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October 13, 1982

Mr. Darrell G. Eisenhut, Director
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Zion Station Units 1 and 2
NUREG 0737 Item II.B.3
Post Accident Sampling System
Additional Information
NRC Docket Nos. 50-295/304

References (a): J. D. Neighbors letter to L. O. DelGeorge dated July 22, 1982

(b): E. D. Swartz letter to D. G. Eisenhut dated August 16, 1982

Dear Mr. Eisenhut:

Reference (a) requested that the Commonwealth Edison Company provide a schedule for providing certain documentation concerning the NUREG 0737 Item II.B.3 Post Accident Sampling System at our Zion Station. Accordingly, Reference (b) provided the requested schedule and indicated that we expected to be in a position to submit the requisite information by October 15, 1982.

The Enclosure to this letter provides the requested information and indicates how the Zion Station implementation satisfies each Reference (a) criterion for NUREG 0737 Item II.B.3.

To the best of my knowledge and belief, the statements contained in the Enclosure are true and correct. In some respects these statements are not based on my personal knowledge but upon information furnished by other Commonwealth Edison employees. Such information has been reviewed in accordance with Company practice and I believe it to be reliable.

Please address any questions that you may have concerning this matter to this office.

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One (1) signed original and thirty-nine (39) copies of this letter with Enclosure are provided for your use.

Very truly yours,

E. Douglas Swartz
Nuclear Licensing Administrator

Enclosure

cc: J. G. Keppler, Regional Administrator RIII
David L. Wigginton - ORB 1
RIII Inspector - Zion

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ENCLOSURE

COMMONWEALTH EDISON COMPANY

Zion Station Units 1 and 2

NUREG 0737 Item II.B.3 Post
Accident Sampling System -
Additional Information

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Zion Station High Radiation Sampling System

General Description

The liquid sampling equipment located in the primary sample room on elevation 592 feet of the auxiliary building is designed for post accident analysis of primary coolant. An in-line chemical analysis panel (CAP) and an grab-sampling panel (both manufactured by Sentry Equipment Corporation of Oconomowoc, Wisconsin) have been purchased for each unit. The grab-sampling panel is designed to create fixed volumes (cooled and depressurized) of diluted and undiluted primary coolant samples. This panel is also capable of giving a controlled volume of diluted strip gas. These samples can be analyzed in the station's gas chromatograph or sent to an offsite laboratory when necessary. The electrically powered components of the high radiation sampling system are supplied from non-ESF buses which are capable of being manually connected to ESF buses should the need arise.

The CAP is capable of performing in-line analyses of ph, dissolved oxygen, chloride, hydrogen, and specific conductivity of primary coolant during normal and post-accident conditions. The grab-sampling panel is the manual backup for the CAP. A diluted primary coolant grab-sample is required for boron and radionuclide analysis. This sample, or an additional sample can be analyzed in the laboratory for hydrogen, oxygen, and chlorides. Special casks have been purchased for these samples, so that they can be safely handled. The isotopic analysis shall include iodines, cesium, and nonvolatiles. A minimum of one diluted grab-sample can be taken per day for the duration of the post-accident period. Table I contains a summary of the Zion system analysis capabilities.

Samples are taken from the reactor coolant system by direct extraction from the reactor coolant system piping through dedicated sample taps and sample lines connected to the high radiation sampling system. Samples taken from the containment atmosphere are extracted directly from the containment atmosphere through containment air sampling panel system piping and containment penetrations. No isolated auxiliary systems are required to be in operation in order for the reactor coolant and containment atmosphere samples to be taken.

A diluted primary coolant sample can be drawn via a direct tap, delivered to the laboratories, and analyzed within 3 hours of the time that the sampling decision is made. The radiation exposure to any individual will be less than the exposure limits specified in General Design Criterion 19. The shielding design is based on sources specified in Regulatory Guides 1.4 and 1.7. The primary coolant volume for this post-accident shielding design is the same as the normal primary coolant volume. A more detailed description of the shielding is provided on page 3.

Laboratory equipment has been purchased that will allow identification and quantification of isotopes which include iodines, cesiums, noble gases, and nonvolatiles. The accuracy, range, and sensitivity of these instruments and the CAP are adequate for describing radiological and chemical status of the primary coolant. Table II gives the expected concentrations of a few radioactive isotopes using Regulatory Guides 1.4 and 1.7 source assumptions.

The following design features are included in the high radiation sampling system:

- Purging and flushing is designed into both the liquid sampling and containment atmosphere sampling portions of the high radiation sampling system.
- Stainless steel piping for all sample lines and piping of the system.
- Fifteen tube diameter radius bends in field sample lines.
- Heat tracing of containment atmosphere sample lines to reduce iodine plateout.
- Purging and flushing of lines to reduce plateout and exposures.
- Multiple sample taps for reactor coolant sampling to ensure representative sampling and diverse sample points.
- Optimum panel sample line sizes to limit crud buildup.
- A waste drain tank and pumps for collection of liquid sample effluents before return to containment during accident conditions, or to the chemical drain tank or volume control tank under normal operating conditions.

Ventilation air from the high radiation sampling system liquid sample panels and chemical analysis panels located in the primary sample room is exhausted through the engineered safety features filter system. The filter system includes pre-filters, HEPA filters, and charcoal adsorbers.

Shieldinq

The design basis post-accident sources for the post-accident sampling system assumes 100% fuel cladding damage which results in the most conservative liquid concentrations and containment air concentrations. Regulatory Guide 1.4 sources are placed in the normal operating primary coolant volume (ie., 100% nobles, 50% halogens, and 1% of all other isotopes). Containment air contains 100% nobles and 25% halogens. Credit for containment spray was taken.

The panel manufacturer designed the panels with shielding for the front of the panel only. The grab-sampler and the CAP have 7 inches of lead shot and 1 inch of steel. The containment air sampler has 3 inches of steel shielding. The shielding design for the liquid sampling panels are shown on Figures I-III. The shielding for the air sampling system is similar. The transportation casks satisfy NRC shipping requirements (i.e., 10 mrem/hr. at 1 meter).

The shielding design exceeds the requirements of General Design Criterion 19. Tables III and IV give dose rate summaries for the primary sample room and the containment air sample panel area. Table V gives the estimated total integrated doses experienced by a trained operator performing all of the tasks. Laboratory procedures and localized shielding will be utilized to maintain doses (to lab workers) well below the allowable levels in General Design Criterion 19.

Miscellaneous

The testing frequency of the post-accident sampling system will be at a minimum yearly. All analysis functions will be verified.

Formal initial training will be given to all personnel responsible for the post-accident sampling system. Because many components of the post-accident sampling system are used during normal operations, operator familiarity with the equipment will be maintained. Operators will receive formal retraining on an annual basis.

In order to provide a realistic estimate of core damage, a procedure must be developed based upon measurements of radionuclide concentrations. In addition to the radionuclide measurements, other plant indicators (e.g., reactor water level, total quantity of hydrogen released from zirconium-water reaction, and containment radiation monitors) must be considered when estimating core damage. Accordingly, such a procedure for estimating core damage must include not only the measurement of specific radionuclides, but a weighted assessment of their meaning based on a variety of plant parameters. Therefore, the Commonwealth Edison Company is currently pursuing the possibility of developing such a procedure through the Westinghouse Owners Group.

TABLE I

Zion HRSS Analysis Capabilities

Analysis	Instrumentation/Type	Location
Chloride	Ion Chromatograph (In-Line)	Primary Sample Room
Dissolved Hydrogen	Gas Chromatograph (In-Line)	Primary Sample Room
Dissolved Oxygen	Probe (In-Line)	Primary Sample Room
ph	Probe (In-Line)	Primary Sample Room
Conductivity	Probe (In-Line)	Primary Sample Room
Boron	Titration (Grab Sample)	Hot Laboratory

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TABLE II

Radionuclide Inventory in the Reactor Coolant and the Containment Atmosphere at One Hour After an Accident

	Radionuclide Inventory (Curies)	
Radionuclide	Reactor Coolant	Containment Atmosphere
I-131	4.96×10^7	2.48×10^7
I-132	5.17×10^7	2.59×10^7
I-133	7.25×10^7	3.63×10^7
I-134	4.70×10^7	2.35×10^7
I-135	8.26×10^7	4.13×10^7
Kr-83m	6.20×10^6	6.20×10^6
Kr-85m	1.48×10^7	1.48×10^7
Kr-85	9.41×10^5	9.41×10^5
Kr-87	2.03×10^7	2.03×10^7
Kr-88	4.03×10^7	4.03×10^7
Xe-131m	9.11×10^5	9.11×10^5
Xe-133m	4.52×10^6	4.52×10^6
Xe-133	1.87×10^8	1.87×10^8
Xe-135m	3.85×10^6	3.85×10^6
Xe-135	3.68×10^7	3.68×10^7
Xe-138	8.19×10^6	8.19×10^6
Solids	4.85×10^7	---

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TABLE III

Dose Rate Summary
Primary Sample Room

Dose Point	Source	Maximum Dose Rate (mrem/hr)
1	LSP Process Piping (in panel)	315
	Connecting Piping (behind panel)	100
	Connecting Piping (under floor)	350
	Backscatter (above panel)	350
	Total	1115
2	LSP process piping (in panel)	315
	Connecting Piping (behind panel)	100
	Connecting Piping (under floor)	negligible
	Direct & Scatter Radiation thru door	350
	Backscatter (above panel)	350
	Total	1115
3	Connecting Piping (behind door)	150
	Backscatter from CAP, LSP	200
	Total	350
4,5	CAP process piping (in panel)	150
	Connecting Piping (behind panel)	100
	Connecting Piping (under floor)	negligible
	Backscatter (above panel)	350
	Total	600
6	CAP process piping (scatter, in-panel)	550
	CAP process piping (direct)	500
	Connecting Piping (in chase behind masonry wall)	60
	Total	1110
7	Connecting lines (underneath floor)	765

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TABLE IV

Dose Rate Summary
CASP (Shower) Room

Dose Point	Source	Maximum Dose Rate (mrem/hr)
1	CASP process piping (in panel)	30
	CASP process piping (behind panel)	250
	Backscatter (top & side)	25
	Total	305
2	CASP process piping and connecting lines	1000

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TABLE V

Estimate of Integrated Dose

Liquid Sample (Primary Sample Room)

Activity	Time (min)	Dose Rate (mrem/hr)	Dose (mrem)
Walk from hot lab to remote control panel. Initiate sampling operation	10	1000	167
Walk to primary sample room	1	1000	17
Obtain sample	35	2115	1234
Remove cart and return to hot lab via elevator near column M and 22	9	1000	150
Total	55	-	1568

Containment Air Sample (Shower Room)

Activity	Time (min)	Dose Rate (mrem/hr)	Dose (mrem)
Walk from hot lab to remote control panel	2	1000	33
Initiate sampling operation	18	1000	300
Walk from remote panels to CASP (shower) room	4	1000	67
Isolate sampling cart	1	1305	22
Wait unit sampling cycle is completed	7	1000	117
Withdraw sampling cart and return to hot lab	5	1000	83
Total	37	--	622

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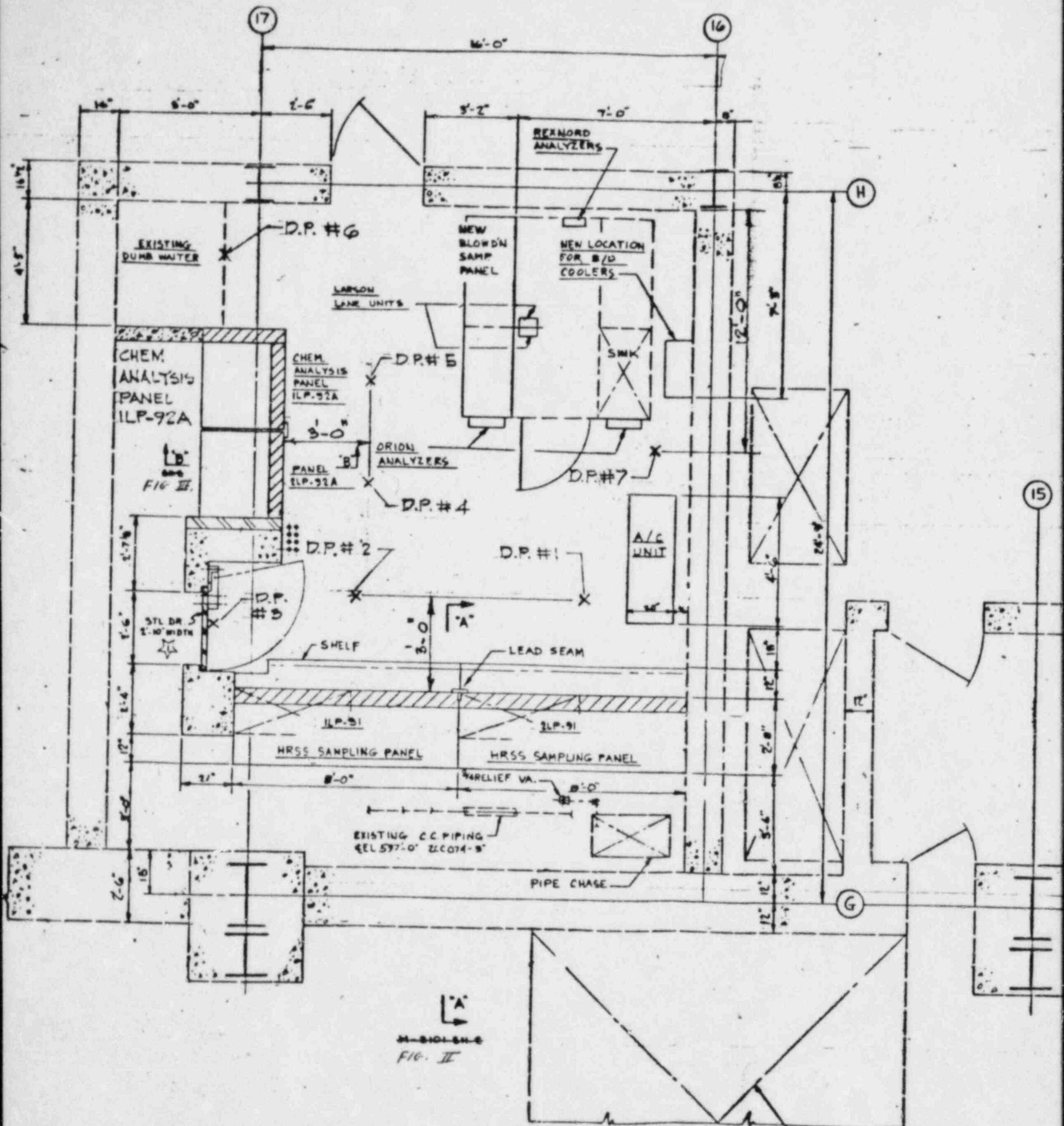
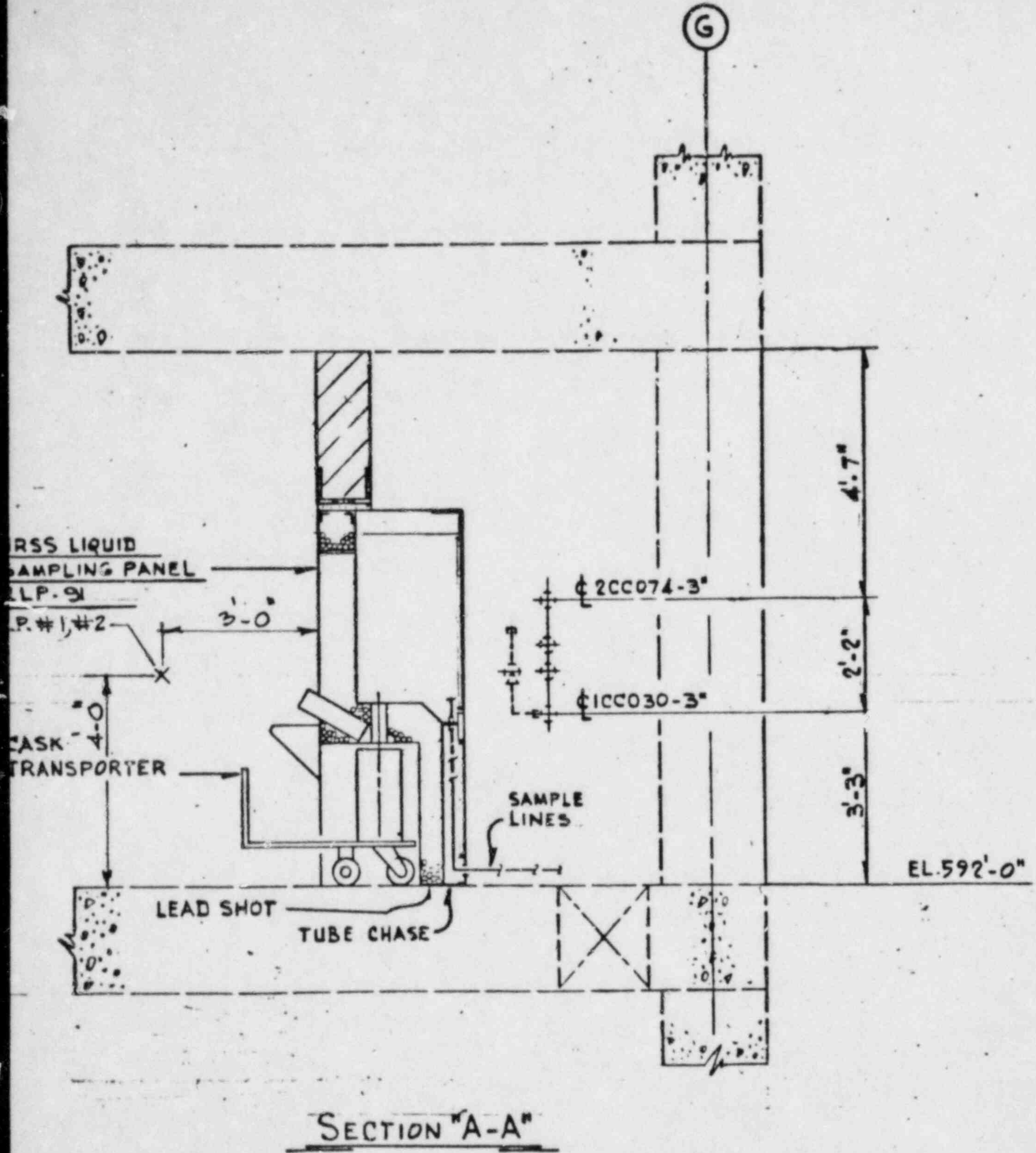


EXIST. PRIMARY SAMPLE ROOM
PLAN EL. 597'-0"

FIGURE I



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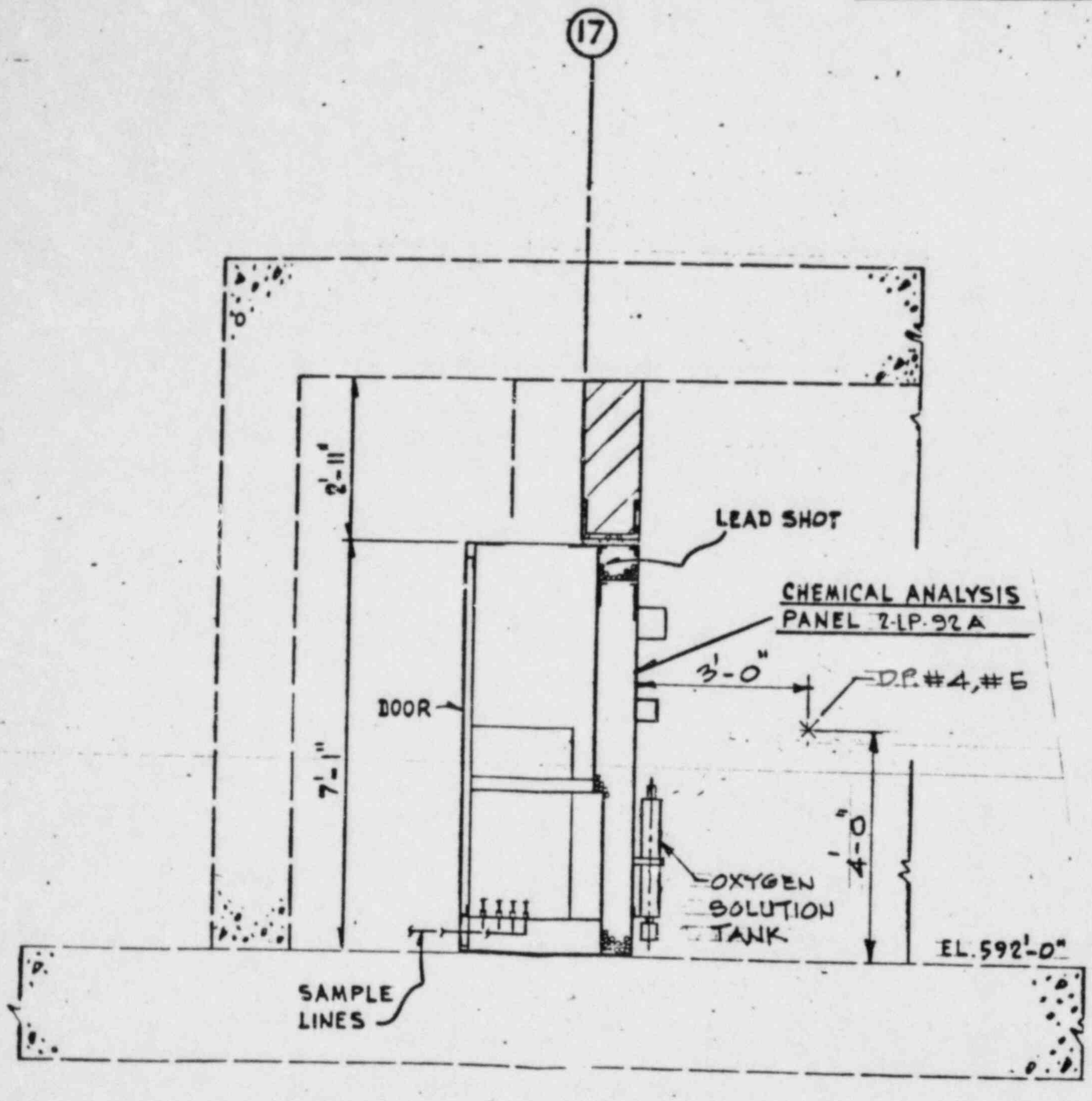
SECTION VIEW

FIGURE II



SECTION "B-B"

URE 2B

OF THE LSP & CAP

FIGURE III