

**Report no.
UCSI 77-7**

**STRUCTURES AND MATERIALS RESEARCH
Department of Civil Engineering**

**STUDIES OF CONCRETE
FOR CALLAWAY
UNION ELECTRIC COMPANY
UNIT N^o 1
POST TENSIONED REACTOR BUILDING**

Final Report

**by
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Report to
Bechtel Power Corporation
Gaithersburg, Maryland

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**STRUCTURAL ENGINEERING LABORATORY
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Final Report

STUDIES OF CONCRETE FOR CALLAWAY, UNION ELECTRIC COMPANY, UNIT #1, POST TENSIONED REACTOR BUILDING

1.0 SCOPE

The purpose of this test program was to establish the uniaxial creep and other mechanical and thermal properties of the proposed concrete mix design for the Callaway, Union Electric Company, Unit #1, Reactor Building. The work consisted of furnishing all supervision, labor, material, equipment, and performance of all operation and incidentals necessary for the concrete material properties test, except as noted in Section 2.7.

The test program consisted of two options: Option I, the final test program; and, Option II, a preliminary test program. Option II was completed and a report was submitted on October 5, 1975.

The Option I test program required the testing of one concrete mix.

1.1 Mix No. E-1

- 1.1.1 A mix with 3/4-in. maximum size aggregate.
- 1.1.2 Compressive strength of 6000 psi at 90 days.
- 1.1.3 Mix design supplied by Owner.

2.0 TEST PROGRAM

The Option I test program comprised the evaluation of the following properties of the concrete for Class E-1 concrete.

- 2.1 Compressive Strength to be determined on sealed concrete specimens, stored at 73°F, at ages of 7, 28, 90, 180, and 365 days.
- 2.2 Modulus of Elasticity and Poisson's Ratio to be determined on 6-in. by 12-in. sealed concrete specimens, stored at 73°F, at ages of 7, 28, 90, 180, and 365 days.

- 2.3 Coefficient of Thermal Expansion to be determined on two 6-in. by 16-in. sealed concrete specimens, stored at 73°F, at ages of 28, 180, and 365 days.
- 2.4 Specific Heat to be determined on two 8-in. by 16-in. sealed concrete specimens, stored at 73°F, at ages of 28 and 365 days.
- 2.5 Diffusivity to be determined on two 8-1/2-in. by 17-in. sealed concrete specimens, stored at 73°F, at ages of 28 and 365 days.
- 2.6 Creep Characteristics of sealed concrete specimens to be determined at a sustained stress of 2100 psi initially applied at ages of 28, 90, 180, and 365 days. The autogenous strain change shall be determined for a period of one year on sealed creep specimens that are to be loaded at age one year. The creep tests shall be carried out at 73°F and 110°F. Each creep test shall be conducted on a set of two 6-in. by 16-in. sealed concrete specimens.
- 2.7 The following related work is not included.
- 2.7.1 Supply of portland cement, admixtures, and aggregate used for the test program.
- 2.7.2 Performance of acceptance or user tests for concrete materials.

3.0 ABBREVIATIONS

ACI - American Concrete Institute
ASTM - American Society for Testing and Materials
AISI - American Iron Steel Institute

4.0 CODES AND STANDARDS

Codes and standards referenced herein are listed below, together with their common abbreviations and year of adoption, as used in this

Specification. Standards or codes, including the year of adoption or revision, appearing in referenced documents other than those describing test procedures or methods of sampling shall not be considered as part of this Specification unless specifically referenced below.

- ASTM C 33-74 Standard Specification for Concrete Aggregates
- ASTM C 39-72 Standard Method of Test for Compressive Strength of Cylindrical Concrete Specimens
- ASTM C 125-74 Standard Definitions of Terms Relating to Concrete and Concrete Aggregates
- ASTM C 127-73 Standard Method of Test for Specific Gravity and Absorption of Coarse Aggregate
- ASTM C 128-73 Standard Method of Test for Specific Gravity and Absorption of Fine Aggregate
- ASTM C 138-75 Standard Method of Test for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
- ASTM C 143-74 Standard Method of Test for Slump of Portland Cement Concrete
- ASTM C 150-74 Standard Specification for Portland Cement
- ASTM C 192-69 Standard Method of Making and Curing Concrete Test Specimens in the Laboratory
- ASTM C 231-75 Standard Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method
- ASTM C 469-65 Standard Method of Test for Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression
- ASTM C 566-67 Standard Method of Test for Total Moisture Content of Aggregate by Drying
- ASTM C 617-73 Standard Method of Capping Cylindrical Concrete Specimens
- ASTM E 4-72 Standard Method of Verification of Testing Machines
- ASTM E 6-73 Standard Definitions of Terms Relating to Methods of Mechanical Testing
- ASTM E 12-70 Standard Definitions of Terms Relating to Density and Specific Gravity of Solids, Liquids and Gases
- ASTM E 83-67 Standard Method of Verification and Classification of Extensometers

5.0 MANUFACTURE OF CONCRETE SPECIMENS

5.1 Mixing and Placing

Concrete was proportioned in accordance with the mix design and materials supplied by the Owner. The mix design is shown in Table A.

Aggregates were prepared in accordance with ASTM C 192, Section 4.3. Bulk specific gravity and absorption were determined for the aggregates in accordance with ASTM C 127 and C 128 and are reported in Table B. Cement and aggregate were stored in sealed steel drums.

Mixing of concrete was in accordance with ASTM C 192, Section 5.1.2. Cement and aggregate were stored at $73^{\circ}\pm 3^{\circ}\text{F}$ for at least two days before mixing to assure a uniform temperature of these materials. Slump was measured in accordance with ASTM Method C 143. Entrained air content was measured in accordance with ASTM Method C 231. Unit weight and yield were determined in accordance with ASTM C 138. Specimens were made and consolidated in accordance with ASTM C 192, Sections 5.3 and 5.4.3, respectively. Accurate records of the mix proportions, moisture content of aggregate, air content, unit weight, and yield were retained.

The specimens for the creep and thermal coefficient of expansion were cast in 6.000 inches (within a tolerance of $-.002$ inches) by 18 inches machined split cast iron molds. Prior to casting, one Carlson 8-in. strain gage, properly calibrated, was centered on the axis of the cast iron mold. The lead wire from the strain gage was brought out through a hole drilled in the center of a 2-in. thick plate placed at the bottom of the mold and sealed by means of an "O" ring. The final specimen length was 16 inches.

A 1/8-in. by 8-in. metal rod was placed diametrically across the top of this mold to serve as a support for a wire which held the meter in an axial position during casting. After casting, the wire was cut-off and the rod removed and the top of the cast iron mold sealed with Saran wrap.

The creep and thermal expansion specimens were allowed to set five hours after casting to allow bleeding water to be reabsorbed prior to capping. Then, a conical shaped layer of mortar made from the original mix was formed on the top of each cylinder. The 1-1/2-in. thick steel top-plates were then worked back and forth into position until the mortar appeared to be

spread uniformly between the plate and the specimen. A leveling plate was used to assure that each top-plate was normal to the axis of the specimen. The creep and thermal expansion specimens were then moved to the 73°F, 50 percent RH room.

The split cast iron molds were stripped from the creep and thermal expansion specimens at the age of one day. Within three minutes after removal of the cast iron mold, a 1/16-in. thick butyl rubber sheet was wrapped and bonded to the top and bottom steel plates with rubber cement. A three-inch wide lap splice was used to join the butyl rubber sheet. Large hose clamps were placed over the butyl rubber and the end steel plates to assure that the specimens would be internally sealed. The specimens to be tested at 73°F remained in the 73°F, 50 percent RH room. The specimens to be tested at 110°F were moved to the 110°F room at the age of 14 days and insulated with two inches of fiberglass insulation so that the temperature would rise slowly.

Compressive strength specimens were cast in 6-in. by 12-in. sheet-metal cans. The lid and all joints were sealed with silicon rubber to internally seal the specimens. All sealed compressive strength specimens remained in the 100 percent RH room until just prior to testing, at which time they were stripped, capped, and covered with Saran wrap to ensure water retention throughout the test period.

Modulus of elasticity and Poisson's ratio were determined on the compressive strength cylinders.

Specimens for thermal diffusivity tests were cast in 8-1/2-in. by 17-in. by 0.020-in. thick steel cans. They were cast solid except for a 3/8-in. diameter by 8-1/2-in. deep thermometer well which was centered on the axis of the specimen. After casting, lids were placed on the specimens and the cans were sealed with silicon rubber prior to being moved to the 73°F, 100 percent RH room. The external metal container was left on the cylinders throughout the duration of the test.

Specimens for the specific heat tests were cast in 8-in. by 16-in. by 0.020-in. thick copper cans. They were cast solid except for a 1-5/8-in. O.D. by 1-1/2-in. I.D. brass tube centered on the axis for the full length of the specimen. After casting, lids were placed on the specimens and the

cans were sealed with silicon rubber prior to being moved to the 73°F, 100 percent RH room. The external metal container remains on the cylinders throughout the duration of the test.

5.2 Curing Procedure

After each specimen was consolidated and finishing of the top surface was completed, it was placed in a room under the environmental conditions specified herein for the required test.

6.0 TEST RESULTS

6.1 Mix Design Data

The mix design and data for the concrete mixes used in casting the specimens are shown in Table C. In Table C the weight of cement, water, sand, and 3/4-in. aggregate per cubic yard of concrete were computed using the measured unit weight of the concrete and the batch weights of each material. [Weight of each material, pcy = (Unit weight of concrete, pcy) × (Batch weight of each material, lb.) ÷ (Total batch weight, lb.)]

6.2 Compressive Strength and Elastic Properties

Compressive strengths were determined at the ages of 7, 28, 90, 180 & 365 days for Class E-1 concrete. The average diameter of each specimen was between 5.96-in. and 5.98-in. The ends of the cylinders to which loads were applied were plane square end surfaces at right angles to the axis of the specimen and met the planeness requirements of Section 1.2 of ASTM Method C 617. Each specimen was checked for planeness. Testing procedures were in accordance with ASTM C 469, Sections 4.3 through 4.7, inclusive. The testing machine and compressometer used comply with ASTM C 469, Section 2. Each strength determination represents the average obtained from three 6-in. by 12-in. cylinders. The same three 6-in. by 12-in. concrete cylinders were used in the determination of compressive strength, modulus of elasticity (E), and Poisson's ratio (μ). The modulus of elasticity and Poisson's ratio were determined by use of an XYY recorder employing differential transformers. This arrangement produces a continuous plot of stress versus longitudinal strain and lateral strain versus longitudinal strain from which both modulus of elasticity (E) and Poisson's ratio (μ) were

computed. The loading rate used was 60,000 lbs. per minute which is equivalent to 35 psi per second for a 6-in. diameter specimen. Compressive strengths, modulus of elasticity, and Poisson's ratio for sealed concrete specimens stored at 73°F and 100 percent RH are shown in Table D.

6.3 Thermal Diffusivity

The values for Thermal Diffusivity represent the average of two values obtained by separately testing two 8-1/2-in. diameter by 17-in. long concrete cylinders for each age. These average values of thermal diffusivity for 28 and 365 days were 0.044 ft²/hr and 0.038 ft²/hr, respectively.

Thermal Diffusivity is determined by cooling 8-1/2-in. diameter by 17-in. long cylinders from 120°F to 40°F and measuring the temperature change at the center of the specimen. To assure uniform heat throughout, the specimen was placed in a hot water bath and kept at 120°±1°F for a period of 24 hours prior to the start of the test. Cooling was started when the specimen was removed from the hot water bath and placed in a cold water bath set at 40°F in which it remained until the end of the test. During the test the cold water bath was kept at a constant temperature of 40°±0.2°F by the addition of ice. Each water bath was located in rooms controlled at 110°F and 40°F, respectively.

To monitor the temperature of both the cold water and the specimen, a Hewlett Packard model HP2801A Quartz Thermometer indicator was used. Good thermal contact between the concrete and the quartz thermometer was made by the use of a small amount of mercury at the bottom of a thin walled brass tube cast in the specimen at the time of casting. The quartz thermometer probe has an equivalent mass of 1-1/2 grams of water.

A more detailed description of this test appears in "Thermal Properties of Concrete", Bulletin 1, United States Bureau of Reclamation, Boulder Canyon Project, Final Reports, 1940, pp. 66-86 and pp. 133-143.

6.4 Specific Heat

The values for 28 and 365 day specific heat represent the average of two values obtained by separately testing two 8-in. diameter by 16-in.

long concrete cylinders for each age. These average values for 28 and 365 day specific heat were 0.225 Btu/lb and 0.208 Btu/lb.

Specific Heat was determined by the use of an adiabatic calorimeter designed to measure the amount of heat required to raise the temperature of a cylindrical test specimen. By using this instrument, no heat is either lost or gained from sources surrounding the testing apparatus, and thus, all heat is transferred directly from the heaters in the calorimeter to the specimen. The device is similar to that described in "Thermal Properties of Concrete", Bulletin 1, United States Bureau of Reclamation, Boulder Canyon Project Analysis, Final Reports, 1940, pp. 26-27, and pp. 112 to 117.

The test specimen was first submerged in a water bath and the surrounding air, water, and specimen were allowed 24 hours to come to equilibrium at approximately 73°F. The test was started and the specimen was heated by heating the water under adiabatic conditions obtained by heating the surrounding air at the same rate as the water until a temperature rise of about 30°F was obtained. The temperatures of the water bath and difference between the water and air was measured by the use of iron-constantan (Type A) thermocouples in which the voltage was monitored by a Dana Digital Voltmeter Model 5900 capable of measuring a voltage of 1×10^{-6} volts. This corresponds to a temperature of approximately 0.01°F. The amount of heat given to the specimen was determined by measuring the amount of power used by the heaters with a watt-hour meter with an accuracy of 0.10 watt hour.

6.5 Thermal Coefficient of Expansion

The two sealed 6-in. by 16-in. thermal coefficient of expansion specimens containing Class E-1 concrete were measured for length changes by means of a Carlson strain meter at successive temperatures of 73°F, 40°F, 100°F, 40°F, 100°F, and 73°F. Specimens were left for at least 24 hours at each temperature before strain readings were taken. At the end of the cycling period, the specimens were stored at 73°F. The average linear thermal expansion for the two specimens at ages 28, 180, and 365 days were 4.2, 4.6 and 4.9 respectively. These values are listed in Table D.

6.6 Sustained Modulus of Elastic, Creep, and Autogenous Strains

Creep characteristics for the concrete were determined on sealed 6-in. by 16-in. cylinders with centrally embedded Carlson strain meters.

Creep specimens were loaded at ages of 28, 90, 180, and 365 days. At each age, four specimens were initially loaded, two at 73°F with class E-1 concrete and two at 110°F also with class E-1 concrete. The specimens which were loaded at the age of 365 days were also used to determine autogenous strains for the 28, 90, and 180 day loaded specimens.

The loading frames used are capable of applying and maintaining a stress level of 2100 psi to all loaded creep specimens despite any change in the dimension of the specimen. Each frame is capable of accepting two specimens in tandem (lengthwise) for simultaneous loading. The frame consists of two header plates (thickness of 1 inch) connected by three 1-1/2-in. (AISI C 1215) steel rods. Care was taken to prevent eccentric loading on all specimens. The hydraulic load-maintaining element consisted of accumulators, regulators, indicator gages, and a high pressure pump which is used to maintain the load on each frame. Pressure gages provide a means for measuring the load to the nearest 2 percent of the total applied stress.

For applying the initial stress of 2100 psi, a manual hand pump was used to apply the stress at a uniform rate of 35 ± 5 psi per second. At this rate the total stress was applied in 1 minute. Each loaded creep specimen's strain gage was read at: 1 minute before loading was started (shown in the tables as -0.0007 days; zero time (full load applied); one minute and approximately at 10 minutes, 2 hours, 6 hours, and 24 hours after full load was applied. The gages were then read daily for the next week, weekly for one month and monthly until the age of 365 days at which time the 28, 90, and 180 day loaded specimens were unloaded. The strain gages imbedded in these specimens were read at: -.0007 days before unloading was started (full load still applied); zero time (fully unloaded); five minutes; two hours; eight hours; 24 hours, daily for a week and weekly for a month. At this time, the 365 day old specimens used to determine the autogenous strains were loaded using the same procedure previously described above.

Sustained modulus of elasticity, creep characteristics, and autogenous strains for sealed concrete specimens are shown in Tables E to L.

Table E - Class E-1 concrete stored at 73°F and stressed for 337 days starting at age 28 days.

Table F - Class E-1 concrete stored at 110°F and stressed for 337 days starting at age 28 days.

Table G - Class E-1 concrete stored at 73°F and stressed for 276 days starting at age 90 days.

Table H - Class E-1 concrete stored at 110°F and stressed for 276 days starting at age 90 days.

Table I - Class E-1 concrete stored at 73°F and stressed for 185 days starting at age 180 days.

Table J - Class E-1 concrete stored at 110°F and stressed for 185 days starting at age 180 days.

Table K - Class E-1 concrete stored at 73°F and stressed for 42 days starting at age 365 days.

Table L - Class E-1 concrete stored at 110°F and stressed for 42 days starting at age 365 days.

In the above tables, the sustained modulus of elasticity was computed by dividing the applied stress of 2100 psi by the sum of the elastic, creep, and autogenous strains. The autogenous strain values shown are based on a zero value at time of full load. The data for creep plus autogenous strains, creep strains, and creep strains per psi of stress starts after full load was applied.

Elastic plus creep plus autogenous strains, creep plus autogenous strains, and creep strains versus log of time plus one day for the average of two sealed concrete specimens are all plotted and shown in Figs. 1-10.

Fig. 1 - Class E-1 concrete stressed at age 28 days and stored at 73°F.

Fig. 2 - Class E-1 concrete stressed at age 90 days and stored at 73 °F.

Fig. 3 - Class E-1 concrete stressed at age 180 days and stored at 73°F.

Fig. 4 - Class E-1 concrete stressed at age 365 days and stored at 73°F.

Fig. 5 - Class E-1 concrete stressed at age 28 days and stored at 110°F.

Fig. 6 - Class E-1 concrete stressed at age 90 days and stored at 110°F.

Fig. 7 - Class E-1 concrete stressed at age 180 days and stored at 110°F.

Fig. 8 - Class E-1 concrete stressed at age 365 days and stored at 110°F.

Elastic plus creep plus autogenous strains are plotted versus time for the average of two sealed concrete specimens in Figures 9 and 10.

Fig. 9 - Class E-1 concrete stressed at ages 28, 90, 180 days and stored at 73°F.

Fig. 10 - Class E-1 concrete stressed at ages 28, 90, 180 days and stored at 110°F.

The complete computer calculations for determining the strains due to loading the sealed concrete specimens are shown in Tables E1 & E2 to L1 & L2.

Tables E1 & E2 - Class E-1 concrete stressed at age 28 days and stored at 73°F.

Tables F1 & F2 - Class E-1 concrete stressed at age 28 days and stored at 110°F.

Tables G1 & G2 - Class E-1 concrete stressed at age 90 days and stored at 73°F.

Tables H1 & H2 - Class E-1 concrete stressed at age 90 days and stored at 110°F.

Tables I1 & I2 - Class E-1 concrete stressed at age 180 days and stored at 73°F.

Tables J1 & J2 - Class E-1 concrete stressed at age 180 days and stored at 110°F.

Tables K1 & K2 - Class E-1 concrete stressed at age 365 days and stored at 73°F.

Tables L1 & L2 - Class E-1 concrete stressed at age 365 days and stored at 110°F.

The complete computer calculations for determining the autogenous strains are shown in Tables M1 & M2 to N1 & N2.

Tables M1 & M2 - Class E-1 concrete stored at 73°F.

Tables N1 & N2 - Class E-1 concrete stored at 110°F.

7.0 COMMENTS

7.1 Bechtel specifications for slump are given for field conditions measured at point and time of placement. Clarification is needed as to what procedure should be followed in the laboratory to measure the desired slump. For the mixes made at Berkeley, slump was measured three minutes and eight minutes after end of mixing.

7.2 All work was performed in accordance with the "Quality Assurance Program" submitted prior to the start of testing.

7.3 In Table A of Progress Report No. 2, the modulus of elasticity and Poisson's ratio at age 180 days are shown as 6.42×10^6 psi and 0.24 respectively. These seem to be too large when comparing to the values at ages 90 and 365 days shown in Table D of the final report. Rechecking the calibration on the XYY recorder the value at modulus of elasticity and Poisson's ratio at age 180 days should be 6.24×10^6 psi and 0.21 respectively.

TABLE A

CALLAWAY, UNION ELECTRIC COMPANY, UNIT #1,
POST TENSIONED REACTOR BUILDING

<u>Material</u>	<u>Source</u>
Cement:	Alpha Portland Cement Co., Type II
Sand:	Callaway County Sand Co., Callaway County, Missouri
3/4-in. Aggregate:	Auxvasse Quarry (crushed limestone)
WRA Admixture:	Sika Plastocrete 161-Type A
AEA Admixture:	Sika AER CC-135

Specifications

Compressive Strength:	6000 psi at 90 days
Slump:	
Working limit at point of placement:	3 inches - Mix E-1
Inadvertency margin:	2 inches - Mix E-1
Rejection limit:	5 inches - Mix E-1
Air:	3 to 6 percent
Temperature:	73°F ± 3°F

Weights (SSD) for one cubic yard of concrete (as per letter from Pittsburgh
Testing Laboratory dated August 10, 1976)

Mix No.	E-1
Maximum Size Aggregate:	3/4-in.
Cement, lbs:	634
Water, lbs:	232
Sand, lbs:	1466
3/4-in. Aggregate, lbs:	1662
WRA, fl. oz:	31.7
AEA, fl. oz:	1.86

TABLE B

CALLAWAY, UNION ELECTRIC COMPANY, UNIT #1,
POST TENSIONED REACTOR BUILDING

Bulk Specific Gravity & Absorption Capacity

Aggregate	Bulk Specific Gravity (Saturated Surface Dry)	Absorption Capacity percent (Berkeley)
Sand	2.63	0.32
3/4 in. Aggregate	2.69	0.77

Note: Aggregates not initially oven dried in the determination of these values.

TABLE C

CASTING DATA FOR MIX E-1

Date	Sept. 8, 1976		Sept. 9, 1976	
Specimens Cast	4 - 6×16-in. creep specs. 6 - 6×12-in. cylinders 1 - 8-1/2×17-in. diffusivity cylinder 1 - 8×16-in. specific heat cylinder	8 - 6×16-in. creep specs. 6 - 6×12-in. cylinders	6 - 6×16-in. creep specs. 6 - 6×12-in. cylinders 1 - 8-1/2×17-in. diffusivity cylinder 1 - 8×16-in. specific heat specimen	
Batch No.	4	5	6	Avg.
Batch Size, cu. ft.	3.8	3.8	3.8	3.8
Cement, pcy	648	639	641	643
Water, pcy	237	234	234	235
Sand, pcy (SSD)	1497	1476	1481	1485
3/4-in. Aggregate, pcy, SSD	1697	1673	1679	1683
AER, oz/cu. yd.	1.89	1.86	1.89	1.88
WRA, oz/cu. yd.	32.4	31.9	32.0	32.1
Unit Wt., pcf	151	149	149	150
1st Slump, in. (a)	1-1/2	1-1/2	1-1/2	1-1/2
2nd Slump, in. (b)	1-1/4	1-1/2	1-1/2	1-1/2
Air, % by volume	3.1	3.3	2.7	3.0
Temp., °F	74	74	75	74
W/C Ratio by wt.	0.366	0.366	0.365	0.366

(a) First slump was taken three minutes after end of mixing.

(b) Second slump was taken eight minutes after end of mixing.

TABLE D

MECHANICAL AND THERMAL PROPERTIES

Property *	Age, days	Class E-1
		3/4-in. MSA
Compressive Strength, psi	7	5990
	28	7600
	90	8540
	180	9180
	365	9430
Poisson's Ratio	7	0.21
	28	0.21
	90	0.18
	180	0.24 0.21
	365	0.21
Modulus of Elasticity, (psi × 10 ⁶)	7	5.20
	28	5.63
	90	5.65
	180	6.42 6.24
	365	6.25
Linear Thermal Expansion, microstrain/°F	28	4.2
	180	4.6
	365	4.9

*All concrete specimens were sealed up to and during testing.

TABLE F

AVERAGE ELASTIC, CREEP AND AUTOGENOUS STRAINS
 UNION ELECTRIC OPTION 1 CLASS E-1 ES7414
 (SPECIMEN: SEALED 6 BY 16 IN. CONCRETE CYL.)

AGE OF LOADING : 28 DAYS
 TEST TEMPERATURE : 110 DEG. F.
 ULT. STR. : 7600. PSI
 APPLIED TEST STRESS : 2100. PSI
 PER. ULT. STR. APPLIED: 27.6 PERCENT
 METER NUMBERS
 AUTOGENOUS : 11-08 AND 11-09
 CREEP : 11-06 AND 11-07

*****-----MICROSTRAIN-----*****						
TIME	*SUSTAINED	*ELASTIC,	* CREEP	*	*	*
UNDER	*MODULUS OF	* CREEP	* PLUS	*	*	*
STRESS,	*ELASTICITY*	PLUS	* AUTOG-	* AUTOG-	* CREEP	*SPECIFIC
DAYS	* MFSI	* AUTOG-	* ENDS	* ENDS	*	* CREEP
	* (A)	* ENDS	*	*	*	* (B)

-0.0007		0				
.0000	5.15	-405	0	0	0	0.
.0028	5.15	-408	-3	0	-3	-.0014
.0063	5.08	-413	-7	0	-7	-.0033
.0201	4.95	-424	-19	0	-19	-.0050
.0535	4.86	-432	-27	0	-27	-.0129
.2688	4.61	-456	-51	-1	-50	-.0238
1.2236	4.26	-453	-88	-4	-84	-.0400
2.0	4.11	-511	-105	-5	-100	-.0476
3.0	3.98	-527	-122	-6	-116	-.0552
4.0	3.90	-539	-133	-8	-125	-.0555
5.1	3.83	-549	-144	-9	-135	-.0643
6.0	3.76	-558	-152	-11	-141	-.0671
8.1	3.63	-578	-172	-14	-158	-.0752
14.1	3.44	-610	-204	-20	-184	-.0876
21.0	3.25	-646	-241	-27	-214	-.1019
28.1	3.12	-674	-268	-31	-237	-.1129
43.2	2.95	-711	-305	-32	-273	-.1300
62.7	2.75	-752	-347	-46	-301	-.1433
74.2	2.71	-774	-368	-52	-316	-.1505
77.0	2.71	-776	-370	-53	-317	-.1510
88.1	2.64	-794	-389	-58	-331	-.1576
95.2	2.60	-807	-402	-62	-340	-.1615
105.1	2.58	-814	-409	-64	-345	-.1643
119.0	2.53	-829	-423	-67	-356	-.1655
120.9	2.53	-830	-424	-67	-357	-.1700
137.9	2.47	-849	-443	-74	-369	-.1757
148.9	2.44	-860	-455	-77	-378	-.1800
160.3	2.41	-870	-465	-82	-383	-.1824
181.2	2.35	-879	-473	-75	-358	-.1855
201.0	2.34	-857	-492	-85	-407	-.1938
214.2	2.32	-907	-501	-89	-412	-.1962
229.0	2.29	-915	-514	-94	-420	-.2000
253.0	2.24	-936	-531	-100	-431	-.2052
272.1	2.22	-947	-541	-102	-439	-.2050
279.0	2.21	-952	-546	-104	-442	-.2105
291.0	2.18	-963	-558	-108	-450	-.2143
302.1	2.17	-969	-564	-109	-455	-.2167
318.5	2.14	-980	-575	-113	-462	-.2200
336.5	2.12	-951	-585	-115	-470	-.2238

(A) SUSTAINED MODULUS OF ELASTIC = 2100. PSI DIVIDED BY SUM OF ELASTIC, CREEP, AND AUTOGENOUS STRAINS.
 (B) SPECIFIC CREEP = CREEP STRAIN DIVIDED BY 2100. PSI

TABLE G

AVERAGE ELASTIC, CREEP AND AUTOGENOUS STRAINS
 UNION ELECTRIC OPTICON 1 CLASS E-1 ES7414
 (SPECIMEN: SEALED 6 BY 16 IN. CONCRETE CYL.)

AGE OF LOADING : 90 DAYS
 TEST TEMPERATURE : 73 DEG. F.
 ULT. STR. : 8540. PSI
 APPLIED TEST STRESS : 2100. PSI
 PER. ULT. STR. APPLIED: 24.6 PERCENT
 METER NUMBERS
 AUTOGENOUS : 73-10 AND 73-11
 CREEP : 73-14 AND 73-15

*****-----MICROSTRAIN-----*****						
TIME	*SUSTAINED *ELASTIC,* CREEP *	* * * * *	* * * * *	* * * * *	* * * * *	* * * * *
UNDER	*MODULUS CF* CREEP *	* PLUS *	* AUTOG- *	* AUTOG- *	* CREEP *	* SPECIFIC
STRESS,	*ELASTICITY* PLUS *	* AUTOG- *	* ENOUS *	* ENOUS *	* CREEP *	* CREEP
DAYS	* MPsi	* AUTOG- *	* ENOUS *	* ENOUS *	* ENOUS *	* CREEP
	* (A)	* ENOUS *	* * * * *	* * * * *	* * * * *	* (B)

-0.0007		0				
0.0000	5.79	-363	0	0	0	0.
0.0028	5.60	-375	-12	0	-12	-0.0057
0.0063	5.59	-376	-13	0	-13	-0.0062
0.0410	5.48	-383	-20	0	-20	-0.0095
0.0826	5.43	-387	-24	0	-24	-0.0114
0.2076	5.36	-392	-29	0	-29	-0.0126
0.3590	5.28	-398	-35	0	-35	-0.0167
0.5993	5.13	-409	-46	-1	-45	-0.0214
1.7	4.98	-422	-58	-1	-57	-0.0271
3.0	4.91	-428	-65	0	-65	-0.0310
4.0	4.83	-435	-71	-1	-70	-0.0323
5.0	4.79	-438	-75	-1	-74	-0.0352
6.0	4.76	-441	-78	-2	-76	-0.0362
7.0	4.74	-443	-80	-2	-78	-0.0371
8.2	4.68	-449	-86	-3	-83	-0.0395
13.3	4.55	-462	-99	-6	-93	-0.0443
16.0	4.51	-466	-103	-7	-96	-0.0457
27.1	4.27	-492	-128	-10	-118	-0.0562
38.2	4.15	-506	-143	-10	-133	-0.0623
43.1	4.10	-512	-149	-10	-139	-0.0662
58.1	3.98	-527	-164	-9	-155	-0.0728
60.0	3.96	-530	-167	-9	-158	-0.0752
77.0	3.86	-544	-180	-10	-170	-0.0810
88.0	3.80	-552	-188	-7	-181	-0.0862
99.3	3.76	-558	-195	-9	-186	-0.0886
107.1	3.72	-565	-201	-8	-193	-0.0919
120.3	3.65	-575	-211	-9	-202	-0.0962
140.1	3.58	-586	-223	-10	-213	-0.1014
153.2	3.55	-592	-229	-11	-218	-0.1038
168.1	3.54	-594	-231	-10	-221	-0.1052
192.0	3.49	-602	-239	-9	-230	-0.1095
211.1	3.44	-610	-247	-8	-239	-0.1138
218.0	3.44	-611	-248	-7	-241	-0.1146
223.0	3.41	-616	-252	-10	-242	-0.1152
230.0	3.38	-622	-259	-11	-248	-0.1161
238.0	3.35	-626	-263	-12	-251	-0.1195
258.0	3.32	-633	-270	-13	-257	-0.1224
276.0	3.26	-644	-280	-15	-265	-0.1262

(A) SUSTAINED MODULUS OF ELASTIC = 2100. PSI DIVIDED BY SUM OF ELASTIC, CREEP, AND AUTOGENOUS STRAINS.
 (B) SPECIFIC CREEP = CREEP STRAIN DIVIDED BY 2100. PSI

TABLE H

AVERAGE ELASTIC, CREEP AND AUTOGENOUS STRAINS
 UNION ELECTRIC OPTICON 1 CLASS E-1 ES7414
 (SPECIMEN: SEALED 6 BY 16 IN. CONCRETE CYL.)

AGE OF LOADING : 90 DAYS
 TEST TEMPERATURE : 110 DEG. F.
 ULT. STR. : 8540. PSI
 APPLIED TEST STRESS : 2100. PSI
 PER. ULT. STR. APPLIED: 24.6 PERCENT
 METER NUMBERS
 AUTOGENOUS : 11-08 AND 11-09
 CREEP : 11-10 AND 11-11

*****-----MICROSTRAIN-----*****

TIME UNDER STRESS DAYS	*SUSTAINED *MODULUS OF *ELASTICITY* * (A)	*ELASTIC, * PLUS * AUTOGEN- * ENOUS * * (B)	* CREEP * PLUS * AUTOGEN- * ENOUS * * (B)	* AUTOGEN- * ENOUS * * (B)	* CREEP * ENOUS * * (B)	* SPECIFIC * CREEP * (B)
-.0007		0				
.0000	5.57	-352	0	0	0	0.
.0020	5.69	-369	-17	0	-17	-.0081
.0063	5.63	-373	-21	0	-21	-.0100
.0410	5.40	-385	-37	0	-37	-.0176
.0826	5.30	-396	-44	0	-44	-.0210
.3361	5.10	-412	-60	0	-60	-.0266
.9993	4.90	-429	-77	-2	-75	-.0357
2.2	4.75	-442	-90	-2	-88	-.0419
4.0	4.48	-469	-117	-4	-113	-.0538
5.0	4.39	-478	-126	-4	-122	-.0581
6.0	4.33	-485	-133	-5	-128	-.0610
13.3	4.14	-507	-155	-8	-147	-.0700
16.0	4.08	-515	-163	-9	-154	-.0733
27.1	3.83	-549	-197	-14	-183	-.0871
38.2	3.68	-571	-219	-18	-201	-.0957
44.1	3.61	-582	-230	-20	-210	-.1000
58.1	3.48	-603	-251	-23	-228	-.1066
60.0	3.48	-604	-252	-23	-229	-.1066
77.0	3.34	-628	-276	-30	-246	-.1171
88.0	3.27	-642	-290	-33	-257	-.1224
99.3	3.22	-652	-300	-38	-262	-.1248
107.1	3.17	-662	-310	-39	-271	-.1290
120.3	3.16	-664	-312	-31	-281	-.1338
140.1	3.07	-685	-333	-41	-292	-.1390
153.2	3.01	-697	-345	-45	-300	-.1429
168.1	2.95	-711	-359	-50	-309	-.1471
192.0	2.88	-730	-378	-56	-322	-.1533
211.1	2.83	-742	-390	-58	-332	-.1581
218.0	2.81	-748	-396	-60	-336	-.1600
230.0	2.76	-760	-408	-64	-344	-.1638
241.1	2.74	-766	-414	-65	-349	-.1662
258.0	2.70	-778	-426	-69	-357	-.1700
276.0	2.65	-791	-439	-71	-368	-.1752

(A) SUSTAINED MODULUS OF ELASTIC = 2100. PSI DIVIDED BY SUM OF ELASTIC, CREEP, AND AUTOGENOUS STRAINS.
 (B) SPECIFIC CREEP = CREEP STRAIN DIVIDED BY 2100. PSI

TABLE I

AVERAGE ELASTIC, CREEP AND AUTOGENOUS STRAINS
 UNDER ELECTRIC OPTION 1 CLASS E-1 ES7414
 (SPECIMEN: SEALED 6 BY 16 IN. CONCRETE CYL.)

AGE OF LOADING : 180 DAYS
 TEST TEMPERATURE : 73 DEG. F.
 ULT. STR. : 9180. PSI
 APPLIED TEST STRESS : 2100. PSI
 PER. ULT. STR. APPLIED: 22.9 PERCENT
 METER NUMBERS
 AUTOGENOUS : 73-10 AND 73-11
 CREEP : 73-16 AND 73-17

*****-----MICROSTRAIN-----*****						
TIME	*SUSTAINED	*ELASTIC,*	*CREEP *	* * *	* * *	* * *
UNDER	*MODULUS OF*	*CREEP *	* PLUS *	* * *	* * *	* * *
STRESS,*	*ELASTICITY*	* PLUS *	* AUTOG-*	* AUTOG-*	* CREEP *	*SPECIFIC
DAYS *	* MFSI	* AUTOG-*	* ENOUS *	* ENOUS *	* * *	* CREEP
* (A)	* ENOUS *	* * *	* * *	* * *	* * *	* (B)

-0.0007		0				
0.0000	6.14	-342	0	0	0	0.
0.0028	5.80	-362	-20	0	-20	-0.0055
0.0063	5.79	-363	-20	0	-20	-0.0055
0.0618	5.72	-367	-25	0	-25	-0.0119
0.0813	5.72	-367	-25	0	-25	-0.0119
0.1403	5.71	-368	-26	0	-26	-0.0124
1.1021	5.54	-379	-37	-1	-36	-0.0171
2.1	5.41	-388	-46	0	-46	-0.0219
3.1	5.36	-392	-50	-1	-49	-0.0233
3.9	5.29	-397	-54	-1	-53	-0.0252
5.0	5.25	-400	-58	-1	-57	-0.0271
7.0	5.19	-405	-62	0	-62	-0.0295
8.1	5.15	-408	-65	-2	-63	-0.0300
15.5	4.96	-423	-81	-1	-80	-0.0381
29.1	4.72	-445	-103	-2	-101	-0.0481
48.9	4.54	-463	-120	-3	-117	-0.0557
62.0	4.44	-473	-130	-4	-126	-0.0600
76.8	4.38	-480	-138	-3	-135	-0.0643
100.8	4.27	-492	-149	-2	-147	-0.0700
119.9	4.18	-502	-159	-1	-158	-0.0752
126.8	4.17	-504	-162	0	-162	-0.0771
131.8	4.13	-509	-166	-3	-163	-0.0776
138.8	4.09	-514	-172	-4	-168	-0.0800
146.8	4.05	-519	-176	-5	-171	-0.0814
166.8	3.98	-527	-184	-6	-178	-0.0848
184.8	3.92	-536	-194	-8	-186	-0.0888

(A) SUSTAINED MODULUS OF ELASTIC = 2100. PSI DIVIDED BY SUM OF ELASTIC, CREEP, AND AUTOGENOUS STRAINS.

(B) SPECIFIC CREEP = CREEP STRAIN DIVIDED BY 2100. PSI

TABLE J

AVERAGE ELASTIC, CREEP AND AUTOGENOUS STRAINS
 UNION ELECTRIC OPTION 1 CLASS E-1 ES7414
 (SPECIMEN: SEALED 6 BY 16 IN. CONCRETE CYL.)

AGE OF LOADING : 180 DAYS
 TEST TEMPERATURE : 110 DEG. F.
 ULT. STR. : 9180. PSI
 APPLIED TEST STRESS : 2100. PSI
 PER. ULT. STR. APPLIED: 22.9 PERCENT
 METER NUMBERS
 AUTOGENOUS : 11-08 AND 11-09
 CREEP : 11-12 AND 11-13

*****-----MICROSTRAIN-----*****						
TIME	*SUSTAINED *ELASTIC,*	* CREEP *	* * *	* * *	* * *	* * *
UNDER	*MODULUS CF*	* CREEP *	* PLUS *	* * *	* * *	* * *
STRESS,	*ELASTICITY*	PLUS	* AUTOG-	* AUTOG-	* CREEP	* SPECIFIC
DAYS	* MPSI	* AUTOG-	* ENOUS	* ENOUS	* * *	* CREEP
	* (A)	* ENOUS	* * *	* * *	* * *	* (B)

-0.0007		0				
0.0000	6.33	-332	0	0	0	0.
0.0028	6.29	-334	-2	0	-2	-0.0010
0.0063	6.19	-339	-7	0	-7	-0.0033
0.0403	5.58	-351	-19	0	-19	-0.0090
0.0882	5.88	-357	-25	0	-25	-0.0119
0.1201	5.83	-360	-28	0	-28	-0.0133
1.0951	5.43	-387	-55	-1	-54	-0.0257
2.1	5.28	-398	-66	-2	-64	-0.0305
3.1	5.17	-406	-74	-3	-71	-0.0338
3.9	5.10	-412	-80	-3	-77	-0.0367
5.0	5.02	-418	-86	-3	-83	-0.0395
6.9	4.92	-427	-95	-3	-92	-0.0438
8.1	4.86	-432	-100	-5	-95	-0.0452
15.9	4.59	-458	-126	-6	-120	-0.0571
29.0	4.40	-477	-145	2	-147	-0.0700
48.9	4.13	-508	-176	-8	-168	-0.0800
62.0	4.00	-525	-193	-12	-181	-0.0862
76.8	3.86	-544	-212	-17	-195	-0.0929
100.8	3.69	-569	-237	-23	-214	-0.1019
119.9	3.60	-584	-252	-25	-227	-0.1081
126.8	3.55	-591	-259	-27	-232	-0.1105
138.8	3.48	-604	-272	-31	-241	-0.1148
149.9	3.43	-612	-280	-32	-248	-0.1181
166.8	3.36	-625	-293	-36	-257	-0.1224
184.8	3.29	-639	-307	-38	-269	-0.1281

(A) SUSTAINED MODULUS OF ELASTIC = 2100. PSI DIVIDED BY SUM OF ELASTIC, CREEP, AND AUTOGENOUS STRAINS.
 (B) SPECIFIC CREEP = CREEP STRAIN DIVIDED BY 2100. PSI

TABLE K

AVERAGE ELASTIC, CREEP AND AUTOGENOUS STRAINS
 UNION ELECTRIC OPTION 1 CLASS E-1 ES7414
 (SPECIMEN: SEALED 6 BY 16 IN. CONCRETE CYL.)

AGE OF LOADING : 365 DAYS
 TEST TEMPERATURE : 73 DEG. F.
 ULT. STR. : 9430. PSI
 APPLIED TEST STRESS : 2100. PSI
 PER. ULT. STR. APPLIED: 22.3 PERCENT
 METER NUMBERS
 AUTOGENOUS : 73-10 AND 73-11
 CREEP : 73-10 AND 73-11

*****-----MICROSTRAIN-----*****

TIME	*SUSTAINED *ELASTIC,*	* CREEP *	* * *	* * *	* * *	* * *
UNDER	*MODULUS CF*	* CREEP *	* PLUS *	* * *	* * *	* * *
STRESS,	*ELASTICITY*	* PLUS *	* AUTOG-	* AUTOG-	* CREEP *	* SPECIFIC
DAYS	* MPST	* AUTOG-	* ENOUS *	* ENOUS *	* * *	* CREEP
	* (A)	* ENOUS *	* * *	* * *	* * *	* (B)
-0.0007		0				
0.0000	6.14	-342	0	0	0	0.
0.0278	5.75	-365	-23	0	-23	-0.0110
0.0813	5.68	-370	-28	0	-28	-0.0133
0.2458	5.59	-376	-34	0	-34	-0.0162
1.0764	5.32	-395	-53	1	-54	-0.0257
2.0	5.36	-392	-50	1	-51	-0.0243
3.1	5.29	-397	-55	1	-56	-0.0267
4.0	5.25	-400	-58	1	-59	-0.0281
5.0	5.19	-405	-63	1	-64	-0.0305
6.0	5.22	-402	-60	1	-61	-0.0290
14.0	4.95	-424	-82	1	-83	-0.0395
18.3	4.88	-430	-88	1	-89	-0.0424
29.3	4.68	-445	-107	1	-108	-0.0514
42.0	4.67	-450	-108	1	-109	-0.0519

(A) SUSTAINED MODULUS OF ELASTIC = 2100. PSI DIVIDED BY SUM OF ELASTIC, CREEP, AND AUTOGENOUS STRAINS.
 (B) SPECIFIC CREEP = CREEP STRAIN DIVIDED BY 2100. PSI

TABLE L

AVERAGE ELASTIC, CREEP AND AUTOGENOUS STRAINS
 UNDER ELECTRIC CHARGE CLASS E-1 ES7414
 (SPECIMEN: SEALED 6 BY 16 IN. CONCRETE CYL.)

AGE OF LOADING : 365 DAYS
 TEST TEMPERATURE : 110 DEG. F.
 ULT. STR. : 9430. PSI
 APPLIED TEST STRESS : 2100. PSI
 PER. ULT. STR. APPLIED: 22.3 PERCENT
 METER NUMBERS
 AUTOGENOUS : 11-08 AND 11-09
 CREEP : 11-08 AND 11-09

*****-----MICROSTRAIN-----*****

TIME UNDER STRESS, DAYS	*SUSTAINED *MODULUS OF *ELASTICITY* * (A)	*ELASTIC, * CREEP * PLUS * AUTOGEN- * ENDS	* CREEP * PLUS * AUTOGEN- * ENDS	* AUTOGEN- * ENDS	* AUTOGEN- * ENDS	* CREEP	* SPECIFIC * CREEP * (B)
-0.0007		0					
0.0000	6.25	-336	0	0	0	0	0.
0.0111	6.07	-346	-9	0	-9	-9	-.0043
0.0750	5.80	-362	-26	0	-26	-26	-.0124
0.2396	5.61	-374	-37	0	-37	-37	-.0176
1.0118	5.30	-396	-60	1	-61	-61	-.0290
1.0840	5.26	-399	-62	1	-63	-63	-.0300
2.0	5.17	-406	-70	1	-71	-71	-.0338
3.1	5.07	-414	-78	1	-79	-79	-.0376
4.0	5.10	-412	-76	1	-77	-77	-.0367
5.0	5.08	-413	-76	1	-77	-77	-.0367
6.0	4.92	-427	-90	1	-91	-91	-.0433
14.0	4.71	-446	-109	1	-110	-110	-.0524
18.3	4.59	-458	-121	1	-122	-122	-.0581
29.3	4.41	-476	-140	1	-141	-141	-.0671
42.0	4.33	-485	-149	1	-150	-150	-.0714

(A) SUSTAINED MODULUS OF ELASTIC = 2100. PSI DIVIDED BY SUM OF ELASTIC, CREEP, AND AUTOGENOUS STRAINS.
 (B) SPECIFIC CREEP = CREEP STRAIN DIVIDED BY 2100. PSI

TABLE E1

ELASTIC AND CREEP STRAINS (NOT CORRECTED FOR ALYGENOUS STRAINS)
 UNICEN ELECTRIC OPTICS CLASS E-1 ES7414
 (SPECIMEN: SEALED 6 BY 16 IN. CONCRETE CYL.)

CALIBRATION CONSTANTS:

METER RESISTANCE AT 0.0 DEGREES F. = 48.22 CHMS
 TEMP. CALIBRATION CONSTANT = 10.83 F/CHM CHANGE IN RESIST.
 STRAIN CALIBRATION CONSTANT = 8.87 MICRIVOLTS/VOLT/MICROSTRAIN
 CALIBRATED RANGE = 11100 TO -10100 MICROVOLTS/VOLT
 METER COEFF. OF THERMAL EXPANSION = 6.7 MICROSTRAIN/DEGREE F.
 CONCRETE COEFF. OF THERMAL EXPANSION = 4.6 MICROSTRAIN/DEGREE F.
 STRAIN INCREMENT FACTOR = 0 PERCENT

STRAIN METER NO. : 551 73-02
 AGE OF LOADING : 28 DAYS
 TEST TEMPERATURE : 73 DEG. F.
 LLT. STR. : 7000. PSI
 APPLIED TEST STRESS : 2100. PSI
 PER. ULT. STR. APPLIED: 27.6 PERCENT

NOTE: FOR MODE 4 OR 5 VOLTS, AND MODE 3 MICROVOLTS -- THE BRIDGE VOLTAGE WAS 2.00000 VOLTS.

*****MICROSTRAIN*****											
DATE	TIME	AGE, DAYS	DAYS	MODE	RESIST. CHMS	TEMP. DEGREE F.	MODE 3 MICR-VOLTS	CHANGE MICR-VOLTS	TEMPERATURE CORRECTED FROM DAY ONE	MICROSTRAIN ELASTIC CREEP SPECIFIC CREEP	

9-9-76	1000	0									
SPECIMEN CAST											
9-10-76	1430	1.2			-36586	55.26	76.3	12081	0	0	
9-16-76	1400	7.2			-37166	55.03	73.8	11766	-315	-22	
9-21-76	1145	12.1			-37186	55.01	73.5	11494	-587	-38	
9-23-76	915	14.0			-37177	55.02	73.6	11428	-653	-41	
10-1-76	930	22.0			-37171	55.02	73.7	11364	-717	-45	
10-7-76	855	28.0									
LOADING BEGINS											
10-7-76	855	28.0			-00007	-37167	55.03	73.7	11332	-749	-46
SPECIMEN FULLY LOADED, APPLIED TEST STRESS 2100 PSI											
10-7-76	856	28.0			.0000	-37167	55.03	73.7	4710	-7371	-420
10-7-76	856	28.0			.0028	-37160	55.04	73.8	4367	-7714	-439
10-7-76	905	28.0			.0063	-37157	55.04	73.9	4300	-7781	-443
10-7-76	925	28.0			.0201	-37157	55.04	73.9	4180	-7501	-449
10-7-76	1105	28.0			.0896	-37131	55.07	74.2	3985	-8096	-460
10-7-76	1615	28.3			.3049	-37141	55.06	74.1	3745	-8336	-473
10-8-76	1510	29.2			1.2597	-37156	55.04	73.9	3389	-8652	-494
10-9-76	1010	30.0				-37156	55.04	73.9	3215	-8666	-504
10-10-76	1145	31.1				-37176	55.02	73.6	3046	-9035	-514
10-11-76	950	32.0				-37176	55.02	73.6	2847	-9234	-525
10-12-76	1130	33.1				-37172	55.02	73.7	2710	-9371	-533
10-13-76	1045	34.0				-37166	55.03	73.8	2620	-9461	-538
10-15-76	1320	36.1				-37171	55.02	73.7	2376	-9705	-551
10-20-76	1400	41.2				-37171	55.02	73.7	1967	-10114	-574
10-21-76	1145	42.1				-37186	55.01	73.5	1892	-10189	-579
10-28-76	930	49.0				-37158	55.04	73.9	1512	-10569	-600
11-4-76	1100	56.0				-37175	55.02	73.6	1240	-10641	-616
11-19-76	1500	71.2				-37190	55.00	73.4	680	-11401	-648
12-23-76	845	104.9				-37222	54.96	73.0	7	-12074	-686
1-3-77	1145	116.1				-37242	54.93	72.7	-184	-12265	-698
1-14-77	1200	127.1				-37217	54.97	73.1	-314	-12395	-704
1-19-77	1050	132.0				-37211	54.97	73.1	-376	-12457	-708
2-3-77	945	147.0				-37199	54.99	73.3	-536	-12617	-716
2-5-77	826	148.9				-37208	54.98	73.2	-549	-12630	-717
2-22-77	905	166.0				-37196	54.99	73.3	-670	-12751	-724
3-5-77	747	176.9				-37158	55.04	73.9	-740	-12821	-727
3-16-77	1547	188.2				-37171	55.02	73.7	-794	-12875	-730
4-6-77	1446	209.2				-37161	55.04	73.8	-1109	-13190	-748
4-26-77	1041	229.0				-37165	55.03	73.8	-1219	-13300	-754
5-9-77	1347	242.2				-37173	55.02	73.7	-1280	-13361	-758
5-24-77	938	257.0				-37163	55.03	73.8	-1334	-13415	-760
6-17-77	856	281.0				-37181	55.01	73.5	-1447	-13528	-767
7-6-77	1056	300.0				-37148	55.05	74.0	-1561	-13642	-773
7-13-77	850	307.0				-37165	55.03	73.8	-1541	-13622	-772
7-18-77	920	312.0				-37122	55.07	74.2	-1544	-13625	-771
7-25-77	816	318.9				-37140	55.06	74.1	-1639	-13720	-777
8-2-77	842	326.9				-37100	55.11	74.7	-1704	-13785	-779
8-22-77	808	346.9				-37133	55.07	74.2	-1789	-13870	-785
9-9-77	806	364.9				-37156	55.04	73.9	-1865	-13946	-790
9-9-77	812	364.9									
SPECIMEN(S) FULLY UNLOADED, ZERO APPLIED TEST STRESS											
9-9-77	812	364.9				-37162	55.04	73.8	3977	-8104	-461
9-9-77	820	364.9				-37157	55.04	73.9	4087	-7994	-455
9-9-77	1006	365.0				-37151	55.05	74.0	4224	-7857	-447
9-9-77	1316	365.1				-37155	55.04	73.9	4287	-7794	-443
9-10-77	815	365.9				-37176	55.02	73.6	4412	-7669	-437
9-11-77	1117	367.1				-37181	55.01	73.6	4502	-7579	-432
9-12-77	758	367.9				-37186	55.00	73.5	4550	-7531	-429
9-13-77	922	369.0				-37176	55.02	73.6	4595	-7486	-427
9-22-77	831	377.9				-37188	55.00	73.5	4781	-7300	-416
10-7-77	1639	393.3				-37160	55.04	73.8	4876	-7205	-410
10-20-77	926	406.0				-37161	55.04	73.8	4951	-7130	-406

MODULUS: LOADING E = 5.6 AT AGE 28 DAYS (STRESS LEVEL 0 TO 2100 PSI)

NOTE: MINUS DAYS UNDER LOAD INDICATES SPECIMEN LOADING TIME PRIOR TO FULL LOAD

TABLE E2

ELASTIC AND CREEP STRAINS (ACT CORRECTED FOR AUTOGENOUS STRAINS)
 UNICA ELECTRIC OPTIC 1 CLASS E-1 E57414
 (SPECIMEN: SEALED 6 BY 16 IN. CONCRETE CYL.)

CALIBRATION CONSTANTS:

METER RESISTANCE AT 0.0 DEGREES F. = 48.43 CHMS
 TEMP. CALIBRATION CONSTANT = 10.79 F/CHM CHANGE IN RESIST.
 STRAIN CALIBRATION CONSTANT = 8.77 MICROVOLTS/VOLT/MICROSTRAIN
 CALIBRATED RANGE = 11100 TO -10100 MICROVOLTS/VOLT
 METER COEFF. OF THERMAL EXPANSION = 6.7 MICROSTRAIN/DEGREE F.
 CONCRETE COEFF. OF THERMAL EXPANSION = 4.6 MICROSTRAIN/DEGREE F.
 STRAIN INCREMENT FACTOR = 0 PERCENT

STRAIN METER NO. : 957 73-05
 AGE OF LOADING : 28 DAYS
 TEST TEMPERATURE : 73 DEG. F.
 LLT. STR. : 7600. PSI
 APPLIED TEST STRESS : 2100. PSI
 PER. ULT. STR. APPLIED: 27.6 PERCENT

NOTE: FOR MODE 4 OR 5 VOLTS, AND MODE 3 MICROVOLTS -- THE BRIDGE VOLTAGE WAS 2.0000 VOLTS.

DATE	TIME	AGE, DAYS	DAYS UNDER LOAD	MODE 4 OR 5 VOLTS	RESIST. CHMS	TEMP. DEGREE F.	MODE 3 VOLTS	CHANGE FROM ELASTIC	TEMPERATURE CORRECTED	MICROSTRAIN	CREEP SPECIFIC	CREEP
*****-----MICROSTRAIN-----*****												
9-9-76	1000	0										
SPECIMEN CAST												
9-10-76	1430	1.2			-36788	55.51	76.4	11079	0	0		
9-16-76	1400	7.2			-36541	55.32	74.3	10809	-270	-19		
9-21-76	1145	12.1			-36573	55.28	73.9	10559	-520	-34		
9-23-76	915	14.0			-36564	55.29	74.0	10453	-586	-38		
10-1-76	930	22.0			-36563	55.29	74.0	10401	-678	-43		
LOADING BEGINS												
10-7-76	855	28.0			-0007	-36990	55.26	73.6	10367	-712	-45	0
SPECIMEN FULLY LOADED, APPLIED TEST STRESS 2100 PSI												
10-7-76	856	28.0			.0000	-36550	55.26	73.6	3687	-7292	-426	-381
10-7-76	856	28.0			.0028	-36990	55.26	73.6	3380	-7699	-444	-399
10-7-76	905	28.0			.0063	-36990	55.26	73.6	3302	-7777	-448	-403
10-7-76	925	28.0			.0201	-36990	55.26	73.6	3172	-7507	-456	-411
10-7-76	1105	28.0			.0856	-36568	55.28	73.9	2952	-8127	-468	-423
10-7-76	1615	28.3			.3045	-36576	55.27	73.8	2692	-8387	-483	-438
10-8-76	1510	29.2			1.2597	-36586	55.26	73.7	2299	-8780	-505	-460
10-9-76	1010	30.0			2.1	-36586	55.26	73.7	2134	-8645	-515	-470
10-10-76	1145	31.1			3.1	-37008	55.23	73.4	1928	-9151	-527	-482
10-11-76	950	32.0			4.0	-37008	55.23	73.4	1745	-9334	-538	-493
10-12-76	1130	33.1			5.1	-37002	55.24	73.5	1617	-9462	-545	-500
10-13-76	1045	34.0			6.1	-37001	55.24	73.5	1522	-9557	-550	-505
10-15-76	1320	36.1			8.2	-37006	55.23	73.4	1290	-9789	-563	-518
10-20-76	1400	41.2			13.2	-37006	55.24	73.4	917	-10162	-585	-540
10-21-76	1145	42.1			14.1	-37023	55.21	73.2	842	-10237	-589	-544
10-28-76	930	49.0			21.0	-36598	55.24	73.5	482	-10597	-609	-564
11-4-76	1100	56.0			28.1	-37020	55.22	73.2	232	-10847	-624	-579
11-19-76	1500	71.2			43.3	-37035	55.20	73.0	-381	-11460	-660	-615
12-23-76	845	104.9			77.0	-37085	55.13	72.3	-1079	-12158	-701	-656
1-3-77	1145	116.1			88.1	-37115	55.10	71.9	-1349	-12428	-717	-672
1-14-77	1200	127.1			99.1	-37072	55.15	72.5	-1555	-12634	-728	-683
1-19-77	1050	132.0			104.1	-37068	55.15	72.6	-1650	-12729	-733	-688
2-3-77	945	147.0			119.0	-37054	55.17	72.8	-1853	-12932	-744	-699
2-5-77	826	148.9			121.0	-37071	55.15	72.5	-1876	-12555	-746	-701
2-22-77	905	166.0			138.0	-37046	55.18	72.9	-2023	-13102	-753	-702
3-5-77	747	176.9			149.0	-37026	55.21	73.2	-2078	-13157	-756	-711
3-16-77	1547	188.2			160.3	-37034	55.20	73.0	-2147	-13226	-760	-715
4-6-77	1446	209.2			181.2	-37019	55.22	73.2	-2605	-13684	-786	-741
4-26-77	1041	229.0			201.1	-37027	55.21	73.1	-2775	-13854	-796	-751
5-9-77	1347	242.2			214.2	-37033	55.20	73.0	-2867	-13946	-801	-756
5-24-77	938	257.0			229.0	-37022	55.21	73.2	-2946	-14025	-805	-760
6-17-77	856	281.0			253.0	-36987	55.26	73.7	-3057	-14136	-811	-766
7-6-77	1056	300.0			272.1	-36598	55.25	73.5	-3154	-14233	-817	-772
7-13-77	850	307.0			275.0	-37012	55.23	73.3	-3141	-14220	-816	-771
7-18-77	920	312.0			284.0	-36587	55.26	73.7	-3139	-14218	-815	-770
7-25-77	816	318.9			291.0	-36585	55.26	73.7	-3236	-14315	-821	-776
8-2-77	842	326.9			299.0	-36550	55.31	74.2	-3299	-14378	-823	-778
8-22-77	808	346.9			319.0	-36575	55.27	73.8	-3370	-14449	-828	-783
9-9-77	806	364.9			337.0	-37001	55.24	73.5	-3456	-14535	-834	-789
SPECIMEN(S) FULLY UNLOADED, ZERO APPLIED TEST STRESS												
9-9-77	812	364.9				-36597	55.25	73.6	2198	-8281	-511	-466
9-9-77	820	364.9				-36595	55.25	73.6	2346	-8733	-503	-458
9-9-77	1006	365.0				-36590	55.25	73.6	2518	-8561	-493	-448
9-9-77	1316	365.1				-36592	55.25	73.6	2596	-8483	-489	-444
9-10-77	815	365.9				-37013	55.23	73.3	2766	-8213	-479	-434
9-11-77	1117	367.1				-37018	55.22	73.3	2866	-8213	-474	-429
9-12-77	758	367.9				-37021	55.22	73.2	2919	-8160	-471	-426
9-13-77	922	369.0				-37014	55.22	73.3	2972	-8107	-468	-423
9-22-77	831	377.9				-37031	55.20	73.1	3212	-7667	-455	-410
10-7-77	1639	393.3				-37002	55.24	73.5	3374	-7705	-445	-400
10-20-77	926	406.0				-36598	55.25	73.5	3426	-7593	-438	-393

MODULUS: LOADING E = 5.5 AT AGE 28 DAYS (STRESS LEVEL 0 TO 2100 PSI)

NOTE: MINUS DAYS UNDER LOAD INDICATES SPECIMEN LOADING TIME PRIOR TO FULL LOAD

TABLE F2

ELASTIC AND CREEP STRAINS (NOT CORRECTED FOR AUTOGENOUS STRAINS)
 UNICA FLECTRIC OPTION 1 CLASS E-1 E57414
 (SPECIMEN: SEALED 6 BY 16 IN. CONCRETE CYL.)

CALIBRATION CONSTANTS:

METER RESISTANCE AT 0.0 DEGREES F. = 48.27 OHMS
 TEMP. CALIBRATION CONSTANT = 10.42 F/ohm CHANGE IN RESIST.
 STRAIN CALIBRATION CONSTANT = 9.08 MICRCVOLTS/VOLT/MICROSTRAIN
 CALIBRATED RANGE = 1110 TO -10100 MICRCVOLTS/VOLT
 METER COEFF. OF THERMAL EXPANSION = 6.7 MICRCSTRAIN/DEGREE F.
 CONCRETE COEFF. OF THERMAL EXPANSION = 4.6 MICRCSTRAIN/DEGREE F.
 STRAIN INCREMENT FACTOR = 0 PERCENT

STRAIN METER NO. : 558 11-07
 AGE OF LOADING : 22 DAYS
 TEST TEMPERATURE : 110 DEG. F.
 ULT. STR. : 7000. PSI
 APPLIED TEST STRESS : 2100. PSI
 PER. ULT. STR. APPLIED: 27.6 PERCENT

NOTE: FOR MODE 4 OR 5 VOLTS, AND MODE 3 MICRCVOLTS -- THE BRIDGE VOLTAGE WAS 2.00000 VOLTS.

DATE	TIME	AGE, DAYS	MODE	RESIST. OHMS	TEMP. DEGREE F.	MODE 3 MICRCVOLTS	CHANGE MICRCVOLTS	TEMPERATURE CORRECTED ELASTIC CREEP SPECIFIC
***** MICROSTRAIN *****								
9-9-76	1000	0	SPECIMEN CAST					
9-10-76	1430	1.2		-36961	55.29	76.0	13554	0
9-16-76	1400	7.2		-37092	55.12	74.2	13316	-238
9-21-76	1145	12.1		-37118	55.09	73.8	13122	-432
9-23-76	915	14.0		-37119	55.09	73.8	13070	-484
10-1-76	930	22.0		-34534	58.45	110.2	11719	-1235
10-7-76	947	28.0	LOADING BEGINS					
10-7-76	947	28.0	-0007	-34484	58.52	110.9	11759	-1795
10-7-76	948	28.0	SPECIMEN FULLY LOADED, APPLIED TEST STRESS 2100 PSI					
10-7-76	948	28.0	0000	-34484	58.52	110.9	4485	-9069
10-7-76	952	28.0	0028	-34484	58.52	110.9	4442	-9112
10-7-76	957	28.0	0063	-34477	58.53	111.0	4355	-9199
10-7-76	1017	28.0	0201	-34482	58.52	110.9	4157	-9397
10-7-76	1105	28.0	0535	-34479	58.53	111.0	4032	-9522
10-7-76	1615	28.3	2688	-34472	58.54	111.1	2595	-9559
10-8-76	1510	29.2	12236	-34463	58.55	111.2	2936	-10618
10-9-76	1025	30.0	2.0	-34463	58.55	111.2	2611	-10543
10-10-76	1045	31.0	3.0	-34482	58.52	110.9	2347	-11207
10-11-76	950	32.0	4.0	-34482	58.52	110.9	2162	-11292
10-12-76	1130	33.1	5.1	-34502	58.50	110.6	1987	-11567
10-13-76	1045	34.0	6.0	-34497	58.50	110.7	1842	-11712
10-15-76	1320	36.1	8.1	-34519	58.47	110.4	1452	-12102
10-21-76	1210	42.1	14.1	-34406	58.62	112.0	797	-12757
10-28-76	930	49.0	21.0	-34419	58.61	111.8	77	-13477
11-4-76	1110	56.0	28.1	-34427	58.60	111.7	-439	-13593
11-19-76	1500	71.2	43.2	-34359	58.69	112.7	-1163	-14717
12-9-76	145	90.7	62.7	-34436	58.58	111.6	-1836	-15390
12-20-76	1445	102.2	74.2	-34394	58.64	112.2	-2186	-15740
12-23-76	845	104.9	77.0	-34362	58.68	112.7	-2242	-15766
1-3-77	1145	116.1	88.1	-34389	58.65	112.3	-2559	-16113
1-14-77	1330	127.1	99.2	-34424	58.60	111.8	-2764	-16318
1-20-77	1155	133.1	105.1	-34419	58.61	111.8	-2894	-16448
2-3-77	1000	147.0	119.0	-34385	58.65	112.3	-3175	-16729
2-5-77	754	148.9	120.9	-34395	58.64	112.2	-3193	-16747
2-22-77	836	165.9	137.9	-34380	58.66	112.4	-3548	-17102
3-5-77	800	176.9	148.9	-34380	58.66	112.4	-3764	-17318
3-16-77	1605	188.3	160.3	-34379	58.66	112.4	-3942	-17496
4-6-77	1500	209.2	181.2	-34365	58.68	112.6	-4106	-17660
4-26-77	1053	229.0	201.0	-34451	58.56	111.4	-4412	-17566
5-9-77	1327	242.1	214.2	-34309	58.75	113.4	-4679	-18233
5-24-77	1005	257.0	229.0	-34342	58.71	112.9	-4884	-18433
6-17-77	842	280.9	253.0	-34371	58.67	112.5	-5177	-18731
7-6-77	1201	300.1	272.1	-34316	58.74	113.3	-5400	-18954
7-13-77	548	307.0	279.0	-34343	58.71	112.9	-5478	-19032
7-25-77	906	319.0	291.0	-34342	58.71	112.9	-5682	-19236
8-5-77	1156	330.1	302.1	-34309	58.75	113.4	-5813	-19267
8-22-77	832	346.9	318.9	-34405	58.62	112.0	-5959	-19513
9-9-77	833	364.9	336.9	-34361	58.68	112.7	-6163	-19717
9-9-77	840	364.9	SPECIMEN(S) FULLY UNLOADED, ZERO APPLIED TEST STRESS					
9-9-77	840	364.9	-34384	58.65	112.3	-11	-13565	-670
9-9-77	850	365.0	-34382	58.66	112.4	142	-13412	-661
9-9-77	1034	365.0	-34399	58.63	112.1	315	-13239	-652
9-9-77	1326	365.1	-34402	58.63	112.1	435	-13119	-646
9-10-77	825	365.9	-34434	58.59	111.6	627	-12527	-636
9-11-77	1127	367.1	-34429	58.59	111.7	732	-12222	-630
9-12-77	812	367.9	-34429	58.59	111.7	910	-12444	-620
9-13-77	938	369.0	-34455	58.55	111.3	1076	-12478	-612
9-26-77	1519	382.2	-34460	58.55	111.3	1236	-12318	-603
10-7-77	1653	393.3	-34543	58.44	110.1	1360	-12194	-599
10-20-77	910	406.0	-34430	58.59	111.7	1474	-12080	-589

MODULUS: LOADING E = 5.3 AT AGE 28 DAYS (STRESS LEVEL 0 TO 2100 PSI)

NOTE: MINUS DAYS UNDER LOAD INDICATES SPECIMEN LOADING TIME PRIOR TO FULL LOAD

TABLE G1

ELASTIC AND CREEP STRAINS (NOT CORRECTED FOR AUTOGENOUS STRAINS)
UNION ELECTRIC OPTION 1 CLASS E-1 ES7414
(SPECIMEN: SEALED 6 BY 16 IN. CONCRETE CYL.)

CALIBRATION CONSTANTS:

METER RESISTANCE AT 0.0 DEGREES F. = 48.30 OHMS
TEMP. CALIBRATION CONSTANT = 10.22 F/OHM CHANGE IN RESIST.
STRAIN CALIBRATION CONSTANT = 8.73 MICROVOLTS/VOLT/MICROSTRAIN
CALIBRATED RANGE = 11100 TO -10100 MICROVOLTS/VOLT
METER COEFF. OF THERMAL EXPANSION = 6.7 MICRSTRAIN/DEGREE F.
CONCRETE COEFF. OF THERMAL EXPANSION = 4.6 MICRSTRAIN/DEGREE F.
STRAIN INCREMENT FACTOR = 0 PERCENT

STRAIN METER NO. : 993 73-14
AGE OF LOADING : 90 DAYS
TEST TEMPERATURE : 73 DEG. F.
ULT. STR. : 2540. PSI
APPLIED TEST STRESS : 2100. PSI
PER. ULT. STR. APPLIED: 24.6 PERCENT

NOTE: FOR MODE 4 OR 5 VOLTS, AND MODE 3 MICROVOLTS -- THE BRIDGE VOLTAGE WAS 2.00000 VOLTS.

DATE	TIME	AGE, DAYS	DAYS UNDER LCAD	MODE	RESIST. OHMS	TEMP. DEGREE F.	MODE 3 VOLTS	CHANGE FROM ELASTIC	TEMPERATURE CORRECTED		
									*MICRSTRAIN	*CREEP	

SPECIMEN CAST											
9-9-76	1000	0									
9-10-76	1430	1.2									
9-16-76	1400	7.2									
9-21-76	1145	12.1									
9-23-76	915	14.0									
10-1-76	930	22.0									
10-7-76	1105	28.0									
10-15-76	1320	36.1									
12-7-76	817	88.9									
LOADING BEGINS											
12-7-76	817	88.9									
12-7-76	818	88.9									
SPECIMEN FULLY LOADED, APPLIED TEST STRESS 2100 PSI											
12-7-76	818	88.9									
12-7-76	822	88.9									
12-7-76	827	88.9									
12-7-76	917	89.0									
12-7-76	1017	89.0									
12-7-76	1317	89.1									
12-7-76	1655	89.3									
12-8-76	817	89.9									
12-9-76	145	90.7									
12-10-76	815	91.9									
12-11-76	815	92.9									
12-12-76	815	93.9									
12-13-76	830	94.9									
12-14-76	815	95.9									
12-15-76	1220	97.1									
12-20-76	1445	102.2									
12-23-76	845	104.9									
1-3-77	1145	116.1									
1-14-77	1200	127.1									
1-19-77	1050	132.0									
2-3-77	945	147.0									
2-5-77	826	148.9									
2-22-77	905	166.0									
3-5-77	747	176.9									
3-16-77	1547	188.2									
3-24-77	1138	196.1									
4-6-77	1446	209.2									
4-26-77	1041	225.0									
5-9-77	1347	242.2									
5-24-77	938	257.0									
6-17-77	856	281.0									
7-6-77	1056	300.0									
7-13-77	850	307.0									
7-18-77	920	312.0									
7-25-77	816	318.9									
8-2-77	842	326.9									
8-22-77	808	346.9									
9-9-77	806	364.9									
9-9-77	812	364.9									
9-9-77	812	364.9									
9-9-77	820	364.9									
9-9-77	1006	365.0									
9-9-77	1316	365.1									
9-10-77	815	365.9									
9-11-77	1117	367.1									
9-12-77	758	367.9									
9-13-77	922	369.0									
9-26-77	1433	382.2									
10-7-77	1639	393.3									
10-20-77	926	406.0									

SPECIMEN(S) FULLY UNLOADED, ZERO APPLIED TEST STRESS											
9-9-77	812	364.9									
9-9-77	820	364.9									
9-9-77	1006	365.0									
9-9-77	1316	365.1									
9-10-77	815	365.9									
9-11-77	1117	367.1									
9-12-77	758	367.9									
9-13-77	922	369.0									
9-26-77	1433	382.2									
10-7-77	1639	393.3									
10-20-77	926	406.0									

MODULUS: LOADING

E = 5.7 AT AGE 85 DAYS (STRESS LEVEL 0 TO 2100 PSI)

NOTE: MINUS DAYS UNDER LCAD INDICATES SPECIMEN LOADING TIME PRIOR TO FULL LOAD

TABLE G2

ELASTIC AND CREEP STRAINS (NOT CORRECTED FOR AUTOGENOUS STRAINS)
 UNION ELECTRIC OPTICON 1 CLASS E-1 ES7414
 (SPECIMEN: SEALED 6 BY 16 IN. CONCRETE CYL.)

CALIBRATION CONSTANTS:

METER RESISTANCE AT 0.0 DEGREES F. = 48.24 OHMS
 TEMP. CALIBRATION CONSTANT = 10.83 F/OHM CHANGE IN RESIST.
 STRAIN CALIBRATION CONSTANT = 8.90 MICROVOLTS/VOLT/MICROSTRAIN
 CALIBRATED RANGE = 11100 TO -10100 MICROVOLTS/VOLT
 METER COEFF. OF THERMAL EXPANSION = 6.7 MICROSTRAIN/DEGREE F.
 CONCRETE COEFF. OF THERMAL EXPANSION = 4.6 MICROSTRAIN/DEGREE F.
 STRAIN INCREMENT FACTOR = 0 PERCENT

STRAIN METER NO. : 959 73-15
 AGE OF LOADING : 50 DAYS
 TEST TEMPERATURE : 73 DEG. F.
 ULT. STR. : 8540 PSI
 APPLIED TEST STRESS : 2100 PSI
 PER. ULT. STR. APPLIED: 24.6 PERCENT

NOTE: FOR MODE 4 OR 5 VOLTS, AND MODE 3 MICROVOLTS -- THE BRIDGE VOLTAGE WAS 2.00000 VOLTS.

DATE	TIME	AGE, DAYS	DAYS UNDER LOAD	MODE 4 OR 5 VOLTS	RESIST. OHMS	TEMP. DEGREE F.	MODE 3 MICROVOLTS	CHANGE FROM DAY ONE	TEMPERATURE CORRECTED MICROSTRAIN	RELATIVE CREEP PERCENT	CREEP
***** SPECIMEN CAST *****											
9-9-76	1000	0									
9-10-76	1430	1.2			-36548	55.31	76.6	11321	0	0	
9-16-76	1400	7.2			-37096	55.12	74.5	10949	-372	-24	
9-21-76	1145	12.1			-37141	55.06	73.9	10694	-627	-40	
9-23-76	915	14.0			-37129	55.08	74.1	10611	-710	-44	
10-1-76	930	22.0			-37128	55.08	74.1	10389	-932	-57	
10-7-76	1105	28.0			-37116	55.09	74.2	10331	-990	-60	
10-15-76	1320	36.1			-37149	55.05	73.8	10288	-1033	-63	
***** LOADING BEGINS *****											
12-7-76	817	88.9			-0.0007	-37179	55.01	73.4	10053	-1268	-77
***** SPECIMEN FULLY LOADED, APPLIED STRESS 2100 PSI *****											
12-7-76	818	88.9			0.0000	-37179	55.01	73.4	3691	-7630	-434
12-7-76	818	88.9			0.0028	-37179	55.01	73.4	3519	-7802	-444
12-7-76	822	88.9			0.0063	-37162	55.04	73.6	3479	-7842	-446
12-7-76	827	88.9			0.0410	-37166	55.03	73.5	3351	-7970	-453
12-7-76	897	89.0			0.0826	-37162	55.04	73.6	3280	-8041	-457
12-7-76	917	89.0			0.2076	-37158	55.04	73.6	3195	-8126	-462
12-7-76	1017	89.0			0.3590	-37156	55.04	73.7	3089	-8232	-468
12-7-76	1317	89.1			0.9993	-37166	55.03	73.5	2902	-8419	-478
12-7-76	1655	89.3			1.7271	-37151	55.05	73.8	2676	-8645	-491
12-8-76	817	89.9			3.0	-37166	55.03	73.5	2610	-8711	-495
12-9-76	145	90.7			4.0	-37166	55.03	73.5	2510	-8811	-500
12-10-76	815	91.9			5.0	-37166	55.03	73.5	2420	-8901	-505
12-11-76	815	92.9			6.0	-37181	55.01	73.3	2357	-8964	-509
12-12-76	815	93.9			7.0	-37166	55.03	73.5	2310	-9011	-512
12-13-76	830	94.9			8.2	-37175	55.02	73.4	2217	-9104	-517
12-14-76	815	95.9			13.3	-37186	55.01	73.3	2002	-9315	-529
12-15-76	1220	97.1			16.0	-37157	55.04	73.7	1917	-9404	-533
12-20-76	1445	102.2			27.1	-37241	54.93	72.5	1565	-9756	-556
12-23-76	845	104.9			36.2	-37207	54.98	73.0	1315	-10006	-569
1-3-77	1145	116.1			43.1	-37201	54.99	73.1	1216	-10105	-574
1-14-77	1200	127.1			58.1	-37187	55.00	73.3	971	-10350	-587
1-19-77	1050	132.0			60.0	-37198	54.99	73.1	939	-10382	-590
2-3-77	945	147.0			77.0	-37178	55.02	73.4	706	-10615	-602
2-5-77	826	148.9			88.0	-37166	55.03	73.5	582	-10739	-609
2-22-77	905	166.0			99.3	-37169	55.03	73.5	487	-10834	-614
3-5-77	747	176.9			107.1	-37156	55.04	73.7	382	-10939	-620
3-16-77	1547	188.2			120.3	-37151	55.05	73.7	182	-11159	-632
3-24-77	1138	196.1			140.1	-37157	55.04	73.7	-29	-11350	-643
4-6-77	1446	209.2			153.2	-37165	55.03	73.5	-126	-11447	-648
4-26-77	1041	229.0			168.1	-37153	55.05	73.7	-111	-11432	-647
5-9-77	1347	242.2			192.0	-37117	55.09	74.2	-269	-11590	-655
5-24-77	938	257.0			211.1	-37131	55.08	74.0	-409	-11730	-663
6-17-77	856	281.0			218.0	-37140	55.06	73.9	-416	-11737	-664
7-6-77	1056	300.0			223.0	-37130	55.08	74.0	-501	-11822	-668
7-13-77	850	307.0			230.0	-37120	55.09	74.2	-616	-11937	-675
7-18-77	920	312.0			238.0	-37087	55.13	74.6	-709	-12030	-679
7-25-77	816	318.9			258.0	-37111	55.10	74.3	-831	-12152	-686
8-2-77	842	326.9			276.0	-37139	55.06	73.9	-1020	-12341	-698
8-22-77	808	346.9									
9-9-77	806	364.9									
9-9-77	812	364.9									
9-9-77	812	364.9									
9-9-77	820	364.9									
9-9-77	1006	365.0									
9-9-77	1316	365.1									
9-10-77	815	365.9									
9-11-77	1117	367.1									
9-12-77	758	367.9									
9-13-77	922	369.0									
10-7-77	1639	393.3									
10-20-77	926	406.0									

MODULUS: LOADING

E = 5.9 AT AGE 89 DAYS (STRESS LEVEL 2100 PSI)

NOTE: MINUS DAYS UNDER LOAD INDICATES SPECIMEN LOADING TIME PRIOR TO FULL LOAD

TABLE H1

ELASTIC AND CREEP STRAINS (NOT CORRECTED FOR AUTOGENOUS STRAINS)
 UNIC ELECTRIC OPTIC 1 CLASS E-1 E57414
 (SPECIMEN: SEALED 6 BY 16 IN. CONCRETE CYL.)

CALIBRATION CONSTANTS:

METER RESISTANCE AT 0.0 DEGREES F. = 48.25 OHMS
 TEMP. CALIBRATION CONSTANT = 10.80 F/ohm CHANGE IN RESIST.
 STRAIN CALIBRATION CONSTANT = 8.27 MICR/VOLTS/VOLT/MICROSTRAIN
 CALIBRATED RANGE = 1110 TO -10100 MICROVOLTS/VOLT
 METER COEFF. OF THERMAL EXPANSION = 6.7 MICR/STRAIN/DEGREE F.
 CONCRETE COEFF. OF THERMAL EXPANSION = 4.6 MICR/STRAIN/DEGREE F.
 STRAIN INCREMENT FACTOR = 0 PERCENT

STRAIN METER NO. : 554 11-10
 AGE OF LOADING : 90 DAYS
 TEST TEMPERATURE : 110 DEG. F.
 LLT. STR. : 2540. PSI
 APPLIED TEST STRESS : 2100. PSI
 PER. LLT. STR. APPLIED: 24.6 PERCENT

NOTE: FOR MCDE 4 OR 5 VOLTS, AND MCDE 3 MICROVOLTS -- THE BRIDGE VOLTAGE WAS 2.00000 VOLTS.

DATE	TIME	AGE, DAYS	MODE	RESIST. OHMS	TEMP. DEGREE F.	MCDE 3 VOLTS	CHANGE	TEMPERATURE CORRECTED	ELASTIC CREEP	SPECIFIC CREEP
*	*	* LEAD	* UNDER 4 OR 5 VELTS	* OHMS	* DEGREE F.	* VELTS	* MICR-VOLTS	* VOLTS	* DAY ONE	* CREEP
*****MICROSTRAIN*****										
*****SPECIMEN CAST*****										
9-9-76	1000	0								
9-10-76	1430	1.2		-36263	55.42	73.7	1461	0	0	
9-16-76	1400	7.2		-37023	55.21	71.5	1102	-359	-24	
9-21-76	1145	12.1		-37046	55.18	71.2	855	-606	-38	
9-23-76	915	14.0		-37037	55.20	71.3	770	-651	-43	
10-1-76	930	22.0		-34437	58.58	107.9	-469	-1530	-36	
10-7-76	1105	28.0		-34392	58.64	108.6	-439	-1500	-33	
10-15-76	1320	36.1		-34456	58.56	107.6	-609	-2070	-44	
*****LOADING BEGINS*****										
12-7-76	840	88.9		-00007	-34300	58.76	109.9	-1598	-3059	-96
*****SPECIMEN FULLY LOADED, APPLIED TEST STRESS 2100 PSI*****										
12-7-76	841	88.9		00000	-34300	58.76	109.9	-7786	-9247	-444
12-7-76	845	88.9		00028	-34300	58.76	109.9	-8066	-9527	-460
12-7-76	850	89.0		00063	-34300	58.76	109.9	-8126	-9587	-464
12-7-76	940	89.0		00410	-34298	58.77	109.9	-8324	-9785	-475
12-7-76	1040	89.0		00826	-34303	58.76	109.8	-8430	-9897	-481
12-7-76	1645	89.3		03361	-34312	58.75	109.7	-8703	-10164	-496
12-8-76	840	89.9		05993	-34290	58.78	110.0	-8996	-10457	-512
12-9-76	1345	91.2		2.2	-34356	58.69	109.1	-9126	-10587	-522
12-11-76	815	92.9		4.0	-34320	58.74	109.6	-9888	-11349	-563
12-12-76	815	93.9		5.0	-34340	58.71	109.3	-9950	-11411	-568
12-13-76	815	94.9		6.0	-34300	58.76	109.9	-10060	-11521	-573
12-15-76	815	96.9		8.0	-34300	58.76	109.9	-10169	-11630	-579
12-20-76	1445	102.2		13.3	-34314	58.75	109.7	-10311	-11772	-587
12-23-76	845	104.9		16.0	-34280	58.79	110.2	-10447	-11508	-594
1-3-77	1145	116.1		27.1	-34307	58.76	109.8	-11000	-12461	-626
1-14-77	1330	127.1		38.2	-34347	58.70	109.2	-11365	-12826	-648
1-20-77	1155	133.1		44.1	-34339	58.71	109.3	-11552	-13013	-658
2-3-77	1000	147.0		56.1	-34310	58.75	109.7	-11917	-13378	-678
2-5-77	754	148.9		60.0	-34323	58.73	109.6	-11937	-13398	-679
2-22-77	836	165.9		77.0	-34305	58.76	109.8	-12330	-13751	-701
3-5-77	800	176.9		89.0	-34302	58.76	109.9	-12569	-14030	-714
3-16-77	1005	186.3		99.3	-34306	58.76	109.8	-12719	-14180	-723
3-24-77	1131	196.1		107.1	-34303	58.76	109.8	-12881	-14342	-732
4-6-77	1500	209.2		120.3	-34295	58.77	110.0	-12931	-14392	-734
4-26-77	1053	225.0		140.1	-34381	58.66	108.7	-13234	-14655	-754
5-9-77	1327	242.1		153.2	-34237	58.85	110.8	-13510	-14571	-765
5-24-77	1005	257.0		166.1	-34272	58.80	110.3	-13724	-15185	-778
6-17-77	842	280.9		192.0	-34301	58.76	109.9	-14038	-15499	-797
7-6-77	1201	300.1		211.1	-34249	58.83	110.6	-14263	-15724	-808
7-13-77	948	307.0		218.0	-34271	58.80	110.3	-14340	-15801	-813
7-25-77	906	319.0		230.0	-34277	58.79	110.2	-14543	-16004	-825
8-5-77	1156	330.1		241.1	-34242	58.84	110.7	-14675	-16136	-831
8-22-77	832	346.9		258.0	-34235	58.72	109.4	-14824	-16285	-842
9-9-77	833	364.9		276.0	-34299	58.77	109.9	-15080	-16541	-855
*****SPECIMEN(S) FULLY UNLOADED, ZERO APPLIED TEST STRESS*****										
9-9-77	840	364.9			-34309	58.75	109.8	-9153	-10014	-522
9-9-77	850	365.0			-34309	58.75	109.8	-8818	-10275	-503
9-9-77	1034	365.0			-34314	58.75	109.7	-8609	-10070	-491
9-9-77	1326	365.1			-34312	58.75	109.7	-8505	-9966	-485
9-10-77	825	365.9			-34337	58.71	109.3	-8331	-9792	-476
9-11-77	1127	367.1			-34337	58.72	109.4	-8225	-9686	-470
9-12-77	812	367.9			-34329	58.73	109.5	-8178	-9639	-467
9-13-77	538	369.0			-34354	58.69	109.1	-8004	-9465	-458
9-26-77	1519	382.2			-34343	58.71	109.3	-7855	-9316	-450
10-7-77	1653	393.3			-34435	58.58	107.9	-7747	-9208	-446
10-20-77	910	406.0			-34310	58.75	109.7	-7653	-9114	-437

MODULUS: LOADING E = 6.0 AT AGE 89 DAYS (STRESS LEVEL 0 TO 2100 PSI)

NOTE: MINUS DAYS UNDER LOAD INDICATES SPECIMEN LOADING TIME PRIOR TO FULL LOAD

TABLE H2

ELASTIC AND CREEP STRAINS (NOT CORRECTED FOR AUTOGENOUS STRAINS)
 UNION ELECTRIC OPTION 1 CLASS E-1 E57414
 (SPECIMEN: SEALED 6 BY 16 IN. CONCRETE CYL.)

CALIBRATION CONSTANTS:
 METER RESISTANCE AT 0.0 DEGREES F. = 48.39 CHMS
 TEMP. CALIBRATION CONSTANT = 10.88 F/OM CHANGE IN RESIST.
 STRAIN CALIBRATION CONSTANT = 9.00 MICROVOLTS/VOLT/MICROSTRAIN
 CALIBRATED RANGE = 11100 TO -10100 MICROVOLTS/VOLT
 METER COEFF. OF THERMAL EXPANSION = 6.7 MICRSTRAIN/DEGREE F.
 CONCRETE COEFF. OF THERMAL EXPANSION = 4.6 MICRSTRAIN/DEGREE F.
 STRAIN INCREMENT FACTOR = 0 PERCENT

STRAIN METER NO. : 1002 11-11
 AGE OF LOADING : 90 DAYS
 TEST TEMPERATURE : 110 DEG. F.
 ULT. STR. : 2240. PSI
 APPLIED TEST STRESS : 2100. PSI
 PER. ULT. STR. APPLIED: 24.6 PERCENT

NOTE: FOR MCODE 4 CR 5 VOLTS, AND MCODE 3 MICROVOLTS -- THE BRIDGE VOLTAGE WAS 2.00000 VOLTS.

DATE	TIME	AGE, DAYS	MODE	RESIST.	TEMP.	MCODE 3	CHANCE	TEMPERATURE CORRECTED	MICROSTRAIN	ELASTIC	CREEP	SPECIFIC CREEP
* DATE	* TIME	* DAYS	* UNDER 4 OR 5	* CHMS	* DEGREE F.	* MICR-	* MICRO-	* FROM	* VOLTAGE	* DAY ONE	* CREEP	* CREEP
***** MICROSTRAIN *****												
9-9-76	1000	0										
SPECIMEN CAST												
9-10-76	1430	1.2		-0.37076	55.1E	73.4	15041	0	0			
9-16-76	1400	7.2		-0.37213	54.97	71.5	14776	-265	-18			
9-21-76	1145	12.1		-0.37246	54.93	71.0	14567	-474	-30			
9-23-76	915	14.0		-0.37244	54.53	71.0	14505	-536	-34			
10-1-76	930	22.0		-0.34669	58.2E	107.4	13136	-1505	-33			
10-7-76	1105	28.0		-0.34624	58.33	108.0	13269	-1772	-25			
10-15-76	1320	36.1		-0.34684	58.26	107.1	13068	-1573	-38			
LOADING BEGINS												
12-7-76	840	88.9		-0.34538	58.45	109.2	12188	-2553	-82	0		
SPECIMEN FULLY LOADED, APPLIED TEST STRESS 2100 PSI												
12-7-76	841	88.9		.0000	-0.34300	58.76	112.7	5650	-9391	-438	-356	0
12-7-76	845	88.9		.002E	-0.34200	58.76	112.7	5318	-9723	-457	-375	-15 -0.00905
12-7-76	850	89.0		.0063	-0.34300	58.76	112.7	5235	-9FC6	-461	-379	-23 -0.01095
12-7-76	940	89.0		.041C	-0.34528	58.46	109.4	4994	-10C47	-482	-400	-44 -0.0205E
12-7-76	1040	89.0		.082E	-0.34530	58.46	109.3	4868	-10173	-489	-407	-51 -0.02429
12-7-76	1340	89.2		.207E	-0.34534	58.45	109.3	4700	-10241	-498	-416	-60 -0.02857
12-7-76	1645	89.3		.3361	-0.34524	58.45	109.3	4557	-10484	-506	-424	-68 -0.03238
12-8-76	840	89.9		.9993	-0.34520	58.47	109.5	4229	-10812	-524	-442	-86 -0.04095
12-9-76	1345	91.2		2.2	-0.34560	58.39	108.6	3970	-11071	-540	-458	-102 -0.04857
12-11-76	815	92.9		4.0	-0.34300	58.76	112.7	3574	-11467	-554	-472	-116 -0.05524
12-12-76	815	93.9		5.0	-0.34300	58.76	112.7	3324	-11717	-567	-485	-125 -0.06143
12-13-76	815	94.6		6.0	-0.34300	58.76	112.7	3164	-11877	-576	-494	-138 -0.06571
12-15-76	1220	97.1		8.2	-0.34532	58.46	109.3	3150	-11891	-584	-502	-146 -0.06952
12-20-76	1445	102.2		13.3	-0.34534	58.45	109.3	2757	-12284	-606	-524	-168 -0.08000
12-23-76	845	104.9		16.0	-0.34500	58.50	109.8	2588	-12453	-614	-532	-176 -0.08381
1-3-77	1145	116.1		27.1	-0.34526	58.46	109.4	1967	-13074	-650	-566	-212 -0.10095
1-14-77	1330	127.1		36.2	-0.34563	58.41	108.9	1560	-13481	-673	-591	-235 -0.11190
1-20-77	1155	133.1		44.1	-0.34559	58.42	108.9	1364	-13677	-684	-602	-246 -0.11714
2-3-77	1000	147.0		58.1	-0.34533	58.46	109.3	949	-14052	-706	-624	-268 -0.12762
2-5-77	754	148.9		60.0	-0.34545	58.44	109.1	924	-14117	-708	-626	-270 -0.12857
2-22-77	836	165.9		77.0	-0.34525	58.47	109.4	465	-14576	-733	-651	-295 -0.1404E
3-5-77	800	176.9		88.0	-0.34522	58.47	109.5	200	-14641	-748	-666	-310 -0.14762
3-16-77	1605	188.3		99.3	-0.34534	58.45	109.3	-21	-15062	-760	-678	-322 -0.15333
3-24-77	1131	196.1		107.1	-0.34528	58.46	109.4	-199	-15240	-770	-688	-332 -0.15810
4-6-77	1500	209.2		120.3	-0.34520	58.47	109.5	-261	-15202	-773	-691	-335 -0.15952
4-26-77	1053	225.0		140.1	-0.34604	58.36	108.3	-601	-15642	-795	-713	-357 -0.17000
5-9-77	1327	242.1		153.2	-0.34457	58.56	110.4	-911	-15552	-807	-725	-369 -0.17571
5-24-77	1005	257.0		168.1	-0.34495	58.51	109.9	-1149	-16190	-822	-740	-384 -0.18266
6-17-77	842	280.9		192.0	-0.34521	58.47	109.5	-1499	-16540	-842	-760	-404 -0.19238
7-6-77	1201	300.1		211.1	-0.34474	58.53	110.2	-1759	-16800	-855	-773	-417 -0.19857
7-13-77	948	307.0		218.0	-0.34456	58.50	109.8	-1846	-16887	-861	-779	-423 -0.20143
7-25-77	906	319.0		230.0	-0.34502	58.50	109.7	-2069	-17110	-873	-791	-435 -0.20714
8-5-77	1156	330.1		241.1	-0.34462	58.55	110.3	-2211	-17252	-880	-798	-442 -0.2104E
8-22-77	832	346.9		258.0	-0.34557	58.42	109.0	-2381	-17422	-892	-810	-454 -0.21615
9-9-77	833	364.9		276.0	-0.34529	58.46	109.4	-2627	-17668	-905	-823	-467 -0.22238
SPECIMEN(S) FULLY UNLOADED, ZERO APPLIED TEST STRESS												
9-9-77	840	364.9			-0.34544	58.44	109.1	3537	-11504	-563	-481	-125
9-9-77	850	365.0			-0.34542	58.44	109.2	3699	-11242	-554	-472	-116
9-9-77	1034	365.0			-0.34541	58.44	109.2	3859	-11182	-545	-463	-107
9-9-77	1326	365.1			-0.34527	58.46	109.4	3964	-11077	-539	-457	-101
9-10-77	825	365.9			-0.34553	58.43	109.0	4153	-10888	-529	-447	-91
9-11-77	1127	367.1			-0.34549	58.43	109.1	4257	-10784	-523	-441	-85
9-12-77	612	367.9			-0.34547	58.44	109.1	4342	-10699	-518	-436	-80
9-13-77	938	369.0			-0.34575	58.40	108.7	4528	-10513	-509	-427	-71
9-21-77	1519	382.2			-0.34570	58.41	108.8	4745	-10296	-497	-415	-65
10-7-77	1653	393.3			-0.34635	58.32	107.8	4870	-10171	-492	-410	-54
10-20-77	910	406.0			-0.34538	58.45	109.2	4980	-10061	-483	-401	-45

MODULUS: LOADING E = 5.9 AT AGE 89 DAYS (STRESS LEVEL 0 TO 2100 PSI)

NOTE: MINUS DAYS UNDER LOAD INDICATES SPECIMEN LOADING TIME PRIOR TO FULL LOAD

TABLE II

ELASTIC AND CREEP STRAINS (NOT CORRECTED FOR AUTOGENOUS STRAINS)
UNIAxIAL ELECTRIC OPTIC CLASS E-1 E57414
(SPECIMEN: SEALED 6 BY 16 IN. CONCRETE CYL.)

CALIBRATION CONSTANTS:

METER RESISTANCE AT 0.0 DEGREE F. = 48.12 OHMS
TEMP. CALIBRATION CONSTANT = 10.86 F/OHM CHANGE IN RESIST.
STRAIN CALIBRATION CONSTANT = 8.40 MICRIVOLTS/VOLT/MICROSTRAIN
CALIBRATED RANGE = 11100 TO -10100 MICRIVOLTS/VOLT
METER COEFF. OF THERMAL EXPANSION = 6.7 MICROSTRAIN/DEGREE F.
CONCRETE COEFF. OF THERMAL EXPANSION = 4.6 MICROSTRAIN/DEGREE F.
STRAIN INCREMENT FACTOR = 6 PERCENT

STRAIN METER NO. : 995 73-16
AGE OF LOADING : 180 DAYS
TEST TEMPERATURE : 73 DEG. F.

LLY. STR. : 9180. PSI
APPLIED TEST STRESS : 2100. PSI
PER. ULT. STG. APPLIED: 22.5 PERCENT

NOTE: FOR MODE 4 OR 5 VOLTS, AND MODE 3 MICRIVOLTS -- THE BRIDGE VOLTAGE WAS 2.0000 VOLTS.

DATE	TIME	AGE, DAYS	MODE	RESIST.	TEMP.	MODE 3	CHANGE	TEMPERATURE CORRECTED	MICROSTRAIN
			4 OR 5	CHMS	DEGREE F.	MICRO	MICRO	ELASTIC	SPECIFIC
			LCAD	VOLTS	F.	VOLTS	VOLTS	DAY	CREEP
***** SPECIMEN CAST *****									
9-9-76	1000	0							
9-10-76	1430	1.2		-37091	55.13	76.1	2431	0	0
9-16-76	1400	7.2		-37266	54.90	73.7	2155	-276	-21
9-21-76	1145	12.1		-37288	54.88	73.4	1997	-434	-31
9-23-76	915	14.0		-37277	54.89	73.5	1951	-480	-33
10-1-76	930	22.0		-37272	54.89	73.6	1915	-516	-35
10-7-76	1105	28.0		-37246	54.93	73.9	1905	-526	-35
10-15-76	1320	36.1		-37279	54.89	73.5	1922	-509	-35
3-8-77	1307	180.1		-37276	54.89	73.5	1234	-1197	-76
***** LOADING BEGINS *****									
3-8-77	1327	180.1		-37276	54.89	73.5	1224	-1207	-72
***** SPECIMEN FULLY LOADED, APPLIED TEST STRESS 2100 PSI *****									
3-8-77	1328	180.1		0.0000	-37276	54.89	73.5	-5166	-7597
3-8-77	1328	180.1		0.0028	-37276	54.89	73.5	-5551	-7592
3-8-77	1332	180.1		0.0063	-37276	54.89	73.5	-5566	-7597
3-8-77	1337	180.2		0.0618	-37272	54.89	73.6	-5641	-8072
3-8-77	1457	180.2		0.0813	-37274	54.85	73.5	-5644	-8075
3-8-77	1525	180.2		0.1403	-37274	54.89	73.6	-5669	-8100
3-8-77	1650	180.3		1.1021	-37274	54.89	73.6	-5882	-8293
3-9-77	1555	181.2			-37285	54.88	73.4	-6035	-8466
3-10-77	1617	182.3		2.1	-37279	54.89	73.5	-6109	-8540
3-11-77	1546	183.2		3.1	-37303	54.86	73.2	-6177	-8608
3-12-77	1202	184.1		3.5	-37297	54.86	73.2	-6249	-8680
3-13-77	1326	185.1		5.0	-37311	54.85	73.0	-6320	-8751
3-15-77	1230	187.1		7.0	-37311	54.85	73.0	-6382	-8813
3-16-77	1547	188.2		8.1	-37251	54.87	73.3	-6670	-9101
3-24-77	1138	196.1		15.9	-37257	54.86	73.2	-7085	-9516
4-6-77	1446	209.2		29.1	-37257	54.86	73.2	-7359	-9830
4-26-77	1041	229.0		48.9	-37296	54.87	73.3	-7717	-10148
5-9-77	1347	242.2		62.0	-37262	54.91	73.7	-7959	-10290
5-24-77	938	257.0		76.8	-37273	54.89	73.6	-8145	-10576
6-17-77	856	281.0		100.2	-37285	54.88	73.4	-8174	-10605
7-6-77	1056	300.0		119.9	-37275	54.85	73.5	-8271	-10702
7-13-77	850	307.0		126.8	-37265	54.90	73.7	-8381	-10812
7-18-77	920	312.0		131.8	-37230	54.95	74.2	-8484	-10915
7-25-77	816	318.9		138.8	-37256	54.92	73.8	-8612	-11043
8-2-77	842	326.9		146.8	-37276	54.89	73.5	-8769	-11200
8-22-77	808	346.9		166.8				-633	-561
9-9-77	806	364.9		184.8					
***** SPECIMEN(S) FULLY UNLOADED, ZERO APPLIED TEST STRESS *****									
9-9-77	812	364.9			-37277	54.89	73.5	-2575	-5406
9-9-77	820	364.9			-37275	54.89	73.5	-2832	-5263
9-9-77	1006	365.0			-37266	54.90	73.7	-2790	-5221
9-9-77	1316	365.1			-37275	54.89	73.5	-2515	-4946
9-10-77	815	365.9			-37299	54.86	73.2	-2372	-4803
9-11-77	1117	367.1			-37301	54.86	73.2	-2287	-4718
9-12-77	758	367.9			-37309	54.85	73.1	-2225	-4656
9-13-77	922	369.0			-37294	54.87	73.3	-2182	-4613
9-26-77	1433	382.2			-37273	54.89	73.6	-1908	-4336
10-7-77	1639	393.3			-37290	54.87	73.3	-1913	-4344
10-20-77	926	406.0			-37283	54.88	73.4	-1659	-4090

MODULUS: LOADING E = 5.8 AT AGE 180 DAYS (STRESS LEVEL 0 TO 2100 PSI)

NOTE: MINUS DAYS UNDER LCAD INDICATES SPECIMEN LOADING TIME PRIOR TO FULL LCAD

TABLE I2

ELASTIC AND CREEP STRAINS (NOT CORRECTED FOR AUTOGENOUS STRAINS)
 UNIAXIAL ELECTRIC OPTICAL CLASS E-1 ES7414
 (SPECIMEN: SEALED 6" BY 16" IN. CONCRETE CYL.)

CALIBRATION CONSTANTS:
 METER RESISTANCE AT 0.0 DEGREES F. = 48.31 OHMS
 TEMP. CALIBRATION CONSTANT = 10.28 F/OHM CHANGE IN RESIST.
 STRAIN CALIBRATION CONSTANT = 9.15 MICRUVOLTS/VOLT/MICROSTRAIN
 CALIBRATED RANGE = 11100 TO -10100 MICRUVOLTS/VOLT
 METER COEFF. OF THERMAL EXPANSION = 6.7 MICROSTRAIN/DEGREE F.
 CONCRETE COEFF. OF THERMAL EXPANSION = 4.6 MICROSTRAIN/DEGREE F.
 STRAIN INCREMENT FACTOR = 6 PERCENT

STRAIN METER NO. : 1001 73-17
 AGE OF LOADING : 180 DAYS
 TEST TEMPERATURE : 73 DEG. F.
 ULT. STR. : 9180 PSI
 APPLIED TEST STRESS : 2100 PSI
 PER. ULT. STR. APPLIED: 22.5 PERCENT

NOTE: FOR MODE 4 OR 5 VOLTS, AND MODE 3 MICRUVOLTS -- THE BRIDGE VOLTAGE WAS 2.00000 VOLTS.

DATE	TIME	AGE, DAYS	DAYS UNDER LOAD	MODE	RESIST. OHMS	TEMP. DEGREE F.	MODE 3 MICRUVOLTS	CHANGE MICRUVOLTS	TEMPERATURE CORRECTED FROM ELASTIC CREEP SPECIFIC CREEP
*****-----MICROSTRAIN-----									
*****-----TEMPERATURE CORRECTED-----									
*****-----SPECIFIC CREEP-----									
*****-----CREEP-----									
*****-----SPECIMEN CAST-----									
9-9-76	1000	0							
9-10-76	1430	1.2							
9-16-76	1400	7.2							
9-21-76	1145	12.1							
9-23-76	915	14.0							
10-1-76	930	22.0							
10-7-76	1105	28.0							
10-15-76	1320	36.1							
3-8-77	1307	180.1							
*****-----LOADING BEGINS-----									
3-8-77	1327	180.1							
3-8-77	1328	180.1							
*****-----SPECIMEN FULLY LOADED, APPLIED TEST STRESS 2100 PSI-----									
3-8-77	1328	180.1							
3-8-77	1332	180.1							
3-8-77	1337	180.2							
3-8-77	1457	180.2							
3-8-77	1525	180.2							
3-8-77	1650	180.3							
3-9-77	1555	181.2							
3-10-77	1617	182.3							
3-11-77	1546	183.2							
3-12-77	1202	184.1							
3-13-77	1326	185.1							
3-15-77	1230	187.1							
3-16-77	1547	188.2							
3-24-77	1135	196.1							
4-6-77	1444	209.2							
4-26-77	1041	229.0							
5-9-77	1347	242.2							
5-24-77	938	257.0							
6-17-77	856	281.0							
7-6-77	1056	300.0							
7-13-77	850	307.0							
7-18-77	920	312.0							
7-25-77	816	318.9							
8-2-77	842	326.9							
8-22-77	808	346.9							
9-9-77	804	364.9							
*****-----SPECIMENS FULLY UNLOADED, ZERO APPLIED TEST STRESS-----									
9-9-77	812	364.9							
9-9-77	820	364.9							
9-9-77	1006	365.0							
9-9-77	1316	365.1							
9-10-77	815	365.9							
9-11-77	1117	367.1							
9-12-77	758	367.9							
9-13-77	922	365.0							
9-26-77	1433	382.2							
10-7-77	1635	393.3							
10-20-77	924	406.0							

MODULUS: LOADING E = 6.4 AT AGE 180 DAYS (STRESS LEVEL 0 TO 2100 PSI)

NOTE: MINUS DAYS UNDER LOAD INDICATES SPECIMEN LOADING TIME PRIOR TO FULL LOAD

TABLE J1

ELASTIC AND CREEP STRAINS (NOT CORRECTED FOR AUTOGENOUS STRAINS)
 UNICA ELECTRIC OPTICAL CLASS E-1 E57414
 (SPECIMEN: SEALED 6 BY 16 IN. CONCRETE CYL.)

CALIBRATION CONSTANTS:

METER RESISTANCE AT 0.0 DEGREES F. = 48.36 CHMS
 TEMP. CALIBRATION CONSTANT = 10.82 F/CHM CHANGE IN RESIST.
 STRAIN CALIBRATION CONSTANT = 8.66 MICROVOLTS/VOLT/MICROSTRAIN
 CALIBRATED RANGE = 1110 TO -10100 MICROVOLTS/VOLT
 METER COEFF. OF THERMAL EXPANSION = 6.7 MICROSTRAIN/DEGREE F.
 CONCRETE COEFF. OF THERMAL EXPANSION = 4.6 MICROSTRAIN/DEGREE F.
 STRAIN INCREMENT FACTOR = 6 PERCENT

STRAIN METER NO. : 1000 11-12
 AGE OF LOADING : 120 DAYS
 TEST TEMPERATURE : 110 DEG. F.
 ULT. STR. : 9180. PSI
 APPLIED TEST STRESS : 2100. PSI
 PER. ULT. STR. APPLIED: 22.9 PERCENT

NOTE: FOR MODE 4 OR 5 VOLTS, AND MODE 3 MICROVOLTS -- THE BRIDGE VOLTAGE WAS 2.0000 VOLTS.

DATE	TIME	AGE, DAYS	DAYS UNDER LCAD	MODE	RESIST. CHMS	TEMP. DEGREE F.	MODE 3 VOLTS	CHANGE VOLTS	TEMPERATURE CORRECTED	MICROSTRAIN	ELASTIC CREEP	SPECIFIC CREEP
***** SPECIMEN CAST *****												
9-9-76	1000	0										
9-10-76	1430	1.2			-36902	55.37	75.8	13023	0	0		
9-16-76	1400	7.2			-37048	55.18	73.8	12614	-409	-27		
9-21-76	1145	12.1			-37088	55.13	73.3	12357	-666	-43		
9-23-76	915	14.0			-37082	55.14	73.3	12303	-720	-46		
10-1-76	930	22.0			-34514	58.48	109.5	10936	-2087	-49		
10-7-76	1105	28.0			-34514	58.48	109.5	11001	-2022	-45		
10-15-76	1320	36.1			-34574	58.40	108.6	10913	-2110	-52		
***** LOADING BEGINS *****												
3-8-77	1348	180.2			-0.0007	-34398	58.63	111.2	9545	-3478	-114	0
***** SPECIMEN FULLY LOADED, APPLIED TEST STRESS 2100 PSI *****												
3-8-77	1349	180.2			0.0000	-34398	58.63	111.2	3623	-9400	-437	-323
3-8-77	1349	180.2			0.002E	-34398	58.63	111.2	3565	-945E	-440	-326
3-8-77	1353	180.2			0.0063	-34398	58.63	111.2	3478	-9E4E	-445	-331
3-8-77	1358	180.2			0.0402	-34383	58.65	111.4	3205	-9E1E	-459	-345
3-8-77	1447	180.2			0.0882	-34272	58.67	111.5	3071	-9552	-466	-352
3-8-77	1556	180.2			0.1201	-34367	58.68	111.6	3013	-10C10	-469	-355
3-9-77	1642	180.3			1.0551	-34363	58.68	111.7	2505	-10E1E	-497	-383
3-10-77	1606	181.3			2.1	-34377	58.66	111.5	2298	-10725	-508	-394
3-11-77	1626	182.3			3.1	-34377	58.66	111.5	2298	-10725	-508	-394
3-12-77	1554	183.2			3.5	-34380	58.66	111.4	2147	-10E7E	-517	-403
3-12-77	1150	184.1			5.0	-34373	58.67	111.5	2029	-10554	-523	-409
3-13-77	1332	185.1			6.5	-34365	58.68	111.6	1892	-11131	-530	-416
3-15-77	1156	187.1			8.1	-34396	58.64	111.2	1752	-11271	-539	-425
3-16-77	1605	188.3			15.9	-34379	58.66	111.4	1645	-11278	-544	-430
3-24-77	1131	196.1			25.0	-34368	58.67	111.6	1115	-1150E	-572	-45E
4-6-77	1500	209.2			48.9	-34360	58.68	111.7	777	-1224E	-591	-477
4-26-77	1053	229.0			62.0	-34444	58.57	110.5	227	-1279E	-623	-505
5-9-77	1327	242.1			76.8	-34297	58.77	112.6	-189	-13212	-641	-527
5-24-77	1005	257.0			100.8	-34332	58.72	112.1	-521	-13544	-660	-546
6-17-77	842	280.9			119.9	-34361	58.68	111.7	-961	-13584	-685	-571
7-6-77	1201	300.1			126.8	-34309	58.75	112.5	-1221	-14304	-701	-587
7-13-77	948	307.0			138.8	-34331	58.72	112.1	-1389	-14412	-708	-594
7-25-77	906	319.0			149.9	-34355	58.69	111.8	-1641	-14664	-722	-60E
8-5-77	1156	330.1			166.8	-34307	58.76	112.5	-1811	-14834	-730	-61E
8-22-77	832	346.9			184.8	-34397	58.64	111.2	-1996	-15C19	-743	-625
9-9-77	893	364.9				-34361	58.68	111.7	-2312	-15335	-759	-645
***** SPECIMEN(S) FULLY UNLOADED, ZERO APPLIED TEST STRESS *****												
9-9-77	840	364.9				-34377	58.66	111.5	3729	-9294	-430	-316
9-9-77	840	364.9				-34377	58.66	111.5	3899	-9124	-421	-307
9-9-77	850	365.0				-34366	58.68	111.6	4067	-8556	-412	-298
9-9-77	1034	365.0				-34359	58.69	111.7	4169	-8254	-406	-292
9-10-77	1326	365.1				-34382	58.65	111.4	4368	-8655	-396	-282
9-10-77	825	365.9				-34377	58.66	111.5	4467	-8556	-390	-276
9-11-77	1127	367.1				-34377	58.66	111.5	4552	-8471	-386	-272
9-12-77	812	367.9				-34402	58.63	111.1	4740	-8283	-376	-262
9-13-77	938	369.0				-34280	58.66	111.4	4930	-8C93	-365	-251
9-26-77	1519	382.2				-34423	58.60	110.8	5037	-7586	-361	-247
10-7-77	1653	393.3				-34353	58.69	111.8	5140	-7E83	-353	-239
10-20-77	910	406.0										

MODULUS: LOADING

E = 6.5 AT AGE 120 DAYS (STRESS LEVEL 0 TO 2100 PSI)

NOTE: MINUS DAYS UNDER LCAD INDICATES SPECIMEN LOADING TIME PRIOR TO FULL LCAD

TABLE J2

**ELASTIC AND CREEP STRAINS (NOT CORRECTED FOR AUTOGENOUS STRAINS)
UNION ELECTRIC OPTICON 1 CLASS E-1 E57414
(SPECIMEN: SEALED 6 BY 16 IN. CONCRETE CVL.)**

CALIBRATION CONSTANTS:

METER RESISTANCE AT 0.0 DEGREES F. = 48.65 OHMS
 TEMP. CALIBRATION CONSTANT = 10.75 F/OHM CHANGE IN RESIST.
 STRAIN CALIBRATION CONSTANT = 8.84 MICRUVOLTS/VOLT/MICROSTRAIN
 CALIBRATED RANGE = 11100 TO -10100 MICRUVOLTS/VOLT
 METER COEFF. OF THERMAL EXPANSION = 6.7 MICROSTRAIN/DEGREE F.
 CONCRETE COEFF. OF THERMAL EXPANSION = 4.6 MICROSTRAIN/DEGREE F.
 STRAIN INCREMENT FACTOR = 6 PERCENT

STRAIN METER NO. : 996 11-13
 AGE OF LOADING : 180 DAYS
 TEST TEMPERATURE : 110 DEG. F.

ULT. STR. : 9180. PSI
 APPLIED TEST STRESS : 2100. PSI
 PER. ULT. STR. APPLIED: 22.9 PERCENT

NOTE: FOR MODE 4 OR 5 VOLTS, AND MODE 3 MICRUVOLTS -- THE BRIDGE VOLTAGE WAS 2.00000 VOLTS.

DATE	TIME	AGE, DAYS	DAYS UNDER LCAD	MODE 4 OR 5	RESIST. CHMS	TEMP. DEGREE F.	MODE 3 MICRUVOLTS	CHANGE MICRUVOLTS	TEMPERATURE CORRECTED FROM ELASTIC CREEP SPECIFIC
***** MICROSTRAIN *****									
9-9-76	1000	0							
SPECIMEN CAST									
9-10-76	1430	1.2			-36706	55.62	74.9	6003	0
9-16-76	1400	7.2			-36848	55.44	73.0	5619	-284
9-21-76	1145	12.1			-36881	55.40	72.5	5388	-615
9-23-76	915	14.0			-36877	55.40	72.6	5315	-688
10-1-76	930	22.0			-34289	58.78	108.9	4160	-1843
10-7-76	1105	28.0			-34247	58.84	109.5	4227	-1776
10-15-76	1320	36.1			-34314	58.75	108.5	4186	-1817
LOADING BEGINS									
3-8-77	1348	180.2			-34180	58.92	110.4	2906	-3097
SPECIMEN FULLY LOADED, APPLIED TEST STRESS 2100 PSI									
3-8-77	1349	180.2			0.000	58.92	110.4	-3482	-9485
3-8-77	1353	180.2			0.002	58.92	110.4	-3537	-9540
3-8-77	1358	180.2			0.003	58.92	110.4	-3602	-9605
3-8-77	1447	180.2			0.0403	58.95	110.7	-3802	-9605
3-8-77	1556	180.2			0.0822	58.96	110.9	-3916	-9519
3-8-77	1642	180.3			0.1201	58.97	111.0	-3973	-9576
3-9-77	1606	181.3			1.0951	58.97	111.0	-4447	-10450
3-10-77	1626	182.3			2.1	58.95	110.7	-4652	-10655
3-11-77	1554	183.2			3.1	58.95	110.7	-4781	-10784
3-12-77	1150	184.1			3.6	58.96	110.8	-4889	-10892
3-13-77	1332	185.1			5.0	58.96	110.8	-5004	-11007
3-15-77	1156	187.1			6.9	58.92	110.4	-5133	-11136
3-16-77	1605	188.3			8.1	58.94	110.6	-5245	-11248
3-24-77	1131	196.1			15.5	58.95	110.7	-5718	-11721
4-6-77	1500	209.2			29.0	58.96	110.8	-6064	-12067
4-26-77	1053	229.0			48.9	58.85	109.7	-6575	-12578
5-9-77	1327	242.1			62.0	59.05	111.7	-6980	-12583
5-24-77	1005	257.0			76.8	59.00	111.2	-7304	-13307
6-17-77	842	280.9			100.8	58.96	110.8	-7747	-13750
7-6-77	1201	300.1			119.9	59.03	111.6	-8046	-14049
7-13-77	948	307.0			126.8	59.00	111.2	-8149	-14152
7-25-77	906	319.0			138.8	58.98	111.1	-8390	-14393
8-5-77	1156	330.1			149.9	59.03	111.6	-8558	-14561
8-22-77	832	348.9			166.8	58.91	110.3	-8749	-14752
9-9-77	833	364.9			184.8	58.95	110.8	-8999	-15002
SPECIMEN(S) FULLY UNLOADED, ZERO APPLIED TEST STRESS									
9-9-77	840	364.9			-34169	58.94	110.6	-2952	-8955
9-9-77	850	365.0			-34169	58.94	110.6	-2752	-8755
9-9-77	1034	365.0			-34164	58.95	110.7	-2597	-8600
9-9-77	1326	365.1			-34159	58.95	110.7	-2490	-8493
9-10-77	825	365.9			-34187	58.91	110.3	-2297	-8300
9-11-77	1127	367.1			-34182	58.92	110.4	-2195	-8198
9-12-77	812	367.9			-34179	58.93	110.5	-2107	-8110
9-13-77	938	369.0			-34199	58.90	110.2	-1925	-7528
9-26-77	1519	382.2			-34183	58.92	110.4	-1725	-7728
10-7-77	1653	393.3			-34224	58.87	109.8	-1607	-7610
10-20-77	910	406.0			-34153	58.96	110.8	-1505	-7508

MODULUS: LOADING

E = 6.2 AT AGE 180 DAYS (STRESS LEVEL 0 TO 2100 PSI)

NOTE: MINUS DAYS UNDER LCAD INDICATES SPECIMEN LOADING TIME PRIOR TO FULL LCAD

TABLE K1

ELASTIC AND CREEP STRAINS (NOT CORRECTED FOR AUTOGENOUS STRAINS)
 UNION ELECTRIC OPTION 1 CLASS E-1 ES7414
 (SPECIMEN: SEALED 6 BY 16 IN. CONCRETE CYL.)

CALIBRATION CONSTANTS:

METER RESISTANCE AT 0.0 DEGREES F. = 48.18 OHMS
 TEMP. CALIBRATION CONSTANT = 10.84 F/OHM CHANGE IN RESIST.
 STRAIN CALIBRATION CONSTANT = 8.53 MICROVOLTS/VOLT/MICROSTRAIN
 CALIBRATED RANGE = 11100 TO -10100 MICROVOLTS/VOLT
 METER COEFF. OF THERMAL EXPANSION = 6.7 MICROSTRAIN/DEGREE F.
 CONCRETE COEFF. OF THERMAL EXPANSION = 4.6 MICROSTRAIN/DEGREE F.
 STRAIN INCREMENT FACTOR = 6 PERCENT

STRAIN METER NO. : 527 73-10
 AGE OF LOADING : 365 DAYS
 TEST TEMPERATURE : 73 DEG. F.
 LLT. STR. : 9430 PSI
 APPLIED TEST STRESS : 2100 PSI
 PER. ULT. STR. APPLIED: 22.3 PERCENT

NOTE: FOR MCDE 4 OR 5 VOLTS, AND MCDE 3 MICROVOLTS -- THE BRIDGE VOLTAGE WAS 2.00000 VOLTS.

DATE	TIME	AGE, DAYS	DAYS	MODE	RESIST. OHMS	TEMP. DEGREE F.	MCDE 3 VOLTS	CHANGE MICROVOLTS	TEMPERATURE CORRECTED	MICROSTRAIN	ELASTIC CREEP	SPECIFIC CREEP
***** SPECIMEN CAST *****												
* 9-8-76	1000	0										
9-9-76	1630	1.3			-37002	76.5	3520	0	0			
9-16-76	1400	8.2			-37166	55.03	2975	-545	-34			
9-21-76	1145	13.1			-37176	55.02	74.1	2802	-718	-44		
9-23-76	915	15.0			-37184	55.01	74.0	2764	-756	-47		
10-1-76	930	23.0			-37173	55.02	74.2	2702	-818	-50		
10-7-76	1105	29.0			-37153	55.05	74.4	2672	-848	-51		
10-15-76	1320	37.1			-37179	55.01	74.1	2646	-874	-53		
10-21-76	1145	43.1			-37201	54.99	73.8	2615	-905	-55		
10-28-76	930	50.0			-37203	54.98	73.7	2580	-940	-57		
11-4-76	1100	57.0			-37227	54.95	73.4	2530	-990	-61		
11-19-76	1430	72.2			-37525	54.57	69.3	2382	-1138	-78		
12-7-76	917	90.0			-37251	54.92	73.1	2236	-1284	-78		
12-7-76	1655	90.3			-37236	54.94	73.3	2234	-1286	-78		
12-8-76	817	90.9			-37261	54.91	72.9	2235	-1285	-78		
12-20-76	1445	103.2			-37338	54.81	71.9	2157	-1363	-85		
1-3-77	1145	117.1			-37357	54.79	71.6	2100	-1420	-89		
1-14-77	1200	128.1			-37327	54.83	72.0	2066	-1454	-90		
1-19-77	1050	133.0			-37326	54.83	72.0	2064	-1456	-90		
2-3-77	945	148.0			-37299	54.86	72.4	2059	-1461	-89		
2-5-77	826	149.9			-37313	54.84	72.2	2070	-1450	-89		
2-22-77	905	167.0			-37288	54.88	72.6	2044	-1476	-90		
3-5-77	747	177.9			-37256	54.92	73.0	2076	-1444	-87		
3-8-77	1525	181.2			-37252	54.92	73.1	2083	-1437	-87		
3-8-77	1650	181.3			-37246	54.93	73.1	2085	-1435	-86		
3-9-77	1555	182.2			-37236	54.94	73.3	2080	-1440	-86		
3-10-77	1617	183.3			-37247	54.93	73.1	2069	-1451	-87		
3-11-77	1546	184.2			-37242	54.93	73.2	2069	-1451	-87		
3-12-77	1202	185.1			-37268	54.90	72.9	2079	-1441	-87		
3-13-77	1326	186.1			-37270	54.90	72.8	2082	-1438	-87		
3-15-77	1230	188.1			-37283	54.88	72.6	2080	-1440	-88		
3-16-77	1547	189.2			-37291	54.87	72.5	2091	-1429	-87		
3-24-77	1138	197.1			-37271	54.90	72.8	2065	-1455	-88		
4-6-77	1446	210.2			-37261	54.91	72.9	2043	-1477	-89		
4-26-77	1041	230.0			-37265	54.90	72.9	2023	-1497	-90		
5-9-77	1347	243.2			-37280	54.88	72.7	2014	-1506	-91		
5-24-77	938	258.0			-37271	54.90	72.8	2017	-1503	-91		
6-17-77	856	282.0			-37245	54.93	73.2	2153	-1367	-83		
7-6-77	1056	301.0			-37223	54.96	73.5	2110	-1410	-84		
7-13-77	850	308.0			-37245	54.93	73.2	2145	-1375	-83		
7-18-77	920	313.0			-37222	54.96	73.5	2060	-1460	-87		
7-25-77	816	319.9			-37227	54.95	73.4	2075	-1445	-86		
8-2-77	842	327.9			-37165	55.03	74.3	2017	-1503	-88		
8-22-77	808	347.9			-37226	54.95	73.4	2005	-1515	-90		
9-8-77	806	364.9			-37154	54.99	73.9	1998	-1522	-90		
* 9-8-77	815	364.9										
9-8-77	815	364.9			-0007	-37154	54.99	1998	-1522	-85	0	0
* 9-8-77	816	364.9										
9-8-77	816	364.9			0000	-37174	55.02	74.2	-4588	-8108	-432	0
9-8-77	856	365.0			0278	-37161	55.04	74.3	-5047	-8567	-456	-347
9-8-77	1013	365.0			0813	-37161	55.04	74.3	-5152	-8672	-462	-371
9-8-77	1410	365.2			2452	-37156	55.04	74.4	-5279	-8799	-468	-377
9-9-77	1006	366.0			1.0764	-37154	55.05	74.4	-5649	-9169	-488	-383
9-10-77	815	366.9			1.9993	-37194	55.00	73.9	-5529	-9109	-486	-383
9-11-77	1117	368.1			3.1	-37199	54.99	73.8	-5692	-9212	-491	-401
9-12-77	758	366.9			4.0	-37204	54.98	73.7	-5745	-9265	-494	-406
9-13-77	922	370.0			5.0	-37196	54.99	73.8	-5850	-9370	-500	-406
9-14-77	810	370.9			6.0	-37201	54.99	73.8	-5790	-9310	-497	-406
9-22-77	831	378.9			14.0	-37203	54.98	73.8	-6202	-9722	-518	-409
9-26-77	1433	383.2			18.3	-37168	55.03	74.2	-6337	-9557	-525	-409
10-7-77	1639	394.3			29.3	-37172	55.02	74.2	-6699	-10219	-544	-412
10-20-77	926	407.0			42.0	-37176	55.02	74.1	-6719	-10239	-545	-412

MODULUS: LOADING E = 6.1 AT AGE 365 DAYS (STRESS LEVEL 0 TO 2100 PSI)

NOTE: MINUS DAYS UNDER LOAD INDICATES SPECIMEN LOADING TIME PRIOR TO FULL LOAD

TABLE K2

ELASTIC AND CREEP STRAINS (NOT CORRECTED FOR AUTOGENOUS STRAINS)
 UNICN ELECTRIC OPTION 1 CLASS E-1 E57414
 (SPECIMEN: SEALED 6 BY 16 IN. CONCRETE CYL.)

CALIBRATION CONSTANTS:

METER RESISTANCE AT 0.0 DEGREES F. = 48.10 OHMS
 TEMP. CALIBRATION CONSTANT = 10.86 F/OHM CHANGE IN RESIST.
 STRAIN CALIBRATION CONSTANT = 8.79 MICROVOLTS/VOLT/MICROSTRAIN
 CALIBRATED RANGE = 11100 TO -10100 MICROVOLTS/VOLT
 METER COEFF. OF THERMAL EXPANSION = 6.7 MICROCSTRAIN/DEGREE F.
 CONCRETE COEFF. OF THERMAL EXPANSION = 4.6 MICROCSTRAIN/DEGREE F.
 STRAIN INCREMENT FACTOR = 6 PERCENT

STRAIN METER NO. : 968 73-11
 AGE OF LOADING : 365 DAYS
 TEST TEMPERATURE : 73 DEG. F.
 LLT. STR. : 9430. PSI
 APPLIED TEST STRESS : 2100. PSI
 PER. ULT. STR. APPLIED: 22.3 PERCENT

NOTE: FOR MODE 4 OR 5 VOLTS, AND MODE 3 MICROCVLTS -- THE BRIDGE VCLTAGE WAS 2.00000 VOLTS.

DATE	TIME	AGE, DAYS	DAYS UNDER LOAD	MODE	RESIST. OHMS	TEMP. DEGREE F.	MODE 3 VOLTS	CHANGE MICROVOLTS	TEMPERATURE CORRECTED MICROVOLTS	ELASTIC CREEP	SPECIFIC CREEP
***** MICROSTRAIN *****											
***** SPECIMEN CAST *****											
9-8-76	1000	0									
9-9-76	1630	1.3			-0.37112	55.10	76.0	5429	0	0	
9-16-76	1400	8.2			-0.37278	54.89	73.7	5014	-415	-27	
9-21-76	1145	13.1			-0.37293	54.87	73.5	4831	-598	-38	
9-23-76	915	15.0			-0.37299	54.86	73.4	4770	-659	-42	
10-1-76	930	23.0			-0.37293	54.87	73.5	4667	-762	-48	
10-7-76	1105	29.0			-0.37268	54.90	73.8	4580	-849	-52	
10-15-76	1320	37.1			-0.37294	54.87	73.5	4536	-893	-55	
10-21-76	1145	43.1			-0.37331	54.82	73.0	4541	-888	-56	
10-26-76	930	50.0			-0.37341	54.81	72.8	4502	-927	-58	
11-4-76	1100	57.0			-0.37365	54.78	72.5	4465	-964	-61	
11-19-76	1430	72.2			-0.37397	54.74	72.1	4407	-1022	-65	
12-7-76	917	90.0			-0.37396	54.74	72.1	4306	-1123	-71	
12-7-76	1655	90.3			-0.37386	54.75	72.2	4306	-1123	-71	
12-8-76	817	90.9			-0.37401	54.73	72.0	4305	-1124	-71	
12-20-76	1445	103.2			-0.37485	54.62	70.9	4257	-1172	-76	
1-3-77	1145	117.1			-0.37515	54.59	70.4	4237	-1192	-79	
1-14-77	1200	128.1			-0.37482	54.63	70.9	4224	-1205	-78	
1-19-77	1050	133.0			-0.37478	54.63	70.9	4233	-1196	-78	
2-3-77	945	148.0			-0.37447	54.67	71.4	4216	-1213	-78	
2-5-77	826	149.9			-0.37458	54.66	71.2	4222	-1207	-78	
2-22-77	905	167.0			-0.37433	54.69	71.6	4206	-1223	-78	
3-5-77	747	177.9			-0.37403	54.73	72.0	4236	-1193	-75	
3-8-77	1525	181.2			-0.37397	54.74	72.1	4238	-1191	-75	
3-8-77	1650	181.3			-0.37391	54.74	72.2	4244	-1185	-75	
3-9-77	1555	182.2			-0.37380	54.76	72.3	4234	-1195	-75	
3-10-77	1617	183.3			-0.37394	54.74	72.1	4225	-1204	-76	
3-11-77	1546	184.2			-0.37389	54.75	72.2	4225	-1204	-76	
3-12-77	1202	185.1			-0.37418	54.71	71.8	4234	-1195	-76	
3-13-77	1326	186.1			-0.37417	54.71	71.8	4237	-1192	-76	
3-15-77	1230	188.1			-0.37438	54.68	71.5	4240	-1189	-76	
3-16-77	1547	189.2			-0.37449	54.67	71.3	4248	-1181	-76	
3-24-77	1138	197.1			-0.37423	54.70	71.7	4222	-1207	-77	
4-6-77	1446	210.2			-0.37396	54.74	72.1	4193	-1236	-78	
4-26-77	1041	230.0			-0.37392	54.74	72.1	4172	-1257	-79	
5-9-77	1347	243.2			-0.37416	54.71	71.8	4184	-1245	-79	
5-24-77	938	258.0			-0.37406	54.73	72.0	4186	-1243	-78	
6-17-77	856	282.0			-0.37372	54.77	72.4	4154	-1275	-79	
7-6-77	1056	301.0			-0.37356	54.79	72.6	4123	-1306	-80	
7-13-77	850	308.0			-0.37380	54.76	72.3	4147	-1282	-80	
7-18-77	920	313.0			-0.37357	54.79	72.6	4065	-1364	-84	
7-25-77	816	319.9			-0.37382	54.76	72.3	4080	-1349	-84	
8-2-77	842	327.9			-0.37310	54.85	73.3	4040	-1389	-84	
8-22-77	808	347.9			-0.37378	54.76	72.3	3986	-1443	-89	
***** LOADING BEGINS *****											
9-8-77	815	364.9			-0.0007	-0.37291	54.87	73.5	3983	-1446	-82
***** SPECIMEN FULLY LOADED, APPLIED TEST STRESS 2100 PSI *****											
9-8-77	816	364.9			0.0000	-0.37279	54.89	73.7	-2307	-7736	-419
9-8-77	856	365.0			0.0278	-0.37266	54.90	73.9	-2717	-8146	-441
9-8-77	1013	365.0			0.0813	-0.37266	54.90	73.9	-2815	-8244	-446
9-8-77	1410	365.2			0.2458	-0.37258	54.92	74.0	-2920	-8349	-451
9-9-77	1006	366.0			1.0764	-0.37259	54.91	74.0	-3256	-8685	-469
9-10-77	815	366.9			1.9993	-0.37299	54.86	73.4	-3163	-8592	-465
9-11-77	1117	368.1			3.1	-0.37306	54.85	73.3	-3261	-8690	-471
9-12-77	758	368.9			4.0	-0.37311	54.85	73.3	-3308	-8737	-474
9-13-77	922	370.0			5.0	-0.37299	54.86	73.4	-3403	-8832	-478
9-14-77	810	370.9			6.0	-0.37304	54.85	73.4	-3336	-8765	-475
9-22-77	831	378.9			14.0	-0.37306	54.85	73.3	-3737	-9166	-497
9-26-77	1433	383.2			18.3	-0.37266	54.90	73.9	-3857	-9286	-502
10-7-77	1639	394.3			29.3	-0.37275	54.89	73.8	-4207	-9636	-521
10-20-77	926	407.0			42.0	-0.37281	54.88	73.7	-4218	-9647	-522

MODULUS: LOADING E = 6.2 AT AGE 365 DAYS (STRESS LEVEL 0 TO 2100 PSI)

NOTE: MINUS DAYS UNDER LOAD INDICATES SPECIMEN LOADING TIME PRIOR TO FULL LOAD

TABLE L1

**ELASTIC AND CREEP STRAINS (NOT CORRECTED FOR AUTOGENOUS STRAINS)
UNION ELECTRIC OPTION 1 CLASS E-1 E57414
(SPECIMEN: SEALED 6 BY 16 IN. CONCRETE CYL.)**

CALIBRATION CONSTANTS:

METER RESISTANCE AT 0.0 DEGREES F.	= 48.06 OHMS	STRAIN METER NO. :	925	11-08
TEMP. CALIBRATION CONSTANT	= 10.87 F/OHM CHANGE IN RESIST.	AGE OF LOADING :	365	DAYS
STRAIN CALIBRATION CONSTANT	= 8.80 MICROVOLTS/VOLT/MICROSTRAIN	TEST TEMPERATURE :	110	DEG. F.
CALIBRATED RANGE	= 11100 TO -10100 MICROVOLTS/VOLT			
METER COEFF. OF THERMAL EXPANSION	= 6.7 MICRSTRAIN/DEGREE F.	LLT. STR.	: 9430.	PSI
CONCRETE COEFF. OF THERMAL EXPANSION	= 4.6 MICRSTRAIN/DEGREE F.	APPLIED TEST STRESS :	2100.	PSI
STRAIN INCREMENT FACTOR	= 6 PERCENT	PER. ULT. STF. APPLIED:	22.3	PERCENT

NOTE: FOR MODE 4 OR 5 VOLTS, AND MODE 3 MICROVOLTS -- THE BRIDGE VOLTAGE WAS 2.00000 VOLTS.

DATE	TIME	AGE, DAYS	DAYS UNDER LCAD	MODE 4 OR 5	RESIST. OHMS	TEMP. DEGREE F.	MODE 3 VOLTS	CHANGE MICROVOLTS	TEMPERATURE CORRECTED FROM ELASTIC CREEP SPECIFIC CREEP	
*****-----MICRSTRAIN-----*****										
*****-----TEMPERATURE CORRECTED-----*****										
*****-----FROM ELASTIC CREEP SPECIFIC CREEP*****										
*****-----*****										
9-8-76	1000	0								
SPECIMEN CAST										
9-9-76	1630	1.3			-37147	55.05	76.0	4103	0	
9-16-76	1400	8.2			-37308	54.85	73.8	3687	-416	
9-21-76	1145	13.1			-37321	54.83	73.6	3393	-710	
9-23-76	915	15.0			-37329	54.82	73.5	3306	-797	
10-1-76	930	23.0			-34728	58.20	110.2	1865	-2238	
10-7-76	1105	29.0			-34702	58.23	110.6	1387	-2716	
10-15-76	1320	37.1			-34754	58.16	109.8	1217	-2886	
10-21-76	1210	43.1			-34663	58.28	111.1	1200	-2903	
10-28-76	930	50.0			-34648	58.30	111.3	1132	-2571	
11-4-76	1110	57.0			-34658	58.29	111.2	1072	-3031	
11-19-76	1500	72.2			-34601	58.36	112.0	1034	-3069	
12-7-76	940	90.0			-34616	58.34	111.8	832	-3271	
12-7-76	1645	90.3			-34624	58.33	111.7	825	-3278	
12-8-76	840	90.9			-34608	58.36	111.9	815	-3288	
12-9-76	145	91.7			-34693	58.24	110.7	832	-3271	
12-15-76	1220	98.1			-34622	58.34	111.7	752	-3251	
12-20-76	1445	103.2			-34624	58.33	111.7	724	-3379	
12-23-76	845	105.9			-34592	58.38	112.1	704	-3399	
1-3-77	1145	117.1			-34619	58.34	111.8	635	-3468	
1-14-77	1330	128.1			-34657	58.29	111.2	587	-3516	
1-20-77	1155	134.1			-34654	58.29	111.2	557	-3546	
2-3-77	1000	148.0			-34628	58.33	111.6	495	-3608	
2-5-77	754	149.9			-34643	58.31	111.4	507	-3596	
2-22-77	836	166.9			-34625	58.33	111.7	400	-3703	
3-5-77	800	177.9			-34627	58.33	111.6	340	-3763	
3-8-77	1556	181.2			-34606	58.36	111.9	321	-3782	
3-8-77	1642	181.3			-34603	58.36	112.0	321	-3782	
3-9-77	1606	182.3			-34622	58.34	111.7	323	-3780	
3-10-77	1626	183.3			-34638	58.32	111.5	323	-3780	
3-11-77	1554	184.2			-34642	58.31	111.4	315	-3788	
3-12-77	1150	185.1			-34638	58.32	111.5	310	-3793	
3-13-77	1332	186.1			-34630	58.33	111.6	305	-3798	
3-15-77	1156	188.1			-34656	58.29	111.2	300	-3803	
3-16-77	1605	189.3			-34636	58.32	111.5	295	-3808	
3-24-77	1131	197.1			-34631	58.32	111.6	245	-3858	
4-6-77	1500	210.2			-34622	58.34	111.7	412	-3651	
4-26-77	1053	230.0			-34704	58.23	110.5	260	-3843	
5-9-77	1327	243.1			-34567	58.41	112.5	135	-3568	
5-24-77	1005	258.0			-34602	58.36	112.0	50	-4053	
6-17-77	842	281.9			-34629	58.33	111.6	-46	-4149	
7-6-77	1201	301.1			-34661	58.35	112.3	-104	-4207	
7-13-77	948	308.0			-34603	58.36	112.0	-126	-4229	
7-25-77	906	320.0			-34615	58.35	111.8	-181	-4284	
8-5-77	1156	331.1			-34577	58.40	112.4	-221	-4324	
8-22-77	832	347.9			-34670	58.27	111.0	-241	-4344	
9-8-77	832	364.9								
9-8-77	832	364.9			-0.0007	-34574	58.40	112.4	-311	-4414
9-8-77	833	364.9								
9-8-77	833	364.9								
9-8-77	849	365.0			-0.0111	-34574	58.40	112.4	-6709	-10642
9-8-77	1021	365.0			-0.0750	-34574	58.40	112.4	-7019	-11122
9-8-77	1418	365.2			-0.2396	-34566	58.41	112.5	-7231	-11334
9-9-77	850	366.0			1.0118	-34604	58.36	112.0	-7677	-11780
9-9-77	1034	366.0			1.0840	-34599	58.37	112.0	-7732	-11835
9-10-77	825	366.9			1.9944	-34618	58.34	111.8	-7876	-11979
9-11-77	1127	368.1			3.1	-34609	58.35	111.9	-8028	-12131
9-12-77	812	368.9			4.0	-34607	58.36	111.9	-7985	-12088
9-13-77	938	370.0			5.0	-34638	58.32	111.5	-7979	-12082
9-14-77	925	371.0			6.0	-34570	58.41	112.5	-8284	-12387
9-22-77	853	379.0			14.0	-34640	58.31	111.5	-8593	-12696
9-26-77	1519	383.2			18.3	-34640	58.31	111.5	-8814	-12917
10-7-77	1653	394.3			29.3	-34735	58.19	110.1	-9115	-13218
10-20-77	910	407.0			42.0	-34610	58.35	111.9	-9332	-13435

MODULUS: LOADING E = 6.3 AT AGE 365 DAYS (STRESS LEVEL 0 TO 2100 PSI)

NOTE: MINUS DAYS UNDER LCAD INDICATES SPECIMEN LOADING TIME PRIOR TO FULL LOAD

TABLE L2

ELASTIC AND CREEP STRAINS (NOT CORRECTED FOR AUTOGENOUS STRAINS)
 UNION ELECTRIC OPTION 1 CLASS E-1 E57414
 (SPECIMEN: SEALED 6 BY 16 IN. CONCRETE CYL.)

CALIBRATION CONSTANTS:

METER RESISTANCE AT 0.0 DEGREES F. = 48.16 OHMS
 TEMP. CALIBRATION CONSTANT = 10.85 F/CMH CHANGE IN RESIST.
 STRAIN CALIBRATION CONSTANT = 8.90 MICROVOLTS/VOLT/MICROSTRAIN
 CALIBRATED RANGE = 11100 TO -10100 MICROVOLTS/VOLT
 METER COEFF. OF THERMAL EXPANSION = 6.7 MICROSTRAIN/DEGREE F.
 CONCRETE COEFF. OF THERMAL EXPANSION = 4.6 MICRSTRAIN/DEGREE F.
 STRAIN INCREMENT FACTOR = 6 PERCENT

STRAIN METER NO. : 990 11-09
 AGE OF LOADING : 365 DAYS
 TEST TEMPERATURE : 110 DEG. F.

ULT. STR. : 6430. PSI
 APPLIED TEST STRESS : 2100. PSI
 PER. ULT. STR. APPLIED: 22.3 PERCENT

NOTE: FOR MODE 4 OR 5 VOLTS, AND MODE 3 MICROVOLTS -- THE BRIDGE VOLTAGE WAS 2.0000 VOLTS.

DATE	TIME	AGE, DAYS	MODE	RESIST. OHMS	TEMP. DEGREE F.	MODE 3 MICROVOLTS	%CHANGE FROM DAY ONE	TEMPERATURE CORRECTED ELASTIC CREEP	%ELASTIC CREEP	%CREEP
*****MICROSTRAIN*****										
SPECIMEN CAST										
9-8-76	1000	0								
9-9-76	1630	1.3								
9-16-76	1400	8.2								
9-21-76	1145	13.1								
9-23-76	915	15.0								
10-1-76	930	23.0								
10-7-76	1105	29.0								
10-15-76	1320	37.1								
10-21-76	1210	43.1								
10-28-76	930	50.0								
11-4-76	1110	57.0								
11-19-76	1500	72.2								
12-7-76	940	90.0								
12-7-76	1645	90.3								
12-8-76	840	90.9								
12-9-76	145	91.7								
12-15-76	1220	98.1								
12-20-76	1445	103.2								
12-23-76	845	105.9								
1-3-77	1145	117.1								
1-14-77	1330	128.1								
1-20-77	1155	134.1								
2-3-77	1000	148.0								
2-5-77	754	149.9								
2-22-77	836	166.9								
3-5-77	800	177.9								
3-8-77	1556	181.2								
3-8-77	1642	181.3								
3-9-77	1606	182.3								
3-10-77	1626	183.3								
3-11-77	1554	184.2								
3-12-77	1150	185.1								
3-13-77	1332	186.1								
3-15-77	1156	188.1								
3-16-77	1605	189.3								
3-24-77	1131	197.1								
4-6-77	1500	210.2								
4-26-77	1053	230.0								
5-9-77	1327	243.1								
5-24-77	1005	258.0								
6-17-77	642	281.9								
7-6-77	1201	301.1								
7-13-77	948	308.0								
7-25-77	906	320.0								
8-5-77	1156	331.1								
8-22-77	832	347.9								
9-8-77	832	364.9								
9-8-77	832	364.9								
9-8-77	833	364.9								
9-8-77	833	364.9								
9-8-77	849	365.0								
9-8-77	1021	365.0								
9-8-77	1418	365.2								
9-9-77	850	366.0								
9-9-77	1034	366.0								
9-10-77	825	366.9								
9-11-77	1127	368.1								
9-12-77	812	368.9								
9-13-77	938	370.0								
9-14-77	925	371.0								
9-22-77	853	379.0								
9-26-77	1519	383.2								
10-7-77	1653	394.3								
10-20-77	910	407.0								
LOADING BEGINS										
9-8-77	832	364.9								
9-8-77	833	364.9								
9-8-77	833	364.9								
9-8-77	849	365.0								
9-8-77	1021	365.0								
9-8-77	1418	365.2								
9-9-77	850	366.0								
9-9-77	1034	366.0								
9-10-77	825	366.9								
9-11-77	1127	368.1								
9-12-77	812	368.9								
9-13-77	938	370.0								
9-14-77	925	371.0								
9-22-77	853	379.0								
9-26-77	1519	383.2								
10-7-77	1653	394.3								
10-20-77	910	407.0								

MODULUS: LOADING E= 6.2 AT AGE 365 DAYS (STRESS LEVEL 0 TO 2100 PSI)

NOTE: MINUS DAYS UNDER LOAC INDICATES SPECIMEN LOADING TIME PRIOR TO FULL LOAD

TABLE M1

**ELASTIC AND CREEP STRAINS (NOT CORRECTED FOR AUTOGENOUS STRAINS)
UNION ELECTRIC OPTICAL CLASS E-1 ES7414
(SPECIMEN: SEALED 6 BY 16 IN. CONCRETE CYL.)**

CALIBRATION CONSTANTS:

METER RESISTANCE AT 0.0 DEGREES F. = 48.18 OHMS
 TEMP. CALIBRATION CONSTANT = 10.84 F/OHM CHANGE IN RESIST.
 STRAIN CALIBRATION CONSTANT = 8.93 MICROVOLTS/VOLT/MICROSTRAIN
 CALIBRATED RANGE = 11100 TO -10100 MICROVOLTS/VOLT
 METER COEFF. OF THERMAL EXPANSION = 6.7 MICROSTRAIN/DEGREE F.
 CONCRETE COEFF. OF THERMAL EXPANSION = 4.6 MICROCSTRAIN/DEGREE F.
 STRAIN INCREMENT FACTOR = 0 PERCENT

STRAIN METER NO. : 927 73-10
 AGE OF LOADING : DAYS
 TEST TEMPERATURE : 73 DEG. F.
 ULT. STR. : 0. PSI
 APPLIED TEST STRESS : 0. PSI
 PER. ULT. STR. APPLIED: 1 PERCENT

NOTE: FOR MODE 4 OR 5 VOLTS, AND MODE 3 MICROVOLTS -- THE BRIDGE VOLTAGE WAS 2.00000 VOLTS.

DATE	TIME	AGE, DAYS	DAYS	MODE	RESIST.	TEMP.	MODE 3	CHANGE	TEMPERATURE CORRECTED
				4 OR 5	OHMS	DEGREE	MICRO	MICRO FROM	ELASTIC CREEP SPECIFIC
			LOAD	VOLTS		F.	VOLTS	VOLTS DAY ONE	CREEP
***** SPECIMEN CAST *****									
9-8-76	1000	0							
9-9-76	1630	1.3			-37002	55.24	76.5	3520	0
9-16-76	1400	8.2			-37166	55.03	74.3	2975	-945
9-21-76	1145	13.1			-37176	55.02	74.1	2802	-718
9-23-76	915	15.0			-37184	55.01	74.0	2764	-756
10-1-76	930	23.0			-37173	55.02	74.2	2702	-818
10-7-76	1105	29.0			-37153	55.05	74.4	2672	-848
10-15-76	1320	37.1			-37179	55.01	74.1	2646	-874
10-21-76	1145	43.1			-37201	54.99	73.8	2615	-905
10-26-76	930	50.0			-37203	54.98	73.7	2580	-940
11-4-76	1100	57.0			-37227	54.95	73.4	2530	-990
11-19-76	1430	72.2			-37525	54.57	69.3	2382	-1138
12-7-76	917	90.0			-37251	54.92	73.1	2236	-1284
12-7-76	1455	90.3			-37236	54.94	73.3	2234	-1286
12-8-76	817	90.9			-37261	54.91	72.9	2235	-1285
12-20-76	1445	103.2			-37332	54.81	71.9	2157	-1363
1-3-77	1145	117.1			-37357	54.79	71.6	2100	-1420
1-14-77	1200	128.1			-37327	54.83	72.0	2066	-1454
1-19-77	1050	133.0			-37326	54.83	72.0	2064	-1456
2-3-77	945	148.0			-37299	54.86	72.4	2059	-1461
2-5-77	826	149.9			-37313	54.84	72.2	2070	-1450
2-22-77	905	167.0			-37288	54.88	72.6	2044	-1476
3-5-77	747	177.9			-37256	54.92	73.0	2076	-1444
3-8-77	1525	181.2			-37252	54.92	73.1	2083	-1437
3-8-77	1650	181.3			-37246	54.93	73.1	2085	-1435
3-9-77	1555	182.2			-37236	54.94	73.3	2080	-1440
3-10-77	1617	183.3			-37247	54.93	73.1	2069	-1451
3-11-77	1546	184.2			-37242	54.93	73.2	2069	-1451
3-12-77	1202	185.1			-37268	54.90	72.9	2079	-1441
3-13-77	1326	186.1			-37270	54.90	72.8	2082	-1438
3-15-77	1230	188.1			-37263	54.88	72.6	2080	-1440
3-16-77	1547	189.2			-37291	54.87	72.5	2091	-1429
3-24-77	1138	197.1			-37271	54.90	72.8	2065	-1455
4-6-77	1446	210.2			-37261	54.91	72.9	2043	-1477
4-26-77	1041	230.0			-37265	54.90	72.9	2023	-1497
5-9-77	1347	243.2			-37260	54.88	72.7	2014	-1506
5-17-77	823	250.9			-37289	54.87	72.6	2016	-1504
5-24-77	938	258.0			-37271	54.90	72.8	2017	-1503
7-6-77	1056	301.0			-37223	54.96	73.5	2110	-1410
7-13-77	850	308.0			-37245	54.93	73.2	2145	-1375
7-18-77	920	313.0			-37222	54.96	73.5	2060	-1460
7-25-77	816	319.9			-37227	54.95	73.4	2075	-1445
8-2-77	842	327.9			-37165	55.03	74.3	2017	-1503
9-8-77	815	364.9			-37194	54.99	73.9	1998	-1522
12-8-77	815	455.9			-37194	54.99	73.9	1998	-1522

TABLE M2

**ELASTIC AND CREEP STRAINS (NOT CORRECTED FOR AUTOGENOUS STRAINS)
UNION ELECTRIC OPTION 1 CLASS E-1 E57414
(SPECIMEN: SEALED 6 BY 16 IN. CONCRETE CYL.)**

CALIBRATION CONSTANTS:

METER RESISTANCE AT 0.0 DEGREES F. = 48.10 OHMS
 TEMP. CALIBRATION CONSTANT = 10.26 F/OHM CHANGE IN RESIST.
 STRAIN CALIBRATION CONSTANT = 8.79 MICROVOLTS/VOLT/MICROSTRAIN
 CALIBRATED RANGE = 11100 TO -10100 MICROVOLTS/VOLT
 MEYER COEFF. OF THERMAL EXPANSION = 6.7 MICRSTRAIN/DEGREE F.
 CONCRETE COEFF. OF THERMAL EXPANSION = 4.6 MICRSTRAIN/DEGREE F.
 STRAIN INCREMENT FACTOR = 0 PERCENT

STRAIN METER NO. : 988 73-11
 AGE OF LOADING : DAYS
 TEST TEMPERATURE : 73 DEG. F.

ULT. STR. : 0. PSI
 APPLIED TEST STRESS : 0. PSI
 PER. ULT. STR. APPLIED: 1 PERCENT

NOTE: FOR MODE 4 OR 5 VOLTS, AND MODE 3 MICROVOLTS -- THE BRIDGE VOLTAGE WAS 2.00000 VOLTS.

DATE	TIME	AGE, DAYS	LOAD VOLTS	MODE	RESIST. OHMS	TEMP. F.	MCDE 3 VOLTS	CHANGE VOLTS	TEMPERATURE CORRECTED	ELASTIC CREEP	SPECIFIC CREEP
***** MICROSTRAIN *****											
***** TEMPERATURE CORRECTED *****											
***** FROM ELASTIC CREEP SPECIFIC CREEP *****											
***** SPECIMEN CAST *****											
9	8-76	1000	0								
9	9-76	1630	1.3		-37112	55.10	76.0	5429	0	0	
9	16-76	1400	8.2		-37278	54.89	73.7	5014	-415	-27	
9	21-76	1145	13.1		-37293	54.87	73.5	4831	-598	-38	
9	23-76	915	15.0		-37299	54.86	73.4	4770	-659	-42	
10	1-76	930	23.0		-37293	54.87	73.5	4667	-762	-48	
10	7-76	1105	29.0		-37268	54.90	73.8	4580	-849	-52	
10	15-76	1320	37.1		-37294	54.87	73.5	4536	-893	-55	
10	21-76	1145	43.1		-37331	54.82	73.0	4541	-888	-56	
10	28-76	930	50.0		-37341	54.81	72.8	4502	-927	-58	
11	4-76	1100	57.0		-37365	54.78	72.5	4465	-964	-61	
11	19-76	1430	72.2		-37397	54.74	72.1	4407	-1022	-65	
12	7-76	917	90.0		-37366	54.74	72.1	4306	-1123	-71	
12	7-76	1655	90.3		-37386	54.75	72.2	4306	-1123	-71	
12	8-76	817	90.9		-37401	54.73	72.0	4305	-1124	-71	
12	20-76	1445	103.2		-37485	54.62	70.9	4257	-1172	-76	
1	3-77	1145	117.1		-37515	54.59	70.4	4237	-1192	-79	
1	14-77	1200	128.1		-37482	54.63	70.9	4224	-1205	-78	
1	19-77	1050	133.0		-37478	54.63	70.9	4233	-1196	-78	
2	3-77	945	148.0		-37447	54.67	71.4	4216	-1213	-78	
2	5-77	826	149.9		-37458	54.66	71.2	4222	-1207	-78	
2	22-77	905	167.0		-37433	54.69	71.6	4206	-1223	-78	
3	5-77	747	177.9		-37403	54.73	72.0	4236	-1193	-75	
3	8-77	1525	181.2		-37397	54.74	72.1	4230	-1191	-75	
3	8-77	1650	181.3		-37391	54.74	72.2	4244	-1185	-75	
3	9-77	1555	182.2		-37380	54.76	72.3	4234	-1195	-75	
3	10-77	1617	183.3		-37394	54.74	72.1	4225	-1204	-76	
3	11-77	1546	184.2		-37389	54.75	72.2	4225	-1204	-76	
3	12-77	1202	185.1		-37418	54.71	71.8	4234	-1195	-76	
3	13-77	1326	186.1		-37417	54.71	71.8	4237	-1192	-76	
3	15-77	1230	188.1		-37438	54.68	71.5	4240	-1189	-76	
3	16-77	1547	189.2		-37449	54.67	71.3	4248	-1181	-76	
3	24-77	1138	197.1		-37423	54.70	71.7	4222	-1207	-77	
4	6-77	1446	210.2		-37396	54.74	72.1	4193	-1236	-78	
4	26-77	1041	230.0		-37392	54.74	72.1	4172	-1257	-79	
5	9-77	1347	243.2		-37416	54.71	71.8	4184	-1245	-79	
5	17-77	823	250.9		-37419	54.71	71.8	4191	-1238	-78	
5	24-77	938	258.0		-37406	54.73	72.0	4186	-1243	-78	
7	6-77	1056	301.0		-37356	54.79	72.6	4123	-1306	-80	
7	13-77	850	308.0		-37380	54.76	72.3	4147	-1282	-80	
7	18-77	920	313.0		-37357	54.79	72.6	4065	-1364	-84	
7	25-77	816	319.9		-37382	54.76	72.3	4080	-1349	-84	
8	2-77	842	327.9		-37310	54.85	73.3	4040	-1389	-84	
9	8-77	815	364.9		-37291	54.87	73.5	3983	-1446	-86	
12	8-77	815	455.9		-37291	54.87	73.5	3983	-1446	-86	

TABLE N1

ELASTIC AND CREEP STRAINS (NOT CORRECTED FOR AUTOGENOUS STRAINS)
 UNICA ELECTRIC OPTION 1 CLASS E-1 E57414
 (SPECIMEN: SEALED & BY 16 IN. CONCRETE CYL.)

CALIBRATION CONSTANTS:

METER RESISTANCE AT 0.0 DEGREES F.	= 48.06 OHMS	STRAIN METER NO. :	989	11-08
TEMP. CALIBRATION CONSTANT	= 10.87 F/OHM CHANGE IN RESIST.	AGE OF LOADING :		DAYS
STRAIN CALIBRATION CONSTANT	= 8.80 MICROVOLTS/VOLT/MICROSTRAIN	TEST TEMPERATURE :	110	DEG. F.
CALIBRATED RANGE	= 11100 TC -10100 MICROVOLTS/VOLT			
METER COEFF. OF THERMAL EXPANSION	= 6.7 MICROSTRAIN/DEGREE F.	ULT. STR. :	0.	PSI
CONCRETE COEFF. OF THERMAL EXPANSION	= 4.6 MICROSTRAIN/DEGREE F.	APPLIED TEST STRESS :	0.	PSI
STRAIN INCREMENT FACTOR	= 0 PERCENT	PER. ULT. STR. APPLIED:		1 PERCENT

NOTE: FOR MODE 4 OR 5 VOLTS, AND MODE 3, MICROVOLTS — THE BRIDGE VOLTAGE WAS 2.00000 VOLTS.

DATE	TIME	AGE, DAYS	MODE	RESIST.	TEMP.	MODE 3	CHANGE	TEMPERATURE CORRECTED
			4 CR 5	CHMS	DEGREE	MICRO-	MICRO-	FROM ELASTIC CREEP SPECIFIC
			LCAD	VOLTS	F.	VOLTS	DAY ONE	CREEP
*****-----MICROSTRAIN-----								
9-8-76	1000	0	SPECIMEN CAST					
9-9-76	1630	1.3		-.37147	55.05	76.0	4103	0
9-16-76	1400	8.2		-.37308	54.85	73.8	3687	-416
9-21-76	1145	13.1		-.37321	54.83	73.6	3393	-710
9-23-76	915	15.0		-.37329	54.82	73.5	3306	-797
10-1-76	930	23.0		-.34728	58.20	110.2	1865	-2238
10-7-76	1105	29.0		-.34702	58.23	110.6	1387	-2716
10-15-76	1320	37.1		-.34754	58.16	109.8	1217	-2886
10-21-76	1210	43.1		-.34663	58.28	111.1	1200	-2903
10-28-76	930	50.0		-.34648	58.30	111.3	1132	-2971
11-4-76	1110	57.0		-.34658	58.29	111.2	1072	-3031
11-19-76	1500	72.2		-.34601	58.36	112.0	1034	-3069
12-7-76	940	90.0		-.34616	58.34	111.8	832	-3271
12-7-76	1645	90.3		-.34624	58.33	111.7	825	-3278
12-8-76	840	90.9		-.34608	58.36	111.9	815	-3288
12-9-76	145	91.7		-.34653	58.24	110.7	832	-3271
12-15-76	1220	98.1		-.34622	58.34	111.7	752	-3351
12-20-76	1445	103.2		-.34624	58.33	111.7	724	-3379
12-23-76	845	105.9		-.34592	58.38	112.1	704	-3399
1-3-77	1145	117.1		-.34619	58.34	111.8	635	-3468
1-14-77	1330	128.1		-.34657	58.29	111.2	587	-3516
1-20-77	1155	134.1		-.34654	58.29	111.2	557	-3546
2-3-77	1000	148.0		-.34628	58.33	111.6	495	-3608
2-5-77	754	149.9		-.34643	58.31	111.4	507	-3596
2-22-77	836	166.9		-.34625	58.33	111.7	400	-3703
3-5-77	800	177.9		-.34627	58.33	111.6	340	-3763
3-8-77	1556	181.2		-.34606	58.36	111.9	321	-3782
3-8-77	1642	181.3		-.34603	58.36	112.0	321	-3782
3-9-77	1606	182.3		-.34622	58.34	111.7	323	-3780
3-10-77	1626	183.3		-.34638	58.32	111.5	323	-3780
3-11-77	1554	184.2		-.34642	58.31	111.4	315	-3788
3-12-77	1150	185.1		-.34638	58.32	111.5	310	-3793
3-13-77	1332	186.1		-.34630	58.33	111.6	305	-3798
3-15-77	1156	188.1		-.34656	58.29	111.2	300	-3803
3-16-77	1605	189.3		-.34636	58.32	111.5	295	-3808
3-24-77	1131	197.1		-.34631	58.32	111.6	245	-3858
4-6-77	1500	210.2		-.34622	58.34	111.7	412	-3691
4-26-77	1053	230.0		-.34784	58.23	110.5	260	-3843
5-9-77	1327	243.1		-.34567	58.41	112.5	135	-3568
5-17-77	811	250.9		-.34625	58.33	111.7	100	-4003
5-24-77	1005	258.0		-.34602	58.36	112.0	50	-4053
6-17-77	842	281.9		-.34629	58.33	111.6	-46	-4149
7-6-77	1201	301.1		-.34581	58.39	112.3	-104	-4207
7-13-77	948	308.0		-.34603	58.36	112.0	-126	-4229
7-25-77	986	320.0		-.34615	58.35	111.8	-181	-4284
8-5-77	1156	331.1		-.34577	58.40	112.4	-221	-4324
8-22-77	832	347.9		-.34670	58.27	111.0	-241	-4344
9-8-77	832	364.9		-.34574	58.40	112.4	-311	-4414
12-8-77	832	455.9		-.34574	58.40	112.4	-311	-4414

TABLE N2

ELASTIC AND CREEP STRAINS (NOT CORRECTED FOR AUTOGENOUS STRAINS)
 UNION ELECTRIC OPTION 1 CLASS E-1 E57414
 (SPECIMEN: SEALED & BY 16 IN. CONCRETE CYL.)

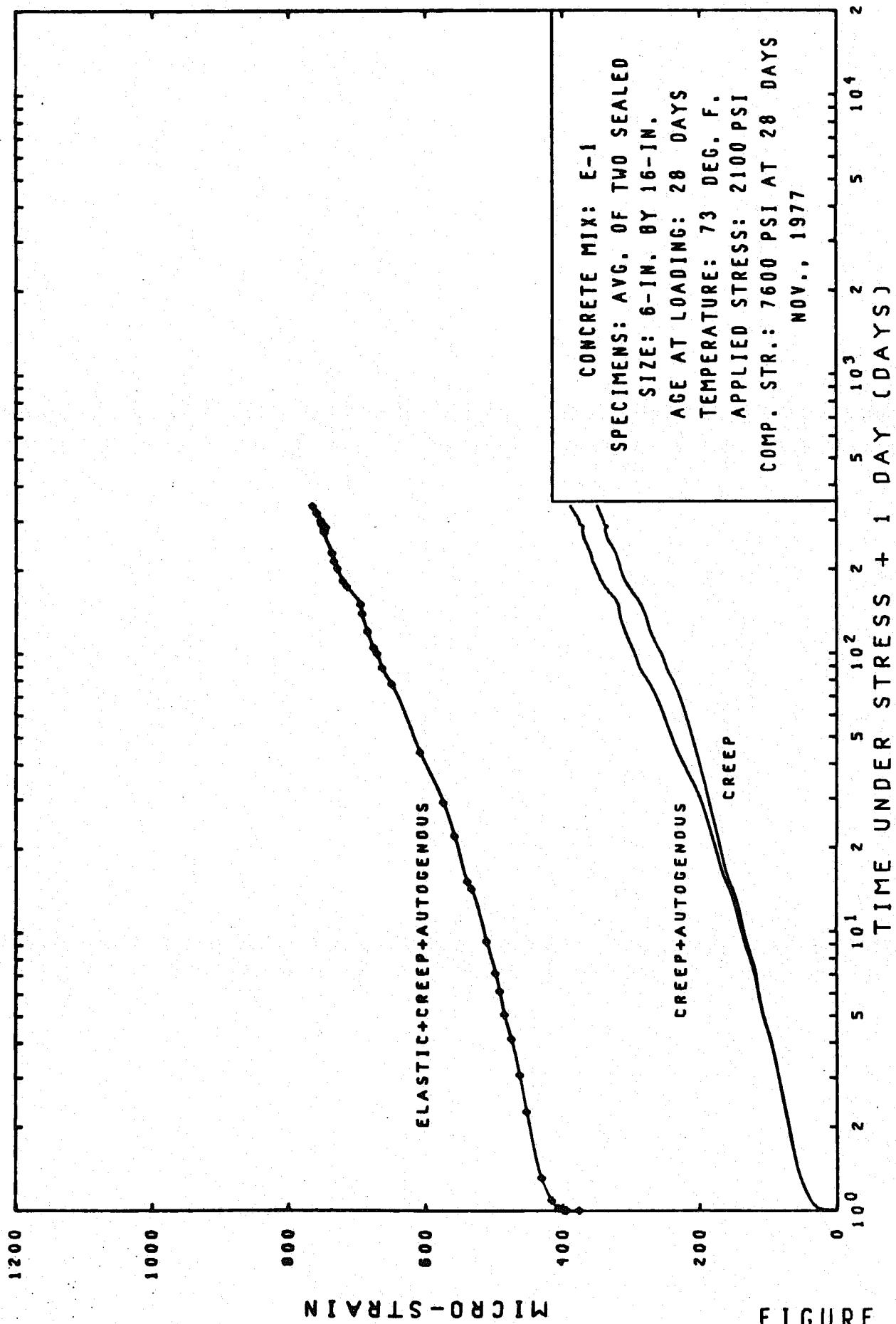
CALIBRATION CONSTANTS:

METER RESISTANCE AT 0.0 DEGREES F. = 48.16 OHMS
 TEMP. CALIBRATION CONSTANT = 10.85 F/OHM CHANGE IN RESIST.
 STRAIN CALIBRATION CONSTANT = 8.90 MICROVOLTS/VOLT/MICROSTRAIN
 CALIBRATED RANGE = 11100 TC -10100 MICROVOLTS/VOLT
 METER COEFF. OF THERMAL EXPANSION = 6.7 MICRSTRAIN/DEGREE F.
 CONCRETE COEFF. OF THERMAL EXPANSION = 4.6 MICRSTRAIN/DEGREE F.
 STRAIN INCREMENT FACTOR = 0 PERCENT

STRAIN METER NO. : 950 11-09
 AGE OF LOADING : DAYS
 TEST TEMPERATURE : 110 DEG. F.
 LLT. STR. : 0. PSI
 APPLIED TEST STRESS : 0. PSI
 PER. ULT. STR. APPLIED: 1 PERCENT

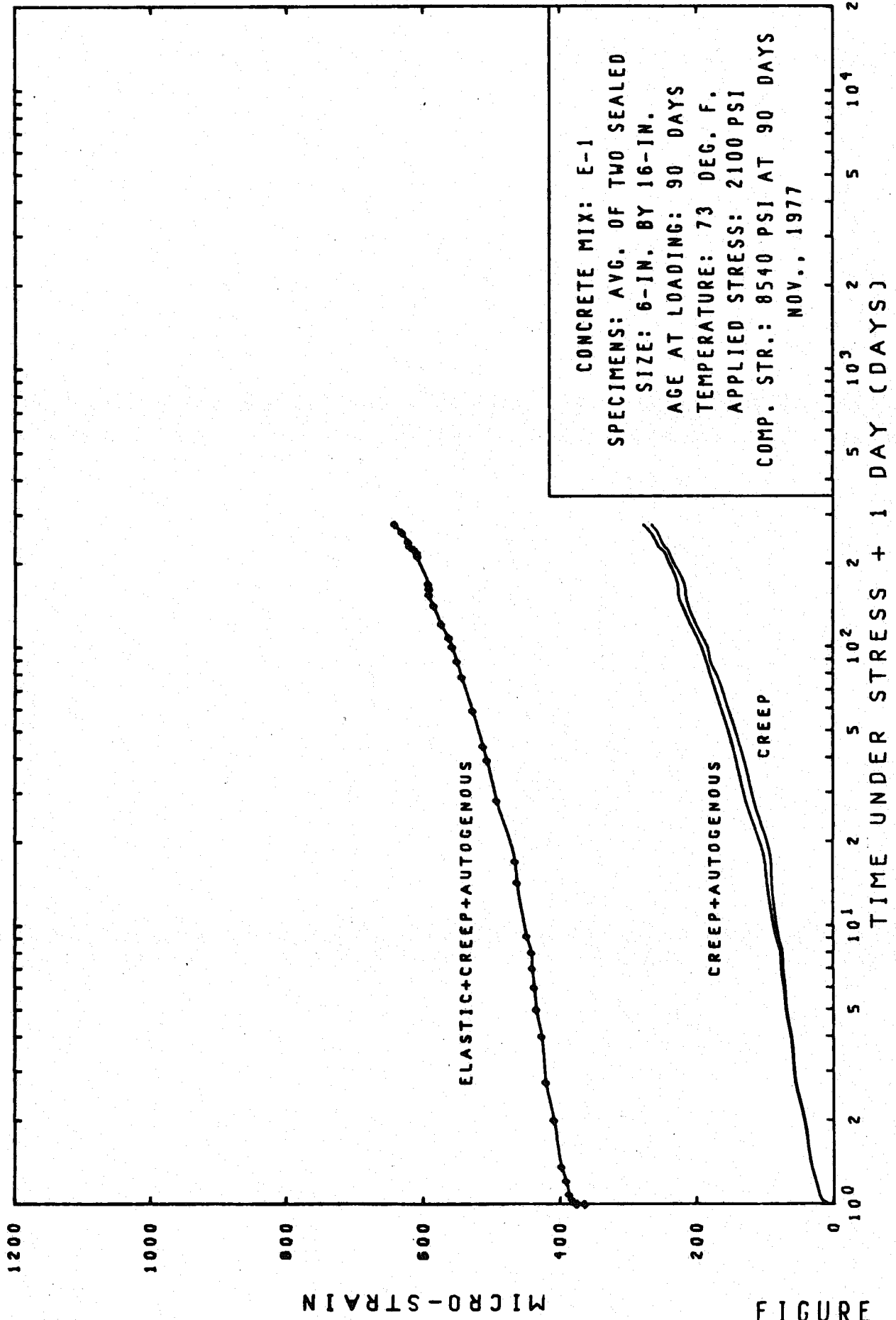
NOTE: FOR MODE 4 OR 5 VOLTS, AND MODE 3 MICROVOLTS -- THE BRIDGE VOLTAGE WAS 2.00000 VOLTS.

DATE	TIME	AGE, DAYS	MODE	RESIST.	TEMP.	MODE 3	CHANGE	TEMPERATURE CORRECTED
			4 OR 5	OHMS	DEGREE	MICRO-	FROM	ELASTIC CREEP SPECIFIC
		LOAD	VOLTS	F.	VOLTS	VOLTS	DAY ONE	CREEP
***** MICROSTRAIN *****								
SPECIMEN CAST								
9-8-76	1000	0						
9-9-76	1630	1.3		-37059	55.17	76.0	10506	0
9-16-76	1400	8.2		-37216	54.97	73.8	10004	-502
9-21-76	1145	13.1		-37233	54.95	73.6	9896	-610
9-23-76	915	15.0		-37237	54.94	73.6	9862	-644
10-1-76	930	23.0		-34642	58.31	110.1	8469	-2037
10-7-76	1105	29.0		-34638	58.32	110.2	8296	-2210
10-15-76	1320	37.1		-34689	58.25	109.5	8047	-2459
10-21-76	1210	43.1		-34586	58.38	110.9	7798	-2708
10-28-76	930	50.0		-34553	58.43	111.4	7574	-2532
11-4-76	1110	57.0		-34572	58.40	111.1	7511	-2595
11-19-76	1500	72.2		-34534	58.45	111.7	7498	-3008
12-7-76	940	90.0		-34551	58.43	111.4	7278	-3228
12-7-76	1645	90.3		-34557	58.42	111.4	7269	-3237
12-8-76	840	90.9		-34540	58.45	111.6	7257	-3249
12-9-76	145	91.7		-34626	58.33	110.4	7278	-3228
12-15-76	1220	98.1		-34557	58.42	111.4	7167	-3339
12-20-76	1445	103.2		-34557	58.42	111.4	7123	-3383
12-23-76	845	105.9		-34525	58.47	111.8	7091	-3415
1-3-77	1145	117.1		-34583	58.43	111.4	7009	-3497
1-14-77	1330	128.1		-34589	58.38	110.9	6946	-3560
1-20-77	1155	134.1		-34586	58.38	110.9	6907	-3599
2-3-77	1000	148.0		-34563	58.42	111.3	6824	-3682
2-5-77	754	149.9		-34580	58.39	111.0	6829	-3677
2-22-77	836	166.9		-34555	58.43	111.4	6692	-3814
3-5-77	800	177.9		-34557	58.42	111.4	6622	-3884
3-8-77	1556	181.2		-34538	58.45	111.6	6606	-3900
3-8-77	1642	181.3		-34536	58.45	111.7	6599	-3907
3-9-77	1606	182.3		-34554	58.43	111.4	6600	-3906
3-10-77	1626	183.3		-34571	58.40	111.2	6596	-3910
3-11-77	1554	184.2		-34572	58.40	111.1	6588	-3918
3-12-77	1150	185.1		-34570	58.41	111.2	6586	-3920
3-13-77	1332	186.1		-34560	58.42	111.3	6575	-3931
3-15-77	1156	188.1		-34586	58.38	110.9	6573	-3933
3-16-77	1605	189.3		-34569	58.41	111.2	6563	-3943
3-24-77	1131	197.1		-34558	58.42	111.3	6510	-3996
4-6-77	1500	216.2		-34547	58.44	111.5	6652	-3854
4-26-77	1053	230.0		-34629	58.33	110.3	6488	-4018
5-9-77	1327	243.1		-34492	58.51	112.3	6356	-4150
5-17-77	811	250.9		-34550	58.43	111.5	6330	-4176
5-24-77	1005	258.0		-34527	58.46	111.8	6280	-4226
6-17-77	842	281.9		-34526	58.42	111.4	6189	-4317
7-6-77	1201	301.1		-34509	58.49	112.1	6129	-4377
7-13-77	548	308.0		-34524	58.46	111.8	6100	-4406
7-25-77	906	320.0		-34542	58.44	111.6	6053	-4453
8-5-77	1156	331.1		-34502	58.50	112.2	6006	-4500
8-22-77	832	347.9		-34599	58.37	110.8	5987	-4519
9-8-77	832	364.9		-34496	58.50	112.2	5902	-4604
12-8-77	832	455.9		-34496	58.50	112.2	5902	-4604



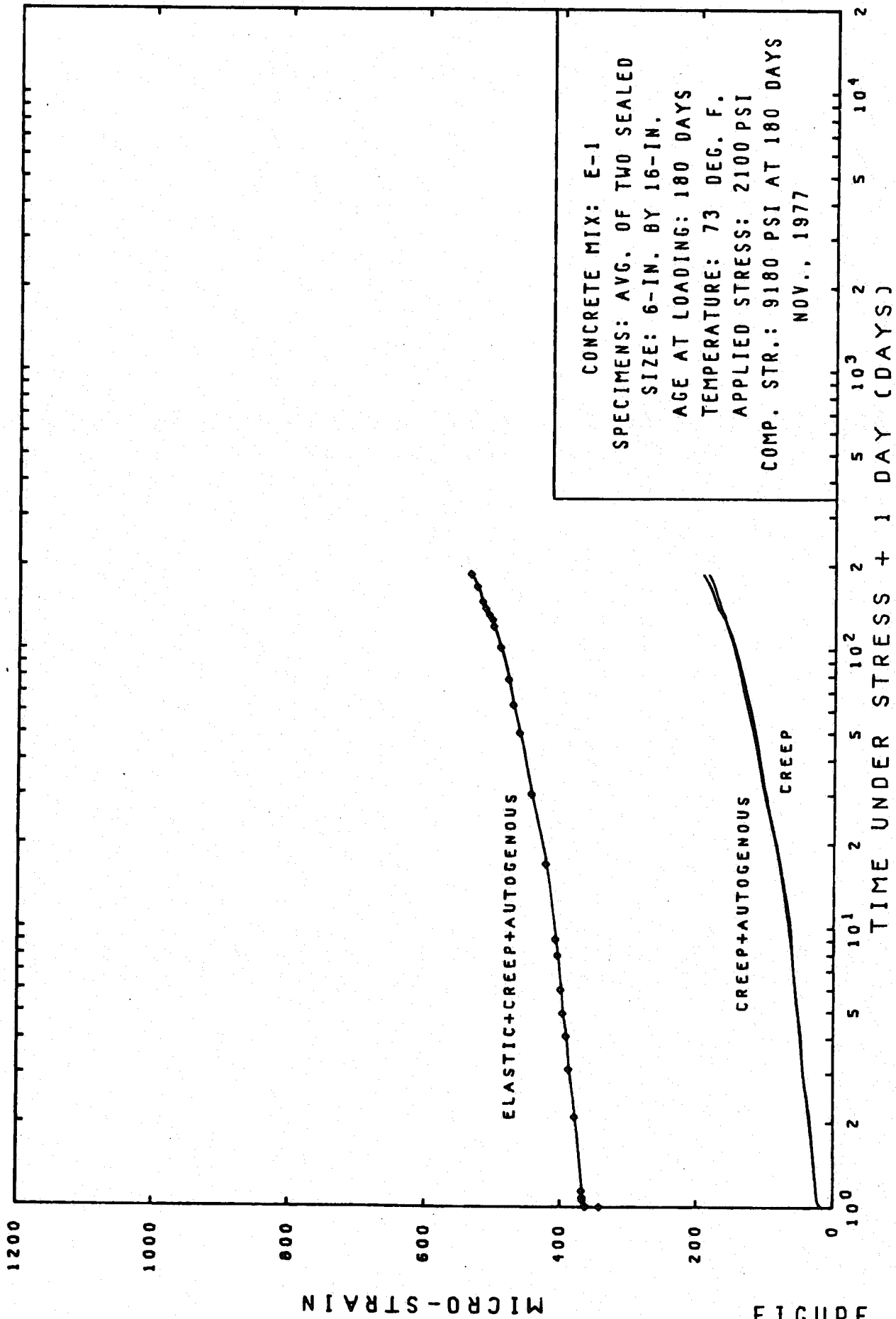
ELASTIC, CREEP AND AUTOGENOUS STRAINS
 CALLAWAY POST TENSIONED REACTOR BUILDING

FIGURE 1



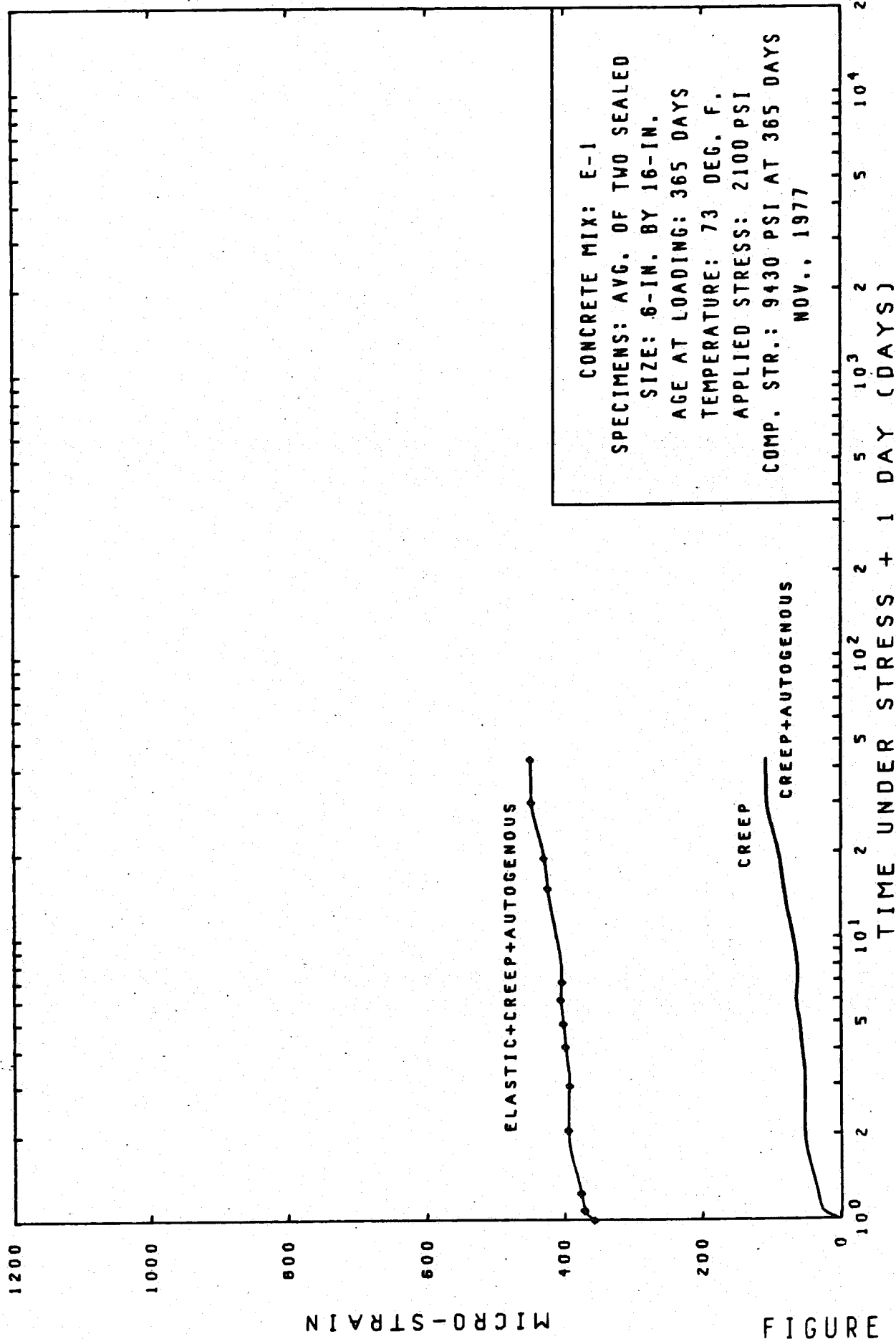
ELASTIC, CREEP AND AUTOGENOUS STRAINS
 CALLAWAY POST TENSIONED REACTOR BUILDING

FIGURE 2



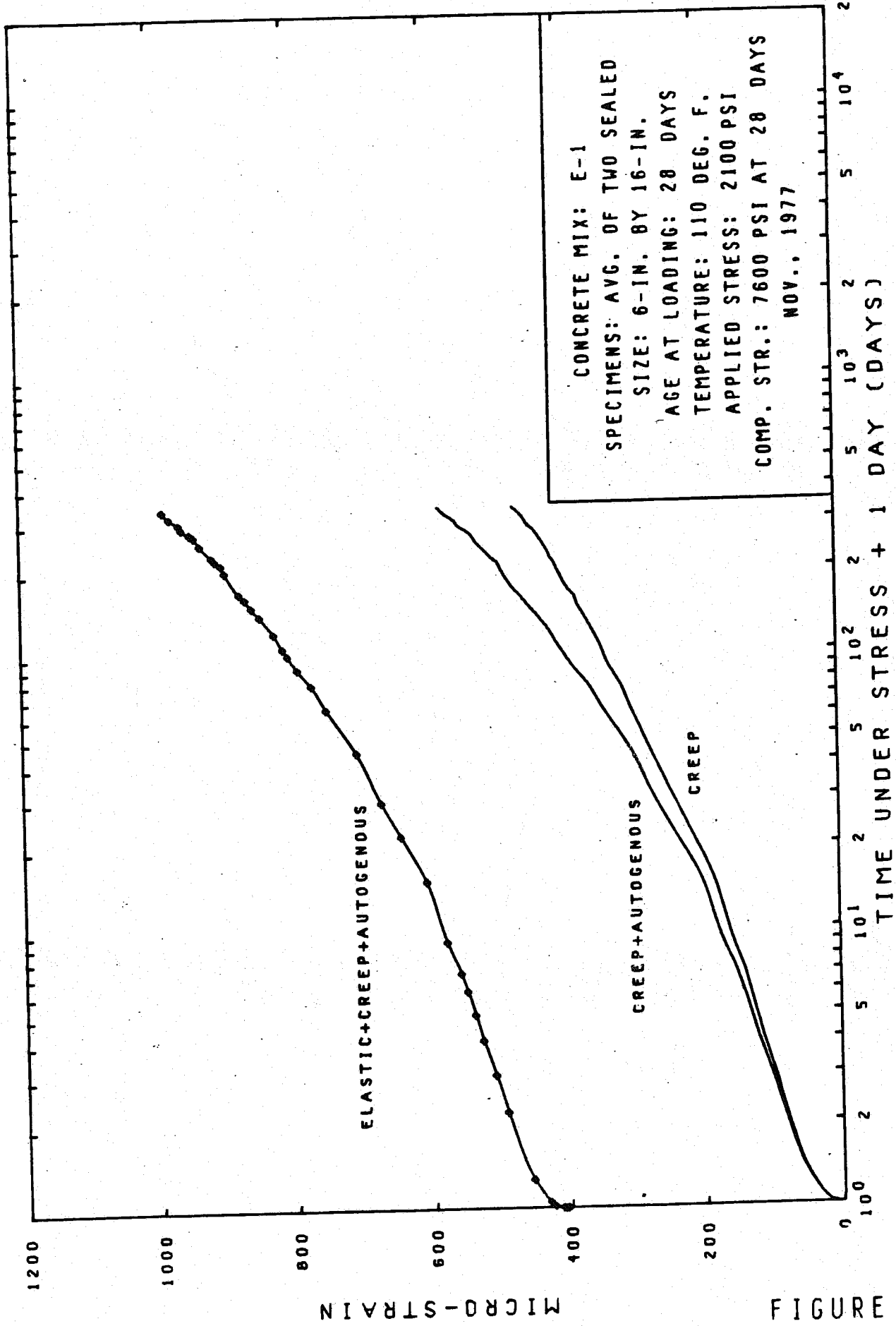
ELASTIC, CREEP AND AUTOGENOUS STRAINS
 CALLAWAY POST TENSIONED REACTOR BUILDING

FIGURE 3



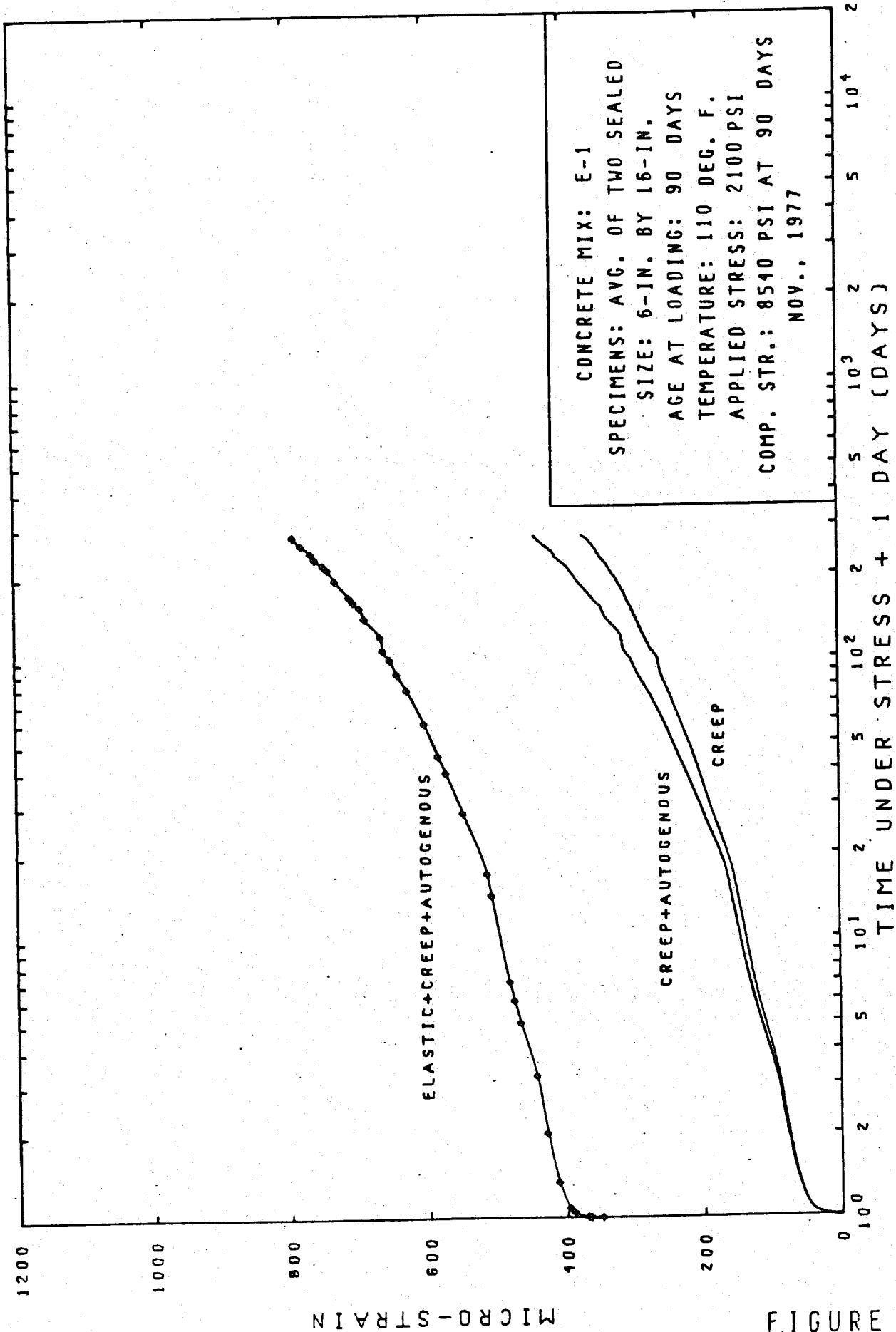
ELASTIC, CREEP AND AUTOGENOUS STRAINS
 CALLAWAY POST TENSIONED REACTOR BUILDING

FIGURE 4



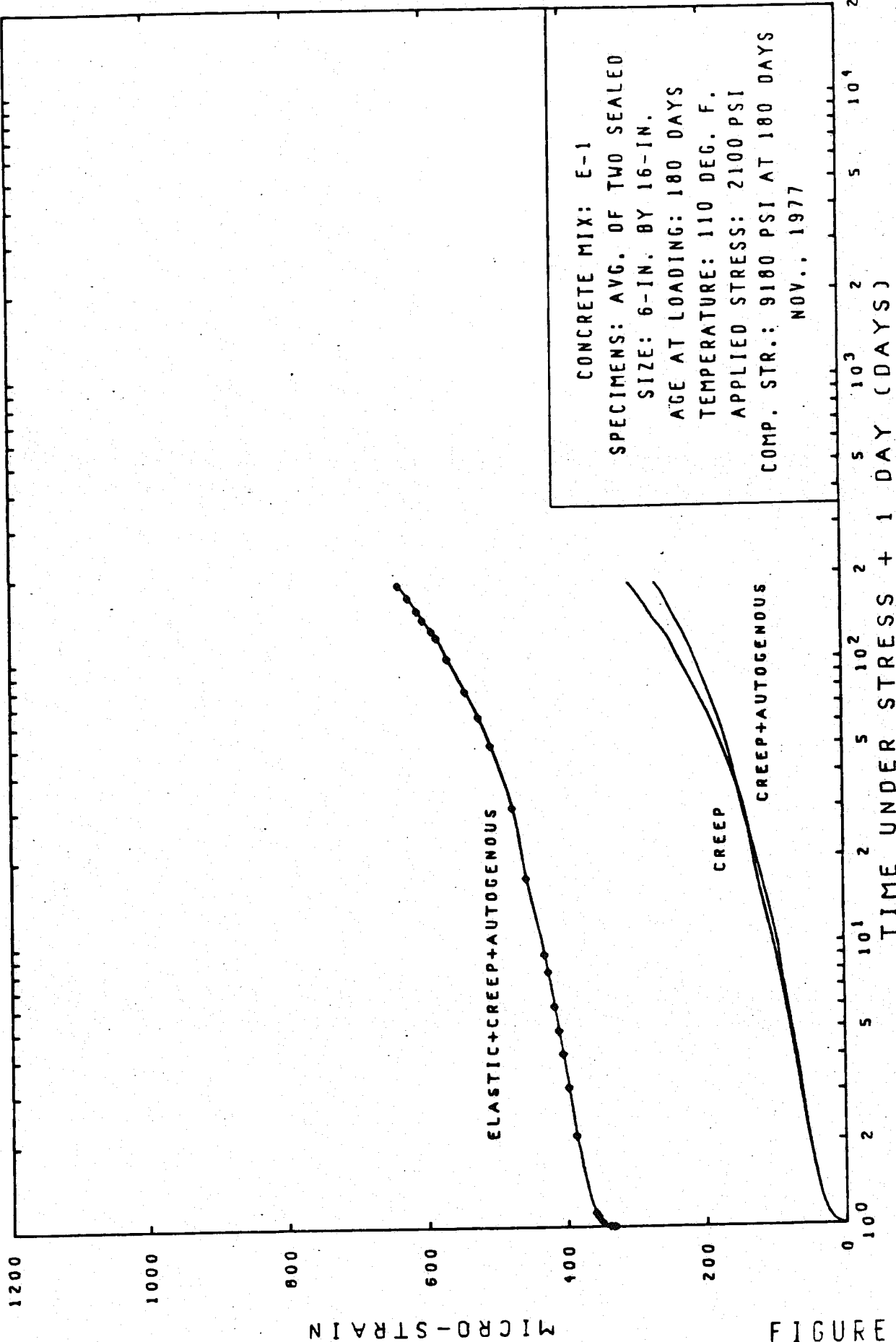
ELASTIC, CREEP AND AUTOGENOUS STRAINS
CALLAWAY POST TENSIONED REACTOR BUILDING

FIGURE 5



ELASTIC, CREEP AND AUTOGENOUS STRAINS
 CALLAWAY POST TENSIONED REACTOR BUILDING

FIGURE 6

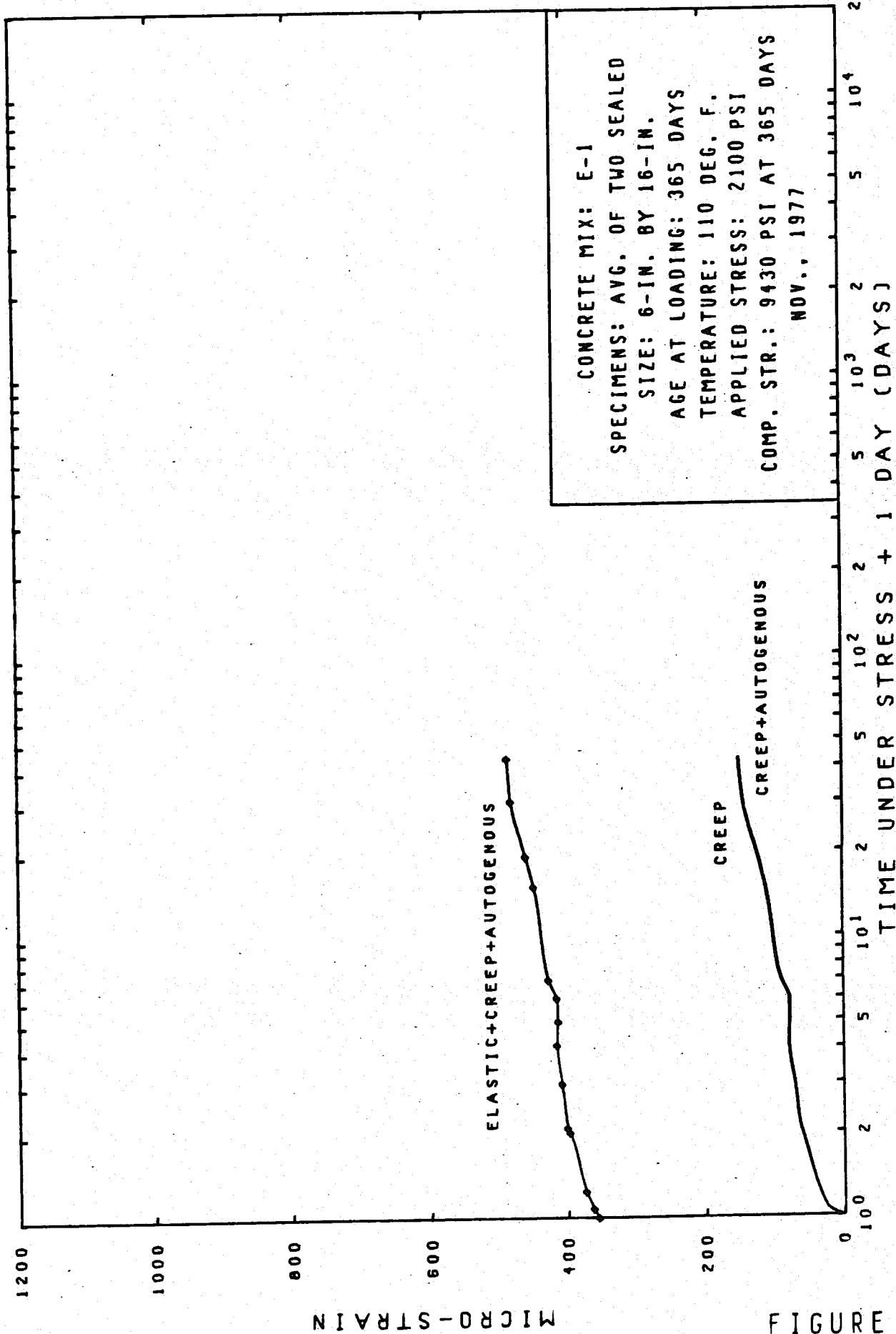


MICRO-STRAIN

TIME UNDER STRESS + 1 DAY (DAYS)

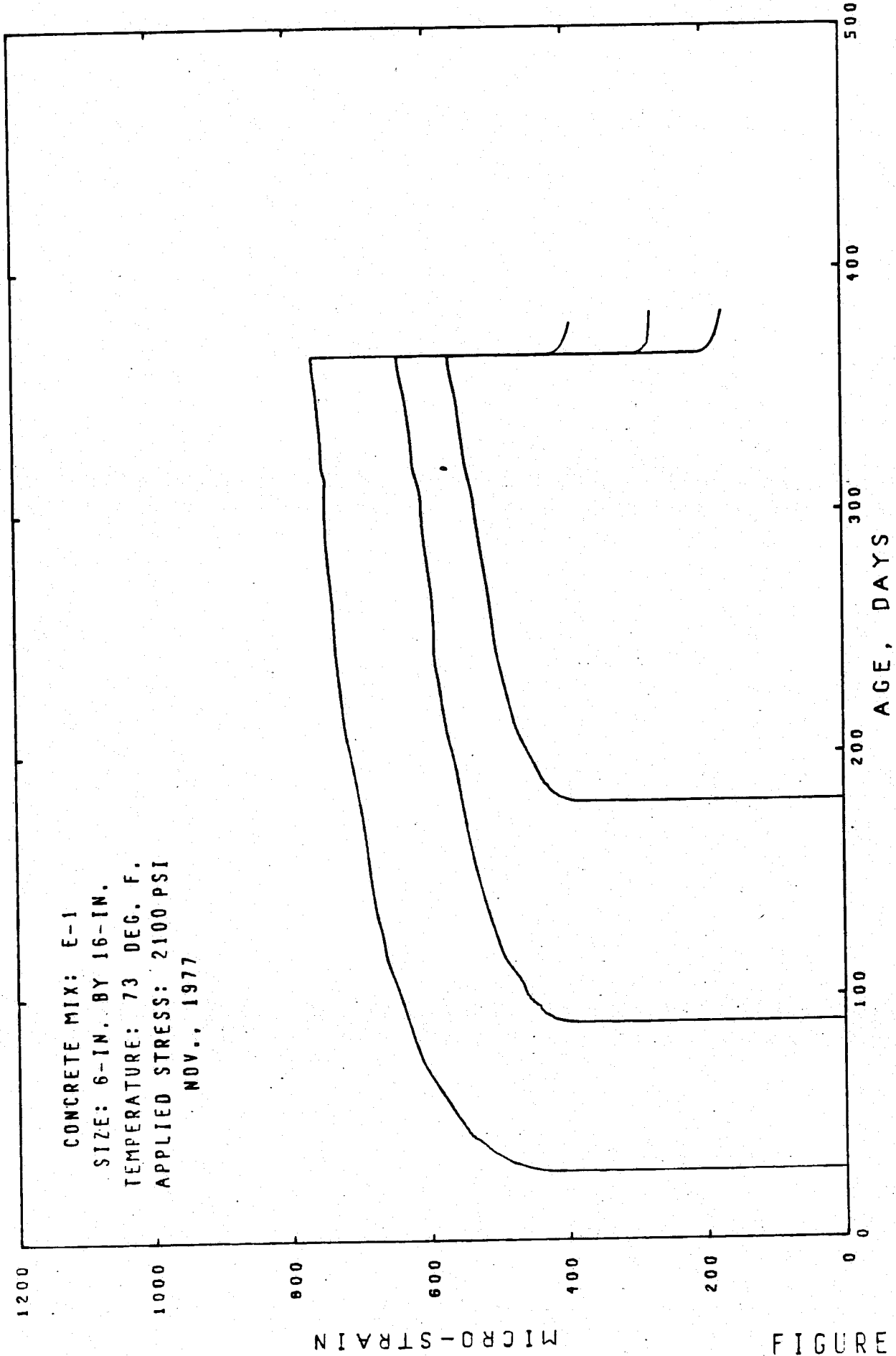
FIGURE 7

ELASTIC, CREEP AND AUTOGENOUS STRAINS
 CALLAWAY POST TENSIONED REACTOR BUILDING



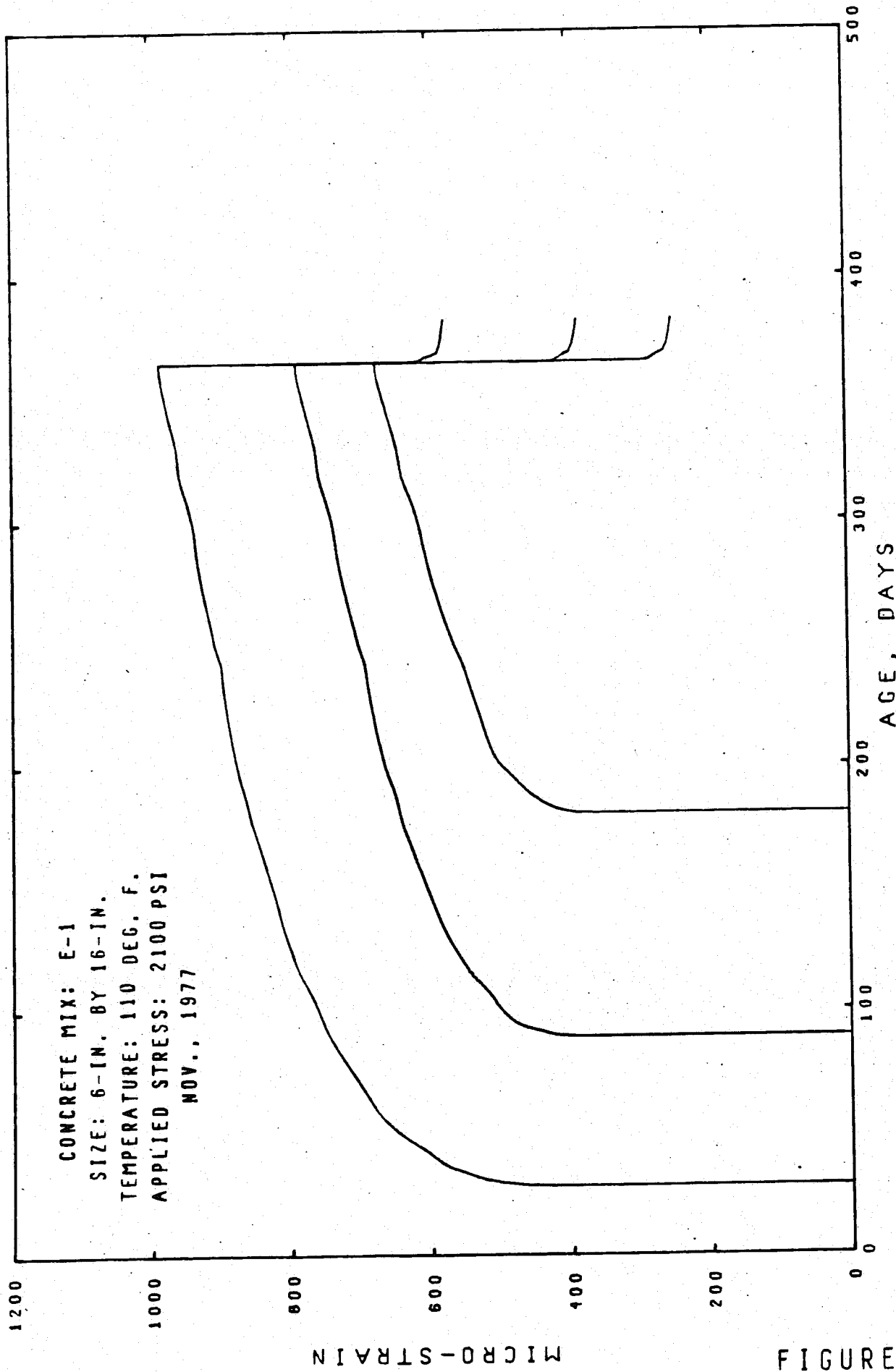
ELASTIC, CREEP AND AUTOGENOUS STRAINS
 CALLAWAY POST TENSIONED REACTOR BUILDING

FIGURE 8



ELASTIC PLUS CREEP PLUS AUTOGENOUS STRAINS
CALLAWAY POST TENSIONED REACTOR BUILDING

FIGURE 9



ELASTIC PLUS CREEP PLUS AUTOGENOUS STRAINS
CALLAWAY POST TENSIONED REACTOR BUILDING

FIGURE 10