TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

August 14, 1980

Director of Nuclear Reactor Regulation
Attention: Mr. A. Schwencer, Chief
Light Water Reactors Branch No. 2
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Schwencer:

In the Matter of the Application of) Docket Nos. 50-327
Tennessee Valley Authority) 50-328

The additional information on the Sequoyah Nuclear Plant unit 1 interim distributive ignition system (IDIS) listed below is enclosed for your review.

Enclosure 1 is the revision which will be made to the Sequoyah Nuclear Plant FSAR section 6.2.5.7 and includes additional FSAR figures 6.2-140 through 6.2-147. These FSAR revisions and figures describe the IDIS and the location of the igniters inside containment. This revision to the FSAR will be included in Amendment 68.

Enclosure 2 is a copy of the TVA Division of Engineering Design scoping document for testing the IDIS.

Enclosure 3 lists the changes which will be made to the Sequoyah Nuclear Plant Emergency Operating Instructions (EOI's) to identify plant conditions where operation of the IDIS is required. The plant EOI's will be revised by August 21, 1980.

The analytical work performed by TVA and Westinghouse in support of the IDIS design was transmitted to NRC by my letter to you dated August 8, 1980. The information transmitted by that letter together with the system description provided in Enclosure 1 constitute TVA's safety evaluation of these proposed measures for hydrogen control.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills, Manager
Nuclear Regulation and Safety

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Enclosures

ENCLOSURE 1

SEQUOYAH NUCLEAR PLANT
FSAR REVISIONS - INTERIM DISTRIBUTED CONTROLLED
HYDROGEN IGNITION SYSTEM

6.2.5.7 Interim Distributive Ignition System

Due to the ice condenser design and relatively small containment volume, the postaccident hydrogen concentration is higher for ice condenser containments than it is for a dry containment.

At TMI-2, the core was uncovered to the extent that severe core damage with resulting hydrogen generation from zirconium-water reaction occurred. This ultimately led to hydrogen release to the containment atmosphere and a subsequent assumed hydrogen burn which produced a 28 lb/in^2g pressure spike. This pressure spike occurred in a containment of a volume of approximately 2.3 million cubic feet. The Sequoyah containment volume is approximately one-half that of TMI-2 (i.e., 1.2 million cubic feet), has a design pressure of 12 lb/in^2g and an ultimate pressure capability of approximately 43 lb/in^2g. The ultimate pressure of 43 lb/in^2g would be reached at Sequoyah if there is a zirconium-water reaction of approximately 25 percent, if the approximately 520 pounds of hydrogen produced is released into the containment, and if all the hydrogen is burned adiabatically.

Different aspects of hydrogen generation, control, and mitigation were investigated. This includes a limited study of risk similar to WASH-1400, the identification of representative transients which would lead to some core degradation, and the evaluation of the more important concepts for the prevention or mitigation of the consequences from hydrogen combustion. The migitation concepts evaluated include inerting containment, filtered/vented containment, "Halon" suppression, igniters, an additional containment, and coupled containments. From this evaluation it was decided that an additional reduction of overall risk may be achieved in the interim by the installation of a distributive ignition system at Sequoyah unit 1. TVA is concurrently studying in greater detail degraded core conditions and several of the mitigation concepts mentioned earlier for their applicaton as a long term, permanent solution.

6.2.5.7.1 System Description

The interim distributive ignition system is designed to burn hydrogen inside the containment in the event of an accident in which excessive hydrogen is generated inside the reactor vessel and released into containment. It is

designed to ignite the hydrogen prior to it reaching a dangerously high level. This system is intended to back up the safety-grade hydrogen recombiner system, but it is not a safety-grade system itself.

The system consists of 30 thermal resistance-type igniters distributed throughout containment (locations shown in Figures 6.2-141 through 6.2-146). The igniter mounting details are shown in Figure 6.2-147. The transformer shown in Figure 6.2-147 is capable of operating in a temperature environment greater than 350° F. The standby lighting circuit supplies the transformer with 120V ac which is dropped down to 14V ac for the igniter. At 14V ac and 8 amps, the exposed portion of the igniter rod will reach approximately 1720° F. These igniters have been adapted for direct installation into the existing standby lighting circuits. This lighting circuit, described in FSAR Section 9.5.3.2, is powered from shutdown boards which have normal and alternate ac power supply and, in the event of their failure, is fed from the diesel generators. The only modification to the existing standby lighting system is that this system will be normally deenergized at the standby lighting cabinets once the igniters are installed and will only be turned on by the operator after a LOCA.

The standby lighting cabinets are located in the auxiliary building, about 150 feet from the main control room and at essentially the same elevation, and are easily accessible following an accident.

It is noted that the interim distributive ignition system will not generate any more negative effects on containment integrity than uncontrolled hydrogen ignition. Rather, by burning hydrogen at a concentration as low as possible, the resulting transients in pressure and temperature are expected to be lower than what may result in the case of uncontrolled ignition.

E30221.02

KEY TO FIGURE 6.2-141 THROUGH 6.2-146

Denotes normal lighting fixtures (LC) - ◯

Denotes standby lighting fixtures (LS) - ◎

Fixture Description

Format: "X-Y" , where

X is one of the following;

- L- fixture containing a lightbulb
- G- fixture containing glowplug type igniter

Y is one of the following;

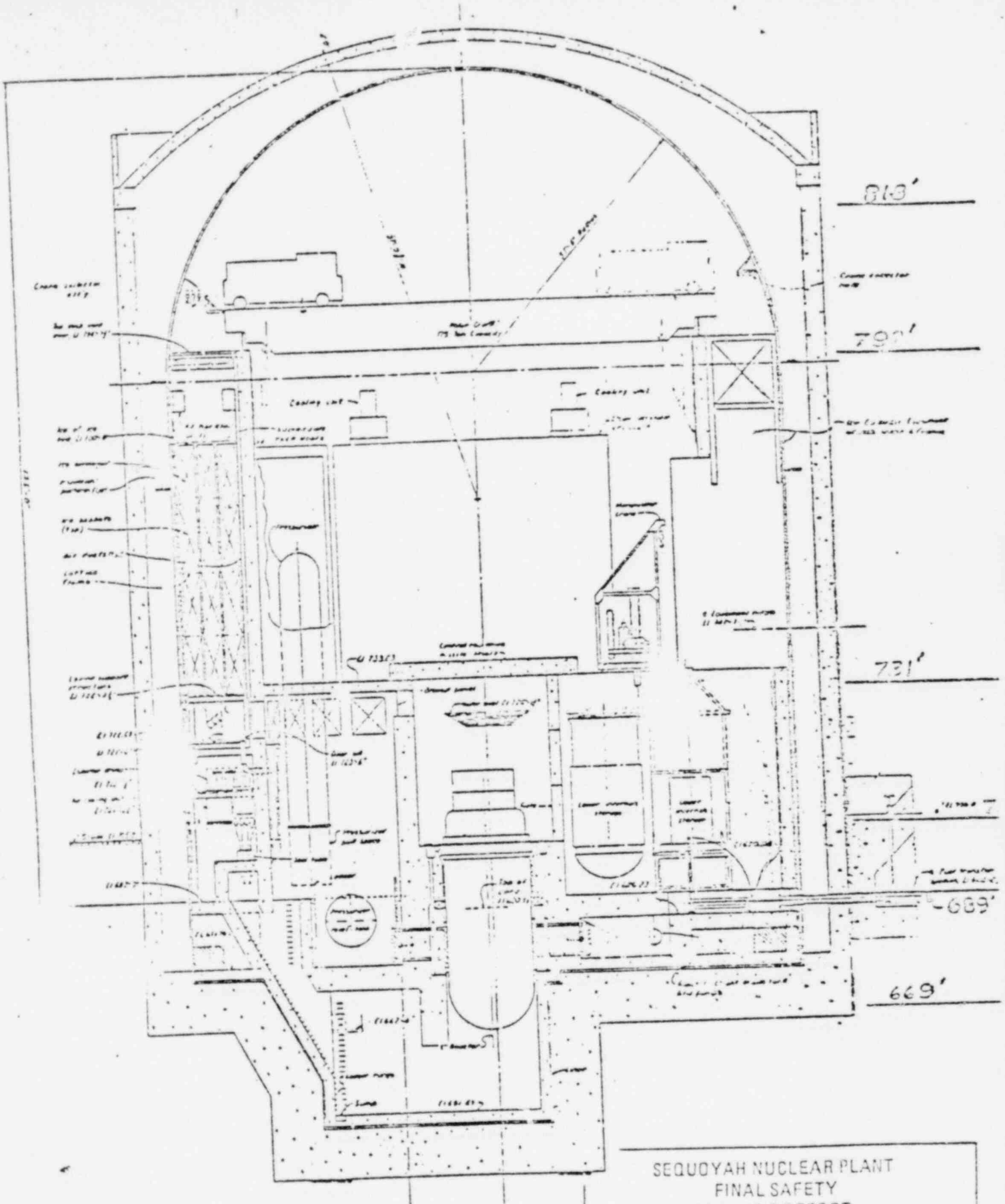
- A- phase A electricity
- B- phase B electricity
- C- phase C electricity

Denotes H_2 sampling location:

1. El. 674.78 Az. 280°
2. El. 716.0 Az. 310°
3. El. 716.6 Az. 230°
4. El. 730.0 Az. 310°
5. El. 756.0 Az. 90°
6. El. 756.0 Az. 315°

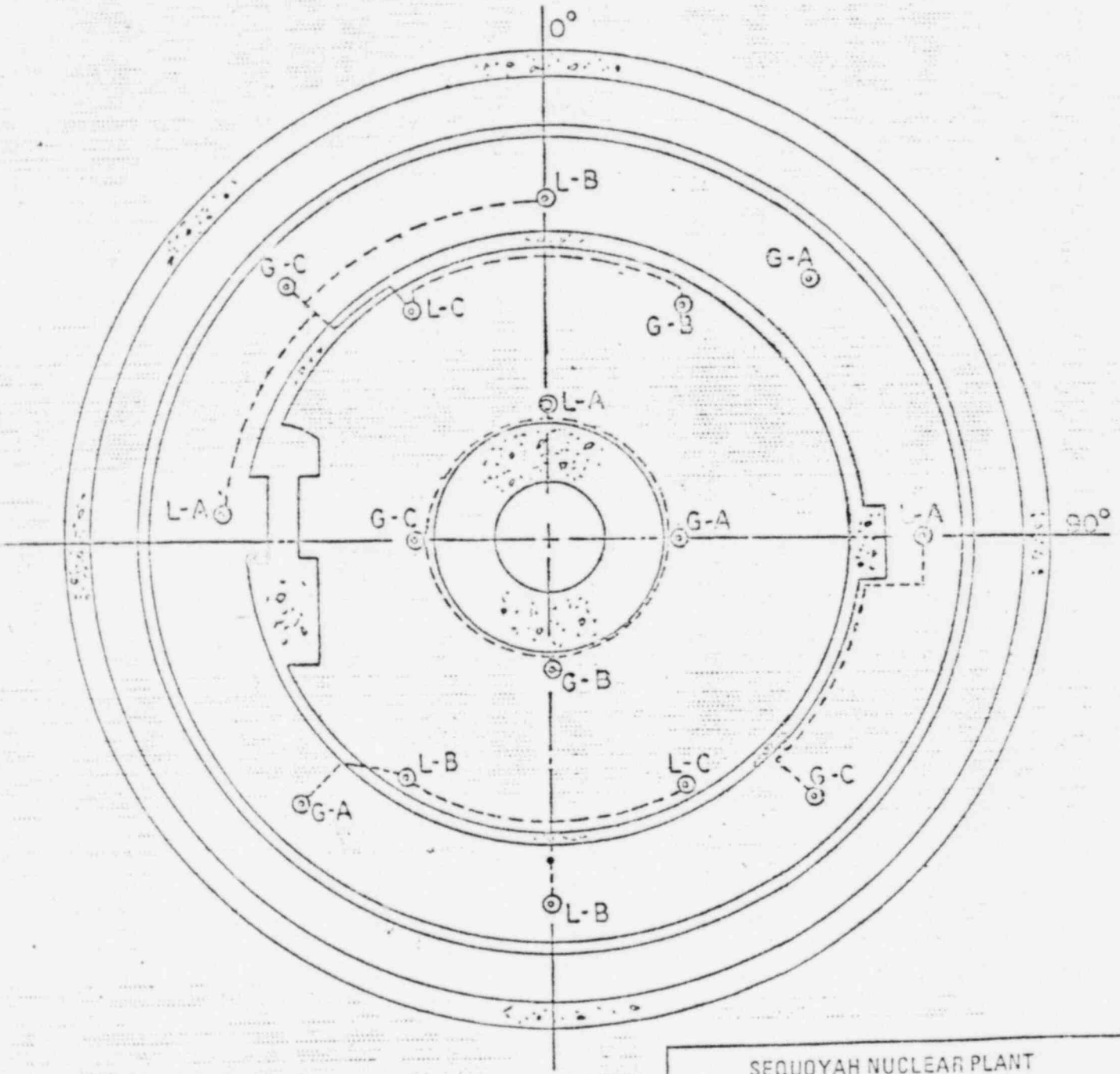
SEQUOYAH NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT

FIGURE 6.2-140



SEQUOYAH NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT

CONTAINMENT LIGHTING
FIXTURE ELEVATION
FIGURE 6.2-141



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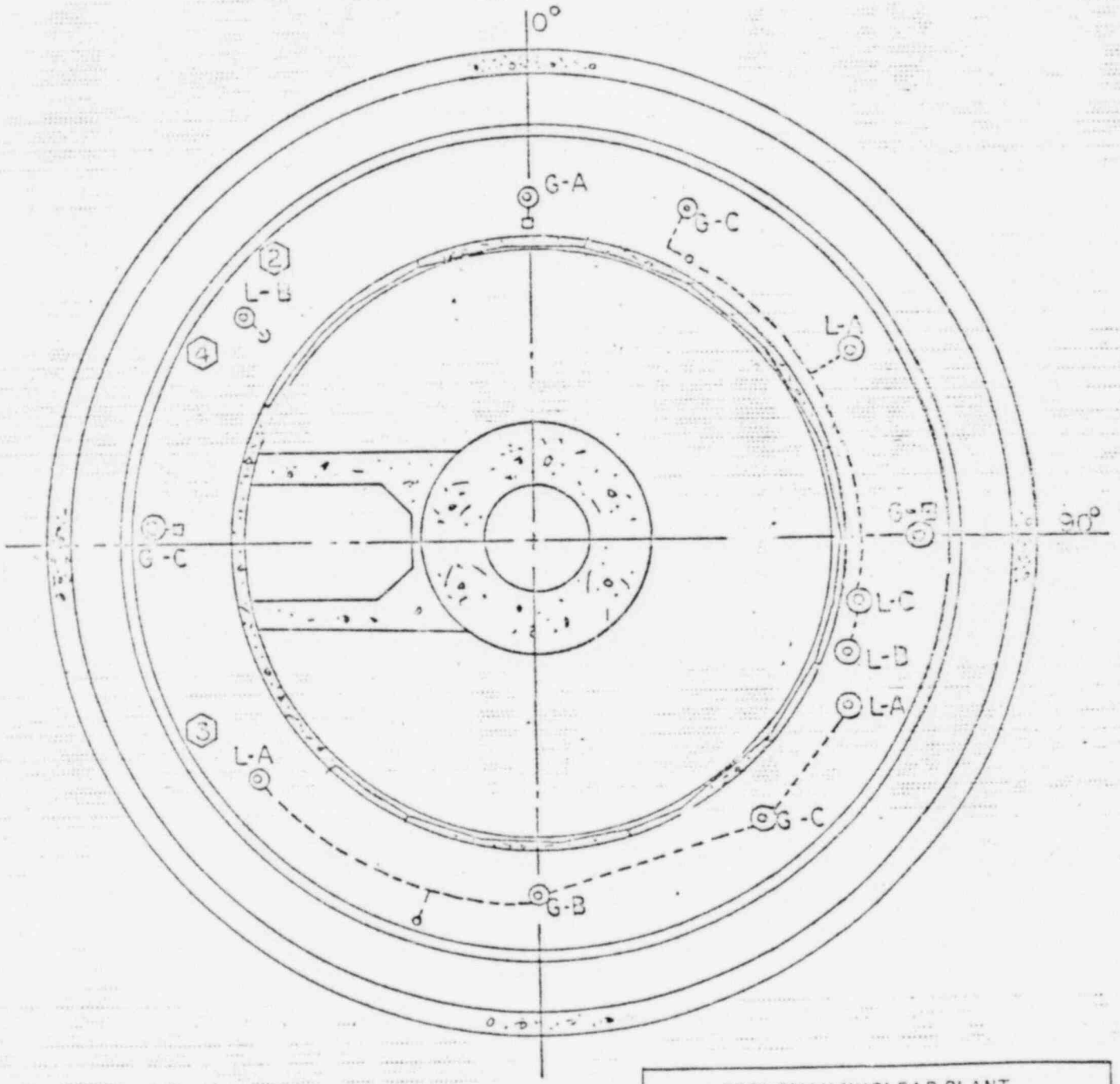
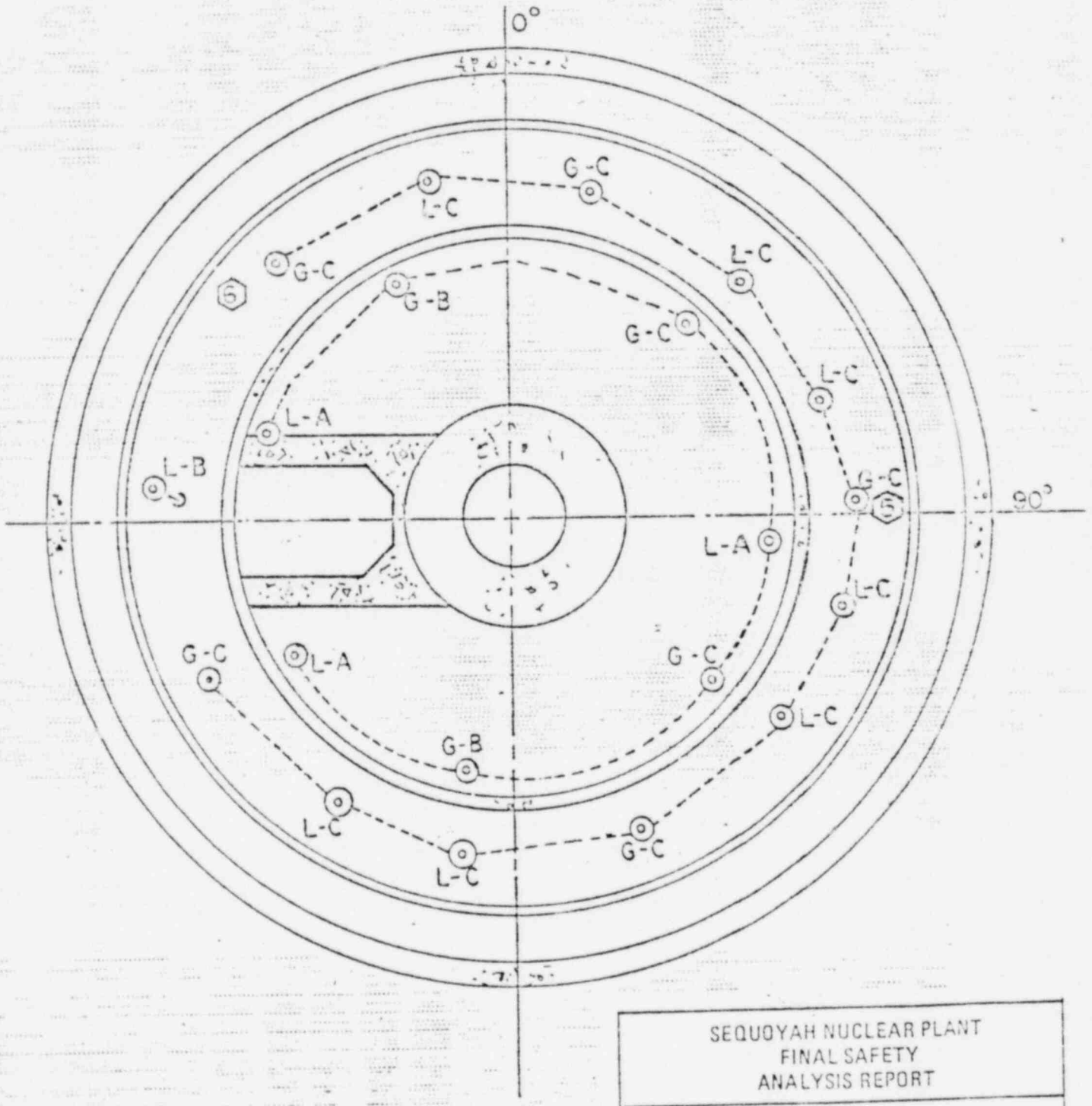
CONTAINMENT LIGHTING FIXTURES
EL. 689.0'
FIGURE 6.2-142



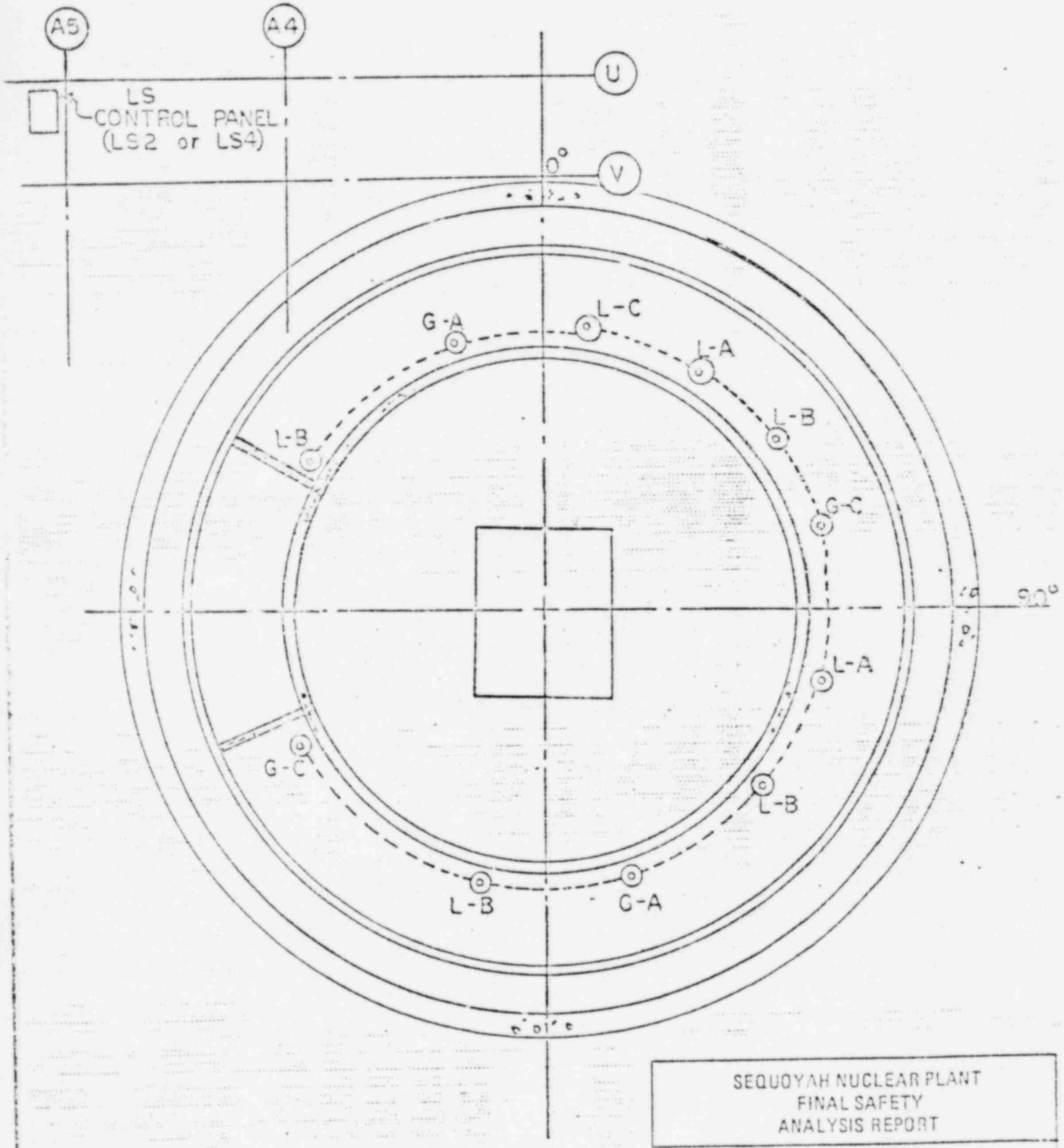
SEQUOYAH NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT

CONTAINMENT LIGHTING FIXTURES
EL. 700.3
FIGURE 6.2-143



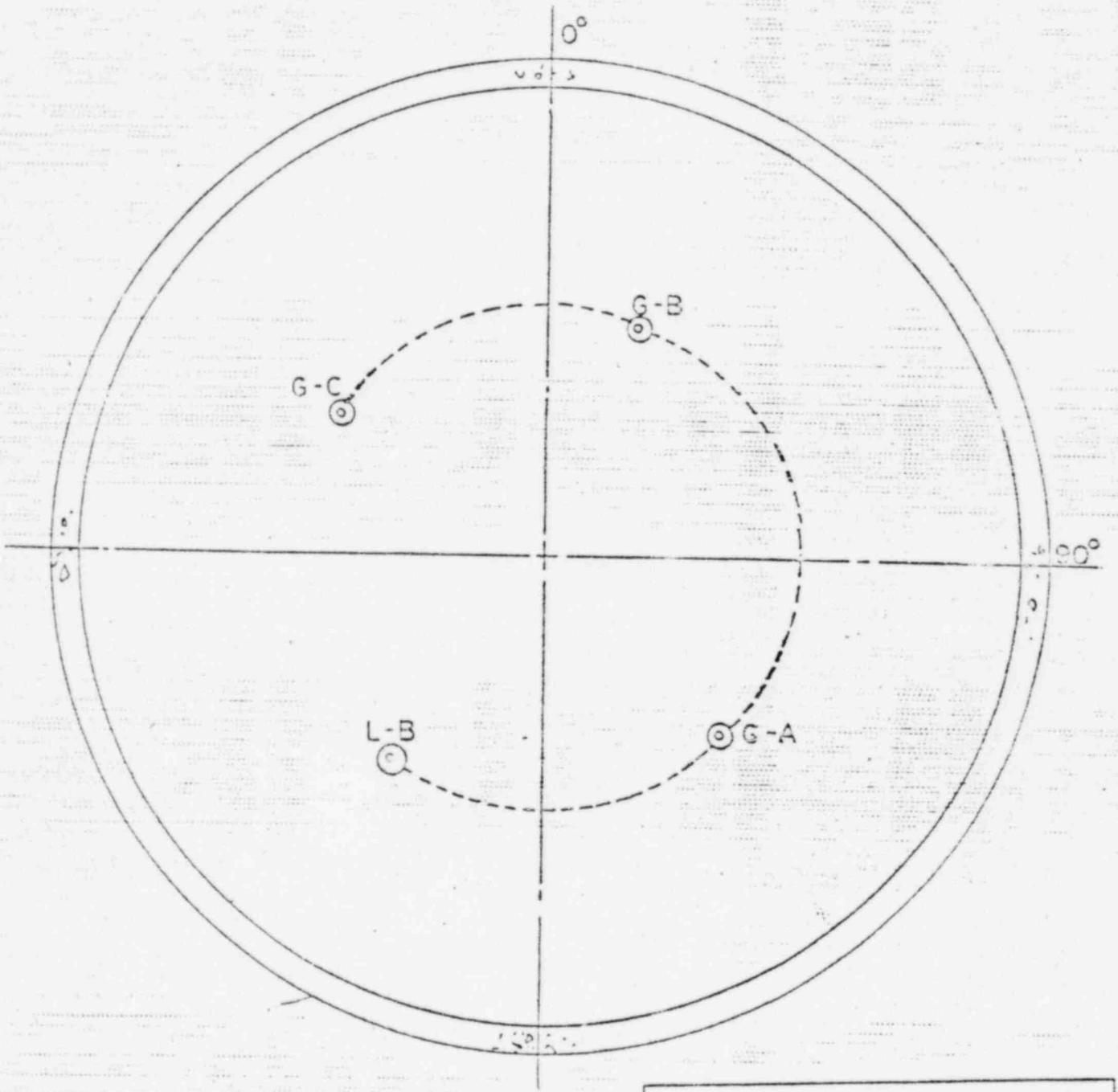
SEQUOYAH NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT

CONTAINMENT LIGHTING FIXTURES
EL 731.0'
FIGURE 6.2-144



SEQUOYAH NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT

CONTAINMENT LIGHTING FIXTURES
EL 792.0'
FIGURE 6.2-145



SEQUOYAH NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT

CONTAINMENT LIGHTING FIXTURES
EL 818.0'
FIGURE 6.2-146

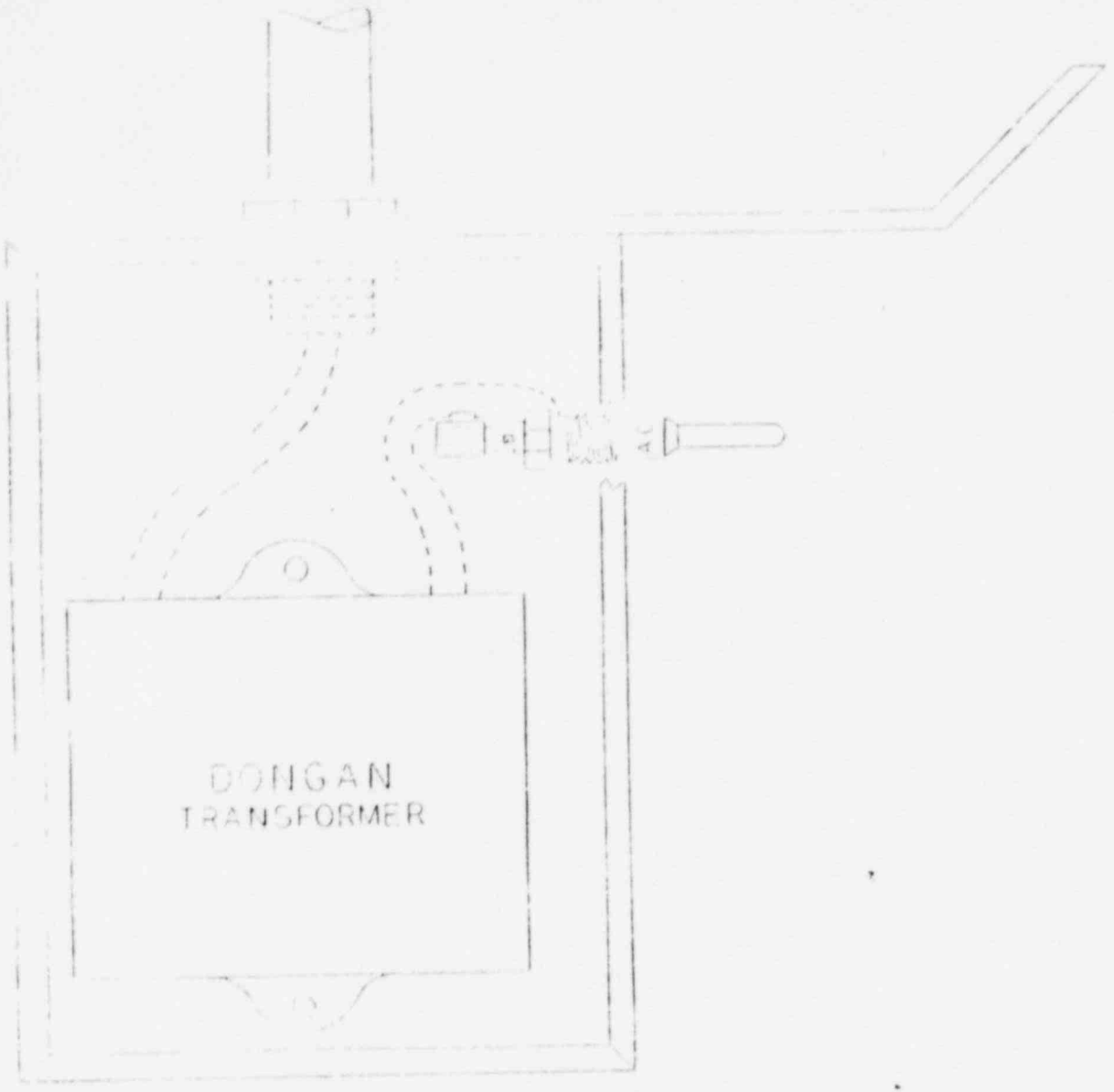


FIGURE 7

SEQUOYAH NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT

PRELIMINARY PHASE I
MOUNTING DETAIL
FIGURE 6.2-147

ENCLOSURE 2
SEQUOYAH NUCLEAR PLANT UNIT 1
TESTING REQUIREMENTS - INTERIM
DISTRIBUTED CONTROLLED HYDROGEN IGNITION SYSTEM

TVA SEQUOYAH

UNIT(S) 1

SCOPING DOCUMENT FOR PREOPERATIONAL TEST NO. TVA- 65

Title: Operational Test of the Interim Controlled Hydrogen Ignition System

Prepared by: _____ _____
J. J. Wilder Date

Submitted by: _____ _____
L. W. Lau Date

Approved by: _____ _____
G. F. Dilworth Date

1.0 References

1.1 Interim Controlled Distributed Hydrogen Ignition System - Phase 1 - Design Criteria.

2.0 Discussion of Test

The operational test of the interim controlled hydrogen ignition system will verify the voltage and temperature at the igniter plugs. Also, this test will establish the baseline current readings for performing the periodic surveillance test of the hydrogen ignition system.

3.0 Test Objectives

The purpose of this test is to verify that this system, once installed, will provide ignition sources of a specified temperature. In addition, by measuring the current at the standby lighting cabinet after testing all igniters for proper temperature, a baseline can be established for future periodic surveillance tests.

4.0 Acceptance Criteria

This test will verify that:

a. The ac voltage at the output of the igniter transformers is no greater than 14 volts and no less than 11.5 volts.
b. That the temperature of each igniter is at least 1500° F.

5.0 Additional Testing

After verifying that all igniters meet the acceptance criteria in section 4.0 above, measure the current in each circuit at the standby lighting system cabinet and record the results on Table 1, attached.

6.0 Prerequisites

The standby lighting system must be operational. In particular penetration protection fuses must have been installed and the remaining lighting locations where igniters are <u>not</u> installed should have their bulbs removed.

7.0 Environmental Conditions

No special environmental conditions are required for this test.

8.0 Special Test Equipment

Special instrumentation to be used includes an optical pyrometer and a volt and amp meter.

9.0 Scope of Testing

This test will cover only operational verification of the igniter system. The igniters will not be tested in place for their ability to burn hydrogen, nor will an endurance test be performed in situ.

TABLE 1

Igniter Current

Circuit	Current
10A	
10B	
10C	
11A	
11C	
12A	
12B	
12C	

Data in this table to be used to verify current readings taken during surveillance testing.

Note: There are no igniters on circuit 11B; therefore, no current reading is required.

ENCLOSURE 3

SEQUOYAH NUCLEAR PLANT UNIT 1
EMERGENCY OPERATING INSTRUCTION MODIFICATION -
INTERIM DISTRIBUTED CONTROLLED HYDROGEN IGNITION SYSTEM

The emergency operating instructions (EOI's) will be modified to include the operation of this new system by an operator after an accident. The EOI's will be revised to include the following modifications by August 21, 1980.

1. EOI-0, "Immediate Actions and Diagnostics Unit 1 or 2," R2:

   Add to II.B:

   "For unit 1 only
   11. Dispatch an operator to the standby emergency lighting cabinet to initiate the controlled distributed hydrogen ignition system."

2. EOI-1A, "Loss of Reactor Coolant Unit 1 or 2," R12:

   "For unit 1 only
   Note: Verify the controlled distributed hydrogen ignition system was actuated in EOI-0, section II.B.11. Also verify that they have been loaded on the diesel generators if offsite power has been lost."