Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FHWA/TX-86/ 2 +285-1		

4. Title and Subtitle	5. Report Date
Hot-Mix Pavement Stability Performance versus Laboratory test Results	November 1985
	6. Performing Organization Code
7. Author(s) Fred Benson, D.F. Martinez and Deborah Jessup	8. Performing Organization Report No. Research Report 285-1
9. Performing Organization Name and Address Texas Transportation Institute The Texas A&M University System College Station, Texas 77843	10. Work Unit No. (TRAIS)
	11. Contract or Grant No. Study No. 2-9-80-285
12. Sponsoring Agency Name and Address Texas State Department of Highways and Public Transportation: Transportation Planning Division Austin, Texas 78763	13. Type of Report and Period Covered Interim - September 1979 November 1985
	14. Sponsoring Agency Code

15. Supplementary Notes
Research performed in cooperation with DOT, FHWA,
Research Study Title: Asphalt Concrete Mixture Design and Specification.

16. Abstract

The problem to be addresed by this study was to determine what characteristics of the Item 340 hot-mix material itself and its production, placement and service environments were significant in determining how well the hot-mix surface layer would function in the field. SDHPT districts were asked for submission of well and/or poorly performing candidate pavements from a rutting or shoving distress standpoint.

In all, 18 separate roadway locations or sites were included in this study. The following types of data were obtained from these sites:

(1) doing visual evaluations and taking rut depths on the surface,

(2) taking roadway cores for subsequent laboratory testing.

Also a records search was made to determine pertinent facts affecting each roadway site from hot-mix design through production, laydown, compaction and service history of the roadway surface.

In general, the more rutted pavements contained softer asphalts, lower air voids and more temperature susceptible asphalts. Indirect tensile strengths and Marshall stabilities tend to be lower for the more rutted pavements. The more rutted pavements tend to have grading curves with the higher humps above the No. 30 sieve of the ASTM continuous grading curve. Hveem stability appears to be no indication of rutting as found in this study.

17. Key Words	18. Distribution Statement
Hot-mix asphalt concrete (HMAC), stability, rutting	No restrictions. This document is available to the public through the National Technical Information Service 5285 Port Royal Road Springfield, Virginia 22161

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	237	

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HOT-MIX PAVEMENT STABILITY PERFORMANCE
VERSUS LABORATORY TEST RESULTS

by

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Research Report 285-1
Research Study Number 2-9-80-285
Asphalt Concrete Mixture Design and Specification

Sponsored by

Texas State Department of Highways and Public Transportation
in cooperation with
U. S. Department of Transportation, Federal Highway Administration

November 1985

TEXAS TRANSPORTATION INSTITUTE
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College Station, Texas

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INTRODUCTION

Flexible pavements are subject to several types of distress. These include cracking, rutting, raveling, slippage and structural failures. The cracking distress covers longitudinal, transverse and alligator cracking. The general area of rutting includes longitudinal or continuous wheelpath rutting, spot rutting or isolated areas of ruts and shoving which are associated with stopping and starting movements of vehicles, usually at intersections.

In hot-mix surface layers, the distress of rutting can become a significant problem. Longitudinal rutting in wheel paths can occur to absolute depths in excess of 1 inch (25 mm) and severely shoved and rutted areas can occur at intersections with magnitudes of distress exceeding those of longitudinal ruts.

Rutting in wheelpaths creates problems for the motorist both from standing water during and after rainfall and from the distorted roadway surface which may make vehicle control difficult. The standing water creates drag, visibility hindering spray and the potential for hazardous hydroplaning. The rut distorted surface makes handling of motor vehicles difficult to dangerous in the achieving of steering maneuvers including passing, moving on and off the roadway and stopping.

Because of the serious problems created by the rutting distress, the Texas State Department of Highways and Public Transportation (SDHPT) has targeted this area for study. Remedial measures governing the design, production and placement of hot-mix placed under SDHPT Specification Item 340 are being implemented as a result of this and other associated research.

DEFINITION OF PROBLEM

The problem to be addressed by this part of Study 2-9-80-285 was to determine what characteristics of the Item 340 hot-mix material itself and its production, placement and service environments were significant in determining how well the hot-mix surface layer would function in the field. Among the questions asked were the following:

1. How did the original materials, including aggregates, asphalt cement and any additives affect performance on the roadway?
2. How did the design of the hot-mix which fixed proportions of individual components, serve to influence roadway performance?
3. How did the type of hot-mix plant and conduct of operations of that plant influence the character of the mix on the roadway?
4. How did transportation, construction, weather and compaction operations influence the final hot-mix performance?
5. How did the existing roadway structural section and surface affect the characteristics of the Item 340 hot-mix layer?
6. Finally, how did the amount and type of traffic, including truck percentages and axle loadings, and service weather environment affect roadway performance?

Answers to the above questions needed to be found to determine why some hot-mix surface layers performed well from a rutting standpoint and to establish why certain other roadway pavements did not perform well.

STUDY APPROACH

Included in the objective of this study was the need to compare the performances of good pavements with Item 340 surface layers versus the performances of marginal Item 340 surface layered pavements. The SDHPT districts and urban office were sent letters of inquiry asking for submission of well and/or poorly performing candidate pavements from a rutting or shoving distress standpoint. Replies were received from 18 districts offering pavement sections for study. Because of study limitations of time and funding, only nine districts had roadway sections ultimately tested under the project.

Data concerning each roadway tested was obtained in the same general manner. First, a time was set and field coring was completed on each selected site chosen by the districts as representative of a particular roadway. During this phase, field cores were obtained, rut depths measured and roadway evaluations were made for Pavement Rating Scores. General information relating to roadway distress and history was taken. At a later date, the district was again contacted and a thorough files review was made at district offices to obtain data concerning design, production, weather, laydown and service conditions for the Item 340 surface layers. In the meantime, the roadway hot-mix cores were visually inspected, measured, tested under the Texas Transportation Institute (TTI) laboratory test sequences (1); and the data were then tabulated for analysis.

The data obtained from each of the pavement sections was compared with that of the others in determining why some sections performed well and others did not. These comparisons were based on three areas: (1) data obtained in the field on the pavement site, (2) data obtained from analysis of field cores and (3) data taken from the reviews of files concerning design, production, laydown and field service of the pavements.

Among the roadway sites studied, two major highways were evaluated as a part of Study 2-8-80-287, "Desirable Asphalt Properties". These were US 82, a few miles west of Dickens, Dickens County in District 25, and US 287, just north of Dumas, in Moore County, District 4. Each of these two highways had seven distinct test subsections that differed by containing a different asphalt cement. For this study's purposes, these have been observed and evaluated for one year.

The bulk of the test sections evaluated under Study 285 were existing sections with Item 340 surface layers. Samples from these sections were tested in the laboratory under a somewhat different testing sequences than used for the two roadway sections on US 82 and US 287.

ROADWAY SITES OBSERVED

In all, 18 separate roadway locations or sites were included in the 285 study, not counting the 14 individual subsections in the two joint Study 285-287 efforts on US 82 and US 287. In all, 10 different SDHPT districts were involved. The laboratory test results from all of this roadway testing and evaluation effort are contained in Tables 1a through 21.

Table 22 provides a brief summary and general information about each roadway section tested. Also listed is the laboratory test sequence number under which the roadway section field cores or field laboratory compacted specimens were tested. The table area "Comments" notes whether the test sections were part of the joint 285/287 study efforts and gives other unique information concerning the roadway site. Finally, a "Data Code Number" is given for each section and subsection in parentheses in the first column in order to identify each section in further data result tables.

DATA ACQUISITION AND TESTING PLANS

As noted briefly earlier, data was obtained in three areas. These included the field, the laboratory, and the office. The field area for data taking involved (1) doing visual evaluations and taking rut depths on the surface, and (2) taking roadway cores for subsequent laboratory testing. The laboratory area involved testing the specimens and cores obtained in the field. In the office, a records search was made to determine pertinent facts affecting each roadway site from hot-mix design through production, laydown, compaction and service history of the roadway surface.

Laboratory Testing Sequences

Laboratory Testing Sequences I and II used in the 285 study are shown in Figures 1 and 2 respectively. Testing Sequence I was used to test the field laboratory compacted samples of plant produced hot-mix from the on-site monitoring of the joint 285/287 efforts on US 82 and US 287 in 1982. Testing Sequence II was used on cores obtained from roadway sites visited as listed in Table 23, including the 14 subsections subsequently cores on US 82 and US 287.

Laboratory Testing Sequence I. Figure 1 is a schematic of the testing plan as originally planned for testing fresh hot-mix produced for the construction of joint Study 285/287 research efforts that took place at US 82 in Dickens County and US 287 in Moore County. At each of these roadway locations, seven subsections containing different asphalt cements but the same aggregate combinations and gradings, were paved and the hot-mix sampled and compacted into specimens. For example, the aggregate used to pave US 82 consisted entirely of a gradation from a siliceous gravel crushed from one hill site which was also used as the hot-mix drum-dryer plant site. The seven different asphalt cements used on US 82 were MacMillan AC-20, Dorchester AC-20, Exxon AC-20, Shamrock AC-20, Shamrock AC-10, Cosden AC-20 and Cosden AC-10.

As illustrated in Figure 1, there are four horizontal test series or legs for testing 18 gyratory shear molded samples from the US 82 and US 287 field laboratories. The tests included Hveem and Marshall Stability, resilient modulus, M_R, and indirect tension. The testing is first done dry for certain samples, as for Marshall Stability and indirect tension in the top and bottom legs of the series, and then done after water soaking under 0^o to 140^oF Lottman and the standard Lottman water tests in the two middle legs. By comparing test results from before and after water soaking, an estimate may be obtained concerning a hot-mixed material's susceptibility to moisture damage.

The bottom leg of Testing Sequence I is used to determine Rice specific gravity, percent air voids and percent density of the compacted specimens, when used in conjunction with the bulk specific gravities obtained on all of the specimens at the start of the total sequence. The top leg accomplishes testing of the asphalt cement properties and aggregate gradation used in the mixture. The Marshall samples are failed, then crumbled and the asphalt cement extracted. Then the asphalt properties such as viscosity, penetration, ring and ball and specific gravity are measured on the extracted asphalt. The aggregate remaining from the extraction is sieved for grading analysis.

Some tests in Test Sequence I are labeled "special". These consisted of (1) compacting special sized cylindrical samples of the roadway hot-mix for running creep tests, (2) running the Texas Freeze-Thaw Pedestal Test (2) on specially prepared samples of the job aggregates and asphalt cements as another indicator of potential water susceptibility, and (3) performing the one-cycle (0 to 140°F) Lottman water test in the second test leg in order to measure water susceptibility and compare with the standard water test results in leg three. These tests were considered special because they were not ordinarily run in the TTI standard laboratory testing programs as of 1982.

The cross-hatched block in the top horizontal test series or test leg one indicates that results of sieving the extracted aggregate would be also used in another 285 substudy. This is the wet versus dry sieving of hot-mix aggregates substudy to determine the merits of using wet sieving during the design and construction of hot-mix paving layers.

Laboratory Testing Sequence II. This sequence was used for testing cores from roadway sites where the hot-mix surface layers had been in service for some time. Accordingly, no special tests on the original plant produced hot-mixes or aggregates and asphalts were run.

It will be observed that some deviations were made from these sequences from time to time with different roadway sites. These differences will be evident upon examination of Tables 1a through 21. The changes were believed at the time to be appropriate based on the judgement of the TTI researchers.

Joint Study 285/287 Roadway Sites

The hot-mix surface layers on US 82 and US 287 were placed in 1982, US 82 in June and US 287 in September. The production, placement, compaction and performance of these two hot-mix surfaces have been monitored by TTI researchers under both Studies 285 and 287 through 1983. These sections are still being monitored under Study 287 going through the 1983-1984 fiscal year.

Laboratory Testing of Study 285/287 Sites. This testing has been covered under both Test Sequences I and II as shown in Figures 1 and 2 for Study 285 for both the US 82 and US 287 roadway sites. Test Sequence I shown in Figure 1 was first used to test the field laboratory compacted samples of fresh hot-mix produced at the contractor's plant for each of these highways. Results of the laboratory testing of these samples are shown in Tables 1a through 1g for the fresh mix produced for US 82 at Dickens and in Tables 2a through 2g for the US 287 hot-mix near Dumas.

Approximately a year after the surfaces were placed on US 82 and US 287, field cores were taken. These were tested in 1983 under Test Sequence II as shown in Figure 2. These results are shown, respectively, in Tables 3A through 3G and 4A through 4G.

Field Data for Study 285/287 Sites. Some general information concerning US 82 and US 287 was obtained at the time these Item 340 pavement surface layers were placed in 1982. Of course, at that time, no rutting or other major noticeable distress had occurred, and Pavement Rating Scores, PRS (3), though not taken, would have been 100. It should be mentioned that both US 82 and US 287 were cored under Study 287 within several months after placement, and air voids computed for both pavements were found to be higher than expected. This tendency for high air voids is also evident in the Study 285 1983 cores.

As noted previously, both US 82 and US 287 were cored in 1983 under the joint 285/287 effort. Some localized distress was noted, especially in two subsections for US 287. Neither rut depths nor PRS scores were taken under Study 285 for US 287. The reason for this is that under visual inspection, little or no rutting had developed in the roadway, and the distress in US 287 was limited to two subsites which were undergoing raveling and some raveling of the hot-mix in the wheel paths. Since the US 287 distress was not due to plastic deformation, the pavment was not rated nor were depths measured at that time.

Records Data for 285/287 Sites. Some of these data were acquired at the time of placement and in the months subsequent to the placement of the Item 340 layers. This consisted of hot-mix design work sheets, daily reports, observations made and recorded on the job sites and information made available by Districts 25 and 4 after construction.

It should be noted that the Dalhart Residency office provided TTI with 30 combined cold-feed aggregate samples during the US 287 hot-mix production for the Study 285 wet versus dry screening substudy. This aggregate sampling represented 10 days of the drum-dryer plant production and included the two days during which the seven subsections were placed and eight subsequent days of production. Results from screening these samples will be reported in Report 285-2 which this follows this report.

285 Roadway Sites

These sites represent those that had already been in service for different periods of time. These were nominated by the SDHPT districts as either "well performing" or "poorly performing" from a rutting or shoving stability standpoint in the Item 340 surface layers.

Field Data for Study 285 Sites. Pavement Rating Scores, PRS, and rut depths were measured at each location. Pavement Rating Scores were based on the procedure developed by Epps et al. (3). Rut depths were taken in wheel paths by means of placing a saw-toothed gage graduated in two-millimeter (mm) increments under an aluminum bar laid across the rut, and obtaining an average of from 10 to 20 such measurements at each roadway site. Results of these measurements are given in Table 23 for those pavements rated.

At each roadway section location, from 12 to 21 pavement cores were obtained for subsequent laboratory testing. Usually half were taken from a wheelpath and half from between the wheelpath. The number of cores taken was often dictated by field conditions; for example, at one location the drill bit was used up after only 13 cores and no spare bit was available. At another location, an 18-core section had already been cored, and it was decided to take an additional minimum of 12 comparison cores at a more rutted area less than a mile down the road.

Laboratory Testing of Study 285 Sites. This testing was accomplished in general accordance with the plan laid out in Test Sequence II. Results are contained in Tables 5 through 21.

Records Data for 285 Sites. Most of these data have been collected in separate efforts from the field data acquisition and coring work. Thus, this portion of data gathering has been the last to be accomplished on this 285 study.

SUMMARIES OF DATA

Field Data

Tables. Field and some general data concerning the laboratory test results-field stability performance are contained in Tables 22, 23 and 23A. Table 22 includes the following general information about the roadway sites: highway number, control-section number, district, county and location or limits of the roadway sites. Also included are the laboratory testing sequence or plan used, comments, the table number the data are found in and a Data Code Number assigned to each section to help with identification.

For instance, field laboratory compacted specimens of hot-mix placed on US 82 and studied under the joint Study 285/287 Laboratory Sequence I are shown in Tables 1a through 1g under Data Code Numbers 1 through 7. Field cores obtained from the US 77 Bypass around Kingsville in Kleberg County and tested under study 285 Laboratory Sequence II are noted under Table Number 10 and Data Code number 34, as shown on the second page of Table 22.

Unless indicated otherwise under the comments column of Table 22, data were obtained by TTI personnel and a TTI coring rig assembled for field coring of pavements in general. SDHPT personnel provided traffic control and safety flagging for the coring crew and equipment. The exceptions were field cores taken and furnished by Districts 18 and 11 from the IH 35 and US 59 roadways.

Table 23 provides Pavement Rating Score, PRS, values and rut depth data for each of the roadway sites studied. In the instances of the IH 35 and US 59 (Data Code Numbers 32 and 40) sites, estimates of 12 mm (millimeters) were given for the rutting distress, which was not measured by TTI on the sites of coring. (Some measurements were actually made by one author on IH 35 in April 1982 during an effort to find a non-rutted spot and averages of those measurements at eight locations ranged from 0 to 13 mm). Finally, two different paving layers were tested in cores taken at each of three different locations as indicated by "Same" for Data Code Numbers 42, 46 and 48.

Table 23A lists the seven different asphalt cements used in the seven subsections at both the US 82 and US 287 roadway sections. Given in this table are the order of the asphalt cements used in building the subsections, the Data Code Number and the Table Number. As noted in this table, Data Code Numbers 1 and 15 signify the same roadway subsection on US 82, with Code Number 1 representing field laboratory prepared specimens tested and shown in Table 1A and Code Number 15 denoting field cores tested and shown in Table 3A.

Laboratory Data

Tables. Laboratory data contained in Tables 1a through 2g (Data Code Numbers 1-14) provide results of Test Sequence I laboratory testing work on both US 82 and US 287 field laboratory molded samples. These samples were molded in a gyratory shear compactor at the hot-mix plants in June and September, 1982, respectively. Although the asphalt cement source varied from one subsection to another, as shown in Table 23A, the aggregate mix proportions and grading designs and design asphalt content remained the same for each subsection of each of these two roadways, thus making the difference in asphalt cement source the only apparent difference from subsection to subsection for each roadway.

Laboratory data contained in Tables 3A through 4G (Data Code Numbers 15-28) are for test results on cores obtained from the US 82 and US 287 roadways around the first of June, 1983. Since these were cores, Laboratory Sequence II was used as a general testing plan.

Tables 5 through 21A (Data Code Numbers 29-48) represent data results for 17 different pavement sections that the districts submitted as "poorly" or "well" performing pavements. In all instances, these pavements had SDHPT Item 340 surface layers, and in most instances, the next underlying pavement layer consisted of Item 292 (black base) material. As will be evident in some extracted aggregate grading curves, several Item 292 layers were also evaluated, as it was thought possible these might be influencing the surface rutting distress manifestation.

The roadway cores reported on in Tables 5 through 21 were tested under Laboratory Test Sequence II shown in Figure 2. For the bulk of the testing, this test plan was adhered to, but the 18-cycle Lottman water damage testing was dropped after about half of the total testing effort because of its time and cost. Also, the 7-day soak water damage test was used somewhat inconsistently. However, the 24-hour Lottman water damage test was used on most of the roadway section cores and provided the most consistently used water susceptibility test.

For ease of comparison, data from Tables 12 through 21 are presented in Tables 24 through 28. This allows quicker comparison of how the materials from each of the sections compare with each other. For instance, Table 24 draws together most of the properties of the extracted asphalt (Data Code Numbers 1 through 48). Table 25 gathers resilient modulus M_R data; Table 26, indirect tension; Table 27, Hveem stability and Table 28, Marshall stability and flow.

Table 30 contains results of Texas Freeze-Thaw Pedestal water damage testing on aggregates and asphalts representing the joint 285/287 study effort on US 287, Data Code Numbers 8 through 14. Information on how this test is run may be found in reference 3. The Texas Pedestal test is shown to be run in Laboratory Sequence I. Although also shown to be performed in this sequence, at the time of writing of this report, the creep tests have not been run, so no data is available in Study 285 on creep.

Grading Curves. Figure 3 through 33 are gradation curves of aggregates obtained from extractions of asphalts from laboratory or core specimens as called for in leg I of the testing sequences. The heavy, solid line in each figure represents the actual gradation figured on a weight basis. The lighter, dashed line represents the continuously graded curve specified by the American Society for Testing and Materials (ASTM) (4) as conforming to a dense grading for three-eighths-inch (9.5 mm) nominal sized material. Certain characteristics from the grading curves are summarized in Table 29. These include the following: (1) weight percent retained on the No. 10 (2.00 mm) sieve, (2) percent passing the No. 200 (75 μm) sieve, (3) the percent hump above the No. 30 (600 μm) sieve, and (4) the percent of material retained between the No. 10 and No. 40 (2.00 mm to 425 μm) sieves.

Records Data. Five tables, from Table 31, Part I, through Table 33 are intended to contain summarized data obtained from SDHPT records and files for the roadway sections included in this hot-mix pavement stability performance versus laboratory test results study. Table 31 contains data about the date of placement of the Item 340 layer tested, the layer age in years and the accumulated traffic per lane. This table also gives percent trucks and accumulated 18-kip single axle load information.

Table 32, part IIA, contains data on apshalt source and grade, SDHPT design asphalt content and extracted asphalt content and TTI extracted asphalt content. Also included are SDHPT laboratory density values and any SDHPT field densities from the placed and compacted materials.

Table 32, Part IIB, contains Hveem stability data and a place for any Marshall stability tests that may have been run. One column is provided for an overall average project Hveem value, another is provided for a Hveem value representative of the place on the roadway cored and the third column is provided for the Hveem value at the design asphalt content. The final column as noted above is provided for any Marshall stabilities that may have been run during design or construction to evaluate the paving mixture.

Table 32, Part IIC, contains data about the type of hot-mix plant used, the breakdown rolling employed and temperatures used in the plant and on the road. This table also lists the thickness of hot-mix placed and the weather at laydown for the pavement site cored.

Table 33 covers the SDHPT extraction test results on aggregate gradations and compares them with the design or expected values. This includes the amount retained in the No. 10 (2.00 mm) sieve and the amount passing the No. 200 (75 μm) sieve.

DISCUSSION OF DATA RESULTS

Ranking Tables

In Tables 34 through 40, different properties and test results are shown for pavement sections represented by Data Code Numbers 29 through 48 which are ranked in descending order of rut depths. Since rut depths give an approximate indication of pavement stability under loading, this ranking was believed appropriate. Pavement subsections from US 82 and US 287 (Data Code Numbers 1-28) are not listed in these tables because these had not exhibited or had measurable rut depths noted as of June 1983, as indicated in Table 23. Some subsections of US 287, particularly Data Code Numbers 15 and 17, have had significant distress, but this has not been of the rutting or shoving type. Rather, this distress has been one of the raveling and shelling out, leading to some bad pot holes in certain areas.

Table 34. This table compares properties of extracted asphalts for pavement sections Data Code Numbers 29 through 48 listed in order of decreasing rut depths. If averages of asphalt properties of the top ten Data Code Numbers are compared with those of the bottom nine Data Code Numbers, the top ten pavement sections are seen to have somewhat softer

extracted asphalts for every property listed. For instance, average viscosity at $140^{o}F$ for the top ten (excluding Data Code Number 32) is found to be approximately 4210 poise, whereas that for the bottom nine (excluding Data Code Number 42) is found to be about 6960 poise. Similarly, penetration at $77^{o}C$ for the top ten numbers averages about 44 whereas that for the bottom nine averages 36. Ring and ball temperature results show an average of about $130^{o}F$ for the top 10 numbers or sections and an average of $137^{o}F$ for the bottom nine numbers.

Even with excepting the two high viscosity values at $140^{o}F$ for Data Code Numbers 32 and 42, the data for the bottom nine pavement sections in all cases are more variable than that for the top ten sections. This may be caused by a number of reasons. One probably is that ages of the pavement sections is not considered here. Another would be that the type of plant used to manufacture the hot-mix is not taken into account. Finally, the actual grade of asphalt cement originally used has not been entered into the consideration, either.

It is further noted that the average asphalt viscosity value at $140^{o}F$ for the top ten sections for rutting approximates an AC-20 that has hardened to about twice its original viscosity after going through, say, a weigh-batch plant. This average for an AC-20 indicates possibly that these asphalts have hardened little from hot-mix production through service life. Also, this could indicate contamination of the asphalts with softer materials. Another indication may be the use of asphalts softer than the service requirements. Finally, this low average may indicate the use of lower viscosity asphalt cements in drum-dryer plants with little or no hardening taking place during production, to the possible detriment of the service performance of the pavements.

Table 35. This table illustrates average air voids and M_R data at different temperatures for the pavements represented by Data Code Numbers 29 through 48. Pavements are ranked in order of descending rut depths.

In the air voids column, it is noted that from Data Code Numbers 44 through 29, representing the more rutted pavements, air voids range from 1.0 to 3.4 and from 7.1 to 11.2 percent. Therefore, the more rutted pavements are represented by air voids below about three and one-half percent and above seven percent for this limited number of pavements. The average air void content for the top ten rutted pavements is 3.6, and excluding Data Code Numbers 40 and 48, 2.2 percent. The average air void for the bottom ten, Code Numbers 41 through 37, is 4.9 percent. So the better performing pavements on the average are in an air voids state near five percent, and the poorer performing below three percent, if the two high values noted above are not included.

Comparing averages for the 10 higher rutted pavements (code Numbers 44 through 29) versus those for the 10 lower (Code Numbers 41 through 37) for resilient modulus, M_R, values taken at four different temperatures shows some important trends. Firstly, average M_R values for the 10 higher rutted sections at -13°F and 33°F average 2.917 and 1.832 x 10^6 psi versus 2.223 and 1.557 x 10^6 psi*, respectively for the 10 lower rutted sections. At 77°F and 104°F, the deeper rutted sections have average M_R averages of 0.390 and 0.140 x 10^6 psi versus 0.526 and 0.134 x 10^6 psi for the lower rutted sections, respectively. Excluding Data Code Numbers 32 M_R at 104°F, the average of the nine more rutted sections would be 0.067 x 10^6 psi at 104°F, or about one-half of the less rutted pavements' average.

Based on the above, the 10 more rutted sections appear to have higher M_R dynamic strengths at the lower temperatures and lower strengths at the higher temperatures and lower strengths at the higher temperatures than the nine less rutted pavements. Thus, the core specimens from the more rutted sections show a larger average loss in M_R dynamic strength with increasing temperatures. At the temperatures nearer actual service temperatures, 77 and 104°F (25 and 40°C), the less rutted pavement sections show M_R dynamic strengths approximately twice those of the more rutted pavements, excluding Data Code Number 32 M_R values at both temperatures. These values are 0.526 and 0.140 x 10^6 psi, respectively for the less rutted pavements versus 0.292 and 0.067 x 10^6 psi for the more rutted pavements.

Table 36. This table was formed by taking the differences between the M_R values at different temperatures in Table 35. Taking averages of these groups of differences for the more rutted pavements represented by Data Code Numbers 44 through 29 and comparing these with averages for the less rutted pavements, Data Code Numbers 41 through 37, again shows differences between the two groups of pavements. This is the case for every difference group.

*Note: 10^6 psi is equal to 6.895 x 10^6 pascals (Pa).

For instance, for the difference between M_R at -13°F to 33°F, the average difference for Data Code Numbers 44 through 29, is 1.084×10^6 psi and the average for Data Code Numbers 41 through 37 is 0.666×10^6 psi. In every instance except for one the average difference between specified adjacent temperatures is higher for the more rutted pavements.

An interpretation is that the more rutted pavement sections have aggregate-binder systems that are much more temperature susceptible than those of the less rutted pavement sections. Thus, the M_R - temperature curve is steeper for the more rutted materials. For the exception between 77°F and 104°F, the average M_R strength at 104°F was previously rated higher by a factor of two for the less rutted pavements. Thus, since the difference is also higher for the less rutted pavements, the M_R value at 77°F is also higher on the average, therefore, indicating greater pavement strengths at service temperatures.

Table 37. Taken from this table, the average value for dry tensile strength for the more rutted pavements, Data Code Numbers 44 through 29, is found to be 145 psi, this is compared with an average value of 173 psi for the less rutted sections, Data Code Numbers 41 through 37. Both average values are adequate compared with 125 psi which is often used as a level of hot-mix tensile strength indicating potentially good performance. It is questioned whether these tensile values in most of the pavements were originally as high as now found, especially for the more rutted pavement sections, or whether these results are largely the products increased density and asphalt hardening.

A second comparison that is made from this table is that the tensile strength after 24-hour Lottman testing (1). The average for the more rutted pavement sections was 99 psi, and that for the less rutted sections was 94 psi. Going from dry to wet tensile strengths, the more rutted pavements actually show a higher retained strength ratio of 99/145 or 68 percent versus 94/173 or 54 percent. A possible explanation for this is that the more rutted pavements cores have lower voids on the average and thus are probably more water tight and less water susceptibile than the less rutted pavements.

There is not enough data from the tensile strength testing after the 18-cycle Lottman to make good comparisons. This is an example where some testing was discontinued because of time and cost.

Table 38. This table compares Hveem stability results for the more rutted pavements versus stability values for the less rutted pavements. the average Hveem for the more rutted represented by Data Code Numbers 44 through 29 is 35.6 percent compared with 31.7 percent for those less rutted of Data Code Numbers 41 through 37. This represents little actual difference in Hveem values, and the fact that the higher Hveem average is associated with the more rutted pavements is probably not significant.

Average Hveem stabilities after the 24-hour Lottman test turn out approximately equal for the two groups of pavements. The average Hveem for the more rutted pavements is 27.0, whereas that for the less rutted is 27.7. Again, no great difference is shown.

Tables 39 & 39A. These tables present average Marshall stability and flow values which may be compared between the more rutted pavements group and the less rutted pavements group. The average dry Marshall for the more rutted pavement sections is found to be 1659 lbs*. This is compared with 2432 lbs making for a much higher average for the less rutted group.

The average Marshall stability after 24-hour Lottman testing for the more rutted group is 1527 lbs. This is compared with a slightly higher average of 1698 lbs for the less rutted pavements.

Overall, the dry Marshall values shown in Table 39 prior to water damage testing are, with one exception, high compared to the Marshall minimum design criteria for the "heavy" traffic category requirement of 750 lbs (5). Even after 24-hour Lottman water testing, Marshall stability values are still very high even for the more rutted sections, and most exceed the minimum design criteria listed above.

The Marshall flow values for the more rutted pavements, Data Code Numbers 44 through 29, have an average of 10.1 which is almost identical to that for the less rutted pavements, Numbers 41 through 37, of 10.3. Even after 24-hour Lottman water testing, the averages are still almost the same at 14.2 and 14.4, respectively.

*Note: 1 lb = 0.454 kg.

Table 40. This table is a condensation of certain data from Figures 14 through 33, the aggregate grading curves representing pavements of consecutive Data Code Numbers 29 through 48. Averages of values for the more rutted pavements can again be compared with those for the less rutted pavements.

Taking the percent retained on the No. 10 (2.00 mm) sieve, the more rutted pavements, Data Code Numbers 44 through 29, show an average of 53.9 percent, and the less rutted, 60.1 percent. For the percent passing the No. 200 (75 m) sieve, the averages are 4.5 for the more rutted and 4.9 for the less rutted, thus showing little difference.

For the percent hump of the aggregate grading curve above No. 30 sieve of the ASTM curve, the average for the less rutted is 6.9, or about half that of the rutted pavements. Concerning the percent retained between the No. 10 and 40 sieves, the average for the more rutted is slightly higher at 14.1 percent versus 11.4 percent for the less rutted pavements.

It is noted that the six least rutted pavements, Data Code Numbers 39 through 37 at the bottom of the table, have only a two percent average hump above the No. 30 sieve of the continuous grading curve. Above Data Code Number 39 in Table 40, the percents of hump above the No. 30 sieve are much larger. However, age of pavement, total accumulated traffic and accumulated truck loading are not considered in making the above comparison.

Data Result Curves and Figures

The data for this segment of the study consist of those for the extracted aggregate gradation analyses from the first leg of the testing sequences and the data expressed for the results of resilient modulus, M_R, indirect tension, Hveem and Marshall testing in the test sequences. The extracted aggregate grading curves are shown in Figures 3 through 33. The results of the data from the M_R etc. testing is presented in Figures 34 through 53.

Extracted Aggregate Gradation Curves. Figures 3 through 13 are grading curves for most of the subsections on US 82 and US 287 as represented by Data Code Numbers 15 through 28. As noted in these curves, the results of the sieve analyses on the extracted aggregates are shown in the solid, dark lines. These results are compared with the ASTM three-eighths-inch (9.5 mm) nominal sized continuous grading curve which represents a dense grading design.

As indicated in Figures 3 through 13, two general characteristics stand out about each of these grading curves. One is that each approximates the shape of the dense grading curve. The other is that each of the grading curves from US 82 and US 287 plots to the right and below the ASTM continuous grading curve. According to Hveem (6), by their aggregate gradations plotting as these do, the US 82 and US 287 hot-mixes represent those mixtures that will not tend to become "...readily unstable with slight excess of asphalt or water".

Also, there are no humps at the No. 30 sieve from excessive amounts of fine aggregate. According to Goode and Lufsey(7), the higher the hump at the No. 30 sieve the higher the potential for the bituminous mixture to have stability problems. These authors stated that "Such mixtures have an excess of sand in relation to total sand. This excess of sand not only produces lower compacted densities but tends to float the larger particles and destroy stability that might otherwise result from coarse aggregate interlock. In addition, fine sand is inherently less stable than coarse sand" (7).

Figures 14 through 33 are grading curve results for pavement sections represented by Data Code Numbers 29 through 48 in consecutive order. There is one general trend for these figures, and that is for most of the extracted grading curves to plot to the right of the ASTM continuous curve in the coarse aggregate range and then to plot above the ASTM curve for all or parts of the fine aggregate range. This tendency is partly in response to SDHPT Item 340 specification requirements. As a result of this tendency many of the grading curves do show an excess of No. 30 sieve size material resulting in a "hump" in this part of the grading curve.

The closest extracted aggregate grading to the ASTM continuous grading is the curve for the US 90A aggregates shown in Figure 22. This pavement section happens to be the best from a rutting standpoint, with a zero average rut depth having been measured in the area where the pavement cores were taken. Other pavement sections whose curves approximately approach the ASTM continuous grading include Data Code Numbers 31, 32, and 38; however, the latter two of these pavement sections are among those most rutted. It is still probably that the gradations of these three roadway sections may have served to retard the onset of rutting, and that possibly other factors overwhelmed the beneficial grading curves, such as stripping below the Item 340 layer, excess asphalt originally placed in the mix, or the use of too soft an asphalt.

Another feature about the grading curves is their tendency to have less material pass the No. 200 sieve as compared with the ASTM continuous grading curve. One group of exceptions are Data Code Numbers 31, 37, and 39 which have ASTM proposed amounts of material passing the No. 200 sieve and are good performing pavements. A second group of exceptions are poorly performing consecutive Data Code Numbers 44 through 48 which also show the ASTM proposed amount of material passing the No. 200 sieve. Except for Data Code Number 44, these grading curves also show large humps above the No. 30 sieve.

Hveem Stability. Hveem stability results for US 82 and US 287 Data Code Numbers 1 through 28 are shown in Figures 34 and 35. In Figure 34, the overall averages of all Hveem values before water susceptibility testing are plotted versus percent air voids, and Figure 35 is a plot of Hveem stability versus air voids after the 24-hour Lottman test for water damage. Thus, the plots are for both laboratory prepared specimens and field cores.

As shown in Figure 34, the trend is for Hveem stability to decline with increasing air voids above nine percent. Another trend is for the values for the US 287 Data Code Numbers to remain above those of the US 82 Data Code Numbers. From laboratory specimens to field cores, the stability values are seen to drop from 10 to 15 percent.

Figure 35 shows that water has affected the stabilities, lowering nearly all of the values, especially those for the US 287 Data Code Numbers. The laboratory molded specimens for Data Code Numbers 8-14 have dramatically dropped; with the exception of these, the trend for decreasing stabilities with air voids is still seen as in Figure 34.

Figures 36 and 37 indicate results of Hveem stability testing for roadways with Data Code Numbers from 5 to 48. Figure 36 plots overall Hveem averages versus air voids whereas Figure 37 plots Hveem values tested in leg II of the test sequences.

As shown in Figure 35, the trend is for dry Hveem values to increase with increasing air voids. On the surface, this would seem the reverse of the situation in Figure 34. It should be noted, however, that the air voids in Figure 36 range from 1 to 7, and in Figure 34 from 4 to 14. It is believed that the increase in Hveem stability with air voids shown in Figure 36 represents the decreasing effect of the binder upon stability occurring up to air void contents still low enough where the sectional strengths of the cores have not been significantly reduced by increased air space. In Figure 34, it is believed that the air contents are present in magnitudes where the sectional strength has been reduced.

Figure 37 represents Hveem stability values that have declined in general from Figure 36 after 24-hour Lottman water testing for Data Code Number 5 to 48 roadway section cores. The trend is still for Hveem stability to increase with increasing air voids, again probably showing the decreasing influence of binder with increasing air voids that are high enough to markedly reduce core strength.

Marshall Stability. Marshall stability results versus air void contents for US 82 and US 287 are presented in Figure 38. For various reasons, very few tests were run on these subsection samples after the 24-hour Lottman water damage test as shown in Table 28. Therefore, no figure was prepared for this testing.

As shown in Figure 38, there is a general trend for Marshall stabilities to decline with increasing air voids. This decline is approximately 600 lbs (272 kg) going from six to fourteen percent air voids. As would be expected, the laboratory molded samples for Data Code Numbers 1 through 14 plot the highest at approximately six percent air voids and the field cores plot the lowest at the higher air void content.

Figures 39 and 40 are plots of dry and after 24-hour Lottman water test Marshall stability results for Data Code Numbers 29 through 48.

Figure 39 shows little if any correlation between Marshall stability and air voids in a dry state for these roadway cores. The trend is for Marshall stability to remain almost level from one to seven percent air voids, indicating that both binder amounts and reduction of specimen section due to voids are not influencing the Marshall test results. In Figure 40, the Marshall stability results appear to have been affected by the 24-hour Lottman test, with a general trend for decreasing stabilities with increasing air voids.

Resilient Modulus, M_R. Graphical results of resilient modulus testing for roadway sections represented by Data Code Numbers 1-28 are shown in Figures 41 through 43. Results for roadways with Code Numbers 29 through 48 are shown in Figures 44 through 47.

Figure 41 for results of overall M_R testing on the US 82 and US 287 laboratory compacted and roadway core specimens shows a fairly strong trend for M_R values to decline rapidly with increasing air voids. As shown in this figure, three test samples had very low values at approximately 14 percent voids. Figure 42 reveals that many of the selected samples of the above specimens when subjected to 24-hour Lottman water damage testing suffered dramatic losses of M_R dynamic modulus beginning at approximately seven percent air voids. Other samples selected from the dry M_R testing again show a drastic loss in strength, especially above eight percent air voids, when subjected to the 18-cycle Lottman testing shown in Figure 43. As indicated in the above figures, the breaking point for severe loss of strength appears to be around six to seven percent air voids.

Figure 44 shows overall dry M_R test results on Data Code Numbers 29 through 48 roadway sections. In this figure, all pavement sections with M_R values (at 77^oF) less than 0.4×10^6 psi (2.8×10^9 pascals) were among those with the highest rut depths. It is noted that cores from these either had measured air voids less than three or greater than seven percent. Data Code Number 40 with 11.2 percent voids and a M_R value of 0.094×10^6 psi (0.6×10^9 pascals) is not shown because of being off the figure scale. Also noted on this figure is the tendency for the peak M_R strengths to occur at between three and four percent air voids in these pavement cores.

Figure 45 illustrates that the 24-hour Lottman water testing dropped the M_R strengths of all specimens having dry M_R values greater than 0.4×10^6 psi. Interestingly, the M_R values of those specimens with air voids less than three percent and dry M_R's less than 0.4×10^6 psi actually showed an increase. It is believed that water surface tension may be acting here. Also noted in Figure 45 is a light trend for M_R values to decrease with increasing air voids. Somewhat of a peak in the values is noted at from two to four percent air voids.

Figure 46 reveals that 18-cycle Lottman testing generally drops the M_R values from the dry state. Trends are hard to see in this figure. Again, those specimens with low airvoids either gained slightly or were little affected in M_R strength, echoing the trend from Figure 45.

Figure 47 shows the results of M_R testing on Data Code Numbers 29 through 48 samples at 104°F (40°C), which temperature is close to road service termperature from a stability standpoint. As noted in this figure, there appears to be an M_R strength peak from four to six percent pavement air voids at this higher temperature. The pavements with the highest rut depths either fell below three percent in air voids or below a M_R value of 0.05×10^6 psi (0.3×10^9 pascals) at air voids above seven percent.

Indirect Tensile Strength. Figures 48 through 50 give results of indirect tensile testing of US 82 and US 287 laboratory specimens and cores. Figures 51 through 53 show the results of this testing on roadway cores obtained for Data Code Numbers 29 through 48.

Figure 48 for dry indirect tension testing on the Dickens and Dumas laboratory and field core specimens shows a definite, strong decline in indirect tensile strength with increasing air voids. Tensile strength appears to be heading up, even at four percent air voids, leaving the conclusion that the peak is yet to be reached at a lower air void content.

Figures 49 and 50 show considerable decreases in splitting tensile strengths after Lottman water testing for most specimens. This decrease is accelerated for increasing void contents especially above eight percent. The 18-cycle Lottman appears to be somewhat more severe than the 24-hour Lottman test in reducing strengths.

Figure 51 illustrates the results of indirect tensile testing on the dry pavement cores showing that there is a peak in the values around air voids contents of three to five percent. It is significant to note that with the exception of the one tensile strength reading at 2.4 percent air voids, all the pavement sections with three percent or less air voids fall within the group of pavements found to have rutted the most within this study. This one exception is that of Data Code Numbers 39.

Figure 52 illustrates the effects of 24-hour Lottman water testing on the indirect tensile strengths of the dry samples from Figure 51. There is now more of a downward trend in tensile strength running from one to seven percent air voids and much less indication of any peak around three to four percent air voids. Also to be noted is how low air voids specimens have declined very little in tensile strength and have actually risen relative to those specimens having above three percent air voids. Here again, the effects of water tension forces may be acting in the reduced voids of these samples.

Figure 53 is comprised of a mixture of 7-day soaked and 18-cycle Lottman tested samples. There is a lot of scatter in this figure and trends are not readily apparent. Most of the samples retained respectable strength levels above 120 psi.

CONCLUSIONS

Some general conclusions may be drawn concerning the pavement sections that have sufferec greater rutting than the well performing pavements. These are as follows:

1. On the average, the extracted asphalts for the more rutted pavements were found to be considerably softer than those for the less rutted pavements.
2. The rutted pavements, with two exceptions, are pavements with lower percent air voids, from about 3.4 percent down to 1.0 percent. The two exceptions have air voids above seven percent. It seems probably that the rutted pavements represent

those whose air voids have become excessively filled with asphalt binder for one or more reasons.

3. The more rutted pavements have aggregate-asphalt systems that are, on the average, considerably more temperature susceptible, or have steeper, M_R versus temperature curves. These pavements on the average show considerably smaller M_R values at both 77^{o}F (25^{o}C) and 104^{o}F (40^{o}C), 0.292 and 0.067 x 10^6 psi versus 0.526 and 0.140 x 10^6 psi, which temperatures more closely approximate the service range of temperatures where as much strength as possible is needed to reduce plastic deformation.
4. Indirect tensile strengths before water soaking tend to be lower for the more rutted pavements but are still at or above normally accepted values. The average for the more rutted is 145 psi versus 173 psi for the less rutted.
5. There is little or no difference between Hveem values for the more rutted pavements and those of pavements in the less rutted group. Hveem stability appears to be no indication at all of rutting as found in this study.
6. Marshall stability values for the more rutted pavements are found to average about 32 percent less than those for the less rutted pavements. After Lottman water soaking, there is little difference between the two average values.
7. The more rutted pavements tend to have grading curves with the higher humps above the No. 30 sieve (600μm) of the ASTM continuous grading curve.

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Table 1a. Test Sequence I results for Item 340 Type "D" HMAC using MacMillan AC-20, U.S. 82, Dickens, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
I	2-2	2.263	0.479	1614	17.5							
	2-14	2.239	0.363	1533	16	5.7	20	38	7 x 10^6	11,250	8.3	138
	2-15	2.279	0.378	1513	21							
	Avg.	2.260	0.407	1553	18							

				Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
II	2-3	2.280	0.474	43.9	37.8	0.419	34.1	28.0	1,716	23			
	2-7	2.253	0.331	46.5	40.8	0.269	33.6	27.9	994	25			
	2-8	2.263	0.319	48.3	42.5	0.280	33.1	27.3	1,065	22			
	2-9	2.265	0.375	48.1	42.2	0.273	31.8	25.9			75	.00412	18,186.2
	2-10	2.269	0.343	38.0	31.9	0.276	28.8	22.6			71	.00442	16,160.6
	2-17	2.267	0.349	43.2	37.6	0.300	28.9	23.2			74	.00383	19,440.4
	Avg.	2.266	0.365	45.0	39.0	0.303	32.0	26.0	1,260	23	73	.00412	17,929.1

Table 1a (continued) Test Sequence I results for Item 340 Type "D" HMAC using MacMillan AC-20, U.S. 82, Dickens, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
III	1-2	2.290	0.316	49.9	44.1	0.020	30.4	24.6			59.0	0.00383	15,393.2
	2-4	2.289	0.348	41.7	35.3	0.177	39.6	33.3			103.8	0.00472	22,016.0
	2-5	2.280	0.328	46.9	40.8	0.081	41.3	35.3			99.1	0.00560	17,693.5
	2-11	2.256	0.368	55.7	49.9	0.205	44.2	38.4			106.1	0.00413	25,715.9
	2-12	2.254	0.331	49.9	44.0	0.076	33.9	28.1			78.8	0.00678	11,617.9
	2-13	2.251	0.438	52.9	47.4	0.236	50.2	44.7			105.6	0.00413	25,602.14
	Avg.	2.270	0.355	50.0	44.0	0.133	40.0	34.0			92.1	0.00487	19,673.1

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	M_R x 10^6 psi -13°F	M_R x 10^6 psi 33°F	M_R x 10^6 psi 68°F	M_R x 10^6 psi 104°F	Splitting Tensile Test @ 77°F Stress (psi)	Splitting Tensile Test @ 77°F Strain (in/in)	Splitting Tensile Test @ 77°F Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	2-1	2.254	0.398	1.410	1.337	0.539	0.099	101.7	0.00354	28749	2.404	6.2
	2-6	2.272	0.344	1.935	1.214	0.610	0.094	101.5	0.00304	33443	2.404	5.5
	2-16	2.268	0.366	2.279	0.966	0.577	0.107	102.3	0.00316	32429	2.404	5.7
	Avg.	2.265	0.369	1.875	1.172	0.575	0.100	101.8	0.00325	31540	2.404	5.8

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

R.S.G. - Rice Specific Gravity

Table 1b. Test Sequence I results for Item 340 Type "D" HMAC Dorchester AC-20, U.S. 82, Dickens, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test: Stability (lbs)	Marshall Test: Flow (0.01 in)	Percent Asphalt	Penetration, dmm: 39.2°F	Penetration, dmm: 77°F	Viscosity, poises: 77°F	Viscosity, poises: 140°F	Viscosity, poises: 275°F	Ring and Ball Softening Point, °F
I	4-1	2.277	.560	1904	15							
	4-4	2.264	.769	2307	17	5.65	21	32	1.4×10^6	11355	8.737	144
	4-5	2.271	.463	2006	16							
	4-11	2.261	.435	—	—							
	Avg.	2.268	.557	2072	16							

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F*: Stress (psi)	Splitting Tensile Test @ 77°F*: Strain (in/in)	Splitting Tensile Test @ 77°F*: Modulus (psi)
II	4-7	2.272	.618	46.5	40.6	.490	42.1	36.2	1725	21			
	4-8	2.264	.545	49.1	43.0	.509	39.7	33.6			122.7	.00324	37839.8
	4-13	2.268	.460	41.8	35.8	.440	38.1	32.1	1555	22			
	4-14	2.280	.434	46.2	39.8	.393	34.7	28.3	1397	22			
	4-15	2.276	.423	46.8	40.8	.465	35.7	29.6			106.9	.00501	21346.4
	4-16	2.259	.409	46.2	40.0	.387	34.5	28.7	—	—	106.3	.00422	24037.2
	Avg.	2.270	.482	46.0	40.0	.447	38.0	31.0	1559	22	112.0	.00422	27741.0

Table 1b. (continued) Test Sequence I results for Item 340 Type "D" HMAC Dorchester AC-20, U.S. Dickens, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
III	4-3	2.226	.608	50.6	45.5	.476	47.4	42.3	1223	35.5			
	4-10	2.289	.427	42.3	35.9	.289	23.0	16.6			100.0	.00634	15785.6
	4-12	2.269	.419	43.9	37.9	.318	35.9	29.9	1338	24.0			
	4-17	2.266	.402	45.9	39.9	.277	29.8	23.8			106.6	.00604	17649.2
	4-18	2.272	.442	44.1	38.0	.331	34.0	27.9	1617	22.0			
	4-20	2.276	.508	46.6	40.5	.389	37.9	31.8			128.9	.00501	25733.2
	Avg.	2.266	.468	46.0	40.0	.347	35.0	29.0	1393	27.0	112.0	.00580	19723.0

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	M_R x 10^6 psi -13°F	M_R x 10^6 psi 33°F	M_R x 10^6 psi 68°F	M_R x 10^6 psi 104°F	Splitting Tensile Test @ 77°F Stress (psi)	Splitting Tensile Test @ 77°F Strain (in/in)	Splitting Tensile Test @ 77°F Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	4-6	2.274	.579	3.536	1.381	.678	.128	127.5	.00324	39314.56		4.8
	4-9	2.283	.438	1.529	1.322	.580	.100	109.5	.00354	30970.44	2.389	4.4
	4-19	2.270	.477	1.651	1.303	.698	.122	127.8	.00368	34720.98		5.0
	Avg.	2.276	.498	2.239	1.335	.652	.117	121.6	.00349	35002.0	2.389	4.7

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

Table 1c. Test Sequence I results for Item 340 Type "D" HMAC using Exxon AC-20, U.S. 82, Dickens, Texas

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
I	3-7	2.246	0.838	2,035	19							
	3-8	2.252	0.639	2,068	15	5.17	8	21	1.6×10^7	8,668	6.055	136
	3-12	2.264	0.703	1,967	16							
	Avg.	2.254	0.727	2,023	17							

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Strain (in/in)	Modulus (psi)
II	3-1	2.274	0.562	47.0	40.9	0.596	35.7	29.6	1,617	19			
	3-2	2.281	0.657	44.3	38.0	0.622	36.9	30.6			171.3	.00442	38741.2
	3-10	2.252	0.629	43.6	38.1	0.660	41.5	35.9			168.2	.00413	40773.8
	3-11	2.248	0.816	49.6	44.0	0.698	49.9	44.3	2,238	22			
	3-14	2.266	0.609	44.1	38.5	0.592	37.7	32.1	1,667	19			
	3-17	2.282	0.623	44.9	38.4	0.622	37.0	30.5	--	--	156.0	.00442	35296.4
	Avg.	2.267	0.649	46.0	40.0	0.632	40.0	34.0	1,841	20	165.0	.00432	38271.0

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

Table 1c. (continued) Test Sequence I results for Item 340 Type "D" HMAC using Exxon AC-20, U.S. 82, Dickens, Texas

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
III	3-4	2.280	0.654	45.2	39.0	0.533	36.3	30.1	1,816	19			
	3-5	2.274	0.554	46.7	40.6	0.566	35.9	29.8	1,838	17			
	3-6	2.276	0.626	45.5	39.3	0.495	30.5	24.3			160.7	.00545	29467.6
	3-13	2.258	0.564	46.3	40.4								
	3-15	2.269	0.612	50.2	44.2	0.540	46.1	40.1			174.0	.00516	33742.6
	3-16	2.268	0.726	46.4	40.4	0.498	38.1	32.1	-----	---	162.4	.00560	29003.0
	Avg.	2.269	0.623	47.0	41.0	0.526	37.0	31.0	1,827	18	166.0	.00540	30738.0

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	M_R x 10^6 psi -13°F	33°F	68°F	104°F	Splitting Tensile Test @ 77°F Stress (psi)	Strain (in/in)	Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	3-3	2.266	0.641	1.681	1.793	1.045	0.124	151.9	.00383	39640.42		6.2
	3-9	2.271	0.711	2.895	1.638	1.045	0.149	178.2	.00324	54956.02	2.416	6.0
	3-18	2.253	0.642	2.305	1.555	0.987	0.112	147.6	.00383	38521.06	-----	6.7
	Avg.	2.263	0.665	2.294	1.662	1.026	0.128	159.0	.00363	44373.0	2.416	6.3

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

Table 1d. Test Sequence I results for Item 340 Type "D" HMAC using Shamrock AC-20, U.S. 82, Dickens, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
I	5-4	2.261	.528	1620	17.0							
	5-5	2.260	.796	1606	17.5	4.91	14	29	1.84×10^7	9564	11.028	141
	5-9	2.262	.607	1507	15.5							
	Avg.	2.261	.644	1578	17.0							

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
II	5-2	2.261	.588	42.3	36.5	.446	37.5	31.8					
	5-3	2.274	.524	41.6	35.5	.397	35.1	29.0			114.93	.00413	27854.66
	5-6	2.260	.656	43.7	38.1	.510	42.7	37.1			117.49	.00766	15332.6
	Avg.	2.265	.589	43.0	37.0	.451	38.4	33.0			116.0	.00590	21594.0

Table 1d. (continued) Test Sequence I results for Item 340 Type "D" HMAC using Shamrock AC-20, U.S. 82, Dickens, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
III	5-7	2.269	.548	43.6	37.8	.240	44.6	38.8			122.18	.00825	14806.72
	5-10	2.262	.654	44.5	38.8	.263	44.8	39.1			129.36	.00707	18289.35
	5-12	2.268	.440	44.4	38.6	.236	46.4	40.6			110.20	.00884	12463.71
	Avg.	2.266	.547	44.0	38.4	.246	45.0	39.5			121.00	.00805	15187.00

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	M_R x 10^6 psi -13°F	M_R x 10^6 psi 33°F	M_R x 10^6 psi 68°F	M_R x 10^6 psi 104°F	Splitting Tensile Test @ 77°F Stress (psi)	Splitting Tensile Test @ 77°F Strain (in/in)	Splitting Tensile Test @ 77°F Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	5-1	2.259	.435	2.557	1.675	.766	.103	104.0	.00825	12607.40		5.8
	5-8	2.270	.636	2.376	1.964	.783	.159	131.5	.00530	24779.69	2.398	5.3
	5-13	2.266	.540	1.868	1.654	.877	.106	114.1	.00707	16128.07		5.5
	Avg.	2.265	.537	2.267	1.764	.809	.123	117.0	.00687	17838.00	2.398	5.5

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

Table 1e. Test Sequence I results for Item 340 Type "D" HMAC using Shamrock AC-10, U.S. 82, Dickens, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
I	5-14	2.269	.319	1187	14.5							
	5-17	2.273	.375	1444	14.0	5.06	21	62	1.20×10^7	2000	5.934	122
	5-23	2.277	.363	1285	14.0							
	Avg.	2.273	.352	1305.0	14.0							

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
II	5-16	2.269	.372	43.6	37.6	.327	29.9	23.9			71.16	.01179	6036.15
	5-18	2.261	.317	42.8	37.0	.285	31.9	26.3			70.81	.01002	7066.26
	5-20	2.257	.349	44.0	38.8	.314	33.7	28.1			66.51	.01031	6447.95
	Avg.	2.262	.346	44.0	38.0	.309	32.0	26.0			70.0	.01071	6517.00

Table 1e. (continued) Test Sequence 1 results for Item 340 Type "D" HMAC using Shamrock AC-10, U.S. 82, Dickens, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
III	5-19	2.266	.369	46.1	40.2	.251	47.3	41.4			80.7	.01267	6369.6
	5-21	2.263	.309	44.9	39.2	.227	45.3	39.6			84.4	.01650	5111.8
	5-22	2.246	.345	44.9	39.4	.239	46.4	40.9			85.9	.00884	9716.0
	Avg.	2.258	.341	45.0	40.0	.239	46.0	41.0			84.0	.01267	7066.0

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	M_R x 10^6 psi -13°F	M_R x 10^6 psi 33°F	M_R x 10^6 psi 68°F	M_R x 10^6 psi 104°F	Splitting Tensile Test @ 77°F Stress (psi)	Splitting Tensile Test @ 77°F Strain (in/in)	Splitting Tensile Test @ 77°F Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	5-24	2.264	.368	2.096	1.665	.616	.053	109.9	.01179	9320.12		4.5
	5-25	2.277	.281	2.413	1.556	.671	.051	74.5	.00943	7900.15	2.370	3.9
	5-26	2.274	.335	2.658	1.538	.602	.056	72.6	.00884	8210.74		4.1
	Avg.	2.272	.328	2.389	1.586	.630	.053	86.0	.01002	8477.00	2.370	4.1

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

Table 1f. Test Sequence 1 results for Item 340 Type "D" HMAC using Cosden AC-20, U.S. 82, Dickens, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
I	6-5	2.260	.733	1433	20							
	6-11	2.255	.611	1818	16	5.17	9	29	1.4 x 10^7	4750	4.49	132
	6-2	2.225	.653	1451	27							
	Avg.	2.247	.667	1567	21							

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
II	6-3	2.278	.589	43.0	36.9	.558	35.8	35.1			142.6	.00825	17280.50
	6-8	2.239	.543	49.6	44.3	.475	38.1	36.6			112.74	.00707	15938.98
	6-13	2.228	.674	42.1	37.1	.459	37.9	36.2			104.15	.00589	17669.58
	Avg.	2.248	.602	44.9	39.4	.497	37.3	36.0			119.8	.00707	16963.00

Table 1f. (continued) Test Sequence I results for Item 340 Type "D" HMAC using Cosden AC-20, U.S. 82, Dickens, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
III	6-6	2.247	.565	50.7	45.1	.444	50.7	45.2			108.9	.01002	10863.1
	6-7	2.235	.508	40.6	35.4	.458	47.8	42.6			85.2	.00384	9640.3
	6-12	2.225	.653	44.4	39.5	.373	48.5	43.5			77.1	.00825	9339.9
	Avg.	2.235	.575	45.2	40.0	.425	49.0	43.8			90.4	.00904	9947.8

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	M_R x 10^6 psi -13°F	M_R x 10^6 psi 33°F	M_R x 10^6 psi 68°F	M_R x 10^6 psi 104°F	Splitting Tensile Test @ 77°F Stress (psi)	Splitting Tensile Test @ 77°F Strain (in/in)	Splitting Tensile Test @ 77°F Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	6-1	2.269	.502	2.276	1.990	.907	.108	135.8	.00884	15363.36		6.2
	6-4	2.258	.648	2.104	1.408	.914	.158	154.9	.00813	19047.00	2.418	6.6
	6-10	2.243	.555	2.106	1.480	.882	.123	130.4	.00766	17020.04	——	7.2
	Avg.	2.257	.568	2.162	1.626	.901	.130	140.0	.00821	17144.0	2.418	6.7

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

Table 1g. Test Sequence I results for Item 340 Type "D" HMAC using Cosden AC-10, U.S. 82, Dickens, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
I	6-16	2.235	.470	1480	13.5							
	6-21	2.295	.505	1539	15.0	4.48	8	28	1.3 x 10^6	4322	4.155	132
	6-24	2.293	.709	1755	15.5							
	Avg.	2.274	.561	1591	15.0							

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
II	6-15	2.253	.501	44.9	39.3	.440	36.7	35.5			95.9	.00825	11621.5
	6-17	2.256	.466	45.7	39.9	.356	36.7	35.6			106.16	.00825	12864.32
	6-18	2.247	.573	44.7	39.2	.473	39.5	38.2			99.47	.00825	12054.35
	Avg.	2.252	.513	45.0	40.0	.423	38.0	36.0			101.0	.00825	12180.00

Table 1g. (continued) Test Sequence I results for Item 340 Type "D" HMAC using Cosden AC-10, U.S. 82, Dickens, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Strain (in/in)	Modulus (psi)
III	6 -14	2.242	.440	47.2	41.8	.364	46.9	41.6			85.6	.01179	7262.1
	6 -22	2.284	.488	43.3	37.3	.463	49.3	43.4			126.4	.01210	9750.6
	6 -25	2.295	.529	43.4	36.9	.479	50.1	43.7			136.0	.01150	11829.1
	Avg.	2.274	.486	45.0	39.0	.435	50.0	43.0			116.0	.01178	9614.0

				M_R x 10^6 psi -13°F	33°F	68°F	104°F	Splitting Tensile Test @ 77°F Stress (psi)	Strain (in/in)	Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	6 -19	2.232	.457	1.668	1.291	.806	.094					6.9
	6 -20	2.290	.517	2.050	1.267	.755	.087	124.4	.00943	13189.72	2.396	4.4
	6 -23	2.299	.485	2.205	1.784	.821	.094	138.2	.00872	15838.75	____	4.0
	Avg.	2.274	.486	1.974	1.447	.794	.092	131.0	.00908	14514.0	2.396	5.1

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

Table 2a. Test Sequence 1 results for Item 340 Type "D" HMAC MacMillan AC-10, U.S. 287, Dumas, Texas

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
I	1-10	2.261	.310									
	1-13	2.265	.319	2594	18	5.26	57	107	5.6×10^5	1360	3.491	112
	1-15	2.247	.274	2462	17							
	Avg.	2.258	.301	2528	18							

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
II	1-2	2.236	.247	49.7	47.1	.081	27.3	24.8					
	1-3	2.225	.230	46.1	42.9	.083	26.6	23.4	1032	24			
	1-5	2.239	.292	49.8	46.3	.118	26.2	22.7	1105	27			
	1-9	2.250	.307	50.8	46.8	.092	28.7	24.7			52.7	.00794	6633.6
	1-12	2.272	.318	55.3	50.6	.088	18.5	13.8			49.8	.01079	4617.4
	1-18	2.250	.289	53.9	48.1	.074	26.8	20.9			43.3	.00992	4363.8
	Avg.	2.245	.281	51.0	47.0	.089	26.0	22.0	1069	26	49.0	.00955	5205.0

Table 2a. (Continued) Test Sequence I results for Item 340 Type "D" HMAC MacMillan AC-10, U.S. 287, Dumas, Texas

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
III	1-1	2.233	.285	49.5	46.2	.042	21.9	18.7	851	22			
	1-4	2.227	.236	41.9	39.5	.045	24.9	22.4	938	34			
	1-6	2.230	.155	42.9	39.3	.038	20.9	17.3	839	28			
	1-8	2.235	.317	58.8	53.3	.036	21.7	16.2					
	1-16	2.250	.263	50.2	46.4	.034	17.4	13.5			30.04	.01357	2213.24
	1-17	2.273	.304	57.6	54.5	.034	18.6	15.5	—	—	33.16	.01208	2745.05
	Avg.	2.241	.260	50.0	47.0	.038	21.0	17.0	876	28	32.00	.01283	2479.00

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	M_R x 10^6 psi -13°F	M_R x 10^6 psi 33°F	M_R x 10^6 psi 68°F	M_R x 10^6 psi 104°F	Splitting Tensile Test @ 77°F Stress (psi)	Splitting Tensile Test @ 77°F Strain (in/in)	Splitting Tensile Test @ 77°F Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	1-7	2.250	.311	1.792	1.656	.387	.080	83.4	.00454	18372.8		8.7
	1-11	2.262	.303	1.958	1.681	.377	.080	74.6	.00482	15469.4	2.464	8.2
	1-14	2.250	.279	2.294	1.635	.326	.079	60.3	.00454	13279.8	—	8.7
	Avg.	2.254	.298	2.015	1.657	.363	.080	73.0	.00463	15707.0	2.464	8.5

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

Table 2b. Test Sequence I results for Item 340 Type "D" HMAC using Dorchester AC-10, U.S. 287, Dumas, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F +	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
I	2-10	2.261	.371	1522	14							
	2-13	2.249	.344	1533	14	5.7	26	66	1.5×10^6	1989	3.976	122
	2-16	2.245	.318	1745	16							
	Avg.	2.252	.344	1600	15							

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability+ Percent (UNC)	Hveem Stability+ Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
II	2-1	2.233	.290			.060	11.9	5.7	558	20			
	2-6	2.239	.260			.066	11.8	5.8	621	21			
	2-8	2.238	.313			.061	11.8	5.9	595	21			
	2-9	2.262	.342			.110	10.9	4.4			40.0	.00851	4698.0
	2-11	2.249	.360			.107	21.4	15.7			51.1	.00682	7498.6
	2-15	2.239	.300			.070	9.9	4.0	—	—	31.6	.00910	3474.6
	Avg.	2.243	.311			.079	13.0	7.0	591	21	41.0	.00814	5224.0

+ The Before - Saturation Testing of the HVEEM Stability samples in this leg was inadvertently omitted and the samples were only tested after being subjected to the accelerated Lottman test.

Table 2b. (continued) Test Sequence I results for Item 340 Type "D" HMAC using Dorchester AC-10, U.S. 287, Dumas, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
III	2-2	2.240	.303	49.3	43.9	.061	6.9	1.5	749	27			
	2-4	2.254	.204	57.0	51.0	.045	6.7	0.8	818	24			
	2-5	2.248	.291	48.5	43.3	.063	12.9	7.7	839	26			
	2-7	2.265	.347	55.3	49.2	.064	11.5	5.4			33.74	.00748	4511.72
	2-14	2.240	.286	52.2	46.2	.060	9.5	3.5			27.66	.00863	3205.74
	2-18	2.232	.325	49.9	43.9	.040	13.6	7.5	___	___	23.76	.01611	1474.95
	Avg.	2.247	.293	52.0	46.0	.056	10.0	5.0	802	26	28.00	.01074	3064.00

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	M_R x 10^6 psi -13°F	M_R x 10^6 psi 33°F	M_R x 10^6 psi 68°F	M_R x 10^6 psi 104°F	Splitting Tensile Test @ 77°F Stress (psi)	Splitting Tensile Test @ 77°F Strain (in/in)	Splitting Tensile Test @ 77°F Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	2-3	2.266	.301	1.809	1.211	.472	.101	87.4	.00397	22003.8		6.9
	2-12	2.247	.346	1.833	1.379	.463	.101	88.0	.00426	20681.4	2.433	7.6
	2-17	2.239	.323	1.731	1.182	.415	.095	82.4	.00312	26402.4	___	8.0
	Avg.	2.251	.323	1.791	1.257	.450	.099	86.0	.00378	23029.2	2.433	7.5

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

Table 2c. Test Sequence I results for Item 340 Type "D" HMAC Exxon AC-10, U.S. 287, Dumas, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
I	3-12	2.219	.415	1708	15							
	3-14	2.202	.525	1820	16	5.7	7	45	2.9 x 10^6	2995	3.858	126
	3-16	2.202	.424	1633	15							
	Avg.	2.208	.455	1720	15							

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability+ Percent (UNC)	Hveem Stability+ Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
II	3-6	2.205	.380			.086	28.9	23.8	327	17			
	3-7	2.226	.400			.119	28.9	23.5	367	23			
	3-8	2.197	.422			.124	24.6	19.5	431	18			
	3-9	2.215	.343			.113	27.6	22.9			28.7	.00709	4049.2
	3-13	2.228	.371			.117	27.0	21.9			38.7	.00767	5047.4
	3-18	2.198	.512			.260	40.1	35.1			73.2	.00284	25805.8
	Avg.	2.212	.405			.137	30.0	25.0	375	19	47.0	.00587	11634.0

+The before-saturation testing of the HVEEM Stability samples in this leg was inadvertently omitted and samples were only tested after being subjected to the accelerated Lottman test.

Table 2c. (continued) Test Sequence I results for Item 340 Type "D" HMAC Exxon AC-10, U.S. 287, Dumas, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
III	3-2	2.202	.417	49.5	44.2	.025	26.4	21.6	199	17			
	3-3	2.202	.339	51.5	46.2	.027	33.0	28.2	224	19			
	3-4	2.198	.378	51.4	46.2	.027	24.4	18.9	247	20			
	3-5	2.193	.387	53.1	48.3	.024	30.2	25.6			15.37	.01035	1484.53
	3-5A	2.204	.396	49.6	44.8	.026					13.44	.01151	1167.94
	3-10	2.240	.351	50.0	44.5	.028					19.52	.01035	1885.71
	3-17	2.210	.464	48.5	43.8	.050	——	——	——	——	26.79	.00920	2911.42
	Avg.	2.207	.390	51.0	45.0	.030	29.0	24.0	223	19	19.00	.01027	1862.00

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	M_R x 10^6 psi -13°F	M_R x 10^6 psi 33°F	M_R x 10^6 psi 68°F	M_R x 10^6 psi 104°F	Splitting Tensile Test @ 77°F Stress (psi)	Splitting Tensile Test @ 77°F Strain (in/in)	Splitting Tensile Test @ 77°F Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	3-1	2.209	.440	2.370	1.440	.591	.116	108.1	.00255	42322.0		10.5
	3-11	2.202	.383	2.073	1.342	.540	.124	97.6	.00341	28658.2	2.467	10.7
	3-15	2.201	.415	2.176	1.268	.626	.126	104.9	.00397	26395.8	——	10.8
	Avg.	2.204	.413	2.206	1.350	.586	.122	104.0	.00331	32459.0	2.467	10.7

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

Table 2d. Test Sequence I results for Item 340 Type "D" HMAC Diamond Shamrock AC-20, U.S. 287, Dumas, Texas.

Phase	Sample	Bulk * Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
I	4-10	2.250	.486	1825	16							
	4-11	2.253	.512	1788	16	5.39	12	51	3.4 x 10^6	2984	7.13	125
	4-18	2.255	.441	1988	17							
	Avg.	2.253	.480	1867	16							

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability+ Percent (UNC)	Hveem Stability+ Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
II	4-4	2.242	.422			.261	7.5	2.6	1022	26			
	4-5	2.242	.417			.295	8.0	2.2	1001	26			
	4-7	2.245	.406			.180	12.5	7.1	922	25			
	4-12	2.223	.388			.150	20.4	15.1			54.4	.00511	10656.6
	4-13	2.254	.429			.253	19.8	14.2			55.0	.00680	8083.4
	4-14	2.254	.468			.231	12.1	5.9			54.8	.00539	10170.4
	4-16	2.270	.511			.220	12.6	6.8	—	—	75.4	.00482	15634.2
	Avg.	2.247	.434			.227	13.0	8.0	982	26	60.0	.00553	11136.0

+The before-saturation testing of the HVEEM Stability samples in this leg was inadvertently omitted and samples were only tested after being subjected to the accelerated Lottman test.

Table 2d. (continued) Test Sequence I results for Item 340 Type "D" HMAC Diamond Shamrock AC-20, U.S. 287, Dumas, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
III	4-1	2.251	.417	50.5	44.6	.413			1407	25			
	4-6	2.238	.401	41.6	36.4	.265			1107	25			
	4-9	2.248	.423	53.6	48.0	.235			1001	24			
	4-15	2.259	.458	57.1	50.7	.358	15.9	9.5			67.88	.00748	9077.77
	4-17	2.252	.498	50.9	45.1	.294	18.1	12.2			45.28	.00690	6560.41
	4-19	2.253	.409	54.3	48.1	.124	10.0	4.2			43.25	.00978	4422.97
	Avg.	2.250	.434	51.0	46.0	.282	15.0	9.0	1172	25	52.00	.00805	6687.00

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	M_R x 10^6 psi -13°F	M_R x 10^6 psi 33°F	M_R x 10^6 psi 68°F	M_R x 10^6 psi 104°F	Splitting Tensile Test @ 77°F Stress (psi)	Splitting Tensile Test @ 77°F Strain (in/in)	Splitting Tensile Test @ 77°F Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	4-2	2.249	.423	1.989	1.421	.547	.137	97.4	.00426	22891.6		6.4
	4-3	2.239	.446	2.039	1.460	.571	.142	101.0	.00340	29672.0	2.402	6.8
	4-8	2.245	.487	1.764	1.495	.547	.134	100.2	.00340	29442.0		6.5
	Avg.	2.244	.452	1.931	1.459	.555	.138	100.0	.00369	27335.0	2.402	6.6

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

Table 2e. Test Sequence I results for Item 340 Type "D" HMAC Diamond Shamrock AC-10, U.S. 287, Dumas, Texas

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
I	5-1	2.277	.362	1764	16							
	5-17	2.259	.317	1241	15	6.18	20	75	1.6 x 10^6	1723	5.236	121
	5-18	2.253	.330	1314	15							
	Avg.	2.263	.336	1440	15							

Phase	Sample			Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
II	5-4	2.266	.290	51.0	44.8	.286	15.1	8.8	1250	25			
	5-8	2.281	.311	46.8	40.3	.317	15.5	9.0	1267	22			
	5-10	2.263	.305	44.5	38.4	.333	12.7	6.6	1183	25			
	5-11	2.259	.322	46.8	40.4	.315	14.3	7.9			99.9	.00710	14079.8
	5-15	2.263	.284	46.0	39.6	.286	19.7	13.3			95.8	.00681	14065.6
	5-16	2.252	.349	48.1	42.5	.246	12.9	7.2	----	---	121.4	.00880	13802.6
	Avg.	2.264	.310	47.2	41.0	.297	15.0	9.0	1233	24	106.0	.00757	13983.0

Table 2e. (continued) Test Sequence I Results for Item 340 Type "D" HMAC Diamond Shamrock AC-10, U.S. 287, Dumas, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
III	5-3	2.265	.303	33.3	27.8	.272			1247	23			
	5-5	2.264	.279	46.2	39.9	.225			1205	21			
	5-6	2.267	.290	47.8	41.5	.241			1220	23			
	5-7	2.268	.336	46.4	40.2	.285	15.3	9.1			67.54	.00690	9785.15
	5-9	2.277	.319	47.1	40.6	.285	21.3	14.9			67.54	.00690	9785.15
	5-13	2.269	.311	48.1	41.4	.280	13.1	6.5			66.32	.00805	8235.15
	Avg.	2.268	.306	45.0	39.0	.265	17.0	10.0	1224	22	67.00	.00728	9269.00

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	M_R x 10^6 psi -13°F	M_R x 10^6 psi 33°F	M_R x 10^6 psi 68°F	M_R x 10^6 psi 104°F	Splitting Tensile Test @ 77°F Stress (psi)	Splitting Tensile Test @ 77°F Strain (in/in)	Splitting Tensile Test @ 77°F Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	5-2	2.269	.335	1.903	1.437	.410	.075	66.6	.00454	14678.6		5.4
	5-12	2.269	.306	1.538	1.275	.386	.071	63.1	.00511	12360.8	2.398	5.4
	5-14	2.264	.317	1.988	1.378	.376	.069	59.8	.00511	11700.0		5.6
	Avg.	2.267	.319	1.810	1.363	.391	.072	63.0	.00492	12913.0	2.398	5.5

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

Table 2f. Test Sequence I results for Item 340 Type "D" HMAC Cosden AC-20, U.S. 287, Dumas, Texas

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
I	7-1	2.276	.541	1898	16							
	7-7	2.249	.673	1935	16	5.56	12	41	5.0 x 10^6	2374	3.415	125
	7-15	2.236	.578	2080	17							
	Avg.	2.254	.597	1971	16							

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
II	7-2	2.268	.510	54.5	48.2	.260	14.9	8.6	970	26			
	7-8	2.235	.520	55.8	50.1	.194	24.2	18.5	754	24			
	7-11	2.249	.519	54.1	48.0	.193	16.2	10.1	949	20			
	7-14	2.251	.649	55.8	49.8	.249	12.1	6.2			79.1	.00454	17416.0
	7-17	2.222	.559	54.8	49.4	.192	25.4	20.0			54.5	.00425	12813.0
	7-18	2.273	.535	48.5	42.4	.209	13.8	7.8			106.8	.00596	17931.4
	Avg.	2.250	.549	54.0	48.0	.216	18.0	12.0	891	23	80.0	.00492	16054.0

Table 2f. (continued) Test Sequence I results for Item 340 Type "D" HMAC Cosden AC-20, U.S. 287, Dumas, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
III	7-4	2.261	.519	51.1	45.0	.132			569	23			
	7-5	2.273	.533	53.5	47.4	.277			993	23			
	7-6	2.269	.516	42.0	35.8	.259			825	21			
	7-9	2.336	.478	55.9	50.7	.063	13.7	8.5			30.99	.00798	3884.24
	7-12	2.254	.558	55.9	49.8	.192	14.3	8.2			47.56	.00532	8939.76
	7-13	2.248	.632	57.0	51.1	.172	23.7	17.8	----	----	47.39	.00532	8908.70
	Avg.	2.274	.539	53.0	47.0	.183	17.0	12.0	796	22	42.00	.00621	7244.00

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	M_R x 10^6 psi -13°F	M_R x 10^6 psi 33°F	M_R x 10^6 psi 68°F	M_R x 10^6 psi 104°F	Splitting Tensile Test @ 77°F Stress (psi)	Splitting Tensile Test @ 77°F Strain (in/in)	Splitting Tensile Test @ 77°F Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	7-3	2.256	.531	1.964	1.449	.660	.151	146.2	.00482	30309.4		8.0
	7-10	2.234	.545	1.911	1.439	.682	.148	136.9	.00312	43874.0	2.451	8.9
	7-16	2.236	.596	1.915	1.274	.714	.144	137.3	.00340	40336.8	----	8.8
	Avg.	2.242	.557	1.930	1.387	.685	.148	140.0	.00378	38173.0	2.451	8.6

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

Table 2g. Test Sequence I Results for Item 340 Type "D" HMAC Cosden AC-10, U.S. 287, Dumas, Texas

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
I	6-3	2.275	.523	1752	16							
	6-6	2.262	.544	1552	15	5.77	12	47	2.0 x 10	1943	3.078	122
	6-16	2.254	.595	1799	16							
	Avg.	2.264	.554	1701	16							

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Strain (in/in)	Modulus (psi)
II	6-2	2.263	.488	46.7	40.7	.237	17.7	11.7	840	25			
	6-7	2.274	.463	53.1	46.5	.283	9.7	3.0	1020	24			
	6-8	2.268	.515	50.0	44.2	.242	16.0	10.1	964	26			
	6-11	2.259	.538	45.0	39.0	.226	16.0	10.0			75.1	.00596	12599.6
	6-13	2.283	.456	50.8	44.3	.254	12.9	6.4			104.2	.00515	20238.8
	6-17	2.236	.568	52.7	47.4	.224	34.3	28.9			74.0	.00454	16294.4
	Avg.	2.264	.505	50.0	44.0	.244	18.0	12.0	941	25	84.0	.00522	16378.0

Table 2g. (continued) Test Sequence I results for Item 340 Type "D" HMAC Cosden AC-10, U.S. 287, Dumas, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
III	6-1	2.275	.427	52.9	46.6	.325			1169	22			
	6-4	2.269	.457	53.7	47.3	.352			1110	24			
	6-5	2.271	.510	52.4	46.1	.320			1014	23			
	6-14	2.247	.480	53.2	47.3	.216	28.8	22.9			43.38	.00532	8154.17
	6-15	2.253	.554	56.0	49.8	.210	28.7	22.6			55.59	.00638	8708.78
	6-18	2.245	.532	55.6	50.3	.195	22.4	17.1	—	—	56.40	.00532	10601.58
	Avg.	2.260	.493	54.0	48.0	.270	27.0	21.0	1098	23	52.00	.00567	9155.00

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	M_R x 10^6 psi -13°F	M_R x 10^6 psi 33°F	M_R x 10^6 psi 68°F	M_R x 10^6 psi 104°F	Splitting Tensile Test @ 77°F Stress (psi)	Splitting Tensile Test @ 77°F Strain (in/in)	Splitting Tensile Test @ 77°F Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	6-9	2.270	.496	1.731	1.600	.694	.144	123.5	.00425	29010.8		5.8
	6-10	2.257	.526	1.793	1.761	.669	.135	126.6	.00410	30866.6	2.411	6.4
	6-12	2.267	.552	2.093	1.667	.557	.144	127.8	.00483	26489.8	—	6.0
	Avg.	2.265	.525	1.872	1.676	.640	.141	126.0	.00439	28789.0	2.411	6.1

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

Table 3A. Test Sequence II results for Item 340 Type "D" cores using MacMillan AC-20, U.S. 82, Dickens, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY @ 77°F	VISCOSITY @ 140°F	VISCOSITY @ 275°F	PENETRATION 39.2°F	PENETRATION 77°F	RING & BALL	PERCENT ASPHALT
I	1-4	1.406	2.159	.347	1,065	11							
	1-8	1.370	2.141	.325	990	13							
	1-10	1.286	2.137	.433	1,150	9							
	AVG.	1.354	2.146	.368	1,068	11	2.1×10^7	9,787	5.669	3	17	143	5.95

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R * @ 77°F	HVEEM* STABILITY UNC	HVEEM* STABILITY THD	INDIRECT TENSION* MODULUS	INDIRECT TENSION* STRESS	INDIRECT TENSION* STRAIN	MARSHALL STABILITY	MARSHALL FLOW
II	1-7	1.071	2.126	.432	58.9	34.1	.156	45.3	20.5	6,225.0	22.0	.00353		
	1-12	0.792	2.134	.324	66.1	35.6	.082	63.5	33.0	5,471.0	13.0	.00238		
	1-15	1.331	2.151	.343	38.9	19.3	.285	41.7	22.1	12,272.0	29.0	.00236		
	AVG.	1.065	2.137	.366	54.6	29.7	.174	50.2	25.2	7,989.3	21.3	.00276		

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R ** @ 77°F	HVEEM ** STABILITY UNC	HVEEM ** STABILITY THD	INDIRECT TENSION ** MODULUS	INDIRECT TENSION ** STRESS	INDIRECT TENSION ** STRAIN
III	1-13	1.273	2.143	.324	45.5	24.7	.301	51.9	31.1	32,315.0	51.0	.00518
	1-14	1.419	2.145	.342	38.1	20.2	.275	44.0	26.1	18,586.0	52.0	.00280
	1-16	1.193	2.141	.409	47.3	24.9	.310	57.4	35.0	26,492.0	42.0	.00159
	AVG.	1.295	2.143	.358	43.6	23.3	.295	51.1	30.7	25,797.7	48.3	.00319

Table 3A.(Continued) Texas Sequence II results for Item 340 Type "D" cores using MacMillan AC-20, U.S. 82, Dickens, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R*** @ 77°F	HVEEM*** STABILITY UNC	HVEEM*** STABILITY THD	INDIRECT TENSION*** MODULUS	INDIRECT TENSION*** STRESS	INDIRECT TENSION*** STRAIN	*** MARSHALL STABILITY	*** MARSHALL FLOW
	1-2	1.356	2.172			.388		40.6	21.4	.053	37.6	17.6	2,748.0	15.0	.00346		
	1-5	1.465	2.157			.295		34.6	17.6	.040	+	+				+	+
IV	1-6	1.332	2.137			.294		34.3	14.7	.040	36.2	16.5	2,385.0	11.0	.00461		
	1-9	1.106	2.051			.114		44.7	20.6	.013	39.0	14.9				+	+
	1-11	1.019	2.139			.320		47.3	21.4	.033	42.0	16.1	1,253.0	11.0	.00878		
	1-17	1.274	2.154			.337		42.5	21.7	.053	41.7	21.0				93	25
	AVG.	1.259	2.135			.291		40.7	19.6	.039	39.3	17.2	2,128.7	12.3	.00562	93	25

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN	RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
	1-1	1.335	2.155	2.736	1.307	.378	.072	33,292.0	119.0	.00357	2.366	8.9
	1-3	1.493	2.162	1.994	1.285	.315	.049	20,413.0	85.0	.00416	2.406	10.1
V	1-18	1.080	2.142	2.244	1.348	.327	.072	39,506.0	118.0	.00299	2.400	10.8
	AVG.	1.303	2.153	2.325	1.313	.340	.064	31,070.3	107.3	.00357	2.391	9.9

* Denotes Test Results Following the Accelerated (24 hour) Lottman Moisture Treatment Procedure.

** Denotes Test Results Following the 7-day Soak Period.

*** Denotes Test Results Following the (18 cycle) Lottman Moisture Treatment Procedure.

\+ Denotes No Test Values Available.

M_R Modulus of Resiliency.

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In Table 3A (MacMillan AC-20) the sample (1-5) in the fourth leg of the test procedure fell apart after the standard Lottman. The Marshall tests could not be performed, and therefore there are no results. The sample (1-9) was damaged in the Hveem stability test after the Lottman in leg 4. No Marshall tests could be performed.

In Table 3B (Dorchester AC-20), the sample (2-9) fell apart after the standard Lottman, and no further testing could be performed. The sample (2-6) was damaged in the Hveem stability test following the standard Lottman. Both samples were in the fourth leg sequence.

In Table 3C (Exxon AC-20), the samples [(3-10), (3-11)] fell apart after the standard Lottman in the fourth leg. No other tests could be performed.

In Table 3G (Cosden, AC-10) in the 3rd leg, all of the samples were allowed to completely dry out. After they were relocated, they were allowed to soak at 77^{o}F over a weekend. The Hveem stability test was run at 77^{o}F. Also, starting with 3G, the 4th leg was dropped from the testing procedure sequence. Only the resilient modulus tests (-13^{o}F, 33^{o}F, 77^{o}F, and 104^{o}F) were performed. The sequence was modified due to the long period of time required to perform the 18-cycle Lottman testing performance.

Table 3B. Test Sequence II results for Item 340 Type "D" cores using Dorchester AC-20, U.S. 82, Dickens, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY			PENETRATION		RING & BALL	PERCENT ASPHALT
							@ 77°F	@ 140°F	@ 275°F	39.2°F	77°F		
I	2-8	.855	2.066	.341	1,112	12							
	2-10	1.358	2.085	.359	550	17							
	2-17	1.328	2.114	.320	1,160	13							
	AVG.	1.180	2.088	.340	941	14	2.1×10^7	8,670	5.787	2	20	140	4.96

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R * @ 77°F	HVEEM* STABILITY		INDIRECT TENSION*			MARSHALL STABILITY	MARSHALL FLOW
					UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN		
II	2-2	1.024	2.084	.337	70.0	42.9	.192	54.1	28.4	10,417.0	19.0	.00182		
	2-3	1.232	2.091	.313	45.9	24.3	.154	41.7	20.0	5,772.0	21.0	.00364		
	2-5	.956	2.085	.350	62.6	36.8	.105	62.7	35.6	5,579.0	13.0	.00233		
	AVG.	1.071	2.087	.333	50.9	34.7	.150	52.8	28.0	7,256.0	17.2	.00260		

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R ** @ 77°F	HVEEM ** STABILITY		INDIRECT TENSION **		
					UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN
III	2-11	.843	2.112	.337	73.1	43.7	.164	76.5	47.1	14,759.0	29.0	.00196
	2-13	1.380	2.089	.349	45.1	26.5	.270	47.9	29.2	22,539.0	36.0	.00160
	2-16	1.484	2.112	.288	40.3	23.8	.272	40.4	23.9	26,143.0	31.0	.00119
	AVG.	1.236	2.104	.325	52.8	31.3	.235	54.9	33.4	21,147.0	32.0	.00158

Table 3B. (Continued) Test Sequence II results for Item 340 Type "D" cores using Dorchester AC-20, U.S. 82, Dickens, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY		M_R*** @ 77°F	HVEEM*** STABILITY		INDIRECT TENSION***			*** MARSHALL STABILITY	*** MARSHALL FLOW
								UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN		
IV	2-1	1.373	2.097			.348		42.1	23.3	.052	37.2	18.4	1,918.0	12.0	.00626		
	2-4	1.216	2.101			.287		44.7	22.7	.052	33.9	12.0	1,238.0	10.0	.00808		
	2-6	1.488	2.101			.277		33.6	17.2	.046	32.4	15.9	+	+	+		
	2-9	1.340	2.085			.238		37.5	18.0	.017	+	+				+	+
	2-18	1.337	2.095			.327		42.7	23.1	.039	35.7	16.1				121.0	13
	2-19	1.374	2.093			.235		38.8	20.0	.037	37.9	19.1				33.3	17
	AVG.	1.355	2.095			.285		39.9	20.7	.041	35.4	16.3	1,578.0	11.0	.00717	77.2	15

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	INDIRECT TENSION			RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
								MODULUS	STRESS	STRAIN		
V	2-7	1.347	2.088	1.707	1.204	.277	.059	27,716.0	83.0	.00299	2.439	14.4
	2-12	1.387	2.101	2.009	1.382	.343	.076	32,044.0	115.0	.00359	2.419	13.2
	2-14	1.348	2.084	2.132	1.235	.326	.058	32,641.0	97.0	.00297	2.449	14.9
	2-15	1.464	2.087	1.641	1.171	.284	.056	22,769.0	82.0	.00360	2.419	13.7
	AVG.	1.387	2.090	1.872	1.248	.308	.062	28,792.5	94.3	.00329	2.432	14.1

* Denotes Test Results Following the Accelerated (24 hour) Lottman Moisture Treatment Procedure.

** Denotes Test Results Following the 7-day Soak Period.

*** Denotes Test Results Following the (18 cycle) Lottman Moisture Treatment Procedure.

\+ See attached notes.

M_R Modulus of Resiliency.

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In Table 3A (MacMillan AC-20) the sample (1-5) in the fourth leg of the test procedure fell apart after the standard Lottman. The Marshall tests could not be performed, and therefore there are no results. The sample (1-9) was damaged in the Hveem stability test after the Lottman in leg 4. No Marshall tests could be performed.

In Table 3B (Dorchester AC-20), the sample (2-9) fell apart after the standard Lottman, and no further testing could be performed. The sample (2-6) was damaged in the Hveem stability test following the standard Lottman. Both samples were in the fourth leg sequence.

In Table 3C (Exxon AC-20), the samples [(3-10), (3-11)] fell apart after the standard Lottman in the fourth leg. No other tests could be performed.

In Table 3G (Cosden, AC-10) in the 3rd leg, all of the samples were allowed to completely dry out. After they were relocated, they were allowed to soak at 77°F over a weekend. The Hveem stability test was run at 77°F. Also, starting with 3G, the 4th leg was dropped from the testing procedure sequence. Only the resilient modulus tests (-13°F, 33°F, 77°F, and 104°F) were performed. The sequence was modified due to the long period of time required to perform the 18-cycle Lottman testing performance.

Table 3C. Test Sequence II results for Item 340 Type "D" cores using Exxon AC-20, U.S. 82, Dickens, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY			PENETRATION		RING & BALL	PERCENT ASPHALT
							@ 77°F	@ 140°F	@ 275°F	39.2°F	77°F		
I	3-3	1.352	2.173	.211	986	10							
	3-9	1.217	2.160	.181	1,188	12							
	3-16	1.186	2.139	.165	1,105	11							
	AVG.	1.252	2.157	.186	1,093	11	8.0×10^6	5,523	8.082	8	32	137	6.19

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R * @ 77°F	HVEEM* STABILITY		INDIRECT TENSION*			MARSHALL STABILITY	MARSHALL FLOW
					UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN		
II	3-2	1.431	2.173	.248	44.4	26.8	.181	43.9	26.3	13.045.0	39.0	.00299		
	3-8	1.292	2.163	.200	45.4	24.9	.172	48.1	27.7	9,460.0	34.0	.00359		
	3-18	1.214	2.163	.177	51.6	29.7	.123	51.0	29.0	9,445.0	28.0	.00296		
	AVG.	1.312	2.166	.208	47.1	27.1	.159	47.7	27.7	10,650.0	33.2	.00397		

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R ** @ 77°F	HVEEM ** STABILITY		INDIRECT TENSION **		
					UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN
III	3-6	1.398	2.170	.227	48.1	29.8	.204	48.6	30.3	13,158.0	63.0	.00479
	3-7	1.279	2.164	.196	46.5	25.9	.182	55.7	35.0	16,670.0	53.0	.00318
	3-14	1.247	2.160	.176	48.1	26.8	.164	59.2	37.9	14,160.0	56.0	.00395
	AVG.	1.308	2.165	.200	47.6	27.5	.183	54.5	34.4	14,442.7	57.3	.00397

Table 3C.(Continued) Test Sequence II results for Item 340 Type "D" cores using Exxon AC-20, U.S. 82, Dickens, Texas

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R*** @ 77°F	HVEEM*** STABILITY UNC	HVEEM*** STABILITY THD	INDIRECT TENSION*** MODULUS	INDIRECT TENSION*** STRESS	INDIRECT TENSION*** STRAIN	*** MARSHALL STABILITY	*** MARSHALL FLOW
	3-4	1.376	2.165			.216		40.4	21.6	.048	37.7	19.0	2,917.0	19.0	.00651		
	3-10	1.218	2.147			.148		50.1	28.2	.035	+	+				+	+
IV	3-11	1.353	2.140			.164		42.9	23.7	.046	+	+				+	+
	3-13	1.229	2.150			.194		47.9	26.3	.046	52.6	31.0	4,082.0	16.0	.00392		
	3-15	1.144	2.150			.169		50.6	27.3	.039	51.7	28.3	3,362.0	16.0	.00476		
	3-17	1.289	2.157			.159		40.8	20.3	.040	41.4	21.0				93	15
	AVG.	1.268	2.152			.175		45.5	24.6	.042	45.9	24.8	3,453.7	17.0	.00490	93	15

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN	RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
	3-1	1.432	2.152	2.026	1.307	.260	.049	18,622.0	89.0	.00478	2.400	10.3
V	3-5	1.420	2.155	2.004	1.233	.210	.043	15,128.0	81.0	.00535	2.387	9.7
	3-12	1.196	2.157	2.357	1.068	.180	.039	12,162.0	80.0	.00658	2.392	9.8
	AVG.	1.349	2.155	2.129	1.203	.217	.044	15,304.0	83.3	.00557	2.393	9.9

* Denotes Test Results Following the Accelerated (24 hour) Lottman Moisture Treatment Procedure.

** Denotes Test Results Following the 7-day Soak Period.

*** Denotes Test Results Following the (18 cycle) Lottman Moisture Treatment Procedure.

++ See attached notes.

M_R Modulus of Resiliency.

US 82 DICKENS, TEXAS PROBLEMS

In Table 3A (MacMillan AC-20) the sample (1-5) in the fourth leg of the test procedure fell apart after the standard Lottman. The Marshall tests could not be performed, and therefore there are no results. The sample (1-9) was damaged in the Hveem stability test after the Lottman in leg 4. No Marshall tests could be performed.

In Table 3B (Dorchester AC-20), the sample (2-9) fell apart after the standard Lottman, and no further testing could be performed. The sample (2-6) was damaged in the Hveem stability test following the standard Lottman. Both samples were in the fourth leg sequence.

In Table 3C (Exxon AC-20), the samples [(3-10), (3-11)] fell apart after the standard Lottman in the fourth leg. No other tests could be performed.

In Table 3G (Cosden, AC-10) in the 3rd leg, all of the samples were allowed to completely dry out. After they were relocated, they were allowed to soak at 77°F over a weekend. The Hveem stability test was run at 77°F. Also, starting with 3G, the 4th leg was dropped from the testing procedure sequence. Only the resilient modulus tests (-13°F, 33°F, 77°F, and 104°F) were performed. The sequence was modified due to the long period of time required to perform the 18-cycle Lottman testing performance.

Table 3D. Test Sequence II results for Item 340 Type "D" cores using Shamrock AC-20, U.S. 82, Dickens, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY @ 77°F	VISCOSITY @ 140°F	VISCOSITY @ 275°F	PENETRATION 39.2°F	PENETRATION 77°F	RING & BALL	PERCENT ASPHALT
I	4-3	1.215	2.114	.315	674	20							
	4-14	1.193	2.180	.253	1,147	9							
	4-16	1.331	2.117	.266	982	13							
	AVG.	1.246	2.137	.278	934	14	$1.2x10^7$	12,300	11.762	5	25	143°	5.86

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R * @ 77°F	HVEEM* STABILITY UNC	HVEEM* STABILITY THD	INDIRECT TENSION* MODULUS	INDIRECT TENSION* STRESS	INDIRECT TENSION* STRAIN	MARSHALL STABILITY	MARSHALL FLOW
II	4-4	1.376	2.139	.264	46.2	27.4	.173	41.4	22.6	11,628.0	34.7	.00298		
	4-5	1.494	2.121	.290	42.7	26.3	.205	37.5	21.2	10,412.0	37.3	.00358		
	4-15	1.457	2.131	.244	39.9	22.0	.185	33.9	16.8	10,982.0	32.8	.00299		
	AVG.	1.442	2.130	.266	42.9	25.2	.188	37.6	20.2	11,007.3	34.9	.00318		

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R ** @ 77°F	HVEEM ** STABILITY UNC	HVEEM ** STABILITY THD	INDIRECT TENSION ** MODULUS	INDIRECT TENSION ** STRESS	INDIRECT TENSION ** STRAIN
III	4-8	1.258	2.105	.289	44.6	23.5	.189	46.6	25.5	11,356.0	47.4	.00417
	4-10	1.437	2.151	.264	50.5	33.0	.167	51.7	48.1	14,846.0	44.3	.00298
	4-17	1.415	2.156	.240	44.3	26.4	.201	48.1	30.1	14,134.0	30.6	.00358
	AVG.	1.370	2.137	.264	46.5	27.6	.186	48.8	34.6	13,445.3	40.8	.00358

Table 3D. (Continued) Test Sequence II results for Item 340 Type "D" cores using Shamrock AC-20, U.S. 82, Dickens, Texas

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R^{***} @ 77°F	HVEEM*** STABILITY UNC	HVEEM*** STABILITY THD	INDIRECT TENSION*** MODULUS	INDIRECT TENSION*** STRESS	INDIRECT TENSION*** STRAIN	*** MARSHALL STABILITY	*** MARSHALL FLOW
IV	4-2	1.487	2.120			.282		36.9	20.3	.060	39.5	23.0	8,637.0	34.0	.00394		
	4-6	1.357	2.132			.237		42.0	22.9	.075	41.0	21.9	5,792.0	28.0	.00483		
	4-11	1.507	2.138			.258		40.7	24.6	.157	41.7	25.6	13,316.0	42.0	.00315		
	4-12	1.330	2.151			.228		50.8	31.1	.067	47.9	28.3				446	18
	4-13	1.378	2.151			.239		47.0	28.3	.071	50.5	31.8				515	16
	4-18	1.556	2.151			.236		39.0	23.9	.081	40.8	25.7				375	13
	AVG.	1.436	2.141			.247		42.7	26.1	.085	43.6	26.1	9,248.3	34.7	.00397	445	16

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN	RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
V	4-1	1.410	2.141	1.413	.980	.279	.051	9,456.0	56.0	.00592	2.383	10.2
	4-7	1.295	2.129	1.978	1.010	.253	.051	9,724.0	52.0	.00535	2.364	9.9
	4-9	1.282	2.141	1.810	.921	.238	.042	6,619.0	44.0	.00665	2.377	9.9
	AVG.	1.329	2.137	1.734	.970	.257	.048	8,599.7	50.7	.00597	2.375	10.0

* Denotes Test Results Following the Accelerated (24 hour) Lottman Moisture Treatment Procedure.

** Denotes Test Results Following the 7-day Soak Period.

*** Denotes Test Results Following the (18 cycle) Lottman Moisture Treatment Procedure.

\+ Denotes No Test Values Available.

M_R Modulus of Resiliency.

Table 3E. Test Sequence II results for Item 340 Type "D" cores using Shamrock AC-10, U.S. 82, Dickens, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY			PENETRATION		RING & BALL	PERCENT ASPHALT
							@ 77°F	@ 140°F	@ 275°F	39.2°F	77°F		
I	5-3	1.796	2.128	.261	1029	10							
	5-6	1.795	2.095	.204	895	12							
	5-7	1.401	2.108	.285	1439	12							
	AVG.	1.663	2.110	.250	1121	11	1.7×10^7	12439	7.289	15	37	139.5	+

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R* @ 77°F	HVEEM* STABILITY		INDIRECT TENSION*			MARSHALL STABILITY	MARSHALL FLOW
										MODULUS	STRESS	STRAIN		
II	5-1	1.647	2.074	.251	37.9	24.6	.103	30.2	16.9	7207	14.5	.00201		
	5-5	1.782	2.107	.234	38.1	27.5	.116	34.5	23.9	7668	26.4	.00345		
	5-9	1.651	2.078	.238	34.9	21.6	.093	32.2	19.0	5956	13.7	.00230		
	AVG.	1.693	2.086	.241	37.0	24.6	.104	32.3	19.9	6944	18.2	.00259		

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R** @ 77°F	HVEEM** STABILITY		INDIRECT TENSION**		
										MODULUS	STRESS	STRAIN
III	5-2	1.767	2.120	.218	34.7	23.8	.107	36.9	26.6	8360.0	28.8	.00345
	5-4	1.646	2.103	.274	37.2	23.9	.127	34.8	21.5	8273.4	28.5	.00345
	5-8	1.688	2.084	.115	35.1	22.6	.102	31.2	18,7	5048.8	18.9	.00373
	AVG.	1.700	2.102	.202	35.7	23.4	.112	34.3	22.3	7227.4	25.4	.00354

Table 3E. (Continued) Test Sequence II results for Item 340 Type "D" cores using Shamrock AC-10, U.S. 82, Dickens, Texas

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY		M_R*** @77°F	HVEEM*** STABILITY		MARSHALL*** STABILITY	MARSHALL FLOW***	INDIRECT TENSION*** MODULUS	INDIRECT TENSION*** STRESS	INDIRECT TENSION*** STRAIN
	5-10	1.678	2.049	1.215	.741	.230	.086	41.2	28.5	.011	31.9	19.3	135	16			
	5-13	1.704	2.039	1.234	.838	.210	.067	35.7	23.5	.011	30.0	17.8	104	16			
	5-15	1.474	2.035	1.496	.871	.256	.080	39.1	22.3	.015	30.8	13.1	76	11			
IV	5-17	1.543	2.039	1.471	.874	.238	.082	35.1	19.7	.014	30.2	14.8			3721.7	8.3	.00223
	5-11	1.686	2.058	1.219	.848	.228	.080	35.3	22.8	.015	27.2	14.6			697.3	7.9	.01133
	5-12	2.065	2.065	1.176	.651	.176	.058	34.8	29.8	.014	23.0	18.1			918.7	5.5	.00595
	AVG.	1.692	2.048	1.302	.804	.223	.076	36.9	24.4	.013	28.9	16.3	105	14	1779.2	7.2	.00650

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN	RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
	5-14	1.754	2.037	.211	19435.3	72.6	.00373	2.391	14.9
	5-16	1.640	2.054	.251	28035.6	80.5	.00287	2.398	14.2
V	5-18	1.656	2.062	.276	18637.2	75.0	.00402	2.390	13.8
	AVG.	1.683	2.051	.246	22036.0	76.0	.00354	2.393	14.3

NOTES:

** Denotes Test Results Following The 7-day Soak Period.

*** Denotes Test Results Following The (18 cycle) Lottman Moisture Treatment Procedure.

† Denotes No Test Values Available.

M_R Modulus of Resiliency.

Table 3F. Test Sequence II results for Item 340 Type "D" cores using Cosden AC-20, U.S. 82, Dickens, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY @ 77°F	VISCOSITY @ 140°F	VISCOSITY @ 275°F	PENETRATION 39.2°F	PENETRATION 77°F	RING & BALL	PERCENT ASPHALT
I	6-6	1.413	2.090	.446	1167	9							
	6-9	1.250	2.092	.427	1194	10							
	6-11	1.375	2.106	.425	1299	10							
	AVG.	1.346	2.096	.433	1220	10	3.0×10^7	15,466	7.447	0	18	142	5.25

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R @ 77°F	HVEEM* STABILITY UNC	HVEEM* STABILITY THD	INDIRECT TENSION* MODULUS	INDIRECT TENSION* STRESS	INDIRECT TENSION* STRAIN	MARSHALL STABILITY	MARSHALL FLOW
II	6-3	1.578	2.102	.429	42.1	24.7	.200	37.8	23.1	41,854.0	49.2	.00117		
	6-5	1.547	2.101	.461	43.6	28.3	.215	35.8	20.5	46,894.9	42.7	.00091		
	6-14	1.450	2.108	.440	44.5	27.3	.215	38.8	21.5	43,035.9	41.7	.00097		
	AVG.	1.525	2.104	.443	43.4	27.7	.210	37.5	21.7	43,928.3	44.5	.00102		

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN
III	6-2	1.492	2.098	.444	44.8	28.4	.260	52.9	36.5	51,824.2	62.4	.00120
	6-12	1.400	2.104	.437	47.7	29.4	.258	53.4	35.1	55,515.3	62.0	.00112
	6-17	1.400	2.097	.435	45.8	27.5	.216	49.4	31.2	39,814.0	40.9	.00103
	AVG.	1.431	2.100	.439	46.1	28.4	.245	51.9	34.2	49,051.2	55.1	.00112

Table 3F. (Continued) Test Sequence II results for Item 340 Type "D" cores using Cosden AC-20, U.S. 82, Dickens, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R*** @ 77°F	HVEEM*** STABILITY UNC	HVEEM*** STABILITY THD	INDIRECT TENSION*** MODULUS	INDIRECT TENSION*** STRESS	INDIRECT TENSION*** STRAIN	*** MARSHALL STABILITY	*** MARSHALL FLOW
	6-1	1.702	2.101	3.114	1.330	.435	.058	32.1	19.9	.234	37.8	25.6				618	23
	6-4	1.549	2.092	3.420	1.356	.391	.055	40.1	24.8	.286	47.1	31.8				800	21
IV	6-7	1.400	2.098	2.120	1.417	.428	.054	43.7	25.5	.215	42.0	23.8				716	20
	6-13	1.400	2.111	2.191	1.531	.428	.055	48.3	30.1	.233	41.8	23.6	27,472.6	65.4	.00238		
	6-15	1.450	2.105	2.178	1.463	.381	.062	42.4	25.1	.239	38.4	21.1	41,517.9	65.9	.00159		
	6-18	1.582	2.099	2.184	1.471	.300	.054	47.9	33.3	.232	44.3	29.7	29,174.5	69.4	.00238		
	AVG.	1.514	2.101	2.534	1.482	.394	.056	40.6	26.5	.240	41.9	25.9	32,721.7	66.9	.00212	711	21

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	@ -13°F	@ 33°F	@ 77°F	@ 104°F	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN	RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
	6-8	1.325	2.085			.445		85,534.6	102.1	.00119	2.379	12.4
V	6-10	1.238	2.099			.432		28,241.5	151.7	.00537	2.366	11.3
	6-16	1.813	2.112			.492		55,432.6	132.3	.00239	2.391	11.7
	AVG.	1.125	2.099			.456		56,402.9	128.7	.00298	2.379	11.8

* Denotes Test Results Following the Accelerated (24 hour) Lottman Moisture Treatment Procedure.

** Denotes Test Results Following the 7-day Soak Period.

*** Denotes Test Results Following the (18 cycle) Lottman Moisture Treatment Procedure.

\+ Denotes No Test Values Available.

M_R Modulus of Resiliency.

Table 3G. Test Sequence II results for Item 340 Type "D" cores using Cosden AC-10, U.S. 82, Dickens, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY			PENETRATION		RING & BALL	PERCENT ASPHALT
							@ 77°F	@ 140°F	@ 275°F	39.2°F	77°F		
I	7-5	1.280	2.086	.156	963	14							
	7-10	1.341	2.078	.168	1,071	12							
	7-15	1.492	2.098	.161	1,001	14							
	AVG.	1.371	2.087	.162	1,012	13	1.85×10^7	23,115	9.7	10	21	141°	4.23

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R @ 77°F	HVEEM* STABILITY		INDIRECT TENSION*			MARSHALL STABILITY	MARSHALL FLOW
					UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN		
II	7-1	1.444	2.071	.156	38.0	20.6	.129	41.9	24.6	14,732	19.3	.00131		
	7-3	1.459	2.059	.150	40.7	23.6	.135	40.1	23.0	4,409	11.2	.00254		
	7-9	1.445	2.068	.185	36.6	19.2	.121	42.8	25.4	14,667	13.2	.00090		
	AVG.	1.449	2.066	.164	38.4	21.1	.128	41.6	24.3	11,269	14.6	.00158		

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R @ 77°F	HVEEM STABILITY		INDIRECT TENSION		
					UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN
III	7-6	1.486	2.067	.156	39.1	22.6	.072	32.8	16.3	3,038.4	14.5	.00476
	7-7	1.213	2.059	.141	44.4	22.5	.045	39.8	17.8	1,930.0	9.2	.00476
	7-12	1.535	2.082	.126	34.4	18.8	.055	24.5	TLTC	1,307.3	10.4	.00793
	AVG.	1.411	2.069	.141	39.3	21.3	.057	32.4	17.1	2,091.9	11.4	.00582

Table 3G. (Continued) Test Sequence II results for Item 340 Type "D" cores using Cosden AC-10, U.S. 82, Dickens, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R*** @ 77°F	HVEEM*** STABILITY UNC	HVEEM*** STABILITY THD	INDIRECT TENSION*** MODULUS	INDIRECT TENSION*** STRESS	INDIRECT TENSION*** STRAIN	*** MARSHALL STABILITY	*** MARSHALL FLOW
	7-6	1.486	2.058	1.255	.549	.106	.028	++									
IV	7-8	1.213	2.050	1.292	.766	.123	.032	++									
	7-14	1.535	2.095	1.869	.742	.151	.041	++									
	AVG.	1.411	2.068	1.472	.686	.127	.034										

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	@ -13°F	@ 33°F	@ 77°F	@ 104°F	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN	RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
	7-4	1.267	2.055			.130		1,420.7	50.9	.03583	2.428	15.4
V	7-13	1.288	2.100			.134		1,378.3	57.6	.04179	2.423	13.3
	7-16	1.293	2.070			.119		1,008.3	54.2	.05375	2.429	14.8
	AVG.	1.283	2.075			.128		1,269.1	54.2	.04379	2.427	14.5

* Denotes Test Results Following the Accelerated (24 hour) Lottman Moisture Treatment Procedure.

** Denotes Test Results Following the 7-day Soak Period.

*** Denotes Test Results Following the (18 cycle) Lottman Moisture Treatment Procedure.

++ See attached notes.

M_R Modulus of Resiliency.

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In Table 3A (MacMillan AC-20) the sample (1-5) in the fourth leg of the test procedure fell apart after the standard Lottman. The Marshall tests could not be performed, and therefore there are no results. The sample (1-9) was damaged in the Hveem stability test after the Lottman in leg 4. No Marshall tests could be performed.

In Table 3B (Dorchester AC-20), the sample (2-9) fell apart after the standard Lottman, and no further testing could be performed. The sample (2-6) was damaged in the Hveem stability test following the standard Lottman. Both samples were in the fourth leg sequence.

In Table 3C (Exxon AC-20), the samples [(3-10), (3-11)] fell apart after the standard Lottman in the fourth leg. No other tests could be performed.

In Table 3G (Cosden, AC-10) in the 3rd leg, all of the samples were allowed to completely dry out. After they were relocated, they were allowed to soak at 77^{o}F over a weekend. The Hveem stability test was run at 77^{o}F. Also, starting with 3G, the 4th leg was dropped from the testing procedure sequence. Only the resilient modulus tests (-13^{o}F, 33^{o}F, 77^{o}F, and 104^{o}F) were performed. The sequence was modified due to the long period of time required to perform the 18-cycle Lottman testing performance.

Table 4A. Test Sequence II results for Item 340 Type "D" cores using MacMillan AC-10, U.S. 287, Dumas, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY @ 77°F	VISCOSITY @ 140°F	VISCOSITY @ 275°F	PENETRATION 39.2°F	PENETRATION 77°F	RING & BALL	PERCENT ASPHALT
I	1-2	1.604	2.138	.149	1,180	11							
	1-7	1.313	2.123	.165	982	13							
	1-17	1.707	2.115	.122	894	12							
	AVG.	1.541	2.125	.145	1,019	12	7.0×10^5	1,453	3.592	30	90	116°	4.01

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R * @ 77°F	HVEEM* STABILITY UNC	HVEEM* STABILITY THD	INDIRECT TENSION* MODULUS	INDIRECT TENSION* STRESS	INDIRECT TENSION* STRAIN	MARSHALL STABILITY	MARSHALL FLOW
II	1-4	1.535	2.130	.129	50.8	35.2	.011	27.6	11.9	10,857.8	77.8	.00716		
	1-9	1.707	2.107	.091	43.3	31.2	.014	28.0	15.9	11,207.1	76.9	.00686		
	1-12	1.555	2.122	.143	48.5	33.4	.044	40.6	25.5	14,405.1	77.4	.00537		
	AVG.	1.599	2.120	.121	47.5	33.3	.023	32.1	17.8	12,156.7	77.4	.00646		

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R ** @ 77°F	HVEEM ** STABILITY UNC	HVEEM ** STABILITY THD	INDIRECT TENSION ** MODULUS	INDIRECT TENSION ** STRESS	INDIRECT TENSION ** STRAIN
III	1-1	1.558	2.143	.144	57.0	41.9	.035	+	+	2,795.6	20.0	.00716
	1-5	1.570	2.131	.149	48.6	33.7	.023	+	+	849.2	5.1	.00579
	1-14	1.709	2.109	.129	44.7	32.7	.037	+	+	7,801.8	46.6	.00597
	AVG.	1.612	2.128	.141	50.1	36.1	.032	+	+	3,815.5	23.9	.00631

Table 4A. (Continued) Test Sequence II results for Item 340 Type "D" cores using MacMillan AC-10, U.S. 287, Dumas, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R^{***} @ 77°F	HVEEM*** STABILITY UNC	HVEEM*** STABILITY THD	INDIRECT TENSION*** MODULUS	INDIRECT TENSION*** STRESS	INDIRECT TENSION*** STRAIN	*** MARSHALL STABILITY	*** MARSHALL FLOW
IV	1-3	1.555	2.091	1.377	.751	.141	.026	48.5	33.4	.018	32.5	17.4				50	9
	1-8	1.516	2.129	1.547	.788	.125	.030	52.8	36.9	.031	41.2	25.3				181	4
	1-10	1.559	2.114	1.416	.785	.121	.026	47.3	32.2	.029	35.7	20.7				175	11
	1-13	1.608	2.111	1.588	.805	.125	.026	49.5	35.4	.035	38.6	24.5	2,709.8	15.0	.00555		
	1-16	1.667	2.118	1.692	.823	.115	.026	47.5	34.6	.033	39.9	27.0	2,785.9	15.5	.00555		
	1-18	1.646	2.129	1.639	.913	.146	.029	47.3	33.9	.044	41.0	27.6	3,413.6	19.0	.00555		
	AVG.	1.592	2.115	1.543	.811	.129	.027	48.8	34.4	.032	38.2	23.8	2,969.8	16.5	.00555	135	8

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN	RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
V	1-6	1.388	2.124			.159		13,928.9	49.9	.00358	2.451	13.3
	1-11	1.363	2.110			.115		12,717.0	49.3	.00388	2.459	14.2
	1-15	1.602	2.130			.134		13,060.6	50.7	.00388	2.465	13.6
	AVG.	1.451	2.121			.136		13,235.5	50.0	.00378	2.458	13.7

* Denotes Test Results Following the Accelerated (24 hour) Lottman Moisture Treatment Procedure.

** Denotes Test Results Following the 7-day Soak Period.

*** Denotes Test Results Following the (18 cycle) Lottman Moisture Treatment Procedure.

\+ Denotes No Test Values Available.

M_R Modulus of Resiliency.

US 287 DUMAS, TEXAS PROBLEMS

In Table 4A (MacMillan AC-10) the results for the Hveem stability test following the 7-day soak and resilient modulus (77°F) tests were lost in the lab.

In Table 4C (Exxon AC-10) the asphalt properties were lost and no samples could be located to rerun an extraction and recovery. In the 2nd leg, all samples fell apart before the testing sequence could be completed. In the 4th leg the samples (3-5, 3-18) were damaged during the testing sequence and no further tests could be run on them.

In Table 4E (Shamrock AC-10), the 4th leg testing sequence was discontinued due to the long period of time required to perform the 18-cycle Lottman. The program has been revised to include the resilient modulus tests at different temperatures in another leg. Also, there are no results for the indirect tension test run on Sample 5-8 because the test was incorrectly run.

Table 4B. Test Sequence II results for Item 340 Type "D" cores using Dorchester AC-10, U.S. 287, Dumas, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY @ 77°F	VISCOSITY @ 140°F	VISCOSITY @ 275°F	PENETRATION 39.2°F	PENETRATION 77°F	RING & BALL	PERCENT ASPHALT
I	2-2	1.192	2.154	.295	1460	11							
	2-7	1.251	2.146	.323	1405	10							
	2-15	1.128	2.157	.292	1362	10							
	AVG.	1.190	2.152	.303	1409	10	1.28×10^6	1930	4.043	26	71	123°	4.99

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R @ 77°F	HVEEM* STABILITY UNC	HVEEM* STABILITY THD	INDIRECT TENSION* MODULUS	INDIRECT TENSION* STRESS	INDIRECT TENSION* STRAIN	MARSHALL STABILITY	MARSHALL FLOW
II	2-1	1.242	2.146	.275	58.7	37.3	.031	43.3	21.9	2957.9	17.9	.00607		
	2-9	1.180	2.145	.328	61.1	38.5	.035	47.5	24.9	2890.9	17.5	.00607		
	2-17	1.246	2.146	.325	57.5	36.2	.034	43.7	22.4	3316.9	17.9	.00539		
	AVG.	1.223	2.146	.309	59.1	37.3	.033	44.8	23.1	3055.2	17.8	.00584		

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN
III	2-3	1.037	2.147	.317	69.2	43.7	.031	54.3	28.8	4175.2	25.3	.00607
	2-12	1.263	2.155	.321	57.0	36.0	.035	43.0	22.1	4541.0	21.4	.00472
	2-16	1.214	2.148	.348	58.3	36.3	.044	41.2	19.2	3890.7	23.6	.00607
	AVG.	1.171	2.150	.329	61.5	38.7	.037	46.2	23.4	4202.3	23.4	.00562

Table 4B. (Continued) Test Sequence II results for Item 340 Type "D" cores using Dorchester AC-10, U.S. 287, Dumas, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R*** @ 77°F	HVEEM*** STABILITY UNC	HVEEM*** STABILITY THD	INDIRECT TENSION*** MODULUS	INDIRECT TENSION*** STRESS	INDIRECT TENSION*** STRAIN	*** MARSHALL STABILITY	*** MARSHALL FLOW
IV																	
	AVG.																

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	@ -13°F	@ 33°F	@ 77°F	@ 104°F	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN	RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
V	2-8	1.226	2.150	1.784	.981	.310	.094	36920.6	74.6	.00202	2.453	12.4
	2-13	1.202	2.156	1.906	1.085	.332	.098	29471.3	79.4	.00270	2.447	11.9
	2-18	1.204	2.147	1.787	1.093	.315	.099	28932.0	78.0	.00270	2.450	12.4
	AVG.	1.211	2.151	1.826	1.053	.319	.097	31774.6	77.3	.00247	2.450	12.2

* Denotes Test Results Following the Accelerated (24 hour) Lottman Moisture Treatment Procedure.

** Denotes Test Results Following the 7-day Soak Period.

*** Denotes Test Results Following the (18 cycle) Lottman Moisture Treatment Procedure.

\+ Denotes No Test Values Available.

M_R Modulus of Resiliency.

Table 4C. Test Sequence II results for Item 340 Type "D" cores using Exxon AC-10, U.S. 287, Dumas, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY @ 77°F	VISCOSITY @ 140°F	VISCOSITY @ 275°F	PENETRATION 39.2°F	PENETRATION 77°F	RING & BALL	PERCENT ASPHALT
	3-4	1.252	2.072	.154	905	9							
	3-8	1.295	2.081	.187	893	12							
I	3-15	1.380	2.113	.210	1,099	11							
	AVG.	1.309	2.089	.184	967	11	++						

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R @ 77°F	HVEEM* STABILITY UNC	HVEEM* STABILITY THD	INDIRECT TENSION* MODULUS	INDIRECT TENSION* STRESS	INDIRECT TENSION* STRAIN	MARSHALL STABILITY	MARSHALL FLOW
	3-2	1.381	2.057	.179	41.9	23.3	++							
	3-12	1.324	2.109	.214	57.7	37.9	.023	++						
II	3-17	1.387	2.055	.194	40.6	22.1	++							
	AVG.	1.364	2.074	.196	46.7	27.8	.023							

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN
	3-6	1.304	2.058	.189	44.2	24.1	.021	56.2	36.0	485.7	4.64	.00955
	3-10	1.303	2.098	.224	48.6	28.4	.037	36.1	16.0	3,958.0	16.54	.00418
III	3-14	1.394	2.118	.243	55.5	37.1	.052	36.5	18.1	2,608.6	17.13	.00567
	AVG.	1.334	2.091	.219	49.4	29.9	.037	42.9	23.4	2,350.7	12.77	.00676

Table 4C. (Continued) Test Sequence II results for Item 340 Type "D" cores using Exxon AC-10, U.S. 287, Dumas Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R*** @ 77°F	HVEEM*** STABILITY UNC	HVEEM*** STABILITY THD	INDIRECT TENSION*** MODULUS	INDIRECT TENSION*** STRESS	INDIRECT TENSION*** STRAIN	*** MARSHALL STABILITY	*** MARSHALL FLOW
IV	3-1	1.306	2.043	1.361	1.051	.195	.035	45.4	25.3	.054	34.8	14.6				89	17
	3-5	1.361	2.061	1.106	0.846	.134	.040	48.1	29.1	++							
	3-9	1.302	2.087	1.427	0.876	.151	.045	41.4	21.2	.040	30.9	10.7				72	13
	3-13	1.335	2.096	1.239	0.819	.175	.043	48.1	28.6	.092	42.0	22.4				266	14
	3-16	1.457	2.123	1.561	1.061	.213	.044	60.8	41.2	.131	51.7	34.6	2,508.1	37.8	.01507		
	3-18	1.494	2.047	1.226	0.854	.142	.028	38.0	21.6	.074	33.7	17.3	++				
	AVG.	1.376	2.076	1.320	0.918	.168	.039	47.0	27.8	.078	38.6	19.9	2,508.1	37.8	.01507	142	15

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	@ -13°F	@ 33°F	@ 77°F	@ 104°F	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN	RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
V	3-3	1.379	2.074			.202		16,989.5	69.2	.00408	2.469	15.8
	3-7	1.331	2.084			.201		19,301.2	69.4	.00359	2.463	15.4
	3-11	1.181	2.096			.214		18,666.5	70.1	.00375	2.455	14.9
	AVG.	1.297	2.085			.206		18,319.1	69.6	.00381	2.462	15.4

* Denotes Test Results Following the Accelerated (24 hour) Lottman Moisture Treatment Procedure.

** Denotes Test Results Following the 7-day Soak Period.

*** Denotes Test Results Following the (18 cycle) Lottman Moisture Treatment Procedure.

++ See attached notes.

M_R Modulus of Resiliency.

US 287 DUMAS, TEXAS PROBLEMS

In Table 4A (MacMillan AC-10) the results for the Hveem stability test following the 7-day soak and resilient modulus (77^{o}F) tests were lost in the lab.

In Table 4C (Exxon AC-10) the asphalt properties were lost and no samples could be located to rerun an extraction and recovery. In the 2nd leg, all samples fell apart before the testing sequence could be completed. In the 4th leg the samples (3-5, 3-18) were damaged during the testing sequence and no further tests could be run on them.

In Table 4E (Shamrock AC-10), the 4th leg testing sequence was discontinued due to the long period of time required to perform the 18-cycle Lottman. The program has been revised to include the resilient modulus tests at different temperatures in another leg. Also, there are no results for the indirect tension test run on Sample 5-8 because the test was incorrectly run.

Table 4D. Test Sequence II results for Item 340 Type "D" cores using Shamrock AC-20, U.S. 287, Dumas, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY @ 77°F	VISCOSITY @ 140°F	VISCOSITY @ 275°F	PENETRATION 39.2°F	PENETRATION 77°F	RING & BALL	PERCENT ASPHALT
I	4-1	1.851	2.168	.395	1094	14							
	4-7	1.818	2.069	.411	1074	14							
	4-12	1.786	2.120	.373	905	12							
	AVG.	1.818	2.119	.393	1024	13	$5.8x10^6$	4468	8.41	10	41	130°	4.99

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R @ 77°F	HVEEM* STABILITY UNC	HVEEM* STABILITY THD	INDIRECT TENSION* MODULUS	INDIRECT TENSION* STRESS	INDIRECT TENSION* STRAIN	MARSHALL STABILITY	MARSHALL FLOW
II	4-3	2.003	2.158	.389	40.2	34.0	.096	31.3	25.1	14148.6	47.7	.00337		
	4-8	1.833	2.147	.385	37.9	28.3	.069	32.6	23.0	6135.2	34.7	.00566		
	4-20	1.837	2.147	.380	39.7	30.2	.069	29.5	20.0	7633.2	32.9	.00431		
	AVG.	1.891	2.151	.385	39.3	30.8	.078	31.1	22.7	9305.7	38.4	.00445		

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN
III	4-5	1.926	2.160	.402	40.5	32.8	.105	31.0	23.3	6621.4	44.6	.00674
	4-13	1.685	2.140	.317	41.2	28.7	.082	33.7	21.2	6131.8	26.4	.00431
	4-19	1.784	2.154	.281	39.4	28.9	.084	30.7	20.1	6288.0	33.9	.00539
	AVG.	1.798	2.151	.333	40.4	30.1	.090	31.8	21.5	6347.1	35.0	.00548

Table 4D. (Continued) Test Sequence II results for Item 340 Type "D" cores using Shamrock AC-20, U.S. 287, Dumas, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY		M_R*** @ 77°F	HVEEM*** STABILITY		INDIRECT TENSION***			*** MARSHALL STABILITY	*** MARSHALL FLOW
								UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN		
IV																	
	AVG.																

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	@ -13°F	@ 33°F	@ 77°F	@ 104°F	INDIRECT TENSION			RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
								MODULUS	STRESS	STRAIN		
V	4-6	1.856	2.162	1.809	1.156	.371	.088	26721.0	90.0	.00337	2.425	10.8
	4-13	1.856	2.108	1.549	1.095	.338	.082	31810.8	72.9	.00229	2.422	13.0
	4-18	1.780	2.158	1.816	1.120	.388	.088	38697.2	93.9	.00243	2.429	11.2
	AVG.	1.831	2.143	1.725	1.124	.366	.086	32409.7	85.6	.00270	2.425	11.6

* Denotes Test Results Following the Accelerated (24 hour) Lottman Moisture Treatment Procedure.

** Denotes Test Results Following the 7-day Soak Period.

*** Denotes Test Results Following the (18 cycle) Lottman Moisture Treatment Procedure.

\+ Denotes No Test Values Available.

M_R Modulus of Resiliency.

Table 4E. Test Sequence II results for Item 340 Type "D" cores using Shamrock AC-10, U.S. 287, Dumas, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY @ 77°F	VISCOSITY @ 140°F	VISCOSITY @ 275°F	PENETRATION 39.2°F	PENETRATION 77°F	RING & BALL	PERCENT ASPHALT
I	5-2	1.345	2.219	.148	1249	14							
	5-7	1.248	2.209	.154	1155	12							
	5-14	1.330	2.190	.169	893	16							
	AVG.	1.308	2.206	.157	1099	14	$2.0x10^6$	2263	4.813	15	57	123°	5.95

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R @ 77°F	HVEEM* STABILITY UNC	HVEEM* STABILITY THD	INDIRECT TENSION* MODULUS	INDIRECT TENSION* STRESS	INDIRECT TENSION* STRAIN	MARSHALL STABILITY	MARSHALL FLOW
II	5-6	1.472	2.214	.139	43.4	25.0	.054	35.9	19.1	2717.4	32.4	.012		
	5-11	1.379	2.202	.126	44.3	25.6	.065	40.1	21.5	2513.9	30.0	.012		
	5-16	1.414	2.189	.162	44.7	26.8	.059	37.3	19.4	2912.7	31.3	.011		
	AVG.	1.422	2.202	.142	44.1	25.8	.059	37.8	20.0	2714.7	31.2	.012		

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN
III	5-3	1.455	2.221	.163	43.1	26.0	.108	38.2	21.0	7753.9	60.2	.00776
	5-9	1.454	2.212	.150	42.3	25.2	.092	41.5	24.3	7195.0	55.8	.00776
	5-13	1.429	2.182	.162	42.2	24.5	.059	42.1	24.4	5187.8	31.0	.00576
	AVG.	1.446	2.205	.158	42.5	25.2	.086	40.6	23.2	6712.2	49.0	.00709

Table 4E. (Continued) Test Sequence II results for Item 340 Type "D" cores using Shamrock AC-10, U.S. 287, Dumas, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY		M_R*** @ 77°F	HVEEM*** STABILITY		INDIRECT TENSION***			*** MARSHALL STABILITY	*** MARSHALL FLOW
								UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN		
IV	5-1	1.403	2.227	1.509	.947	.136	.029	++									
	5-5	1.454	2.222	1.789	1.002	.163	.023	++									
	5-10	1.269	2.221	1.788	.934	.143	.027	++									
	5-12	1.319	2.200	1.579	.952	.169	.046	++									
	5-15	1.425	2.196	1.563	.902	.144	.040	++									
	5-18	1.438	2.213	1.350	1.010	.164	.031	++									
	AVG.	1.385	2.213	1.596	.958	.153	.033										

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	@ -13°F	@ 33°F	@ 77°F	@ 104°F	INDIRECT TENSION			RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
								MODULUS	STRESS	STRAIN		
V	5-4	1.350	2.216			.148		11851.9	70.736	.00597	2.364	6.3
	5-8	1.392	2.215			.123		+	+	+	2.366	6.3
	5-17	1.363	2.222			.170		13529.1	78.819	.00597	2.366	6.0
	AVG.	1.368	2.218			.147		12529.1	74.777	.00597	2.365	6.2

* Denotes Test Results Following the Accelerated (24 hour) Lottman Moisture Treatment Procedure.

** Denotes Test Results Following the 7-day Soak Period.

*** Denotes Test Results Following the (18 cycle) Lottman Moisture Treatment Procedure.

\+ Denotes No Test Values Available.

M_R Modulus of Resiliency.

++ See the footnote on the attached page.

US 287 DUMAS, TEXAS PROBLEMS

In Table 4A (MacMillan AC-10) the results for the Hveem stability test following the 7-day soak and resilient modulus (77^{O}F) tests were lost in the lab.

In Table 4C (Exxon AC-10) the asphalt properties were lost and no samples could be located to rerun an extraction and recovery. In the 2nd leg, all samples fell apart before the testing sequence could be completed. In the 4th leg the samples (3-5, 3-18) were damaged during the testing sequence and no further tests could be run on them.

In Table 4E (Shamrock AC-10), the 4th leg testing sequence was discontinued due to the long period of time required to perform the 18-cycle Lottman. The program has been revised to include the resilient modulus tests at different temperatures in another leg. Also, there are no results for the indirect tension test run on Sample 5-8 because the test was incorrectly run.

Table 4F. Test Sequence II results for Item 340 Type "D" cores using Cosden AC-20, U.S. 287, Dumas, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY @ 77°F	VISCOSITY @ 140°F	VISCOSITY @ 275°F	PENETRATION 39.2°F	PENETRATION 77°F	RING & BALL	PERCENT ASPHALT
I	6-1	1.580	2.155	.377	634	10							
	6-11	1.382	2.152	.393	606	11							
	6-17	1.471	2.152	.392	606	9							
	AVG.	1.478	2.153	.387	615	10	4.6×10^6	2453	5.800	8	43	126°	5.16

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R @ 77°F	HVEEM* STABILITY UNC	HVEEM* STABILITY THD	INDIRECT TENSION* MODULUS	INDIRECT TENSION* STRESS	INDIRECT TENSION* STRAIN	MARSHALL STABILITY	MARSHALL FLOW
II	6-2	1.576	2.176	.431	50.2	35.4	.229	48.8	34.1	37021.7	84.8	.00229		
	6-4	1.430	2.150	.396	50.5	32.9	.185	46.0	28.4	21568.6	63.9	.00297		
	6-7	1.366	2.131	.337	45.6	26.7	.187	40.8	21.8	17357.7	44.5	.00256		
	AVG.	1.457	2.152	.388	48.8	31.7	.200	45.2	28.1	25316.0	64.4	.00261		

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN
III	6-3	1.399	2.169	.422	54.3	36.1	.173	53.4	35.1	14702.7	61.4	.00418
	6-6	1.444	2.142	.397	50.7	33.3	.147	49.2	31.8	13738.0	46.3	.00337
	6-16	1.647	2.170	.395	45.1	31.8	.163	44.1	30.8	13495.5	61.8	.00458
	AVG.	1.497	2.160	.405	50.3	33.7	.161	48.9	32.2	13978.7	56.5	.00404

Table 4F. (Continued) Test Sequence II results for Item 340 Type "D" cores using Cosden AC-20, U.S. 287, Dumas, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY		M_R^{***} @ 77°F	HVEEM*** STABILITY		INDIRECT TENSION***			*** MARSHALL STABILITY	*** MARSHALL FLOW
								UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN		
IV																	
	AVG.																

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	@ -13°F	@ 33°F	@ 77°F	@ 104°F	INDIRECT TENSION			RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
								MODULUS	STRESS	STRAIN		
V	6-5	1.322	2.149	1.836	1.317	.401	.089	39406.1	90.3	.00229	2.398	10.2
	6-8	1.356	2.120	1.641	1.164	.314	.078	32655.3	88.0	.00270	2.387	11.4
	6-13	1.525	2.158	1.553	1.389	.405	.084	47184.3	101.8	.00216	2.390	9.8
	AVG.	1.401	2.142	1.677	1.290	.373	.084	39748.6	93.4	.00238	2.392	10.5

* Denotes Test Results Following the Accelerated (24 hour) Lottman Moisture Treatment Procedure.

** Denotes Test Results Following the 7-day Soak Period.

*** Denotes Test Results Following the (18 cycle) Lottman Moisture Treatment Procedure.

+ Denotes No Test Values Available.

M_R Modulus of Resiliency.

Table 4G. Test Sequence II results for Item 340 Type "D" cores using Cosden AC-10, U.S. 287, Dumas, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY			PENETRATION		RING & BALL	PERCENT ASPHALT
							@ 77°F	@ 140°F	@ 275°F	39.2°F	77°F		
I	7-1	1.392	2.106	.499	1116	10							
	7-7	1.494	2.100	.454	1046	10							
	7-11	1.427	2.093	.405	909	12							
	AVG.	1.438	2.100	.453	1024	11	8.5×10^6	4492	4.384	8	28	130°	5.26

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R @ 77°F	HVEEM* STABILITY		INDIRECT TENSION*			MARSHALL STABILITY	MARSHALL FLOW
					UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN		
II	7-5	1.561	2.099	.449	47.8	32.8	.136	35.3	20.3	21180.6	57.1	.00270		
	7-9	1.560	2.106	.450	42.9	27.9	.195	36.0	20.9	27249.6	73.5	.00270		
	7-13	1.460	2.084	.419	45.7	28.6	.204	37.5	20.4	34839.7	61.0	.00175		
	AVG.	1.527	2.096	.439	45.5	29.8	.178	36.3	20.5	27756.6	63.9	.00238		

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R @ 77°F	HVEEM STABILITY		INDIRECT TENSION		
					UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN
III	7-6	1.577	2.104	.481	42.9	28.2	.126	32.3	17.6	8904.3	44.4	.00499
	7-10	1.457	2.092	.432	47.4	30.2	.118	35.3	18.2	11022.0	37.1	.00337
	7-15	1.356	2.111	.428	52.1	33.0	.132	42.5	23.4	11843.0	39.9	.00337
	AVG.	1.463	2.102	.447	47.5	30.5	.125	36.7	19.7	10589.8	40.5	.00391

Table 4G. (Continued) Test Sequence II results for Item 340 Type "D" cores using Cosden AC-10, U.S. 287, Dumas, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY		M_R*** @ 77°F	HVEEM*** STABILITY		INDIRECT TENSION***			*** MARSHALL STABILITY	*** MARSHALL FLOW
								UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN		
IV																	
	AVG.																

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	@ -13°F	@ 33°F	@ 77°F	@ 104°F	INDIRECT TENSION			RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
								MODULUS	STRESS	STRAIN		
V	7-3	1.352	2.065	1.817	1.196	.387	.088	40221.7	103.0	.00256	2.402	14.4
	7-12	1.465	2.085	1.747	1.262	.422	.085	47412.9	108.6	.00229	2.416	13.6
	7-14	1.315	2.087	1.752	1.234	.456	.089	40408.2	108.9	.00270	2.420	13.5
	AVG.	1.377	2.079	1.772	1.231	.422	.087	42680.9	106.8	.00252	2.413	13.8

* Denotes Test Results Following the Accelerated (24 hour) Lottman Moisture Treatment Procedure.

** Denotes Test Results Following the 7-day Soak Period.

*** Denotes Test Results Following the (18 cycle) Lottman Moisture Treatment Procedure.

† Denotes No Test Values Available.

M_R Modulus of Resiliency.

Table 5. Test Sequence II results for IH 45 18-core section, Madisonville, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
	2-10	2.374	.748	1390	7							
I	2-12	2.384	.848	1208	8							
	2-18	2.389	.960	1196	8							
	AVG	2.382	.852	1265	8	4.13	4	22	1.4×10^7	8300	5.24	135

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Strain (in/in)	Modulus (psi)
	2-1	2.395	.684	49.0	30.4	.418	36.5	17.6	916	11			
II	2-2	2.374	.576	38.1	25.1	.365	29.2	16.1	715	14			
	2-3	2.416	.885	46.3	32.6	.364	35.2	21.5	624	14			
	2-9	2.383	.650	42.8	27.6	.397					147.7	.00244	60468.2
	2-13	2.418	.657	47.3	31.2	.532							
	2-17	2.392	.798	39.3	29.5	.400					128.7	.00172	7466.0
	AVG	2.396	.708	43.8	29.4	.413	33.6	18.4	752	13	138.2	.00208	33967.1

Table 5. Test Sequence II results for IH 45 18-core section, Madisonville, Texas (Continued).

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
	2-5	2.367	.797	51.2	38.3	.474	40.7	27.7	678	13			
III	2-7	2.388	.546	36.2	22.3	.412	36.0	22.1	908	14			
	2-11	2.366	.854	49.9	34.4	.530	51.9	36.4	788	11			
	2-14	2.415	.613	41.4	25.7	.537	42.2	26.5			227.7	.00395	57624.4
	2-15	2.419	.651	50.1	32.0	.531	47.7	29.6			209.1	.00442	47358.9
	2-16	2.418	.666	51.3	34.3	.578	40.1	23.1			244.8	.00407	60184.7
	AVG	2.396	.688	46.7	31.2	.510	43.1	27.6	791	13	227.2	.00415	55056.0

Phase	Sample	Bulk Specific Gravity		M_R x 10^6 psi -13°F	M_R x 10^6 psi 33°F	M_R x 10^6 psi 68°F	M_R x 10^6 psi 104°F	Splitting Tensile Test @ 77°F Stress (psi)	Splitting Tensile Test @ 77°F Strain (in/in)	Splitting Tensile Test @ 77°F Modulus (psi)	Rice Specific Gravity	Percent Air Voids
	2-4	2.387	.749	2.637	2.430		.187	230.8	.00402	57381.0	2.481	3.8
IV	2-6	2.396	.853	2.711	2.138		.186	236.9	.00460	51527.7	2.462	2.7
	2-8	2.389	.661	2.726	1.950		.069	226.3	.00569	39786.2	2.482	3.7
	AVG	2.391	.754	2.691	2.173		.147	231.3	.00477	49565.0	2.475	3.4

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

\+ Denotes No Data Available.

Table 6. Test Sequence II results for IH 45 12-core section, Madisonville, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
I	1-1	2.414	0.683	1056	7	4.01	7	32	$5.3x10^6$	4038	4.089	127
	1-6	2.391	0.646	1537	7	4.52	10	40	+	2450	3.947	128
	1-9	2.398	0.763	1300	5	4.11	4	23	$9.8x10^6$	6422	6.132	131
	AVG	2.401	0.697	1298	6	4.21	7	32	$7.6x10^6$	4303.3	4.723	129

Phase	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
II										

Table 6. Test Sequence II results for IH 45 12-core section, Madisonville, Texas (Continued).

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Strain (in/in)	Modulus (psi)
III	1-2	2.404	0.576	79.2	46.3	.614	69.0	36.1			186.0	.00699	26604.0
	1-4	2.390	0.618	71.6	35.9	.619	65.7	30.0			185.0	.00641	28848.0
	1-5	2.398	0.675	74.9	40.4	.644	64.5	29.9			173.0	.00350	49366.0
	1-7	2.389	0.754	67.1	38.4	.510	58.5	29.9	+	+			
	1-10	2.401	0.562	76.3	38.6	.668	73.2	35.5	+	+			
	1-11	2.399	0.596	73.1	38.5	.585	63.2	29.1	864	12			
	AVG	2.397	0.630	73.7	39.7	.607	65.8	31.8	864	12	181.0	.00563	34939.0

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	M_R x 10^6 psi -13°F	33°F	68°F	104°F	Splitting Tensile Test @ 77°F Stress (psi)	Strain (in/in)	Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	1-3	2.394	0.694	2.501	2.039		.075	.00519	162.0	31243.0	2.481	3.5
	1-8	2.389	0.617	2.468	2.143		.094	.00384	130.0	33821.0	2.449	2.4
	1-12	2.402	0.675	4.119	2.316		.058	.00396	202.0	50993.0	2.477	3.0
	AVG	2.395	0.662	3.029	2.166		.076	.00433	165.0	38686.0	2.469	3.0

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

+ No Test Value Available.

Table 7. Test Sequence II results for IH 45, Huntsville, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
I	3-1	2.403	.426	2148	8	4.24	29	52	2.83x10^6	3583	3.832	128
	3-2	2.354	.461	1560	7							
	3-3	2.389	.477	2155	7							
	AVG	2.382	.445	1954	7	4.24	29	52	2.83x10^6	3583	3.832	128

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
II	3-4	2.381	.435	66.0	57.4	.066	39.5	30.9	224	17			
	3-5	2.350	.854	70.1	58.2	.192	52.9	41.0	672	12			
	3-6	2.343	.466	42.6	39.5	.150	39.7	31.6	577	11			
	3-7	2.363	.483	61.0	47.7	.148	48.9	35.6			29.0	.00290	99733.3
	3-8	2.420	.484	51.7	42.6	.194	40.6	31.6			67.7	.00383	176560.2
	3-9	2.338	.748	63.7	51.8	.224	49.5	37.7			43.5	.00267	162920.9
	AVG	2.366	.578	59.2	49.5	.162	45.2	34.7	491	13	46.7	.00313	146408.1

Table 7. Test Sequence II results for IH 45, Huntsville, Texas (Continued).

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
	3-10	2.440	.564	63.0	53.7	.365	55.8	46.5	2138	12			
III	3-11	2.396	.303	49.4	39.2	.174	42.1	31.9	1002	12			
	3-12	2.346	.514	50.4	39.3	.078	41.1	30.0					
	3-13	2.364	.409	50.9	41.2	.083	38.7	28.9			23.0	.00431	5345.2
	3-14	2.334	.824	59.2	52.3	.168	37.4	30.5			31.5	.00316	9979.8
	3-15	2.335	.936	63.7	50.9	.078	48.4	35.7			22.3	.00431	5181.3
	AVG	2.369	.592	56.1	46.1	.158	43.9	33.9	1570	12	22.3	.00393	6835.4

Phase	Sample	Bulk Specific Gravity	M_R x 10^6 psi -13°F	M_R x 10^6 psi 33°F	M_R x 10^6 psi 68°F	M_R x 10^6 psi 104°F	Splitting Tensile Test @ 77°F Stress (psi)	Splitting Tensile Test @ 77°F Strain (in/in)	Splitting Tensile Test @ 77°F Modulus (psi)	Rice Specific Gravity	Percent Air Voids
	3-16	2.355	2.205	1.542	.727	.317	130.5	.00116	112281.5	2.496	5.6
IV	3-17	2.344	2.093	1.307	.425	.197	88.6	.00151	58676.5	2.496	6.1
	3-18	2.427	2.421	1.474	.514	.237	107.9	.00186	58016.4	2.504	3.1
	AVG	2.375	2.240	1.441	.555	.250	109.0	.00151	76324.8	2.499	5.0

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

Table 8. Test Sequence II results for IH 35, Waxahachie, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
I	400-3 OS	2.225	1.244	2544	9							
	405-325 BWP	2.229	1.180	2678	8							
	404 BWP	2.234	1.026	2618	8							
	AVG	2.229	1.150	2613	8	5.14	14	39	1.5×10^7	22920	8.4	135

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
II	399 BWP	2.375	1.055	56.4	40.5	.744	57.9	42.1	2460	10			
	406-575 OS	2.337	1.481	88.3	61.9	.629	50.6	24.1	1890	21			
	406-575 BWP	2.166	0.506	75.2	52.3	.445	66.4	43.4	3023	14			
	406-575 BWP	2.372	1.643	87.2	63.5	1.064	66.9	43.2			77.6	.00170	45584.3
	399 BWP	2.382	1.137	78.2	57.0	.808	45.3	24.0			68.1	.00284	22987.4
	406 BWP	2.350	1.192	85.0	58.1	.775	66.8	39.9			57.5	.00227	25352.2
	AVG	2.330	1.169	78.4	55.6	.774	59.0	36.1	2458	15	67.7	.00227	31308.0

Table 8. Test Sequence II results for IH 35, Waxahachie, Texas (Continued).

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
	404 OS	2.390	1.048	89.0	59.6	.492	78.0	48.7	2372	15			
III	399 OSWP	2.395	1.213	89.4	61.7	.596	85.1	57.4	2363	13			
	399 OS	2.391	0.935	71.3	47.6	.430	67.1	43.3	2389	15			
	404 BWP	2.366	1.132	80.0	52.1	.315	63.6	35.6			30.5	0.00144	21236.0
	399 BWP	2.389	1.086	88.9	60.1	.263	81.3	52.6			45.4	0.00345	13159.3
	402 OS	2.315	0.863	85.0	54.5	.074	72.0	41.6			24.2	0.00373	6472.7
	AVG	2.374	1.046	83.9	55.9	.362	74.5	46.5	2375	14	33.3	0.00287	13622.7

Phase	Sample	Bulk Specific Gravity	M_R x 10^6 psi -13°F	M_R x 10^6 psi 33°F	M_R x 10^6 psi 68°F	M_R x 10^6 psi 104°F	Splitting Tensile Test @ 77°F Stress (psi)	Splitting Tensile Test @ 77°F Strain (in/in)	Splitting Tensile Test @ 77°F Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	400-3 BWP	2.347	2.177	2.372	.816	.835	120.0	.00086	138805.0	2.456	4.4
	400-30 SWP	2.375	3.564	3.844	1.538	.541	207.1	.00056	373169.0	2.439	2.6
	399 BWP	2.394	4.065	2.482	1.460	.804	177.5	.00077	230912.0	2.471	3.1
	AVG	2.372	3.269	2.899	1.271	.727	168.2	.00073	247628.7	2.455	3.4

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

Table 9. Test Sequence II results for US 77, Kingsville, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
	5-1	2.194	.442	+	+	8.43	10	48	4.75x10^6	2861	4.144	130
I	5-2	2.199	.470	+	+							
	5-19	2.192	.575	2984	8							
	AVG	2.195	.496	2984	8	8.43	10	48	4.75x10^6	2861	4.144	130

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
	5-3	2.217	.462	21.7	2.60	.106	6.8	12.3			43.0	.00417	10310.0
II	5-8	2.207	.362	2.15	4.2	.244	4.1	13.2			58.0	.00444	13049.0
	5-9	2.180	.430	32.0	11.6	.244	3.0	17.5			38.0	.00418	9087.0
	5-10	2.185	.400	34.6	14.5	.170	3.8	16.3	1250	18			
	5-13	2.211	.507	31.3	17.0	.378	5.7	8.6	1300	19			
	5-15	2.219	.374	40.0	20.7	.447	11.3	8.0	1636	17			
	AVG	2.203	.423	30.2	11.8	.265	5.8	12.7	1395	18	46.3	.00426	10815.3

Table 9. Test Sequence II results for US 77, Kingsville, Texas (Continued).

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
	5-6	2.201	.475	41.7	21.1	.296	19.7	.7			95.0	.00297	31983
III	5-7	2.202	.383	22.7	4.5	.316	11.0	7.2			125.0	.00538	23247
	5-11	2.216	.454	39.1	23.4	.259	15.8	.1			114.0	.00238	47930
	5-12	2.218	.425	37.3	22.5	.317	14.2	.6	1419	14			
	5-14	2.214	.368	30.5	18.8	.321	34.2	22.4	1421	18			
	5-16	2.218	.346	20.7	3.9	.286	11.7	5.7	1779	17			
	AVG	2.212	.409	32.0	15.7	.299	17.8	6.1	1540	16	111.3	.00358	34386.7

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	M_R x 10^6 psi -13°F	M_R x 10^6 psi 33°F	M_R x 10^6 psi 68°F	M_R x 10^6 psi 104°F	Splitting Tensile Test @ 77°F Stress (psi)	Splitting Tensile Test @ 77°F Strain (in/in)	Splitting Tensile Test @ 77°F Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	5-4	2.198	.471	2.272	1.368		.117	173.0	.00418	41415		
	5-5	2.190	.452	2.063	1.245		.096	+	+	+	2.266	
	5-17	2.203	.319	2.034	0.938		.065	166.0	.00716	23170		
	5-18	2.194	.409	2.370	1.261		.076				2.256	
	AVG	2.196	.413	2.185	1.203		.089	170.0	.00567	32293	2.261	3.0

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

+ No Test Value Available.

Table 10 . Test Sequence II results for US 77, Sinton, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
I	6-2	2.251	.483	2667	11							
	6-12	2.182	.548	2335	11							
	6-16	2.189	.608	2832	9							
	AVG.	2.207	.546	2611	10	6.51	10	55	4.95×10^6	2712	4.078	128

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
II	6-5	2.246	.463	30.1	16.7	.469	25.6	12.2			+	+	+
	6-6	2.251	.450	30.2	19.4	.405	31.9	21.0			68.0	.00361	18843.0
	6-7	2.250	.478	29.3	19.1	.338	31.3	21.0			71.0	.00419	16941.0
	6-13	2.154	.416	46.7	23.1	.210	42.6	18.9	1251	10			
	6-15	2.179	.602	30.2	19.4	.251	34.9	24.1	816	19			
	6-17	2.191	.545	29.1	16.8	.367	34.0	21.6	1196	18			
	AVG.	2.212	.492	32.6	19.4	.340	33.4	19.8	1088	16	69.5	.00390	17892.0

Table 10. Test Sequence II results for US 77, Sinton, Texas (Continued).

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
III	6-1	2.224	.330	35.2	20.8	.097	22.6	8.1			.00149	88.0	59076.0
	6-4	2.216	.448	34.7	16.5	.244	36.8	18.6			.00060	114.0	189772.0
	6-8	2.192	.611	37.5	22.1	.096	35.8	20.4			.00089	49.0	54878.0
	6-10	2.183	.536	48.2	29.3	.255	38.2	19.3	916	15			
	6-11	2.204	.456	34.7	18.9	.215	33.5	15.5	1321	15			
	6-14	2.170	.476	42.0	24.0	.251	34.9	19.1	1136	11			
	AVG.	2.193	.476	38.7	21.9	.193	33.6	16.8	1124	14	.00099	83.7	101225.3

Phase	Sample			M_R x 10^6 psi -13°F	M_R x 10^6 psi 33°F	M_R x 10^6 psi 68°F	M_R x 10^6 psi 104°F	Splitting Tensile Test @ 77°F Stress (psi)	Splitting Tensile Test @ 77°F Strain (in/in)	Splitting Tensile Test @ 77°F Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	6-3	2.235	.470	1.087	1.591		.083	222.0	.00418	53061.0	2.309	3.2
	6-9	2.229	.508	2.056	1.546		.080	240.0	.00417	57514.0	2.331	4.4
	6-18	2.154	.556	1.880	1.429		.148	236.0	.00658	65854.0	2.292	6.0
	AVG.	2.206	.511	2.008	1.522		.104	232.7	.00498	58809.7	2.311	4.5

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

\+ - No Test Data Available.

Table 11. Test Sequence II results for IH 37, Oakville, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
I	4-1	2.161	.412	2572	12	5.59	10	33	1.30×10^7	8776	5.837	140
	4-4	2.162	.399	2340	18							
	4-11	2.161	.455	2323	16							
	AVG.	2.161	.422	2412	15							

Phase	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
II										

Table 11. Test Sequence II results for IH 37, Oakville, Texas (Continued).

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
III	4-3	2.168	.382	35.2	26.8	.283	32.1	23.7			112.0	.00089	125234
	4-8	2.152	.379	38.7	28.5	.283	29.9	19.7			97.0	.00090	108008
	4-9	2.158	.397	44.8	30.2	.290	35.8	21.1			120.0	.00060	200590
	4-10	2.153	.406	40.0	35.8	.277	31.3	27.2	1494	28			
	4-12	2.161	.428	41.3	33.3	.307	27.7	19.7	1677	25			
	4-13	2.155	.386	38.1	31.3	.260	24.6	17.8	1323	27			
	AVG.	2.158	.396	39.7	31.0	.283	30.2	21.5	1498	27	109.7	.00080	144611

Phase	Sample			M_R x 10^6 psi -13°F	33°F	68°F	104°F	Splitting Tensile Test @ 77°F Stress (psi)	Strain (in/in)	Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	4-2	2.157	.402	1.768	1.020		.078					
	4-5	2.173	.432	2.039	1.133		.080	141.0	.00418	33728.0	2.306	
	4-6	2.150	.373	1.647	1.083		.070	135.0	.00419	32219.0		
	4-7	2.145	.386	1.980	1.286		.077	143.0	.00417	34288.0	2.297	
	AVG.	2.156	.398	1.859	1.131		.076	139.7	.00418	33411.7	2.302	6.3

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

Table 12. Test Sequence II results for SH 71, Columbus, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
	2-9	2.256	.764	2380	12							
I	2-12	2.298	.875	4462	11							
	2-15	2.271	.721	2890	11	5.41	3	20	1.6×10^6	10,200	6.851	139
	AVG	2.275	.787	3244	11	5.41	3	20	1.6×10^6	10,200	6.851	139

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
II	2-3	2.258	.848	44.7	20.9	.562	32.9	17.2	2224	16			
	2-4	2.250	.720	42.3	27.7	.491	35.1	20.5	2250	11			
	2-5	2.234	.760	52.2	38.2	.520	40.8	26.8	1793	15			
	2-11	2.298	.526	48.3	26.8	.369	40.6	19.1			174.0	.00479	36349.0
	2-13	2.261	.592	41.5	23.2	.482	30.5	12.2			202.0	.00358	56427.0
	2-18	2.273	.653	50.8	29.7	.476	32.6	13.4			196.0	.00298	65817.0
	AVG	2.262	.683	46.6	27.8	.483	35.4	18.2	2089	14	190.7	.00378	52864.3

Table 12. Test Sequence II results for SH 71, Columbus, Texas (Continued).

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
III	2-2	2.254	.740	40.2	24.1	.694	41.5	25.4					
	2-6	2.250	.691	40.1	26.0	.666	42.5	28.5					
	2-8	2.247	.818	42.6	26.7	.778	45.0	29.1					
	2-10	2.308	.466	42.9	23.4	.415	37.0	17.6	1725	14	203.0	.00358	56735.0
	2-14	2.274	.638	44.9	25.5	.561	39.9	20.6	2225	14	218.0	.00359	60732.0
	2-17	2.283	.560	42.7	20.3	.524	44.0	21.6	2602	13	226.0	.00418	54027.0
	AVG	2.269	.652	42.2	24.3	.606	41.7	23.8	2184	14	215.7	.00378	57164.7

Phase	Sample	Bulk Specific Gravity	M_R x 10^6 psi -13°F	M_R x 10^6 psi 33°F	M_R x 10^6 psi 77°F	M_R x 10^6 psi 104°F	Splitting Tensile Test @ 77°F Stress (psi)	Splitting Tensile Test @ 77°F Strain (in/in)	Splitting Tensile Test @ 77°F Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	2-1	2.250	2.803	2.137	.795	.120	284.0	.00030	952000.0	2.353	4.4
	2-7	2.281	2.286	1.659	.727	.086	277.0	.00030	920562.0	2.335	2.3
	2-16	2.259	2.304	2.001	.687	.089	259.0	.00060	433651.0	2.318	2.5
	AVG	2.263	2.464	1.932	.736	.098	273.3	.00040	771737.7	2.335	3.1

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

Table 13. Test Sequence II for US 90A Colorado County, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
	3-2	2.234	.533	+	+							
I	3-3	2.232	.477	1444	12							
	3-10	2.204	.492	+	+	5.45	16	41	$5.2x10^6$	6508	6.209	132
	AVG	2.223	.501	1444	12	5.45	16	41	$5.2x10^6$	6508	6.209	132

Phase	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
II										

Table 13. Test Sequence II for US 90A Colorado County, Texas (Continued)

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
	3-1	2.253	.507	50.8	36.5	.455	51.3	37.0			160.0	.00299	53467.0
III	3-5	2.267	.443	49.9	41.7	.370	46.8	38.6			188.0	.00477	39453.0
	3-6	2.249	.469	46.6	40.7	.451	44.4	38.5			164.0	.00359	45677.0
	3-8	2.222	.489	48.7	36.9	.403	48.9	37.1	1620	15			
	3-9	2.209	.456	43.4	33.8	.306	41.2	31.6	1285	15			
	3-11	2.215	.464	40.6	29.5	.347	43.5	32.4	1373	18			
	AVG	2.236	.471	46.7	36.5	.389	46.0	35.9	1426	16	170.7	.00378	46199.0

Phase	Sample	Bulk Specific Gravity	M_R x 10^6 psi -13°F	M_R x 10^6 psi 33°F	M_R x 10^6 psi 77°F	M_R x 10^6 psi 104°F	Splitting Tensile Test @ 77°F Stress (psi)	Splitting Tensile Test @ 77°F Strain (in/in)	Splitting Tensile Test @ 77°F Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	3-4	2.226	1.723	1.155	.506	.075	154.0	.00060	258389.0	2.404	7.4
	3-7	2.232	2.147	1.506	.481	.078	136.0	.00052	260911.0	2.387	6.5
	3-12	2.224	2.468	1.316	.469	.075	137.0	.00030	459487.0	2.309	3.7
	AVG	2.227	2.113	1.326	.485	.076	142.3	.00047	326262.3	2.367	5.9

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

+ No Data Available.

Table 14. Test Sequence II for FM 2061 McAllen, original design (Loop 374).

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
I	7-3	2.591	.274	1169	10	5.8	15	64	1.73×10^6	2000	3.605	122
	7-10	2.394	.360	1599	9							
	7-12	2.377	.287	647	10							
	AVG	2.454	.307	1138	10	5.8	15	64	1.73×10^6	2000	3.605	122

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Strain (in/in)	Modulus (psi)
II	7-1	2.365	.286	29.3	15.3	.299	28.2	14.1			119.0	.00659	18069.0
	7-2	2.369	.283	19.3	10.3	.301	18.6	9.6			124.0	.00716	17315.0
	7-7	2.372	.227	20.2	12.4	.289	19.8	12.0			128.0	.00714	17930.0
	7-8	2.370	.226	24.9	16.3	.297	14.8	6.1	1164	12			
	7-9	2.403	.355	52.0	30.2	.416	55.3	33.5	1636	10			
	7-11	2.389	.211	62.1	47.5	.373	64.4	39.3	1479	13			
	AVG	2.378	.265	34.6	22.0	.329	33.5	19.1	1426	12	123.7	.00696	17771.3

Table 14. Test Sequence II for FM 2061 McAllen, original design (Loop 374). (Continued)

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	(THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	(THD)	Marshall Test** Stability pounds	Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Strain (in/in)	Modulus (psi)
III													

Phase	Sample	Bulk Specific Gravity	M_R x 10^6 psi -13°F	33°F	77°F	104°F	Splitting Tensile Test @ 77°F Stress (psi)	Strain (in/in)	Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	7-4	2.366	2.112	1.384	.259	.034	141.0	.00597	23602.0	2.375	0.4
	7-5	2.358	1.594	1.389	.214	.033	135.0	.00418	32330.0	2.368	0.4
	7-6	2.352	2.121	1.517	.232	.037	148.0	.00598	24760.0	2.394	1.8
	7-13	2.382	2.554	1.962	.350	.046	142.0	.00537	26444.0	2.414	1.3
	AVG	2.365	2.095	1.563	.264	.038	141.5	.00538	26784.0	2.388	1.0

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

+ Data Not Available - Estimated Weights Used in Calculation of BSG.

Table 15. Test Sequence II for FM 2061 McAllen, modified design (Loop 374).

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
I	8-3	2.377	.513	2093	9							
	8-5	2.335	.478	1125	13							
	8-11	2.372	.675	1970	12	5.09	5	32	1.1×10^7	6280	5.414	135
	AVG	2.361	.555	1729	11	5.09	5	32	1.1×10^7	6280	5.414	135

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
II	8-1	2.358	.264	52.2	34.6	.337	57.8	32.5			122.0	.00418	29220.0
	8-2	2.372	.200	55.8	47.5	.372	64.7	40.3			117.0	.00418	29760.0
	8-4	2.371	.432	48.4	25.5	.478	52.4	29.5	1460	19			
	8-7	2.326	.513	47.2	31.5	.591	66.6	41.5	1953	14			
	8-8	2.358	.293	41.7	20.4	.253	45.3	23.9			109.0	.00659	16538.0
	8-12	2.362	.669	50.3	26.4	.605	54.3	30.4	1252	19			
	AVG	2.358	.395	49.3	31.0	.439	56.9	33.0	1555	17	116.0	.00498	25172.7

Table 15. Test Sequence II for FM 2061 McAllen, modified design (Loop 374). (Continued)

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
III													

Phase	Sample	Bulk Specific Gravity	M_R x 10^6 psi -13°F	M_R x 10^6 psi 33°F	M_R x 10^6 psi 77°F	M_R x 10^6 psi 104°F	Splitting Tensile Test @ 77°F Stress (psi)	Splitting Tensile Test @ 77°F Strain (in/in)	Splitting Tensile Test @ 77°F Modulus (psi)	Rice Specific Gravity	Percent Air Voids
	8-6	2.330	2.604	2.352	.611	.139	208.0	.00238	87288.0	2.435	4.3
IV	8-9	2.367	2.396	1.540	.417	.062	139.0	.00416	33374.0	2.400	1.4
	8-10	2.366	2.401	1.791	.489	.071	172.0	.00298	57647.0	2.400	1.4
	AVG	2.354	2.467	1.894	.506	.091	173.0	.00317	59436.3	2.412	2.4

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

Table 16. Test Sequence II results for U.S. 59, Shelby County pavement distress problem. Page 1

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY @ 77°F	VISCOSITY @ 140°F	VISCOSITY @ 275°F	PENETRATION 39.2°F	PENETRATION 77°F	RING & BALL	PERCENT ASPHALT
I	2A	1.270	2.605										
	3A	1.146	2.589										
	4A	0.919	2.580										
	AVG.	1.112	2.594				6.0×10^6	3693	3.554	22	55	130°	4.69

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY (UNC)	HVEEM STABILITY (THD)	M_R @ 77°F	HVEEM* STABILITY (UNC)	HVEEM* STABILITY (THD)	INDIRECT TENSION* MODULUS	INDIRECT TENSION* STRESS	INDIRECT TENSION* STRAIN	MARSHALL STABILITY	MARSHALL FLOW
II	2B	1.616	2.303	.087	36.2	22.2	.074	34.4	20.4	34561.0	52.0	.00150		
	3B	2.937	2.353	.103	35.0	47.5	.094	20.6	33.1				260	13
	4B	2.842	2.346	.093	24.4	35.0	.084	20.3	30.9	26798.0	48.0	.00179		
	AVG.	2.465	2.334	.094	31.9	34.9	.084	25.1	28.1	30679.5	50.0	.00165	260	13

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY (UNC)	HVEEM STABILITY (THD)	M_R @ 77°F	HVEEM STABILITY (UNC)	HVEEM STABILITY (THD)	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN
III												
	AVG.											

Table 16. (Continued) Test Sequence II results for U.S. 59, Shelby County pavement distress problem. Page 2

LEG NO.	SAMPLE NO	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY		M_R @77°F	HVEEM STABILITY		MARSHALL STABILITY	MARSHALL FLOW	INDIRECT TENSION		
											(UNC)	(THD)			MODULUS	STRESS	STRAIN
IV																	
	AVG.																

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	INDIRECT TENSION			RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
					MODULUS	STRESS	STRAIN		
V	2A	1.270	2.605					2.686	
	3A	1.146	2.598						
	4A	0.919	2.580					2.693	
	AVG.	1.112	2.594					2.690	3.4

NOTES:

1) 'A' samples are from 4 inch diameter cores testing item 340 surface material.

2) 'B' samples are from the same 4 inch diameter cores testing underlying item 292 materials.

3) '6' samples are testing item 292 materials from layers A, B, and C of 6 inch cores.

*Denotes test results following the accelerate Lottman (24 hour moisture treatment).

Table 16. (Continued) Test Sequence II results for U.S. 59, Shelby County pavement distress problem. Page 3

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY			PENETRATION		RING & BALL	PERCENT ASPHALT
							@ 77°F	@ 140°F	@ 275°F	39.2°F	77°F		
I	6A						5.8×10^6	4356	5.626	19	44	135	4.2
	6B						5.0×10^6	5301	5.987	21	42	134	5.8
	6C						4.5×10^6	4320	5.368	20	45	131	5.6
	AVG.						5.1×10^6	4659	5.660	20	44	133	5.2

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R @ 77°F	HVEEM* STABILITY		INDIRECT TENSION*			MARSHALL STABILITY	MARSHALL FLOW
										MODULUS	STRESS	STRAIN		
II														
	AVG.													

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R @ 77°F	HVEEM STABILITY		INDIRECT TENSION		
										MODULUS	STRESS	STRAIN
III												
	AVG.											

Table 16. (Continued) Test Sequence II results for U.S. 59, Shelby County pavement distress problem. Page 4

LEG NO.	SAMPLE NO	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY		M_R @77°F	HVEEM STABILITY		MARSHALL STABILITY	MARSHALL FLOW	INDIRECT TENSION		
															MODULUS	STRESS	STRAIN
IV																	
	AVG.																

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	INDIRECT TENSION			RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
					MODULUS	STRESS	STRAIN		
V	3B	2.937	2.353					2.649	11.2
	AVG.	2.937	2.353					2.649	11.2

NOTES:

1) 'A' samples are from 4 inch diameter cores testing item 340 surface material.

2) 'B' samples are from the same 4 inch diameter cores testing underlying item 292 materials.

3) '6' samples are testing item 292 materials from layers A, B, and C of 6 inch cores.

*Denotes test results following the accelerate Lottman (24 hour moisture treatment).

Table 17A. Test Sequence II results for Item 340 Type "D" black cores on U.S. 290, Hempstead, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY			PENETRATION		RING & BALL	PERCENT ASPHALT
							@ 77°F	@ 140°F	@ 275°F	39.2°F	77°F		
I	1-6B	1.404	2.277	.494	1,318	4.5							
	1-7A	1.379	2.321	.846	2,242	6.0							
	1-10B	1.499	2.297	.557	904	5.5							
	1-11B	1.884	2.224	.463	468	5.5							
	AVG.	1.542	2.280	.590	1,233	5.4	+	+	+	+	+	+	+

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R @ 77°F	HVEEM* STABILITY		INDIRECT TENSION*			MARSHALL * STABILITY	MARSHALL* FLOW
					UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN		
II	1-5A	1.538	2.312	.538	56.4	40.9	.356	42.4	26.9				1,209	8.0
	1-5B	1.239	2.278	.695	43.6	22.0	.201	58.9	37.5	32,392	51.0	.00157		
	1-9A	1.901	2.310	.314	37.0	28.8	.281	34.5	26.3				640	8.5
	1-9B	1.209	2.288	.482	57.0	34.9	.254	60.2	38.1	34,524	69.0	.00200		
	1-10A	2.009	2.322	.454	32.1	26.0	.376	30.2	24.1				1,081	9.0
	1-11A	1.999	2.288	.382	33.2	27.0	.255	34.6	28.4	18,571	59.0	.00318		
	AVG.	1.649	2.300	.478	43.2	29.9	.287	43.5	30.2	28,496	59.7	.00225	977	8.5

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R @ 77°F	HVEEM STABILITY		INDIRECT TENSION		
					UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN
III												
	AVG.											

Table 17A. (Continued) Test Sequence II results for Item 340 Type "D" black cores on U.S. 290, Hempstead, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY		M_R*** @ 77°F	HVEEM*** STABILITY		INDIRECT TENSION***			*** MARSHALL STABILITY	*** MARSHALL FLOW
								UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN		
IV																	
	AVG.																

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	INDIRECT TENSION			RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
								MODULUS	STRESS	STRAIN		
V	1-6A	1.974	2.319	2.524	2.047	.471	.142	54,895	218.0	.00397	2.413	3.9
	1-7B	1.354	2.273	2.537	2.737	.529	.275	71,633	170.0	.00237	2.421	6.1
	1-8A	1.896	2.307	2.377	1.845	.382	.153	64,826	206.0	.00318	2.415	4.5
	1-8B	1.314	2.268	2.428	2.123	.677	.186	53,451	148.0	.00277	2.414	6.0
	AVG.	1.635	2.292	2.467	2.188	.515	.189	61,201	185.5	.00307	2.416	5.1

* Denotes Test Results Following the Accelerated (24 hour) Lottman Moisture Treatment Procedure.

** Denotes Test Results Following the 7-day Soak Period.

*** Denotes Test Results Following the (18 cycle) Lottman Moisture Treatment Procedure.

\+ Denotes No Test Values Available.

M_R Modulus of Resiliency.

Table 17B. Test Sequence II results for Item 340 Type "D" iron ore cores on U.S. 290, Hempstead, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY @ 77°F	VISCOSITY @ 140°F	VISCOSITY @ 275°F	PENETRATION 39.2°F	PENETRATION 77°F	RING & BALL	PERCENT ASPHALT
I	1-2	1.050	2.372	.587	4,925	11.0							
	1-18	1.477	2.377	.705	5,240	10.5							
	1-20	1.350	2.388	.799	5,461	11.0							
	1-21	1.518	2.418	.715	5,796	10.0							
	AVG.	1.349	2.389	.702	5,356	10.6	$3.0x10^7$	82085	11.13	10	21	160°	4.46

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R @ 77°F	HVEEM* STABILITY UNC	HVEEM* STABILITY THD	INDIRECT TENSION* MODULUS	INDIRECT TENSION* STRESS	INDIRECT TENSION* STRAIN	MARSHALL STABILITY	MARSHALL FLOW
II	1-1	.873	2.376	.553	85.0	56.2	.301	86.4	57.6				4,170	14
	1-4	.945	2.374	.537	77.4	50.0	.265	+	+				+	+
	1-16	1.541	2.422	.676	54.9	39.5	.567	55.2	33.8				5,463	16
	1-19	1.578	2.404	.775	59.4	44.7	.600	61.3	46.6	67,823	161.0	.00237		
	1-23	1.227	2.318	.621	73.8	52.1	.370	68.0	46.3	31,590	100.0	.00317		
	1-24	1.334	2.350	.425	60.2	40.6	.368	62.3	42.7	33,936	108.0	.00318		
	AVG.	1.250	2.374	.598	68.5	47.2	.412	66.6	45.4	44,450	123.0	.00291	4,817	15

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN
III	1-3	.972	2.396	.619	83.7	56.9	.414	83.2	56.4	38,709	123.0	.00318
	1-17	1.622	2.392	.673	57.7	43.9	.612	56.3	42.5	69,282	165.0	.00238
	1-22	1.381	2.398	.621	61.3	42.7	.520	70.9	52.3	70,910	141.0	.00199
	AVG.	1.370	2.395	.638	67.6	47.8	.515	70.1	50.4	59,634	143.0	.00252

Table 17B. (Continued) Test Sequence II results for Item 340 Type "D" iru. re cores on U.S. 290, Hempstead, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY		M_R^{***} @ 77°F	HVEEM*** STABILITY		INDIRECT TENSION***			*** MARSHALL STABILITY	*** MARSHALL FLOW
								UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN		
IV																	
	AVG.																

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	INDIRECT TENSION			RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
								MODULUS	STRESS	STRAIN		
V	1-13	1.337	2.386	2.015	1.256	.643	.271	97,558	155.0	.00159	2.540	6.1
	1-14	1.320	2.392	2.059	1.248	.608	.274	104,135	165.0	.00158	2.532	5.5
	1-15	1.452	2.398	2.304	1.409	.737	.272	67,259	160.0	.00238	2.568	6.6
	AVG.	1.370	2.392	2.126	1.304	.663	.272	89,651	160.0	.00185	2.547	6.1

* Denotes Test Results Following the Accelerated (24 hour) Lottman Moisture Treatment Procedure.

** Denotes Test Results Following the 7-day Soak Period.

*** Denotes Test Results Following the (18 cycle) Lottman Moisture Treatment Procedure.

\+ Denotes No Test Values Available.

M_R Modulus of Resiliency.

Table 18. Test Sequence II results for Item 340 Type "D" Asphadure" cores on U.S. 62 in Lubbock, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY			PENETRATION		RING & BALL	PERCENT ASPHALT
							@ 77°F	@ 140°F	@ 275°F	39.2°F	77°F		
I	7-6	1.340	2.083	.446	1,000	16.0							
	7-9	1.433	2.069	.413	1,318	12.0							
	7-10	1.383	2.123	.647	1,894	12.0							
	7-14	.898	2.026	.517	1,334	10.0							
	AVG.	1.264	2.075	.506	1,387	12.5	4.75×10^6	14,725	10.828	3	20	141°	6.94

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R* @ 77°F	HVEEM* STABILITY		INDIRECT TENSION*			MARSHALL* STABILITY	MARSHALL* FLOW
					UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN		
II	7-3	1.736	2.105	.436	64.6	41.1	.284	34.7	23.1	27,511	109.0	.00396		
	7-4	1.703	2.089	.352	40.3	28.8	.161	28.4	16.2				841	16.0
	7-5	1.293	2.075	.408	50.6	29.4	.184	48.2	27.8				1,061	17.0
	7-8	1.252	2.069	.380	58.2	35.7	.195	47.9	26.7	16,562	79.0	.00477		
	7-12	1.191	2.061	.503	51.5	31.1	.218	68.6	36.2				1,619	16.0
	7-13	1.136	2.088	.592	42.6	30.4	.309	61.1	37.6	30,383	121.0	.00398		
	AVG.	1.385	2.081	.445	51.3	32.8	.225	48.2	27.9	24,819	103.0	.00424	1,174	16.3

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R @ 77°F	HVEEM STABILITY		INDIRECT TENSION		
					UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN
III												
	AVG.											

Table 8. Test Sequence II results for IH 35, Waxahachie, Texas (Continued).

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
	404 OS	2.390	1.048	89.0	59.6	.492	78.0	48.7	2372	15			
III	399 OSWP	2.395	1.213	89.4	61.7	.596	85.1	57.4	2363	13			
	399 OS	2.391	0.935	71.3	47.6	.430	67.1	43.3	2389	15			
	404 BWP	2.366	1.132	80.0	52.1	.315	63.6	35.6			30.5	0.00144	21236.0
	399 BWP	2.389	1.086	88.9	60.1	.263	81.3	52.6			45.4	0.00345	13159.3
	402 OS	2.315	0.863	85.0	54.5	.074	72.0	41.6			24.2	0.00373	6472.7
	AVG	2.374	1.046	83.9	55.9	.362	74.5	46.5	2375	14	33.3	0.00287	13622.7

Phase	Sample	Bulk Specific Gravity	M_R x 10^6 psi -13°F	33°F	68°F	104°F	Splitting Tensile Test @ 77°F Stress (psi)	Strain (in/in)	Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	400-3 BWP	2.347	2.177	2.372	.816	.835	120.0	.00086	138805.0	2.456	4.4
	400-30 SWP	2.375	3.564	3.844	1.538	.541	207.1	.00056	373169.0	2.439	2.6
	399 BWP	2.394	4.065	2.482	1.460	.804	177.5	.00077	230912.0	2.471	3.1
	AVG	2.372	3.269	2.899	1.271	.727	168.2	.00073	247628.7	2.455	3.4

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

Table 9. Test Sequence II results for US 77, Kingsville, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
I	5-1	2.194	.442	+	+	8.43	10	48	4.75×10^6	2861	4.144	130
	5-2	2.199	.470	+	+							
	5-19	2.192	.575	2984	8							
	AVG	2.195	.496	2984	8	8.43	10	48	4.75×10^6	2861	4.144	130

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
II	5-3	2.217	.462	21.7	2.60	.106	6.8	12.3			43.0	.00417	10310.0
	5-8	2.207	.362	2.15	4.2	.244	4.1	13.2			58.0	.00444	13049.0
	5-9	2.180	.430	32.0	11.6	.244	3.0	17.5			38.0	.00418	9087.0
	5-10	2.185	.400	34.6	14.5	.170	3.8	16.3	1250	18			
	5-13	2.211	.507	31.3	17.0	.378	5.7	8.6	1300	19			
	5-15	2.219	.374	40.0	20.7	.447	11.3	8.0	1636	17			
	AVG	2.203	.423	30.2	11.8	.265	5.8	12.7	1395	18	46.3	.00426	10815.3

Table 9. Test Sequence II results for US 77, Kingsville, Texas (Continued).

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
	5-6	2.201	.475	41.7	21.1	.296	19.7	.7			95.0	.00297	31983
III	5-7	2.202	.383	22.7	4.5	.316	11.0	7.2			125.0	.00538	23247
	5-11	2.216	.454	39.1	23.4	.259	15.8	.1			114.0	.00238	47930
	5-12	2.218	.425	37.3	22.5	.317	14.2	.6	1419	14			
	5-14	2.214	.368	30.5	18.8	.321	34.2	22.4	1421	18			
	5-16	2.218	.346	20.7	3.9	.286	11.7	5.7	1779	17			
	AVG	2.212	.409	32.0	15.7	.299	17.8	6.1	1540	16	111.3	.00358	34386.7

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	M_R x 10^6 psi -13°F	33°F	68°F	104°F	Splitting Tensile Test @ 77°F Stress (psi)	Strain (in/in)	Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	5-4	2.198	.471	2.272	1.368		.117	173.0	.00418	41415		
	5-5	2.190	.452	2.063	1.245		.096	+	+	+	2.266	
	5-17	2.203	.319	2.034	0.938		.065	166.0	.00716	23170		
	5-18	2.194	.409	2.370	1.261		.076				2.256	
	AVG	2.196	.413	2.185	1.203		.089	170.0	.00567	32293	2.261	3.0

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

\+ No Test Value Available.

Table 10 . Test Sequence II results for US 77, Sinton, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
I	6-2	2.251	.483	2667	11							
	6-12	2.182	.548	2335	11							
	6-16	2.189	.608	2832	9							
	AVG.	2.207	.546	2611	10	6.51	10	55	4.95×10^6	2712	4.078	128

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
II	6-5	2.246	.463	30.1	16.7	.469	25.6	12.2			+	+	+
	6-6	2.251	.450	30.2	19.4	.405	31.9	21.0			68.0	.00361	18843.0
	6-7	2.250	.478	29.3	19.1	.338	31.3	21.0			71.0	.00419	16941.0
	6-13	2.154	.416	46.7	23.1	.210	42.6	18.9	1251	10			
	6-15	2.179	.602	30.2	19.4	.251	34.9	24.1	816	19			
	6-17	2.191	.545	29.1	16.8	.367	34.0	21.6	1196	18			
	AVG.	2.212	.492	32.6	19.4	.340	33.4	19.8	1088	16	69.5	.00390	17892.0

Table 10 . Test Sequence II results for US 77, Sinton, Texas (Continued).

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
III	6-1	2.224	.330	35.2	20.8	.097	22.6	8.1			.00149	88.0	59076.0
	6-4	2.216	.448	34.7	16.5	.244	36.8	18.6			.00060	114.0	189772.0
	6-8	2.192	.611	37.5	22.1	.096	35.8	20.4			.00089	49.0	54878.0
	6-10	2.183	.536	48.2	29.3	.255	38.2	19.3	916	15			
	6-11	2.204	.456	34.7	18.9	.215	33.5	15.5	1321	15			
	6-14	2.170	.476	42.0	24.0	.251	34.9	19.1	1136	11			
	AVG.	2.193	.476	38.7	21.9	.193	33.6	16.8	1124	14	.00099	83.7	101225.3

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	M_R x 10^6 psi -13°F	33°F	68°F	104°F	Splitting Tensile Test @ 77°F Stress (psi)	Strain (in/in)	Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	6-3	2.235	.470	1.087	1.591		.083	222.0	.00418	53061.0	2.309	3.2
	6-9	2.229	.508	2.056	1.546		.080	240.0	.00417	57514.0	2.331	4.4
	6-18	2.154	.556	1.880	1.429		.148	236.0	.00658	65854.0	2.292	6.0
	AVG.	2.206	.511	2.008	1.522		.104	232.7	.00498	58809.7	2.311	4.5

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

\+ - No Test Data Available.

Table 11. Test Sequence II results for IH 37, Oakville, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
I	4-1	2.161	.412	2572	12	5.59	10	33	1.30×10^7	8776	5.837	140
	4-4	2.162	.399	2340	18							
	4-11	2.161	.455	2323	16							
	AVG.	2.161	.422	2412	15							

Phase	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
II										

Table 11. Test Sequence II results for IH 37, Oakville, Texas (Continued).

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	(THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	(THD)	Marshall Test** Stability pounds	Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Strain (in/in)	Modulus (psi)
III	4-3	2.168	.382	35.2	26.8	.283	32.1	23.7			112.0	.00089	125234
	4-8	2.152	.379	38.7	28.5	.283	29.9	19.7			97.0	.00090	108008
	4-9	2.158	.397	44.8	30.2	.290	35.8	21.1			120.0	.00060	200590
	4-10	2.153	.406	40.0	35.8	.277	31.3	27.2	1494	28			
	4-12	2.161	.428	41.3	33.3	.307	27.7	19.7	1677	25			
	4-13	2.155	.386	38.1	31.3	.260	24.6	17.8	1323	27			
	AVG.	2.158	.396	39.7	31.0	.283	30.2	21.5	1498	27	109.7	.00080	144611

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	M_R x 10^6 psi -13°F	33°F	68°F	104°F	Splitting Tensile Test @ 77°F Stress (psi)	Strain (in/in)	Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	4-2	2.157	.402	1.768	1.020		.078					
	4-5	2.173	.432	2.039	1.133		.080	141.0	.00418	33728.0	2.306	
	4-6	2.150	.373	1.647	1.083		.070	135.0	.00419	32219.0		
	4-7	2.145	.386	1.980	1.286		.077	143.0	.00417	34288.0	2.297	
	AVG.	2.156	.398	1.859	1.131		.076	139.7	.00418	33411.7	2.302	6.3

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

Table 12. Test Sequence II results for SH 71, Columbus, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
	2-9	2.256	.764	2380	12							
I	2-12	2.298	.875	4462	11							
	2-15	2.271	.721	2890	11	5.41	3	20	$1.6x10^6$	10,200	6.851	139
	AVG	2.275	.787	3244	11	5.41	3	20	$1.6x10^6$	10,200	6.851	139

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
II	2-3	2.258	.848	44.7	20.9	.562	32.9	17.2	2224	16			
	2-4	2.250	.720	42.3	27.7	.491	35.1	20.5	2250	11			
	2-5	2.234	.760	52.2	38.2	.520	40.8	26.8	1793	15			
	2-11	2.298	.526	48.3	26.8	.369	40.6	19.1			174.0	.00479	36349.0
	2-13	2.261	.592	41.5	23.2	.482	30.5	12.2			202.0	.00358	56427.0
	2-18	2.273	.653	50.8	29.7	.476	32.6	13.4			196.0	.00298	65817.0
	AVG	2.262	.683	46.6	27.8	.483	35.4	18.2	2089	14	190.7	.00378	52864.3

Table 12. Test Sequence II results for SH 71, Columbus, Texas (Continued).

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
III	2-2	2.254	.740	40.2	24.1	.694	41.5	25.4					
	2-6	2.250	.691	40.1	26.0	.666	42.5	28.5					
	2-8	2.247	.818	42.6	26.7	.778	45.0	29.1					
	2-10	2.308	.466	42.9	23.4	.415	37.0	17.6	1725	14	203.0	.00358	56735.0
	2-14	2.274	.638	44.9	25.5	.561	39.9	20.6	2225	14	218.0	.00359	60732.0
	2-17	2.283	.560	42.7	20.3	.524	44.0	21.6	2602	13	226.0	.00418	54027.0
	AVG	2.269	.652	42.2	24.3	.606	41.7	23.8	2184	14	215.7	.00378	57164.7

Phase	Sample	Bulk Specific Gravity	M_R x 10^6 psi -13°F	M_R x 10^6 psi 33°F	M_R x 10^6 psi 77°F	M_R x 10^6 psi 104°F	Splitting Tensile Test @ 77°F Stress (psi)	Splitting Tensile Test @ 77°F Strain (in/in)	Splitting Tensile Test @ 77°F Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	2-1	2.250	2.803	2.137	.795	.120	284.0	.00030	952000.0	2.353	4.4
	2-7	2.281	2.286	1.659	.727	.086	277.0	.00030	920562.0	2.335	2.3
	2-16	2.259	2.304	2.001	.687	.089	259.0	.00060	433651.0	2.318	2.5
	AVG	2.263	2.464	1.932	.736	.098	273.3	.00040	771737.7	2.335	3.1

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

Table 13. Test Sequence II for US 90A Colorado County, Texas.

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
	3-2	2.234	.533	+	+							
I	3-3	2.232	.477	1444	12	5.45	16	41	$5.2x10^6$	6508	6.209	132
	3-10	2.204	.492	+	+							
	AVG	2.223	.501	1444	12	5.45	16	41	$5.2x10^6$	6508	6.209	132

Phase	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
II										

Table 13. Test Sequence II for US 90A Colorado County, Texas (Continued)

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
III	3-1	2.253	.507	50.8	36.5	.455	51.3	37.0			160.0	.00299	53467.0
	3-5	2.267	.443	49.9	41.7	.370	46.8	38.6			188.0	.00477	39453.0
	3-6	2.249	.469	46.6	40.7	.451	44.4	38.5			164.0	.00359	45677.0
	3-8	2.222	.489	48.7	36.9	.403	48.9	37.1	1620	15			
	3-9	2.209	.456	43.4	33.8	.306	41.2	31.6	1285	15			
	3-11	2.215	.464	40.6	29.5	.347	43.5	32.4	1373	18			
	AVG	2.236	.471	46.7	36.5	.389	46.0	35.9	1426	16	170.7	.00378	46199.0

Phase	Sample	Bulk Specific Gravity	M_R x 10^6 psi -13°F	M_R x 10^6 psi 33°F	M_R x 10^6 psi 77°F	M_R x 10^6 psi 104°F	Splitting Tensile Test @ 77°F Stress (psi)	Splitting Tensile Test @ 77°F Strain (in/in)	Splitting Tensile Test @ 77°F Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	3-4	2.226	1.723	1.155	.506	.075	154.0	.00060	258389.0	2.404	7.4
	3-7	2.232	2.147	1.506	.481	.078	136.0	.00052	260911.0	2.387	6.5
	3-12	2.224	2.468	1.316	.469	.075	137.0	.00030	459487.0	2.309	3.7
	AVG	2.227	2.113	1.326	.485	.076	142.3	.00047	326262.3	2.367	5.9

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

+ No Data Available.

Table 14. Test Sequence II for FM 2061 McAllen, original design (Loop 374).

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
	7-3	2.591	.274	1169	10	5.8	15	64	1.73x10^6	2000	3.605	122
I	7-10	2.394	.360	1599	9							
	7-12	2.377	.287	647	10							
	AVG	2.454	.307	1138	10	5.8	15	64	1.73x10^6	2000	3.605	122

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Strain (in/in)	Modulus (psi)
II	7-1	2.365	.286	29.3	15.3	.299	28.2	14.1			119.0	.00659	18069.0
	7-2	2.369	.283	19.3	10.3	.301	18.6	9.6			124.0	.00716	17315.0
	7-7	2.372	.227	20.2	12.4	.289	19.8	12.0			128.0	.00714	17930.0
	7-8	2.370	.226	24.9	16.3	.297	14.8	6.1	1164	12			
	7-9	2.403	.355	52.0	30.2	.416	55.3	33.5	1636	10			
	7-11	2.389	.211	62.1	47.5	.373	64.4	39.3	1479	13			
	AVG	2.378	.265	34.6	22.0	.329	33.5	19.1	1426	12	123.7	.00696	17771.3

Table 14. Test Sequence II for FM 2061 McAllen, original design (Loop 374). (Continued)

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
III													

Phase	Sample	Bulk Specific Gravity	M_R x 10^6 psi -13°F	M_R x 10^6 psi 33°F	M_R x 10^6 psi 77°F	M_R x 10^6 psi 104°F	Splitting Tensile Test @ 77°F Stress (psi)	Splitting Tensile Test @ 77°F Strain (in/in)	Splitting Tensile Test @ 77°F Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	7-4	2.366	2.112	1.384	.259	.034	141.0	.00597	23602.0	2.375	0.4
	7-5	2.358	1.594	1.389	.214	.033	135.0	.00418	32330.0	2.368	0.4
	7-6	2.352	2.121	1.517	.232	.037	148.0	.00598	24760.0	2.394	1.8
	7-13	2.382	2.554	1.962	.350	.046	142.0	.00537	26444.0	2.414	1.3
	AVG	2.365	2.095	1.563	.264	.038	141.5	.00538	26784.0	2.388	1.0

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

+ Data Not Available - Estimated Weights Used in Calculation of BSG.

Table 15. Test Sequence II for FM 2061 McAllen, modified design (Loop 374).

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Marshall Test Stability (lbs)	Marshall Test Flow (0.01 in)	Percent Asphalt	Penetration, dmm 39.2°F	Penetration, dmm 77°F	Viscosity, poises 77°F	Viscosity, poises 140°F	Viscosity, poises 275°F	Ring and Ball Softening Point, °F
	8-3	2.377	.513	2093	9							
I	8-5	2.335	.478	1125	13							
	8-11	2.372	.675	1970	12	5.09	5	32	$1.1x10^7$	6280	5.414	135
	AVG	2.361	.555	1729	11	5.09	5	32	$1.1x10^7$	6280	5.414	135

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R* @ 77°F x 10^6 psi	Hveem Stability* Percent (UNC)	Hveem Stability* Percent (THD)	Marshall Test* Stability pounds	Marshall Test* Flow 0.01 in	Splitting Tensile Test @ 77°F* Stress (psi)	Splitting Tensile Test @ 77°F* Strain (in/in)	Splitting Tensile Test @ 77°F* Modulus (psi)
	8-1	2.358	.264	52.2	34.6	.337	57.8	32.5			122.0	.00418	29220.0
II	8-2	2.372	.200	55.8	47.5	.372	64.7	40.3			117.0	.00418	29760.0
	8-4	2.371	.432	48.4	25.5	.478	52.4	29.5	1460	19			
	8-7	2.326	.513	47.2	31.5	.591	66.6	41.5	1953	14			
	8-8	2.358	.293	41.7	20.4	.253	45.3	23.9			109.0	.00659	16538.0
	8-12	2.362	.669	50.3	26.4	.605	54.3	30.4	1252	19			
	AVG	2.358	.395	49.3	31.0	.439	56.9	33.0	1555	17	116.0	.00498	25172.7

Table 15. Test Sequence II for FM 2061 McAllen, modified design (Loop 374). (Continued)

Phase	Sample	Bulk Specific Gravity	M_R @ 77°F x 10^6	Hveem Stability Percent (UNC)	Hveem Stability Percent (THD)	M_R** @ 77°F x 10^6 psi	Hveem Stability** Percent (UNC)	Hveem Stability** Percent (THD)	Marshall Test** Stability pounds	Marshall Test** Flow 0.01 in	Splitting Tensile Test @ 77°F** Stress (psi)	Splitting Tensile Test @ 77°F** Strain (in/in)	Splitting Tensile Test @ 77°F** Modulus (psi)
III													

Phase	Sample	Bulk Specific Gravity	M_R x 10^6 psi -13°F	M_R x 10^6 psi 33°F	M_R x 10^6 psi 77°F	M_R x 10^6 psi 104°F	Splitting Tensile Test @ 77°F Stress (psi)	Splitting Tensile Test @ 77°F Strain (in/in)	Splitting Tensile Test @ 77°F Modulus (psi)	Rice Specific Gravity	Percent Air Voids
IV	8-6	2.330	2.604	2.352	.611	.139	208.0	.00238	87288.0	2.435	4.3
	8-9	2.367	2.396	1.540	.417	.062	139.0	.00416	33374.0	2.400	1.4
	8-10	2.366	2.401	1.791	.489	.071	172.0	.00298	57647.0	2.400	1.4
	AVG	2.354	2.467	1.894	.506	.091	173.0	.00317	59436.3	2.412	2.4

Notes

* Denotes test results after (24-hour) Lottman moisture treatment procedure.

** Denotes test results after (18 cycle) Lottman moisture treatment procedure.

M_R - Resilient Modulus

Table 16. Test Sequence II results for U.S. 59, Shelby County pavement distress problem. Page 1

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY			PENETRATION		RING & BALL	PERCENT ASPHALT
							@ 77°F	@ 140°F	@ 275°F	39.2°F	77°F		
I	2A	1.270	2.605										
	3A	1.146	2.589										
	4A	0.919	2.580										
	AVG.	1.112	2.594				6.0×10^6	3693	3.554	22	55	130°	4.69

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R @ 77°F	HVEEM* STABILITY		INDIRECT TENSION*			MARSHALL STABILITY	MARSHALL FLOW
					(UNC)	(THD)		(UNC)	(THD)	MODULUS	STRESS	STRAIN		
II	2B	1.616	2.303	.087	36.2	22.2	.074	34.4	20.4	34561.0	52.0	.00150		
	3B	2.937	2.353	.103	35.0	47.5	.094	20.6	33.1				260	13
	4B	2.842	2.346	.093	24.4	35.0	.084	20.3	30.9	26798.0	48.0	.00179		
	AVG.	2.465	2.334	.094	31.9	34.9	.084	25.1	28.1	30679.5	50.0	.00165	260	13

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R @ 77°F	HVEEM STABILITY		INDIRECT TENSION		
					(UNC)	(THD)		(UNC)	(THD)	MODULUS	STRESS	STRAIN
III												
	AVG.											

Table 16. (Continued) Test Sequence II results for U.S. 59, Shelby County pavement distress problem. Page 2

LEG NO.	SAMPLE NO	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY		M_R @77°F	HVEEM STABILITY (UNC)	HVEEM STABILITY (THD)	MARSHALL STABILITY	MARSHALL FLOW	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN
IV																	
	AVG.																

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN	RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
V	2A	1.270	2.605					2.686	
	3A	1.146	2.598						
	4A	0.919	2.580					2.693	
	AVG.	1.112	2.594					2.690	3.4

NOTES:

1) 'A' samples are from 4 inch diameter cores testing item 340 surface material.
2) 'B' samples are from the same 4 inch diameter cores testing underlying item 292 materials.
3) '6' samples are testing item 292 materials from layers A, B, and C of 6 inch cores.

*Denotes test results following the accelerate Lottman (24 hour moisture treatment).

Table 16. (Continued) Test Sequence II results for U.S. 59, Shelby County pavement distress problem. Page 3

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY			PENETRATION		RING & BALL	PERCENT ASPHALT
							@ 77°F	@ 140°F	@ 275°F	39.2°F	77°F		
I	6A						5.8×10^6	4356	5.626	19	44	135	4.2
	6B						5.0×10^6	5301	5.987	21	42	134	5.8
	6C						4.5×10^6	4320	5.368	20	45	131	5.6
	AVG.						5.1×10^6	4659	5.660	20	44	133	5.2

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R @ 77°F	HVEEM* STABILITY		INDIRECT TENSION*			MARSHALL STABILITY	MARSHALL FLOW
										MODULUS	STRESS	STRAIN		
II														
	AVG.													

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R @ 77°F	HVEEM STABILITY		INDIRECT TENSION		
										MODULUS	STRESS	STRAIN
III												
	AVG.											

Table 16. (Continued) Test Sequence II results for U.S. 59, Shelby County pavement distress problem. Page 4

LEG NO.	SAMPLE NO	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY		M_R @77°F	HVEEM STABILITY		MARSHALL STABILITY	MARSHALL FLOW	INDIRECT TENSION		
															MODULUS	STRESS	STRAIN
IV																	
	AVG.																

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	INDIRECT TENSION			RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
					MODULUS	STRESS	STRAIN		
V	3B	2.937	2.353					2.649	11.2
	AVG.	2.937	2.353					2.649	11.2

NOTES:

1) 'A' samples are from 4 inch diameter cores testing item 340 surface material.
2) 'B' samples are from the same 4 inch diameter cores testing underlying item 292 materials.
3) '6' samples are testing item 292 materials from layers A, B, and C of 6 inch cores.

*Denotes test results following the accelerate Lottman (24 hour moisture treatment).

Table 17A. Test Sequence II results for Item 340 Type "D" black cores on U.S. 290, Hempstead, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY @ 77°F	VISCOSITY @ 140°F	VISCOSITY @ 275°F	PENETRATION 39.2°F	PENETRATION 77°F	RING & BALL	PERCENT ASPHALT
I	1-6B	1.404	2.277	.494	1,318	4.5							
	1-7A	1.379	2.321	.846	2,242	6.0							
	1-10B	1.499	2.297	.557	904	5.5							
	1-11B	1.884	2.224	.463	468	5.5							
	AVG.	1.542	2.280	.590	1,233	5.4	+	+	+	+	+	+	+

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R @ 77°F	HVEEM* STABILITY UNC	HVEEM* STABILITY THD	INDIRECT TENSION* MODULUS	INDIRECT TENSION* STRESS	INDIRECT TENSION* STRAIN	MARSHALL * STABILITY	MARSHALL* FLOW
II	1-5A	1.538	2.312	.538	56.4	40.9	.356	42.4	26.9				1,209	8.0
	1-5B	1.239	2.278	.695	43.6	22.0	.201	58.9	37.5	32,392	51.0	.00157		
	1-9A	1.901	2.310	.314	37.0	28.8	.281	34.5	26.3				640	8.5
	1-9B	1.209	2.288	.482	57.0	34.9	.254	60.2	38.1	34,524	69.0	.00200		
	1-10A	2.009	2.322	.454	32.1	26.0	.376	30.2	24.1				1,081	9.0
	1-11A	1.999	2.288	.382	33.2	27.0	.255	34.6	28.4	18,571	59.0	.00318		
	AVG.	1.649	2.300	.478	43.2	29.9	.287	43.5	30.2	28,496	59.7	.00225	977	8.5

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN
III												
	AVG.											

Table 17A. (Continued) Test Sequence II results for Item 340 Type "D" black cores on U.S. 290, Hempstead, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY		M_R*** @ 77°F	HVEEM*** STABILITY		INDIRECT TENSION***			*** MARSHALL STABILITY	*** MARSHALL FLOW
								UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN		
IV																	
	AVG.																

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	INDIRECT TENSION			RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
								MODULUS	STRESS	STRAIN		
V	1-6A	1.974	2.319	2.524	2.047	.471	.142	54,895	218.0	.00397	2.413	3.9
	1-7B	1.354	2.273	2.537	2.737	.529	.275	71,633	170.0	.00237	2.421	6.1
	1-8A	1.896	2.307	2.377	1.845	.382	.153	64,826	206.0	.00318	2.415	4.5
	1-8B	1.314	2.268	2.428	2.123	.677	.186	53,451	148.0	.00277	2.414	6.0
	AVG.	1.635	2.292	2.467	2.188	.515	.189	61,201	185.5	.00307	2.416	5.1

* Denotes Test Results Following the Accelerated (24 hour) Lottman Moisture Treatment Procedure.

** Denotes Test Results Following the 7-day Soak Period.

*** Denotes Test Results Following the (18 cycle) Lottman Moisture Treatment Procedure.

+ Denotes No Test Values Available.

M_R Modulus of Resiliency.

Table 17B. Test Sequence II results for Item 340 Type "D" iron ore cores on U.S. 290, Hempstead, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY			PENETRATION		RING & BALL	PERCENT ASPHALT
							@ 77°F	@ 140°F	@ 275°F	39.2°F	77°F		
I	1-2	1.050	2.372	.587	4,925	11.0							
	1-18	1.477	2.377	.705	5,240	10.5							
	1-20	1.350	2.388	.799	5,461	11.0							
	1-21	1.518	2.418	.715	5,796	10.0							
	AVG.	1.349	2.389	.702	5,356	10.6	$3.0x10^7$	82085	11.13	10	21	160°	4.46

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R @ 77°F	HVEEM* STABILITY		INDIRECT TENSION*			MARSHALL STABILITY	MARSHALL FLOW
					UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN		
II	1-1	.873	2.376	.553	85.0	56.2	.301	86.4	57.6				4,170	14
	1-4	.945	2.374	.537	77.4	50.0	.265	+	+				+	+
	1-16	1.541	2.422	.676	54.9	39.5	.567	55.2	33.8				5,463	16
	1-19	1.578	2.404	.775	59.4	44.7	.600	61.3	46.6	67,823	161.0	.00237		
	1-23	1.227	2.318	.621	73.8	52.1	.370	68.0	46.3	31,590	100.0	.00317		
	1-24	1.334	2.350	.425	60.2	40.6	.368	62.3	42.7	33,936	108.0	.00318		
	AVG.	1.250	2.374	.598	68.5	47.2	.412	66.6	45.4	44,450	123.0	.00291	4,817	15

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R @ 77°F	HVEEM STABILITY		INDIRECT TENSION		
					UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN
III	1-3	.972	2.396	.619	83.7	56.9	.414	83.2	56.4	38,709	123.0	.00318
	1-17	1.622	2.392	.673	57.7	43.9	.612	56.3	42.5	69,282	165.0	.00238
	1-22	1.381	2.398	.621	61.3	42.7	.520	70.9	52.3	70,910	141.0	.00199
	AVG.	1.370	2.395	.638	67.6	47.8	.515	70.1	50.4	59,634	143.0	.00252

Table 17B. (Continued) Test Sequence II results for Item 340 Type "D" ira re cores on U.S. 290, Hempstead, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R^{***} @ 77°F	HVEEM*** STABILITY UNC	HVEEM*** STABILITY THD	INDIRECT TENSION*** MODULUS	INDIRECT TENSION*** STRESS	INDIRECT TENSION*** STRAIN	*** MARSHALL STABILITY	*** MARSHALL FLOW
IV																	
	AVG.																

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN	RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
V	1-13	1.337	2.386	2.015	1.256	.643	.271	97,558	155.0	.00159	2.540	6.1
	1-14	1.320	2.392	2.059	1.248	.608	.274	104,135	165.0	.00158	2.532	5.5
	1-15	1.452	2.398	2.304	1.409	.737	.272	67,259	160.0	.00238	2.568	6.6
	AVG.	1.370	2.392	2.126	1.304	.663	.272	89,651	160.0	.00185	2.547	6.1

* Denotes Test Results Following the Accelerated (24 hour) Lottman Moisture Treatment Procedure.

** Denotes Test Results Following the 7-day Soak Period.

*** Denotes Test Results Following the (18 cycle) Lottman Moisture Treatment Procedure.

\+ Denotes No Test Values Available.

M_R Modulus of Resiliency.

Table 18. Test Sequence II results for Item 340 Type "D" Asphadure" cores on U.S. 62 in Lubbock, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY @ 77°F	VISCOSITY @ 140°F	VISCOSITY @ 275°F	PENETRATION 39.2°F	PENETRATION 77°F	RING & BALL	PERCENT ASPHALT
I	7-6	1.340	2.083	.446	1,000	16.0							
	7-9	1.433	2.069	.413	1,318	12.0							
	7-10	1.383	2.123	.647	1,894	12.0							
	7-14	.898	2.026	.517	1,334	10.0							
	AVG.	1.264	2.075	.506	1,387	12.5	4.75×10^6	14.725	10.828	3	20	141°	6.94

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R* @ 77°F	HVEEM* STABILITY UNC	HVEEM* STABILITY THD	INDIRECT TENSION* MODULUS	INDIRECT TENSION* STRESS	INDIRECT TENSION* STRAIN	MARSHALL* STABILITY	MARSHALL* FLOW
II	7-3	1.736	2.105	.436	64.6	41.1	.284	34.7	23.1	27,511	109.0	.00396		
	7-4	1.703	2.089	.352	40.3	28.8	.161	28.4	16.2				841	16.0
	7-5	1.293	2.075	.408	50.6	29.4	.184	48.2	27.8				1,061	17.0
	7-8	1.252	2.069	.380	58.2	35.7	.195	47.9	26.7	16,562	79.0	.00477		
	7-12	1.191	2.061	.503	51.5	31.1	.218	68.6	36.2				1,619	16.0
	7-13	1.136	2.088	.592	42.6	30.4	.309	61.1	37.6	30,383	121.0	.00398		
	AVG.	1.385	2.081	.445	51.3	32.8	.225	48.2	27.9	24,819	103.0	.00424	1,174	16.3

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN
III												
	AVG.											

Table 18. (Continued) Test Sequence II results for Item 340 Type "D" Asphadure" cores on U.S. 62 in Lubbock, Texas

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY		M_R^{***} @ 77°F	HVEEM*** STABILITY		INDIRECT TENSION***			*** MARSHALL STABILITY	*** MARSHALL FLOW
								UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN		
IV																	
	AVG.																

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	INDIRECT TENSION			RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
								MODULUS	STRESS	STRAIN		
V	7-1	1.430	2.091	2.079	1.679	.485	.101	44,204	140.0	.00317	2.269	7.8
	7-2	1.635	2.113	2.073	1.527	.419	.087	47,866	152.0	.00318	2.242	5.8
	7-7	1.363	2.080	1.945	1.483	.406	.080	41,223	131.0	.00318	2.254	7.7
	7-11	1.359	2.085	2.798	1.821	.581	.110	63,002	150.0	.00238	2.257	7.6
	AVG.	1.447	2.092	2.224	1.628	.473	.095	49,074	143.3	.00291	2.256	7.3

* Denotes Test Results Following the Accelerated (24 hour) Lottman Moisture Treatment Procedure.

** Denotes Test Results Following the 7-day Soak Period.

*** Denotes Test Results Following the (18 cycle) Lottman Moisture Treatment Procedure.

\+ Denotes No Test Values Available.

M_R Modulus of Resiliency.

Table 19. Test Sequence II results for field cores of surface hot-mix Item 340 from U.S. 87 at 34th Street in Lubbock, Texas

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY @ 77°F	VISCOSITY @ 140°F	VISCOSITY @ 275°F	PENETRATION 39.2°F	PENETRATION 77°F	RING & BALL	PERCENT ASPHALT
I	6-10	1.011	2.257	.544	3375	11							
	6-15	1.187	2.317	.274	2085	21							
	6-16	1.171	2.259	.293	2606	14							
	6-17	1.021	2.268	.212	2375	14							
	AVG.	1.098	2.275	.331	2610	15	$6.4x10^6$	3434	4.85	10	37	130°	5.64

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R @ 77°F	HVEEM* STABILITY UNC	HVEEM* STABILITY THD	INDIRECT TENSION* MODULUS	INDIRECT TENSION* STRESS	INDIRECT TENSION* STRAIN	MARSHALL STABILITY	MARSHALL FLOW
II	6-7	1.109	2.213	.197	68.6	44.6	.215	41.0	17.0	12,439.0	79.0	.00635		
	6-9	1.092	2.173	.279	56.7	32.3	.244	34.7	10.3				1479	16
	6-11	0.930	2.251	.526	38.1	10.4	.277	35.8	8.2	17,979.0	128.0	.00712		
	6-12	1.073	2.290	.210	20.1	TLTC	.314	17.0	TLTC				2002	18
	6-13	0.997	2.281	.187	38.1	11.8	.283	31.6	5.3				2050	19
	6-14	1.175	2.266	.242	22.5	TLTC	.432	19.8	TLTC	14,002.0	111.0	.00793		
	AVG.	1.063	2.246	.274	40.7	24.8	.294	30.0	10.2	14,806.7	106.0	.00713	1844	18

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN
III	6-1	1.198	2.267	.395	59.5	37.2	.330	44.8	22.5	29,030.0	138.0	.00475
	6-3	1.033	2.247	.209	56.8	34.2	.181	14.4	TLTC	31,078.0	136.0	.00438
	6-8	1.182	2.206	.227	13.7	TLTC	.218	53.2	30.6	25,220.0	140.0	.00555
	6-18	1.080	2.267	.236	34.4	8.8	.230	13.8	TLTC	26,275.0	146.0	.00556
	AVG.	1.123	2.247	.267	41.1	26.7	.240	31.6	26.6	27,900.8	140.0	.00506

Table 19. (Continued) Test Sequence II results for field cores of surface hot-mix Item 340 from U.S. 87 at 34th Street in Lubbock, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R^{***} @ 77°F	HVEEM*** STABILITY UNC	HVEEM*** STABILITY THD	INDIRECT TENSION*** MODULUS	INDIRECT TENSION*** STRESS	INDIRECT TENSION*** STRAIN	*** MARSHALL STABILITY	*** MARSHALL FLOW
IV																	
	AVG.																

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	@ -13°F	@ 33°F	@ 77°F	@ 104°F	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN	RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
	6-2	1.086	2.227	2.951	1.943	.310	.084	49,890.0	158.0	.00317	2.252	1.1
	6-4	0.871	2.245	2.903	1.740	.208	.070	18,431.0	132.0	.00716	2.259	0.6
V	6-5	0.961	2.251	2.785	1.608	.282	.065	26,549.0	147.0	.00554	2.273	1.0
	6-6	1.237	2.240	2.829	1.434	.227	.093	35,689.0	113.0	.00317	2.271	1.4
	AVG.	1.039	2.241	2.867	1.681	.257	.078	32,639.8	137.5	.00476	2.264	1.0

* Denotes Test Results Following the Accelerated (24 hour) Lottman Moisture Treatment Procedure.

** Denotes Test Results Following the 7-day Soak Period.

*** Denotes Test Results Following the (18 cycle) Lottman Moisture Treatment Procedure.

\+ Denotes No Test Values Available.

M_R Modulus of Resiliency.

Table 20A. Test Sequence II results for field cores of surface hot-mix Item 340 from Loop 287 in Lufkin, Texas

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY @ 77°F	VISCOSITY @ 140°F	VISCOSITY @ 275°F	PENETRATION 39.2°F	PENETRATION 77°F	RING & BALL	PERCENT ASPHALT
I	4-10	.610	2.363	.152	1251	10							
	4-12	.708	2.371	.124	1390	10							
	4-14	.680	2.367	.202	1390	12							
	4-15	.840	2.344	.136	1807	12							
	AVG.	.710	2.361	.154	1460	11	3.15×10^6	3427	5.638	17	52	128°	5.59

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R @ 77°F	HVEEM* STABILITY UNC	HVEEM* STABILITY THD	INDIRECT TENSION* MODULUS	INDIRECT TENSION* STRESS	INDIRECT TENSION* STRAIN	MARSHALL STABILITY	MARSHALL FLOW
II	4-1	.973	2.361	.074	63.4	36.6	.295	71.3	44.6				2224	18
	4-2	.948	2.359	.077	64.4	37.1	.233	45.9	18.6	17,197.0	109.0	.00634		
	4-4	.877	2.370	.118	70.3	41.6	.312	74.9	46.2				2641	18
	4-6	.822	2.360	.130	68.1	38.3	.270	79.0	49.2	19,527.0	108.0	.00553		
	4-7	.710	2.367	.143	78.0	46.0	.308	72.5	40.5				1946	15
	4-13	.776	2.369	.187	68.1	37.4	.272	76.4	45.6	18,423.0	117.0	.00635		
	AVG.	.851	2.364	.122	68.7	39.5	.282	70.0	40.8	18,382.3	111.3	.00607	2270	17

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R @ 77°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN
III	4-5	.779	2.362	.113	84.0	53.3	.260	73.3	42.6	18,030.0	129.0	.00715
	4-9	.678	2.360	.162	87.2	54.5	.282	80.2	47.5	32,822.0	143.0	.00436
	4-11	.735	2.347	.127	82.9	51.4	.245	80.2	48.6	24,959.0	139.0	.00557
	4-18	.926	2.363	.143	76.7	49.0	.487	58.4	30.7	23,525.0	131.0	.00557
	AVG.	.780	2.358	.136	82.7	52.1	.319	73.0	42.4	24,834.0	135.5	.00566

Table 20A. (Continued) Test Sequence II results for field cores of surface hot-mix Item 340 from Loop 287 in Lufkin, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY		M_R*** @ 77°F	HVEEM*** STABILITY		INDIRECT TENSION***			*** MARSHALL STABILITY	*** MARSHALL FLOW
								UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN		
IV																	
	AVG.																

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	@ -13°F	@ 33°F	@ 77°F	@ 104°F	INDIRECT TENSION			RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
								MODULUS	STRESS	STRAIN		
V	4-3	.775	2.366	3.921	1.689	.092	.067	35,214.0	140.0	.00398	2.427	2.5
	4-8	.758	2.350	3.762	1.375	.125	.058	19,855.0	126.0	.00635	2.398	2.0
	4-16	.917	2.362	3.267	1.646	.156	.055	28,448.0	113.0	.00397	2.389	1.1
	4-17	.774	2.361	3.295	1.590	.136	.052	19,260.0	107.0	.00556	2.423	2.6
	AVG.	.806	2.360	3.561	1.575	.127	.058	25,694.3	121.5	.00497	2.409	2.0

* Denotes Test Results Following the Accelerated (24 hour) Lottman Moisture Treatment Procedure.

** Denotes Test Results Following the 7-day Soak Period.

*** Denotes Test Results Following the (18 cycle) Lottman Moisture Treatment Procedure.

\+ Denotes No Test Values Available.

M_R Modulus of Resiliency.

Table 20B. Test Sequence II results for field cores from second layer of hot-mixed material from Loop 287 in Lufkin, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY			PENETRATION		RING & BALL	PERCENT ASPHALT
							@ 77°F	@ 140°F	@ 275°F	39.2°F	77°F		
I	4-1A	1.122	2.314	.093	1138	12.5							
	4-2A	1.046	2.366	.125	1625	14.0							
	4-11A	1.106	2.354	.110	1547	13.0							
	4-18A	0.929	2.360	.081	1279	11.0							
	AVG.	1.051	2.349	.102	1397	12.6	3.1×10^6	3938	5.674	15	43	129°	5.68

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R @ 77°F	HVEEM* STABILITY		INDIRECT TENSION*			MARSHALL STABILITY	MARSHALL FLOW
					UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN		
II	4-3A	1.082	2.366	.109	66.0	41.4	.265	55.8	31.2				2000	12
	4-4A	0.973	2.397	.125	74.4	47.6	.292	70.4	43.6	19,332.0	123.0	.00636		
	4-7A	1.073	2.388	.079	55.2	30.4	.144	61.1	36.3				1800	14
	4-12A	1.098	2.367	.073	54.2	29.9	.123	47.5	23.3	10,964.0	87.0	.00794		
	4-13A	1.224	2.382	.093	44.9	23.1	.141	45.4	23.6	16,393.0	104.0	.00634		
	4-14A	1.250	2.363	.068	54.1	32.8	.172	42.9	21.8				1444	14
	AVG.	1.117	2.377	.091	58.1	34.2	.190	53.9	30.0	15,563.0	104.7	.00688	1748	13

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R @ 77°F	HVEEM STABILITY		INDIRECT TENSION		
					UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN
III	4-5A	1.249	2.386	.090	51.6	30.4	.154	30.3	9.0	15,188.0	133.0	.00876
	4-9A	1.253	2.354	.079	51.6	30.5	.125	32.4	11.2	16,013.0	127.0	.00793
	4-10A	1.088	2.359	.105	52.8	28.3	.138	51.0	26.5	13,412.0	117.0	.00872
	4-16A	1.152	2.347	.115	58.0	34.8	.148	48.4	25.2	16,449.0	117.0	.00711
	AVG.	1.186	2.362	.097	53.5	31.0	.141	40.5	18.0	15,265.5	123.5	.00813

Table 20B. (Continued) Test Sequence II results for field cores from second layer of hot-mixed material from Loop 287 in Lufkin, Texas

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R*** @ 77°F	HVEEM*** STABILITY UNC	HVEEM*** STABILITY THD	INDIRECT TENSION*** MODULUS	INDIRECT TENSION*** STRESS	INDIRECT TENSION*** STRAIN	*** MARSHALL STABILITY	*** MARSHALL FLOW
IV																	
	AVG.																

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	@ -13°F	@ 33°F	@ 77°F	@ 104°F	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN	RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
V	4-6A	1.055	2.387	3.188	1.409	.083	.025	17,119.0	109.0	.00637	2.391	0.2
	4-8A	1.102	2.384	3.348	1.580	.078	.032	14,365.0	103.0	.00717	2.427	1.8
	4-15A	1.072	2.315	2.417	1.412	.111	.040	17,315.0	110.0	.00635	2.429	4.7
	4-17A	1.273	2.354	2.721	1.214	.095	.035	18,916.0	105.0	.00555	2.449	3.9
	AVG.	1.126	2.360	2.919	1.404	.092	.033	16,928.8	106.8	.00636	2.424	2.7

* Denotes Test Results Following the Accelerated (24 hour) Lottman Moisture Treatment Procedure.

** Denotes Test Results Following the 7-day Soak Period.

*** Denotes Test Results Following the (18 cycle) Lottman Moisture Treatment Procedure.

\+ Denotes No Test Values Available.

M_R Modulus of Resiliency.

Table 21A. Test Sequence II results for field cores of surface hot-mix Item 340 from U.S. 59 north of Lufkin, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY			PENETRATION		RING & BALL	PERCENT ASPHALT
							@ 77°F	@ 140°F	@ 275°F	39.2°F	77°F		
I	5-9	0.876	2.371	.193	2085	11							
	5-10B	0.997	2.356	.222	2780	9							
	5-13	0.953	2.372	.179	2085	10							
	5-16	0.996	2.365	.168	2641	9							
	AVG.	0.956	2.366	.191	2398	10	$1.5x10^6$	3685	8.17	18	50	131°	6.14

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R @ 77°F	HVEEM* STABILITY		INDIRECT TENSION*			MARSHALL STABILITY	MARSHALL FLOW
					UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN		
II	5-2B	0.772	2.363	.213	72.2	41.4	.350	59.3	28.4	19,168.0	122.0	.00636		
	5-3B	0.812	2.372	.174	64.5	34.5	.312	67.8	37.8	17,915.0	114.0	.00636		
	5-8	0.855	2.372	.190	60.0	30.8	.274	56.7	27.5				1946	14
	5-14	1.067	2.348	.147	33.9	9.0	.286	44.8	19.8	18,387.0	131.0	.00712		
	5-17	1.052	2.347	.144	36.8	11.6	.266	37.9	12.7				2300	14
	5-18	1.050	2.362	.166	42.6	17.3	.317	48.4	23.2				2125	17
	AVG.	0.935	2.361	.172	51.7	24.1	.301	51.6	24.9	18,490.0	1223	.00662	2124	15

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R @ 77°F	HVEEM STABILITY		INDIRECT TENSION		
					UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN
III	5-1B	0.695	2.373	.205	72.7	40.4	.194	79.4	47.1	18,404.0	117.0	.00636
	5-6	0.980	2.368	.190	50.8	24.1	.130	56.5	29.9	39,924.0	127.0	.00318
	5-7	0.798	2.375	.165	68.1	37.8	.153	73.8	43.5	15,157.0	96.0	.00633
	5-15	1.059	2.364	.169	43.9	18.8	.133	47.3	22.2	29,229.0	185.0	.00633
	AVG.	.883	2.370	.182	58.9	30.3	.153	64.3	35.7	25,678.5	131.3	.00555

Table 21A. (Continued) Test Sequence II results for field cores of surface hot-mix Item 340 from U.S. 59 north of Lufkin, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY UNC	HVEEM STABILITY TRD	M_R^{***} @ 77°F	HVEEM*** STABILITY UNC	HVEEM*** STABILITY TRD	INDIRECT TENSION*** MODULUS	INDIRECT TENSION*** STRESS	INDIRECT TENSION*** STRAIN	*** MARSHALL STABILITY	*** MARSHALL FLOW
IV																	
	AVG.																

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	@ -13°F	@ 33°F	@ 77°F	@ 104°F	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN	RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
V	5-4B	0.802	2.342	2.700	1.583	.201	.051	17,515.0	139.0	.00794	2.398	2.3
	5-5B	0.999	2.363	2.742	1.499	.186	.050	24,105.0	134.0	.00556	2.375	0.5
	5-11	1.020	2.359	2.905	1.345	.169	.042	20,657.0	131.0	.00644	2.366	0.3
	5-12	0.847	2.356	2.835	1.493	.160	.060	15,268.0	109.0	.00714	2.379	1.0
	AVG.	0.917	2.355	2.796	1.480	.179	.051	19,386	128.3	.00677	2.380	1.1

* Denotes Test Results Following the Accelerated (24 hour) Lottman Moisture Treatment Procedure.

** Denotes Test Results Following the 7-day Soak Period.

*** Denotes Test Results Following the (18 cycle) Lottman Moisture Treatment Procedure.

\+ Denotes No Test Values Available.

M_R Modulus of Resiliency.

Table 21B. Test sequence II results for field cores from bottom layer of hot-mixed material from U.S. 59 north of Lufkin, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	MARSHALL STABILITY	MARSHALL FLOW	VISCOSITY			PENETRATION		RING & BALL	PERCENT ASPHALT
							@ 77°F	@ 140°F	@ 275°F	39.2°F	77°F		
I	5-9	1.011	2.198	.196	925	10							
	5-12	.929	2.231	.130	612	12							
	5-13	1.058	2.189	.163	900	9							
	5-18	.888	2.216	.142	556	9							
	AVG.	.972	2.209	.158	748	10	3.7×10^6	5100	8.509	12	42	126°	6.79

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R @ 77°F	HVEEM* STABILITY		INDIRECT TENSION*			MARSHALL STABILITY	MARSHALL FLOW
					UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN		
II	5-3B	.842	2.240	.121	78.5	48.5	.095	75.7	45.7				1112	12
	5-5B	1.010	2.178	.158	80.5	54.3	.084	68.5	42.2				612	11
	5-7	1.071	2.230	.083	67.8	37.5	.101	59.0	28.7	25,772.0	82.0	.00318		
	5-8	1.030	2.239	.139	76.5	47.4	.079	61.2	32.1	12,203.0	73.0	.00598		
	5-15	1.170	2.161	.169	61.5	36.4	.097	53.8	28.8	14,778.0	59.0	.00399		
	AVG.	1.025	2.210	.134	73.0	44.8	.091	62.0	35.5	17,584.3	71.3	.00438	862	12

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ 77°F	HVEEM STABILITY		M_R @ 77°F	HVEEM STABILITY		INDIRECT TENSION		
					UNC	THD		UNC	THD	MODULUS	STRESS	STRAIN
III	5-2B	.901	2.218	.117	85.5	54.7	.108	74.2	45.9	22,092.0	70.0	.00317
	5-4B	.980	2.203	.168	71.4	41.2	.112	61.0	34.3	25,018.0	99.0	.00396
	5-11B	1.017	2.160	.154	70.3	44.5	.102	62.0	36.1	21,638.0	69.0	.00319
	5-17	1.194	2.175	.138	56.5	31.3	.082	53.3	31.0	20,217.0	80.0	.00396
	AVG.	1.023	2.189	.144	70.9	42.9	.101	62.6	36.8	22,241.3	79.5	.00357

Table 21B. (Continued) Test Sequence II results for field cores from bottom layer of hot-mixed material from U.S. 59 north of Lufkin, Texas.

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	M_R @ -13°F	M_R @ 33°F	M_R @ 77°F	M_R @ 104°F	HVEEM STABILITY UNC	HVEEM STABILITY THD	M_R^{***} @ 77°F	HVEEM*** STABILITY UNC	HVEEM*** STABILITY THD	INDIRECT TENSION*** MODULUS	INDIRECT TENSION*** STRESS	INDIRECT TENSION*** STRAIN	*** MARSHALL STABILITY	*** MARSHALL FLOW
IV																	
	AVG.																

LEG NO.	SAMPLE NO.	HEIGHT	BULK SPECIFIC GRAVITY	@ -13°F	@ 33°F	@ 77°F	@ 104°F	INDIRECT TENSION MODULUS	INDIRECT TENSION STRESS	INDIRECT TENSION STRAIN	RICE SPECIFIC GRAVITY	PERCENT AIR VOIDS
V	5-18	.802	2.242	3.155	1.154	.144	.038	12,914.0	92.0	.00712	2.397	6.5
	5-10	.846	2.199	2.631	0.909	.115	.033	10,951.0	78.0	.00712	2.375	7.4
	5-14	.960	2.182	2.904	1.084	.164	.041	21,600.0	103.0	.00477	2.354	7.3
	5-16	1.018	2.199	3.889	1.419	.134	.035	18,015.0	143.0	.00794	2.368	7.1
	AVG.	.907	2.206	3.145	1.142	.139	.037	15,870	104.0	.00674	2.374	7.1

* Denotes Test Results Following the Accelerated (24 hour) Lottman Moisture Treatment Procedure.

** Denotes Test Results Following the 7-day Soak Period.

*** Denotes Test Results Following the (18 cycle) Lottman Moisture Treatment Procedure.

\+ Denotes No Test Values Available.

M_R Modulus of Resiliency.

Table 22. Summary of roadway pavements with Item 340 layers evaluated under Project 2-9-80-285.

Laboratory Test Data Table Number*	Highway Number**	Control-Section Number	District Number	County	Location or Limits of Roadway Section	Laboratory Test Sequence Number	Comments
1a - 1g (1-7)	US 82 (4)	132-1	25	Dickens	From 4.9 miles east of SH 70 to 15.0 miles east in westbound traveled lane; R.	I	Joint 285/287 Studies. Seven different subsections having different asphalt cements.
2a - 2g (8-14)	US 287 (4)	66-4	4	Moore	From approximately 4.5 miles north of Dumas to several miles north in north-bound traveled lane, L.	I	Joint 285/287 Studies. Seven different subsections having different asphalt cements
3A - 3G (15-21)	US 82 (4)	132-1	25	Dickens	Same as above US 82 roadway.	II	Joint 285/287 Studies. Seven different subsections having different asphalt cements.
4A - 4G (22-28)	US 287 (4)	66-4	4	Moore	Same as above US 287 roadway.	II	Joint 285/287 Studies. Seven different subsections having different asphalt cements.
5 (29)	IH 45 (4)	675-4	17	Madison	L northbound traveled lane, Mile Post 144.2, Madisonville.	II	18-core section.
6 (30)	IH 45 (4)	675-4	17	Madison	L north bound traveled lane, Mile Post 143.7, Madisonville.	II	12-core section

Table 22. (Continued) Summary of roadway pavements with Item 340 layers evaluated under Project 2-9-80-285.

Laboratory Test Data Table Number*	Highway Number**	Control-Section Number	District Number	County	Location or Limits of Roadway Section	Laboratory Test Sequence Number	Comments
7 (31)	IH 45 (4)	675-6	17	Walker	R southbound traveled lane, Mile Post 117.4, Huntsville	II	
8 (32)	IH 35 (4)	48-4	18	Ellis	Approximately MP 397 to 407, southbound and northbound traveled lanes.	II	Cores taken and furnised by district.
9 (33)	US 77 Bypass (4)	371-4	16	Kleberg	R southbound traveled lane, 0.4 mile south of FM Road 1356, Kingsville, Texas.	II	
10 (34)	US 77 Bypass (4)	102-4	16	San Patricio	L. northbound traveled lane, 0.5 mile south of JCT with north end of US 77 Business Route, Sinton, Texas.	II	
11 (35)	IH 37 (4)	74-1	16	Live Oak	L northbound traveled lane, Mile Post 66.8, north of George West.	II	
12 (36)	SH 71 Business (2)	266-3	13	Colorado	Southbound lane, 0.3 mile south of north JCT with SH 71 in Columbus, Texas.	II	
13 (37)	US 90A (2)	466-3	13	Colorado	Eastbound lane, 0.2 mile west of Colorado River Bridge.	II	
14 (38)	Loop 374/ FM 2061 (4)	39-3	21	Hidalgo	R, westbound traveled lane, in McAllen.	II	Surface layer of original design.

Table 22. (Continued) Summary of roadway pavements with Item 340 layers evaluated under Project 2-9-80-285.

Laboratory Test Data Table Number*	Highway Number**	Control-Section Number	District Number	County	Location or Limits of Roadway Section	Laboratory Test Sequence Number	Comments
15 (39)	Loop 374/ FM 2061 (4)	39-3	21	Hidalgo	R, westbound traveled lane, in McAllen	II	Surface after modification of design.
16 (40)	US 59 (4)	63-6 & 175-4	11	Shelby	Tenaha, Texas	II	Cores taken and furnished by district. Testing limited.
17A (41)	US 290/ SH 6 (4)	50-5	12	Waller	R, southbound traveled lane, 0.1 mile north of intersection of US 290 with FM Road 159 in Hempstead.	II	Black cores.
17B (42)	US 290/ SH 6 (4)	50-5	12	Waller	Same location as 17a above.	II	Iron ore hot-mix cores
18 (43)	US 62 (4)	130-5	5	Lubbock	Intersection of US 62 with US 84 in Lubbock.	II	Hot-mix containing "Asphadure"
19 (44)	US 87 (4)	68-1	5	Lubbock	Intersection of US 87 with 34th Street in Lubbock.	II	
20A (45)	Loop 287 (4)	2553-1	11	Angelina	L, northbound traveled lane, 1.0 mile south of FM Road 1271 in Lufkin.	II	Surface layer of hot-mixed material.

Table 22. (Continued) Summary of roadway pavements with Item 340 layers evaluated under Project 2-9-80-285.

Laboratory Test Data Table Number*	Highway Number**	Control-Section Number	District Number	County	Location or Limits of Roadway Section	Laboratory Test Sequence Number	Comments
20B (46)	Loop 287 (4)	2553-1	11	Angelina	Same location as 20A above.	II	Second layer of hot-mixed material.
21A (47)	US 59 (4)	176-1	11	Angelina	L northbound traveled lane, 1.0 mile north of FM 2021.	II	Hot-mixed surface layer.
21B (48)	US 59 (4)	176-1	11	Angelina	Same location as 21A above.	II	Second or bottom layer of hot-mixed material.

*Numbers in ( ) indicate Data Code numbers.

**Numbers in ( ) indicate number of lanes.

Table 23. PRS scores and average rut depth measurements for Study 285 roadway sites.

Data* Code Number	Highway Number	PRS Score	Average Rut Depth, mm
1- 7	US 82	100**	0**
8-14	US 287	100**	0**
15-21	US 82	98-100***	0-1***
22-28	US 287	--	--
29	IH 45	89	9
30	IH 45	94	7
31	IH 45	95	1
32	IH 35	--	12 est.
33	US 77 Bypass	92	5
34	US 77 Bypass	100	2
35	IH 37	100	5
36	SH 71 Business	97	1
37	US 90A	100	0
38	Loop 374	76	10
39	Loop 374	98	3
40	US 59	--	12 est.
41	US 290/SH 6	67	6
42	US 290/SH 6	(Same)	(Same)
43	US 62	96	2
44	US 87	88	23
45	Loop 287	90	12
46	Loop 287	(Same)	(Same)
47	US 59	--	9
48	US 59	(Same)	(Same)

*See Table 22.

**Assumed at time Item 340 hot-mix layers were placed.

***Evaluation one year after placement.

-- Data not taken.

Table 23A. Breakdown of US 82 and 287 roadway section subsites by asphalt supplier, type and grade.

Data Code Number	Highway Number	Test Table Number	Asphalt Supplier	Asphalt Type and Grade
1	US 82	1a*	MacMillan	AC-10
2	US 82	1b	Dorchester	AC-20
3	US 82	1c	Exxon	AC-20
4	US 82	1d	Shamrock	AC-20
5	US 82	1e	Shamrock	AC-10
6	US 82	1f	Cosden	AC-20
7	US 82	1g	Cosden	AC-10
8	US 287	2a*	MacMillan	AC-10
9	US 287	2b	Dorchester	AC-10
10	US 287	2c	Exxon	AC-10
11	US 287	2d	Shamrock	AC-20
12	US 287	2e	Shamrock	AC-10
13	US 287	2f	Cosden	AC-20
14	US 287	2g	Cosden	AC-10
15	US 82	3A**	MacMillan	AC-10
16	US 82	3B	Dorchester	AC-20
17	US 82	3C	Exxon	AC-20
18	US 82	3D	Shamrock	AC-20
19	US 82	3E	Shamrock	AC-10
20	US 82	3F	Cosden	AC-20
21	US 82	3G	Cosden	AC-10
22	US 287	4A**	MacMillan	AC-10
23	US 287	4B	Dorchester	AC-10
24	US 287	4C	Exxon	AC-10
25	US 287	4D	Shamrock	AC-20
26	US 287	4E	Shamrock	AC-10
27	US 287	4F	Cosden	AC-20
28	US 287	4G	Cosden	AC-10

*In 1 and 2 series tables, field laboratory compacted specimens were tested.

**In 3 and 4 series tables, roadway cores were tested from same sections.

Table 24. Summary of test results on extracted asphalts from Study 285 roadway sites.

Data Code Number	Extracted Viscosity at 140°F, poise	Extracted Viscosity at 275°F, centipoise	Penetration at 39.2°F, dmm	Penetration at 77°F, dmm	Ring & Ball Point, °F	Percent Asphalt by weight	Test Sample Age, Years
1	11,250	8.3	20	38	138	5.7	0.0
2	11,355	8.7	21	32	144	5.7	0.0
3	8,668	6.1	8	21	136	5.2	0.0
4	9,564	11.0	14	29	141	4.9	0.0
5	2,000	5.9	21	62	122	5.1	0.0
6	4,750	4.5	9	29	132	5.2	0.0
7	4,322	4.2	8	28	132	4.5	0.0
8	1,360	3.5	57	107	112	5.3	0.0
9	1,989	4.0	26	66	122	5.7	0.0
10	2,995	3.9	7	45	126	5.7	0.0
11	2,984	7.1	12	51	125	5.4	0.0
12	1,723	5.2	20	75	121	6.2	0.0
13	2,374	3.4	12	41	125	5.6	0.0
14	1,943	3.1	12	47	122	5.8	0.0
15	9,787	5.7	3	17	143	6.0	1.0
16	8,670	5.8	2	20	140	5.0	1.0
17	5,523	8.1	5	25	143	5.9	1.0
18	12,300	11.8	8	37	137	6.2	1.0
19	12,439	7.3	15	37	140	---	1.0
20	15,466	7.4	0	18	142	5.3	1.0
21	23,155	9.7	10	21	141	4.2	1.0
22	1,453	3.6	30	90	116	4.0	0.7
23	1,930	4.0	26	71	123	5.0	0.7
24	---	---	---	---	---	---	0.7
25	4,468	8.4	10	41	130	5.0	0.7
26	2,263	4.8	15	57	123	6.0	0.7
27	2,453	5.8	8	43	126	5.2	0.7
28	4,492	4.4	8	28	130	5.3	0.7
29	8,300	5.2	4	22	135	4.1	0.7

(Continued)

Table 24. (Continued) Summary of test results on extracted asphalts from Study 285 roadway sites.

Data Code Number	Extracted Viscosity at 140°F poise	Extracted Viscosity at 275°F centipoise	Penetration at 39.2°F, dmm	Penetration at 77°F, dmm	Ring & Ball Point, °F	Percent Asphalt by weight	Test Sample Age, Years
30	4,303	4.7	7	32	129	4.2	
31	3,583	3.8	29	52	128	4.2	
32	22,920	8.4	14	39	135	5.1	
33	2,861	4.1	10	48	130	8.4	
34	2,712	4.1	10	55	128	6.5	
35	8.776	5.8	10	33	140	5.6	
36	10,200	6.9	3	20	139	5.4	
37	6,508	6.2	16	41	132	5.5	
38	2,000	3.6	15	64	122	5.8	
39	6,280	5.4	5	32	135	5.1	
40	3,693	3.5	22	55	130	4.7	
41	---	---	---	---	---	---	
42	82,085	11.1	10	21	160	4.5	
43	14,725	10.8	3	20	141	6.9	
44	3,434	4.9	10	37	130	5.6	
45	3,427	5.6	17	52	128	5.6	
46	3,938	5.6	15	43	129	5.7	
47	3.685	8.2	18	50	131	6.1	
48	5,100	8.5	12	42	126	6.8	

--- Samples were lost or data is missing.

Table 25. Summary of resilient modulus, M_R, results for Study 285 roadway sites.

Data Code Number	M_R @ -13°F, x 10^6 psi	M_R @ 33°F, x 10^6 psi	M_R @ 68°F, x 10^6 psi	M_R @ 77°F, x 10^6 psi	M_R @ 104°F, x 10^6 psi	Average Percent Air Voids
1	1.875	1.172	0.575	---	0.100	5.8
2	2.239	1.335	0.652	---	0.117	4.7
3	2.294	1.662	1.026	---	0.128	6.3
4	2.267	1.764	0.809	---	0.123	5.5
5	2.389	1.586	0.630	---	0.053	4.1
6	2.162	1.626	0.901	---	0.130	6.7
7	1.974	1.447	0.794	---	0.092	5.1
8	2.015	1.657	0.363	---	0.080	8.5
9	1.791	1.257	0.450	---	0.099	7.5
10	2.206	1.350	0.586	---	0.122	10.7
11	1.931	1.459	0.555	---	0.138	6.6
12	1.810	1.363	0.391	---	0.072	5.5
13	1.930	1.287	0.685	---	0.148	8.6
14	1.872	1.676	0.640	---	0.141	6.1
15	2.325	1.313	---	0.340	0.064	9.9
16	1.872	1.248	---	0.308	0.062	14.1
17	2.129	1.203	---	0.217	0.044	9.9
18	1.734	0.970	---	0.257	0.048	10.0
19	1.302	0.804	---	0.223	0.076	14.3
20	2.534	1.428	---	0.394	0.056	11.8
21	1.472	0.686	---	0.127	0.034	14.5
22	1.543	0.811	---	0.129	0.027	13.7
23	1.826	1.053	---	0.319	0.097	12.2
24	1.320	0.918	---	0.168	0.039	15.3
25	1.725	1.124	---	0.366	0.086	11.6
26	1.596	0.958	---	0.153	0.033	6.2
27	1.676	1.290	---	0.373	0.084	10.5
28	1.772	1.231	---	0.422	0.087	13.8

(Continued)

Table 25. (Continued) Summary of resilient modulus, M_R, results for Study 285 roadway sites.

Data Code Number	M_R @ -13°F, x 10^6 psi	M_R @ 33°F, x 10^6 psi	M_R @ 68°F, x 10^6 psi	M_R @ 77°F, x 10^6 psi	M_R @ 104°F, x 10^6 psi	Average Percent Air Voids
29	2.691	2.506	---	0.733*	0.147	3.4
30	3.029	2.166	---	0.655*	0.076	3.0
31	2.240	1.441	0.555	---	0.250	5.0
32	3.269	2.899	1.271	---	0.727	3.4
33	2.185	1.203	---	0.428*	0.089	3.0
34	2.008	1.522	---	0.499*	0.104	4.5
35	1.859	1.131	---	0.403*	0.076	6.3
36	2.464	1.932	---	0.736	0.098	3.1
37	2.113	1.326	---	0.485	0.076	5.9
38	2.096	1.563	---	0.264	0.038	1.0
39	2.467	1.894	---	0.506	0.091	2.4
40	---	---	---	0.094	---	11.2
41	2.467	2.188	---	0.515	0.189	5.1
42	2.126	1.304	---	0.663	0.273	6.1
43	2.224	1.628	---	0.473	0.095	7.3
44	2.867	1.681	---	0.257	0.078	1.0
45	3.561	1.575	---	0.127	0.058	2.0
46	2.919	1.404	---	0.092	0.033	2.7
47	2.796	1.480	---	0.179	0.051	1.1
48	3.145	1.142	---	0.139	0.037	7.1

--- Test not run or data not available.

* Overall M_R for all of test sequence samples.

Note: 10^6 psi = 6.895 x 10^9 pascals (Pa)

Table 26. Summary of indirect tension, σ_T, test results for Study 285 roadway sites.

Data Code Number	σ_{TD} Dry Splitting Tensile Stress, psi	σ_{T24} After 24-Hour Lottman, psi	σ_{T18C} After 18 cycle Lottman, psi	σ_{T7D} After 7-day Soak, psi	Average Air Voids, Percent
1	102	73	92	---	5.8
2	122	112	112	---	4.7
3	159	165	166	---	6.3
4	117	116	121	---	5.5
5	86	70	84	---	4.1
6	140	120	90	---	6.7
7	131	101	116	---	5.1
8	73	49	32	---	8.5
9	86	41	28	---	7.5
10	104	47	19	---	10.7
11	100	60	52	---	6.6
12	63	106	67	---	5.5
13	140	80	42	---	8.6
14	126	84	52	---	6.1
15	107	21	12	48	9.9
16	94	17	11	32	14.1
17	83	33	17	57	9.9
18	51	35	35	41	10.0
19	76	18	7	25	14.3
20	129	45	67	55	11.8
21	54	15	---	11	14.5
22	50	77	17	24	13.7
23	77	18	---	23	12.2
24	70	0	38	--	15.3
25	86	38	---	35	11.6
26	75	31	---	49	6.2
27	93	64	---	57	10.5
28	107	64	---	40	13.8

(Continued)

Table 26. (Continued) Summary of indirect tension, σ_T, test results for Study 285 roadway sites.

Data Code Number	σ_{TD} Dry Splitting Tensile Stress, psi	σ_{T24} After 24-Hour Lottman, psi	σ_{18C} After 18 cycle Lottman, psi	σ_{T7D} After 7-day Soak, psi	Average Air Voids, Percent
29	231	138	227	---	3.4
30	165	---	181	---	3.0
31	109	47	22	---	5.0
32	168	68	33	---	3.4
33	170	46	111	---	3.0
34	233	70	84	---	4.5
35	140	---	110	---	6.3
36	273	190	216	---	3.1
37	142	---	170	---	5.9
38	142	124	---	---	1.0
39	173	116	---	---	2.4
40	---	50	---	---	11.2
41	186	60	---	---	5.1
42	160	123	---	143	6.1
43	143	103	---	---	7.3
44	138	106	---	140	1.0
45	122	111	---	136	2.0
46	107	105	---	123	2.7
47	128	122	---	131	1.1
48	104	71	---	80	7.1

Note: 1 psi = 6.895×10^3 pascals (Pa).

Table 27. Summary of Hveem stability test results for Study 285 roadway sites.

Data Code Number	Overall Dry Hveem Percent	Hveem After 24-Hour Lottman Percent	Hveem After 18-cycle Lottman Percent	Hveem After 7-day Soak Percent	Average Percent Air Voids
1	41.2	25.8	34.1	---	5.8
2	39.8	31.4	28.7	---	4.7
3	40.2	33.8	31.3	---	6.3
4	38.6	32.6	39.5	---	5.5
5	38.7	26.1	40.6	---	4.1
6	39.7	36.0	43.8	---	6.7
7	39.1	36.4	42.9	---	5.1
8	46.8	21.7	17.3	---	8.5
9	46.3	6.9	4.4	---	7.5
10	45.4	24.5	23.6	---	10.7
11	45.5	7.7	8.6	---	6.6
12	39.8	8.8	10.2	---	5.5
13	47.3	11.9	11.5	---	8.6
14	45.8	11.7	20.9	---	6.1
15	23.0	25.2	17.2	30.7	9.9
16	26.9	28.0	16.3	33.4	14.1
17	25.9	27.7	24.6	34.4	9.9
18	25.8	20.2	26.1	34.6	10.0
19	24.2	19.9	16.3	22.3	14.3
20	27.0	21.7	25.9	34.3	11.8
21	21.2	24.3	---	17.1	14.5
22	34.5	17.8	23.8	---	13.7
23	38.0	23.1	---	23.4	12.2
24	28.3	---	19.9	23.4	15.3
25	30.5	22.7	---	21.5	11.6
26	25.5	20.0	---	23.2	6.2
27	32.7	28.1	---	32.6	10.5
28	30.1	20.5	---	19.7	13.8

(Continued)

Table 27. (Continued) Summary of Hveem stability test results for Study 285 roadway sites.

Data Code Number	Overall Dry Hveem Percent	Hveem After 24-Hour Lottman Percent	Hveem After 18,cycle Lottman Percent	Hveem After 7-day Soak Percent	Average Percent Air Voids
29	30.3	18.4	27.6	---	3.4
30	39.7	---	31.8	---	3.0
31	47.8	34.7	33.9	---	5.0
32	55.7	36.2	46.5	---	3.4
33	13.7	12.7	6.1	---	3.0
34	20.5	19.8	16.8	---	4.5
35	31.0	---	21.5	---	6.3
36	26.0	18.2	23.8	---	3.1
37	36.5	---	35.9	---	5.9
38	22.0	19.1	---	---	1.0
39	31.0	33.0	---	---	2.4
40	34.9	28.1	---	---	11.2
41	29.9	30.2	---	---	5.1
42	47.4	45.4	---	50.4	6.1
43	32.8	27.9	---	---	7.3
44	25.6 (17.9)	10.2 (6.8)	---	26.6 (13.3)	1.0
45	44.5	40.8	---	42.4	2.0
46	32.9	30.0	---	18.0	2.7
47	26.6	24.9	---	35.7	1.1
48	44.0	35.5	---	36.8	7.1

Table 28. Summary of Marshall stability test results for Study 285 roadway sites.

Data Code Number	Overall Dry Marshall Strength, lbs	Marshall Strength After 24-Hour Lottman, lbs	Marshall Strength After 18 cycle Lottman, lbs	Dry Marshall Flow, 0.01 in	24-Hour Lottman Marshall Flow, 0.01 in	18 cycle Lottman Marshall Flow, 0.01 in
1	1,553	1,258	---	18	23	--
2	2,072	1,559	1,393	16	22	27
3	2,023	1,841	1,827	17	20	18
4	1,578	---	---	17	--	--
5	1,305	---	---	14	--	--
6	1,567	---	---	21	--	--
7	1,591	---	---	15	--	--
8	2,528	1,069	876	18	26	28
9	1,600	591	802	15	21	26
10	1,720	375	223	15	19	19
11	1,867	982	1,172	16	26	25
12	1,440	1,233	1,224	15	24	22
13	1,971	891	796	16	23	22
14	1,701	941	1,098	16	25	23
15	1,068	---	93	11	--	12
16	941	---	77	14	--	15
17	1,093	---	93	11	--	15
18	934	---	445	14	--	16
19	1,121	---	105	11	--	14
20	1,220	---	711	10	--	21
21	1,012	---	---	13	--	--
22	1,019	---	135	12	--	8
23	1,409	---	---	10	--	--
24	966	---	142	11	--	15
25	1,024	---	---	13	--	--
26	1,099	---	---	14	--	--
27	615	---	---	10	--	--
28	1,024	---	---	11	--	--

(Continued)

Table 28. (Continued) Summary of Marshall stability test results for Study 285 roadway sites.

Data Code Number	Overall Dry Marshall Strength, lbs	Marshall Strength After 24-Hour Lottman, lbs	Marshall Strength After 18 cycle Lottman, lbs	Dry Marshall Flow, 0.01 in	24-Hour Lottman Marshall Flow, 0.01 in	18 cycle Lottman Marshall Flow, 0.01 in
29	1,265	752	791	8	13	13
30	1,298	---	864	6	--	12
31	1,954	491	1,570	7	13	12
32	2,613	2,458	2,375	8	15	14
33	2,984	1,395	1,540	8	18	16
34	2,611	1,088	1,124	10	16	14
35	2,412	---	1,498	15	--	27
36	3,244	2,089	2,184	11	14	14
37	1,444	---	1,426	12	--	16
38	1,138	1,426	---	10	12	--
39	1,729	1,555	---	11	17	--
40	---	260	---	--	13	--
41	1,233	977	---	5	9	--
42	5,356	4,817	---	11	15	--
43	1,387	1,174	---	13	16	--
44	2,610	1,844	---	15	18	--
45	1,460	2,270	---	11	17	--
46	1,397	1,748	---	13	13	--
47	2,398	2,124	---	10	15	--
48	748	862	---	10	12	--

Note: 1 lb = 0.454 kg
1 in = 25.4 mm

Table 29. Characteristics of extracted aggregate grading curves from Study 285 roadway sites.

Data Code Number	Percent Plus No. 10 Sieve	Percent Minus No. 200 Sieve	Percent Hump Above No. 30 Sieve of Continous Grading Curve	Percent Retained Between No. 10 and No. 40 Sieves	Assigned* Performance Rating
1-14	--	--	--	--	--
15	66	4	None	20	--
16	62	3	none	23	--
17	57	5	None	26	--
18	58	4	None	26	--
19	--	--	--	--	--
20	--	--	--	--	--
21	59	4	None	23	--
22	60	3	None	22	--
23	60	4	None	20	--
24	--	--	--	--	--
25	60	4	None	20	--
26	67	0	None	16	--
27	61	3	None	21	--
28	62	4	None	18	--
29	62	3	6	17	F
30	50	3	8	27	P
31	61	6	2	15	G
32	62	3	3	14	P
33	57	3	12	10	F
34	67	4	1	8	G
35	59	3	10	10	F
36	64	4	0	11	G
37	56	7	4	19	G
38	61	3	4	14	P
39	77	6	None	6	G
40	41	2	25	13	P
41	48	2	14	19	F

(Continued)

Table 29. (Continued) Characteristics of extracted aggregate grading curves from Study 285 roadway sites.

Data Code Number	Percent Plus No. 10 Sieve	Percent Minus No. 200 Sieve	Percent Hump Above No. 30 Sieve of Continuous Grading Curve	Percent Retained Between No. 10 and No. 40 Sieves	Assigned* Performance Rating
42	52	9	20	6	F
43	60	5	6	10	G
44	62	7	3	12	P
45	55	6	13	12	P
46	55	7	13	11	P
47	54	5	10	12	P
48	37	6	31	9	P

* G = Good
F = Fair
P = Poor

Table 30. Texas freeze-thaw pedestal test results for US 287 and US 82 roadway subsections.

US 287

Data Code Number	Number of Cycles to Failure
8	6
9	8
10	6
11	12
12	7
13	9
14	10

US 82

Data Code Number	Number of Cycles to Failure
1	---
2	---
3	---
4	---
5	---
6	---
7	---

--- Data not available

Table 31. Part I, design and construction records data for pavement sections covered by Data Code Numbers 1-48.

Data Code Number	Date Pavement Placed	Age,* Years	Accumlated Traffic per Tested Lane x 10^6*	Average Percent Trucks	Accumulated Equivalent 18-Kip Single Axle Loads
1	6/82	0	N/A	N/A	N/A
2	6/82	0	N/A	N/A	N/A
3	6/82	0	N/A	N/A	N/A
4	6/82	0	N/A	N/A	N/A
5	6/82	0	N/A	N/A	N/A
6	6/82	0	N/A	N/A	N/A
7	6/82	0	N/A	N/A	N/A
8	9/82	0	N/A	N/A	N/A
9	9/82	0	N/A	N/A	N/A
10	9/82	0	N/A	N/A	N/A
11	9/82	0	N/A	N/A	N/A
12	9/82	0	N/A	N/A	N/A
13	9/82	0	N/A	N/A	N/A
14	9/82	0	N/A	N/A	N/A
15	6/82	1.0			
16	6/82	1.0			
17	6/82	1.0			
18	6/82	1.0			
19	6/82	1.0			
20	6/82	1.0			
21	6/82	1.0			
22	9/82	0.7			
23	9/82	0.7			
24	9/82	0.7			
25	9/82	0.7			
26	9/82	0.7			
27	9/82	0.7			
28	9/82	0.7			

(Continued)

Table 31. (Continued) Part I, design and construction records data for pavement sections covered by Data Code Numbers 1-48.

Data Code Number	Date Pavement Placed	Age,* Years	Accumlated Traffic per Tested Lane x 10^6*	Average Percent Trucks	Accumulated Equivalent 18-Kip Single Axle Loads
29					
30					
31	11/67	15.1			
32					
33	4/78	5.1			
34	5/80	3.0			
35	1/81	2.3			
36	7/80	2.8			
37	9/82	0.7			
38	3/74	9.3			
39	5/74	9.2			
40					
41	9/78	4.7			
42	3/79	4.2			
43					
44					
45	4-27-78	4.7			
46	4-17-78	4.7			
47	3-06-81	1.8			
48	1-27-81	1.9			

Age = Date pavement cored minus date pavement layer placed.

Table 32. Part IIA, design and construction records data for pavement sections covered by Data Code Numbers 1-48.

Data Code Number	Asphalt Source & Grade	SDHPT Design Percent Asphalt	SDHPT Extracted Asphalt, Percent	TTI Extracted Asphalt, Percent	SDHPT Laboratory Density	Overall SDHPT Project Laboratory Density	SDHPT Field Density
1	*	5.5		5.7			
2	*	5.5		5.7			
3	*	5.5		5.2			
4	*	5.5		4.9			
5	*	5.5		5.1			
6	*	5.5		5.2			
7	*	5.5		4.5			
8	*	6.2		5.3			
9	*	6.2		5.7			
10	*	6.2		5.7			
11	*	6.2		5.4			
12	*	6.2		6.2			
13	*	6.2		5.6			
14	*	6.2		5.8			
15	*	5.5		6.0			
16	*	5.5		5.0			
17	*	5.5		6.2			
18	*	5.5		5.9			
19	*	5.5		---			
20	*	5.5		5.3			

(Continued)

Table 32. Part IIA, design and construction records data for pavement sections covered by Data Code Numbers 1-48.

Data Code Number	Asphalt Source & Grade	SDHPT Design Percent Asphalt	SDHPT Extracted Asphalt, Percent	TTI Extracted Asphalt, Percent	SDHPT Laboratory Density	Overall SDHPT Project Laboratory Density	SDHPT Field Density
21	*	5.5		4.2			
22	*	6.2		4.0			
23	*	6.2		5.0			
24	*	6.2		---			
25	*	6.2		5.0			
26	*	6.2		6.0			
27	*	6.2		5.2			
28	*	6.2		5.3			
29				4.1			
30				4.2			
31		4.0	4.1	4.2			
32				5.1			
33		6.0	5.9	8.4			
34		6.2	6.2	6.5			
35		6.2	6.6	5.6			
36		5.5	5.5	5.4			
37		5.0	4.8	5.5			
38		5.5	5.5	5.8			
39		4.5	5.1	5.1			
40				---			

(Continued)

Table 32. Part 11A, design and construction records data for pavement sections covered by Data Code Numbers 1-48.

Data Code Number	Asphalt Source & Grade	SDHPT Design Percent Asphalt	SDHPT Extracted Asphalt, Percent	TTI Extracted Asphalt, Percent	SDHPT Laboratory Density	Overall SDHPT Project Laboratory Density	SDHPT Field Density
41		4.8	4.6	---			
42		4.9	4.4	4.5			
43				6.9			
44				5.6			
45	Texaco AC-20	5.5	5.8	5.6	98.1	98.0	----
46	Texaco AC-20	5.2	5.2	5.7	98.2	98.4	----
47	Texaco AC-20	6.0	6.0	6.1	97.7	97.2	----
48	Texaco AC-20	6.5	6.7	6.8	92.7	93.3	----

---- Data not available

* See Table 23A

Table 32. Part IIB, design and construction records data for pavement sections covered by Data Code Numbers 1-48.

Data Code Number	SDHPT Overall Project Hveem	SDHPT Hveem for Cored Area	SDHPT Design Hveem Values	Aggregate Combinations
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Table 32. (Continued) Part IIB, design and construction records data for pavement sections covered by Data Code Numbers 1-48.

Data Code Number	SDHPT Overall Project Hveem	SDHPT Hveem for Cored Area	SDHPT Design Hveem Values	Aggregate Combinations
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

Table 32. (Continued) Part IIB, design and construction records data for pavement sections covered by Data Code Numbers 1-48.

Data Code Number	SDHPT Overall Project Hveem	SDHPT Hveem for Cored Area	SDHPT Design Hveem Values	Aggregate Combinations
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
42				
43				
44				
45	30	35	40	62% Gifford-Hill rhyolite;19% Butler coarse sand; 19% Tremble fine sand.
46	19	27	39	62% Gifford-Hill, perch-Hill, limestone; 18% Butler coarse sand; 18% Tremble fine sand.

Table 32. (Continued) Part IIB, design and construction records data for pavement sections covered by Data Code Numbers 1-48.

Data Code Number	SDHPT Overall Project Hveem	SDHPT Hveem for Cored Area	SDHPT Design Hveem Values	Aggregate Combinations
47	--	--	--	55% Gifford-Hill rhyolite; 15% Gifford-Hill limestone screenings; 15% Dickerson coarse sand; 15% Dickerson fine sand.
48	--	--	--	20.0% Holsey pea gravel; 15.0% Gifford-Hill, Perch Hill, crushed limestone; 15% Gifford-Hill, screenings; 50% Dickerson fine sand.

Table 32. Part IIC, design and construction records data for pavement sections covered by Data Code Numbers 1-48.

Data Code Number	Type of Hot-Mix Plant	Type of Break-down Rolling	Temperature of Mix at Plant	Temperature of Hot-Mix on Road	Thickness of Hot-Mix	Weather and Temperature at Laydown
1	drum-dryer					
2	drum-dryer					
3	drum-dryer					
4	drum-dryer					
5	drum-dryer					
6	drum-dryer					
7	drum-dryer					
8	drum-dryer					
9	drum-dryer					
10	drum-dryer					
11	drum-dryer					
12	drum-dryer					
13	drum-dryer					
14	drum-dryer					
15	drum-dryer					
16	drum-dryer					
17	drum-dryer					
18	drum-dryer					

(Continued)

Table 32. (Continued) Part IIC, design and construction records data for pavement sections covered by Data Code Numbers 1-48.

Data Code Number	Type of Hot-Mix Plant	Type of Break-down Rolling	Temperature of Mix at Plant	Temperature of Hot-Mix on Road	Thickness of Hot-Mix	Weather and Temperature at Laydown
19	drum-dryer					
20	drum-dryer					
21	drum-dryer					
22	drum-dryer					
23	drum-dryer					
24	drum-dryer					
25	drum-dryer					
26	drum-dryer					
27	drum-dryer					
28	drum-dryer					
29						
30						
31						
32						
33						
34						
35						
36						

(Continued)

Table 32. (Continued) Part IIC, design and construction records data for pavement sections covered by Data Code Numbers 1-48.

Data Code Number	Type of Hot-Mix Plant	Type of Break down Rolling	Temperature of Mix at Plant	Temperature of Hot-Mix on Road	Thickness of Hot-Mix	Weather and Temperature at Laydown
37						
38						
39						
40						
41						
42						
43						
44						
45	Weigh-Batch		260-280°F	260-280°F	1"	Clear & mild, 43 to 73°F.
46	Weigh-Batch		260°F	250°F	1-1/2"	Cloudy & mild, 62 - 73°F.
47	Drum-Dryer		290°F	290°F	1"	Clear & mild, 47 to 62°F.
48	Drum-Dryer		295°F	295°F	1"	Foggy, cloudy, and mild 54 - 66°F.

Table 33. Part III, design and construction records data for pavement sections covered by Data Code Numbers 1-48.

Data Code Number	SDHPT Design Percent Plus No. 10 Sieve	SDHPT Extracted Percent Plus No. 10 Sieve	SDHPT Design Minus No. 200 Sieve, Percent	SDHPT Extracted Minus No. 200 Sieve, Percent
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				

(Continued)

Table 33. (Continued) Part III, design and construction records data for pavement sections covered by Data Code Numbers 1-48.

Data Code Number	SDHPT Design Percent Plus No. 10 Sieve	SDHPT Extracted Percent Plus No. 10 Sieve	SDHPT Design Minus Minus Sieve, Percent	SDHPT Extracted Minus Minus Sieve, Percent
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45	58.3	52.5	2.4	4.7
46	59.5	56.9	1.6	6.6
47	52.7	53.8	3.5	5.9
48	37.4	36.8	4.5	3.6

Table 34. Asphalt properties for roadway sections ranked in order of decreasing rut depths.

Data Code Number	Decreasing Rut Depths, mm	Viscosity at 140°F poise	Viscosity at 275°F centi-poise	Penetration at 39.2°F dmm	Penetration at 77°F dmm	Ring & Ball Temp-ature °F
44	23	3,434	4.9	10	37	130
45	12	3,427	5.6	17	52	128
46	12	3,938	5.6	15	43	129
32	12 est.	22,920	8.4	14	39	135
40	12 est.	3,693	3.5	22	55	130
38	10	2,000	3.6	15	64	122
30	9	4,303	4.7	7	32	129
47	9	3,685	8.2	18	50	131
48	9	5,100	8.5	12	42	126
29	7	8,300	5.2	4	22	135
41	6	+	+	+	+	+
42	6	82,085	11.1	10	21	160
33	5	2,861	4.1	10	48	130
35	5	8,776	5.8	10	33	140
39	3	6,280	5.4	5	32	135
34	2	2,712	4.1	10	55	128
43	2	14,725	10.8	3	20	141
31	1	3,583	3.8	29	52	128
36	1	10,200	6.9	3	20	139
37	0	6,508	6.2	16	41	132

+ Data was misplaced and is not available.

Table 35. Air void and resilient modulus, M_R, values for roadway sections ranked in order of decreasing rut depths.

Data Code Number	Decreasing Rut Depths mm	Percent Air Voids	M_R at -13°F x 10^6 psi	M_R at 33°F x 10^6 psi	M_R at 77°F x 10^6 psi	M_R at 104°F x 10^6 psi
44	23	1.0	2.867	1.681	0.257	0.078
45	12	2.0	3.561	1.575	0.127	0.058
46	12	2.7	2.796	1.480	0.179	0.051
32	12 est.	3.4	3.269	2.899	1.271	0.727
40	12 est.	11.2	----	----	0.094	----
38	10	1.0	2.096	1.563	0.264	0.038
30	9	3.0	3.029	2.166	0.655	0.076
47	9	1.1	2.796	1.480	0.179	0.051
48	9	7.1	3.145	1.142	0.139	0.037
29	7	3.4	2.691	2.506	0.733	0.147
41	6	5.1	2.467	2.188	0.515	0.189
42	6	6.1	2.126	1.304	0.663	0.273
33	5	3.0	2.185	1.203	0.428*	0.089
35	5	6.3	1.859	1.131	0.403	0.076
39	3	2.4	2.467	1.894	0.506	0.091
34	2	4.5	2.087	1.522	0.499*	0.104
43	2	7.3	2.224	1.628	0.473	0.095
31	1	5.0	2.240	1.441	0.555*	0.250
36	1	3.1	2.464	1.932	0.736	0.098
37	0	5.9	2.113	1.326	0.485	0.076

--- Data not available

10^6 psi = 6.895 x 10^9 pascals (Pa)

Table 36. Differences between resilient modulus, M_R, values at different temperatures for roadway sections ranked in order of decreasing rut depths.

Data Code Number	ΔM_R -13°F to 33°F x 10^6 psi	ΔM_R 33°F to 77°F x 10^6 psi	ΔM_R 77°F to 104°F x 10^6 psi	ΔM_R -13°F to 77°F x 10^6 psi	ΔM_R -13°F to 104°F x 10^6 psi
44	1.186	1.424	0.179	2.610	2.789
45	1.986	1.448	0.069	3.434	3.503
46	1.316	1.301	0.128	2.617	2.745
32	0.370	1.628	0.544	1.998	2.542
40	---	---	---	---	---
38	0.533	1.299	0.226	1.832	2.058
30	0.863	1.511	0.579	2.374	2.953
47	1.316	1.301	0.128	2.617	2.745
48	2.003	1.003	0.102	3.006	3.108
29	0.185	1.773	0.586	1.958	2.544
41	0.279	1.673	0.326	1.952	2.278
42	0.822	0.641	0.390	1.463	1.853
33	0.982	0.775	0.339	1.757	2.096
35	0.728	0.728	0.327	1.456	1.783
39	0.573	1.388	0.415	1.961	2.376
34	0.566	1.023	0.395	1.588	1.983
43	0.596	1.155	0.378	1.751	2.129
31	0.799	0.886	0.305	1.685	1.990
36	0.532	1.196	0.638	1.728	2.366
37	0.787	0.841	0.409	1.628	2.037

--- Data not available

Note: 10^6 psi = 6.895 x 10^9 pascals (Pa)

Table 37. Indirect tensile strength results for roadway sections ranked in order of decreasing rut depths.

Data Code Number	Decreasing Rut Depths, mm	Percent Air Voids	σ TD Dry Splitting Tensile strength, psi	σ T24 After 24-Hour Lottman, psi	σ T18C After 18 Cycle Lottman, psi
44	23	1.0	138	106	---
45	12	2.0	122	111	---
46	12	2.7	107	105	---
32	12 est.	3.4	168	68	33
40	12 est.	11.2	---	50	---
38	10	1.0	142	124	---
30	9	3.0	165	---	181
47	9	1.1	128	122	---
48	9	7.1	104	71	---
29	7	3.4	231	138	227
41	6	5.1	186	60	---
42	6	6.1	160	123	---
33	5	3.0	170	46	111
35	5	6.3	140	---	110
39	3	2.4	173	116	---
34	2	4.5	233	70	84
43	2	7.3	143	103	---
31	1	5.0	109	47	22
36	1	3.1	273	190	216
37	0	5.9	142	---	170

--- Data not available.
est. = estimated
1 psi = 6.895×10^3 pascals (Pa)

Table 38. Hveem stability results for roadway sections ranked in order of decreasing rut depths

Data Code Numbers	Decreasing Rut Depths, mm	Percent Air Voids	Dry Hveem Stability, Percent	Hveem Stability After 24-Hour Lottman, Percent	Hveem Stability After 18-Cycle Lottman, Percent
44	23	1.0	25.6	10.2	26.6*
45	12	2.0	44.5	40.8	42.4*
46	12	2.7	32.9	30.0	18.0*
32	12 est.	3.4	55.7	36.2	---
40	12 est.	11.2	34.9	28.1	---
38	10	1.0	22.0	19.1	---
30	9	3.0	39.7	---	---
47	9	1.1	26.6	24.9	35.7*
48	9	7.1	44.0	35.5	36.8*
29	7	3.4	30.3	18.4	---
41	6	5.1	29.9	30.2	---
42	6	6.1	47.4	45.4	50.4*
33	5	3.0	13.7	12.7	6.1
35	5	6.3	31.0	---	21.5
39	3	2.4	31.0	33.0	---
34	2	4.5	20.5	19.8	16.8
43	2	7.3	32.8	27.9	---
31	1	5.0	47.8	34.7	33.9
36	1	3.1	26.0	18.2	23.8
37	0	5.9	36.5	---	35.9

est. = estimated.

* = 7-day soak test.

--- Data not available

Table 39. Marshall stability results for roadway sections ranked in order of decreasing rut depths.

Data Code Number	Decreasing Rut Depths, mm	Percent Air Voids	Dry Marshall Stability, lbs	Marshall Stability After 24-Hour Lottman, lbs	Marshall Stability After 18-Cycle Lottman, lbs
44	23	1.0	2,610	1,844	---
45	12	2.0	1,460	2,270	---
46	12	2.7	1,397	1,748	---
32	12 est.	3.4	2,613	2,458	2,375
40	12 est.	11.2	---	260	---
38	10	1.0	1,138	1,426	---
30	9	3.0	1,298	---	864
47	9	1.1	2,398	2,124	---
48	9	7.1	748	862	---
29	7	3.4	1,265	752	791
41	6	5.1	1,233	977	---
42	6	6.1	5,356	4,817	---
33	5	3.0	2,948	1,395	1,540
35	5	6.3	2,412	---	1,498
39	3	2.4	1,729	1,555	---
34	2	4.5	2,611	1,088	1,124
43	2	7.3	1,387	1,174	---
31	1	5.0	1,954	491	1,570
36	1	3.1	3,244	2,089	2,184
37	0	5.9	1,444	---	1,426

est. = estimated.

* = 7-day soak test.

--- Data not available

1 lb = 0.454 kg

Table 39A. Marshall stability flow results for roadway sections ranked in order of decreasing rut depths.

Data Code Number	Decreasing Rut Depths, mm	Percent Air Voids	Dry Marshall Flow, .01 in	Marshall Flow After 24-Hour Lottman, .01 in	Marshall Flow After 18-Cycle Lottman, .01 in
44	23	1.0	15	18	--
45	12	2.0	11	17	--
46	12	2.7	13	13	--
32	12 est.	3.4	18	15	14
40	12 est.	11.2	--	13	--
38	10	1.0	10	12	--
30	9	3.0	6	--	12
47	9	1.1	10	15	--
48	9	7.1	10	12	--
29	7	3.4	8	13	13
41	6	5.1	5	9	--
42	6	6.1	11	15	--
33	5	3.0	8	18	16
35	5	6.3	15	--	27
39	3	2.4	11	--	--
34	2	4.5	10	16	14
43	2	7.3	13	16	--
31	1	5.0	7	13	12
36	1	3.1	11	14	14
37	0	5.9	12	--	16

-- Data not available
1 in = 25.4 mm

Table 40. Extracted aggregate grading characteristics for Study 285 roadway sections ranked in order of decreasing rut depths.

Data Code Number	Percent Plus No. 10 Sieve	Percent Minus No. 200 Sieve	Percent Hump Above No. 30 Sieve of Continuous Grading Curve	Percent Retained between No. 10 and 40 Sieves	Assigned Performance Rating
44	62	7	3	12	P
45	55	6	13	12	P
46	55	7	13	11	P
32	62	3	3	14	P
40	41	2	25	13	P
38	61	3	4	14	P
30	50	3	8	27	P
47	54	5	10	12	P
48	37	6	31	9	P
29	62	3	6	17	F
41	48	2	14	19	F
42	52	9	20	[illegible]6	F
33	57	3	12	10	F
35	59	3	10	10	F
39	77	6	Below line	6	G
34	67	4	1	8	G
43	60	5	6	10	G
31	61	6	2	15	G
36	64	4	0	11	G
37	56	7	4	19	G

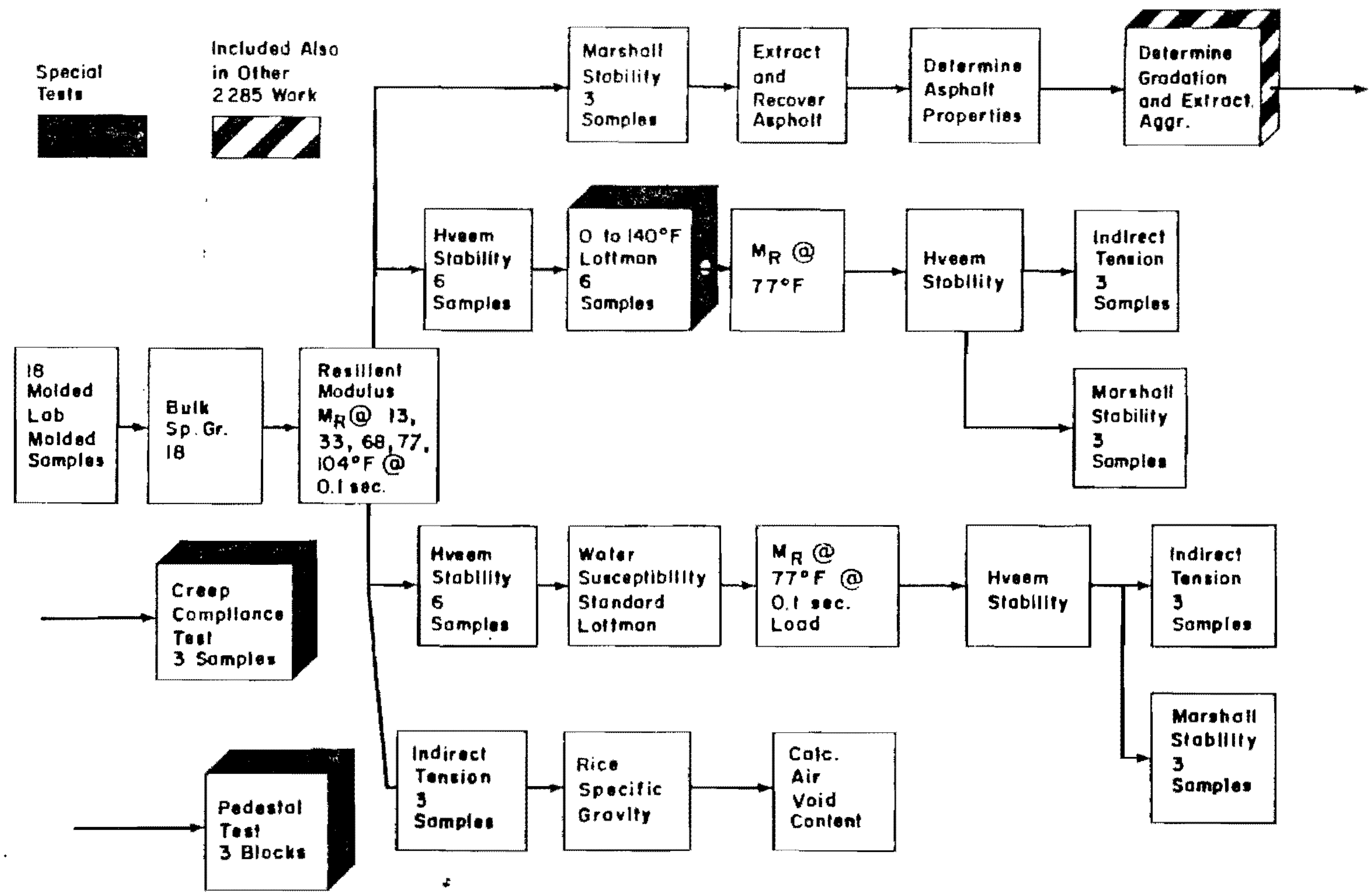

Figure 1. Laboratory Stability SequenceI: field mixed-field lab compacted test specimens placed under Project 2287 in 1982.

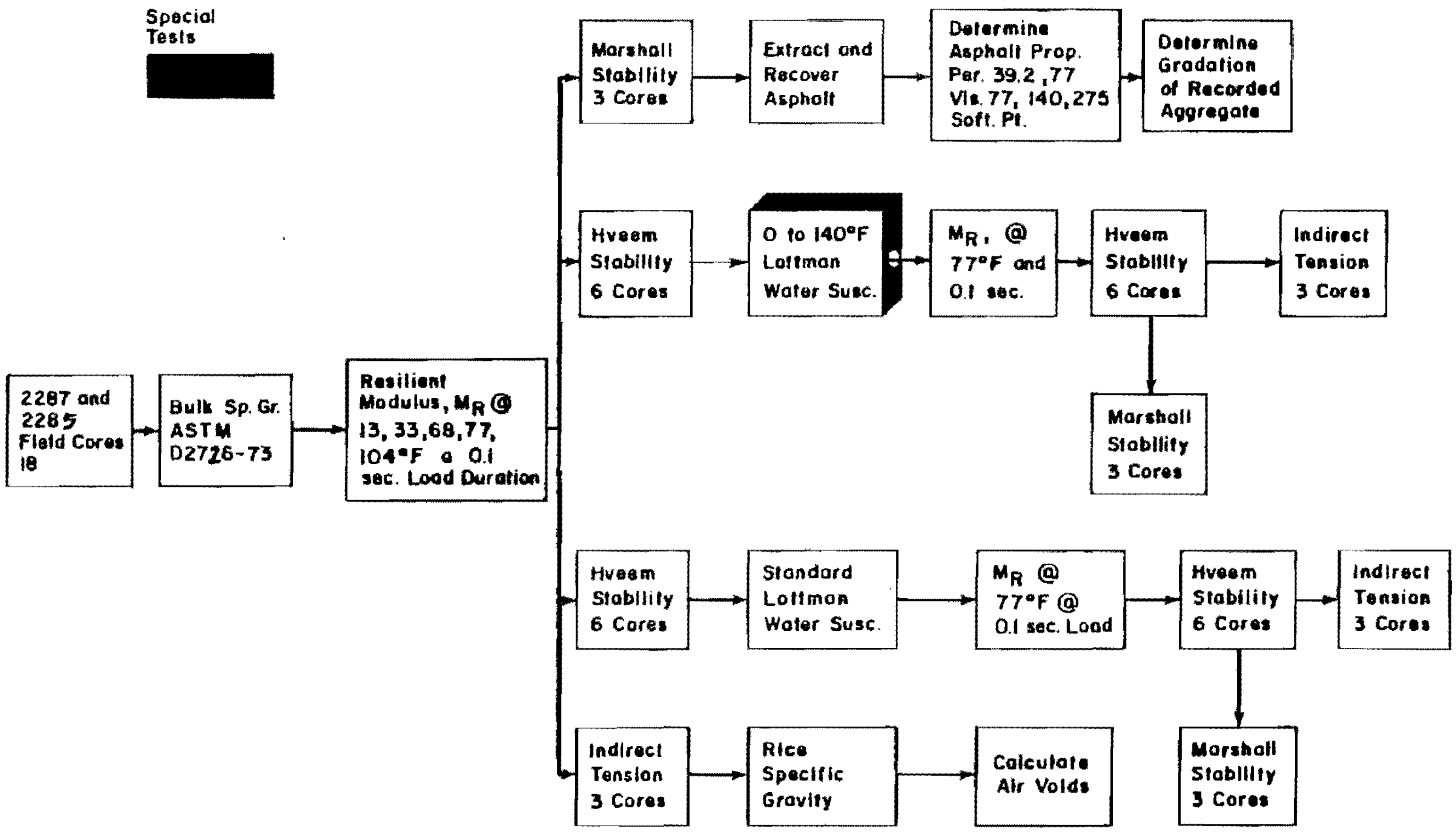

Figure 2. Laboratory Stability Sequence II: cores of field mixed-roadway compacted hot-mix from 28 pavement sections of Project 2287 and 20 pavement sections chosen from districts under Project 2285.

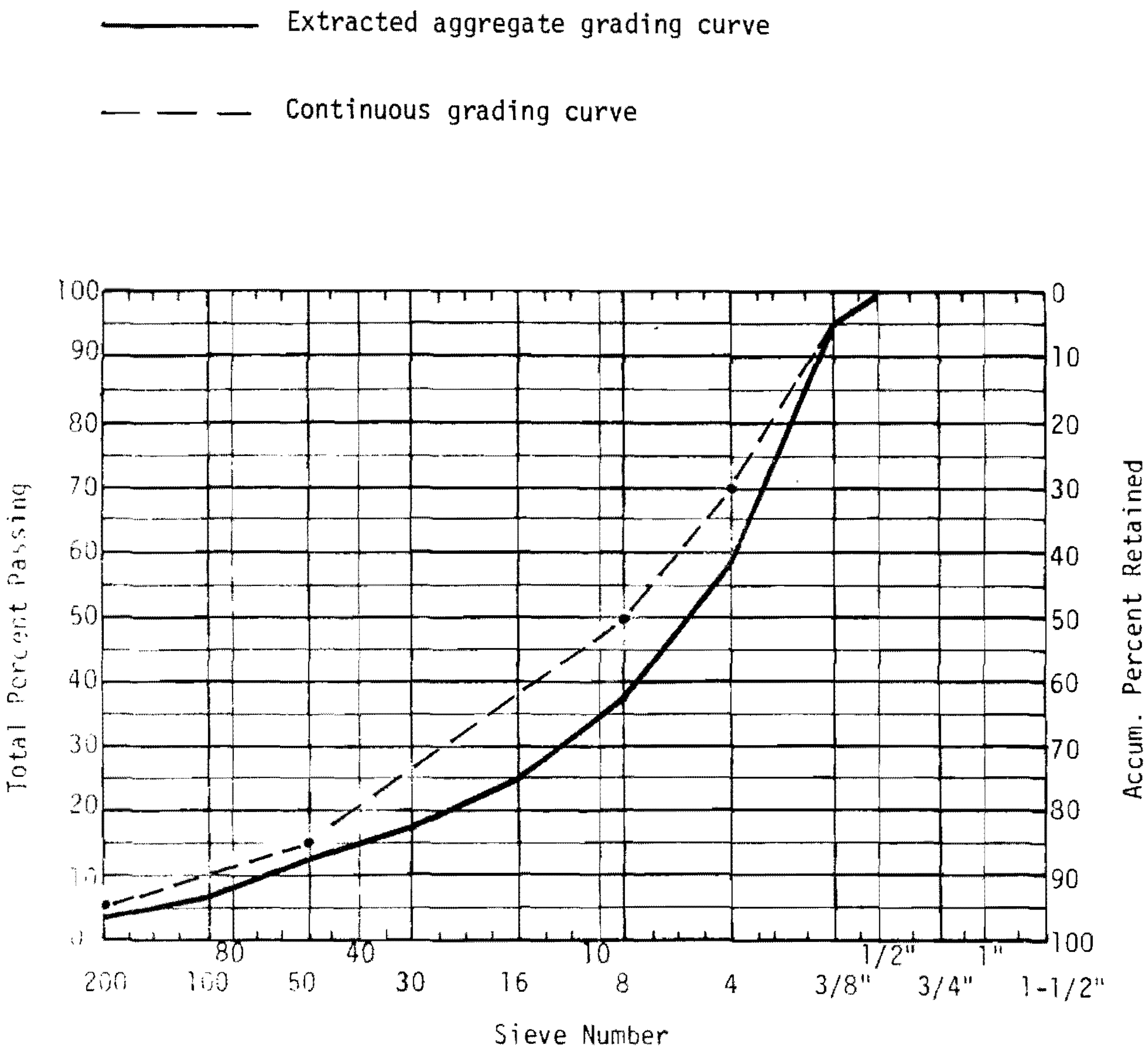

Figure 3. Extracted aggregate gradation curve for US 82. MacMillan AC-10 subsection, Data Code Number 15.

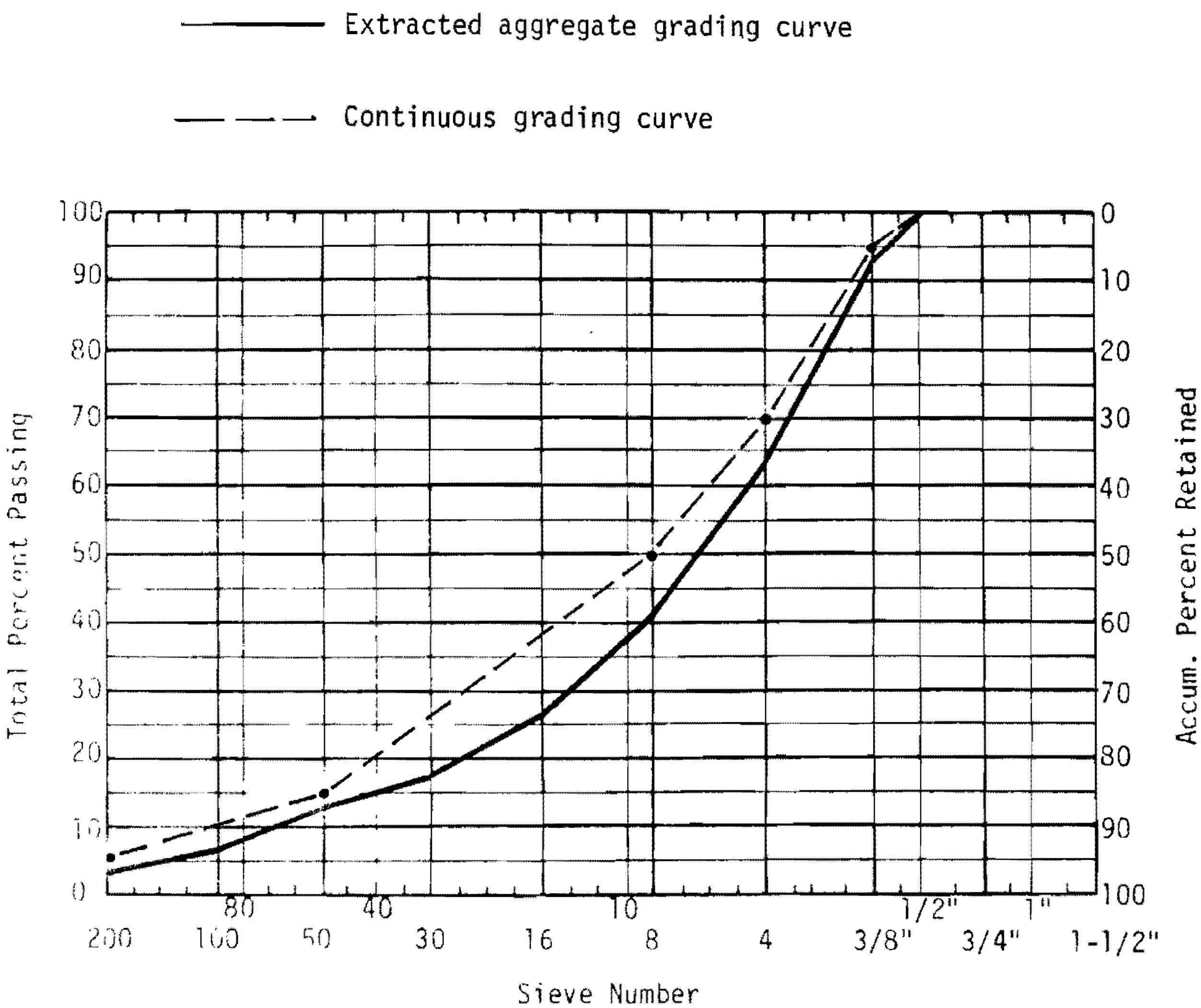

Figure 4. Extracted aggregate gradation curve for US 82, Dorchester AC-20 subsection, Data Code Number 16.

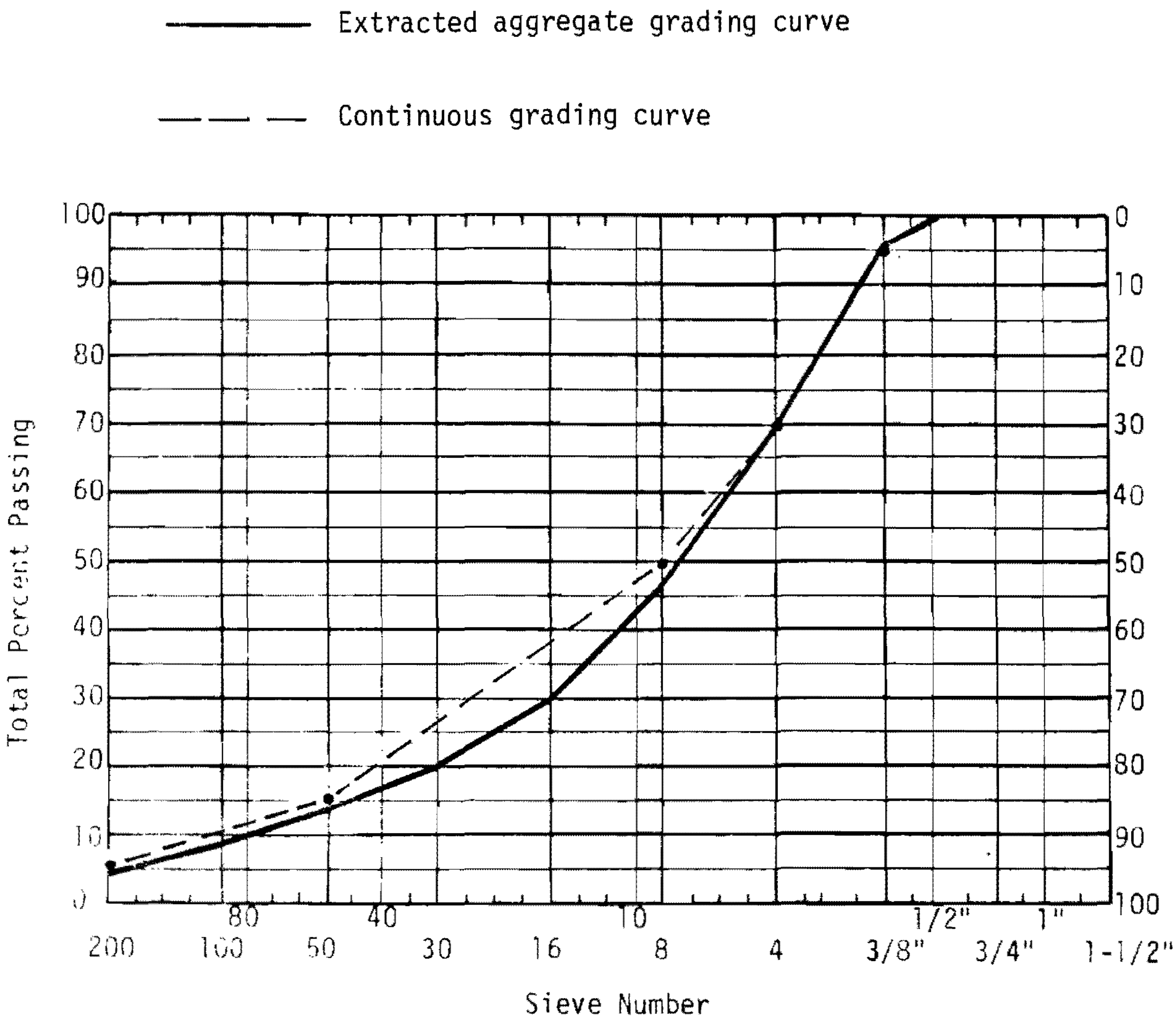

Figure 5. Extracted aggregate gradation curve for US 82, Exxon AC-20 subsection, Data Code Number 17.

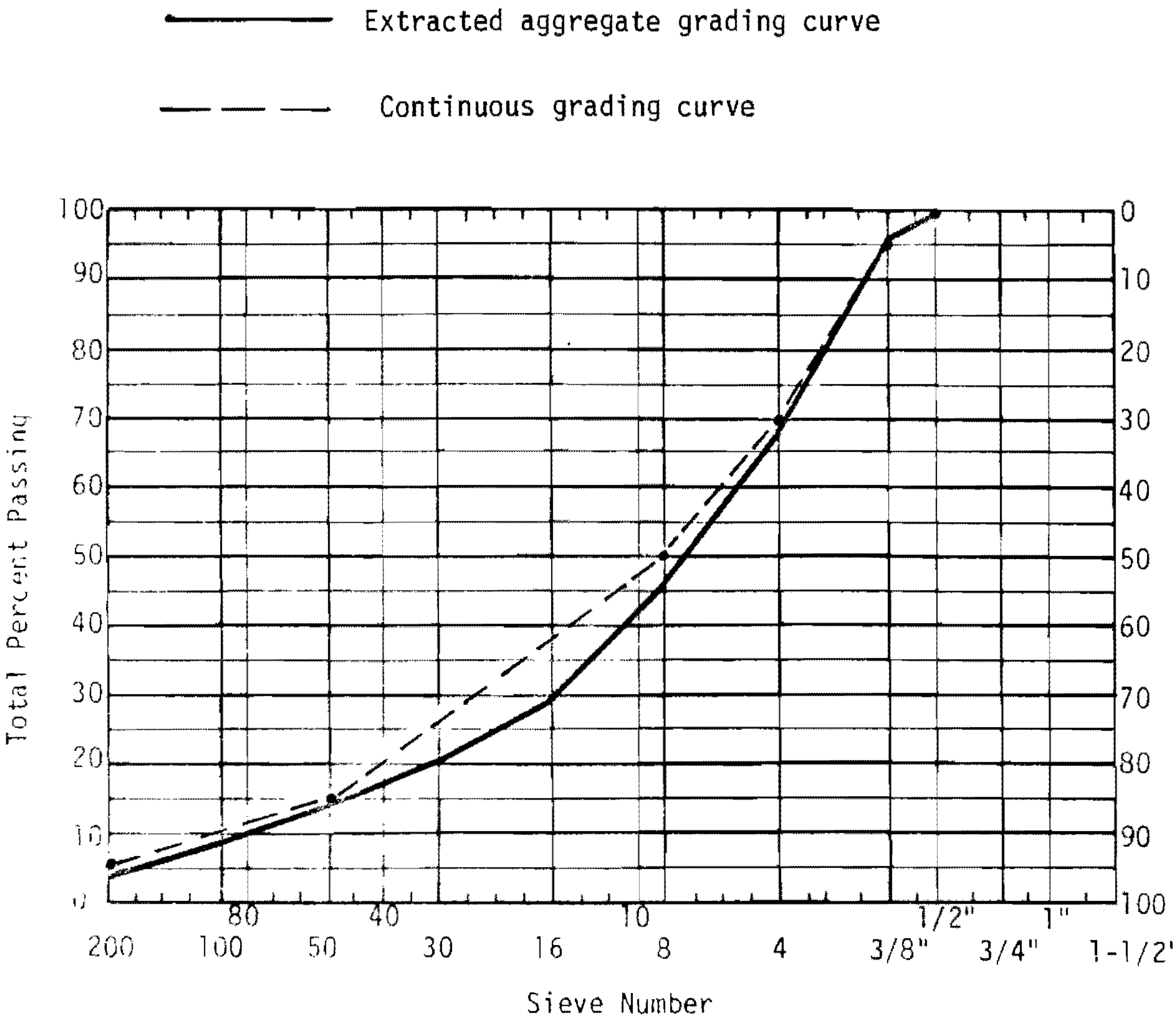

Figure 6. Extracted aggregate gradation curve for US 82, Shamrock AC-20 subsection, Data Code Number 18.

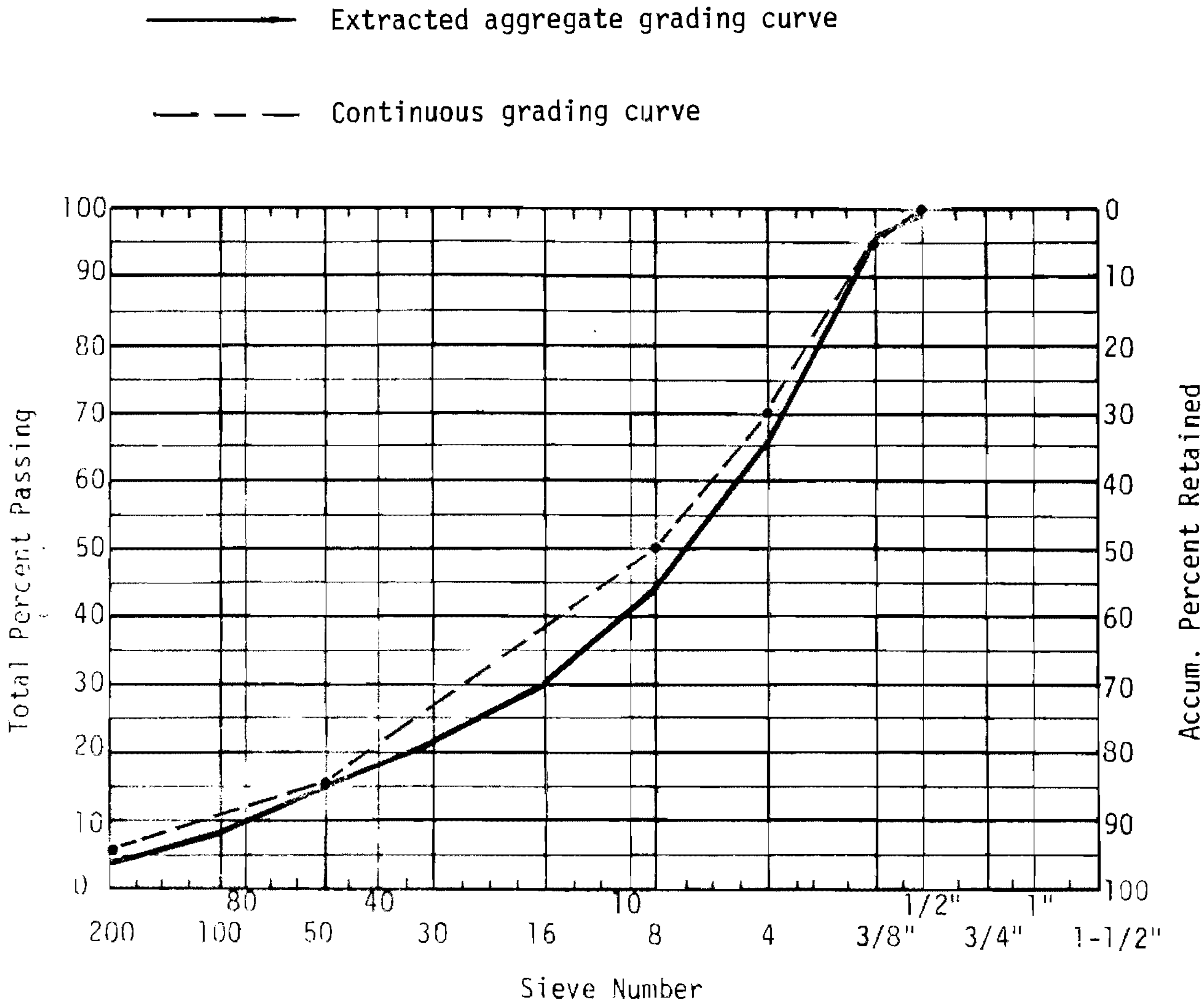

Figure 7. Extracted aggregate gradation curve for US 82, Cosden AC-10 subsection, Data Code Number 21.

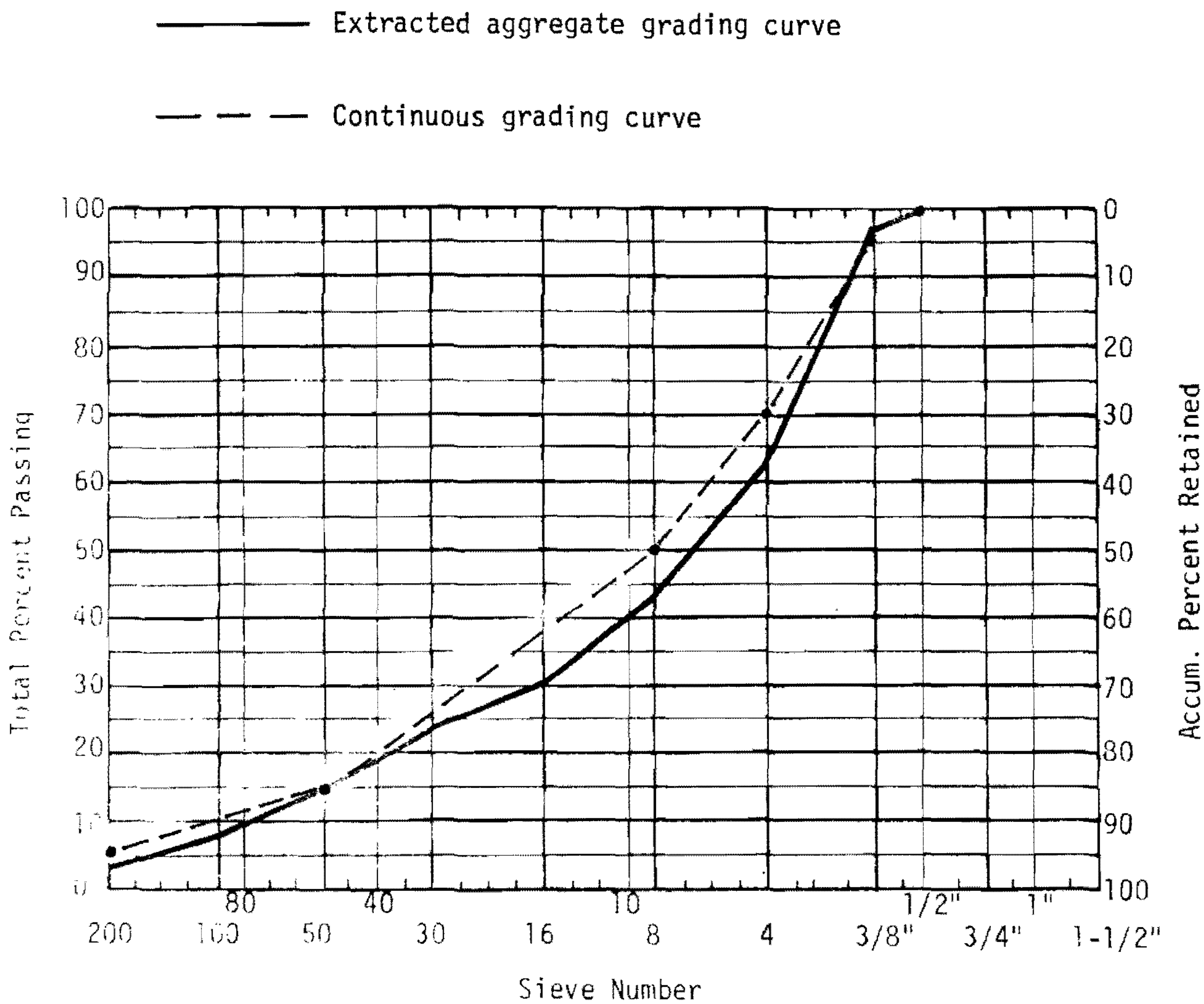

Figure 8. Extracted aggregate gradation curve for US 287, MacMillan AC-10 subsection, Data Code Number 22.

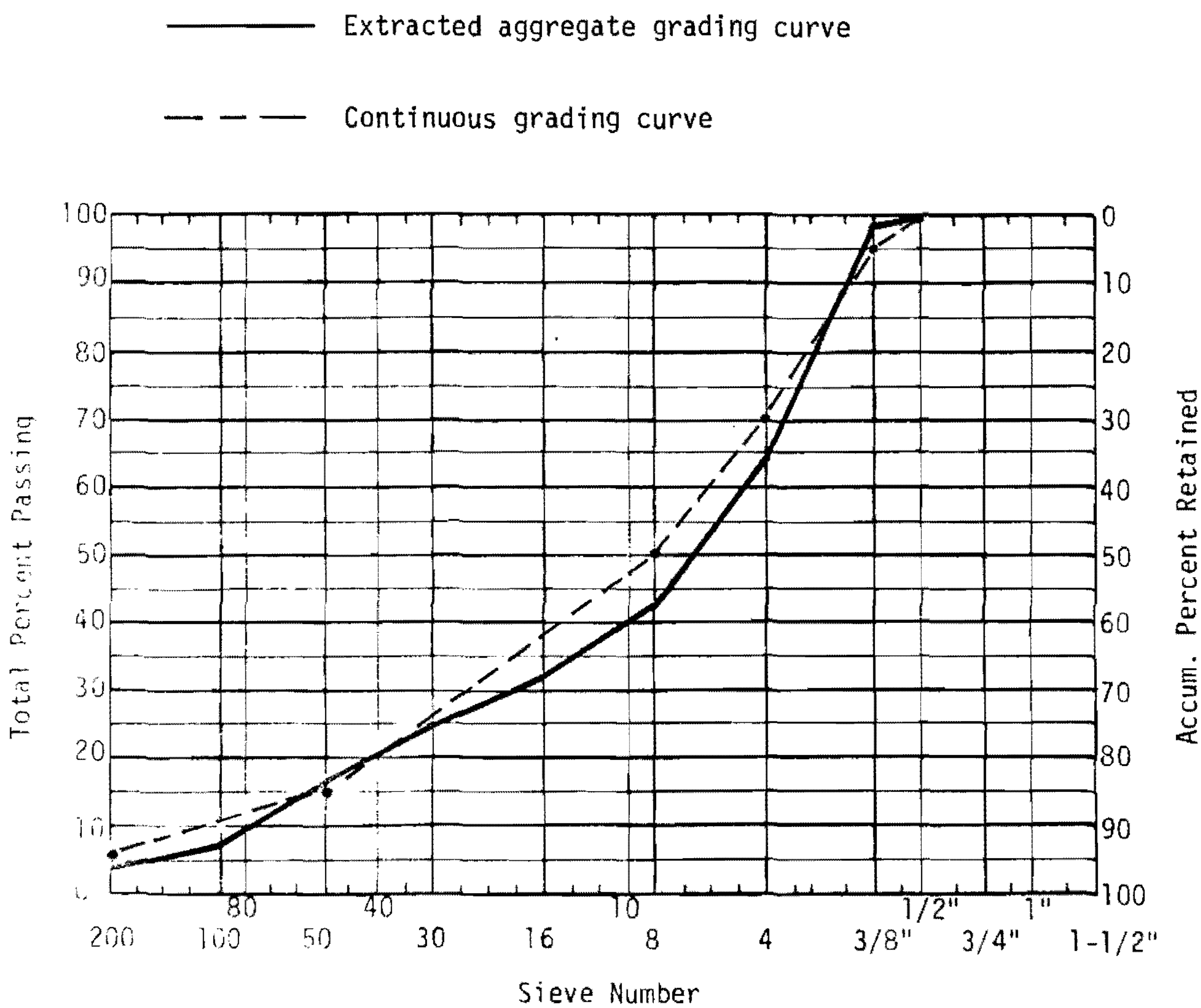

Figure 9. Extracted aggregate gradation curve for US 287, Dorchester AC-10 subsection, Data Code Number 23.

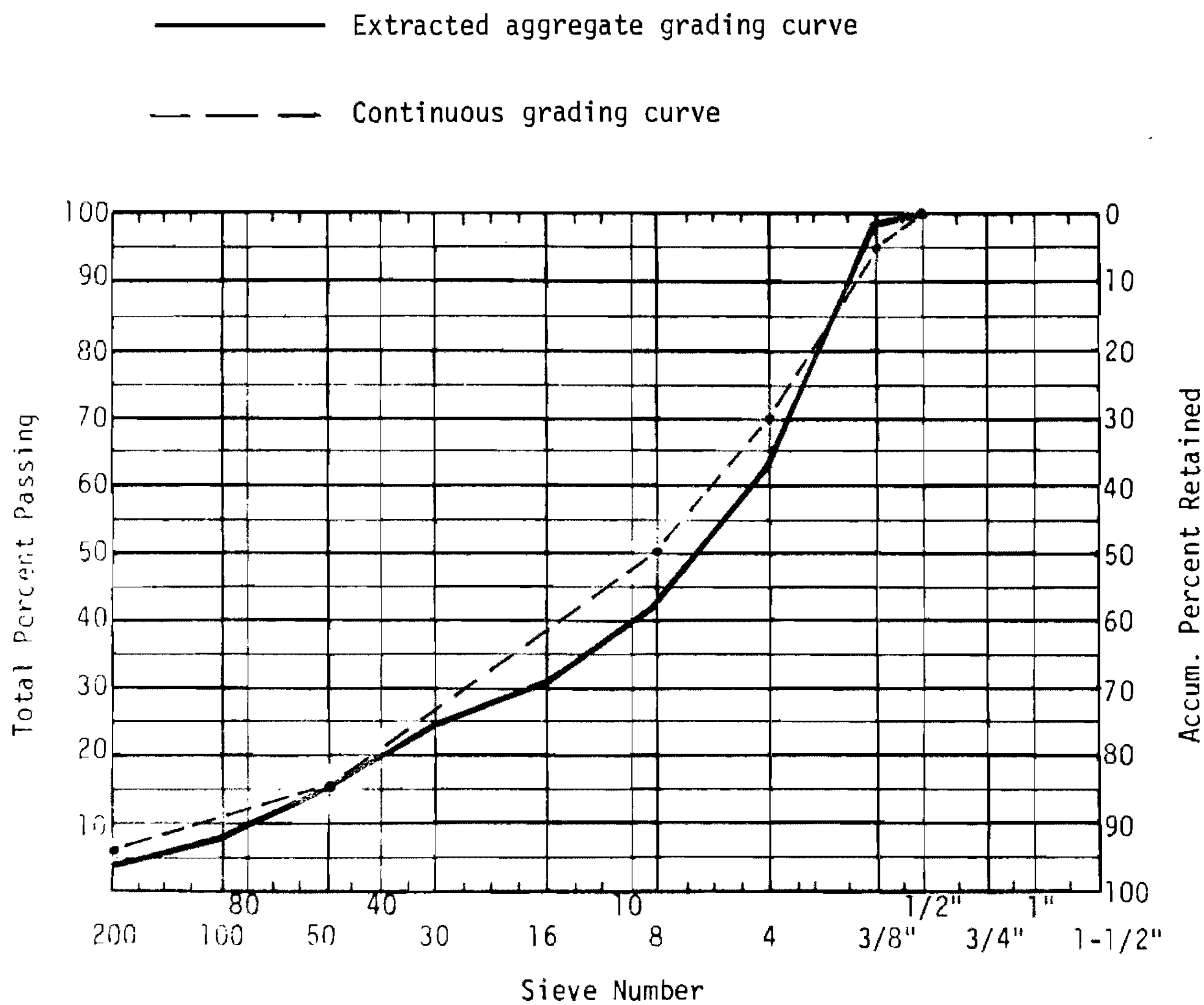

Figure 10. Extracted aggregate gradation curve for US 287, Exxon AC-10 subsection, Data Code Number 24.

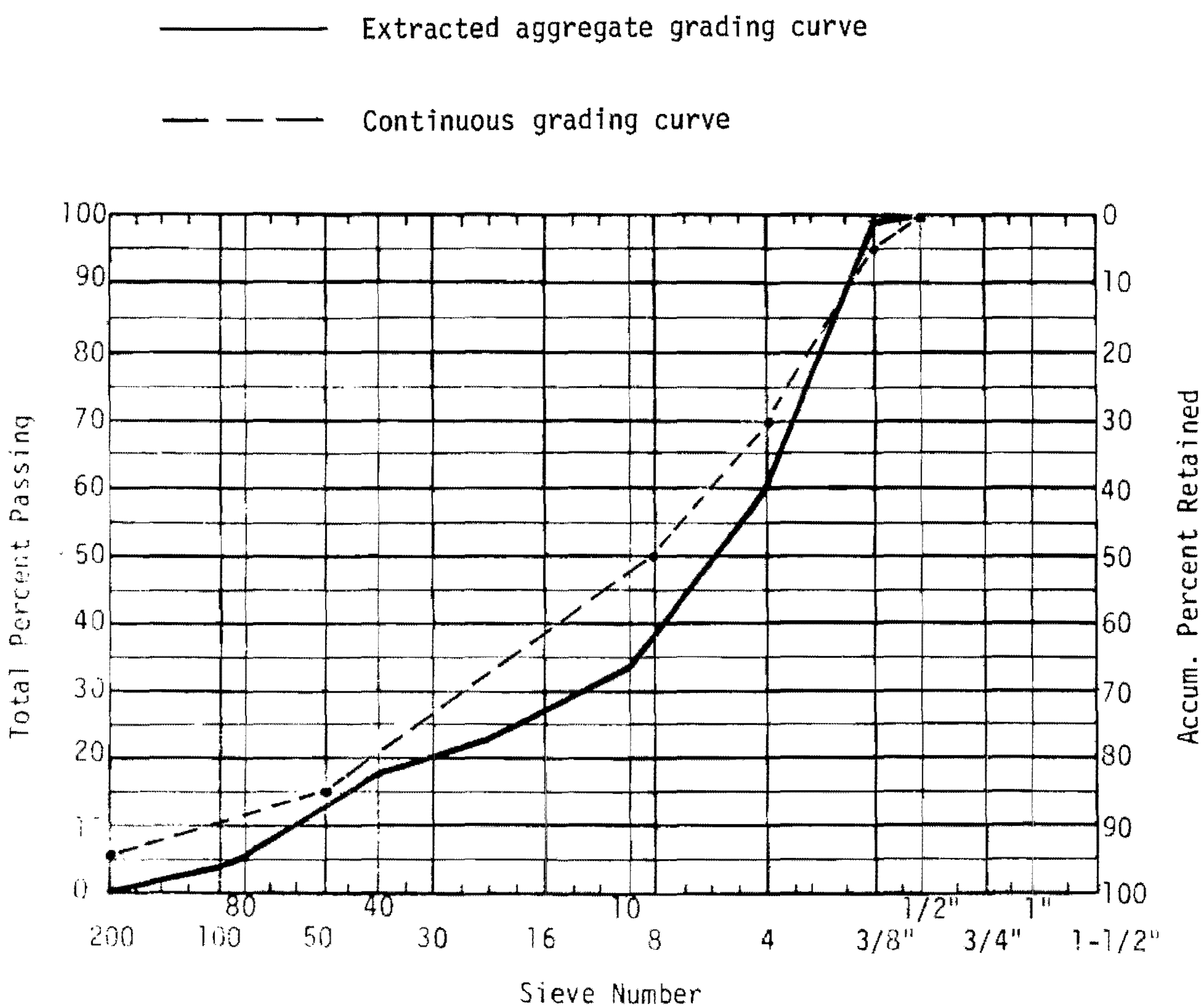

Figure 11. Extracted aggregate gradation curve for US 287, Shamrock AC-10 subsection, Data Code Number 26.

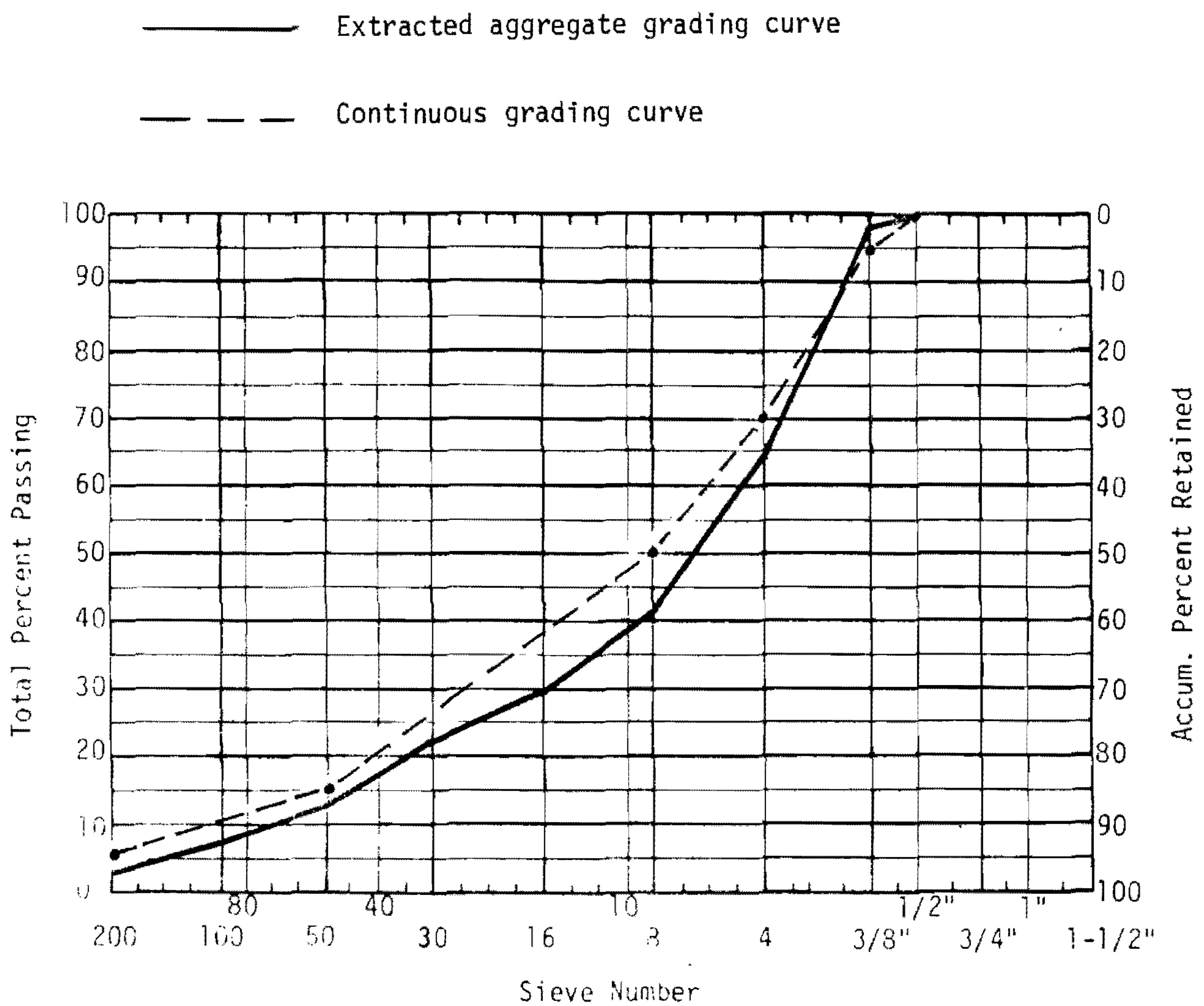

Figure 12. Extracted aggregate gradation curve for US 287, Cosden AC-20, Data Code Number 27.

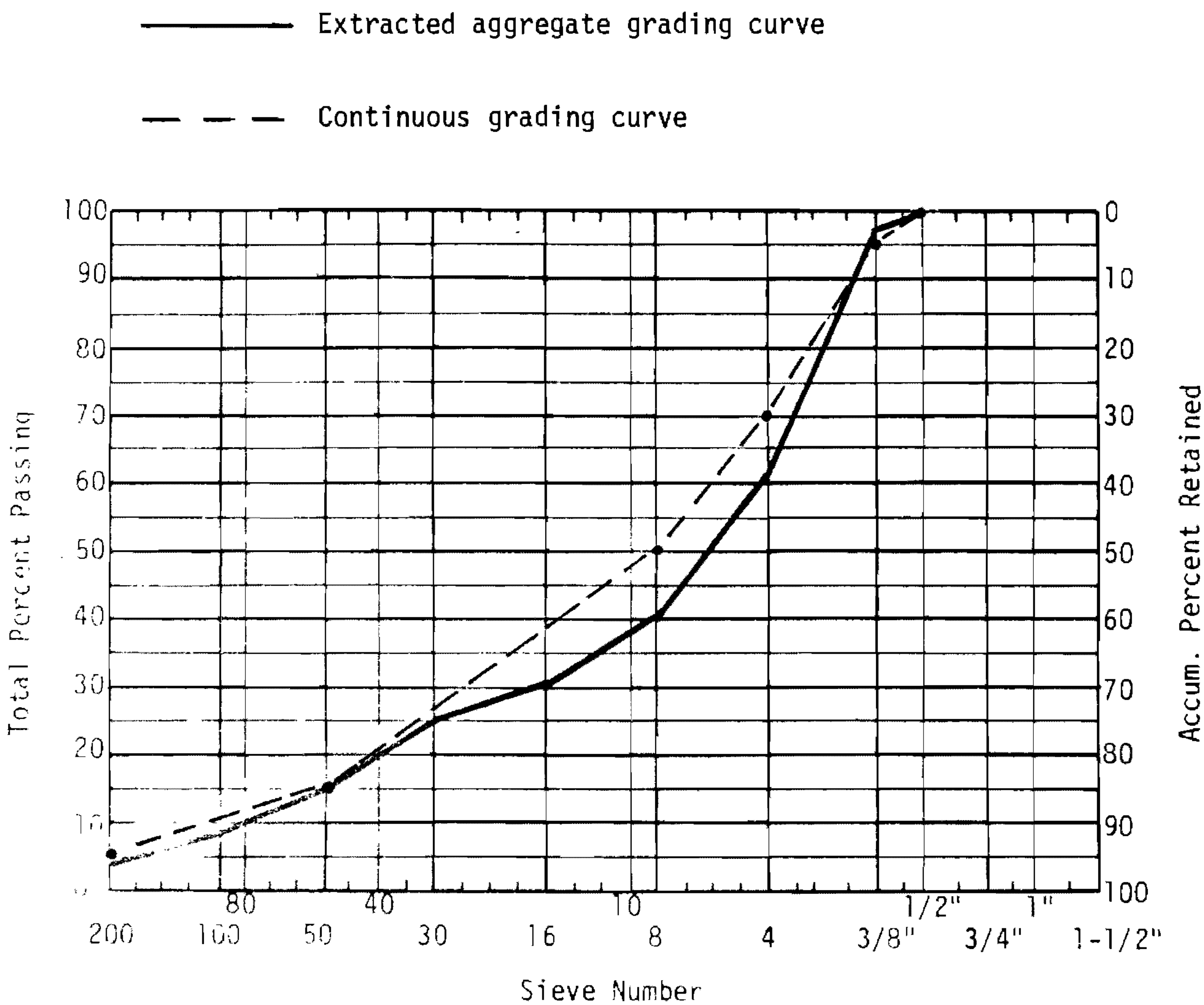

Figure 13. Extracted aggregate gradation curve for US 287, Cosden AC-10 subsection, Data Code Number 28.

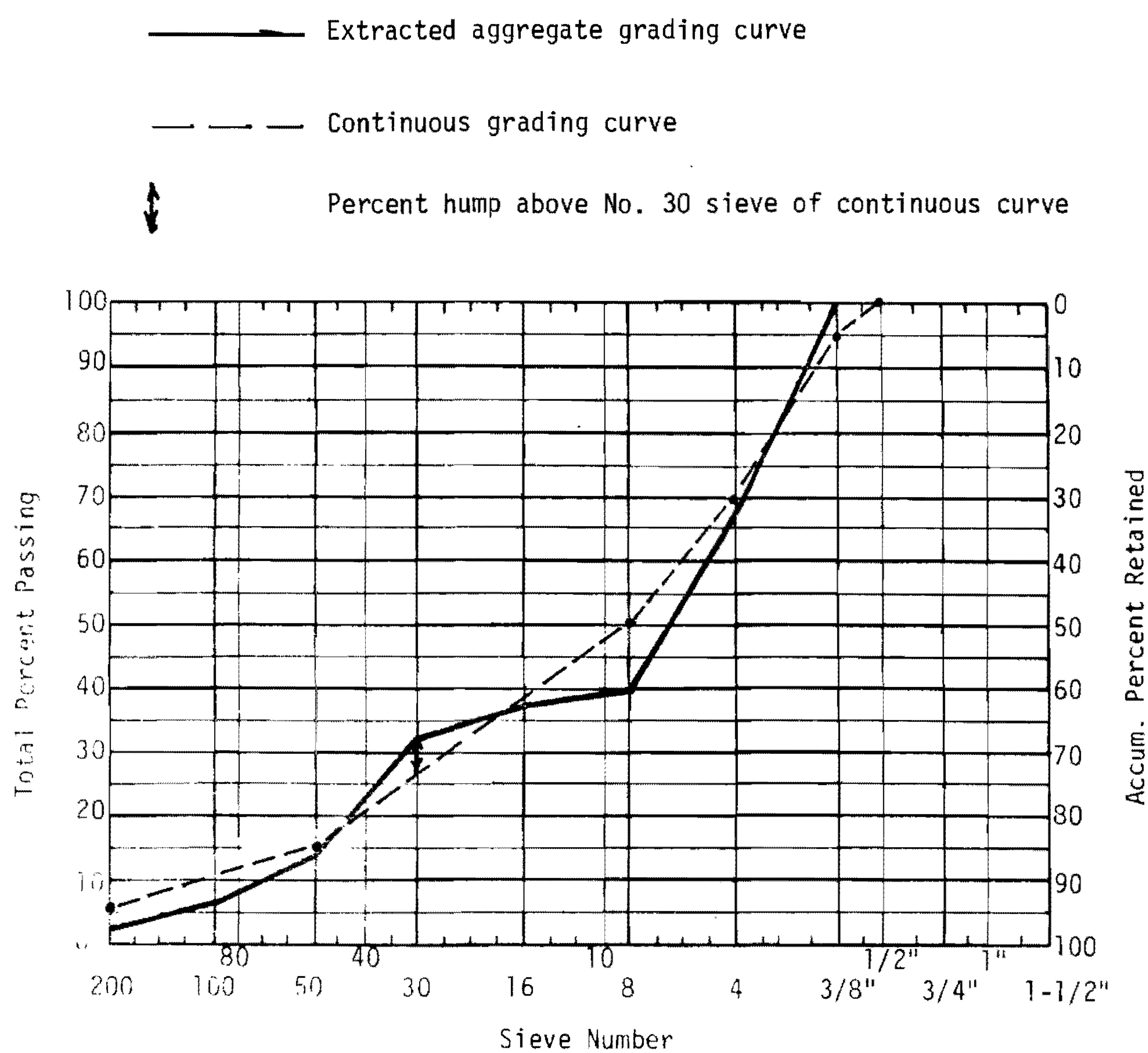

Figure 14. Extracted aggregate gradation curve for IH 45, Madison County, 18-core section (Table 5), Data Code Number 29.

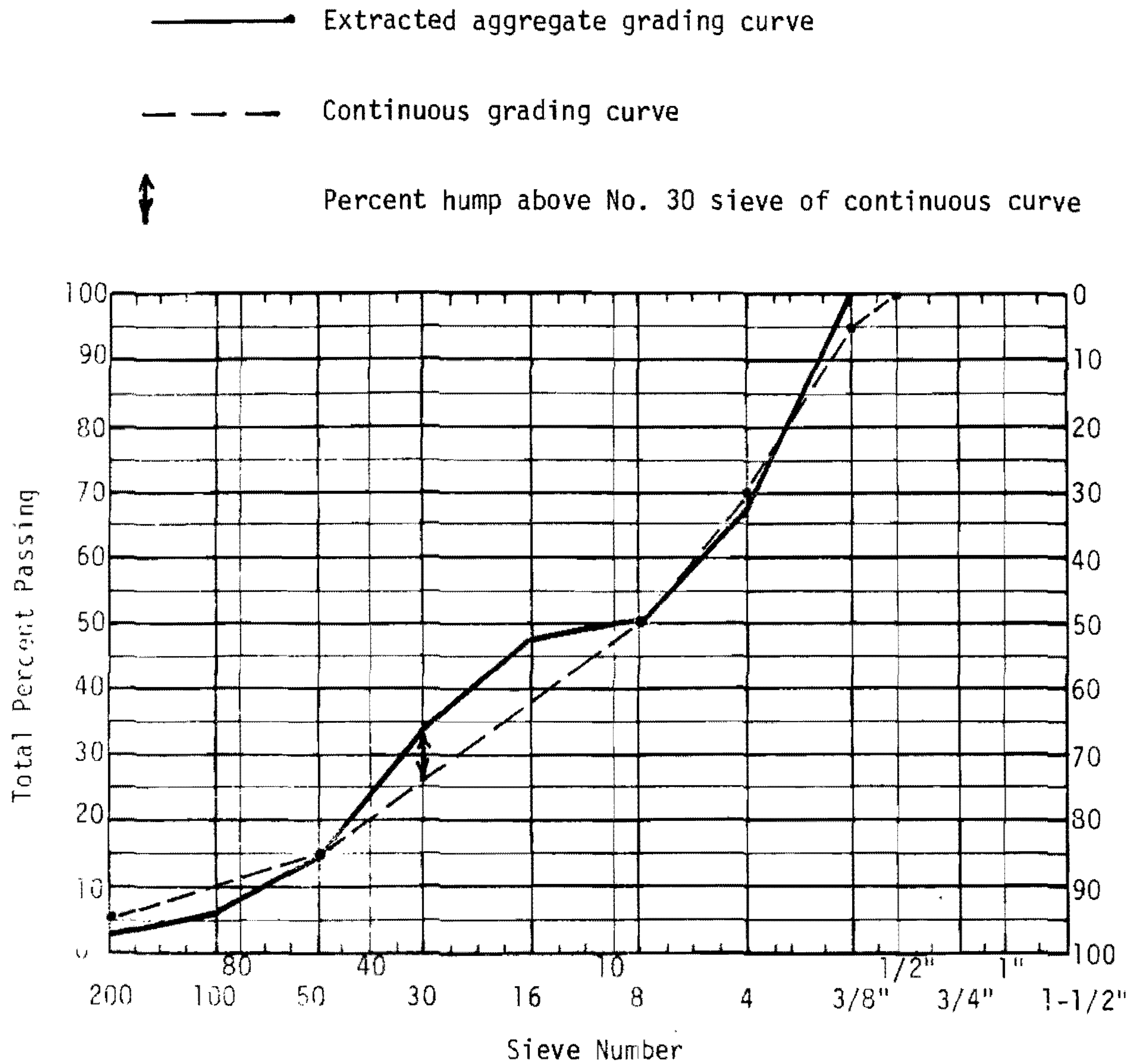

Figure 15. Extracted aggregate gradation curve for IH 45, Madison County, 12-core section (Table 6), Data Code Number 30.

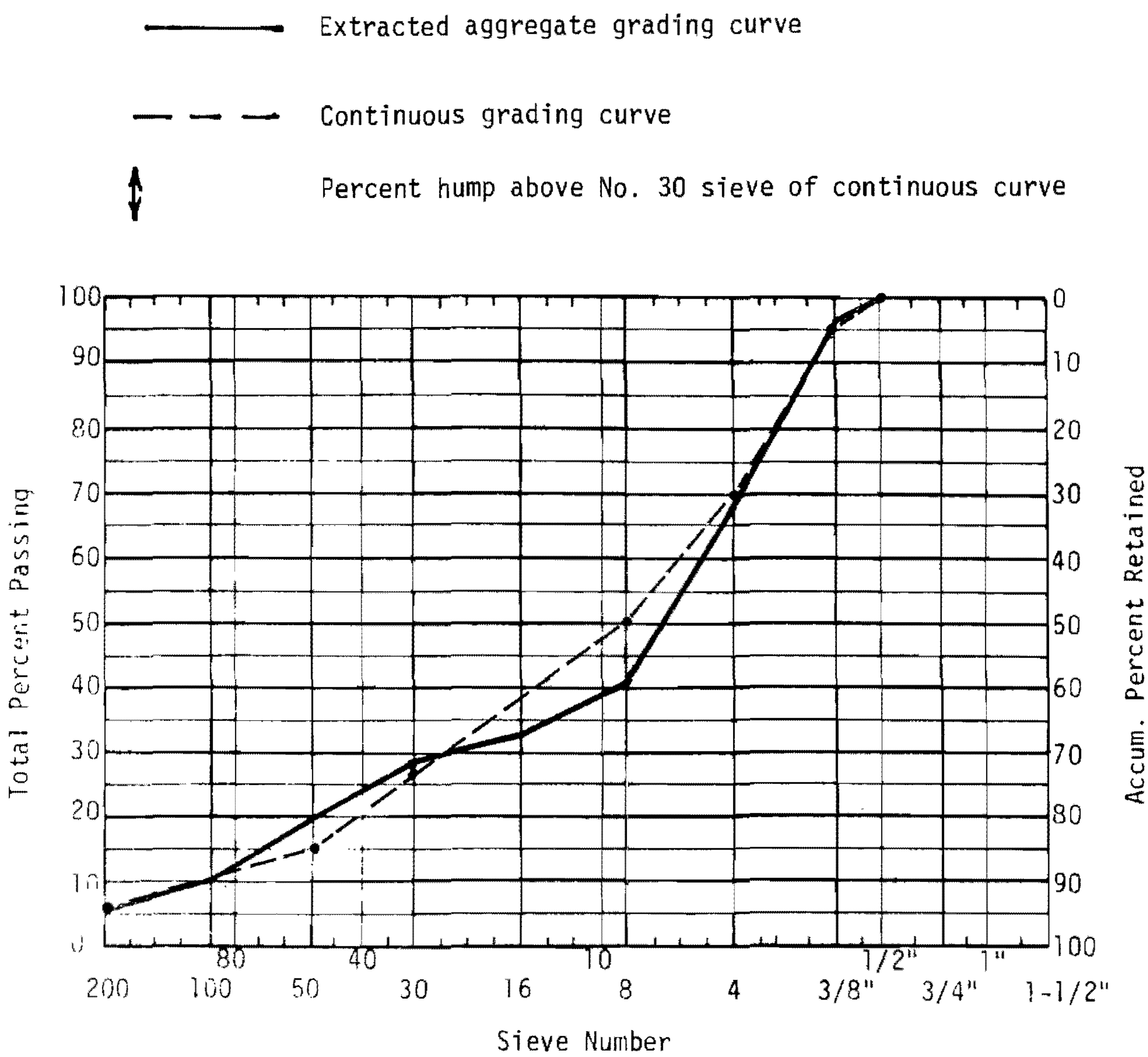

Figure 16. Extracted aggregate gradation curve for IH 45, Walker County, Data Code Number 31.

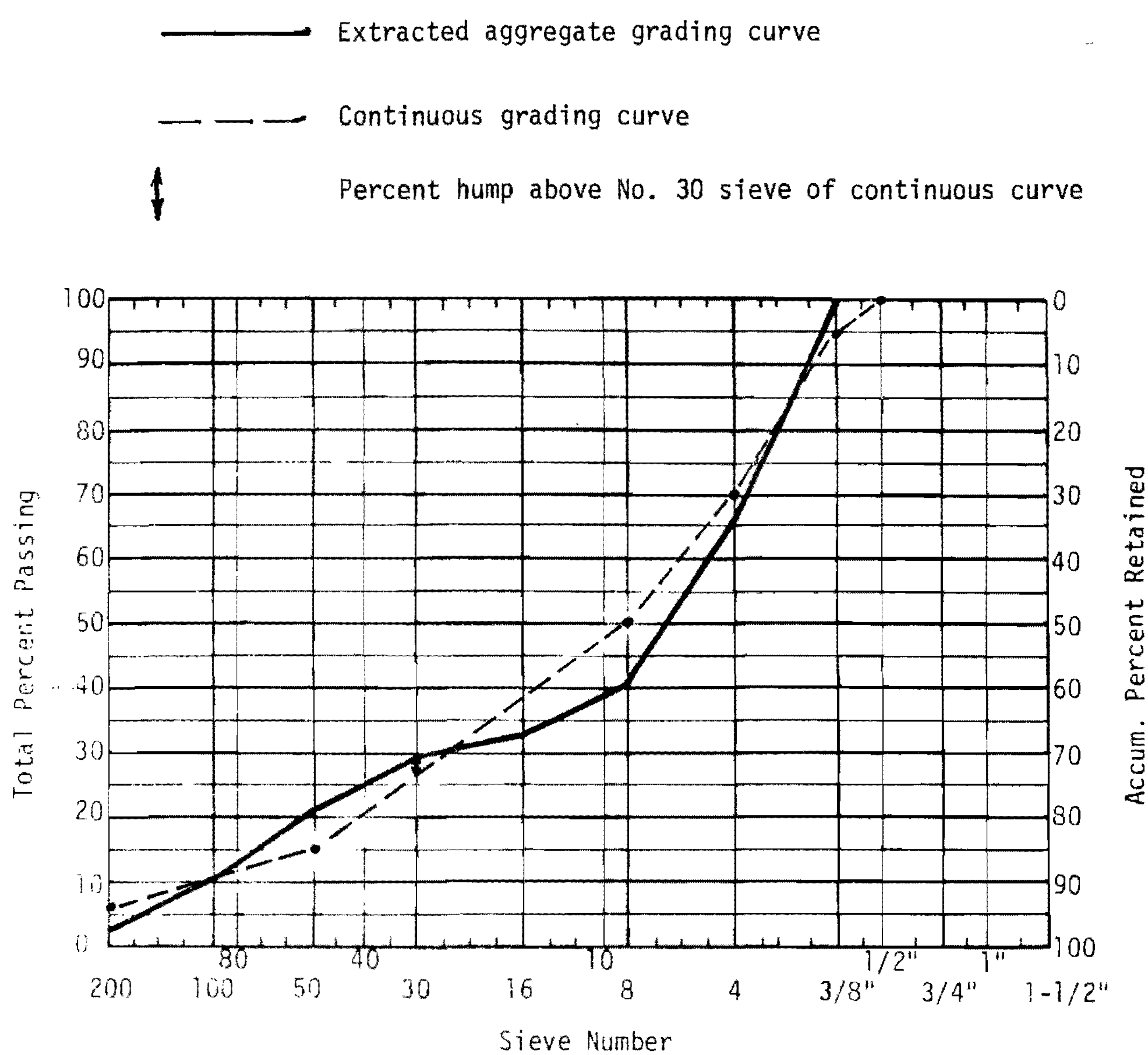

Figure 17. Extracted aggregate gradation curve for IH 35, Ellis County, Data Code Number 32.

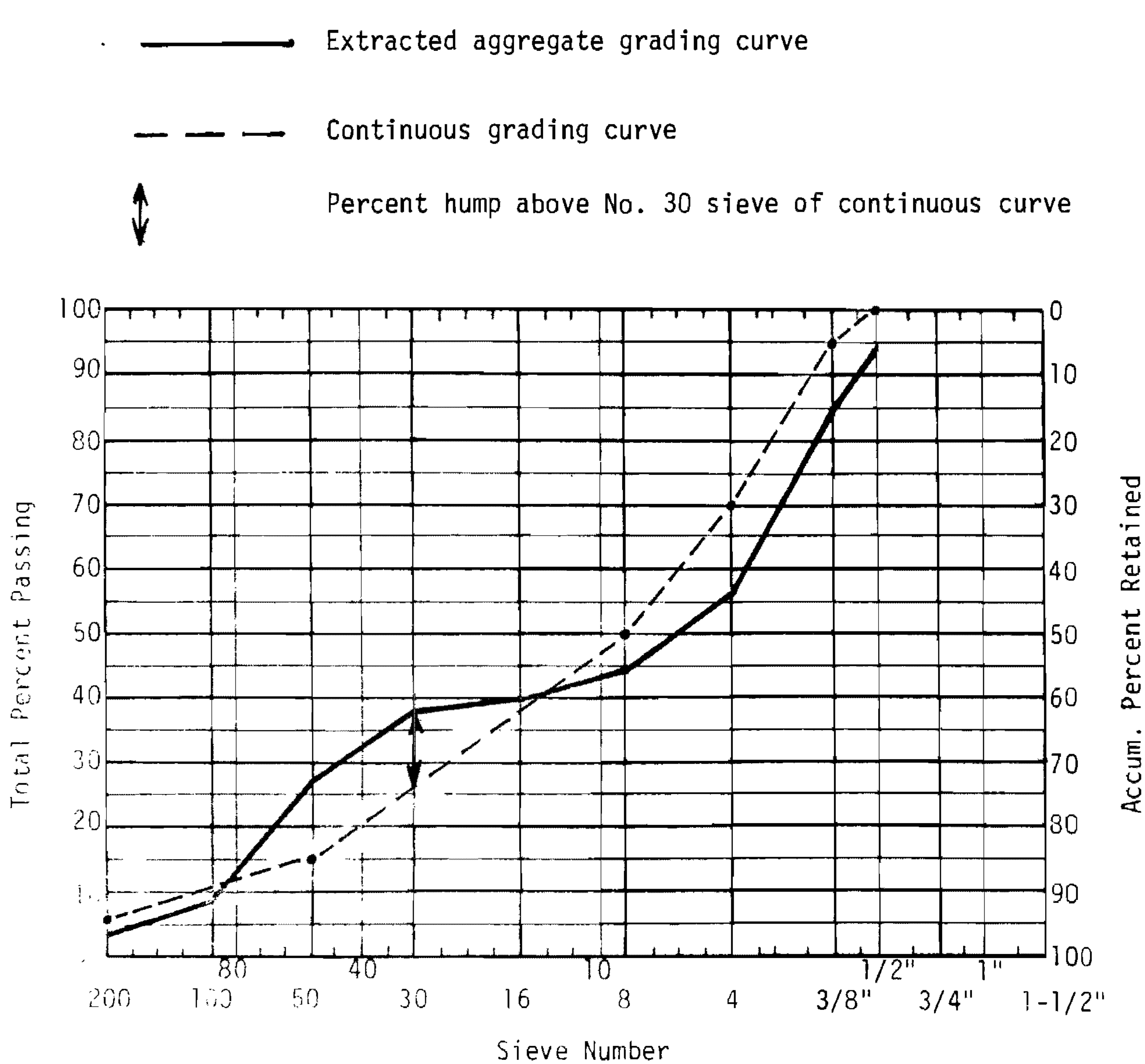

Figure 18. Extracted aggregate gradation curve for US 77 Bypass, Kingsville, Texas, Data Code Number 33.

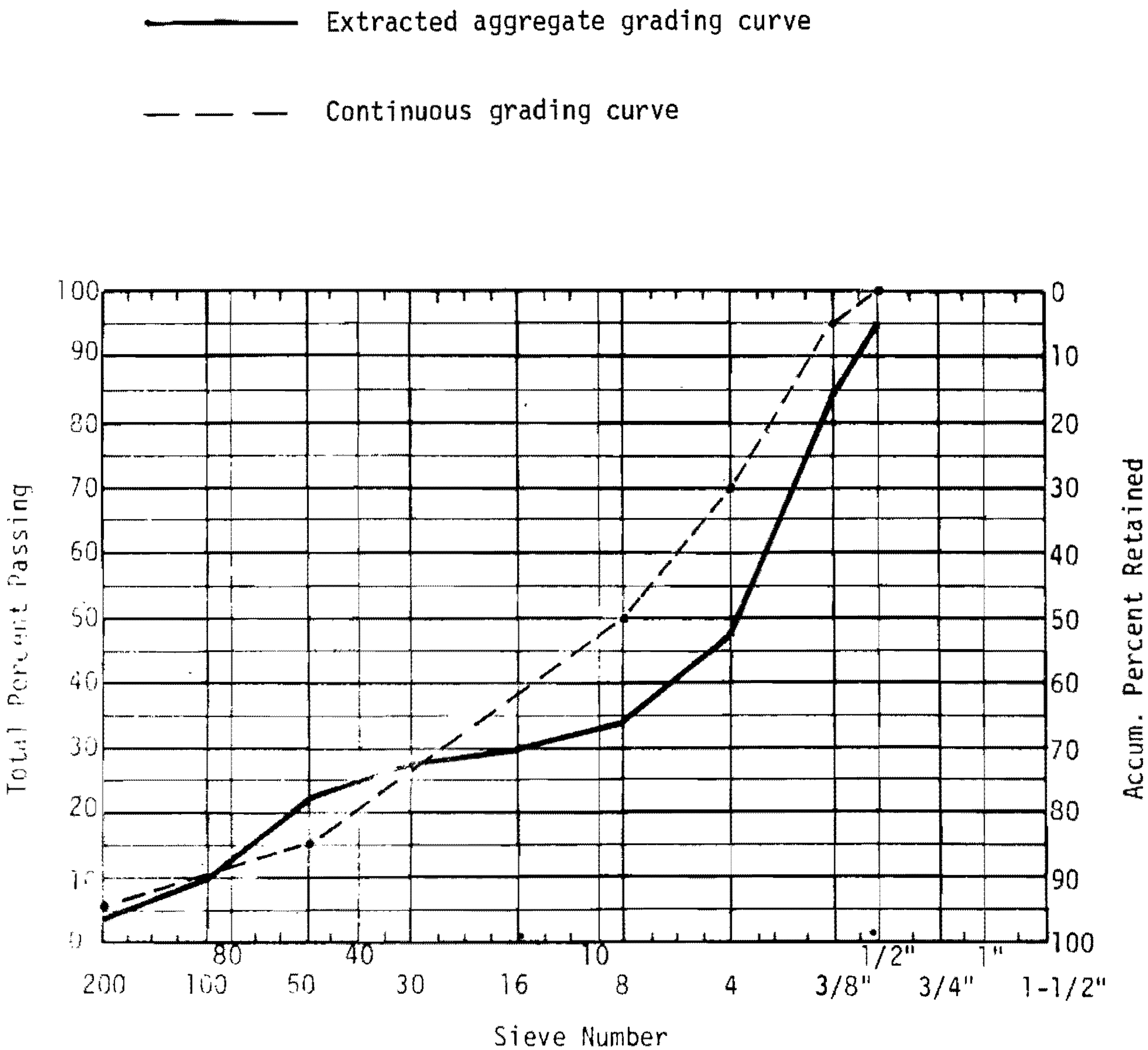

Figure 19. Extracted aggregate gradation curve for US 77 Bypass, Sinton, Texas, Data Code 34.

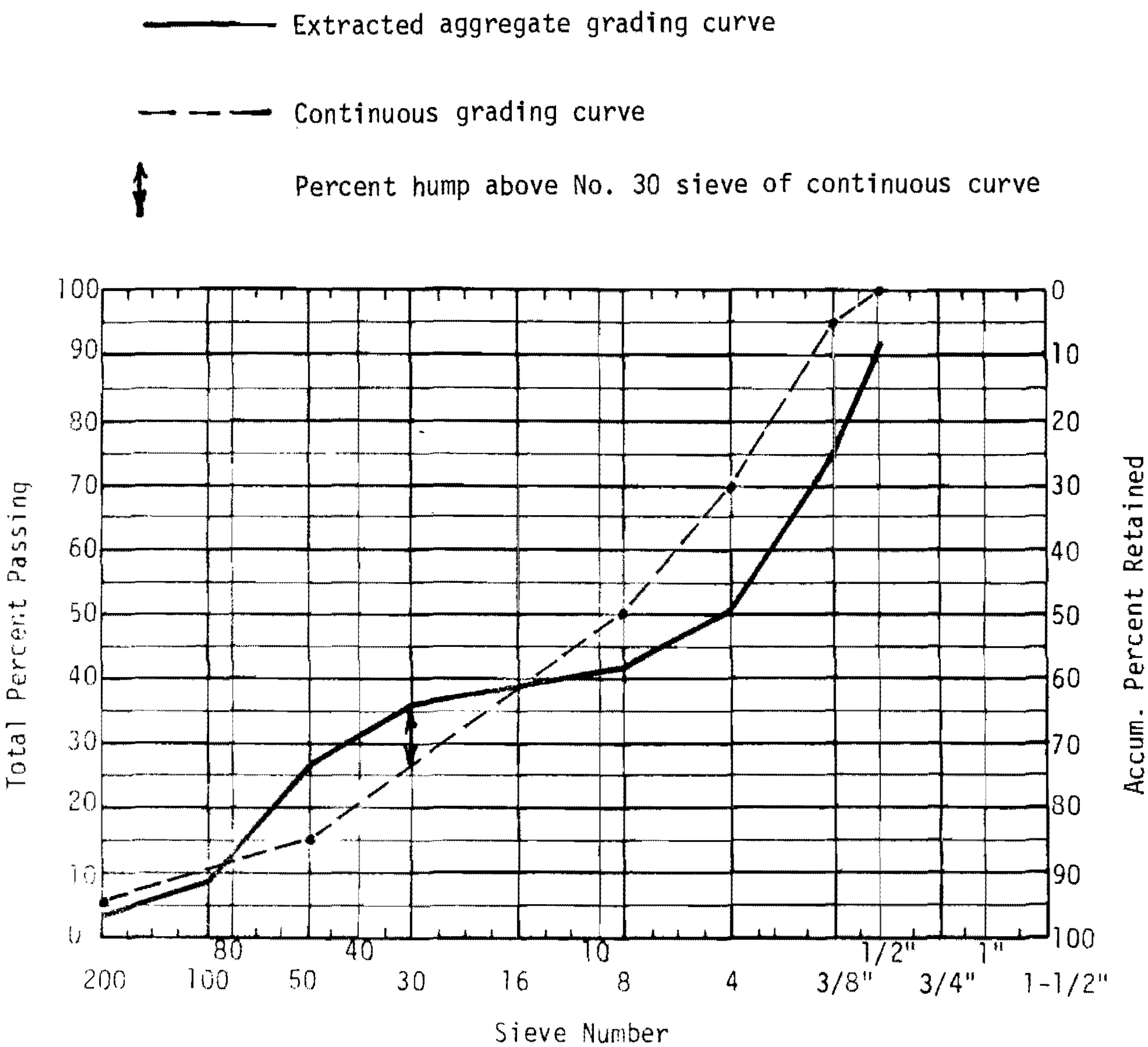

Figure 20. Extracted aggregate gradation curve for IH 37, Oakville, Texas, Data Code Number 35.

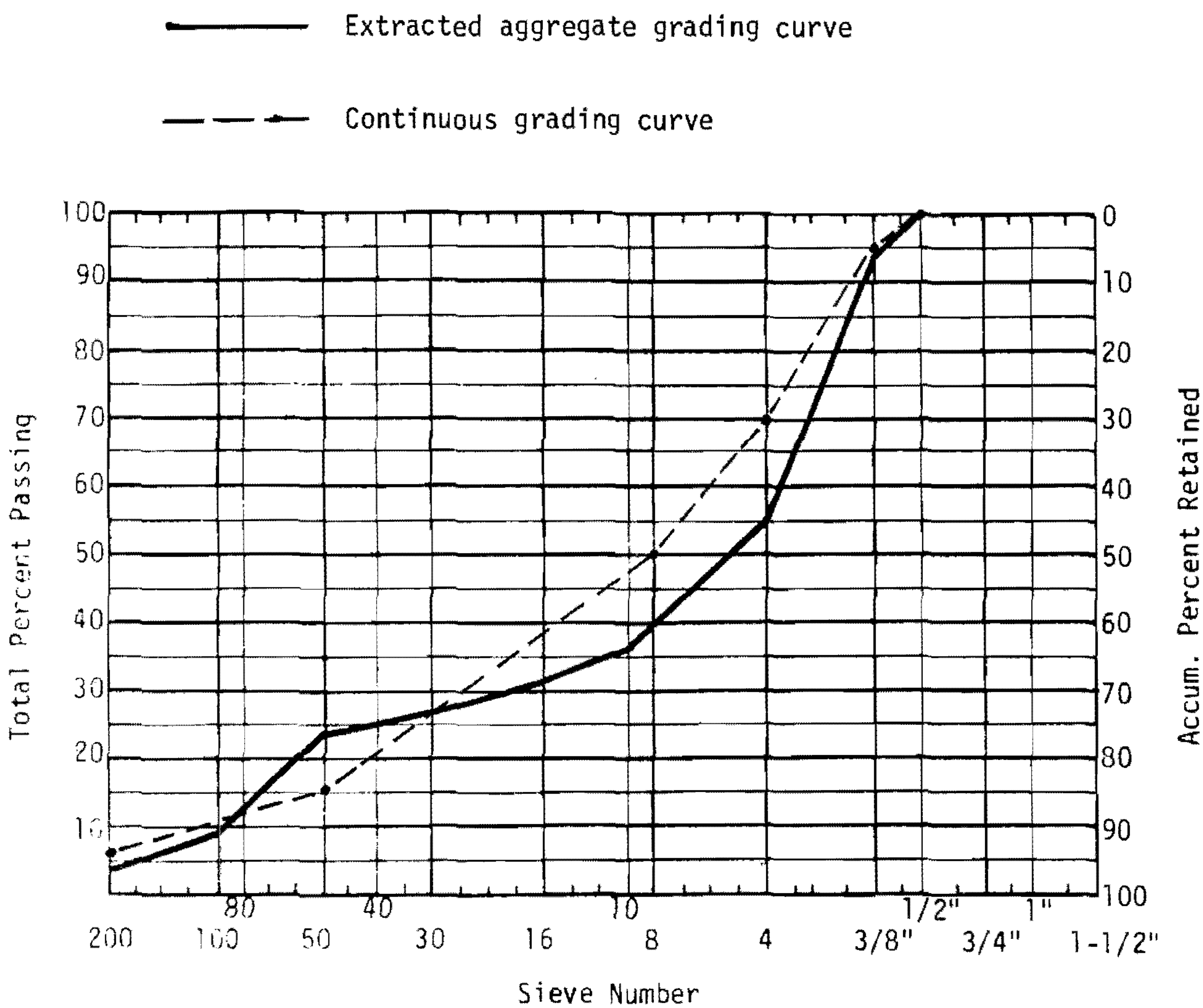

Figure 21. Extracted aggregate gradation curve for SH 71 Business, Columbus, Texas, Data Code Number 36.

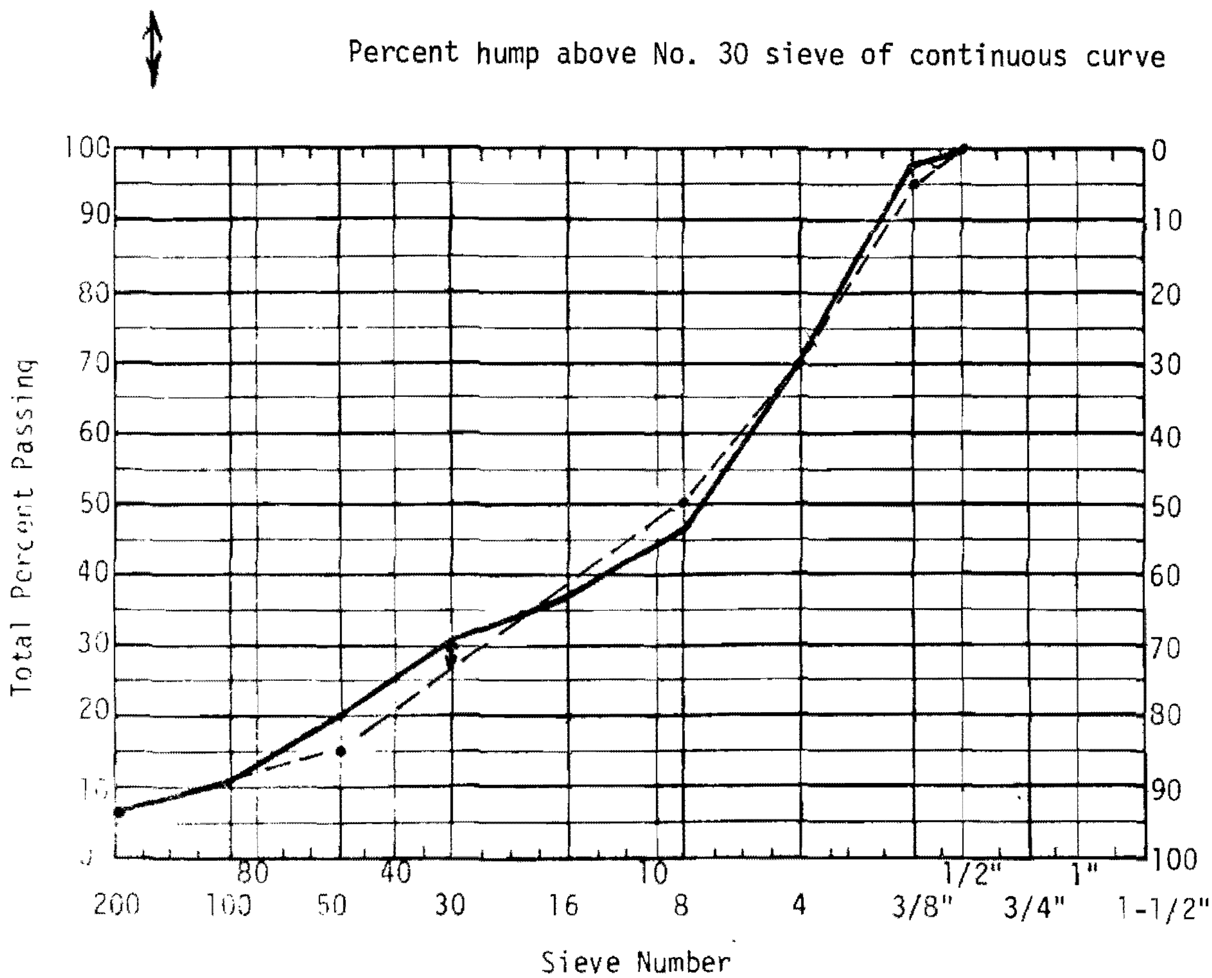

Figure 22. Extracted aggregate gradation curve for US 90A, west of Colorado River, Data Code Number 37.

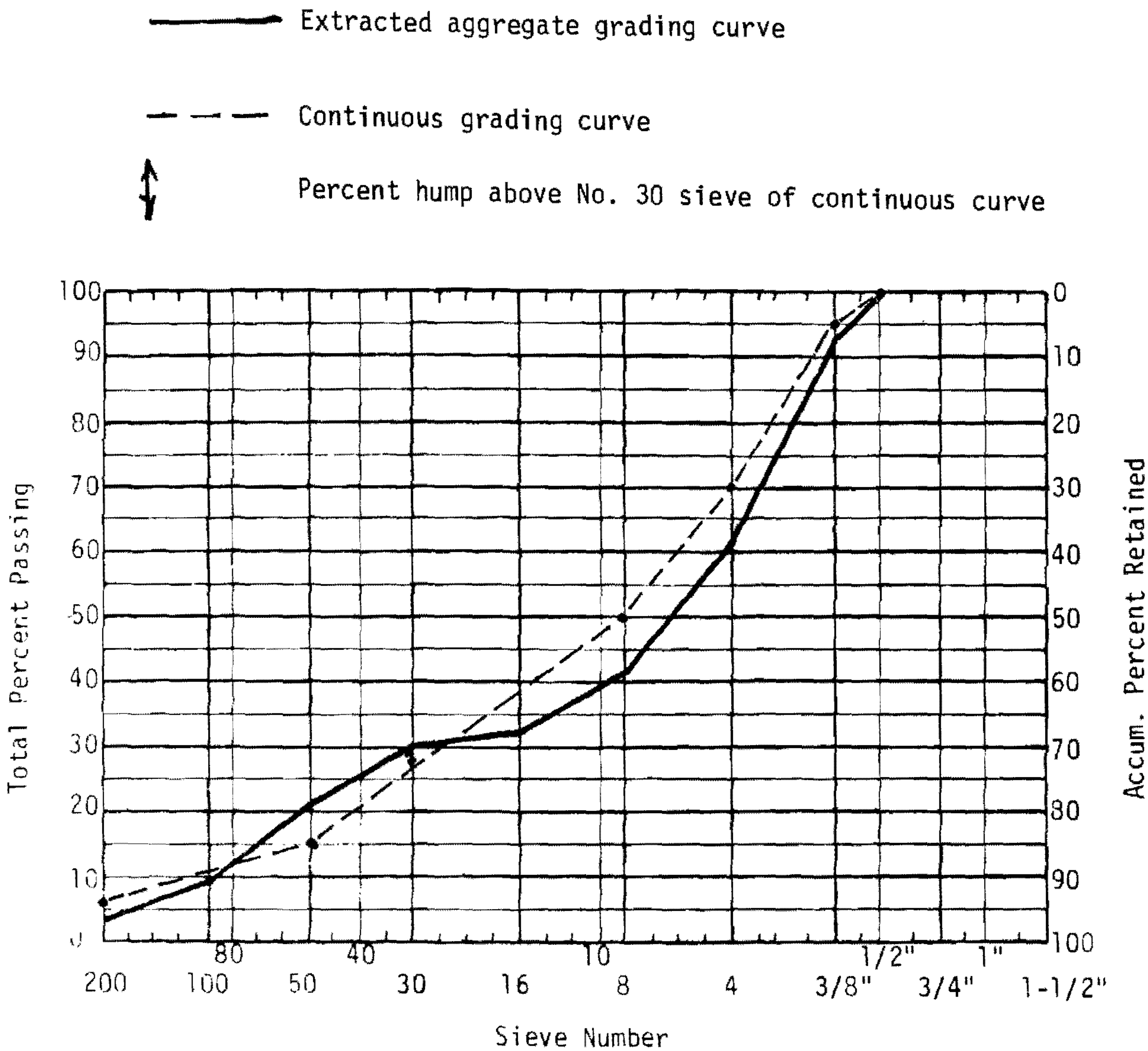

Figure 23. Extracted aggregate gradation curve for Loop 374 (FM 2061), original design section in McAllen, Data Code Number 38.

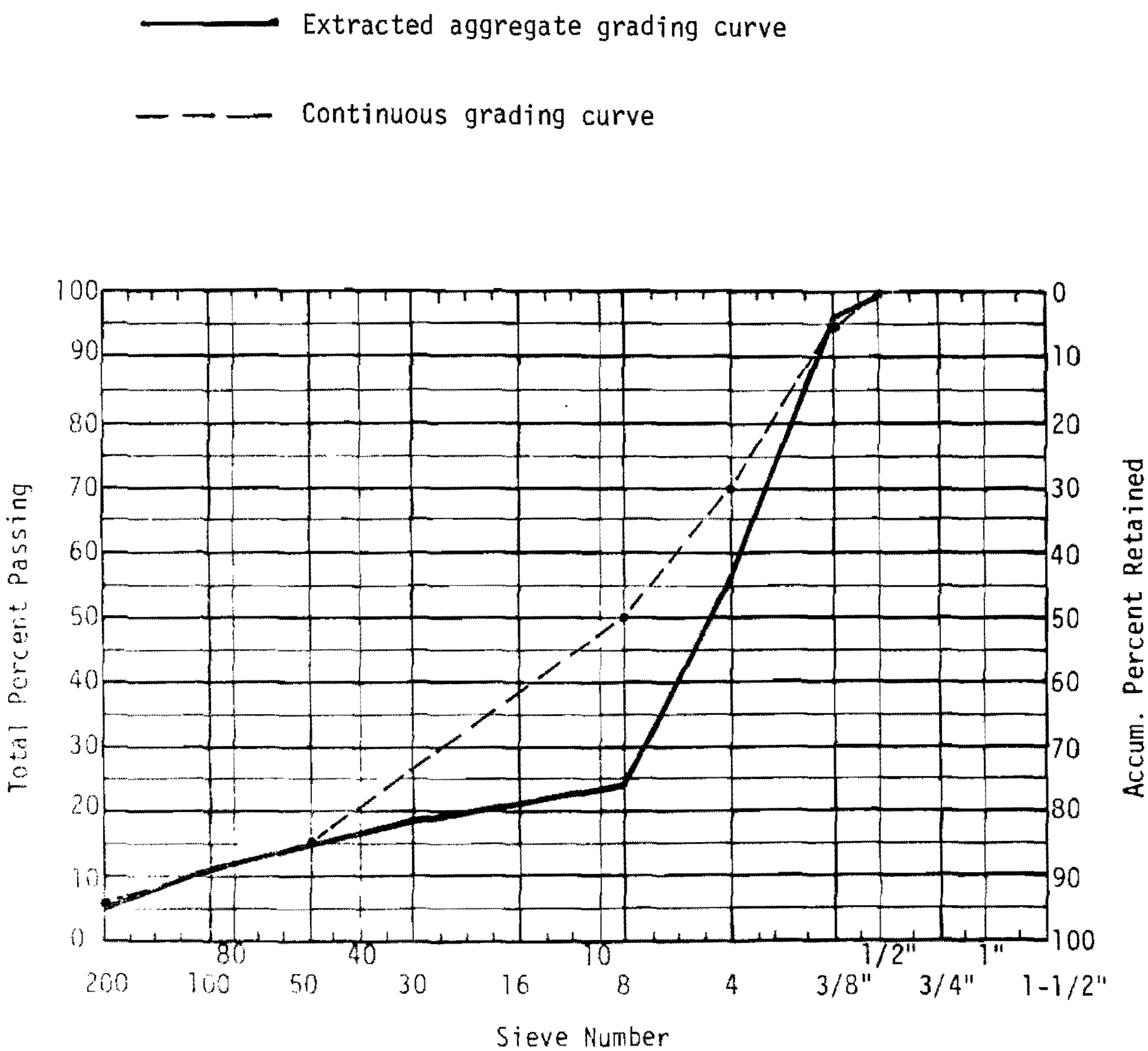

Figure 24. Extracted aggregate gradation curve for Loop 374 (FM 2061), modified design section in McAllen, Data Code Number 39.

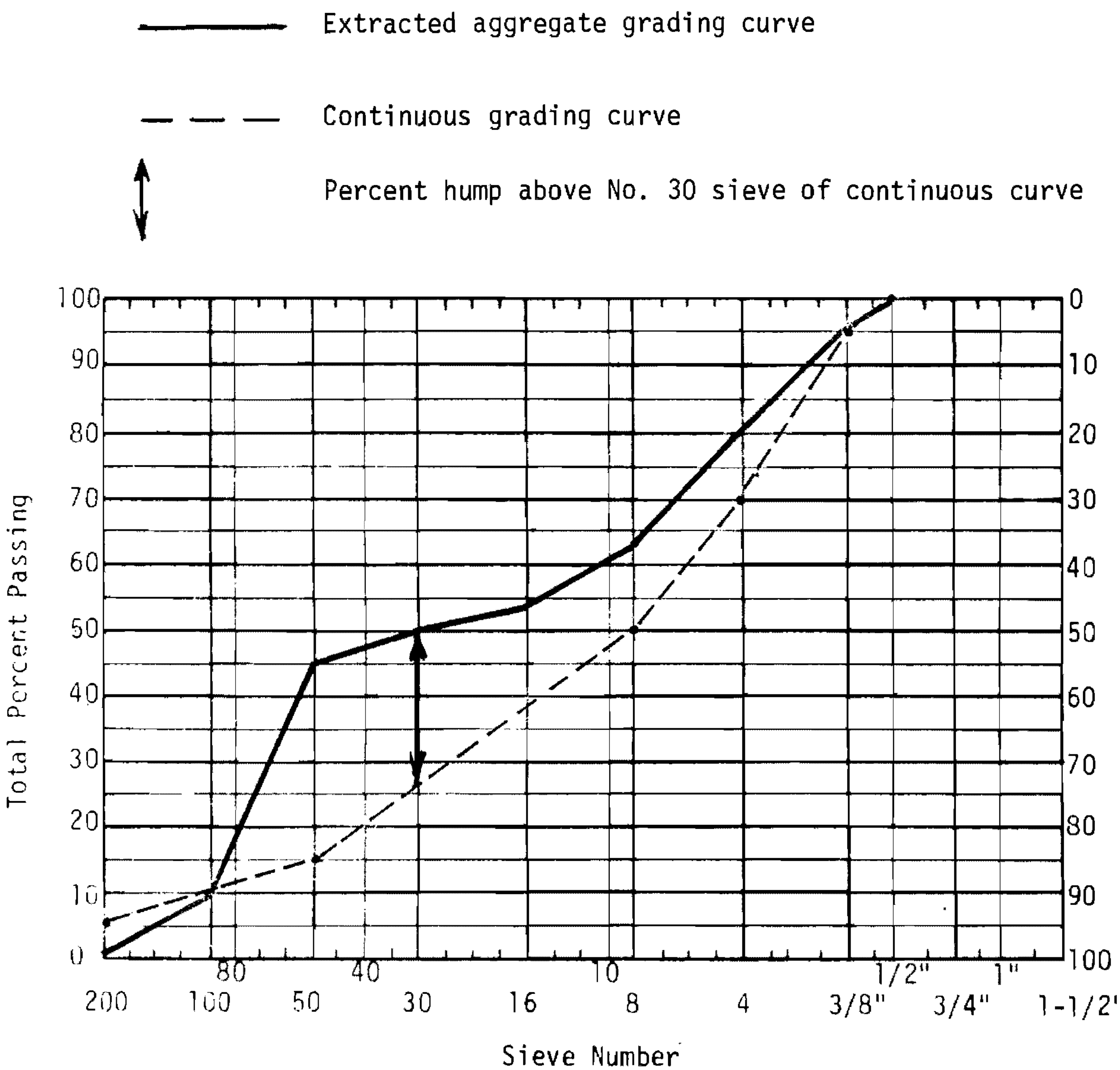

Figure 25. Extracted aggregate gradation curve for US 59, Shelby County, Data Code Number 40.

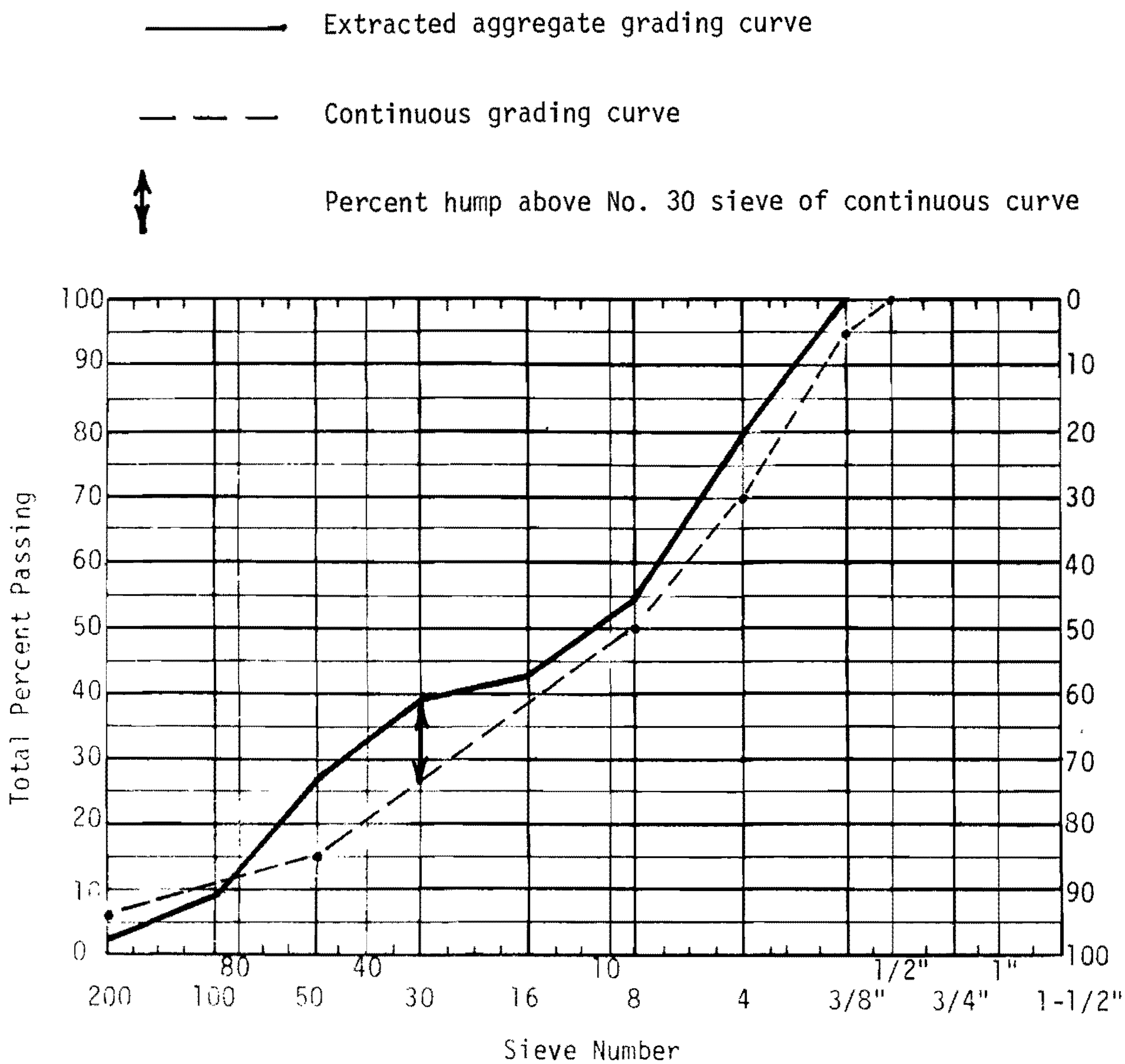

Figure 26. Extracted aggregate gradation curve for US 290/SH 6, black cores in Hempstead, Texas, Data Code Number 41.

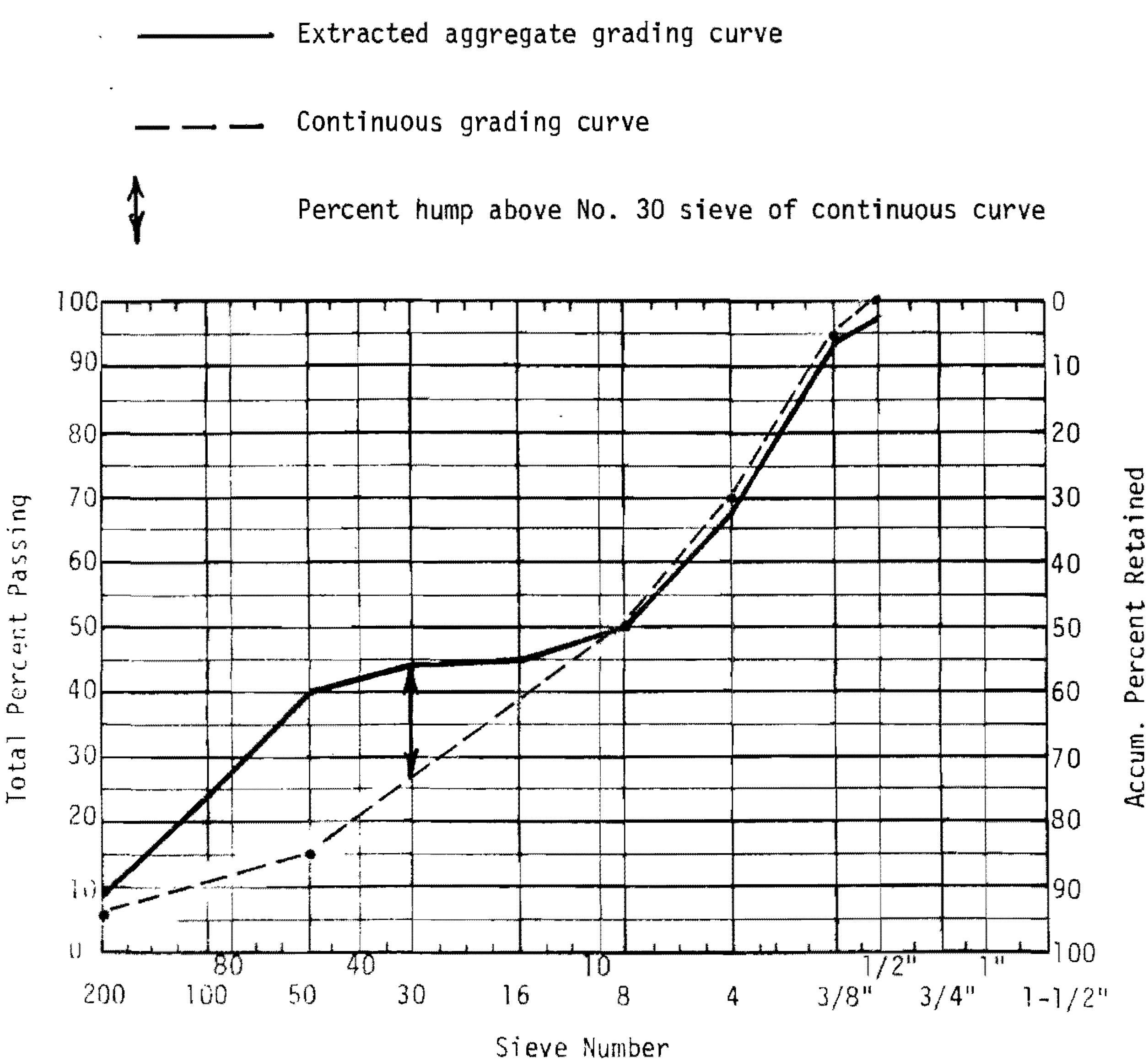

Figure 27. Extracted aggregate gradation curve for US 290/SH 6, iron-ore cores in Hempstead, Texas, Data Code Number 42.

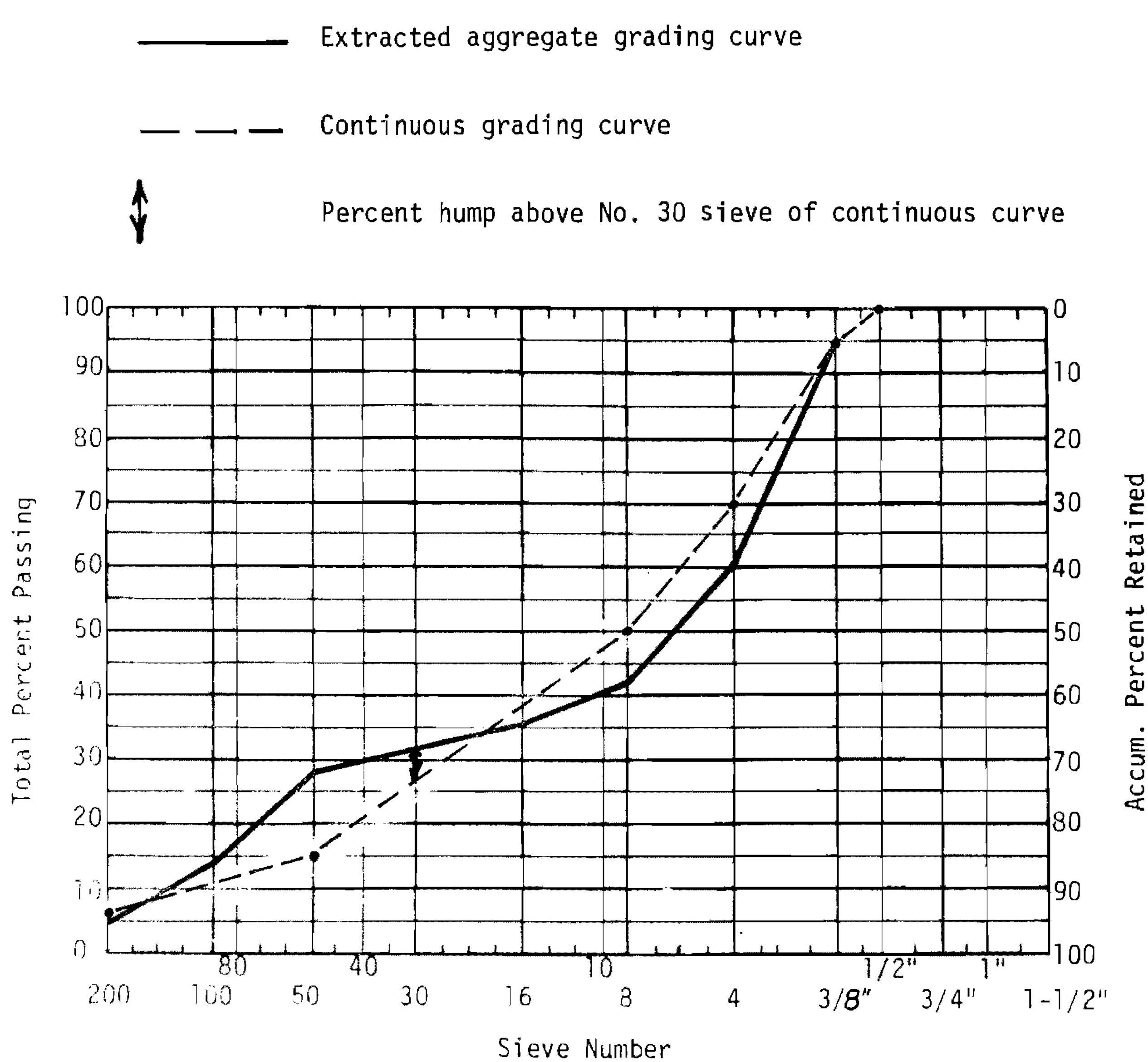

Figure 28. Extracted aggregate gradation curve for "Asphadure" cores on US 62 in Lubbock, Data Code Number 43.

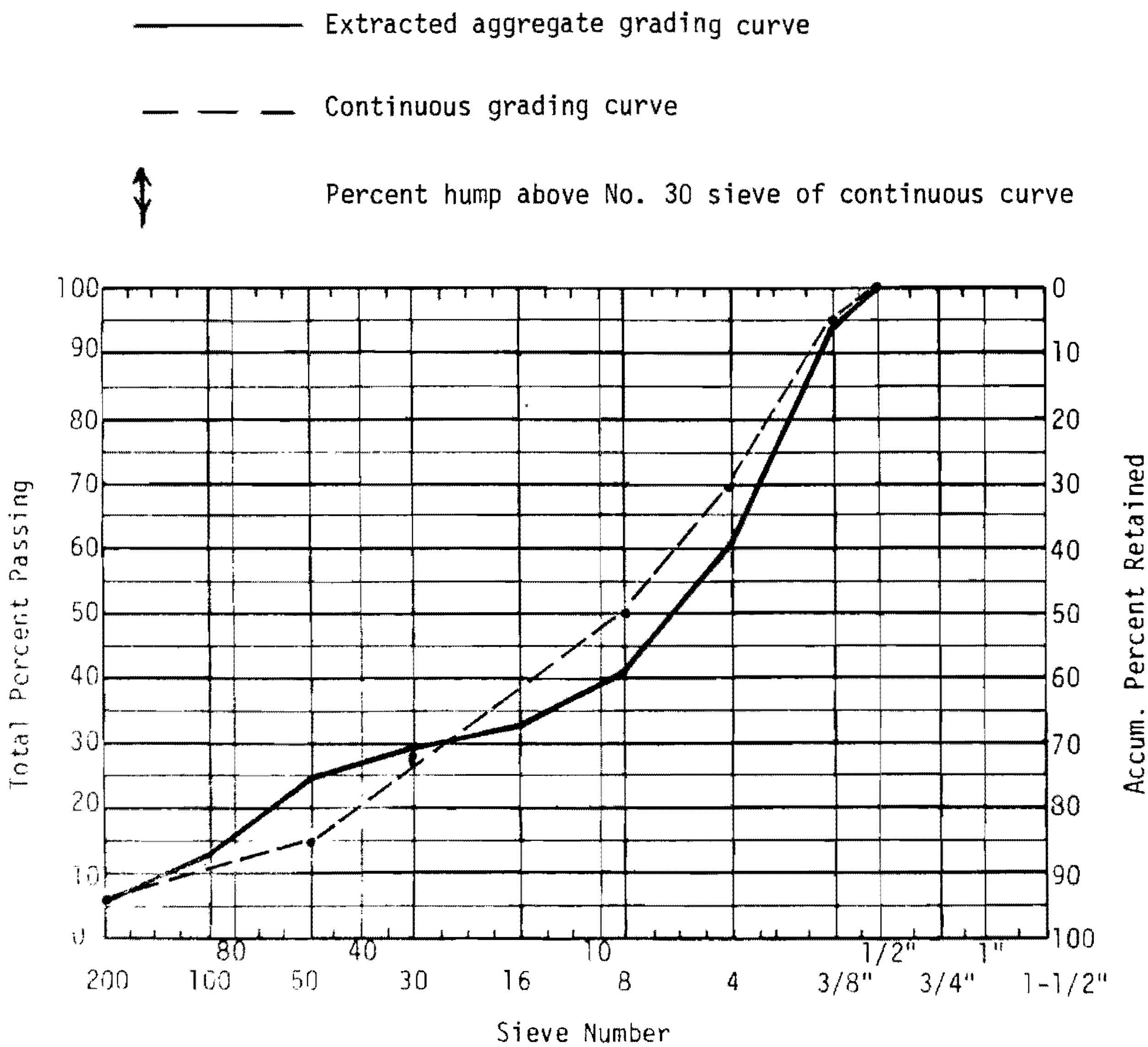

Figure 29. Extracted aggregate gradation curve for US 87 at 34th Street in Lubbock, Data Code Number 44.

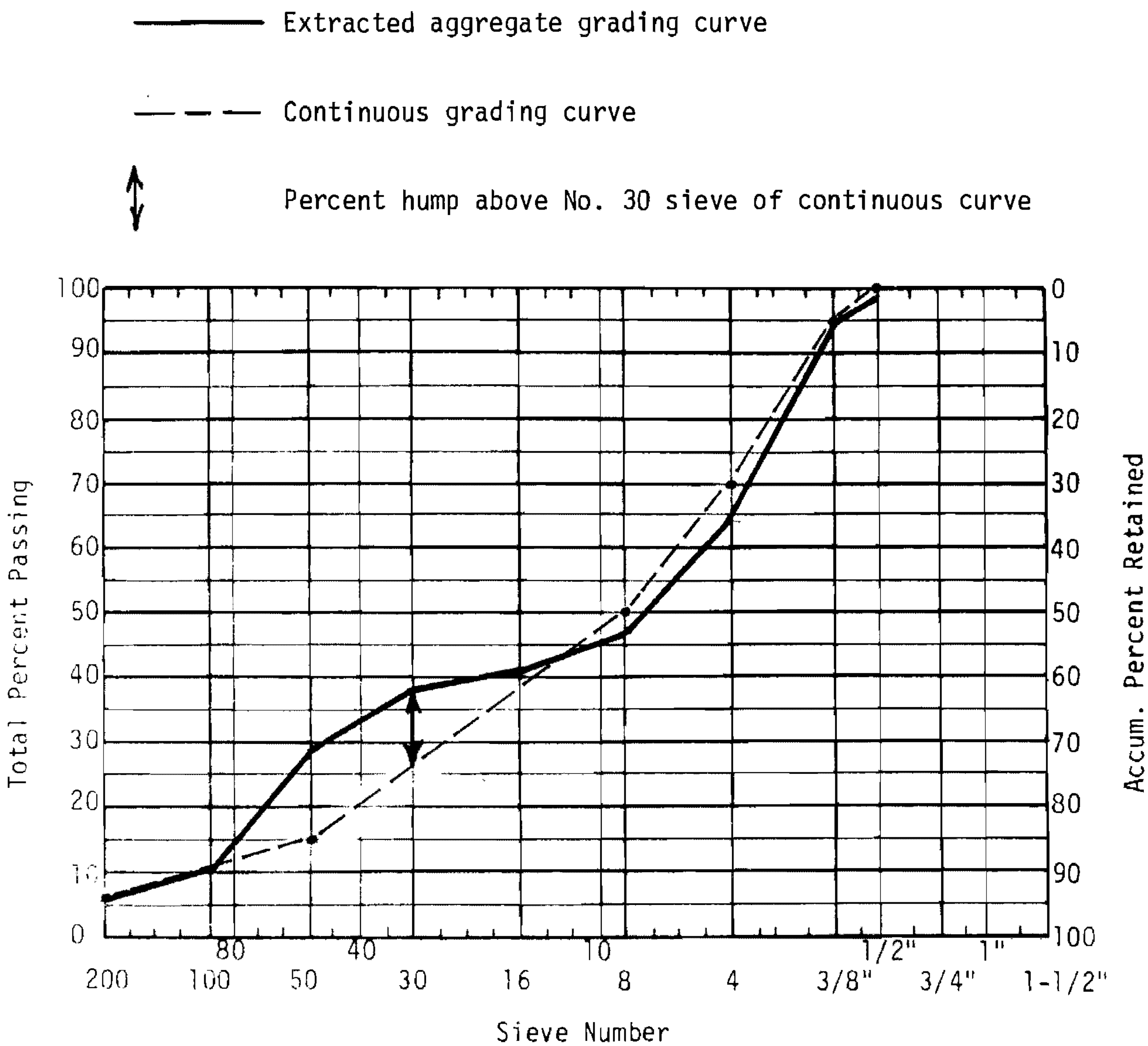

Figure 30. Extracted aggregate gradation curve for Loop 287 (top layer) in Lufkin, Texas, Data Code Number 45.

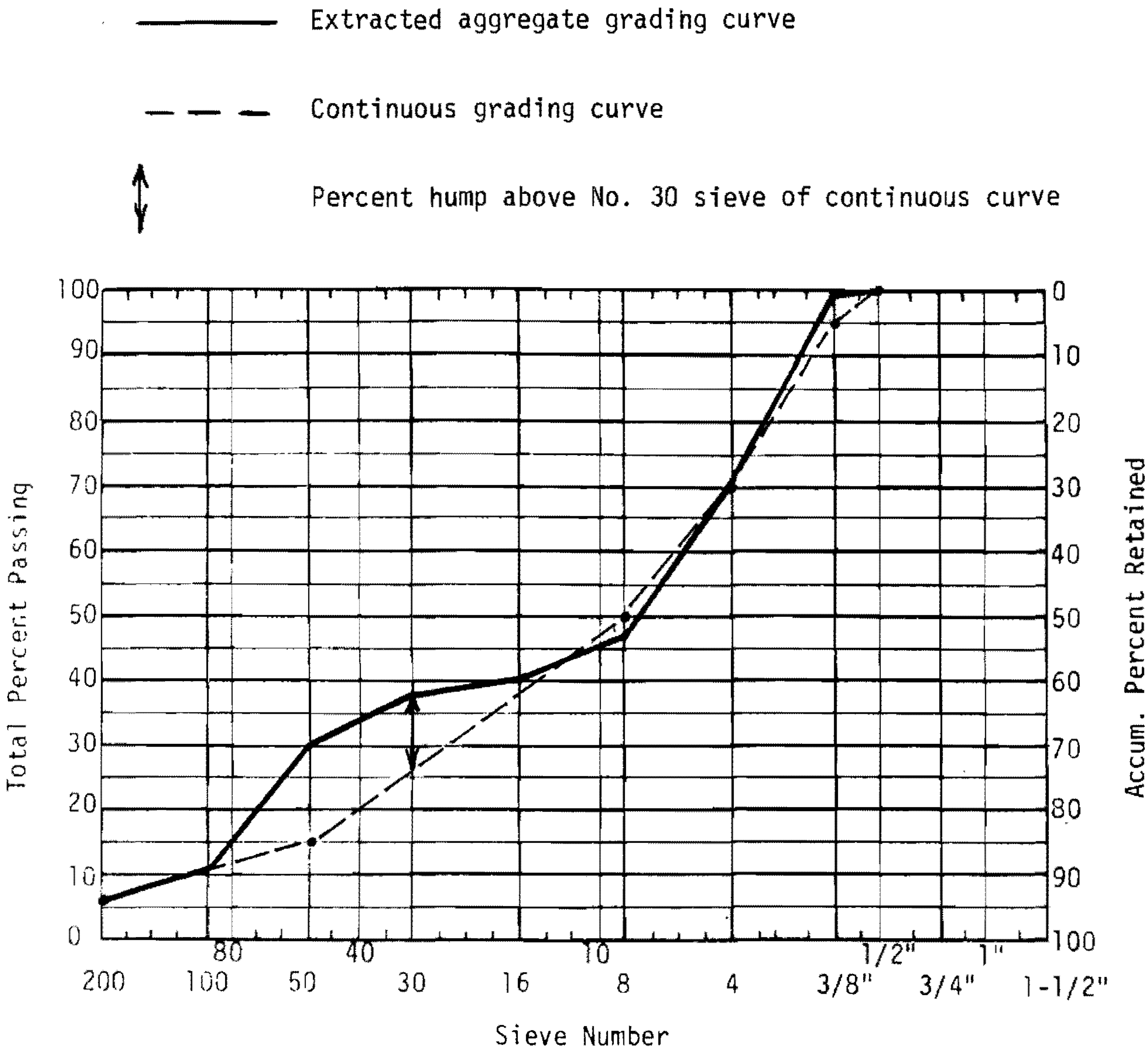

Figure 31. Extracted aggregate gradation curve for Loop 287 (second layer) in Lufkin, Texas, Data Code Number 46.

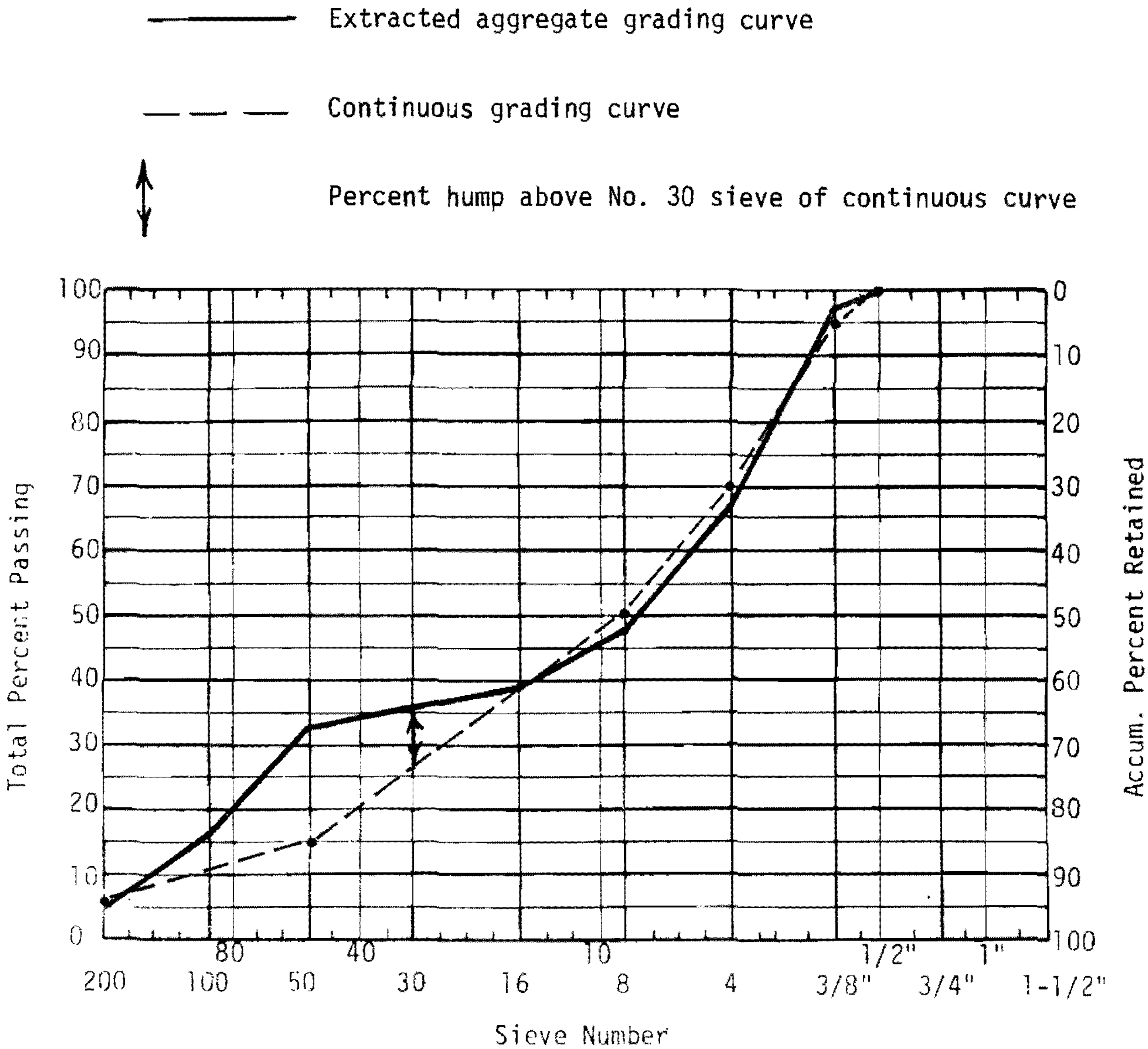

Figure 32. Extracted aggregate gradation curve for US 59 (top layer) north of Lufkin, Texas, Data Code Number 47.

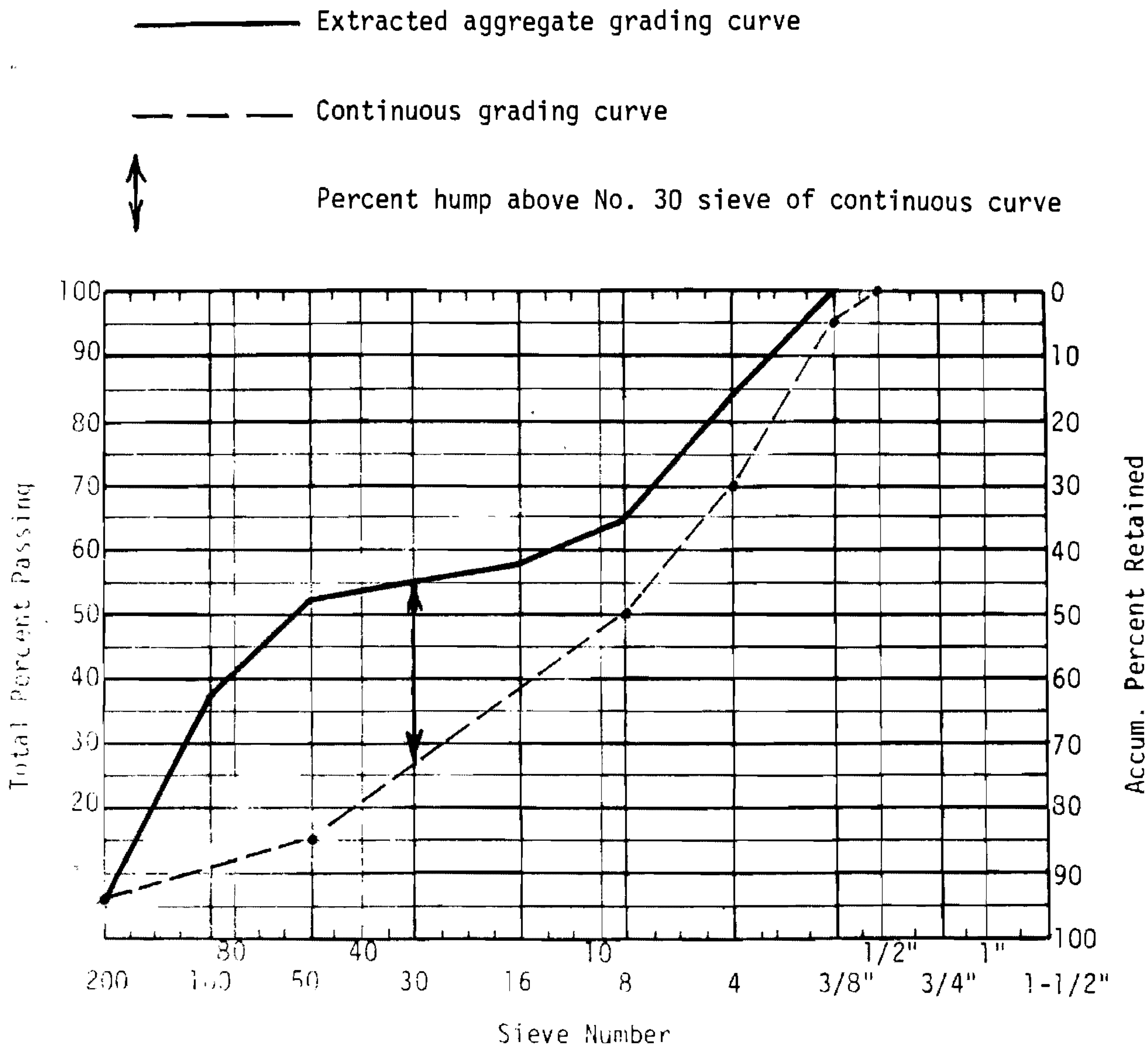

Figure 33. Extracted aggregate gradation curve for US 59 (bottom layer) north of Lufkin, Texas, Data Code Number 48.

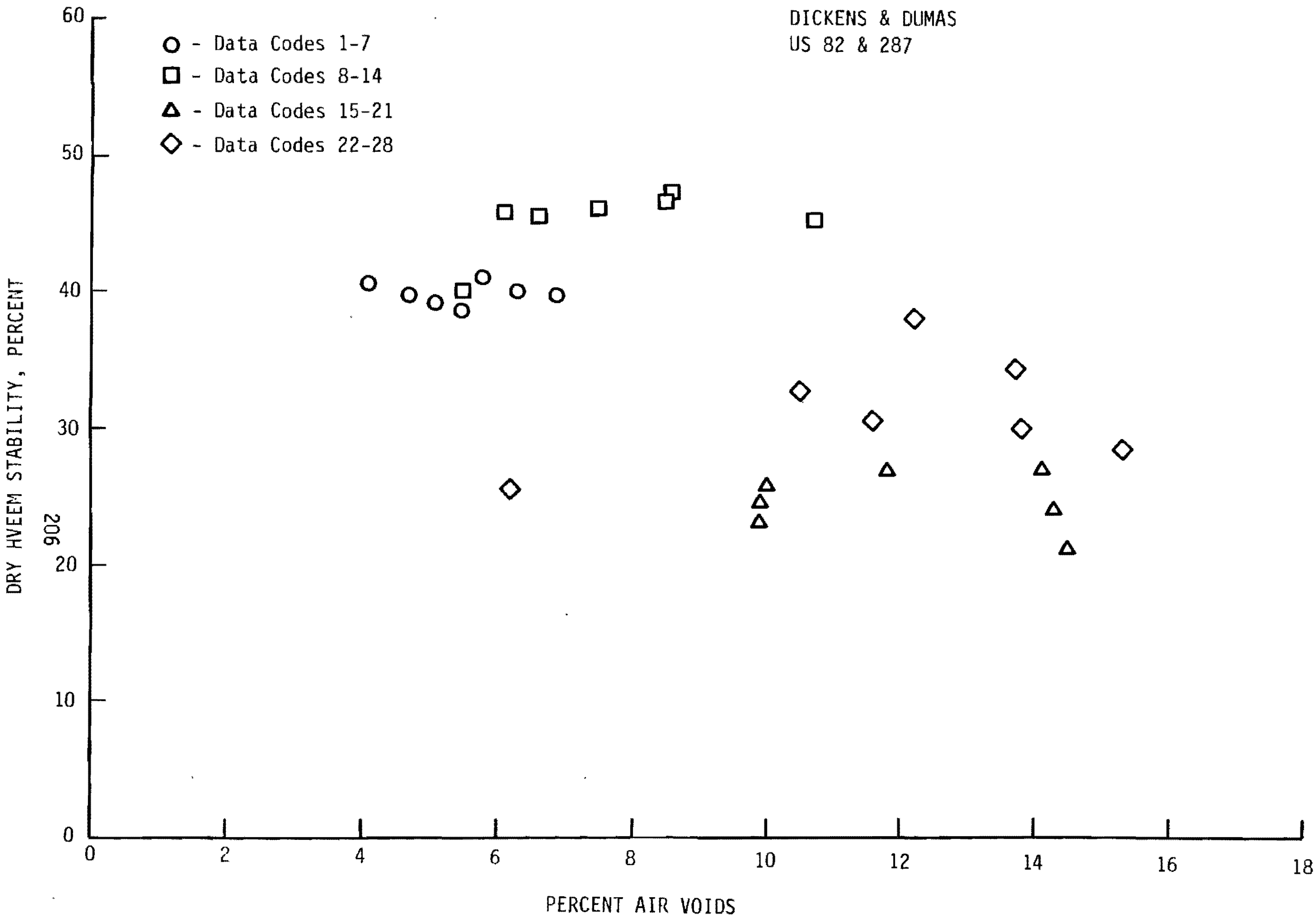

Figure 34. Overall Hveem stability versus percent air voids for US 82 and 287 roadway sections, Data Code Numbers 1-28.

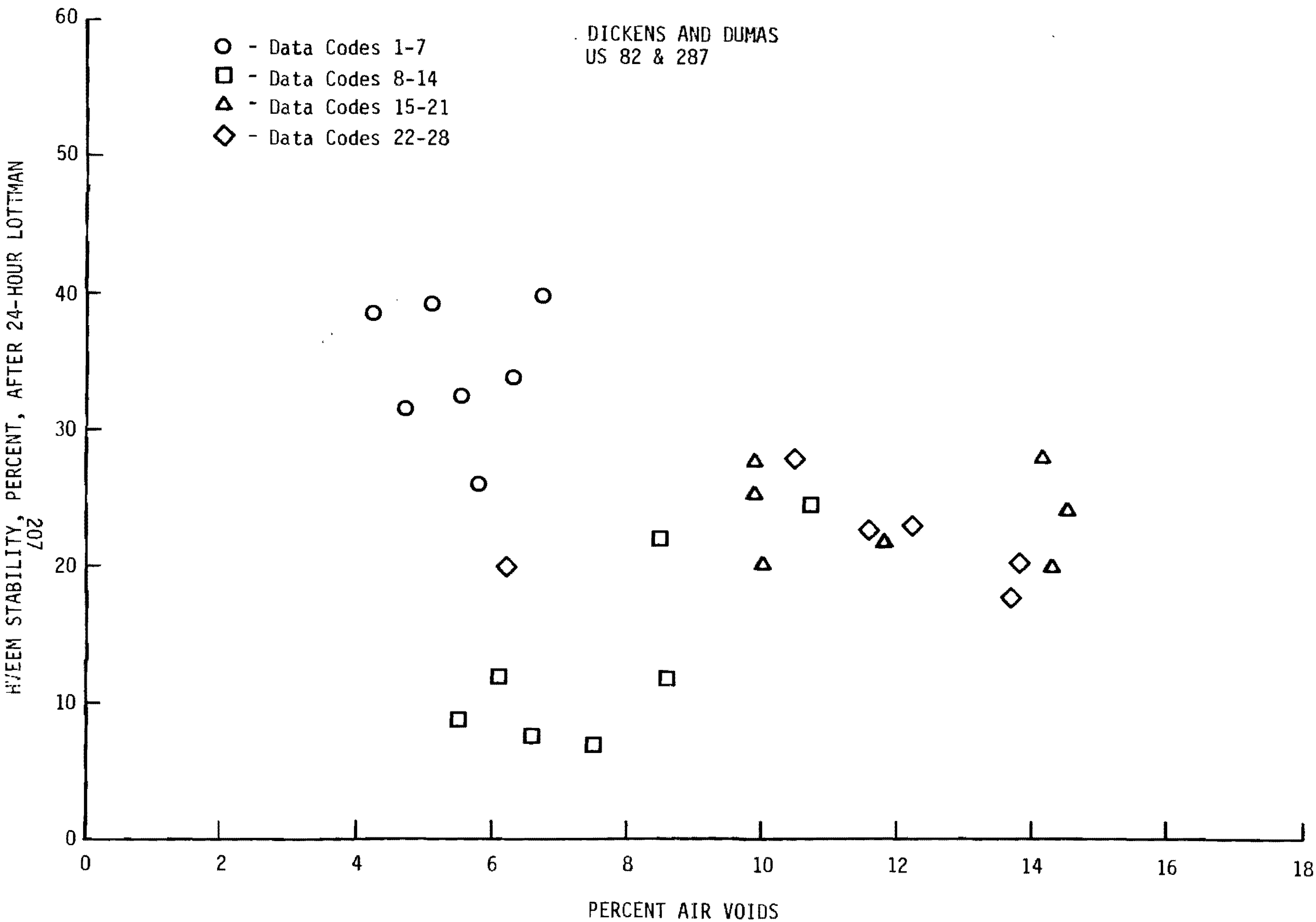

Figure 35. Hveem stability after 24-hour Lottman test versus percent air voids for US 82 and 287 roadway sections. Data Code numbers 1-28.

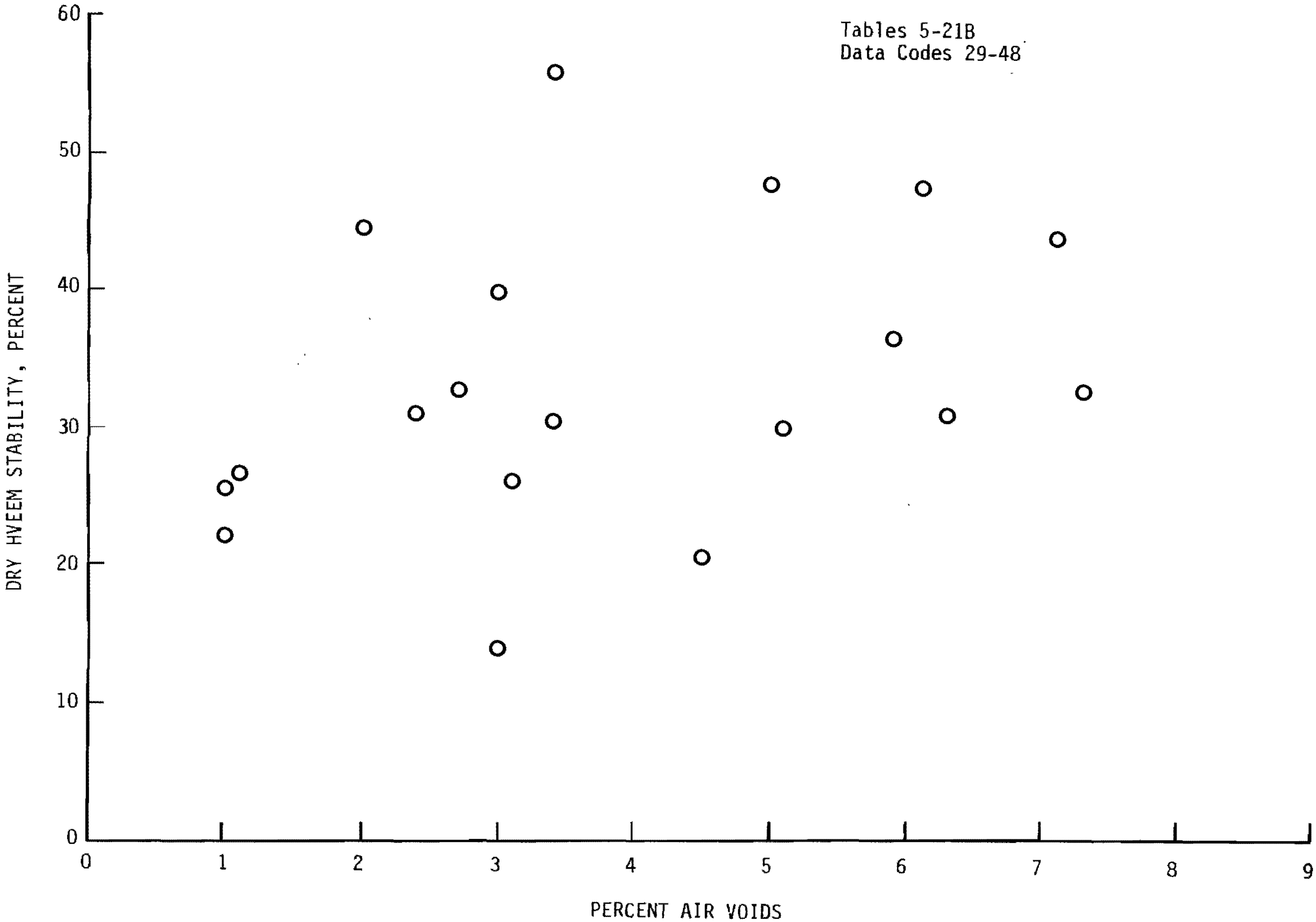

Figure 36. Overall Hveem stability versus percent air voids for roadway sections covered by Data Code Numbers 29-48.

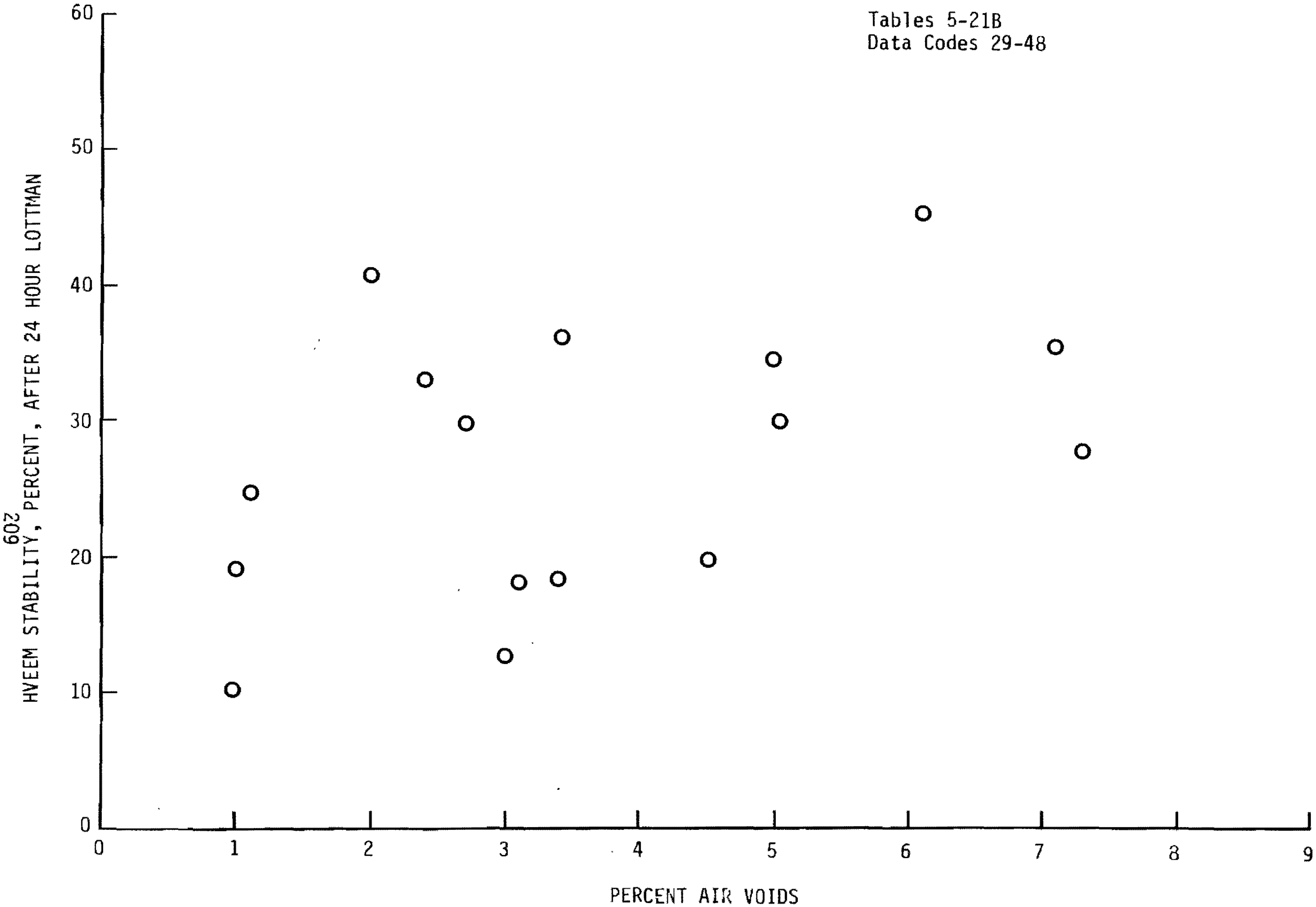

Figure 37. Hveem stability after 24-hour Lottman test versus percent air voids for roadway sections covered by Data Code Numbers 29-48.

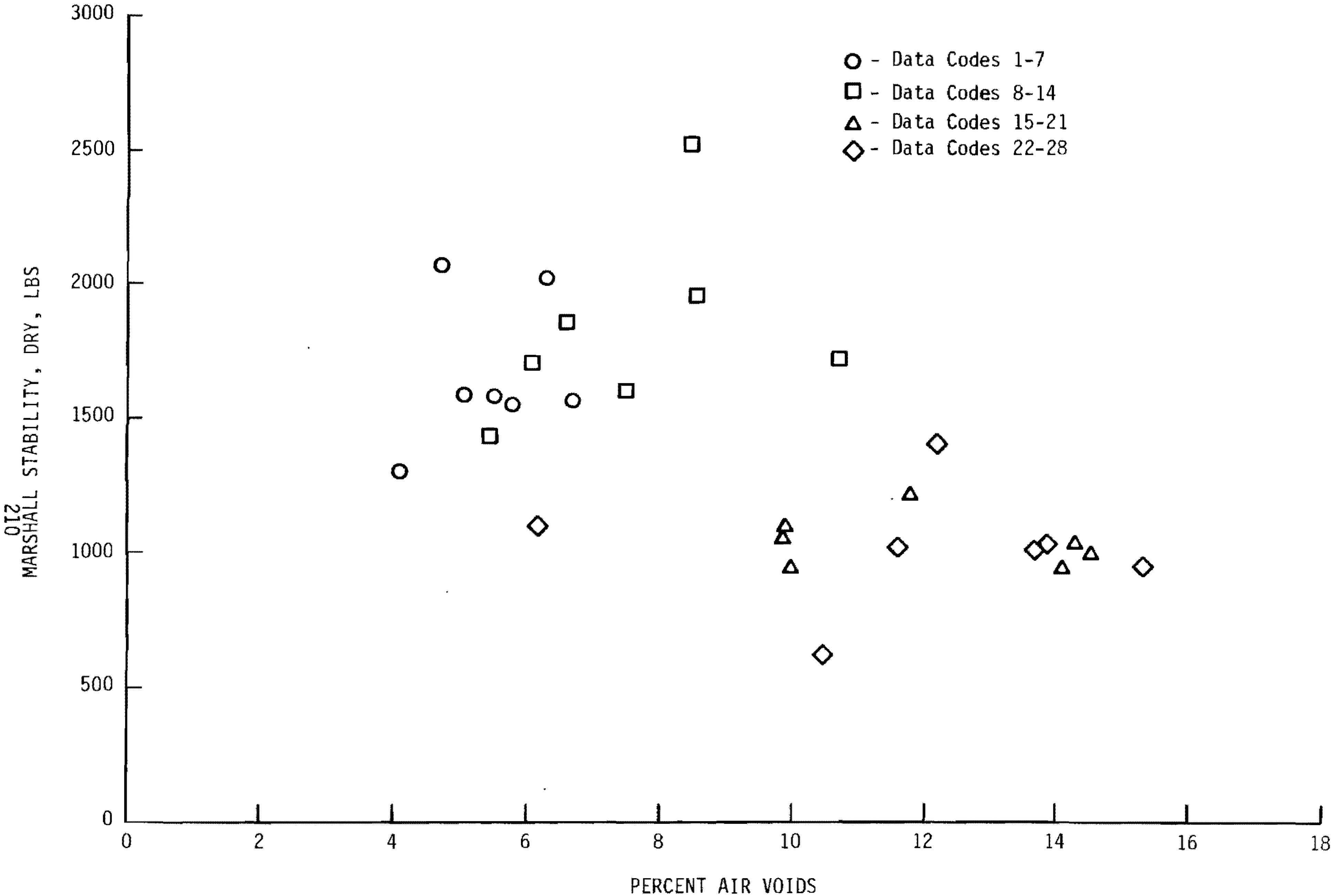

Figure 38. Marshall stability versus percent air voids for US 82 and 287 roadway sections, Data Code Numbers 1-28.

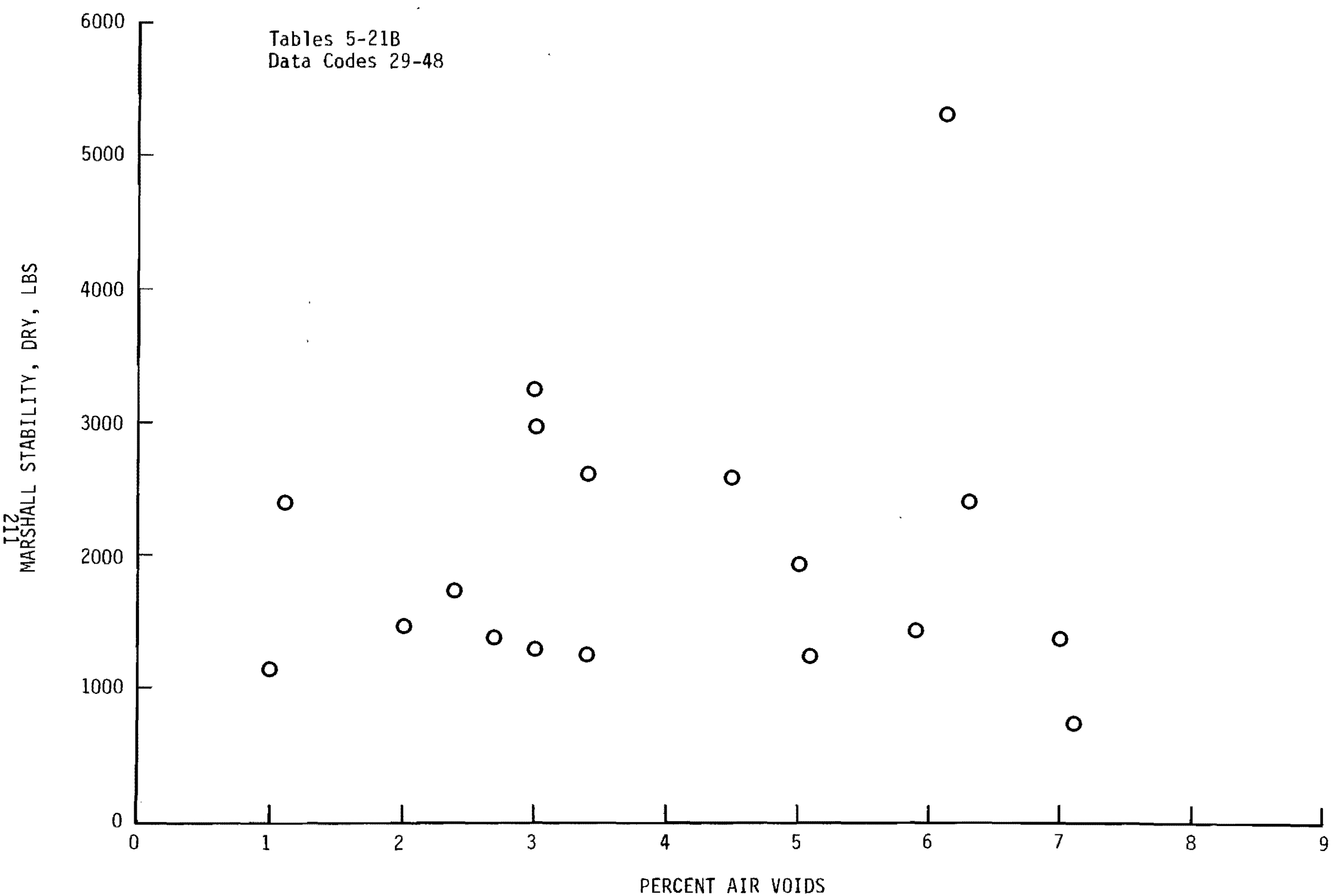

Figure 39. Marshall stability versus percent air voids for roadway sections covered by Data Code Numbers 29-48.

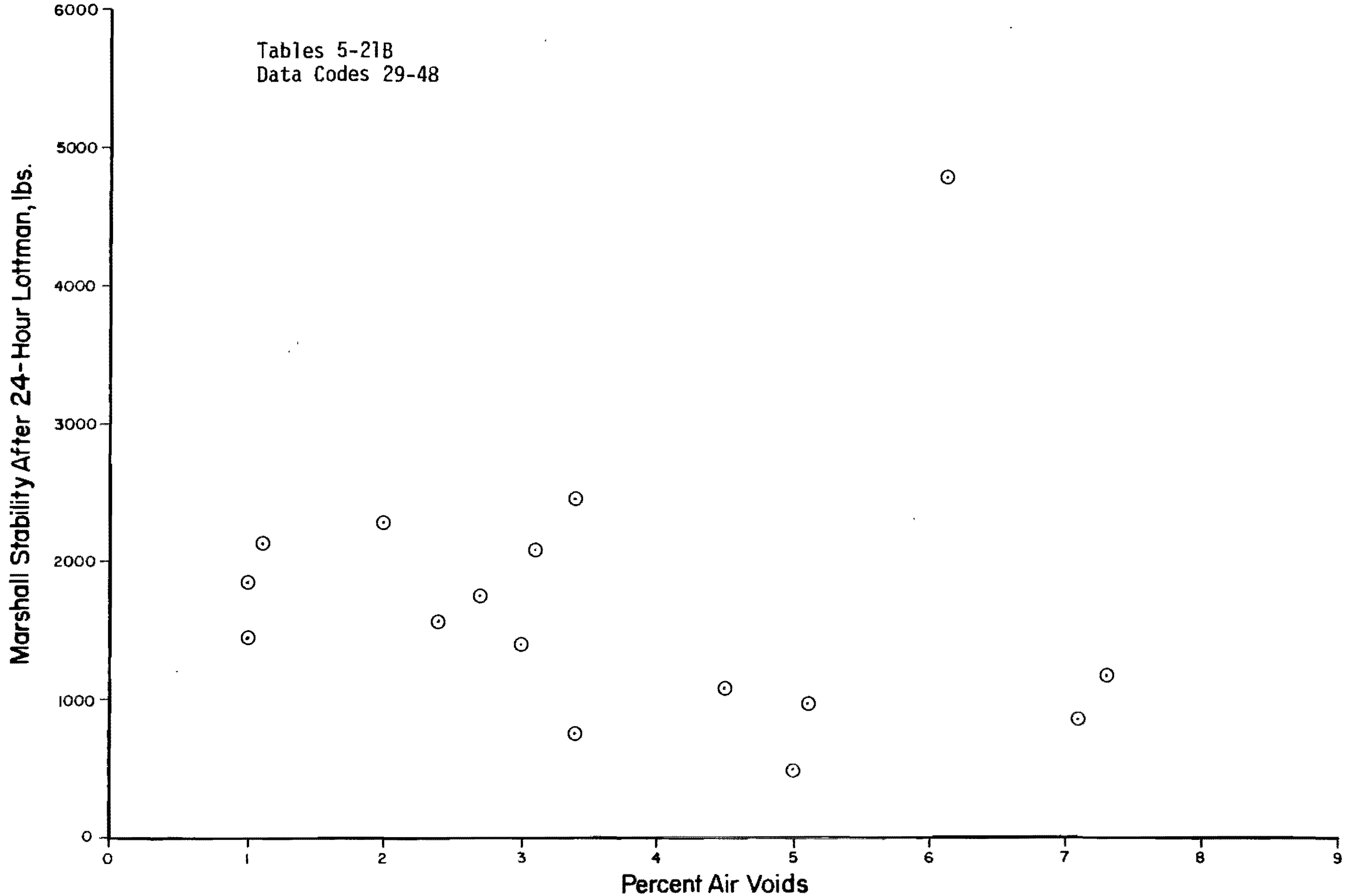

Figure 40. Marshall stability after 24-hour Lottman test versus percent air voids for roadway sections covered by Data Code Numbers 29-48.

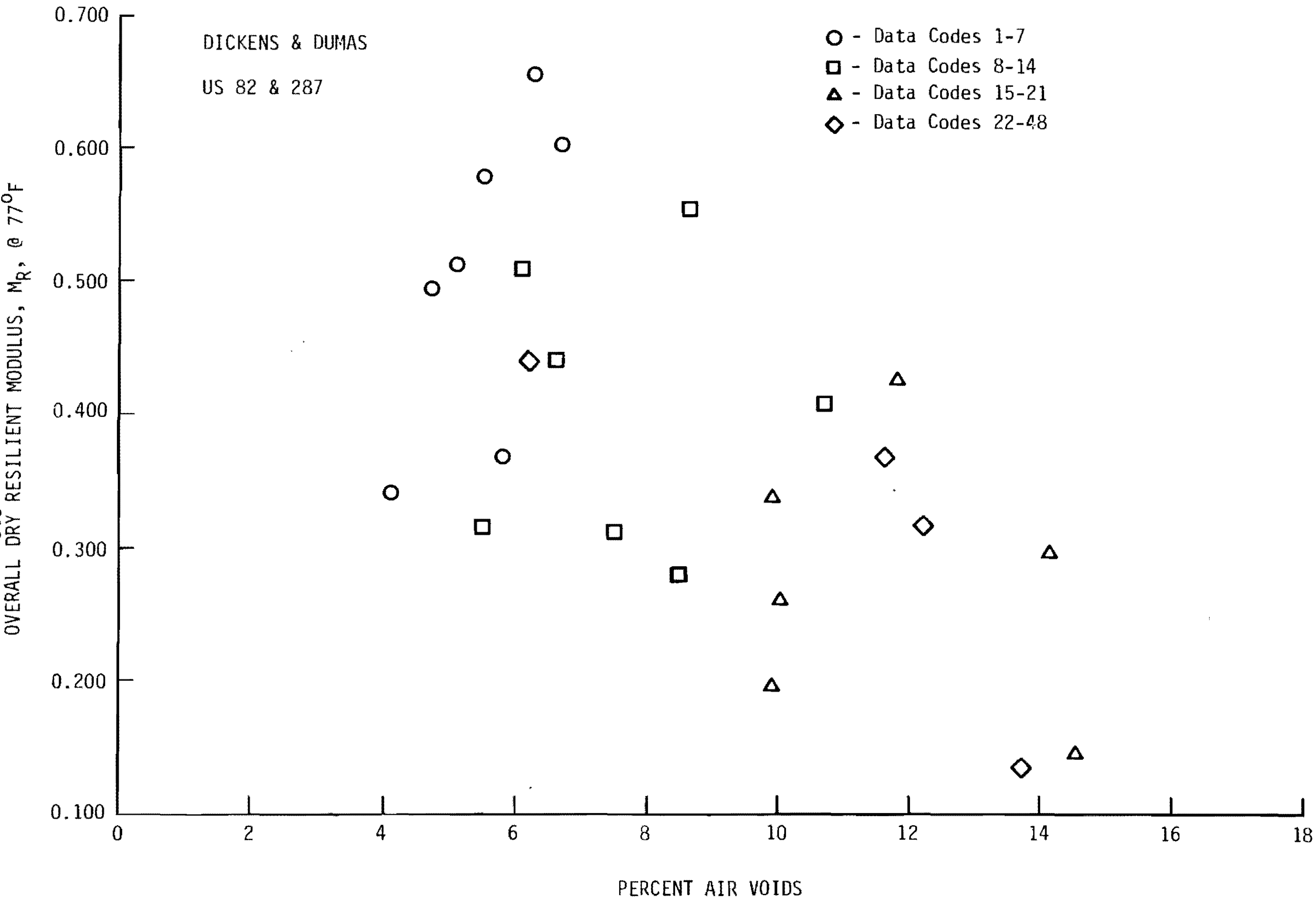

Figure 41. Overall resilient modulus M_R at 77°F versus percent air voids for US 82 and 287 roadway sections, Data Code Numbers 1-28.

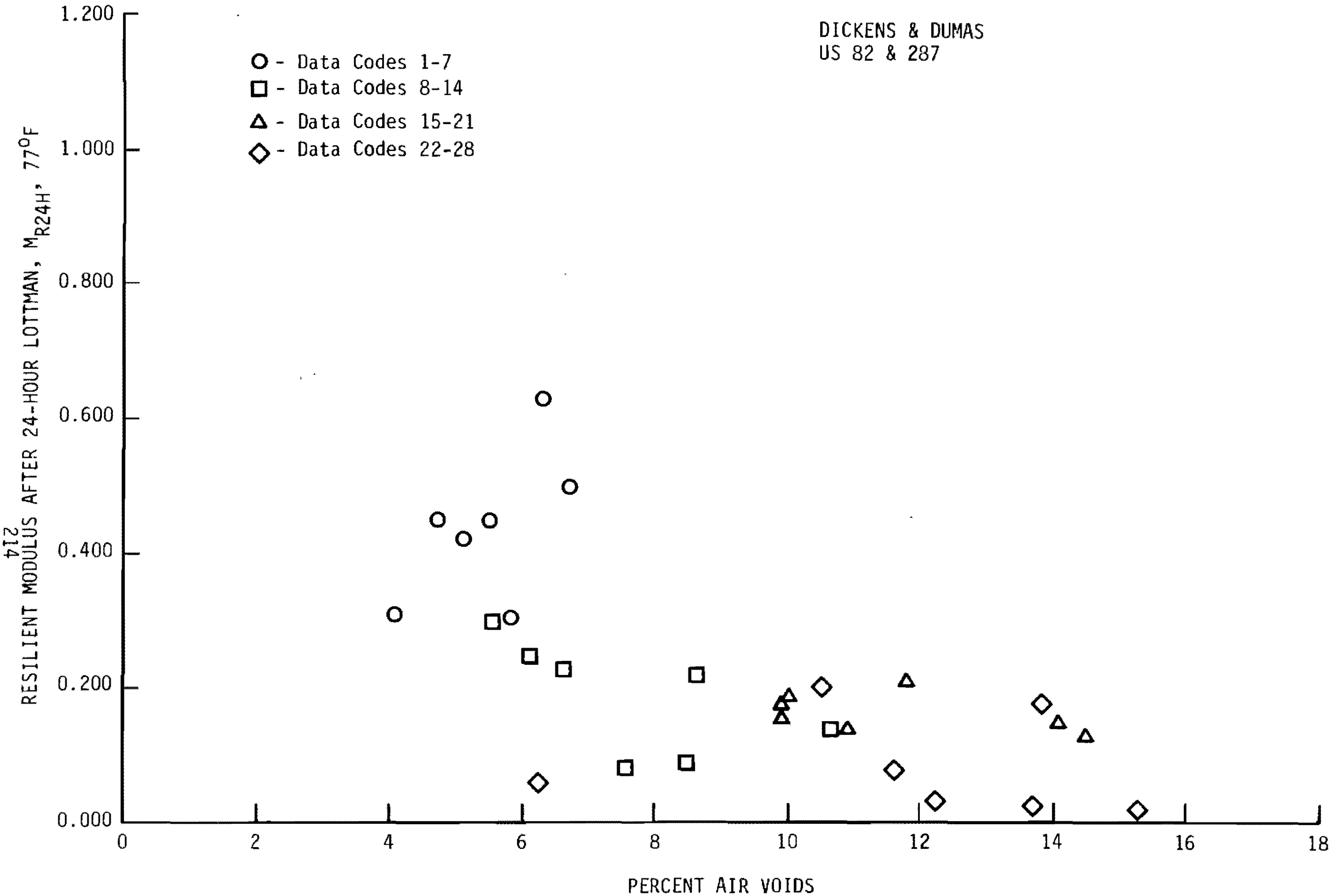

Figure 42. Resilient modulus M_R at 77°F after 24-hour Lottman test versus percent air voids for US 82 and 287 roadway sections, Data Code Numbers 1-28.

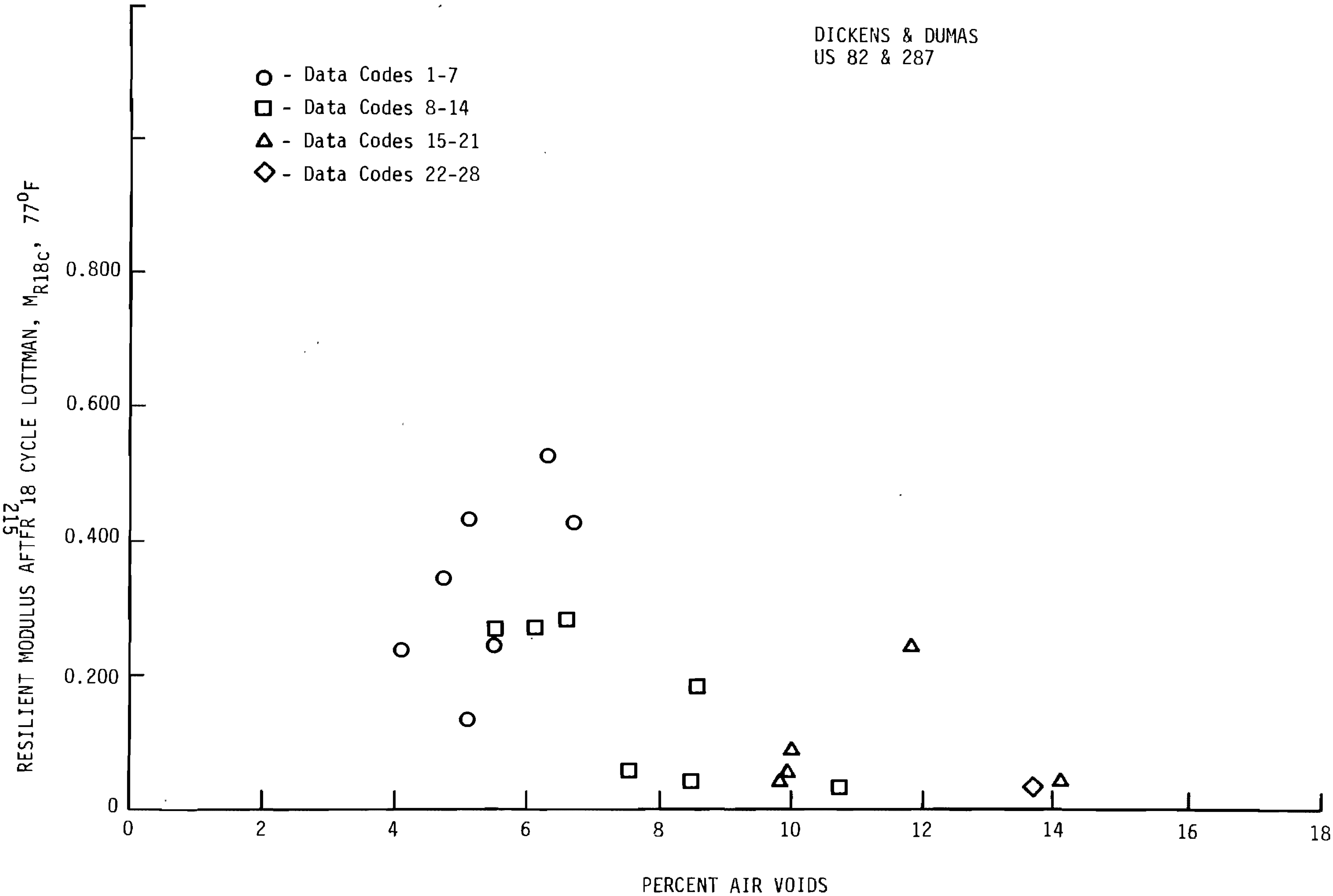

Figure 43. Resilient modulus M_R at 77°F after 18-cycle Lottman test versus percent air voids for US 82 and 287 roadway sections, Data Code Numbers 1-28.

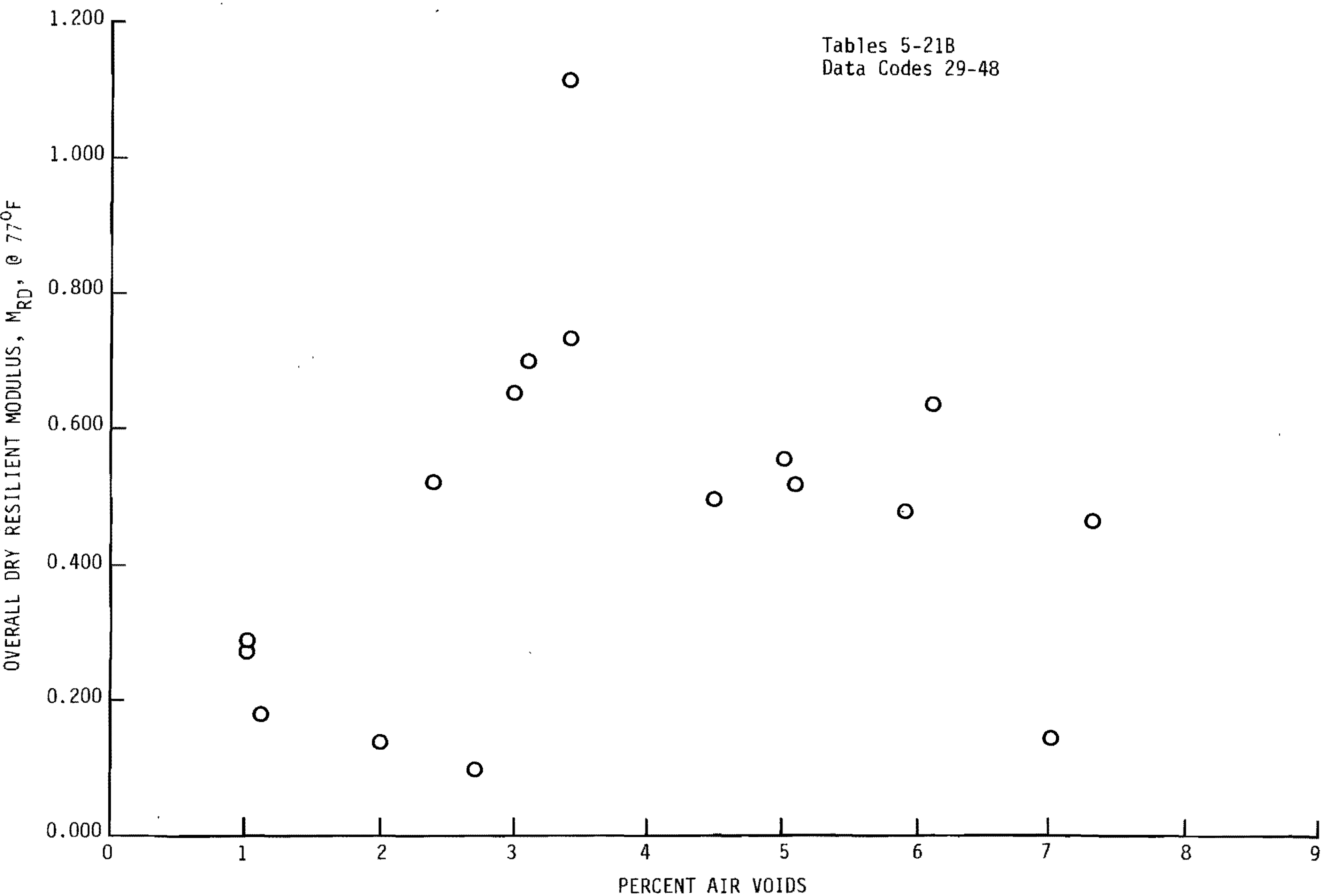

Figure 44. Overall resilient modulus M_R at 77°F versus percent air voids for roadway sections covered by Data Code Numbers 29-48.

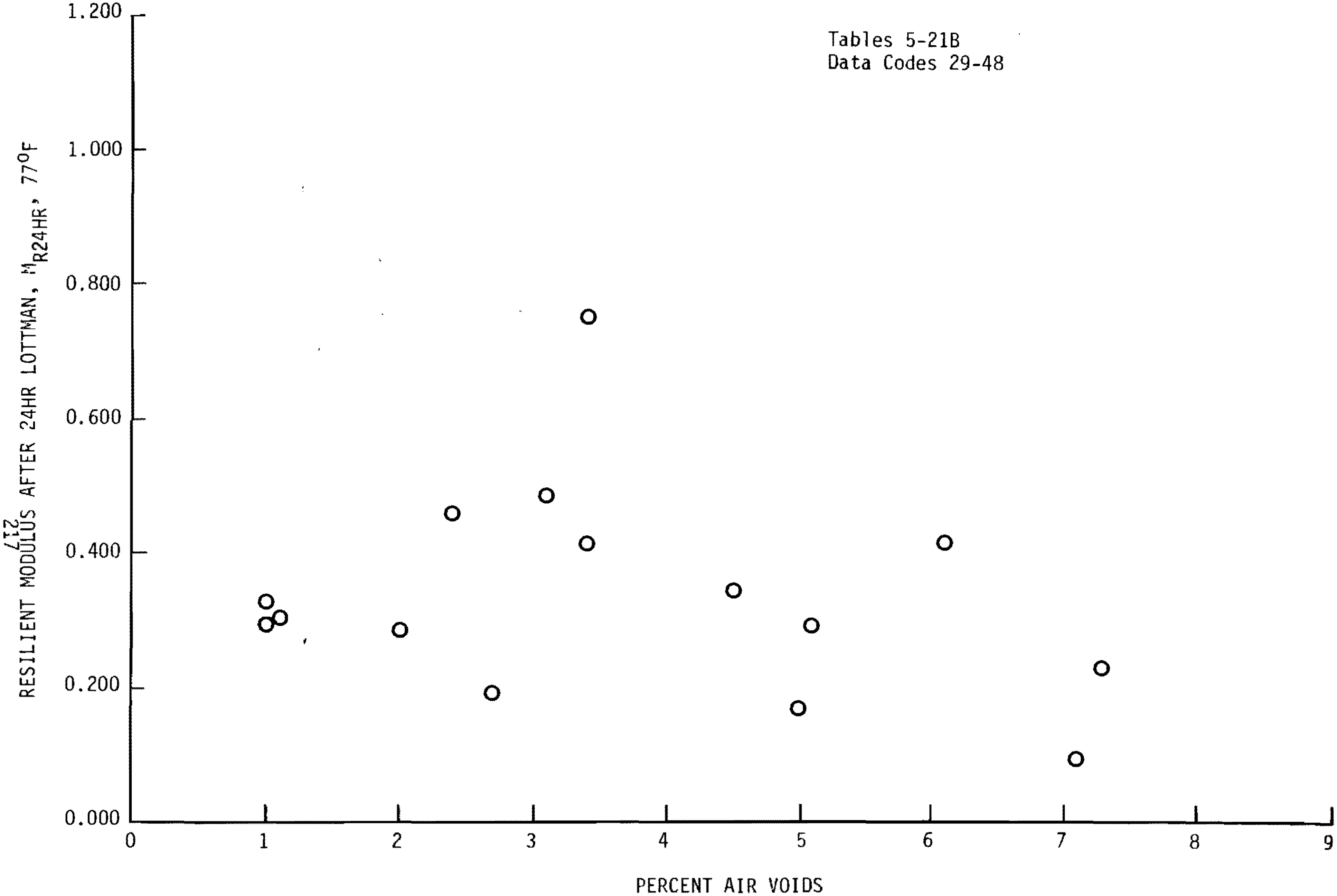

Figure 45. Resilient modulus M_R at 77°F after 24-hour Lottman test versus percent air voids for roadway sections covered by Data Code Numbers 29-48.

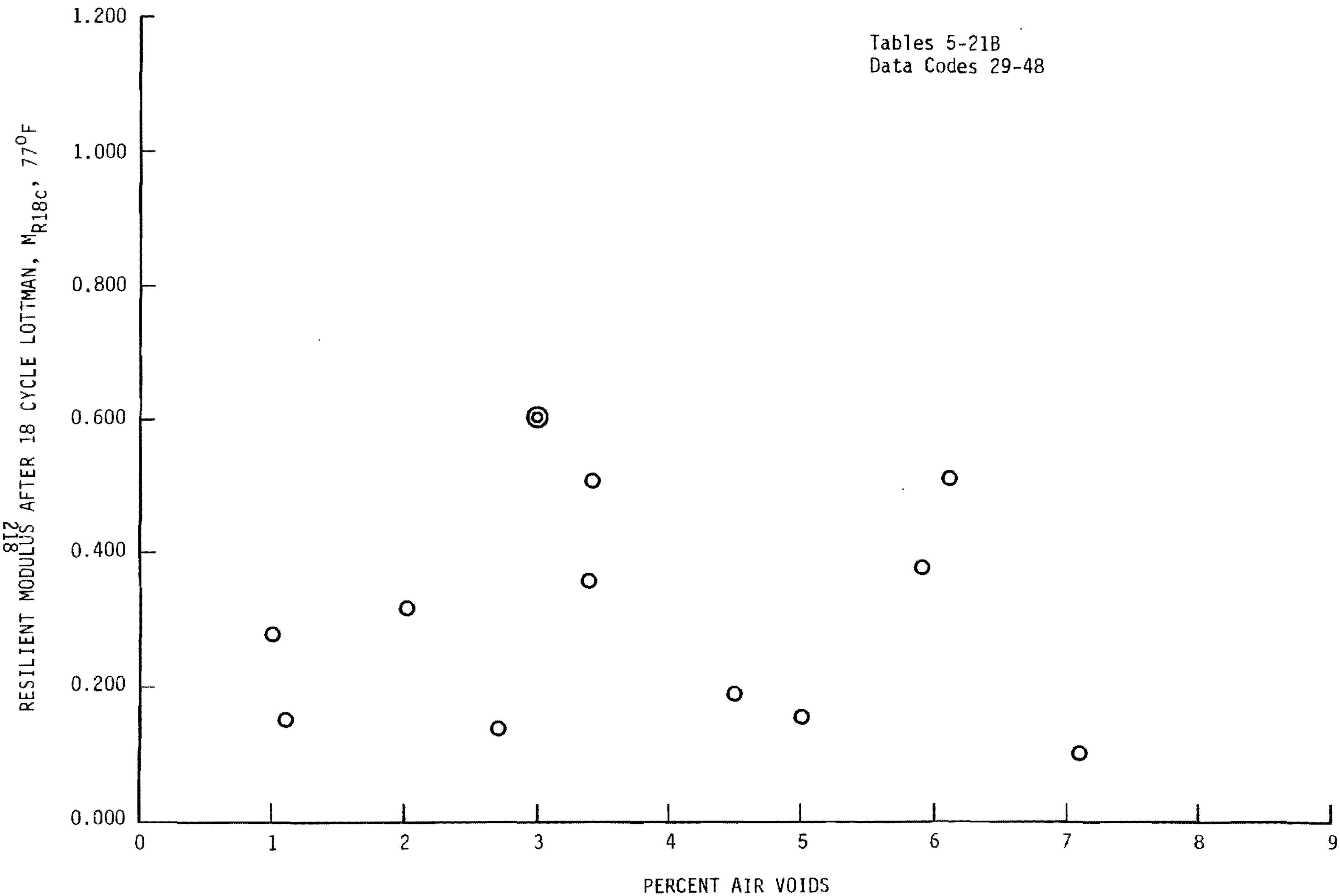

Figure 46. Resilient modulus M_R at 77°F after 18-cycle Lottman test versus percent air voids for roadway sections covered by Data Code Numbers 29-48.

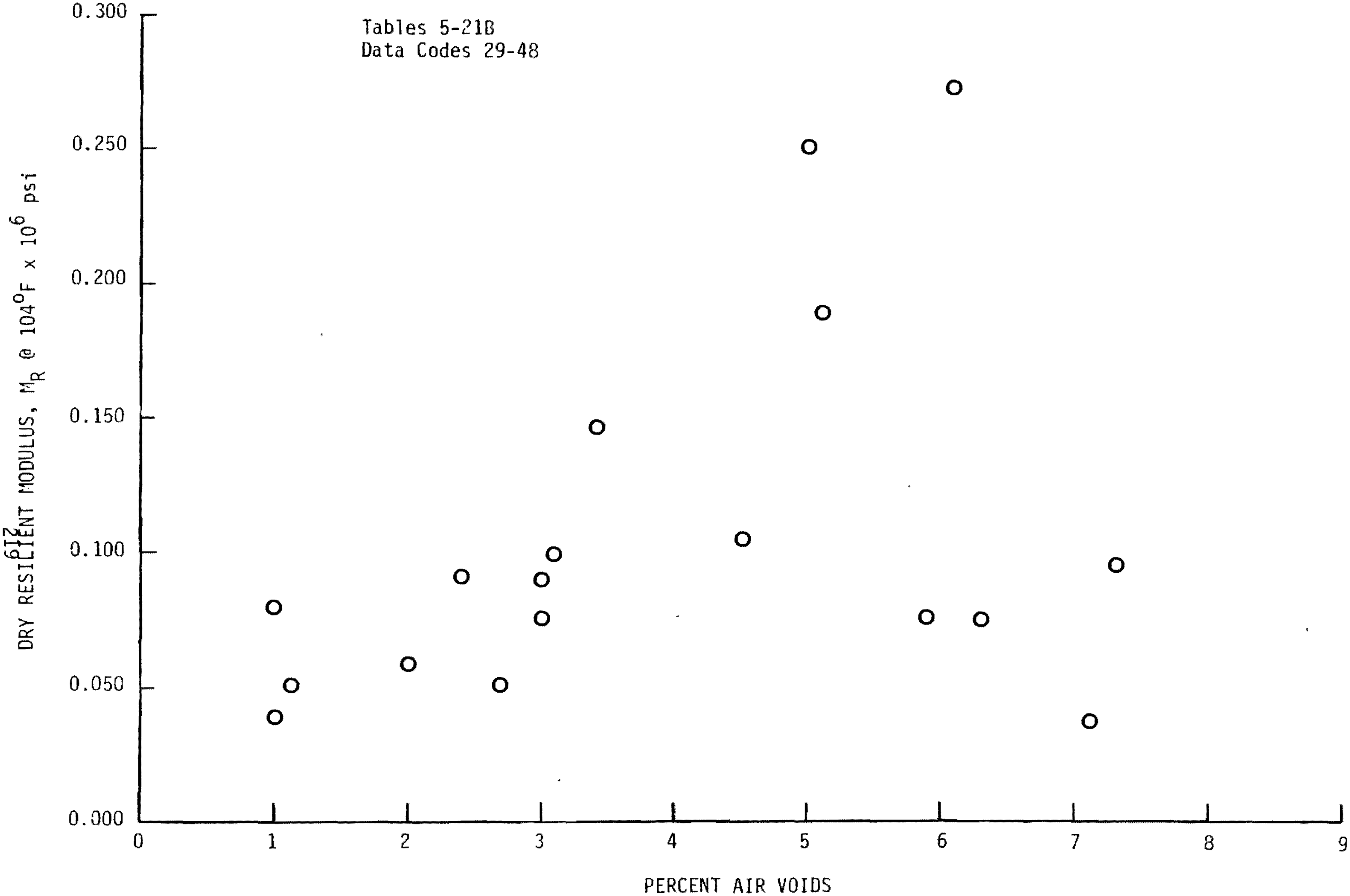

Figure 47. Resilient modulus M_R at 104°F versus percent air voids for roadway sections covered by Data Code Numbers 29-48.

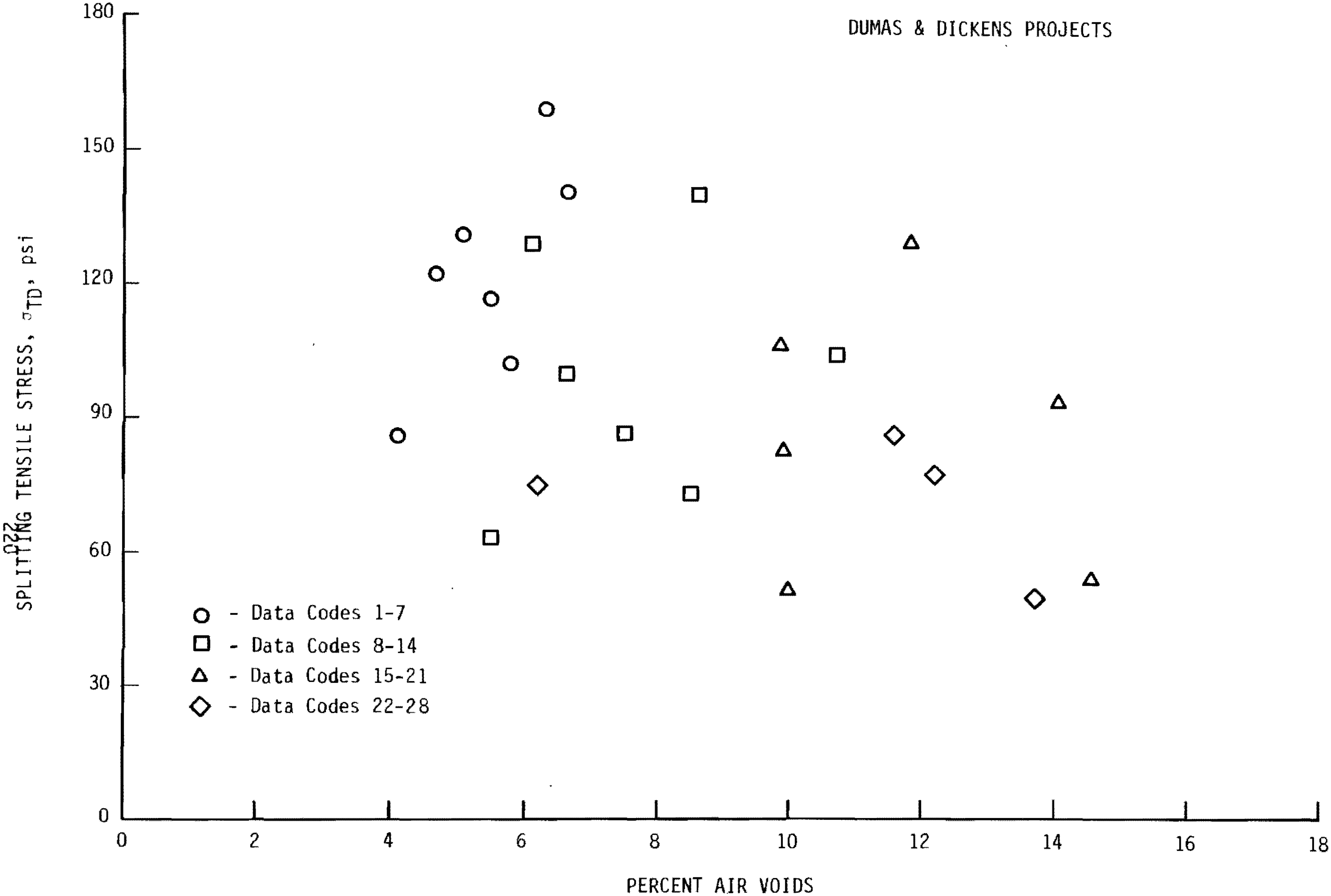

Figure 48. Splitting tensile strength, σ_{TD}, versus percent air voids for US 82 and 287 roadway sections, Data Code Numbers 1-28.

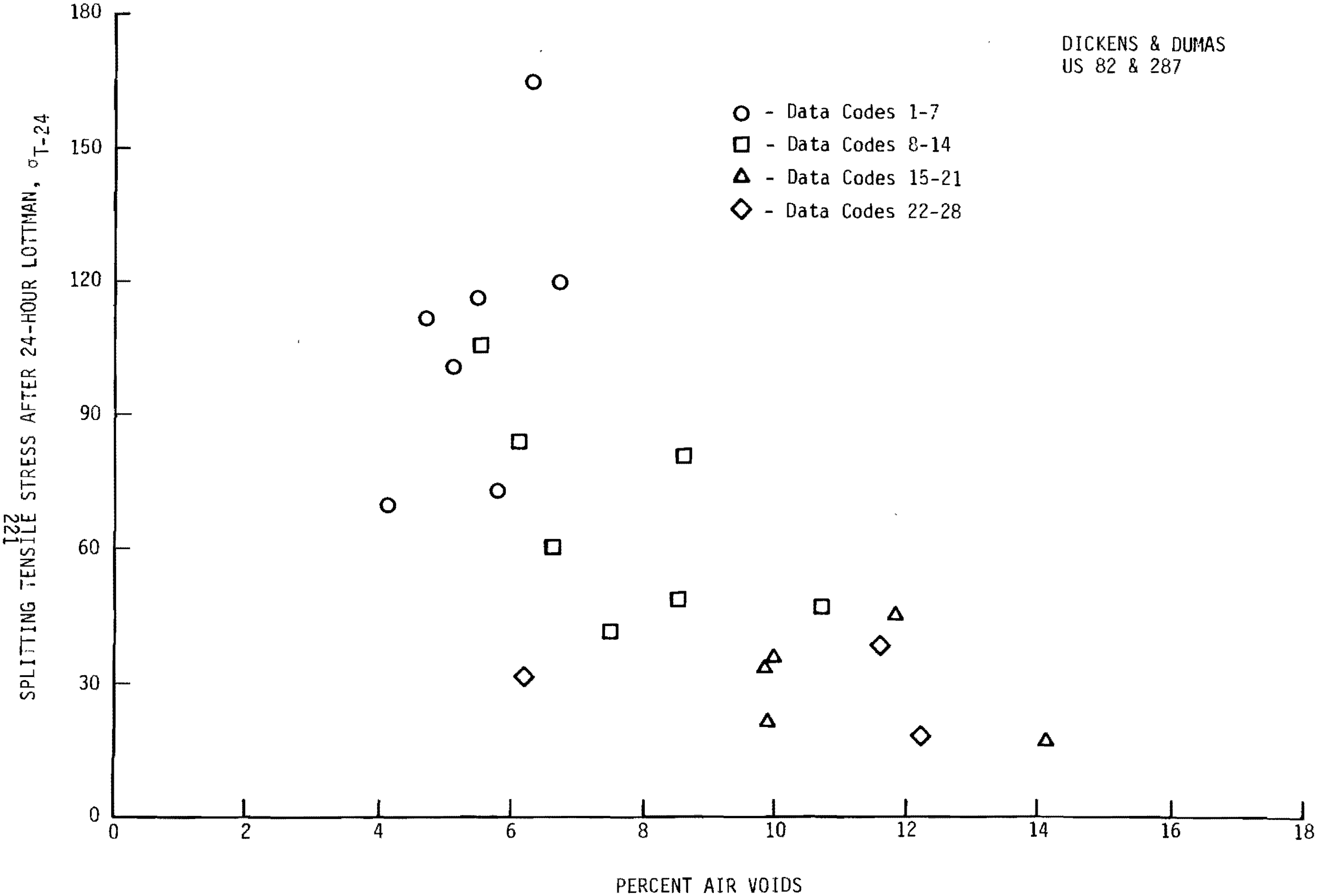

Figure 49. Splitting tensile strength after 24-hour Lottman test, σ_{T24H}, versus percent air voids for US 82 and 287 roadway sections, Data Code Numbers 1-28.

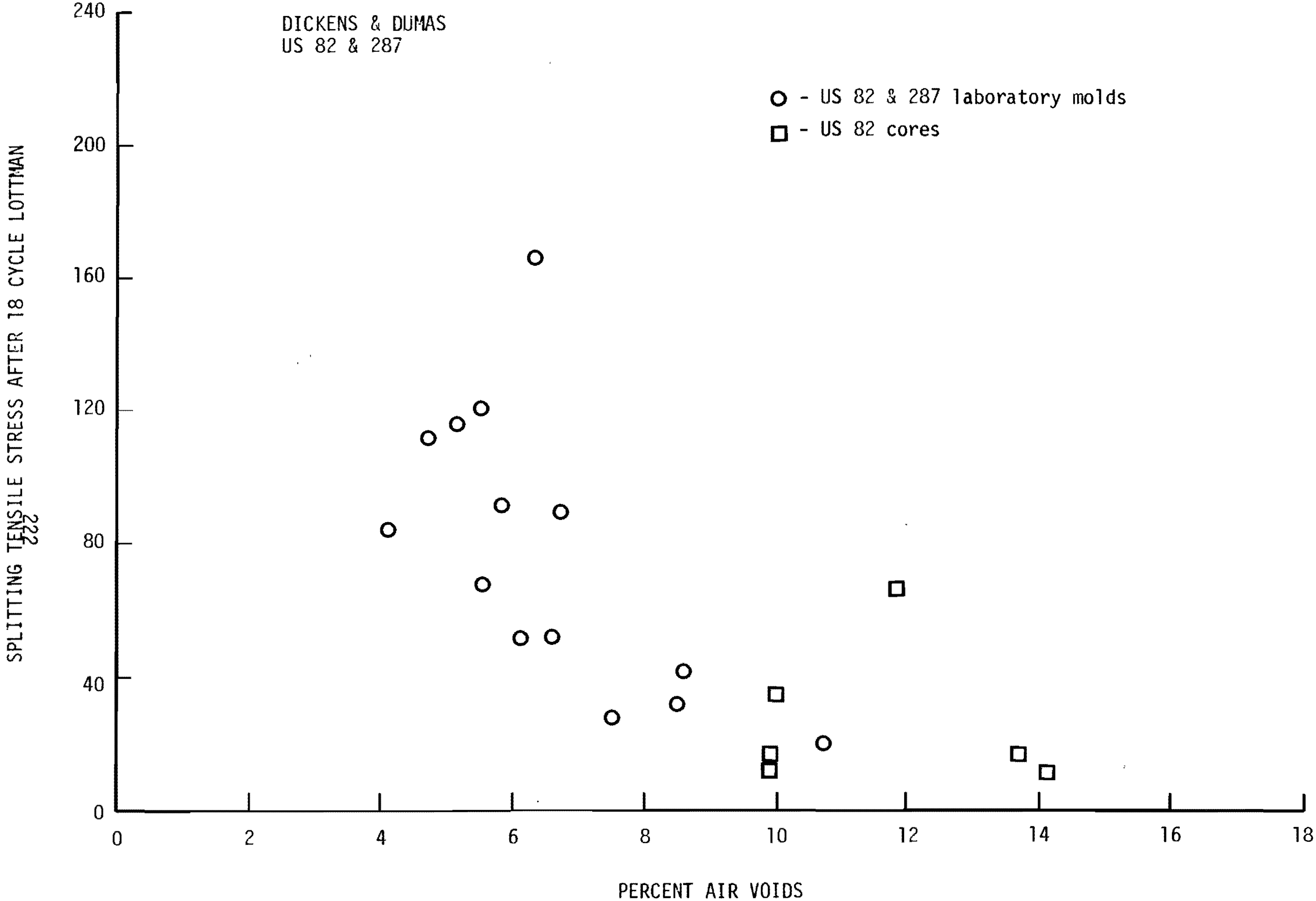

Figure 50. Splitting tensile strength after 18-cycle Lottman, σ_{T18c}, versus percent air voids for US 82 and 287 roadway sections, Data Code Numbers 1-28.

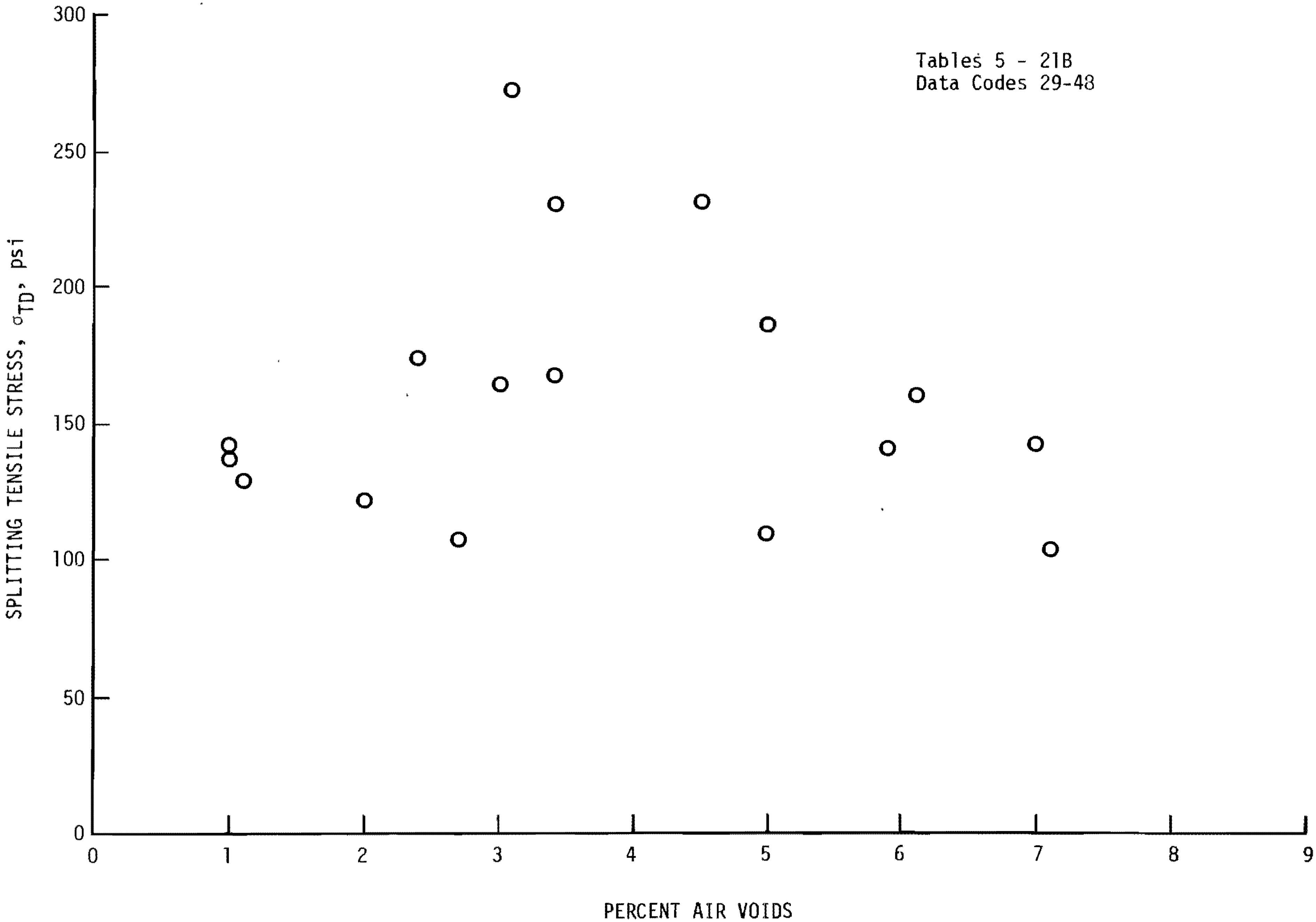

Figure 51. Splitting tensile strength, σ_{TD}, versus percent air voids for roadway sections covered by Data Code Numbers 29-48.

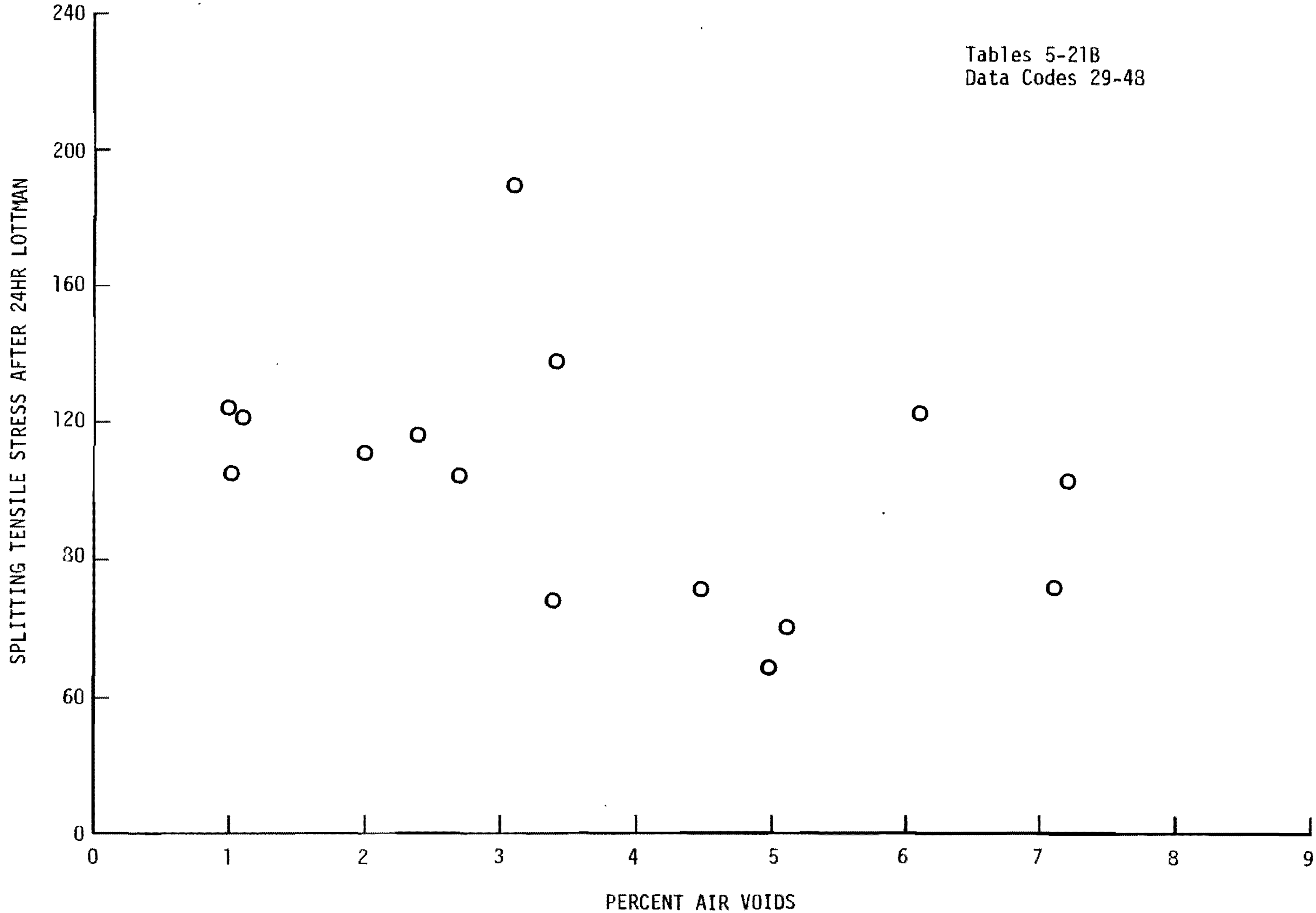

Figure 52. Splitting tensile strength, after 24-hour Lottman test, σ_{T24H}, versus percent air voids for roadway sections covered by Data Code Numbers 29-48.

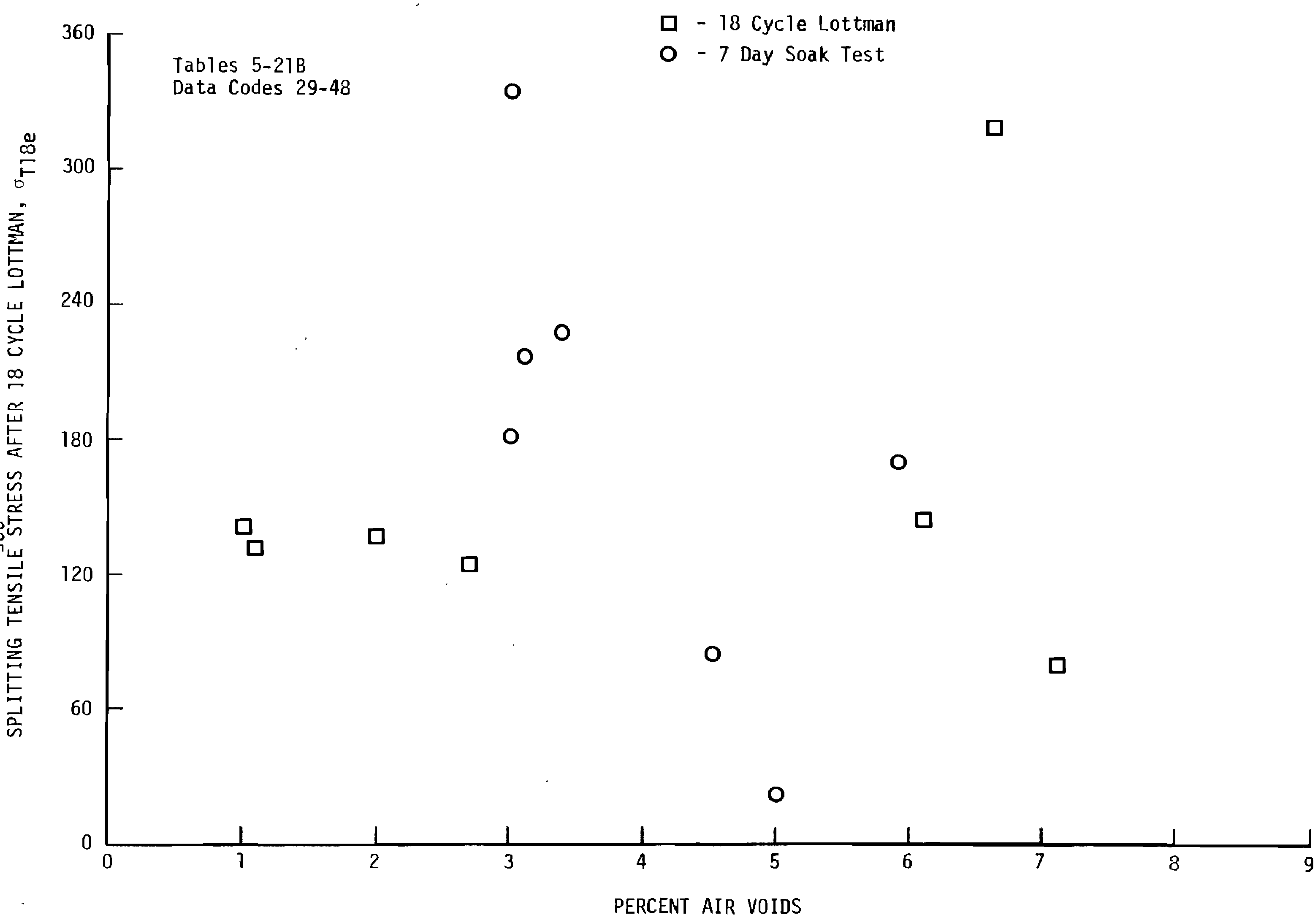

Figure 53. Splitting tensile strength after 18-cycle Lottman test, σ_{T18c}, versus percent air voids for roadway sections covered by Data Code Numbers 29-48.