. Soil data are available for review by the subcontractor. Arrangements can be made if requested.

It is essential that the caisson support of the wings be achieved at the earliest possible moment after excavation commences. Any underpinning of the turbine building should be deferred until the first 1,000 design kips of caisson capacity is installed under the wings.

As indicated in Section 11.3.k of the subject specification, monitoring of the buildings for settlement will be performed by subcontract. The subcontractor is responsible for monitoring each structure which might be affected by the underpinning operation. How will this monitoring be accomplished?

Photographs, plastered glass telltales, plumbness of walls, etc would be usefull indicators of potential movement and documentation.

Describe how the lean concrete backfill will be placed to within a $\pm$3-inch tolerance, what effects water curing will have, and how "positive contact" will be maintained between the underside of the building and the lean concrete backfill.

Clarification to the Specification

1.1.3.c ...could cause soil movement or interfere with the placement of concrete

1.1.3.i Provide intimate contact in lieu of positive contact

1.1.3.1 Provide support for the lean backfill and working slab concrete as necessary for safety and protection of the waterproof membrane

4.2.4 Support of excavation, bracing, lagging and lean backfill concrete procedure.

8.1, Second Paragraph In addition to the underpinning work shown in the subcontract drawings, Subcontractor shall take every reasonable effort necessary to maintain the integrity of these buildings. Subcontractor shall be responsible for supporting structures and taking every reasonable precaution to prevent...

<u>Miscellaneous</u>

During the underpinning/excavation operation, it may be necessary that the dewatering subcontractor be allowed access to the area to install small dewatering equipment to further lower the groundwater table.

11/28/21
JM/meg

TELECOPIER MESSAGE

FROM: ANN ARBOR - (313) 994-7910

SEND TO: Mid

4 P9

DATE 1

CHARGE TO: 7220

AUTHORIZED BY: D Feikl

ORGANIZATION CODE

Provide support for the lean backfill and working slab concrete as necessary for safety and protection of the waterproof membrane

4 P9 + Cover

4.2.4 Support of excavation, bracing, lagging and lean backfill concrete procedure.

8.1, Second Paragraph In addition to the underpinning work shown in the subcontract drawings, Subcontractor shall take every reasonable effort necessary to maintain the integrity of these buildings. Subcontractor will be responsible for supporting structures and taking every reasonable measure to prevent...

CC: M. Rising

J. Betts

A. Boos

Miscellaneous

During the underpinning/excavation operation, it may be necessary that the dewatering subcontractor be allowed access to the area to install small dewatering equipment to further lower the groundwater table.

11/18/81
JP/meg

SB 16993

ATTENDANCE LIST

C-95(Q) - Bid Clarification Meeting

Underpinning, Excavation and Placing of Concrete

December 6, 1979

NAME	POSITION/COMPANY	PHONE
W.S. CARTER	Subcontracts / BECHTEL	994-7085
JON HOOK	CIVIL / BECHTEL	994-7493
Don Bartlett	Hanson ENGINEERS	217-788-2450
C E MERGENTIME	PRESIDENT/MERGENTIME CORP.	201-782-0500
G.E. WILSON	ESTIMATOR/MERGENTIME CORP	(201) 782-0500
DAVE PATEL	SUBCONTRACTS / BECHTEL FIELD	(517) 631-[illegible] X[illegible]
JOHN STRAHL	SUBCONT ADMIN/CONSUMERS FIELD	517-631-095
R.M. Wheeler	Civil / CPCO	517-83570
J.P. ~~Botts~~	Field Eng / Bechtel	517-631-4286
W.C. Paris Jr.	Bechtel Geotech	994-7560
R W Loughney	Loughney Dewatering	516-223-9500
BOB TORRES	BECHTEL PURCHASING AGENT	313-994-7524
Chuck McConnel	Bechtel Civil eng.	
G A Tuveson	Bechtel Civil eng.	994-7727
J. C. Chen	Bechtel Geotech	994-7185
S. C. Lo	Bechtel Civil Eng.	994-7836
M O Rothwell	Bechtel Asst PE	994-7307
KARL WIEDNER	BECHTEL ENGR MGR	994-7169

SB 16994

Bechtel Power Corporation

Interoffice Memorandum

To G. L. Richardson

File No

Subject Response to NRC 50.54 Request, Item 1 Relating to the Diesel Generator Building, Midland Project, Job No. 7220

Date APR 9 1979

From D. R. Johnson

Of SFPD Construction Quality Control

At 425 Market St. 32nd Floor D10 Ext 8-0343

Copies to J. L. Newgen
R. A. Simanek
W. L. Barclay ✓

In reply reference:

2-CQC- 402679

Reference: IOM, G. L. Richardson to Distribution, same subject, dated March 29, 1979.

What follows is Construction Quality Control's best effort attempt to prepare replies to those questions which you assigned to the PFQCE in the above referenced IOM:

1. Variance 6, Items 4, 5, and 6

A. There is no variance to the Bechtel QA program requirements for construction quality control based upon the following evidence:

The Bechtel construction quality control program of surveillance inspection over work performed by Canonie and inspection over work performed by Bechtel was complied with for the compacted backfill operations at the Midland jobsite. In the case of Canonie, they performed and were totally responsible for their own work, inspection, documentation and quality assurance; all in accordance with their Bechtel approved QA manual. Bechtel Construction Quality Control performed surveillance inspection over Canonie in accordance with FIP C-210 and QCI S/C1.10. As stated in Bechtel's construction quality control program document SF/PSP G-6.1, the purpose of surveillance inspection is to determine if an action has been accomplished or if documents have been prepared in accordance with selected requirements of the contract documents. Surveillance inspection does not mean that all or all of any subcontractor activities are observed for the purpose of determining compliance. Surveillance inspection is intended to provide a degree of added confidence that subcontractor work meets contract document requirements.

ROUTE QC 07220	INIT.
PFQCE	
1 A. PFQCE	
2 CIVIL	
ELECT.	
PIPING	
MECH.	
WELDING	
5 DOC.	
RECEIVING	
ADM ASST	
3 Matls. Test Lab Super.	
4 Supbe	
OPEN LOOP ☐ YES ☐ NO DATE...........	

RECEIVED

APR 13 1979

QUALITY CONTROL
BECHTEL JOB 7220

SB 04860

In the case of soil compaction performed by Bechtel, Construction Quality Control was responsible for inspections in accordance with FIP C-211 and QCI C-1.02. Because soil compaction is an activity where inspection of the completed work to verify quality is ineffective, QCI C-1.02 is designed to provide in-process monitoring by surveillance to verify conformance with the documented instructions, i.e. Project Engineering's specifications. This type of inspection program is consistent with the requirement in Criterion X of 10CFR50, Appendix B which states in part:

> "If inspection of processed material or products is impossible or disadvantageous, indirect control by monitoring processing methods, equipment and personnel shall be provided."

A brief description of the work performed by Canonie and Bechtel as well as the surveillance inspection and monitoring performed by Construction Quality Control follows:

1) <u>Canonie</u>

<u>1975:</u> Canonie started fill operations south of the Q line on 10/29/75 for the south access ramp and lay down area for the turbine building. Work proceeded through 11/13/75 to elev. 616 ±. Construction Quality Control surveillance inspection was provided by FIP C-2.10-4-53.

<u>1976:</u> Canonie started fill operations adjacent to the south access ramp 7/11/76 and proceeded to elev. 623 ±. Construction Quality Control surveillance inspection was provided by FIP's C-2.10-4-58 and C-2.10-4-62.

<u>1977:</u> Canonie started fill operations at elev. 623 ± on 6/22/77 for the diesel generator building footings, and completed fill to the bottom footing elev. 628 ± on 7/30/77. Construction Quality Control surveillance inspection was provided by QCI S/C 1.10-1, 2, 3, 4, 5 and 6.

2) <u>Bechtel</u>

<u>1975:</u> Structural backfill (Plant Area Fill) started on 10/17/75 in the area south of and adjacent to the Q line wall from elev. 589' to 612'. Construction Quality Control inspection was provided by FIP 2.11-1-12.

SB 04881
402679

1976: Structural backfill started 7/9/76 for a 3 foot wide area adjacent to the Q line wall from elev. 606 to 618 ± Line 1 through 12. Construction Quality Control inspection was provided by FIP C-2.11-1-19.

1977: Structural backfill began 2/15/77. The majority of work consisted of backfill around the circulating water discharge piping, service water piping and electrical conduit encasement (primarily hand work with some motorized equipment used for small sliver fills in D. G. area). The Bechtel work was performed in the same time period as work performed by Canonie to bring the fill material to elev. 628 ±.

Documentary evidence that the Construction Quality Control program for surveillance inspection over Canonie's implementation of their QA program commitments is provided by the completed FIP's, IR's, NCR's, Bechtel QA audit reports and Canonie inspection reports; all of which are on file at the jobsite.

Documentary evidence that the Construction Quality Control program for inspection of soil compaction performed by Bechtel is similarly provided by the completed FIP's, IR's, DR's, NCR's and Bechtel QA audit reports; all of which are on file at the jobsite.

B. Since there is no variance, the question of generic application is not relevant.

C. The remedial action taken by Project Engineering in revising the specification requirements for proctor curves, lift thickness, density testing, etc., will be reflected in changes to the inspection criteria contained in the QCI's.

D. Except for changes in the inspection criteria referenced in the QCI's to reflect Project Engineering changes to the specifications, no other changes in the Construction Quality Control program are needed for corrective action.

2. Variance 6, Items 7 and 8

A. There is no variance to the Bechtel QA program requirements for construction quality control based upon the following evidence.

1) Evaluations of motorized compaction equipment did occur and are recorded in the following memoranda:

Buchanan to Jeffers of 9/18/73
Dragicevic to Church of 10/5/73
Jeffers to Valenzano of 11/16/73

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402679

The motorized equipment described in the above correspondence was used by both Canonie and Bechtel for compaction work. Evaluation of hand held equipment was accomplished on initial use based upon satisfactory compaction reports. Formal evaluation reports were not required by specification nor provided by Field Engineering. The documented telephone conversation between Grote and Rixford on 9/18/74 should also be noted as it clearly indicates that Project Engineering's position was that equipment capacity is not important provided the main objective of obtaining acceptable compaction test results is achieved.

2) The completed Quality Control Inspection Plans and Inspection Records on file at the jobsite provide documentary evidence that lift thicknesses did not exceed the 12 inch limit. No changes to the maximum lift thickness were made by Field Engineering, and the inspection records show that the specification requirements were met.

B. Since there is no variance, the question of generic application is not relevant.

C. Same as for 1C above.

D. Same as for 1D above. If it is now believed that formal documentation for reporting equipment evaluation is necessary, this requirement should be added to the Project Engineering specification.

3. <u>Variance 7, Items 4 and 5</u>

A. There is no variance to the Bechtel QA program requirements for construction quality control based upon the following evidence:

1) Construction Quality Control through their surveillance of U. S. Testing did in fact identify the lack of moisture testing. As illustrated in the following listed documents, it is apparent that not only QC, but Construction, Project Engineering and QA were all aware of the lack of testing:

NCR-55 of 2/4/74
NCR-324 of 8/6/75
NCR-421 of 5/16/76
QAR SD-40 of 7/22/77
Memo Newgen to Castleberry of 8/15/77
Memo Castleberry to Newgen of 9/30/77
Telecon Hook to Roa of 10/10/77
Telecon Hook to Roa of 10/13/77
NCR-1005 of 10/26/77
Memo Newgen to Castleberry of 11/18/77
Memo Castleberry to Newgen of 12/15/77
Memo Newgen to Richardson of 12/21/77
Telecon Dean/Osborn to Roa of 4/7/78

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402679

2) Following the issuance of QAR SD-40, U. S. Testing did perform moisture tests in the borrow area and they maintained an informal moisture log for this activity starting 8/1/77.

A review of this log by CPCO - QA in January 1978 revealed some inconsistency in reporting dates and moisture contents. As a result, Bechtel QC added a formal review of the U. S. Testing Log to the current inspection plan QCI C-1.02 on 2/13/78 - and this log is now being retained in the QC vault.

B. Same as 1B.

C. No remedial action is needed.

D. No corrective action is needed.

4. Variance 8, Item 1

A. There is no known variance (Geo-Tech has not completed their investigation) to the Bechtel QA program requirements for construction quality control based upon the following evidence:

1) Geo-Tech has not prepared their report as of this writing, but from what we have been told it is their belief that testing frequency and material classification (matching laboratory comparison samples with field samples) were performed incorrectly.

2) U. S. Testing Procedure

U. S. Testing soils technicians selected the lab standard (Proctor curve) used for comparison with the in-place soil material at the time of in-place density testing. They accomplished this by visual comparison of the in-place samples to jarred laboratory samples brought to the field. An approximation of the active jarred samples to select from ranged from 10 to 25 at any given time. These samples included cohesive and non-cohesive material. The laboratory samples representing soils that were encountered frequently remained in this active collection. When a jar sample was no longer being used, it would be placed in the inactive collection retained at the laboratory. Material such as that represented by BMP 278 was encountered frequently, and that is the reason it remained active for such an extended period. The values for BMP 278 were periodically checked with information from either a one point sample or complete proctors. Documentation of these checks was not required by specification and was not maintained.

When an in-place soils sample could not be readily classified through visual comparison, the U. S. Testing technician would bring the soils sample to the test laboratory and perform a one point proctor to assist in the selection. If classification could still not be made, a complete proctor was prepared, and the sample was added to the laboratory's active proctor collection.

3) Construction Quality Control

The Construction Quality Control Engineer assigned to monitor Bechtel soil compaction also monitored the U. S. Testing technician's visual comparison of laboratory samples with in-place density test samples. If the fill being tested was placed by Canonie, this visual comparison was also observed by the responsible Canonie Inspector. Construction Quality Control also monitored the U. S. Testing technician's technique in performing in-place density tests.

Construction Quality Control, in their role of providing technical direction and surveillance of the laboratory, monitored the procedures used for making Proctor curves and one point proctors when visual classification could not be accomplished in the field.

None of the specified testing methods (ASTM D1556, 1557, 2049, etc.) identify comparison of field moisture and density test results with saturation conditions (zero air voids) as a method of checking the validity of test results.

To establish whether or not a particular group of field tests are in error, it will be necessary to incorporate inherent errors in testing methods (sand cone and nuclear methods). The specified test methods (and geotechnical literature) indicate a standard deviation on density measurement of 3 to 5 lbs./cu.ft., and a standard deviation on moisture content on the order of one half to one percent moisture.

Incorrect calculation of relative density test results was identified in 1975 and the correct method of calculation has been employed ever since.

Material gradation specified in specification C-211 was not intended to match that specified as Zone 3 material in C-210. However, Zone 3 material did meet the gradation requirements of C-211 and was used as structural backfill (cohensionless, free-draining material).

Using different laboratory curves to clear failing tests was recognition that the material had been incorrectly identified initially.

In summary, the methods employed at the time were believed to be correct methods. In particular, careful evaluation of the soil encountered in the field when determining the proper curve or laboratory maximum density to use is believed to be consistent with the specification and superior to using one laboratory maximum density test for every 20 field tests without consideration of soil type.

B. Since, at this point in time, no variance has been identified, the question of generic application is not relevant.

C. No remedial action required.

D. No corrective action necessary.

5. Variance 8, Items 2, 3 and 4

A
B
C
D $\Big\}$ Refer to 4A, B, C and D above

6. Variance 8, Item 4, 5 and 6

A. There is no variance to the Bechtel QA program requirements for construction quality control based upon the following evidence:

1) The jobsite records indicate that the minimum testing frequency requirements were exceeded. These records show that one test was perfomed for approximately every 300 cu. yds. of fill under the diesel generator building rather than the required one test per 500 cu. yds.

2) There was no QA program nor QC program requirement to generate a supplementary record listing actual test frequencies. By program, the Quality Control Engineer was instructed to monitor field in-place density testing by surveillance as defined in PSP G-6.1 and verify that he did so by initialing and dating the IR. The Construction Quality Control Engineer did this. The approved program was implemented.

B. Since there is no variance, the questions of generic application is not relevant.

C. No remedial action required.

D. No corrective action necessary.

7. Variance 8, Item 4

   A. QCI C-1.02, Rev. 2 dated 8/77 and Rev. 3, dated 2/78 do not reference the test frequency requirement found in paragraph 5.6 of specification 7220-C-211 as the appropriate inspection criteria. However, under activity number 3-[illegible].b of QCI C-1.02 Rev. 2 and 3, a review of the testing frequency was and is required. Paragraphs 5.1 and 5.5 of specification C-211 are referenced as the inspection criteria for proper test method and technical adequacy. Thus, Rev. 2 and 3 of QCI C-1.02 was written and approved for use with the additional requirements of paragraph 5.6.3 being omitted.

      It should be noted that for the time period during fill placement up to the footing level for the diesel generator buildings Rev. 1 of QCI C-1.02 was in effect which called out the proper specification paragraph reference for testing frequency.

   B. No, this variance is not of a generic nature for the frequency paragraph reference omission was due to a format revision of C-1.02 from Rev. 1 to Rev. 2. A review of C-1.20 Rev. 2 and 3 indicates that all other references were carried through.

   C. QCI C-1.02 will be revised to include paragraph 5.6 of specification 7220-C-211 Rev. 5 as the appropriate inspection criteria for testing frequency.

   D. No corrective action is required to preclude repetition.

8. Variance 12, Items 1 and 2

   A. There is no variance to the Bechtel QA program requirements for construction quality control based upon the following evidence:

      Bechtel Quality Control did implement the information feedback and corrective action requirements addressed in SF/PSP G-3.2.

      1) The following listing represents particular actions taken within QC to correct and improve the Quality Control soils program operations:

QC Corrective Action Report	Based On
QC-19 - 9/14/76	NCR-510
QC-36 - 2/16/77	CPCO QF-142
QC-37 - 2/24/77	CPCO QF-150
QC-63 - 11/1/77	NCR-1006
QC-64 - 11/21/77	CPCO QF-199

2) Quality Control also routes copies of NCRs to the group responsible for the control of the activity apparently caused the nonconformance. This was accomplished for the following identified NCRs.

	Opened	Closed	Sent To	On
NCR-421	5/5/76	6/23/76	Proj. Super.	6/23/76
NCR-686	2/11/77	3/7/77	Proj. Super.	3/7/77
NCR-698	2/9/77	3/7/77	Proj. Super.	3/7/77
NCR-1005	10/26/77	3/24/78	Proj. Super.	3/24/78

B. Since there is no variance, the question of generic application is not relevant.

C. No remedial action required.

D. No corrective action necessary.

In summary, except for Item 7 above, none of the evidence presented to date is indicative of a variance from the established QA program requirements by Construction Quality Control.

D. R. Johnson

DRJ/adm

SB 04888

102679

BECHTEL

0501 11-68

3/16/79

Keiker

7220 - DG BLDG

Bechtel Cause Analysis

① US Testing errors
A) only a couple of Proctors
B) Air voids
C) Retest using lower proctor

meeting 3/23/79 FRI Bechtel
3/27/79 TUES Bechtel & CPCo
→ smaller, maybe DR Johnson attends

3/16/79 4pm was told Stu ↑ & don't do much except
tell Bill B & John R & get ready

SB 04689

DRAFT
G. RICHARDSON
3/15/79

POSSIBLE CAUSES

1. SPECIFICATION REQUIREMENTS INADEQUATE
   - 95% BMP vs. 100% BMP - INVESTIGATE EFFECT OF DIFFERENCE ON SETTLEMEN
   - SPEC. 7220-C-211 - COMPARE WITH SPEC C-210.
     - INVESTIGATE LACK OF FROST PROTECTION
     - INVESTIGATE USE OF COMPACTION BY PONDING.
   - MOISTURE INTRUSION IN GROUND - INVESTIGATE EFFECT ON COMPACTION/SETTLEMENT

2. CONSTRUCTION METHODS/PROCEDURES
   - PLACEMENT METHODS - INVESTIGATE PRACTIC AND ADEQUACY
     - LIFT THICKNESS
     - MOISTURE CONTROL
     - COMPACTION EQUIPMENT
     - TYPE OF MATERIALS.
   - USE OF STOCKPILED MATERIAL - INVESTIGATE EFFECT ON MOISTURE CONTROL AND WEATHERING AND EFFECT IF 1977 WAS A DRY YEAR
   - EXTENSIVELY REEXCAVATED AREA - INVESTIGATE EXTENT PROCEDURES AND CONTRO

3. INSPECTION PROCEDURES.
   - RELIANCE ON TESTING - INVESTIGATE IMPACT AND TESTING ADEQUACY.
   - SMALL AREAS - WAS TEST FREQUENCY INCREASED - INVESTIGATE TEST FREQUENCY/DISTRIBUTI

SB 04690

3. CON'T

- DIFFERENT CONTRACTORS - INVESTIGATE TO DETERMINE DIFFERENCE IN INSPECTION PROCEDURES.
  - COMPARE KNOWN AREAS OF LOW COMPACTION TO CONTRACTOR DOING WORK
- BECHTEL INSPECTION PROCEDURES CHANGED AFTER 7/77 - INVESTIGATE CHANGE AND EFFECT.
- PERSONNEL CHANGES - INVESTIGATE QUALIFICA OF BECHTEL, CANONIE AND USTESTING PERSONN

LIST CHANGES IN C-1.02'S

SB 04691

Kirker DRAFT G. RICHARDSON 3-16-79

DIESEL GENERATOR BUILDING

PLANT AREA FILL INSPECTION - SPEC 7220-C-210

INSPECTION ITEM		7/75 - 1/75	1/75 - 10/76	10/76 - 7/77	7/77 - PRESENT
		FIP-C-210-4	FIP C-210-4	QCIR-C-1.02	QCIR-C-1.02 (BECHTEL) QCIR-SC-1.10 (CANONIE)
BECHTEL QC					
FOUNDATION PREP. APPROVAL BY FE	BECHTEL OPER.	W - Witness prior to 8/74 H - Holdpoint after 8/74	H - Holdpoint	R/H - Review Holdpoint	R/H - Review Holdpoint
	CANONIE OPER.	SAME	SAME	SAME	HP - Holdpoint (QCIR SC-1.10)
MATERIALS PLACED AS SHOWN ON DRAWINGS	BECHTEL OPER	S - Surveillance	W - Witness	S - Surveillance	S(V) - Visual Surveillance
	CANONIE OPER.	SAME	SAME	SAME	NOT ADDRESSED.
LIFT THICKNESS	BECHTEL OPER	S - Surveillance	W - Witness	S - Surveillance	S(V) - Visual Surveillance.
	CANONIE OPER.	SAME	SAME	SAME	SI(V) - Visual Surveillance Inspection (QCIR SC-1.10)
MOISTURE CONTENT	BECHTEL OPER	S - Surveillance	S - Surveillance	S - Surveillance	S(V) - Visual Surveillance
	CANONIE OPER.	SAME	SAME	SAME	SI(V) - Visual Surveillance Inspection (QCIR SC-1.10)
COMPACTION TO REQUIRED DENSITY	BECHTEL OPER.	S - Surveillance	W - Witness	S - Surveillance	S(V) - VISUAL SURVEILLANCE OF TESTING PERFORMANCE
	CANONIE OPER.	SAME	SAME	SAME	SI(V) - Visual Surveillance Inspection (QCIR SC-1.10)
TESTING	BECHTEL OPER.	T - Test	- Test	S - Surveillance	S(V) Visual Surveillance
	CANONIE OPER.	SAME	SAME	SAME	S(V) Visual Surveillance Inspection [QCIR SC-1.10]
RECORDS REVIEW.	BECHTEL OPER	R - Review	R - Review	R - Review	R - Review
	CANONIE OPER	SAME	SAME	SAME	R - Review
CANONIE QC		• DOCUMENT ACCEPTANCE OF BORROW AREAS.			7/77 END OF CONTRACT
ONE QC ENGINEER PRESENT FOR ALL CANONIE "Q" OPERATIONS WHILE IN PROGRESS		• PREPARE DAILY REPORTS DESCRIBING AREA WORKED, ZONE, EQUIP., MOISTURE, ETC. • PERFORM AND DOCUMENT MEASURED LIFT THICKNESS CHECKS - AVE OF 2 PER DAY • PREPARE DEFICIENCY CORRECTIVE ACTION REPORTS FOR ITEMS SUCH AS FAILING TESTS AND INADEQUATE ACTION TO CORRECT THE DEFICIENCY			

SBmm11.07

DRAFT
G RICHARDSON
3-16-79

DIESEL GENERATOR BUILDING

STRUCTURAL BACKFILL INSPECTION - SPEC 7220-C-211

BECHTEL QC INSPECTION OF BECHTEL OPERATIONS	7/73 - 8/74 FIP C-210-4	8/74 - 10/76 FIP-C-211-1	10/76 - 7/77 QCIR-C-1.02	7/77 - PRESENT QCIR-C-1.02
FOUNDATION PREP APPROVAL BY FE	W - WITNESS	H - HOLD POINT	R/H - REVIEW HOLD POINT	R/H - REVIEW HOLD POINT
MATERIAL	S - SURVEILLANCE	I - INSPECT	S - SURVEILLANCE	S(V) - VISUAL SURVEILLANCE
LIFT THICKNESS	S - SURVEILLANCE	I - INSPECT	S - SURVEILLANCE	S(V) - VISUAL SURVEILLANCE
MOISTURE CONTENT	S - SURVEILLANCE	I - INSPECT	S - SURVEILLANCE	S(V) - VISUAL SURVEILLANCE
COMPACTION TO REQUIRED DENSITY	S - SURVEILLANCE	S - SURVEILLANCE	S - SURVEILLANCE	S(V) - VISUAL SURVEILLANCE OF TEST PERFORMANCE RESULTS
TESTING	T - TEST	T - TEST	S - SURVEILLANCE	S(V) - VISUAL SURVEILLANCE
RECORDS REVIEW	R - REVIEW	R - REVIEW	R - REVIEW	R - REVIEW

KBMK11-92

DRAFT
S RICHARDSON
3-16-79

DIESEL GENERATOR BUILDING

BECHTEL QC INSPECTION CALLOUT DEFINITIONS

FROM BECHTEL FIELD INSPECTION MANUAL AND QC NOTICES MANUAL

PRIOR TO 2/76

Witness Point (W) - A pre-selected activity/task on the Inspection Plan which is to be witnessed by the Quality Control Engineer. The responsible Quality Control Engineer shall keep himself sufficiently advised of work progress so that he may witness the designated activity or task. If the Quality Control Engineer is not available at the appointed time, construction may proceed past the Witness Point.

AFTER 2/76

Witness (W) - To watch over, observe or visually examine a specific work operation, examination or test which is performed by others.

PRIOR TO 2/76

Hold Point (H) - A pre-selected activity/task on the Inspection Plan which is to be performed by the Quality Control Engineer and beyond which work shall not proceed without this activity/task being performed and accepted by the Quality Control Engineer.

AFTER 2/76

When a particular inspection activity must be completed at a given point in time before further work may proceed, the inspection activity shall be identified as a "hold point" by adding the letter H behind the applicable code letter I, W, T or R under block 12 on the IR.

Review (R) - To examine any form of documentation for the purpose of establishing its acceptability for specific requirements. Sign off by the Field Quality Control Engineer on the Inspection Record will be performed upon review and acceptance of said documentation.

PRIOR TO 6/76

Test (T) - Activities performed to determine to verify the capability of a component, structure or system to meet specified requirements by subjecting the item to a controlled set of physical, chemical, environmental or operational conditions.

AFTER 6/76

Test (T) - Activities performed to determine or verify the capability of a component, structure or system to meet specified requirements by subjecting the item to a controlled set of physical, chemical, environmental or operational conditions. Whenever a test is performed, the type of the equipment used, the identification ... calibration due date must be recorded.

PRIOR TO 2/76

Surveillance (S) - Requires that the assigned area Quality Control Engineer be present to monitor by observation the designated activities and tasks shown on the Inspection Plan to assure that they are performed in the specified manner.

FROM 2/76 TO 5/77

Surveillance (S) - To progressively monitor items and work operations before, during or after in-process construction. This inspection activity requires that the responsible Field Quality Control Engineer be present in the general work area identified in the Quality Control Instruction as often and for as long a time period as is necessary to effectively monitor the designated activity.

AFTER 5/77

Surveillance (S) - To progressively monitor by randomly witnessing and inspection items and work operations before, during or after in-process construction. This inspection activity requires that the QCE physically verify the work operations described in the Quality Control Instruction to assure they are performed in accordance with inspection criteria requirements. These verifications shall be performed as often and for as long a time period as is necessary to effectively monitor the designated Activity/Task.

AFTER 6/76

Surveillance Inspection (SI). Surveillance inspection consists of a review, observation or inspection of subcontractor personnel, material, equipment, processes and test results performed by a Bechtel Quality Control Engineer. The purpose of the activity is to determine if an action has been accomplished or if documents have been prepared in accordance with selected requirements of the contract documents. Surveillance inspection does not mean that all or all of any subcontractor activities are observed for the purpose of determining compliance. Surveillance inspection is intended to provide a degree of added confidence that subcontractor work meets contract document requirements.

Inspect (I) - Visual examination or measurement to verify the conformance of an item or construction work operation to predetermined quality requirements.

SB004694

BECHTEL

MEMORANDUM

TO Ann Arbor office LOCATION Midland Job #7220
FROM F. Gabrielson DATE 10-4 and 5 1978
SUBJECT JOB NO.
FILE

Review of plant site earth work operations also specifications.

First thing that came to my attention in earth work, was the use of two opposite materials for back fill in the same area. (Cohesive & non cohesive)

I did not see any evidence that the roller requirements was carried out as referred to in spec. 12.8.1 and could not come up with an approved method where as we could deviate from it — it is my opinion that a 12" lift of clay is pretty tough to handle.

F. Gabrielson

BECHTEL ANN ARBOR DISTRIBUTION

1

XC 2

A. Boos XC 3

XC

7220 1380 5410

OCT 20 1978

SB 04728

BECHTEL

MEMORANDUM

TO: ANN ARbOR office LOCATION:

FROM: F Gabrielson DATE: 10-6 (FRI) 1978

SUBJECT: EARTH WORK JOB NO. 7220

FILE:

THE following Reports ARE my daily field observation notes.

Trying To AERATE clay material in THE RAIN?

NOT Enough VAlues put in foundation preparation.

Supervision seems To be A LiTTLE WEAK.

putting Too much VAlues on Vibratory Roller in clay Type materials.

Controled Lift THickness is important.

LighT RAIN

F Gabrielson

GEOTECH
ANN ARBOR
DISC | |
ADMIN | |
SCH | XC 2 |

A. Bous QOW XC 3

XC 1380
7220 3A10

SB 04729 OCT 26 1978

MEMORANDUM

TO: ANN ARBOR office LOCATION

FROM: F Gabrielson DATE: SAT 10-7 1978

SUBJECT: EARTH WORK JOB NO. 7220

FILE

STARTED TEST pad SECTION consisting of 4"-6"-8"-10" And 12" Lifts WITH Tests on each Lift AT (4) passes, (8) passes And (12) passes - TEST AREA is Adjacent To fuel TANK STORAGE - Roller specifications ARE ATTACHED.

Exc. soft clay material from Ramp AT welders loading dock - And back filling with sand - which extends our water problem.

Sherif Afifi And James Wanzeck on job site this day.

F Gabrielson

GEOTECH
DISTRIBUTION
1
2
A-Boos QOW 3
XC 1390
7220 3410
REC'D OCT 20 1978

SB 04730

MEMORANDUM

TO Ann Arbor office
LOCATION
FROM F Gabrielson
DATE Sun 10-8 1978
SUBJECT Earth work
JOB NO. 7220
FILE

Continued back fill and test section in fuel storage tank area - U.S. Testing can not give us enough support on test section also Geotech is not represent on second shift - I'm not sure of how much control we have on test.

F Gabrielson

GEOTECH
ANN ARBOR

1
XC 2 88
QOW 3
A. Boos XC 1390
XC 7220 3410

SB 04731

BECHTEL

MEMORANDUM

TO Ann Arbor office LOCATION

FROM F Gabrielson DATE Mon 10-9 1978

SUBJECT Earth work JOB NO. 7220

FILE

The suitability of the materials is to be determinded by the field eng. - in accordance with section 5.6 of spec. C-211 - I dont question the material but will question moisture control in free draining sand material - use of waffle stomper type of tamper is not reccomended in clay type materials - leaves a slick plane.

Completed 8" test section on test pad @ 10:00 A.M. - placed 10" lift on at 2:00 p.m. Rolled (4) times and waiting on tests.

problem area - sand backfill in ramp at welders loading dock - no way it could drain.

F Gabrielson

1
xc 2
SB 04732
A. Boos QOW 3
xc
xc 1380
7220 3410

MEMORANDUM

TO Ann Arbor office

FROM F Gabrielson

SUBJECT EARTH work

LOCATION

DATE Tues 10-10 1978

JOB NO.

FILE

Light rain last night - dark start up continue with Test pad - backfilling Tank Farm Area also sand backfill behind Gen. blg. - 2 HR wait This A.M. for Test on Test section - 24 Hrs to run Tests on 10" lift - no coverage (Geotech) on second shift.

Length of shank on Rollers should be a requirement if sheep foot type is used.

Need a knowledgable man to call shots on when and where to test - To many times this is left to testing people discretion.

Completed placing 12" lift on Test pad @ 3:00 p.m.

F Gabrielson

I

2

SB 04733

A-Bcos

QOW 3

XC

7220 1390

8.110

BECHTEL

MEMORANDUM

TO: ANN ARBOR LOCATION:

FROM: F GABRIELSON DATE: WED 10-11 1978

SUBJECT: EARTH WORK JOB NO. 7220

FILE

Slow start up - dark until 7:30 - didn't have a good handle on test section - was completed on night shift.

placing clay in tank farm area - placing sand behind Generator building

I find a very poor work line between Eng - Lab and construction.

Asked Jack Delarm (const) to hold lifts to max 6" in clay type material.

F Gabrielson

GEOTECH
ANN ARBOR

1

XC2

A. Boos QOW 3

XC

7220 4598 5918

OCT 20 1978

SB 0473-1

BECHTEL

MEMORANDUM

TO: ANN Arbor LOCATION:

FROM: F Gabrielson DATE: 10-12- THUR. 1978

SUBJECT: EARTH WORK JOB NO. 7220

FILE

Lab TEST RESULTS ARE slow - NOT THAT much support on small fill AREA

REVIEWED Log on compaction TESTS And found Too many density failures - TElls ME contractor WAS Running A border Line job And should HAVE been LEANED on.

F Gabrielson

GEOTECH DISTRIBUTION			
MGR		1	
ADM			
DRFT			
SCH	XC	2	SKB
GEOL			
H&K			
ENG	QOW	3	
A. Buer	XC		
Proj Eng	XC		1.5.8.8
JOB	7220	FILE	5.4.10
REC'D OCT 20 1978			

SB 04735

BECHTEL

MEMORANDUM

TO: ANN ARBOR — LOCATION:

FROM: F GABRIELSON — DATE: FRI 10-13 1978

SUBJECT: EARTH WORK — JOB NO. 7220

FILE:

MET WITH ENG AND TESTING PEOPLE TO SOLVE CORRECT ELEV. AND CORRECTIVE ACTION ON TEST FAILURES - CONTINUE TO BACKFILL OVER FAILING TEST AREAS COULD BE TROUBLE - RECOMENDED TO CONST. TO TRY DIFFERENT TYPE OF COMPACTOR FOR STRUCUAL BACKFILL (CLAY TYPE MATERIALS)

F Gabrielson

GEOTECH
ANN ARBOR
DISTRIBUTION

DISC	ACT	INFO	
MGR		1	
ADMIN			
DRFT			
SOILS	XC	2	
GEOL			
H&H			
EXP			
QDW		3	
PROJ ENG	XC		
PMI	XC		
JOB 7220		FILE 1380 3918	
REC'D OCT 20 1978			

A. Boos

SB 04736

BECHTEL

MEMORANDUM

TO: ANN ARBOR   LOCATION

FROM: F. GABRIELSON   DATE: SAT 10-14 1978

SUBJECT   JOB NO. 7220

FILE

Correct location and elev. is a must on structural back fill testing, have found error where it would be impossible to relocate to make correction.

Asked Jack Delarmt (Const) if we couldn't cut down on test frequency on sand materials - also to try and improve application of clay type materials - we can not live with as many failures as we have

F Gabrielson

GEOTECH
ANN ARBOR
DISTRIBUTION

DISC	ACT	INFO	N/A	INIT
MGR		1		
ADMIN				
DRFT				
SOILS	XC	2		
GEOL				
H&H				
EWP				
QAW		3		
A. Boos ...	XC			
PRE ...	XC		1380	
JOB	7220	FILE	3410	
REC'D	OCT 20 1978			

SB C-737

cc: J. Betts
J. Wasylewski
B. Cheek
L. Basinski

BECHTEL

MEMORANDUM

TO L. Stornetta LOCATION Subcontracts

FROM J. Dean DATE 8/28/78 19

SUBJECT Testing of Subsurface Materials for Diesel/Generator Bldg.

In connection with soil borings presently being done at the Diesel/Generator Building, Project Engineering will require certain tests to be run on the recovered materials.

Please arrange with U.S. Testing Co. to perform whatever tests are required by Project's jobsite representative, Austin Marshall.

It is anticipated that the first request for these tests will be forthcoming this date (8/28/78), and may include any or all of the tests listed below. Testing requirements may not necessarily be limited to this list:

(a). Density
(b). Gradation
(c) Unit Weight
(d). Moisture Content
(e). Atterburg Limits
(f). Unconfined Compression

SB-04506

J. Dean

J. Boon

Bechtel Associates Professional Corporation

Inter-office Memorandum

BEBC-2549

To J. F. Newgen

Date November 20, 1978

Subject Midland Plant Units 1 & 2
Job 7220
Diesel Generator Building
File: 0274, C-2674, 0670.2

From R. L. Castleberry

Of Engineering

At Ann Arbor

Copies to
B. Dhar
N. Swanberg
K. Weidner
P. Martinez
W. Barclay
Com Log

RECEIVED

NOV 20 1978

QUALITY CONTROL
BECHTEL 7220
SIGNATURE

Reference: NCR 1482

It will be required to eliminate the void under the Diesel Generator Building footings. The intent is to improve the uniformity of bearing and to maximize the amount of bearing surface between the footing and foundation soil.

It is envisioned that this would be a grouting operation and would be needed only between the mud mat and the footing. This operation would occur before, and after the surcharge operation but after the structure has been released from the settlement restraints. The existing excavations around the ducts would be filled with lean concrete but provisions must be made to allow the vertical movement between duct and footings.

It is requested that a procedure be developed to meet the intent of the above. The procedure should contain the material to be used to fill the voids and it's anticipated compressive strength. The anticipated performance of the method should also be defined, ie. how small or thin of a void can be filled. Also, the method to be used to provide settlement voids around the electrical ducts and eliminate contact between duct and footing during settlement.

It is presently unclear if this will be considered and extension of the footing or of the mud mat, but for planning purposes the procedure should be written as if there was to be a quality related operation.

Since this operation should proceed as soon after release of settlement restraints as possible, it is requested that the proposed procedure be submitted for project approval by November 22, 1978.

L. R. Gasnski
for/ R. L. Castleberry

SB 04370

REFERENCES: NCR 1482
BEBC-2509
BEBC-2521

11-13-78

EXCAVATING AROUND AND BREAKING THE FOUR CHIMNEY ELECTRICAL DUCT BANKS LOOSE FROM THE DIESEL GENERATOR BLDG.

A. PRIOR TO BREAKING THE DUCTS LOOSE, THE FOLLOWING WORK MUST BE DONE.

1. ALL SEALS, WEDGES, ETC. MUST BE REMOVED FROM BETWEEN ALL SLEEVES AND PIPES FOR ALL PIPES COMING INTO THE DIESEL GENERATOR (D.G.) BLDG. (THIS INCLUDES Q AND NON-Q PIPES)
2. THE HORIZONTAL AND VERTICAL GAPS BETWEEN THE PIPE AND SLEEVE SHALL BE MEASURED AND RECORDED. THIS SHALL BE DONE FOR ALL LINES COMING INTO THE D.G. BLDG. THIS GAP MAY BE MEASURED ON THE INSIDE OF THE BLDG. IF THERE IS NO GAP, THEN THE GAP (IF ANY) MUST BE MEASURED ON THE OUTSIDE OF THE BLDG.
3. CONDENSATE LINES UNDER D.G. BLDG.
   a.) SOUTH END - EXPOSE END OF CONCRETE ENCASEMENT AND MEASURE AND RECORD GAP BETWEEN TOP OF PIPE AND SLEEVES. (6"ϕ & 20"ϕ PIPE
   1). ANCHOR A STAND PIPE TO TOP OF CONCRETE (2 REQ'D) AND TOP OF PIPE (4 REQ'D) IN SUCH A MANNER THAT THE ELEV. OF PIPE & CONCRE[TE] CAN BE MEASURED BY STICKING A ROD INTO

SB 04372

THE STAND PIPE. A COLLAR AROUND THE PIPES IS PROBABLY THE BEST WITH THE STAND PIPE ATTACHED TO THE COLLAR. NO WELDING SHALL BE DONE TO THE STAINLESS PIPE, AND THE COLLAR MUST BE COMPATIBLE WITH STAINLESS STEEL

2). ~~S~~SHOOT TOP ELEV. OF CONCRETE AND PIPE.

b.) NORTH END

MEASURE AND RECORD HORIZONTAL AND VERTICAL GAPS BETWEEN SLEEVE AND PIPE INSIDE OF TURBINE BLDG ONLY. PRIOR TO TAKING MEASUREMENTS, REMOVE ALL WEDGES, ETHAFOAM, ETC BETWEEN SLEEVES & PIPES

DO NOT COMPLETE THE WELDING OF THE 20"φ & 6"φ PIPE INSIDE OF TURBINE BLDG

DO NOT EXPOSE NORTH END OF CONCRETE ENCASEMENT.

4. SURVEY SCRIBES MUST BE PLACED ON THE NORTH AND SOUTH D.G. WALLS DIRECTLY ABOVE THE CONCRETE ENCASED CONDENSATE LINES. (4-REQ'D). RECORD ELEVATION.

5. SURVEY MARKS SHALL BE ESTABLISHED SO AS TO MEASURE THE VERTICAL MOVEMENT BETWEEN EACH DUCT BANK THAT IS CUT LOOSE AND THE FOOTING. ALSO, THE TOP ELEV. OF EACH DUCT BANK SHALL BE SHOT AND RECORDED.

SB 04373

SURVEY MARKS SHALL BE ESTABLISHED

SO AS TO MEASURE THE RELATIVE DISPLACEMENT IN THE E-W DIRECTION BETWEEN DUCT #2 & #4 (SEE FIG. I) AND THE ADJACENT WALL.

6. A MINIMUM OF THE FOLLOWING SCRIBES SHALL BE SHOT: 1, 10, 9, 2, 11, 17, 4, 21, 6, 23, 8, 16, 12, 5, 22, 24, 25, & 26. RECORD ELEV.

7. VISUALLY EXAMINE AND RECORD ANY SIGNS OF OFFSET OR STRESS IN THE DUCT BANKS LISTED IN ITEMS 5 THRU 8 OF REF. BEBC-2521 RECORD TIME IN WHICH THE INSPECTION IS MADE.

   ITEM 9 OF BEBC-2521 NEED NOT BE EXAMINED SINCE IT COMES INTO THE TURBINE BASE MAT SEVERAL FEET INSIDE OF BLDG.

8. PLACE STAND PIPE DOWN TO CONDENSATE ENCASEMENT NEXT TO D.G. BLDG. ON BOTH THE NORTH AND SOUTH SIDE. RECORD TOP OF CONCRETE ELEV.

B. CUTTING OF DUCT BANKS LOOSE.

1. DUCT BANKS SHALL BE EXCAVATED AND BROKE LOOSE IN THE SEQUENCE SHOWN ON FIGURE I
2. THE MUDMAT AND MATERIAL BENEATH THE FOOTINGS IN THE AREAS TO BE EXCAVATED MAY BE REMOVED UPTO WITHIN 12" OF EACH DUCT BANK WHILE THE WORK LISTED ON PAGES 1 THRU 3 IS BEING DONE. ALL FOUR DUCT BANKS MAY BE WORKED ON SIMULTANEOU[illegible] HOWEVER, THE FINAL 12" OF EXCAVATION (SEE FIG. II) SHALL <u>NOT</u> BE DONE UNTIL AFTER THE MEASUREMENTS LISTED IN SECT. A ARE TAKEN AND RECORDED. THE FINAL 12" AROUND EACH DUCT BANK SHALL BE EXCAVATED IN SEQUENCE.
3. ALL WALL FOOTING CONCRETE AS SHOWN ON DCN #5 TO DWG. C-1001 AND DCN #3 TO DWG. C-1002 SHALL BE REMOVED. THIS CAN BE DONE SIMULTANEOUSLY WITH STEP #2.
4. ALL SOIL, STRUCTURAL BACKFILL, AND MUDMAT SHALL BE REMOVED UNDERNEATH OF FOOTING AND AROUND DUCT BANK IN SUCH A MANNER AS TO MINIMIZE THE UNDERMINING OF WALL FOOTING (SEE FIG. II)

   ALL SOIL AND CONCRETE MUST BE REMOVE[illegible] SO AS TO ALLOW MOVEMENT BETWEEN THE DUCT BANK AND FOOTING OF OVER 12" VERTICA[illegible]

5. INSPECT ALL PORTIONS OF DUCTBANK TO MAKE SURE NO SUPPORT EXIST BETWEEN DUCT BANK AND MUDMAT OR STRUCTURAL BACKFILL OR BUILDING.

A REMOVAL OF UP TO ½" OF DUCT BANK CONCRETE IS PERMITTED. IF MORE CONCRETE IS REQUIRED TO BE REMOVED TO ALLOW PASSAGE OF THE DUCT THRU THE FOOTING, APPROVAL FROM THE RESIDENT ENGINEERS IS REQUIRED.

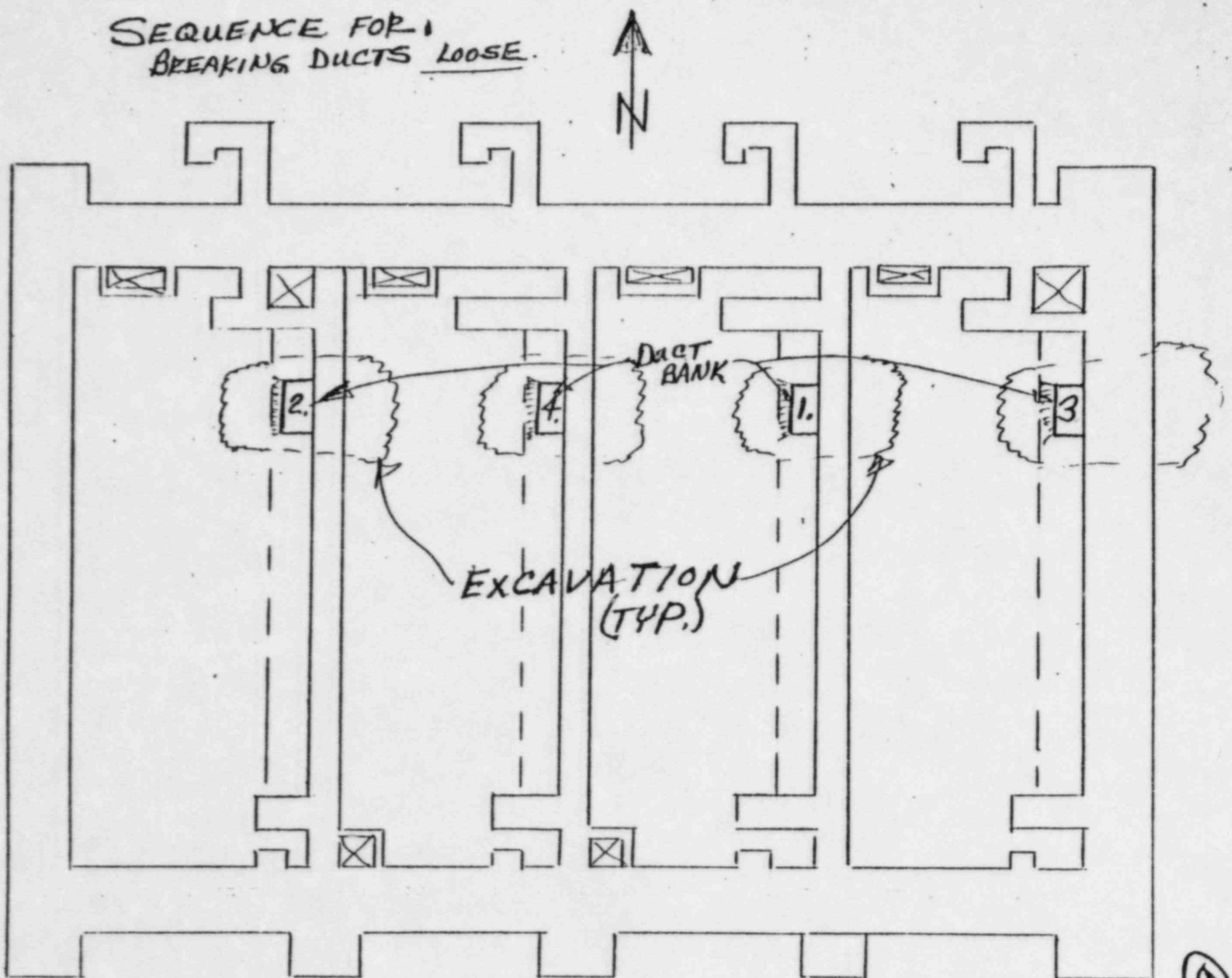
6. ONCE IT HAS BEEN DETERMINED BY THE FIELD ENGINEER THAT THE DUCT IS LOOSE, ALL READINGS LISTED IN SECTION A SHALL BE TAKEN AND RECORDED PRIOR TO THE EXCAVATION OF THE LAST 12" OF THE NEXT DUCT.

7. THE TIME THAT THE DUCT IS CONSIDERED BROKE LOOSE SHALL BE RECORDED.

ALSO, THE TIME AND THE PERSON TAKING ALL READINGS SHALL BE RECORDED.

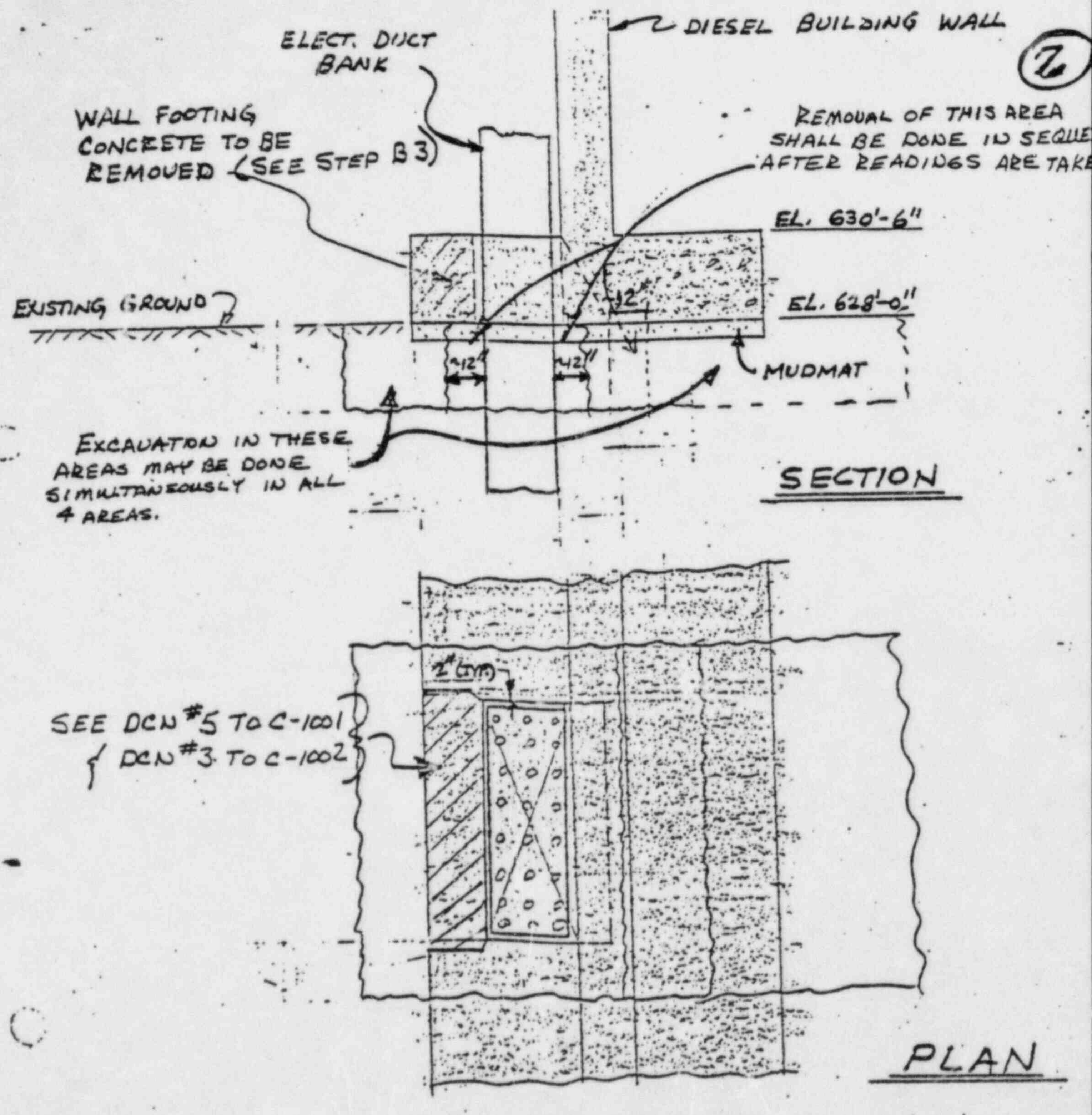
8. READINGS AND MEASUREMENTS SHALL BE TAKEN AND RECORDED AFTER EACH DUCT IS BROKE LOOSE AND PRIOR TO STARTING ON NEX[T]. THERE SHOULD BE 5 SETS OF READINGS AND/OR MEASUREMENTS TAKEN ALTOGETHER.

THE GAP MEASUREMENT IN SECT A. PARA. 3a IS A ONE TIME MEASUREMENT. THE CONDENSATE LINES MAY BE BACKFILLED AS SOON AS THE STANDPIPES ARE INSTALLED.



DIESEL GENERATOR BLDG. FIGURE I

SB 04377



AAO-520 6/76

FIGURE II

SB 04378

BECHTEL

Telephone call

CC: ~~XXXXX~~ S. Rao
W. Barclay
G. Richardson
A. Boos
F. Teague
File

BY J. G. Hook OF QA - Site

TO S. Rao OF AAO

DATE October 10, 19 77 TIME 1:40

SUBJECT Moisture Requirements For Backfill JOB NO.

I called Rao, the originator of letter BEBC-1859, to clear up any misunderstanding I had on the letter.

HOOK: In the past, we controlled the moisture by taking the test at the same time we took our density tests. Was this acceptable?

RAO: Yes, it is, as indicated in letter BEBC-1859.

HOOK: Should we continue in the same manner as we have in the past?

RAO: No. Moisture should be controlled in the borrow area prior to compaction.

HOOK: Should a compaction area be rejected because it did not have the proper moisture content (± 2% of optimum) even though the density was acceptable.

RAO: There is no moisture requirements at the time of density testing, only a density requirement. The moisture requirement is prior to compaction.

QA ROUTE	INFO.	ACT.
LQAE	[initials]	
CIVIL (1)	[initials]	
CIVIL (2)		
MECH		
PIPING		
ELECT.		
INST.		
SEC'Y		
FILE NO.	w/ CAR-SD-40	

SB 04270

0046 (12-67)

BECHTEL

Telephone call

ROUTE R. Ward
J. Dean
QC
F. Teague

BY G. S. Coaster OF Site

TO S. K. Rao OF AAO.

DATE 10-19-77 TIME

SUBJECT Concrete Backfill of 30"φ Discharge Line JOB NO. 7220

Coaster

During backfill of 30φ (steel) discharge line, concrete backfill may extend into stone bedding & rip-rap layer. Is this permissable?

Rao.

Project Engineering says this is acceptable.

SB 04272

I-3 & 4 Inconsistency of Information within the FSAR Relating to DG Building Fill Material and Settlement. Inconsistency between Basis for Settlement Calculations for DG Building and Design Basis.

A ·Split responsibility for preparation.

·Small amount of review exposure because of inactivity in these sections.

·Some minor specification changes made without review for compatibility with FSAR.

·Multiple display of technical information to FSAR.

B Same as A above

C ·Corrected inconsistancies.

·Reviewed soil sections of FSAR.

·Established single point responsibility within disciplines.

D ·Generically applicable to FSAR

·Re-review

·All specification changes will be subject to review for compatability with FSAR.

E ·Procedure governing review of changes for compatability with SAR

·Audit of compliance with procedure for change control.

·Audit re-review.

SB 03844

I-5 Inadequate Design Coordination in the Design of the Duct Bank

A Complete clearance requirements not reflected on the civil drawing used to construct the duct bank.

B Unique circumstance for the particular construction aspect which was not adequately addressed in the design process.

C Reviewed all similiar design configurations and found no additional problems.

D ·Generically applicable to duct bank interfaces.

·Resolved per C above.

E ·Design interface coordination procedure.

·Audit for compliance to procedure.

·Inspection and over inspection programs.

SB 03845

II-1 Insufficient Compactive Effort used in Backfill Operation

A Did not adequately qualify equipment for allowable lift thickness.

B ·Lack of specificity in specification for this parameter.

·Test data misleading (results and methods).

C ·Requalifying equipment

·Revised specification

·Revised QCI

D ·Potential generic applicability

·All procedures reviewed-No other equipment identified which are not already properly qualified.

E Inspection and test.

SB 03846

II-2 Insufficient Technical Direction in the Field

A Soils Engineers not properly deployed.

B No early indicators of quality problem (test results misleading)

C Specification revised to require that soil engineer be stationed at the site. Duties more explicitly defined.

D ·Potential generic applicability.

·All other procedures (areas) reviewed-No other areas identified for which technical direction was judged inadequate.

E ·Specification/Procedural requirements for engineering coverage in field.

·Supervisor control

·Increased QA/QC awareness of the requirements for technical coverage.

·Inspection, test, trending, ect.

SB ~~4[illegible]~~ 03847

III-1 Inadequate QC Inspection of Placement

A Inadequate inspection callouts (extent and documentation).

B ·Misleading test results.

·Program allowed surveillance inspection methods:

- characteristics
- accountability
- sampling

C Eliminated surveillance made for final acceptance of characteristics.

D ·Through 1977-Surveillance used for final acceptance extensively only in the soils area. Therefore, no generic implication.

·Thereafter-Eliminated surveillance per C above.

E ·Borings test and repair program.

·Revised inspection, test, over-inspection, audit, trend, ect.

SB 03848

III-2 Inadequate Soil Moisture Tests (Timing)

A ·Lacked specification clarity to cause test to be run at required time.

·Did not evaluate the effect of the various interpretations applied.

·Did not accomplish formal specification changes.

B Reliance on misleading compaction test results for final acceptance.

C Specification and QCI changes.

D ·Potential generic applicability

·Reviewed specifications in all discipline. for specificity.

E Any inquiries or requests for interpretation necessitate review of specification for specificity. Resulting clarifications are made by SCN's.

SB 03849

III-3 & 4 Incorrect Soil Test Results and Inadequate Test Procedures.

A ·Did not utilize a systematic approach to detect erroneous results.

·Lacked adequate procedures.

·Misused/overused certain laboratory standards. (Investigation of testing and test results in progress)

B ·Need for procedures to administratively control testing not recognized.

·No industry standards for administratively controlling testing.

C ·A laboratory standard is being required for every field test.

·Tests are being plotted against zero air void curves.

·Soil and QC Engineers are reviewing test data.

D ·Potentially Generic to UST testing activities.

·A technical audit has been conducted which included the review of procedural coverage for all other UST testing activities. (25-2-7)

E ·QC and QA Inspection and overinspection.

·Test program

·Preoperational

SB 03550

IV-1 Inadequate Corrective Action for Repetitive Conditions

A ·TREND program did not cause recognition of need for process correction action.

·The process corrective action required by CPCo, NCR199, was not accomplished in a timely manner.

B ·Program allowed date to be diluted by spreading nonconformances over many categories without combining them generically.

·Lack of universal understanding as to who had the responsibility for the schedule aspects of process corrective action.

C ·TREND program revised

·Emphasized QA responsibility for schedule control of process corrective action. (Procedural change in progress)

D ·Generically applicable and resolved per C above.

E ·Application of revised trend program

·Stop work authority.

SB 03851

IV-2. The Bechtel Audit and Monitor Program did not identify the problems relating to the settlement.

A ·Lacked sufficient technical auditing in the program.

B ·Technical aspects not emphasized in the audit process.

C ·Audit and overinspection include the check of quanitative parameters and technical elements.

D ·Generically applicable - resolved per C above.

E Management and CPCo review for adherence to audit schedule.

SB 03852

The PSAR gives explicit criteria on how the plant fill will be designed and placed, both in the text and subsequent answers to DRL questions. Specification C-211 Rev. 2 was developed in accordance with the requirements of the PSAR and the structural backfill is being installed in accordance with this specification. Based on the foregoing, we hold that the PSAR and Specification C-211, Rev. 2, properly state Project license commitments; hence no revision of either document is appropriate, nor is any work stoppage necessary.

Very truly yours,

R. L. Castleberry
Project Engineer

RR:gt

cc: R. C. Bauman

SB 03866

5.1.11 State whether the upper natural undisturbed sands are to be used for support of any Class 1 components or critical appurtenances such as Class 1 piping.

Answer:

The locations of the major structures were specifically selected so that these would be founded on the stiff-to-hard cohesive soils which underlie the site and not on the upper sands. However, certain Class 1 components and piping will be founded on the upper natural undisturbed sands or on controlled compacted fill on these upper natural undisturbed sands. These Class 1 components will include the emergency diesel generators, condensate and borated water storage tanks and associated piping, the service water piping and electrical conduit and portions of the station fire protection system.

The potential for liquefaction of the natural undisturbed sands at the site has been examined based on standard penetration test data assuming post-construction conditions. The final ground surface will be at Elevation 634 with the maximum groundwater at Elevation 627. Soils above Elevation 605 will be cohesive soils in an engineered backfill. Some natural sandy soils will remain in place in varying thicknesses over the site between Elevation 605 and Elevation 575. Standard penetration tests and/or in-place density tests will be performed to determine what sand should be removed in the field. Sands with a relative density of 50 percent or less will be removed.

Standard penetration data were obtained from several test borings drilled at the site in 1969. These data have been converted to relative density (dr) using a relationship developed by A.R.S.S. Bazarea in a dissertation presented to the graduate college of the University of Illinois, Urbana, Illinois. This dissertation entitled "Use of Standard Penetration Test for Estimating Settlements of Shallow Foundations in Sand" presents the most thorough study existing on the relationship between standard penetration (n) values and relative density. The values of relative density for on-site soils obtained in this manner are shown plotted against elevation on Figure 5.1.11-1. Bazaraa's method of evaluating the relative density of sands from standard penetration test data is an extension of Gibbs and Holtz's method. A comparison of the two methods is presented on Figure 5.1.11-2. As shown on the figure, Bazaraa's method is more conservative than the Gibbs and Holtz method.

SB 03867

RECEIVED

SEP 24 1979

QA

Bechtel Power Corporation

Interoffice Memorandum

To: D.L. Johnson B.T. Stojkov
D.B. Hardie T.Y. Mullen
(all w/a)

File No

Subject: Midland Diesel Generator Building Settlement - PIL File #111

Date: September 13, 1979

From: F. Plutchak
FP-79-72

Of: SFPD-Quality Assurance

At: MET-32/A24 Ext. 1156

Copies to: S.I. Heisler - w/o att.
J. Milandin - w/o att.

Since issuance of the CAB meeting agenda for 9/18/79, I received a report that gives further information on the matter. Attached are Sections 7 & 8 of this report which was a presentation made to the NRC by the Midland project regarding the Diesel Generator Building settlement problem at Midland (PIL #111). These sections list the most probable causes of the problem and the actions taken by the project.

Please review and be prepared to determine in our Tuesday, September 18, 1979 meeting what corrective actions are necessary on a division-wide basis to preclude repetition on other projects. Hopefully, some corrective actions have already been taken that are not visible to me. If this is the case, please bring to the meeting documentation of what has been done.

The rest of the report is available in my office along with previous interim reports. I did not reproduce the complete file because of the bulk and because you have received reports previously. Please advise if you require additional information.

F. Plutchak

F. Plutchak

SBC03616

FP:fe

Attachments

RECEIVED
QUALITY ASSURANCE
SEP 17 '79

Route	Info.	Act.
SFPD QA		
FILE NO.		

To File

From TCCooke/RMW

Date August 8, 1979

Subject MIDLAND PROJECT GWO 7020 - MEETING TO DISCUSS CONSULTANTS' REVISED PROPOSAL - CHANGE TO PERMANENT DEWATERING - JUNE 22, 1979
File: B3.0.3 UFI#-00234 Serial: CSC-4297

CC Attendees
KCBrooks (2)

Consumers Power Company

INTERNAL CORRESPONDENCE

Attendees

Consumers Power Company	Bechtel Power Corporation
T. C. Cooke	S. Afifi
G. S. Keeley	R. L. Rixford
D. B. Miller	G. L. Richardson 10-B-3
W. R. Bird	L. A. Dreisbach
B. W. Marguglio	J. Milandin
D. E. Horn	G. Tuveson
T. R. Thiruvengadam	A. J. Boos
D. E. Sibbald	D. Jinnett
K. R. Kline	R. Simanek
	P. A. Martinez
	W. Jones
	J. Wanzeck
	S. Blue
	T. Johnson

After lunch at a meeting in Ann Arbor on June 19, 1979, the consultants got together and decided that there may be some advantages to the Project in installing a permanent dewatering system as an alternative to some of the fixes transmitted to the NRC in conjunction with the 50.54f. questions. In the opinion of the consultants, this revised scheme would resolve all questions for potential liquefaction; and, therefore, eliminate the problems associated with the chemical grout. The consultants had noted that the chemical grout in the area of the Diesel Generator Building would not be completed until June or July 1980 at the earliest. They also discussed the problems with the grout penetrating building cracks, utilities, etc. The railroad bay grouting is not required and no longer needs to be considered. The consultants also requested that the need for complete mining below the Auxiliary Building wings be re-evaluated if liquefaction problems are eliminated.

They stated there is a possibility the remaining work would include shear velocity testing underneath the Auxiliary Building electrical penetration areas to estimate contact stresses with possible grouting of local void areas. Profiling of pipes before and after dewatering and duct bank checks and verification would also have to be made. The piling solution for the service water structures will remain

SB003624

unaffected. Resolution of whether or not permanent dewatering system would have to be a safety system and structure, the possibility of combining the permanent system with the temporary system, installation of Q-list monitoring wells, and a system to monitor the effluent for fines would be required. At the meeting on June 22, 1979, Mr. Tuveson also noted that he would have to recheck his design calculations on the buildings to see whether or not the removal of the buoyant forces would have any effect on the 40-year life of the structures.

The consultants apparently believe that the dewatering system would be easier to defend to the NRC and that it is a less complicated fix for liquefaction.

It was noted on June 22, 1979 that the consultants possibly did not consider the structural recheck required without the buoyant support or the FSAR revisions, which were primarily administrative in nature. W. Jones noted that the cost of total dewatering would be in the neighborhood of $10 to $15 Million with required redundancies. This was for a cased well with permanent submersible pumps considered. Dewatering for the Diesel Generator only would cost approximately $2 Million. This would be balanced by a savings of $2 Million for grouting, $2.2 Million for underpinning, $750,000 for dewatering, with nothing allowed for elimination of tie-up of the Diesel Generator area or mining obstructions.

As a sidelight, I&E Report 79-10 discussing Air Bubbles in the Tank Farm, was also suggested as a topic for the July 10 meeting with the NRC in Washington. Prior to the Thursday meeting with the consultants in Denver (June 28), a matrix should be drawn to show the advantages and disadvantages of various methods proposed to date. This would include not only our responses to the 50.54f. items and the consultants' latest proposal, but also some of the earlier alternates used which were previously discarded for one reason or another, since conditions have changed. These items will be discussed prior to the Thursday meeting with the consultants in Denver and at a meeting in Ann Arbor at 8:00 AM on June 27. It was also decided to send the MCAR 6 Interim Report with a copy letter noting that there are other evaluations being made at this time and mentioning the dewatering option.

pp

CONSUMERS POWER COMPANY
RECEIVED
OCT 0 4 1974
FIELD QUALITY ASSURANCE
MIDLAND, MICHIGAN

JLC	
REW	
DRK	
DCH	
FILE	
RETURN	

Bechtel Power Corporation

Interoffice Memorandum

To J. P. Connolly

Date October 1, 1974

Subject Job 7220 Midland Project
Geotechs Responsibility on
Earthwork Subcontract
0-817

From T. C. Valenzano

Of Construction

Copies to

At Midland, Michigan

This is in response to your request for clarification of Geotech's responsibilities during summer 1973: Geotech's responsibilities were that of providing design assistance to project engineering and assistance to field engineering and QC. Furthermore, Geotech has the responsibility for being cognizant of all phases of the soils work in both engineering and construction. It is their responsibility to be assured that the design is properly interpreted, construction properly performed, and the specified testing requirements properly implemented, and if they are not satisfied, to advise appropriate management personnel. It was within this context that Geotech was allowed to perform acceptance validation for both field engineering and quality control.

This was done because sufficient numbers of experienced Bechtel field engineering and quality control personnel were not available on the site. Geotech's assistance was requested for this reason.

Sufficient numbers were later made available and Geotechs services as an acceptance authority was delegated to QC and field engineers for Q and non-Q work respectively.

T. C. Valenzano

T. C. Valenzano

TCV/sw

SB003631

ATTACHMENT 1

BECHTEL ANN ARBOR

MEMO FROM

JERRY CLEMENTS

DATE 12/12/79

TO:

Lynn Curtis

Attached is my response to your question:

Are there any statements in the NRC's "Prohibition [redacted]" order that are not factual?

I will be glad to discuss this in more detail if you want.

Jer

SB 03706

ATTACHMENT 1 (1)

- Are there any statements in the NRC "Prohibition" order that are not factual?

In reviewing the NRC order, I found the following statements to be incorrect in the "purest" sense:

a. NRC Order Part II, Page 2, and Appendix B, state that: Section 2.5.4.5.3, Fill, states: "All fill and backfill were placed according to Table 2.5-9."

I cannot find such a direct quote in the FSAR. The closest statements I can find are indicated on the attached copy of FSAR pages 2.5-51 and -52.

b. NRC Order Appendix A, Parts 1e, 1f, and 2.b.(2) refer to PSAR Amendment 3 and imply that hard commitments were made through the use of such words as:

1e "... frozen soil would be removed or recompacted..."

1f "... cohesionless soil ... would be compacted to 85% ..."

2b(2) "... this is required by ... PSAR, Amendment 3 ..."

SB 03707

PSAR Amendment 3 consisted of (and only of) a supplement to the Dames & Moore report entitled "Foundation Investigation and Preliminary Explorations for Borrow Materials." The actual wording used in this supplement, corresponding to the above three statements, are:

[1e] D&M Page 15 "... it is recommended that all frozen soils be removed or recompacted ..."

[1f] D&M Page 16 contains a table of "Recommended minimum compaction criteria"

[2b(2)] D&M Page 16 "Filling operations should be performed under the continuous technical supervision..."

A review of the PSAR for references to the Dames & ... revealed that the only direct ...ments commitment made was in the responses to AEC questions 2.14 [PSAR page 2.14-1] and 8 [PSAR page 8.00-1] where the backfill used to replace loose sands would be "compacted in accordance with Page 16 of the report entitled FOUNDATION INVESTIGATION ... dated March 15, 1969."

Thus, the interpretations made by the NRC do not agree "absolutely" with the wording of the documents they reference. However, the differences probably do not alter the conclusions that the NRC reached with respect to these documents.

Joe
12-12-79

SB 03708

EARTH SCIENCES

DAMES & MOORE

CONSULTING ENGINEERS IN THE APPLIED EARTH SCIENCES

HOUSTON
SEATTLE
LOS ANGELES
LONDON ENGLAND
SYDNEY AUSTRALIA
MADRID SPAIN
TEHRAN IRAN
TORONTO CANADA

309 WEST JACKSON BOULEVARD · CHICAGO, ILLINOIS 60606 · 312 922-1772 · TELEX 2-5227

PARTNERS JAMES B THOMPSON · GEORGE D LEAL

ASSOCIATE WILLIAM G PARATORE

CHIEF ENGINEER JAMES [illegible]

March 15, 1969

Bechtel Corporation
P.O. Box 3965
San Francisco, California 94119

Attention: Mr. J. H. Blasingame,
Project Engineer

Gentlemen:

This letter transmits fifteen copies of our "Supplement to Repc Foundation Investigation and Preliminary Explorations for Borrow Materials Proposed Nuclear Power Plant, Midland, Michigan for Consumers Power Company," dated March 15, 1969.

The scope of this investigation was planned in collaboration with Messrs. Flach, Martinez, Kulesza and Cherrington of Bechtel Corporation.

The data and recommendations presented in this report are intended to supplement those presented in our "Report of Foundation Investigation, and Preliminary Explorations for Borrow Materials," dated June 28, 1968, and are considered appropriate for final plant design.

It has been a pleasure to be of service to Consumers Power Company and Bechtel Corporation on this project, and we trust that you will contact us if you should have any questions or comments.

Yours very truly,

DAMES & MOORE

George D Leal

George D. Leal

GDL:WWM:mf

SB 03315

Bechtel Associates Professional Corporation

Inter-office Memorandum

To	T.E. Johnson	Date	December 27, 1979
Subject	Problem Alert Large Settlements Due to Incorrectly Placed Backfill	From	E. Rumbaugh
		Of	Engineering
Copies to	K. Wiedner J. Milandin	At	Ann Arbor

It appears that K. Buchert's TPO Problem Alert will delete a lot of the substance from your draft and may not fully cover us in future backfill operations.

I suggest that we do the following:

1. Try to get the TPO Standard Specs. revised to cover future work similar to your draft problem alert and appropriate new TPO Specs. issued (See Section V of your draft).

2. Use the TPO Problem Alert and your draft problem alert as commentary with the TPO Standard Spec. so anyone in this office will have benefit when using the TPO Specs. in the future.

SE 03001

E Rumbaugh

E. Rumbaugh

ER/emp

See me →
Ted
Maybe its
time for me
to write
Buchert me

CIVIL ENGINEERING • POWER

Bechtel Power Corporation

Inter-office Memorandum

NOV 30 1979

CIVIL ENGINEERING

To	E. A. Rumbaugh
Subject	Problem Alert - Large Settlements Due to Incorrectly Placed Backfill
Copies to	T. E. Johnson, G. A. Tuveson, S. I. Heisler, W. T. Kellermann, S. L. Blue
Date	November 28, 1979
From	J. Milandin
Of	Quality Assurance
At	Ann Arbor

See me

AJAP.

The subject Problem Alert was originated by Ted Johnson as a result of a meeting which we held on June 13, 1979. The Problem Alert was, in effect, issued to take advantage of the Midland problem by providing for certain revisions in our specifications and controls to preclude such a situation from recurring on another project. As you recall, I suggested the Problem Alert. Ted Johnson has been working very closely with me to insure that QA concerns were included. Ted issued the report to Ken Buchert on October 19 and received a reply, attached, from Ken Buchert, apparently incorrectly dated, on August 27, 1979.

Buchert's reply, in effect, deleted all the recommended corrective actions by the Ann Arbor Office and effectively stated corrective actions which are essentially the same as the present program. Without the AAO recommendations, the Problem Alert is truly incomplete. It will not prevent the problem from occurring again once this Problem Alert has been filed. The idea behind the recommended action of the Ann Arbor Office was to perserve these experiences by revising generic specifications and control procedures which govern the placement of backfill.

It is requested that you look into this matter to determine why the San Francisco Power Division Civil Structural Chief rejected the corrective actions proposed by the Ann Arbor Office. Each of those actions, which were proposed, were tied back to problems which were identified during the course of the investigation and were carefully developed to preclude the recurrence of such a situation in the future. Therefore, as the situation now stands, if the office follows through on the Buchert August 27 letter, new projects may fall into the same situation as Midland did when memories dim.

Please respond by 12/12/79. Please advise whether you consider this a matter to be handled by an MCAR.

John Milandin

J. Milandin

JM/le
JM-79-122
File: AAO-QAR-79-66

SB 03502

Bechtel Associates Professional Corporation

Inter-office Memorandum

To	J. Milandin	Date	November 16, 1979
Subject	Problem Alert Large Settlements Due to Incorrectly Placed Backfill	From	T. E. Johnson
		Of	Civil/Structural
Copies to	File: 502	At	Ann Arbor Office

Attached for your information is a copy of the TPO response to the proposed problem alert on incorrectly placed backfill submitted for review by my IOM dated October 19, 1979.

G. Tuveson

G. Tuveson for

T. E. Johnson

TEJ/GT/wh

Attachment

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ANN ARBOR
QUALITY ASSURANCE

NOV 16 '79

Route	Info.	Act.	
QA ADD			
QE			
PQAE			
LQAE			
FQAE			
PQAS			
PQAS			
QC			
QE			
PMQ			
OFFICIAL NOTE			
QA SEC'Y			
FILE NO.			

SB 03503

Bechtel Power Corporation

Interoffice Memorandum

To: Distribution

Subject: Soil Fills, Bechtel Generic Position

Copies to

File No. 2.0, 2.2

Date: August 27, 1979

From: K. P. Buchert

Of: SFPD - Civil/Structural

At: MET/34/B9 Ext. 0552

The following Bechtel Generic Position on soil fills has been finalized after coordination between Engineering and Construction.

1. See that soil report, PSAR, and specifications are in agreement on all projects. Test fills will be used on all projects.

2. Assign a Soils Field Engineer in Construction (Bechtel Construction or on a Subcontractor's staff) to oversee fill operations. Testing will normally be done by a testing laboratory.

3. QC will be responsible for surveillance of the work done by the testing laboratory. This will be done if Bechtel does the work or a subcontractor does the work. This will be in addition to that done in item 2.

4. Construction will prepare an inspection plan and it will be reviewed by Project Engineering with consulting by the Civil Chief's staff and by H&CF. Acceptance and rejection limits will be specified.

5. H&CF soils representative will make periodic visits to the site to make an overall review of entire operation to determine if performance criteria are met.

Please proceed with implementation.

Ken

K. P. Buchert

KPB:slh

Distribution

A. J. Arnold (GPD)	~~F. E. Johnson~~ (AAO)	W. R. Ferris (H&CF)
A. L. Cahn	R. J. Kosiba (LAPD)	R. A. Schnaible (H&CF)
J. A. Dunlap	M. J. Mitchell	
H. B. Friend	J. N. Mulay (MOO)	
R. F. Gibson	K. Wagstaffe (HAO)	
D. W. Halligan	Civil Supvs.	

SB 03504

9024, REV 1/78

Bechtel Associates Professional Corporation

Inter-office Memorandum

To	K. P. Buchert	Date	October 19, 1979
Subject	Problem Alert Large Settlements Due to Incorrectly Place Backfill	From	T. E. Johnson
		Of	Civil/Structural
Copies to	File: 502 A. J. Arnold P. A. Becnel R. J. Kosiba J. Milandin K. Wagstaff	At	Ann Arbor

Attached for your review is a copy of the problem alert on incorrectly placed backfill which occurred at the Midland jobsite. I strongly urge you to issue this as a TPO problem alert.

A copy has been coordinated with P. Becnel of San Francisco Legal, and his comments have been incorporated in the attached draft of the problem alert.

T.E. Johnson

T. E. Johnson

TEJ/js

Attachment

SB 03505

Bechtel Associates Professional Corporation

Inter-office Memorandum

To: K. P. Buchert

Date: October 19, 1979

Subject: Problem Alert
Large Settlements Due to
Incorrectly Place Backfill

From: T. E. Johnson

Of: Civil/Structural

At: Ann Arbor

Copies to: File: 502
A. J. Arnold
P. A. Becnel
R. J. Kosiba
J. Milandin
K. Wagstaff

Ted – Sections I, II, III generally ok. Delete sections IV, V, VI, VII. Add my memo.

Attached for your review is a copy of the problem alert on incorrectly placed backfill which occurred at the Midland jobsite. I strongly urge you to issue this as a TPO problem alert.

A copy has been coordinated with P. Becnel of San Francisco Legal, and his comments have been incorporated in the attached draft of the problem alert.

NOV 13 1979

CIVIL ENGINEERING

T. E. Johnson

T. E. Johnson

FILE 502

TEJ/js

Copied for: ~~T. E. Johnson~~
A. J. Arnold
K. Wagstaffe
R. J. Kosiba
P. Becnel
R. F. Gibson
A. L. Cahn
J. N. Mulay

TED: Sections I, II, III generally okay. Delete Sections IV, V, VI, VII.
Add my memo.

KPB

Ed Salinas, please prepare TPO Problem Alert.

KPB

11/9/79

SB 03506

DISTRIBUTION OF THIS PROBLEM ALERT OUTSIDE OF BECHTEL REQUIRES WRITTEN APPROVAL FROM DIVISION ENGINEERING MANAGEMENT. INFORMATION FROM IT MAY BE USED IN DEVELOPING APPROPRIATE NOTIFICATION OR RECOMMENDATIONS TO CLIENTS, BUT PRIVILEGED OR OTHERWISE SENSITIVE INFORMATION SHALL NOT BE EXTRACTED WITHOUT ABOVE APPROVAL.

Discipline: Civil Engineering Origin: Ann Arbor

Subject: Large Settlements Due to Incorrectly Placed Backfill

Discipline Problem Alert Number: ______________ ____

I. APPLICABILITY

These conditions are applicable to all projects where structures are supported fully or partially by compacted backfill material.

II. PROBLEM DESCRIPTION

Insufficiently compacted plant area backfill under the diesel generator building was discovered because of excessive settlement during construction. The settlement monitoring program, which is designed to detect such conditions, did alert the project to this problem. Further investigation by a soils boring program has indicated that both granular and cohesive soils were improperly compacted in other areas of plant fill as well as at the diesel generator building. This required extensive reanalysis and/or modifications of the diesel generator building, the service water structure, the feedwater isolation valve pits, and portions of the auxiliary building.

Based on a thorough investigation, the most probable causes for the resulting remedial work include the following.

A. All types of compaction equipment used for plant area backfill were not prequalified for lift thickness and number of passes. This was particularly true for the small hand-operated equipment. Except for the prequalified heavy earth-moving equipment used to construct the plant area dikes, reliance was placed on acceptance being established by end result ASTM acceptance tests.

B. A review of test results by the geotechnical soils group has shown that the testing laboratory failed to obtain meaningful and accurate results after performing the applicable ASTM acceptance tests. Some examples are the following.

   1. More than one-half of the test results for relative density and percent compaction were outside the theoretical comparison limit.

SB 03507

2. Incorrect soil indentification and calculation errors were present.

3. Clearing of failed tests was improper or incomplete.

III. CORRECTIVE ACTION TAKEN WHERE PROBLEM OCCURRED

A. The structures are being modified to compensate for the in situ soil conditions using the following solutions:

1. Underpinning by the use of caissons or piles for portions of structures partially supported by fill

2. Reduction of residual settlement by surcharge loading the structure totally supported by fill

3. Elimination of the possibility of liquefaction of extensive sand backfill areas during a seismic event by installing a permanent dewatering system

B. The earthwork specification has been revised to provide more guidance to construction. The specification now requires compaction methods be established which include the number of passes for a given lift thickness for all approved equipment.

C. The quality control (QC) department has rewritten its inspection plans. Instead of essentially providing a surveillance program for the administrative aspects of the soils testing program, an inprocess, in-depth inspection program has been adopted. This program includes the verification of equipment qualifications for the placement methods adopted.

D. A resident geotechnical soils engineer has been assigned to the site to oversee the backfill operation.

E. The soils testing laboratory has been made aware of all testing discrepancies and has taken actions to prevent recurrence. Procedures to control testing activities are now being provided.

F. All of the construction equipment to be used for compacting the various types of soils at the site has been qualified to a maximum lift thickness with a specified number of passes.

IV. ACTION TO BE TAKEN BY BECHTEL PROJECTS

A. Each type of compaction equipment should be qualified at the jobsite for the respective type of soils to be compacted. This qualification includes lift thickness and number of passes, which adds a method criterion to the performance criteria for acceptance. However, the final acceptance criteria are still to be based on testing by the appropriate ASTM acceptance standard.

B. A project soil engineer and a field soil engineer should be assigned to each major project. The project soil engineer is assigned by the geotechnical services department and reports to the head of the soils group in the engineering office. The field soil engineer is on the project construction staff and reports directly to the construction superintendent. The field soil engineer will be hired by Bechtel construction or retained through a subcontract with an outside organization specializing in soil engineering. Project engineering and the geotechnical services group will review the qualifications of the candidate for field soil engineering and monitor the adequacy of his technical performance. The project specifications should clearly establish the responsibilities of the project and field soil engineers. As a minimum, the project and field soil engineers will have the following duties.

1. The project soil engineer's responsibilities will include, as a minimum, the coordination of all project soil engineering activities, the continuous review of soil-related construction activities, and the monitoring of the technical performance of the field soil engineer.

2. The field soil engineer's responsibilities will include, as a minimum, the monitoring of fill placement activities, soil testing laboratory activities, foundation excavations and pile or cassion foundation installations. In addition, he will coordinate all soil-related activities between project engineering/geotechnical services and construction, and forward progress reports to project engineering.

3. In the event the soils and foundation work becomes minor, project engineering/geotechnical services may agree that a full-time field soil engineer may not be needed. The project soil engineer will then assume the responsibilities of the field soil engineer.

C. Quality assurance manuals and vendor procedure manuals for the soils laboratory testing should be reviewed by geotech as well as project engineering.

D. A maximum limit of the number of times a proctor curve may be used as representative of the material being placed should be established. The procedures manual should be reviewed by geotechnical services as well as quality engineering to ensure that proper controls are outlined.

E. To minimize errors in testing, the soils testing laboratory should include the following practices in its testing procedures manual.

1. Cohesive Soils - The moisture content associated with a given field density cannot fall outside the zero air voids curve for the respective specific gravity.

2. Granular Soils - The stockpiled material should be tested for relative density by both the wet and dry methods as defined in the ASTM standards to ensure that the maximum relative density attainable will be used in placement.

F. Backfill Under Structures

1. To ensure that proper compaction is obtained, the frequency of plotting proctor curves or maximum/minimum density tests should be increased.

2. Consideration should also be given to performing static plate bearing tests as defined in the ASTM standards. The project or field soil engineer should have the option of requesting this type of test when appropriate.

V. ACTION TO BE TAKEN BY THE TPO CHIEF CIVIL/STRUCTURAL ENGINEER

A. TPO Specifications C-441 Rev 6 and C-442 Rev 0 which are the materials testing services specifications for both nuclear power plants and fossil fuel power plants are to be revised to eliminate the soil laboratory testing section.

B. New TPO soil laboratory testing specifications are to be issued by February 1, 1980. In addition to the information presently in TPO Specifications C-441 and C-442, these specifications should be expanded to include the following items:

1. Establish a limit on the number of times a proctor curve may be used as representative of the material being placed.

2. Require a check to ensure that for cohesive soils the moisture content associated with a given field density does not fall outside the zero air voids curve.

3. Require stockpiled granular soils should always be tested for relative density by both the wet and dry methods as defined in the ASTM standards.

4. Require procedures to control testing methods.

C. Reevaluate and revise as necessary the soils sections of the following TPO Specifications by February 1, 1980.

C-033 Rev 1	Site Grading
C-052 Rev 0	Pressure Water Piping, Furnishing and Installing
C-053.2 Rev 1	Furnish and Installing Yard Fire Protection System
C-054 Rev 0	Storm Sewer, Furnishing and Installing
C056.1 Rev 1	Furnishing and Installing Culverts
C-058 Rev 2	Constructing a Sanitary Sewer
C-062.1 Rev 0	Circulating Water Pipe Installation (Steel)
C-062.2 Rev 0	Circulating Water Pipe Installation (Concrete)
C-314 Rev 0	Circulating Water Pipe Installation (Fiberglass)
C-234 Rev 2	Structural Excavation and Earthwork Construction

VI. FURTHER INFORMATION

For further information contact G. Tuveson, Ann Arbor office, (313) 994-7727.

VII. FURTHER COORDINATION

Reevaluation and modifications of the TPO specifications should be coordinated with the geotechnical services department of the H&CF division.

10/17/25

SB 03011

Bechtel Associates Professional Corporation

Inter-office Memorandum

To	K. P. Buchert	Date	October 19, 1979
Subject	Problem Alert Large Settlements Due to Incorrectly Place Backfill	From	T. E. Johnson
		Of	Civil/Structural
Copies to	File: 502 A. J. Arnold P. A. Becnel R. J. Kosiba J. Milandin K. Wagstaff	At	Ann Arbor

Attached for your review is a copy of the problem alert on incorrectly placed backfill which occurred at the Midland jobsite. I strongly urge you to issue this as a TPO problem alert.

A copy has been coordinated with P. Becnel of San Francisco Legal, and his comments have been incorporated in the attached draft of the problem alert.

T. E. Johnson

T. E. Johnson

TEJ/js

Attachment

SB 03534

Discipline: Civil Engineering   Origin: Ann Arbor

Subject: Large Settlements Due to Incorrectly Placed Backfill

Discipline Problem Alert Number: ____________________

I. APPLICABILITY

These conditions are applicable to all projects where structures are supported fully or partially by compacted backfill material.

II. PROBLEM DESCRIPTION

Insufficiently compacted plant area backfill under the diesel generator building was discovered because of excessive settlement during construction. The settlement monitoring program, which is designed to detect such conditions, did alert the project to this problem. Further investigation by a soils boring program has indicated that both granular and cohesive soils were improperly compacted in other areas of plant fill as well as at the diesel generator building. This required extensive reanalysis and/or modifications of the diesel generator building, the service water structure, the feedwater isolation valve pits, and portions of the auxiliary building.

Based on a thorough investigation, the most probable causes for the resulting remedial work include the following.

A. All types of compaction equipment used for plant area backfill were not prequalified for lift thickness and number of passes. This was particularly true for the small hand-operated equipment. Except for the prequalified heavy earth-moving equipment used to construct the plant area dikes, reliance was placed on acceptance being established by end result ASTM acceptance tests.

B. A review of test results by the geotechnical soils group has shown that the testing laboratory failed to obtain meaningful and accurate results after performing the applicable ASTM acceptance tests. Some examples are the following.

   1. More than one-half of the test results for relative density and percent compaction were outside the theoretical comparison limit.

2. Incorrect soil indentification and calculation errors were present.

3. Clearing of failed tests was improper or incomplete.

III. CORRECTIVE ACTION TAKEN WHERE PROBLEM OCCURRED

A. The structures are being modified to compensate for the in situ soil conditions using the following solutions:

1. Underpinning by the use of caissons or piles for portions of structures partially supported by fill

2. Reduction of residual settlement by surcharge loading the structure totally supported by fill

3. Elimination of the possibility of liquefaction of extensive sand backfill areas during a seismic event by installing a permanent dewatering system

B. The earthwork specification has been revised to provide more guidance to construction. The specification now requires compaction methods be established which include the number of passes for a given lift thickness for all approved equipment.

C. The quality control (QC) department has rewritten its inspection plans. Instead of essentially providing a surveillance program for the administrative aspects of the soils testing program, an inprocess, in-depth inspection program has been adopted. This program includes the verification of equipment qualifications for the placement methods adopted.

D. A resident geotechnical soils engineer has been assigned to the site to oversee the backfill operation.

E. The soils testing laboratory has been made aware of all testing discrepancies and has taken actions to prevent recurrence. Procedures to control testing activities are now being provided.

F. All of the construction equipment to be used for compacting the various types of soils at the site has been qualified to a maximum lift thickness with a specified number of passes.

IV. ACTION TO BE TAKEN BY BECHTEL PROJECTS

A. Each type of compaction equipment should be qualified at the jobsite for the respective type of soils to be compacted. This qualification includes lift thickness and number of passes, which adds a method criterion to the performance criteria for acceptance. However, the final acceptance criteria are still to be based on testing by the appropriate ASTM acceptance standard.

B. A project soil engineer and a field soil engineer should be assigned to each major project. The project soil engineer is assigned by the geotechnical services department and reports to the head of the soils group in the engineering office. The field soil engineer is on the project construction staff and reports directly to the construction superintendent. The field soil engineer will be hired by Bechtel construction or retained through a subcontract with an outside organization specializing in soil engineering. Project engineering and the geotechnical services group will review the qualifications of the candidate for field soil engineering and monitor the adequacy of his technical performance. The project specifications should clearly establish the responsibilities of the project and field soil engineers. As a minimum, the project and field soil engineers will have the following duties.

1. The project soil engineer's responsibilities will include, as a minimum, the coordination of all project soil engineering activities, the continuous review of soil-related construction activities, and the monitoring of the technical performance of the field soil engineer.

2. The field soil engineer's responsibilities will include, as a minimum, the monitoring of fill placement activities, soil testing laboratory activities, foundation excavations and pile or cassion foundation installations. In addition, he will coordinate all soil-related activities between project engineering/geotechnical services and construction, and forward progress reports to project engineering.

3. In the event the soils and foundation work becomes minor, project engineering/geotechnical services may agree that a full-time field soil engineer may not be needed. The project soil engineer will then assume the responsibilities of the field soil engineer.

C. Quality assurance manuals and vendor procedure manuals for the soils laboratory testing should be reviewed by geotech as well as project engineering.

D. A maximum limit of the number of times a proctor curve may be used as representative of the material being placed should be established. The procedures manual should be reviewed by geotechnical services as well as quality engineering to ensure that proper controls are outlined.

E. To minimize errors in testing, the soils testing laboratory should include the following practices in its testing procedures manual.

1. Cohesive Soils - The moisture content associated with a given field density cannot fall outside the zero air voids curve for the respective specific gravity.

2. Granular Soils - The stockpiled material should be tested for relative density by both the wet and dry methods as defined in the ASTM standards to ensure that the maximum relative density attainable will be used in placement.

F. Backfill Under Structures

1. To ensure that proper compaction is obtained, the frequency of plotting proctor curves or maximum/minimum density tests should be increased.

2. Consideration should also be given to performing static plate bearing tests as defined in the ASTM standards. The project or field soil engineer should have the option of requesting this type of test when appropriate.

V. <u>ACTION TO BE TAKEN BY THE TPO CHIEF CIVIL/STRUCTURAL ENGINEER</u>

A. TPO Specifications C-441 Rev 6 and C-442 Rev 0 which are the materials testing services specifications for both nuclear power plants and fossil fuel power plants are to be revised to eliminate the soil laboratory testing section.

B. New TPO soil laboratory testing specifications are to be issued by February 1, 1980. In addition to the information presently in TPO Specifications C-441 and C-442, these specifications should be expanded to include the following items:

1. Establish a limit on the number of times a proctor curve may be used as representative of the material being placed.

2. Require a check to ensure that for cohesive soils the moisture content associated with a given field density does not fall outside the zero air voids curve.

3. Require stockpiled granular soils should always be tested for relative density by both the wet and dry methods as defined in the ASTM standards.

4. Require procedures to control testing methods.

C. Reevaluate and revise as necessary the soils sections of the following TPO Specifications by February 1, 1980.

C-033 Rev 1	Site Grading
C-052 Rev 0	Pressure Water Piping, Furnishing and Installing
C-053.2 Rev 1	Furnish and Installing Yard Fire Protection System
C-054 Rev 0	Storm Sewer, Furnishing and Installing
C056.1 Rev 1	Furnishing and Installing Culverts
C-058 Rev 2	Constructing a Sanitary Sewer
C-062.1 Rev 0	Circulating Water Pipe Installation (Steel)
C-062.2 Rev 0	Circulating Water Pipe Installation (Concrete)
C-314 Rev 0	Circulating Water Pipe Installation (Fiberglass)
C-234 Rev 2	Structural Excavation and Earthwork Construction

VI. FURTHER INFORMATION

For further information contact G. Tuveson, Ann Arbor office, (313) 994-7727.

VII. FURTHER COORDINATION

Reevaluation and modifications of the TPO specifications should be coordinated with the geotechnical services department of the H&CF division.

10/17/25

Bechtel Associates Professional Corporation

Inter-office Memorandum

To P. Martinez

Date

Subject Midland Plant Units 1 & 2
Job 7220
Plant Area Earthwork
Specifications

From R.L. Castleberry

Of Management

At Ann Arbor

Copies to File: C-2645, 0294, C-210, C-211

H.B. Friend (SF)
E. Rumbaugh
K. Wiedner
B.H. Randolph (SF)
T.E. Johnson
W. Ferris (SF)
S. Blue
S. Afifi
Com Log

*

Based on recent events that have happened at the jobsite with the diesel generator building foundation, various questions have been raised about earthwork construction, and in particular, about the plant area fill. The following is a brief summary of the differences between the consultants' soil report and the project specifications.

Dames and Moore was employed by Bechtel as the foundation consultant and issued a soils report in three stages in 1967, 1968, and 1969. As a result of these reports, the job specifications were developed with minor apparent differences, and these are in the areas of the degree of compaction and the lift thickness.

SB 03510

Compaction Criteria

Attached is Table I which shows the minimum compaction criteria from the Dames and Moore report and the values specified in the project specifications. A testing laboratory, U.S. Testing, has been located at the site and is directed by Bechtel Quality Control to perform the appropriate tests. A review of the test records for the plant area backfill has been completed, and Figure I is a plot for clay of the cumulative relative frequency versus the percent Bechtel Modified Compaction (BMC). This curve indicates that there were not any failure tests below 95% of the ~~time~~ BMC, where the condition went uncorrected. For over 60% of the time, 98% of the BMC was achieved, and for over 31% of the time, 100% of the BMC was obtained. Figure II is a plot for cohesionless (sandy) soils of the cumulative relative frequency versus the percent relative density of the sand. Based on this figure, for at least 96% of the time, 80% relative density of the soil had been obtained, and for over 80% of the time, 85% relative density had been achieved for the sand backfill in the plant area.

It is engineering's opinion, based on Quality Control compaction records, that the difference in the compaction criteria shown in Table I does not account for, or contribute to, the problems experienced at the site. The 95% BMC for clay and 80% relative density values for sand as a minimum requirement would not yield compacted fill material unsuitable for structural use to support buildings.

Lift Thickness

The Dames and Moore report recommended that the soil in the dike embankments be compacted in lift thicknesses not to exceed 12 inches, and 6 to 8 inches in the plant area fill. However, this report did not indicate the type of compaction equipment to be used. The project specifications were developed on the basis of a maximum lift thickness of 12 inches to be used.

SB 03541

In the embankment and dike areas, the project specifcations listed the type equipment and minimum number of roller passes to be used to reach the desired compaction with a control on the moisture content in the fill being placed. The contractor did qualify the equipment being used at the site by making controlled performance tests for several types of soils at the site. Thus, by doing controlled testing, the method being used to compact the soil (four roller passes) was given a high degree of assurance that it would pass the performance test requirements.

The plant area backfill section of the specification did not list the type of equipment or the minimum number of roller passes to be used but relied mainly on the performance testing for acceptance of the fill. However, the major portion of this material was placed by the same subcontractor and with the same equipment used on the dike. In areas where heavy mechanized equipment could not be used, the smaller tampers were also qualified by controlled performance tests. The maximum lift thickness was established for each of these various tampers, and the lift thickness did not exceed 12 inches. Thus, by establishing the maximum lift thickness for the various types of tampers by controlled testing, a high degree of assurance was obtained that the performance test requirements would be met.

General Comments

SB 03542

The earthwork specification does have apparent conflicts in the various sections, and these are the following.

Specification C-210, Section 13.7.1 requires all cohesive (clay) backfill in the plant area to be compacted to not less than 95% maximum density, as determined by ASTM D-1557, Method D, which requires an effective compactive effort of 56,000 foot-pounds of energy per cubic foot of soil. However, the testing section of this specification for plant area backfill, Section 13.4, requires testing of the plant area backfill to be performed in accordance with tests listed for testing of dike and embankment material, Section 12.4. This section and, in particular, Section 12.4.5.1 (cohesive soils), requires laboratory maximum densities to be determined using ASTM D-1557, Method D, modified to require 20,000 foot-pounds of compactive energy per cubic foot of soil (BMC). ~~As a result of these apparent~~ As a result of these apparent differences in the specification, construction used the compaction criteria listed in Table I, 95% BMC.

One hundred percent BMC is considered equivalent to 95% ASTM D-1557, Method D. Figure I does indicate that the actual compaction achieved is, in most cases, well above 95% BMC. Thus, project engineering does not consider that these conflicts are the root cause of the problems with the fill.

Compacted clay fills consist of lumps of particles which are held together by effective stress caused by capillarity. The consultant, Dr. Peck, during a site inspection trip, indicated that it appears the fill was compacted too dry of optimum, and that fill material was not disked sufficiently so that hard lumps were placed. The drier the soil, the harder the lumps will be. The compaction process attempts to deform these lumps and make them coalesce. A given compactive effort will be more successful in doing this if the lumps are softer, as when additional water is added, than when the moisture content is low and the lumps are hard. Fill placed too dry of optimum exhibits a flocculated type structure with an increase in air permeability of the soil mass. Thus, when the pond was filled with water, the clay material became saturated with water,

SB 03513

the hard lumps softened, and the contact surfaces of the flocculated structure became lubricated. Under the fill's own weight, the inner elements or particles collapsed, causing settlement to occur and the soil to exhibit properties of high compressibility.

In addition, Dr. Peck has indicated that refilling of excavations from existing fills tends to be less adequate than the original fill. Further, large areas to be compacted are easier to control than small areas.

The Quality Control records do not indicate that the soil was compacted dry of optimum but was compacted within the specified tolerance of 2% of optimum. However, the clay soil used at the site does vary in properties as shown in the typical moisture-density curves plotted in Figure 3. Thus, the selection of the wrong curve when comparing field measurements with laboratory data can lead to an incorrect conclusion with improper control of the compaction technique being implemented.

Based on our present findings, the soil testing methods are being reevaluated, and an increase in surveillance of these activities is being implemented by the geotech soil department. In addition, an expensive soils investigative program is under way, and hopefully a more definitive explanation will be obtained.

R.L. Castleberry

GT/js
11/29/9

SB 03544

TABLE I

Minimum Compaction Criteria

Purpose of Fill	Onsite Sand Soils Percent Relative Density*		Onsite Clay Soils Percent of Maximum Density**	
	Dames and Moore	Bechtel Specifications	Dames and Moore	Bechtel Specifications
Support of structures	85	80	100	95
Adjacent to structures	75	80	95	95
Area fill (not supporting or adjacent to structures)	70	80	90	95

* Maximum and minimum density of sand soils determined in accordance with ASTM Test D-2049

** Maximum dry density and optimum moisture content determined in accordance with ASTM Test Designation D-1557 modified to require 20,000 foot-pounds of compactive energy per cubic foot of soil (called the Bechtel Modified Compaction, or BMC).

PLANT AREA FILL COMPACTION - COHESIVE SOILS (CLAY)
SAMPLE SIZE-683 TESTS

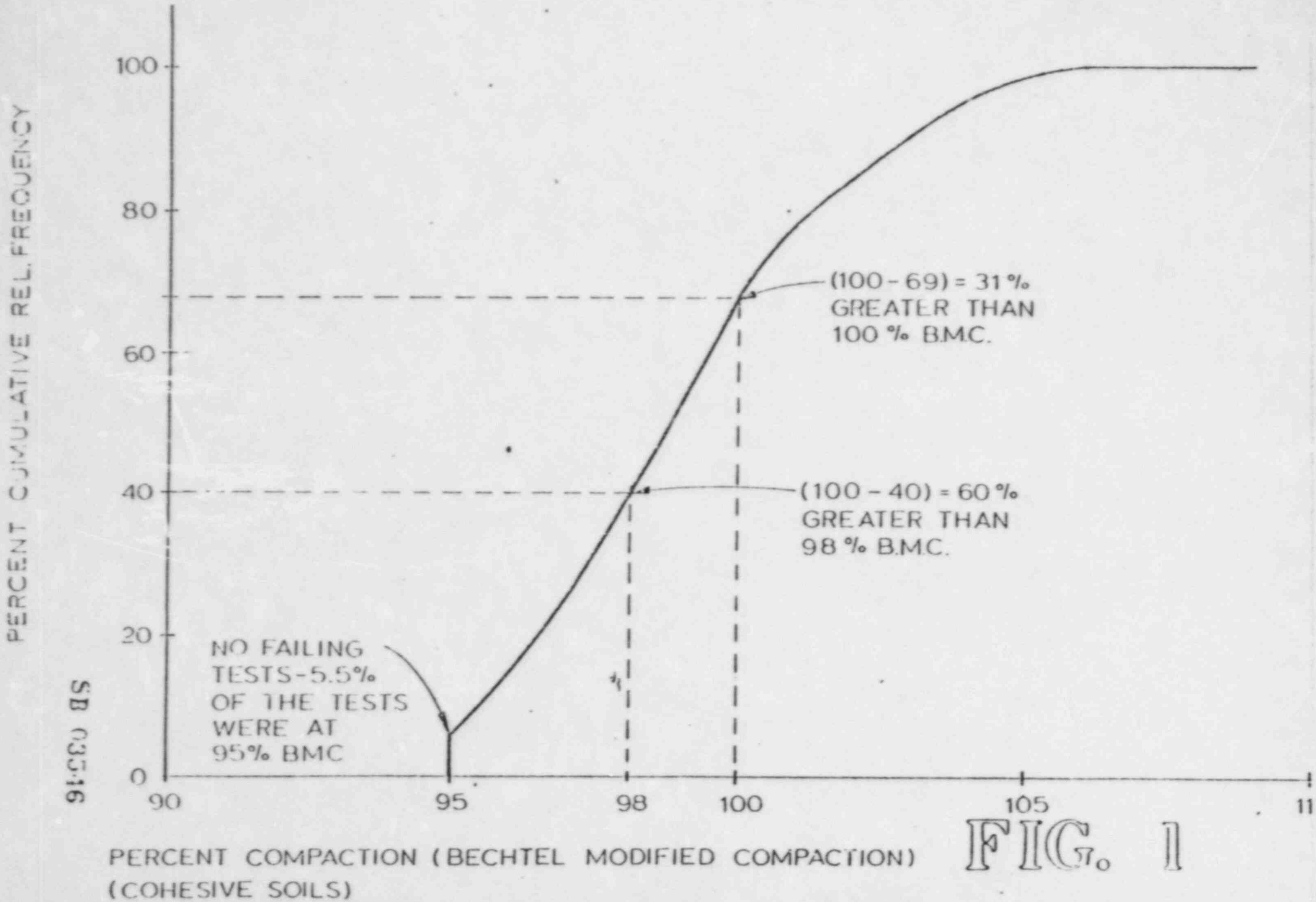
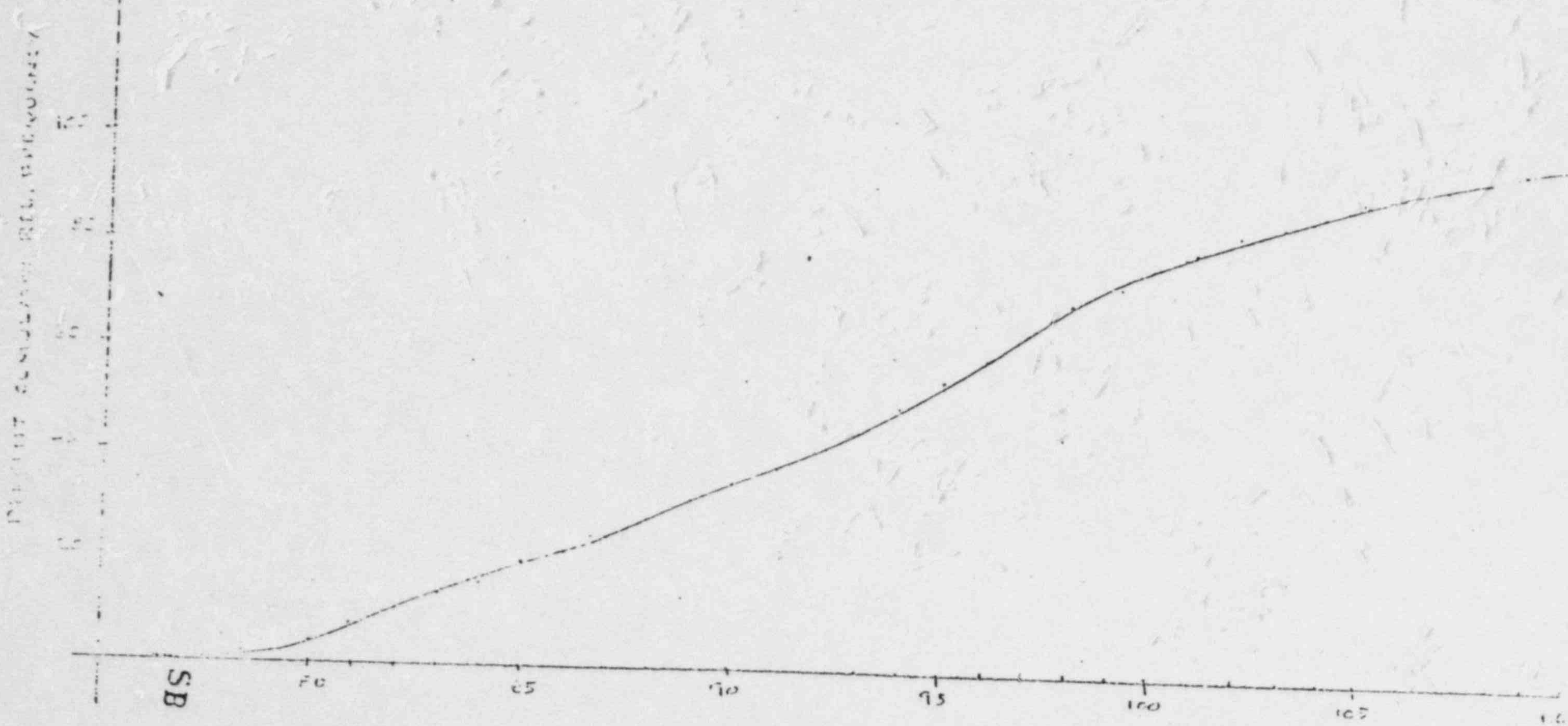


FIG. 1

PLANT AREA FILL - COMPACTION - COHESIONLESS SOILS (SANDY).

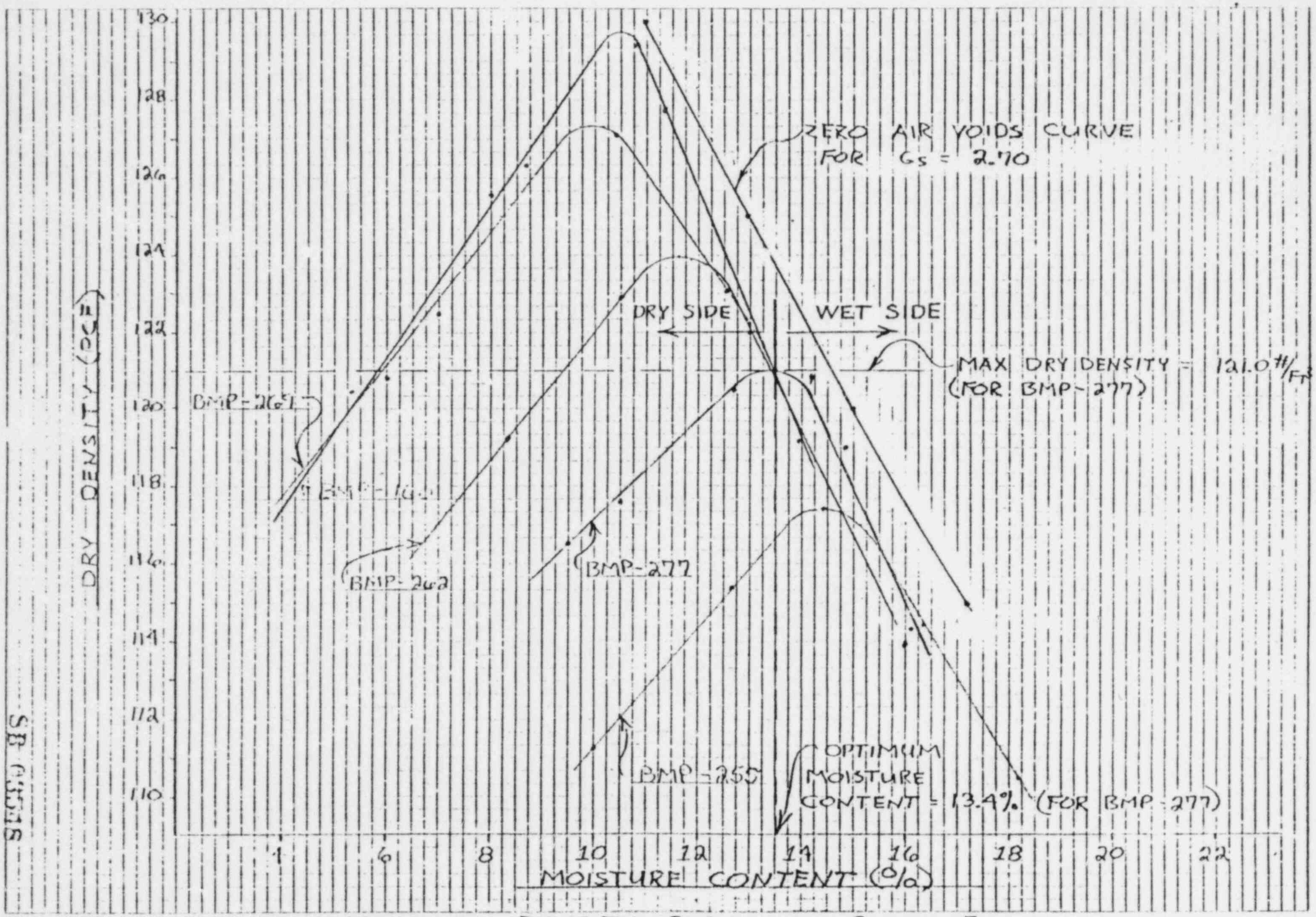
SAMPLE SIZE - 941 TESTS.



PERCENT REL. DENSITY (ASTM D-2049).
(COHESIONLESS SOILS)

FIG. II.

SB 03547



TYPICAL MOISTURE- DENSITY CURVES OF COHESIVE PLANT FILL SOIL FOR BECHTEL MODIFIED COMPACTIVE EFFORT

FIGURE 3

memo from | W. R. FERRIS

BECHTEL

TO: S. S. Afifi

Herewith is a copy of the notes I took at Albuquerque on Dec 8, 1978

W R Ferris

12/11/78

SB 03577

Attendees R.B. Peck
S. Afifi, W. R Ferris, G. Tuveson Bechtel
R. Wheeler Consumers Power Co. Dec 8, 1977

Midland

Diesel Building

1. Surcharge will be put in as Peck requires

2. Turbine Bldg Wall.

Center portion will shimmed to ~~...~~ floor slab.

Tie backs will be put at both ends

5 ft of Fill will be placed inside except where tie-backs.

Tie rods will be protected by ~~a~~ pipes.

Monitor tie rods with jack.

Tie rods may be every 3 ft. - Presently every 6 ft. (2½" rods)

(Completed in a week)

Earth Pressure

Elastic load on wall

2 × Elastic load for tie rod.

3. Breaking Mud Mat - Not necessary to break it up.

~~4. Rebound Measurements~~

4. Surcharge - Currently looking at 20 ft of surcharge above grade.
Settlement can be accelerated by more load or else
you could wait to let the settlement occur under 20 ft.
Decision will have to be made as preloading occurs.
Increments of preload 10 ft over whole area, ~~then~~ leave
for a week, then 5 ft. and finally 5 ft if necessary

5. Rebound - Continue measurements of Borros points. You need
very frequent measurements. Temperature correction not
necessary but ambient air temperature should be taken.

SB 03578

Get several sets of measurements before preloading. (Rec daily for several days prior to loading).

6. Investigation After Surcharge

Peck would like not to do any investigation after preloading. Building and surcharge have proved out subsoil. Consider possibility of digging shallow test pits to evaluate pocket penetrometer resistance, load testing, ~~&~~ undisturbed sampling. (Test pits to be hand dug.)

7. Alternative Solutions

No indication of a bearing capacity problem. After consolidation by preload bearing capacity will be improved. If necessary it can be evaluated by load testing after preloading. If there is a problem ~~design~~ of a mat could resolve the question. It might be desirable to have a mat design available. Alternatively ~~&~~ make sure sand is inside.

Make some CU tests carried out using loading similar to what will actually occur due to preload.

Get a three dimensional picture of where the sand is located. (Material above foundations not a problem)

Then check to see if there are problem areas and determine their groutability. Picture will have to be determined from construction records.

SB C3373

Condensate Lines - Condensate water line encasement may be in contact with the building at the sump and causing it to hang up. Experience at duct bank indicates that the same problem may exist here. It would appear desirable, where it crosses the footing, to cut it loose.

Building Cracks - Cracks should be mapped to have a record. The cracks themselves should have no significance. It would have been nice to have the ~~[illegible]~~ closing of the cracks on cutting the duct banks recorded.

Rationale for Preloading - Time etc.

Final loads will be smaller than the surcharge loads.

It should be possible to give upper limit of future settlements (this should ~~be~~ not exceed the rebound because of preloading).

Prepare authentic plots of settlement versus time for 180+ days. Superimpose the preload on this and probably the stress at the instrument location.

Cause - Discussed briefly with NRC. Peck said it is an independent activity.

Gallagher has compaction curves and we need to know how they fit into the picture according to Peck.

We need to know when the trenches and fills were.

SB 03080

Other Areas

Has check been made back to USGS bench mark. - This will be done (Apparently was not done since 1932). This is not important to immediate evaluation of the settlement of structures. The plant bench mark is satisfactory for this.

Unit 1 transformer pad - Monitored since 9/16/78 - 1/2 inch settlement to 11/21/78

(Prior to that construction indicated about 2")

Pad poured in 1977.

Pt T-1 on SW corner of Turbine building 3/4" since 17 May 1977 ~~(No more load to be added)~~

Very little load added since then.

(No movement since May 1978).

Transformer load 3 ksf.

We should know time rate of settlement from DG building preload. Should these areas be preloaded? ~~Peck~~ said it would do no harm but Client does not know how it would affect schedule.

~~Unit 2 transformer pad~~

If differential settlements develop it will be because of the shallower soils. A low surcharge would help (may) surface condition

~~[illegible]~~ Peck recommended

a small area fill so as not to influence

SB 03301

Overload center portion on pads for transformer.
Consider 5 feet of earth over all of ~~[illegible]~~ transformer area
and then surcharge transformer foundation to design load. This
would be done at time of preload for d.g. building. Prior to
doing this check to determine ~~[illegible]~~ how much differential manufacturer can accomodate.
A check should be made of utilities etc to see if
any go under foundations.
Ask manufacturer about vertical deformation and tilting
of transformer and ~~the~~ ability of bus to accomodate this.

Unit 2 Transformer - Settlement relatively small.
Conditions better than Unit 1. Preload may
be ~~[illegible]~~ required.

Tank Farms North Side Category I.
East and West Tanks are Category I also pipes from
the auxiliary building (borated water)
Two center tanks are not Category I
Tanks about 40 ft high.
Pumps are currently installed. Settlements just nominal.
Pipes entering tank are 20 inch. Tanks & can be
test loaded to provide preload but something must be
done about piping. Don't hook big pipes up until after the
~~testing~~. Take levels on a tank during testing tests to see if
~~[illegible]~~ any settlements develop. Find out water table at
the tank farms.

Use survey measurements and use a rule instead of a survey rod. A local bench mark can be used. See what happens in initial week of loading. Water probably cannot be left in tank for long (this needs to be checked). What quantity of water is required. (Ground water table (6 piezometers) is from 617 to 622)

Four of the 6 piezometers were destroyed during backfilling.

Condensate Storage Tanks (Not Cat. I)

ST1 – ST-8 – Settlement of about 7/8" settlement under essentially no load. This would represent settlement of fill under its own weight.

Consider preloading the tank area.

Decide on February 15, 1979 if preloading must be done. A Preload fill weight influence access. Preloading might be considered after tank is installed. It might also be done, one at a time.

Guard House

Pile Foundation

Bullock Creek Bridge - Pipe bridges - 48" pipe

Radwaste Bldg

Sits on fill. Settlement of about 1/4" since 9/23/78 (about 1/4 inch before that

Still under construction (50% comp.) GWT @ 622. SB 03583

Do nothing at present.

Retaining Walls - Could perhaps use a carpenters level and set points.

Bechtel Power Corporation

Interoffice Memorandum

To P.A. Martinez

Subject Job 7220 Midland Project

Q-Listed Backfill

File or Log #: BCBM-454

Copies to K. Wiedner S. Blue/S. Afifi

R. Hermeston J. Betts

W. Barclay M. Peterson

L. Dreisbach

R. Castleberry

File No.

Date April 9, 1979

From J. F. Newgen

Of Construction

At Midland, MI Ext.

APPROVAL:

A. J. Boos

L. F. Stornetta

Other

References: 1)

2)

Body: ~~This letter is in response to~~ ~~(cross out if not applicable)~~

This memo is written to confirm the lifting of the (project) management "stop work" on Q-listed backfill placement for the Midland Project. The stop work removal is based on the following committments:

1) Construction will assign a ~~[illegible]~~ ~~[illegible]~~ ~~qualified field~~ field engineer to ~~monitor all~~ technically direct the placement of all Q-listed backfill on the project. The ~~[illegible]~~ assignment will be the individual's

JFN/AVB/ Place initials in the box.

Attachments ☐ yes ☐ no

Response ☐ yes ☐ no

SB 17322 over

primary assignment and as such he should be able to devote his full time to soils placement. Milt Peterson who has over seven years of construction soils excavation and placement experience has been initially assigned this responsibility.

② Geo-Tech will assign a soils engineer in support of the field engineer as described in ① above. This individual will visit the site ~~t~~ frequently to assure that the soils are being placed properly and ~~to~~ that the testing ~~laboratory~~ laboratory work conforms to all requirements of ~~t~~ technical specification 7220-C-208.

③ Construction will ~~perform~~ place test pads for cohesive and cohesionless fill materials under the surveillance of Geo-Tech to qualify lift thicknesses for hand held compaction equipment. Geo-Tech will provide the ~~tech~~ test parameters for the pads. ~~to Project Engineering~~ This information will be transmitted to Construction via ~~Project Engineering~~ normal project channels.

SB 17323

Bechtel Pow[illegible] Corporation

Post Of[illegible]
Midland [illegible]
April 11, 1[illegible]

U. S. Testing Company, Inc.
141 Park Avenue
Hoboken, New Jersey 07030

Attention: Dave Edley

Job 7220 Midland Project
Subcontract 72[illegible]-208
Proposed Audi[illegible]
C-208-B-361

Dear Mr. Edley:

As you are aware, Bechtel, as well as Consumers Power Compan[illegible] and the Nuclear Regulatory Commission, has been conducting investigations into unusual settlements which have occurred beneath the diesel generator building, as well as in other areas of the plant fill. These investigations have uncovered some questions relating to U. S. Testing's implementation of quality assurance requirements under Subcontract 7220-C-208. We propose to meet with you at the Midland jobsite to discuss these items in the near future as soon as our investigation is complete. The situation requires, and we must insist, that all documentation and physical samples relating to the soils testing on the Midland site in the possession of U. S. Testing be preserved [illegible]s written authorization is received from Bechtel to destroy them.

We also intend to conduct a quality assurance and engineering audit of your operations at the Midland site. We expect to conduct this audit on or about the week of April 23, 1979, in order that potential findings can be resolved so as to not delay upcoming construction.

In addition, attached is NRC report 78-20, dated March 22, 1979, and Consumers Power Company letter No. HOWE-83-79 dated March 9, 1979. The NRC report describes certain statements made to the NRC by U. S. Testing personnel and the Consumers Power Company letter responds to questions raised by the NRC. It is requested that you review these documents and notify Bechtel of any inconsistencies at the earliest possible date.

Very truly yours,

J. F. Newgen
Project Superintendnet

JFN/AB/sk

Attachments
cc: P. Becnel
P. Martinez
L. Dreisbach
W. Barclay

SB 17374

BECHTEL

+ 6005

DRAFT
G. RICHARDSON
3/15/79

REGROUPING OF POSSIBLE CAUSES BY SEQUENCE

1. SPECIFICATION REQUIREMENTS INADEQUATE
   - 95% BMP vs. 100% BMP - INVESTIGATE EFFECT OF DIFFERENCE ON SETTLEME
   - SPEC. 7220-C-211 - COMPARE WITH SPEC C-210
     - INVESTIGATE LACK OF FROS PROTECTION
     - INVESTIGATE USE OF COMPACTION BY PONDING,
   - MOISTURE INTRUSION IN GROUND - INVESTIGATE EFFECT O COMPACTION/SETTLEMENT

2. CONSTRUCTION METHODS/PROCEDURES
   - PLACEMENT METHODS - INVESTIGATE PRACTI AND ADEQUACY. INVES IGATE USE OF 12" LIFTS. REVIEW EQUIP. QUALIFICAT
     - LIFT THICKNESS
     - MOISTURE CONTROL
     - COMPACTION EQUIPMENT
     - TYPE OF MATERIALS.
   - USE OF STOCKPILED MATERIAL - INVESTIGATE EFFECT ON MOISTURE CONTROL AND WEATHERING AND EFFECT IF 1977 WAS A DRY YEAR
   - EXTENSIVELY REEXCAVATED AREA - INVESTIGATE EXTENT PROCEDURES AND CONTR

3. INSPECTION PROCEDURES.
   - RELIANCE ON TESTING - INVESTIGATE IMPACT AND TESTING ADEQUACY
   - SMALL AREAS - WAS TEST FREQUENCY INCREASED - INVESTIGATE TEST FREQUENCY/DISTRIBUT
     - DIG TEST PITS

SB 17722

3. CON'T

• DIFFERENT CONTRACTORS -	INVESTIGATE TO DETERMINE DIFFERENCES IN INSPECTION PROCEDURES.
	• COMPARE KNOWN AREAS OF LOW COMPACTION TO CONTRACTOR DOING WORK.
• BECHTEL INSPECTION PROCEDURES CHANGED AFTER 7/77	- INVESTIGATE CHANGE AND EFFECT.
• PERSONNEL CHANGES	- INVESTIGATE QUALIFICATIO[NS] OF BECHTEL, CANONIE AND USTESTING PERSONNE[L]

MIDLAND SOILS CHRONOLOGY AND SUMMARY

Soils placement on the Midland job is broken down between cooling pond dike construction and plant fill. A subcontractor (Canonie, Inc.) constructed the dikes during the period of 1969-70 and 1973-77. Plant area fill (which is essentially complete) has been placed by both a subcontractor (Canonie, Inc.) and Bechtel. Canonie's work was limited to placement of large, open plant fill areas with mechanical equipment, while Bechtel generally placed smalle areas inaccesible to mechanized equipment with hand compactors. Bechtel has, however, placed some areas of plant fill with mechanized equipment. Placement of plant fill has extended from 1974 to present.

All soils testing on the project is performed by a subcontractor (U.S. Testing, Inc.). Their responsibilities include taking tests in accordance with ASTM standards at locations specified by Bechtel or Canonie. While not explicitly stated in their contract, U.S. Testing has also accepted the job of soils classification to facilitate testing.

Soils placement by Bechtel has been done under the technical direction of Bechtel field engineers assigned to specific plant areas i.e. yard facilities, Auxiliary Building, etc. There was not a designated soils field engineer on the jobsite. Because they were assigned responsibilities in addition to soils placement (i.e. rebar and formwork inspection, material requisitioning, etc.) the field engineers were not always physically present during the fill placement. Labor foremen were utilized to help call for soils tests under the direction of the field engineer. Technical acceptance of plant fill has been based on satisfactory test results.

Bechtel Construction Quality Control performed surveillance over the work done by Canonie. Canonie implemented their own approved QA program and Bechtel QC verified proper implementation by observation and review of records. Two to three times a day Bechtel QC would observe fill placed by Bechtel construction. Full time inspection was not required.

The settlement of the Diesel Generator Building was noted during routine construction survey work. Settlement markers were assigned and an extensive boring program was undertaken to ascertain the extent of the problem. The results of the boring program which are included in MCAR 24 show material with highly variable in-place properties in the first 15 feet under the structure. This fill which includes both clay and sand was placed by Bechtel during 1977

As a result of the problems noted with the Diesel Generator Building an extensive settlement monitoring and soils boring program was undertaken for the balance of the plant. This program, which is still underway, includes borings taken through building base slabs. Those structures/facilities which are or may be effected by soil not meeting specification requirements to date include:

1) Diesel Generator Building
2) Unit #1 Main Transformer Area
3) Condensate Tank Area
4) Service Water Structure (North corner)
5) Unit #1 Penetration Room
6) Units #1 and #2 Feedwater Isolation Valve Pits
7) Borated Water Tank (Western tank only)

As a general rule we note that the "soft" soil encountered under these structures/ facilities was placed by Bechtel using hand held equipment.

A surcharging program is currently underway to preconsolidate the fill under the Diesel Generator Building. Remedial measures to correct soils problems with the other above listed structures/facilities are under investigation.

SB 17755

Bechtel Power Corporation

Interoffice Memorandum

To P. A. Martinez
Project Engineer

Subject Job 7220 Midland Project
Canonie Construction Co.
Subcontract 7220-C-210
Plant Foundation Excavation
and Cooling Pond Dikes

Copies to BCBE 303

Date May 15, 1974

From E. E. Felton

Of Construction

At Midland, Michigan

Attached is a letter from Canonie Construction Company of May 3, 1974 and their consultant's, E. D'Appolonia Consulting Engineers, Inc., fill characteristics report.

Canonie Construction Company has submitted this information as a possible claim. Because this claim could have a severe contract cost impact, we request your careful review and comments.

E. E. Felton

EEF/EJS/ja

Attachment

SB 17787

5024 (10-72)

Bechtel Power Corporation

Interoffice Memorandum

To	P. A. Martinez	Date	June 5, 1974
Subject	Job 7220 Midland Project Structural Backfill Specification 7220-C-211 BCBE 319	From	E. E. Felton
		Of	Construction
Copies to	R. L. Rixford J. H. Allen	At	Midland, Michigan

During April, 1974, civil procedure C-301 was replaced by Specification 7220-C-211, Rev. 0. At this time the field requested that a finer cohesionless and free draining material than that specified be considered; i.e., a material with 95-100% passing the #40 sieve. Reasoning for this was that the finer material is locally available within five miles from the jobsite as compared to twenty miles or more for the material specified and is available at a much lower cost. Some concern existed on possible liquefaction of this material and because of the time needed to fully test and evaluate it, the finer material was denied.

The field would like to continue to pursue this material. Please inform us of the testing required.

Please contact R. Grote if any further information is required.

E. E. Felton

EEF/RAG/kt

SB 17788

5024 (10-72)

DRAFT

DRAFT
October 31, 1978

Mr. G. S. Keeley
Project Manager
CONSUMERS POWER COMPANY
1945 West Parnall Road
Jackson, Michigan 49201

Midland Units 1 and 2
Consumers Power Company
Bechtel Job 7220
CONTINUATION OF DIESEL GENERATOR BUILDING WORK
Files

Dear Mr. Keeley:

This letter is to formalize the items discussed during our meeting of October 25, 1978, at the Midland jobsite. We advised that the consultants' formal recommendation is expected by November 7, 1978. Preliminary discussions with the consultants, however, have indicated two possible courses of action appear likely, either, accepting the building anticipated settlements throughout its life and modifying the design, or preloading the soil to incur most of the settlement prior to plant operation, In either case, it would be desirable that the subsurface soils be monitored for movement. Recognizing that there will be some interval between obtaining the consultants' final recommendation and embarking on whatever plan is utlimately approved, at this meeting we outlined our plan of activities for continuation of diesel generator building construction and preparation for the possible surcharging of the building area.

Specifically, we propose to

(1) Proceed with repair work on the building. This includes releasing any settlement restraints imposed by the electrical duct banks and then grouting any gaps which exist beneath the building foundations to insure adequate contact with the underlying soil.

SB 17822

(2) Concurrent with this repair activity we plan to proceed with installation of soil settlement monitors in and around the building.

(3) In preparation for the possibility that surcharging may be undertaken, we will proceed with the design and installation of measures to protect the turbine building and adjacent transformer areas from any effects of the surcharge.

(4) We will also proceed with the installation of any frost protection measures which may be needed. We currently envision using a layer of sand for this protection.

(5) Prior to and after releasing the electrical duct banks, we will perform survey measurements on the ends of the casing for the condensate pipes. We will also perform visual inspection and gap measurement for the following pipes: condensate at casing entry and exit, service water at building entry, and diesel oil at building entry. Visual inspection shall be for physical damage or the potential of damage due to settlement. Gaps will be measured at the top, bottom, and sides of pipes.

Since our meeting we have developed cost estimates which show that the release of the duct banks and grouting will cost approximately ______________________, the soil monitors will cost ______________________, and the preparations for surcharging will cost ______________________.

The advance measures for protection of the turbine building and transformer area and frost protection, which are required only if preloading is used, would provide a schedule advantage if started at this time should preloading be decided upon.

So that the underlying soil may be subject to conditions anticipated for plant operation, we request that you proceed to fill the cooling pond to its design level of elevation 627.

As we currently envision having the diesel generators for Unit 2 available for hot functional testing on the first of March 1980, it is imperative that the construction schedule be maintained. Our current schedule requires that construction be resumed by March 1, 1979, at the very latest. It is highly desirable to have the weight of the building in place as soon as possible in the event preloading is undertaken. We therefore request your concurrence to resume building construction.

As the builders risk insurance for the Midland Project is maintained by Consumers Power Company, we ask that the insurer be informed of the large settlements experienced.

As there is considerable urgency to these items, it is our hope to be able to start work immediately. If you have questions or comments, please advise us by ________________________.

Very truly yours,
P. A. Martinez
Project Manager

PAM/pp

SB 17824

DIESEL GENERATOR BUILDING

1. Install monitoring gauges for building.
2. Excavation for manhole inspection and other pipe to go through footing and walls.
3. Cut duct runs free from foundations in four (4) locations.
4. Three (3) feet of sand around building to keep clay from freezing up.
5. Backfill around and inside of building.
6. Complete four (4) floor slabs.
7. Complete all walls.
8. Complete roof.
9. Wait for building to set with all the weight.
10. Remove all fill sand.
11. Place floor slab.
12. Grout under building where voids exist.

Bechtel Associates Professional Corporation

Inter-office Memorandum

To	S. S. Afifi	Date	23 October 1978
Subject	Midland Units 1 & 2-Job 7220-001 Backfill Study Trip Report August 26 - October 11, 1978	From	A. S. Marshall
		Of	Geotechnical Services
Copies to	S. L. Blue R. L. Castleberry w/a H. H. Burke/W. R. Ferris w/a T. E. Johnson w/a P. Martinez w/a J. O. Wanzeck w/a K. Wiedner w/a 1310, 3120 xc: ~~[illegible]~~, J. F. Newgen J. Betts	At	Ann Arbor 10(D)5

RECEIVED
NOV 17 1978
BECHTEL POWER CORP
JOB 7220
PER [illegible]

Transmitted with this memo is a trip report summarizing my activities at the Midland site during August 26 through October 11, 1978.

Austin S. Marshall

A. S. Marshall

ASM/lap
Attachment

SB 17926

Midland Units 1 & 2
Job 7220-001

TRIP REPORT

PERIOD: August 26 through October 11, 1978

LOCATION: Midland Power Plant
Midland, Michigan

SUBJECT: Backfill Study

ATTENDEE: A. S. Marshall - Geotech/Soils

Backfill Study

During the backfill study, borings were drilled in the following areas:

1. Diesel Generator Building
2. Condensate Water Tanks
3. Unit 1, Unit 2 and Startup Transformers
4. Category I Water Lines
5. Retaining Walls
6. Service Water Buildings
7. Tank Farm
8. Radwaste Building
9. Administration Building
10. Cooling Tower
11. Evaporator Building
12. Chlorination Building
13. Discharge Structures
14. Diesel Fuel Tanks
15. Guard House
16. Proposed Bullock Creek Bridge

Split spoon, shelby tube, and Osterberg tube samples were taken from the borings. Dutch cone penetrations were made in the diesel generator building area. Test pits were excavated in which sand cone density tests were taken and a bulk sample was taken from one pit. Test pit

SB 17827

locations included the north end of the east bay of the diesel generator building, just east of the condensate water tanks, and along the north side of the tank farm.

Samples were transported and tested by Goldberg-Zoino-Dunnicliff and Associates, Inc.

Observations on Backfill Placement

The following observations were made on backfill placement during the period:

1. Materials were placed and compacted in lift thicknesses exceeding those specified.

2. Heavier equipment appeared to be required to achieve compaction on clays.

3. Clays compacted in confined areas with vibratory plate compactors were often only compacted in the upper few inches of each lift.

4. Areas were being backfilled as "temporary" without field engineering's awareness.

5. Clay backfill materials were not being disced to breakdown the large "clumps" that did not appear to breakdown during compaction.

6. Field inspection of backfill operations by engineering personnel was very limited.

7. Materials observed 20 feet northwest of the primary water makeup tank indicated soft materials might underlie this area.

Upon discussion of the above mentioned observations with Al Boos and Jim Betts the following actions were taken:

1. Materials were to be compacted within limits specified for sands and in 6-inch loose lifts for clays.

2. A procedure was implemented through which "temporary" fill would be located and documented for later removal and replacement.

3. A disc was brought on-site and was used to breakdown the size of the clay "clumps" at the stockpile.

4. Field inspection was increased by field engineering by placing a field engineer over backfill, and only backfill.

5. Soft materials observed at Elev. 628 just northwest of the primary water makeup tank were excavated to about Elev. 617 and replaced with compacted materials.

Dike Inspection

Mr. Don Sibbald of Consumers Power Company and A. S. Marshall made a detailed dike inspection on October 11, 1978. The upstream and downstream slopes and off-dike areas were inspected for seepage, riprap problems, erosion, animal burrow holes, cracks and other potential signs of distress. The inspection did not indicate any signs of distress.

Proposed Pipe Bridge Study

One boring was drilled on each side of Bullock Creek. The slopes on which the abutments are to be constructed are very steep and are covered with tall grass. The creek bottom area appeared to be faced off with soil-cement.

Copies of boring and dutch cone logs will be presented later.

A. S. Marshall

A. S. Marshall

ASM/lap
Attachment

1. Question: With available information, provide the best estimate of the type and quantity of fill (i.e., lean concrete, sand, or clay) within the limits of E075 to E430 and S5225 to S5036. Also, provide plan and cross section sketch of such information.

Response: The engineering protrayal provided in the early cross section developed by Engineering provides the information requested above to the same level of accuracy which the field would provide if we were to generate a similar drawing. The only exception to the forgoing is the case of lean concrete where we note (via a review of personal records) that the attached amounts of lean concrete were placed.

SB 17896

DATE	LOCATION OF FILL	ELEV.	CUBIC YARDS
12/20/78	D/G BACKFILL @ DUCTBANK STUB BAY #4	628'	2
12/15/78	" " " " " " " "	"	3
12/13/78	D/G BACKFILL @ DUCTBANK STUBS BAYS 1, 2, & 3	628'	38
12/12/78	D/G BACKFILL @ DUCTBANK STUB BAY #4	628'	10
8/18/78	DUCTBANK MUDMAT S/E D/G	627'	2
8/17/78	DUCTBANK MUDMAT SE D/G	627'	12
8/7/78	DUCTBANK MUDMAT RUNS E-W S/W D/G	627'	29
8/1/78	" " S. D/G	627'	5
7/31/78	DUCTBANK MUDMAT RUNS E-W S/ D/G	627	11
7/14/78	MUDMAT S D/G	"	6
7/7/78	DUCTBANK MUDMAT SE D/G.	627	3
7/5/78	DUCTBANK MUDMAT SE D/G	627	26
4/18/78	DUCTBANK MUDMAT E D/G BLDG	630	1
4/14/78	SEWER ENCASEMENT SW D/G	–	9
12/20/77	BACKFILL BAY #2 @ SE	628	5
11/28/77	MUDMAT @ D/G		42
11/15/77	MUDMAT @ D/G		144
10/19/77	MUDMAT for D/G FTGS		113
9/7/77	DUCTBANK MUDMAT @ D/G		18
8/18/77	MUDMAT @ D/G		57
6/10/76	BACKFILL @ S. T/B #1 (4.5-5.5 LINE)	603	16
			552 CY

SB 17807

Bechtel Power Corporation

Interoffice Memorandum

To J. P. Connolly

Date October 1, 1974

Subject Job 7220 Midland Project
Geotechs Responsibility on
Earthwork Subcontract
0-817

From T. C. Valenzano

Of Construction

At Midland, Michigan

Copies to

This is in response to your request for clarification of Geotech's responsibilities during summer 1973: Geotech's responsibilities were that of providing design assistance to project engineering and assistance to field engineering and QC. Furthermore, Geotech has the responsibility for being cognizant of all phases of the soils work in both engineering and construction. It is their responsibility to be assured that the design is properly interpreted, construction properly performed, and the specified testing requirements properly implemented, and if they are not satisfied, to advise appropriate management personnel. It was within this context that Geotech was allowed to perform acceptance validation for both field engineering and quality control.

This was done because sufficient numbers of experienced Bechtel field engineering and quality control personnel were not available on the site. Geotech's assistance was requested for this reason.

Sufficient numbers were later made available and Geotechs services as an acceptance authority was delegated to QC and field engineers for Q and non-Q work respectively.

T. C. Valenzano
T. C. Valenzano

TCV/sw

SB 17021

Copies: [redacted]
* Valenzano
* File C-95-Q
* Holman

Bechtel Power Corporation

Interoffice Memorandum

To J. W. Lillywhite

Subject Job 7220 Midland Project
Subcontract 7220-C-95 "Q"
Underpinning - Report on
December 6, 1979 A^2 Bid
Clarification Meeting With
Mergentime Corporation

Copies to

File No.

Date December 18, 1979

From D. A. Pattee

Of Subcontracts

At Midland, MI

Ext.

Attachments: Meeting Agenda
Attendance List
Meeting Agenda (abbreviated)

Meeting opened with discussion on the requirements of The Michigan Professional Engineering Statute. Mergentime said that their engineering firm, which will be doing the engineering, design, and drawings, would be Hanson Engineers Incorporated out of Springfield, Ill. D. L. Barlett, Hanson Engineers, stated their firm was registered in the State of Michigan and will verify. Mergentime and Hanson stated they would assure everything performed would be per the law. Consumers Power saw no problem.

The available sheet pile sheets at the jobsite would not suit Mergentime's purpose and, therefore, could not be used. Mergentime explained their tentative manloading schedule and sequence of events and will submit their plan in detail if awarded. They plan on a one shift, five day, eight hour per day operation for the first month onsite. Unit # 2 will start first and Unit # 1 will follow approximately two weeks later. After the first month, they would then shift to a multiple shift operation, only after they start beneath the structure, and possibly each shift, day and swing, would go to a ten (10) hour day. No weekend work is anticipated. Mergentime submitted the names and resumes of their intended jobsite personnel. Five people are assigned as superintendents and a crew size of 15-35 men.

Mergentime submitted their Q.A. Chart and will be forwarded with Ann Arbor issued meeting notes.

Mergentime indicated they had not actually included a time period in their bid schedule for engineering and document package submittals and all indications presented by Bechtel would show at least two (2) months added to the schedule prior to jobsite mobilization. Mergentime stated they would submit their intended schedule of document submittals to Bechtel A^2 by December 14, 1979. Bechtel engineering said they would try their best to turn around drawings more quickly.

SB 10085

Hanson Engineers and Bechtel discussed Item 6.a for technical clarification and determined Mergentime to be correct in their understanding of Section 6.2.1 of Specification C-95.

Clarification to Section 7.2.4 was that Mergentime was going to test caissons as required by Specification at every 500 design tons of resistance.

Clarification of change to Section 10.9.1. No objection from Mergentime to change word "initial" contact to "intimate" contact.

Explanation of mud mat removal: Mergentime is intending to remove mud mat to waterproof membrane and anything that could be a safety hazard. Cost was included in their price already.

There remains still a problem on ground loss due to dewatering wells now installed within the effected zone of influence. Mergentime was planning on grouting to stabilize.

Mergentime is intending to use "Siroc" grout and will submit data on material.

New soil data will be forwarded to both bidders and were requested to review for potential cost impact.

Mergentime was agreeable to modify their proposed sequence of caisson installation to insure adequate protection from loss of control of building while excavating and installing the caissons. Mergentime explained their proposed monitoring of building to satisfaction of Bechtel.

Mergentime explained sequence of events for placement of lean concrete, use of wet blankets, and pressure grouting to ensure positive contact to satisfaction of Bechtel and Consumers.

Brief clarification to Specification change to Sections 1.1.3 c; 1.1.3 i; added 1.1.3 l; rewrote 8.1.

Area access by dewatering Subcontractor developed into where project must re-evaluate the scope of the underpinning and possible re-bid.

Mergentime agreed to extend their bid proposal to January 14, 1980.

Meeting adjourned.

Dave

Dave Pattee

DAP/km

Attachment

SB 16986

MEETING AGENDA

MIDLAND UNITS 1 & 2

BECHTEL/CONSUMERS POWER/MERGENTINE CORP.

DATE: December 6, 1979

TIME & DURATION: 9:30 A.M. to 3:30 P.M. (5 Hrs.)

LOCATION: Ann Arbor Office, Conference Room 5B3

SUBJECT: Bid Clarification Meeting for Underpinning, Excavation and Placing of Concrete (7220-C-95(Q))

PURPOSE: Clarify commercial and technical bid items

REFERENCE: TWX to Mergentine, dated 11/30/79

TOPICS:

1.	Contractor furnished sheet piles, 125 pieces.	Mergentine
2.	Manloading schedule.	"
3.	Personnel resumes.	"
4.	Field Organization chart with QA interface.	"
* 5.	Current schedule for mobilization, procedures, construction start.	"
6.	Technical	
a)	Spec., Section 6.2.1 - Sketch 7220-M-3 shows caisson outside 3 feet E-W Centroidal axis. Clarify!	"
b)	Spec., Section 7.2.4 - Sketch 7220-M-8, Note 2 shows test load at end of installation not after every 500 design tons of resistance. Clarify!	"
c)	Spec., Section 10.9.1 - How will "initial contact" be ensured? intimate	"
d)	Spec., Section 6.1.7 - Mud Mat - (1) Extent of Mud Mat removal. (2) Support of Mud Mat if not removed. (3) Unit price per sq. ft. of exposed surface for mud mat removal.	"
e)	Tangent cassion - How is ground loss to be prevented under turbine building?	"
f)	Grout - (a) Type. (b) Clay backfill penetration & reaction.	"
g)	Soil Data on de-watering wells availability.	Bechtel
h)	Caisson support of wings after excavation	Mergentine
i)	Spec., Section 11.3.K - Subcontractor monitoring of buildings settlement.	"
j)	Lean concrete backfill - How will tolerence $\pm$ 3" be met, effect of water curing, and "positive contact" maintenance.	"

SB 10987

Meeting Agenda
Page Two

k) Spec. clarifications of Sections 1.1.3.C, 1.1.3.i, 1.1.3.1 add' Mergentine
4.2.4, 8.1. *2

l) Area access by de-watering subcontractor "

7. Action Item Assignment & Summarization.

MEETING NOTICE

DAVE PATTEE ①

BECHTEL JOB NO. 7220 - 101

PROJECT MIDLAND PLANT UNITS 1 & 2

SUBJECT OF THE MEETING

UNDERPINNING SUBCONTRACT

4.2.4, 3.1

1) Area access by de-watering subcontractor

7. Action Item Assignment & Summarization.

BECHTEL POWER CORP.
JOB 7220
DEC 5 1979
1220 C-95

DAY THURSDAY DECEMBER 6, 1979

TIME 10:30 TO 3:00

LOCATION 5(B)3

ATTENDEES

BECHTEL AAO

S. AFIFI
P. CHEN
B. DHAR
J. HOOK
J. JEFFERS
C. MCCONNEL
S. LO
W. PARIS
M. ROTHWELL
B. TORRES
K. WIEDNER
J. WANZECK
G. TUVESON

BECHTEL FIELD

~~A. BOOS~~
J. BETTS
M. RUNG

CPCO

J. STRAHL
B. WHEELER
D. SIBBALD

CONSULTANTS

C. GOULD
D. LOUGHNEY

MERGENTIME

C. MERGENTIME
+ 2 REPRESENTATIVES

The addressee, checked above, if unable to attend, is requested to:

☐ NOTIFY CHAIRPERSON ☐ SEND REPRESENTATION

PURPOSE OF THE MEETING

TO REVIEW AND RESOLVE COMMENTS ON MERGENTIME'S PROPOSAL

☒ AGENDA ATTACHED ☒ MEETING NOTES WILL BE DISTRIBUTED

CHAIRPERSON	PHONE	DATE
J. HOOK	7493	11/30/79

SB 16989

AAO-910

(2)

AGENDA

FOR

PRESENTATION OF MERGENTIME'S PROPOSAL

SPECIFICATION 7220-C-95(Q)

GENERAL

The Michigan Professional Engineering Statute requires engineering and construction to be performed by different companies. This may or may not be applicable but you are requested to look into this matter.

One hundred and twenty-five pieces of straight profile type sheet pile, 16 inches by 17 feet, manufactured by U.S. Steel (old designation MP101, new designation PS28), are available to be used by the subcontractor for the installation of the excess shaft. Would this be acceptable and what cost adjustments would there be?

COMMERCIAL

Provide a preliminary manloading schedule for the proposed sequence of work (this should address the intended work basis, five 8-hour days, shift work, schedule or casual overtime requirements, etc).

Send for our review the resumes of the project superintendent and project engineers that, if awarded the subcontract, will be assigned to the project.

Provide a typical field organization chart with quality assurance (QA) interface.

Provide a current schedule indicating how soon mobilization, submitting of procedures, and actual construction will start if awarded the subcontract.

TECHNICAL

As indicated in Section 6.2.1 of the subject specification, the allowable eccentricity of the underpinning support system during construction is 3 feet with respect to the east-west centroidal axis. Sketch 7220-M-3 shows the first caisson installed outside this limit.

As indicated in Section 7.2.4 of the subject specification, a test load is to be performed after every 500 design tons of resistance is installed and not at the end of the installation as indicated on Sketch 7220-M-8, Note 2.

SB 16990

3

As indicated in Section 10.9.1 of the subject specification, the use of grout is to ensure intimate contact with soil and structure in the zone of influence. How will the statement "intimate contact" be implemented.

Does the removal of the mud mat apply for the entire area or just the area above the caissons? If the mud mat is not be removed, how will the mud mat be supported (reference Section 6.1.7)? If it is requested by the contractor that the mud mat be removed, what would the unit price per square foot of exposed surface be?

When installing the tangent caissons under the turbine building and subsequent excavation in that area, no ground loss is required. Therefore, because the tangent caissons may not be in full contact, welding or grouting may be required.

What type of grout will be used (chemical or cement, manufacturer)? How will the proposed grout penetrate and react to the clay backfill material in the general area?

The subcontractor should be aware that dewatering wells are in very close proximity to the area being grouted. Soil data are available for review by the subcontractor. Arrangements can be made if requested.

It is essential that the caisson support of the wings be achieved at the earliest possible moment after excavation commences. Any underpinning of the turbine building should be deferred until the first 1,000 design kips of caisson capacity is installed under the wings.

As indicated in Section 11.3.k of the subject specification, monitoring of the buildings for settlement will be performed by subcontract. The subcontractor is responsible for monitoring each structure which might be affected by the underpinning operation. How will this monitoring be accomplished?

Photographs, plastered glass telltales, plumbness of walls, etc would be usefull indicators of potential movement and documentation.

Describe how the lean concrete backfill will be placed to within a +3-inch tolerance, what effects water curing will have, and how "positive contact" will be maintained between the underside of the building and the lean concrete backfill.

Clarification to the Specification

1.1.3.c ...could cause soil movement or interfere with the placement of concrete

1.1.3.i Provide intimate contact in lieu of positive contact

SB 16991

1.1.3.1 Provide support for the lean backfill and working slab concrete as necessary for safety and protection of the waterproof membrane

4.2.4 Support of excavation, bracing, lagging and lean backfill concrete procedure.

8.1, Second Paragraph In addition to the underpinning work shown in the subcontract drawings, Subcontractor shall take every reasonable effort necessary to maintain the integrity of these buildings. Subcontractor shall be responsible for supporting structures and taking every reasouable precaution to prevent...

Miscellaneous

During the underpinning/excavation operation, it may be necessary that the dewatering subcontractor be allowed access to the area to install small dewatering equipment to further lower the groundwater table.

11/28/21
JH/meg

TELECOPIER MESSAGE

FROM: ANN ARBOR - (313) 994-7910

SEND TO: 4 P9

DATE

Mid

CHARGE TO: 7220

AUTHORIZED BY: D. Leibe

ORGANIZATION CODE

4.?.3.2 Provide support for the lean backfill and working slab concrete as necessary for safety and protection of the waterproof membrane

4 P9 + Cover

4.2.4 Support of excavation, bracing, lagging and lean backfill concrete procedure.

8.1, Second Paragraph In addition to the underpinning work shown in the subcontract drawings, Subcontractor shall take every reasonable effort necessary to maintain the integrity of these buildings. Subcontractor will be responsible for supporting structures and taking every reasonable measure to prevent...

CC: M. Rung

J. Betts

A. Boos

Miscellaneous

During the underpinning/excavation operation, it may be necessary that the dewatering subcontractor be allowed access to the area to install small dewatering equipment to further lower the groundwater table.

11/23/81
JM/meg

SB 16993

ATTENDANCE LIST

C-95(Q) - Bid Clarification Meeting

Underpinning, Excavation and Placing of Concrete

December 6, 1979

NAME	POSITION/COMPANY	PHONE
W.S. CARTER	Subcontracts / BECHTEL	994-7085
JON HOOK	CIVIL / BECHTEL	994-7493
Don Bartlett	HANSON ENGINEERS	217-788-2450
C E MERGENTIME	PRESIDENT / MERGENTIME CORP.	201-782-0500
G.E. WILSON	ESTIMATOR / MERGENTIME CORP	(201) 782-0500
DAVE PETTEE	SUBCONTRACTS / BECHTEL FIELD	(517) 631-[illegible] X[illegible]
JOHN STRAHL	SUBCONT ADMIN / CONSUMERS FIELD	517-631-095
R.M. Wheeler	Civil / CPCO	517-835-10
J.P. ~~Botts~~	Field Eng / Bechtel	517-631-9286
W.C. Paris Jr.	Bechtel Geotech	994-7560
R.W. Loughney	Loughney Dewatering	516-223-9500
BOB TORRES	BECHTEL PURCHASING AGENT	313-994-7524
Chuck McConnel	Bechtel Civil eng.	
G.A. Tuveson	Bechtel Civil eng.	994-7727
J.C. Chen	Bechtel Geotech	994-7185
S. C. Lo	Bechtel Civil Eng.	994-7836
M O Rothwell	Bechtel Asst PE	994-7307
KARL WIEDNER	BECHTEL ENGR MGR	994-7169

SB 16994

TELECOPY

BEBC- 3311

Bechtel Associates Professional Corporation

Inter-office Memorandum

To J.F. Newgen

Date October 3, 1979

Subject Midland Plant Units 1 & 2
Job 7220
Plant Area Dewatering
File: 0274, C-2645

From L.H. Curtis

Of Engineering

At Ann Arbor

Copies to

L. Basinski
J. Betts
[redacted]
L. Curtis
J. Darby
B. Dhar
T. Johnson
B.C. McConnel
W. Paris, Jr.
J. Wanzeck
K. Wiedner
Com Log

References: 1) BEBC-3294, 9/24/79
2) Drawing 7220-C-1145(Q), Rev 4

To expedite the field investigations program for the plant area dewatering system, the instructions in Reference 1 have been modified. Four boring locations have been eliminated, five boring locations have been shifted to more accessible areas, locations of three pump test wells have been predetermined, use of Revert as a hole-stabilizing agent will be permitted, and the installation requirements for the pump test wells have been established.

The revised schedule of borings described in Reference 1 is as follows:

Boring*	Location	Approximate Depth**	Well
PD-1	S5335/E50	75	No
PD-2	S5335/E110	55	No
PD-3	S5335/E185	55	Yes**
PD-4	S5335/E250	75	No
PD-5	S5335/E315	55	No
PD-6	S5325/E390	55	Yes**
PD-7	S5335/E450	75	No
PD-8	S5325/E515	55	No
PD-9	S5260/E600	75	No
PD-10	S5275/E485	55	Yes**
PD-11***	S5065/W30	60	Yes**
PD-13	S5095/E540	55	Yes**
PD-14***	S4980/E980	50	Yes**
PD-15***	S4870/E695	55	Yes
PD-19	S5192/E160	60	Yes
PD-20	S5192/E348	60	Yes

*Borings PD-12, 16, 17, and 18 have been eliminated.
**To be determined by onsite geotechnical engineer
***New location

SB 17126

Bechtel Associates Professional Corporation

TELECOPY

IOM to J.F. Newgen
BEBC-3311
Page 2

Revised Reference 1, Note 1 to read:

1) The holes for the borings shall be advanced with casings, hollow-stemmed augers and clean water, or with the use of Revert. Bentonite or other hole-stablizing chemical agents shall not be used.

Revised Reference 1, Note 4 to read:

4) Borings PD 1, 2, 4, 5, 7, 8, and 9 shall be plugged in accordance with Note 11 on Drawing 7220-C-1145(Q). The remaining borings shall be either plugged in accordance with Note 11 on Drawing 7220-C-1145(Q) or converted to a pump test well or to an observation well as directed by the onsite geotechnical engineer. Wells shall be provided with permanent barrier protection.

All other requirements specified in Reference 1 remain the same.

The pump test wells shall be a minimum of 8 inches in diameter and shall be provided with a minimum of two observations wells and two borros anchors at each location. The installation details of the test wells, observation wells, and borros anchors, and the procedure for performing the pump test will be at the direction of the onsite geotechnical engineer.

for [signature] L.H. Curtis

BCM/js
10/1/5

SB 17127

MIDLAND SOILS

CHRONOLOGY AND SUMMARY

Soils placement on the Midland job is broken down between cooling pond dike construction and plant fill. This write-up will address the soils placement history for both areas, however, greater detail will be provided for the plant fill as that is the area where significant soils problems have been encountered.

A subcontractor (Cannonie, Inc.) constructed the dikes during the period of 1969-1950 and 1973-77. The original contract was let to Cannonie in 1968. The dike design is basically a clay berm with a sand core. The dike was designed to be constructed from on-site clay materials and imported sand. Shortly after work started, it was discovered that sufficient specified clay materials were not available on site. In response, Project Engineering revised the specification to allow greater fines (i.e., delete the requirement that not more than 60% pass the No. 200 sieve). Work continued and the emergency cooling water pond was essentially completed and some dike work completed prior to subcontract closeout in 1969. This subcontract closure was a part of project shutdown due to licensing problems.

The subcontract was rebid in 1973 upon project reactivation and was again awarded to Cannonie. The previous specification change on increased fines was omitted from the new subcontract specification and had to be added after award.

Cannonie continuously complained about the lack of "good soil" to build

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haul roads. Even when well compacted by heavy earth moving equipment, the roads turned to quagmires when heavy rains fell. Cannonie also experienced continual problems with moisture control in the borrow and fill areas. In 1975 a contract change was negotiated for over $1,000,000 to compensate Cannonie for changed conditions.

Cannonie completed the pond dikes, the plant area dikes and the north plant fill during the 1973, 1974, 1975 (part thereof) and 1976 seasons. In 1977 Cannonie returned to the site to complete site fill south of the power block, part of which had been completed by Bechtel.

The specification for the dike construction required the use of mechanized equipment for fill placement and compaction. It also required this equipment and the maximum lift thicknesses for which the material was to be placed to be qualified. These qualification tests were run and documented.

In process acceptance of fill placement was based on the number of passes of the equipment, the minimum number to achieve compaction being determined in the aforementioned tests. Final acceptance of the clay fill was based on in place density and moisture tests taken within specified frequencies.

Cannonie's Quality Assurance program included an on site quality control engineer to provide a continuous overview and inspection of their work. His duties included verification of proper equipment selection and performance, material lift thickness, number of roller passes and maintenance of quality related documentation. The Bechtel Subcontracts

Group administered the subcontract for Bechtel while the Bechtel Quality Control Department provided a surveillance inspection over Cannonie's Q-listed work for the period of 1974 thru 1978. Bechtel's Geo-Technical Group provided an overview of Cannonie's work by a series of periodic site visits. These site visits were most frequent in the 1973-1974 work period. Bechtel's Quality Control Department was responsible for reviewing the in place moisture and density tests for final acceptance of dike material. There were Bechtel and Cannonie generated nonconformances over the dike work. These nonconformances have been resolved owing in part to borings taken to qualify questionable materials.

Plant area fill (which is essentially complete) has been placed by both a subcontractor (Cannonie, Inc.) and Bechtel. Cannonie's work was limited to placement of large, open plant fill areas with mechanical equipment, while Bechtel generally placed smaller areas inaccessible to mechanized equipment with "hands on" compactors. Bechtel has, however, placed some areas of plant fill with mechanized equipment. Placement of plant fill has extended from 1974 to present.

There are some noteworthy differences between the dike work and plant fill which should be examined. First, the Project Engineering call out for plant fill, including that under Q-listed structures on fill, consisted of random fill. Random fill, by definition, could consist of any site materials which were free of humus, organics, or other deleterious material that could be compacted to meet specification requirements. Concrete could be and was utilized as a random fill material at the discretion of the field engineer. There were no specification directions prohibiting or specifying the use of different types of random fill materials in a common area. Layering of different random fill materials was allowed. Secondly, the acceptance of plant fill has been based upon meeting the specification compaction requirements as determined by taking tests within specified frequencies as opposed to a number of equipment passes. The specification did specify maximum lift thicknesses (12" for clay and sand) and required that qualification tests be run to verify that the compaction requirements could be met. Qualification tests were run, albeit, as production tests on fill placements.

The Project Engineering documents for compaction of clay materials used for plant fill have been contradictory in the past. The Dames and Moore soil report, which was a part of the PSAR, specified a compactive effort to yield 95% of the maximum density by ASTM 1557 Method D. The "Placement" section of the projection specification indicated that the material should be placed to meet the aforementioned criteria, however, the "Testing" section of the same specification called for the material to be tested to 95% of maximum density by the Bechtel Modified Proctor (BMP) (95% maximum density by the BMP is equivalent to approximately 90% maximum density by ASTM 1557 Method D). The project specification for the on site materials testing subcontractor (U. S. Testing, Inc.) also specified that the clay material be tested to 95% of maximum density by the BMP. Field Engineering questioned Project Engineering on this contradiction and were advised that 95% of maximum density by the BMP was to be used. Geo-Tech maintains that Project Engineering was in error in their position;

specifically, 95% of maximum density by ASTM 1557 Method D has always been and is still required. Project Engineering did revise the affected specifications recently to require 95% of maximum density by ASTM 1557 Method D, however, the field has only been able to qualify a single piece of hand held compaction equipment ("jumping jack") at a 4 inch lift thickness. All other hand held equipment has failed at the 4 inch lift thickness. Attempted qualification of a 25,000 pound dynamic force sheeps foot roller at an 8 inch lift thickness has also failed. It would appear from these qualification tests, that the on site clay material is suitable for dike construction using large equipment but is not suited for use as plant fill in the power block area where the work areas are small and generally inaccessible to mechanized equipment.

As stated previously, an overview of dike construction was provided by Geo-Tech (most notably) in the 1973-1974 period. The Dames and Moore soil report and a Project Engineering internal design criteria procedure required that all soils work on the Midland project including testing be performed under the continuous direction of a qualified soils engineer. Neither of these documents defined a qualified soils engineer nor did the project specification require the presence of this individual. (The field found out about this requirement during the NRC investigation of the "soils problem". Geo-Tech did not provide an overview on past soil placements for plant fill. The project specification has, however, been changed recently to require an on site Geotechnical Soils Engineer to provide technical direction over soils placement. Geo-Tech was not able to provide this individual so Construction retained the services of an individual with a masters degree in civil engineering (soils) and 3 years consulting experience. This person was deemed to meet the requirements of being a qualified soils engineer.

All soils testing on the project has been performed by a subcontractor (U.S. Testing, Inc.). Their responsibilities include taking tests in accordance with ASTM Standards at locations specified by Bechtel or Cannonie, While not explicitly stated in their contract, in the past U. S. Testing also accepted the job of soils classification to facilitate testing. This has been changed in that the specification now requires U.S. Testing to run a proctor for each clay test and a relative density for each sand test.

Soils placement by Bechtel has been done in the past under the technical direction of Bechtel field engineers assigned to specific plant areas i. e., yard facilities, Auxiliary Building, etc. There was not a designated soils field engineer on the jobsite. Because they were assigned responsibilities in addition to soils placement (i. e., rebar and formwork inspection, material requisitioning, etc.) the field engineers were not always physically present during the fill placement. Labor forement were utilized to help call of soils tests under the direction of the field engineer. Technical acceptance of plant fill was based on satisfactory test results. As stated previously, the specification now requires that all fill be placed under the continuous direction of the on site Geotechnical Soils Engineer.

His responsibilities include in part:

1. Approval of all subgrade preparations.

2. Suitability of materials used for random fill.
3. Approving the use of different random fill materials in layers and zones so that the structural integrity of buried utilities and supported structures is not jeopardized.
4. Selection of lift thicknesses for the equipment used for compaction.
5. Maintaining moisture control during the placement.
6. Proper performance and application of compacting equipment. This includes speed, frequency, number of passes, proper overlap, and lift thickness.
7. Calling for soil tests within the required specification frequencies.
8. Reviewing the acceptability of all soil test reports.

Bechtel Field Quality Control Engineers performed surveillance inspection of Cannonie's placement of Q-listed plant fill. They also provided surveillance over Q-listed plant fill placed by Bechtel. In general, this meant that two to three times a day the Q. C. field engineer observed the fill placement and testing operations. Full time inspection was not implemented. Quality Control has now revised its inspection program to provide field and laboratory Q. C. Engineers to provide continuous surveillance over the placement and testing activities.

The settlement of the Diesel Generator Building was noted during routine construction survey work. Settlement markers were assigned and an extensive soil boring program was undertaken to ascertain the extent of the problem.

The results of the boring program which are included in MCAR 24 show material with highly variable properties in the first 15 feet under the structure. This fill which consists essentially of sand over the northern half of the building and clay over the southern half, was placed by Bechtel in 1977.

As a result of the problems with the Diesel Generator Building an extensive settlement monitoring and soil boring program was undertaken for the balance of the plant. This program included borings taken through building base slabs. The results of this investigation are included in MCAR 24. As a general rule, in those instances where "soft" fill was encountered the fill was placed by Bechtel using hand held equipment. It has been determined that remedial actions will be required to correct the discrepant soils conditions. The most noteworthy is a plan to provide a permanent plant dewatering system for the power block. It is felt that a draw down of the water table will eliminate the potential for liquefaction of sand fill under a seismic event. A summary of other remedial actions is provided below.

Structure	Proposed Remedial Action
Diesel Generator Building	Surcharge Program (In progress since 4/79)
Unit #1 Main Transformer Area	Surcharge program (In progress since 6/79)
Condensate Tank Area	Provide flexible pipe connections to tanks to accommodate anticipated settlement

Structure	Proposed Remedial Action
Service Water Structure (North Corner)	Piles and pile cap to provide vertical support
Diesel Generator Fuel Storage Tanks	Proof Load by filling with water (In progress since 3/79)
Borated Water Storage Tanks	Proof load by filling with water
Auxiliary Building Train Bay	None
Units 1 & 2 Feedwater Isolation Valve Pits	Remove and replace defective soil. Will require local dewatering
Units 1 & 2 Electrical Penetration Rooms	Remove and replace part or all of the defective material. Will require local dewatering and temporary underpinning

The above actions are described in more detail in Bechtel's response to the NRC's 50.54 (f) request for information.

As investigation into the soil problems on the Midland jobsite continues certain conclusions are being reached by individuals as to the probable cause. No single root cause has been identified; the general consensus is that several items combined to produce the problem. The items most prominently suggested are summarized below with the field's comments on them.

Item 1 - Far too great a reliance was placed on testing for acceptance of the fill. When combined with questionable test results (as observed by a detailed review of U. S. Testing operations and some 6,000 soil test reports) this could produce placements not meeting specification requirements without raising questions.

Field Comment - The acceptance of plant fill was based on acceptance of in place density tests by Project Engineering specification direction. All parties (Bechtel Field, Q. C. and Project Engineering and CPCO) participated in the selection of U. S. Testing as the on site testing laboratory and the eventual monitoring of their activities. No adverse trends were uncovered in audits of their soil testing activities.

Item 2 - The lift thicknesses at which the fill was placed were excessive. The required compaction could not be achieved using these thicknesses and the equipment that was used.

Field Comment - The lift thicknesses used were within the specification limits and were qualified by in place density production tests.

Item 3 - A "qualified" soils engineer was not on site to provide continuous technical direction over plant fill placement and associated testing. This individual would have identified that the testing was questionable and the lift thicknesses excessive.

Field Comment - Project Engineering's failure to include this requirement in the project specifications and Geo-Tech's failure to provide an overview of plant fill have been identified earlier in this report. The current On Site Geotechnical Soils Engineer who fills this requirement has a Masters Degree in Civil

Engineering (soils) and 3 years consulting experience. Without being specifically directed, the field would not have been expected to use someone with these qualifications as the field engineer assigned to soils placement.

Item 4 - If test pads had been run on the material for varying lift thicknesses, moisture content and equipment use, the field would have known that their placement techniques were improper.

Field Comment - This seems unlikely since the qualification tests were run and accepted, albeit, as part of production tests.

Item 5 - There was insufficient inspection of the fill placement and too much responsiblity and reliability was placed on the foreman of the soils crew.

Field Comment - The quality of soils placement, or any other activity, is not achieved by inspection. The techniques used by craftsmen, field engineers and supervision were the equivalent of those used previously and appeared to achieve satisfactory results when checked in accordance with specification requirements. (Note that specification relies on testing for acceptance.)

Item 6 - The nuclear densiometer (Troxler device) can give erroneously high moisture contents. This can lead to erroneous conclusions about compaction of clay soils.

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Field Comment - It appears that this is a true statement. Although initial correlations with traditional techniques for moisture content determination were utilized to approve the use of the Troxler device, subsequent correlation checks were not made. Use of the Troxler device has been discontinued.

Item 7 - If clay is under compacted and is on the dry side of the optimum moisture content, the uncompacted clay lumps may soften when saturated by groundwater.

Field Comment - This appears logical, however, it is difficult to assess the actual moisture content at the time of placement in light of the reliability of the Troxler device.

Item 8 - Quality Assurance problems with reinforcing steel in the 1975-1977 time period detracted from the effort required to ensure a proper program for plant fill soils placement.

Field Comment - This is a highly subjective comment and if applicable was not a major cause. It could have been contributory, however, as rebar did take top civil priority during this time period.

General Field Comment - It appears that no one item will be traced which caused the "soil problem," however a series of probable causes could be put together as follows:

1. Site fill is designed as a "saturated area (il e., the impervious dike follows the site perimeter allowing free flow of cooling pond water into the site fill).

2. Random fill is specified for the plant fill which allows significant use of sand (around pipe, duct runs, buildings, general backfill, etc.) and concrete. The sand provides flow paths for water as do the interfaces between the various fill types (concrete/sand, concrete/clay, sand/clay).

3. Decrease in compaction requirements from 95% ASTM 1557-D to 95% BMP (about 90% ASTM 1557-D).

4. Design material was not available on site and a material containing significantly more fines was substituted. The substitute material was much more difficult to handle, particularly in terms of moisture control. Small, hand held equipment may not have been able to properly compact even though tests were OK. Also, this material was subject to "pumping" and breakdown when exposed to water flow, perhaps as seen at soil type boundaries.

5. Soils testing apparently gave erroneous results both from the point of Troxler use and generally poor testing results and errors.

6. Inadequate Non-Manual control of the placement process to assimilate the various deviations from ideal and recognize the potential problem. This would include Field

Engineering Supervision and Field Quality Control, Quality Assurance, Project Engineering and Geo Tech were also contributory

* Note as of 8-24-79 it has become necessary to abandon efforts to compact random fill to 95% ASTM 1557-D as we have not been able to consistently achieve such compaction with any hand held or motorized equipment (except jumping jacks inventoried earlier) available to the field.

5-10-79

STAN / JIM

1. Attached is my evaluation of UST Co. tests.

2. Plots ref. in item 8. are being updated by AA soils. Tom Nehil.

3. An evaluation of what the specs say compared to what is called "Prudent Soils Engineering" will follow later this afternoon or tomorrow morning.

4. Please advise ASAP of NRC meeting date next week. Karl Wiedner wanted me to come.

5. Karl wanted to see the above info.

J. H. Allen

SB 1?302

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DRAFT

REVIEW OF U.S. TESTING COMPANY

FIELD AND LABORATORY CONSTRUCTION

TEST DATA ON SOILS USED AS FILL

This in-depth review was made as a result of settlement of the diesel generator building in excess of that predicted. Soil samples indicated soil conditions not compatible with good quality fill. All fill was judged as it was being placed by the results of the field tests performed by U.S. Testing Company.

The review showed a large number of discrepancies as outlined in the following paragraphs. Review comments are based on the technical specifications and subcontract documents agreed to by U.S. Testing Company. Prudent soils engineering and soils testing judgement was assumed based on personnel resumes and previous documented work experience of U.S. Testing Company.

11. Overuse of laboratory test compaction curves. Table 9-1 of Specification 7220-C-208, page 14B, indicates one field density and moisture content test be taken per every 500 cubic yards of fill placed. It also indicates one compaction, grain size, and specific gravity per every 10,000 cubic yards of material. This gives a ratio of 20 field density tests to 1 lab compaction test. This requirement was not followed by U.S. Testing Company. Records show that some laboratory compaction curves were used several hundred times over a period exceeding two years.

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though no time requirements on use of lab tests is specified, prudent knowledge of soils testing and variability of soils from large borrow sources would preclude such extended use.

2. Occasional use of different compaction tests to clear a failing field test. A field test that fails to meet standards dictated by the selected laboratory test data must normally be cleared by another field test in the same area on the same type of soil compared to the same laboratory data. In some cases, laboratory data were used to clear failing tests that were classified failed by different data.

3. Test Results plot above zero air voids line on compaction data plots. For a given soil at a given specific gravity, it is impossible for a test result (defined by moisture content and density) to plot above the zero air voids curve. There are numerous cases when this supposedly happened. If some of these points are translated into a specific gravity (assuming slightly less than 100% saturation) impossibly high values result indicating something is wrong with the data.

4. Some points indicate extremely high compaction effort. Specifications call for a field compactive effort of 20,000 ft-lbs. Laboratory test curves must be related to the same effort for use in comparing with field tests. According to plots of field data

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BAM

points, other field compactive effort ranged from less than 10,000 ft-lbs to over 60,000 ft-lbs of effort or field test data is wrong in many cases. It is noted that 100% of modified Proctor (ASTM D 1557) which is extremely difficult to obtain is rated at 56,000 ft-lbs of effort. Therefore, it is highly doubtful that 60,000 ft-lbs of effort was actually obtained. For comparative purposes, it was determined by testing (performed by Bechtel on a representative site soil sample) that 100% of specified effort (20,000 ft-lbs) is approximately equal to 94% of the maximum density as determined by ASTM D 1557 (56,000 ft-lbs effort).

5. Calculation Errors on field data sheets. Arithmetic errors are noted on some field data sheets that were not corrected. There is a signature at the bottom of the data sheets indicating that the data and calculations had been checked.

6. Repeated use of questionable laboratory test data. Some laboratory compaction test data were used repeatedly even though the field tests compared to them failed repeatedly. In one case, the first 15 field tests compared with the same lab test failed. Prudent soil mechanics knowledge would call suspision to this.

7. Retests foo far from original tests. In some cases, retests to clear a failed test were not taken in the same area. Either

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RAM

test location coordinates were incorrectly listed on some data sheets or some retests were over 20 feet from the failed test location. There is also a probable error in recording dates for testing or retesting since one retest was dated 3 weeks prior to the time the original test failed.

8. Limits of accuracy for laboratory data. Specified compactive effort was 20,000 ft-lbs. This establishes a compaction curve relating moisture and density for a specific soil. Moisture was specified for field placed fill to be within ±2% of optimum moisture as determined by this effort. Density was specified to be greater than 95% of the maximum density as determined by this effort. Prudent soils knowledge also indicates values over about 5% greater than this effort should be suspect. Once compactive effort becomes significantly higher than 20,000 ft-lbs or indicated density greater than about 105% of maximum, the labo laboratory test data may no longer be acceptable for comparison with field data. As compaction effort is increased, maximum density is increased and optimum moisture content decreases. The shape of the compaction curve changes with a corresponding change in range of acceptable moisture content relative to optimum. A +2% numerical value of moisture content acceptable at the specified compactive effort would be too wet at a higher effort and at very high densities may show anaapparent location to the right of the air voids curve. The basic error described here was apparently overlooked by U.S. Testing Company. Plots of selected laboratory

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compaction test data with assigned field test results are given at the end of the text. A window of acceptability is shown for each laboratory test. The above discussion becomes readily apparent.

9. Accuracy of test equipment. Calibration data for the ~~Trexler~~ Traxler Nuclear Density device indicates a range of accuracy of $\pm 4\%$. Such a large variation should be verified as it could have impact on test results that were marginally acceptable.

10. Relative density versus Proctor type compaction curve. Cases were noted where material classified on the data sheet as zone 3 (sand) was compared to the proctor type test and other cases where clay soils were compared to relative density tests. An error exists either in listing the wrong type soil on the data sheet or in comparing field test results to the wrong laboratory test data.

In summary, referring to the attached data plots, only about 25% of the field test results fall in the zone strictly defined by the specifications and prudent knowledge of soil mechanics. About 40% of the data falls in a zone considered possible for the given soil as defined by an obtainable compactive effort of 100% of ASTM D 1557. Based on the shotgun scatter of data shown on the plots, even the laws of probability indicate this much data would fall into the acceptable window.

~~compared~~

~~were noted~~

~~10. Relative density versus Proctor type to~~

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Since no reliable conclusions can be drawn to clearly define good data from bad data, all points are suspect and, therefore, all of the thousands of data points determined by U.S. Testing should be discarded as totally unreliable.

tabs 4- 38-43-61

(A)

MIDLAND NUCLEAR PLANT

JOB 7220-101

SPECIFICATION & SUBCONTRACT REQUIREMENTS

AND

ENGINEERING PRUDENCE

This is a comparison of what the documents call for in black and white as compared to good prudent soils engineering. Documents referred to are listed below:

Specification 7220-C-208

Specification 7220-C-210

Subcontract 7220-C-208

Specification 7220-C-211

Specification 7220-C- 22

Document	Prudent Practice
Subcontract 7220-C-208	
1. No. 24, page 7 of 15, states that the Subcontractor shall be responsible for his work and for any damages caused by him.	1. No explanation required.
2. No. 25, page 8 of 15, states that during performance of work or final inspection or during the warranty period, Subcontractor shall correct any defects caused by him.	2. No explanation required.

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SB 1S315

MIDLAND NUCLEAR PLANT

JOB 7220-101

SPECIFICATION & SUBCONTRACT REQUIREMENTS

AND

ENGINEERING PRUDENCE

This is a comparison of what the documents call for in black and white as compared to good prudent soils engineering. Documents referred to are listed below:

Specification 7220-C-208

Specification 7220-C-210

Subcontract 7220-C-208

Specification 7220-C-211

Specification 7220-C- 22

Document	Prudent Practice
Subcontract 7220-C-208	
1. No. 24, page 7 of 15, states that the Subcontractor shall be responsible for his work and for any damages caused by him.	1. No explanation required.
2. No. 25, page 8 of 15, states that during performance of work or final inspection or during the warranty period, Subcontractor shall correct any defects caused by him.	2. No explanation required.

Document	Prudent Practice
Subcontract 7220-C-208, Con'd	
3. No. 40, page 13 of 15 states that Contractor can terminate Subcontractor for default. Lack of properly skilled workmen is considered default.	3. Properly skilled workmen would have recognized bad test results.
4. No. 42, page 14 of 15, states that final acceptance by Contractor is subject to inspection and tests proving work was done in accordance with requirements.	4. No explanation required.
5. No. 45, page 14 of 15 discusses payments to Subcontractor on successful completion of work. Subcontractor is responsible for defaults.	5. All retesting and exploration is due to faulty testing by U.S. Testing; therefore, they should pay for it.
6. Exhibit C, page 17 of 47. The last sentence of the first paragraph states: "Our Company's responsibility to the Utility is to provide them with data to allow them to accept or reject specific construction materials."	6. U.S. Testing Company position as stated by themselves.

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6. U.S. Testing Company position as stated by themselves.

construction materials."
construction materials."

"construction materials."

C 9Ha

Document	Prudent Practice
Subcontract 7220-C-208, Con't	
7. Exhibit C, page 17 of 47. No. 2 states, "You are to <u>immediately</u> report data that indicates material that does not comply to specifications or procedures."	7. This recognizes U.S. Testing Co. responsibility of having personnel competent to judge acceptability of test data results.
8. Exhibit C, page 20 of 47. Item F states: "Immediately inform the designated Quality Control Engineer of any specification violation or failure in test results. Such notification must be indicated on the appropriate daily report."	8. See Note 7 above.
9. Exhibit C, page 21 of 47. The <u>Note</u> states that U.S. Testing is to provide inspection and test data to the QC staff.	9. No explanation is required.
10. Exhibit C, page 26 of 47. Soils inspection and testing as understood by U.S. Testing is outlined here.	10. U.S. Testing did not do what they said they would do. Refer to items B, C, D, E, F, and <u>Note</u> on page 27 of 47.

Document	PrBeadanPractice
Subcontract 7220-C-208, Con't	
7. Exhibit C, page 17 of 47. No. 2 states, "You are to immediately report data that indicates material that does not comply to specifications or procedures.¶	7. This recognizes U.S. Testing Co. responsibility of having personnel competent to judge acceptability of test data results.
8. Exhibit C, page 20 of 47. Item F states: "Immediately inform the designated Quality Control Engineer of any specification violation or failure in test results. Such notification must be indicated on the appropriate daily report."	8. See Note 7 above.
9. Exhibit C, page 21 of 47. The Note states that U.S. Testing is to provide inspection and test data to the QC staff.	9. No explanation is required.
10. Exhibit C, page 26 of 47. Soils inspection and testing as understood by U.S. Testing is outlined here.	10. U.S. Testing did not do what they said they would do. Refer to items B, C, D, E, F, and Note on pages22 of 47.

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D

Document		Prudent Practice	
	Subcontract 7220-C-208, Con't		
11.	Exhibit C, Page 29 of 47. Item E quotes wrong ASTM designations for referencing laboratory tests.	11.	ASTM D 698 at 12,400 ft-lbs effort is referenced rather than 20,000 as specified.
	Spec 7220-C-208		
12.	Sec. 9.1, page 14. When directed by Contractor, ASTM D 1557 is to be modified to 20,000 ft-lbs effort.	12.	Do we have records that we directed U.S. Testing to do this?
13.	Table 9-1. This table specified test frequency relative to cubic yards of fill placed.	13.	Subcontractor should take initiative in determining amount of fill placed so as to determine when to run a new compaction test. However, responsibility should be shared with Bechtel/Client QC to provide this data to Subcontractor.

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Document	Prudent Practice
Subcontract 7220-C-208, Con't	
11. Exhibit C, Page 29 of 47. Item E quotes wrong ASTM designations for referencing laboratory tests.	11. ASTM D 698 of 12,400 ft-lbs effort is referenced rather than 20,000 as specified.
12. Spec 7220-C-208, Sec. 9.1,	
12. Spec 7220-C-208	
12. Sec. 9.1, page 14. When directed by Contractor, ASTM D 1557 is to be modified to 20,000 ft-lbs effort.	12. Do we have records that we directed U.S. Testing to do this?
13. Table 9-1. This table specified test frequency relat relative to cubic yards of fill placed.	13. Subcontractor should take initiative in determining amount of fill placed so as to determine when to run a new compaction test. However, responsibility should be shared with Bechtel/Client QC to provide this data to Subcontractor.
14......	
Spec 7220-G-22	
14. Sec. 4.1. page 2. Review by the Contractor does not relieve the Subcontractor of any of his contractual responsibilities.	

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E

Document	Prudent Practice
Spec 7220-G-22	
14. Sec. 4.1, page 2. Review by the Contractor does not relieve the Subcontractor of any of his contractual responsibilities.	14. No explanation required.
Spec 7220-C-210	
15. Sec. 12.6, page 50. Moisture content is specified as 2% above or below optimum.	15. Spec refers only to ±2% from optimum, not to optimum as defined by ASTM D 1557, ASTM D 698, or 20,000 ft-lbs effort. Also, a prudent soils lab technician knows that optimum changes with changing effort.
16. Sec. 13.7, page 57. Refers to compaction equal to 95% of ASTM D 1557 for cohesive soils and relative density of 80% for granular material.	16. Does section 9 of Spec 7220-C-208 modify section 13.7.1 of Spec 7220-C-210? It appears to do so.
17. Sec. 12.4.4.2, paragraph 2, page 43. Nuclear device may be used provided results are compatible with those obtained by the specified procedure.	17. A statement of ±4% deviation on the Troxler equipment seems to preclude compatibility of this device with conventional tests.

Document	Prudent Practice
Spec 7220-G-22	
14. Sec. 411, page 2. Review by the Contractor does not relieve the Subcontractor of any of his contractual responsibilities.	14. No explanation required.
15.	
Spec 7220-C-210	
15. Sec. 12.6, page 50. Moisture content is specified as 2% above or below optimum.	15. Spec refers only to ±2% from optimum, not to optimum as defined by ASTM D 1557, ASTM D 698, or 20,000 ft-lbs effort. Also,aa prudent soils lab technician knows that optimum changes with changing effort.
16. Sec. 13.7, page 57. Refers to compaction equal to 95% of ASTM D 1557 for cohesive soils and relative density of 80% for granular granular material.	16. Does section 9 of Spec 7220-C-208 modify Section 13.7.1 of Spec 7220-C-210? It appears to do so.
17. Sec. 12.4.4.2, paragraph 2, page 43. Nuclear device may be used provided results are compatible with those obtained by the specified procedure.	17. A statement of ±4% deviation on the Trexler equipment seems to preclude compatibility of this device with conventional tests.

SB 19323

Document	Prudent Practice
Spec 7220-G-~~22~~ 210	
18. Sec. 12.4.5.1, page 43. This section tells in detail how to determine maximum density and optimum moisture content.	18. Prudent soils technicians know ~~this~~ optimum moisture content is not a vertical line but that optimum moisture varies with density.
19. Section 12.6.1, page 50. Spec states minimum density but not a maximum.	19. Prudent soils engineers or technicians would realize that densities above 100% of that specified would have a lower numerical value of optimum moisture content. Also, any value above about 105% should be suspect.

Document	Prudent Practice
18. Sec. 12.4.5.1, page 43. This section tells in detail how to determine maximum density and optimum moisture content.	18. Prudent soils technicians know this is not a vertical line but that optimum moisture varies with density.
19. Section 12.6.1, page 50. Spec states minimum density but not a maximum.	19. Prudent soils engineers or technicians would realize that densities above 100% of that specified would have a lower numerical value of optimum moisture content.

Document	Prudent Practice
18. Sec. 12.4.5.1, page 43. This	

Document	Prudent Practice
Spec 7220-G-22	
18. Sec. 12.4.5.1, page 43. This	

SPECIFICATION & SUBCONTRACT REQUIREMENTS AND ENGINEERING PRUDENCE

This is a comparison of what the documents call for in black and white as compared to good prudent soils engineering. Documents referred to are listed below:

Specification 7220-C-208
Specification 7220-C-210
Subcontract 7220-C-208
Specification 7220-C-211
Specification 7220-G-22

Document	Prudent Practice
Subcontract 7220-C-208	
① No. 24 page 7 of 15 states that the Subcontractor shall be responsible for his work and for any damages caused by him.	① No explanation required
② No. 25 page 8 of 15 states that during performance of work or final inspection or during the warranty period, subcontractor shall correct any defects caused by him.	② No explanation required.

SB 18326

(cont'd)

③ No. 40, page 13 of 15 states that Contractor can terminate Subcontractor for default. ~~Properly skilled~~ Lack of properly skilled workman is considered default.	③ ~~No explanation req~~ Properly skilled workman would have recognized bad test results.
④ No. 42 page 14 of 15 states that final acceptance by Contractor is subject to inspection and tests proving work was done in accordance with requirements.	④ No. explanation required
⑤ No. 45 page 14 of 15 discusses payments to subcontractor on successful completion of work. Subcontractor is responsible for defaults.	⑤ ~~No explanation required~~ All retesting and explanation is due to faulty testing by U.S. Testing; therefore they should pay for it.
⑥ Exhibit C page 17 of 47 - The last sentence of the first par. states: "Our Company's responsibility to the Utility is to provide them with data to allow them to accept or reject specific construction materials."	⑥ U.S. Testing Co position as stated by themselves.

SB 18327

(cont'd)

⑦ Exhibit C, page 17 of 47. No. 2. states "You are to <u>immediately</u> report data that indicates material that does not comply to specifications or procedures."	⑦ This recognizes ~~their~~ U-S Testing Co. responsibility of having personnel competent to judge acceptability of test data results.
⑧ Exhibit C, page 20 of 47. Item F. states: "Immediately inform the designated Quality Control Engineer of any specification violation or failure in test results. Such notification must be indicated on the appropriate daily report."	⑧ See note ⑦ above.
⑨ Exhibit C, page 21 of 47. The <u>Note</u> states that U-S. Testing is to provide inspection and test data to the QC staff.	⑨ No explanation required
⑩ Exhibit C page 26 of 47. Soils Inspection & Testing as understood by U-S. Testing is outlined here.	⑩ U-S. Testing did not do what they said they would do. Ref. items B, C, D, E, F and Note on page 27 of 47

(cont'd)

(11) Exhibit C page 29 of 47. Item E. quotes wrong ASTM designations for referencing laboratory tests.	(11) ASTM D 698 at 12,000 ft-lb effort ~~and ASTM D~~ 1557 at 56,000 ft-lbs effort is referenced rather than 20,000 as specified.
(12) Spec. 7220-C-208, Sect 9.1, page 14. When directed by Contractor, ASTM D 1557 is to be modified to 20,000 ft-lbs effort.	(12) Do we have records that we directed U.S. Testing to do this?
(13) ~~Spec. 7220-C-208~~, Table 9-1. This table specifies test frequency relative to cubic yards of fill placed.	(13) Subcontractor should take initiative in determining amount of fill placed so as to determine when to run a new compaction test. However, Responsibility should be shared with Bechtel/Client QC to provide this data to Sub.
(14) Spec 7220-G-22, Sect 4.1 page 2. Review by the Contractor does not relieve the subcontractor of any of his contractural responsibilities.	(14) No. explanation required.

SB 19329

(cont'd)

(15) Spec 7220-C-210 Sect. 12.6 page 50. Moisture content is specified as 2% above or below optimum	(15) Spec. refers only to ± 2% from optimum, not to opt. as defined by ASTM D1557, ASTM D698, or 20,000 ft-lbs effort. Also a prudent soils lab technician knows that opt. changes with changing effort.
(16) ~~Spec 7220-C-210~~ Sect 13.7 page 57. Refers to compaction equal to 95% of ASTM D-1557 for cohesive soils and Relative density of 80% for granular material	(16) Does section 9 of spec 7220-C-208 modify section 13.7.1 of Spec 7220-C-210? It appears to do so.
(17) ~~Spec 7220-C-210~~ Sect 12.4.4.2 par. 2 page 43. Nuclear device may be used provided results are compatible with those obtained by the specified procedure.	(17) A statement of ± 4% deviation on the Troxler equipment ~~[illegible]~~ seems to preclude compatibility of this device with conventional tests.
X (18) Spec ~~7220-C-210~~ Sect. 12.4.5.1 page 43. This section tells in detail how to determine max. density and opt. moisture content.	(18) Prudent soils technicians know this is not a vertical line but that opt. moisture varies with density.

SB 18330

(cont'd.)

(19) ~~Spec #220-C-210~~ Sect. 12.6.1 Page 50. Spec ~~tells how to~~ states minimum density but not a maximum.	(19) Prudent soils engineer or technician would realize that densities above 100% of that specified would have a lower numerical value of optimum moisture content.

SB 18331

34
16
2|18 9

→ 4 more

Total cap. cost of plant = $1.670 Billion

3 mo. delay costs ≈ $83 million

24 mo delay costs ≈ $890 million

Fill			loose max lift
Zone	1	Impervious fill Clay ~~Random~~ Sandy silty Clays or Sandy Silts	12"
Zone	1A	Impervious fill ~~Random~~ graded sandy Glacial till	4"
Zone	2	Random Any material free of humus	12"
	2A	" adjacent to conc str.	2A 4"
	3	Sand drain - Clean graded	12"
	4	Gravel	—
	4A	Crushed limestone	—
	4Z	Crushed stone as bedding for riprap	—
	5	Riprap	—
	5A	Riprap same as above but w/ min size	—
	6	Topsoil & seeding	—

SB 19332

11-27-79

Jimmy Allen

For your information I would appreciate any comments if any

Jim Wanzeck

[redacted]

SB 18345

WANZECK

Bechtel Power Corporation

Interoffice Memorandum 002265

To	J. Rutgers	File No	
Subject	Job 7220 Midland Project Subcontract 7220-C-208 U. S. Testing Comments of Bechtel Geo-Technical "Review of U. S. Testing Field and Laboratory Tests on Soils" BCBM-521-R	Date	October 29, 1979
		From	L. E. Davis
		Of	Construction
Copies to		At	Midland

GEOTECH ANN ARBOR DISTRIBUTION

JOB 7220 FILE

RCC'D NOV 8 1979

Attached is a report submitted by U. S. Testing commenting on Bechtel Geo-Tech's review of test procedures dated July, 1979.

If we can be of further assistance, please contact us.

for L. E. Davis

LED/JWL/km

This responds to Chron 001719.

GET COPY ALL QC RECORDS TO US TESTING FROM BECHTEL TO UST

NO REQUEST FROM PROJECT

SB 16346

d States Test g Company, Inc.
Power Generation Services Division

1415 PARK AVENUE
HOBOKEN, NEW JERSEY 07030 (201) 792-2400 (212) 943-0488

vendor surveillance
concrete testing
on-site inspection
nondestructive testing
environmental evalua
training programs

002285

001434

File: C-208-222/1015.900
October 1, 1979

RECEIVED
OCT 9 1979
BECHTEL POWER CORP.
JOB 7220
FER 566.1 C-208

Bechtel Power Corporation
P. O. Box 2167
Midland, Michigan 48640

Attention: Mr. J. F. Newgen

Subject: Midland Project Job 7220
Subcontract 7220-C-208
U.S. Testing's Response to "Geotech Review of U.S. Testing Field and Laboratory Tests on Soils

Dear Mr. Newgen:

Please find attached United States Testing's response to the Bechtel report "Review of U. S. Testing Field and Laboratory Tests on Soils" dated July 1979.

You requested that we respond solely to the summary contained in Section 8, however, we feel it is necessary to respond to all the sections, which in itself details Section 8.

Our response appendices the Bechtel report in so far that it closely follows its logic, answering questions or making statements on each particular point. This U. S. Testing report is not meant to point fingers in any direction but only to indicate, to Bechtel, some of the problems and concerns we faced.

If you have any questions, do not hesitate to contact me.

Very truly yours,

UNITED STATES TESTING COMPANY, INC.

M. Anselmo

M. Anselmo
Project Engineer

MA:hg
Attachments

SB 19347

002265

001434

UNITED STATES TESTING COMPANY'S

Response to the Bechtel Report

"Review of U. S. Testing Field
and Laboratory Construction
Test Data on Soils Uses as Fill"

Midland Units 1 & 2
Job No. 7220

Note: This U. S. Testing report must be read in connection with the Bechtel report in so far that it will provide clarification and rebut statements contained therein.

SB 1S348

002265

001434

1. Use of Laboratory Test Compaction Curves

This section of the Bechtel report is concerned with the implied ratio of Field Density Tests to Laboratory Compaction Tests (Ratio 20:1) given in Table 9-1 of Specification 7220-C-208 and the period of time lapse between Laboratory Tests vs. Field Tests.

It is the position of U. S. Testing that Bechtel was then and is now responsible for the monitoring, determining and communicating with U. S. Testing on the fill yardage for use in performing Lab Density Tests. In fact, there were more Lab Density Tests performed by U. S. Testing Technicians (who were double checking results) than directed by Bechtel. It should also be noted that, in most cases, our only Bechtel interface in the field was a labor foreman.

The testing of soil will yield the same densities no matter what time lapse has expired between original testing and subsequent re-tests as long as the material re-tested is representative of the original tests and the test method has not changed. The actual volume of soil that may be represented by any one compaction curve has not been nor can it now be determined. In addition, Bechtel did not control excavated material as required by their specifications and drawings (documented in report on Admin. Bldg.) and it would be likely that any given cubic yard of soil was not only placed several times but tested several times, i.e., the same proctor values would be employed each time a yard of that particular soil was placed. NOT TRUE

SB 18349

001434 002265

Visual proctor selection was many times backed-up by pounding a new proctor, ? in fact, most proctors on the job were generated in this manner as opposed to Bechtel maintaining a frequency list.

During the original submittal of U. S. Testing QA Manual, Bechtel (Project CORRECT Engineering & Subcontracts) removed the provisions for performing one-point proctor tests for each Field Density Test.

2. Questionable Retests

The statement "A Field Density Test that fails to meet AT THE TIME OF FAILURE requirements of the specification should have been reported to Bechtel..." is incorrect. All failing test results were reported to either Q.C. or our field interface. However, it has become apparent that our field interface may not have been responsible for making these decisions. Any test U. S. Testing dispositioned as "clearing" was done so at the direction of Bechtel. The clearing of failing tests still is a Bechtel responsibility and on the occasions where U. S. Testing noted clearing tests, the report was a mode of conveying information from our interface. The Bechtel Report mentions three (3) cases where failing tests were cleared, one was "apparently resolved by merely using another Laboratory Compaction Curve...", another "tests labeled 'failed' were incorrectly cleared though the same laboratory standard was referenced.", and the third "two retests were dated prior to the time the original test failure." In fact,

SB 18350

these 'clearings' were the action of Bechtel employees who were also in the habit of marking up U. S. Testing reports. It appears that the standard Bechtel procedure for the dispositioning of failures was to scan reports looking for passing results in the same general area. The direction of U. S. Testing to a test area and provisions for test locations is the responsibility of Bechtel, on those occasions where the Bechtel interface could not relate specific locations the suggestion may have been made by U. S. Testing personnel.

We agree with the Bechtel assumption that it was possible to encounter different soils in the same location, however, it is more likely that the different soils were encountered as a result of the non-control of excavated materials as opposed to the removal and replacement subsequent to a test failure.

U. S. Testing responsibility on this project is to perform testing not control its placement, and in fact, U. S. Testing was excluded from being involved in placement control.

3. Theoretically Impossible Test Results

Any given soil has individual components that cover a broad spectrum of specific gravity values. The major factor contributing to specific gravity values determined by the test method Bechtel requested (ASTM-D854) results from a 25 gram sample and thus the specific gravity values resulting there from should be interpreted with that in mind. The application of the likely

Larger Sample
Size [illegible]

band of specific gravity values represented in the Bechtel report figure 1 results in a 49 percent reduction of theoretically impossible results. The remainder of these test points falling above zero-voids line will be discussed in Section 6. However, specific gravity values from 2.57 to 2.82 for soil fractions are documented for material on this project.

The comment regarding the doubtfullness of the variation of soil properties is likely to be discounted by an examination of the data of the current soils evaluation program.

4. Repeated use of Questionable Laboratory Test Data

Although"...the fact that soil was not being placed or compacted according to specifications" was a major cause for concern. It is evident that another area of concern existed. Errors in calculations went unnoticed thru a good checking system. It is unfortunate that Bechtel's checking system simultaneously experienced difficulty.

5. Limits of Accuracy and Acceptability for Test Data

Although Bechtel statements conclude that only 25 to 40 percent of all clay tests represent compliance to specification, it should not be construed to represent the percentage of valid test data. The envelop of reasonably encountered test values would encompass the vast majority of test data. It has been demonstrated that the nominal scattering of data that may not have been anticipated was well within the statical variance that would be applied to this data.

001434 002265

6. Accuracy of Test Equipment

The average deviation of the nuclear device from oven-dry moistures was +.12 % for a set of 30 tests. The range of differences was approximately from -3 % to + 4 %. It was the assumption of U. S. Testing that Bechtel Engineering was appropriately applying this data to placement tests.

Contrary to the assumption regarding figure 9 with its "impossibly high dry densities" current test data closely resembles this graphical representation.

The use of the nuclear device was employed at the consent of Bechtel to facilitate production.

7. Relative Density Tests

Some of the specification 7220-C-210 zone numbers are an area of concern because of the overlapping soil classifications, i.e., clay could be either zone 1 or 2. The inherent nomenclatural difficulties that plagued the Bechtel Organization in providing data was not addressed in the limited potential problem areas. A re-evaluation of test data, with this third concern in mind, would probably change Bechtel conclusions.

Regarding calculation errors of relative densities and assuming the validity of these errors, it is again unfortunate that our checking systems broke-down.

SB 18353

The re-evaluation of maximum density by the wet method was in response to a relatively recent innovation of Bechtel assigning a geotechnical engineer to oversee the soils operation, here-to-fore there have been no "radical changes" or Bechtel material controls that would serve to flag the need for maximum density method re-determinations. Subsequent to this, the comparison of maximum density methods have been done routinely by U. S. Testing in response to material changes that were identifiable by newly instituted material controls and routine communication with assigned geotechnical representatives. These current comparisons have yielded maximum density variations that result in relative density changes from minimal to 20 %. The acceptability of high relative density results should have been evaluated as part of Bechtel process control that did not exist.

- NOT [illegible] MANY [illegible] TIMES

— ? who

IT IS NOT. THE HIGH RELAT[IVE] DENSITIES THAT ARE DETRIMENTAL IF ALL THE DENS. THAT WERE AROUND 80%

Summary

The Bechtel request that U. S. Testing respond to items 1 thru 5 has been detailed in this report.

The closing remarks of the Bechtel report makes the statement that"...on many occasions the inplace density was divided by the maximum density from the relative density test to get percent compaction..." is true. However, the report fails to mention that this method of calculation was a specific Bechtel directive. Where IS DIRECTIVE ?

SB 18354

001434 002265

In conclusion, the problems and concerns attributed to U. S. Testing results from a lack of proper soil identification and material quantities normally covered in inspection and placement responsibilities, none of which are contractually the responsibility of the U. S. Testings scope of operations. We are the testing arm of Bechtel. Our function is the reporting of data not its evaluation.

INCORRECT DATA.

NOT ASKING FOR EVALUATION JUST
CORRECT TESTING
BECHTEL [illegible] PROBLEMS ARE
OF NO CONCERN [illegible] US TESTING
AS USTESTING RESPONSIBILITY IS TO GIVE
CORRECT DATA [illegible] ANALYSIS OF
BECHTEL'S CHECKING
THE MAJORITY OF BECHTEL PEOPLE
WATCHING UST CAME FROM UST
AND UNFORTUNATELY YOU ARE ONLY AS
GOOD AS THE JOB YOU CAME FROM
JIM

SB 1?355

170

Bechtel Incorporated

Inter-office Memorandum

To	J. H. Blasingame	Date	May 8, 1970
Subject	Consumers Power Company Midland Plant Units 1 & 2 Job No. 7220-001 Investigation of Sand under Class 1 Structures	From	H. H. Burke
		Of	H & T - Soils
Copies to	J. G. Thon B. M. Pusheck A. C. Flach, Jr. R. L. Kulesza	At	50 Beale Street

Enclosed is a draft of document titled "Investigation of Sand below Class 1 Components," dated May 1970. This program was prepared at the verbal request of Phil Martinez, in accordance with the commitment for the removal of all sand with a relative density of less than 75 percent below Class 1 structures and components.

The accompanying drawing SK-C-247 showing the borehold locations in relation to the Class 1 structures and components was prepared by the Project group with the cooperation of Rick Kulesza, who suggested the borehole locations. These were based on 50-foot spacing, and data from previous investigations was considered.

We recommend that one of our soils engineers should attend the initial phase of this investigation to assist with the attainment of the required quality of this work. If this meets with your approval, then we would appreciate advance notice regarding the scheduling of the investigation.

H. H. Burke

HHB:el

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BECHTEL CORP.
MAY 8 1970
POWER DIVN.
S. F.

SB 19086

JOB 7220

DRAFT
May 1970

CONSUMERS POWER COMPANY

MIDLAND PLANT UNITS 1 AND 2

JOB 7220-001

INVESTIGATION OF SAND BELOW CLASS I COMPONENTS

1. General

The purpose of this investigation is to delineate the areas below Class 1 structures and components where the foundation soil consists of sand and to determine the in-situ density of the sand. This will be achieved by means of standard penetration tests carried out in boreholes.

2. Borehole Locations

The locations of boreholes are shown on appended drawing SK-C-247. Additional boreholes may be required to determine the lateral extent of sand under Class 1 components. Any additional boreholes will be requested by Engineering after analysis of data from the present boreholes.

3. Depth of Boreholes

All boreholes shall be terminated not higher than ten feet below the base elevations of Class 1 structures and components indicated on drawing SK-C-247. This minimum depth applies where sand is not encountered below the foundation level. Where sand extends below the foundation level, the borehole shall be continued to the bottom of the sand and 10 feet into cohesive soils underlying the sand, except that the borehole can be terminated where at least three successive tests resulted in a penetration resistance in excess of 50 blows per foot.

SB 19087

4. Drilling and Sampling Equipment

The boreholes shall be performed with a drill capable of installing BX-size casing and performing standard penetration tests. A hollow-stem augering machine is acceptable.

Sampling shall be performed by standard split spoon sampler described in ASTM 1586-64T. An ample supply of water-tight jars and sample identification labels shall be maintained at the site.

5. Sampling and Testing

Standard penetration tests will be carried out in accordance with ASTM 1586-64T. Special attention is essential to ensure that the free fall of the 140-lb. hammer does not deviate from 30 inches and that the sampler is not jarred upwards during the raising of the hammer. Where tests are performed below ground water table, the borehole casing must be nearly full of water during the test. Casing must be used in sand, but need not be used in cohesive soil such as clayey silt, clay and clayey till.

The frequency of standard penetration tests shall be as follows:

Above the foundation level of Class I structures indicated on the drawings: At 5-foot intervals.

Below the indicated elevations: At 2-1/2-foot intervals in the first 10 feet,and at 5-foot intervals thereafter, to the bottom of borehole determined in accordance with paragraph 3.

The soil recovered in the split spoon sampler shall be described on borehole logs in accordance with the Unified Soils Classification System. Representative portions of all samples, at least 3 to 4 inches long (where possible), shall be placed in water-tight jars sealed with tape and wax or equivalent sealing substance and labeled as to date of sampling, borehole

SB 19088

number, sample number and sample depth. All sample jars shall be retained in indoor storage until written notice is issued by Engineering that the samples can be disposed of. The samples shall be kept out of direct sunlight and heat at all times.

Engineering may issue additional instruction for retainment of certain bulk samples of material from specific locations.

6. Borehole Logs

All boreholes shall be fully logged on standard Bechtel log forms provided by Engineering. The soil data shall be plotted on the logs to scale with respect to depth. All the data spaces printed on the logs shall be filled out where applicable. In particular, the following information shall be included on the logs:

Borehole number

Borehole coordinates

Ground elevation at top of borehole

Dates of start and completion of borehole

Groundwater conditions

Sample number and depth

Soil description for each sample

Number of blows for each 6 inches of penetration

Number of inches of sample recovery

7. Presentation and Analysis of Results

Two copies of logs of completed boreholes shall be sent to Engineering on a weekly basis. At least one copy of logs shall be retained in the Field office. Analysis of results and determination of relative density and of limits of sand to be removed shall be performed by Engineering.

SB 19089

Bechtel Power Corporation

Inter-office Memorandum

To	Distribution	Date	June 26, 1979
Subject	Midland Job 7220 Plant Fill Soil Test Results Review - Generic Implications	From	J. Milandin
		Of	Quality Assurance
Copies to	H. W. Wahl P. Hansen R. K. Vassar S. Blue A. Betters J. Amaral M. Mitchell J. Bashore	At	Ann Arbor

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DISC	ACT	INFO	W...	UNIT
MGR				
ADMIN				
DRFT				
SOILS				
Proj Mgr				
Proj Eng			1330	

JOB 7220 FILE 3410
REC'D JUN 27 1979

An engineering problem alert will be issued July 30, 1979 to document a comprehensive set of actions as set forth in the attached minutes.

The actions are a result of a report issued by H&CF which identified seven questionable areas of concern resulting from a review of U. S. Testing field and laboratory test data on soils used as plant area fill. The report concludes that all soil test results are suspect and should not be used alone for acceptance of the fill.

Please note that for loop closure purposes, the problem alert will identify a plan and schedule to accomplish actions to prevent recurrence should such actions be identified.

J. Milandin

JM/le
JM-79-66
attachment

Distribution:	E. Rumbaugh	[redacted]
	K. Wiedner	T. Johnson
	D. Johnson	P. Martinez
	R. Simanek	S. Heisler
	J. Milandin	G. Richardson

SB 13116

REPORT OF MINUTES OF THE SOILS TEST RESULTS

JUNE 13, 1979

Those in attendance were:		
	E. Rumbaugh	T. Johnson
	K. Wiedner	P. Martinez
	D. Johnson	S. Heisler
	R. Simanek	J. Milandin
	J. Wanzeck	G. Richardson

DISCUSSION

A meeting was held to discuss the Midland plant fill associated soils test report impact on Ann Arbor Office projects and other Bechtel projects. The report, current draft forwarded by P. Martinez letter dated 6/12/79, entitled "Draft Review of U. S. Testing Field and Laboratory Construction Test Data on Soils Used as Fill", addresses seven (7) areas which should be evaluated and appropriate corrective action taken. The areas are:

1. Over use of certain laboratory testing compaction curves.
2. Questionable retests.
3. Test results plot above zero-air-void curve on compaction data plots.
4. Reported use of questionable laboratory test data.
5. Limits of accuracy and acceptability for test data.
6. Accuracy of test equipment.
7. Relative density tests.

ACTION ITEM #1

Engineering will issue a problem alert(s) which is(are) to address the following:

1. Soils placement and testing specification revisions which should be made as demanded by the results of the review in the subject report.
2. Administrative systems revisions which are necessary as a result of such systems having had an effect on the technical performance of soils placement and testing. Administrative systems to be considered are: QA Program including adding technical audits of testing lab performance, Sub-contract Administration, Job Staffing (i.e. qualifications, accountability of soils engineers), and Methods for dispositioning and documenting consultant's recommendations.
3. Soils interface conditions. Interfaces where differential settlement could exist under a given structure.
4. A plan and schedule to accomplish the revisions to implement the necessary actions for Ann Arbor Office, Midland, and TPO specifications and administrative systems.

The problem alert is to be issued by July 30, 1978.

ACTION ITEM #2

Don Johnson to evaluate the documentation and intent associated with the technical direction of testing laboratories on Midland and other projects.

Complete by June 22, 1979

SB 13117

J. Milandin
J. Milandin

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MGR		
ADMIN		
DRFT		
SOILS	2	
[redacted]		
GKC	4	
AM	5	
Proj Mgr		
Proj Eng		
JOB 7220	FILE	135
REC'D	NOV 30 1979	

Bechtel Power Corporation

Inter-office Memorandum

To E. A. Rumbaugh

Subject Problem Alert - Large Settlements Due to Incorrectly Placed Backfill

Copies to
T. E. Johnson W. T. Kellermann
G. A. Tuveson S. L. Blue
S. I. Heisler

Date November 28, 1979

From J. Milandin

Of Quality Assurance

At Ann Arbor

The subject Problem Alert was originated by Ted Johnson as a result of a meeting which we held on June 13, 1979. The Problem Alert was, in effect, issued to take advantage of the Midland problem by providing for certain revisions in our specifications and controls to preclude such a situation from recurring on another project. As you recall, I suggested the Problem Alert. Ted Johnson has been working very closely with me to insure that QA concerns were included. Ted issued the report to Ken Buchert on October 19 and received a reply, attached, from Ken Buchert, apparently incorrectly dated, on August 27, 1979.

Buchert's reply, in effect, deleted all the recommended corrective actions by the Ann Arbor Office and effectively stated corrective actions which are essentially the same as the present program. Without the AAO recommendations, the Problem Alert is truly incomplete. It will not prevent the problem from occurring again once this Problem Alert has been filed. The idea behind the recommended action of the Ann Arbor Office was to perserve these experiences by revising generic specifications and control procedures which govern the placement of backfill.

It is requested that you look into this matter to determine why the San Francisco Power Division Civil Structural Chief rejected the corrective actions proposed by the Ann Arbor Office. Each of those actions, which were proposed, were tied back to problems which were identified during the course of the investigation and were carefully developed to preclude the recurrence of such a situation in the future. Therefore, as the situation now stands, if the office follows through on the Buchert August 27 letter, new projects may fall into the same situation as Midland did when memories dim.

Please respond by 12/12/79. Please advise whether you consider this a matter to be handled by an MCAR.

John Milandin
J. Milandin

JM/le
JM-79-122
File: AAO-QAR-79-66

SB 13118

Bechtel Incorporated

Interoffice Memorandum

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DISC	ACT	INFO	W/A	INIT
MGR		1		
ADMIN				
DRFT				
SOILS	X	2		
		3		
		4		
		5		
Proj Mgr				
Proj Eng				
JOB 7220		FILE 9410		
REC'D JUL 2 1979				

To S. Afifi

Date June 29, 1979

Subject Midland Project
Job 7220-101
Review of US Testing Work

From Walter R. Ferris

Of H&CF - Soils

Copies to M. Mirsky/R. Schnaible
H. H. Burke

At 45/31/C36
Extension 7834

I have read the latest version of the review of the quality control tests in the backfill at Midland and I have the following comments:

Page 1 - line 7 - "preformed" should be "performed".

Page 2 - 8th line from bottom - delete the words "soil mechanics"

Page 5 - line 11 - The sentence starting --"However, the.... is unintelligible. I believe that something has been ommitted.

Page 5 - I don't agree with the discussion in paragraph 6. It is incomplete.

Errors in the moisture content in those cases where the wet density is correct will just move the points parallel to the zero air voids curve. Clearly as the report explains this does not provide a reason why points plot above the zero air voids curve. However if the moisture content is correct and the wet density is wrong then it would be possible for points to plot above and below the zero air voids curve depending on whether the erroneous unit weight is higher or lower than the correct value. Since no reliable correlation between nuclear and sand cone densities was performed it is not possible to say with certainty what the actual reason is. It may well be that the nuclear device was reading both moisture content and unit weight too high or just the unit weight was too high. In any case the selection of the appropriate compaction curve has nothing to to do with this as the zero air voids curve depends only on specific gravity. Furthermore based on the very limited data presented it appears that U. S. Testing was no better able to do sand cone tests than nuclear density tests.

I believe that this whole paragraph should be rewritten to say that:

"No reliable correlation between sand cone and nuclear density tests was carried out therefore there is no basis for determining if U. S. Testing would have performed better using the sand cone procedure.

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However it is clear that a large number of the nuclear density tests are wrong. This can be explained by considering the wet unit weight may have been wrong or both the moisture content and unit weight may have been wrong. A reliable correlation with properly conducted sand cone tests should have revealed this but it was not apparently done."

Page 6 - line 14 - there is a typo after "364 tests". I believe it should be "were" instead of "whosed".

W. R. Ferris

WRF/mz

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File: UST C-208-257/1015.4
March 18, 1980

RECEIVED
MAR 24 1980
BECHTEL POWER CORP.
JOB 7220
PER 61X(I) C-208

Bechtel Power Corporation
Post Office Box 2167
Midland, Michigan 48640

Attention: Mr. L. E. Davis

Subject: Midland Plant, Units 1 and 2
Subcontract #7220-C-208

Re: Submittal of Controlled Copies,
Status "FA-I"

Dear Mr. Davis:

Enclosed for your review and approval are controlled copy numbers 4, 8, 9, 10 and 11 of Document entitled:

QCP-7, Revision 3 "Soils Fines Testing of the Area Dewatering System"

By copy of this letter I am forwarding controlled copy No. 5 to Mr. J. Speltz.

Kindly acknowledge receipt by signing one (1) copy of this letter and returning it to the undersigned.

Very truly yours,

UNITED STATES TESTING COMPANY, INC.

M. Anselmo

M. Anselmo
Project Engineer

MA:hg
Enc. (5)

Acknowledgement ____________________

Date ____________________

SB 19171

cc: Mr. J. Speltz w/enc.
Mr. J. Lillywhite

7220-C208-16-4