002265

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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 15844

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.

SB 15845

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 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 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,

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

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.

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.

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.

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 15850

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.

SB 15851

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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 0644/2801

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 15853

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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

22 pp

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REVIEW OF U. S. TESTING
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.

2. Questionable Retests

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. 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 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.

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 ± 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 ± 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.

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 $\pm$ 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

001719

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.

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

001719

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.

MOISTURE-DENSITY FOR BMP 278

SPECIFIC GRAVITY = 2.65
ALL TESTS

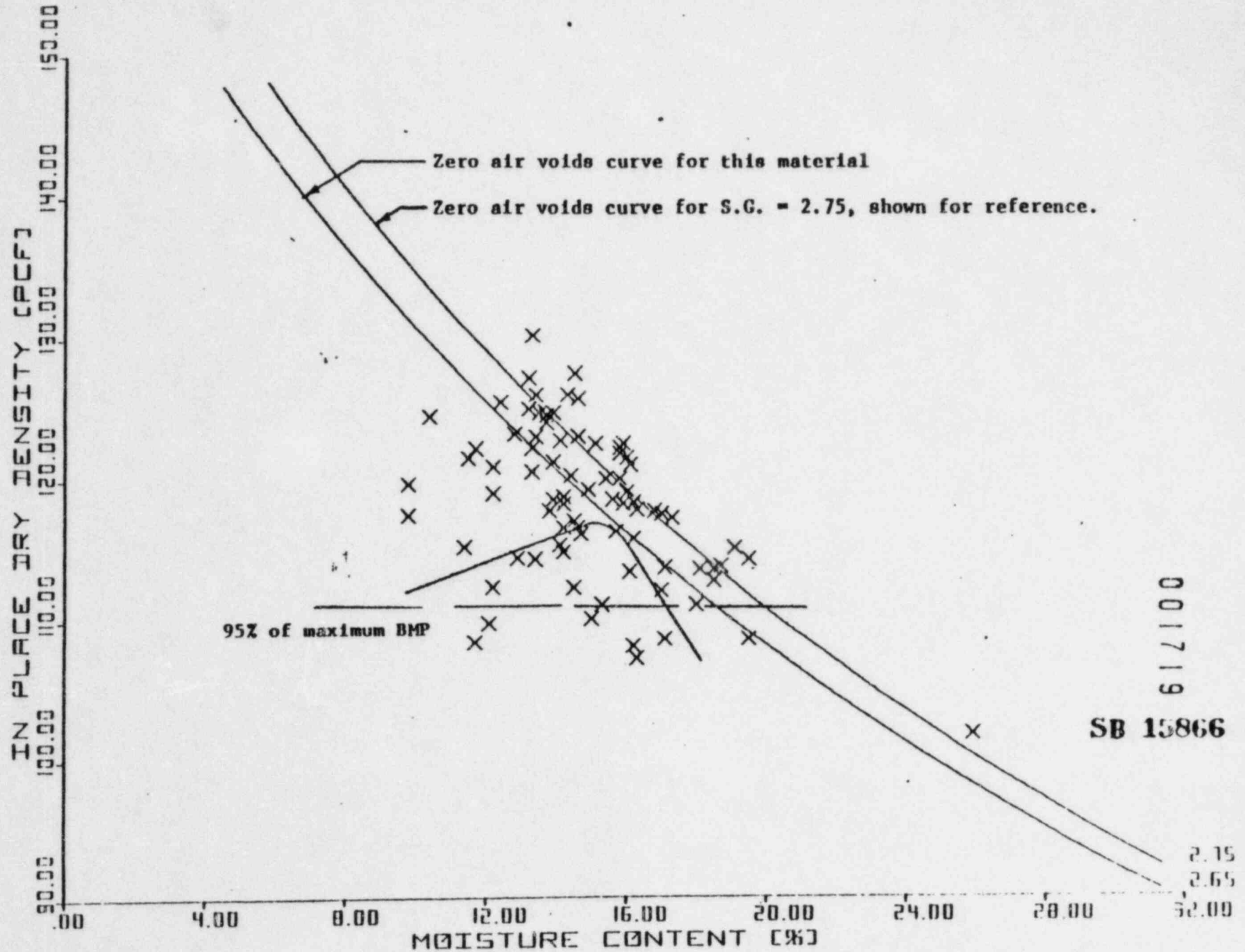
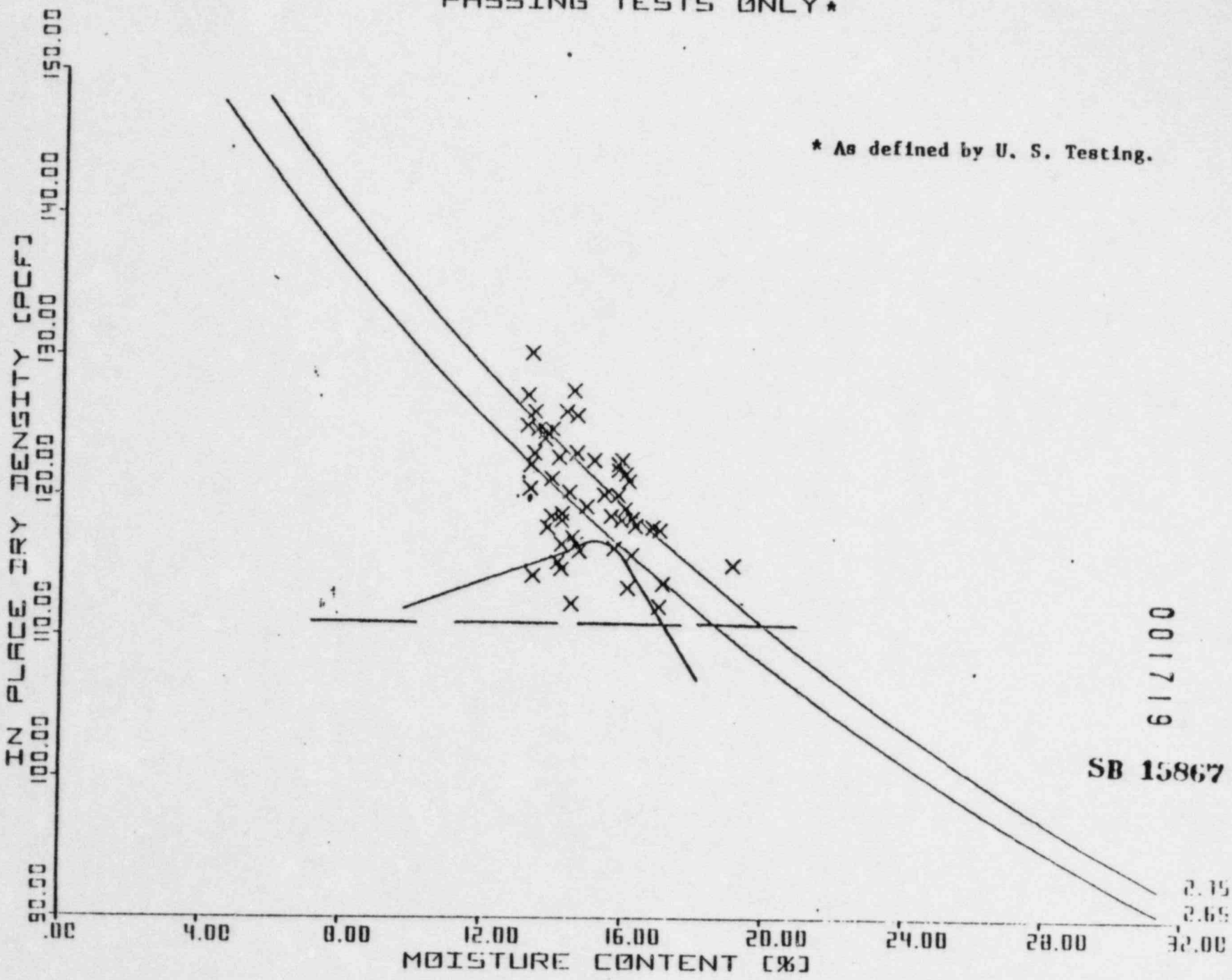


FIGURE 1

MOISTURE-DENSITY FOR BMP 278

SPECIFIC GRAVITY = 2.65
PASSING TESTS ONLY*



* As defined by U. S. Testing.

FIGURE 2

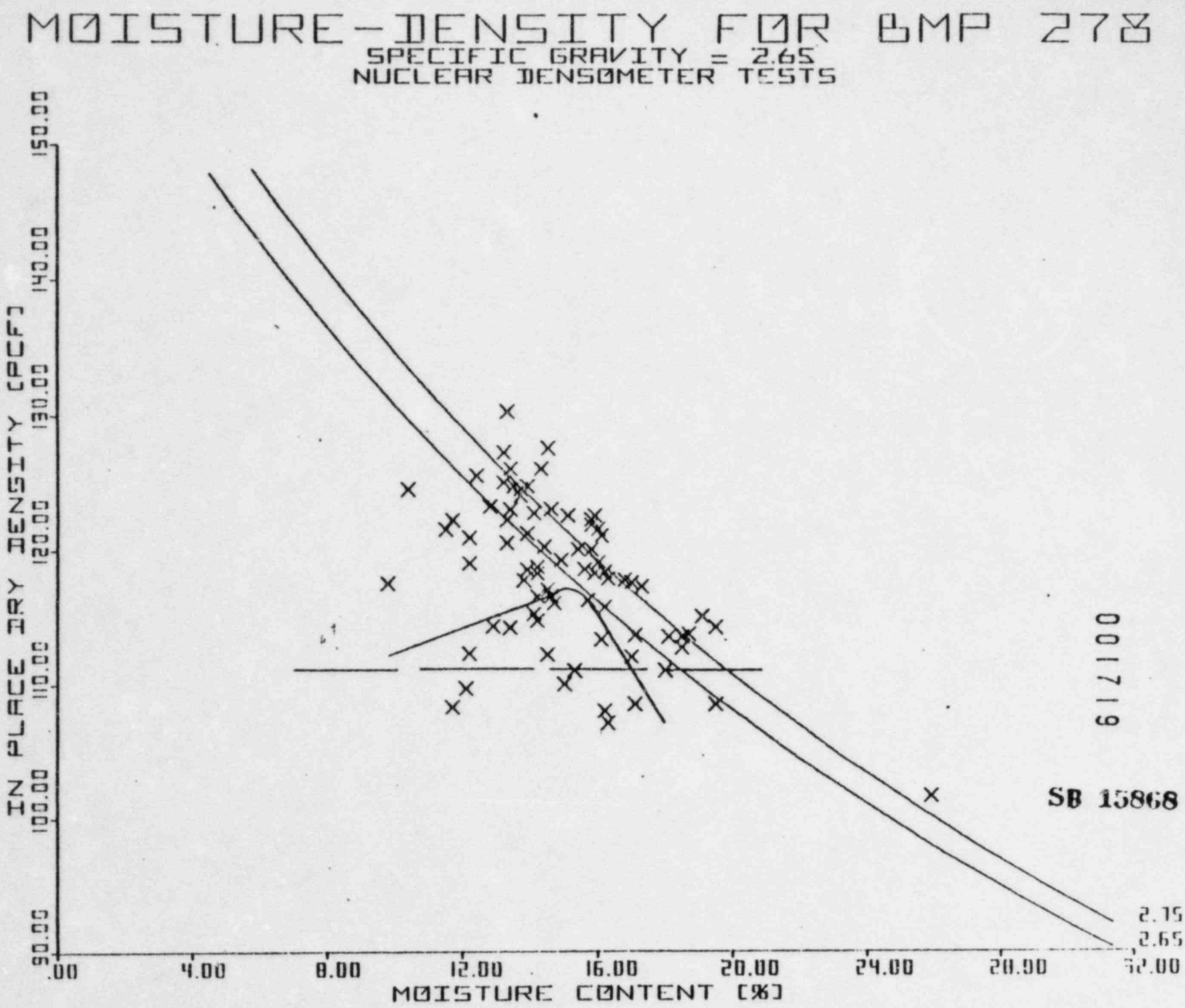

MOISTURE-DENSITY FOR BMP 278
SPECIFIC GRAVITY = 2.65
NUCLEAR DENSOMETER TESTS
IN PLACE DRY DENSITY (PCF)
90.00
100.00
110.00
120.00
130.00
140.00
150.00
.00
4.00
8.00
12.00
16.00
20.00
24.00
28.00
32.00
MOISTURE CONTENT (%)
2.75
2.65
SB 15868
617100

FIGURE 3

MOISTURE-DENSITY FOR BMP 278

SPECIFIC GRAVITY = 2.65

SAND-CONE TESTS

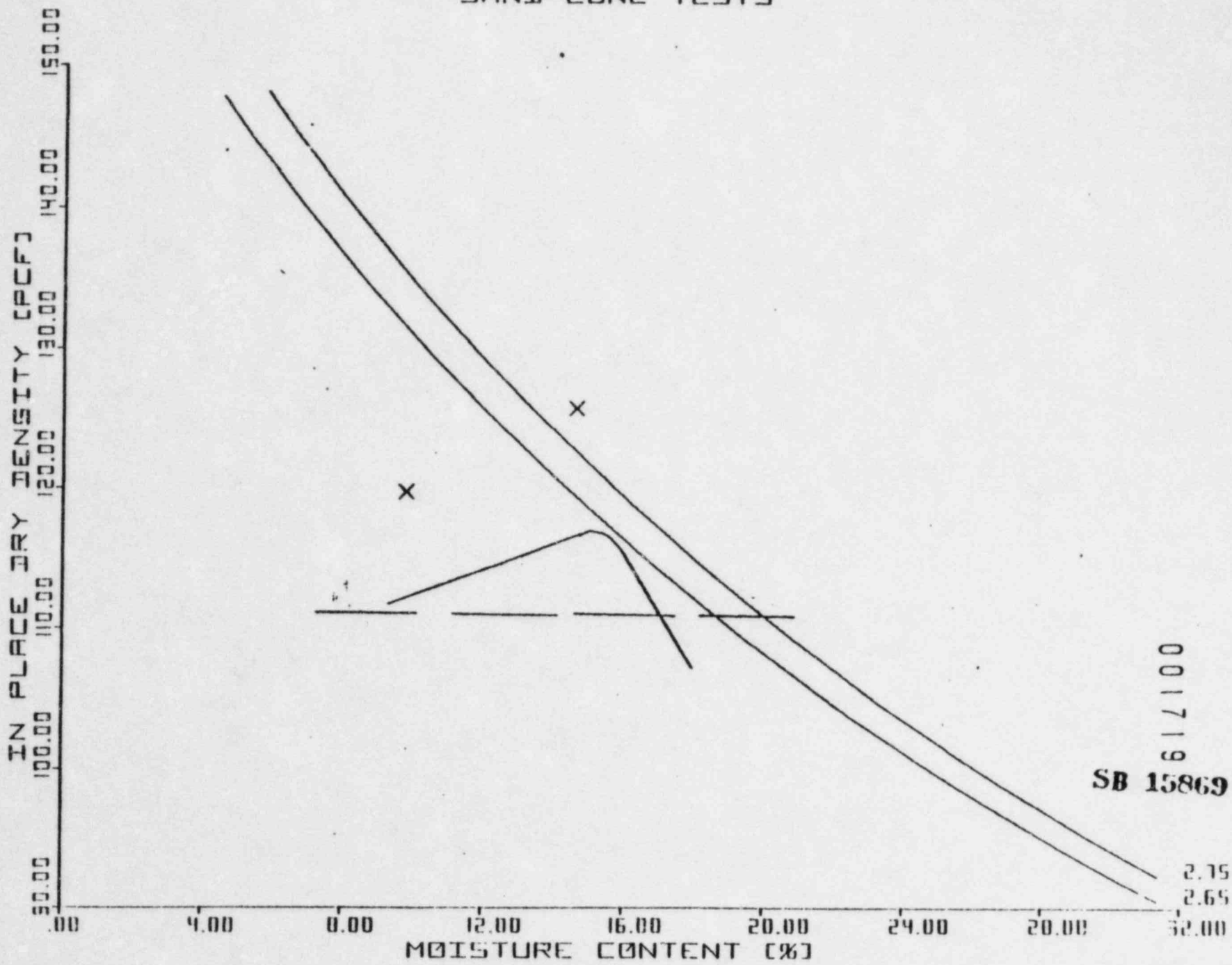


FIGURE 4

MOISTURE DENSITY FOR BMP 278

SPECIFIC GRAVITY = 2.65
NUC. DENS. PASSING TESTS*

*As defined by U. S. Testing

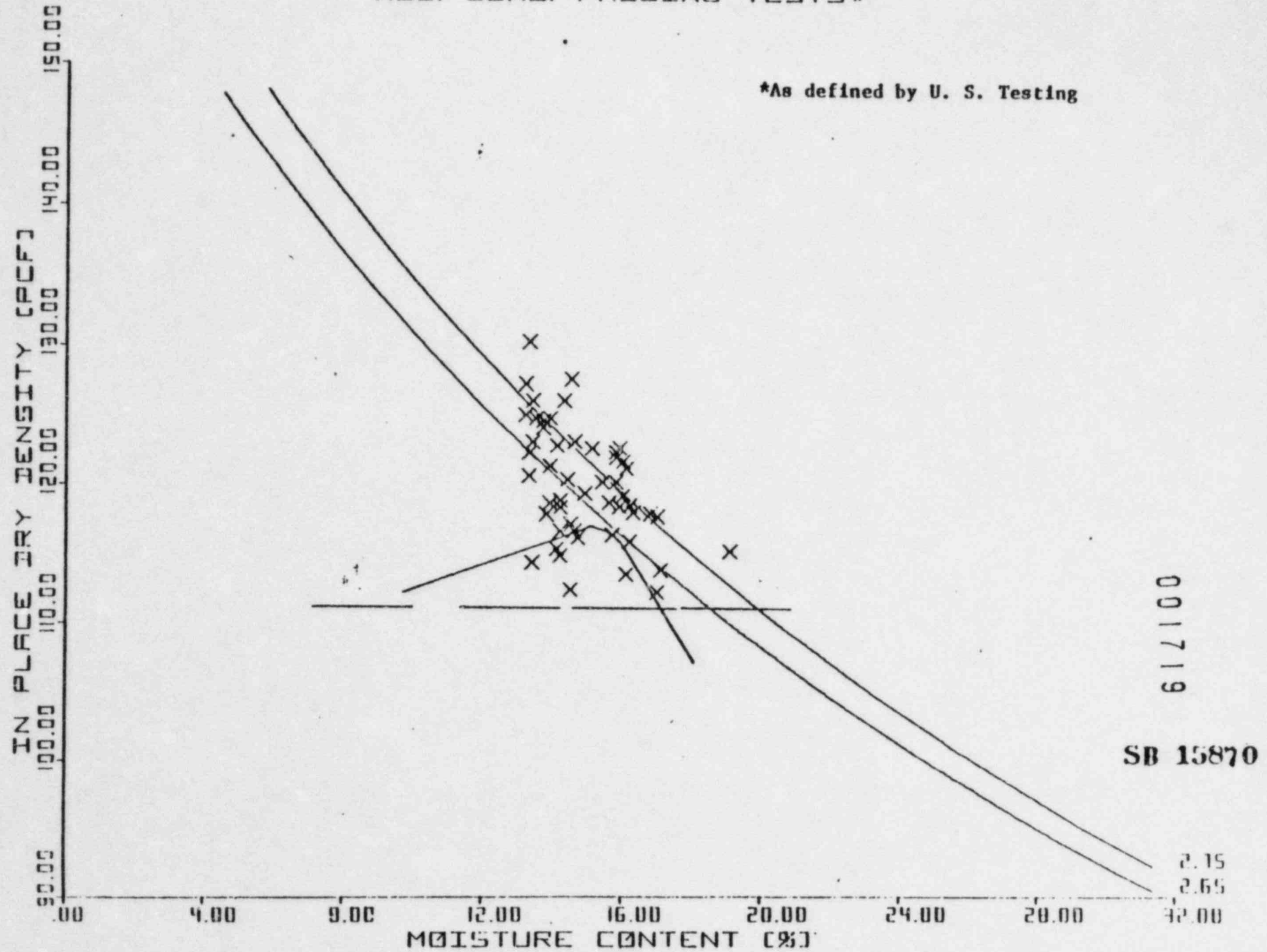


FIGURE 5

001719

SB 15870

MOISTURE-DENSITY FOR BMP 278

SPECIFIC GRAVITY = 2.65
SAND-CONE PASSING TESTS *

*As defined by U. S. Testing

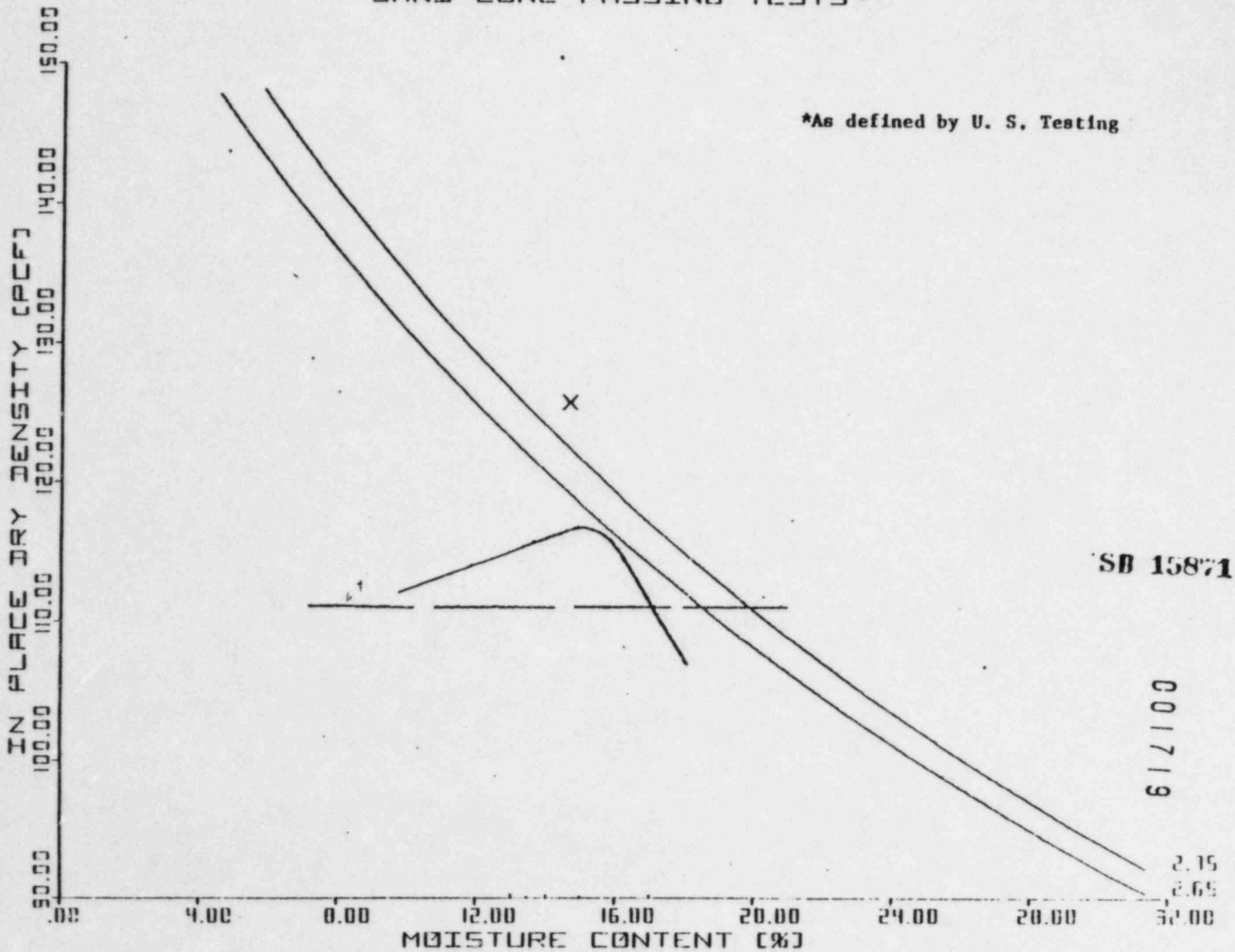


FIGURE 6

SB 15871

001719

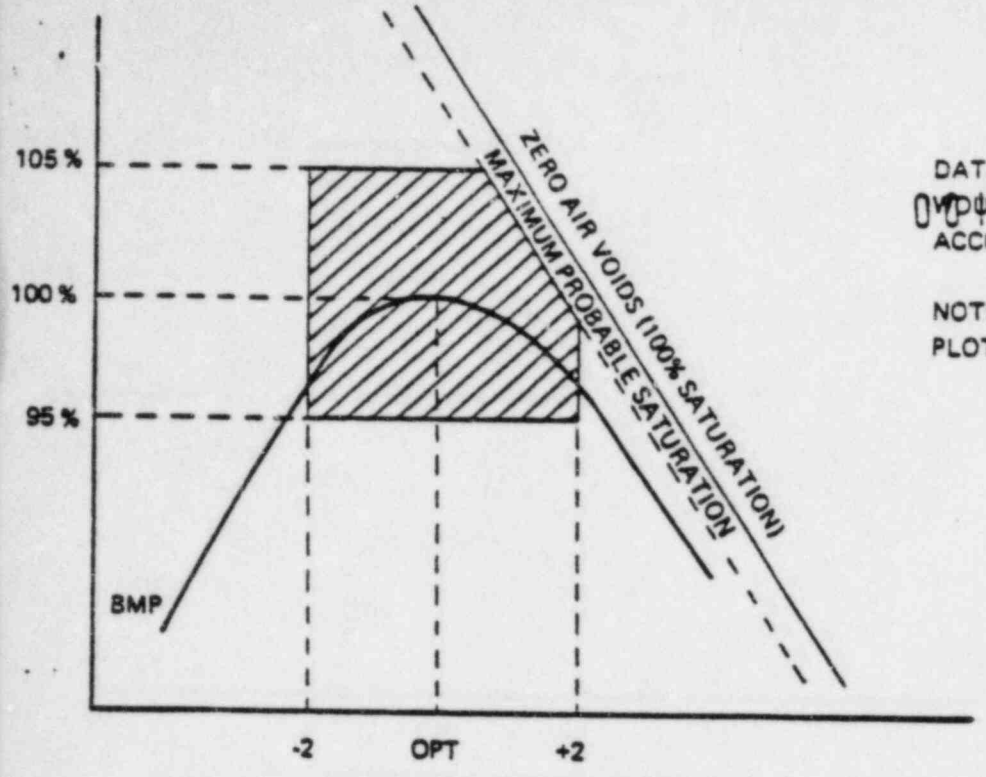


FIGURE 7-A-

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

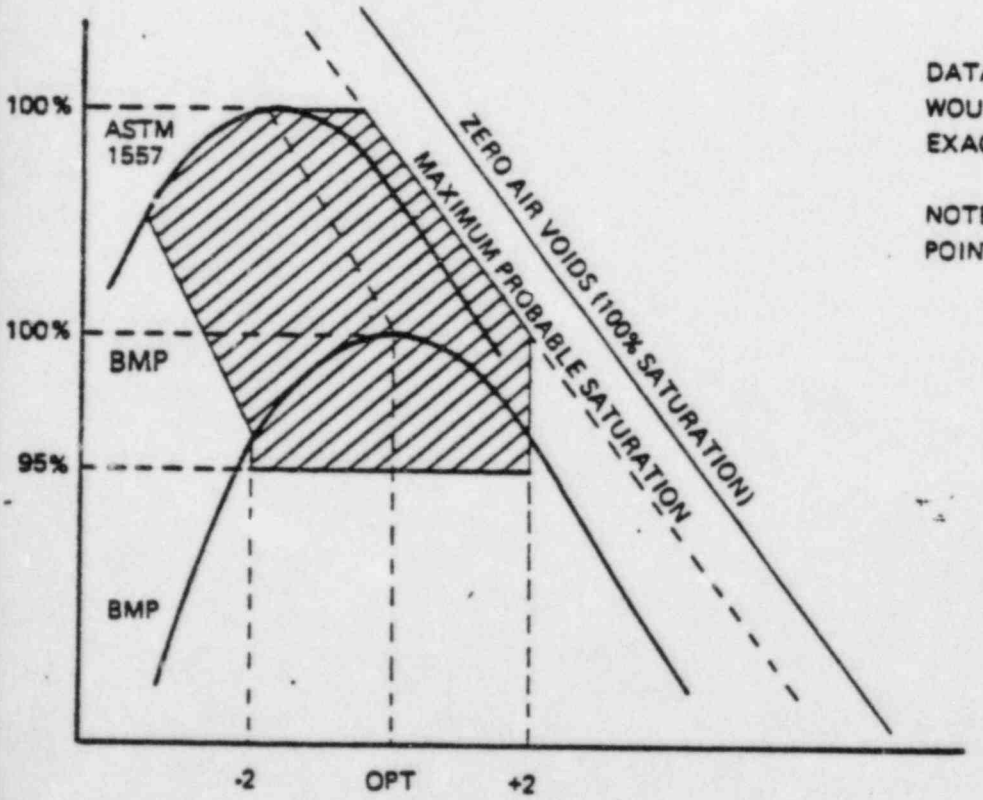


FIGURE 7-B-

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 15872

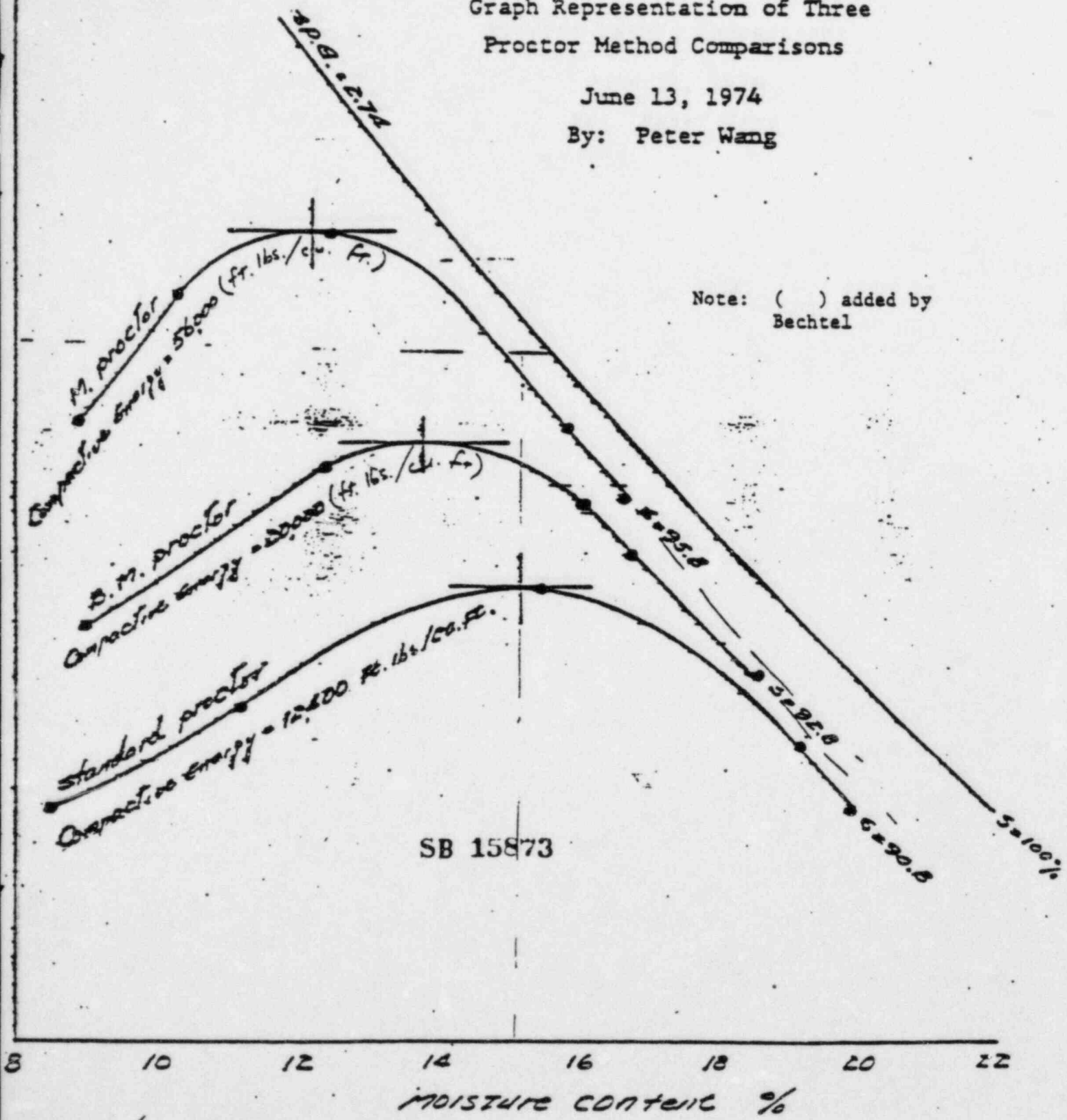
FIGURE 7: WINDOWS OF ACCEPTABILITY (A) BASED ON BMP SPECIFICATION (B) REGARDLESS OF EXACT WORDING OF SPECIFICATION

UNITED STATES TESTING CO., INC. 0017.9

Graph Representation of Three
Proctor Method Comparisons

June 13, 1974

By: Peter Wang



Note: ( ) added by Bechtel

SB 15873

FIGURE 8

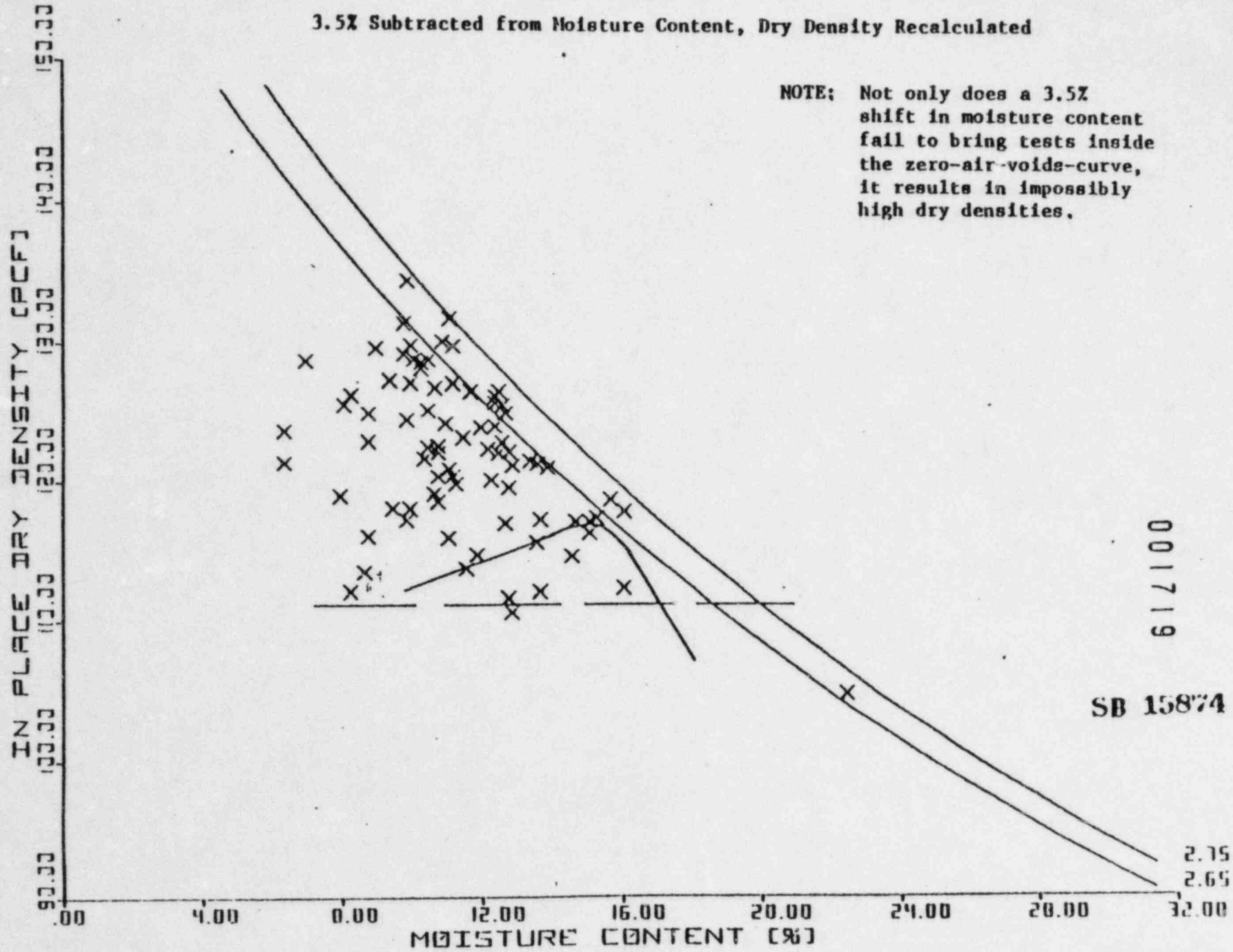
MOISTURE-DENSITY FOR BMP 278

SPECIFIC GRAVITY = 2.65

ALL TESTS

3.5% Subtracted from Moisture Content, Dry Density Recalculated

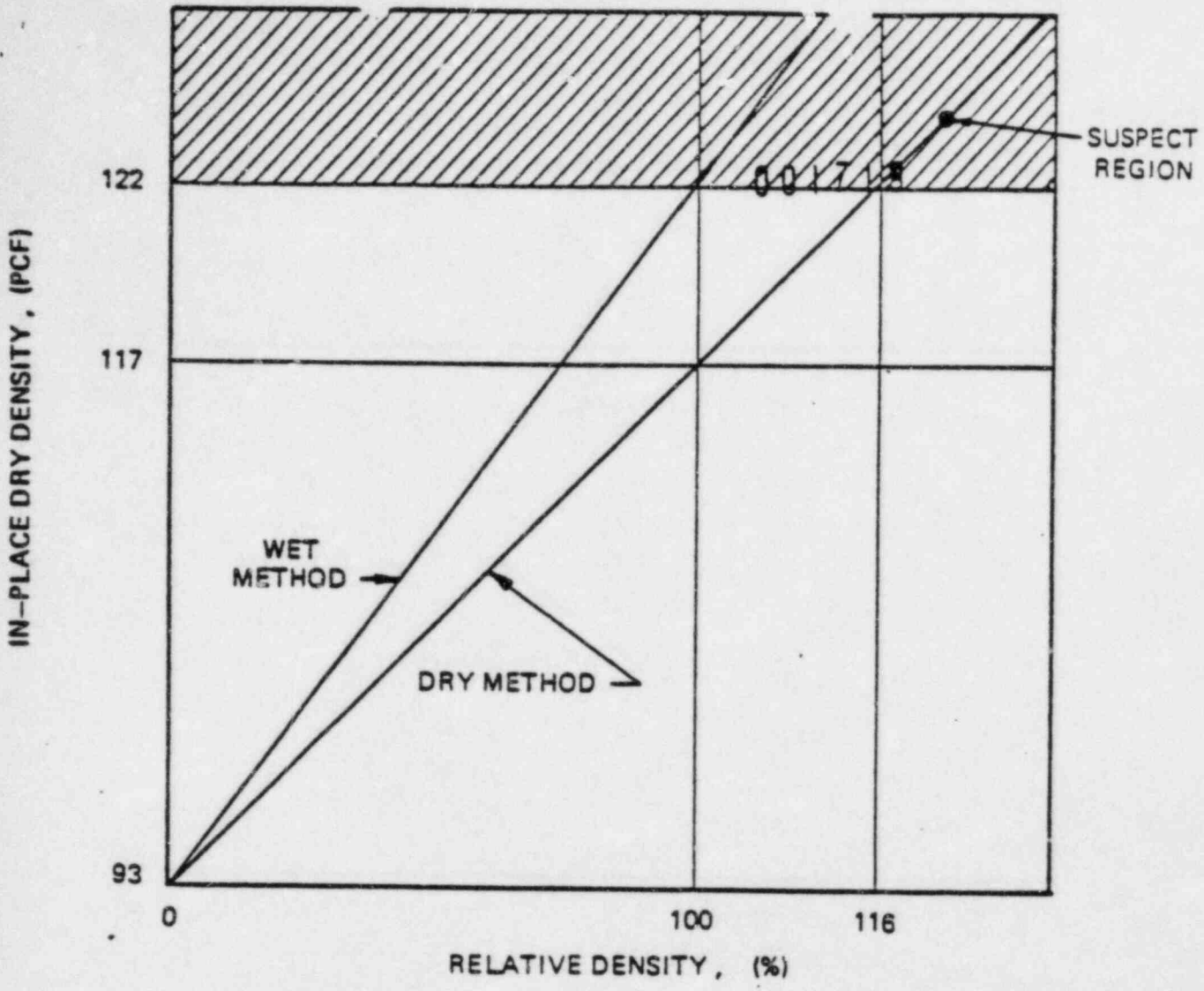
NOTE: Not only does a 3.5% shift in moisture content fail to bring tests inside the zero-air-voids-curve, it results in impossibly high dry densities.



001719

SB 15874

FIGURE 9



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

125

5517

To File

From TCCooke

Date March 13, 1980

Consumers Power Company

Internal Correspondence

Subject MIDLAND PROJECT GWO 7020 - MEETING WITH NRC ON THE MIDLAND PLANT FILL STATUS AND Resolution FEBRUARY 27 AND 28, 1980 - MIDLAND
File: 0485.16 UFI: 00234(S) 71*01

CC Attendees* CAHunt
DBMiller DESibbald
RMWheeler *CPCo, Bechtel and Consultants only

Generally speaking, the meeting followed the agenda (attached). GSKeeley noted in his opening remarks that we had met with the staff and the consultants in the July 1979 and January 1980 meetings, and that these meetings were augmented by their visits to the site. He also noted that, based on our previous discussions, we had been ready to start remedial contracts in December 1979 when we received the soils order from the NRC. Consumers Power then concelled negotiations with the contractors until better indications from the staff were available to the effect that the issues had been resolved. Mr. Keeley also noted that we were submitting Revision 5 responses to 50.54(f) Questions 4, 14, 16, 17, 18, 19, 20, and 24 through 35 next week. He then stated that the meeting today would be for purposes of updating the new NRC consultants through a tour, a review of the history of the problems and a verbal discussion of the planned remedial actions. TCCooke then discussed the historical aspects, the investigative program, the settlement, and outlined some of the planned remedial actions. From that point forward, various Bechtel engineers followed the agenda; at the same time highlighting some of the more pertinent portions of the responses to the questions that Mr. Keeley had noted would be sent to the NRC next week. The presentation was a repeat of the meeting of January 16, 1980 except that item 5 of the agenda, "Evaluation of Piping" had not been discussed on January 16, 1980.

The second day of the meeting started off with an extensive site tour by four groups of NRC and consultants personnel, as noted below.

Group A - Soils Review
Group B - Structures Review
Group C - Mechanical Review
Group D - Hydrology Review

Following the site tour Consumers Power Company Consultants gave their overview of the situation and the planned remedial action. A general discussion followed.

Discussion Topics

1. D. Hood expressed an interest in observing the area in the field where the pipe will connect to the control room pressurization tank. It was noted that this system is not completely designed (drawings will not be released until May 1980). B. Dahr was available to answer questions.

2. The NRC meeting minutes will not include the figures passed out today if they

3. There was a general discussion on the amount of detail the NRC requires for their review.

4. Interest was expressed and discussions took place on how the permanent dewatering wells would be maintained (incrustation). There was also discussion concerning the disposal of any acidizing chemicals.

   a. Environmental acceptability
   b. Possibility of the acidizing chemicals increasing the concentration of unacceptable chemicals in the cooling pond water.

   There appeared to be no problem.

5. The NRC was interested in the ability of the Category I retaining walls (Service Water), ability to withstand the postulated failure of a concrete pipe break in that area. It should be noted that these walls have been designed for saturated fill. The location of the concrete pipes are as shown on the location plan. There would be no problem associated with a concrete pipe break (K. Wiedner).

6. The effect of a guillotine break of the circulating water pipe was discussed. (It should be noted that a guillotine break of a non Category I steel circulating water pipe embedded in soil is not possible. A rupture of the circulating water pipe in the vicinity of the Diesel Generator Building is being evaluated. The pumps can be shut off, however, and butterfly valves are provided to isolate the discharge end of the circulating water pipes from the pond.

7. Interest was expressed in the type of well filter pack utilized (gravel, sand, gradation, etc.) Additional description can be provided if requested.

8. In response to a question regarding consequences of not underpinning the electrical penetration areas, it was noted that the fix on the Auxiliary Building electrical penetration areas was required because some borings in the area show low blow counts. For this reason, a positive remedial action is required to transfer the horizontal and vertical seismic force into sound foundation media. The Auxiliary Buildings wing walls are not designed to function as a cantilever.

9. The bending moment in the concrete walls of the Service Water Pump Structure due to the offset pile connection to the Service Water Building, and the shear forces at that point were discussed in detail. The NRC seemed to be interested in the bending moment capacity of the wall to resist that for which it was not originally designed, and the ability of the tie rods to transfer load. Details for the load transfer from the piles to the Service Water Structure were discussed.

10. Many questions were asked concerning pile criteria for loading, testing, driving, etc. Similar questions were asked on the cassions. This information can be documented if the NRC desires.

11. It is safe to assume that all pipe lines need not be profiled. There were profiled pipe lines in the same area and parallel to unprofiled pipe lines. Generally, parallel pipe lines were installed in the same trench, and there would have to be very large offsets to encounter a stress problem.

12. Detailed piezometer information concerning the soil profile adjacent to their locations was discussed. The NRC was interested in how we determined that the surcharge piezometers were located in clay layers rather than sand. Review of the piezometer charts and boring logs during preload is required by the NRC to enable them to increase their confidence. The logs have been previously transmitted. The piezometer charts and installation information will be transmitted as noted under commitments.

Commitments

1. A commitment was made by Consumers Power Company to provide five additional pieces of information to the NRC; namely, (1) a summary of the remarks by the Consumers Power Company Consultants made during this meeting; (2) thirty-one additional primary/secondary Diesel Generator consolidation curves; (3) the criteria utilized to select and locate the observation wells; (4) surcharge piezometer sketches and installation information; and (5) the location plan of buried concrete pipe.

2. Cracks in Concrete - A commitment was made to monitor the widths of cracks in the Service Water Pump Structure, the Auxiliary Building electrical penetrations area, and the feedwater isolation valve pits before and after installation of piles or support systems (JRotz).

   There will be crack monitoring of the borated water storage tanks foundation during the loading operation. Any cracks in concrete with walls' widths greater than 13 mils outside or 16 mils, inside will be repaired (JRotz).

3. In response to Gallagher's question a commitment was made to grout the existing partial and local gaps between the Diesel Generator Building footings and soils, as a precautionary measure, even though the preload shows that the footings as they exist now are adequate to transfer the load (BDahr).

4. The southwest settlement marker concerning the measured vs. the predicated secondary compression settlement from August 15, 1979 to January 16, 1980, assuming the surcharge remains, was in error. This was noted during Sherif Afifi's presentation (Figure 27-15) and has been corrected.

5. CPCo/Bechtel Consultants continue to be involved in the review of remedial actions.

6. Service Water Pump Structure - Bechtel will measure the building displacement as well as pile displacement during jacking operations to arrive at a realisic stiffness for dynamic analysis of the structure with piles during the SSE (Afifi and Davisson).

7. Service Water Pump Structure - Bechtel will envelope the spring constant used for pile and siesmic analysis. (McConnell)

8. Diesel Generator Building: Structural Analysis - The spring stiffness will be varied such that the predicated forty year settlement will be simulated and structures will be re-analyzed to show all the design criteria has been met (BDahr).

9. Structural Design and Criteria Incorporation Settlement Load Combination - Midland criteria as given in response to 50.54(f) Questions do not correspond

1.142. Bechtel stated that as agreed in the January 16, 1980 meeting with the NRC staff, a comparison between Midland criteria and ACI-349 criteria will be performed (BDahr).

10. Borated Water Storage Tank - In the structural analysis of the BWST support ring foundation the stiffness of springs will be adjusted so as to simulate differential settlements predicated by the Soils Group. The foundation will be re-analyzed to show it meets all requirements of design criteria (BDahr).

11. BWST Piping - It was noted that the BWST Piping would be disconnected during the load test.

12. Service Water Building Pipe Clearance - The limited clearance between the Service Water Pipe and the Service Water Building Pipe penetration will be checked. The reason for the wood blocks being left in place for an extended period will also be checked.

Attachments

sld

ATTENDEES

Consumers Power

G. S. Keeley
T. C. Cooke
T. Thiruvengadam
D. E. Horn

Bechtel

Harris Burke
Sherif Afifi
Ron Riat (2)
Bimal Dahr
Bill Paris
Julius Rotz
Jim Wanzeck
Karl Wiedner
John Rutgers
Lynn Curtis
Al Boos (2)
Chuck McConnel
Walt Ferris

Consultants

R. B. Peck (1)
A. J. Hendron, Jr. (1)
C. H. Gould (1)
M. T. Davisson (1)

NRC

L. Heller
R. Cook
J. Kane
A. Cappucci
F. Rinaldi
R. Gonzalis
G. Gallagher
D. Hood

US Corp of Engineers

N. Gehring
J. Grundstrom
B. Otto
W. Lawhead
P. Hadala
J. Simpson
J. Norton
R. Erickson

E-TEC

P. Chen
J. Brammer

US Navy Weapons Center

P. Huang
J. Matra

(1) February 28 only
(2) February 27 only

MEETING WITH NRC ON MIDLAND PLANT FILL STATUS AND RESOLUTION
February 27 & 28, 1980
Midland Site

1.0	INTRODUCTION	G. Keeley
2.0	PRESENT STATUS OF SITE INVESTIGATIONS	T. Cooke
	2.1 Meetings with Consultants and Options Discussed (Historical)	
	2.2 Investigative Program	
	A. Boring Program	
	B. Test Pits	
	C. Crack Monitoring and Strain Gauges	
	D. Utilities	
	2.3 Settlement	
	A. Area Noted	
	B. Preload	
	C. Instrumentation	
3.0	WORK ACTIVITY UPDATE	J. Wanzeck
	3.1 Summary of work activities and settlement surveys for all Category I structures and facilities founded partially or totally on fill	
4.0	REMEDIAL WORK IN PROGRESS OR PLANNED (Q4, 12, 27, 31, 33 & 35)	S. Afifi
	4.1 Diesel Generator Structures	
	4.2 Service Water Pump Structures	
	4.3 Tank Farm	
	4.4 Diesel Oil Tanks	
	4.5 Underground Facilities	
	4.6 Auxiliary Building and FW Isolation Valve Pits	
	4.7 Liquefaction Potential	
5.0	EVALUATION OF PIPING (Q16, 17, 18, 19 & 20)	D. Riat
6.0	DEWATERING (Q24)	B. Paris
7.0	ANALYTICAL INVESTIGATION	B. Dahr
	7.1 Structural Investigation (Q14, 26, 28, 29, 30 & 34)	
	7.2 Seismic Analysis (Q25)	C. McConnell
	7.3 Structural Adequacy with Respect to PSAR, FSAR, etc.	J. Rotz
8.0	SITE TOUR	All
9.0	CONSULTANTS SUMMARY	Peck/Hendron/ Gould/Davisson
10.0	DISCUSSION	All

AL 8005 3pg.

Bechtel Associates Professional Corporation

Inter-office Memorandum

TELECOPY

BERC-2391

To: J.F Newgen

Subject: Midland Plant Units 1 & 2
Job 7220
NRC Questions
Regarding Loose Sand
File: 0274, C-1700, 0500.1A

Date: August11, 1978

From: R.L. Cantleberry

Of: Engineering

At: Ann Arbor

Copies to:
S. Blue
S. Afifi
P.A. Martinez
G. Butler
K. Wiedner

Ref. A. Letter from J.H. Blasingame to H.R. Denton dated 7/27/78.
Ref. B. Letter from J.H. Blasingame to D.L. Johnson dated 8/3/78.

Enclosed herewith in a copy of NRC question 362.2 concerning removal loose sands beneath Class I components. We have not been successful in locating the evidence and procedures employed for removal of insitu sands with relative density less than 75%. Our efforts included searching through your subcontract documents and our files.

Our records indicate that specific instructions were outlined via inter-office memorandum and drawing C-44 to perform insitu density tests in the Class-I component areas to ascertain the need for removal of sands. (example Ref. A & B)

We feel that there must be some records available for the excavations done to remove the loose sand and insitu density tests to substantiate the need for not removing loose sands. Please furnish any and all the records for removal of loose sand including the areas and the extent of excavation. Please note that this is a very important subject and may lead us into an extensive boring program to adequately justify the compliance with our commitment to the licensing agency. Therefore, it is requested that you take immediate steps to locate the records and respond to us as quickly as possible. Also, please note that the schedule for answering this question is critical.

Furthermore, the results of the borings taken on 7/21/78 in the tank-farm area have been evaluated and we find it necessary to have three (3) additional borings taken in the following locations.

1. S. 4580; E. 230
2. S. 4620; E. 230
3. S. 4600; E. 250

8009050

JOB 7220	A	D	I
ROUTING	C	T	E
Proj. Supt.			
F. Sup.			
P.E. Engr.			
A.P. E.			
Al.			
C.			
C.			
Aux.			
Yard			
Civ. Sup.			
Civ. Eng.			
Mech. Sup.			
Mech. Eng.			
Elec. Sup.			
Elec. Eng.			
Weld. Eng.			
Off. Eng.			
I & A			
C. C.			
Purc.			

Please advise us of the schedule for doing these borings so that we can send a representative from the Geotechnical group to witness the borings.

R.L. Castleberry

RLC/prn

Enclosure: 1. NRC Question 212.2.

8208300051

Question 362.2 (2.5.4.5.1)

Question 1 and the resulting discussion on Page 8.00-1 included in Amendment Number 9 to your FSAR stated that all natural sands with relative densities less than 75% would be removed beneath all Class 1 structures and beneath non-Class 1 structures so sited that their failure could endanger the adjacent Class 1 structures. Discuss the methods employed in mapping and removing the sands having less than 75% relative density. Provide plan and sectional figures showing the areas where these materials were removed. Figure A9-2 of the FSAR which displays subsurface profiles of Class 1 piping should be updated to show removal of sands of less than 75% relative density and be presented in the FSAR. Figure 2.5-21 of the FSAR shows loose sands beneath the Class 1 tanks although they were to have been removed. Explain this inconsistency, and provide proper documentation of as-built conditions. 8

Responses

Subsection 2.5.4.5.1 has been revised in response to this question. The request to provide plan and sectional figures of areas where the loose sands were removed will be responded in more detail by amendment in August 1978.

SBD90052

FIELD ENGINEER'S REPORT FORM

MIDLAND UNITS 1 & 2

JOB 7220 DATE 3/7/78 PAGE 1 OF 10

ITEM NO.	INSPECTION DESCRIPTION	ACTION REQUIRED/TAKEN

DIKE SOILS TEST AUDIT

SUBJECT REVIEW WAS PERFORMED ON 458 TESTS, RANDOMLY SAMPLED FROM ALL SECTIONS OF THE COOLING POND DIKE.

IN GENERAL ONLY ONE OF THE TESTS AUDITED HAD FAILING RESULTS WITH NO POSSIBLE RETEST PERFORMED IN THE SAME AREA - NORTH MILLER DIKE (MD #22)

SEVERAL TESTS WERE FOUND TO BE FAILING WITH RETEST NOT INDICATED OR TEST WAS LOGGED AS PASSING BUT HAD FAILING RESULTS. IN EACH CASE A POSSIBLE RETEST WAS LOCATED IN THE SAME AREA.

SOUTH DIKE
MD 621 POSSIBLE RETEST #629

NORTH DIKE
MD 135 POSSIBLE RETEST #135

NORTH MILLER DIKE
MD 302 POSSIBLE RETEST #301 & #303

REMARKS:

SB009330

SIGNATURE

ROUTE
J. BETTS
J. DEAN
M. DUGAS
C. CROSS

FILE

FIELD ENGINEER'S REPORT FORM

MIDLAND UNITS 1 & 2

JOB 7220 DATE 3/7/78 PAGE 2 OF 10

ITEM NO	INSPECTION DESCRIPTION	ACTION REQUIRED/TAKEN
	PAGE 2 SOILS AUDIT (CONT'D)	
	NORTHEAST DIKE	
	MD 359 POSSIBLE RETEST #360	
	IN ADDITION, SOME TEST RESULTS WERE NOT INSERTED IN LOG, U.S. TESTING HAS FURNISHED ACTUAL TEST RESULTS AND ALL WERE FOUND TO BE PASSING.	
	NORTH MILLER DIKE	
	MD 521 LOG NO. UST-5-5	
	WEST PLANT DIKE	
	MD #272 LOG NO. UST-U-23	
	MD #274 " " UST-U-23	

REMARKS:

SB009331

J. S. Caster

SIGNATURE

ROUTE

J. BETTS
J. DEAN
M. DUGAS
C. CROSS

FILE

BECHTEL

CALCULATION SHEET

DATE

DESIGN BY GSC/MD DATE 2/2/78 CHECKED BY SHEET NO. 1

PROJECT DIKE SOILS AUDIT JOB NO.

SUBJECT CALCULATION NO. FILE NO.

SOUTH DIKE

TEST NO.	TEST P/F	REMARKS	TEST NO.	TEST P/F	REMARKS
119	P		157		
258	P		149		
619			494		
30			681		
581			603		
330			356	P	
225			634	F	RETEST #641
475			306	P	
147			496		
136			128		
186			412	P	
601			104	F	RETEST #105
601			209	P	
537			704		
648			517		
508			371		
542			509		
42			595		
60			54		
435			230		
393			290		
487			585		
577			207		
409	P		526	P	
621	F	* RETEST NOT INDICATED.	614	F	RETEST #627.
441	P	POSSIBLE RETEST #629. 100' AWAY.	371	P	
353			546		
435			138		
681			544		
132			47		
271			197		SB0 03332
316			103		

BECHTEL

CALCULATION SHEET

DATE

DESIGN BY DATE CHECKED BY SHEET NO. 2

PROJECT JOB NO.

SUBJECT CALCULATION NO. FILE NO.

SOUTH DIKE (CONT'D)

TEST NO.	TEST P/F	REMARKS	TEST NO.	TEST P/F	REMARKS
529	P		315		
582			712		
538			632		
495			796	P	
37			62	F	RETEST #75
129			166	P	
94	P		491		
			340		
EAST DIKE			110		
			818		
391	P		513		
790			591		
885			593		
249			563		
240			901		
529			737		
356			262		
164			495		
407			562		
677			312		
187			814		
590			19		
853			755		
457			185		
587			694		
426			343		
909			452		
777	P		587		
874	P	ZONE 3 TEST	762		SB009333
563	P		159		
337			109		
247			723	P	

BECHTEL

CALCULATION SHEET

DATE

DESIGN BY DATE CHECKED BY SHEET NO. 3

PROJECT JOB NO.

SUBJECT CALCULATION NO. FILE NO.

EAST DIKE (CONT'D)

TEST NO.	TEST P/F	REMARKS
825	P	
720		
296	P	
22	F	RETEST # 106
463	P	
731		
510		
211		
695		
295		
440		
714		
603		
746		
19		
597		
475		
110		
340		
748		
773		
612		
461		
343		
71		
698		
174		
565		
653		
178		
423		
275		
825	P	
103		
317		
812		
759		
833		
855		
726	P	

NORTH DIKE

TEST NO.	TEST P/F	REMARKS
279	P	
127	P	
316	P	
91	—	*FOR INFO ONLY
118	P	
310		
325		
178		
414		
353		
265		
309		
349		
163		
290		
272		
344		
506		
366		
373		
263		
179	P	

SB009334

CALCULATION SHEET

DATE

DESIGN BY DATE CHECKED BY SHEET NO. 4

PROJECT JOB NO.

SUBJECT CALCULATION NO. FILE NO.

NORTH DIKE (CONT'D)

TEST NO.	TEST P/F	REMARKS
325	P	
342	|	
218	P	
135	F	FAILED - M.C. 2.2% MARKED AS PASSING.
346	P	POSSIBLE RETEST #136
352		
380		
374		
250		
436		
81		
163		
77		
389		
213		
424		
501		
318		
387		
321		
302	P	
434	—	VOID TEST

NORTHWEST DIKE.

TEST NO.	TEST P/F	REMARKS
163	P	
43		
166		
80		
103		
73		
66	P	
108	P	
54	F	RETEST #56
	|	
	|	
69	P	
171	|	
80	P	
36	F	RETEST #46
75	P	

NORTH MILLER DIKE

TEST NO.	TEST P/F	REMARKS
44	P	
250	|	
223		
276		
496		
185		
316	P	M.C. 2.2% MARKED AS PASS..
302	F	POSSIBLE RETEST #301 & #303.
329	P	
524	|	
622	P	
67	—	VOID TEST
489	P	
538	|	
432		
567		
219		
143	P	

SB009335

BECHTEL

CALCULATION SHEET

DATE

DESIGN BY DATE CHECKED BY SHEET NO. 5

PROJECT JOB NO.

SUBJECT CALCULATION NO. FILE NO.

NORTH MILLER DIKE

TEST NO.	TEST P/F	REMARKS
597	P	
98		
90		
473		
176		
374		
521	P	NOT LOGGED LOG. NO. UST-S-5
278		
350		
218		
497		
24		
204		
471		
471		
176		
473		
27		
411		
246		
610		
272		
406		
343		
402		
327		
394		
479		
31		
95		
235		
94	P	

TEST NO.	TEST P/F	REMARKS.
1-1	P	
456		
139		
560		
292		
318		
112		
534		
337		
323		
202		
331		
22	F	NO PASSING TEST NOT LOGGED POSSIBLE RETEST NOT AVAILABL

WEST PLANT DIKE

64	P	
252	P	
269	—	VOID TEST
234	P	
208	P	
271	—	VOID TEST
210	P	
272	P	TEST NOT INSERTE IN LOG UST-W-23
175	P	
84	P	
36	P	
109	P	
65	P	
316	P	SB009336
305	P	
282	P	

BECHTEL

CALCULATION SHEET

DATE

DESIGN BY ____ DATE ____ CHECKED BY ____ SHEET NO. 6

PROJECT ____ JOB NO. ____

SUBJECT ____ CALCULATION NO. ____ FILE NO. ____

WEST PLAN DIKE

TEST NO.	TEST P/F	REMARKS
291	P	
274	* P	* TEST NOT INSERTED IN LOG. LOG NO. WST-W-23
81	P	
300	—	
144	—	
95	P	
159	F	RETEST #164
277	P	OMC MISSING CLERICAL ERROR
200	P	
223	—	
177	—	
103	—	
79	—	
318	—	
236	P	

BAFFLE DIKE

153	P	
166	—	
174	—	
97	—	
84	—	
76	—	
70	—	
123	—	
182	—	
177	—	
114	—	
182	—	
141	P	

TEST NO.	TEST P/F	REMARKS
169	P	
154	P	

WEST DIKE

137	P	
80	—	
127	—	
34	—	
158	—	
146	—	
151	—	
53	—	
113	—	
50	—	
129	—	
123	—	
119	P	

NORTHEAST DIKE

883	P	
864	—	
476	—	
921	—	
463	—	
335	—	
202	—	
761	—	
849	—	
463	P	

SBO 09337

BECHTEL

CALCULATION SHEET

DATE

DESIGN BY DATE CHECKED BY SHEET NO. 7.

PROJECT JOB NO.

SUBJECT CALCULATION NO. FILE NO.

NORTHEAST DIKE

TEST NO.	TEST P/F	REMARKS	TEST NO.	TEST P/F	REMARKS
773	P		803	P	
231			1049		
764			1026		
878			1005		
763			606		
209			394		
971			948		
285			761	P	
475			775	—	
166			794	P	
893			788		
929			612		
990			200		
512			453		
381			183		
645	P		633		
175	—		743		
775	P		568		
658			260		
1019			1032		
170			189		
335			980		
602			288		
546			663	P	RETEST 664
345			165	P	RETEST 193/233/
1088			139	P	234/474
287			244	F	RETEST #248/25:
1048			959	P	366
991	P	MARKED AS PASSING	161	F	RETEST 174
359	P	POSSIBLE RETEST	1020	P	
675	P	#360	444	P	SB009338

BECHTEL

CALCULATION SHEET

0510 (11-74)

DATE

DESIGN BY DATE CHECKED BY SHEET NO. 8

PROJECT JOB NO.

SUBJECT CALCULATION NO. FILE NO.

NORTHEAST DIKE.

TEST NO.	TEST P/F	REMARKS
705	P	
706		
173		
889		
373		
392		
965	P	
586	F	RETEST 589
915	P	
376		
815		
725		
357		
1036	P	
149	F	RETEST 184
1002	P	
1048	P	
797		
723		
662		
790		
938	P	

SB009339

MEETING NOTES

U. S. TESTING, CONSUMERS POWER COMPANY AND

BECHTEL POWER CORPORATION

DATE: April 9, 1979

PLACE: U. S. Testing Headquarters, Hoboken, NJ

SUBJECT: See Below*

ATTENDEES:		
	E. Basile	U. S. Testing Company
	E. Zadena	U. S. Testing Company
	E. Edley	U. S. Testing Company
	M. Anzelmo	U. S. Testing Company
	J. Speltz	U. S. Testing Company
H	B. Marguglio	Consumers Power Company
	D. Worn	Consumers Power Company
	R. Wheeler	Consumers Power Company
	D. Palmer	Bechtel Power Corporation
	G. Richardson	Bechtel Power Corporation

I)* Ben Marguglio opened the meeting by establishing the following agenda:

1) Describe the problems relating to the Midland soils problem.

2) What U. S. Testing thinks may be the problem: where did U. S. Testing contribute to the problem?

3) What did U. S. Testing say to the NRC during the NRC investigation.

II) Ben Marguglio presented the following to describe the types of problems:

1) Inconsistencies in the SAR

2) SAR Requirements not translated accurately/clearly into the specifications.

3) Requirements for testing were not totally stated. Callout for proctor not total story.

4) Interpretations were varied and not released through normal specification channels.

5) Client suspects there was not a total understanding of the process by any one individual. Lack of expertise.

6) There may have been incorrect proctor selection.

7) There may not have been timely corrective action in identifying the extent of the problem and identification of the problem as opposed to fix.

8) Accountability for inspection may have been lacking.

Who inspected
What inspected
How inspected, etc.

9) U. S. Testing may have utilized to a sampling process without sufficient historical background on the process.

10) U. S. Testing may have failed to qualify the test or the inspection process.

Ben added that all of the above contributed or could have contributed to the problem.

III) The main discussions during the meeting centered around the above. The following is a brief description of the important points of this discussion.

1) Ben discussed the conflicting test methods in specification C-210 and asked what U. S. Testing did to assure themselves that they had a clear Specification to work to.

U. S. Testing responded that their direction to use Bechtel modified proctor came from Bechtel as did direction of when to take moistures. There was nothing in writing - direction was verbal.

U. S. Testing added that it was not their responsibility to determine when or where to take a test.

U. S. Testing clearly stated that U. S. Testing responsibility was for performing the testing and not to inspect as to where and when testing is to be performed - this is a Bechtel responsibility.

Question by Don Horn concerning moisture, compaction, and fitting of sample to the proper proctor was directed to U. S. Testing. Inherent error and judgement could be highly contributary factors in giving the wrong result.

U. S. Testing stated that variables exist within a soils testing program that can cause erroneous data. U. S. Testing suggested that the testing agency be given more autonomy in making decisions. It was suggested that possibly the testing agency would serve best if it were responsibile directly to the Client.

Ben stated that on Consumers Power Company jobs (future) he expects U. S. Testing to assure that specification interpretations/changes are obtained officially - and added that U. S. Testing Q A should not allow this to happen.

U. S. Testing responded that their Contract does not provide for this type of QA involvement.

2) Ben asked what type of mechanism U. S. Testing used to determine when a new proctor was required.

U. S. Testing responded that this was (is) normally triggered by the lab technician during selection of the proctor in response to a field test.

U. S. Testing added that there are no procedures to cover this operation; that it is a judgement operation that would be difficult to procedurize.

Ben summarized the problem of direction during testing as being unsatisfactory and a more stringent direction process between Contractor and Subcontractor would be required, particularly that any change in test or specification changes must be received in writing prior to implementation.

3) Ben asked who notified U. S. Testing when a new proctor was needed.

U. S. Testing responded this was an ongoing item and proctors were taken as a regular thing and were taken at material changes and new borrows - again there were no procedures.

U. S. Testing stated that they could not remember ever being requested by Bechtel to take a sample specifically to develop a proctor.

U. S. Testing added it was not their responsibility to maintain the test frequency and that they were not privileged to quantity information.

Question of frequency revealed that:

1) 10,000 yard frequency test was not accurately followed as related to exact yardage being moved but was an ongoing check basis based on frequency roughly correleted with yardage - this was done because exact yardage movement was not immediately available to prompt the precise frequency implied by the specification.

U. S. Testing added they felt that they did more than their Contract required in:

Determining new sources and material changes where new proctors are required.

Selection of the appropriate proctor to compare to the field density.

Over involvement with Canonie.

4) Ben asked how U. S. Testing identified the proper curve to use when the curve may be six months old.

U. S. Testing responded, they kept approximately 15 samples to be used.

Ben inquired what the field procedure was in determining when a new proctor is needed. U. S. Testing responded that:

1) Judgement factor by experienced field personnel determines a large portion of the decision.

2) If characteristics changed, or a new borrow was started then an additional proctor would be made .

Ben added following statement:

For Consumers Power Company projects U. S. Testing should take the attitude that, in the absence of a controlled single source or specific designation for a change in soils, the most conservative approach should be taken.

5) General discussion on testing calculations:

A) Some conflicts noted in D. Horn's audits - U. S. Testing should consider.

B) All test reports submitted to Bechtel Q. C. for review - does not include actual calculations.

C) There normally was not a plot of field test results on the proctor curves - no comparisons to zero air-voids curve.

D) If test plots on wrong side of zero air-voids curve there is an error (per D. Edley).

E) Errors are inherent in test methods being applied:

Troxler has $\pm$ 3% error.

Results are conservative.

6) Ben asked what U. S. Testing thought might be the problem - U. S. Testing had no input.

7) Ben asked if U. S. Testing had recommendations for future work - U. S. responded:

A) Take a look at the role you want the test lab to perform.

B) U. S. Testing added that it was Bechtel's responsibility to determine when a new proctor is needed.

C) Review area of what is acceptable material.

Ben requested that U. S. Testing provide Consumers Power with testimonial information that was provided to the NRC during the interviews covering the soils investigation at Midland.

U. S. Testing inquired whether Bechtel would object to this release. Bechtel Subcontracts representative stated that there would be no objection.

The dialogue of these interviews is attached.

Prepared by:

David L. Palmer Date

NRC DIESEL GENERATOR BUILDING SOILS INVESTIGATION
at the Midland, Michigan, Project Site

Interviewers: Gene Gallagher, NRC Soils Specialist
G. A. Phillip, NRC Investigation Specialist

Interviewee: John Speltz, U.S. Testing Site Project Supervisor

The following notes were generated from notes taken by John Speltz during an interview in the Consumers Power Company conference room on 12/14/78.

Q.) Did you see a conflict in C-210 (earthwork specification) between BMP (Bechtel Modified Proctors) and ASTM D-1557?
A.) Yes, there was an area of concern in section 13.

Q.) What criteria were you working to?
A.) The BMP, as indicated on our reports.

Q.) What is your period of activity on site?
A.) Since December, 1976.

A letter to Church (Subcontracts) from Valenzano (Engineering) of 6/10/74 was shown. Section 13.7 of C-210 was pointed to in the letter.

Q.) What does modified Proctor mean to you?
A.) ASTM D-1557 modifying ASTM D-698.

Q.) Do modified Proctor, BMP, and D-1557 mean the same?
A.) No.

Q.) Does BMP and modified Proctor mean the same?
A.) No.

Showed telecon Hook (Bechtel Q.A. onsite) to Rao (Ann Arbor, Project Engineering), October, 1977, and telecon Teague (Lead Civil Field Engineer) to Rao, October 10, 1977 (copy attached), noting that either D-1557 or BMP can be used.

Q.) What was your source of direction on this?
A.) Verbally, as mentioned in a note on top of the original of the telecon.

Q.) Do you feel Hook or Teague were responding to you (John Speltz)?
A.) No, not to me directly.

Q.) Who would respond to you with this information?
A.) Bechtel Q.C.

Q.) Why is the response so late? → ref: Oct 10, 77 Date
A.) I have no information on that.

Q.) Were there other areas where soil work was going on?
A.) What work are you referring to?

Q.) Were there Q.A. problems in soils at this time?
A.) I believe that Bechtel Q.A. and Consumers Power Company Q.A. were active in soils during this time period (fall of 1978), but I have no specific recollection.

Q.) Is the BMP and type of materials specified for the Diesel Generator fill normal for construction?
A.) I had no interface with Project Engineering and Design.

Showed QCIR SC-1.05 (a Bechtel Q.C. report form).

Q.) Are you aware of Q.C. field activities and responsibilities in soils?
A.) I am aware that they have a program and functions to fulfill, but not of their specific requirements.

Q.) Do you think that Canonie was aware of the specification for compaction and what it was being tested for?
A.) I have no specific knowledge, but assume that they were aware of their job requirements.

Q.) Was Bechtel working soils in addition to Canonie during this time period (1977)?
A.) Yes.

Q.) When did Canonie quit working?
A.) In 1977, there was a big push to be off site for deer hunting season which began November 15th.

Q.) Why are you working to D-1557 now?
A.) Q.C. direction with a memo from Cheek to Siple of 9/29/78 (copy attached).

Q.) What is random fill?
A.) It could be any of several types of material.

Q.) Why would they call random fill just clay?

Cheek to Siple memo was shown. The statement "Random Fill (Clay)" was pointed out.

Q.) If it could be other materials, why would he (Cheek) define it as clay?
Q.) Did he know the difference?
A.) My interpretation of this memo was that it was addressing testing and that he was distinguishing test procedures for granular vs. cohesive soils.

Q.) Do you have anything you wish to add to this discussion?
A.) No.

Bernie Thompson & Roger Smith
NRC Interviews of 1-22-79 & 1-23-79
Same Day - validity was established?!

Q.) Was it difficult to determine what proctor value to use by comparison to the jar samples?
A.) No

Q.) Who gave you the locations and elevations for the tests?
A.) Generally the labor foreman or sometimes the laborers.

Q.) Who selected the site for the test?
A.) The laborers would prepare the site of the test where the foreman selected most of the time. In some instances we would select the exact site in the general area for which the test was requested.

Q.) How often were either Q.C., or Engineering present at the time of the test?
A.) Very seldom.

Q.) Did Q.C. do surveillance on your test activities in the field on a regular basis?
A.) No, not that we were aware of.

Q.) How often did they observe you doing the tests?
A.) Very seldom.

Q.) Do you know what their requirements are for surveillance of soils?
A.) No. I have not had access to that information.

Q.) Were they short of people to do this work?
A.) I cannot answer that question.

Q.) Did they have qualified people for this work?
A.) I cannot answer that question.

Q.) Who was in charge of soils for Q.C.?
A.) Primarily, Daryl Osborn.

Q.) Did he have other responsibilities besides soil work?
A.) Yes. To the best of my knowledge, he had other areas of responsibility.

Q.) Were there grade stakes available for elevations?
A.) Very seldom.

Q.) How were elevations determined?
A.) Mostly from nearby buildings where elevations were written on the walls.

Q.) Were locations established by the use accurate measuring devices?
A.) No. They were usually by walking off from a wall or just eyeballing the distance.

Q.) Were lift thicknesses measured?
A.) Not in my presence.

Q.) Were the areas free of debris prior to the placement of fill material?
A.) I cannot answer that question.

Q.) Did Q.C. make sure that areas were free of debris before placement?
A.) I cannot answer that question.

Q.) How were retests done? Did they (Bechtel) supply you with a sample?
A.) Retests were taken by a technician as close to the original test as possible at the request of Bechtel when they felt the area was ready for a retest. No, Bechtel did not supply us with a sample.

Q.) Was special attention given to test areas?
A.) Yes, although not a common occurance, I did feel that special attention was given to test areas on certain occasions.

Q.) Can you recall such occasions?
A.) Yes.

Q.) Would you discribe such instances?
A.) Roger spoke of a test on the 30" SWI discharge line. Bernie mentioned a test in the same area.

Q.) Did the foreman asking for the tests know the requirements for the frequency of tests?
A.) I cannot answer that question.

Q.) Were lift thicknesses reasonable or were they excessive?
A.) Generally yes, however there were occasions that they were not.

Q.) How was the moisture controlled prior to placement?
A.) Prior to August of 1977, there was no control of moisture prior to placement. After that date until the spring of 1978, one moisture was taken in the morning from the stockpile.

Q.) How was the moisture reported?
A.) The moisture was given to Q.C. and Engineering.

Q.) Was the moisture associated with a proctor value?
A.) No, it was not at this time.

Q.) Were there more than one proctor used during a days production?
A.) Yes.

Q.) Were additional moistures taken for these proctors?
A.) No, not at first. Later the conditions changed.

Q.) What happened after the spring of 1978?
A.) A number of changes transpired in the moisture control via letters from Bechtel personnel. The last letter for direction to U.S.T. was from Rao in the spring of 1978. Most of this correspondence was generated from questions we presented to Bechtel concerning the moisture control.

Q.) Do you have a copy of this letter?
A.) Yes.

Q.) Can we see this letter tomorrow?
A.) Yes.

Q.) Did you feel there were similar problems with soils concerning the Administration Building.
A.) Yes.

Q.) At that time did you feel there were problems with other buildings on the site?
A.) I would say no, based on the fact that most of the other major structures were done or well under construction and there was no other similar circumstances of settling of structures known at that time.

Q.) Was there a difference between Bechtel and Canonie operations?
A.) Yes.

Q.) What were these differences?
A.) Canonie Q.C. Engineer, Gene DeGeer, gave locations by coordinates paced off from grade stakes and elevations by use of a hand level and regineers rule from grade stakes. Canonie also had much heavier equipment to work with.

Q.) Was placed material ever removed and placed at another location?
A.) Yes.

Q.) Who did you report test failures to?
A.) Primarly to Bechtel labor foreman until the use of the test failure stamp was started in the fall of 1977, then they were reported to Engineering and Q.C.

Q.) Who did you interface with in C.C. and Engineering?
A.) In C.C., it was Daryl Osborn and Steve Gilnett. In Engineering, Jerry Morris and Gary Coaster.

Q.) Who were the Bechtel foremen?
A.) Barney J., Mike Davis, Roger Ott, Scott Haney.