BMI/ONWI/C-297

LABORATORY TESTING OF SALT SAMPLES FOR WATER CONTENT/LOSS OF WEIGHT ON HEATING, THERMAL FRACTURE, INSOLUBLE RESIDUE, AND CLAY AND BULK MINERALOGY

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Submitted to:

STONE AND WEBSTER ENGINEERING CORPORATION
P.O. Box 2325
Boston, Massachusetts 02107

TR 86-103
Rev. 1, July 1987

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DISCLAIMER

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TECHNICAL STATUS

This technical report is being archived in advance of DOE technical review because of Congressional shutdown of the Salt Repository Project. Because of project termination, DOE has expedited the report clearance process to ensure availability of project data. A summary of the review status of this report is attached.

LABORATORY TESTING OF SALT SAMPLES FOR WATER CONTENT/LOSS OF WEIGHT ON HEATING, THERMAL FRACTURE, INSOLUBLE RESIDUE, AND CLAY AND BULK MINERALOGY

Contract No. 13697-G110Y-3

by

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ABSTRACT

This report presents the results of laboratory testing performed by Terra Tek Research as a subcontractor to Stone & Webster Engineering Corporation on salt samples from the Palo Duro Basin of the Texas Panhandle. Laboratory specimens were tested to determine water content by loss of weight on heating, temperature of thermal fracture, the amount of insoluble residue, and clay and bulk mineralogy. Testing on these samples occurred from April 18, 1985 to March 25, 1986.

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FOREWORD

The National Waste Terminal Storage Program was established in 1976 by the U.S. Department of Energy's predecessor, the Energy Research and Development Administration. In September 1983, this program became the Civilian Radioactive Waste Management (CRWM) Program. Its purpose is to develop technology and provide facilities for safe, environmentally acceptable, permanent disposal of high-level waste (HLW). HLW includes wastes from both commercial and defense sources, such as spent (used) fuel from nuclear power reactors, accumulations of wastes from production of nuclear weapons, and solidified wastes from fuel reprocessing.

The information in this report pertains to the geotechnical engineering studies of the Salt Repository Project of the Office of Geologic Repositories in the CRWM Program.

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1.0 INTRODUCTION

This report presents the results of laboratory testing performed by Terra Tek Research as a subcontractor to Stone & Webster Engineering Corporation (SWEC). The general test procedures and technical and quality assurance guidelines were developed and provided by SWEC as a part of the contract documents. Terra Tek modified the procedures and developed the specific analytical techniques described in this report.

The primary objective of this testing is to identify the total water content and, if possible, the form in which water exists. Water may exist in these samples in three different forms: free water in the connected intergranular pore space, water isolated as fluid inclusions or disconnected pores, and bound water in certain clay and hydrated minerals. A secondary objective is to determine the temperature and characteristics of sample fracturing due to heating. In addition, the relative amount and identity of impurities (insoluble residue) were determined.

A total of 43 samples were selected by SWEC from core obtained during drilling operations performed in the Palo Duro Basin of the Texas Panhandle. The coring operations and sample handling were dictated by the need for geologic and stratigraphic information more than the need for test data. The sampling strategy for the testing program was to obtain a wide variety of material from the different salt-bearing formations in different program wells. Therefore, the goal was to investigate the range of properties that might be encountered during shaft construction or during construction and operation of a future repository.

It should be noted that prior to their arrival at Terra Tek's laboratory, the samples were exposed to a variety of handling and environmental condi-

tions. A typical scenario for the history of the core before arriving at the lab is as follows:

The coring operation was conducted using saturated brine as a fluid. Each 60 ft core run, contained in the PVC liner, was removed from the core barrel and sawed into 6 ft lengths in the field. The core was extruded from the liner for logging, which took approximately 5 hours for a 60 ft run. It was then reinserted into the PVC liner. The annular space between the core and liner was filled with saturated brine and the liner was sealed. The core was transported to the field office, where it was again extruded from the liner, relogged, photographed, and processed prior to being sawed or broken into 3 ft lengths, which were sealed in plastic bags and packaged in cardboard boxes. This second exposure to the atmosphere generally lasted about 16 hours. The boxed core was then shipped to the Texas Bureau of Economic Geology's (TBEG) Sample and Core Library in Austin. TBEG slabbed the core lengthwise, logged the slabbed surface, and resealed the core in plastic bags. It is not known what type of fluid was used for the slabbing, nor how long the core was exposed to the atmosphere during TBEG's logging. After the samples (between 10 and 18 in. long) were selected by SWEC representatives, TBEG repackaged them in sealed plastic bags for shipment to Terra Tek.

Samples were tested from four different wells: Harman No. 1 (PD-8), completed in September 1982; Holtzclaw No. 1 (PD-10), completed in April 1983; J. Friemel No. 1 (PD-9), completed in March 1983; and Zeeck No. 1 (PD-7), completed in August 1982. Samples were identified by the first three letters of the well name followed by the depth to the top of the sample. Table 1 summarizes when the samples were cored. Table 2 summarizes when the samples were tested.

Table 1. Coring Dates for Salt Samples

TT[a] Sample Number	SWEC[b] Sample Number	Date Cored	Well
1003	ZEE 1133.2	04-20-82	Zeeck No. 1
1022	JFR 1375.9	11-12-82	J. Friemel No. 1
1021	JFR 1369.5	11-12-82	J. Friemel No. 1
1023	JFR 1405.6	11-12-82	J. Friemel No. 1
1027	HOL 1391.1	03-06-83	Holtzclaw No. 1
1024	JFR 1458.4	11-12-82	J. Friemel No. 1
1036	HAR 1280.0	08-14-82	Harman No. 1
1015	JFR 2018.0	11-16-82	J. Friemel No. 1
1016	JFR 2033.6	11-17-82	J. Friemel No. 1
1043	HAR 2279.2	08-24-82	Harman No. 1
1038	HAR 2282.0	08-24-82	Harman No. 1
1002	ZEE 2246.3	05-03-82	Zeeck No. 1
1006	ZEE 2040.8	04-27-82	Zeeck No. 1
1007	ZEE 2120.5	04-29-82	Zeeck No. 1
1001	ZEE 2131.6	04-29-82	Zeeck No. 1
1013	JFR 2058.0	11-17-82	J. Friemel No. 1
1037	HAR 2162.1	08-22-82	Harman No. 1
1005	ZEE 2423.2	05-08-82	Zeeck No. 1
1004	ZEE 2416.1	05-08-82	Zeeck No. 1
Not in Box	JFR 2414.5	11-22-82	J. Friemel No. 1
1041	HAR 2473.6	08-27-82	Harman No. 1
1025	HOL 2414.7	03-22-83	Holtzclaw No. 1
1026	HOL 2436.2	03-22-83	Holtzclaw No. 1
1034	HOL 2465.0	03-22-83	Holtzclaw No. 1
1010	ZEE 2690.3	05-16-82	Zeeck No. 1
1008	ZEE 2646.9	05-14-82	Zeeck No. 1
1014	JFR 2411.7	11-22-82	J. Friemel No. 1
1019	JFR 2458.6	11-23-82	J. Friemel No. 1
1042	HAR 2534.9	08-27-82	Harman No. 1
1033	HOL 2458.0	03-22-83	Holtzclaw No. 1
1029	HOL 2505.9	03-23-83	Holtzclaw No. 1
1009	ZEE 2651.9	05-14-82	Zeeck No. 1
1017	JFR 2598.1	11-26-82	J. Friemel No. 1
1018	JFR 2652.1	11-26-82	J. Friemel No. 1
1035	HAR 2743.3	08-29-82	Harman No. 1
1039	HAR 2791.0	08-29-82	Harman No. 1
1028	HOL 2576.1	03-23-83	Holtzclaw No. 1
1032	HOL 2601.2	03-23-83	Holtzclaw No. 1
1031	HOL 2648.1	03-24-83	Holtzclaw No. 1
1030	HOL 2839.5	03-25-83	Holtzclaw No. 1
1011	ZEE 2746.5	05-17-82	Zeeck No. 1
1012	ZEE 2849.8	05-18-82	Zeeck No. 1
1020	JFR 2589.3	11-26-82	J. Friemel No. 1
1040	HAR 2717.3	08-29-82	Harman No. 1

(a) Terra Tek laboratory sample number.
(b) Stone & Webster Engineering Corporation sample number.

Table 2. Sample Test Schedule Summary

Well	ANALYTICAL SERVICES				
	Insoluble Residue	Thermal Fracture	Moisture Content	Sieve Analysis	X-Ray Diffraction
Zeeck No. 1 (ZEE)	06-03-85 to 06-13-85	07-15-85 to 09-20-85	07-24-85 to 09-27-85	09-12-85 to 10-09-85	08-14-85 to 10-23-85
J. Friemel No. 1 (JFR)	06-13-85 to 06-27-85	09-20-85 to 11-22-85	09-27-85 to 12-05-85	10-09-85 to 12-15-85	08-09-85 to 09-05-85
Holtzclaw No. 1 (HOL)	08-13-85 to 09-13-85	11-22-85 to 01-10-86	12-05-85 to 01-21-86	12-15-85 to 02-19-86	09-13-85 to 10-30-85
Harman No. 1 (HAR)	09-13-85 to 09-23-85	01-10-86 to 02-18-86	01-21-86 to 02-26-86	02-20-86 to 03-25-86	10-23-85 to 10-30-85

Laboratory testing provides detailed information on the properties of a small intact specimen from a specific location; it does not provide in-situ properties directly. The test results must be integrated with other data collected in the program to provide information for design. The technique used for moisture content determination in this suite of tests (loss of weight on heating), assumes that all weight loss is due to evaporation of moisture. It is possible that a small amount of other volatile or organic material is destroyed or driven off during heating. The temperature of thermal fracture data should be used only in a relative sense. Many factors such as specimen size, heating gradient, thermal cycling, and chemical factors are expected to influence this data.

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2.0 CORE SAMPLES

The samples used for laboratory testing were obtained and identified as indicated in Figure 1. The original sample consisted of a right circular cylinder core sample, 4 in. in diameter by 12 to 18 in. long. Approximately one third of the core sample was slabbed off lengthwise prior to receipt at Terra Tek. The test specimens were slabbed lengthwise into three approximately equal sections. Sample section A was used for moisture and thermal-fracturing measurements. Sample section C was used for insoluble residue quantification and characterization. Sample section B was preserved by application of many layers of plastic wrap and then set aside as an archived specimen for future logging by others. A minimum of 500 g of material was used in the laboratory-testing program. In some cases, the actual mass of test specimens was increased as necessary to satisfy experimental requirements.

Thermal-fracturing characteristics were measured prior to determination of moisture content. The elapsed time between the completion of thermal-fracturing measurements and the pulverization of those samples, after cooling in a desiccator, was 1-2 hours. The analysis schedule for insoluble residue samples is summarized in Table 2.

2.1 SAMPLE IDENTIFICATION

Each sample was identified in accordance with the following example:

$$S \quad (nnnn) - A - B - C \qquad (2\text{-}1)$$

where

S = rock type = salt

(nnnn) = Terra Tek laboratory ID number

A = first subdivision of original sample referenced in Figure 1

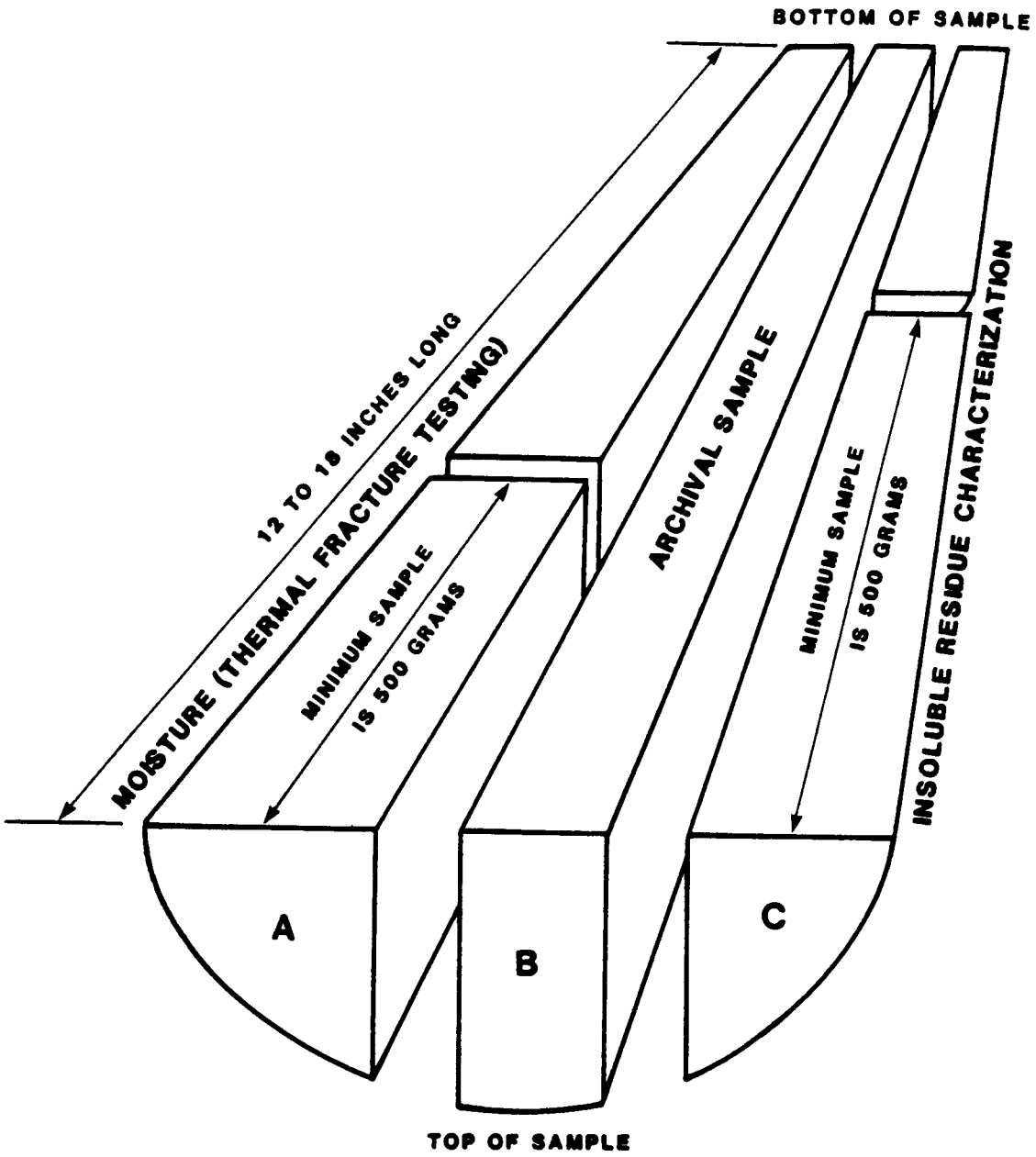

Figure 1. Sample-Sectioning Procedure.

B = second subdivision of original sample referenced in Figure 1

C = third subdivision of original sample referenced in Figure 1

2.2 CORE DOCUMENTATION

Form TT-QA04 (dated 3/82 and amended 5/84), "Core Samples - As-Received," was completed for each core and was used to document the sample's as-received condition. The form was completed when the sample was first unwrapped, immediately prior to photographing and subdividing the sample by slabbing. The ultimate distribution of samples was documented using Form TT-QA28 (dated 3/82 and amended 5/84), "Sample Distribution." This form indicates in explicit fashion the fate of each sample, after slabbing into three sections. Form TT-QA26 (dated 3/82 and amended 5/84), "Sample Record," was the primary logged record that summarizes pertinent data for all received samples. Examples of core documentation forms are provided in Appendix A.

2.3 TEST CONTROL

All tests were conducted in accordance with written procedures as required by Terra Tek's Quality Assurance Program. The test performed and the appropriate procedures are listed according to task as follows:

Task I Receipt of Samples

- I-1. Logging of Samples
- I-2. Sample Handling and Disposition

Task II Sample Preparation

- II-1. Slabbing
- II-2. Photodocumentation
- II-3. Sample Reduction

Task III Test Procedures

- III-1. Water Content/Loss of Weight on Heating
- III-2. Thermal Fracturing
- III-3. Percent Insoluble Residue
- III-4. Mineralogy-Insoluble Residue

Table 3 summarizes all samples received at Terra Tek for testing. Well designations listed in Table 3 and other tables in this report have been abbreviated as follows:

Well	Abbreviated Designation
Harman No. 1	HAR
Holtzclaw No. 1	HOL
J. Friemel No. 1	JFR
Zeeck No. 1	ZEE

Table 3. Samples Tested in the Salt-Index-Testing Program

TT[a] Sample Number	SWEC[b] Sample Number	Formation	Rx Type
1003	ZEE 1133.2	Salado	Clean Salt
1022	JFR 1375.9	Upper Seven Rivers	Chaotic Salt
1021	JFR 1369.5		Chaotic Salt
1023	JFR 1405.6		Dirty Salt
1027	HOL 1391.1		Dirty Salt
1024	JFR 1458.4		Clean Salt
1036	HAR 1280.0		Clean Salt
1015	JFR 2018.0	Upper San Andres	Dirty Salt
1016	JFR 2033.6		Dirty SAlt
1043	HAR 2279.2		Dirty Salt
1038	HAR 2282.0		Dirty Salt
1002	ZEE 2246.3		Dirty Salt
1006	ZEE 2040.8		Dirty Salt
1007	ZEE 2120.5		Intermediate Salt
1001	ZEE 2131.6		Intermediate Salt
1013	JFR 2058.0		Clean Salt
1037	HAR 2162.1		Clean Salt
1005	ZEE 2423.2		Clean Salt
1004	ZEE 2416.1		Clean Salt
Not in Box[c]	JFR 2414.5	Lower San Andres	Dirty Salt
1041	HAR 2473.6	Unit 5	Dirty Salt
1025	HOL 2414.7		Dirty Salt
1026	HOL 2436.2		Dirty Salt
1034	HOL 2465.0		Dirty Salt
1010	ZEE 2690.3		Dirty Salt
1008	ZEE 2646.9		Dirty Salt
1014	JFR 2411.7		Clean Salt
1019	JFR 2458.6		Clean Salt
1042	HAR 2534.9		Clean Salt
1033	HOL 2458.0		Clean Salt
1029	HOL 2505.9		Clean Salt
1009	ZEE 2651.9		Clean Salt
1017	JFR 2598.1	Lower San Andres	Dirty Salt
1018	JFR 2652.1	Unit 4	Dirty Salt
1035	HAR 2743.3		Dirty Salt
1039	HAR 2791.0		Dirty Salt
1028	HOL 2576.1		Dirty Salt
1032	HOL 2601.2		Dirty Salt
1031	HOL 2648.1		Dirty Salt
1030	HOL 2839.5		Dirty Salt
1011	ZEE 2746.5		Dirty Salt
1012	ZEE 2849.8		Dirty Salt
1020	JFR 2589.3		Clean Salt
1040	HAR 2717.3		Clean Salt

(a) Terra Tek laboratory sample number.
(b) Stone & Webster Engineering Corporation sample number.
(c) Sample JFR 2414.5 was not provided for testing.

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3.0 TEST PROCEDURES

This chapter describes the final test procedures with amendments as required by Stone and Webster Engineering Corporation. These test procedures are summarized in Figure 2.

3.1 SLABBING

Each core sample was slabbed into three sections of approximately equal size immediately after recording and logging of pertinent data. An air-cooled cutting saw was used for this purpose. The slabbed samples were immediately photographed, sealed in a double layer of air-tight plastic wrap, and then placed in an air-tight plastic bag. Sample section A (Figure 1) was subsequently used for determining thermal fracturing and moisture content. Sample section C was subsequently pulverized as a preprocessing requirement for determining the percentage of insoluble residue and insoluble residue mineralogy. Following thermal-fracturing tests, section A was also pulverized for additional moisture content determinations.

In general, all cutting or machining of samples was accomplished in a manner that precluded significant alteration of the as-received moisture content of the samples. Air-cooled cutting devices were used exclusively for reducing sample size except when mechanical size reduction of samples by simple hand manipulation was feasible. All test specimens were traceable to their origin and original orientation in as-received samples. Test specimens and unused portions of as-received samples were protected from atmospheric exposure by tightly wrapping samples in several layers of plastic wrap and storing the protected samples in air-tight plastic bags.

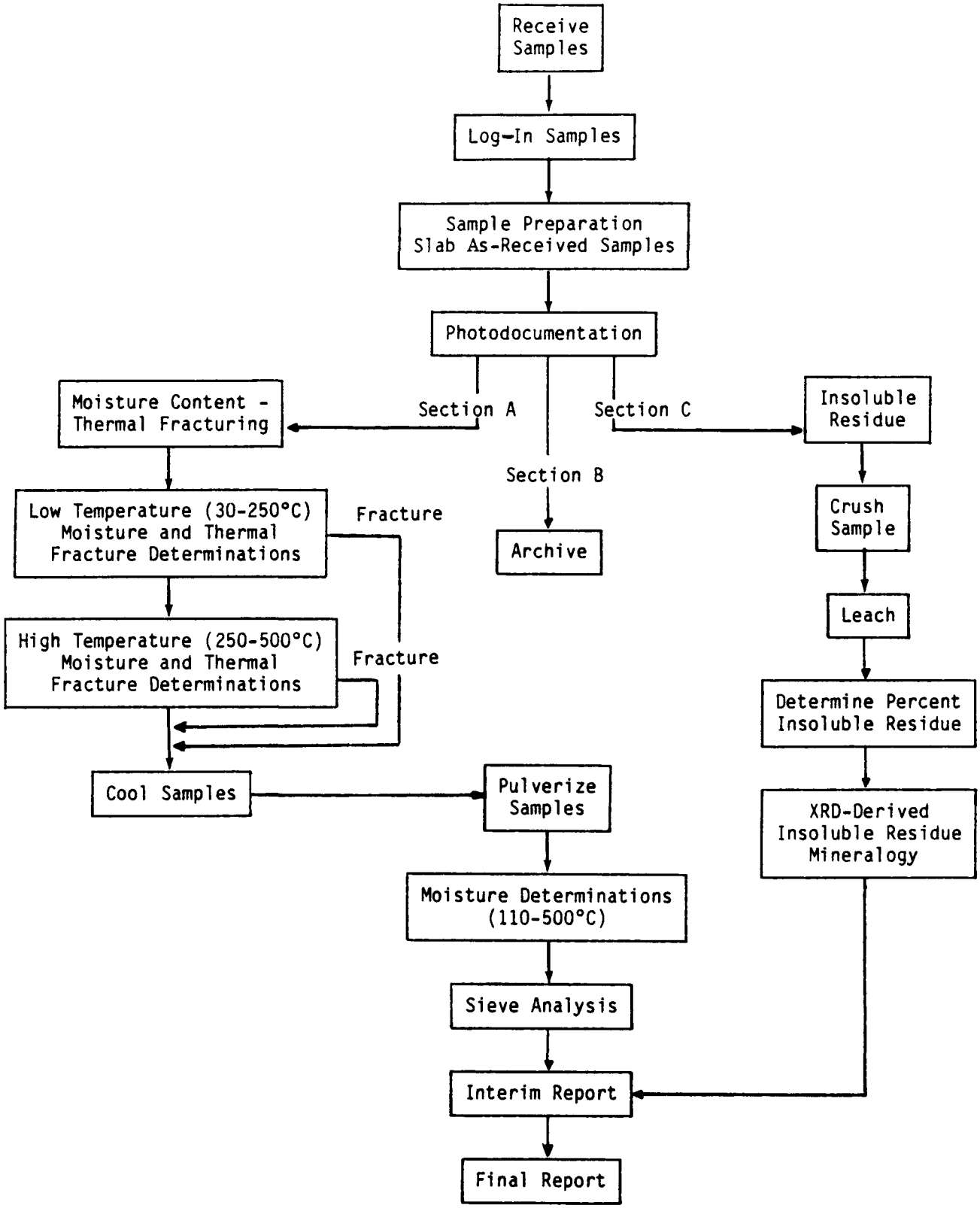

Figure 2. Program Flow Chart.

3.2 PHOTODOCUMENTATION

Color photographs (3 in. x 5 in.) of each of the slabbed (three sections per sample) test specimens are provided in Appendix B.

3.3 MOISTURE CONTENT AND THERMAL FRACTURING

3.3.1 Low-Temperature (30-250°C) Water Content/Loss of Weight on Heating and Thermal Fracturing

Controlled heating of test specimens for determining moisture content and thermal-fracturing characteristics was accomplished using a Fisher Scientific (Model 495) programmable Ashing Furnace. Test specimens were placed in pre-heated and preweighed Hastelloy C-276 crucibles. Strong, low oxidizing alloy crucibles were needed to contain samples in the event of explosive decomposition at elevated temperatures. Weight loss at each specified test point was determined by physically removing the sample from the furnace and immediately placing it in a desiccator. After cooling to room temperature, the sample was reweighed. A Sartorius top-loading balance with a resolution of 0.01 g and a total capacity of 4 Kg (Model 1364 MP) was used to monitor sample weight loss. The balance was periodically calibrated using a standard reference weight set. The crucible used to hold samples was preheated to constant weight at a temperature of 600°C to ensure that all volatile material had been removed prior to testing of samples.

Hastelloy C-276 has excellent resistance to pitting, stress-corrosion and to oxidizing atmospheres up to 1900°F (Cabot Stellite Division). Resistance to corrosion in hydrochloric acid, nitric acid and sulfuric acid is excellent. Corrosion rates of C-276 in deionized water are negligible. Four Hastelloy C-276 crucibles were used for determination of moisture content and thermal-fracturing. Data in Appendix C indicates that in most cases the change in weight of specific crucibles used for both moisture content determinations and measurement of thermal-fracturing did not exceed 0.01 to 0.02 g.

The detailed moisture/thermal-fracturing procedure consisted of the following steps:

1. The preheated and degassed sample crucible was weighed.
2. The sample plus crucible weight was obtained.
3. The sample and crucible were placed in the furnace and maintained at 30°C for at least 12 hours. The sample and crucible were transferred to a desiccator where they were maintained for 30 min. The weight of the crucible and sample was obtained. The sample and crucible were immediately transferred to the oven where they were reheated to 30°C for 1 hour. The sample was then reweighed. The procedure was continued until a constant weight was obtained as indicated by a weight change between successive weighings of less than 0.05 percent.

Step 3 of the moisture/thermal-fracturing procedure was repeated at temperatures of 110, 175 and 250°C using a heating rate of 25°C/min between each temperature interval.

3.3.2 High-Temperature (250-500°C) Thermal Fracturing and Water Content/ Loss of Weight on Heating

Samples from the low-temperature (30 to 250°C) moisture runs were sequentially heated from 250 to 350°C in discrete increments of 25°C. Each new incremental temperature plateau was maintained for 5 min. The heating rate was 1°C/min. At each temperature plateau, the furnace door was opened, and the sample crucible was removed from the oven and inspected for thermal fractures. Unfractured samples were immediately returned to the oven. If the sample had not fractured after attaining a temperature of 350°C, the moisture content of the sample was obtained as described in Section 3.3.1. If the sample had fractured at a temperature plateau between 250 and 350°C, the sample was transferred to a desiccator and stored for further testing. Unfractured samples at 350°C were subjected to a moisture content test as described in Section 3.3.1, reheated to 400°C in incremental steps of 25°C, and

monitored at each 5-min temperature plateau. If thermal fracturing occurred, the sample was removed from the oven and stored in a desiccator for further testing. If thermal fracturing did not occur, the moisture content of the sample was determined at 400°C as described in Section 3.3.1, and moisture content of the samples was then measured at 500°C. Samples were then maintained in a desiccator for further testing.

3.3.3 Sample Pulverization

All specimens subsequent to intact moisture content determinations were pulverized for additional water content tests.

Sample reduction for moisture content determinations was accomplished using a Straub Model 4E grinding mill. Samples were reduced to a nominal size of 0.5 mm (U.S. Mesh size 35). Immediately after crushing, the entire reduced sample was transferred to a preweighed and prefired crucible for moisture content determination. At the end of the moisture test sequence, samples were sieved using the following U.S. Mesh size screens: 6, 10, 20, 40, 60, 120, PAN.

Crushed sample splits for insoluble residue analysis were stored in air-tight plastic bags until needed.

3.3.4 Water Content on Pulverized Specimens

All specimens, subsequent to thermal fracturing or at the conclusion of intact water content determinations, were cooled and then ground to 35-mesh nominal size. These samples were then reanalyzed for moisture content at temperatures of 110, 200, 300, 350, 400, and 500°C. The heating rate between temperature intervals was 25°C/min.

3.3.5 Sieve Analysis

All pulverized specimens subjected to water-content/thermal-fracturing analysis were sieved at the conclusion of a test sequence. The sieving procedure consisted of the following steps:

1. Cool samples in a desiccator.
2. Weigh the cooled samples.
3. Sieve the weighed sample using a screen deck consisting of the following U.S. Mesh size screens:

U.S. Mesh Size	Millimeters
6	3.36
10	2.00
20	0.84
40	0.42
60	0.25
120	0.13
PAN	--

4. Shake sieves in a sieve shaker for 5 min.
5. Reweigh the sieves and sample splits.

3.4 INSOLUBLE RESIDUE QUANTIFICATION AND CHARACTERIZATION

3.4.1 Insoluble Residue Testing

The following procedure was used to determine insoluble residue content of each submitted sample:

1. Approximately 600 g of core material was pulverized (35 mesh) in a Straub Model 4E grinding mill. The crushed material was collected directly into a Pyrex® sample dish.
2. After all the material had been pulverized, the sample dish was placed in a dryer oven preset to 80°C. The samples were dried for a minimum of 12 hours.
3. The dried samples were removed from the oven and placed into a desiccator for 1 hour to cool.
4. 500 g of the dried and cooled sample was weighed into a 1000-ml beaker.

5. 3500 ml of deionized water and a stir bar were placed into a 4000-ml Erlenmeyer flask and heated to 40°C on a stirring hot plate.

6. With the magnetic stirrer on, the sample was transferred to the Erlenmeyer flask through a funnel.

7. The sample was stirred for 2 hours.

8. The magnetic stirrer was shut-off, and the sample was then allowed to settle for 5 hours.

9. After the insoluble residue had settled, the supernatant was siphoned and discarded. The 4000-ml Erlenmeyer flask was refilled with deionized water and left standing for 12 hours.

10. Step 9 was repeated.

11. The final insoluble residue was washed into a preweighed 1000-ml beaker, and the beaker was filled with deionized water and allowed to stand for 12 hours.

12. The supernatant was siphoned off, and the clear liquid was tested for electrical conductivity. If the conductivity was 100 ppm NaCl equivalent or less, the beaker and residue were dried at 80°C.

13. If the conductivity of the supernatant was over 100 ppm NaCl equivalent, the residue was washed in 1000-ml increments of deionized water until the equivalent NaCl conductivity was less than 100 ppm. The sample was then dried at 80°C.

14. When the sample was dry, it was placed in a desiccator to cool. The residue was reweighed and the percentage of insoluble residue was calculated.

Residual soluble salts in the leach water were most conveniently determined by measuring electrical conductivity of the supernatant and expressing the result in terms of equivalent NaCl concentrations. A HACH DR-EL/4 instrument was used for conductivity measurements.

A dual siphon arrangement (Figure 3) was used to speed sample processing. The siphon consisted of a pipette and 1/4-in-diameter plastic hose clamped together. The hose was set slightly above the tip of the pipette. Initially, brine flowed rapidly through the hose. The siphon action of the hose was broken when the liquid level fell below the hose level, but siphoning continued automatically, at a much reduced rate through the pipette. This procedure

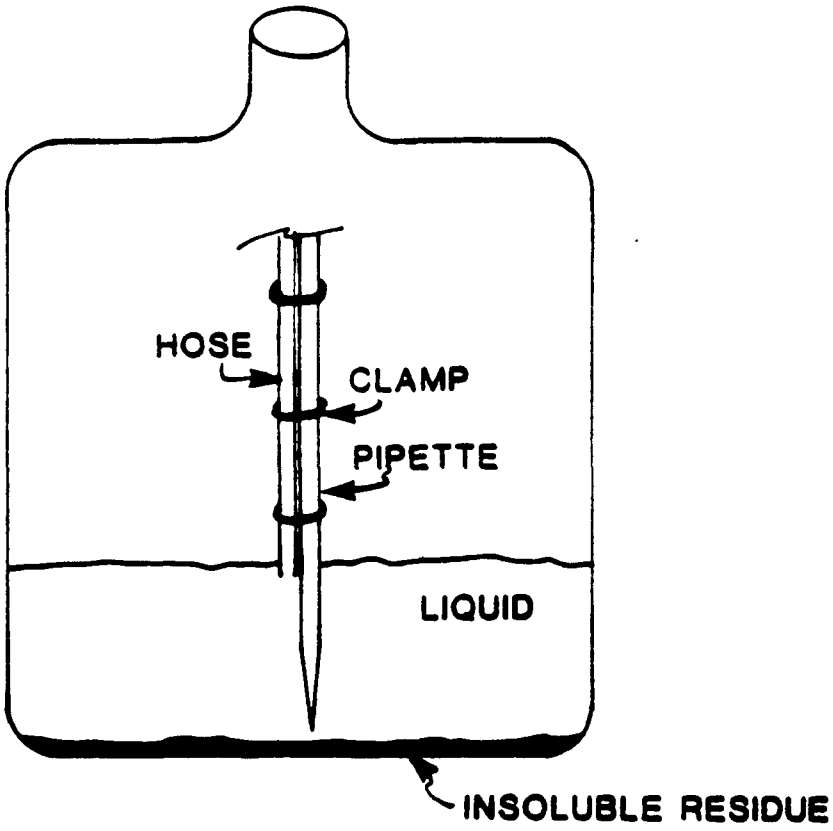

Figure 3. Insoluble Residue Siphon Device.

prevented disturbance of insoluble residue and permitted draining a 4-L flask in about 20 min.

3.4.2 Mineralogy of the Insoluble Residue

The dried insoluble residue was analyzed by x-ray diffraction to determine mineralogy of the clay and nonclay fractions.

3.4.2.1 Sample Preparation and Analysis--Clays

Sample preparation procedures followed those described by Reynolds (1984). The insoluble residue was crushed (not ground) in an iron mortar, and a representative 10 g sample was obtained by means of a chute-type splitter. The sample was then suspended in 200 ml of distilled water and dispersed by a 3-min treatment in a blender. The suspension was irradiated for 5 min with

ultrasonic energy and made 0.01 N with respect to sodium pyrophosphate to promote dispersion.

Samples that were flocculated at this point were washed to dispersion by repeated centrifugation. After dispersion, the <2-μm size fraction was dispersed by a 1-min treatment with ultrasound and then transferred to a pressure vessel reservoir attached to a 0.45-μm pore size, 47-mm-diameter membrane filter. The suspension was filtered using nitrogen under a differential pressure of 150 psig. One ml of 1.0 M $MgCl_2$ was then filtered through, followed by 10 ml of water, leaving the clay cake saturated with magnesium. The filter was transferred to a glass plate that had a 3/4-in. hole bored through the center, and the filter was held in place by a dilute (10:1) solution of mucilage. Drying was performed at 60°C.

3.4.2.2 Diffraction Analysis

Analysis of prepared clays was performed as described by Reynolds (1984). Samples were mounted over a 1/2-degree divergence slit normal to the diffracted beam, and a permaquartz standard was adjusted to provide its strongest reflection at 26.6°2θ. The intensity (I) of the diffracted beam through the sample was measured, the sample was removed, and the diffracted beam (I_0) was measured. Corrections were made for absorption due to the membrane filter. The Beer-Lambert equation was used to calculate the quantity μg where μ is the linear absorption coefficient and g is the weight of sample in g/cm^2.

$$I = I_0 e^{-\mu g} \qquad (3\text{-}1)$$

Calculation of μg permits correction for high 2θ peaks in samples that are not infinitely thick. The corrected intensity I* is given by

$$I^* = \frac{I}{1 - e^{-2\ \mu g/\sin\theta}} \qquad (3\text{-}2)$$

The region between 2θ = 2° and 2θ = 40° was recorded from dry samples, and the data were corrected for sample thickness as described in this section. Samples were then solvated with ethylene glycol at 60°C for 12 hours, and XRD patterns were repeated. Nonmixed layered clays were identified by comparisons with cards from the Joint Committee on Powder Diffraction Studies (JCPDS) and data in Brindley and Brown (1980). Mixed-layer clays were interpreted by techniques described by Reynolds and Hower (1970) and Reynolds (1980a).

Semiquantitative analysis was made by using mineral intensity factors published by Reynolds (1980a) and supplemented by computed values (Reynolds, (1980b). Diffraction intensities were measured as peak height times peak-width at half-height.

3.4.2.3 Sample Preparation and Analysis--Nonclays

A 2 to 5 g portion of the crushed and split residue sample was ground in an automatic hammer mill. The powder was sideloaded into an aluminum plate, and the diffraction pattern was recorded over the angular range 6° to 50°2θ. Minerals were identified by comparison with data on JCPDS cards. Relative abundances were estimated using mineral intensity factors given by Schultz (1964). Total clay content was based on the intensity of the clay prism reflection at -19.8°2θ (Schultz).

3.4.2.4 External Calibration

External calibration was accomplished before each series of sample analyses using a Permaquartz standard and a reagent-grade cholesterol standard. The Permaquartz standard was scanned in the region between 26.55 to 26.75°2θ at a rate of 0.1°2θ/min. The cholesterol standard was scanned in the region between 2.55 to 2.75°2θ at a rate of 0.1°2θ/min. The position of quartz and

cholesterol peaks must lie between 26.63 to 26.67°2θ and 2.64 to 2.67°2θ, respectively, or the alignment of the instrument is checked before continuing with the analytical work. The intensity at the quartz and cholesterol peaks was checked for 10 s. A change in intensity of more than ±10 percent would have indicated problems in the diffraction apparatus that would have to be resolved before continuing with the analytical work. In addition to daily calibration checks, these procedures were repeated if anything unusual occurred during a sample-analysis period. The daily calibration checks were recorded by the analyst.

3.4.2.5 Internal Calibration

Sample position errors are impossible to eliminate unless samples are optically flat and smooth and these characteristics cannot apply to clay aggregates. Since most samples contain traces of quartz, the quartz reflection at 20.85°2θ (Cu Kα) is used as an internal 2θ standard. All peaks are corrected by the amount that this reflection differs from 20.85°. This procedure is valid for low-angle work because the sample-displacement error is proportional to cos θ, and for 0° to 40° 2θ, this involves errors in the displacement function of <6 percent. A final check on low 2θ reflections (≥ 2.65°) is provided by analysis of a pressed pellet of reagent-grade cholesterol.

3.4.2.6 X-Ray Diffraction Equipment

The x-ray diffraction (XRD) analyses were performed on a Phillips Model XRD-2600 x-ray diffraction system. The goniometer was recalibrated by Phillips service personnel three times per year. The XRD system was maintained by the University of Utah. The system was made available for the use of Univer-

sity of Utah Research Park firms at an hourly rate charge. A Terra Tek professional mineralogist prepared and analyzed samples and interpreted the data.

Calibration of the instrument by the operator before each day's operation was accomplished as described in Section 3.4.2.4.

4.0 CALCULATIONS

4.1 MOISTURE CONTENT

The moisture content of each test specimen is referenced to a constant weight of specimens at a base temperature of 30°C. Moisture content was calculated as follows for each thermal cycle:

$$W_{30} = WB_{30} - B \tag{4-1}$$

$$W_t = WB_t - B \tag{4-2}$$

where

W_{30} = final weight (g) of sample after heating to a constant weight at 30°C

W_t = final weight (g) of sample after heating to a constant weight at t°C

WB_{30} = final weight (g) of sample plus container after heating to a constant weight at 30°C

WB_t = final weight (g) of sample plus container after heating to a constant weight at t°C

B = initial weight (g) of sample container

Moisture content heating to temperature t°C is defined as follows:

$$S_t = \left[\frac{W_{30} - W_t}{W_{30}}\right] \times 100 = \left[1 - \frac{(WB_t - B)}{W_{30}}\right] \times 100 \tag{4-3}$$

Let $WB_t = WB_{110}$. Then,

$$S_{110} = \left[\frac{W_{30} - (WB_{110} - B)}{W_{30}}\right] \times 100 = \left[1 - \frac{(WB_{110} - B)}{W_{30}}\right] \times 100 \tag{4-4}$$

where

S_{110} = percent moisture at 110°C

WB_{110} = weight of sample plus container (g) after heating to a constant weight at 110°C

Then, after reheating to a higher temperature of 175°C,

$$S_{175} = [1 - \frac{(WB_{175} - B)}{W_{30}}] \times 100 \qquad (4\text{-}5)$$

where

S_{175} = percent moisture at 175°C

WB_{175} = weight of sample plus container (g) after heating to a constant weight at 175°C

and so on.

4.2 THERMAL FRACTURING/MOISTURE CONTENT

The moisture content of each test specimen was calculated as described in Section 4.1 except that the reference weight of the sample was obtained after heating to constant weight at 110°C:

$$S_t = [1 - \frac{(WB_t - B)}{W_{110}}] \times 100 \qquad (4\text{-}6)$$

4.3 X-RAY DIFFRACTION-SAMPLE THICKNESS CORRECTIONS

The influence of sample thickness on observed x-ray diffraction intensities is influenced by the sample mass attenuation coefficients. Attenuation of monochromatic x-ray radiation after passage through a material is described by

$$\frac{-dI}{I} = \mu_\ell \, dx \qquad (4\text{-}7)$$

where

dI = increment of intensity attenuation of x-ray radiation

I = intensity of incident x-ray radiation

dx = increment of sample thickness

μ_ℓ = linear attenuation coefficient (absorption coefficient)

Integration with initial condition x=0, $I=I_o$ yields

$$I_x = I_o \, e^{-\mu_\ell x} \qquad (4\text{-}8)$$

and

$$\mu_\ell = (1/x) \ln (I_o/I_x) \qquad (4\text{-}9)$$

where

I_x = intensity of transmitted x-ray radiation

I_o = intensity of incident x-ray radiation

x = sample thickness

The mass attenuation coefficient (μ) is given by

$$\mu = \mu_\ell/\rho = (1/\rho x) \ln (I_o/I_x) \qquad (4\text{-}10)$$

where

ρ = the density of the sample

μ is in units of grams per square centimeter (g/cm^2)

Peak intensities I* are corrected by using the lumped constant μg, thereby eliminating problems associated with measurement of sample thickness or density:

$$I^* = \frac{I}{1 - e^{(-2\ \mu g/\sin\ \theta)}} \qquad (4\text{-}11)$$

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5.0 RESULTS

5.1 MOISTURE CONTENT AND THERMAL FRACTURING

All but two samples thermally fractured between temperatures of 250 and 350°C. The thermal fracturing was very violent and required the use of explosion-proof crucibles. The salt samples fractured into fragments approximately 2 to 15 mm in diameter.

Moisture contents and thermal-fracturing properties of the analyzed core samples are summarized in Table 4. Individual data sheets for each analyzed sample are provided in Appendix C. Sieve analysis data for crushed samples are provided in Appendix D.

5.2 INSOLUBLE RESIDUE

It was determined that decanting the supernatant liquid from the settled insoluble residue would result in the loss of substantial fines. A siphon method was used to minimize the loss of fines and settling time.

Insoluble residue data are summarized in Table 5. The comments column in these tables indicates the number of washings samples received with individual 4-L and 1-L quantities of deionized water. The column labeled % Error in Table 5 expresses maximum residual salt remaining in the insoluble residue as equivalent weight percent NaCl. Table 6 summarizes moisture content and percent insoluble residue in all tested samples.

5.3 MINERALOGY

Bulk and clay mineralogies of insoluble residues from the Stone and Webster Engineering Corporation salt samples, as established by semiquantitative x-ray diffraction analysis are summarized in Tables 7 and 8. The diffraction patterns on which the mineralogy was based are included in Appendix E.

Table 4. Moisture Content of Salt Samples

TT[a] Sample Number	SWEC[b] Sample Number	Moisture Content of Intact Specimen		Thermal-Fracturing Temp. (°C)	Moisture Content of Pulverized Specimen		Total Moisture Loss From the Specimen	
		Total Moisture Loss (g)	Percent Moisture Loss (%)		Total Moisture Loss (g)	Percent Moisture Loss (%)	Total Moisture Loss (g)	Percent Moisture Loss (%)
A-1036	HAR 1280.0	0.10	0.03	350	0.09	0.04	0.19	0.07
A-1037	HAR 2162.1	0.10	0.03	250	0.36	0.14	0.46	0.17
A-1043	HAR 2279.2	3.47	1.31	325	2.50	0.98	5.97	2.29
A-1038	HAR 2282.0	1.61	0.50	250	1.53	0.52	3.14	1.02
A-1041	HAR 2473.6	1.22	0.42	325	0.50	0.18	1.72	0.60
A-1042	HAR 2534.9	0.20	0.06	250	0.56	0.20	0.76	0.26
A-1040	HAR 2717.3	0.68	0.23	300	0.58	0.20	1.26	0.43
A-1035	HAR 2743.3	0.77	0.24	325	0.85	0.28	1.62	0.52
A-1039	HAR 2791.0	0.45	0.14	325	1.15	0.41	1.60	0.55
A-1027	HOL 1391.1	2.88	0.70	325	1.78	0.51	4.66	1.21
A-1025	HOL 2414.7	0.17	0.05	275	0.43	0.14	0.60	0.19
A-1026	HOL 2436.2	0.39	0.11	300	0.52	0.16	0.91	0.27
A-1033	HOL 2458.0	0.34	0.10	250	0.82	0.28	1.16	0.38
A-1034	HOL 2465.0	1.80	0.57	325	1.98	0.69	3.78	1.26
A-1029	HOL 2505.9	0.69	0.23	325	0.64	0.25	1.33	0.48
A-1028	HOL 2576.1	0.56	0.20	250	1.34	0.52	1.90	0.72
A-1032	HOL 2601.2	1.45	0.49	325	0.58	0.21	2.03	0.70
A-1031	HOL 2648.1	1.64	0.50	300	0.67	0.21	2.31	0.71
A-1030	HOL 2839.5	0.97	0.35	325	0.50	0.18	1.47	0.53
A-1021	JFR 1369.5	7.41	2.81	NTF[c]	0.90	0.40	8.31	3.21
A-1022	JFR 1375.9	1.02	0.33	300	0.67	0.23	1.69	0.56
A-1023	JFR 1405.6	5.44	2.43	275	6.38	3.10	11.82	5.53
A-1024	JFR 1458.4	4.48	1.57	300	3.94	1.70	8.42	3.27
A-1015	JFR 2018.0	0.82	0.31	350	0.23	0.09	1.05	0.40
A-1016	JFR 2033.6	0.61	0.24	375	0.52	0.19	1.13	0.43
A-1013	JFR 2058.0	0.76	0.27	275	0.63	0.23	1.39	0.50
A-1014	JFR 2411.7	0.60	0.19	250	0.79	0.29	1.39	0.48
A-1019	JFR 2458.6	0.27	0.09	275	0.82	0.27	1.09	0.36
A-1020	JFR 2589.3	1.27	0.36	325	0.95	0.29	2.22	0.65
A-1017	JFR 2598.1	2.14	0.66	350	1.26	0.41	3.40	1.07
A-1018	JFR 2652.1	0.48	0.16	250	0.66	0.24	1.14	0.40
A-1003	ZEE 1133.2	13.72	4.4	NTF[c]	1.48	0.52	15.20	4.96
A-1006	ZEE 2040.8	1.17	0.34	325	0.81	0.24	1.98	0.58
A-1007	ZEE 2120.5	0.68	0.22	325	0.51	0.17	1.19	0.39
A-1001	ZEE 2131.6	0.79	0.28	350	0.53	0.21	1.32	0.49
A-1002	ZEE 2246.3	0.66	0.24	325	0.60	0.24	1.26	0.48
A-1004	ZEE 2416.1	2.97	0.97	300	1.90	0.67	4.87	1.64
A-1005	ZEE 2423.2	0.54	0.15	300	0.37	0.11	0.91	0.26
A-1008	ZEE 2646.9	0.74	0.23	350	0.60	0.19	1.34	0.42
A-1009	ZEE 2651.9	0.48	0.15	325	0.30	0.10	0.78	0.25
A-1010	ZEE 2690.3	0.35	0.12	250	0.67	0.27	1.02	0.39
A-1011	ZEE 2746.5	0.60	0.19	300	0.86	0.27	1.46	0.46
A-1012	ZEE 2849.8	0.65	0.21	325	0.47	0.15	1.12	0.36

(a) Terra Tek laboratory sample number.
(b) Stone & Webster Engineering Corporation sample number.
(c) No Thermal Fracturing Occurred.

Table 5. Insoluble Residue Data

TT[a] Sample Number	SWEC[b] Sample Number	Sample Weight (g)	Beaker Weight (g)	Beaker & Residue Weight (g)	Insoluble Residue Weight (g)	% Residue	(c) Conductivity Expressed as Equivalent NaCl (mg/ℓ)	Residual Brine Remaining (mL)	Equivalent NaCl in Residue (g)	% Error in (d) Insoluble Residue Due to Residual Salt Solution	Comments
C1036	HAR 1280.0	438.20	303.79	304.14	0.35	0.08	85	10	0.001	<0.29	Washings: 3(4ℓ), 1(1ℓ)
C1037	HAR 2162.1	501.45	308.66	313.49	4.83	0.96	100	50	0.005	<0.10	Washings: 3(4ℓ), 2(1ℓ)
C1043	HAR 2279.2	501.10	303.80	334.19	30.39	6.06	50	100	0.005	<0.02	Washings: 3(4ℓ), 1(1ℓ)
C1038	HAR 2282.0	502.09	322.53	346.58	24.05	4.79	70	100	0.007	<0.03	Washings: 3(4ℓ), 1(1ℓ)
C1041	HAR 2473.6	500.89	322.53	328.03	5.50	1.10	35	50	0.002	<0.04	Washings: 3(4ℓ), 1(1ℓ)
C1042	HAR 2534.9	502.66	308.66	309.09	0.43	0.09	75	10	0.001	<0.23	Washings: 3(4ℓ), 1(1ℓ)
C1040	HAR 2717.3	501.96	321.63	323.28	1.35	0.27	100	50	0.005	<0.37	Washings: 3(4ℓ), 2(1ℓ)
C1035	HAR 2743.3	501.98	322.58	325.92	3.34	0.67	40	50	0.002	<0.06	Washings: 3(4ℓ), 1(1ℓ)
C1039	HAR 2791.0	501.13	321.63	325.97	4.34	0.87	25	50	0.001	<0.02	Washings: 3(4ℓ), 1(1ℓ)
C1027	HOL 1391.1	501.07	303.78	375.50	71.72	14.31	200	100	0.020	<0.03	Washings: 3(4ℓ), 1(1ℓ)
C1025	HOL 2414.7	501.22	310.36	311.13	0.77	0.15	50	25	0.001	<0.13	Washings: 3(4ℓ), 1(1ℓ)
C1026	HOL 2436.2	502.61	308.64	312.00	3.36	0.67	20	50	0.001	<0.03	Washings: 3(4ℓ), 1(1ℓ)
C1033	HOL 2458.0	501.54	322.58	323.68	1.10	0.22	100	50	0.005	<0.45	Washings: 3(4ℓ), 2(1ℓ)
C1034	HOL 2465.0	500.95	310.37	332.71	22.34	4.46	150	50	0.008	<0.04	Washings: 3(4ℓ), 2(1ℓ)
C1029	HOL 2505.9	501.25	303.78	305.73	1.95	0.39	100	50	0.005	<0.26	Washings: 3(4ℓ), 1(1ℓ)
C1028	HOL 2576.1	501.79	308.65	324.82	16.17	3.22	50	50	0.003	<0.02	Washings: 3(4ℓ), 1(1ℓ)
C1032	HOL 2601.2	501.91	310.37	311.72	1.35	0.27	100	50	0.005	<0.37	Washings: 3(4ℓ), 2(1ℓ)
C1031	HOL 2648.1	502.65	303.78	330.89	27.11	5.39	200	100	0.020	<0.07	Washings: 3(4ℓ), 3(1ℓ)
C1030	HOL 2839.5	502.03	310.37	316.35	5.98	1.19	100	50	0.005	<0.08	Washings: 3(4ℓ), 1(1ℓ)
C1021	JFR 1369.5	501.08	321.59	457.39	135.80	27.10	150	400	0.060	<0.04	Washings: 4(4ℓ), 1(1ℓ)
C1022	JFR 1375.9	500.14	322.54	349.28	26.74	5.35	100	100	0.010	<0.37	Washings: 3(4ℓ), 1(1ℓ)
C1023	JFR 1405.6	500.25	322.54	371.35	48.81	9.76	100	100	0.010	<0.02	Washings: 3(4ℓ), 1(1ℓ)
C1024a	JFR 1458.4	501.09	322.53	400.56	78.03	15.57	700	1000	0.700	<0.90	Washings: 3(4ℓ), 1(1ℓ)
C1024b	JFR 1458.4	500.88	324.17	402.73	78.56	15.68	700	1000	0.700	<0.89	Washings: 3(4ℓ), 1(1ℓ)
C1015	JFR 2018.0	501.71	322.53	328.61	6.08	1.21	90	50	0.005	<0.07	Washings: 3(4ℓ), 1(1ℓ)
C1016	JFR 2033.6	500.84	321.58	335.88	14.30	2.86	40	50	0.002	<0.01	Washings: 3(4ℓ), 1(1ℓ)
C1013	JFR 2058.0	500.34	324.17	334.30	10.13	2.02	20	50	0.001	<0.01	Washings: 3(4ℓ), 1(1ℓ)
C1014a	JFR 2411.7	500.33	321.88	335.20	13.32	2.66	40	50	0.002	<0.02	Washings: 3(4ℓ), 1(1ℓ)
C1014b	JFR 2411.7	500.57	323.37	336.71	13.34	2.66	40	50	0.002	<0.02	Washings: 3(4ℓ), 1(1ℓ)
C1019	JFR 2458.6	501.52	324.17	327.83	3.66	0.73	100	50	0.005	<0.14	Washings: 3(4ℓ), 1(1ℓ)
C1020	JFR 2589.3	501.04	324.17	325.03	0.89	0.17	10	10	0.001	<0.06	Washings: 3(4ℓ), 1(1ℓ)
C1017	JFR 2598.1	500.06	321.90	336.45	14.55	2.91	100	50	0.005	<0.03	Washings: 3(4ℓ), 2(1ℓ)
C1018	JFR 2652.1	501.85	323.38	356.70	33.32	6.64	40	50	0.002	<0.01	Washings: 3(4ℓ), 1(1ℓ)
C1003	ZEE 1133.2	504.58	324.19	502.67	178.48	35.37	500	400	0.200	<0.11	Washings: 2(4ℓ), 8(1ℓ)
C1006	ZEE 2040.8	502.85	321.89	326.09	4.20	0.84	100	50	0.005	<0.12	Washings: 3(4ℓ), 1(1ℓ)
C1007	ZEE 2120.5	500.73	322.57	330.37	7.80	1.56	30	50	0.002	<0.02	Washings: 3(4ℓ), 1(1ℓ)
C1001	ZEE 2131.6	501.74	322.57	335.44	12.87	2.57	100	50	0.005	<0.04	Washings: 3(4ℓ), 1(1ℓ)
C1002	ZEE 2246.3	500.27	324.19	329.03	4.84	0.97	50	50	0.003	<0.05	Washings: 3(4ℓ), 1(1ℓ)
C1004	ZEE 2416.1	501.12	322.57	331.00	8.43	1.68	20	50	0.001	<0.01	Washings: 3(4ℓ), 1(1ℓ)
C1005	ZEE 2423.2	500.77	324.18	324.53	0.35	0.07	20	10	0.001	<0.29	Washings: 3(4ℓ), 1(1ℓ)
C1008	ZEE 2646.9	500.36	321.90	364.76	42.86	8.57	100	100	0.010	<0.02	Washings: 1(4ℓ), 5(1ℓ)
C1009	ZEE 2651.9	500.16	322.59	333.22	10.63	2.13	100	25	0.003	<0.02	Washings: 3(4ℓ), 4(1ℓ)
C1010	ZEE 2690.3	502.88	321.59	332.18	10.59	2.11	50	50	0.003	<0.02	Washings: 3(4ℓ), 3(1ℓ)
C1011	ZEE 2746.5	501.95	322.54	327.07	4.53	0.90	10	50	0.001	<0.01	Washings: 3(4ℓ), 2(1ℓ)
C1012	ZEE 2849.8	501.00	321.90	324.91	3.01	0.60	100	50	0.005	<0.17	Washings: 4(4ℓ), 2(1ℓ)

(a) Terra Tek laboratory sample number.
(b) Stone & Webster Engineering Corporation sample number.
(c) Conductivity of residual leach water expressed as equivalent NaCl concentration.
(d) Percent error is equivalent to weight percent residual NaCl in insoluble residue.

Table 6. Percent Moisture and Insolubles

TT[a] Sample Number	SWEC[b] Sample Number	Weight % Moisture	Weight % Insoluble
C-1036	HAR 1280.0	0.07	0.08
C-1037	HAR 2162.1	0.17	0.96
C-1043	HAR 2279.2	2.29	6.06
C-1038	HAR 2282.0	1.02	4.79
C-1041	HAR 2473.6	0.60	1.10
C-1042	HAR 2534.9	0.26	0.09
C-1040	HAR 2717.3	0.43	0.27
C-1035	HAR 2743.3	0.52	0.67
C-1039	HAR 2791.0	0.55	0.87
C-1027	HOL 1391.1	1.21	14.31
C-1025	HOL 2414.7	0.19	0.15
C-1026	HOL 2436.2	0.27	0.67
C-1033	HOL 2458.0	0.38	0.22
C-1034	HOL 2465.0	1.26	4.46
C-1029	HOL 2505.9	0.48	0.39
C-1028	HOL 2576.1	0.72	3.22
C-1032	HOL 2601.2	0.70	0.27
C-1031	HOL 2648.1	0.71	5.39
C-1030	HOL 2839.5	0.53	1.19
C-1021	JFR 1369.5	3.21	27.10
C-1022	JFR 1375.9	0.56	5.35
C-1023	JFR 1405.6	5.53	9.76
C-1024	JFR 1458.4	3.27	15.63
C-1015	JFR 2018.0	0.40	1.21
C-1016	JFR 2033.6	0.40	2.86
C-1013	JFR 2058.0	0.50	2.02
C-1014	JFR 2411.7	0.48	2.66
C-1019	JFR 2458.6	0.36	0.73
C-1020	JFR 2589.3	0.65	0.17
C-1017	JFR 2598.1	1.07	2.91
C-1018	JFR 2652.1	0.40	6.64
C-1003	ZEE 1133.2	4.96	35.38
C-1006	ZEE 2040.8	0.58	0.84
C-1007	ZEE 2120.5	0.39	1.56
C-1001	ZEE 2131.6	0.49	2.57
C-1002	ZEE 2246.3	0.48	0.97
C-1004	ZEE 2416.1	1.64	1.68
C-1005	ZEE 2423.2	0.26	0.07
C-1008	ZEE 2646.9	0.42	8.57
C-1009	ZEE 2651.9	0.25	2.13
C-1010	ZEE 2690.3	0.39	2.11
C-1011	ZEE 2746.5	0.46	0.90
C-1012	ZEE 2849.8	0.36	0.60

(a) Terra Tek laboratory sample number.
(b) Stone and Webster Engineering Corporation sample number.

Table 7. Semiquantitative X-ray Diffraction Bulk Mineralogy of Insoluole Residue from Salt Samples (in Weight Percent)

TT[a] Sample Number	SWEC[b] Sample Number	Quartz	K-Feldspar	Plagio-clase	Dolo-mite	Clay	Celes-tite	Anhy-drite	Magne-site
C-1036	HAR 1280.0	INSUFFICIENT INSOLUBLE RESIDUE							
C-1037	HAR 2162.1							100.0	
C-1043	HAR 2279.2	25.3	2.7			69.6		2.3	
C-1038	HAR 2282.0	20.7			4.6	71.6		3.1	
C-1041	HAR 2473.6	13.9	2.3			83.8			
C-1042	HAR 2534.9							100.0	
C-1040	HAR 2717.3						8.6	91.4	
C-1035	HAR 2743.3	24.5	2.7			68.5		4.3	
C-1039	HAR 2791.0	17.3			3.6	36.5		42.6	
C-1027	HOL 1391.1	66.1	33.9			TR			
C-1025	HOL 2414.7	13.4	3.4	TR	10.6	68.1			
C-1026	HOL 2436.2	16.7	4.4	2.0		76.8			
C-1033	HOL 2458.0	6.5			14.5	33.7		45.3	
C-1034	HOL 2465.0	17.1			TR	48.8		34.1	
C-1029	HOL 2505.9				TR			100.0	TR
C-1028	HOL 2576.1	20.4	3.2	0.8		71.9		3.7	
C-1032	HOL 2601.2	4.9			12.7	24.3		58.1	
C-1031	HOL 2648.1	10.6			3.7	TR		85.7	
C-1030	HOL 2839.5	10.5			4.5	TR		85.0	
C-1021	JFR 1369.5	22.6	7.5	3.2		64.1			2.6
C-1022	JFR 1375.9							98.5	1.5
C-1023	JFR 1405.6	1.0				86.6			12.5
C-1024a	JFR 1458.4					90.9			9.1
C-1024b	JFR 1458.4					90.5			9.5
C-1015	JFR 2018.0	22.0			4.1	48.2		25.7	
C-1016	JFR 2033.6	16.7	1.7	1.0	2.5	73.9		4.2	
C-1013	JFR 2058.0	7.3	2.5	1.5	2.3	84.6		1.7	
C-1014a	JFR 2411.7	17.5	3.4	1.8		77.2			
C-1014b	JFR 2411.7	13.1	1.9	1.2	2.6	81.2			
C-1019	JFR 2458.6	8.3			9.1	55.9		26.7	
C-1020	JFR 2589.3	11.7			9.8	74.6	3.9		
C-1017	JFR 2598.1	13.6	1.9			68.3		16.3	
C-1018	JFR 2652.1	25.3	3.0	2.1		69.6			
C-1003	ZEE 1133.2	21.0	4.1	1.6		62.1		4.6	6.6
C-1006	ZEE 2040.8	15.5	TR	TR		65.4		19.2	
C-1007	ZEE 2120.5	16.4	2.3	1.7		79.6			
C-1001	ZEE 2131.6	17.2	3.0	1.0	3.0	75.8			
C-1002	ZEE 2246.3	13.8	2.7	1.0	16.1	67.5			
C-1004	ZEE 2416.1	14.4	4.9		1.8	78.9			
C-1005	ZEE 2423.2	15.3	7.4	TR	17.5	59.9			
C-1008	ZEE 2646.9	20.5	0.6	3.3	9.2	60.3			
C-1009	ZEE 2651.9	0.4					0.4	99.1	
C-1010	ZEE 2690.3	12.6	5.3	2.0	17.4	57.0			
C-1011	ZEE 2746.5	22.3	3.2	1.0		73.6			
C-1012	ZEE 2849.8	1.2						98.8	

(a) Terra Tek laboratory sample number.

(b) Stone & Webster Engineering Corporation sample number.

Table 8. Semiquantitative X-Ray Diffraction Clay Mineralogy of Insoluble Residue from Salt Samples (in Weight Percent) (Page 1 of 2)

TT[a] Sample Number	SWEC[b] Sample Number	C/S	Illite	Chlorite	Smectite	Other
C-1036	HAR 1280.0	INSUFFICIENT INSOLUBLE RESIDUE				
C-1037	HAR 2162.1					UM (100%) (c),(d)
C-1043	HAR 2279.2		88.0	12.0		
C-1038	HAR 2282.0	13.5	79.0	7.5		
C-1041	HAR 2473.6		82.9	17.1		
C-1042	HAR 2534.9					UM (100%) (c),(d),(e)
C-1040	HAR 2717.3					UM (100%) (c),(d),(e)
C-1035	HAR 2743.3	10.7	80.0	9.3		
C-1039	HAR 2791.0		+	+		UM (c),(d)
C-1027	HOL 1391.1	87.9	9.6	2.5		
C-1025	HOL 2414.7	TR	86.3	13.7		(d)
C-1026	HOL 2436.2		92.2	7.8		
C-1033	HOL 2458.0		90.0	10.0		UM (c),(d)
C-1034	HOL 2465.0		87.1	12.9		
C-1029	HOL 2505.9					UM (100%) (c),(d)
C-1028	HOL 2576.1	13.0	87.0	TR		
C-1032	HOL 2601.2	TR	80.2	19.8		UM (c),(d)
C-1031	HOL 2648.1	26.8	70.3	2.9		
C-1030	HOL 2839.5	29.2	67.9	2.9		
C-1021	JFR 1369.5				100.0	
C-1022	JFR 1375.9				100.0	
C-1023	JFR 1405.6		+		+	
C-1024a	JFR 1458.4				100.0	Mag.
C-1024b	JFR 1458.4				100.0	Mag.
C-1015	JFR 2018.0	22.7	74.1	3.3		
C-1016	JFR 2033.6	3.4	91.8	4.8		
C-1013	JFR 2058.0	1.8	93.3	4.9		
C-1014a	JFR 2411.7	10.7	81.5	7.8		
C-1014b	JFR 2411.7	11.6	77.2	11.2		
C-1019	JFR 2458.6	8.4	80.5	11.1		
C-1020	JFR 2589.3	42.8	49.0	8.3		
C-1017	JFR 2598.1	12.9	74.7	12.4		
C-1018	JFR 2652.1	2.4	94.3	3.3		
C-1003	ZEE 1133.2		36.2		63.8	Mag.
C-1006	ZEE 2040.8	10.2	75.7	14.1		
C-1007	ZEE 2120.5	3.1	92.7	4.2		
C-1001	ZEE 2131.6	1.6	91.1	7.2		
C-1002	ZEE 2246.3	5.4	88.1	6.4		
C-1004	ZEE 2416.1	10.3	84.7	5.0		
C-1005	ZEE 2423.2					UM (100%) (c),(d),(e)
C-1008	ZEE 2646.9	45.5	54.4	TR		
C-1009	ZEE 2651.9		+	+		UM (c)
C-1010	ZEE 2690.3	5.7	86.2	8.1		
C-1011	ZEE 2746.5	9.3	80.5	10.2		
C-1012	ZEE 2849.8	NO <2 MICRON PARTICLES				

Table 8. Semiquantitative X-Ray Diffraction Clay Mineralogy of Insoluble Residue from Salt Samples (in Weight Percent) (Page 2 of 2)

KEY

tr	= trace amount	Smec	= Smectite
+	= present but relative amount indeterminant due to poor x-ray pattern	Qtz	= Quartz
		Ksp	= K-feldspar
		Pg	= Plagioclase
Mag	= Magnesite	Dolo	= Dolomite
C/S	= Corrensite(f)	Cel	= Celestite
Chl or C	= Chlorite	ANH	= Anhydrite
		UM	= Unidentified Mineral

(a) Terra Tek laboratory sample number.

(b) Stone & Webster Engineering Corporation sample number.

(c) An unidentified mineral shows up in a number of samples particularly in samples with small amounts of <2 μ material. The unidentified mineral gives strong peaks near the following d-spacings: 7.4, 6.03, 4.27, 3.52, and 3.05. No mineral that fits the spacings precisely can be found. Several of the peaks fit reasonably well with gypsum. Thus, the unidentified mineral could be a hydrated calcium sulfate mineral.

(d) The amount of clay in these samples was too little to prepare by the usual method. Instead, to obtain some information, these samples were filtrated onto a small-diameter silver filter. Absorption coefficients for these samples could not be determined due to the high absorbance of the filter. Mineral percentages were estimated using mineral intensity factors (MIF) determined from the clay mineral analyses provided by Reynolds. Reynolds' estimated mineral percentages were plotted against peak intensity and the MIFs determined by normalizing illite to 1. The following MIFs were derived: illite (001) = 1.0, corrensite (006) = 2.5, smectite (003) = 1.3, and chlorite (003) = 1.1.

(e) No glycolated runs were made on these samples.

(f) A mixed layer chlorite/smectite with amounts of approximately 50 percent chlorite and 50 percent smectite.

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6.0 REFERENCES

Brindley, G. W., and G. Brown, 1980. Crystal Structures of Clay Minerals and Their X-Ray Identification; Monograph 5, Mineralogical Society, London.

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Reynolds, R. C., 1980b. "Quantitative Analysis of Kaolinite, Illite, and Mixed-Layer Illite-Smectite by X-Ray Diffraction Methods," (Abst.), 29th Annual Clay Minerals Conference, p. 83.

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Schultz, L. G., 1964. Quantitative Interpretation of Mineralogical Composition From X-Ray and Chemical Data for the Pierre Shale, U.S. Geological Survey Professional Paper No. 391-C, U.S. Department of the Interior, Washington, DC.

"Hastelloy Alloy C-276", Technical Bulletin, Cabot Corporation, Stellite Division, Kokomo, Indiana, 11 p.

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APPENDIX A

SAMPLE DOCUMENTATION FORMS

TTQA04 - Core Samples - As-Received

TTQA28 - Sample Distribution

TTQA26 - Sample Record

CORE SAMPLES - AS RECEIVED

Terra Tek Sample No.	Client Sample Designation	Date Received	Sample Description	Sample Dimensions	Date Slabbed

Core Sample - Sketches, Descriptions, Comments

Approved _____ (PM)

TTQA28 (3/82)

Exhibit 5-2

SAMPLE DISTRIBUTION

Rock Type	Source Locations	Approx. Dimensions	Rock I.D. No.	Date Cored

Sketches, Descriptions, Core Locations, Comments

Core I.D. No.

Prepared by

Core I.D. No.

Prepared by

Core I.D. No.

Prepared by

Approved _____ (PM)

TT-QA26 (3/82; Amended 5/84) SAMPLE RECORD Exhibit 5-3

TT Sample No.	S&WEC Sample I.D.	Sample Description	Date Received	Date/Time		Archived Sample	Comments
				Slabbed	Photo		

Approved _____ (PM)

APPENDIX B

PHOTODOCUMENTATION OF SAMPLES

PHOTOGRAPHS OF TEST SPECIMENS

Color photographs of each test specimen were obtained prior to testing. Because of the cost of color reproduction and the lack of information depicted in black and white photographs, reproductions have not been included in this report.

Original color photographs are available for viewing in the Battelle Project Management Division Library, 505 King Avenue, Columbus, Ohio.

APPENDIX C

MOISTURE CONTENT AND THERMAL-FRACTURING DATA

SAMPLE NUMBER A-1036
S & WEC SAMPLE DESIGNATION HAR 1280.0

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	454.96	238.12	693.08	238.09	693.05	18.00	0.03		0.01	
					693.05	1.00	0.03	0.03	0.01	0.01
110 C					693.01	48.00	0.07		0.02	
					693.01	1.00	0.07	0.07	0.02	0.02
175 C					692.99	18.00	0.09		0.03	
					692.99	1.00	0.09	0.09	0.03	0.03
250 C					692.98	18.00	0.10		0.03	
					692.98	1.00	0.10	0.10	0.03	0.03
350 C					692.98		0.10		0.03	

THERMAL FRACTURE AT 350 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	454.96	232.71	687.67	232.66	687.62	48.00	0.05		0.02	
					687.62	1.00	0.05	0.05	0.02	0.02
200 C					687.62	18.00	0.05		0.00	
					687.62	1.00	0.05	0.05	0.00	0.00
300 C					687.59	18.00	0.08		0.01	
					687.59	1.00	0.08	0.08	0.01	0.01
350 C					687.58	18.00	0.09		0.02	
					687.59	1.00	0.08	0.08	0.01	0.02
400 C					687.58	18.00	0.09		0.02	
					687.57	1.00	0.10	0.09	0.02	0.02
500 C					687.58	48.00	0.09		0.02	
					687.58	1.00	0.09	0.09	0.02	0.02

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.10 gm
PERCENT MOISTURE LOSS = 0.03 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.09 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.04 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 0.19 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.07 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1037
S & WEC SAMPLE DESIGNATION HAR 216F.1

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	459.75	257.77	717.52	257.74	717.49	18.00	0.03		0.01	
					717.49	1.00	0.03	0.03	0.01	0.01
110 C					717.47	48.00	0.05		0.01	
					717.47	1.00	0.05	0.05	0.01	0.01
175 C					717.46	18.00	0.06		0.01	
					717.44	1.00	0.08	0.07	0.02	0.02
250 C					717.42	18.00	0.10		0.03	

THERMAL FRACTURE AT 250 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	459.76	252.35	712.11	252.19	711.95	48.00	0.16		0.06	
					711.96	1.00	0.15	0.15	0.06	0.06
200 C					711.91	18.00	0.20		0.02	
					711.91	1.00	0.20	0.20	0.02	0.02
300 C					711.86	18.00	0.25		0.04	
					711.85	1.00	0.26	0.25	0.04	0.04
350 C					711.81	18.00	0.30		0.06	
					711.80	1.00	0.31	0.31	0.06	0.06
400 C					711.75	18.00	0.36		0.08	
					711.75	1.00	0.36	0.36	0.08	0.08
500 C					711.75	48.00	0.36		0.08	
					711.75	1.00	0.36	0.36	0.08	0.08

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.10 gm
PERCENT MOISTURE LOSS = 0.03 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.36 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.14 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 0.46 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.17 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1043
S & WEC SAMPLE DESIGNATION HAR 2279.2

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	442.76	259.07	701.83	258.99	701.75	18.00	0.08		0.03	
					701.74	1.00	0.09	0.09	0.03	0.03
110 C					700.18	18.00	1.65		0.61	
					700.18	1.00	1.65	1.65	0.61	0.61
175 C					699.17	18.00	2.66		1.00	
					699.17	1.00	2.66	2.66	1.00	1.00
250 C					698.76	18.00	3.07		1.15	
					698.75	1.00	3.08	3.08	1.16	1.16
325 C					698.36		3.47		1.31	

THERMAL FRACTURE AT 325 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	442.77	253.92	696.69	253.89	696.66	18.00	0.03		0.01	
					696.67	1.00	0.02	0.03	0.01	0.01
200 C					696.50	18.00	0.19		0.06	
					696.50	1.00	0.19	0.19	0.06	0.06
300 C					696.25	48.00	0.44		0.16	
					696.23	1.00	0.46	0.45	0.17	0.17
350 C					696.01	18.00	0.68		0.26	
					696.02	1.00	0.67	0.68	0.25	0.25
400 C					695.35	18.00	1.34		0.52	
					695.34	1.00	1.35	1.35	0.52	0.52
500 C					694.20	18.00	2.49		0.97	
					694.19	1.00	2.50	2.50	0.97	0.97

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 3.47 gm
PERCENT MOISTURE LOSS = 1.31 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 2.50 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.98 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 5.97 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 2.29 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1038
S & WEC SAMPLE DESIGNATION HAR 2282.2

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	450.38	301.34	751.72	301.24	751.62	18.00	0.10		0.03	
					751.62	1.00	0.10	0.10	0.03	0.03
110 C					750.85	48.00	0.87		0.26	
					750.84	1.00	0.88	0.88	0.26	0.26
175 C					750.50	18.00	1.22		0.37	
					750.52	1.00	1.20	1.21	0.37	0.37
250 C					750.11	18.00	1.61		0.50	

THERMAL FRACTURE AT 250 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	450.40	296.27	746.67	295.98	746.38	48.00	0.29		0.10	
					746.39	1.00	0.28	0.28	0.09	0.10
200 C					746.30	18.00	0.37		0.03	
					746.30	1.00	0.37	0.37	0.03	0.03
300 C					746.12	18.00	0.55		0.09	
					746.12	1.00	0.55	0.55	0.09	0.09
350 C					745.94	18.00	0.73		0.15	
					745.94	1.00	0.73	0.73	0.15	0.15
400 C					745.59	18.00	1.08		0.27	
					745.60	1.00	1.07	1.07	0.26	0.27
500 C					745.14	48.00	1.53		0.42	
					745.13	1.00	1.54	1.53	0.42	0.42

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 1.61 gm
PERCENT MOISTURE LOSS = 0.50 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 1.53 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.52 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 3.14 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 1.02 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1041
S & WEC SAMPLE DESIGNATION HAR 2473.6

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
30 C	459.82	286.08	745.90	286.06	745.88	18.00	0.02		0.01	
					745.87	1.00	0.03	0.02	0.01	0.01
110 C					745.77	18.00	0.13		0.04	
					745.77	1.00	0.13	0.13	0.04	0.04
175 C					745.62	18.00	0.28		0.09	
					745.63	1.00	0.27	0.27	0.09	0.09
250 C					745.44	18.00	0.46		0.15	
					745.45	1.00	0.45	0.45	0.15	0.15
325 C					744.68		1.22		0.42	

THERMAL FRACTURE AT 325 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	459.83	282.39	742.22	282.24	742.07	18.00	0.15		0.05	
					742.05	1.00	0.17	0.16	0.06	0.06
200 C					741.98	18.00	0.24		0.03	
					741.99	1.00	0.23	0.24	0.03	0.03
300 C					741.87	48.00	0.35		0.07	
					741.87	1.00	0.35	0.35	0.07	0.07
350 C					741.86	18.00	0.36		0.07	
					741.86	1.00	0.36	0.36	0.07	0.07
400 C					741.78	18.00	0.44		0.10	
					741.78	1.00	0.44	0.44	0.10	0.10
500 C					741.72	18.00	0.50		0.12	
					741.72	1.00	0.50	0.50	0.12	0.12

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 1.22 gm
PERCENT MOISTURE LOSS = 0.42 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.50 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.18 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 1.72 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.60 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1042
S & WEC SAMPLE DESIGNATION HAR 2534.9

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	450.44	291.46	741.90	291.43	741.87	18.00	0.03		0.01	
					741.87	1.00	0.03	0.03	0.01	0.01
110 C					741.86	18.00	0.04		.00	
					741.84	1.00	0.06	0.05	0.01	0.01
175 C					741.82	18.00	0.08		0.02	
					741.82	1.00	0.08	0.08	0.02	0.02
250 C					741.70	18.00	0.20		0.06	

THERMAL FRACTURE AT 250 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	450.41	287.21	737.62	287.00	737.41	18.00	0.21		0.07	
					737.39	1.00	0.23	0.22	0.08	0.08
200 C					737.32	18.00	0.30		0.03	
					737.32	1.00	0.30	0.30	0.03	0.03
300 C					737.19	48.00	0.43		0.08	
					737.18	1.00	0.44	0.44	0.08	0.08
350 C					737.13	18.00	0.49		0.10	
					737.12	1.00	0.50	0.50	0.10	0.10
400 C					737.09	18.00	0.53		0.11	
					737.09	1.00	0.53	0.53	0.11	0.11
500 C					737.06	18.00	0.56		0.12	
					737.06	1.00	0.56	0.56	0.12	0.12

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.20 gm
PERCENT MOISTURE LOSS = 0.06 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.56 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.20 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 0.76 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.26 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1040
S & WEC SAMPLE DESIGNATION HAR 2717.3

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	455.01	289.78	744.79	289.77	744.78	18.00	0.01		.00	
					744.78	1.00	0.01	0.01	.00	.00
110 C					744.56	18.00	0.23		0.08	
					744.56	1.00	0.23	0.23	0.08	0.08
175 C					744.43	18.00	0.36		0.12	
					744.43	1.00	0.36	0.36	0.12	0.12
250 C					744.13	18.00	0.66		0.22	
					744.13	1.00	0.66	0.66	0.22	0.22
300 C					744.11		0.68		0.23	

THERMAL FRACTURE AT 300 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	455.00	282.82	737.82	282.47	737.47	18.00	0.35		0.12	
					737.47	1.00	0.35	0.35	0.12	0.12
200 C					737.36	18.00	0.46		0.04	
					737.37	1.00	0.45	0.46	0.04	0.04
300 C					737.25	48.00	0.57		0.08	
					737.25	1.00	0.57	0.57	0.08	0.08
350 C					737.25	18.00	0.57		0.08	
					737.25	1.00	0.57	0.57	0.08	0.08
400 C					737.24	18.00	0.58		0.08	
					737.25	1.00	0.57	0.58	0.08	0.08
500 C					737.24	18.00	0.58		0.08	
					737.25	1.00	0.57	0.58	0.08	0.08

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.68 gm
PERCENT MOISTURE LOSS = 0.23 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.58 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.20 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 1.26 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.43 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1035
S & WEC SAMPLE DESIGNATION HAR 2743.3

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	442.73	309.22	751.95	309.18	751.91	48.00	0.04		0.01	
					751.91	1.00	0.04	0.04	0.01	0.01
110 C					751.77	18.00	0.18		0.05	
					751.77	1.00	0.18	0.18	0.05	0.05
175 C					751.61	18.00	0.34		0.10	
					751.62	1.00	0.33	0.34	0.09	0.10
250 C					751.51	18.00	0.44		0.13	
					751.52	1.00	0.43	0.44	0.13	0.13
325 C					751.18		0.77		0.24	

THERMAL FRACTURE AT 325 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	442.74	305.27	748.01	305.00	747.74	18.00	0.27		0.09	
					747.74	1.00	0.27	0.27	0.09	0.09
200 C					747.68	18.00	0.33		0.02	
					747.66	1.00	0.35	0.34	0.03	0.02
300 C					747.56	18.00	0.45		0.06	
					747.56	1.00	0.45	0.45	0.06	0.06
350 C					747.40	48.00	0.61		0.11	
					747.40	1.00	0.61	0.61	0.11	0.11
400 C					747.31	18.00	0.70		0.14	
					747.32	1.00	0.69	0.69	0.14	0.14
500 C					747.16	18.00	0.85		0.19	
					747.17	1.00	0.84	0.85	0.19	0.19

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.77 gm
PERCENT MOISTURE LOSS = 0.24 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.85 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.28 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 1.62 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.52 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1039
S & WEC SAMPLE DESIGNATION HAR 2791.0

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	442.76	283.37	726.13	283.33	726.09	18.00	0.04		0.01	
					726.10	1.00	0.03	0.03	0.01	0.01
110 C					725.83	48.00	0.30		0.09	
					725.84	1.00	0.29	0.29	0.09	0.09
175 C					725.77	18.00	0.36		0.11	
					725.77	1.00	0.36	0.36	0.11	0.11
250 C					725.70	18.00	0.43		0.14	
					725.70	1.00	0.43	0.43	0.14	0.14
325 C					725.68		0.45		0.14	

THERMAL FRACTURE AT 325 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	442.75	275.72	718.47	275.46	718.21	48.00	0.26		0.09	
					718.21	1.00	0.26	0.26	0.09	0.09
200 C					718.20	18.00	0.27		.00	
					718.19	1.00	0.28	0.27	0.01	0.01
300 C					718.07	18.00	0.40		0.05	
					718.06	1.00	0.41	0.41	0.05	0.05
350 C					717.97	18.00	0.50		0.09	
					717.96	1.00	0.51	0.50	0.09	0.09
400 C					717.74	18.00	0.73		0.17	
					717.74	1.00	0.73	0.73	0.17	0.17
500 C					717.32	48.00	1.15		0.32	
					717.32	1.00	1.15	1.15	0.32	0.32

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.45 gm
PERCENT MOISTURE LOSS = 0.14 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 1.15 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.41 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 1.60 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.55 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1027
S & WEC SAMPLE DESIGNATION HOL 1391.1

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	454.86	357.16	812.02	356.79	811.65	18.00	0.37		0.10	
					811.65	1.00	0.37	0.37	0.10	0.10
110 C					810.66	18.00	1.36		0.28	
					810.64	1.00	1.38	1.37	0.28	0.28
175 C					809.74	18.00	2.28		0.54	
					809.72	1.00	2.30	2.29	0.54	0.54
250 C					809.45	18.00	2.57		0.62	
					809.45	1.00	2.57	2.57	0.62	0.62
325 C					809.14		2.88		0.70	

THERMAL FRACTURE AT 325 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	454.87	349.09	803.96	348.88	803.75	18.00	0.21		0.06	
					803.75	1.00	0.21	0.21	0.06	0.06
200 C					803.60	48.00	0.36		0.04	
					803.60	1.00	0.36	0.36	0.04	0.04
300 C					803.49	18.00	0.47		0.07	
					803.49	1.00	0.47	0.47	0.07	0.07
350 C					803.20	18.00	0.76		0.16	
					803.20	1.00	0.76	0.76	0.16	0.16
400 C					802.84	18.00	1.12		0.26	
					802.84	1.00	1.12	1.12	0.26	0.26
500 C					802.19	48.00	1.77		0.45	
					802.18	1.00	1.78	1.78	0.45	0.45

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 2.88 gm
PERCENT MOISTURE LOSS = 0.70 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 1.78 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.51 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 4.66 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 1.21 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1025
S & WEC SAMPLE DESIGNATION HOL 2414.7

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
30 C	450.32	312.41	762.73	312.40	762.72	18.00	0.01		.00	
					762.72	1.00	0.01	0.01	.00	.00
110 C					762.68	18.00	0.05		0.01	
					762.67	1.00	0.06	0.06	0.02	0.01
175 C					762.66	18.00	0.07		0.02	
					762.65	1.00	0.08	0.08	0.02	0.02
250 C					762.62	18.00	0.11		0.03	
					762.62	1.00	0.11	0.11	0.03	0.03
275 C					762.56		0.17		0.05	

THERMAL FRACTURE AT 275 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	450.33	307.10	757.43	306.89	757.22	18.00	0.21		0.07	
					757.22	1.00	0.21	0.21	0.07	0.07
200 C					757.16	48.00	0.27		0.02	
					757.16	1.00	0.27	0.27	0.02	0.02
300 C					757.10	18.00	0.33		0.04	
					757.10	1.00	0.33	0.33	0.04	0.04
350 C					757.03	18.00	0.40		0.06	
					757.00	1.00	0.43	0.41	0.07	0.07
400 C					757.00	18.00	0.43		0.07	
					757.00	1.00	0.43	0.43	0.07	0.07
500 C					757.00	48.00	0.43		0.07	
					757.00	1.00	0.43	0.43	0.07	0.07

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.17 gm
PERCENT MOISTURE LOSS = 0.05 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.43 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.14 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 0.60 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.19 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1026
S & WEC SAMPLE DESIGNATION HOL 2436.2

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	459.68	326.22	785.90	326.19	785.87	18.00	0.03		0.01	
					785.88	1.00	0.02	0.02	0.01	0.01
110 C					785.82	18.00	0.08		0.02	
					785.82	1.00	0.08	0.08	0.02	0.02
175 C					785.75	18.00	0.15		0.04	
					785.75	1.00	0.15	0.15	0.04	0.04
250 C					785.65	18.00	0.25		0.07	
					785.65	1.00	0.25	0.25	0.07	0.07
300 C					785.51		0.39		0.11	

THERMAL FRACTURE AT 300 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	459.70	320.13	779.83	319.93	779.63	18.00	0.20		0.06	
					779.63	1.00	0.20	0.20	0.06	0.06
200 C					779.56	48.00	0.27		0.02	
					779.56	1.00	0.27	0.27	0.02	0.02
300 C					779.49	18.00	0.34		0.04	
					779.49	1.00	0.34	0.34	0.04	0.04
350 C					779.42	18.00	0.41		0.07	
					779.40	1.00	0.43	0.42	0.07	0.07
400 C					779.37	18.00	0.46		0.08	
					779.36	1.00	0.47	0.47	0.08	0.08
500 C					779.31	48.00	0.52		0.10	
					779.31	1.00	0.52	0.52	0.10	0.10

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.39 gm
PERCENT MOISTURE LOSS = 0.11 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.52 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.16 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 0.91 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.27 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1033
S & WEC SAMPLE DESIGNATION HOL 2458.0

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
30 C	459.72	306.81	766.53	306.79	766.51	48.00	0.02		0.01	
					766.51	1.00	0.02	0.02	0.01	0.01
110 C					766.44	18.00	0.09		0.02	
					766.43	1.00	0.10	0.09	0.03	0.02
175 C					766.39	18.00	0.14		0.04	
					766.40	1.00	0.13	0.13	0.04	0.04
250 C					766.19	18.00	0.34		0.10	

THERMAL FRACTURE AT 250 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	459.74	302.24	761.98	301.86	761.60	18.00	0.38		0.13	
					761.59	1.00	0.39	0.38	0.13	0.13
200 C					761.53	18.00	0.45		0.02	
					761.53	1.00	0.45	0.45	0.02	0.02
300 C					761.38	18.00	0.60		0.07	
					761.38	1.00	0.60	0.60	0.07	0.07
350 C					761.23	48.00	0.75		0.12	
					761.22	1.00	0.76	0.75	0.13	0.12
400 C					761.20	18.00	0.78		0.13	
					761.20	1.00	0.78	0.78	0.13	0.13
500 C					761.16	18.00	0.82		0.15	
					761.16	1.00	0.82	0.82	0.15	0.15

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.34 gm
PERCENT MOISTURE LOSS = 0.10 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.82 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.28 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 1.16 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.38 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1034
S & WEC SAMPLE DESIGNATION HOL 2465.0

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	450.38	294.31	744.69	294.19	744.57	48.00	0.12		0.04	
					744.57	1.00	0.12	0.12	0.04	0.04
110 C					744.07	18.00	0.62		0.17	
					744.07	1.00	0.62	0.62	0.17	0.17
175 C					743.52	18.00	1.17		0.36	
					743.52	1.00	1.17	1.17	0.36	0.36
250 C					743.32	18.00	1.37		0.42	
					743.31	1.00	1.38	1.38	0.43	0.43
325 C					742.89		1.80		0.57	

THERMAL FRACTURE AT 325 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	450.39	288.29	738.68	288.20	738.59	18.00	0.09		0.03	
					738.59	1.00	0.09	0.09	0.03	0.03
200 C					738.55	18.00	0.13		0.01	
					738.54	1.00	0.14	0.13	0.02	0.02
300 C					738.32	18.00	0.36		0.09	
					738.32	1.00	0.36	0.36	0.09	0.09
350 C					737.50	48.00	1.18		0.38	
					737.51	1.00	1.17	1.17	0.37	0.38
400 C					737.12	18.00	1.56		0.51	
					737.11	1.00	1.57	1.56	0.51	0.51
500 C					736.70	18.00	1.98		0.66	
					736.70	1.00	1.98	1.98	0.66	0.66

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 1.80 gm
PERCENT MOISTURE LOSS = 0.57 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 1.98 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.69 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 3.78 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 1.26 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1029
S & WEC SAMPLE DESIGNATION HOL 2505.9

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	450.34	268.87	719.21	268.81	719.15	18.00	0.06		0.02	
					719.14	1.00	0.07	0.07	0.03	0.02
110 C					719.03	18.00	0.18		0.04	
					719.03	1.00	0.18	0.18	0.04	0.04
175 C					718.98	18.00	0.23		0.06	
					718.97	1.00	0.24	0.24	0.07	0.07
250 C					718.92	48.00	0.29		0.09	
					718.91	1.00	0.30	0.30	0.09	0.09
325 C					718.52		0.69		0.23	

THERMAL FRACTURE AT 325 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	450.36	264.61	714.97	264.46	714.82	18.00	0.15		0.06	
					714.81	1.00	0.16	0.16	0.06	0.06
200 C					714.77	18.00	0.20		0.02	
					714.77	1.00	0.20	0.20	0.02	0.02
300 C					714.65	48.00	0.32		0.06	
					714.65	1.00	0.32	0.32	0.06	0.06
350 C					714.57	18.00	0.40		0.09	
					714.57	1.00	0.40	0.40	0.09	0.09
400 C					714.44	18.00	0.53		0.14	
					714.44	1.00	0.53	0.53	0.14	0.14
500 C					714.33	18.00	0.64		0.19	
					714.33	1.00	0.64	0.64	0.19	0.19

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.69 gm
PERCENT MOISTURE LOSS = 0.23 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.64 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.25 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 1.33 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.48 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1028
S & WEC SAMPLE DESIGNATION HOL 2576.1

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	442.74	267.04	709.78	267.01	709.75	18.00	0.03		0.01	
					709.75	1.00	0.03	0.03	0.01	0.01
110 C					709.61	18.00	0.17		0.05	
					709.61	1.00	0.17	0.17	0.05	0.05
175 C					709.36	18.00	0.42		0.15	
					709.36	1.00	0.42	0.42	0.15	0.15
250 C					709.22	18.00	0.56		0.20	

THERMAL FRACTURE AT 250 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	442.72	261.45	704.17	260.75	703.47	18.00	0.70		0.27	
					703.45	1.00	0.72	0.71	0.28	0.27
200 C					703.34	18.00	0.83		0.05	
					703.34	1.00	0.83	0.83	0.05	0.05
300 C					703.15	48.00	1.02		0.12	
					703.14	1.00	1.03	1.02	0.13	0.12
350 C					703.10	18.00	1.07		0.14	
					703.08	1.00	1.09	1.08	0.15	0.15
400 C					702.99	18.00	1.18		0.18	
					702.99	1.00	1.18	1.18	0.18	0.18
500 C					702.83	18.00	1.34		0.25	
					702.83	1.00	1.34	1.34	0.25	0.25

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.56 gm
PERCENT MOISTURE LOSS = 0.20 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 1.34 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.52 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 1.90 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.72 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1032
S & WEC SAMPLE DESIGNATION HOL 2601.2

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	454.93	288.97	743.90	288.95	743.88	48.00	0.02		0.01	
					743.88	1.00	0.02	0.02	0.01	0.01
110 C					743.84	18.00	0.06		0.01	
					743.84	1.00	0.06	0.06	0.01	0.01
175 C					743.76	18.00	0.14		0.04	
					743.75	1.00	0.15	0.14	0.04	0.04
250 C					743.66	18.00	0.24		0.08	
					743.66	1.00	0.24	0.24	0.08	0.08
325 C					742.45		1.45		0.49	

THERMAL FRACTURE AT 325 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	454.95	280.98	735.93	280.77	735.72	18.00	0.21		0.07	
					735.71	1.00	0.22	0.21	0.08	0.08
200 C					735.65	18.00	0.28		0.02	
					735.61	1.00	0.32	0.30	0.04	0.03
300 C					735.51	18.00	0.42		0.07	
					735.51	1.00	0.42	0.42	0.07	0.07
350 C					735.44	48.00	0.49		0.10	
					735.44	1.00	0.49	0.49	0.10	0.10
400 C					735.40	18.00	0.53		0.11	
					735.39	1.00	0.54	0.53	0.12	0.12
500 C					735.35	18.00	0.58		0.13	
					735.35	1.00	0.58	0.58	0.13	0.13

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 1.45 gm
PERCENT MOISTURE LOSS = 0.49 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.58 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.21 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 2.03 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.70 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1031
S & WEC SAMPLE DESIGNATION HOL 2648.1

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	454.87	326.91	781.78	326.89	781.76	18.00	0.02		0.01	
					781.75	1.00	0.03	0.02	0.01	0.01
110 C					781.59	18.00	0.19		0.05	
					781.59	1.00	0.19	0.19	0.05	0.05
175 C					781.52	18.00	0.26		0.07	
					781.49	1.00	0.29	0.27	0.08	0.08
250 C					781.42	48.00	0.36		0.10	
					781.42	1.00	0.36	0.36	0.10	0.10
300 C					780.14		1.64		0.50	

THERMAL FRACTURE AT 300 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	454.92	320.54	775.46	320.33	775.25	18.00	0.21		0.07	
					775.25	1.00	0.21	0.21	0.07	0.07
200 C					775.18	18.00	0.28		0.02	
					775.18	1.00	0.28	0.28	0.02	0.02
300 C					775.06	48.00	0.40		0.06	
					775.06	1.00	0.40	0.40	0.06	0.06
350 C					775.02	18.00	0.44		0.07	
					775.03	1.00	0.43	0.44	0.07	0.07
400 C					774.92	18.00	0.54		0.10	
					774.92	1.00	0.54	0.54	0.10	0.10
500 C					774.79	18.00	0.67		0.14	
					774.79	1.00	0.67	0.67	0.14	0.14

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 1.64 gm
PERCENT MOISTURE LOSS = 0.50 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.67 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.21 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 2.31 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.71 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1030
S & WEC SAMPLE DESIGNATION HOL 2839.5

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	459.70	277.87	737.57	277.87	737.57	18.00	0.00		0.00	
					737.57	1.00	0.00	0.00	0.00	0.00
110 C					737.49	18.00	0.08		0.03	
					737.49	1.00	0.08	0.08	0.03	0.03
175 C					737.41	18.00	0.16		0.06	
					737.41	1.00	0.16	0.16	0.06	0.06
250 C					737.36	48.00	0.21		0.08	
					737.36	1.00	0.21	0.21	0.08	0.08
325 C					736.60		0.97		0.35	

THERMAL FRACTURE AT 325 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	459.75	271.64	731.39	271.47	731.22	18.00	0.17		0.06	
					731.22	1.00	0.17	0.17	0.06	0.06
200 C					731.18	18.00	0.21		0.01	
					731.18	1.00	0.21	0.21	0.01	0.01
300 C					731.08	48.00	0.31		0.05	
					731.08	1.00	0.31	0.31	0.05	0.05
350 C					731.02	18.00	0.37		0.07	
					731.02	1.00	0.37	0.37	0.07	0.07
400 C					730.94	18.00	0.45		0.10	
					730.94	1.00	0.45	0.45	0.10	0.10
500 C					730.89	18.00	0.50		0.12	
					730.89	1.00	0.50	0.50	0.12	0.12

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.97 gm
PERCENT MOISTURE LOSS = 0.35 %

(2) MOISTURE CONTENT ANAL[illegible]S
TOTAL MOISTURE LOSS = 0.50 gm
PERCENT MOISTURE LOSS [illegible](1)+I(6)) = 0.18 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 1.47 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.53 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1021
S & WES SAMPLE DESIGNATION JFR 1369.5

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	442.76	236.09	678.85	235.30	678.06	18.00	0.79		0.33	
					677.98	1.00	0.87	0.83	0.37	0.35
110 C					675.09	48.00	3.76		1.26	
					675.09	1.00	3.76	3.76	1.26	1.26
175 C					674.74	18.00	4.11		1.41	
					674.74	1.00	4.11	4.11	1.41	1.41
250 C					674.47	18.00	4.38		1.53	
					674.45	1.00	4.40	4.39	1.53	1.53
350 C					674.25	18.00	4.60		1.62	
					674.19	1.00	4.66	4.63	1.64	1.63
400 C					673.80	18.00	5.05		1.81	
					673.77	1.00	5.08	5.07	1.82	1.82
500 C					671.45	48.00	7.40		2.81	
					671.44	1.00	7.41	7.40	2.81	2.81

THERMAL FRACTURING DID NOT OCCUR.

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	442.75	223.73	666.48	223.79	666.54	18.00	-0.06		-0.03	
					666.54	1.00	-0.06	-0.06	-0.03	-0.03
200 C					666.44	18.00	0.04		0.04	
					666.43	1.00	0.05	0.05	0.05	0.05
300 C					666.36	48.00	0.12		0.08	
					666.36	1.00	0.12	0.12	0.08	0.08
350 C					666.32	18.00	0.16		0.10	
					666.32	1.00	0.16	0.16	0.10	0.10
400 C					666.13	18.00	0.35		0.18	
					666.14	1.00	0.34	0.35	0.18	0.18
500 C					665.58	18.00	0.90		0.43	
					665.57	1.00	0.91	0.90	0.43	0.43

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 7.41 gm
PERCENT MOISTURE LOSS = 2.81 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.90 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.40 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 8.31 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 3.21 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1022
S & WEC SAMPLE DESIGNATION JFR 1375.9

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	450.32	296.46	746.78	296.42	746.74	18.00	0.04		0.01	
					746.75	1.00	0.03	0.03	0.01	0.01
110 C					746.60	48.00	0.18		0.05	
					746.60	1.00	0.18	0.18	0.05	0.05
175 C					746.60	18.00	0.18		0.05	
					746.59	1.00	0.19	0.18	0.05	0.05
250 C					746.56	18.00	0.22		0.06	
					746.53	1.00	0.25	0.24	0.07	0.07
300 C					745.76		1.02		0.33	

THERMAL FRACTURE AT 300 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	450.30	290.17	740.47	289.85	740.15	18.00	0.32		0.11	
					740.15	1.00	0.32	0.32	0.11	0.11
200 C					740.15	18.00	0.32		0.00	
					740.15	1.00	0.32	0.32	0.00	0.00
300 C					740.09	48.00	0.38		0.02	
					740.09	1.00	0.38	0.38	0.02	0.02
350 C					739.89	18.00	0.58		0.09	
					739.88	1.00	0.59	0.59	0.09	0.09
400 C					739.85	18.00	0.62		0.10	
					739.85	1.00	0.62	0.62	0.10	0.10
500 C					739.80	18.00	0.67		0.12	
					739.80	1.00	0.67	0.67	0.12	0.12

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 1.02 gm
PERCENT MOISTURE LOSS = 0.33 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.67 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.23 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 1.69 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.56 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1023
S & WEC SAMPLE DESIGNATION JFR 1405.6

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	454.87	212.64	667.51	212.35	667.22	18.00	0.29		0.14	
					667.20	1.00	0.31	0.30	0.15	0.14
110 C					663.49	48.00	4.02		1.76	
					663.48	1.00	4.03	4.02	1.76	1.76
175 C					662.88	18.00	4.63		2.04	
					662.88	1.00	4.63	4.63	2.04	2.04
250 C					662.23	18.00	5.28		2.35	
					662.22	1.00	5.29	5.28	2.35	2.35
275 C					662.07		5.44		2.43	

THERMAL FRACTURE AT 275 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	454.89	205.68	660.57	205.11	660.00	18.00	0.57		0.28	
					660.01	1.00	0.56	0.57	0.27	0.27
200 C					659.87	18.00	0.70		0.06	
					659.87	1.00	0.70	0.70	0.06	0.06
300 C					659.28	48.00	1.29		0.35	
					659.27	1.00	1.30	1.30	0.36	0.35
350 C					657.72	18.00	2.85		1.11	
					657.72	1.00	2.85	2.85	1.11	1.11
400 C					655.53	18.00	5.04		2.18	
					655.52	1.00	5.05	5.05	2.18	2.18
500 C					654.19	18.00	6.38		2.83	
					654.19	1.00	6.38	6.38	2.83	2.83

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 5.44 gm
PERCENT MOISTURE LOSS = 2.43 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 6.38 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 3.10 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 11.82 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 5.53 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1024
S & WEC SAMPLE DESIGNATION JFR 1458.4

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	442.75	240.70	683.45	240.00	682.75	18.00	0.70		0.29	
					682.72	1.00	0.73	0.72	0.30	0.30
110 C					680.32	18.00	3.13		1.01	
					682.31	1.00	1.14	2.14	0.18	0.60
175 C					679.42	18.00	4.03		1.39	
					679.42	1.00	4.03	4.03	1.39	1.39
250 C					679.03	18.00	4.42		1.55	
					679.03	1.00	4.42	4.42	1.55	1.55
300 C					678.97		4.48		1.57	

THERMAL FRACTURE AT 300 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	442.74	232.07	674.81	231.88	674.62	18.00	0.19		0.08	
					674.62	1.00	0.19	0.19	0.08	0.08
200 C					674.40	48.00	0.41		0.09	
					674.40	1.00	0.41	0.41	0.09	0.09
300 C					674.17	18.00	0.64		0.19	
					674.17	1.00	0.64	0.64	0.19	0.19
350 C					672.63	18.00	2.18		0.86	
					672.62	1.00	2.19	2.18	0.86	0.86
400 C					671.66	18.00	3.15		1.28	
					671.65	1.00	3.16	3.15	1.28	1.28
500 C					670.87	48.00	3.94		1.62	
					670.87	1.00	3.94	3.94	1.62	1.62

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 4.48 gm
PERCENT MOISTURE LOSS = 1.57 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 3.94 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 1.70 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 8.42 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 3.27 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1015
B & WEC SAMPLE DESIGNATION JFR EVAP.2

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	459.59	259.34	718.93	259.33	718.92	48.00	0.01		.00	
					718.90	1.00	0.03	0.02	0.01	0.01
110 C					718.87	18.00	0.06		0.02	
					718.87	1.00	0.06	0.06	0.02	0.02
175 C					718.84	18.00	0.09		0.03	
					718.84	1.00	0.09	0.09	0.03	0.03
250 C					718.81	18.00	0.12		0.04	
					718.81	1.00	0.12	0.12	0.04	0.04
350 C					718.11		0.82		0.31	

THERMAL FRACTURE AT 350 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	459.57	252.13	711.70	252.01	711.58	48.00	0.12		0.05	
					711.58	1.00	0.12	0.12	0.05	0.05
200 C					711.57	18.00	0.13		.00	
					711.57	1.00	0.13	0.13	.00	.00
300 C					711.54	18.00	0.16		0.02	
					711.53	1.00	0.17	0.17	0.02	0.02
350 C					711.51	18.00	0.19		0.03	
					711.51	1.00	0.19	0.19	0.03	0.03
400 C					711.49	18.00	0.21		0.04	
					711.48	1.00	0.22	0.22	0.04	0.04
500 C					711.48	48.00	0.22		0.04	
					711.47	1.00	0.23	0.23	0.04	0.04

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.82 gm
PERCENT MOISTURE LOSS = 0.31 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.23 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.09 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 1.05 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.40 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1016
S & WEC SAMPLE DESIGNATION JFR 2033.6

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	454.87	283.90	738.77	283.89	738.76	18.00	0.01		.00	
					738.75	1.00	0.02	0.01	0.01	0.01
110 C					738.58	18.00	0.09		0.03	
					738.68	1.00	0.09	0.09	0.03	0.03
175 C					738.61	18.00	0.16		0.05	
					738.60	1.00	0.17	0.16	0.06	0.05
250 C					738.53	18.00	0.24		0.08	
					738.53	1.00	0.24	0.24	0.08	0.08
350 C					738.52	48.00	0.25		0.08	
					738.52	1.00	0.25	0.25	0.08	0.08
375 C					738.16		0.61		0.21	

THERMAL FRACTURE AT 375 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	454.89	276.97	731.86	276.86	731.75	18.00	0.11		0.04	
					731.74	1.00	0.12	0.12	0.04	0.04
200 C					731.71	18.00	0.15		0.01	
					731.71	1.00	0.15	0.15	0.01	0.01
300 C					731.65	18.00	0.21		0.04	
					731.65	1.00	0.21	0.21	0.04	0.04
350 C					731.50	48.00	0.36		0.09	
					731.50	1.00	0.36	0.36	0.09	0.09
400 C					731.46	18.00	0.40		0.10	
					731.44	1.00	0.42	0.41	0.11	0.11
500 C					731.34	18.00	0.52		0.15	
					731.33	1.00	0.53	0.52	0.15	0.15

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.61 gm
PERCENT MOISTURE LOSS = 0.21 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.52 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.19 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 1.13 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.40 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1013
S & W/EC SAMPLE DESIGNATION: JFR 2054.0

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	450.21	276.78	726.99	276.76	726.97	48.00	0.02		0.01	
					726.97	1.00	0.02	0.02	0.01	0.01
110 C					726.84	18.00	0.15		0.05	
					726.83	1.00	0.16	0.15	0.05	0.05
175 C					726.71	18.00	0.28		0.09	
					726.71	1.00	0.28	0.28	0.09	0.09
250 C					726.57	18.00	0.42		0.14	
					726.57	1.00	0.42	0.42	0.14	0.14
275 C					726.23		0.76		0.27	

THERMAL FRACTURE AT 275 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	450.21	270.23	720.44	269.91	720.12	48.00	0.32		0.12	
					720.12	1.00	0.32	0.32	0.12	0.12
200 C					720.07	18.00	0.37		0.02	
					720.05	1.00	0.39	0.38	0.03	0.02
300 C					719.98	18.00	0.46		0.05	
					719.98	1.00	0.46	0.46	0.05	0.05
350 C					719.90	18.00	0.54		0.08	
					719.90	1.00	0.54	0.54	0.08	0.08
400 C					719.85	18.00	0.59		0.10	
					719.83	1.00	0.61	0.60	0.11	0.10
500 C					719.82	48.00	0.62		0.11	
					719.80	1.00	0.64	0.63	0.12	0.11

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.76 gm
PERCENT MOISTURE LOSS = 0.27 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.63 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.23 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 1.39 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.50 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1014
S & WEC SAMPLE DESIGNATION JFR 241'.7

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	442.70	283.38	726.08	283.33	726.03	48.00	0.05		0.02	
					726.03	1.00	0.05	0.05	0.02	0.02
110 C					725.91	18.00	0.17		0.04	
					725.90	1.00	0.18	0.18	0.05	0.04
175 C					725.75	18.00	0.33		0.10	
					725.74	1.00	0.34	0.34	0.10	0.10
250 C					725.48	18.00	0.60		0.19	

THERMAL FRACTURE AT 250 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	442.70	275.28	717.98	274.89	717.59	48.00	0.39		0.14	
					717.59	1.00	0.39	0.39	0.14	0.14
200 C					717.52	18.00	0.46		0.03	
					717.51	1.00	0.47	0.47	0.03	0.03
300 C					717.42	18.00	0.56		0.06	
					717.42	1.00	0.56	0.56	0.06	0.06
350 C					717.34	18.00	0.64		0.09	
					717.34	1.00	0.64	0.64	0.09	0.09
400 C					717.26	18.00	0.72		0.12	
					717.26	1.00	0.72	0.72	0.12	0.12
500 C					717.19	48.00	0.79		0.15	
					717.19	1.00	0.79	0.79	0.15	0.15

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.60 gm
PERCENT MOISTURE LOSS = 0.19 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.79 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.29 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 1.39 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.48 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1019
S & WEC SAMPLE DESIGNATION JFR 245A.6

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	459.60	312.69	772.29	312.69	772.29	18.00	0.00		0.00	
					772.28	1.00	0.01	.00	.00	.00
110 C					772.19	18.00	0.10		0.03	
					772.19	1.00	0.10	0.10	0.03	0.03
175 C					772.09	18.00	0.20		0.06	
					772.09	1.00	0.20	0.20	0.06	0.06
250 C					772.06	48.00	0.23		0.07	
					772.02	1.00	0.27	0.25	0.09	0.08
275 C					772.02		0.27		0.09	

THERMAL FRACTURE AT 275 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	459.64	305.12	764.76	304.79	764.43	18.00	0.33		0.11	
					764.43	1.00	0.33	0.33	0.11	0.11
200 C					764.37	18.00	0.39		0.02	
					764.37	1.00	0.39	0.39	0.02	0.02
300 C					764.30	18.00	0.46		0.04	
					764.30	1.00	0.46	0.46	0.04	0.04
350 C					764.12	48.00	0.64		0.10	
					764.12	1.00	0.64	0.64	0.10	0.10
400 C					764.05	18.00	0.71		0.12	
					764.05	1.00	0.71	0.71	0.12	0.12
500 C					763.94	18.00	0.82		0.16	
					763.93	1.00	0.83	0.82	0.16	0.16

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.27 gm
PERCENT MOISTURE LOSS = 0.09 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.82 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.27 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 1.09 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.36 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1020
S & WEC SAMPLE DESIGNATION JFR 2589.3

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	459.65	334.42	794.07	334.37	794.02	48.00	0.05		0.01	
					794.01	1.00	0.06	0.06	0.02	0.02
110 C					793.87	18.00	0.20		0.04	
					793.87	1.00	0.20	0.20	0.04	0.04
175 C					793.83	18.00	0.24		0.06	
					793.83	1.00	0.24	0.24	0.06	0.06
250 C					793.70	18.00	0.37		0.10	
					793.67	1.00	0.40	0.39	0.10	0.10
325 C					792.80		1.27		0.36	

THERMAL FRACTURE AT 325 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	459.72	327.42	787.14	326.84	786.56	48.00	0.58		0.18	
					786.56	1.00	0.58	0.58	0.18	0.18
200 C					786.55	18.00	0.59		.00	
					786.54	1.00	0.60	0.60	0.01	.00
300 C					786.41	18.00	0.73		0.05	
					786.41	1.00	0.73	0.73	0.05	0.05
350 C					783.38	18.00	3.76		0.97	
					786.38	1.00	0.76	2.26	0.06	0.51
400 C					786.21	18.00	0.93		0.11	
					786.20	1.00	0.94	0.93	0.11	0.11
500 C					786.19	48.00	0.95		0.11	
					786.18	1.00	0.96	0.95	0.12	0.11

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 1.27 gm
PERCENT MOISTURE LOSS = 0.36 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.95 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.29 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 2.22 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.65 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1017
S & WEC SAMPLE DESIGNATION JFR 2598.1

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
30 C	450.29	312.18	762.47	312.10	762.39	18.00	0.08		0.03	
					762.40	1.00	0.07	0.08	0.02	0.02
110 C					761.93	18.00	0.54		0.15	
					761.93	1.00	0.54	0.54	0.15	0.15
175 C					761.44	18.00	1.03		0.30	
					761.44	1.00	1.03	1.03	0.30	0.30
250 C					761.26	18.00	1.21		0.36	
					761.24	1.00	1.23	1.22	0.37	0.37
350 C					760.33		2.14		0.66	

THERMAL FRACTURE AT 350 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	450.33	304.35	754.68	304.22	754.55	18.00	0.13		0.04	
					754.54	1.00	0.14	0.13	0.05	0.04
200 C					754.47	18.00	0.21		0.03	
					754.47	1.00	0.21	0.21	0.03	0.03
300 C					754.35	18.00	0.33		0.07	
					754.35	1.00	0.33	0.33	0.07	0.07
350 C					753.97	48.00	0.71		0.19	
					753.97	1.00	0.71	0.71	0.19	0.19
400 C					753.73	18.00	0.95		0.27	
					753.72	1.00	0.96	0.95	0.27	0.27
500 C					753.42	18.00	1.26		0.37	
					753.41	1.00	1.27	1.26	0.37	0.37

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 2.14 gm
PERCENT MOISTURE LOSS = 0.66 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 1.26 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.41 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 3.40 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 1.07 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1018
S & WEC SAMPLE DESIGNATION JFR 2652.1

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	442.72	288.37	731.09	288.34	731.06	18.00	0.03		0.01	
					731.06	1.00	0.03	0.03	0.01	0.01
110 C					730.90	18.00	0.19		0.06	
					730.90	1.00	0.19	0.19	0.06	0.06
175 C					730.81	18.00	0.28		0.09	
					730.80	1.00	0.29	0.29	0.09	0.09
250 C					730.61	18.00	0.48		0.16	

THERMAL FRACTURE AT 250 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	442.77	281.17	723.94	280.89	723.66	18.00	0.28		0.10	
					723.66	1.00	0.28	0.28	0.10	0.10
200 C					723.58	18.00	0.36		0.03	
					723.58	1.00	0.36	0.36	0.03	0.03
300 C					723.48	18.00	0.46		0.06	
					723.48	1.00	0.46	0.46	0.06	0.06
350 C					723.38	18.00	0.56		0.10	
					723.38	1.00	0.56	0.56	0.10	0.10
400 C					723.34	48.00	0.60		0.11	
					723.34	1.00	0.60	0.60	0.11	0.11
500 C					723.29	18.00	0.65		0.13	
					723.27	1.00	0.67	0.66	0.14	0.14

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.48 gm
PERCENT MOISTURE LOSS = 0.16 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.66 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.24 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 1.14 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.40 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1003
S & WEC SAMPLE DESIGNATION TEST 1.0 A

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	1175.41	304.70	1480.11	304.50	1479.91	18.00	0.20		0.07	
					1479.90	1.00	0.21	0.20	0.07	0.07
110 C					1477.63	18.00	2.48		0.75	
					1477.60	1.00	2.51	2.49	0.76	0.75
175 C					1475.84	18.00	4.27		1.34	
					1475.81	1.00	4.30	4.28	1.35	1.34
250 C					1475.55	18.00	4.56		1.43	
					1475.55	1.00	4.56	4.56	1.43	1.43
350 C					1473.81	36.00	6.30		2.00	
					1473.81	1.00	6.30	6.30	2.00	2.00
400 C					1469.58	18.00	10.53		3.39	
					1469.53	1.00	10.58	10.55	3.41	3.40
500 C					1466.39	48.00	13.72		4.44	
					1466.38	1.00	13.73	13.72	4.44	4.44

THERMAL FRACTURING OF SAMPLE DID NOT OCCUR.

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	442.78	285.14	727.92	284.37	727.15	48.00	0.77		0.27	
					727.15	1.00	0.77	0.77	0.27	0.27
200 C					727.01	18.00	0.91		0.05	
					727.00	1.00	0.92	0.91	0.05	0.05
300 C					726.90	18.00	1.02		0.09	
					726.89	1.00	1.03	1.02	0.09	0.09
350 C					726.86	18.00	1.06		0.10	
					726.86	1.00	1.06	1.06	0.10	0.10
400 C					726.79	18.00	1.13		0.13	
					726.79	1.00	1.13	1.13	0.13	0.13
500 C					726.44	48.00	1.48		0.25	
					726.44	1.00	1.48	1.48	0.25	0.25

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 13.72 gm
PERCENT MOISTURE LOSS = 4.44 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 1.48 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.52 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 15.20 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 4.96 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1006
S & WEC SAMPLE DESIGNATION ZEE 2040.8

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	455.03	332.34	787.37	332.31	787.34	18.00	0.03		0.01	
					787.32	1.00	0.05	0.04	0.02	0.01
110 C					787.16	18.00	0.21		0.05	
					787.15	1.00	0.22	0.22	0.06	0.06
175 C					786.97	18.00	0.40		0.11	
					786.96	1.00	0.41	0.40	0.11	0.11
250 C					786.82	48.00	0.55		0.16	
					786.81	1.00	0.56	0.56	0.16	0.16
325 C					786.20		1.17		0.34	

THERMAL FRACTURE AT 325 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	455.02	325.69	780.71	325.48	780.50	18.00	0.21		0.06	
					780.51	1.00	0.20	0.21	0.06	0.06
200 C					780.50	48.00	0.21		0.00	
					780.50	1.00	0.21	0.21	0.00	0.00
300 C					780.39	18.00	0.32		0.03	
					780.34	1.00	0.37	0.35	0.05	0.04
350 C					780.30	18.00	0.41		0.06	
					780.27	1.00	0.44	0.43	0.07	0.07
400 C					780.07	18.00	0.64		0.13	
					780.07	1.00	0.64	0.64	0.13	0.13
500 C					779.90	18.00	0.81		0.18	
					779.91	1.00	0.80	0.81	0.18	0.18

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 1.17 gm
PERCENT MOISTURE LOSS = 0.34 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.81 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.24 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 1.98 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.58 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1007
S & WEC SAMPLE DESIGNATION ZES 212V.5

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	443.09	307.30	750.39	307.29	750.38	18.00	0.01		.00	
					750.38	1.00	0.01	0.01	.00	.00
110 C					750.27	18.00	0.12		0.04	
					750.26	1.00	0.13	0.13	0.04	0.04
175 C					750.17	18.00	0.22		0.07	
					750.17	1.00	0.22	0.22	0.07	0.07
250 C					750.01	48.00	0.38		0.12	
					750.01	1.00	0.38	0.38	0.12	0.12
325 C					749.71		0.68		0.22	

THERMAL FRACTURE AT 325 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	459.74	299.45	759.19	299.30	759.04	18.00	0.15		0.05	
					759.04	1.00	0.15	0.15	0.05	0.05
200 C					758.97	48.00	0.22		0.02	
					758.97	1.00	0.22	0.22	0.02	0.02
300 C					758.92	18.00	0.27		0.04	
					758.90	1.00	0.29	0.28	0.05	0.04
350 C					758.87	18.00	0.32		0.06	
					758.85	1.00	0.34	0.33	0.06	0.06
400 C					758.77	18.00	0.42		0.09	
					758.76	1.00	0.43	0.43	0.09	0.09
500 C					758.69	18.00	0.50		0.12	
					758.68	1.00	0.51	0.51	0.12	0.12

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.68 gm
PERCENT MOISTURE LOSS = 0.22 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.51 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.17 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 1.19 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.39 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1001
S & WEC SAMPLE DESIGNATION ZEE 2131.6

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
30 C	1177.70	267.90	1445.60	267.85	1445.55	18.00	0.05		0.02	
					1445.56	1.00	0.04	0.04	0.01	0.02
110 C					1445.51	18.00	0.09		0.01	
					1445.51	1.00	0.09	0.09	0.01	0.01
175 C					1445.41	18.00	0.19		0.05	
					1445.40	1.00	0.20	0.19	0.06	0.05
250 C					1445.27	18.00	0.33		0.10	
					1445.27	1.00	0.33	0.33	0.10	0.10
350 C					1444.81		0.79		0.28	

THERMAL FRACTURE AT 350 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	121.63	254.39	376.02	254.22	375.85	48.00	0.17		0.07	
					375.85	1.00	0.17	0.17	0.07	0.07
200 C					375.82	18.00	0.20		0.01	
					375.82	1.00	0.20	0.20	0.01	0.01
300 C					375.78	18.00	0.24		0.03	
					375.78	1.00	0.24	0.24	0.03	0.03
350 C					375.74	18.00	0.28		0.04	
					375.73	1.00	0.29	0.28	0.05	0.05
400 C					375.65	18.00	0.37		0.08	
					375.65	1.00	0.37	0.37	0.08	0.08
500 C					375.49	48.00	0.53		0.14	
					375.49	1.00	0.53	0.53	0.14	0.14

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.79 gm
PERCENT MOISTURE LOSS = 0.28 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.53 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.21 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 1.32 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.49 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1002
S & WEC SAMPLE DESIGNATION ZEE 2246.5

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	1192.43	265.87	1458.30	265.85	1458.28	18.00	0.02		0.01	
					1458.28	1.00	0.02	0.02	0.01	0.01
110 C					1458.24	18.00	0.06		0.02	
					1458.21	1.00	0.09	0.07	0.03	0.02
175 C					1458.16	18.00	0.14		0.05	
					1458.12	1.00	0.18	0.16	0.06	0.05
250 C					1458.09	18.00	0.21		0.07	
					1458.09	1.00	0.21	0.21	0.07	0.07
325 C					1457.64		0.66		0.24	

THERMAL FRACTURE AT 325 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	139.44	258.28	397.72	258.03	397.47	48.00	0.25		0.10	
					397.47	1.00	0.25	0.25	0.10	0.10
200 C					397.43	18.00	0.29		0.02	
					397.43	1.00	0.29	0.29	0.02	0.02
300 C					397.36	18.00	0.36		0.04	
					397.36	1.00	0.36	0.36	0.04	0.04
350 C					397.29	18.00	0.43		0.07	
					397.28	1.00	0.44	0.44	0.07	0.07
400 C					397.20	18.00	0.52		0.10	
					397.20	1.00	0.52	0.52	0.10	0.10
500 C					397.13	48.00	0.59		0.13	
					397.11	1.00	0.61	0.60	0.14	0.14

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.66 gm
PERCENT MOISTURE LOSS = 0.24 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.60 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.24 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 1.26 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.48 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1004
S & WEC SAMPLE DESIGNATION ZEE 2416.1

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	450.41	292.87	743.28	292.74	743.15	18.00	0.13		0.04	
					743.15	1.00	0.13	0.13	0.04	0.04
110 C					741.88	18.00	1.40		0.43	
					741.86	1.00	1.42	1.41	0.44	0.44
175 C					741.24	18.00	2.04		0.65	
					741.24	1.00	2.04	2.04	0.65	0.65
250 C					740.95	48.00	2.33		0.75	
					740.93	1.00	2.35	2.34	0.76	0.75
300 C					740.31		2.97		0.97	

THERMAL FRACTURE AT 300 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	450.34	282.94	733.28	282.82	733.16	18.00	0.12		0.04	
					733.16	1.00	0.12	0.12	0.04	0.04
200 C					733.10	48.00	0.18		0.02	
					733.09	1.00	0.19	0.18	0.02	0.02
300 C					732.86	18.00	0.42		0.11	
					732.84	1.00	0.44	0.43	0.11	0.11
350 C					732.53	18.00	0.75		0.22	
					732.52	1.00	0.76	0.75	0.23	0.22
400 C					731.95	18.00	1.33		0.43	
					731.96	1.00	1.32	1.32	0.42	0.43
500 C					731.38	18.00	1.90		0.63	
					731.38	1.00	1.90	1.90	0.63	0.63

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 2.97 gm
PERCENT MOISTURE LOSS = 0.97 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 1.90 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.67 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 4.87 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 1.64 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1005
S & WEC SAMPLE DESIGNATION ZEE 2422.2

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	- PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	459.77	328.18	787.95	328.12	787.89	18.00	0.06		0.02	
					787.89	1.00	0.06	0.06	0.02	0.02
110 C					787.84	18.00	0.11		0.02	
					787.85	1.00	0.10	0.11	0.01	0.01
175 C					787.79	18.00	0.16		0.03	
					787.79	1.00	0.16	0.16	0.03	0.03
250 C					787.67	48.00	0.28		0.07	
					787.64	1.00	0.31	0.30	0.08	0.07
300 C					787.41		0.54		0.15	

THERMAL FRACTURE AT 300 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	443.09	321.68	764.77	321.48	764.57	18.00	0.20		0.06	
					764.56	1.00	0.21	0.20	0.07	0.06
200 C					764.56	48.00	0.21		.00	
					764.55	1.00	0.22	0.22	0.01	.00
300 C					764.45	18.00	0.32		0.04	
					764.45	1.00	0.32	0.32	0.04	0.04
350 C					764.45	18.00	0.32		0.04	
					764.44	1.00	0.33	0.32	0.04	0.04
400 C					764.40	18.00	0.37		0.05	
					764.40	1.00	0.37	0.37	0.05	0.05
500 C					764.40	18.00	0.37		0.05	
					764.40	1.00	0.37	0.37	0.05	0.05

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.54 gm
PERCENT MOISTURE LOSS = 0.15 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.37 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.11 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 0.91 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.26 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1008
S & WEC SAMPLE DESIGNATION ZEE 2646.9

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	450.35	316.66	767.01	316.65	767.00	18.00	0.01		.00	
					766.99	1.00	0.02	0.01	0.01	.00
110 C					766.83	18.00	0.18		0.05	
					766.83	1.00	0.18	0.18	0.05	0.05
175 C					766.81	18.00	0.20		0.06	
					766.80	1.00	0.21	0.21	0.06	0.06
250 C					766.69	48.00	0.32		0.10	
					766.69	1.00	0.32	0.32	0.10	0.10
350 C					766.27		0.74		0.23	

THERMAL FRACTURE AT 350 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	450.38	308.90	759.28	308.70	759.08	18.00	0.20		0.06	
					759.08	1.00	0.20	0.20	0.06	0.06
200 C					759.07	48.00	0.21		.00	
					759.06	1.00	0.22	0.21	0.01	.00
300 C					758.98	18.00	0.30		0.03	
					758.98	1.00	0.30	0.30	0.03	0.03
350 C					758.94	18.00	0.34		0.05	
					758.93	1.00	0.35	0.34	0.05	0.05
400 C					758.83	18.00	0.45		0.08	
					758.83	1.00	0.45	0.45	0.08	0.08
500 C					758.68	18.00	0.60		0.13	
					758.68	1.00	0.60	0.60	0.13	0.13

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.74 gm
PERCENT MOISTURE LOSS = 0.23 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.60 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.19 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 1.34 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.42 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1009
S & WEC SAMPLE DESIGNATION ZEE 2651.9

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
30 C	454.97	305.01	759.98	304.98	759.95	18.00	0.03		0.01	
					759.95	1.00	0.03	0.03	0.01	0.01
110 C					759.90	18.00	0.08		0.02	
					759.91	1.00	0.07	0.08	0.01	0.01
175 C					759.90	18.00	0.08		0.02	
					759.90	1.00	0.08	0.08	0.02	0.02
250 C					759.86	18.00	0.12		0.03	
					759.85	1.00	0.13	0.13	0.03	0.03
325 C					759.50		0.48		0.15	

THERMAL FRACTURE AT 325 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	454.96	297.84	752.80	297.69	752.65	48.00	0.15		0.05	
					752.63	1.00	0.17	0.16	0.06	0.05
200 C					752.62	18.00	0.18		0.01	
					752.62	1.00	0.18	0.18	0.01	0.01
300 C					752.55	18.00	0.25		0.03	
					752.55	1.00	0.25	0.25	0.03	0.03
350 C					752.51	18.00	0.29		0.05	
					752.52	1.00	0.28	0.28	0.04	0.05
400 C					752.50	18.00	0.30		0.05	
					752.49	1.00	0.31	0.30	0.05	0.05
500 C					752.50	48.00	0.30		0.05	
					752.50	1.00	0.30	0.30	0.05	0.05

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.48 gm
PERCENT MOISTURE LOSS = 0.15 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.30 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.10 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 0.78 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.25 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1010
S & WEC SAMPLE DESIGNATION ZEE 2630.5

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	459.74	270.82	730.56	270.80	730.54	18.00	0.02		0.01	
					730.51	1.00	0.05	0.03	0.02	0.01
110 C					730.32	18.00	0.24		0.08	
					730.32	1.00	0.24	0.24	0.08	0.08
175 C					730.27	18.00	0.29		0.10	
					730.27	1.00	0.29	0.29	0.10	0.10
250 C					730.21	18.00	0.35		0.12	

THERMAL FRACTURE AT 250 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	459.80	255.00	714.80	254.73	714.53	18.00	0.27		0.11	
					714.53	1.00	0.27	0.27	0.11	0.11
200 C					714.49	18.00	0.31		0.02	
					714.49	1.00	0.31	0.31	0.02	0.02
300 C					714.35	48.00	0.45		0.07	
					714.35	1.00	0.45	0.45	0.07	0.07
350 C					714.24	18.00	0.56		0.11	
					714.24	1.00	0.56	0.56	0.11	0.11
400 C					714.14	18.00	0.66		0.15	
					714.13	1.00	0.67	0.66	0.16	0.16
500 C					714.14	18.00	0.66		0.15	
					714.12	1.00	0.68	0.67	0.16	0.16

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.35 gm
PERCENT MOISTURE LOSS = 0.12 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.67 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.27 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 1.02 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.39 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1011
S & WEC SAMPLE DESIGNATION ZEE 2746.5

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	442.99	320.59	763.58	320.59	763.58	18.00	0.00		0.00	
					763.57	1.00	0.01	.00	.00	.00
110 C					763.45	18.00	0.13		0.04	
					763.44	1.00	0.14	0.13	0.04	0.04
175 C					763.36	18.00	0.22		0.07	
					763.37	1.00	0.21	0.22	0.07	0.07
250 C					763.22	48.00	0.36		0.11	
					763.21	1.00	0.37	0.37	0.12	0.11
300 C					762.98		0.60		0.19	

THERMAL FRACTURE AT 300 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	442.99	314.11	757.10	313.73	756.72	18.00	0.38		0.12	
					756.71	1.00	0.39	0.38	0.12	0.12
200 C					756.59	18.00	0.51		0.04	
					756.59	1.00	0.51	0.51	0.04	0.04
300 C					756.45	48.00	0.65		0.09	
					756.46	1.00	0.64	0.64	0.08	0.08
350 C					756.41	18.00	0.69		0.10	
					756.41	1.00	0.69	0.69	0.10	0.10
400 C					756.32	18.00	0.78		0.13	
					756.32	1.00	0.78	0.78	0.13	0.13
500 C					756.24	18.00	0.86		0.15	
					756.24	1.00	0.86	0.86	0.15	0.15

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.60 gm
PERCENT MOISTURE LOSS = 0.19 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.86 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.27 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 1.46 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.46 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

SAMPLE NUMBER A-1012
WEC SAMPLE DESIGNATION ZEE 2843.8

THERMAL FRACTURE ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B INITIAL SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 30 C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE	I AVERAGE PERCENT MOISTURE
30 C	454.79	316.47	771.26	316.47	771.26	48.00	0.00		0.00	
					771.26	1.00	0.00	0.00	0.00	0.00
110 C					771.20	18.00	0.06		0.02	
					771.18	1.00	0.08	0.07	0.03	0.02
175 C					771.13	18.00	0.13		0.04	
					771.13	1.00	0.13	0.13	0.04	0.04
250 C					771.07	18.00	0.19		0.06	
					771.07	1.00	0.19	0.19	0.06	0.06
325 C					770.61		0.65		0.21	

THERMAL FRACTURE AT 325 C

MOISTURE CONTENT ANALYSIS

TEMPERATURE	A CRUCIBLE WT (gm)	B SAMPLE WT (gm)	C CRUCIBLE + SAMPLE WT (gm)	D SAMPLE WEIGHT 110C (gm)	E FINAL WT (gm)	HEATING TIME (HRS)	F MOISTURE LOSS (gm)	G AVERAGE MOISTURE LOSS (gm)	H PERCENT MOISTURE LOSS	I AVERAGE PERCENT MOISTURE
110 C	454.80	310.45	765.25	310.15	764.95	48.00	0.30		0.10	
					764.95	1.00	0.30	0.30	0.10	0.10
200 C					764.89	18.00	0.36		0.02	
					764.89	1.00	0.36	0.36	0.02	0.02
300 C					764.81	18.00	0.44		0.05	
					764.80	1.00	0.45	0.45	0.05	0.05
350 C					764.78	18.00	0.47		0.05	
					764.78	1.00	0.47	0.47	0.05	0.05
400 C					764.78	18.00	0.47		0.05	
					764.78	1.00	0.47	0.47	0.05	0.05
500 C					764.78	48.00	0.47		0.05	
					764.78	1.00	0.47	0.47	0.05	0.05

(1) THERMAL FRACTURE ANALYSIS
TOTAL MOISTURE LOSS = 0.65 gm
PERCENT MOISTURE LOSS = 0.21 %

(2) MOISTURE CONTENT ANALYSIS
TOTAL MOISTURE LOSS = 0.47 gm
PERCENT MOISTURE LOSS (I(1)+I(6)) = 0.15 %

TOTAL MOISTURE LOSS FROM THE SAMPLE
TOTAL MOISTURE LOSS (1)+(2) = 1.12 gm
TOTAL PERCENT MOISTURE LOSS (1)+(2) = 0.36 %

EQUATIONS

B = C - A
C = A + B
D = E - A
F = C - D
G = (F(1) + F(2))/2
H = (1 - (E - A)/D)*100
I = (H(1) + H(2))/2

APPENDIX D

SIEVE ANALYSIS DATA

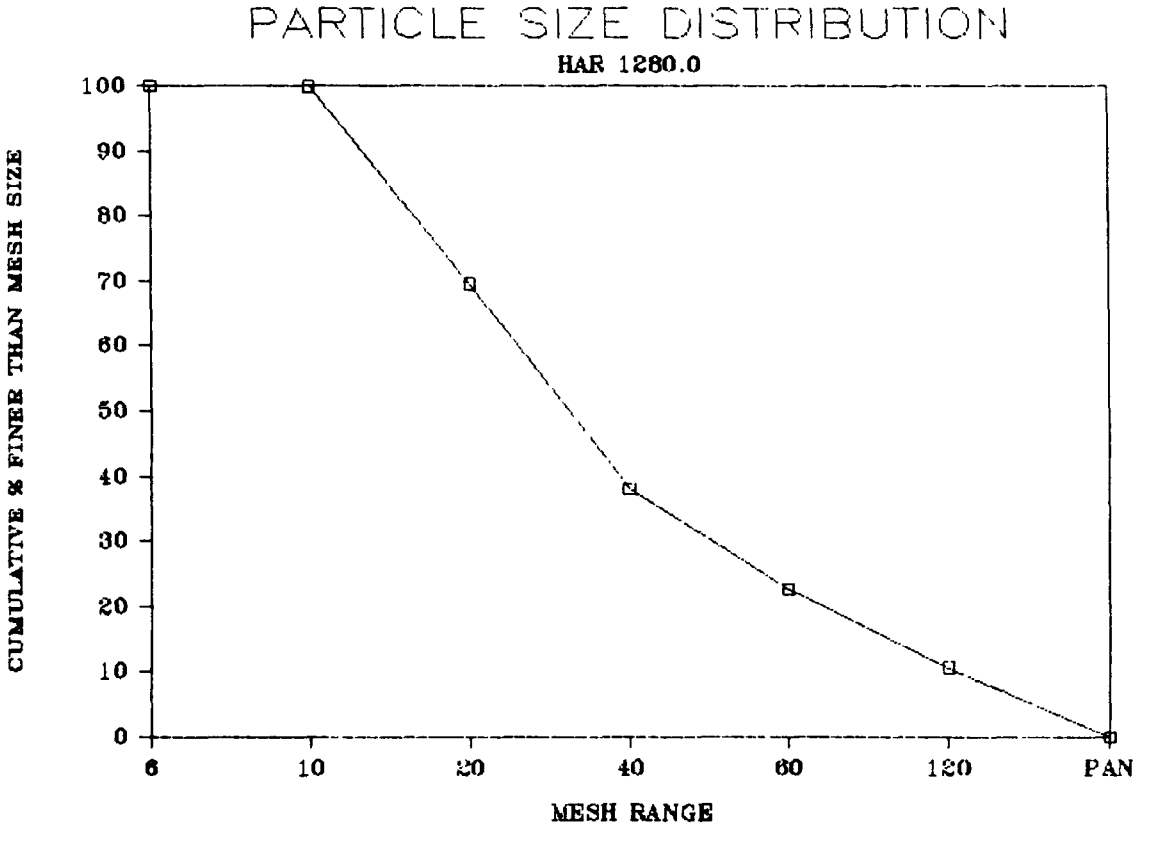
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1036

CLIENT'S SAMPLE DESIGNATION .... HAR 1280.0

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.16	0.16	0.07	0.07
20	70.56	70.72	30.47	30.40
40	73.37	144.09	62.08	31.61
60	35.43	179.52	77.34	15.26
120	27.81	207.33	89.32	11.98
PAN	24.78	232.11	100.00	10.68



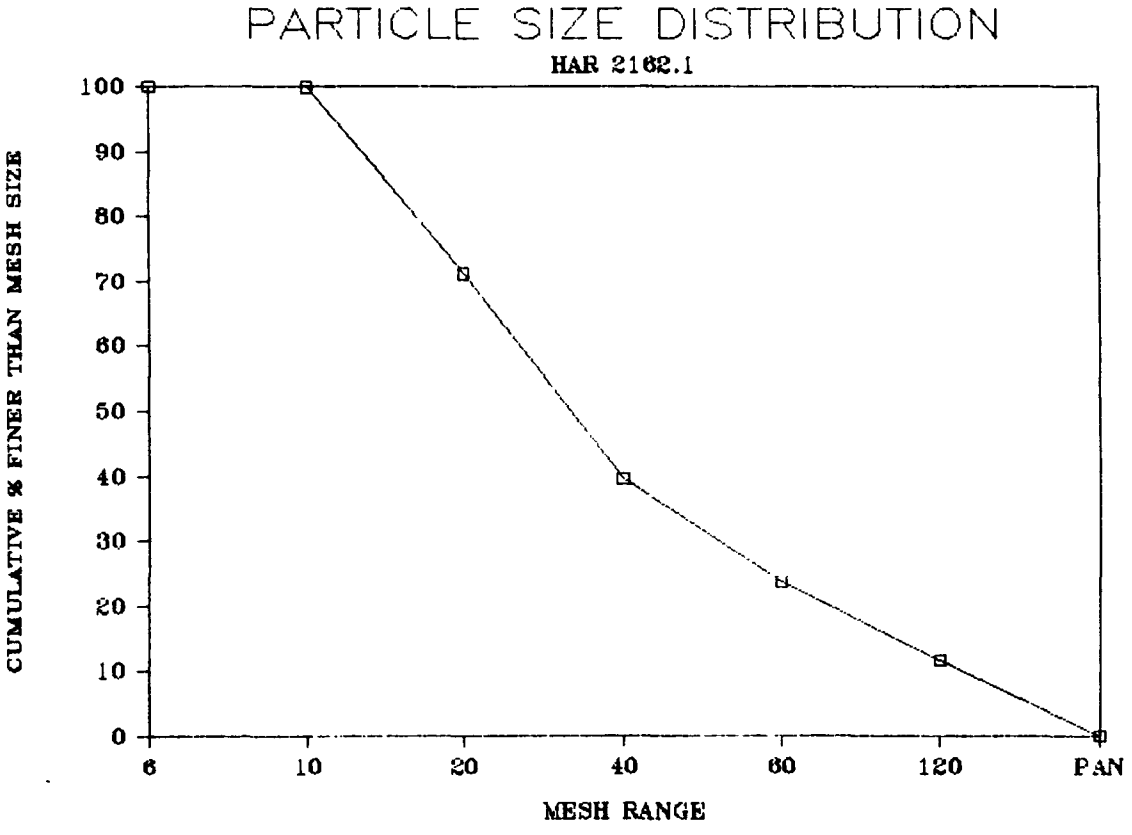
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1037

CLIENT'S SAMPLE DESIGNATION .... HAR 2162.1

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.09	0.09	0.04	0.04
20	72.36	72.45	28.83	28.79
40	79.23	151.68	60.35	31.52
60	40.06	191.74	76.29	15.94
120	30.43	222.17	88.39	12.11
PAN	29.17	251.34	100.00	11.61



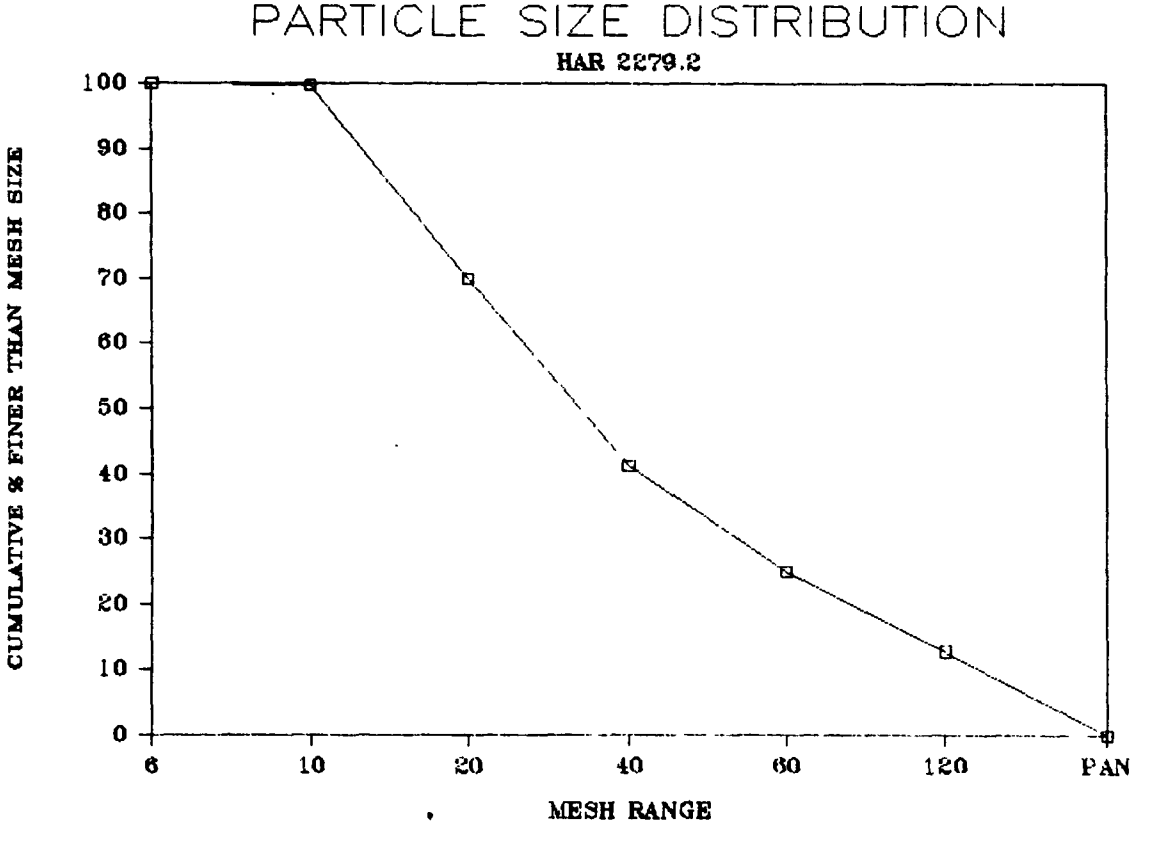
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1043

CLIENT'S SAMPLE DESIGNATION .... HAR 2279.2

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.63	0.63	0.25	0.25
20	74.66	75.29	29.97	29.72
40	72.62	147.91	58.89	28.91
60	40.52	188.43	75.02	16.13
120	30.51	218.94	87.16	12.15
PAN	32.24	251.18	100.00	12.84



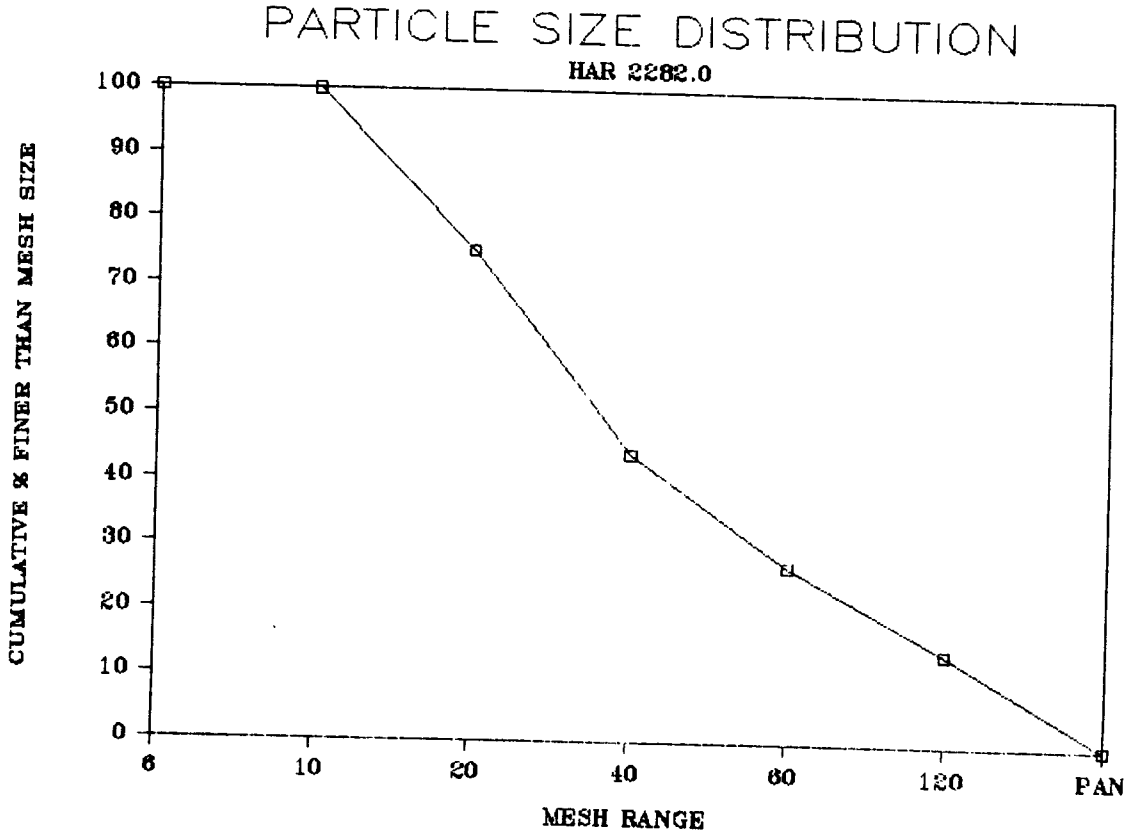
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1038

CLIENT'S SAMPLE DESIGNATION .... HAR 2282.0

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.10	0.10	0.03	0.03
20	72.37	72.47	24.65	24.62
40	91.86	164.33	55.90	31.25
60	50.07	214.40	72.93	17.03
120	38.19	252.59	85.92	12.99
PAN	41.40	293.99	100.00	14.08



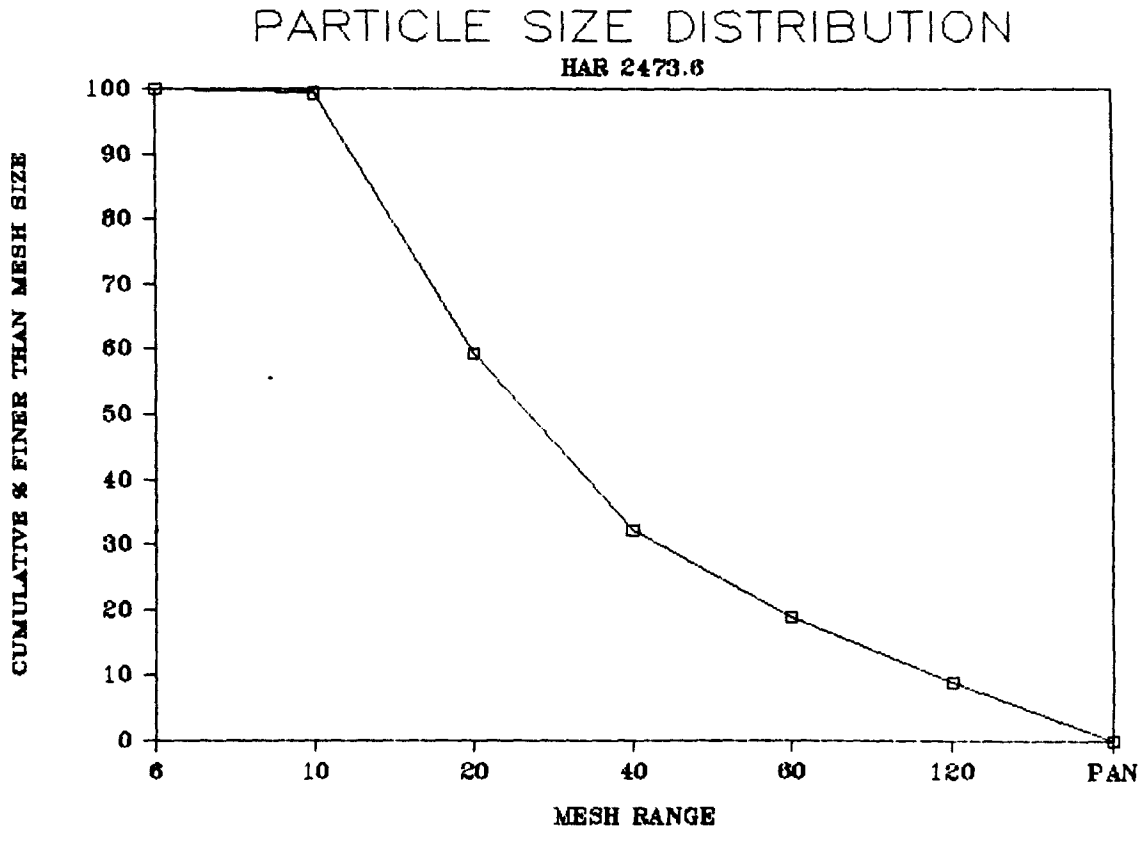
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1041

CLIENT'S SAMPLE DESIGNATION .... HAR 2473.6

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	1.63	1.63	0.58	0.58
20	112.68	114.31	40.64	40.06
40	76.58	190.89	67.87	27.23
60	37.52	228.41	81.21	13.34
120	27.45	255.86	90.97	9.76
PAN	25.41	281.27	100.00	9.03



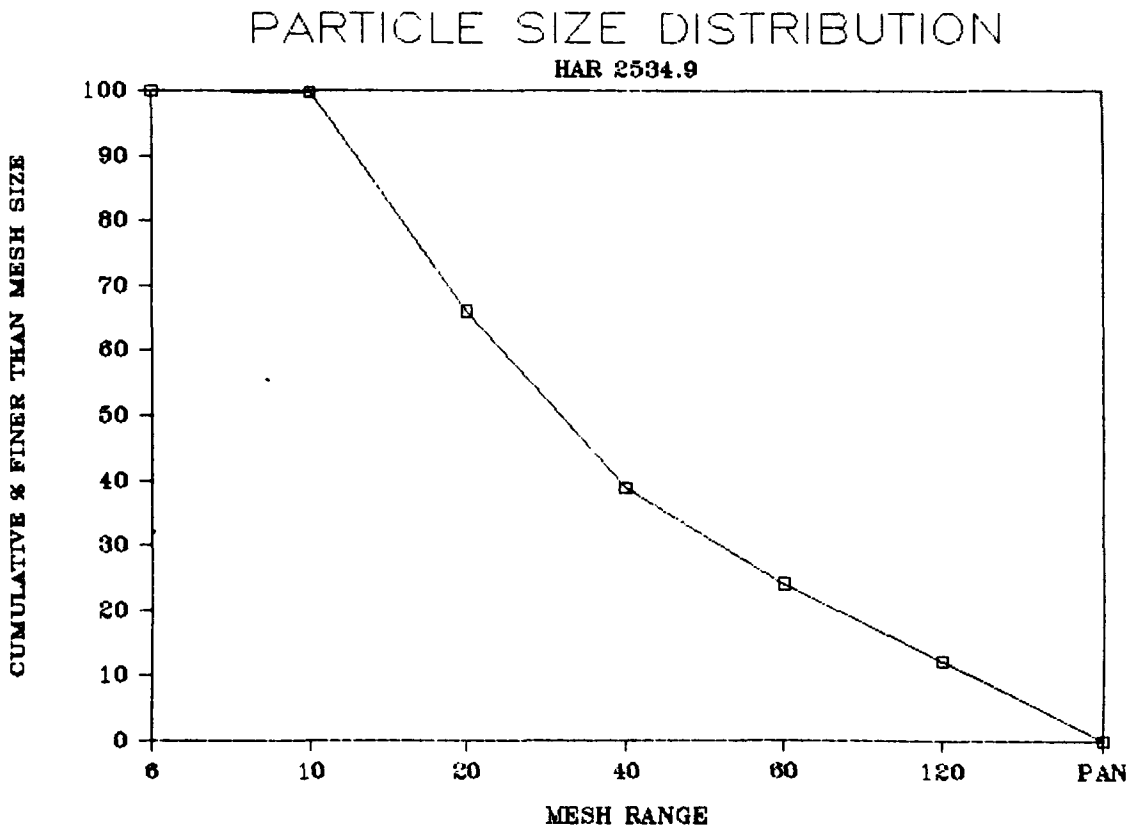
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1042

CLIENT'S SAMPLE DESIGNATION .... HAR 2534.9

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.87	0.87	0.30	0.30
20	96.08	96.95	33.91	33.61
40	77.85	174.80	61.14	27.23
60	42.58	217.38	76.03	14.89
120	33.55	250.93	87.77	11.73
PAN	34.97	285.90	100.00	12.23



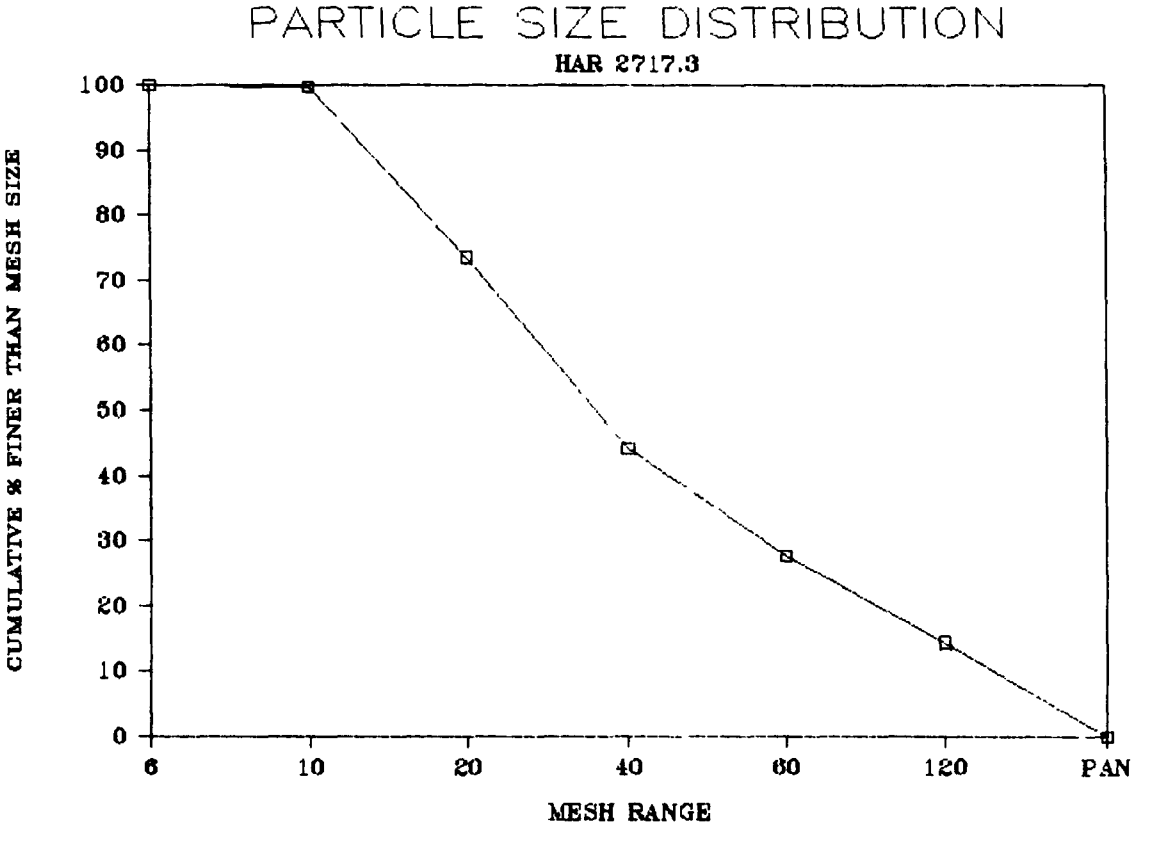
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1040

CLIENT'S SAMPLE DESIGNATION .... HAR 2717.3

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.34	0.34	0.12	0.12
20	74.12	74.46	26.45	26.33
40	82.52	156.98	55.76	29.31
60	46.79	203.77	72.38	16.62
120	37.06	240.83	85.55	13.16
PAN	40.69	281.52	100.00	14.45



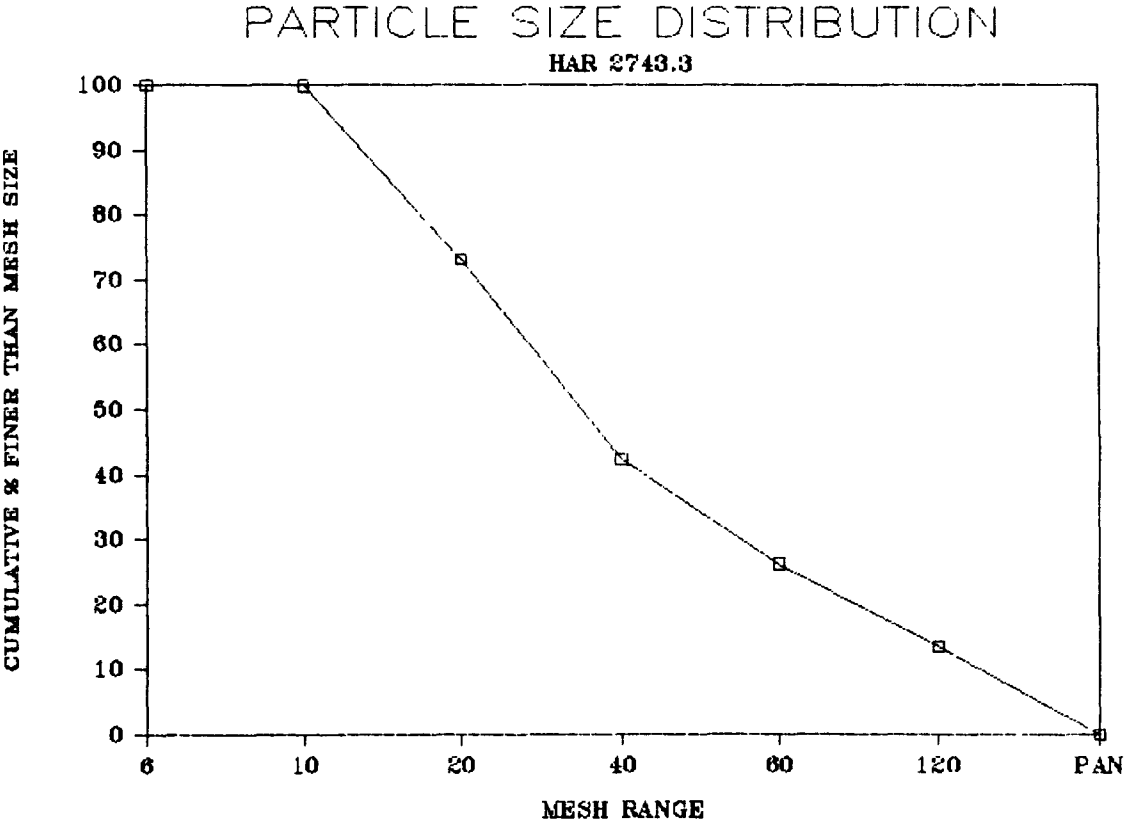
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1035

CLIENT'S SAMPLE DESIGNATION .... HAR 2743.3

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.09	0.09	0.03	0.03
20	81.43	81.52	26.83	26.80
40	93.79	175.31	57.70	30.87
60	49.17	224.48	73.88	16.18
120	38.40	262.88	86.52	12.64
PAN	40.95	303.83	100.00	13.48



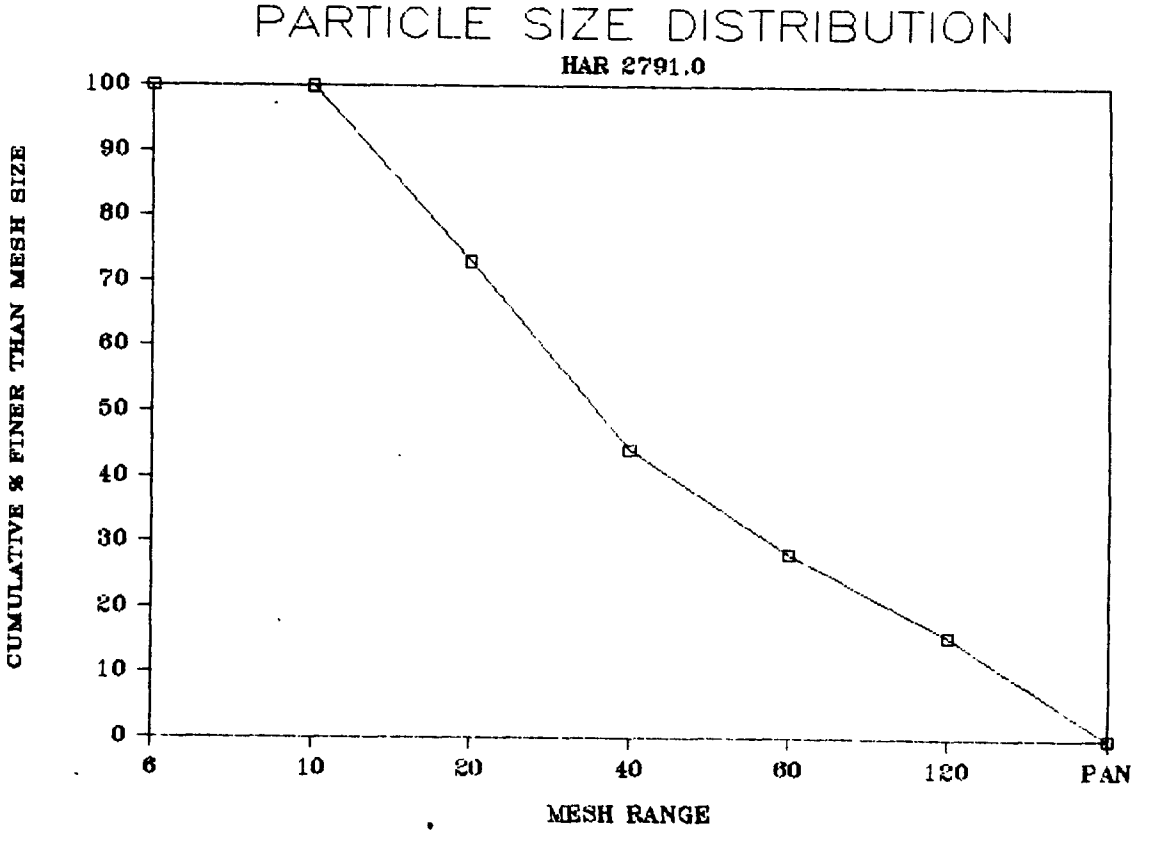
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1039

CLIENT'S SAMPLE DESIGNATION .... HAR 2791.0

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.17	0.17	0.06	0.06
20	73.70	73.87	26.96	26.90
40	79.12	152.99	55.84	28.88
60	43.75	196.74	71.80	15.97
120	34.66	231.40	84.45	12.65
PAN	42.60	274.00	100.00	15.55



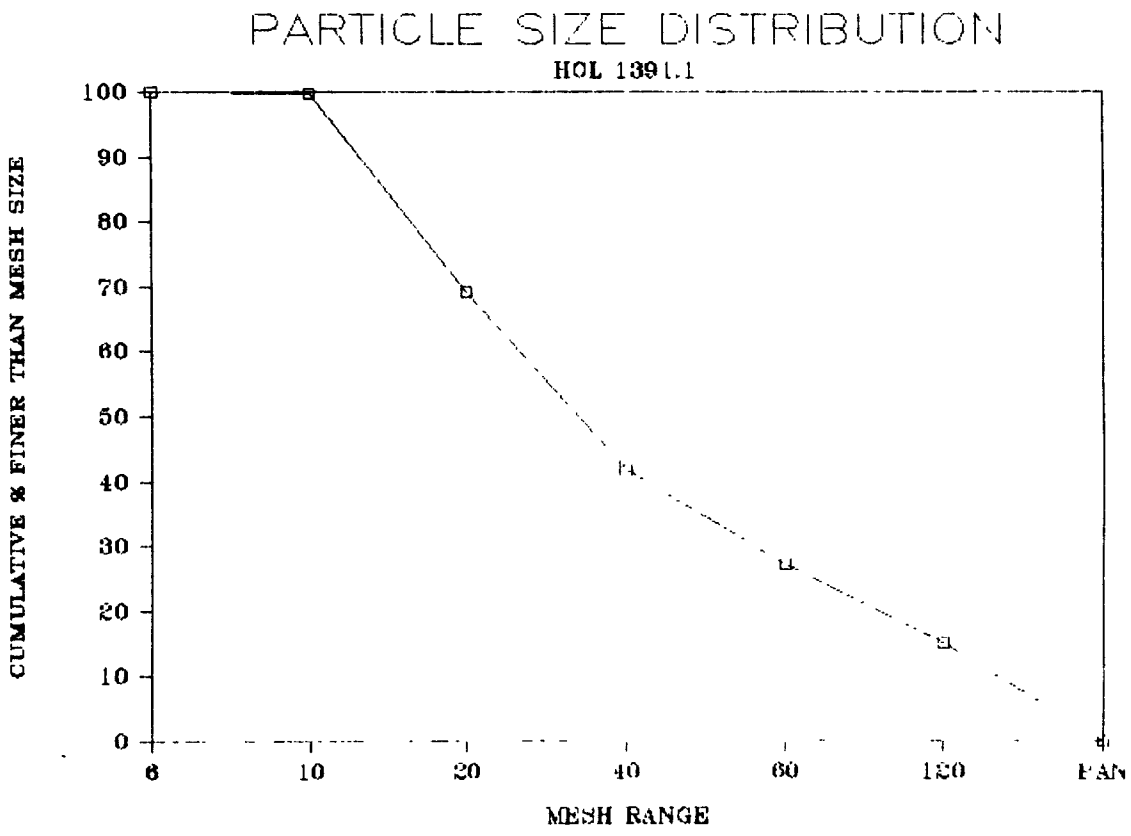
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1027

CLIENT'S SAMPLE DESIGNATION .... HOL 1391.1

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.91	0.91	0.26	0.26
20	106.36	107.27	30.91	30.65
40	94.62	201.89	58.18	27.27
60	51.12	253.01	72.91	14.73
120	41.62	294.63	84.90	11.99
PAN	52.39	347.02	100.00	15.10



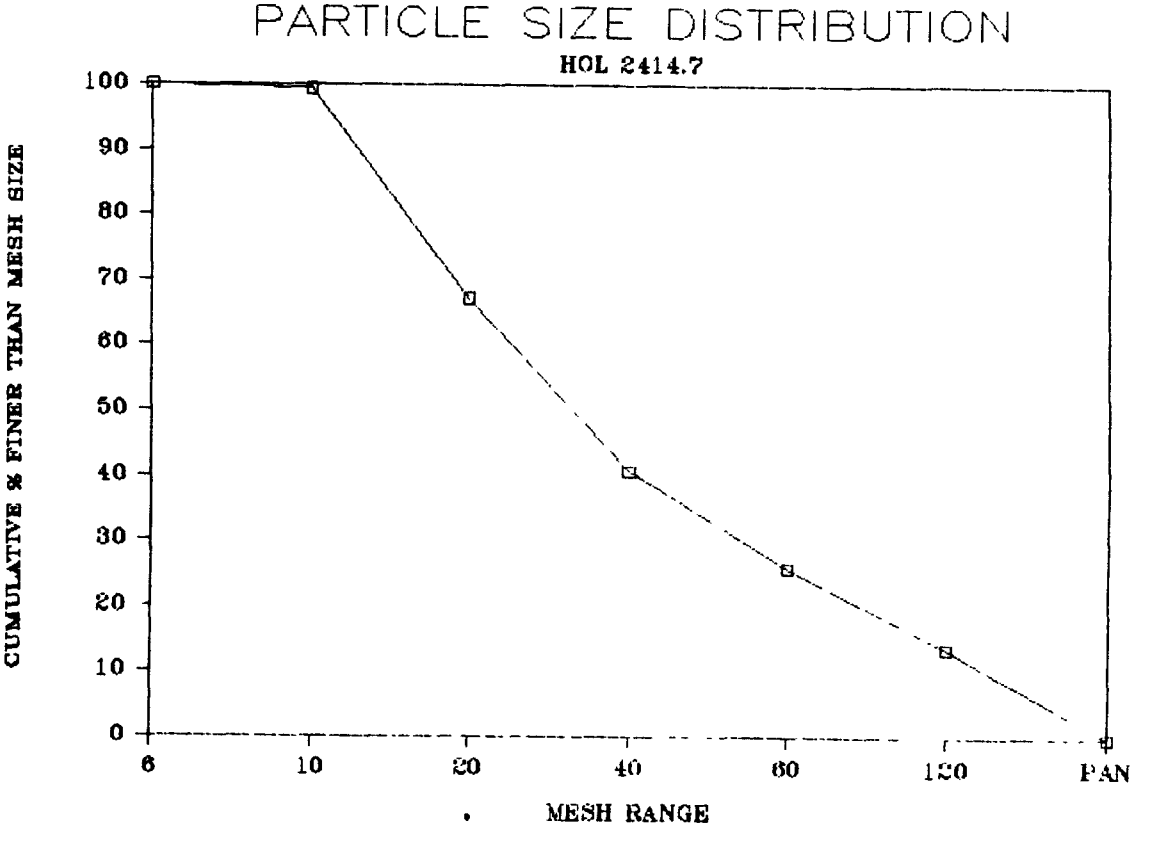
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1025

CLIENT'S SAMPLE DESIGNATION .... HOL 2414.7

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	1.72	1.72	0.56	0.56
20	98.80	100.52	32.84	32.28
40	80.83	181.35	59.25	26.41
60	45.96	227.31	74.26	15.02
120	37.52	264.83	86.52	12.26
PAN	41.26	306.09	100.00	13.48



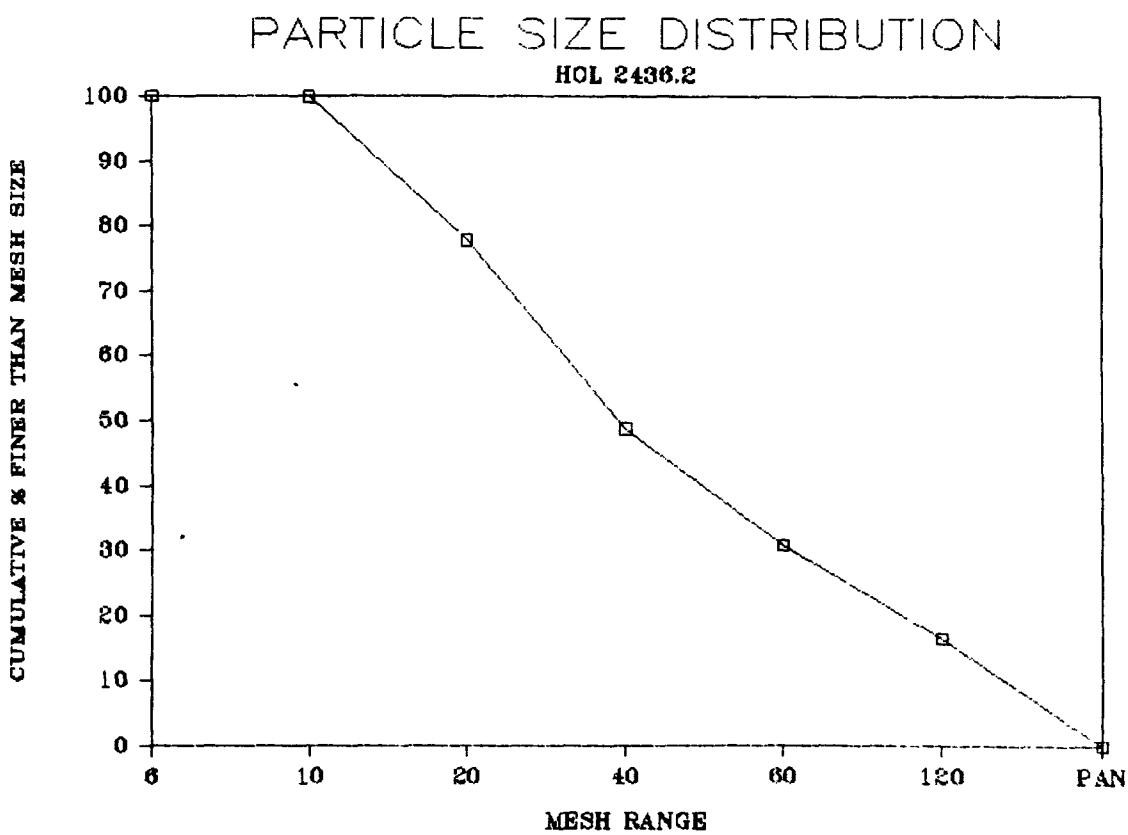
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1026

CLIENT'S SAMPLE DESIGNATION .... HOL 2436.2

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.18	0.18	0.06	0.06
20	70.46	70.64	22.16	22.10
40	92.79	163.43	51.26	29.10
60	57.11	220.54	69.17	17.91
120	46.14	266.68	83.64	14.47
PAN	52.15	318.83	100.00	16.36



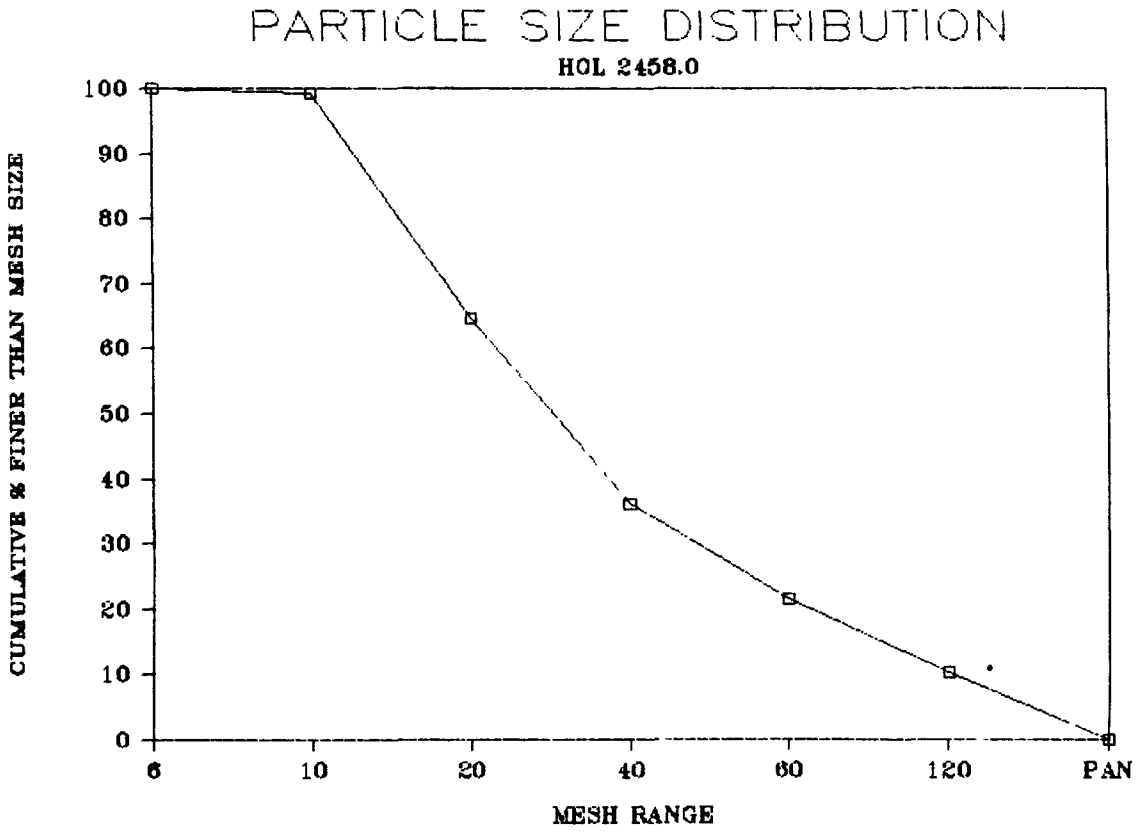
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1033

CLIENT'S SAMPLE DESIGNATION .... HOL 2458.0

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	2.29	2.29	0.76	0.76
20	103.84	106.13	35.28	34.52
40	86.27	192.40	63.96	28.68
60	43.74	236.14	78.50	14.54
120	33.94	270.08	89.78	11.28
PAN	30.75	300.83	100.00	10.22



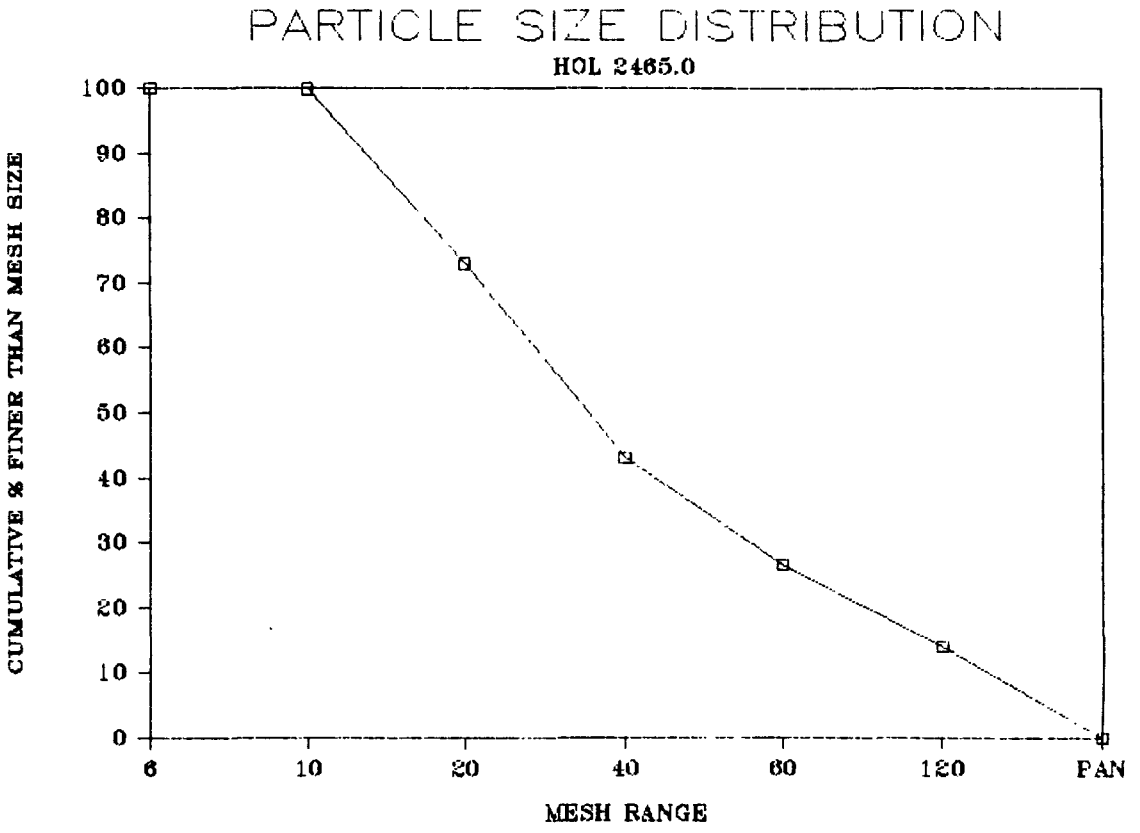
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1034

CLIENT'S SAMPLE DESIGNATION .... HOL 2465.0

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.23	0.23	0.08	0.08
20	76.90	77.13	26.97	26.89
40	85.43	162.56	56.84	29.87
60	47.22	209.78	73.35	16.51
120	35.83	245.61	85.88	12.53
PAN	40.37	285.98	100.00	14.12



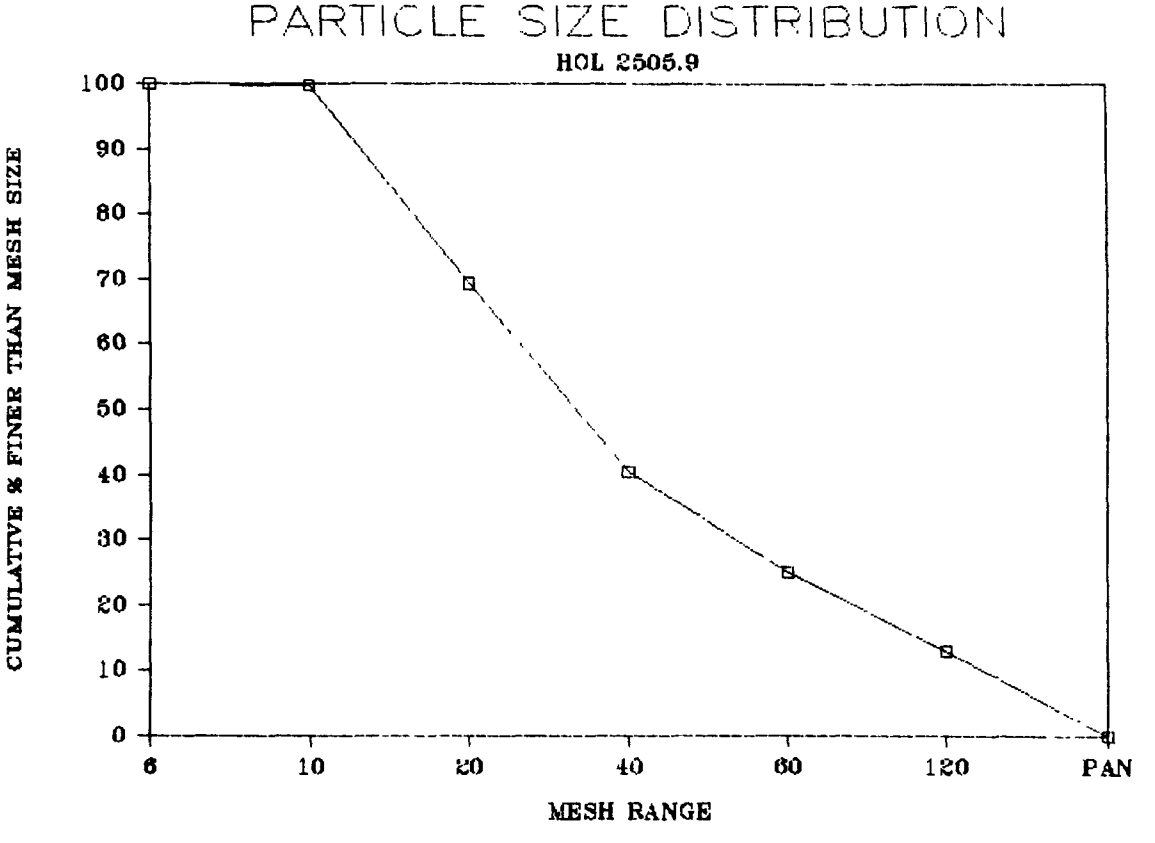
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1029

CLIENT'S SAMPLE DESIGNATION .... HOL 2505.9

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.24	0.24	0.09	0.09
20	80.62	80.86	30.70	30.60
40	76.14	157.00	59.60	28.90
60	40.88	197.88	75.12	15.52
120	31.50	229.38	87.07	11.96
PAN	34.05	263.43	100.00	12.93



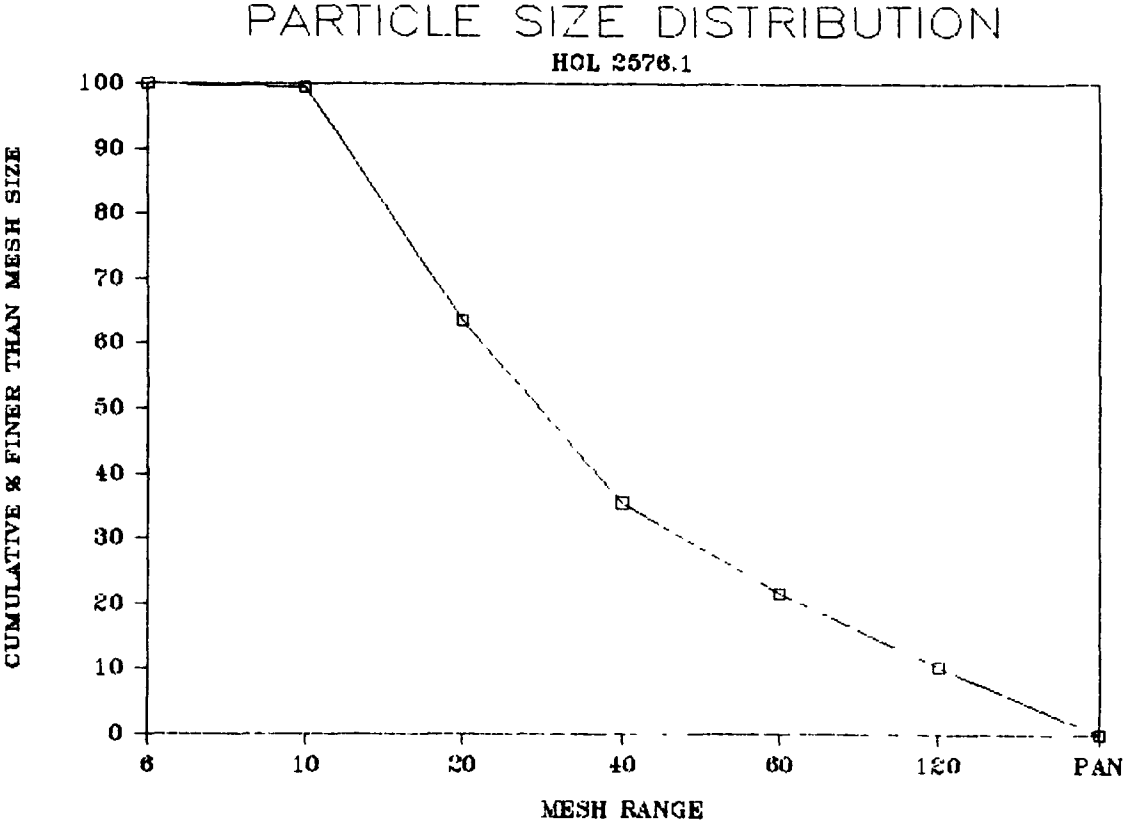
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1028

CLIENT'S SAMPLE DESIGNATION .... HOL 2576.1

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	1.29	1.29	0.50	0.50
20	93.43	94.72	36.48	35.98
40	72.91	167.63	64.56	28.08
60	36.18	203.81	78.49	13.93
120	28.85	232.66	89.60	11.11
PAN	27.01	259.67	100.00	10.40



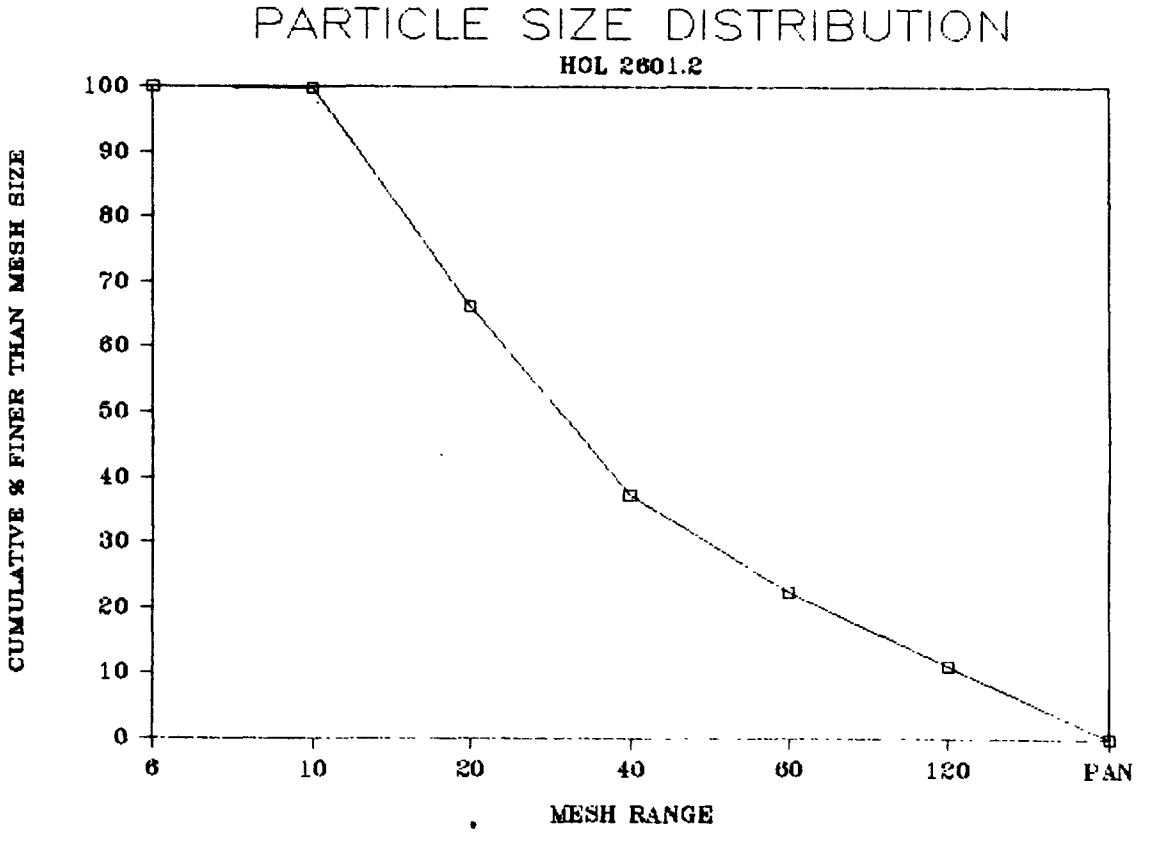
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1032

CLIENT'S SAMPLE DESIGNATION .... HOL 2601.2

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.83	0.83	0.30	0.30
20	93.68	94.51	33.81	33.51
40	80.92	175.43	62.76	28.95
60	41.95	217.38	77.77	15.01
120	31.26	248.64	88.95	11.18
PAN	30.88	279.52	100.00	11.05



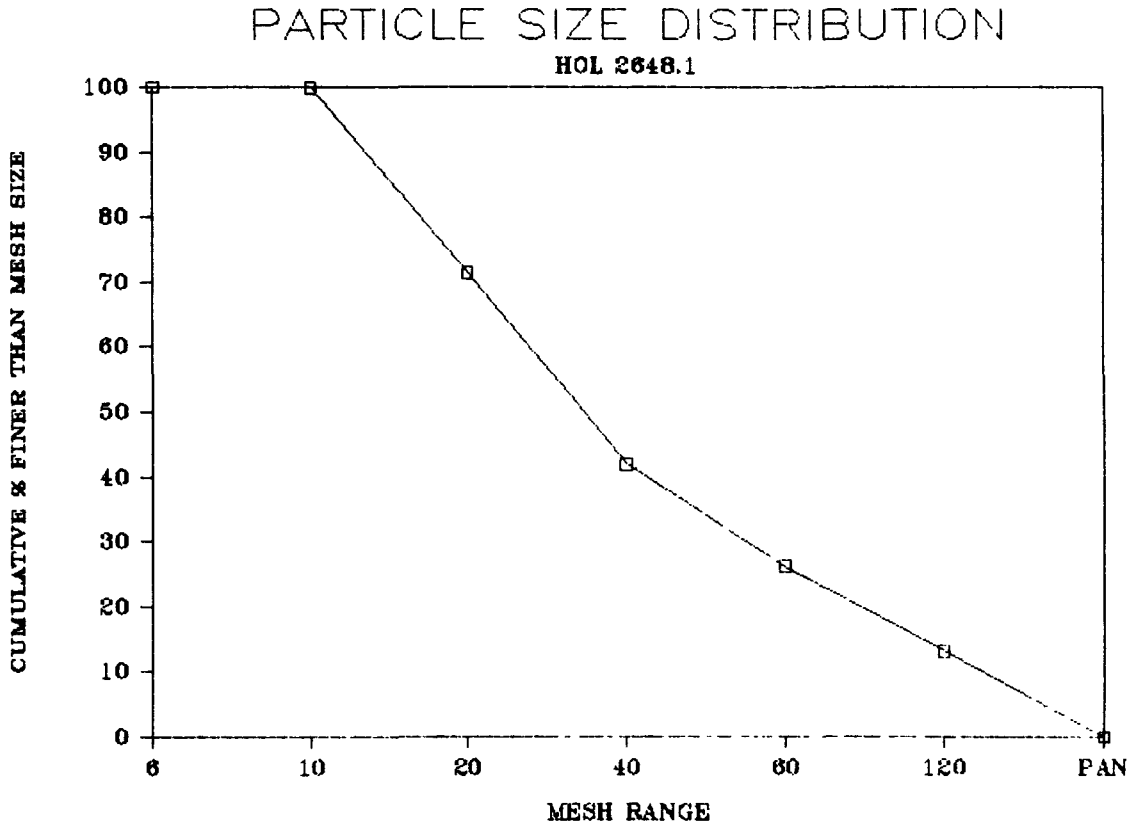
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1031

CLIENT'S SAMPLE DESIGNATION .... HOL 2648.1

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.13	0.13	0.04	0.04
20	91.21	91.34	28.60	28.56
40	94.10	185.44	58.06	29.46
60	50.52	235.96	73.88	15.82
120	41.51	277.47	86.88	13.00
PAN	41.90	319.37	100.00	13.12



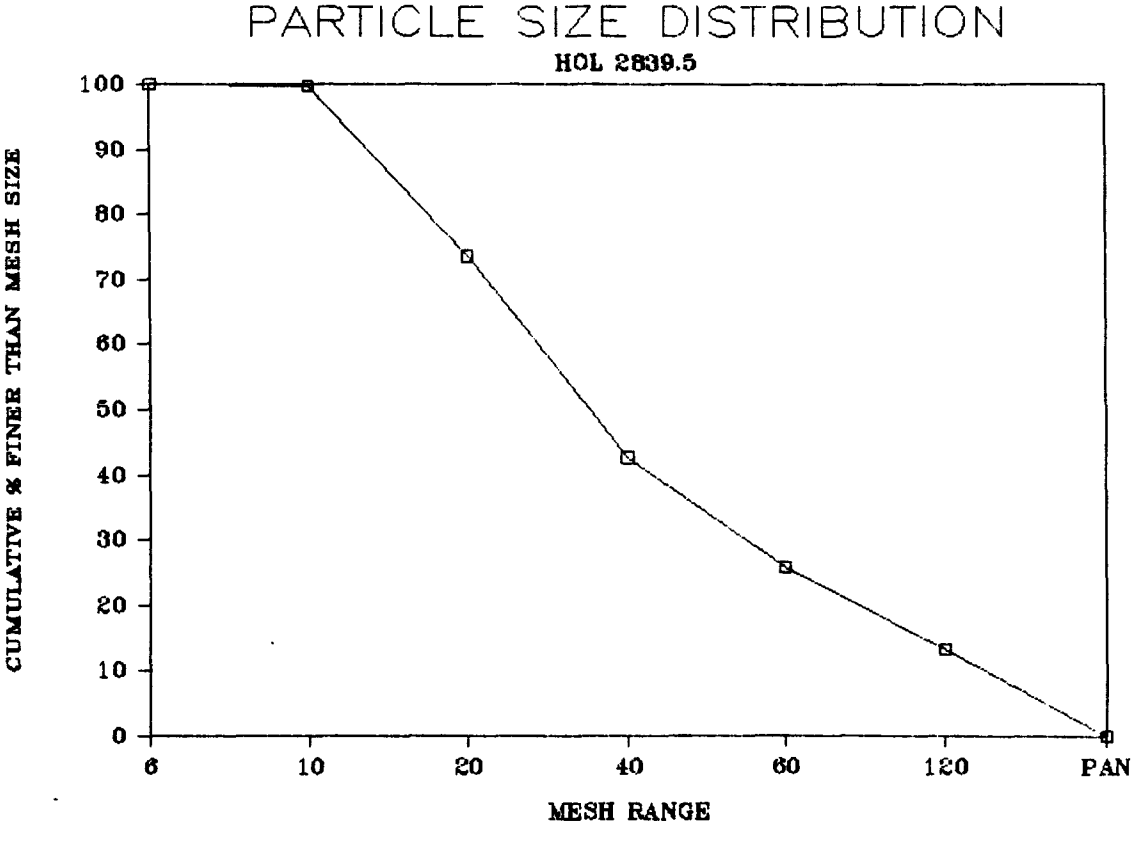
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1030

CLIENT'S SAMPLE DESIGNATION .... HOL 2839.5

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.27	0.27	0.10	0.10
20	71.21	71.48	26.40	26.30
40	83.81	155.29	57.36	30.95
60	45.54	200.83	74.18	16.82
120	34.22	235.05	86.81	12.64
PAN	35.70	270.75	100.00	13.19



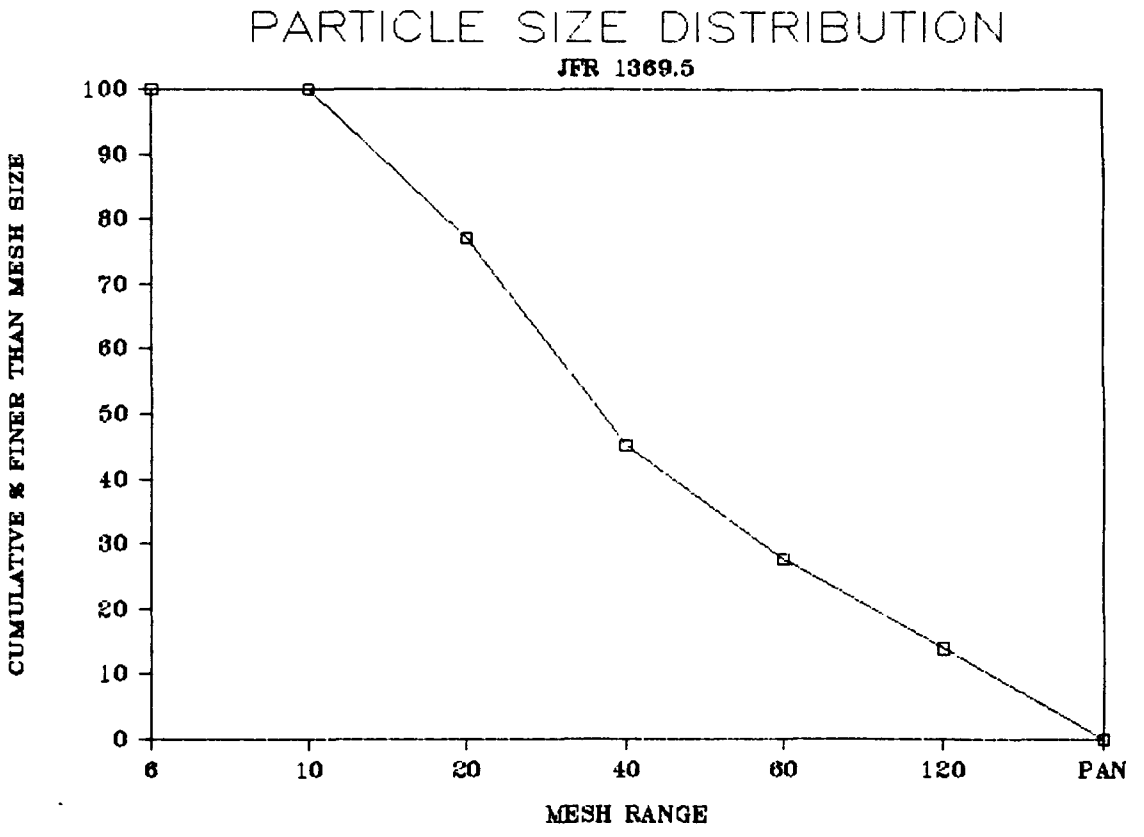
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1021

CLIENT'S SAMPLE DESIGNATION .... JFR 1369.5

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.05	0.05	0.02	0.02
20	74.08	74.13	22.76	22.74
40	104.59	178.72	54.86	32.11
60	57.02	235.74	72.37	17.50
120	44.59	280.33	86.05	13.69
PAN	45.43	325.76	100.00	13.95



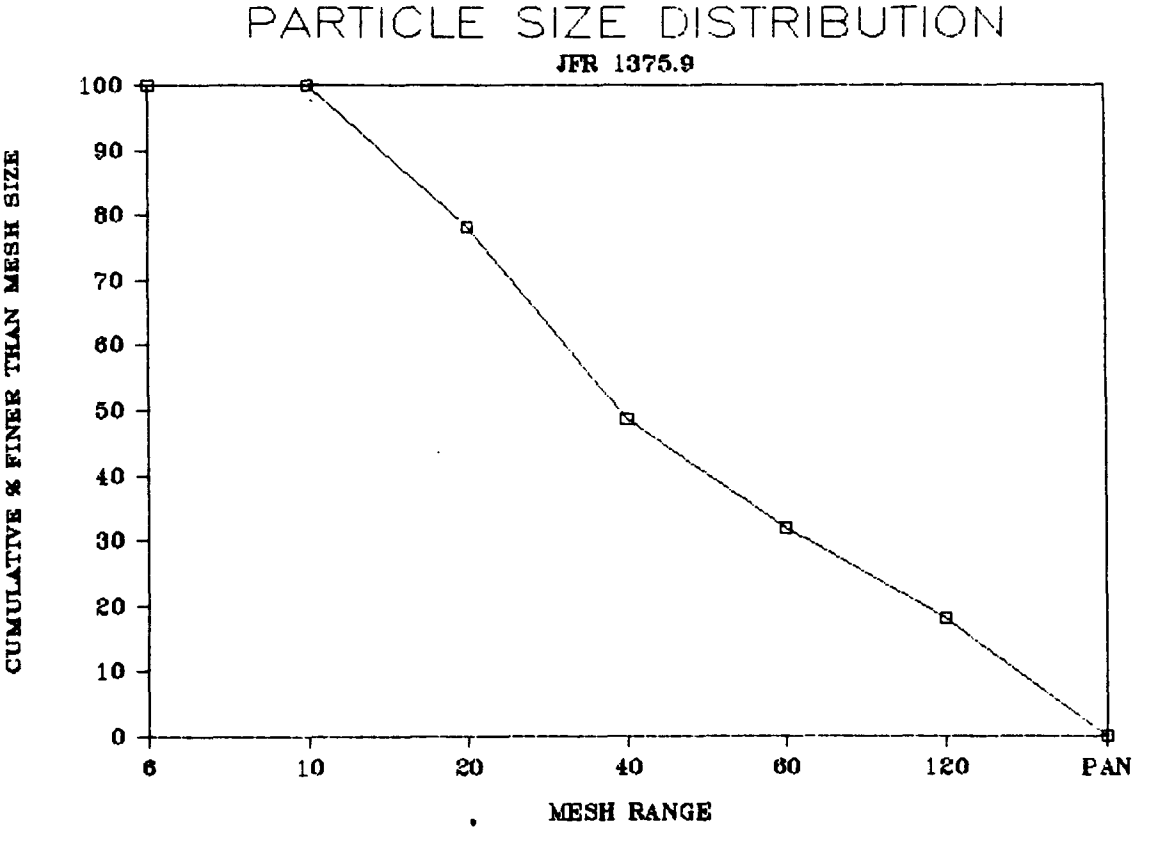
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1022

CLIENT'S SAMPLE DESIGNATION .... JFR 1375.9

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.04	0.04	0.01	0.01
20	63.01	63.05	21.83	21.82
40	85.48	148.53	51.43	29.60
60	48.45	196.98	68.21	16.78
120	39.95	236.93	82.04	13.83
PAN	51.86	288.79	100.00	17.96



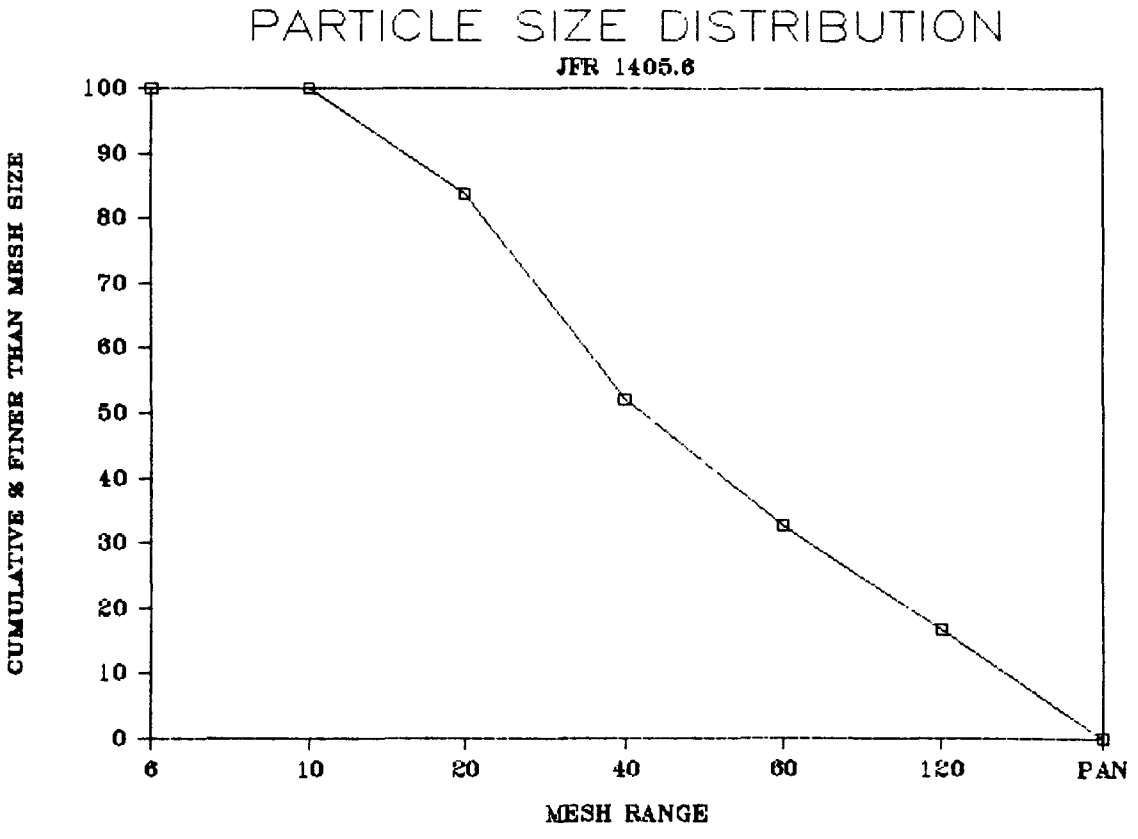
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1023

CLIENT'S SAMPLE DESIGNATION .... JFR 1405.6

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.02	0.02	0.01	0.01
20	32.11	32.13	16.10	16.09
40	63.38	95.51	47.87	31.76
60	38.66	134.17	67.24	19.37
120	32.08	166.25	83.32	16.08
PAN	33.29	199.54	100.00	16.68



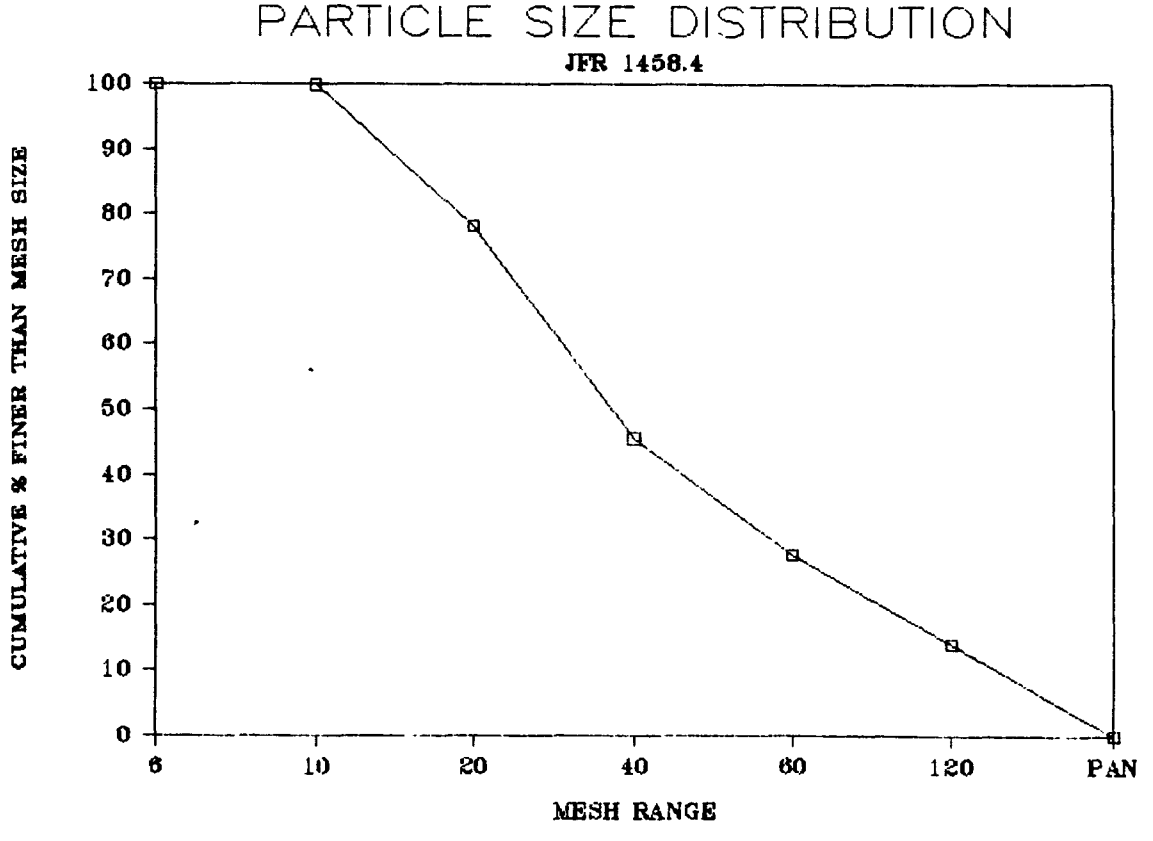
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1024

CLIENT'S SAMPLE DESIGNATION .... JFR 1458.4

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.11	0.11	0.05	0.05
20	49.32	49.43	21.68	21.63
40	74.72	124.15	54.46	32.78
60	40.70	164.85	72.31	17.85
120	31.19	196.04	85.99	13.68
PAN	31.93	227.97	100.00	14.01



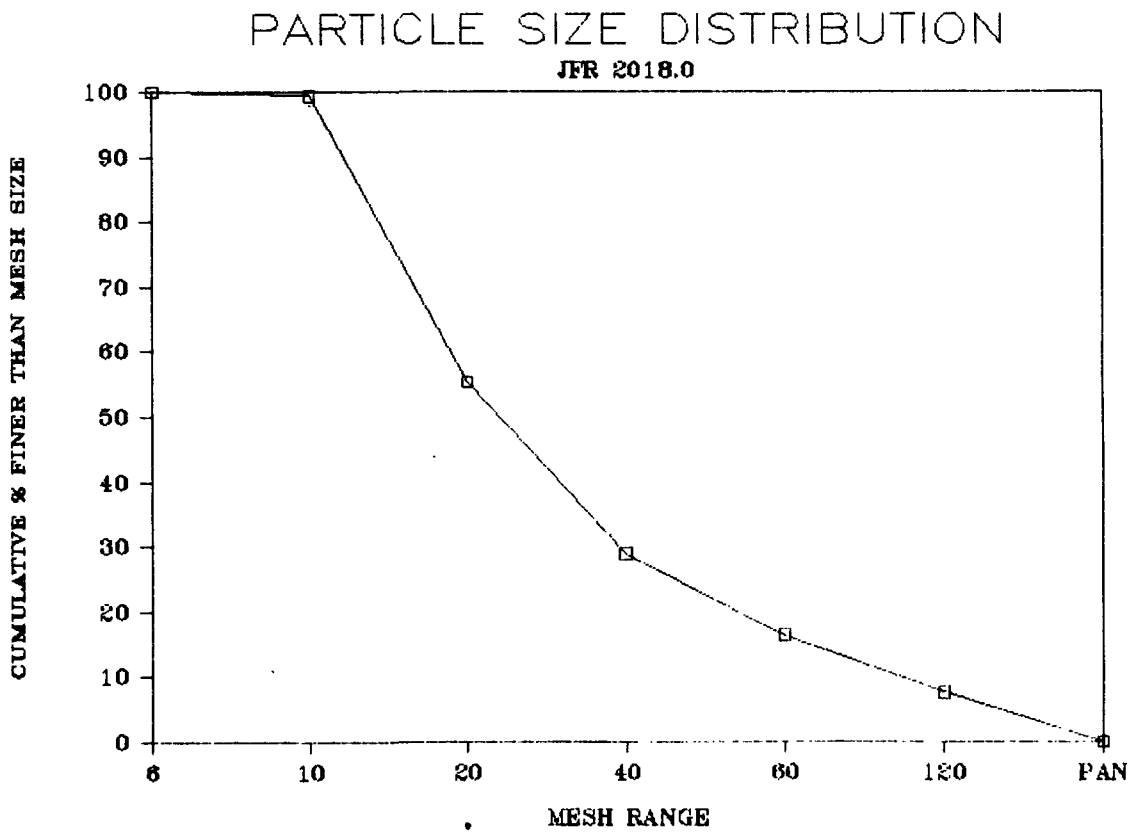
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1015

CLIENT'S SAMPLE DESIGNATION JFR-2018.0

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	1.41	1.41	0.56	0.56
20	110.60	112.01	44.63	44.07
40	66.59	178.60	71.16	26.53
60	31.45	210.05	83.70	12.53
120	22.08	232.13	92.49	8.80
PAN	18.84	250.97	100.00	7.51



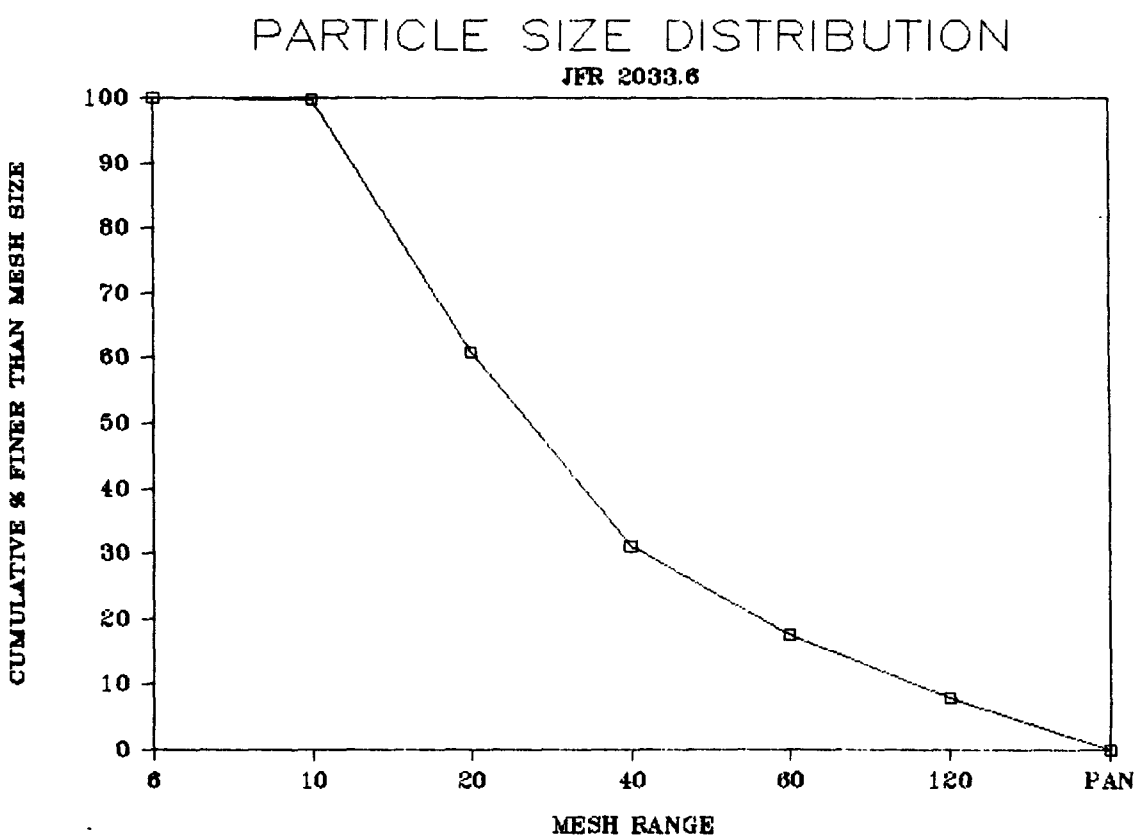
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1016

CLIENT'S SAMPLE DESIGNATION JFR-2033.6

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.41	0.41	0.15	0.15
20	107.30	107.71	39.06	38.91
40	82.44	190.15	68.95	29.89
60	37.66	227.81	82.61	13.66
120	26.19	254.00	92.10	9.50
PAN	21.78	275.78	100.00	7.90



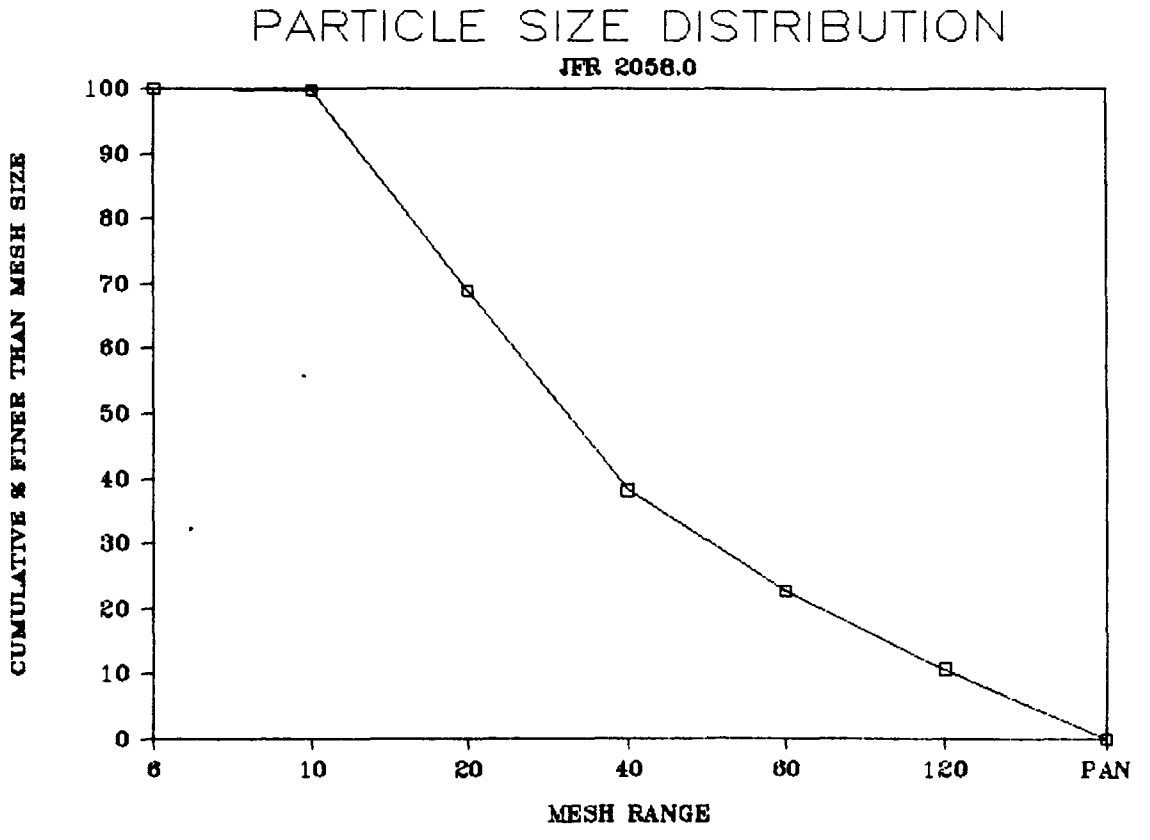
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1013

CLIENT'S SAMPLE DESIGNATION JFR-2058.0

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.27	0.27	0.10	0.10
20	82.90	83.17	31.02	30.92
40	82.60	165.77	61.83	30.81
60	41.83	207.60	77.44	15.60
120	31.80	239.40	89.30	11.86
PAN	28.69	268.09	100.00	10.70



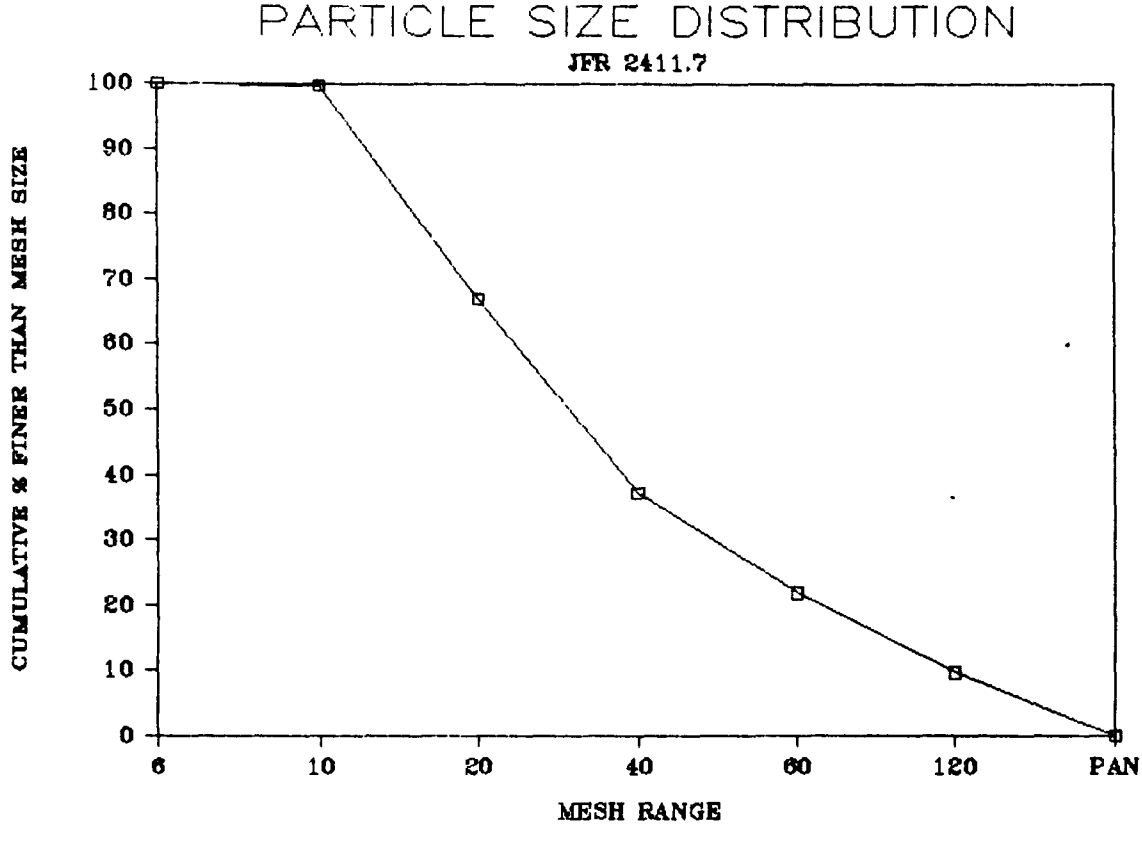
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1014

CLIENT'S SAMPLE DESIGNATION JFR-2411.7

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.40	0.40	0.15	0.15
20	88.02	88.42	32.32	32.17
40	80.04	168.46	61.58	29.26
60	40.88	209.34	76.52	14.94
120	32.77	242.11	88.50	11.98
PAN	31.47	273.58	100.00	11.50



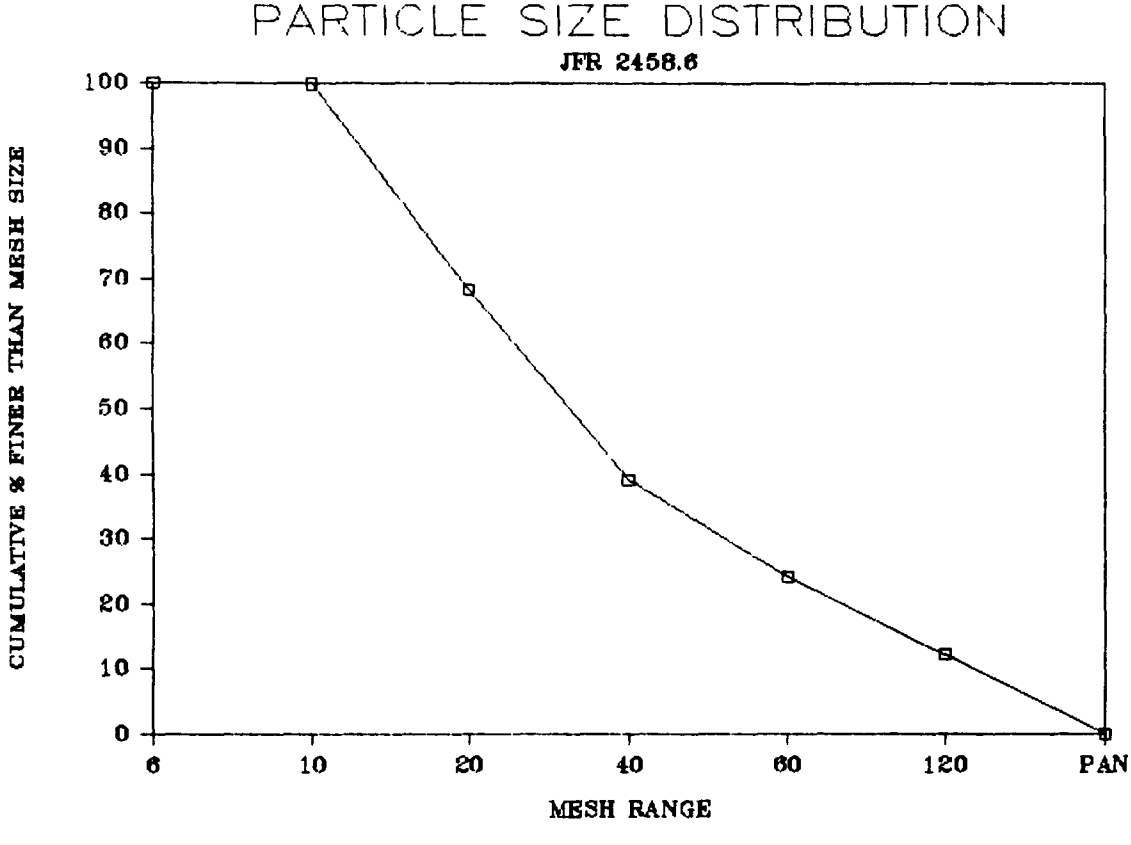
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1019

CLIENT'S SAMPLE DESIGNATION JFR-2458.6

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.12	0.12	0.04	0.04
20	96.06	96.18	31.66	31.62
40	89.06	185.24	60.97	29.31
60	45.26	230.50	75.86	14.90
120	36.37	266.87	87.84	11.97
PAN	36.96	303.83	100.00	12.16



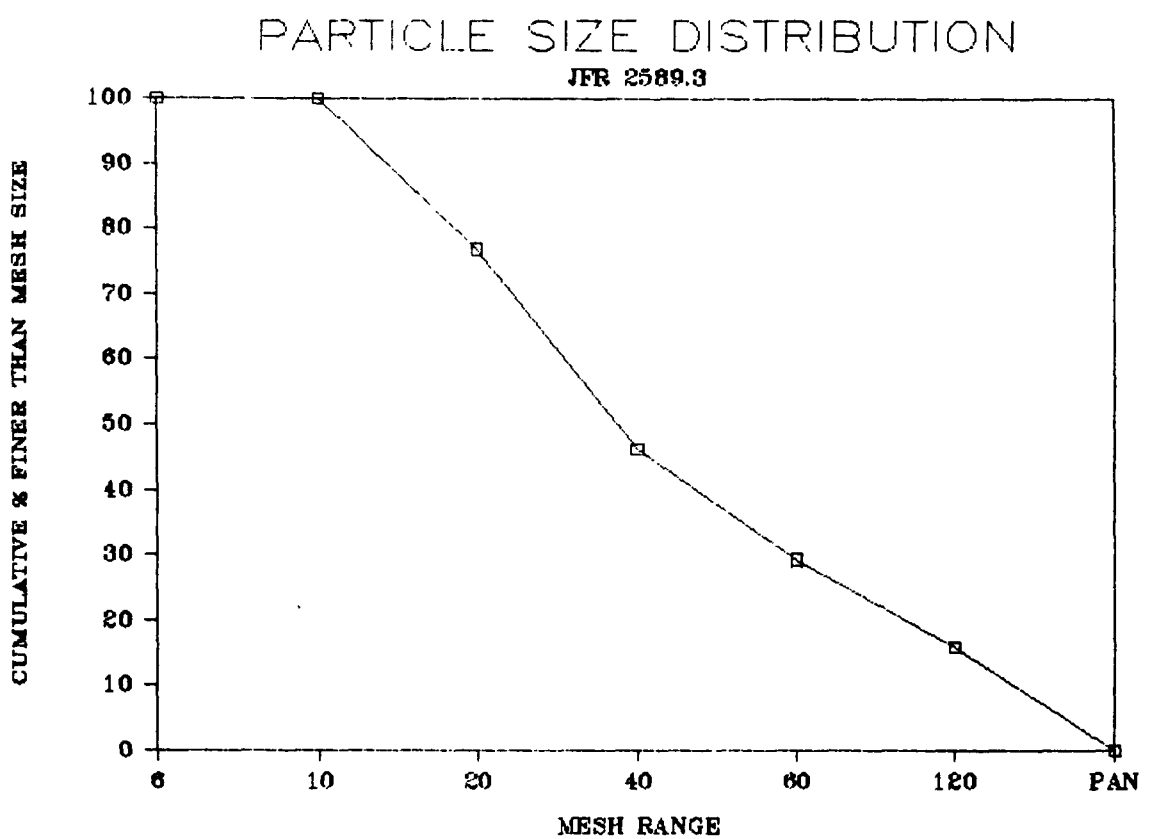
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1020

CLIENT'S SAMPLE DESIGNATION .... JFR 2589.3

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00
20	51.24	51.24	22.98	22.98
40	68.36	119.60	53.65	30.66
60	37.94	157.54	70.67	17.02
120	30.00	187.54	84.13	13.46
PAN	35.39	222.93	100.00	15.87



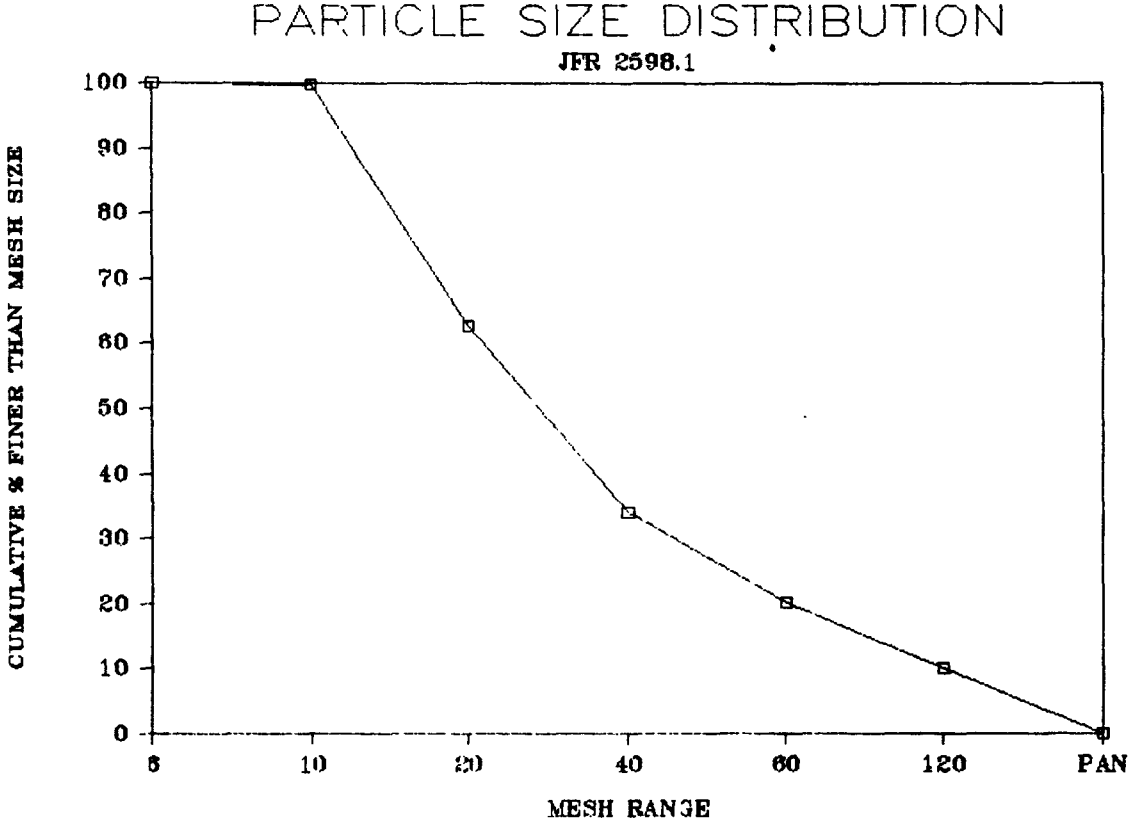
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1017

CLIENT'S SAMPLE DESIGNATION JFR-2598.1

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.51	0.51	0.17	0.17
20	112.15	112.66	37.24	37.07
40	86.73	199.39	65.91	28.67
60	42.12	241.51	79.83	13.92
120	30.61	272.12	89.95	10.12
PAN	30.42	302.54	100.00	10.05



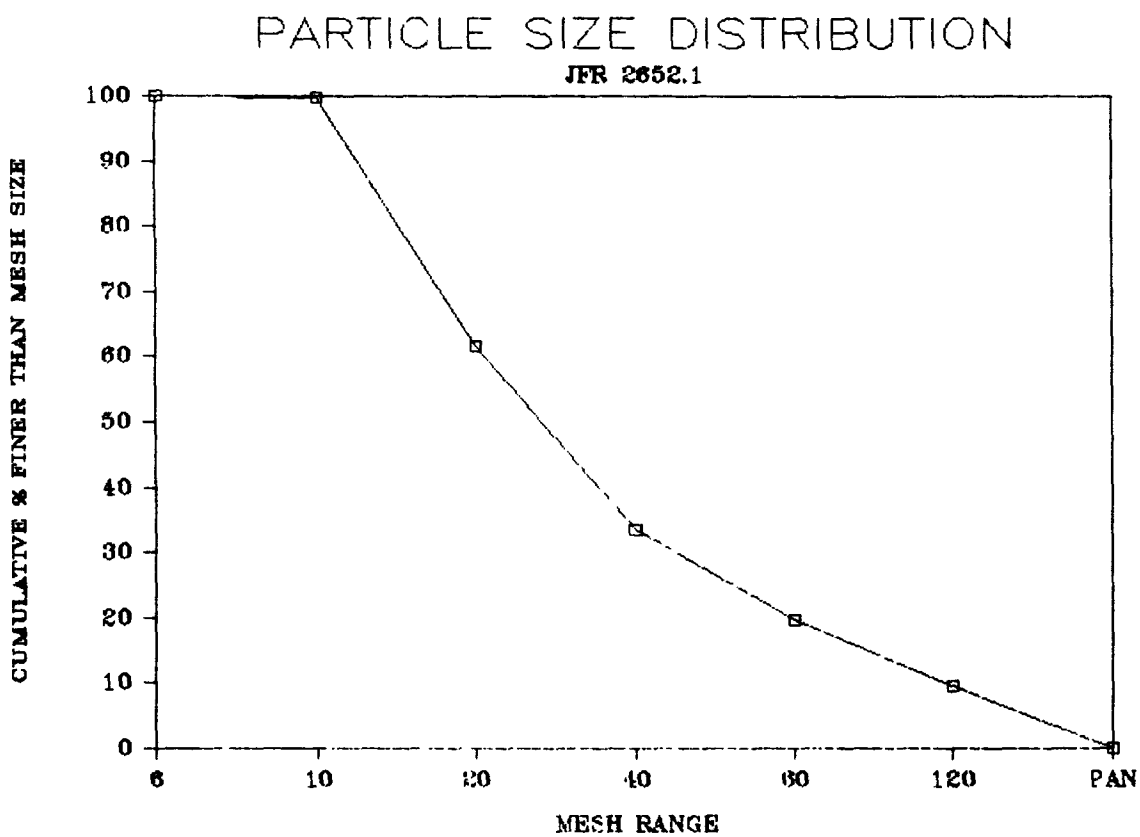
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1018

CLIENT'S SAMPLE DESIGNATION JFR-2652.1

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.43	0.43	0.15	0.15
20	107.07	107.50	38.38	38.23
40	78.87	186.37	66.54	28.16
60	38.52	224.89	80.30	13.75
120	28.61	253.50	90.51	10.22
PAN	26.57	280.07	100.00	9.49



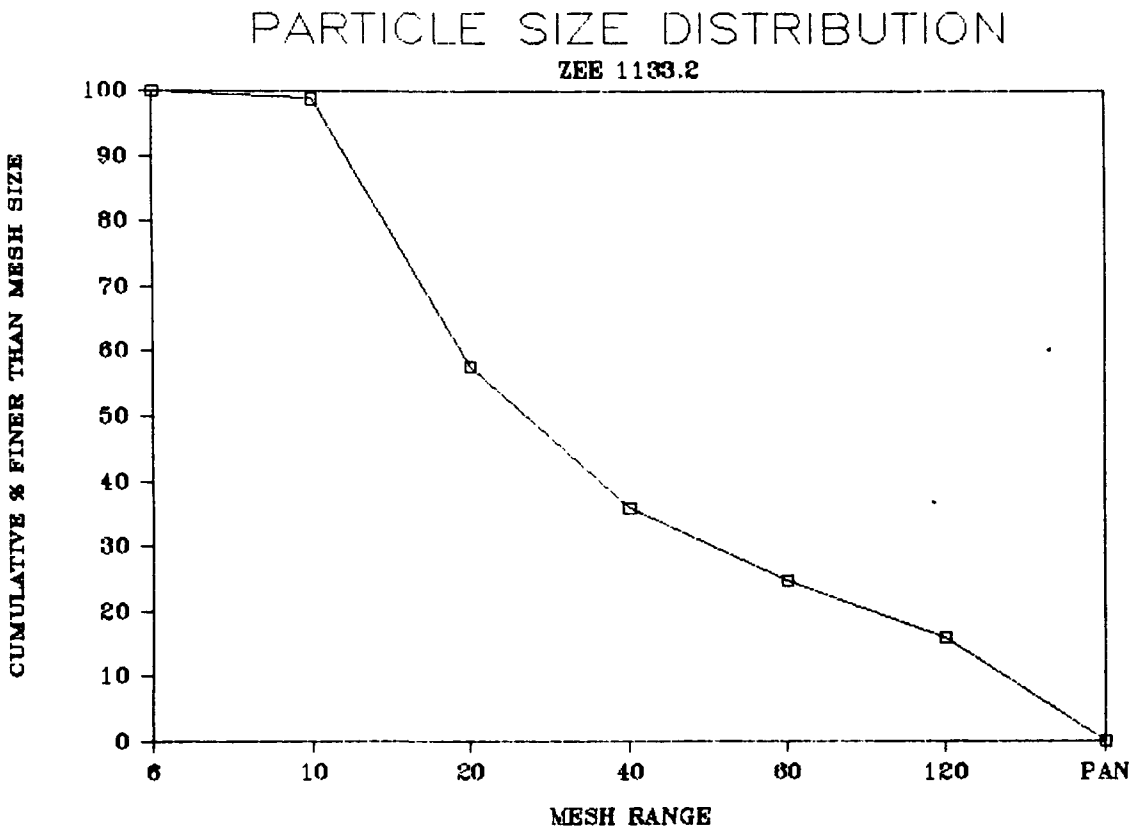
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1003

CLIENT'S SAMPLE DESIGNATION .... ZEE 1133.2

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	3.20	3.20	1.13	1.13
20	116.79	119.99	42.28	41.15
40	61.87	181.86	64.08	21.80
60	32.06	213.92	75.37	11.30
120	24.93	238.85	84.16	8.78
PAN	44.96	283.81	100.00	15.84



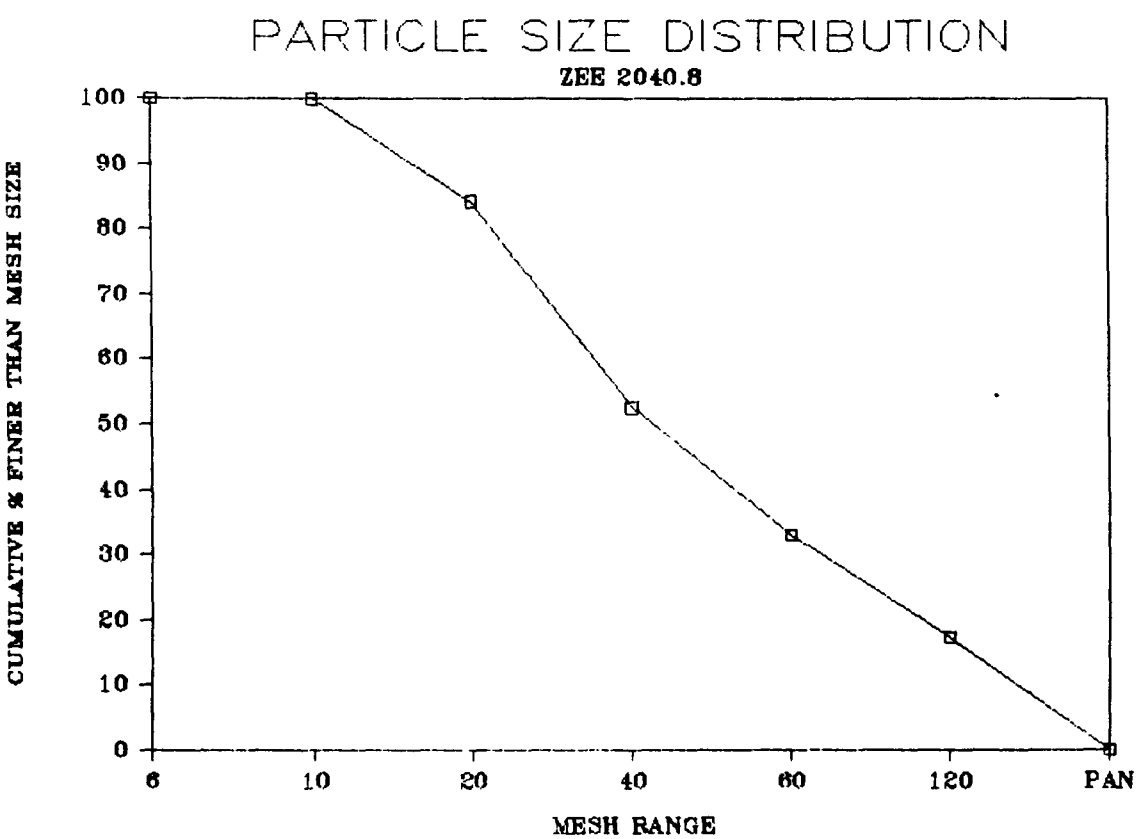
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1006

CLIENT'S SAMPLE DESIGNATION ZEE-2040.8

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.14	0.14	0.04	0.04
20	50.91	51.05	15.80	15.76
40	102.29	153.34	47.47	31.66
60	62.93	216.27	66.95	19.48
120	51.05	267.32	82.75	15.80
PAN	55.72	323.04	100.00	17.25



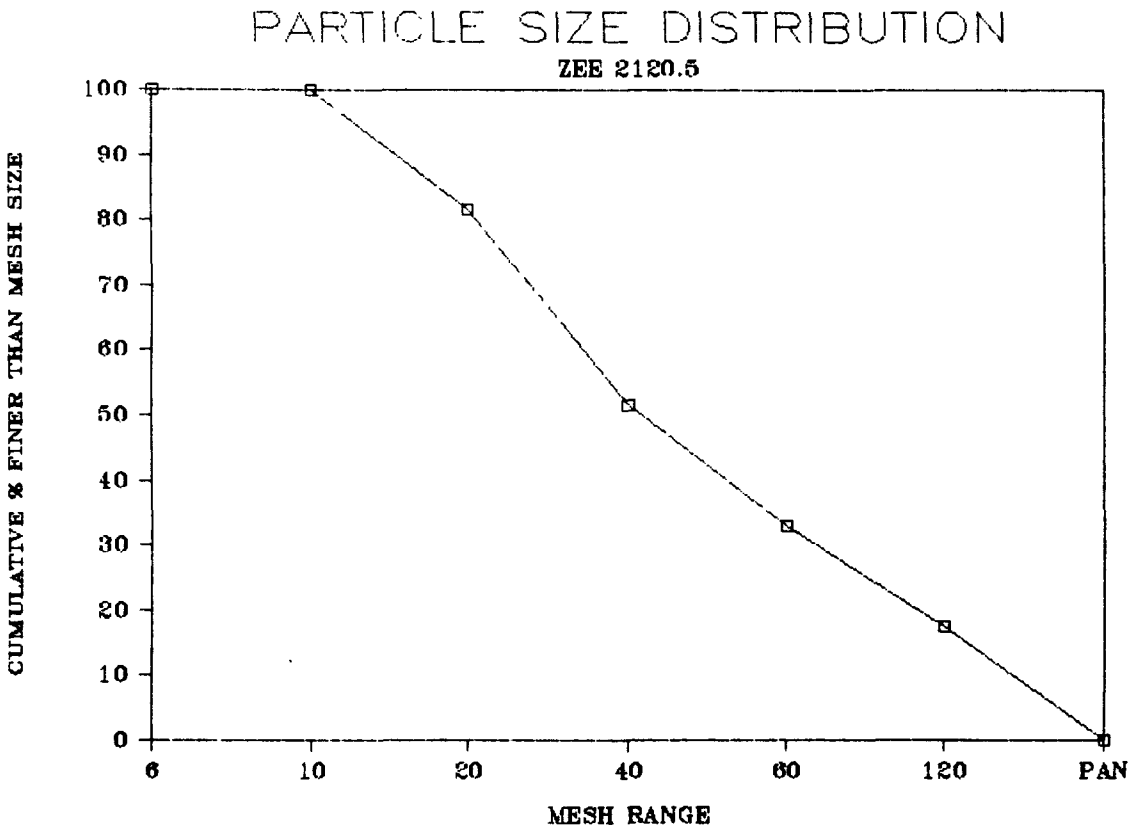
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1007

CLIENT'S SAMPLE DESIGNATION ZEE-2120.5

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00
20	54.32	54.32	18.26	18.26
40	89.97	144.29	48.51	30.25
60	54.84	199.13	66.95	18.44
120	46.19	245.32	82.47	15.53
PAN	52.13	297.45	100.00	17.53



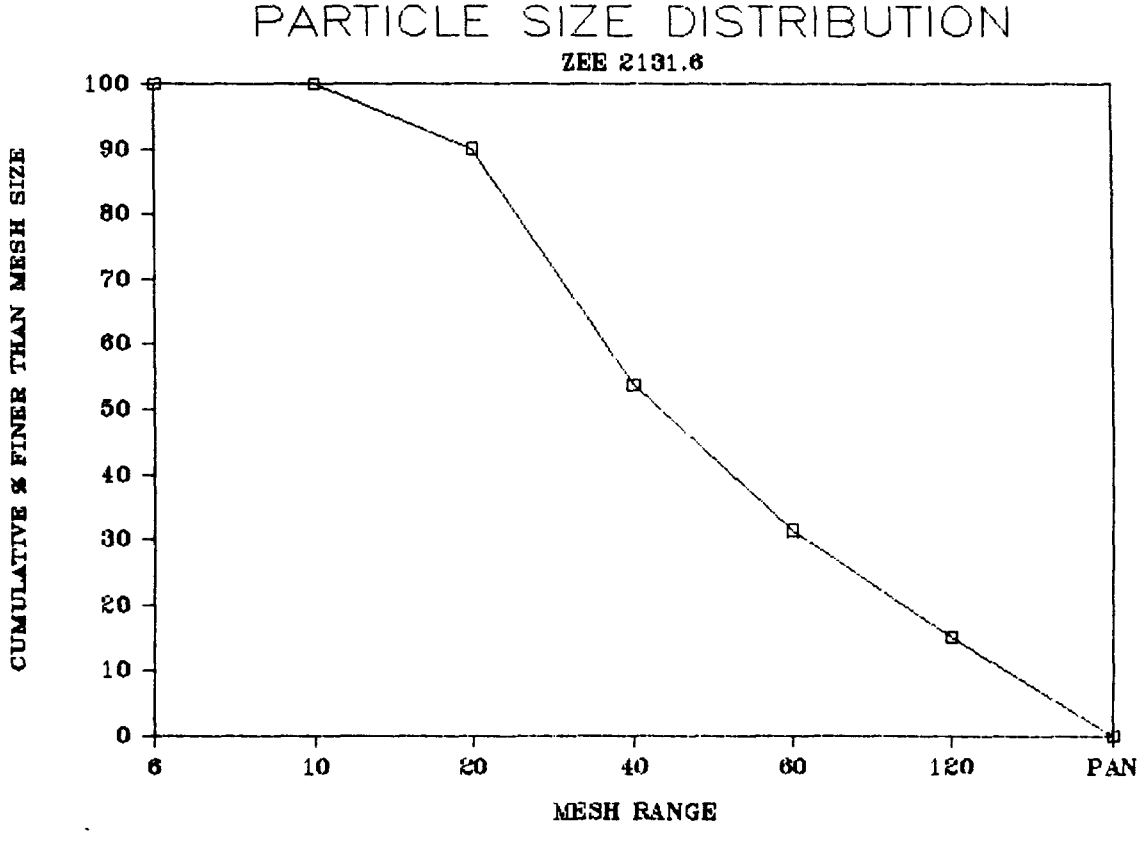
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1001

CLIENT'S SAMPLE DESIGNATION ZEE-2131.6

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00
20	25.15	25.15	9.95	9.95
40	91.74	116.89	46.22	36.28
60	56.49	173.38	68.56	22.34
120	41.36	214.74	84.91	16.35
PAN	38.15	252.89	100.00	15.09



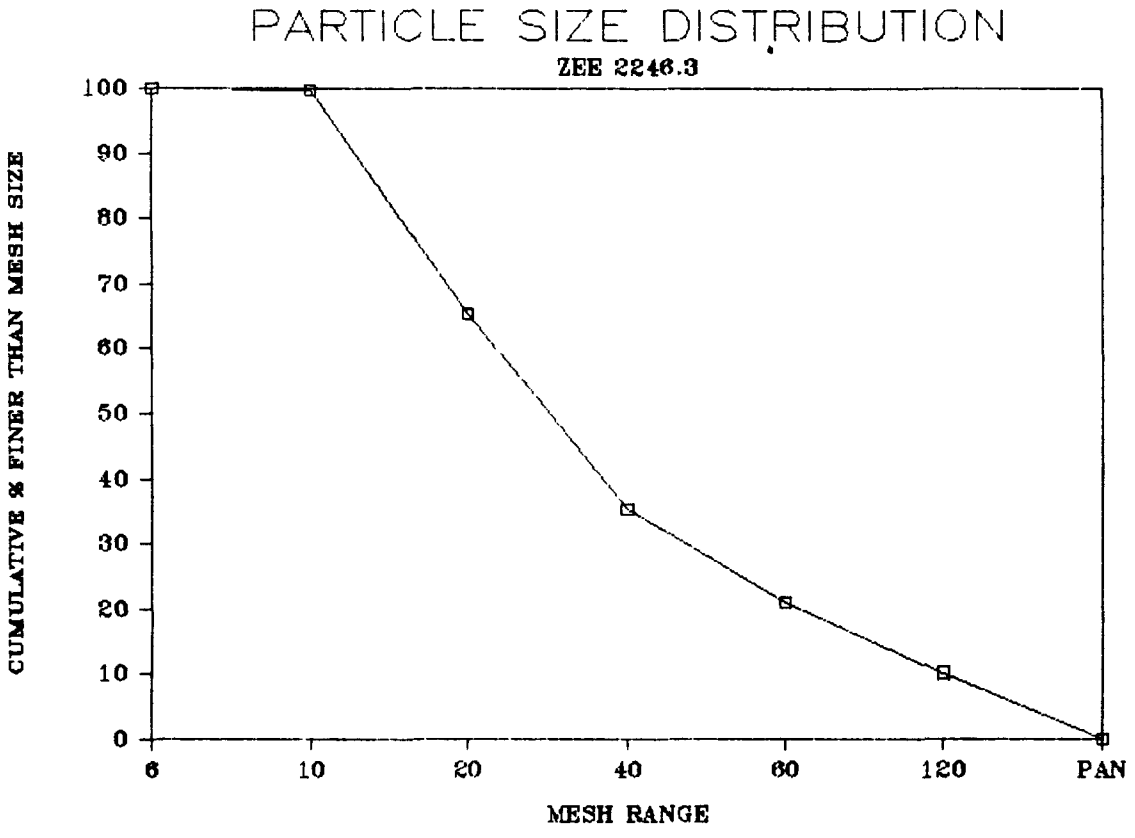
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1002

CLIENT'S SAMPLE DESIGNATION ZEE-2246.3

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.29	0.29	0.11	0.11
20	88.66	88.95	34.56	34.45
40	77.42	166.37	64.65	30.08
60	36.85	203.22	78.97	14.32
120	28.03	231.25	89.86	10.89
PAN	26.10	257.35	100.00	10.14



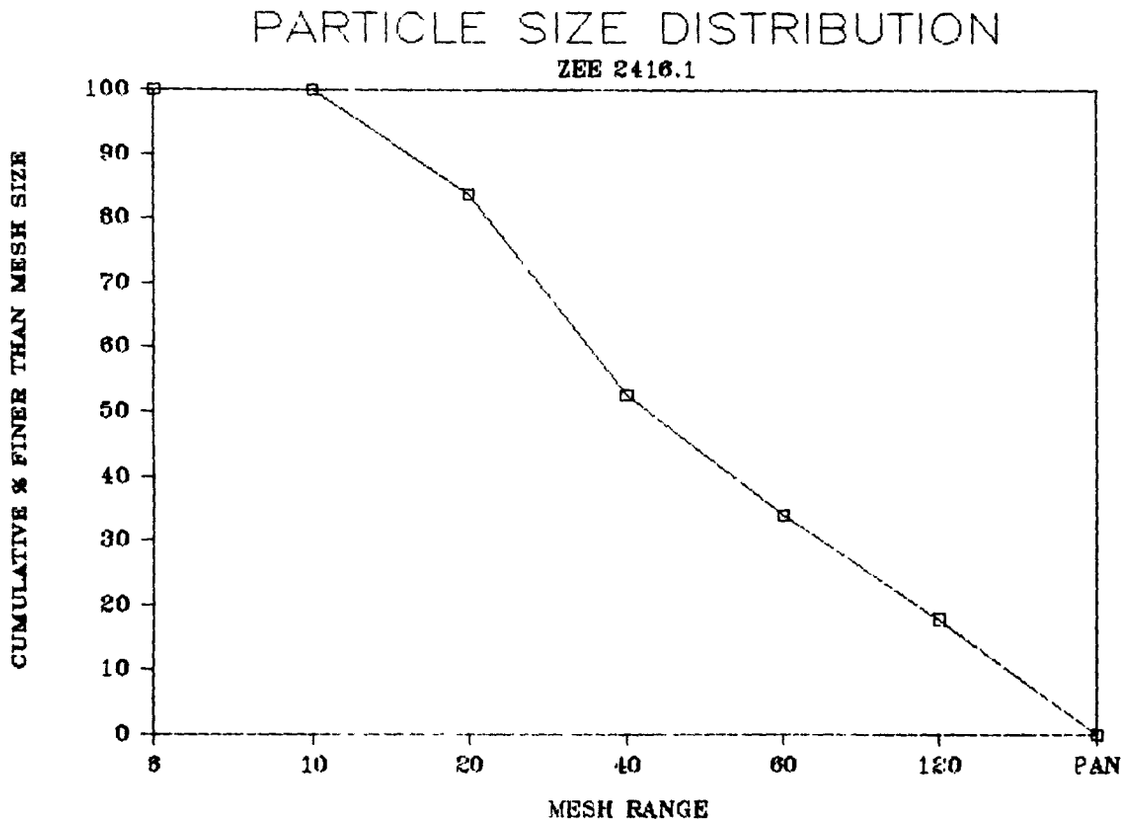
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1004

CLIENT'S SAMPLE DESIGNATION ZEE-2416.1

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00
20	45.56	45.56	16.24	16.24
40	87.43	132.99	47.41	31.16
60	52.16	185.15	66.00	18.59
120	45.24	230.39	82.12	16.13
PAN	50.15	280.54	100.00	17.88



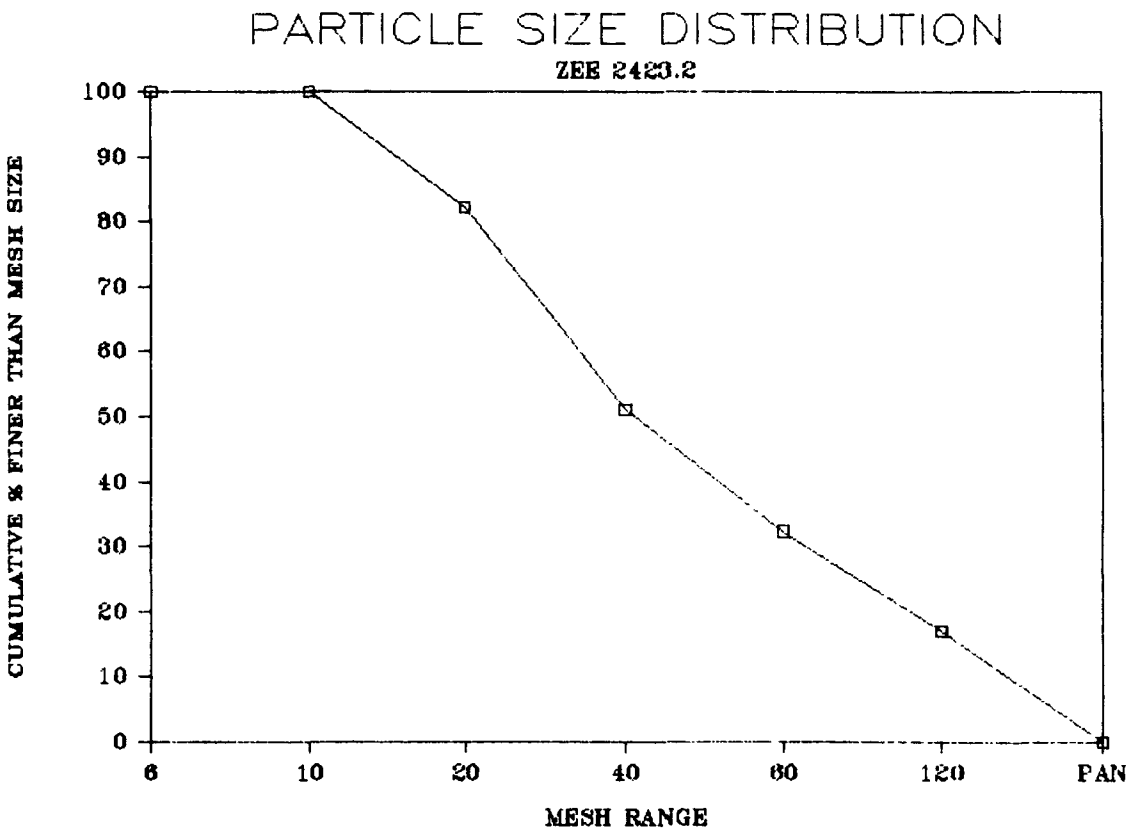
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1005

CLIENT'S SAMPLE DESIGNATION ZEE-2423.2

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.04	0.04	0.01	0.01
20	56.92	56.96	17.88	17.87
40	99.08	156.04	48.99	31.11
60	59.74	215.78	67.74	18.75
120	48.44	264.22	82.95	15.21
PAN	54.31	318.53	100.00	17.05



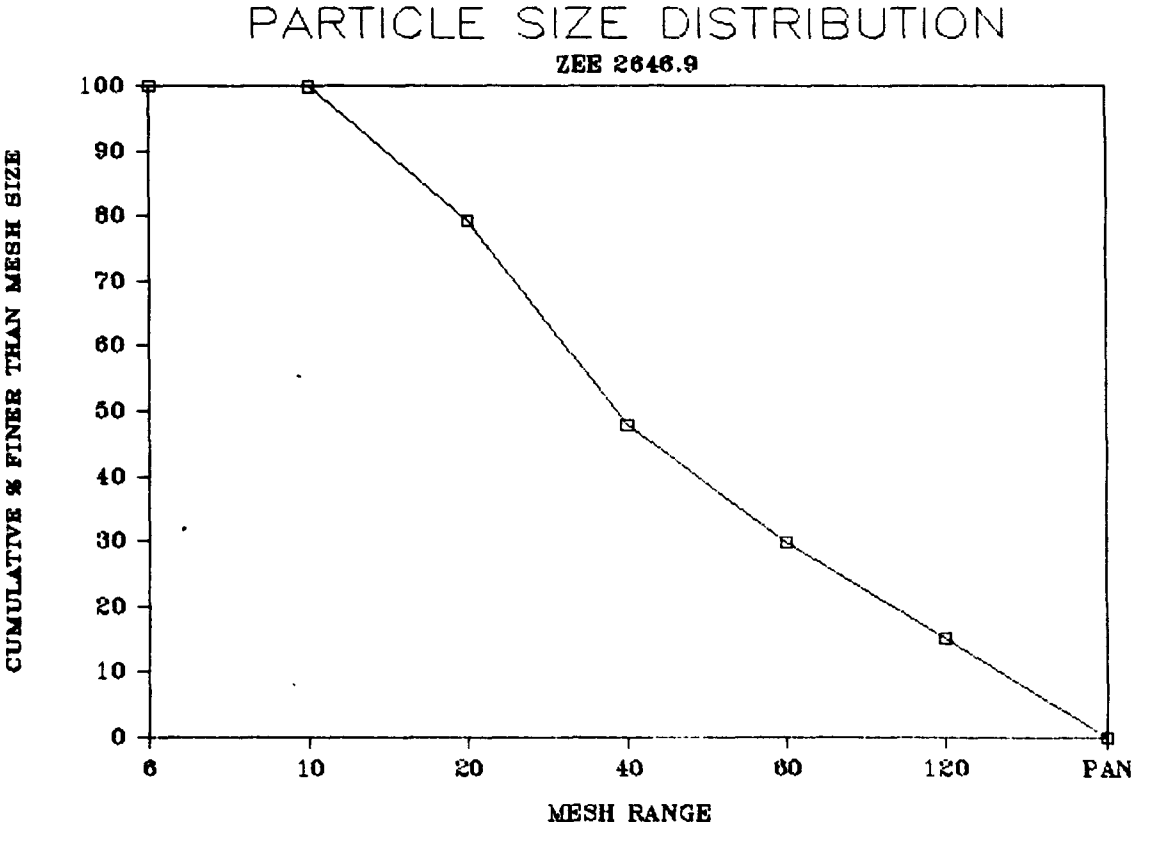
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1008

CLIENT'S SAMPLE DESIGNATION ZEE-2646.9

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.09	0.09	0.03	0.03
20	63.48	63.57	20.72	20.69
40	96.53	160.10	52.17	31.46
60	55.36	215.46	70.21	18.04
120	45.03	260.49	84.89	14.67
PAN	46.38	306.87	100.00	15.11



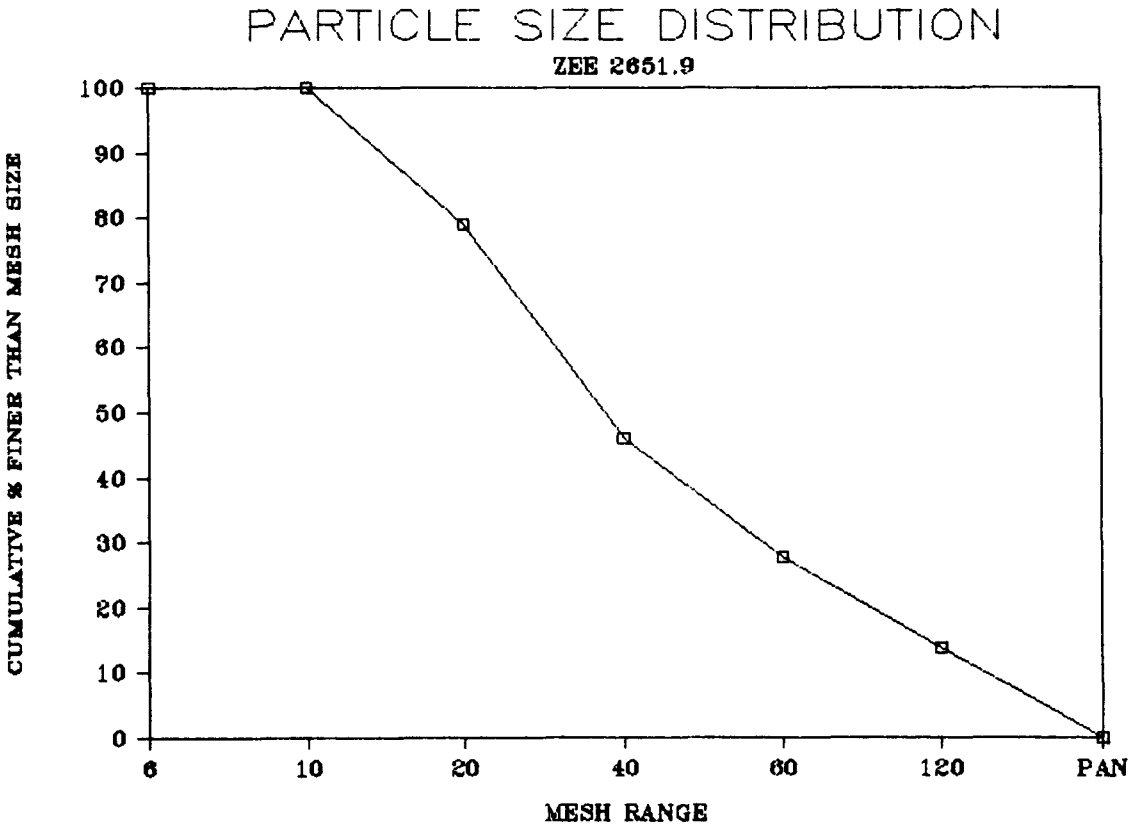
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1009

CLIENT'S SAMPLE DESIGNATION ZEE-2651.9

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.06	0.06	0.02	0.02
20	62.04	62.10	20.98	20.96
40	97.85	159.95	54.03	33.05
60	54.20	214.15	72.34	18.31
120	41.18	255.33	86.25	13.91
PAN	40.71	296.04	100.00	13.75



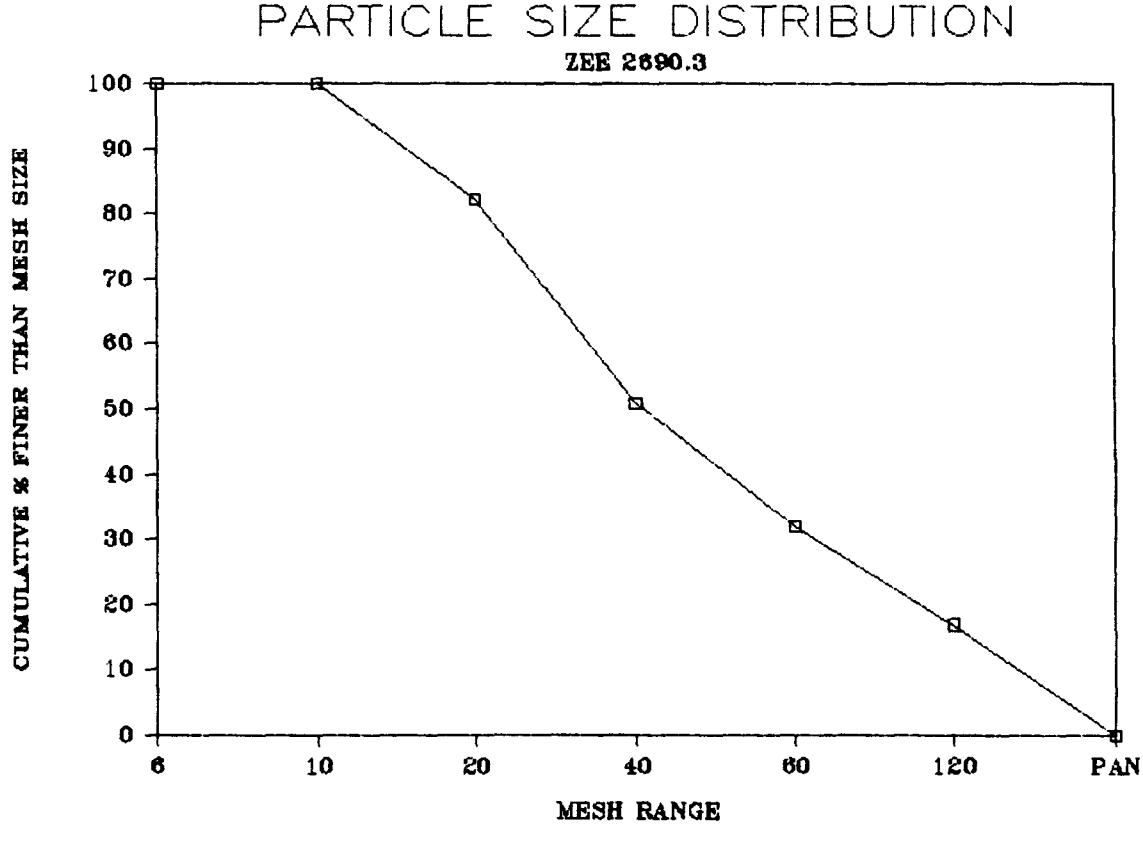
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1010

CLIENT'S SAMPLE DESIGNATION ZEE-2690.3

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00
20	45.05	45.05	17.79	17.79
40	79.70	124.75	49.26	31.47
60	47.80	172.55	68.13	18.87
120	38.20	210.75	83.22	15.08
PAN	42.50	253.25	100.00	16.78



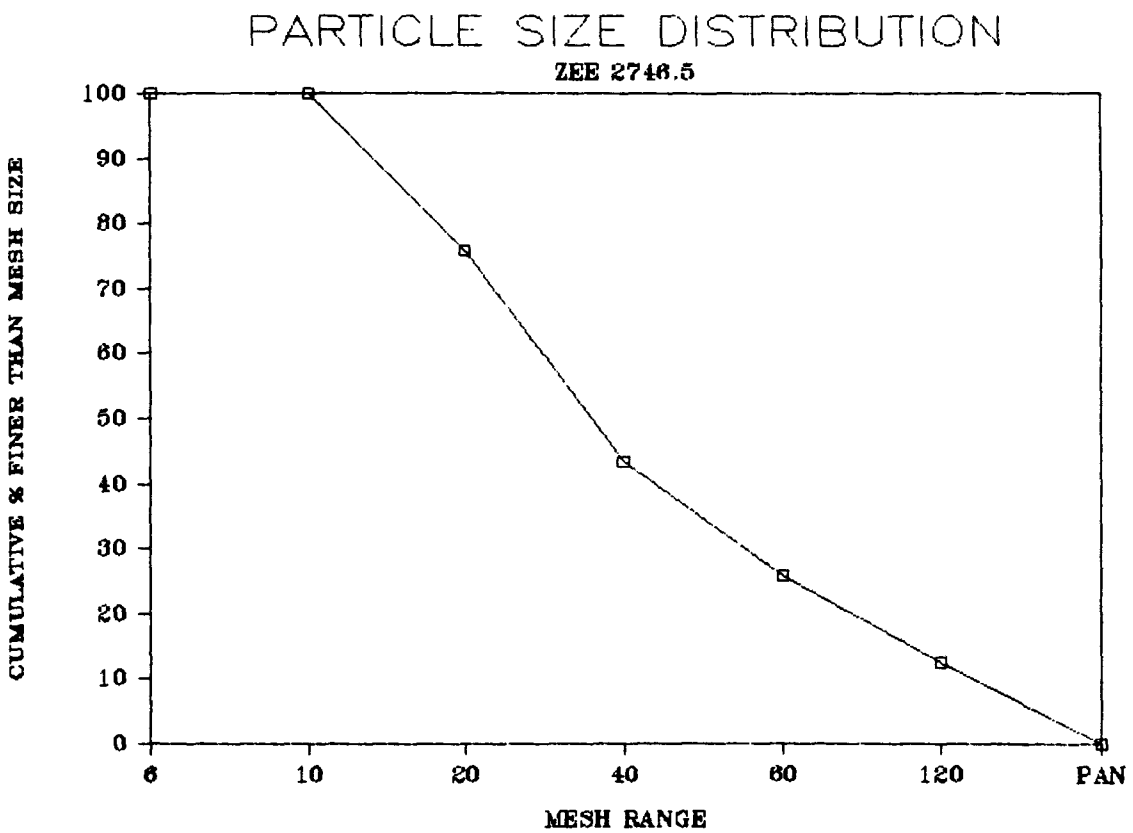
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1011

CLIENT'S SAMPLE DESIGNATION ZEE-2746.5

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00
20	75.44	75.44	24.13	24.13
40	101.64	177.08	56.65	32.52
60	55.07	232.15	74.27	17.62
120	41.61	273.76	87.58	13.31
PAN	38.82	312.58	100.00	12.42



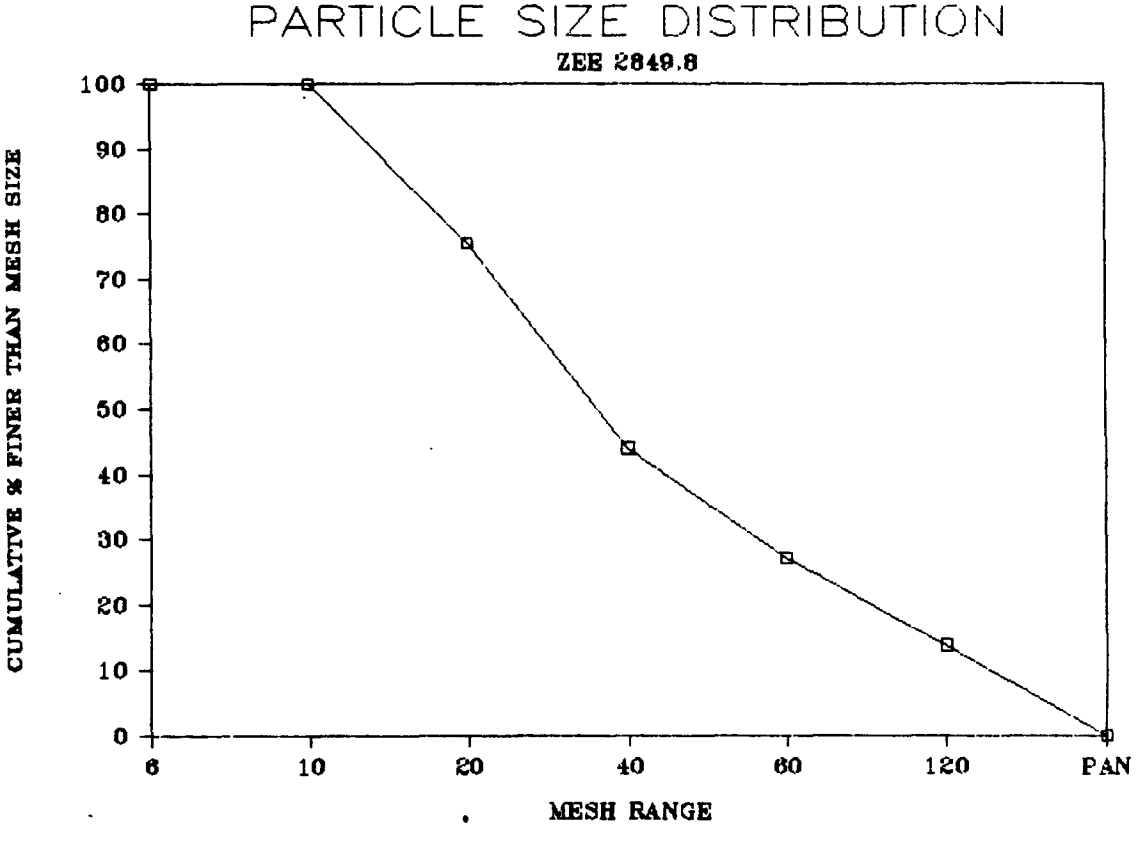
S I E V E A N A L Y S I S

CLIENT ..... STONE & WEBSTER ENGINEERING CORP.

TERRATEK RESEARCH SAMPLE NO A-1012

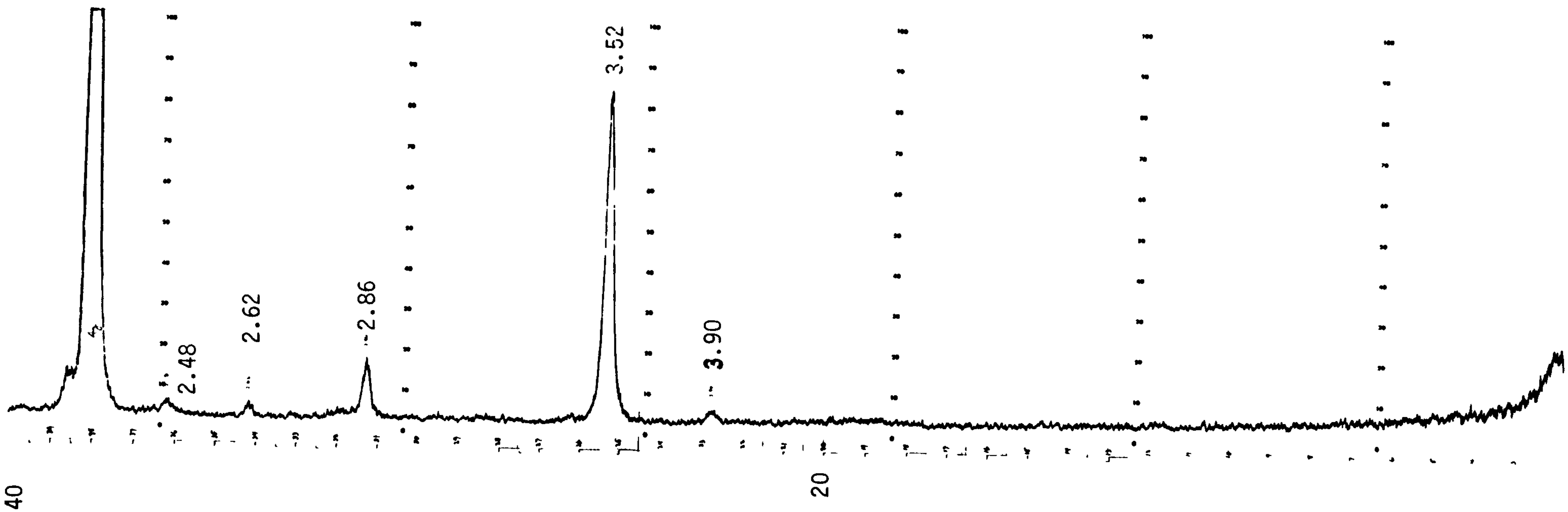
CLIENT'S SAMPLE DESIGNATION ZEE-2849.8

MESH SIZE	RAW WEIGHT(gm)	CUMULATIVE WEIGHT(gm)	CUMULATIVE PERCENT	PERCENT RECOVERY
6	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00
20	75.31	75.31	24.44	24.44
40	97.33	172.64	56.03	31.59
60	52.03	224.67	72.91	16.89
120	40.73	265.40	86.13	13.22
PAN	42.74	308.14	100.00	13.87



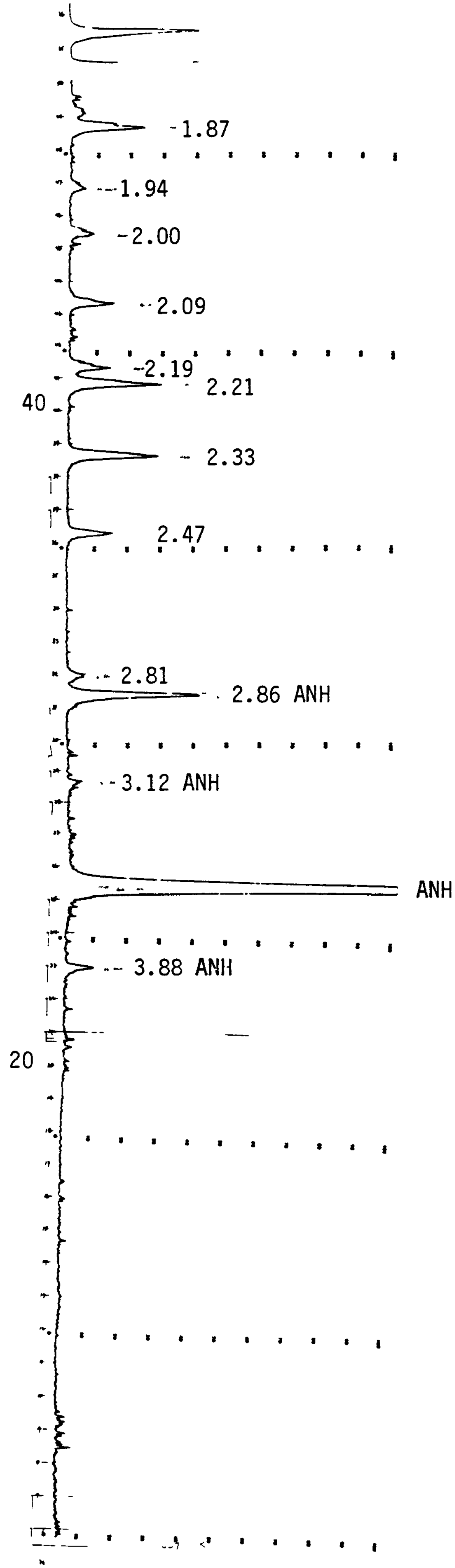
APPENDIX E

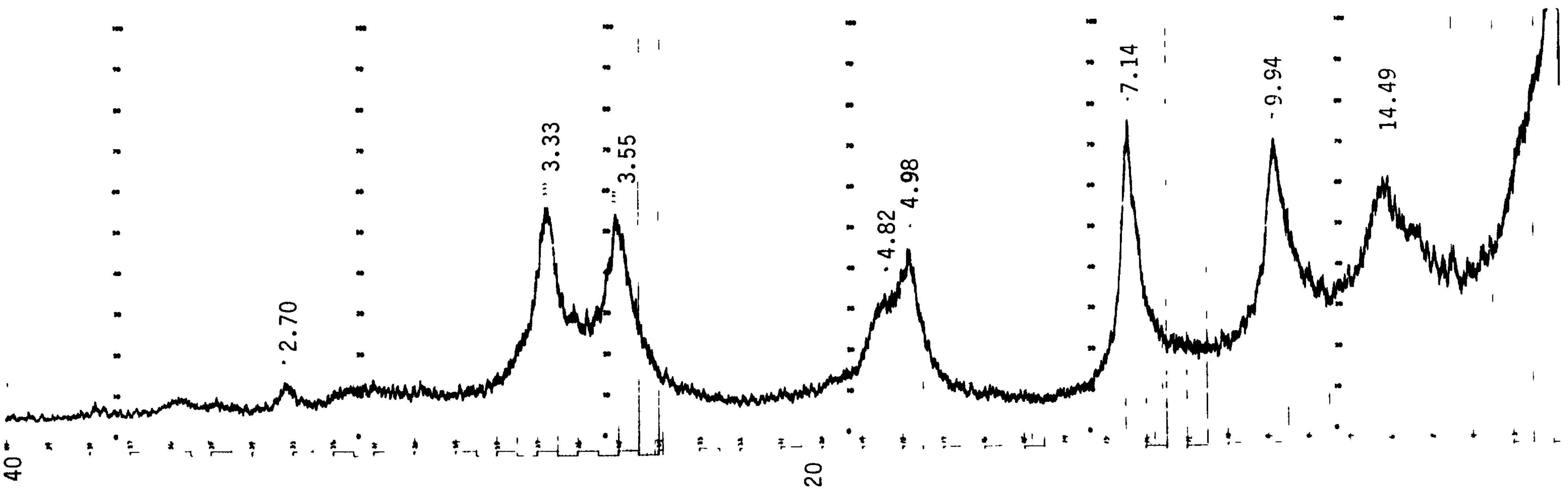
X-RAY DIFFRACTION PATTERNS



C1037 HAR 2162.1 AIR DRIED

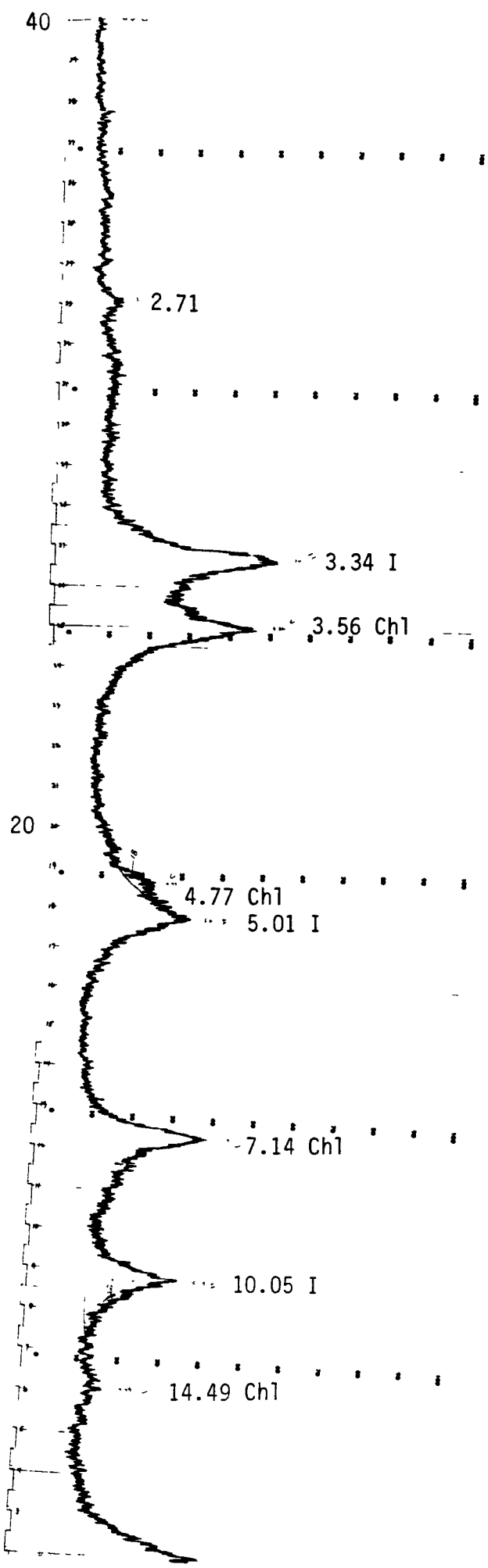
C1037 HAR 2162.1 RANDOM MOUNT

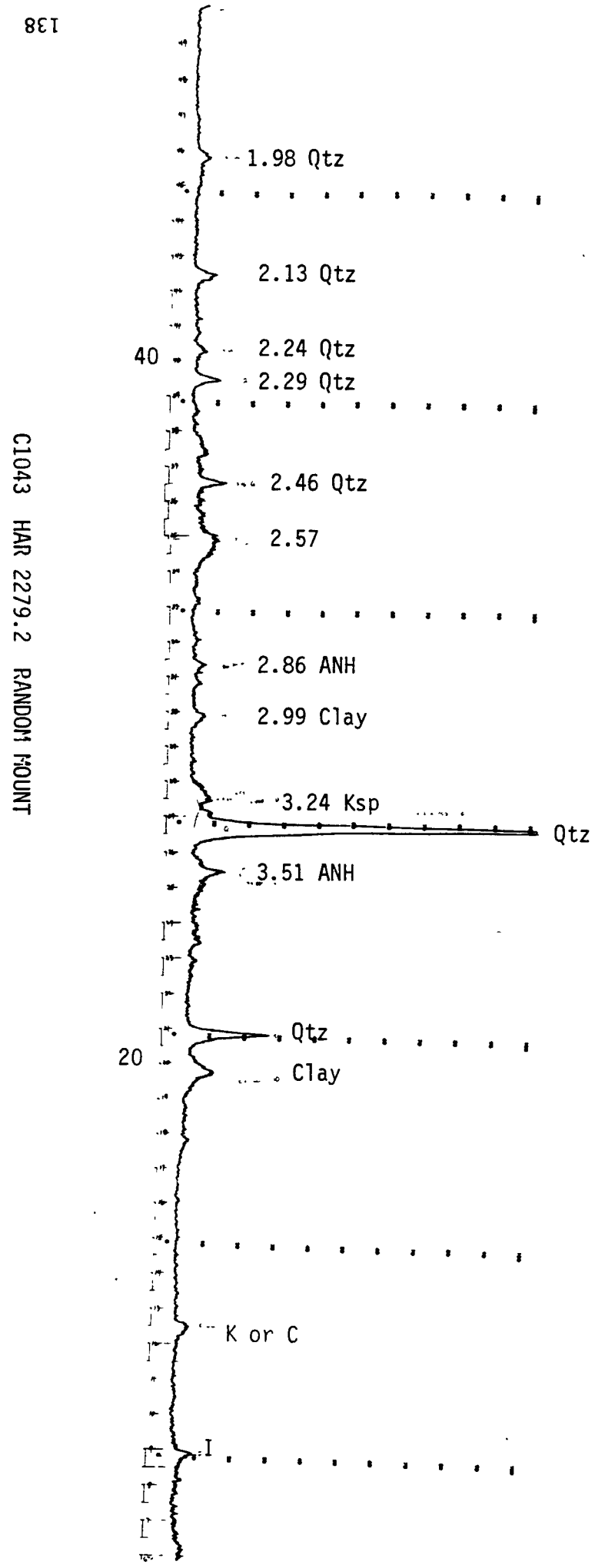




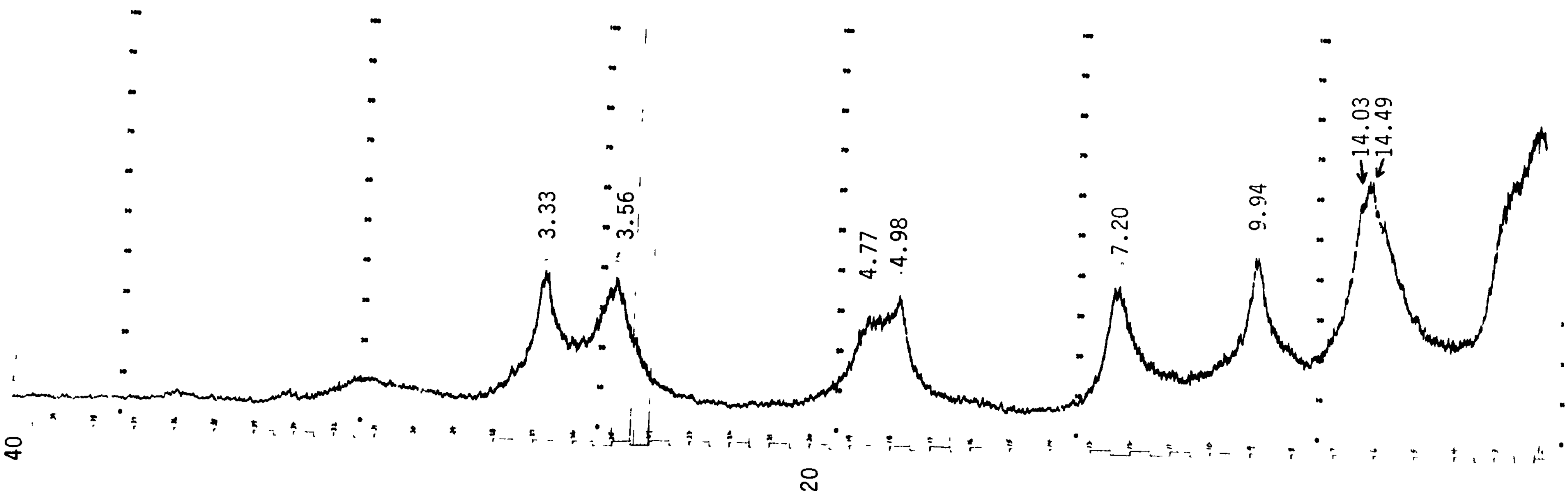
C1043 HAR 2279.2 AIR DRIED

C1043 HAR 2279.2 GLYCOLATED

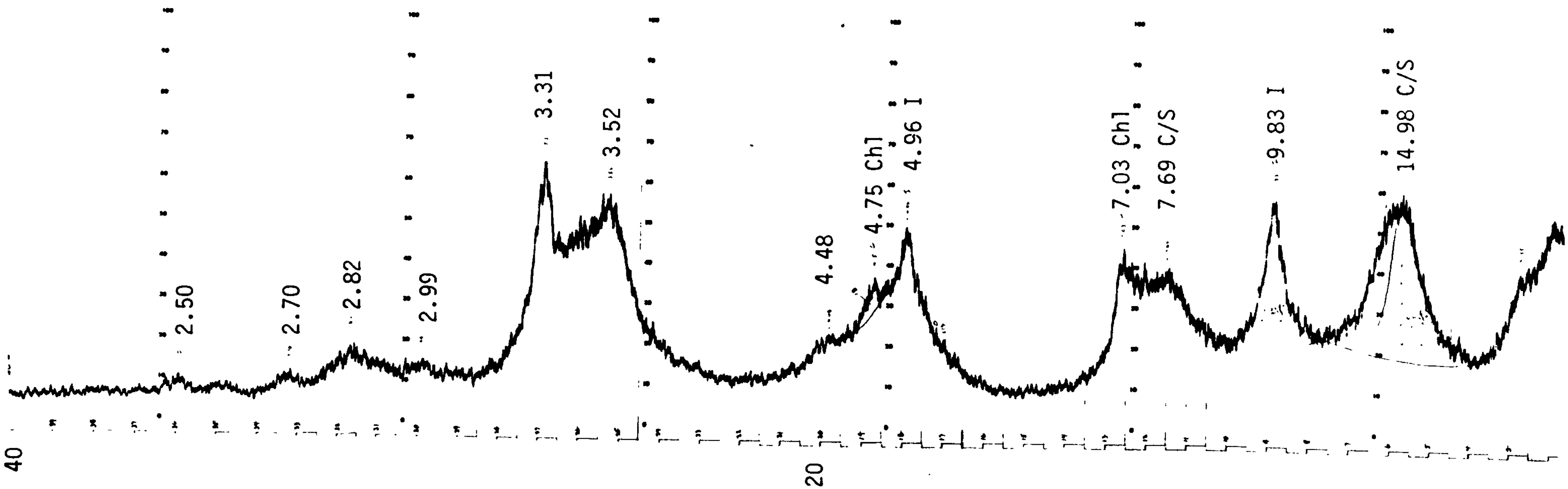




C1043 HAR 2279.2 RANDOM MOUNT

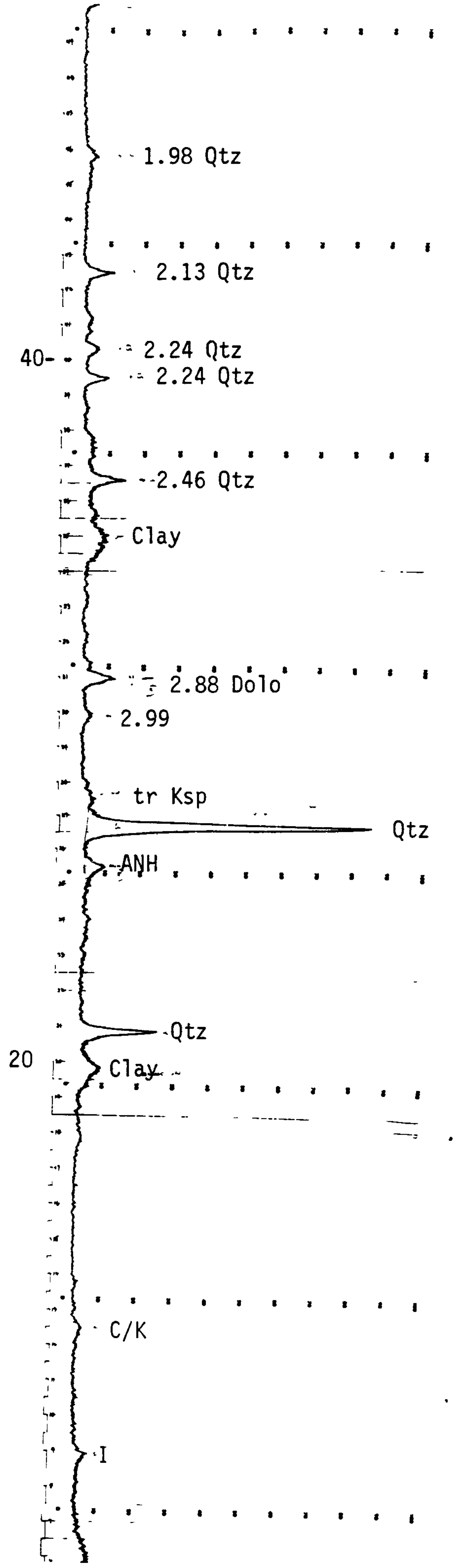


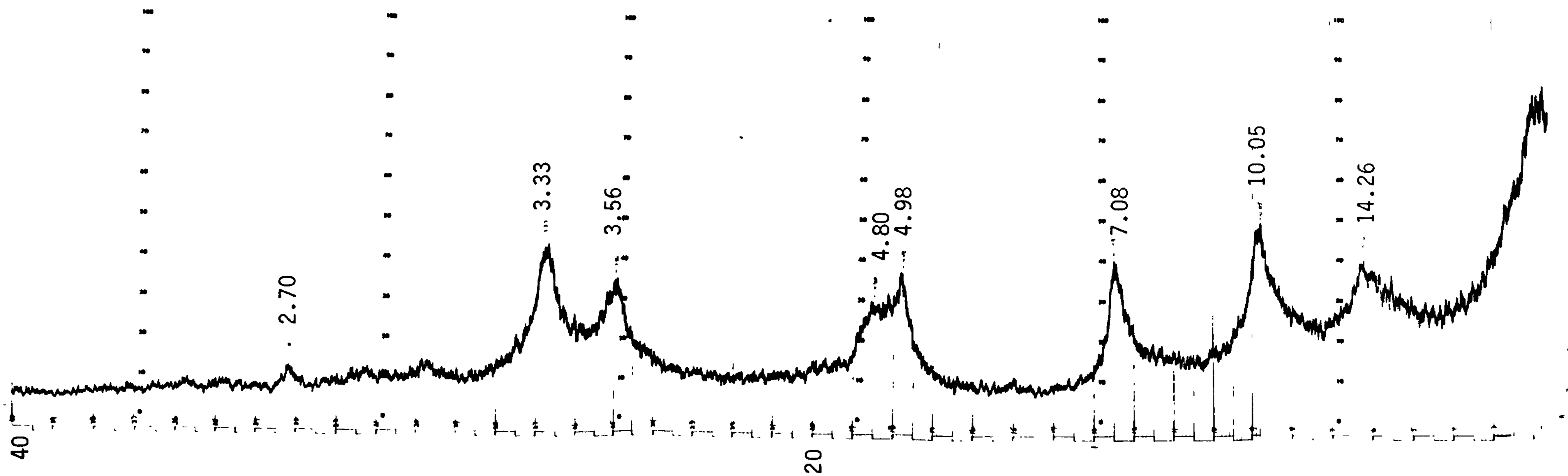
C1038 HAR 2282.0 AIR DRIED



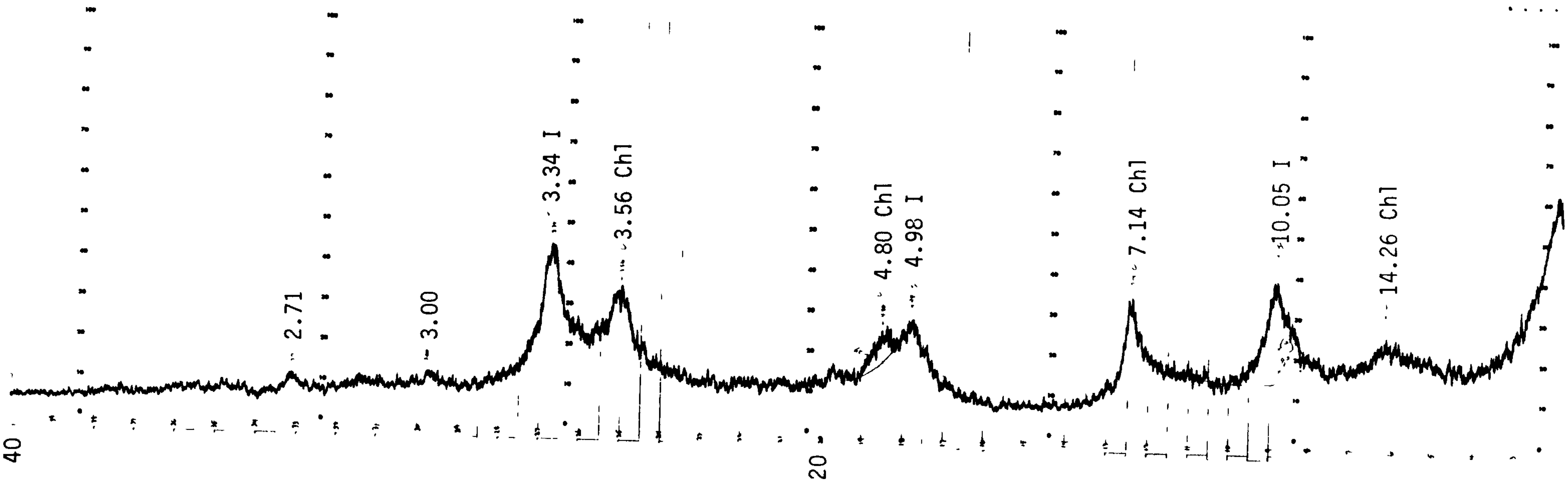
C1038 HAR 2282.0 GLYCOLATED

C1038 HAR 2282.0 RANDOM MOUNT

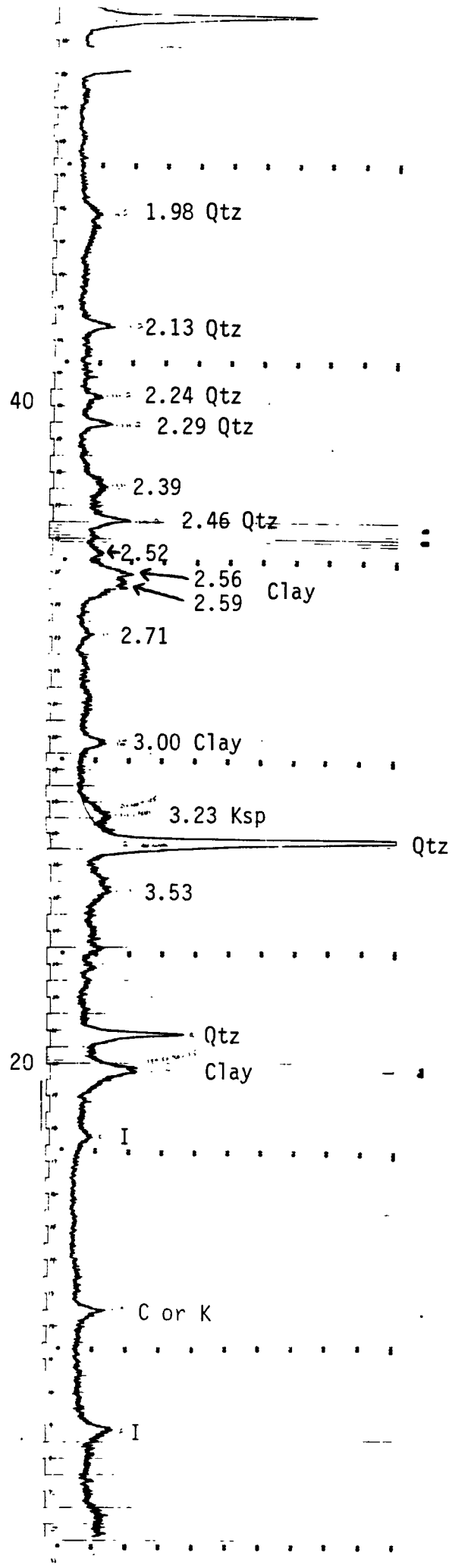




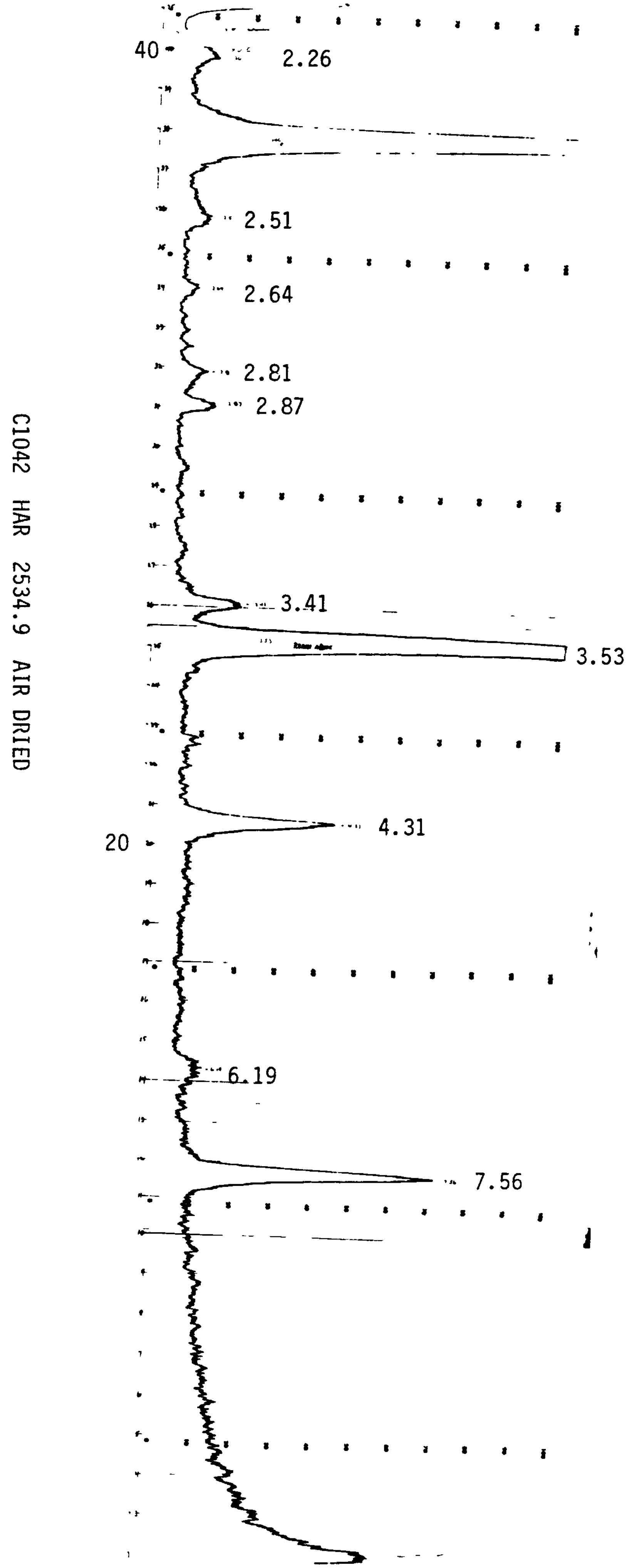
C1041 HAR 2473.6 AIR DRIED



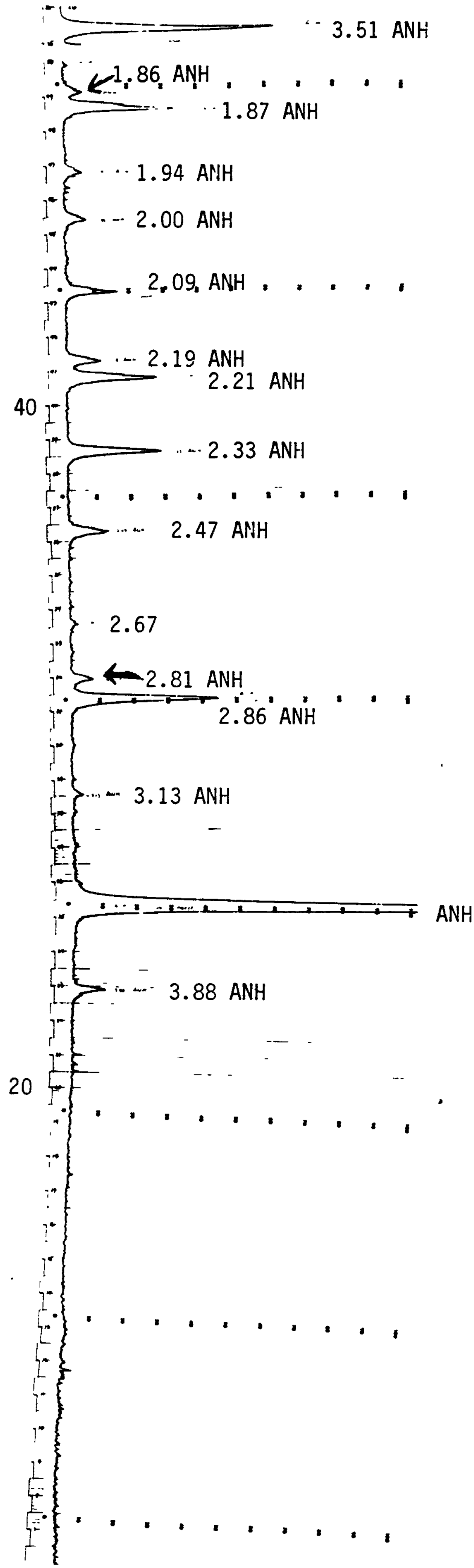
C1041 HAR 2473.6 GLYCOLATED

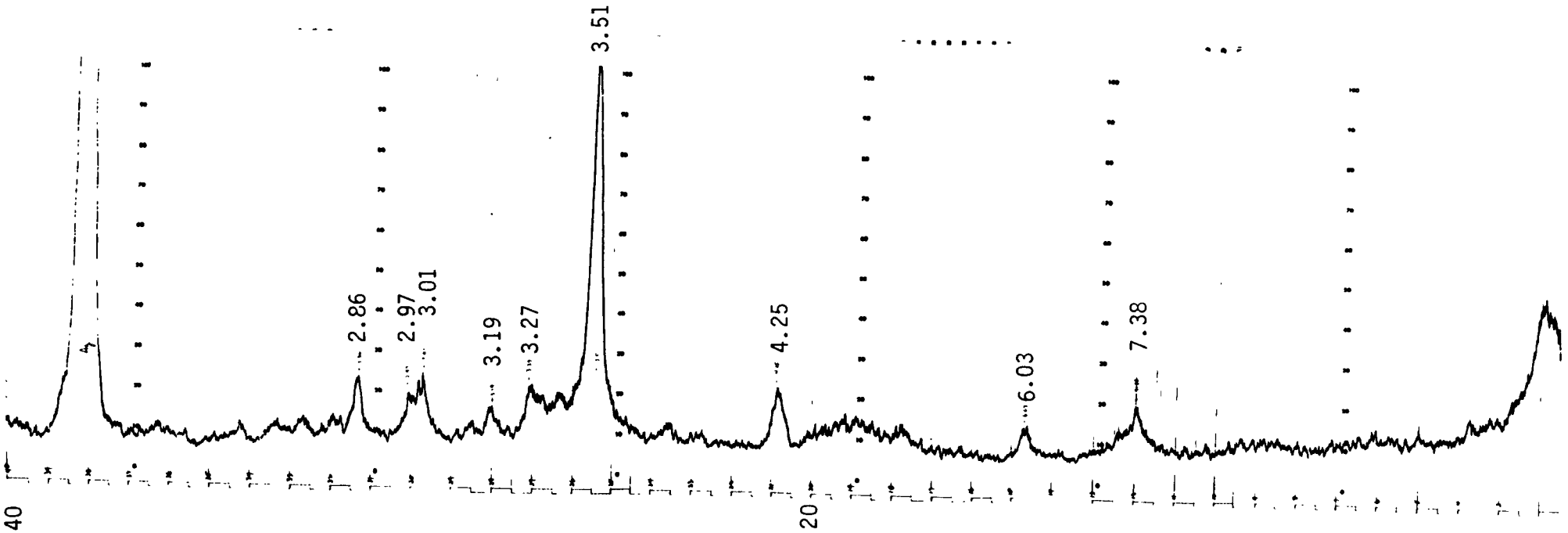


C1041 HAR 2473.6 RANDOM MOUNT


C1042 HAR 2534.9 AIR DRIED
40
2.26
2.51
2.64
2.81
2.87
3.41
3.53
4.31
20
6.19
7.56

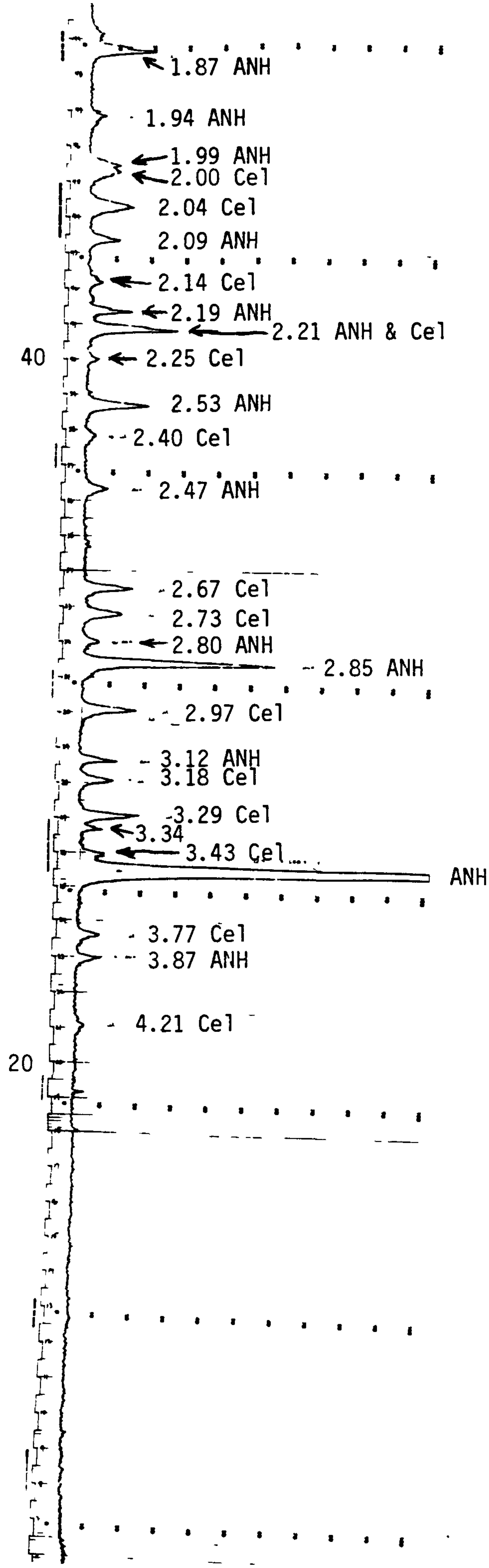
C1042 HAR 2534.9 RANDOM MOUNT

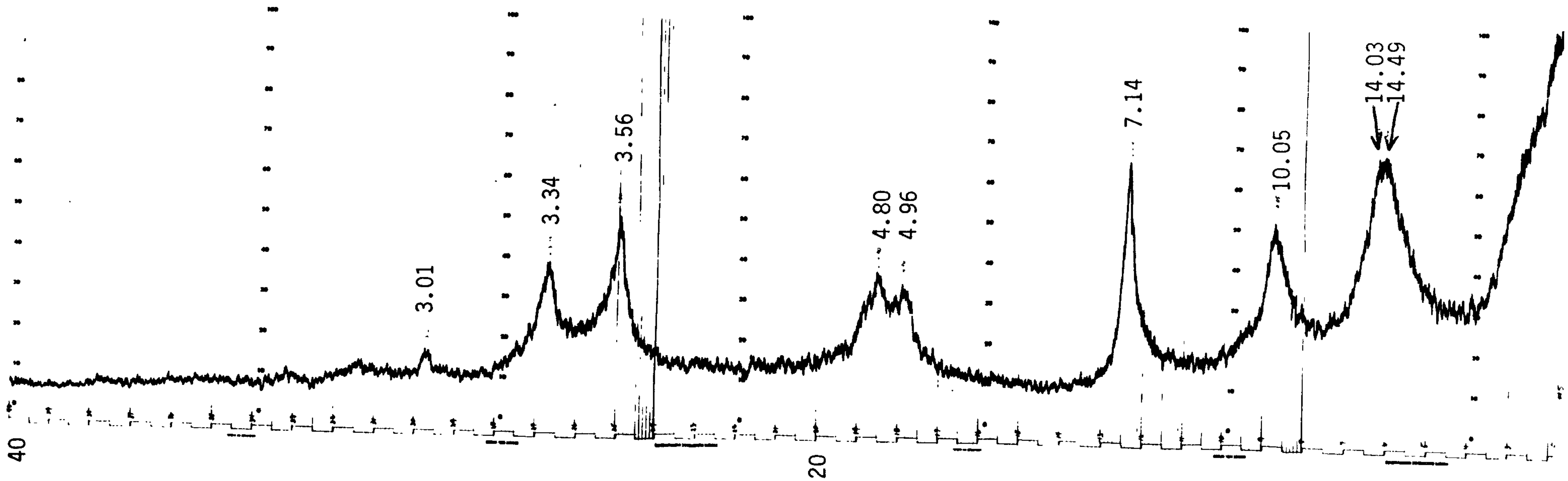




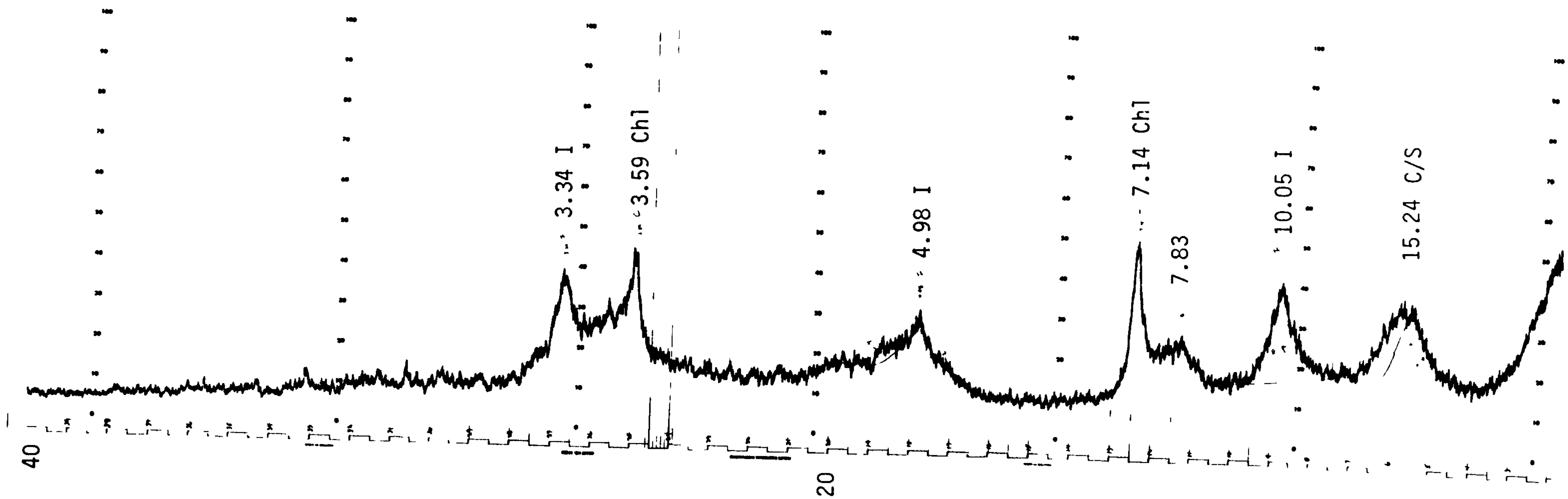
C1040 HAR 2717.3 AIR DRIED

C1040 HAR 2717.3 RANDOM MOUNT



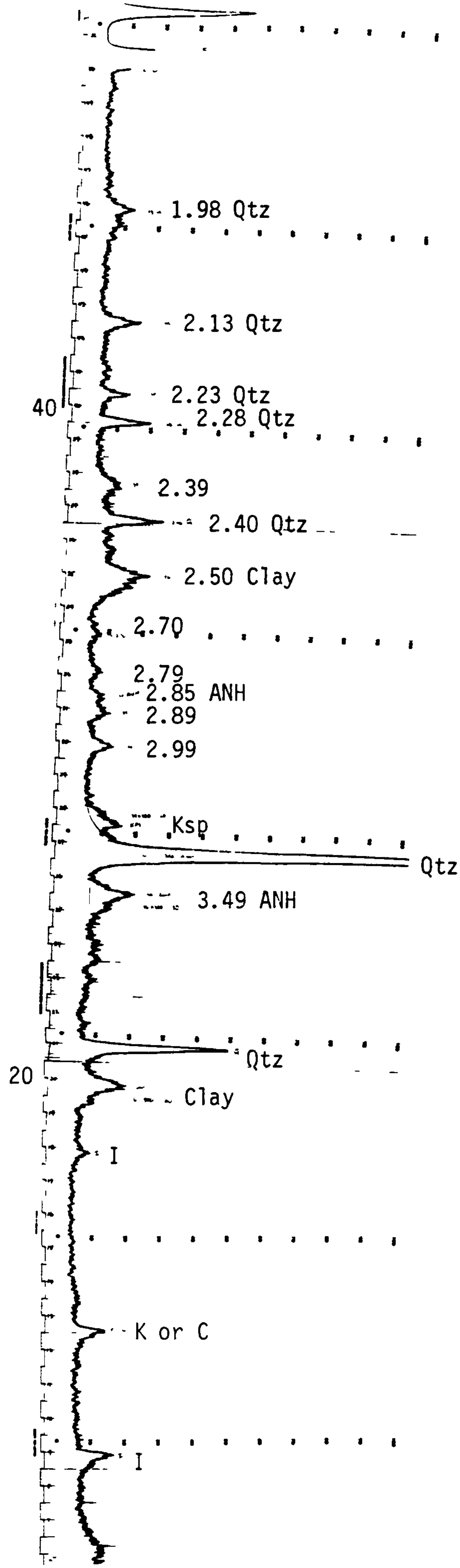


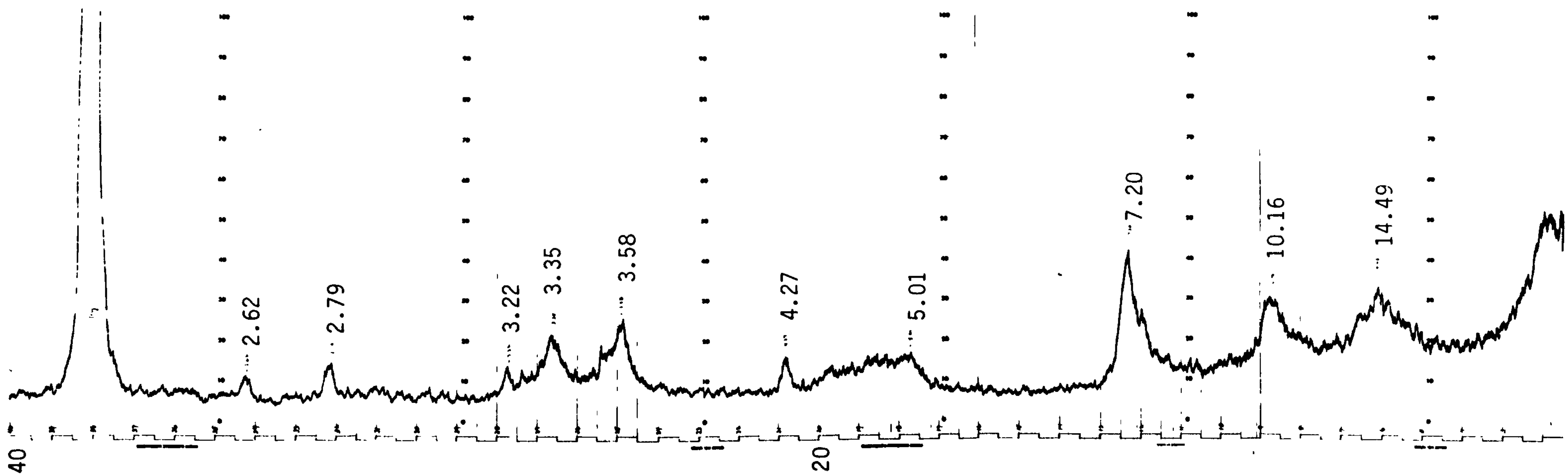
C1035 HAR 2743.2 AIR DRIED



C1035 HAR 2743.3 GLYCOLATED

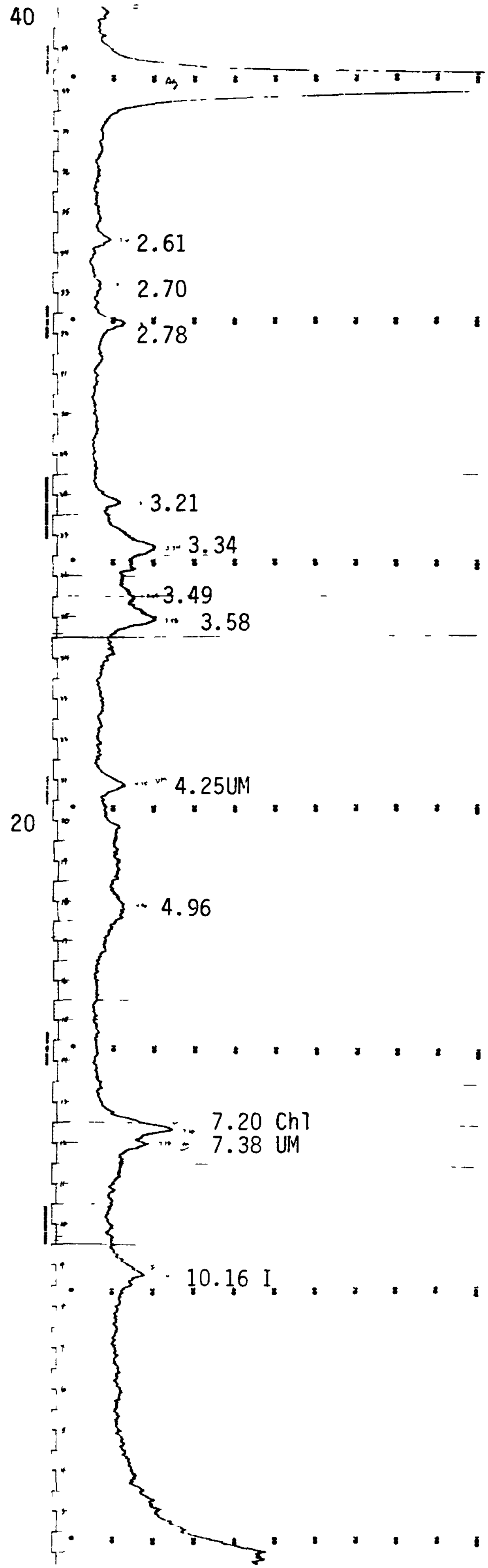
C1035 HAR 2743.3 RANDOM MOUNT



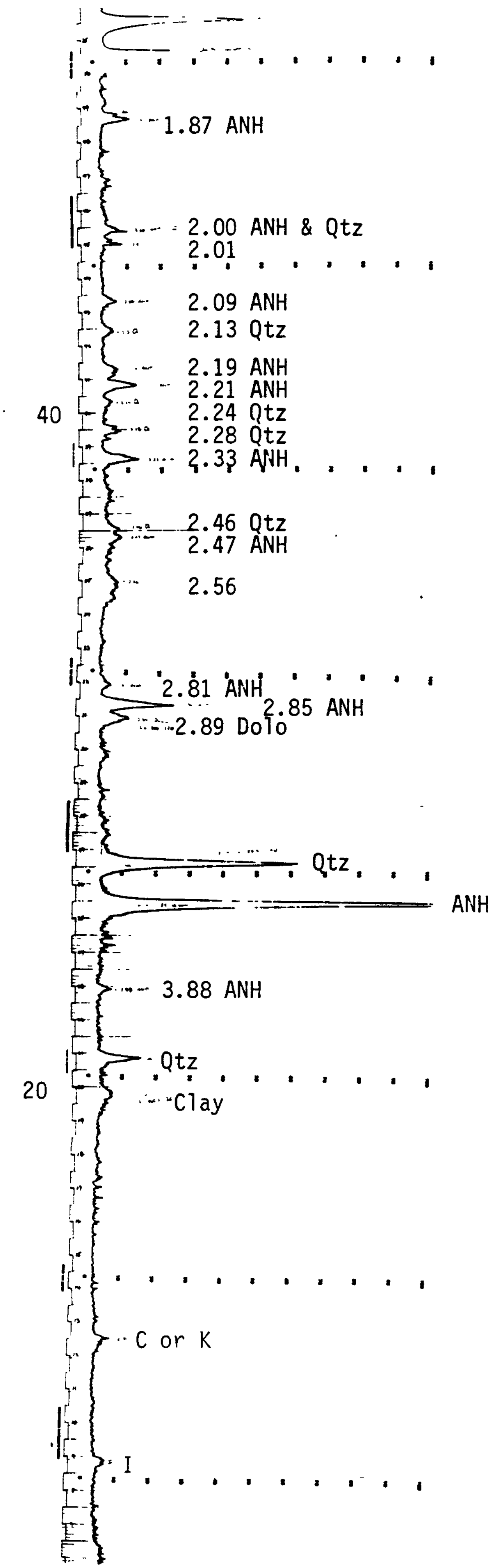


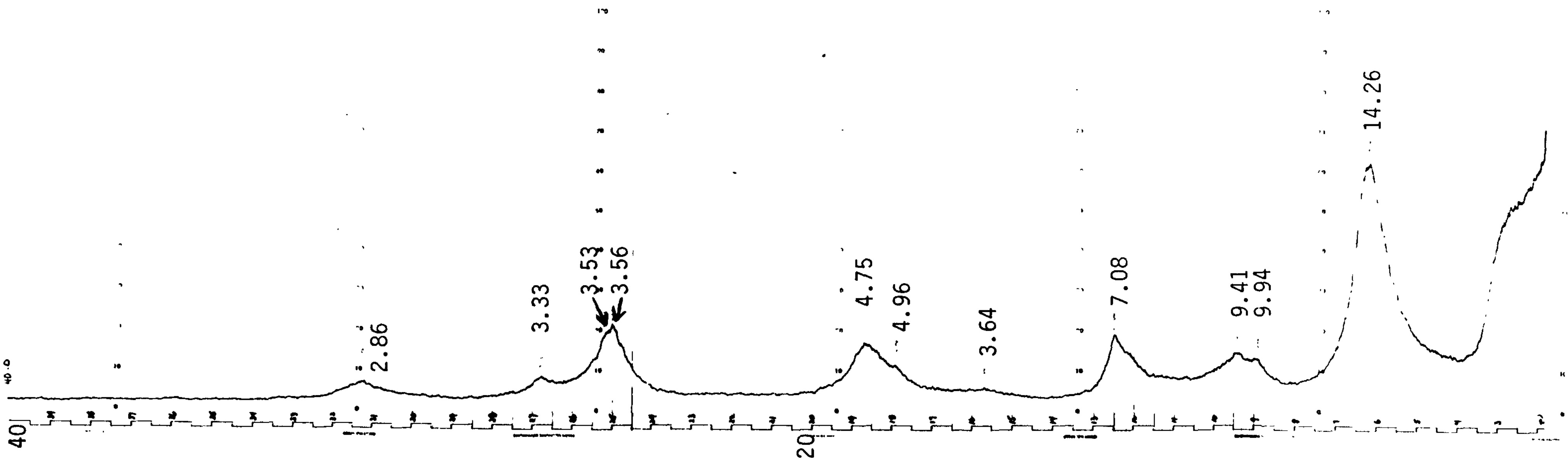
C1039 HAR 2791.0 AIR DRIED

C1039 HAR 2791.0 GLYCOLATED

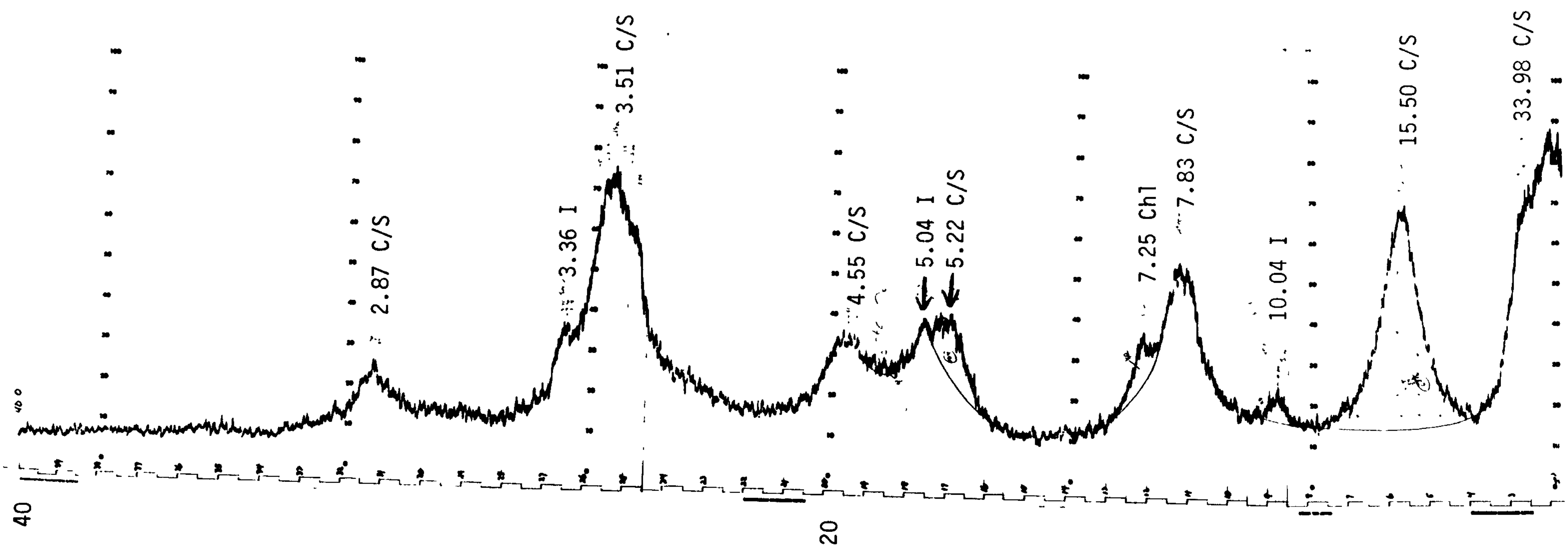


C1039 HAR 2791.0 RANDOM MOUNT



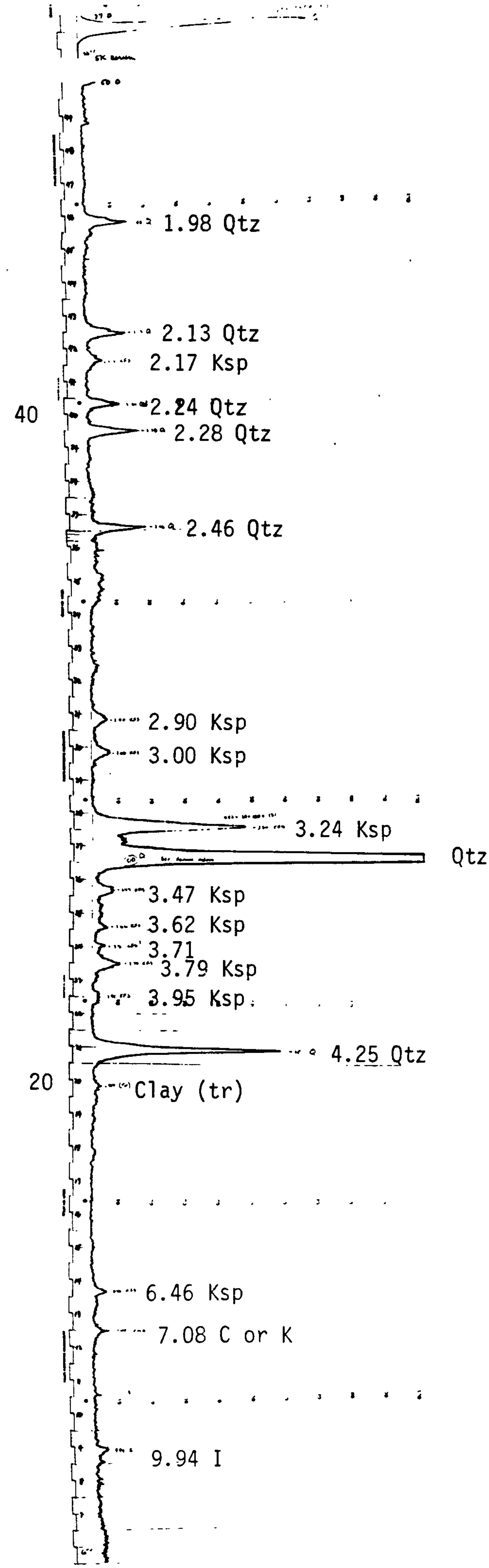


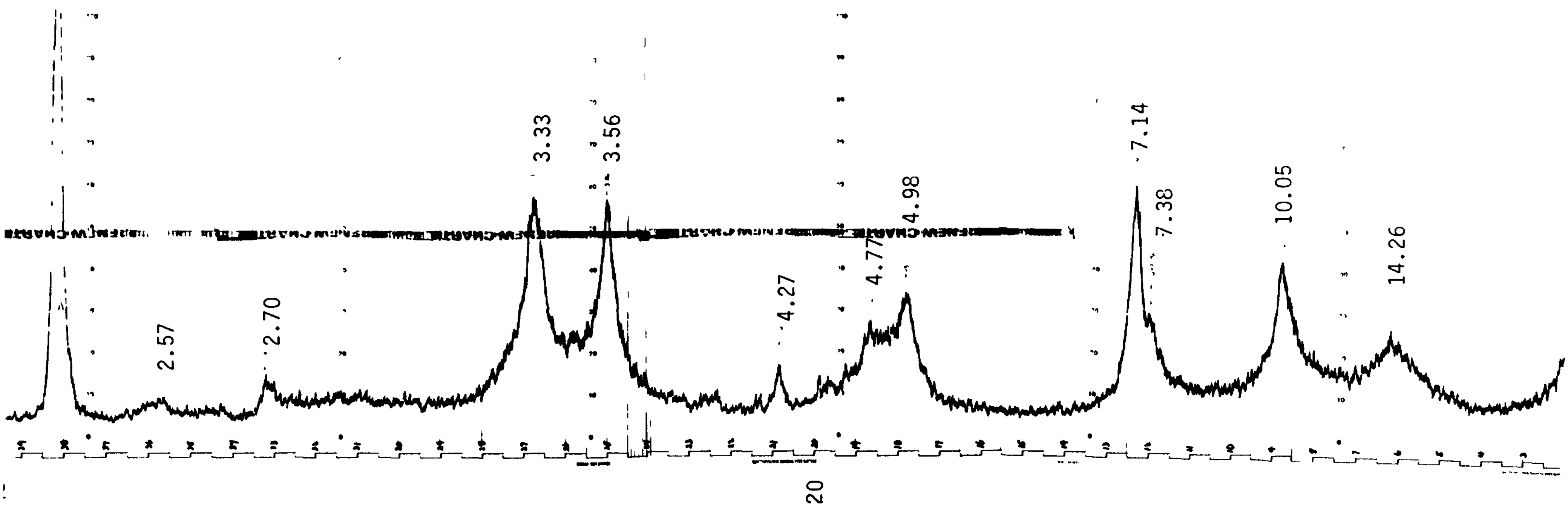
A1027 HOL 1391.1 AIR DRIED



A1027 HOL 1391.1 GLYCOLATED

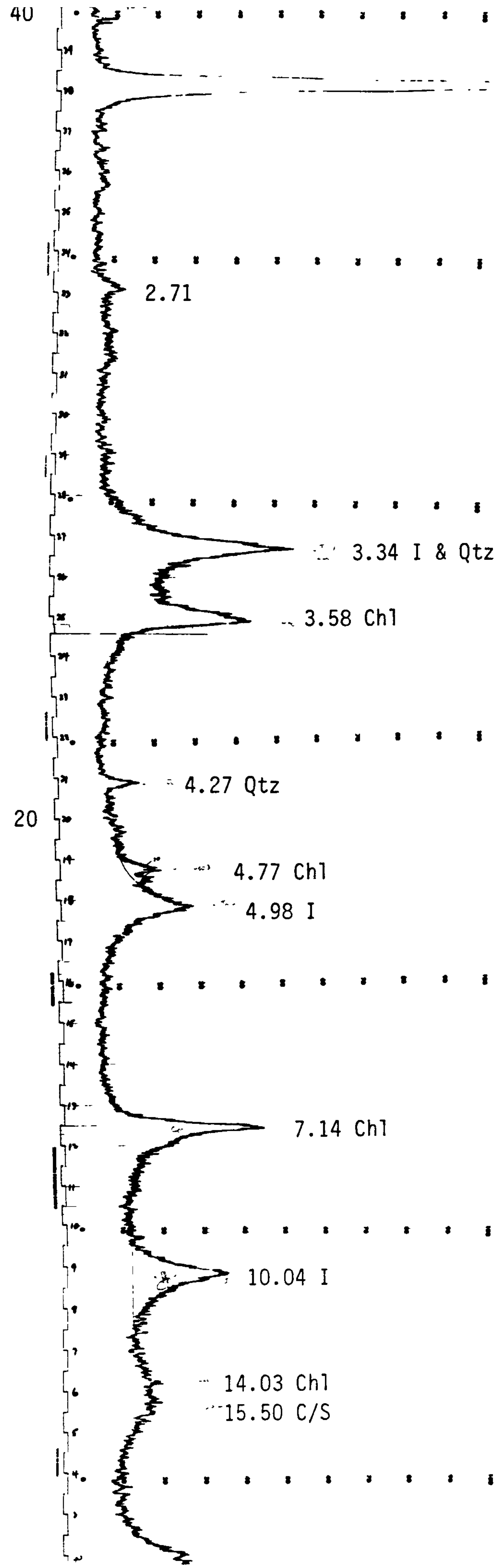
A1027 HOL 1391.1 RANDOM MOUNT



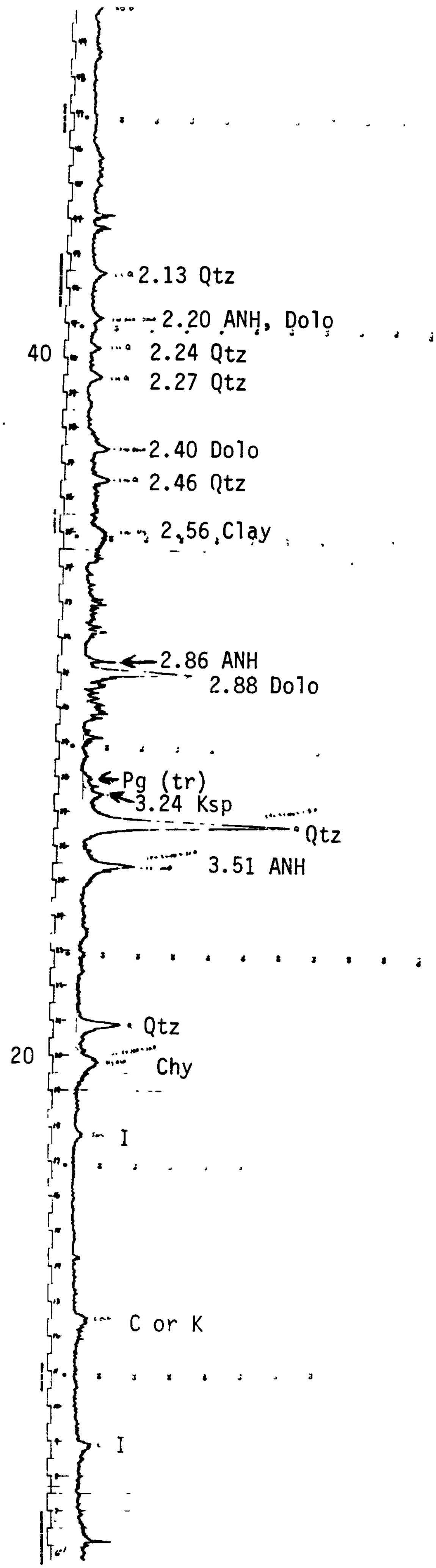


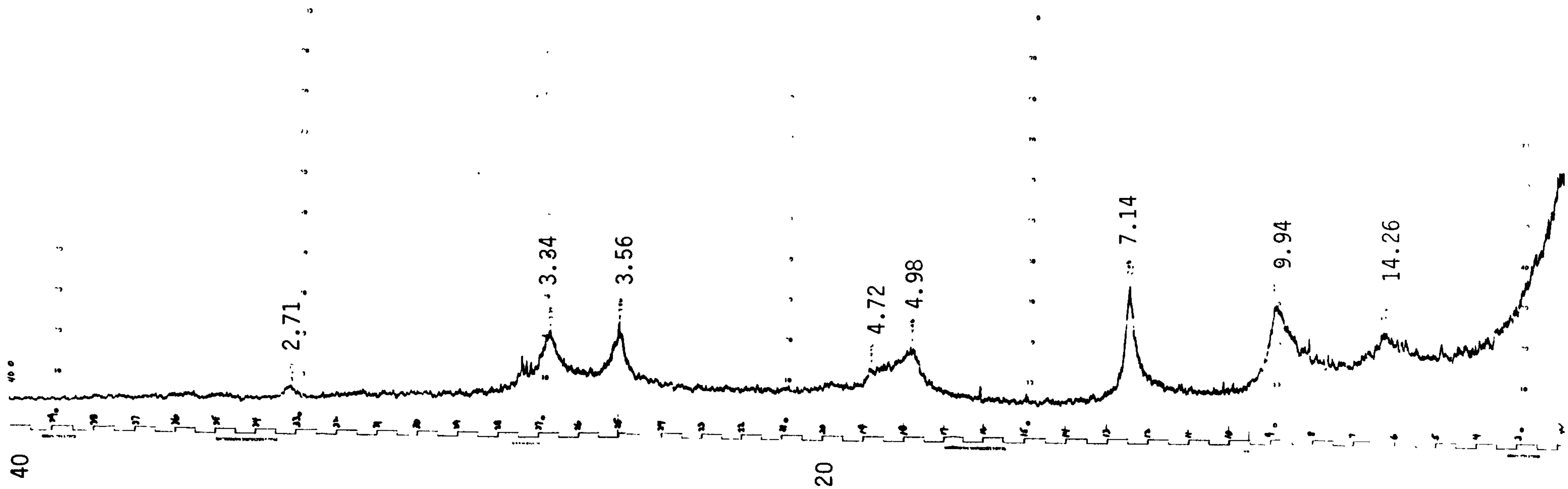
A1025 HOL 2414.7 AIR DRIED

A1025 HOL 2414.7 GLYCOLATED



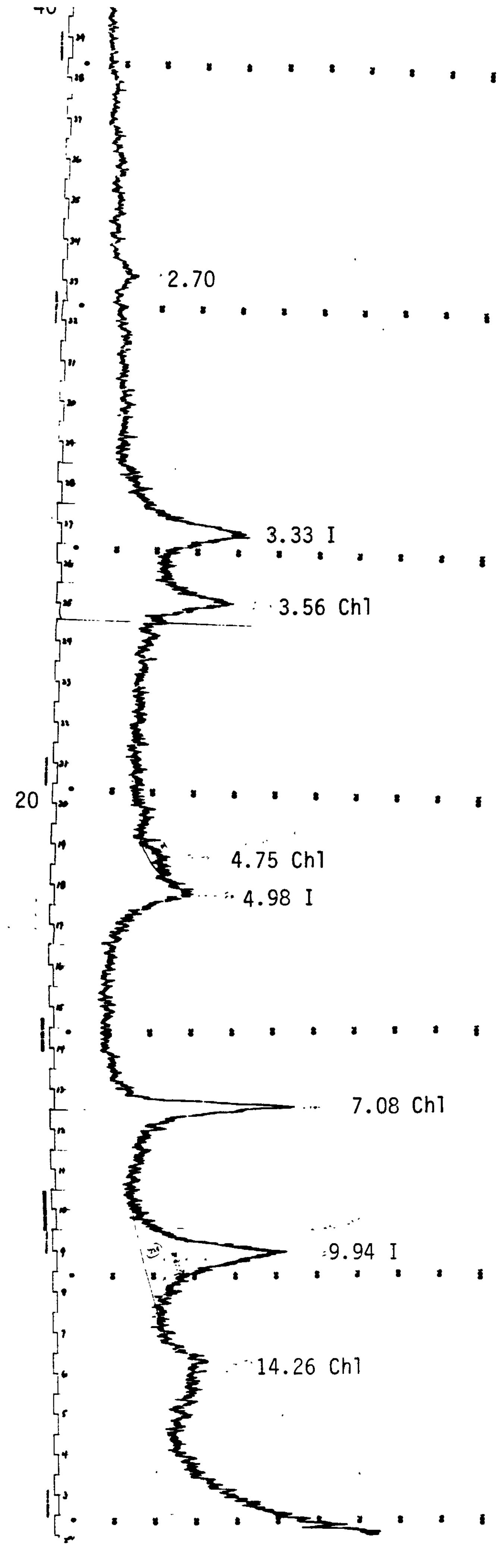
A1025 HOL 2414.7 RANDOM MOUNT



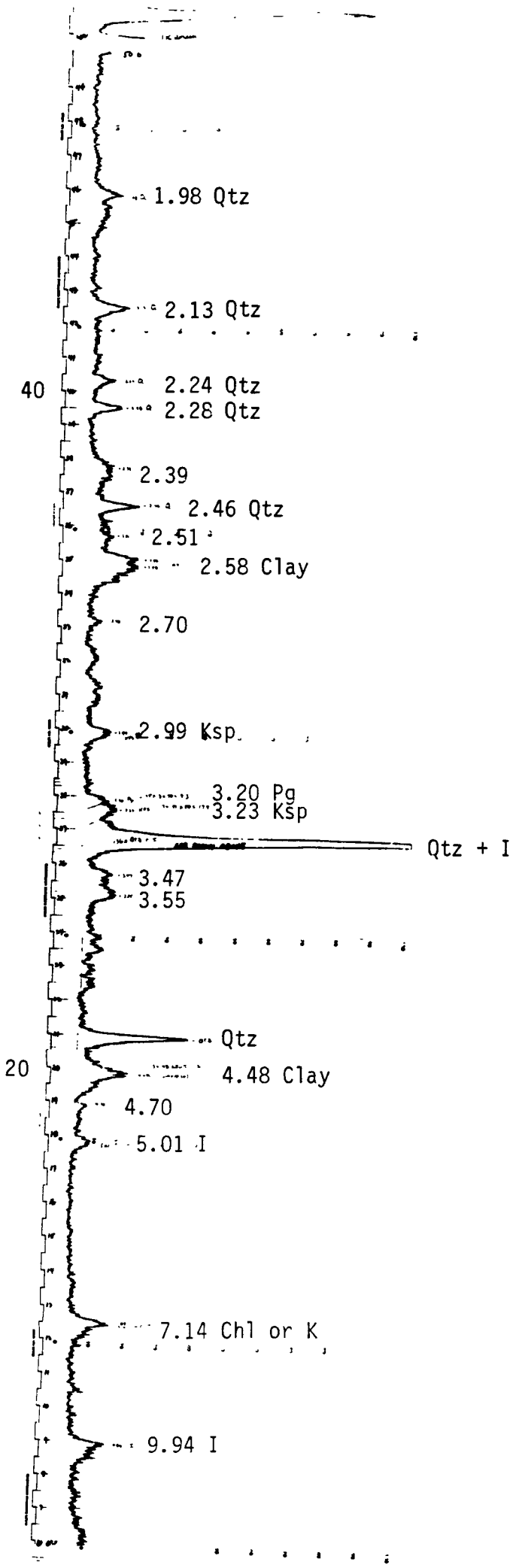


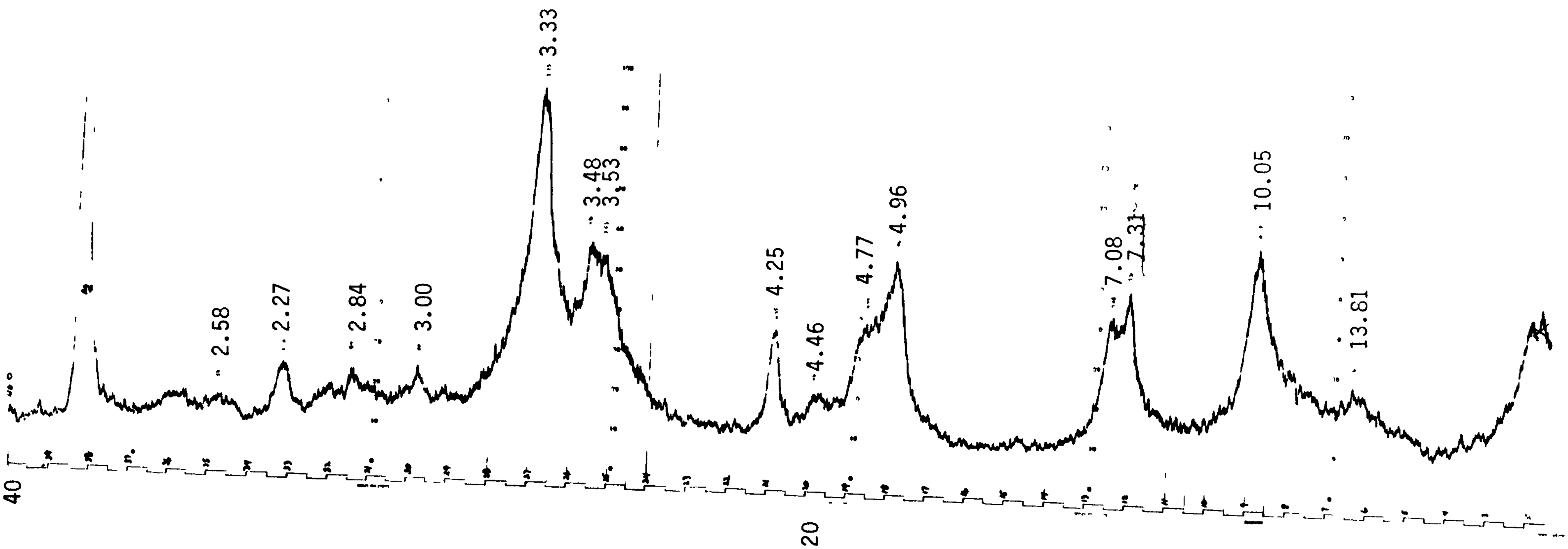
A1026 HOL 2436.2 AIR DRIED

A1026 HOL 2436.2 GLYCOLATED



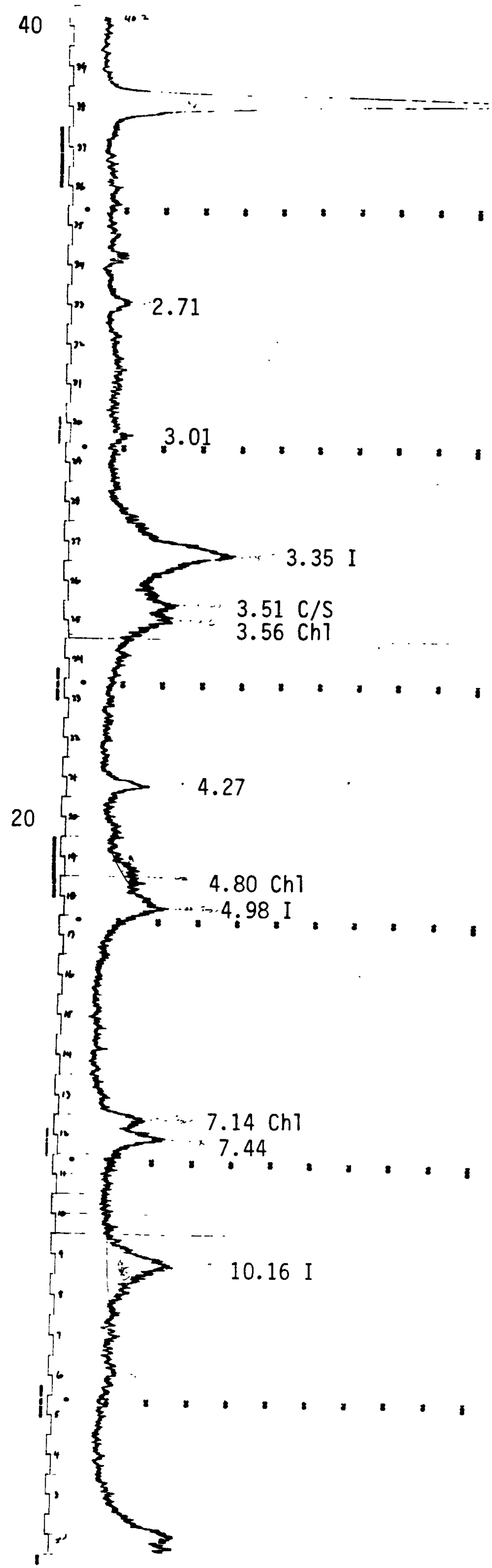
A1026 HOL 2436.2 RANDOM MOUNT



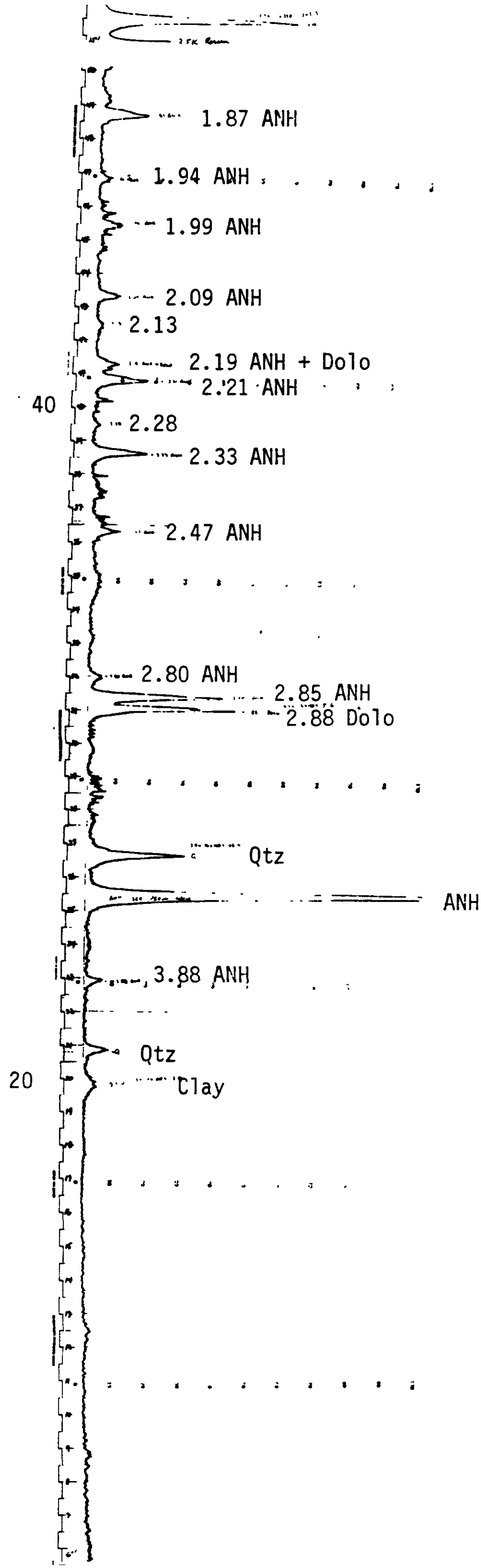


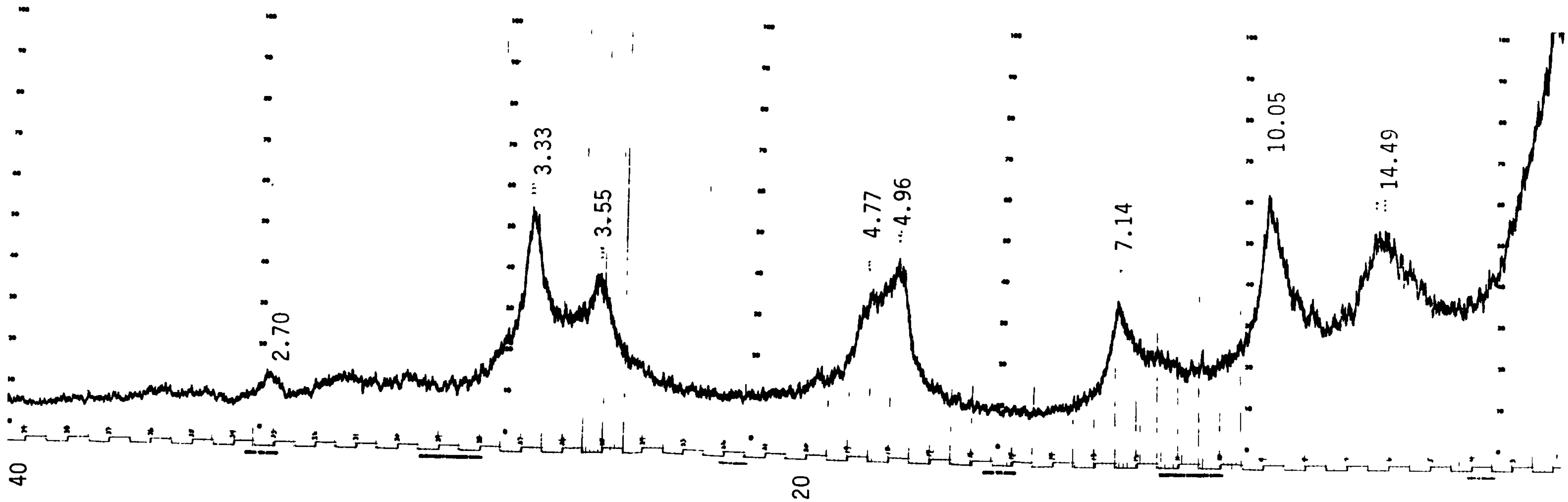
C1033 HOL 2458.0 AIR DRIED

C1033 HOL 2458.0 GLYCOLATED

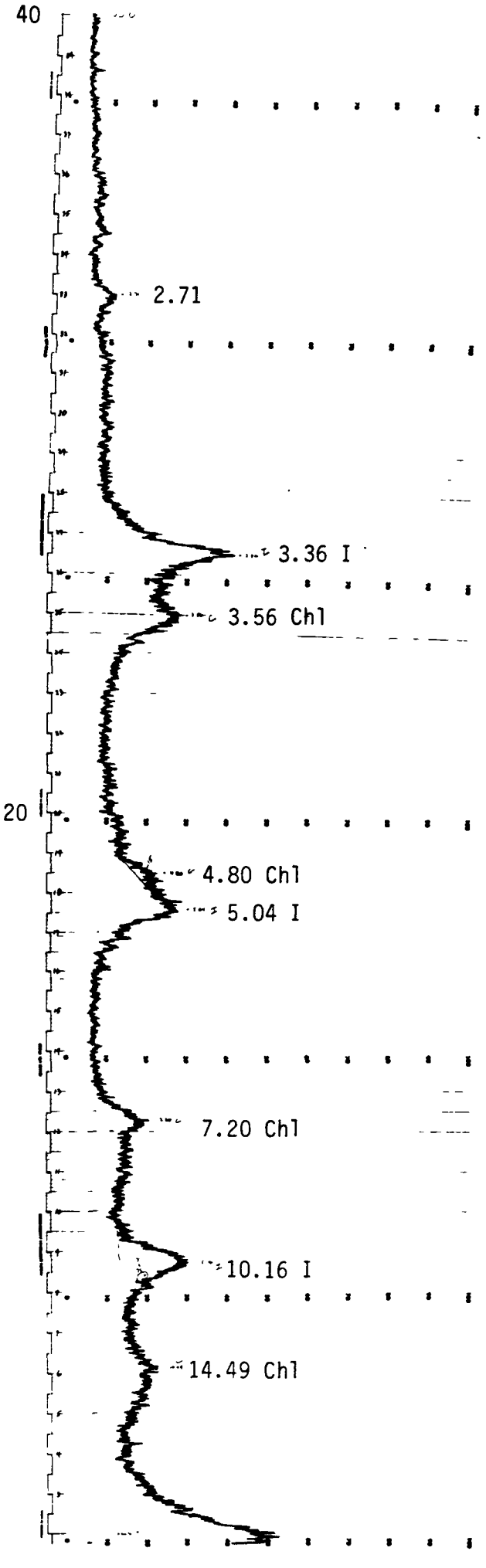


C1033 HOL 2458.0 RANDOM MOUNT

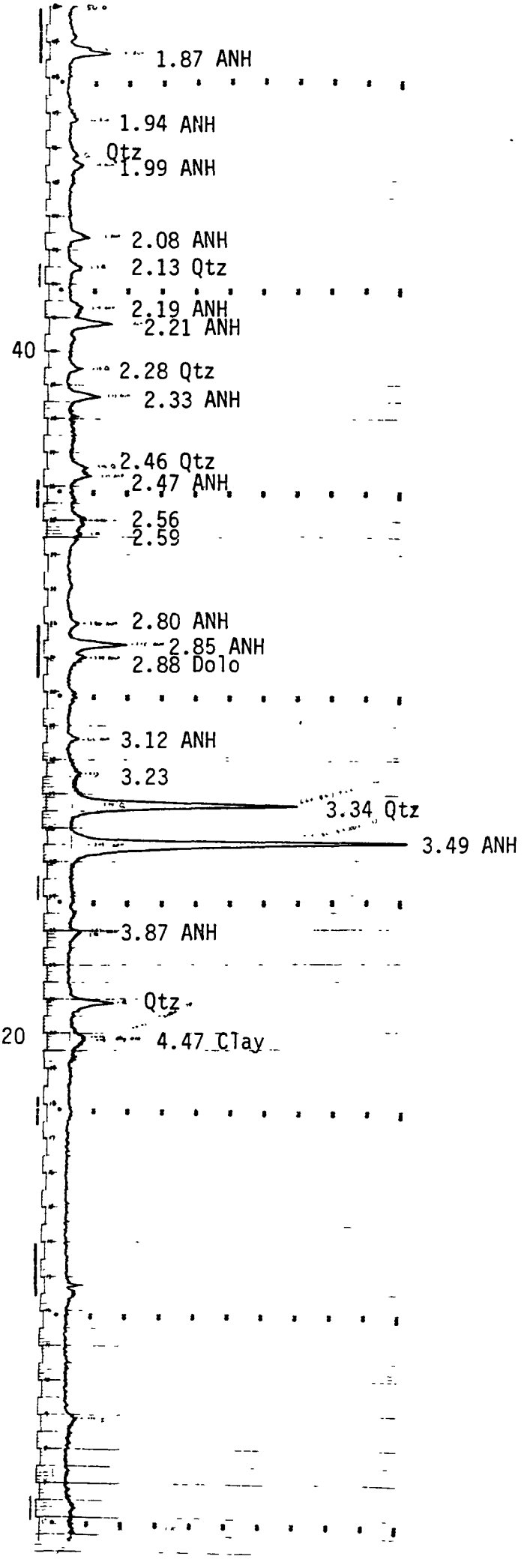




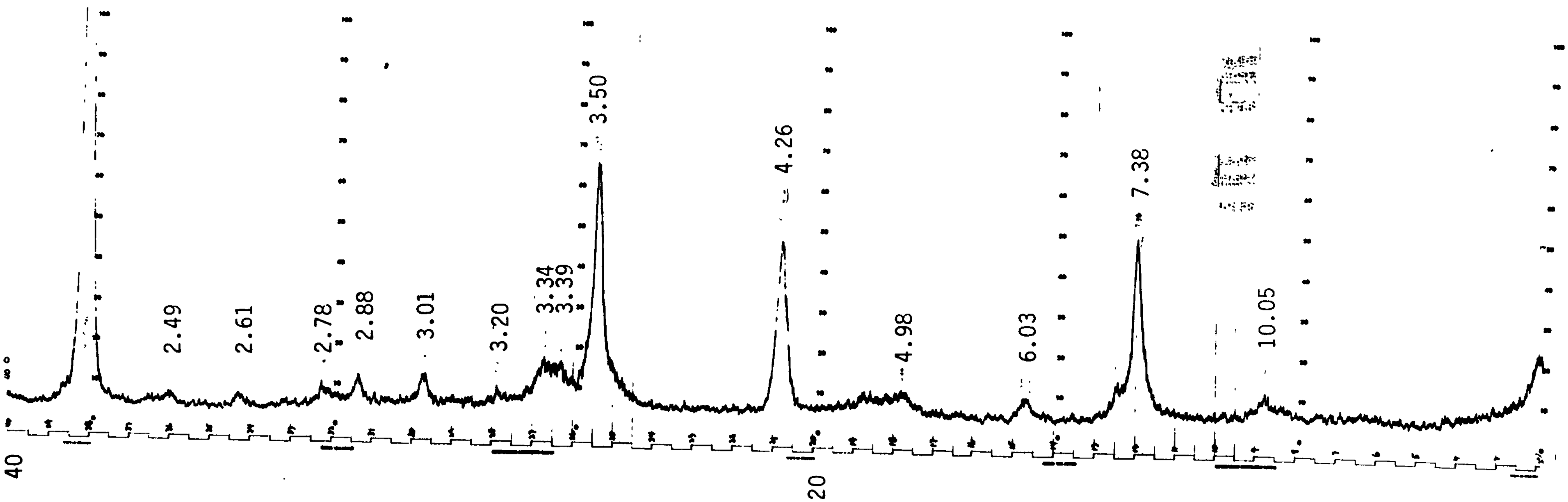
C1034 HOL 2465.0 AIR DRIED



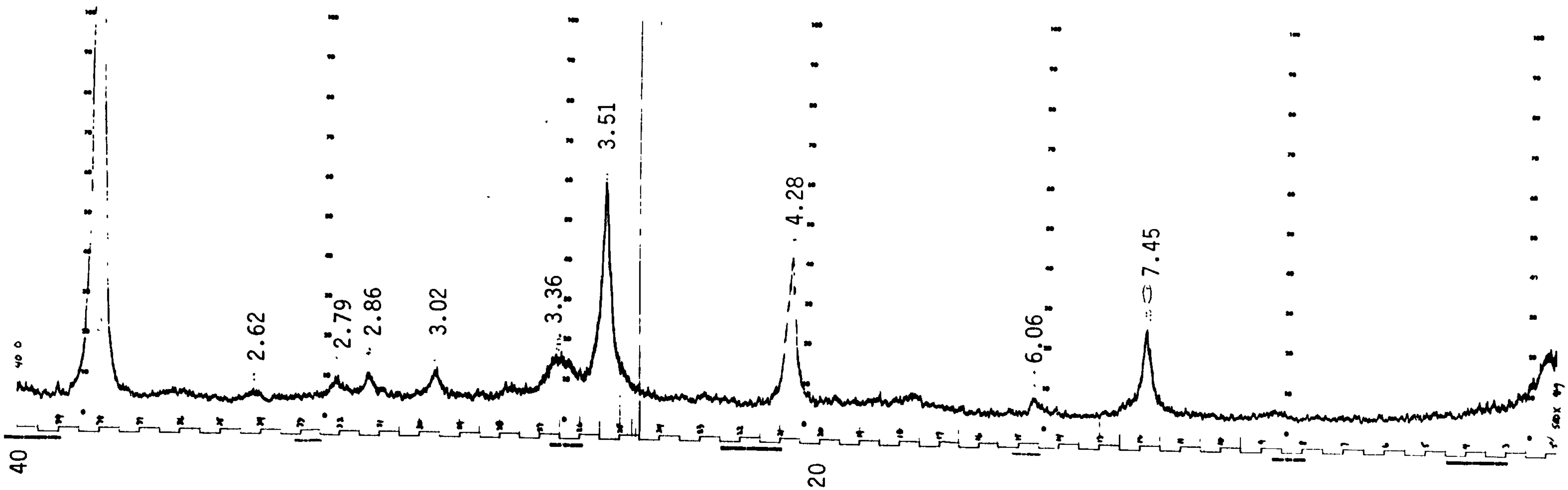
C1034 HOL 2465.0 GLYCOLATED



C1034 HOL 2465.0 RANDOM MOUNT

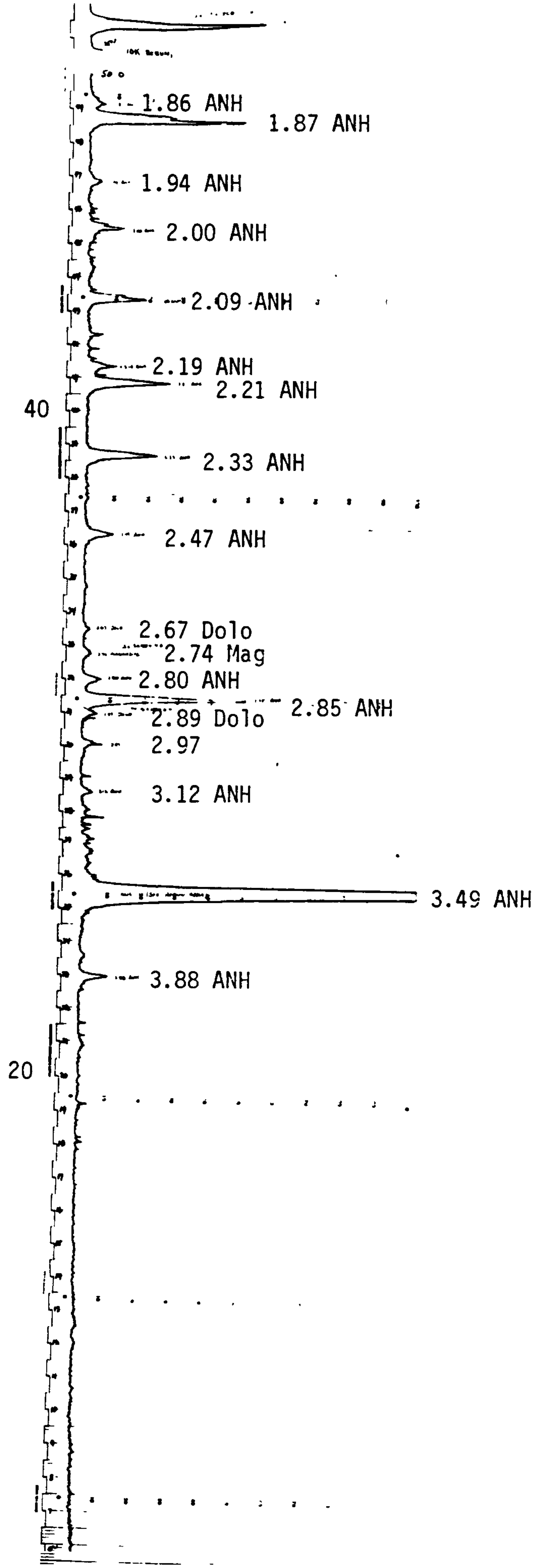


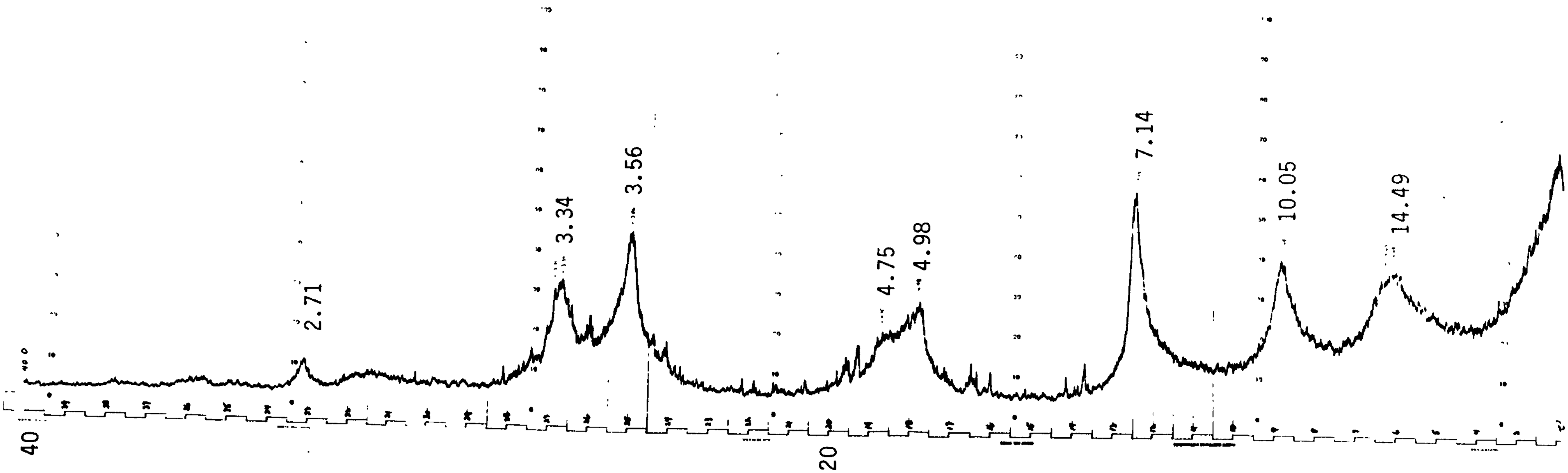
C1029 HOL 2505.9 AIR DRIED



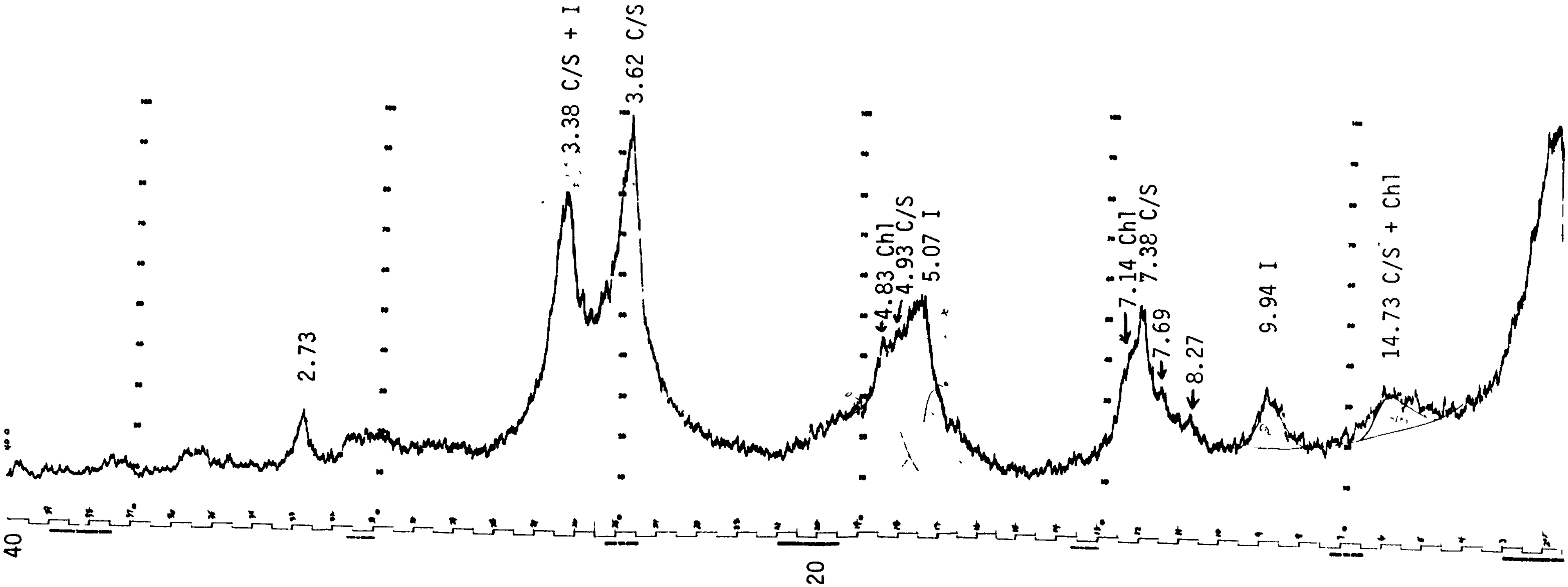
C1029 HOL 2505.9 GLYCOLATED

C1029 HOL 2505.9 RANDOM MOUNT



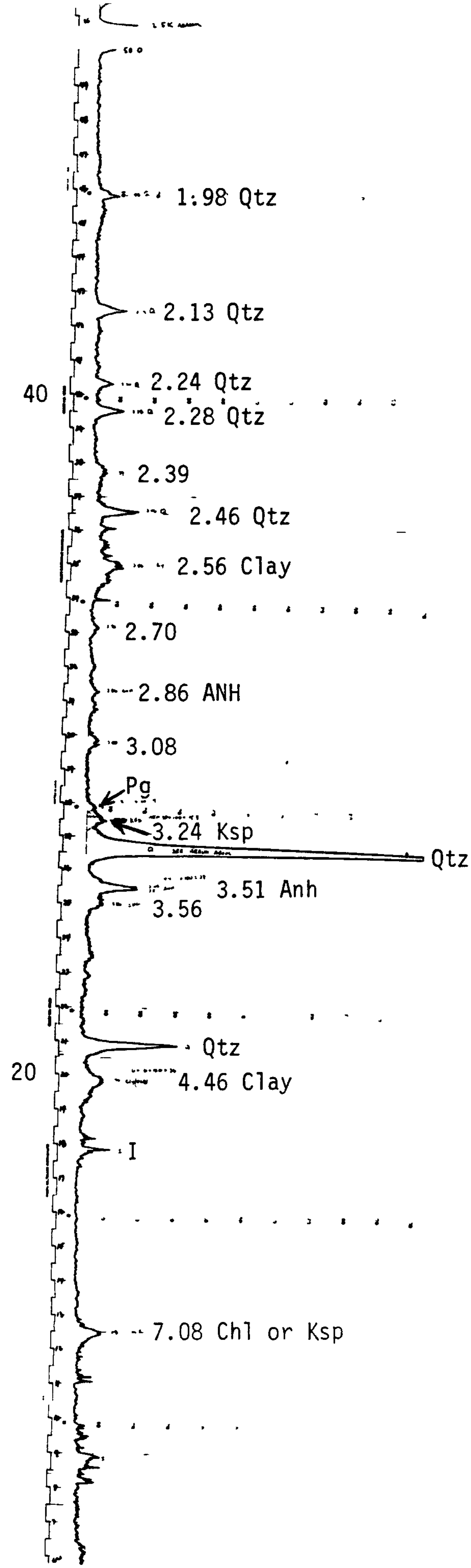


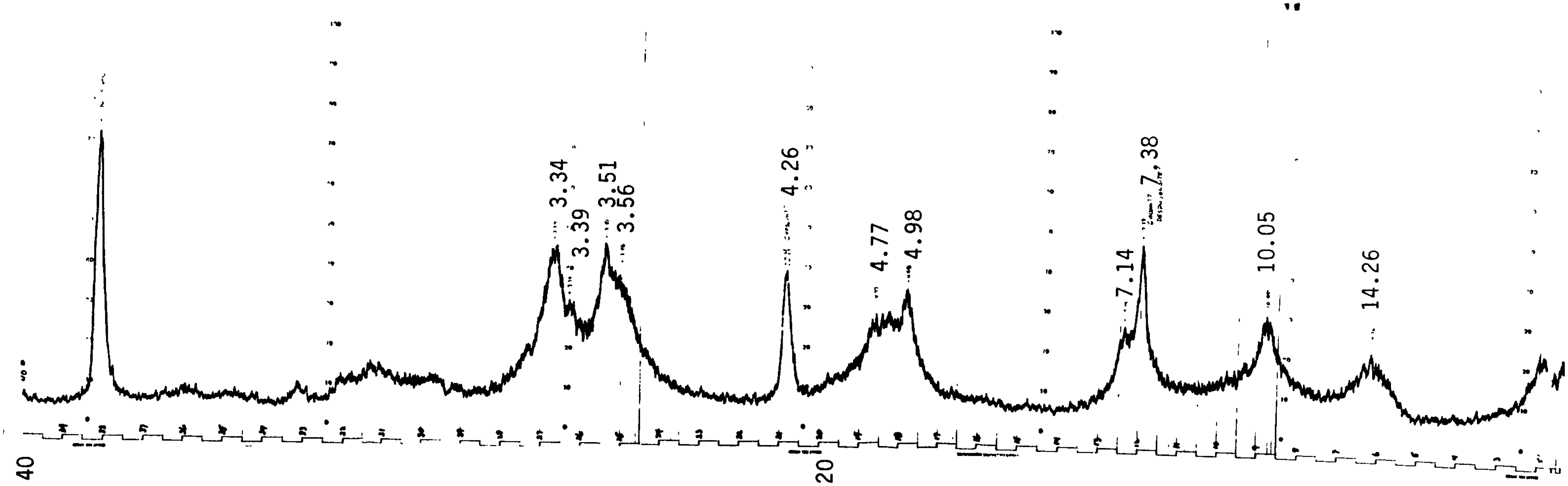
C1028 HOL 2576.1 AIR DRIED



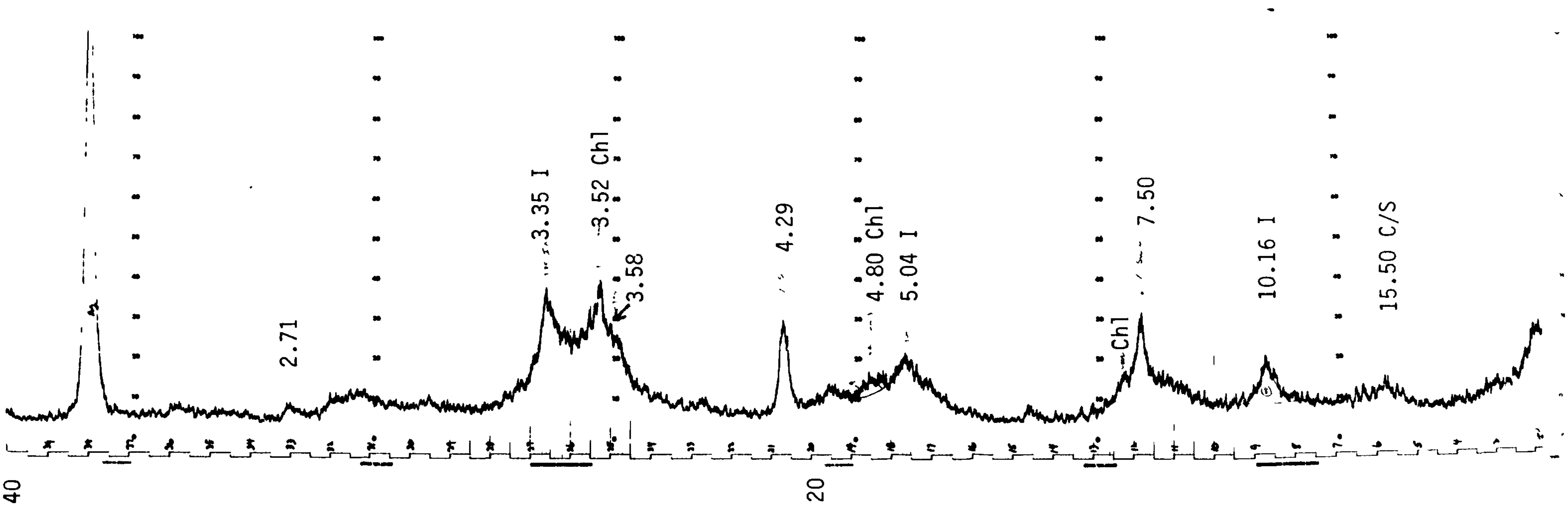
C1028 HOL 2576.1 GLYCOLATED

C1028 HOL 2576.1 RANDOM MOUNT

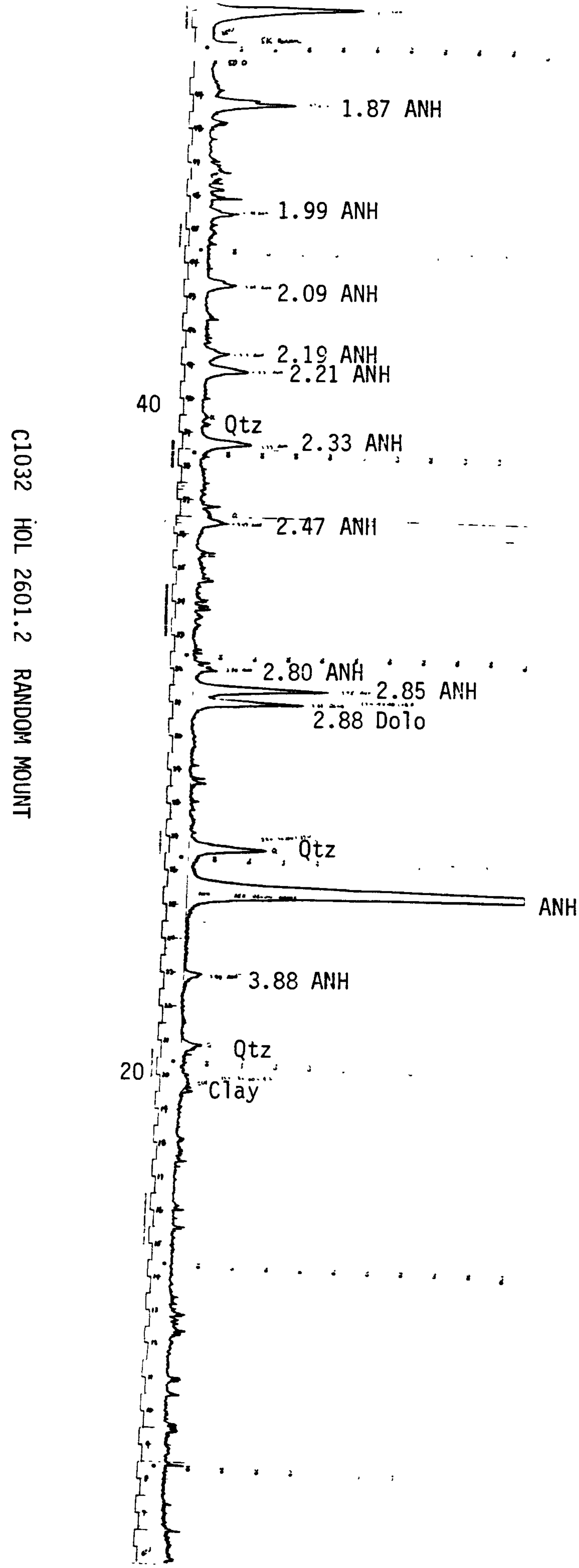


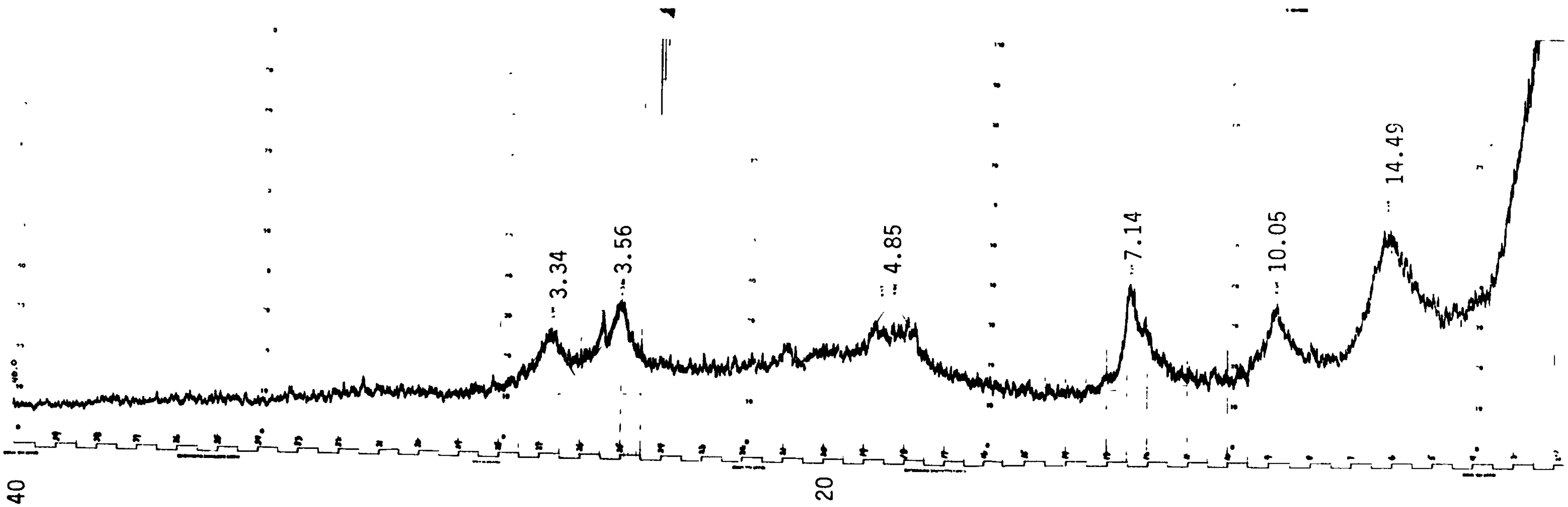


C1032 HOL 2601.2 AIR DRIED

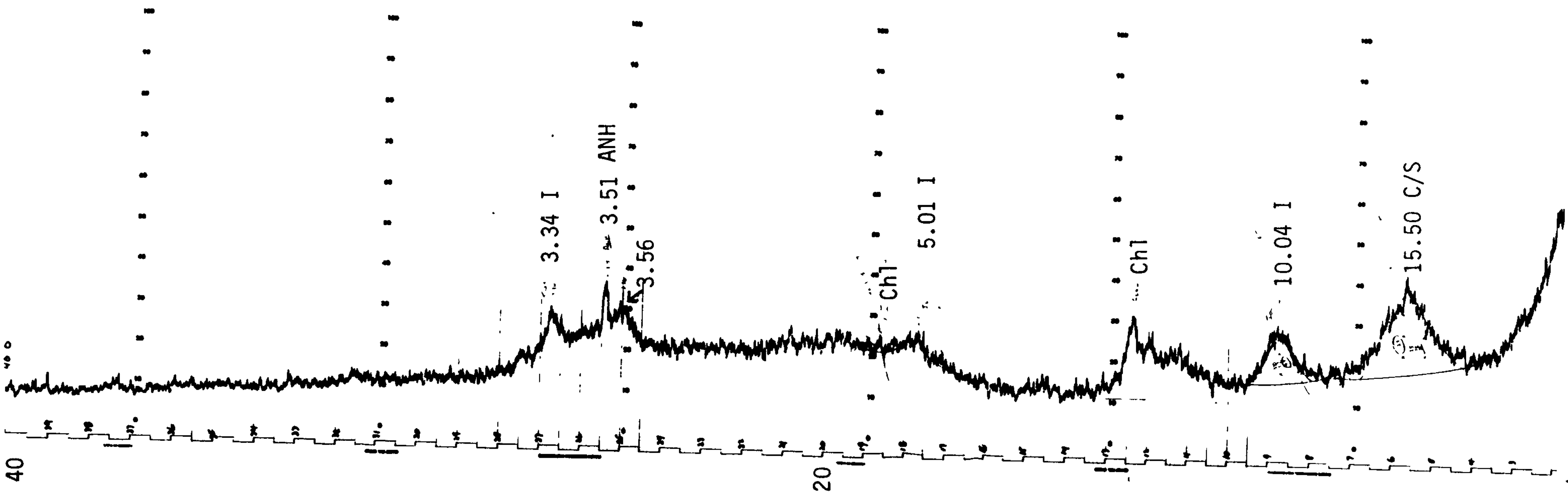


C1032 HOL 2601.2 GLYCOLATED

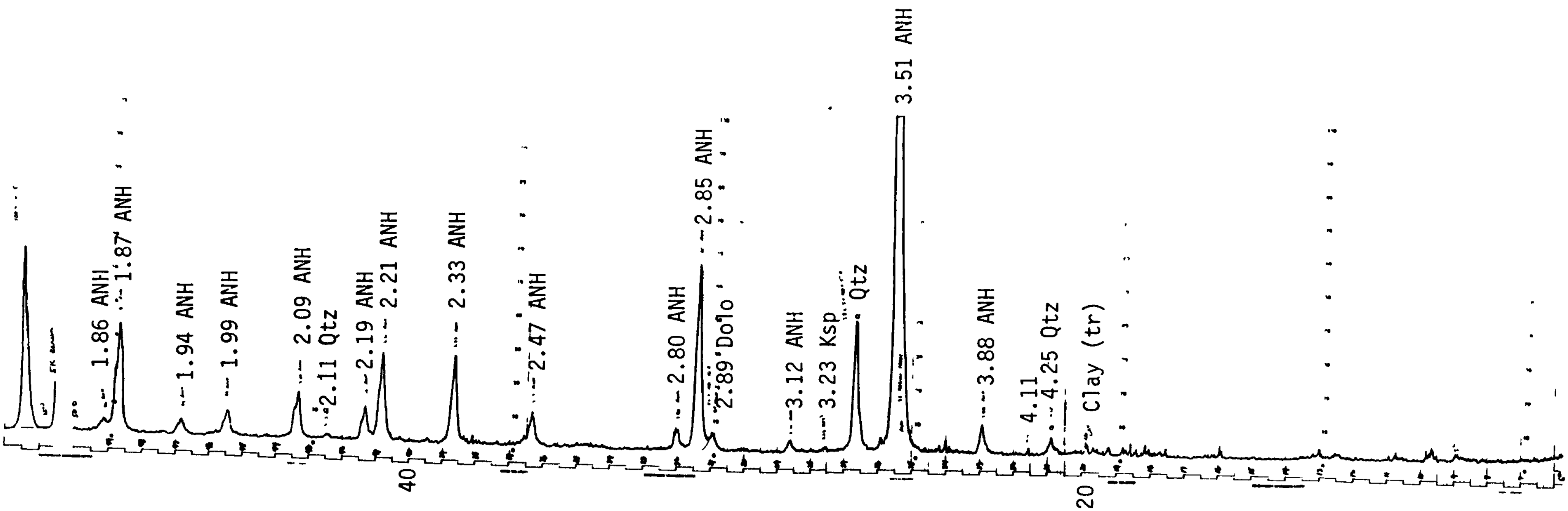

C1032 HOL 2601.2 RANDOM MOUNT
1.87 ANH
1.99 ANH
2.09 ANH
2.19 ANH
2.21 ANH
40
Qtz
2.33 ANH
2.47 ANH
2.80 ANH
2.85 ANH
2.88 Dolo
Qtz
ANH
3.88 ANH
Qtz
20
Clay



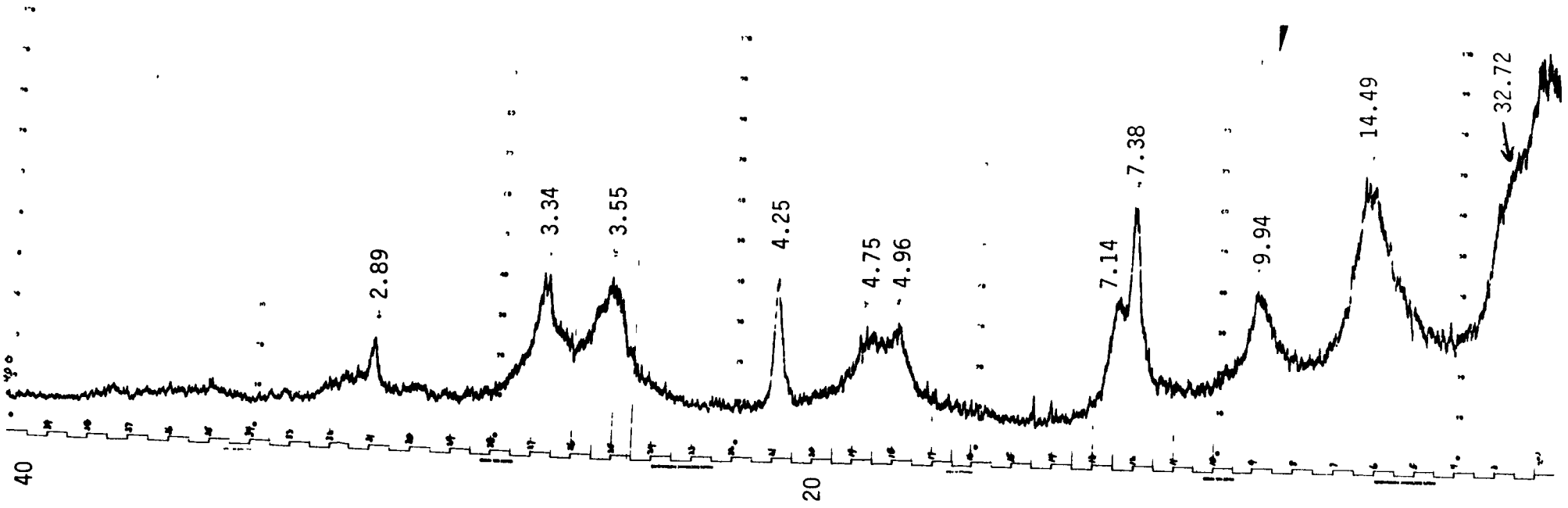
C1031 HOL 2648.1 AIR DRIED



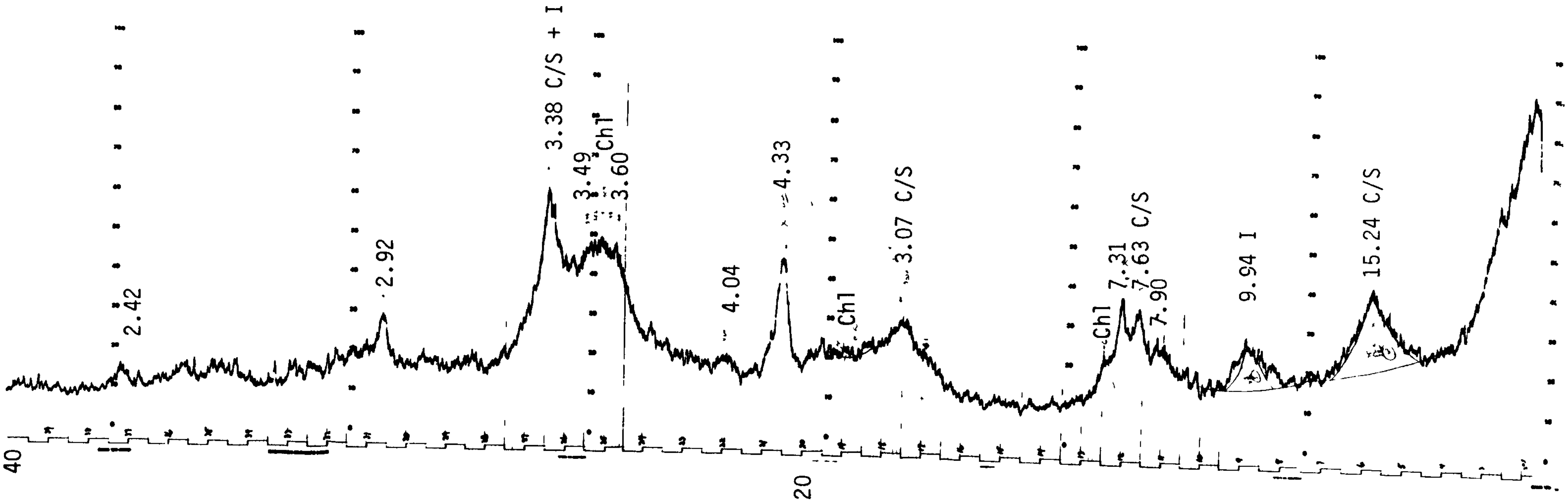
C1031 HOL 2648.1 GLYCOLATED



C1031 HOL 2648.1 RANDOM MOUNT

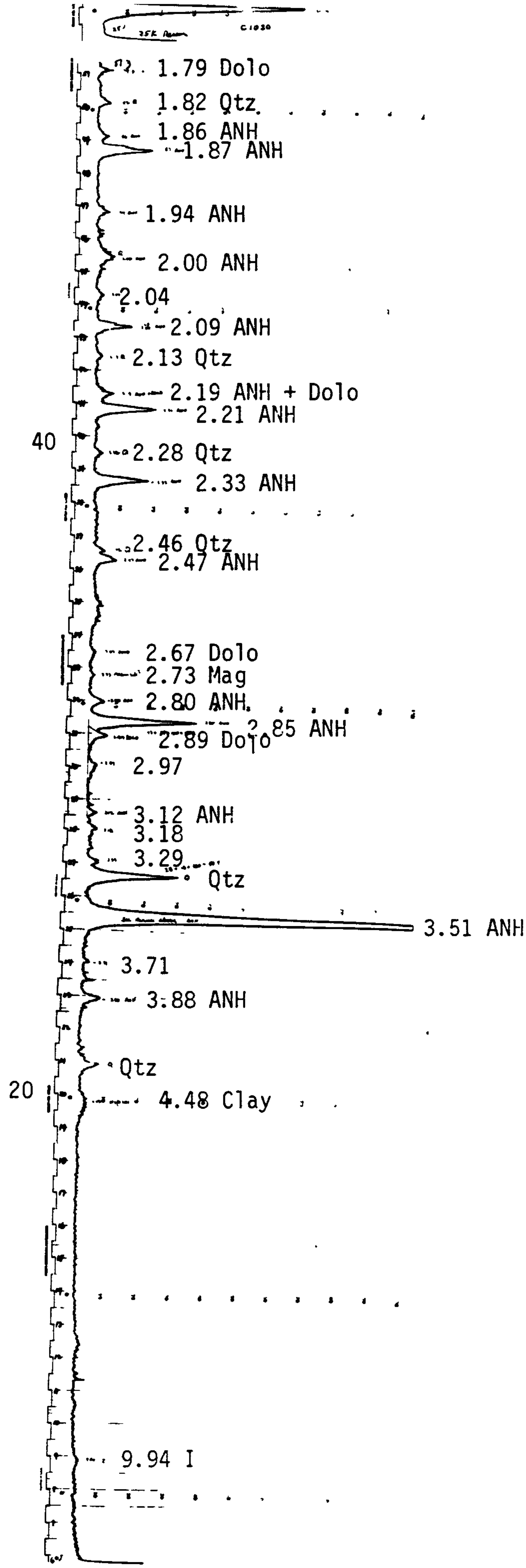


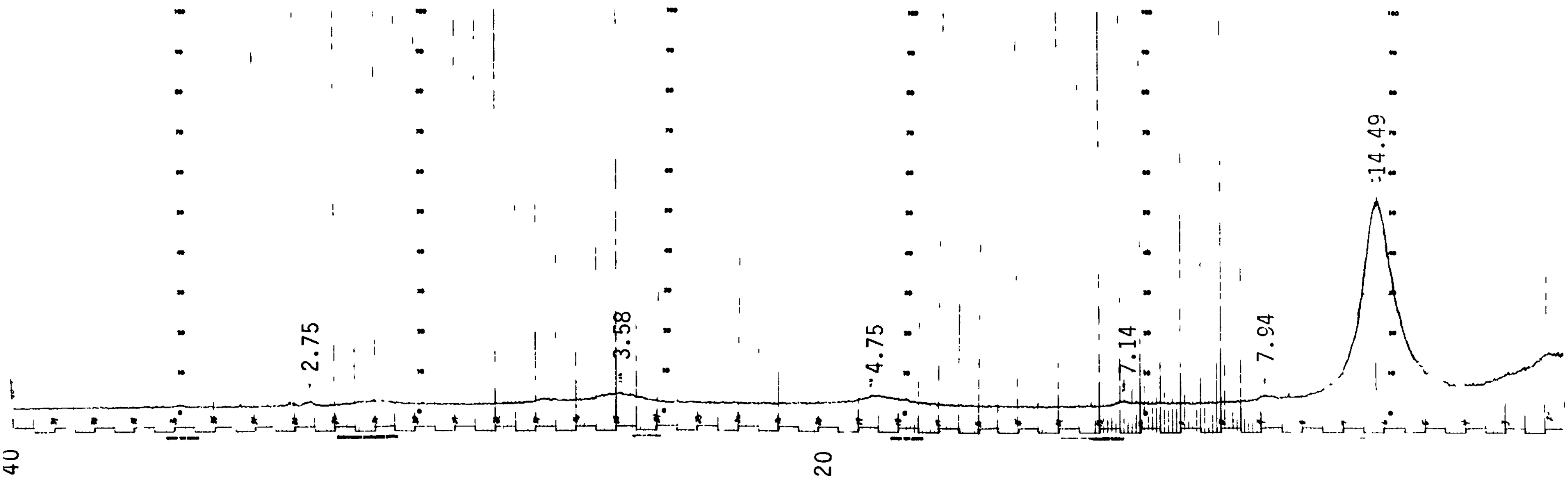
C1030 HOL 2839.5 AIR DRIED



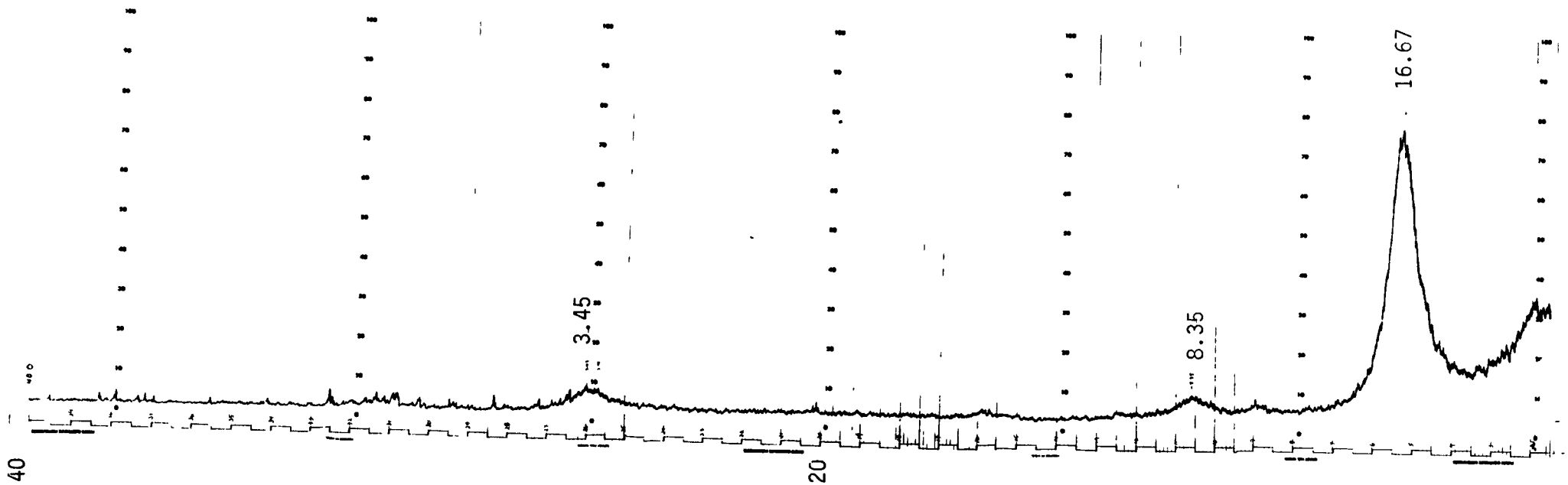
C1030 HOL 2839.5 GLYCOLATED

C1030 HOL 2839.5 RANDOM MOUNT

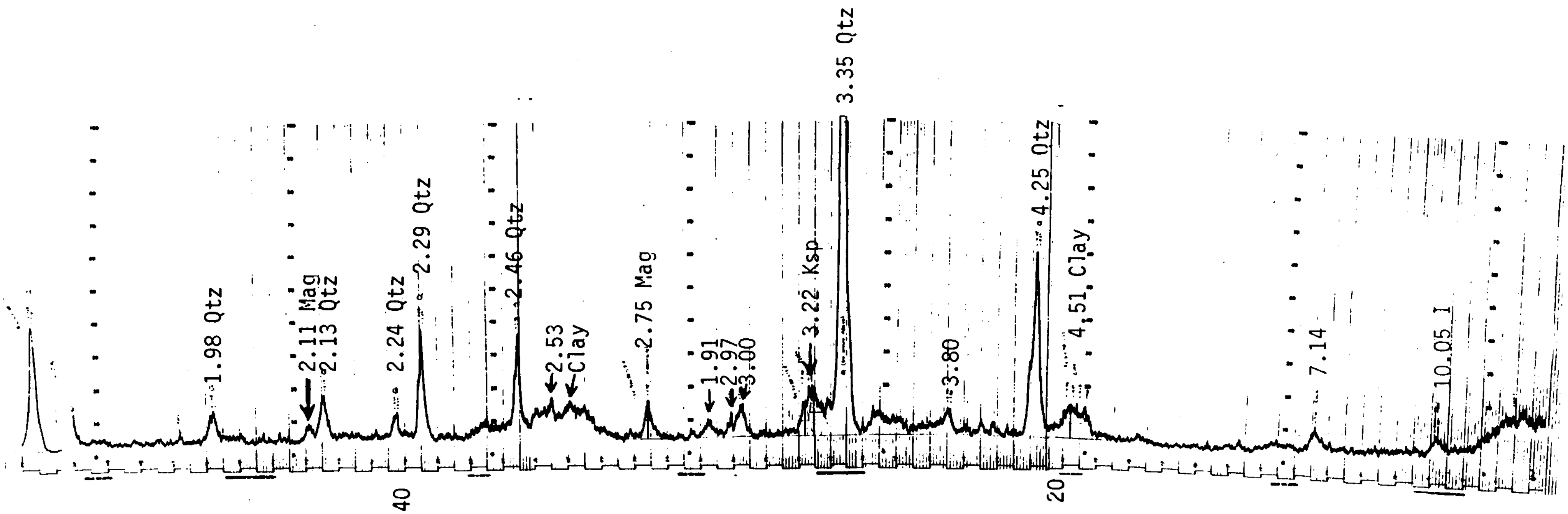




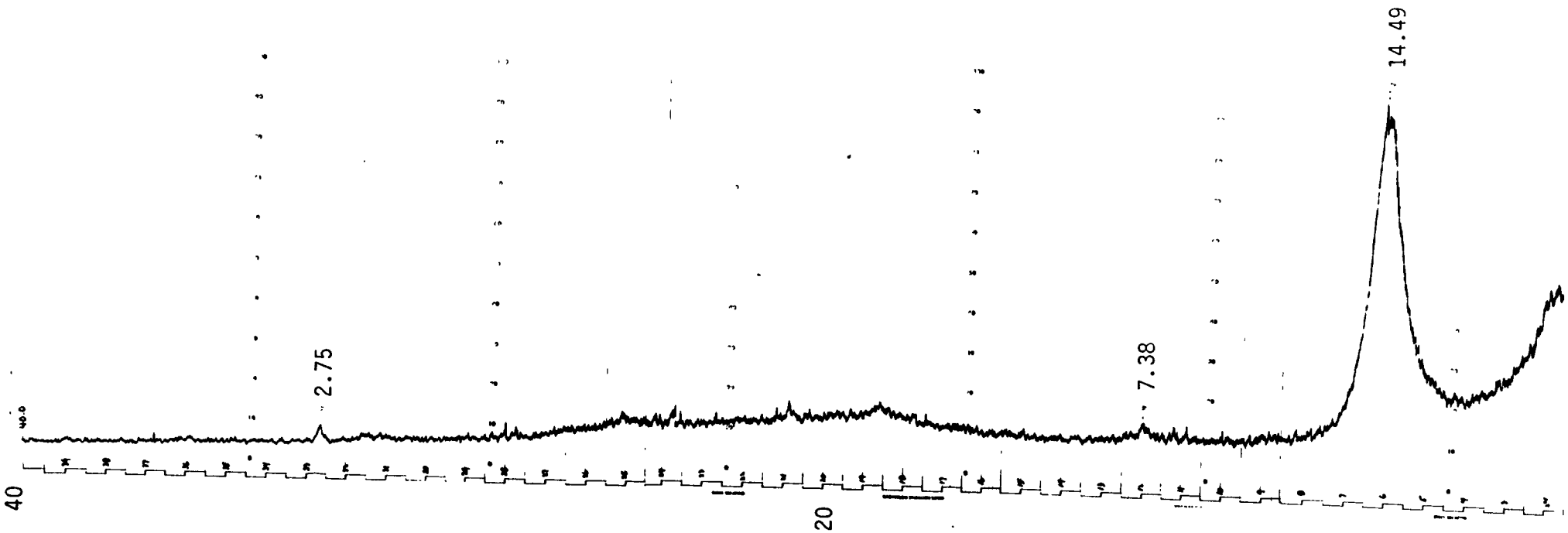
C1021 JFR 1369.5 AIR DRIED



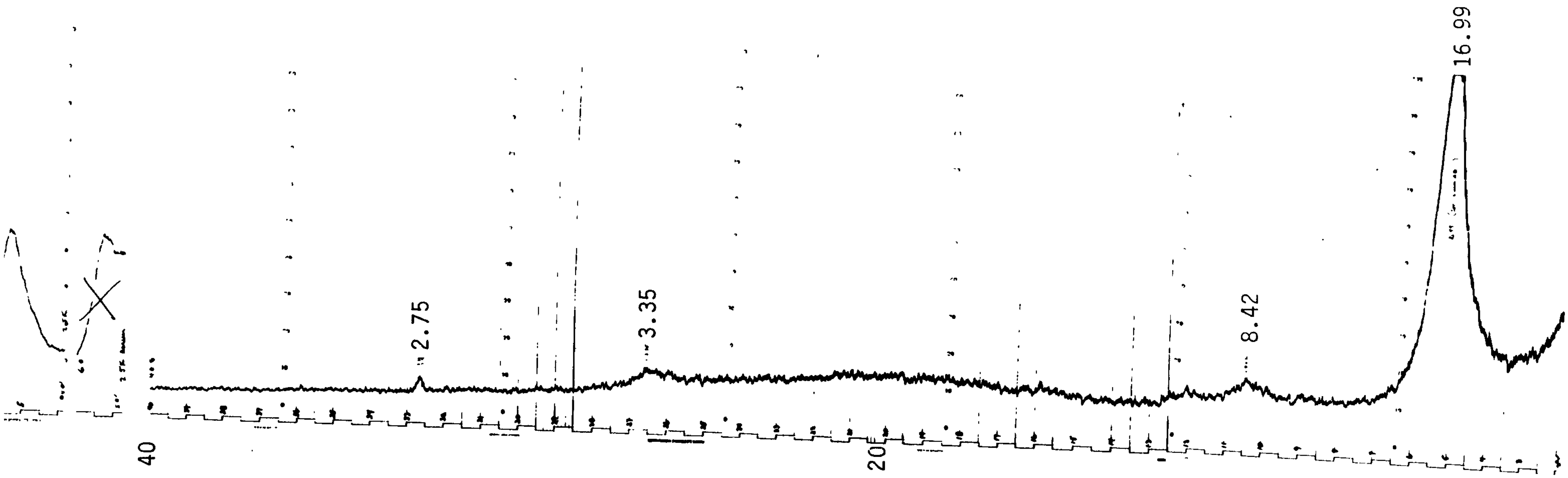
C1021 JFR 1369.5 GLYCOLATED



C1021 JFR 1369.5 RANDOM MOUNT

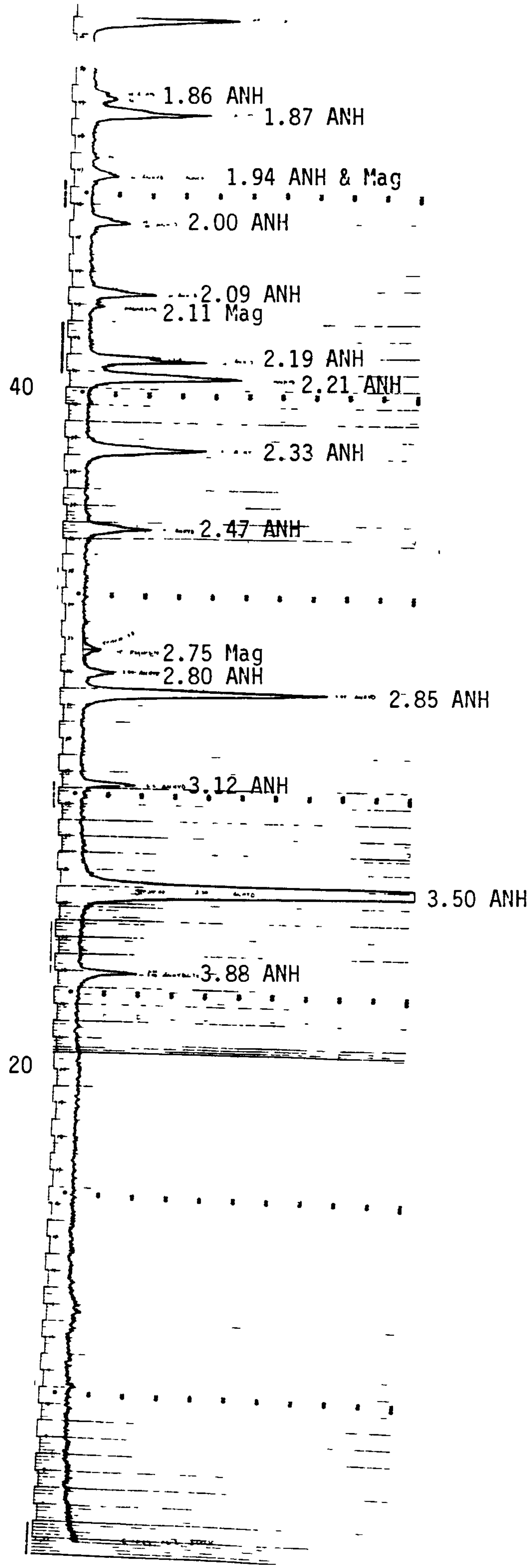


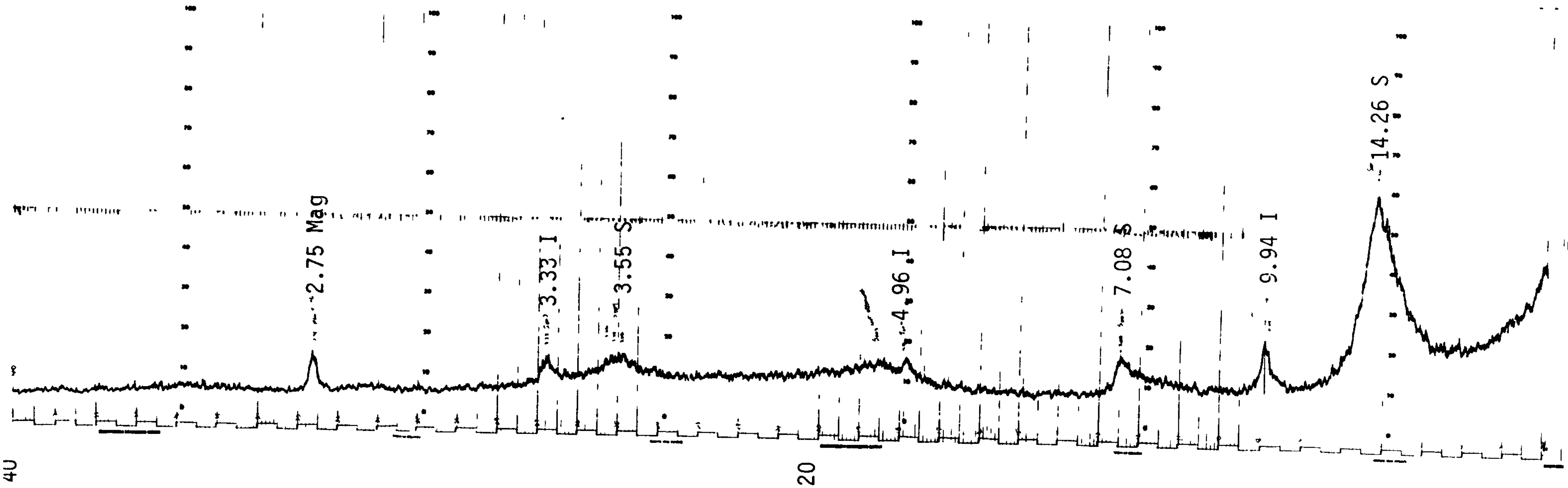
C1022 JFR 1375.9 AIR DRIED



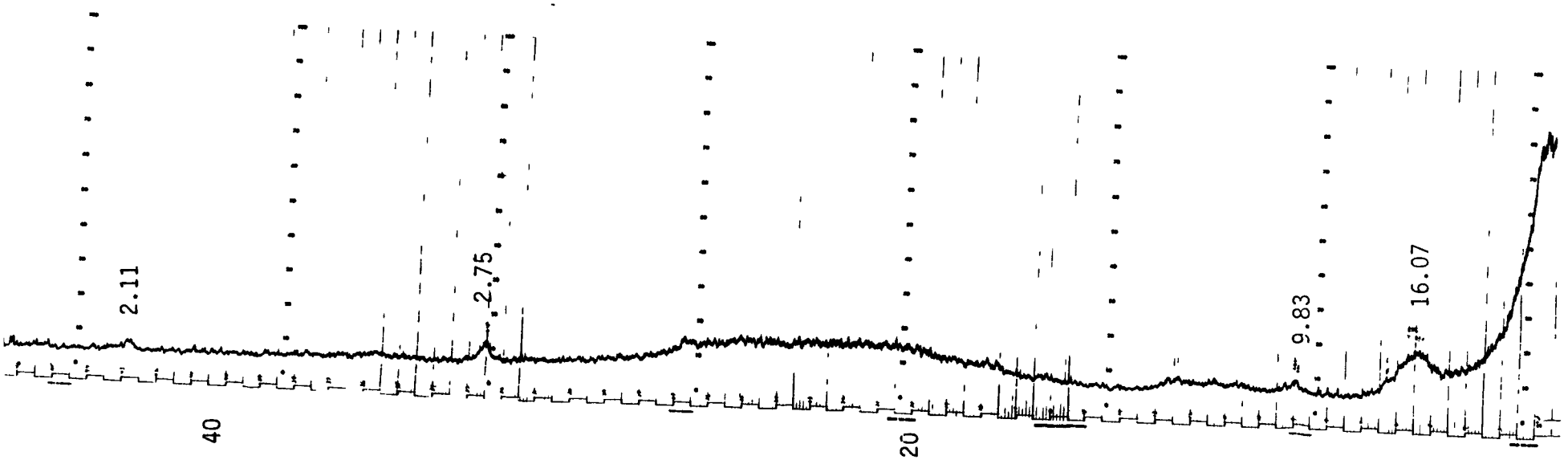
C1022 JFR 1375.9 GLYCOLATED

C1022 JFR 1375.9 RANDOM MOUNT

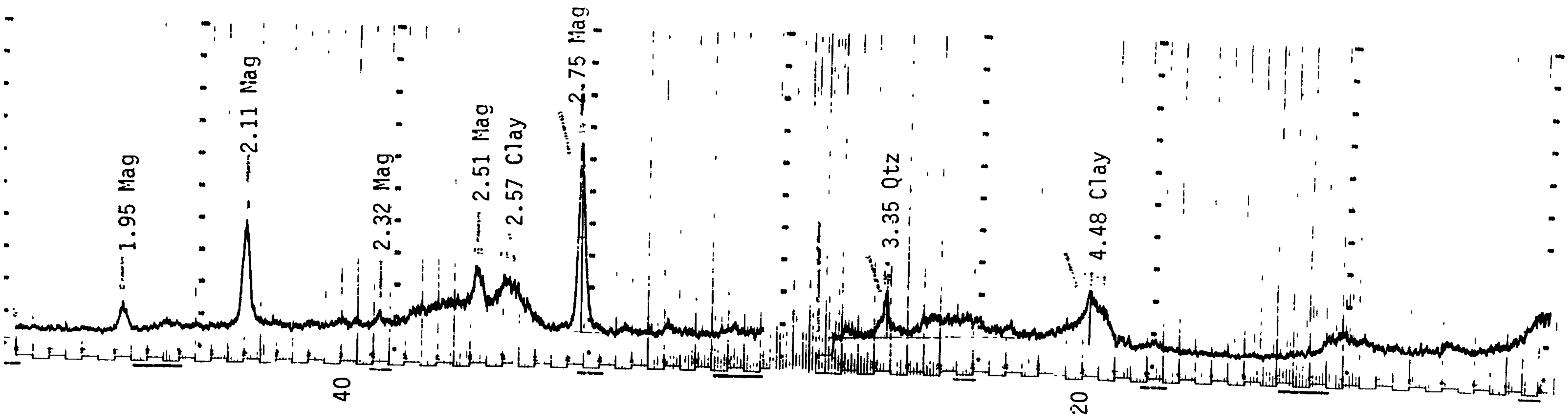




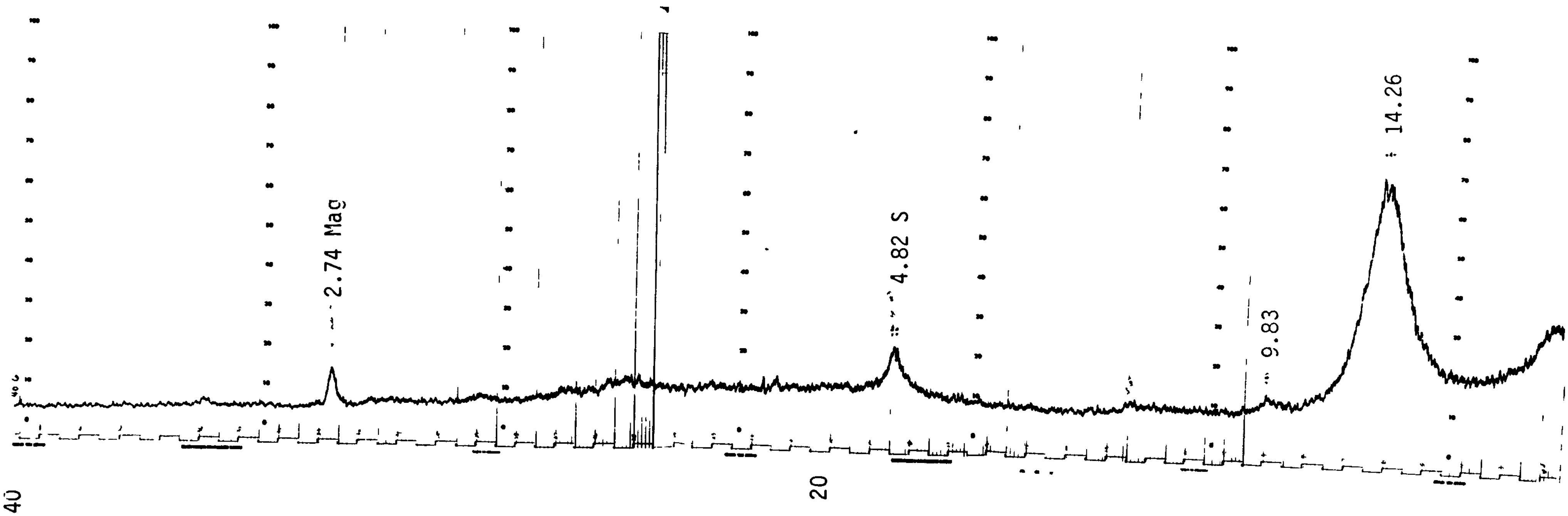
C1023 JFR 1405.6 AIR DRIED



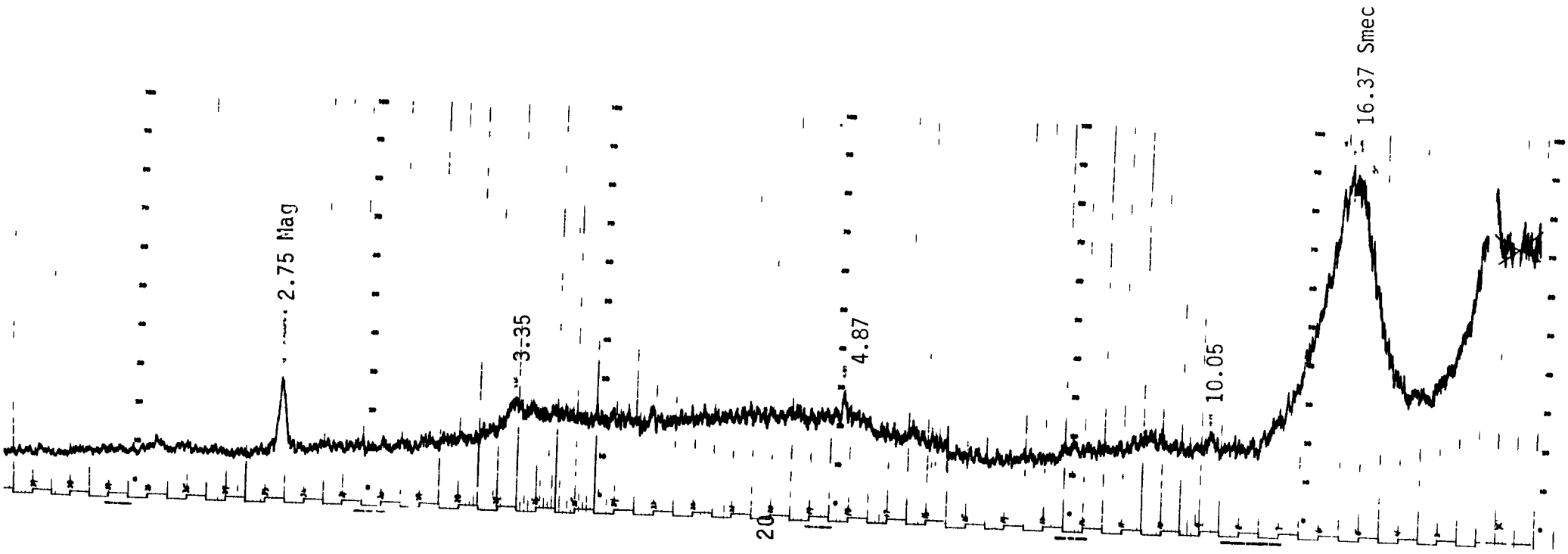
C1023 JFR 1405.6 GLYCOLATED



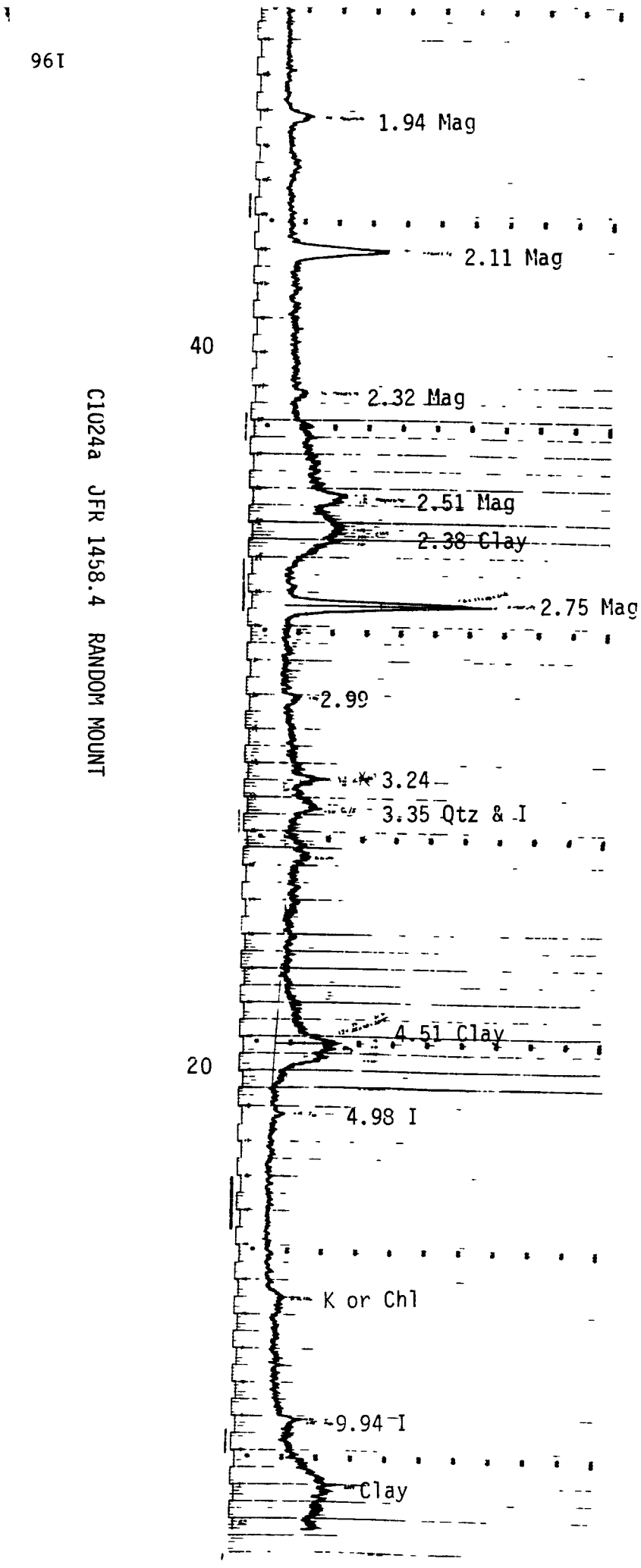
C1023 JFR 1405.6 RANDOM MOUNT

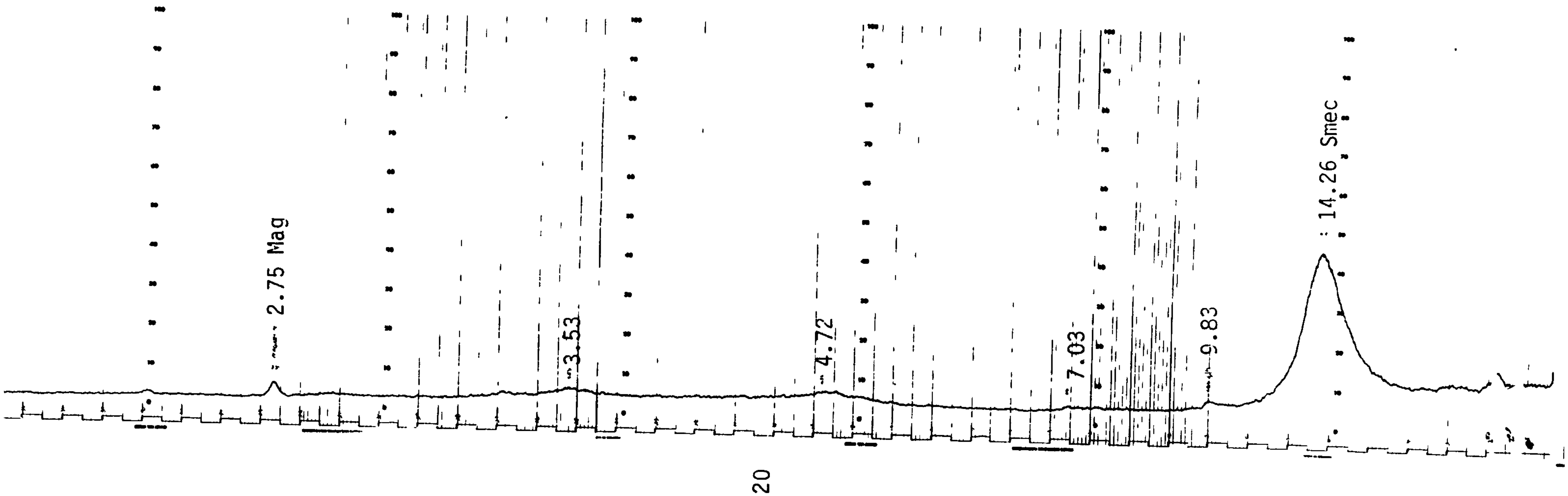


C1024a JFR 1458.4 AIR DRIED

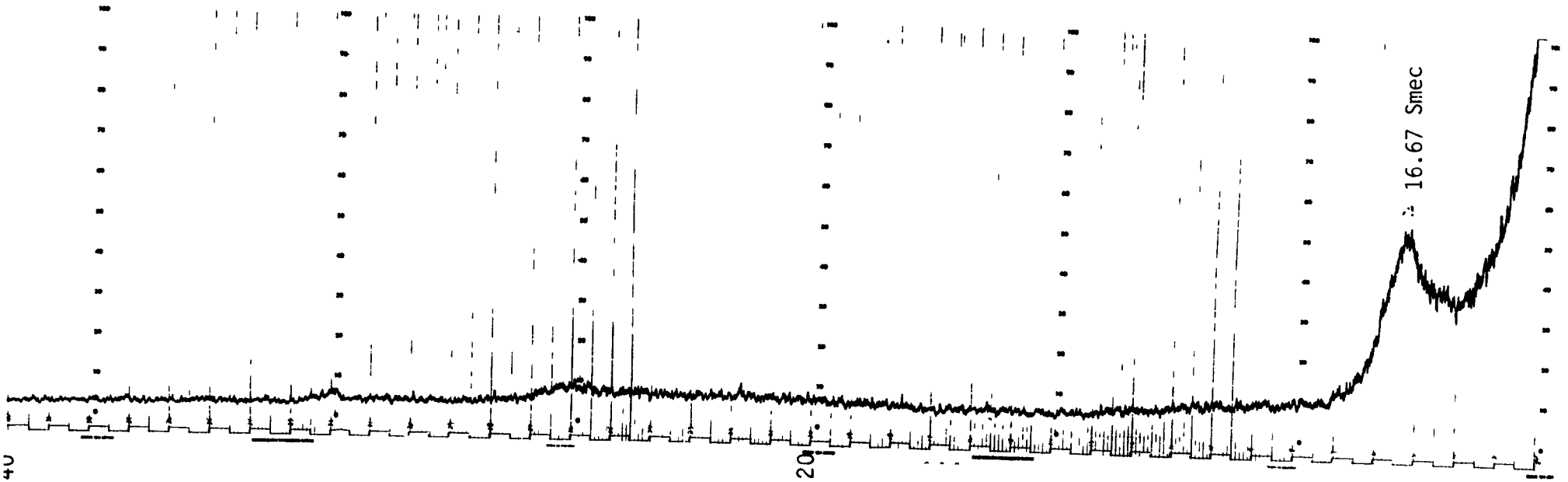


C1024a JFR 1458.4 GLYCOLATED


961
1.94 Mag
2.11 Mag
40
2.32 Mag
2.51 Mag
2.38 Clay
2.75 Mag
2.99
3.24
3.35 Qtz & I
4.51 Clay
20
4.98 I
K or Chl
9.94 I
Clay
C1024a JFR 1458.4 RANDOM MOUNT

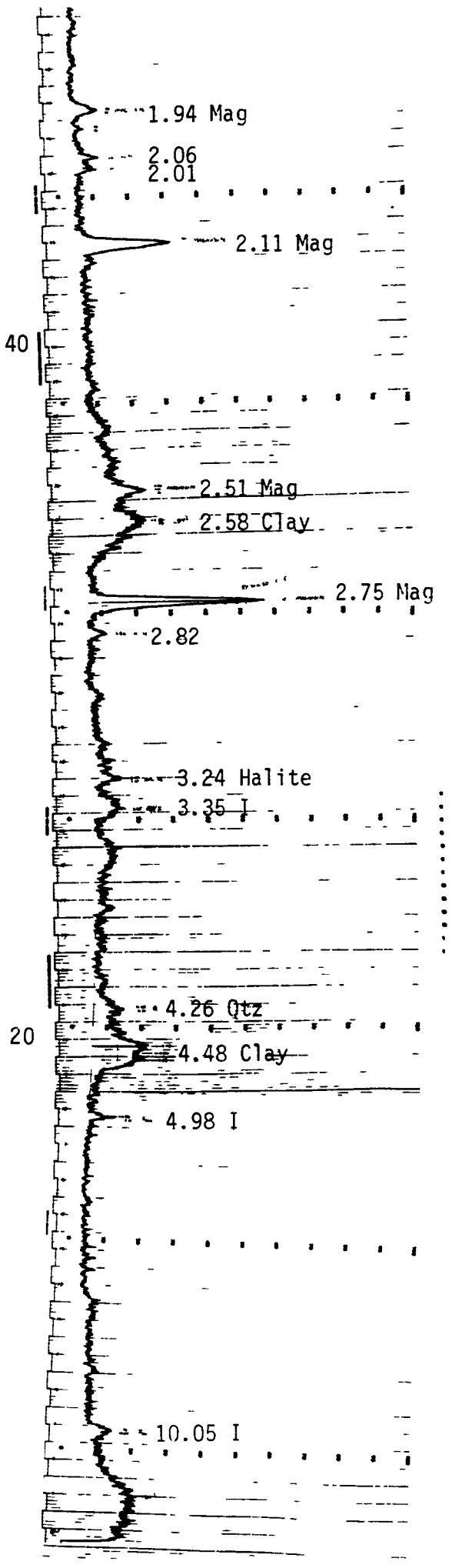


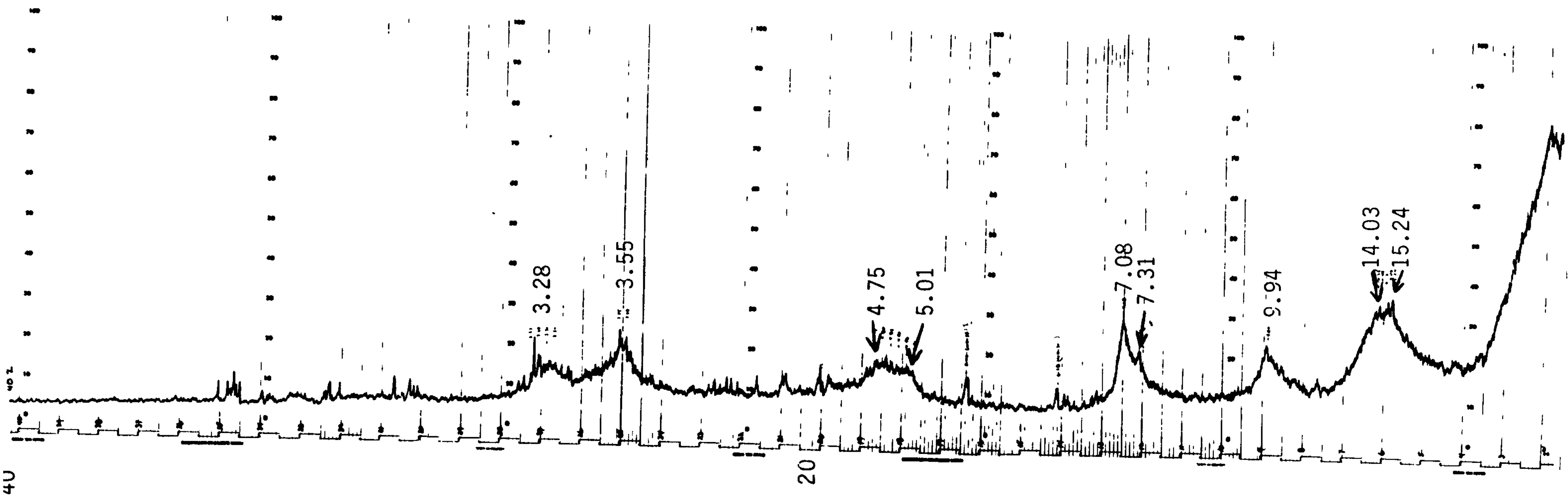
C1024b JFR 1458.4 AIR DRIED



C1024b JFR 1458.4 GLYCOLATED

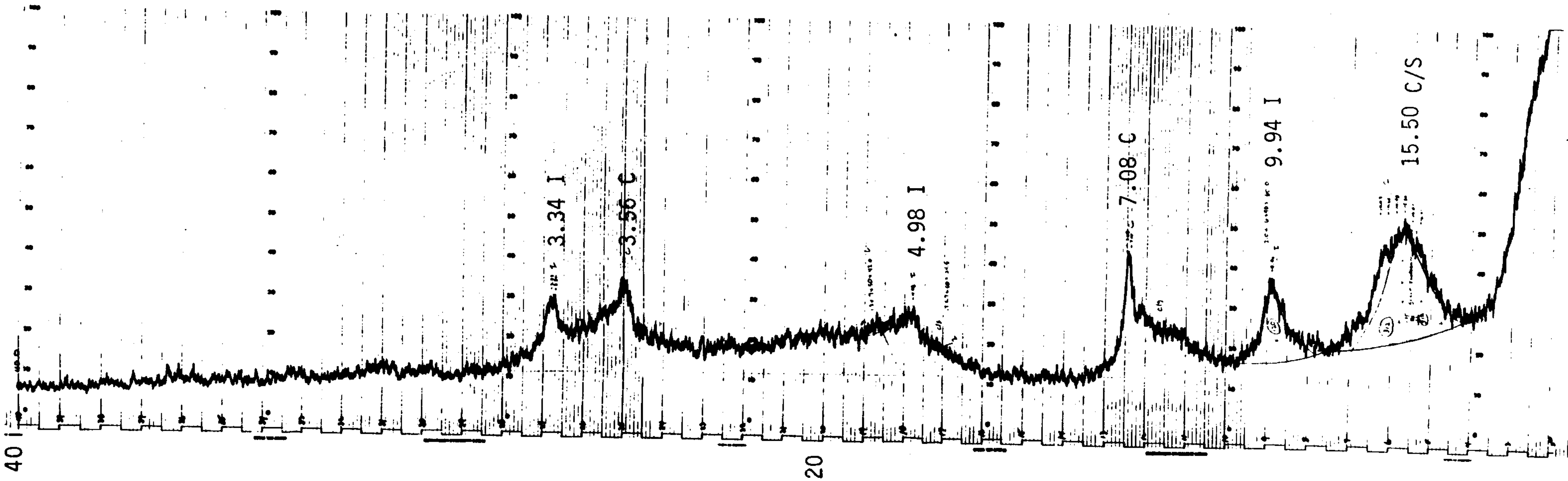
C1024b JFR 1458.4 RANDOM MOUNT



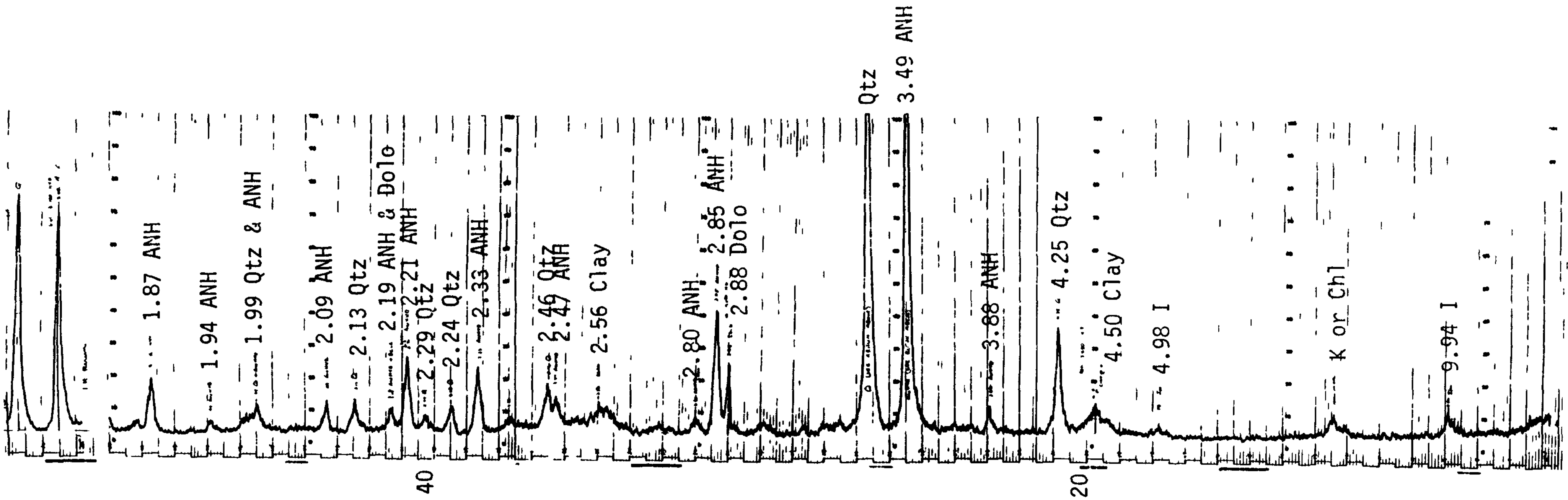


C1015 JFR 2018.0 AIR DRIED

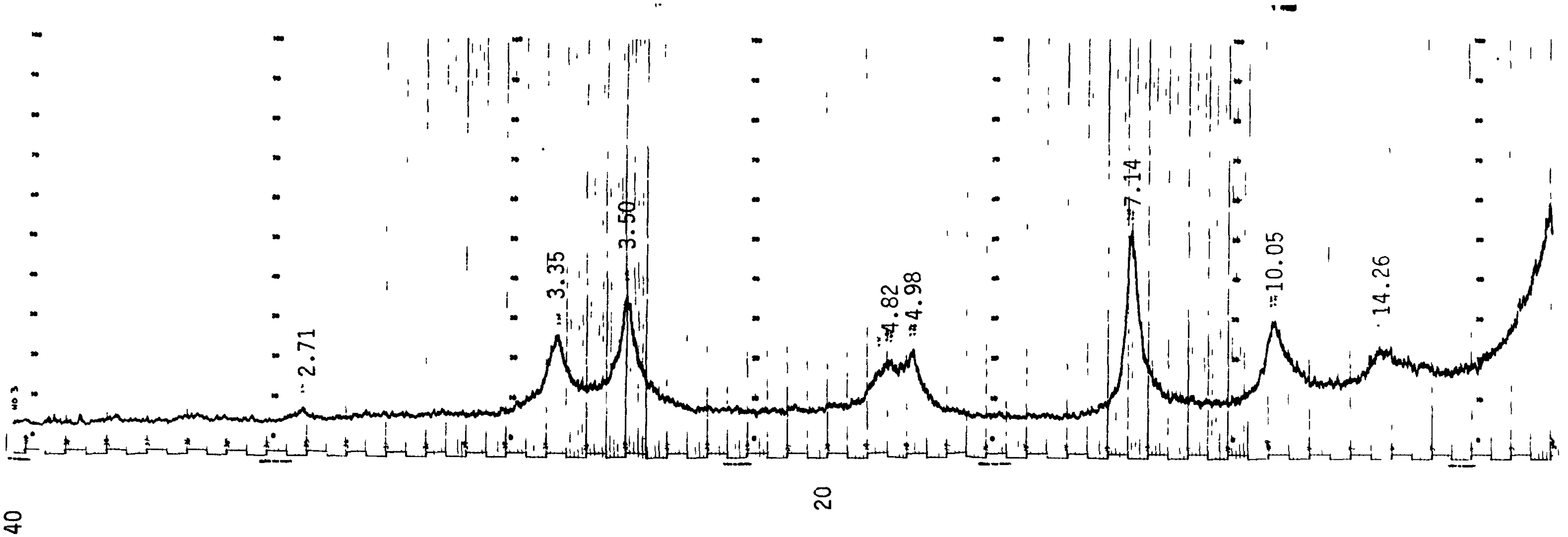
200



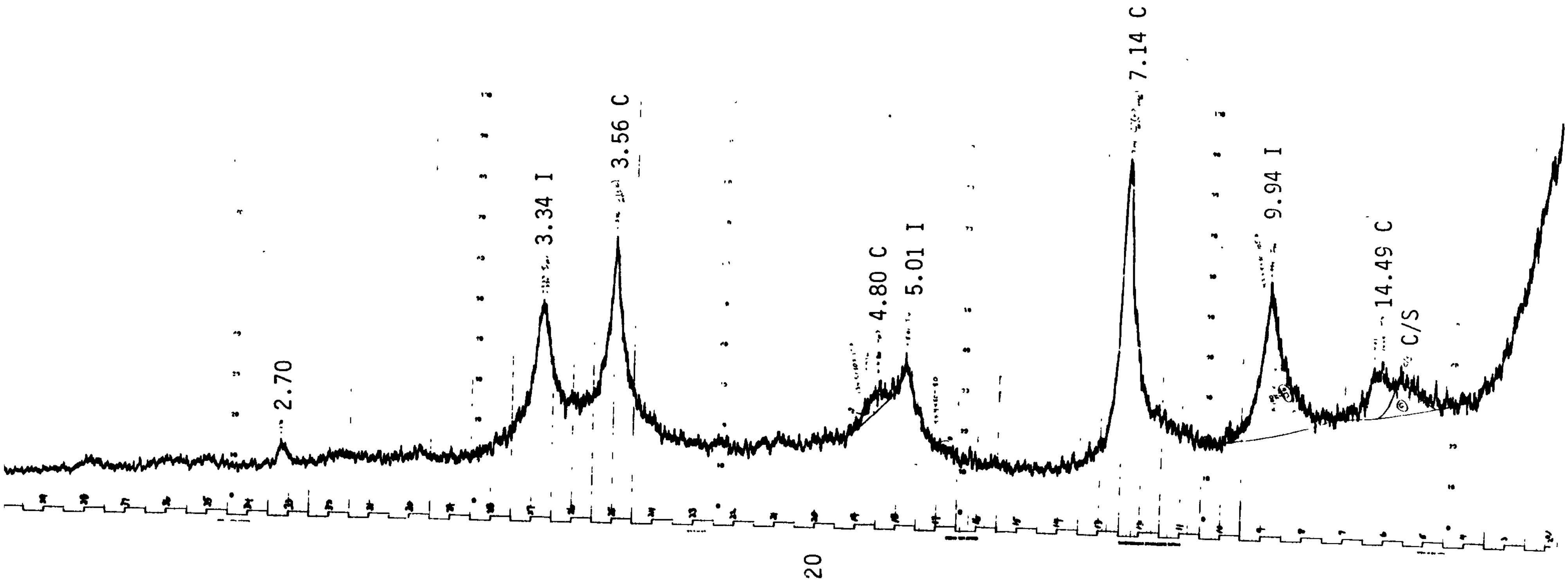
C1015 JFR 2018.0 GLYCOLATED



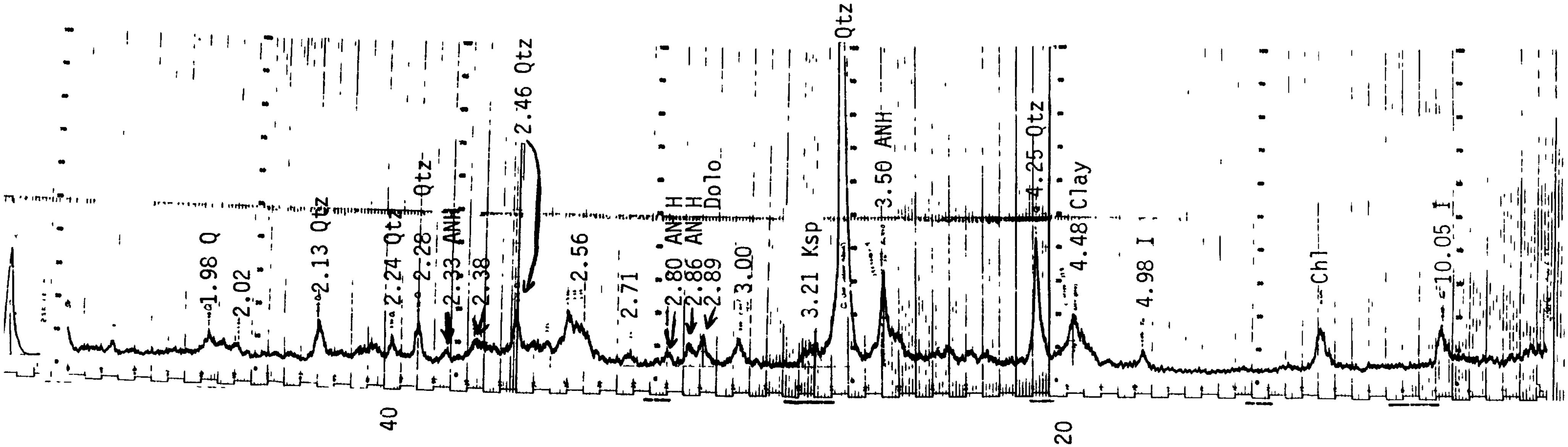
C1015 JFR 2018.0 RANDOM MOUNT



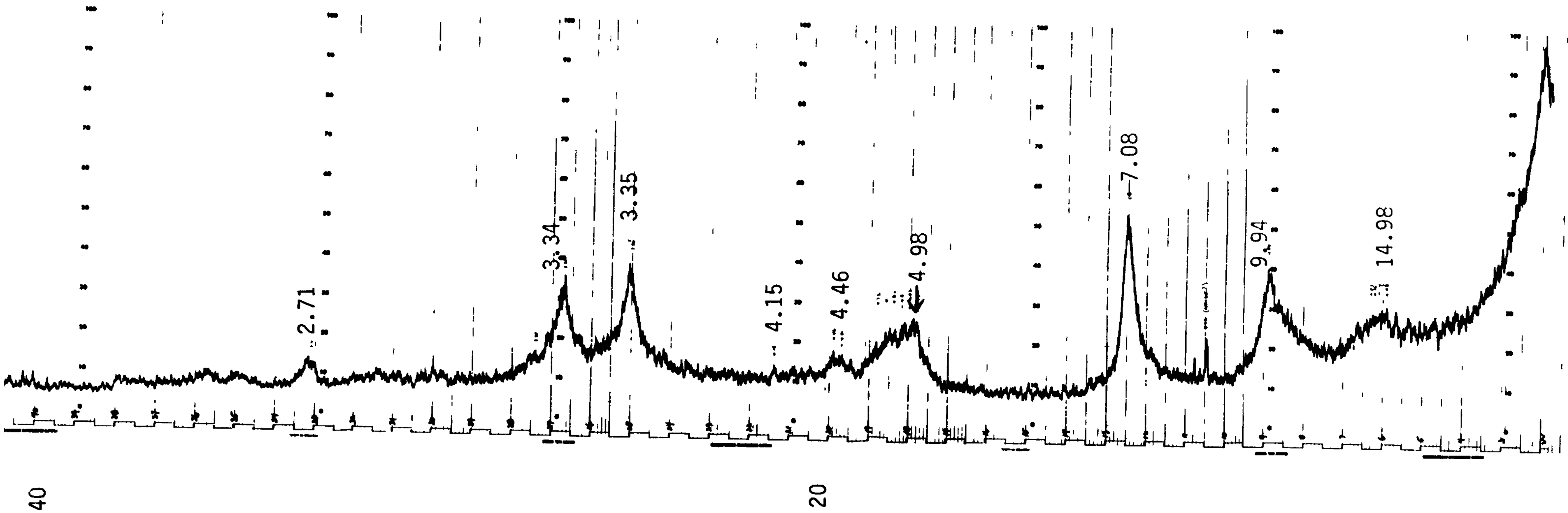
C1016 JFR 2033.6 AIR DRIED



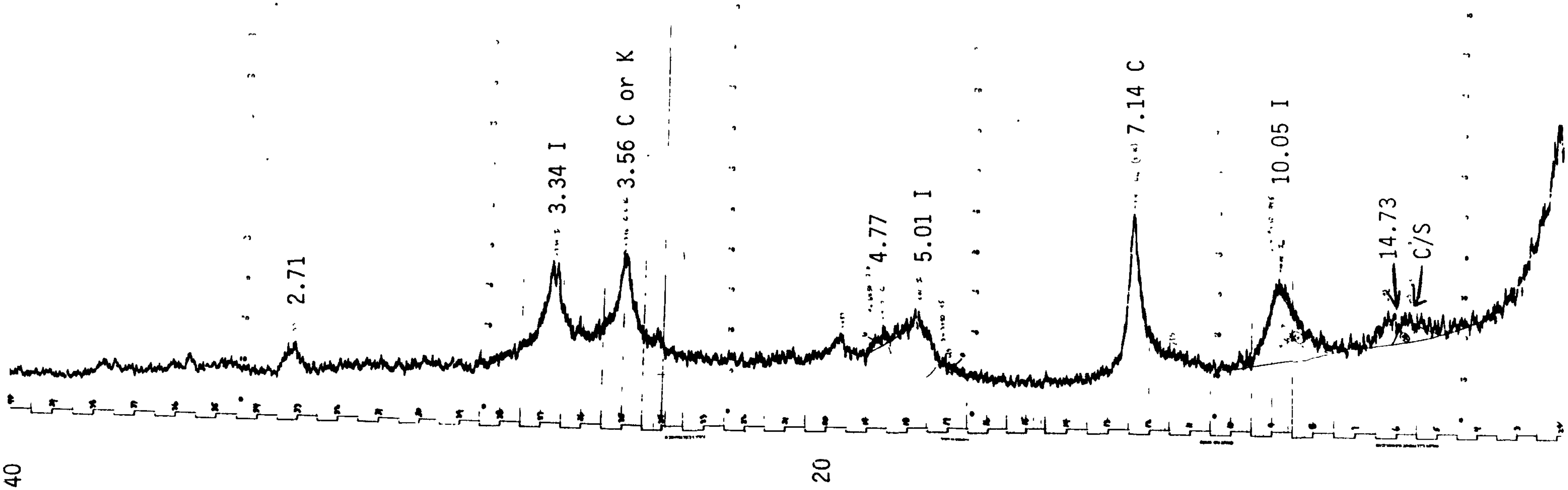
C1016 JFR 2033.6 GLYCOLATED



C1016 JFR 2033.6 RANDOM MOUNT



C1013 JFR 2058.0 AIR DRIED



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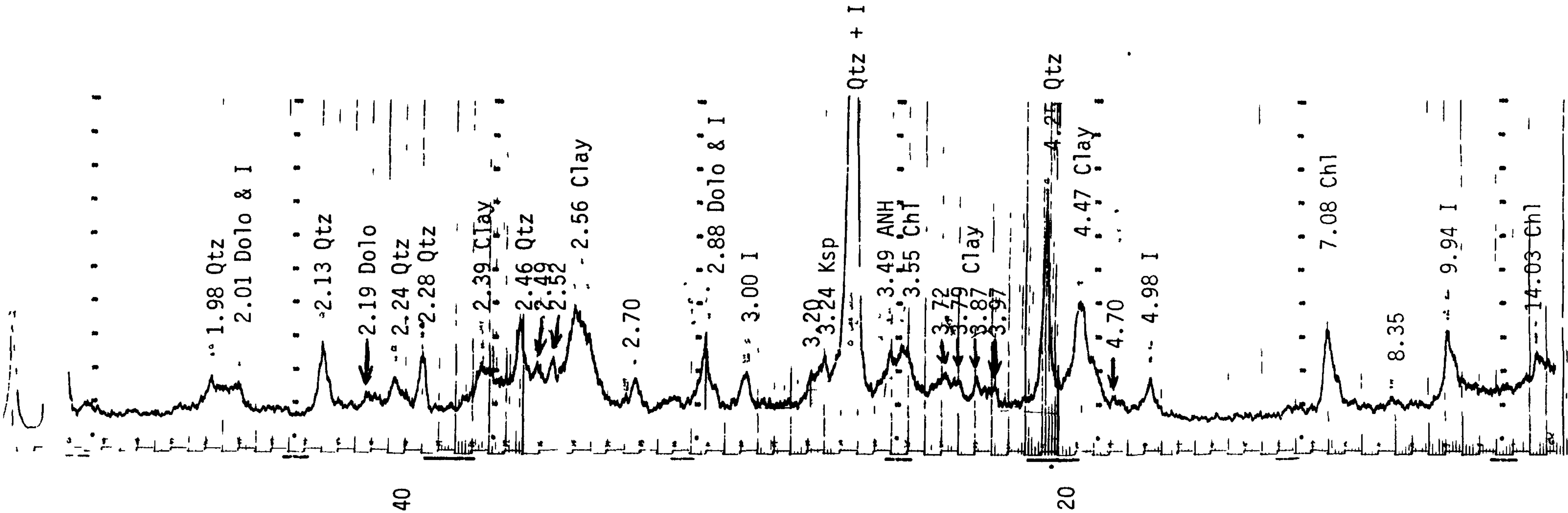

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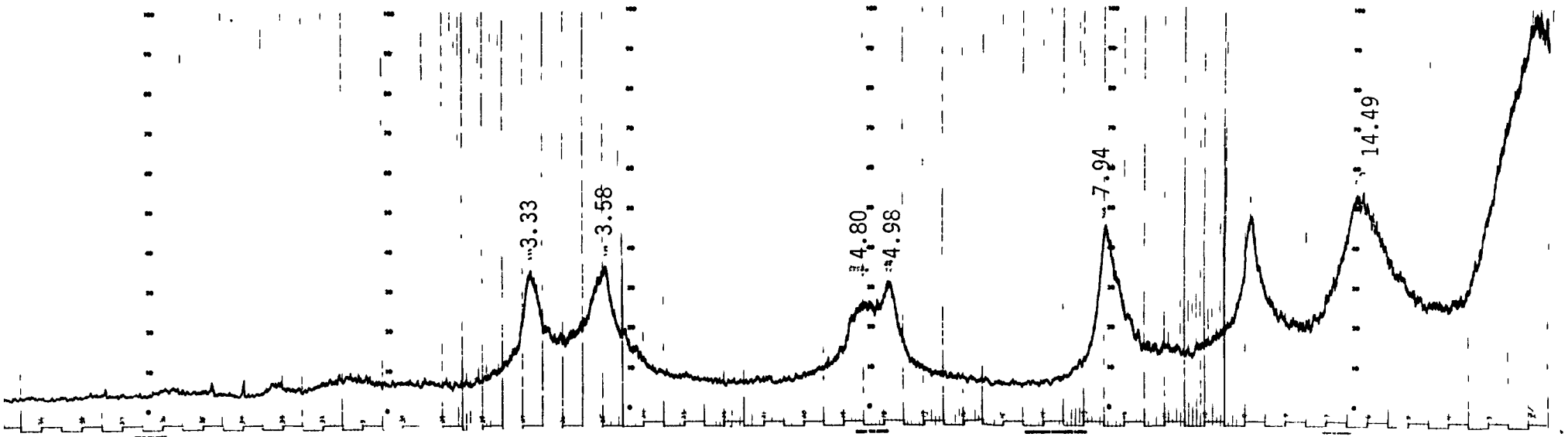

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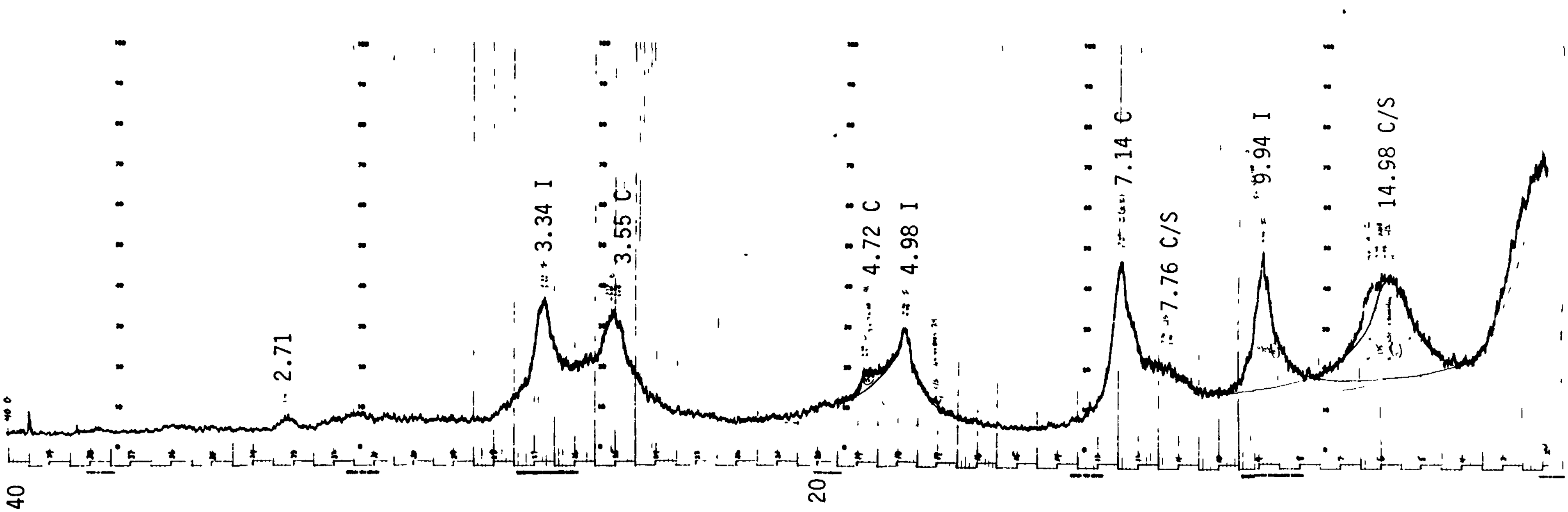
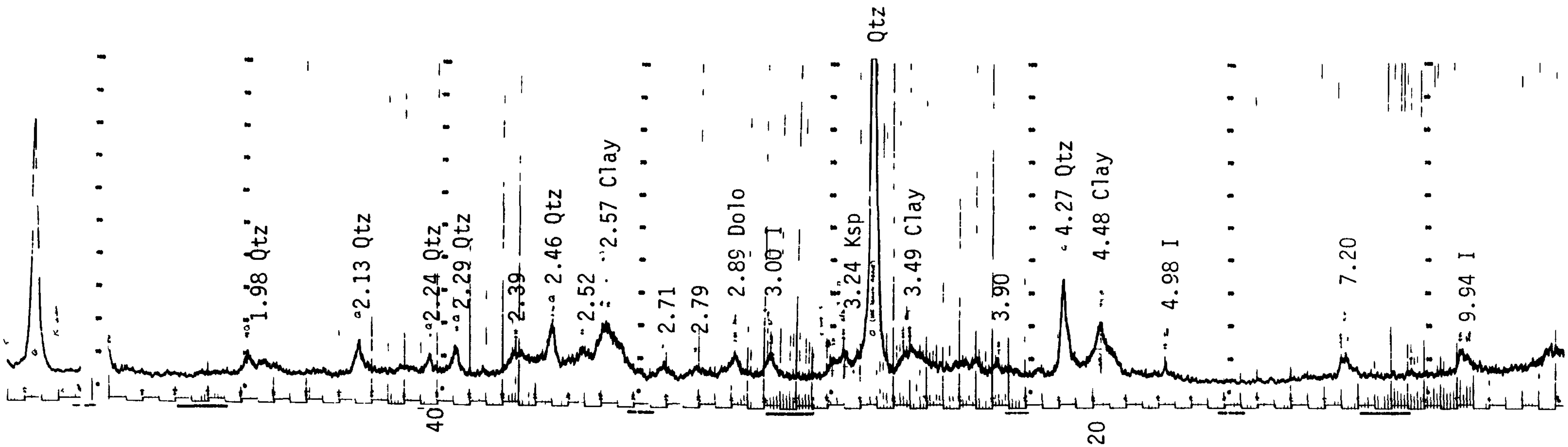
C1014a JFR 2411.7 AIR DRIED



C1014a JFR 2411.7 GLYCOLATED



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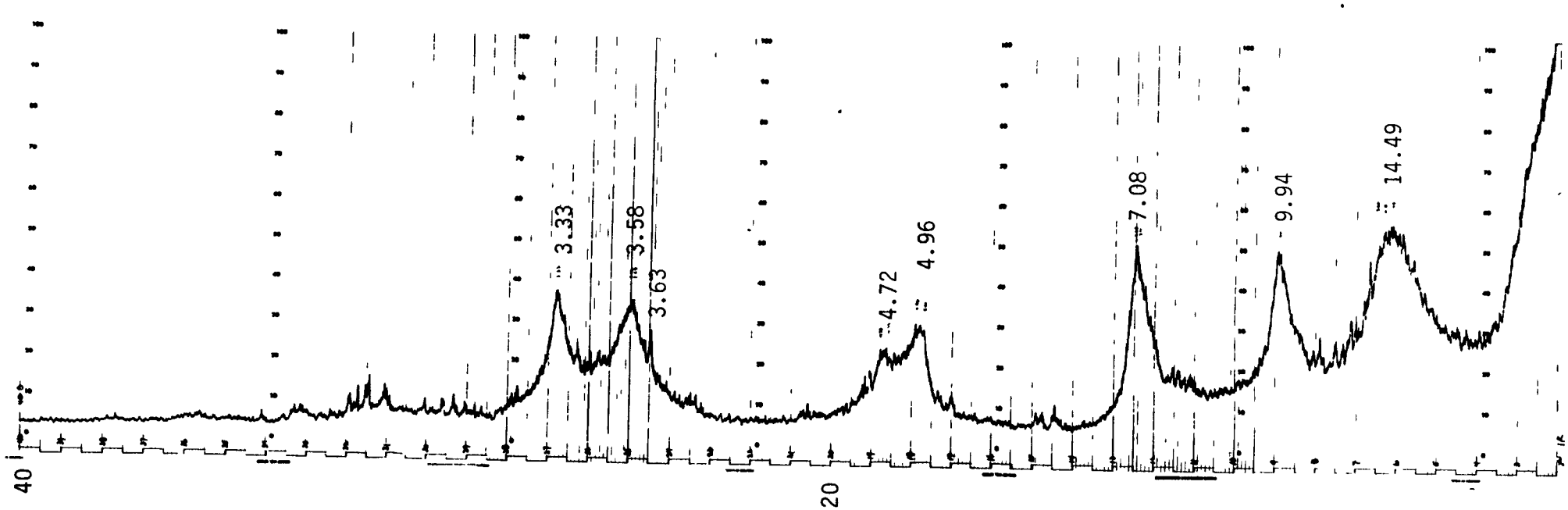

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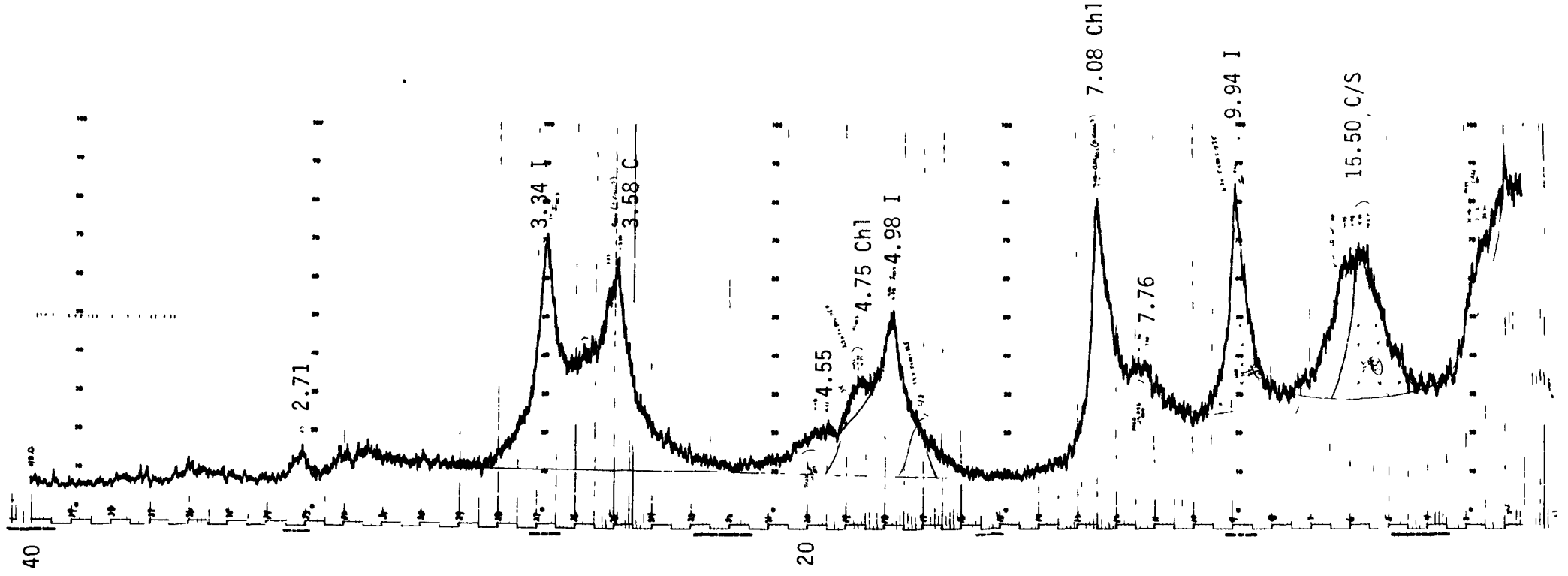
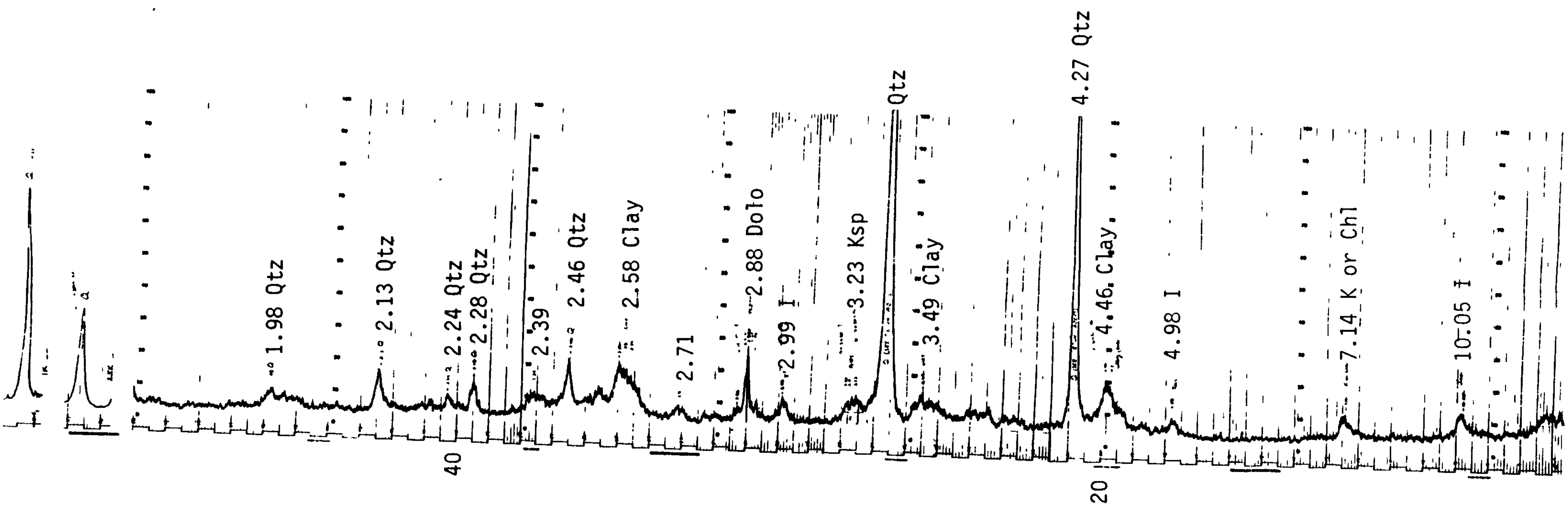
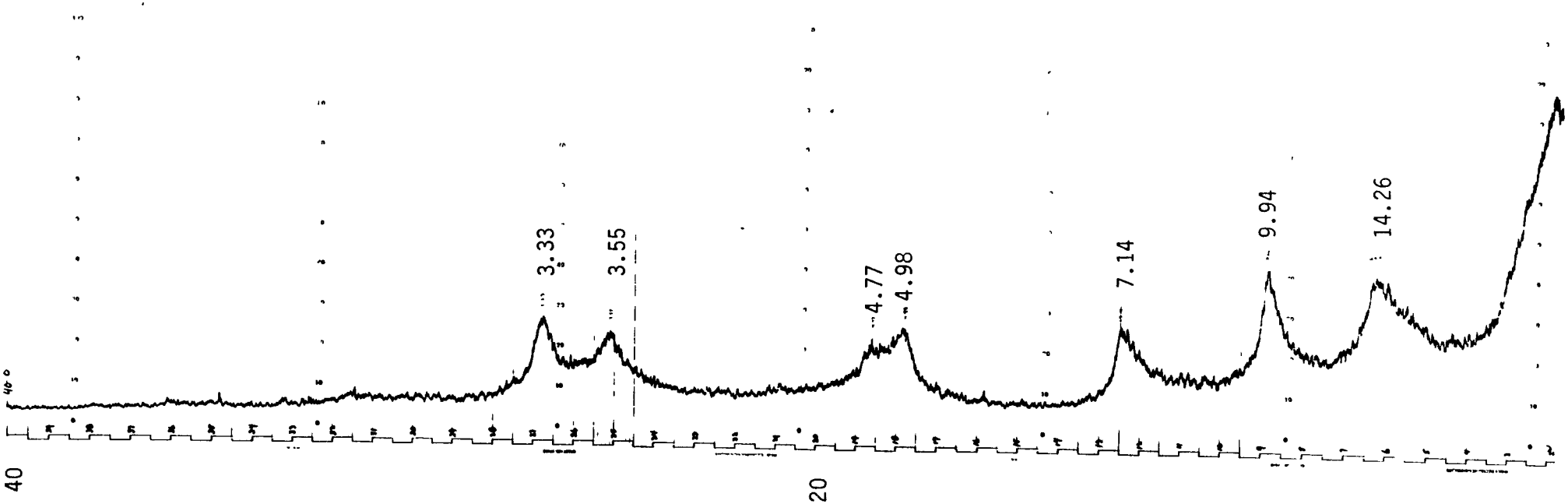


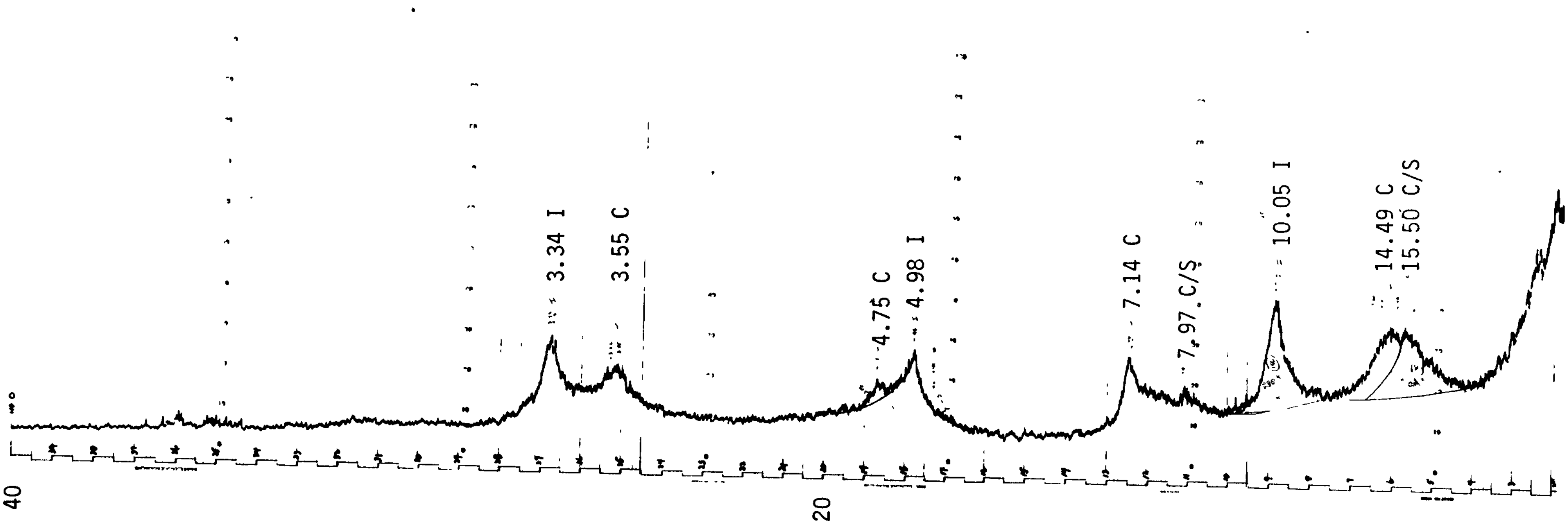
C1014b JFR 2411.7 GLYCOLATED



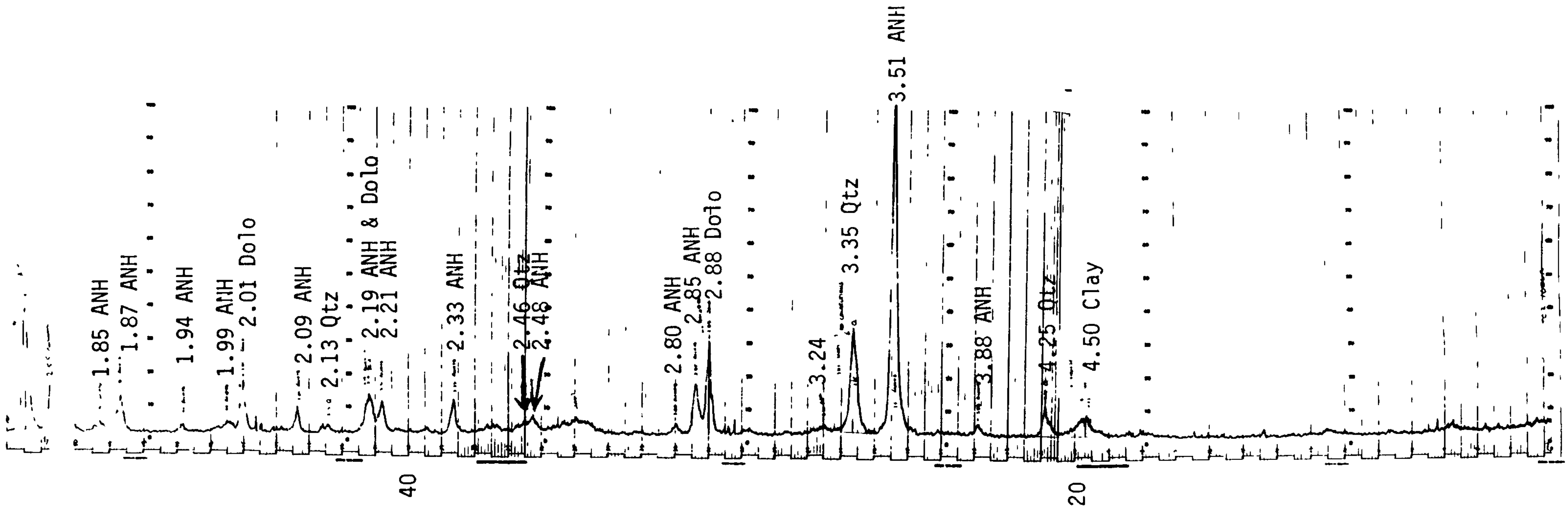
C1014b JFR 2411.7 RANDOM MOUNT



C1019 JFR 2458.6 AIR DRIED



C1019 JFR 2458.6 GLYCOLATED



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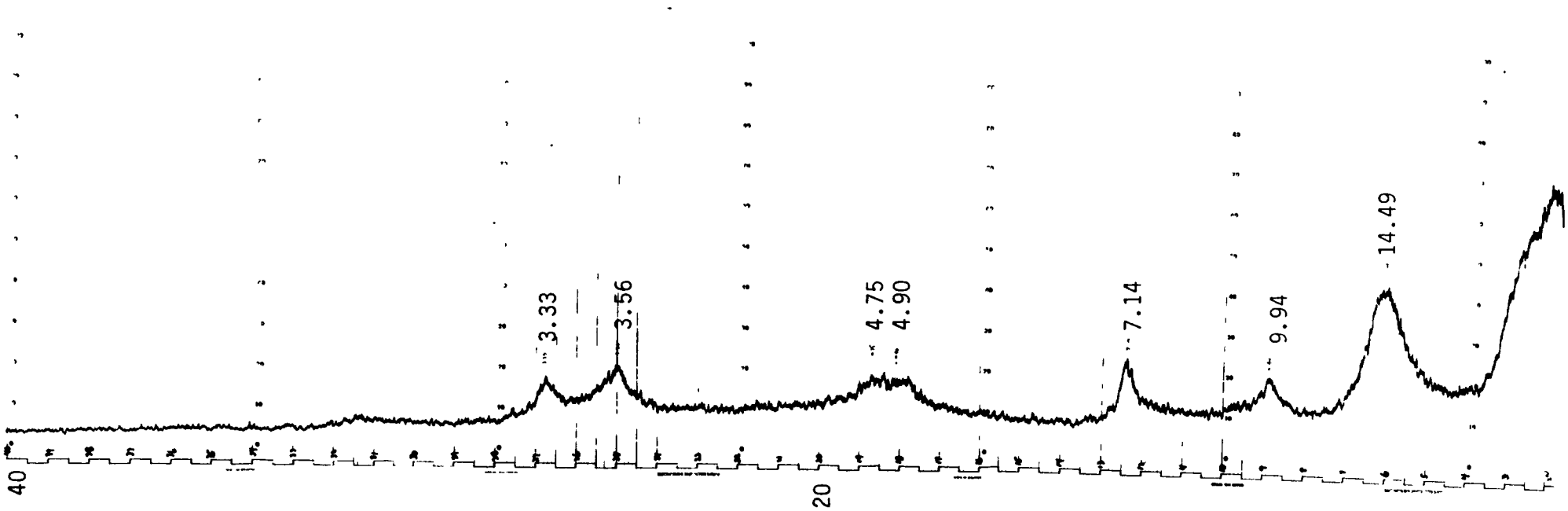
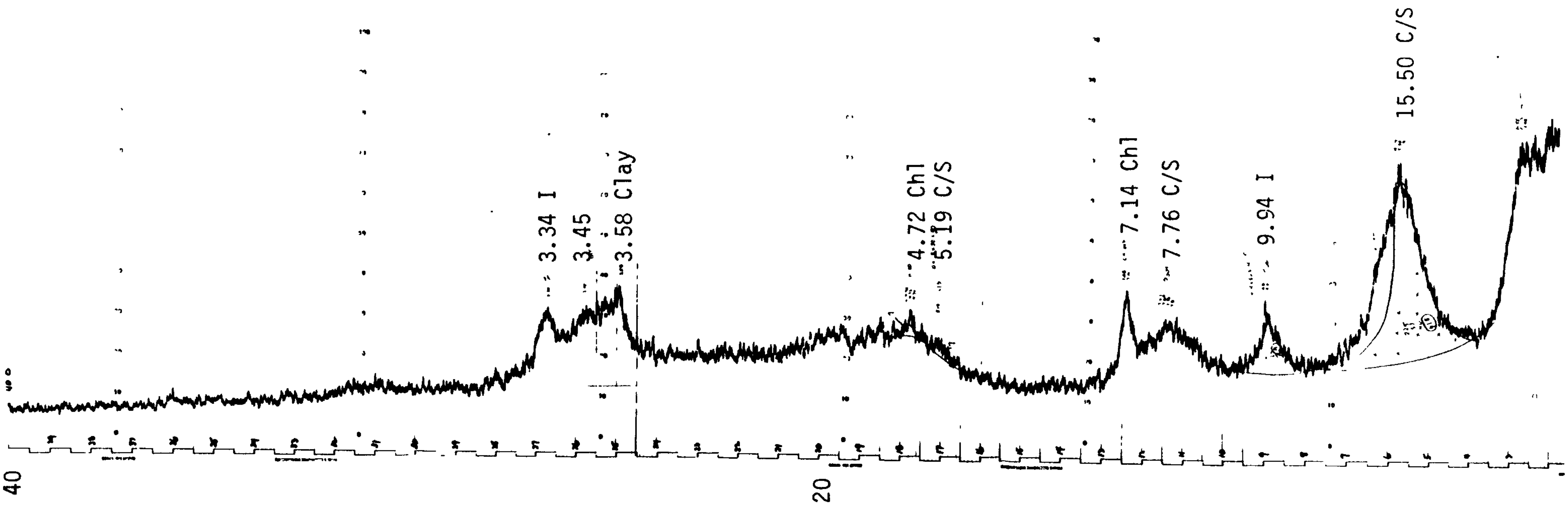
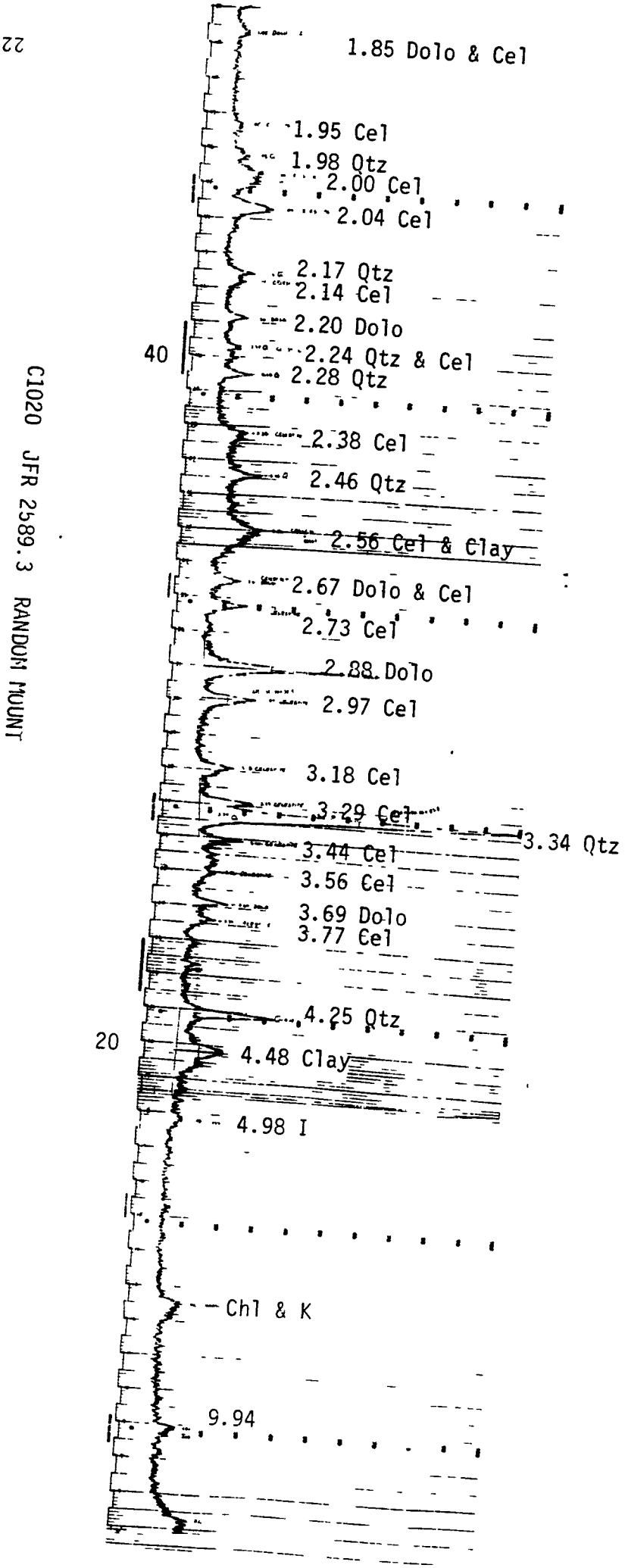
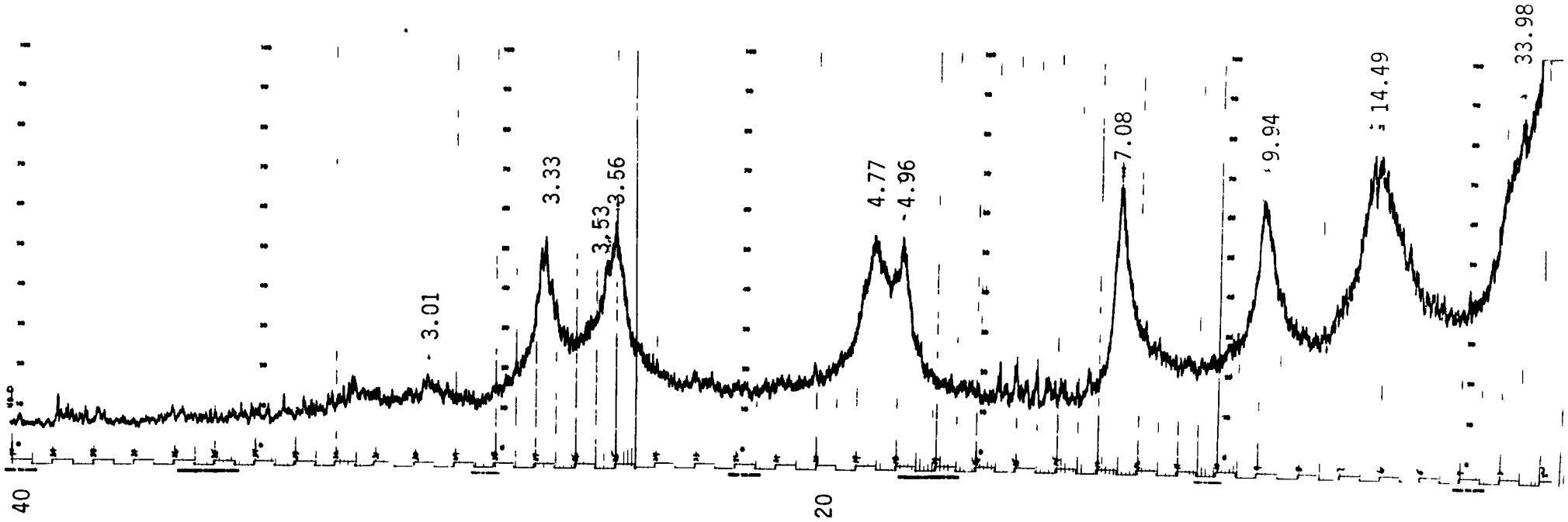


C1020 JFR 2589.3 AIR DRIED

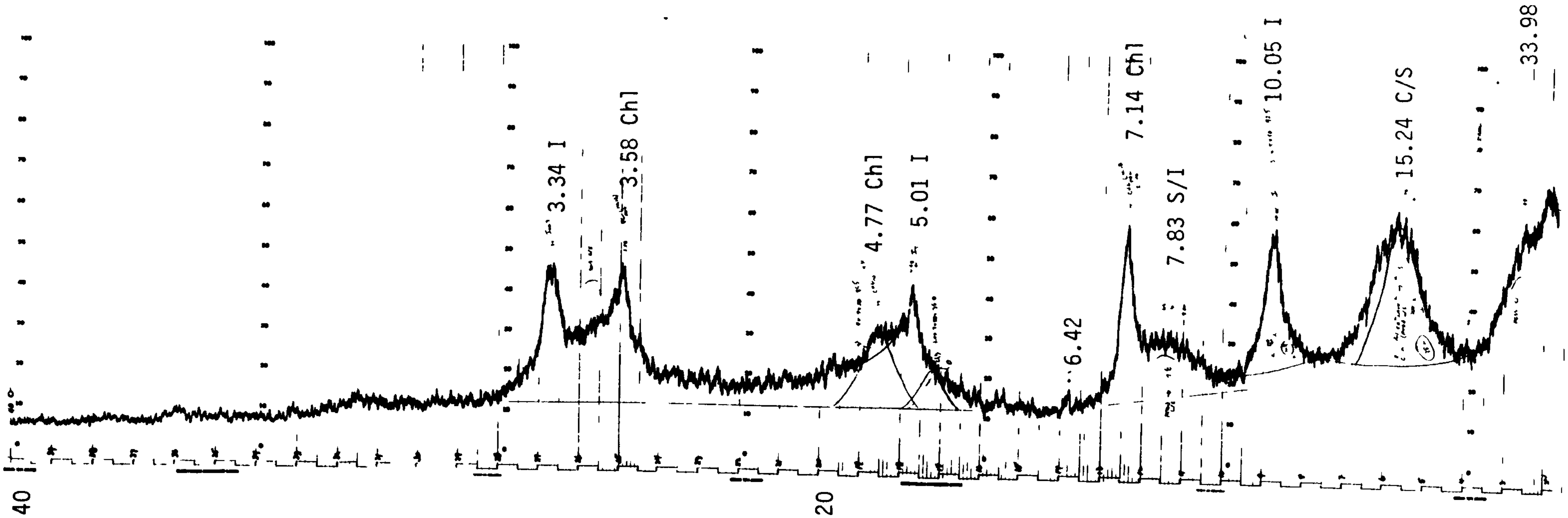


C1020 JFR 2589.3 GLYCOLATED


C1020 JFR 2589.3 RANDOM MOUNT
1.85 Dolo & Cel
1.95 Cel
1.98 Qtz
2.00 Cel
2.04 Cel
2.17 Qtz
2.14 Cel
2.20 Dolo
40
2.24 Qtz & Cel
2.28 Qtz
2.38 Cel
2.46 Qtz
2.56 Cel & Clay
2.67 Dolo & Cel
2.73 Cel
2.88 Dolo
2.97 Cel
3.18 Cel
3.29 Cel
3.34 Qtz
3.44 Cel
3.56 Cel
3.69 Dolo
3.77 Cel
4.25 Qtz
20
4.48 Clay
4.98 I
Chl & K
9.94

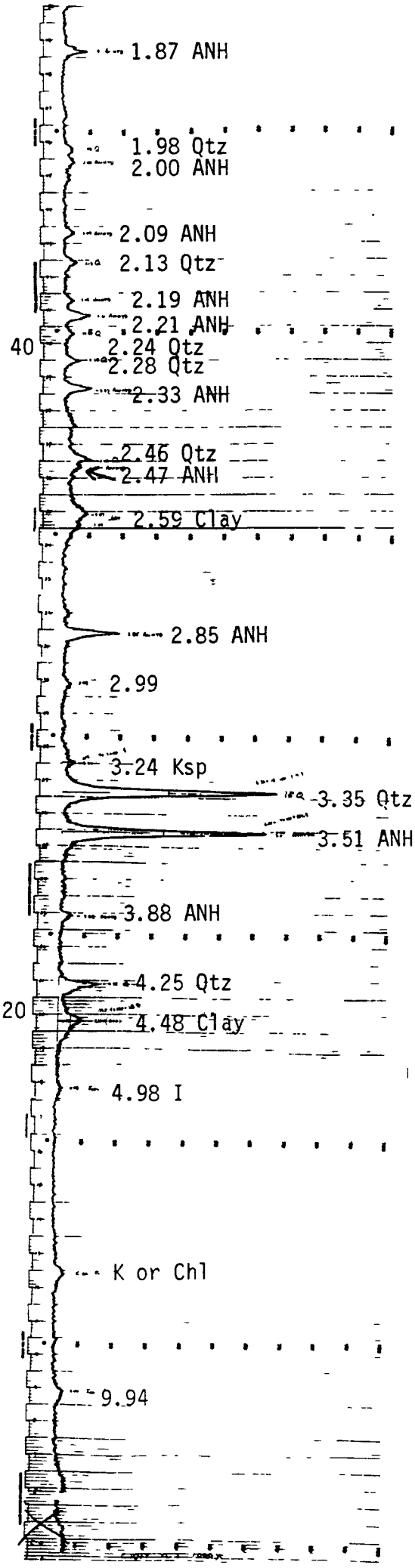


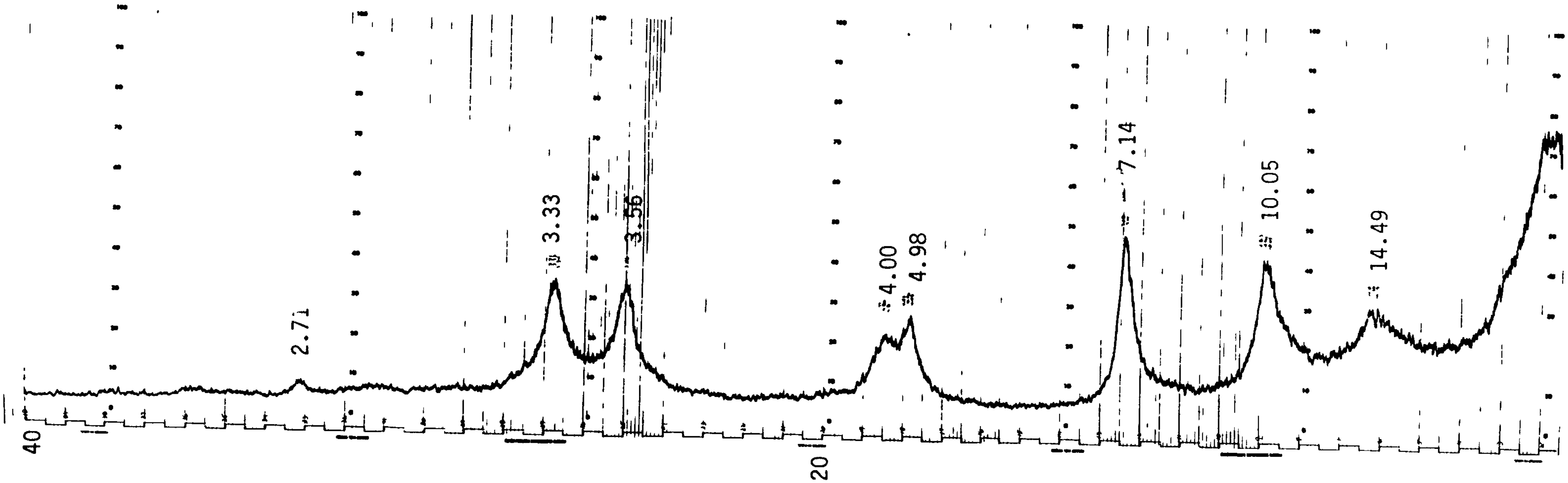
C1017 JFR 2598.1 AIR DRIED



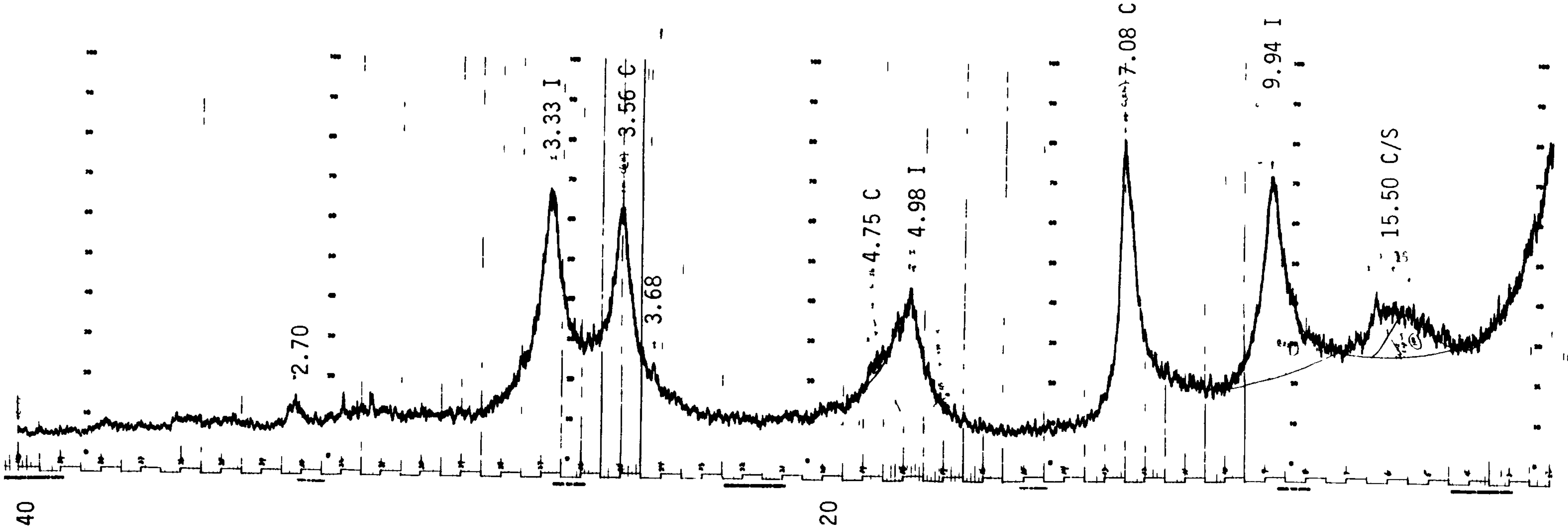
C1017 JFR 2598.1 GLYCOLATED

C1017 JFR 2598.1 RANDOM MOUNT

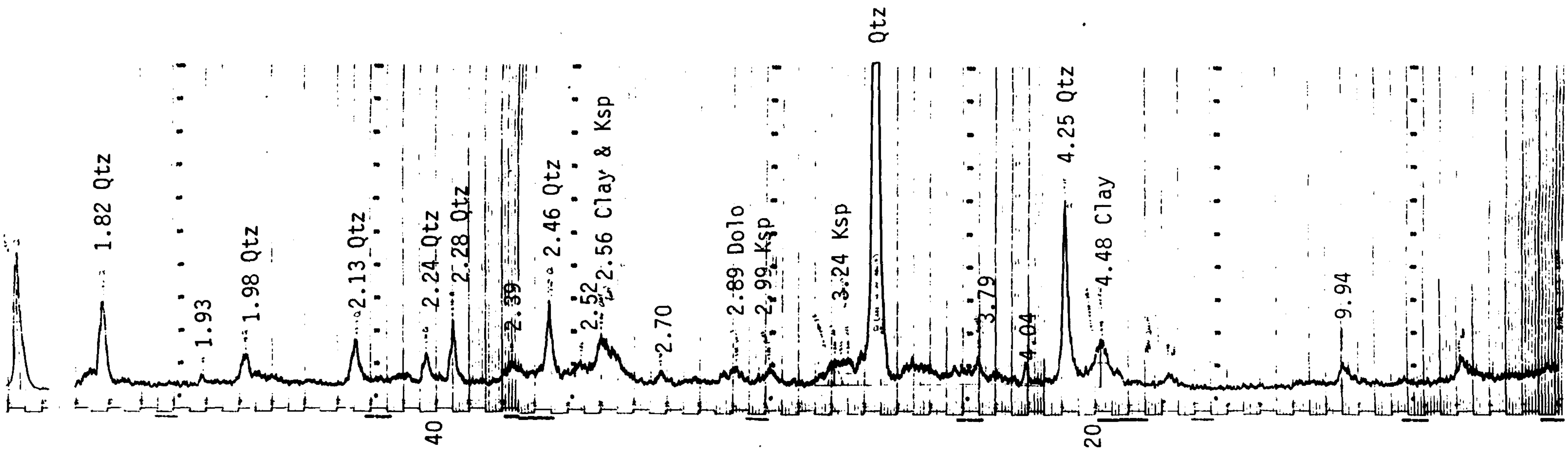




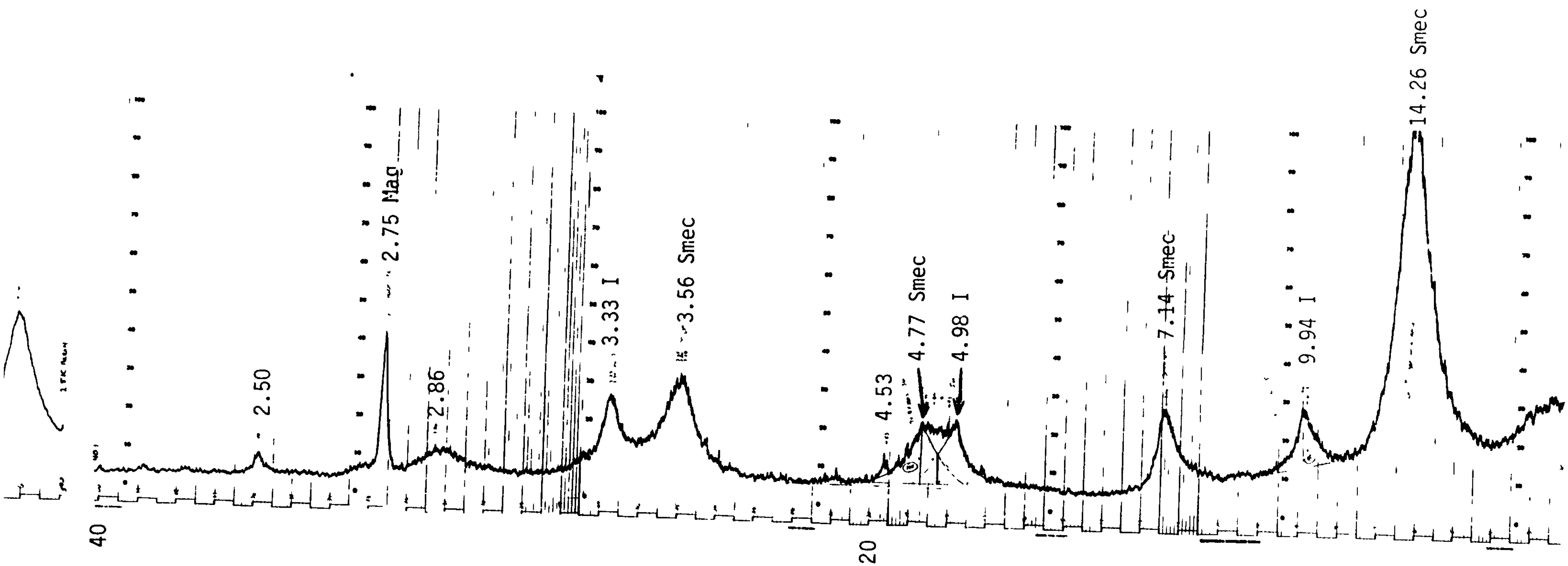
C1018 JFR 2652.1 AIR DRIED



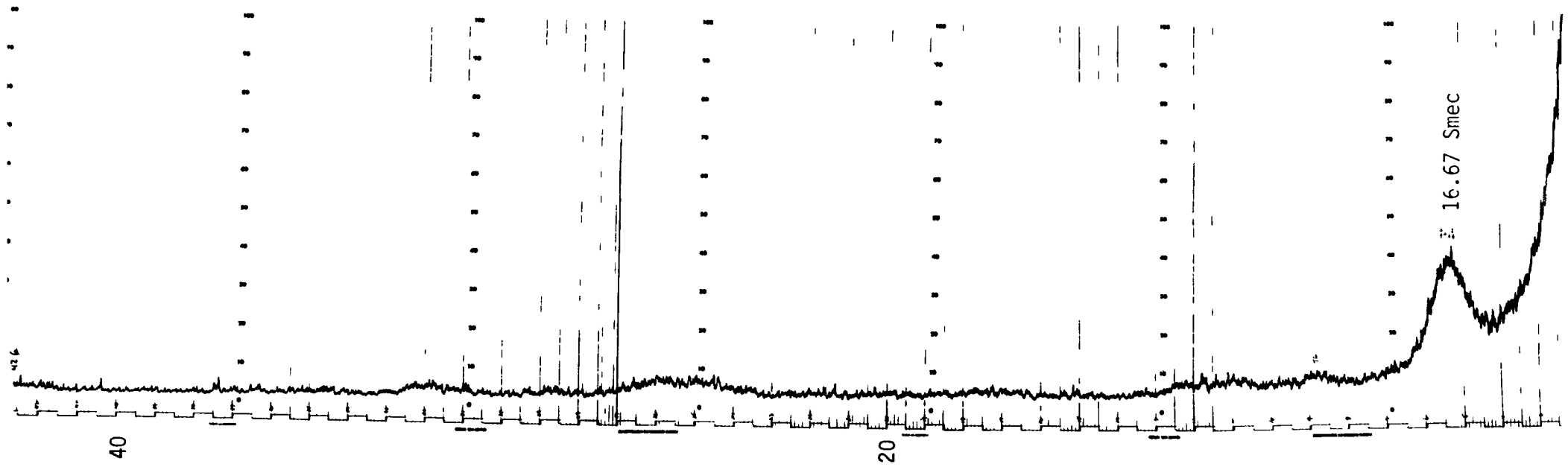
C1018 JFR 2652.1 GLYCOLATED



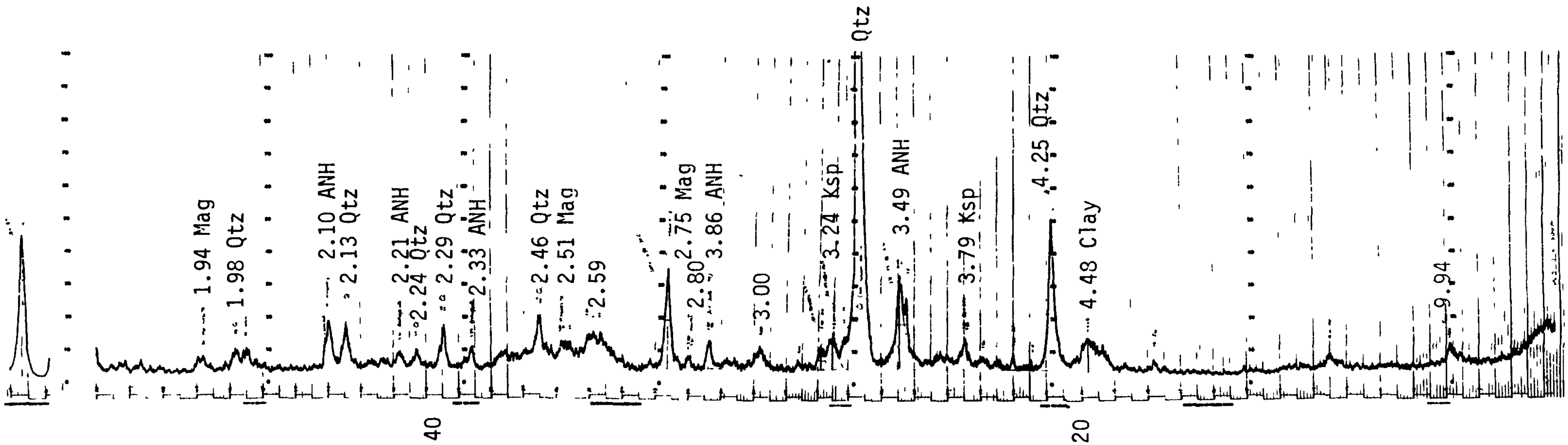
C1018 JFR 2652.1 RANDOM MOUNT



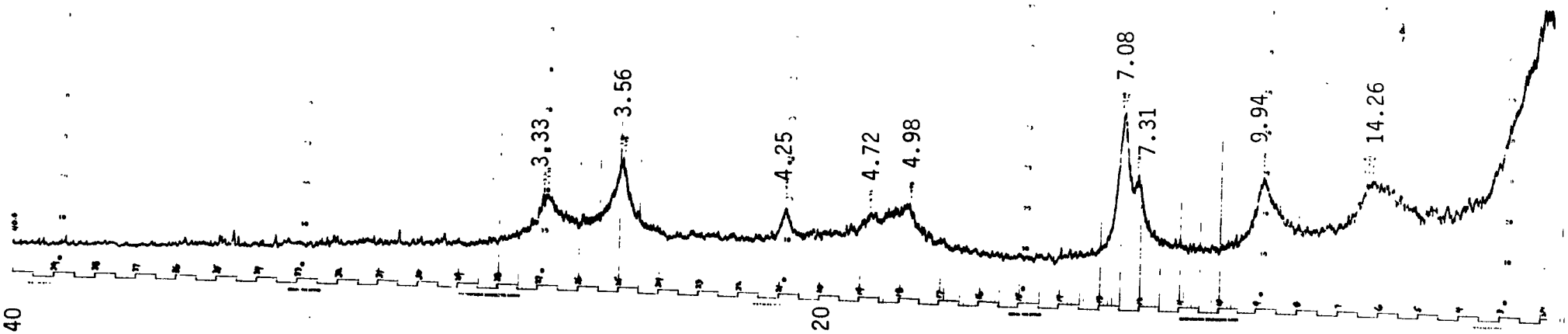
C1003 ZEE 1133.2 AIR DRIED



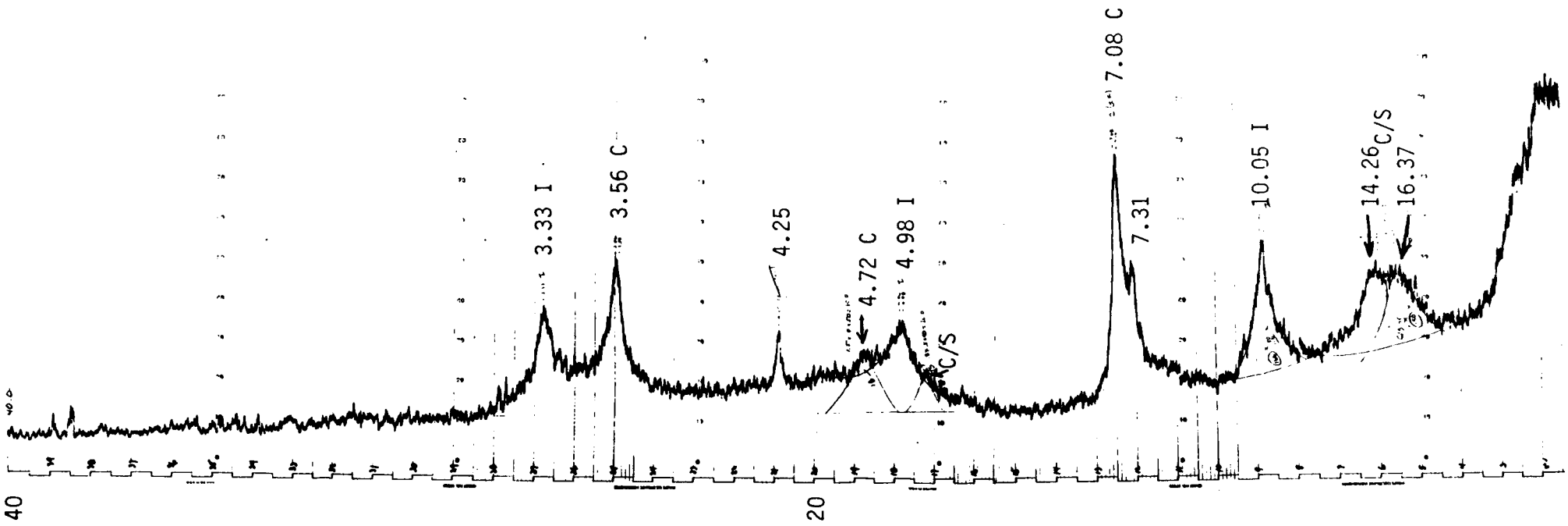
C1003 ZEE 1133.2 GLYCOLATED



C1003 ZEE 1133.2 RANDOM MOUNT

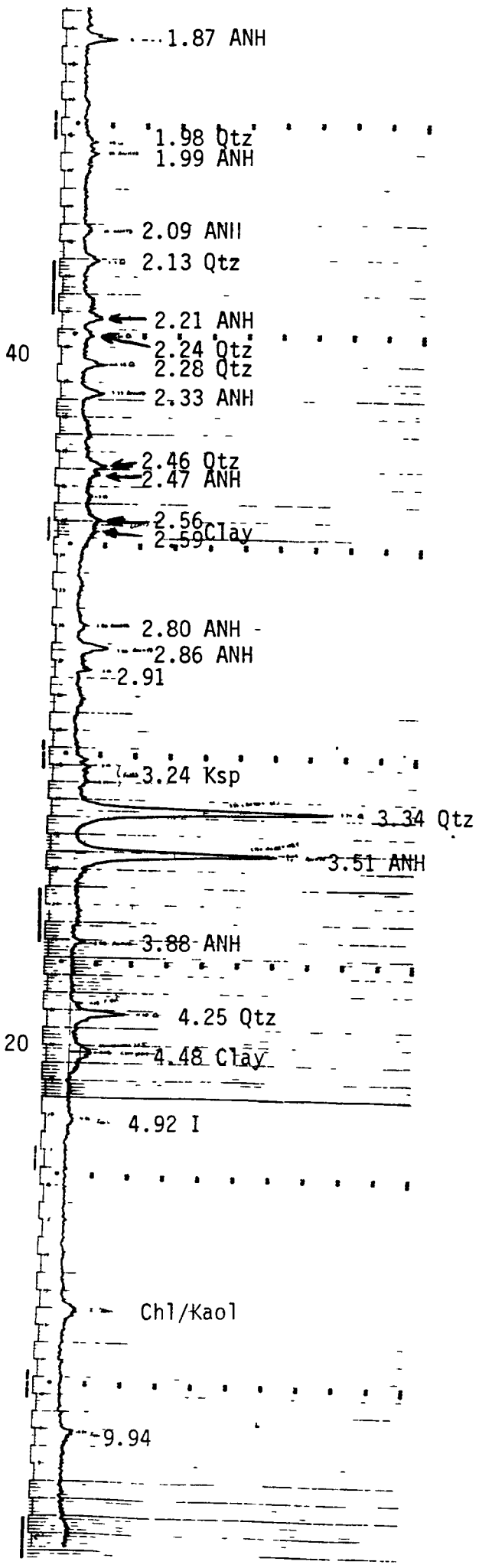


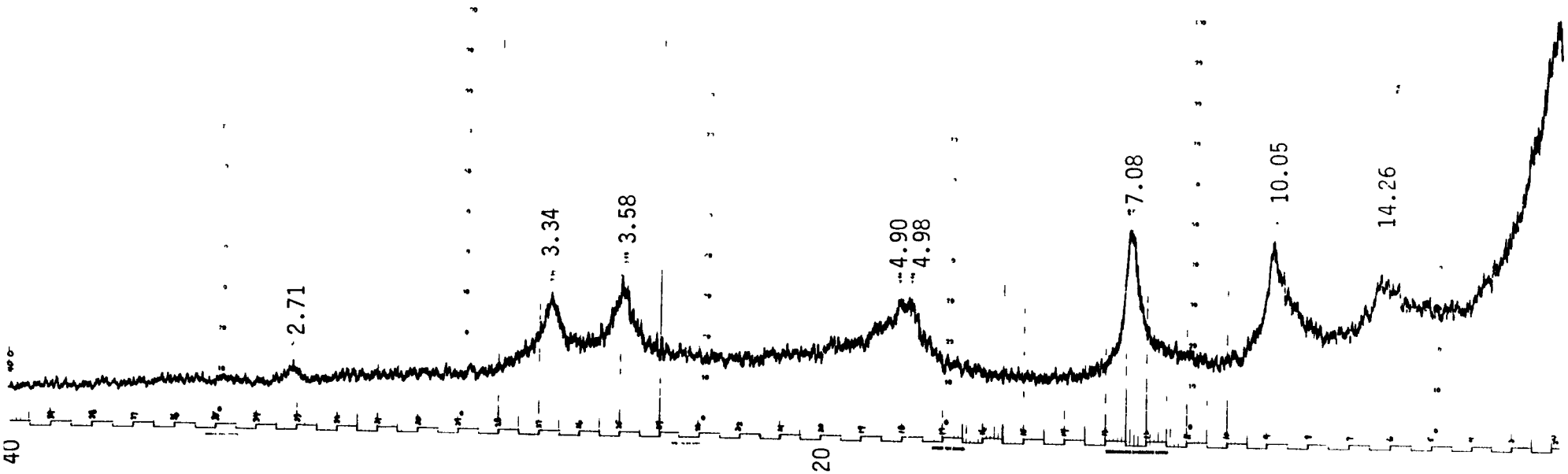
C1006 ZEE 2040.8 AIR DRIED



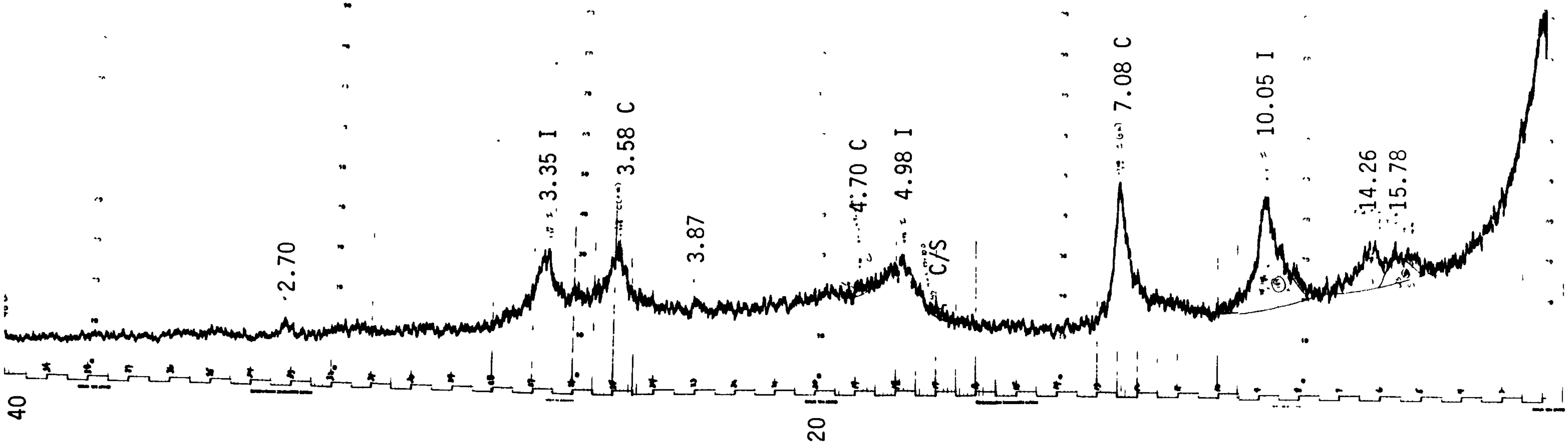
C1006 . ZEE 2040.8 GLYCOLATED

C1006 ZEE 2040.8 RANDOM MOUNT

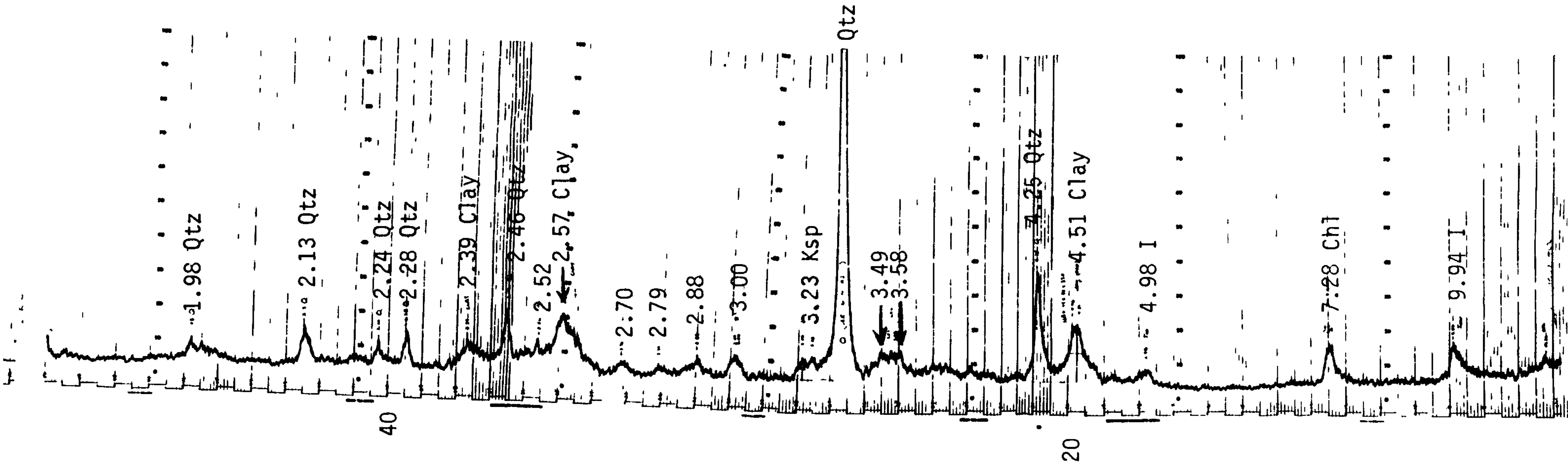




C1007 ZEE 2120.5 AIR DRIED



C1007 ZEE 2120.5 GLYCOLATED



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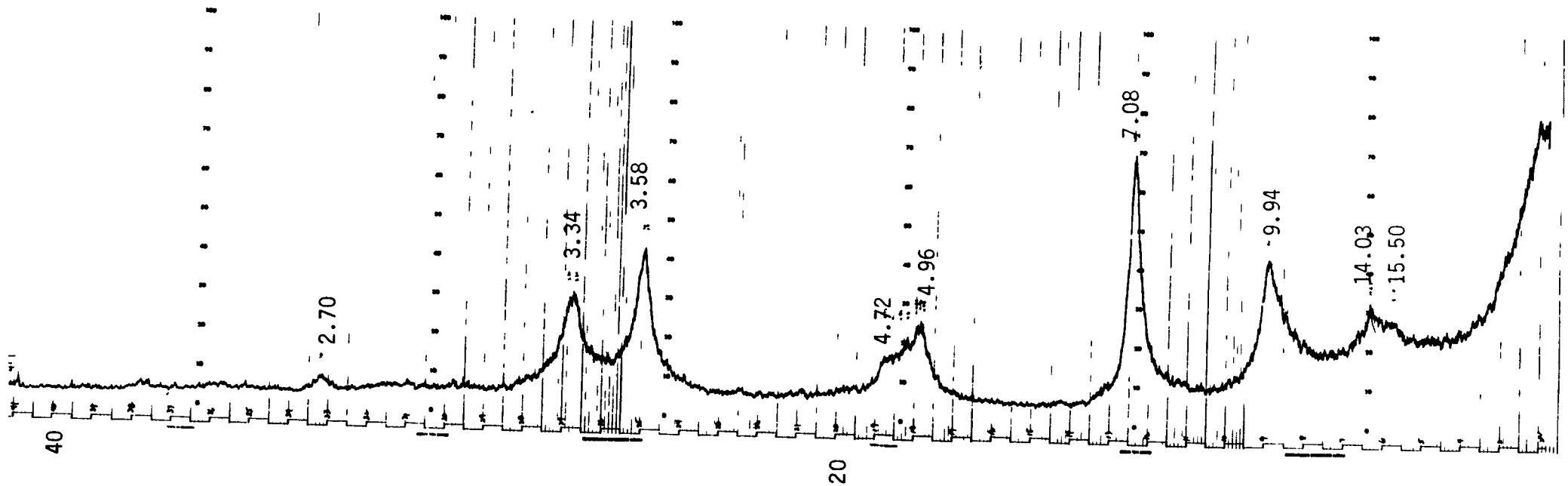
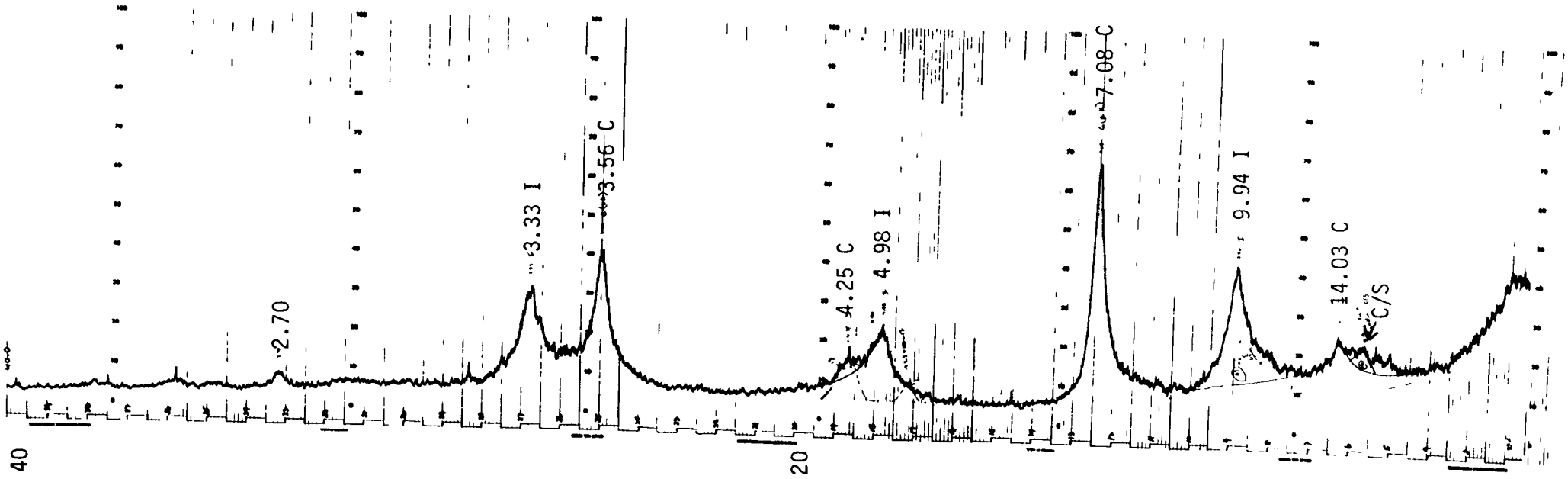
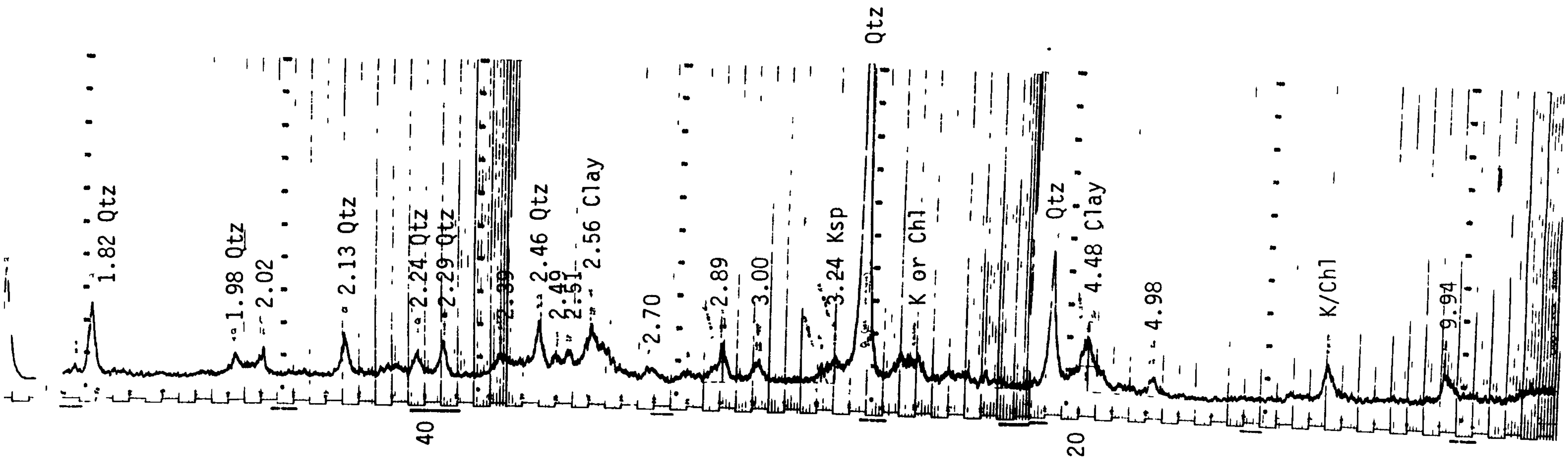


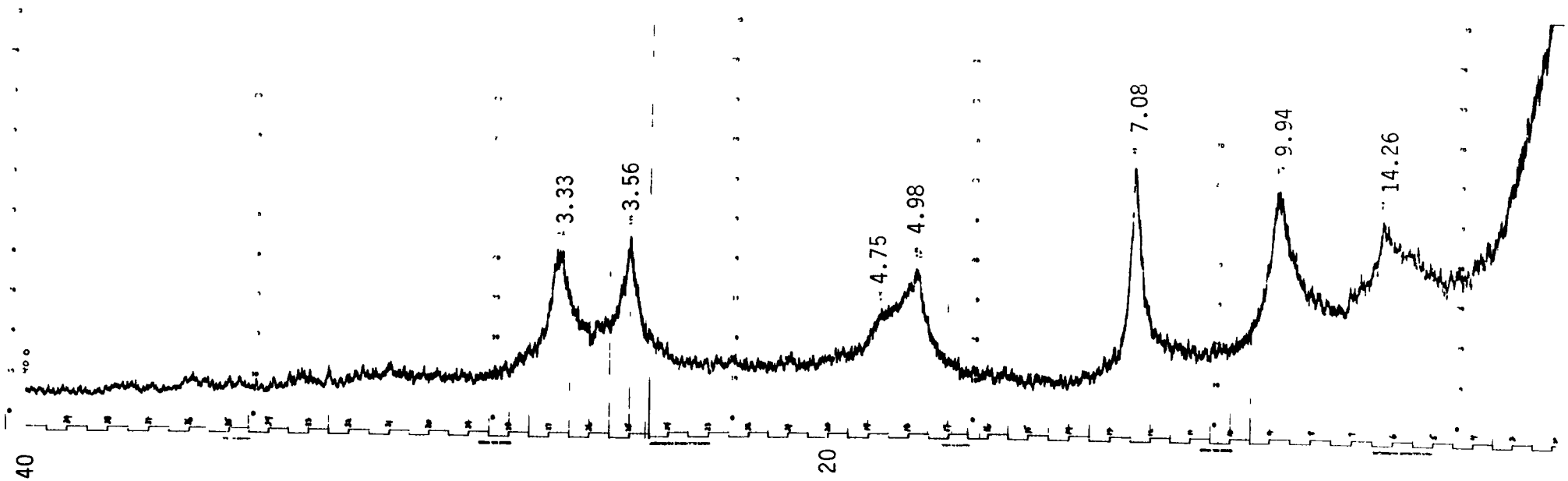
C1001 ZEE 2131.6 AIR DRIED



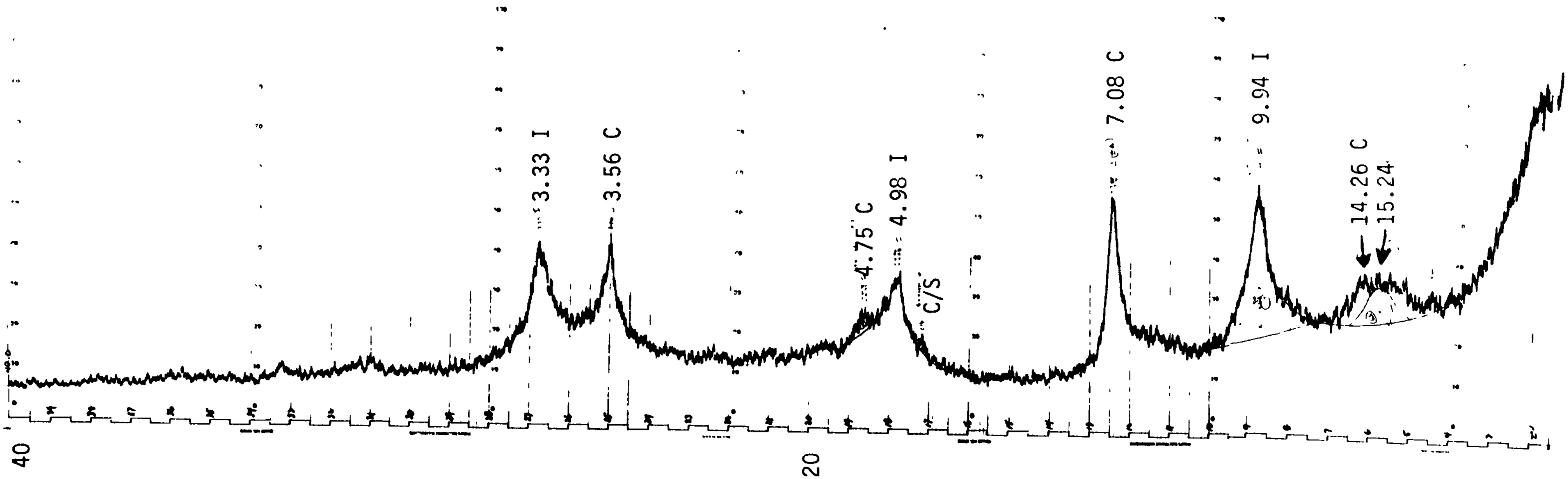
C1001 ZEE 2131.6 GLYCOLATED



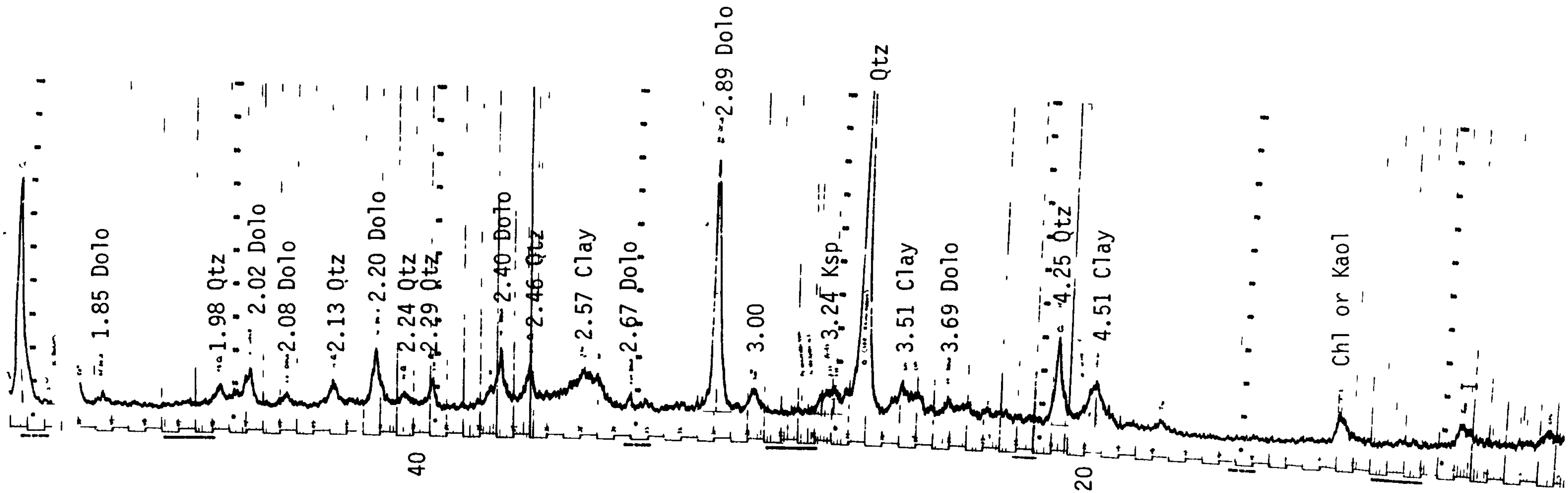
C1001 ZEE 2131.6 RANDOM MOUNT



C1002 ZEE 2246.3 AIR DRIED



C1002 ZEE 2246.3 GLYCOLATED



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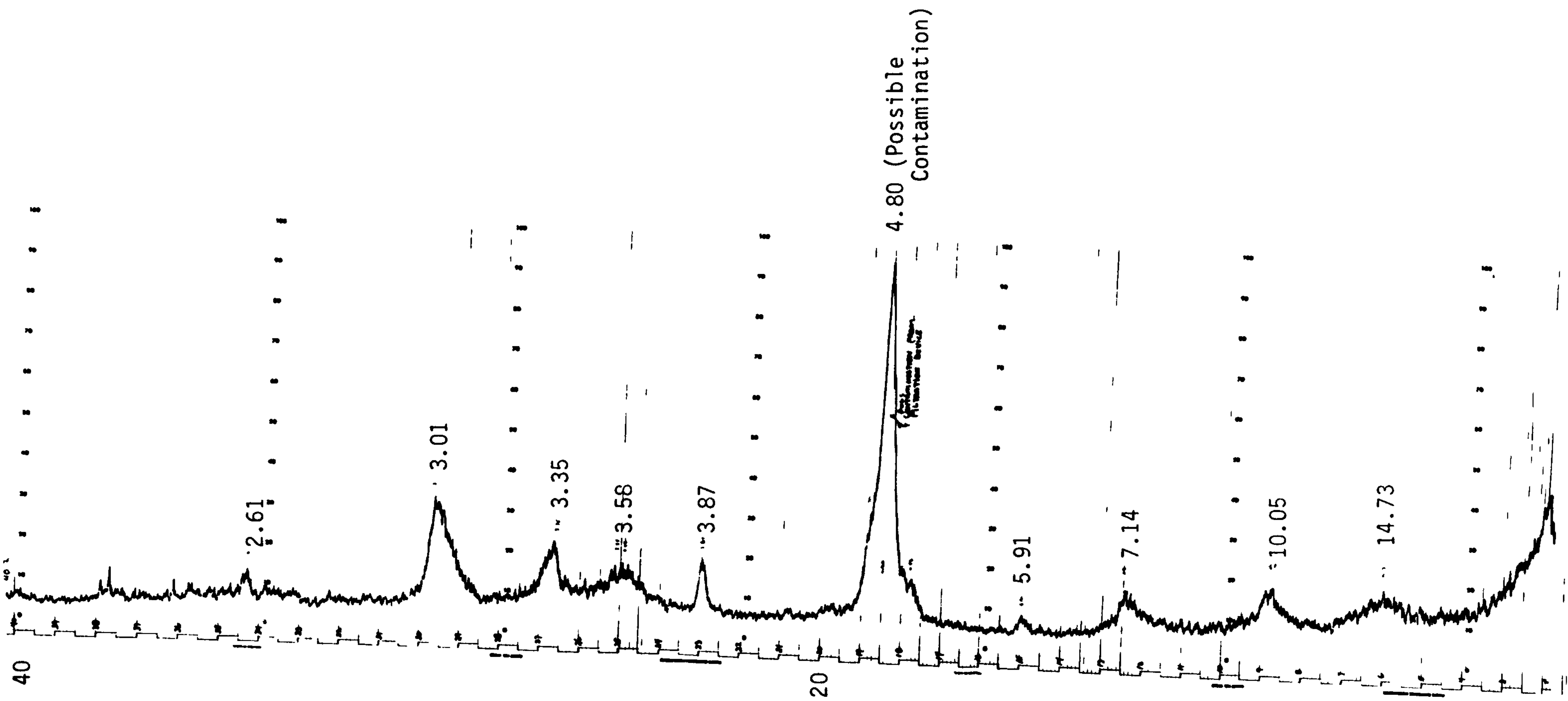
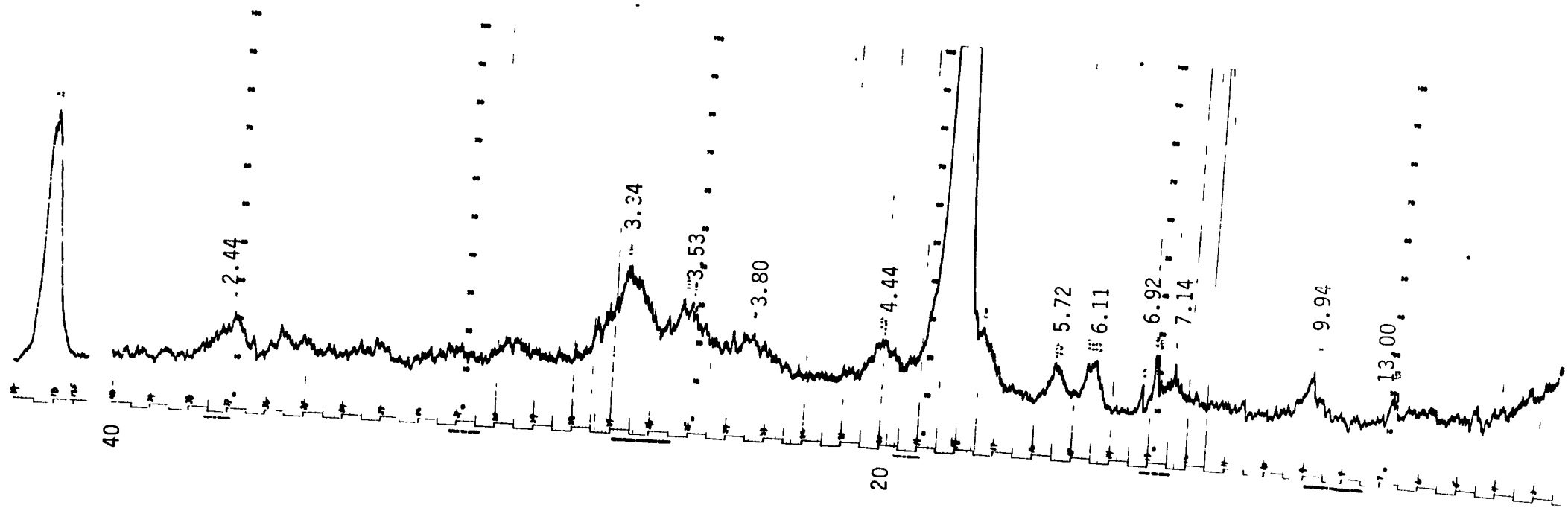
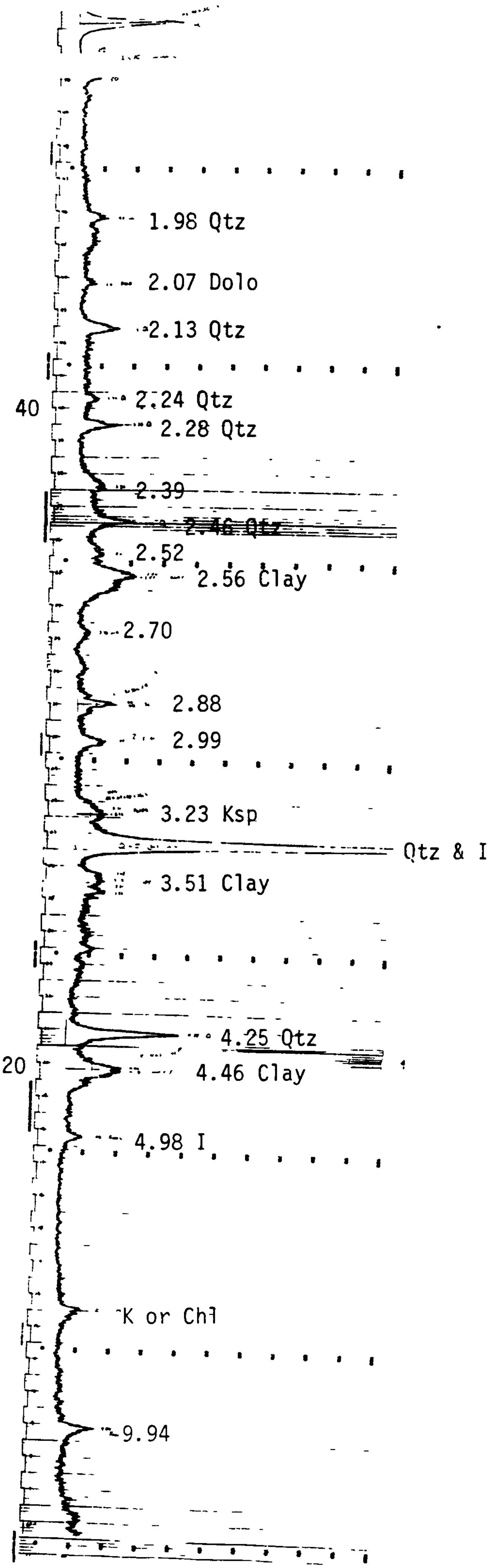


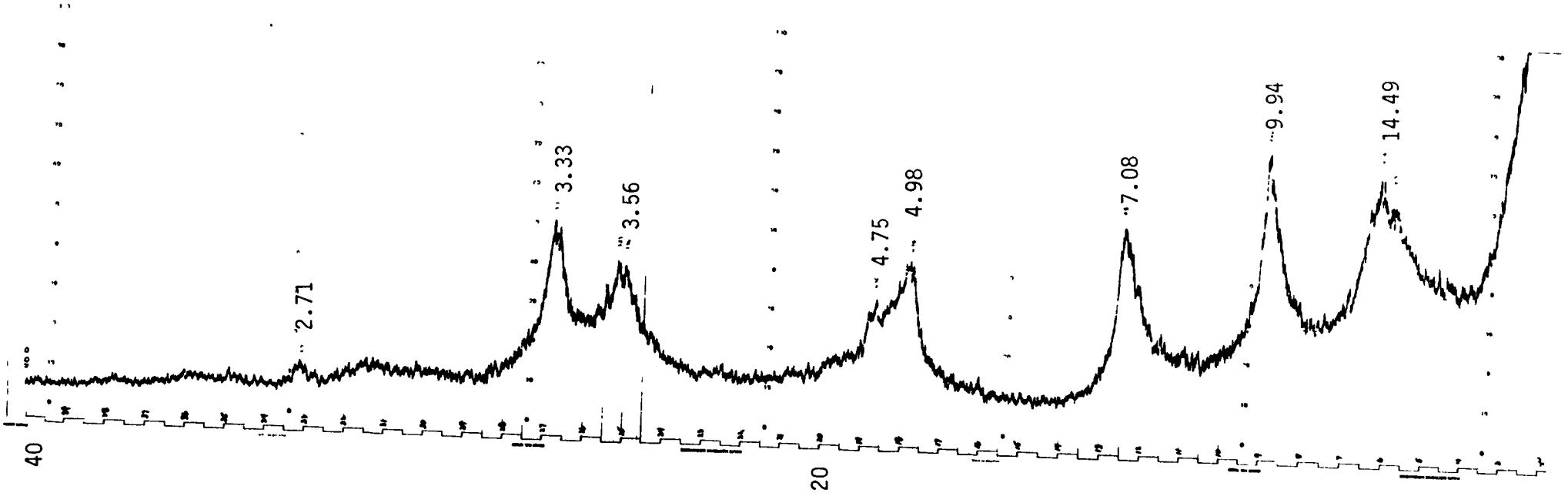
C1004 ZEE 2416.1 AIR DRIED



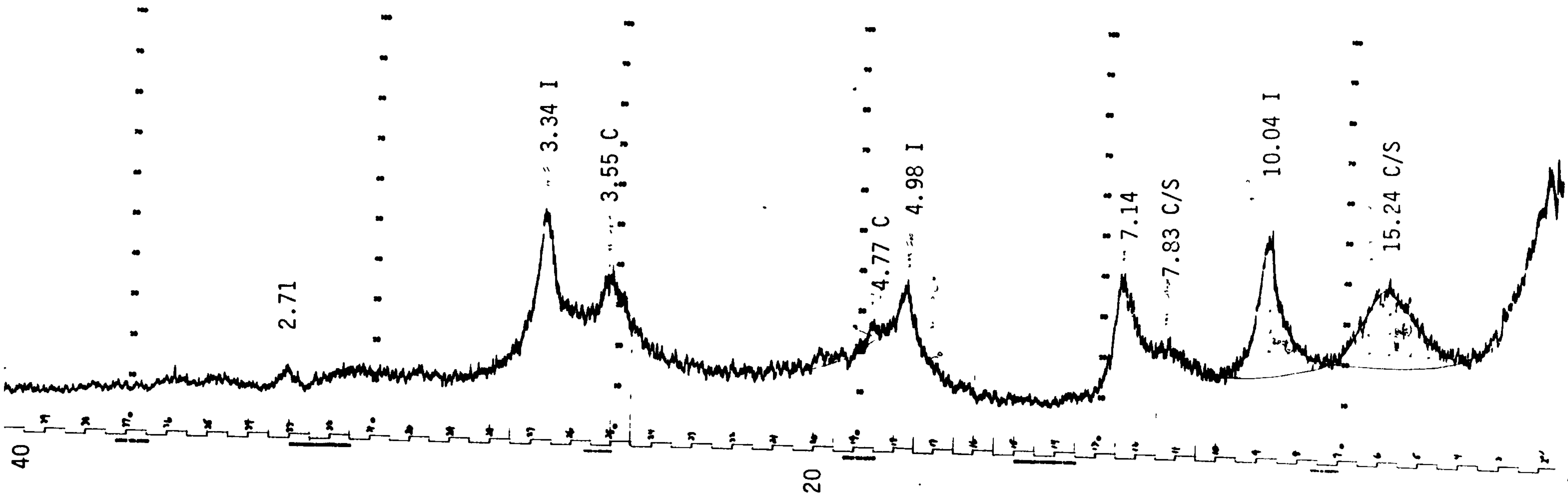
C1004 ZEE 2416.1 GLYCOLATED

C1004 ZEE 2416.1 RANDOM MOUNT

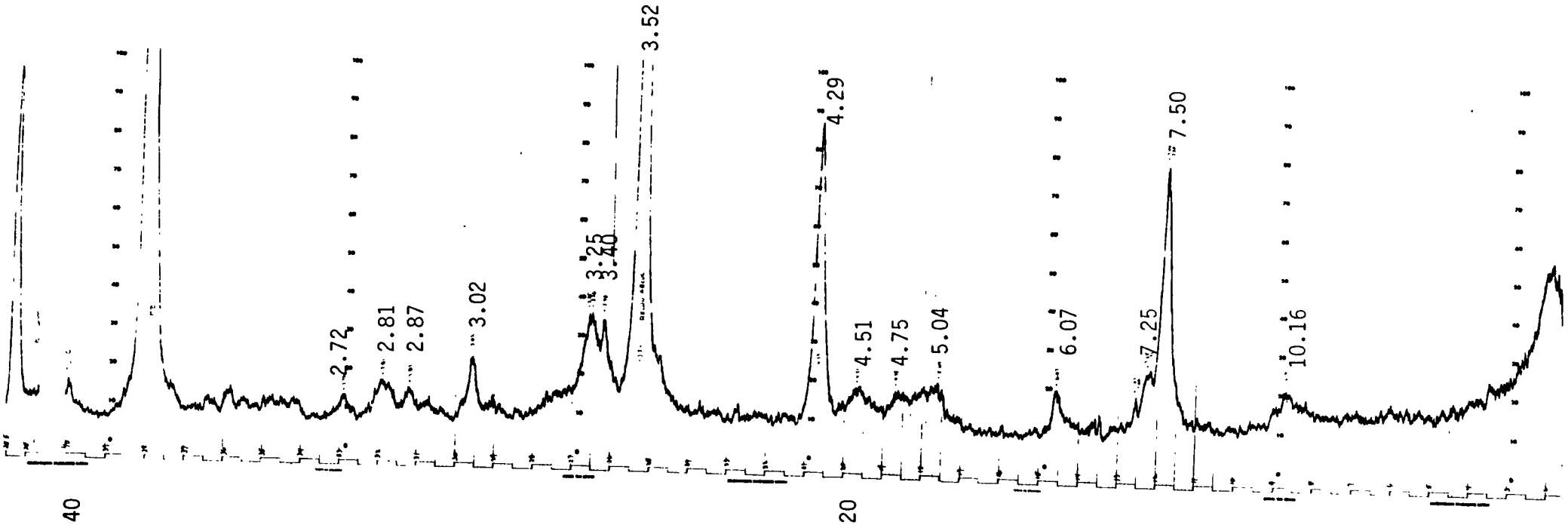




C1004 ZEE 2416.1 (Repeat) AIR DRIED

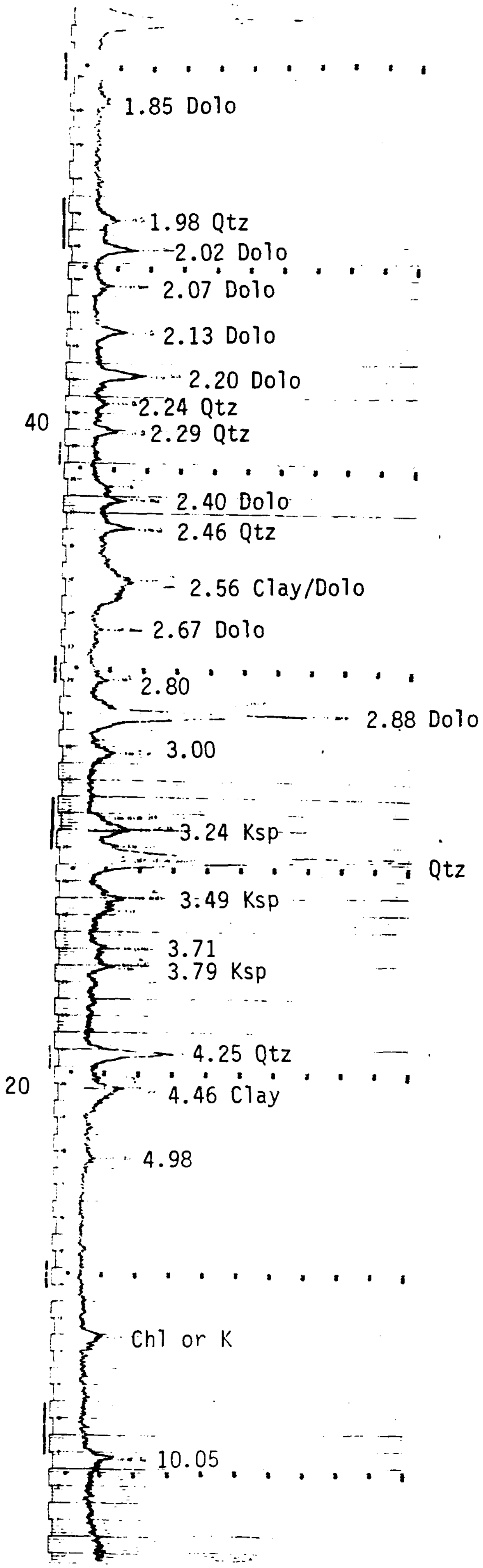


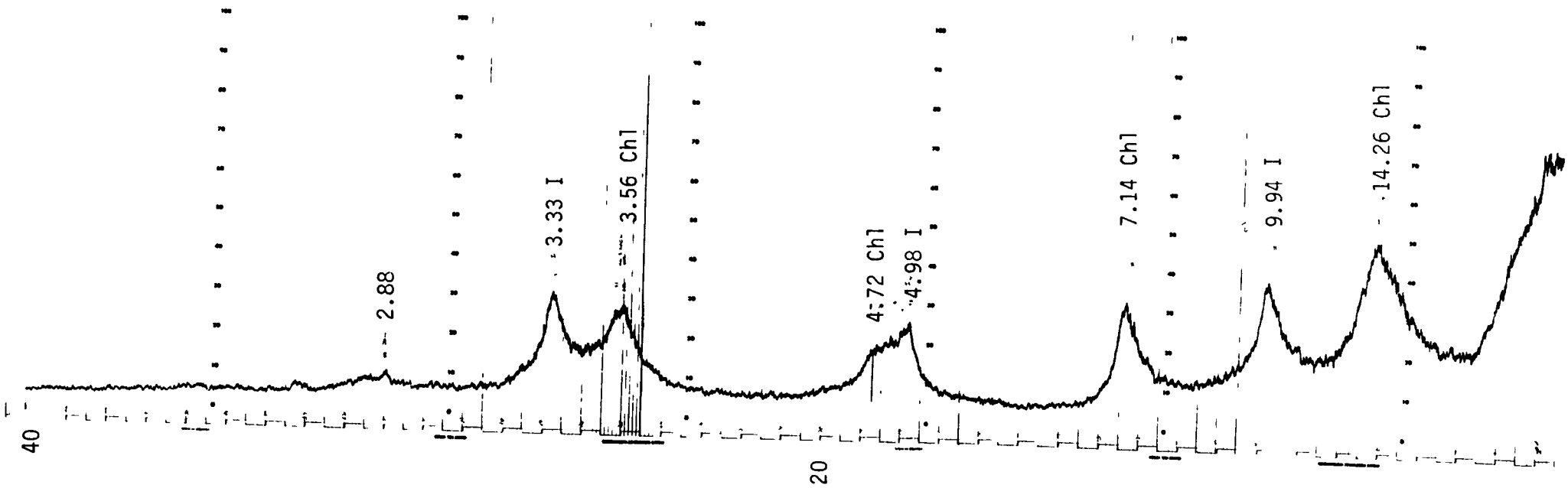
C1004 ZEE 2416.1 (Repeat) GLYCOLATED



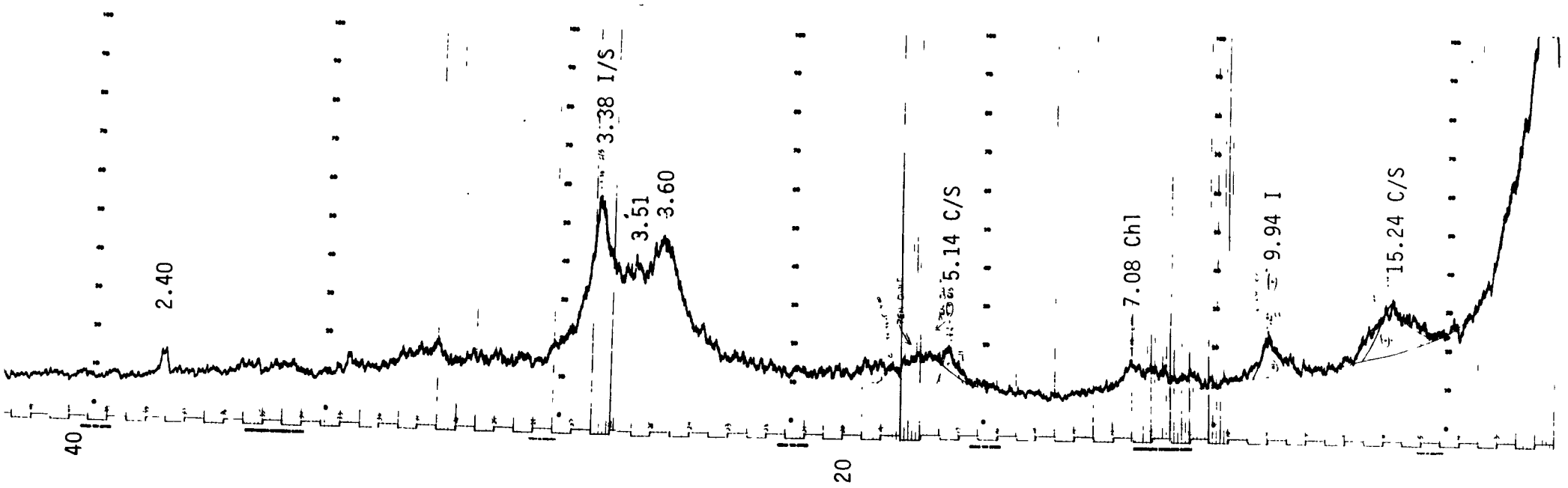
C1005 ZEE 2423.2 AIR DRIED

C1005 ZEE 2423.2 RANDOM MOUNT

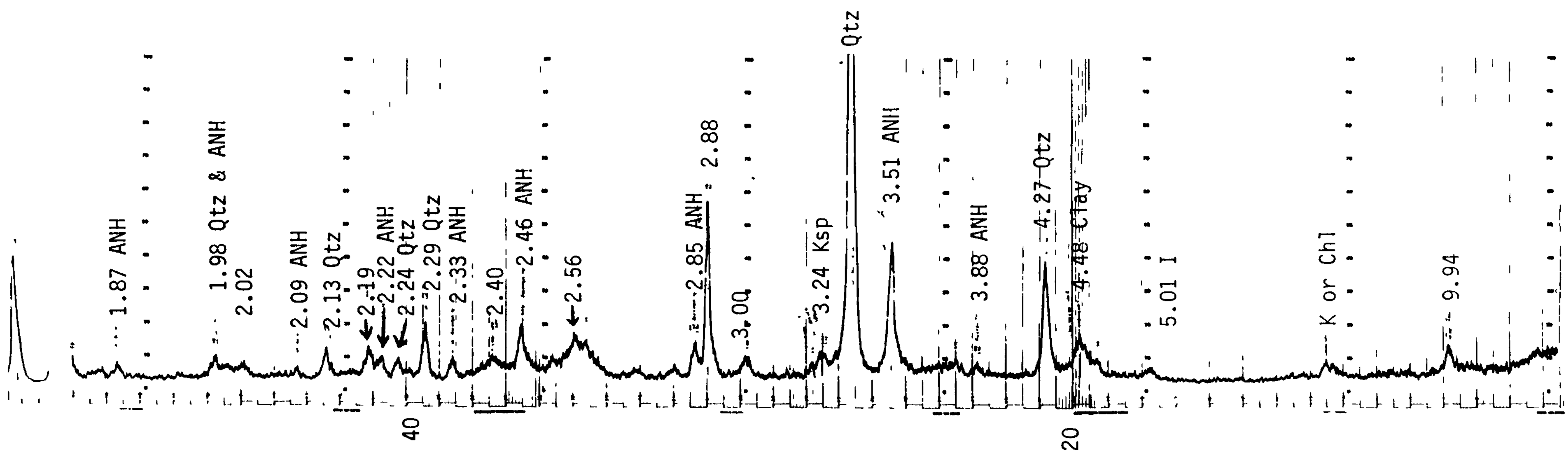




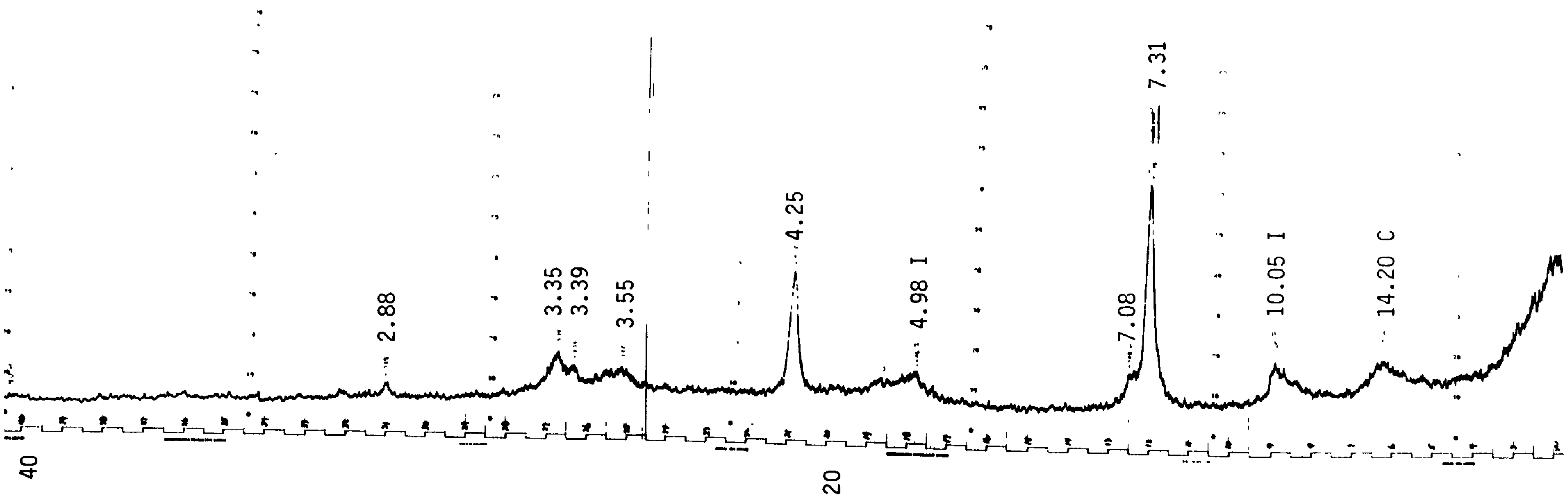
C1008 ZEE 2646.9 AIR DRIED



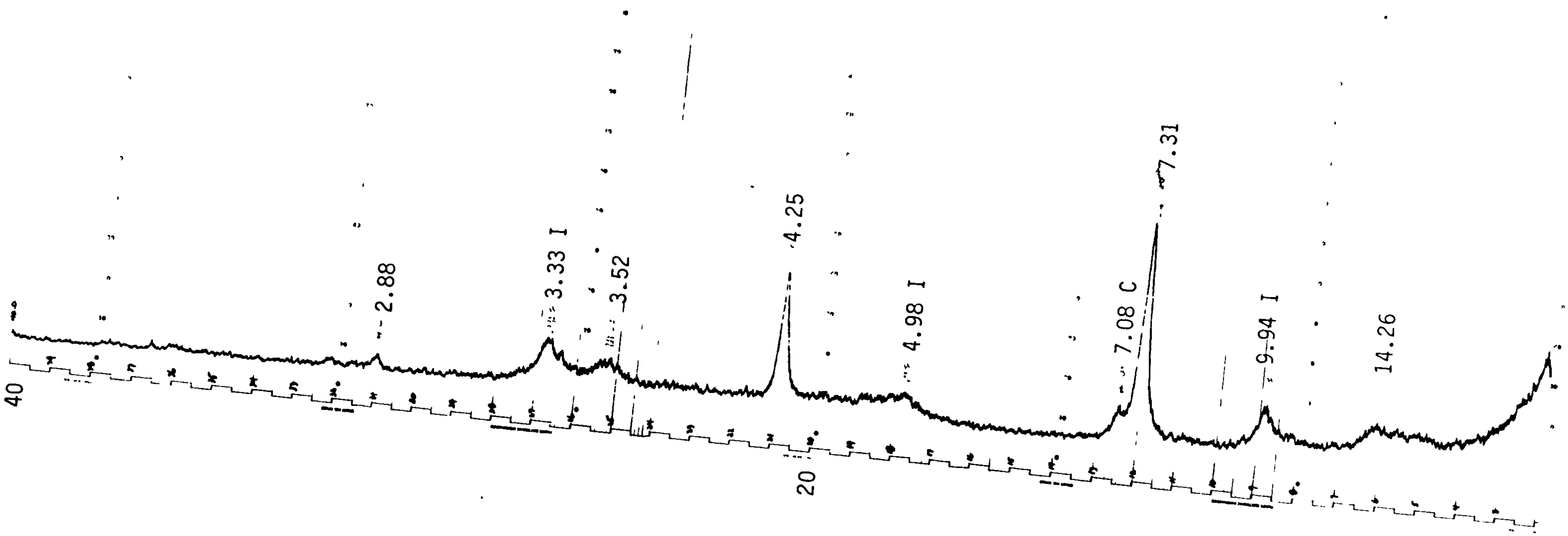
C1008 ZEE 2646.9 GLYCOLATED



C1008 ZEE 2646.9 RANDOM MOUNT

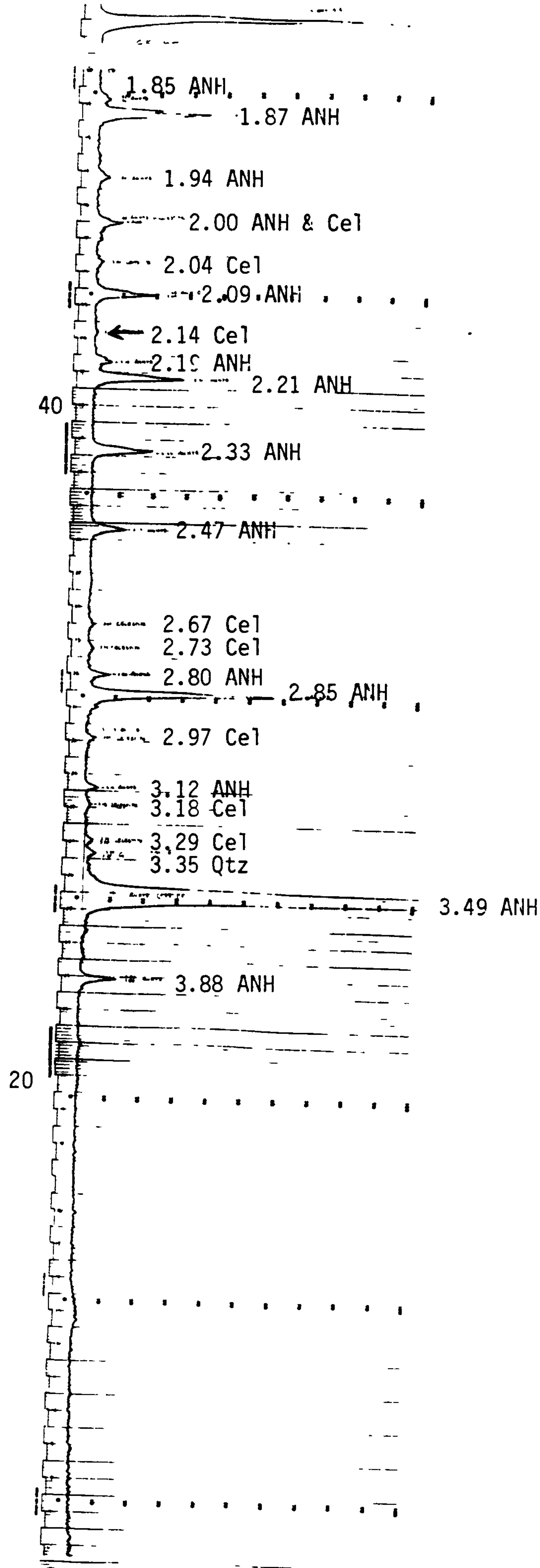


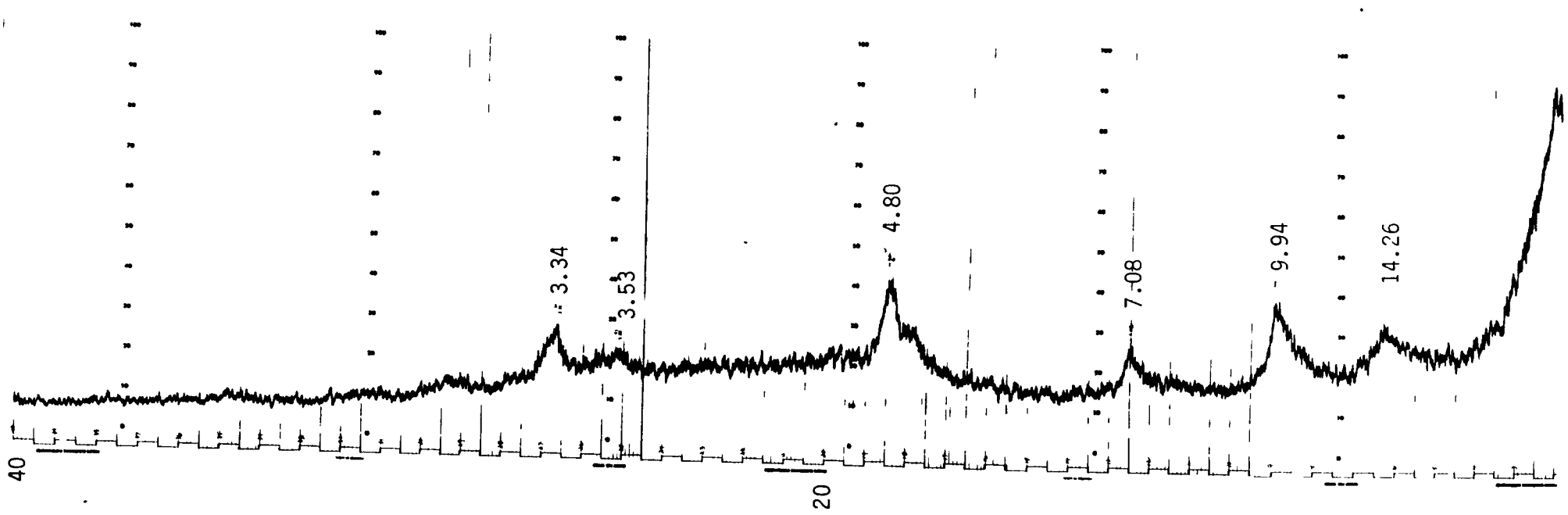
C1009 ZEE 2651.9 AIR DRIED



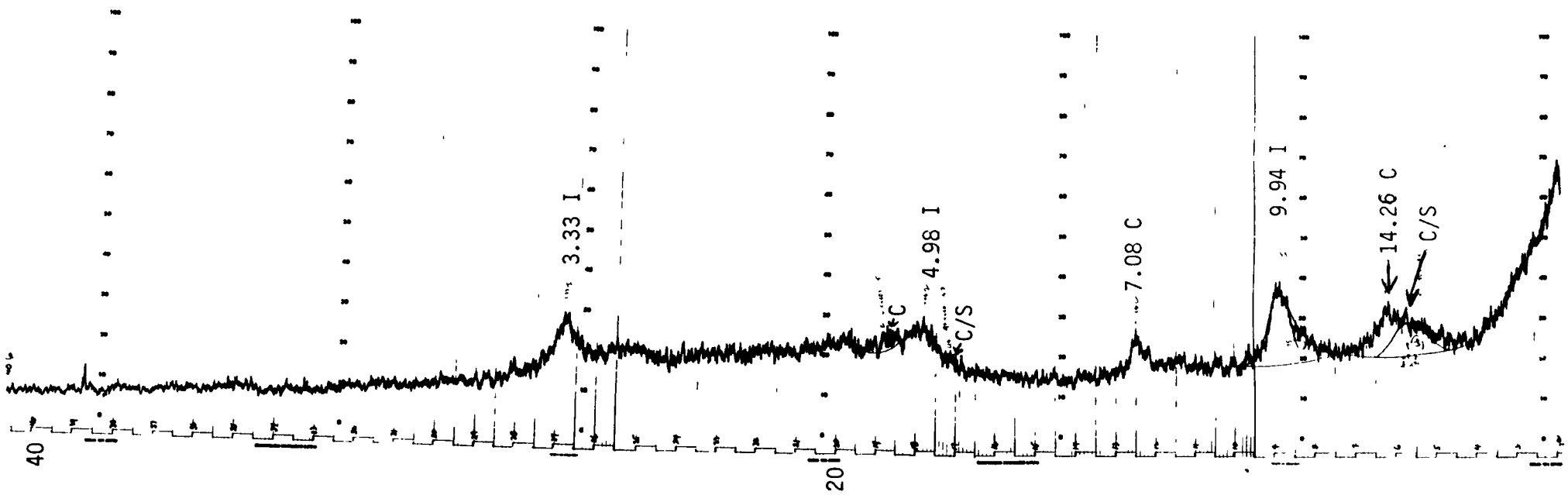
C1009 ZEE 2651.9 GLYCOLATED

C1009 ZEE 2651.9 RANDOM MOUNT



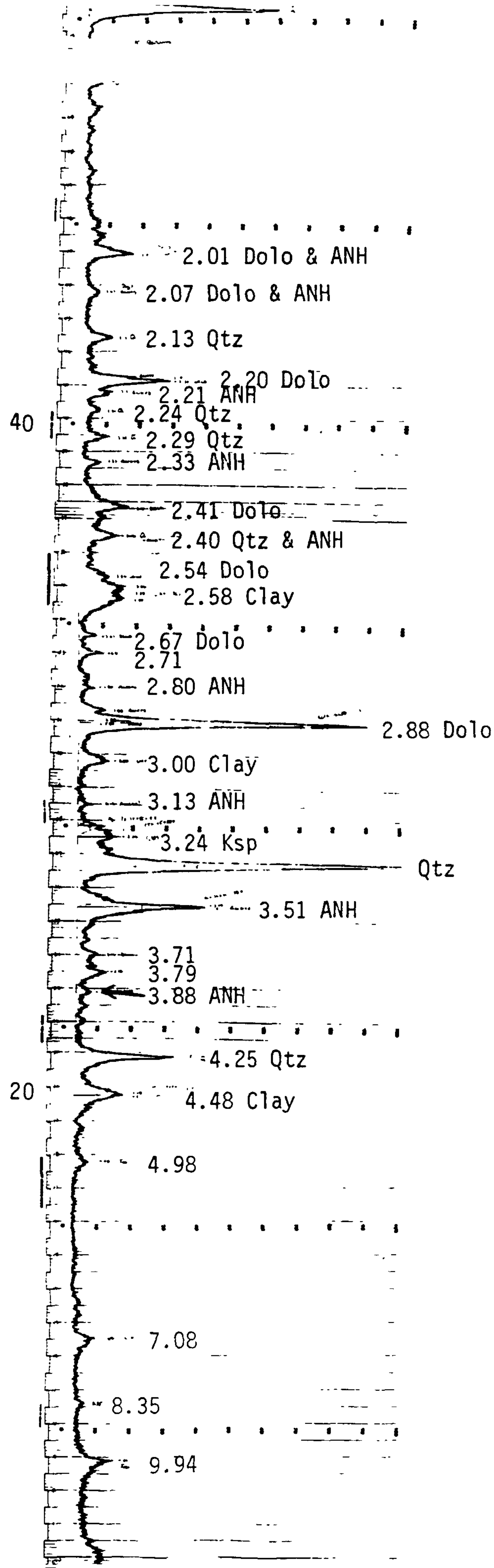


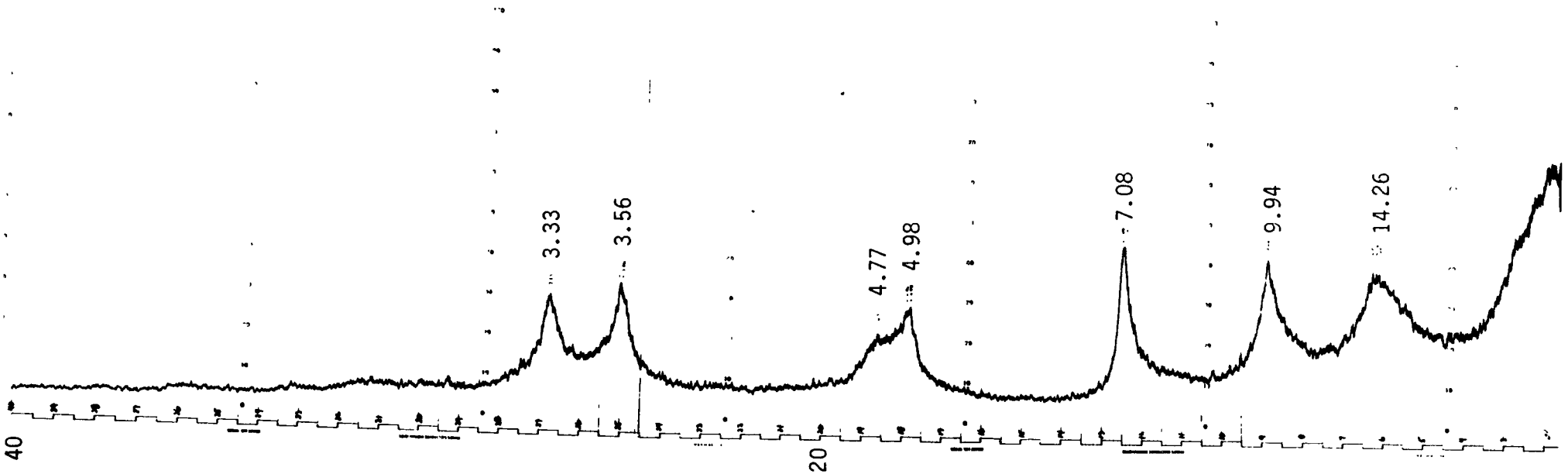
C1010 ZEE 2690.3 AIR DRIED



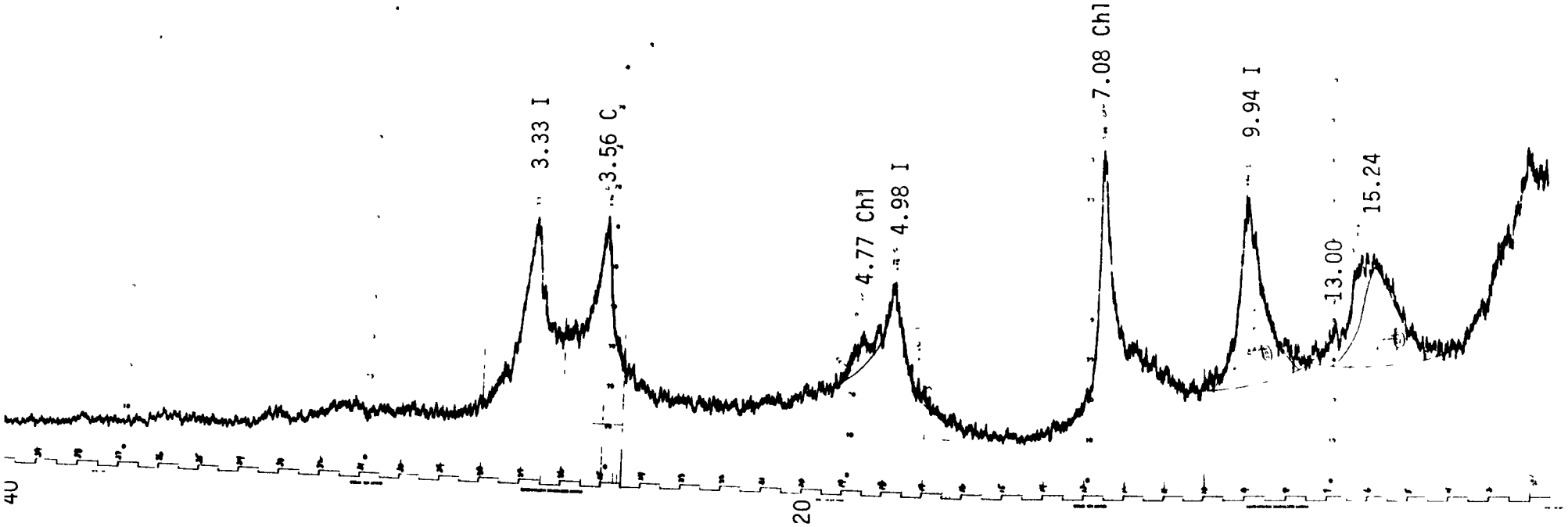
C1010 ZEE 2690.3 GLYCOLATED

C1010 ZEE 2690.3 RANDOM MOUNT





C1011 ZEE 2746.5 AIR DRIED



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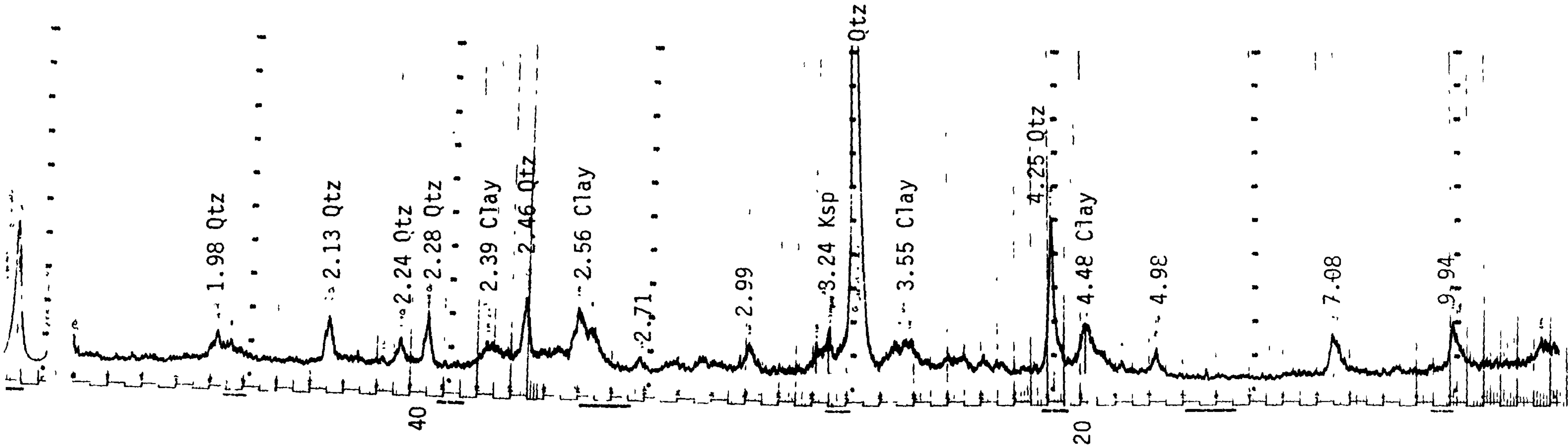
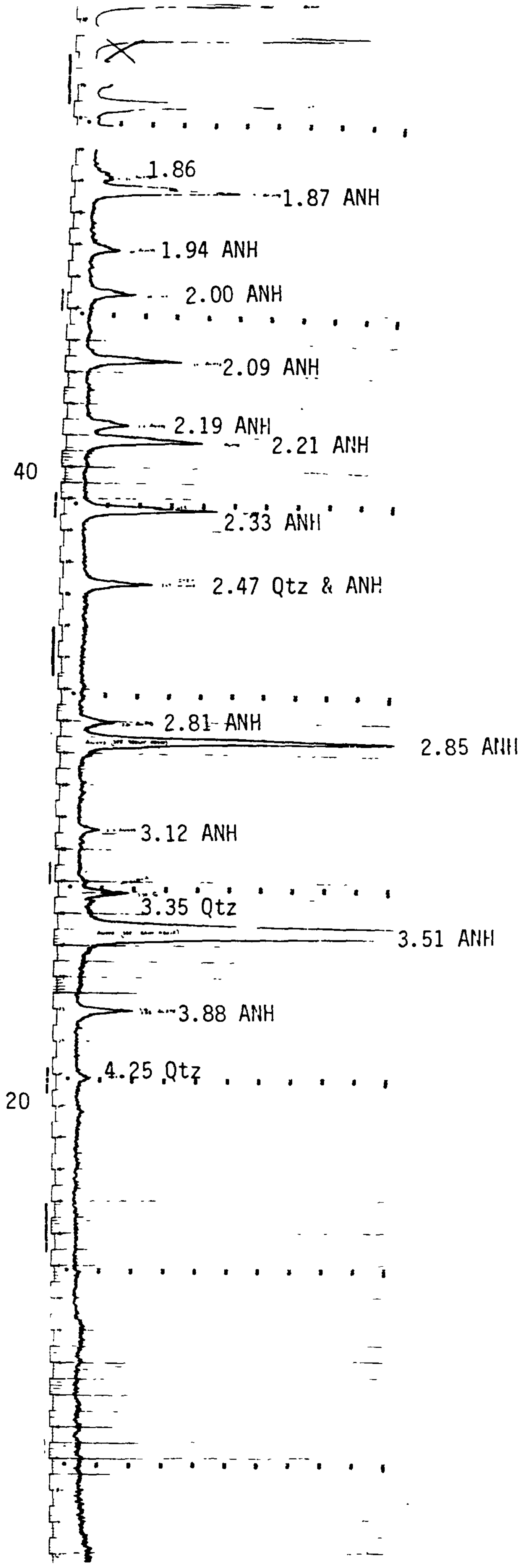


C1011 ZEE 2746.5 RANDOM MOUNT

C1012 ZEE 2849.8 RANDOM MOUNT



CI012 ZEE 2849.8 RANDOM MOUNT