INTERIM REPORT

ON THE

STPEGS RCB NO. 1 LIFT 8 CONTAINMENT VOIDS

INTRODUCTION

On June 5, 1979, Houston Lighting & Power Company submitted a final report on the void deficiency that had occurred on the 15th lift of Unit 1 RCB Containment Shell. This report contained a description of the methods that were used to identify, analyze, and repair these voids. The report also contained information on those actions taken to preclude the recurrence of this deficiency. Prior to the preparation of this final report, information was obtained from site personnel which led to the concern that voids might exist in the 8th lift of the Unit 1 RCB Containment Outer Shell. Soundings were begun and it was determined by drilling that voids did indeed exist. On June 18, 1979, HL&P notitied the NRC that the condition was reportable under the requirements of 10CFR50.55(e). At this time, a stop work notice was issued for the placement of all concrete in the Unit 1 and Unit 2 RCB Containment Shells. At this time, a significant amount of investigation has been performed towards the resolution of this deficiency; however, the work has not been completed. Thus, this interim report will provide the status of this activity and will provide information on the work yet to be completed, including an estimated schedule for the completion of these activities.

INVESTIGATION

The investigation of this deficiency was two-fold. One facet of the investigation was directed toward determining the extent of the voids. The

other facet of the investigation was directed toward determining the cause and providing sufficient corrective action so that the placing of concrete in the RCB Outer Shells could resume. A logic diagram was prepared so that this work could proceed in a planned and orderly manner. A copy of this logic diagram is contained in Figure 1.

Initially, B&R Construction placed a 2' x 2' grid on the steel Containment liner from El. 57'0" to El. 67'0" for the full circumference of the Containment. The liner was then sounded for the purpose of detecting potential void areas, using procedures that were developed during the investigation on Lift 15. All of this activity was conducted under Quality Control surveillance. This procedure involves the tapping of the liner using a metal hammer and identifying areas of "non-contact" between the liner plate and the concrete based upon the sounds as detected by the human ear. The areas of "non-contact" were physically marked on the liner plate and this information was then transferred to drawings and transmitted for evaluation. Drawings of the liner were prepared showing all penetration and liner stiffening systems. Based upon these drawings, direction was provided to drill holes in the liner plate to determine if the "non-contact" areas were indeed voids. A total of 183 holes were drilled and investigated. As the result of this investigation, 12 areas were identified in which voids existed. The voids were then explored using probes and a fiber scope to determine the extent of "non-contact". These void areas are shown in Figure 2. The majority of the "non-contact" areas were attributed to temporary weldments attached

to the liner, normal concrete settlement/shrinkage, and liner movement. These findings were consistent with the conclusions obtained during the investigation of the Lift 15 deficiency.

The investigation to determine the cause of this deficiency and to provide recurrence control for future pours was conducted in the following manner. A review of the pour packages (which included inspection reports, test data, and non-conformance reports) which were applicable to Lift 8 was conducted. This investigation was performed for the purpose of identifying any unexpected conditions which may have occurred during the course of the placements and thus, could have contributed to the problem. The information obtained during this investigation was combined with information obtained during interviews with construction and inspection personnel to provide a basis for assessing the procedures being utilized to control the activities during these complex concrete pours. During the investigation to determine the location of the voids, it was ascertained that the voids of significance were located under the horizontal 8" channel and 1" x 8" plate stiffeners in the vicinity of added reinforcing steel around penetrations. Such areas require an additional amount of attention and vibration during the consolidation of the concrete. During this pour, these areas were at the approximate 5' mark of the 10' pour and their accessibility for inspection and vibration was poor. As the result of these investigations, it was determined that recurrence could be affected by providing for better accessibility to those areas of congestion where additional inspection and vibration is required,

and by strengthening the construction and quality control procedures. A list of recommendations for corrective action was prepared and was reviewed and approved by both Brown & Root and Houston Lighting & Power Companies. A summary of these recommendations is contained in Table 1. Construction and inspection procedures and engineering design documents are currently being revised to accommodate for the implementation of these recommendations.

CONTINUING ACTIVITIES

Based upon the information obtained during this investigation of the voids in Lift 8, it was concluded that other void areas could exist beneath penetrations and the 8" channel and plate stiffeners where additional reinforcing steel is located. Therefore, additional soundings will be made in three general penetration areas of high stress regions and congestion: 1) the equipment hatch, 2) personnel air lock, and 3) the main steam and feedwater lines. The current areas of investigation are shown in Figure 3.1 and 3.2. The logic diagram and plan for the completion of this activity is contained in Figure 3.3.

The use of alternate methods of sounding the liner was investigated. This investigation consisted of reviewing utility reports to the NRC for similar occurrences on the Wolf Creek, Edward Hatch, and VC Summer nuclear power plants. These reports described similar problems and methods of detecting voids behind the liners. The merits and effectiveness of the alternate methods contained in these reports were discussed with industry personnel

directly involved with their use. It was concluded that physically sounding the liner surface and selectively drilling holes to interpret and verify the soundings is as reliable as other more sophisticated techniques used for void detection. To properly interpret the soundings, the geometry of the liner stiffeners, penetrations, and a general configuration and congestion of this reinforcing steel must be considered.

At the present time, activities are underway to resume the placement of concrete in the RCB Containment Shell. Construction and inspection procedures are being revised to upgrade the control of the concrete placement during the shell placements. In addition, design drawings are being revised to provide for additional accessibility to areas where additional inspection and vibration is required. The plan and logic diagram for this activity is also contained in Figure 3.3.

It has been determined that the methods used to repair the voids observed on Lift 15 are appropriate and suitable for use to repair the voids found on Lift 8. Final evaluation of the material used in the repair of Lift 15 will be performed after all information relative to the actual Lift 8 voids is available.

It is estimated that this deficiency, including repair, will be closed out on or before January 19, 1980. The final report will be submitted to the NRC within 30 days thereafter.

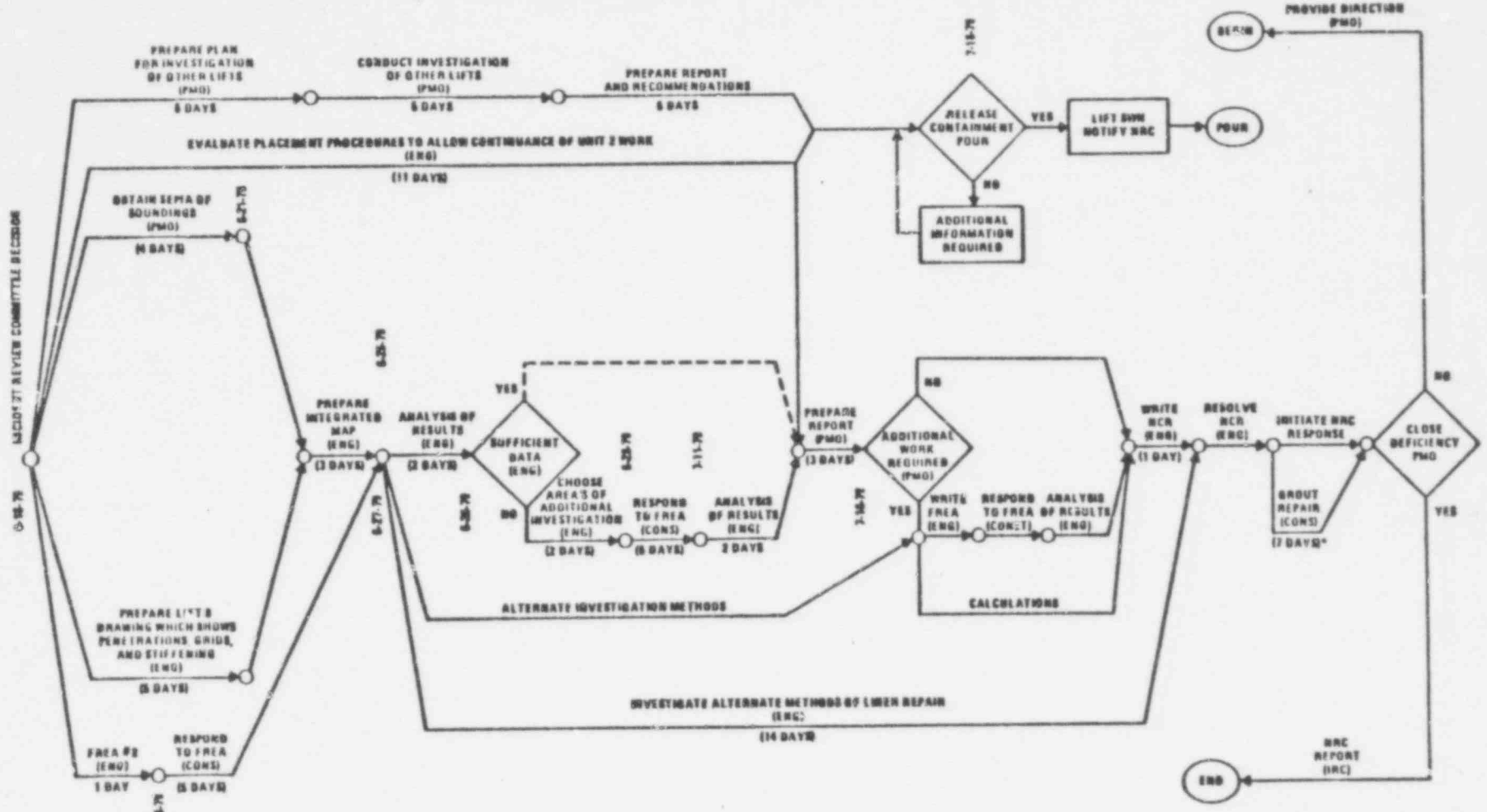
TABLE I

RCB SHELL CONCRETE PLACEMENT
RECURRENCE CONTROL

PROBLEM	RECOMMENDED SOLUTION
1. Concrete-Uniformity	A. Buy all produced concrete (batch @ 6"). B. Area Engineer to visually monitor slump consistency at hopper. C. Use of grout at penetrations as determined by Engineering. D. Aggregate Moisture - Control for coarse aggregate.
2. Preplacement Planning	A. Drawing and meeting on each placement and document. B. Define workable section on placement plan.
3. Inspection	A. Training of QC inspectors. B. Increase number of inspectors to 4 to 6 per pour. C. Advise foreman of inspectors' authority. D. Have specific vibrator inspector(s) on pour.
4. Equipment Breakdown	A. Back-up equipment, one to one, located at the pour. B. Preventive Maintenance Program identified and followed.
5. Access/Visibility Problem	A. Reduce Lift #7 to approximately 6'-0, with channel at top; subsequent lifts to be 10'-0. B. Selective shear bar relocation to increase accessibility (10'-0 c. to c.). C. Lighting available on the form. D. Engineering to review tie attachment at liner for lifts, at top of form.
6. Fatigue	Start by 9:00 or scrap pour.
7. Vibration	A. Crew deposit and vibrate simultaneously, responsible for each workable section. B. Pre-training of vibrator operators. C. Pencil vibrators at each work section for inside and outside face and at penetrations (2 pencil vibrators). D. Vibrators set-up for each section. E. Vibrator/Placement Method written by Construction, including assignment of vibrator operators to each section.
8. Training	A. Vibrator-Placement Foreman - one training placement program on technical aspects.

		B. Vibrator training field class, demonstrating and explaining technique. C. Meeting with crews prior to placement after prepour meeting, Pour Card signed by the foreman.
9.	Production Pressure	At prepour meeting, inspector(s) explain "how" identified problems are to be interfaced and solved during the placement.
10.	Records	Document post-placement interviews.

LIFT 8 VOID INVESTIGATION
(MAY INCLUDE OTHER AREAS)



NOTE: The dates shown are intended for internal planning and scheduling only.

LOGIC FOR THE COMPLETION OF THE ACTIVITIES REQUIRED TO DETERMINE THE EXTENT OF THE LIFT 8 VOID PROBLEM AND TO PROVIDE MANAGEMENT WITH THE INFORMATION NECESSARY TO MAKE CRITICAL DECISIONS FOR FUTURE ACTIONS

* DEPENDENT UPON THE EXTENT OF VOIDS

Figure 1

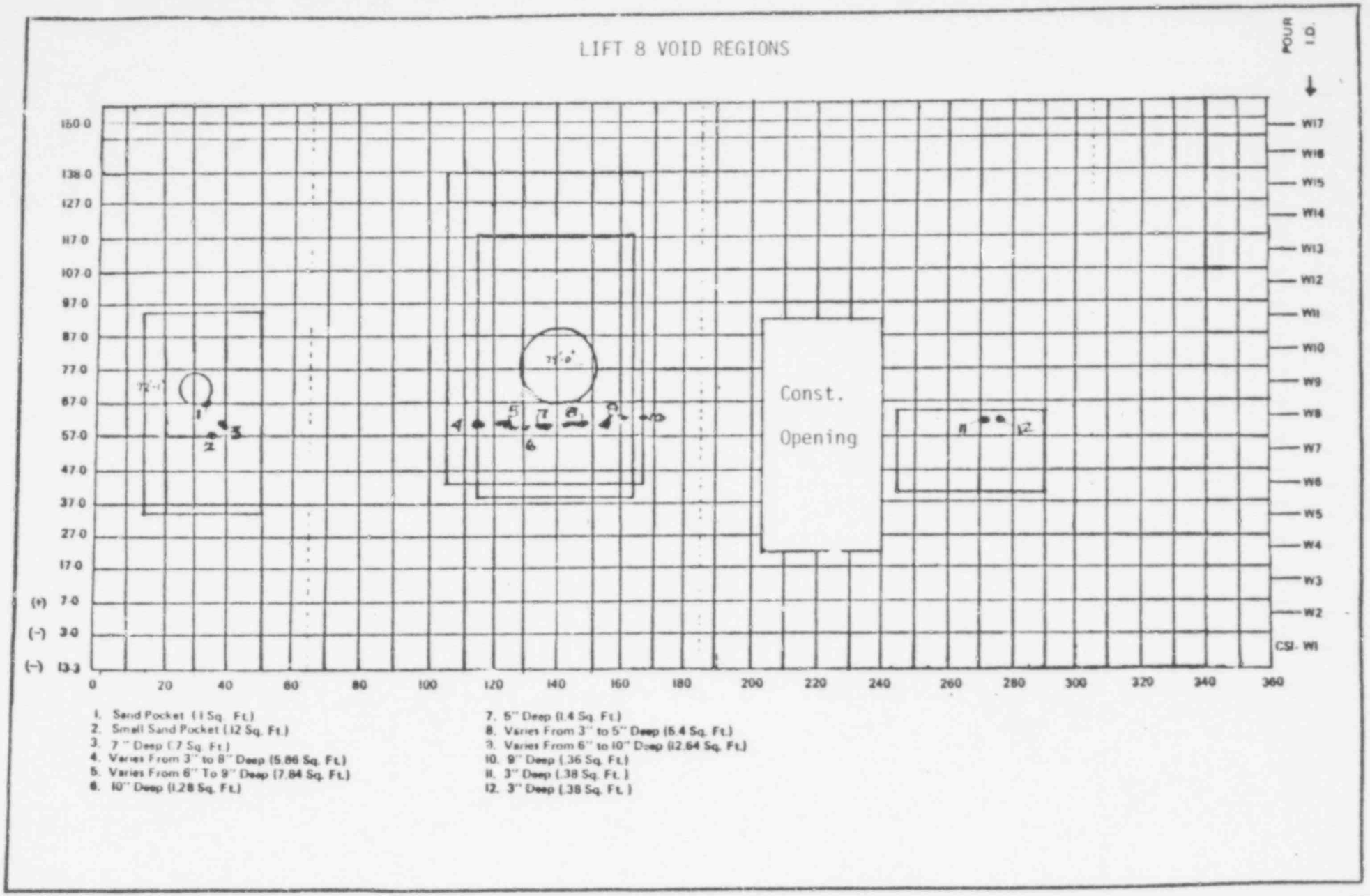


Figure 2

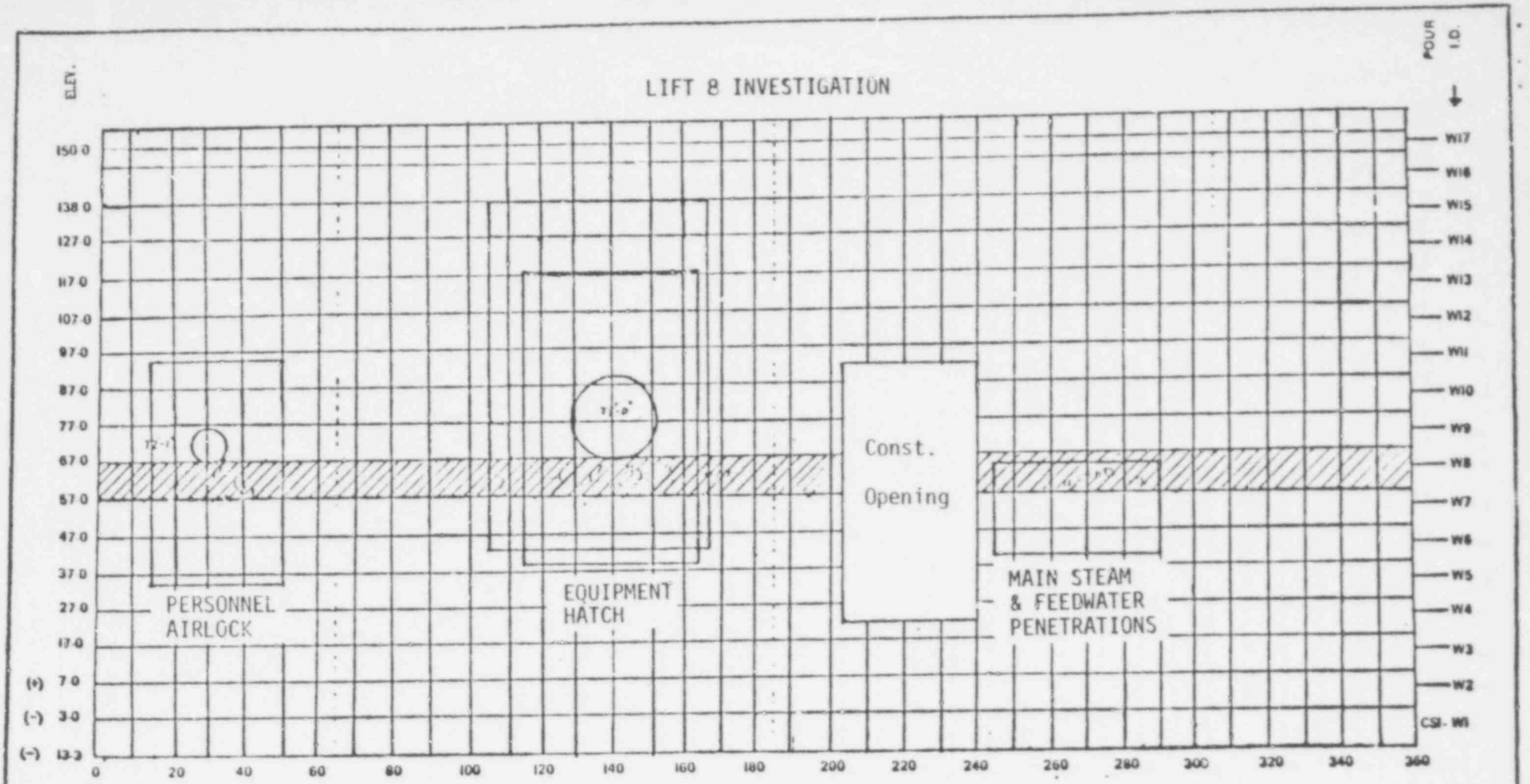


FIGURE 3.1

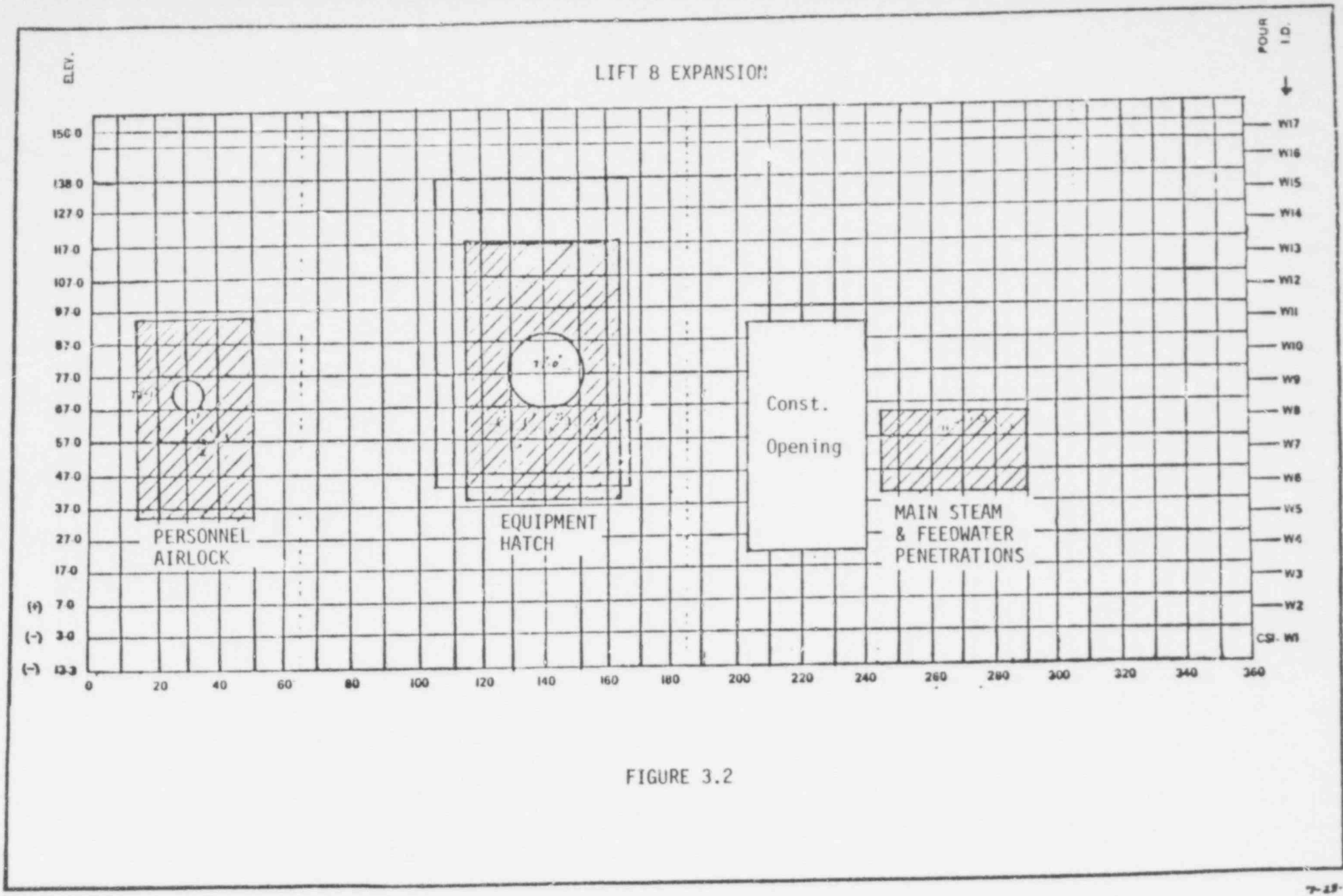
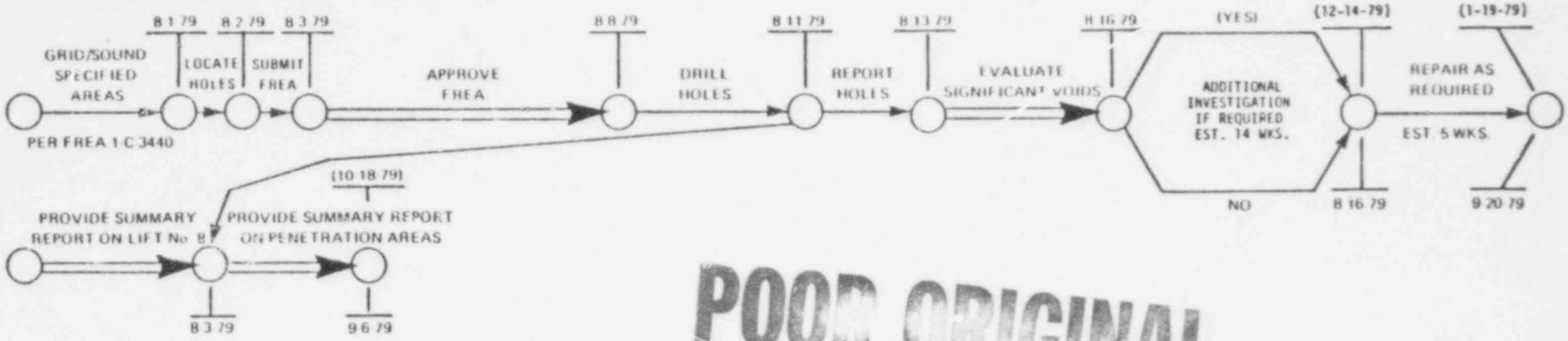


FIGURE 3.2

VOID PLAN

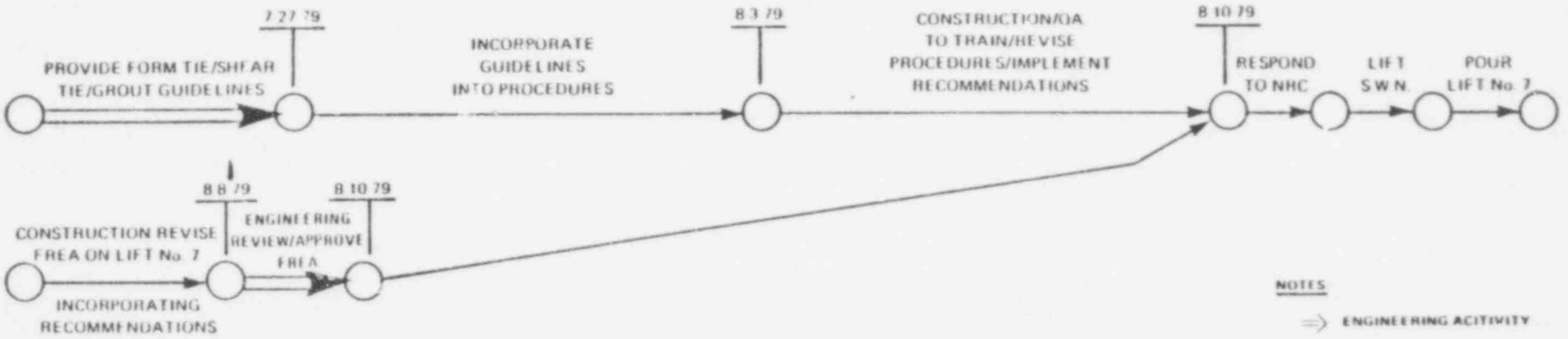
DATE: 8-9-79

INVESTIGATION



FREA 1-C-3440
EXPANDS LIFT 8 INVESTIGATION TO INCLUDE:
a) EQUIPMENT HATCH AREA ELEV. 40' to 118'
b) PERSONNEL AIRLOCK AREA ELEV. 35' to 95'
c) MAIN STEAM/FEEDWATER LINES ELEV. 40' to 65'

RESUME SHELL CONCRETE



NOTES

⇒ ENGINEERING ACITIVITY

( ) DATES IF ADD'L INVESTIGATION REQ'D.

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FIGURE 3.3