Georgia Institute of Technology
NEELY NUCLEAR RESEARCH CENTER
900 ATLANTIC DRIVE
ATLANTA, GEORGIA 30332-0425
USA
(404) 894-3600

93 NOV 2 P2:22

October 22, 1993

Mr. Douglas M. Collins, Chief
Nuclear Materials Safety and Safeguards Branch
Division of Radiation Safety & Safeguards
U.S. Nuclear Regulatory Commission, Region II
101 Marietta St. N.W., Suite 2900
Atlanta, GA 30323-0199

Dear Mr. Collins:

Enclosed are two Blueprints, designated Drawing #1 and #2, that pertain to the design and construction of the Containment Building which houses the Georgia Tech Research Reactor. Drawing #1 shows (Highlighted by red) that the ground floor (Reactor Basement) is at an elevation of 892.92 feet from "sea level". The floor itself is 7 feet 8 inches thick and made of concrete. This floor rests on a steel plate (1/4 in. thick). Below the steel plate there is a layer (2 inch thick) of sand and asphalt and below this sand and asphalt there is a one foot thick layer of concrete. The steel plate in the floor foundation is tied to the cylindrical steel tank (7/16 in. thick) to form a "sealed" containment structure.

The total thickness of the floor foundation is therefore: [7'-8" + 2"(sand and asphalt) + 1/4 inch steel plate + 1' concrete] = 8.85 feet. Subtracting 8.85 ft. from 892.92 feet gives an elevation of 884.07 feet.

Robert and Company (see Attachment A) has determined from the original boring log that, at 884 feet, the containment building structure rests on partially decomposed rock which should support a pressure bearing of 10,000 PSF.

Additionally, the floor foundation rests on a concrete ring 1.5 foot thick, excavated 11.59 feet deep through the bedrock foundation. This concrete ring rests on hard Gray Gneiss rock at an elevation of 872.5 feet from sea level. (See Drawing #2 and Attachment A, Test Boring Record). The ring forms an upside down cup filled with rock formation so that motion in any direction is not possible.

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Conclusion. The sewer problems in Atlanta may cause some surface or near surface, loose dirt to move from on place to another. This may impact some structures if the foundations of these structures are not anchored to bedrock. The Containment Building of the Neely Nuclear Research Center is firmly anchored and its integrity is assured under any scenario of sewer collapse.

I am also enclosing a report addressed to me by Dr. Rodney D. Ice for additional information. Please consider this letter as an interim report. We are continuing to evaluate what other steps might be needed.

Should you have any questions, please let me know.

Sincerely,

R.A. Karam

R.A. Karam, Ph.D., Director
Neely Nuclear Research Center

RAK/ccg

ATTACHMENT A

Attachment No 1

Robert and Company

Architects Engineers Planners
96 Poplar Street N.W.
Atlanta, Georgia 30335-6001
(404) 577-4000 FAX (404) 577-7119

October 4, 1993

Mr. Donald Alexander
Manager Facilities Engineering
Plant Operations Division
Georgia Institute of Technology

RE: Nuclear Reactor Building

Dear Mr. Alexander:

Per the discussion with you on October 1, 1993, We understand that there is an existing 72" diameter underground storm sewer line runs through the northwestern corner of the building and you are concerned about the safety of the reactor if the storm sewer should collapse.

By examining the original building drawings and specifications prepared by Robert and Company in 1960 under job number 5816, we have determined that the reactor structure is supported on a 8 foot thick reinforced concrete circular mat and is independent of the rest of the building structure. The bottom of the reactor foundation mat is at elevation of 884.00 ft, which puts it in the range of soft weathered rock or partially decomposed rock as indicated by borings #1 through #4 of the original boring log. This should have allowable bearing pressure of 10,000 psf as the foundation was originally designed for.

The reactor and its foundation mat have gone through more than a quarter of century's rigorous test and should remain structurally sound as long as the underlaying bearing rock remains unchanged.

We, as structural engineers, can not predict what effect on the bearing rock would be in the event of the collapse of the storm sewer. It is a job of the soils engineer. We suggest that you contact a qualified soils engineer regarding this matter. But the reactor structure should not be damaged even if the building adjacent to it should collapse, since they are separated by an expansion joint, not physically attached to each other.

It is premature for us to do any further investigation at this time, but we will be glad to help if We know what kind of soil condition that we will be dealing with. We hope this will relieve some of your concern. If you have any questions concerning the above, please call.

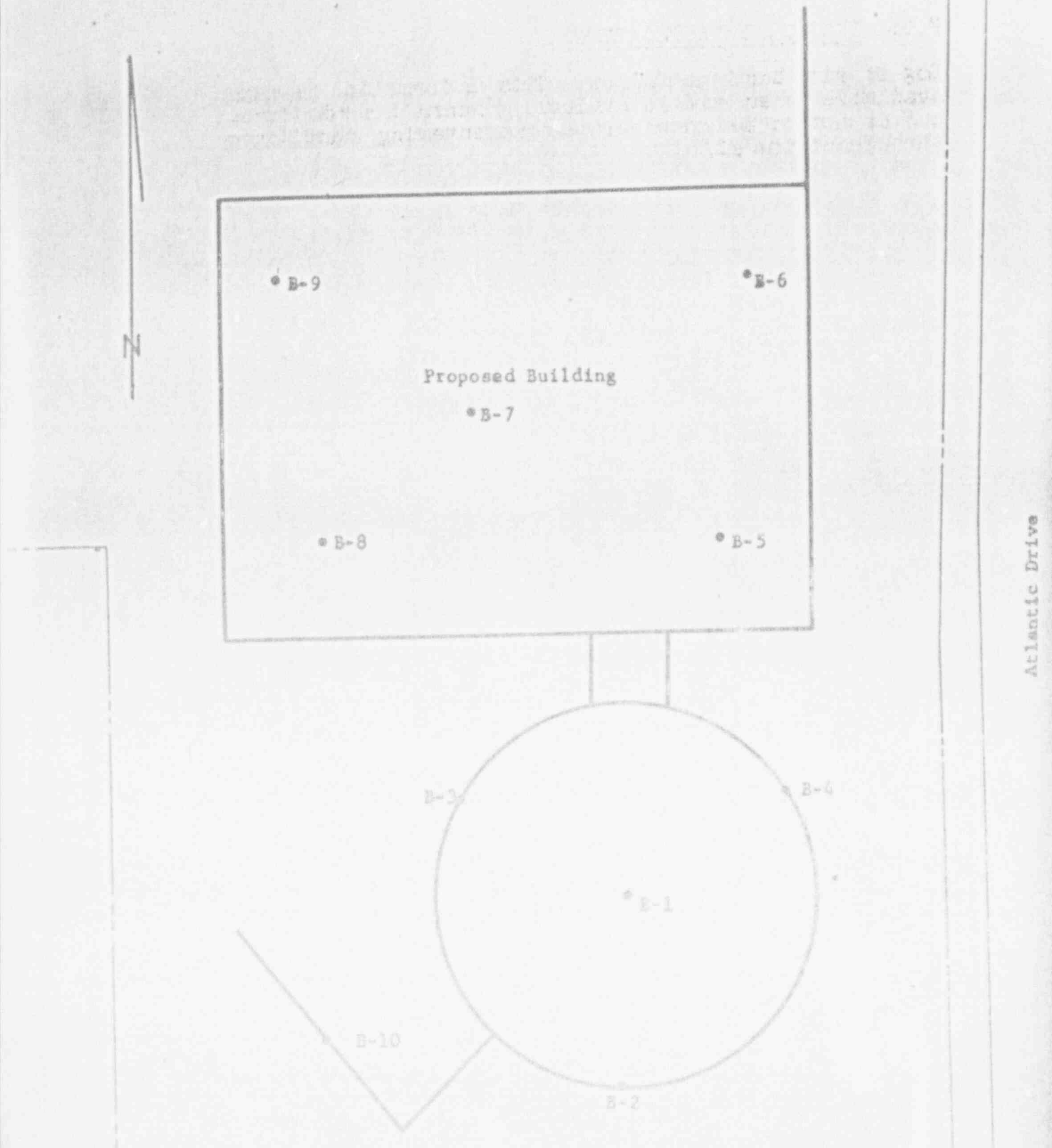
Sincerely,

ROBERT AND COMPANY

Arthur Koo

Arthur C. Koo
Assistant Vice President
Structural Department

cc: Mike Kluttz

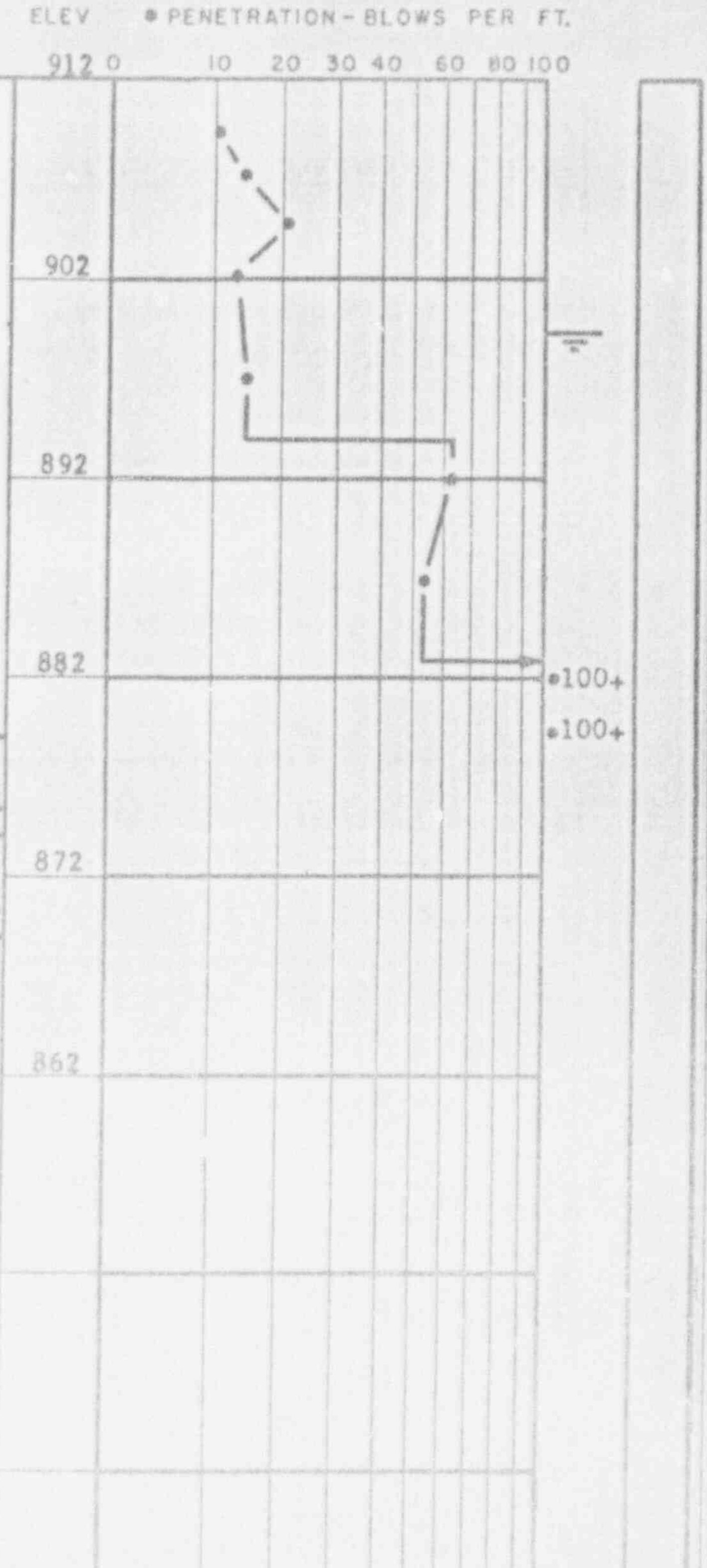


* Soil Test Boring
Scale 1"=30'-0"

Proposed Reactor Building
Georgia Institute of Technology
Atlanta, Georgia

BORING PLAN
LAW ENGINEERING TESTING COMPANY
Atlanta, Georgia
Job 1832

DEPTH FT.	DESCRIPTION	
0	FILL-LOOSE BROWN SILTY GRAVELLY SAND	
3	STIFF AND VERY STIFF BROWN AND GRAY FINE TO COARSE SANDY MICACEOUS GRAVELLY SILT	
18	HARD GRAY FINE TO COARSE SANDY MICACEOUS SILT (PARTIALLY DECOMPOSED ROCK)	
29	SOFT WEATHERED ROCK (GNEISS)	
33	SOFT TO MODERATELY HARD GRAY GNEISS	BX 29%
38	HARD GRAY GNEISS	BX 82%
43	BORING TERMINATED	



PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.5 IN. SAMPLER 1 FT.

UNDISTURBED SAMPLE

% CORE RECOVERY ═ WATER TABLE

TEST BORING RECORD

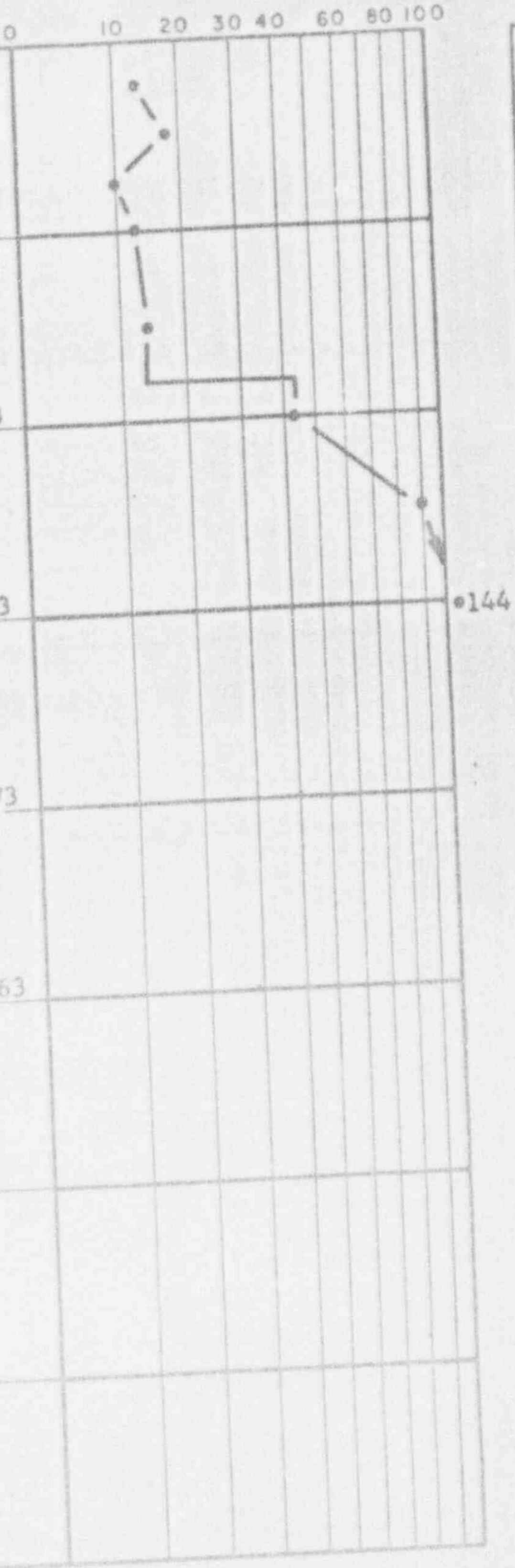
BORING NO B-1

JOB NO 1832

LAW ENGINEERING TESTING CO.

DEPTH FT.	DESCRIPTION		ELEV
0	FILL-STIFF TAN AND RED-BROWN MICACEOUS FINE SANDY GRAVELLY SILTY CLAY AND *		913
4	STIFF AND VERY STIFF TAN AND GRAY MICACEOUS GRAVELLY FINE TO COARSE SANDY SILT		903
18	HARD GRAY FINE TO COARSE SANDY MICACEOUS SILT (PARTIALLY DECOMPOSED ROCK)		893
			883
33	SOFT AND MODERATELY HARD GRAY GNEISS	BX 22%	
38	HARD GRAY GNEISS	BX 85%	873
43	BORING TERMINATED		
			863

● PENETRATION - BLOWS PER FT.



* = CLAYEY SILT

NO GROUND WATER ENCOUNTERED

TEST BORING RECORD

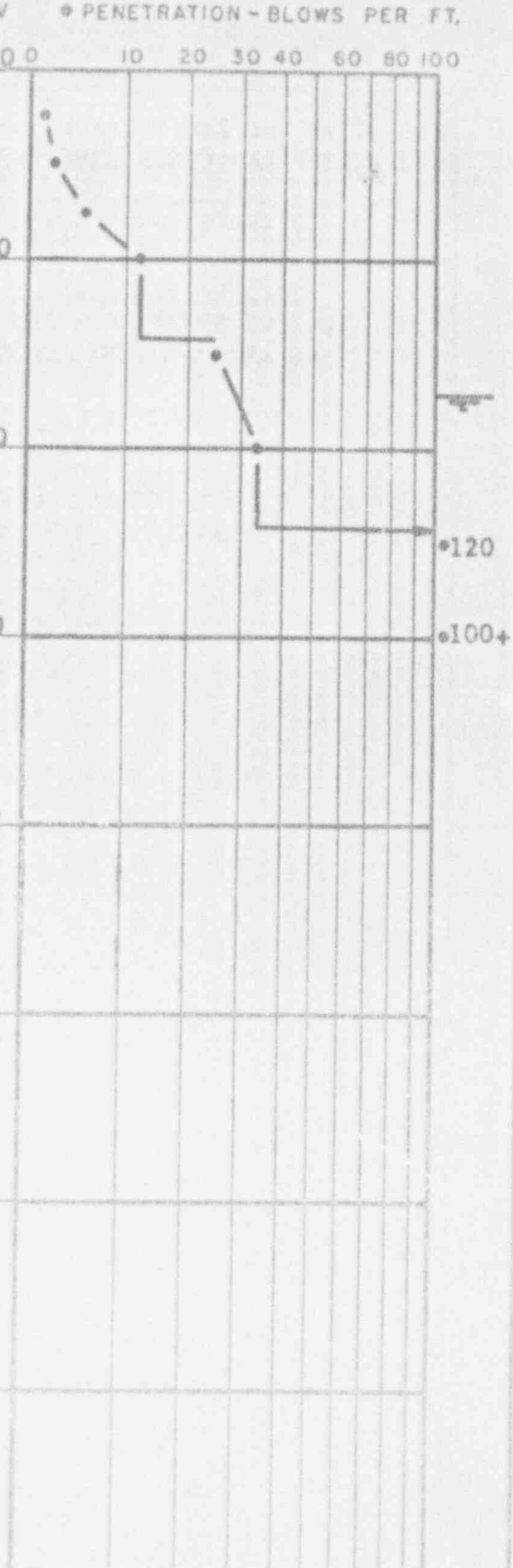
PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.5 IN. SAMPLER 1 FT.

BORING NO. B-2

JOB NO. 1532

UNDISTURBED SAMPLE — WATER TABLE

DEPTH FT.	DESCRIPTION		ELEV
0	FILL-VERY SOFT TO FIRM SANDY MICACEOUS SILT, TOPSOIL, CINDERS, AND GRASS		910
7.5	STIFF RED-BROWN AND TAN FINE TO COARSE SANDY SILTY CLAY AND CLAYEY SILT		900
14	VERY STIFF TO HARD GRAY FINE TO COARSE SANDY GRAVELLY MICACEOUS SILT		890
24	SOFT WEATHERED ROCK (GNEISS)	FT	880
31	MODERATELY HARD TO HARD GRAY GNEISS	BX 70%	
36	BORING TERMINATED		870



FT = FISHTAIL

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.5 IN. SAMPLER 1 FT.

UNDISTURBED SAMPLE

% ROCK CORE RECOVERY — WATER TABLE

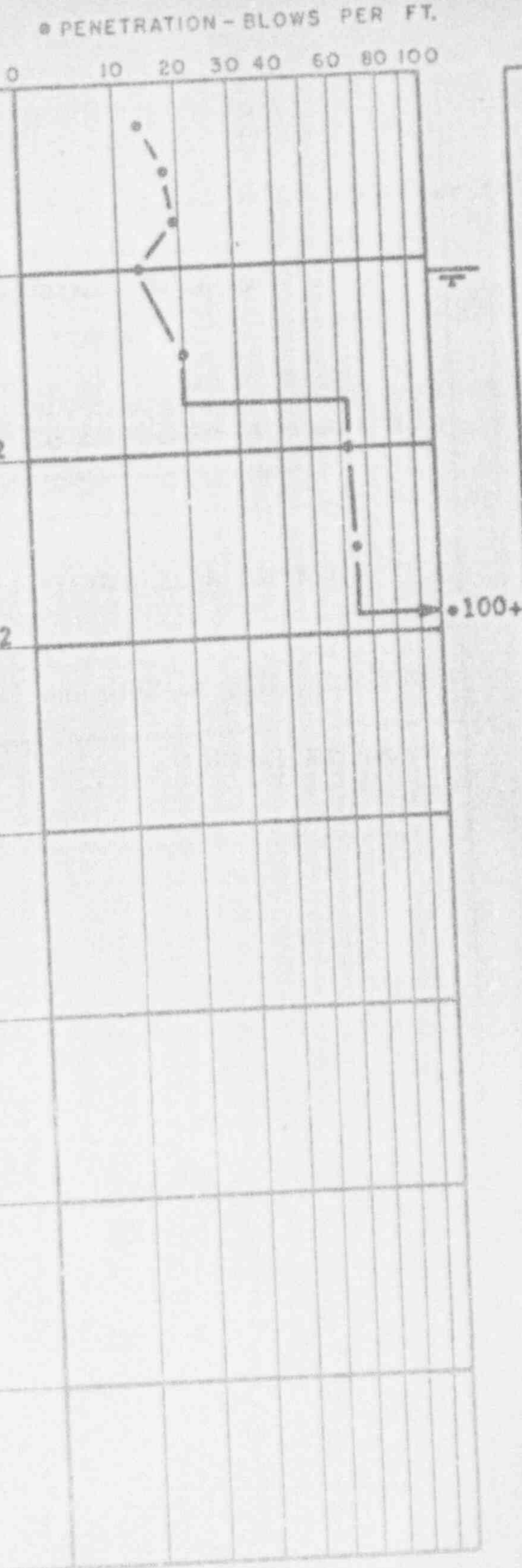
TEST BORING RECORD

BORING NO B-3

JOB NO 1832

LAW ENGINEERING TESTING CO.

DEPTH FT.	DESCRIPTION	ELEV
0	FILL-FIRM RED-BROWN CLAYEY SANDY SILT AND SILTY SAND CONTAINING SOME GRAVEL	912
6	VERY STIFF RED-BROWN AND TAN CLAYEY FINE TO COARSE SANDY MICACEOUS SILT	902
9	STIFF TO VERY STIFF GRAY AND WHITE FINE TO COARSE SANDY MICACEOUS SILT	
17	HARD GRAY FINE TO COARSE SANDY MICACEOUS SILT (PARTIALLY DECOMPOSED ROCK)	892
29	REFUSAL	882



TEST BORING RECORD

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.5 IN. SAMPLER 1 FT.

UNDISTURBED SAMPLE

WATER TABLE

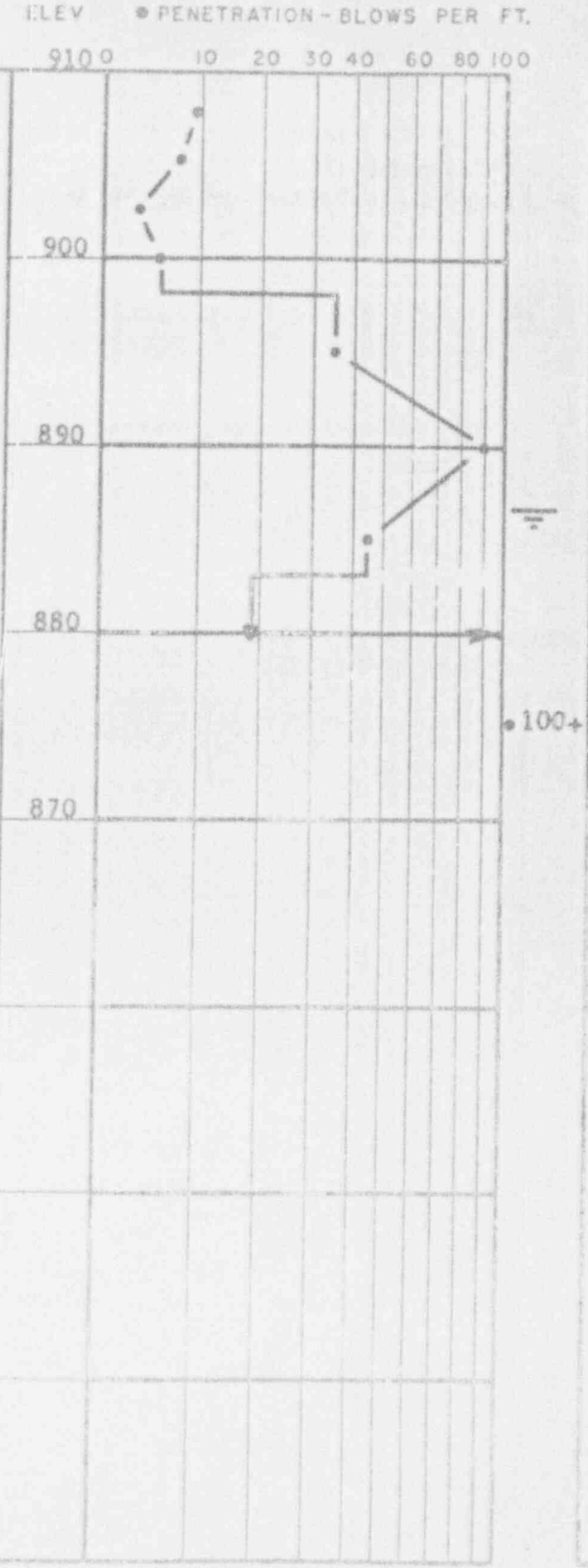
|50| % ROCK CORE RECOVERY

BORING NO B-4

JOB NO 1833

LAW ENGINEERING TESTING CO.

DEPTH FT.	DESCRIPTION
0	FILL-FIRM AND STIFF RED-BROWN FINE AND MEDIUM SANDY CLAYEY SILT AND TOP-SOIL
10	LOOSE TAN AND GRAY CLAYEY SILTY FINE*
11.5	HARD GRAY FINE TO COARSE SANDY MICACEOUS SILT (PARTIALLY DECOMPOSED ROCK)
27	VERY STIFF GRAY FINE SANDY MICACEOUS SILT
30	SOFT WEATHERED ROCK (GNEISS)
37	REFUSAL WITH FISHTAIL BIT



* = TO MEDIUM SAND AND FINE TO MEDIUM SANDY SILT

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.5 IN. SAMPLER 1 FT.

UNDISTURBED SAMPLE

% ROCK CORE RECOVERY — WATER TABLE

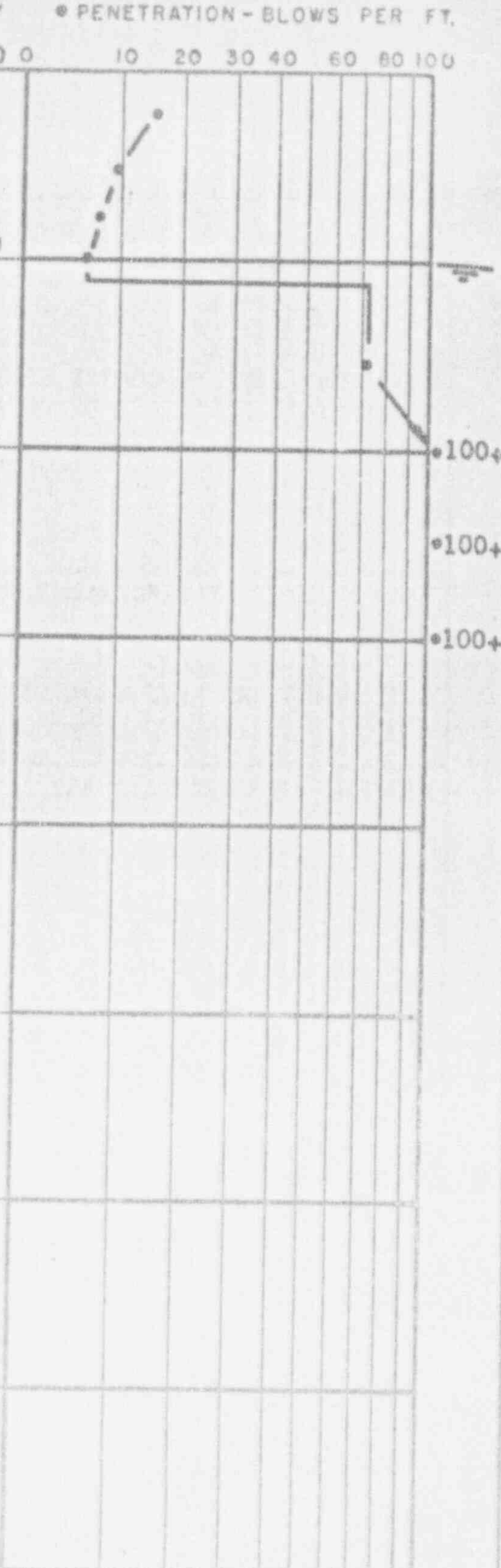
TEST BORING RECORD

BORING NO. B-5

JOB NO. 1832

LAW ENGINEERING TESTING CO.

DEPTH FT.	* DESCRIPTION	ELEV
0		900
	FILL-FIRM AND STIFF BROWN AND GRAY FINE SANDY MICACEOUS SILT CONTAINING TOPSOIL, BRICK AND OTHER RUBBLE	
10		890
11	FIRM GRAY FINE TO MEDIUM SANDY CLAYEY*	
	SOFT WEATHERED ROCK (GNEISS, REFUSAL MATERIALS)	880
30		870
	BORING TERMINATED	



* = SILT (TOPSOIL)

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.5 IN. SAMPLER 1 FT.

UNDISTURBED SAMPLE

|50| % ROCK CORE RECOVERY — WATER TABLE

5915

TEST BORING RECORD

BORING NO B-6

JOB NO 1832

LAW ENGINEERING TESTING CO.

DEPTH FT.	DESCRIPTION	ELEV	● PENETRATION - BLOWS PER FT. (0, 10, 20, 30, 40, 60, 80, 100)
0	FILL-SOFT BROWN FINE SANDY MICACEOUS SILT AND LOOSE BROWN SILTY FINE TO MEDIUM SAND	894	
7	SOFT WEATHERED ROCK (GNEISS, REFUSAL MATERIALS)	884	● 100+
			● 100+
		874	● 100+
			● 100+
		864	● 100+
30	BORING TERMINATED		
		854	

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.5 IN. SAMPLER 1 FT.

UNDISTURBED SAMPLE

% ROCK CORE RECOVERY — WATER TABLE

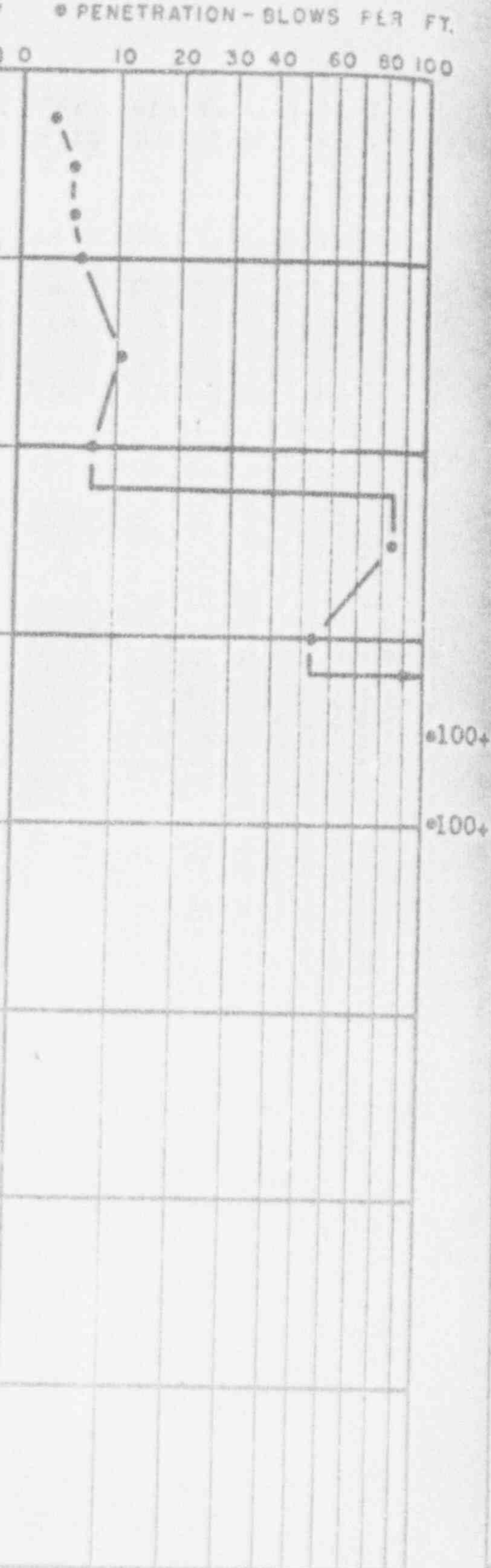
TEST BORING RECORD

BORING NO. B-7

JOB NO. 1832

LAW ENGINEERING TESTING CO.

DEPTH FT.	DESCRIPTION		ELEV
0			910
	FILL-SOFT AND FIRM BROWN AND TAN FINE TO COARSE SANDY MICACEOUS SILT CONTAINING GRAVEL		900
18	FILL-FIRM RED-BROWN FINE SANDY CLAYEY SILT		890
22	HARD GRAY FINE TO COARSE SANDY MICACEOUS SILT (PARTIALLY DECOMPOSED ROCK)		880
32	SOFT WEATHERED ROCK (GNEISS, REFUSAL MATERIALS)	BX 44% BX 23%	
40	BORING TERMINATED		870



NO GROUND WATER ENCOUNTERED

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.5 IN. SAMPLER 1 FT.

UNDISTURBED SAMPLE

[50]% ROCK CORE RECOVERY — WATER TABLE

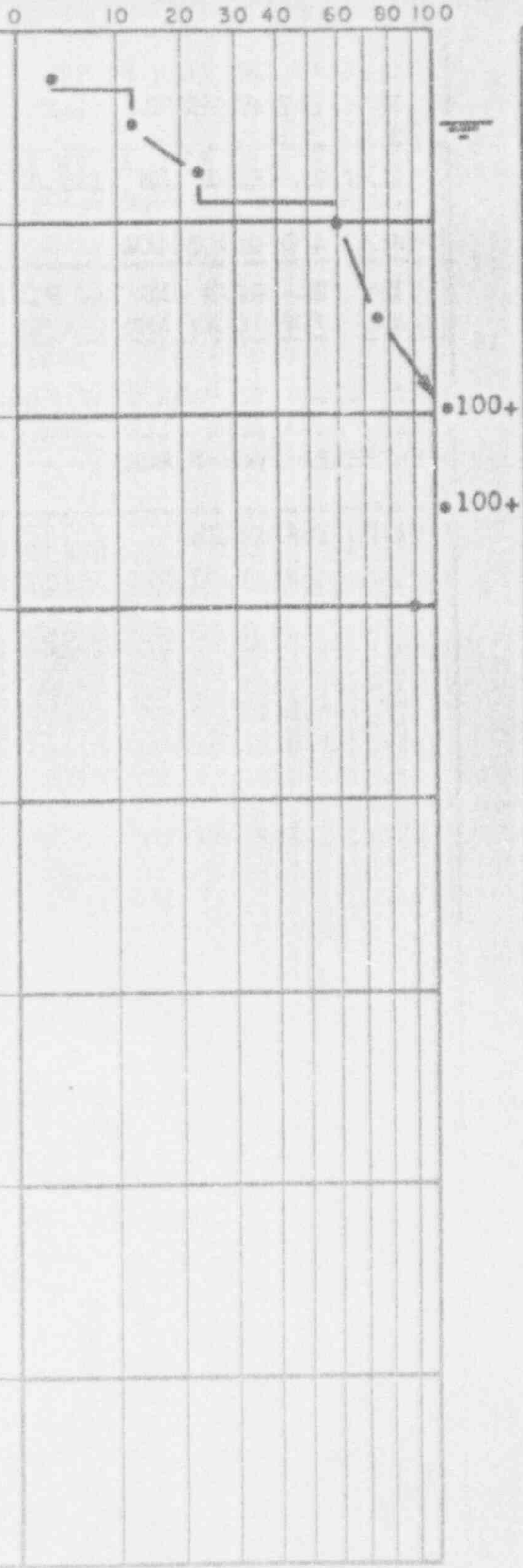
TEST BORING RECORD

BORING NO. B-8

JOB NO. 1832

DEPTH FT.	DESCRIPTION	ELEV
0	SOFT BROWN AND GRAY FINE SANDY MICACEOUS SILT (POSSIBLY FILL)	894
3	STIFF TO VERY STIFF GRAY AND BROWN FINE TO MEDIUM SANDY MICACEOUS SILT	
9	SOFT WEATHERED ROCK (GNEISS, REFUSAL MATERIALS)	884
		874
30	BORING TERMINATED	864

● PENETRATION - BLOWS PER FT.



PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.5 IN. SAMPLER 1 FT.

UNDISTURBED SAMPLE

% ROCK CORE RECOVERY

WATER TABLE

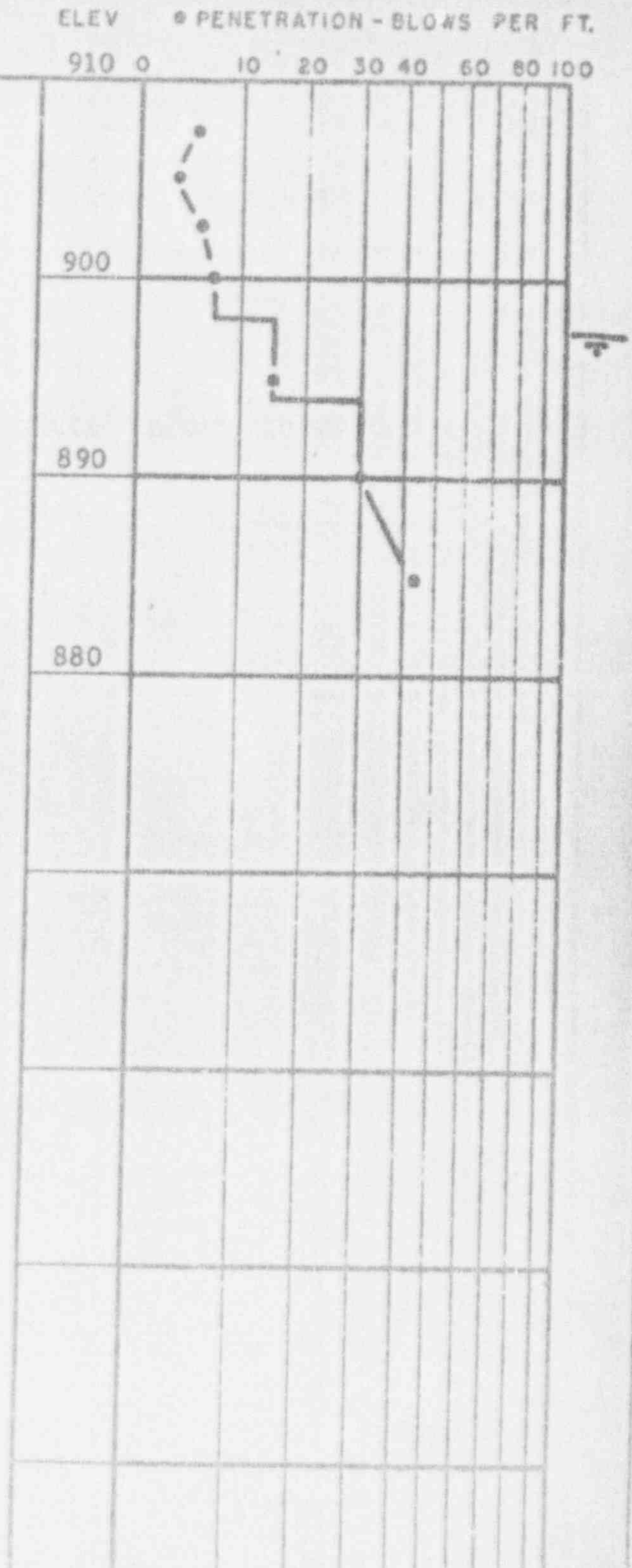
TEST BORING RECORD

BORING NO. B-9

JOB NO. 1832

LAW ENGINEERING TESTING CO.

DEPTH FT.	DESCRIPTION
0	FILL-SOFT AND FIRM BROWN AND GRAY FINE SANDY MICACEOUS SILT CONTAINING GRAVEL
6	FILL-FIRM RED-BROWN FINE SANDY CLAYEY SILT CONTAINING CINDERS, BURNT WOOD PIECES AND OLD BRICK
12	STIFF RED-BROWN AND TAN FINE TO COARSE SANDY SILTY CLAY AND CLAYEY SILT
16	VERY STIFF TO HARD GRAY FINE TO COARSE SANDY MICACEOUS SILT CONTAINING SOME WEATHERED ROCK PIECES
25	BORING TERMINATED



PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.5 IN. SAMPLER 1 FT.

UNDISTURBED SAMPLE

|50| % ROCK CORE RECOVERY — WATER TABLE

TEST BORING RECORD

BORING NO B-10

JOB NO 1832

LAW ENGINEERING TESTING CO

ATTACHMENT B

MEMORANDUM Oct. 13, 1993

TO: R.A. KARAM, Ph.D.
Director,
Neely Nuclear Research Center

FROM: R.D. ICE, Ph.D.
Board Certified Health Physicist
Manager, Office of Radiation Safety

RE: NRC information request regarding GTRR and potential sinkhole

The nearest storm drainage sewer to the nuclear reactor is located in the North parking lot of Neely Nuclear Research Center (NNRC). The sewer line bends SW and goes underneath the NW corner of the laboratory support facility. At its nearest point, the sewer line is over 110 feet from the nuclear reactor and 70 feet from the nuclear reactor containment facility. The storm sewer is 72 inches in diameter and is made of concrete-pipe. This is a tributary sewer line that ~~the~~ follows the natural drainage contours of the surface. The sewer runs roughly 1200 feet east of Atlantic Drive to a trunk sewer which lies in the low land west of the I-75/85 Expressway.

The reactor containment building is a cylindrical 7/16" steel tank having an 82' diameter and a torispherical dome rising about 50 feet above ground level. The sides of the tank are lined with 12" concrete. It has been designed as a leak tight barrier to prevent any escape of gas or fission products. It has a flat bottom which rests upon 12 inches of concrete. Above the 12 inches of concrete is a two inch layer of sand followed by a steel plate that forms the base of the containment facility. Above the steel plate is 7 foot, 8 inches of concrete. This thick slab serves two purposes; it provides ballast against the buoyant force of ground water; and it supports the remainder of the interior building structure, including the reactor. The top of this slab is the basement floor.

There have been no significant watershed changes for the past 30 years around the facility. Ground level approximates the first floor level of the reactor containment building. The ground tapers off from south to north about 20 feet effectively draining the area around the containment facility to the tributary storm sewer located in the North parking lot. The top of the tributary storm sewer is one or two feet below the bottom level of the reactor containment.

The recent catastrophic City of Atlanta sinkhole, approximately a mile away, was associated with the collapse of the major sewer trunk line, not the tributary sewer line that serves Neely Nuclear Research Center. As a result of the collapse, a rainwater back flow situation developed in the tributary sewer line, leading to flooding of the North parking lot. This flooding was the result of an acute trunk line incident and is not indicative of problem with the tributary sewer line that serves NNRC.

Seismic history for Atlanta was reviewed in the Preliminary Safety Analysis Report developed prior to building the nuclear reactor. In summary, Atlanta was noted to be one of the more favorable nuclear reactor sites in the U.S. In March 1993, Law Engineering did a specific assessment of seismic hazards for Georgia Institute of Technology. They reviewed seismic history, performed probabilisitic and deterministic seismic ground motion studies and made estimates of potential ground motion. The report validated Standard Building Code seismic coefficient requirements in general and recommended specific seismic coefficients for Georgia Institute of Technology.

Robert and Company (Attachment One, dated Oct. 4, 1993), has reviewed the original nuclear reactor building drawings, test ground borings and building specifications regarding a potential storm sewer collapse. The test ground borings beneath the nuclear reactor containment building indicate rock at an approximate elevation of 884 feet (above sea level). Review of construction diagrams (Attachment Two), indicate that the finished ground floor of the reactor containment building is at 892.92 feet. When the 8 foot, 10" pad (Concrete/steel/sand base) is subtracted from the ground floor elevation, it is evident that the entire pad is setting on rock. Based upon the location of the test borings, it is also evident that the building contractors had to remove some rock to provide a level base for the containment facility.

Review of engineering diagrams for the containment facility foundation (Attachment No. 3) indicate further building support. Around the edge of the containment facility are additional reinforced concrete pads. These pads are 42" inches thick and penetrate deep into the rock. The tops of the pads are at an elevation of 876 feet.

Conclusions:

1. The recent nearby sinkhole was an acute problem on a City of Atlanta major sewer trunk line and not a problem with the tributary storm sewer line servicing Neely Nuclear Research Center.

2. Topography of the facility provides for adequate drainage of the center.

3. The nuclear reactor containment facility foundation is on bedrock and is anchored by additional footings into bedrock around the edges.

4. Containment vessel integrity would be maintained in any catastrophic event.

REFERENCES

1. Meeting of Oct. 1, 1993 with Jim DePriest, Don Alexander, Brad Satterfield, Ratib Karam and Rod Ice.

2. PSAR, Safeguards Report for the Georgia Tech Research Reactor, January, 1960.

3. Law Engineering, Seismic Hazard Study, GIT, March 1993.

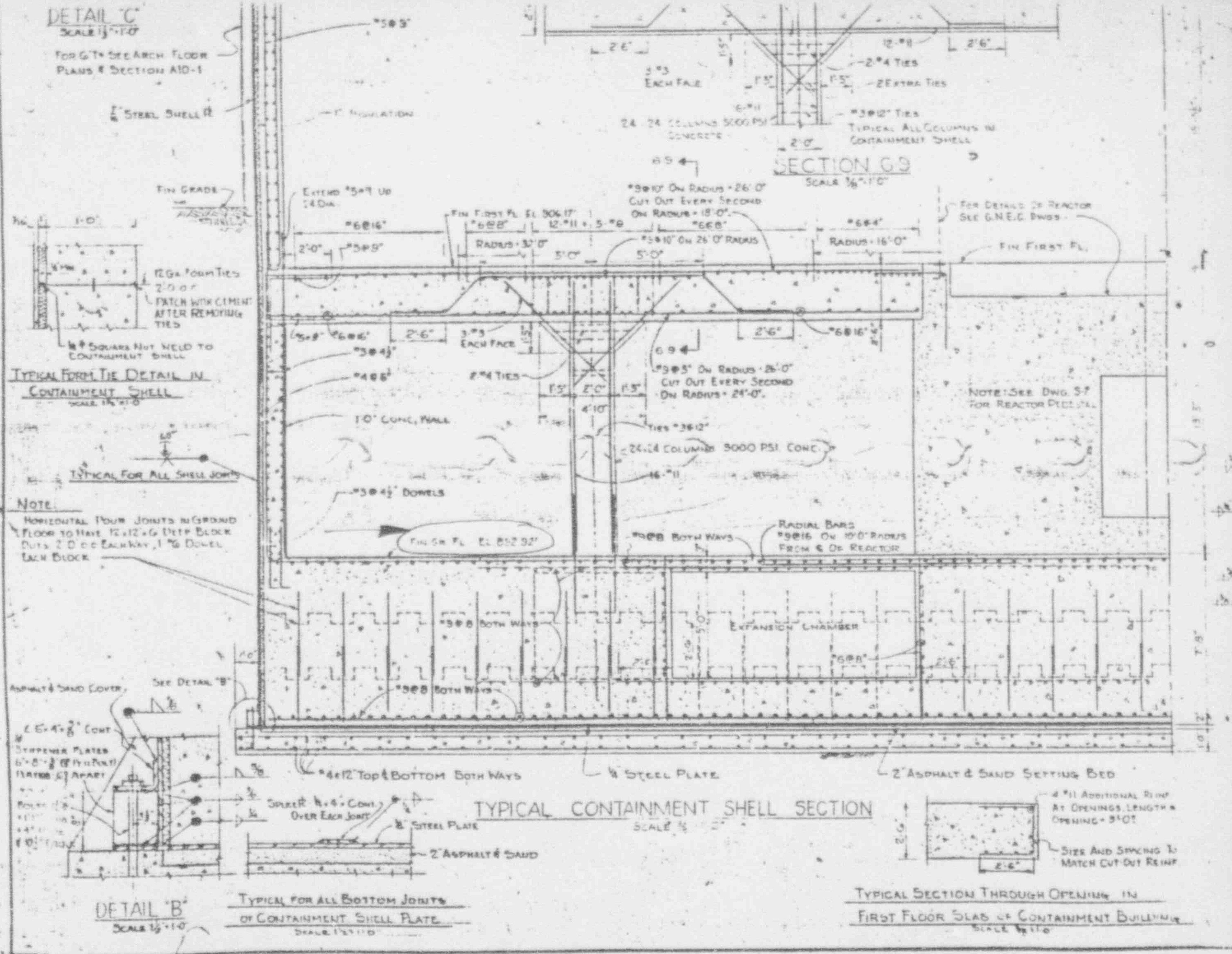
4. Robert and Company, Letter dated Oct. 4, 1993 (Attachment No. 1)

5. Construction Diagram showing cross-section of containment facility "Typical Containment Shell Section" (Attachment No. 2).

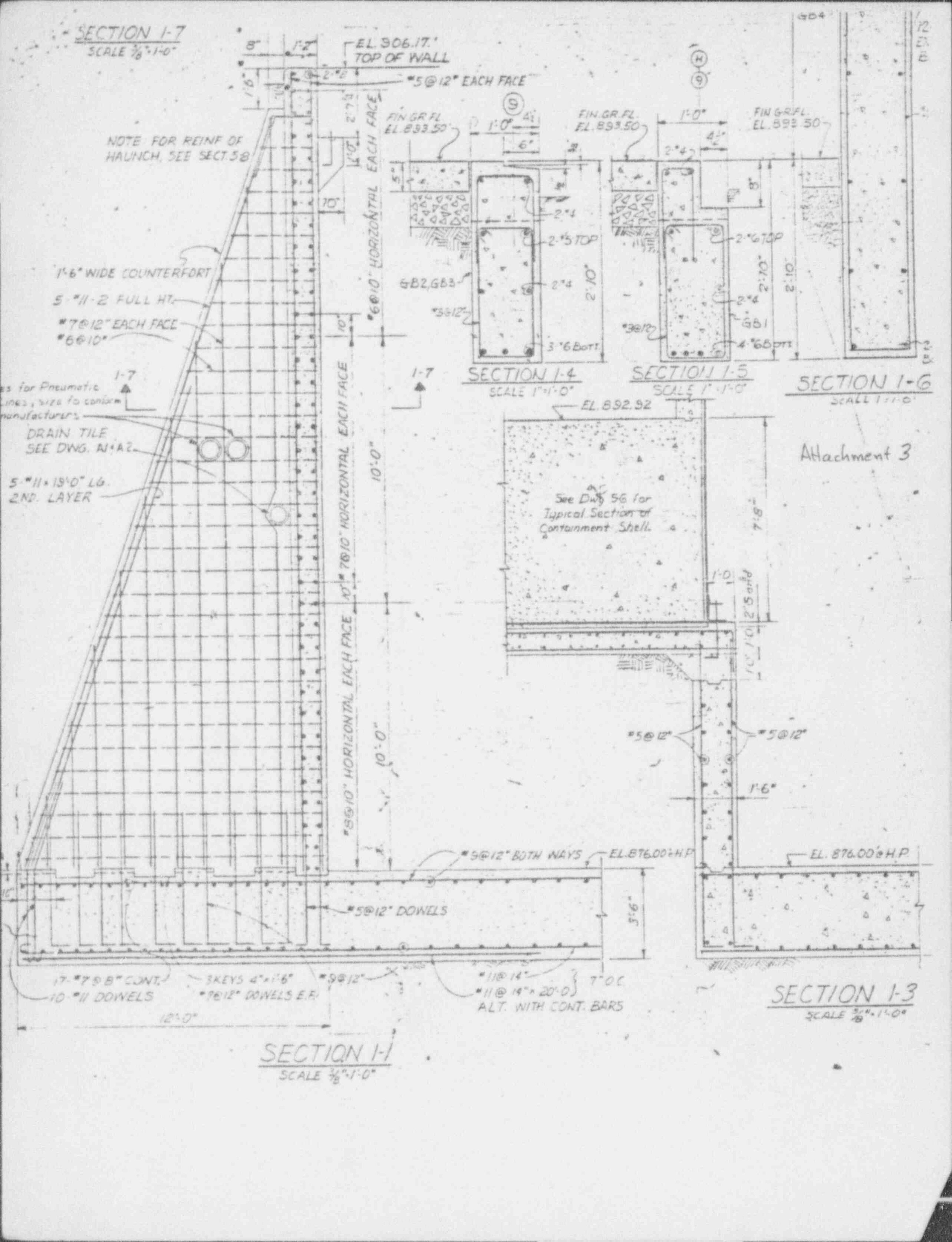
6. Construction Diagram showing containment facility footings, Section 1-3 (Attacnment No. 3).

c:\admin\sinkhole

Attachment Two



Attachment 3



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