J. G. Keppler

DMB

UNION ELECTRIC COMPANY

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ST. LOUIS, MISSOURI

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VICE PRESIDENT

June 29, 1984

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Mr. James G. Keppler
Regional Administrator
U.S. Nuclear Regulatory Commission
Region III
799 Roosevelt Road
Glen Ellyn, IL 60137

Dear Mr. Keppler:

ULNRC-857

ACCEPTABILITY OF TEST RESULTS FOR
CONTROL ROOM HALON SYSTEM (SKC07)

The purpose of this letter is to address a Callaway Plant fuel load deferral item regarding the inability of the control room Halon system to meet system test criteria specified in the pre-operational test program. This particular fuel load deferral item is documented as fire protection item G.7 of Attachment 1 to the Callaway Plant Operating License (NPF-25) and has been designated as an item to be completed prior to exceeding 5% power.

The control room Halon system is a fixed, automatic total flooding system and is provided as an automatic fire suppression system for control room cables routed in a concealed trench traversing the control room floor. The particular control room cables are non-power cables associated with separation groups 2, 4, and 6 which serve completely redundant circuits assigned to train B. The cables are routed from the upper cable spreading room down the west wall of the control room in sealed, but accessible, cable chases and across the floor to the control room consoles. Redundant circuit separation is provided by this routing scheme.

The control room Halon system design is based on NFPA No. 12A-1973 Standards and is intended to automatically flood the concealed floor cable trench and the vertical cable chase with agent when a fire in these areas is detected. Maintaining a Halon concentration of $\geq$5% Halon at the level of the highest combustible for $\geq$10 minutes is the acceptance criterion that Union Electric has committed to in regard to this system. Preoperational testing of the system has demonstrated that the system can meet the acceptance criterion with the exception of a small section at the top of the vertical cable chase extending

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about 5 feet below the floor of the upper cable spreading room. Details associated with the preoperational testing, test results and the acceptance bases for the control room Halon system are provided in Enclosure A.

Based on the detailed technical justification and acceptance evaluation provided in Enclosure A, we have concluded that the preoperational test results for the control room Halon system are acceptable and that the installed system can perform its intended function. Union Electric believes that the control room Halon system, as installed, meets the intent of the FSAR for automatic fixed Halon fire protection of concealed spaces in compliance with NFPA No. 12A-1973 guidelines. When considered in total, the physical separation of control room circuits provided in the Callaway design combined with the fixed automatic total flooding Halon system exceeds the requirements of 10CFR50, Appendix R. Acceptance of this system, as installed, is consistent with safety bases documented in the Callaway SER (NUREG 0830) and its supplements.

Based on the information provided in Enclosure A, Union Electric considers the control room Halon system testing complete and the system operational in accordance with the limiting conditions for operation, defined in the Callaway Plant Technical Specification (NUREG 1058). We believe this information closes Item G.7 of Attachment 2 to the Callaway Operating License.

Very truly yours,

Donald F. Schnell

Donald F. Schnell

DFS:jjw

Enclosure

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Enclosure A

ACCEPTANCE EVALUATION

Control Room Cable Trench and Chase

Halon 1301 Suppression System

System Number SKC07

INTRODUCTION:

Halon concentrations of ≥5% cannot be maintained at the highest elevation in the Control Room cable chase for the duration of the 10 minute acceptance verification test.

Testing performed to verify compliance with design standards has resulted in inability to strictly meet FSAR commitments.

HAZARD AREA AND SYSTEM DESIGN:

System SKC07 serves the cable chase and sub floor trenches located within the Control Room proper. The chase and trenches are used to route cable from the Upper Cable spreading Room to the control boards in the Control Room.

The chase is located on the west wall of the Control Room and extends from elevation 2047'-6" to elevation 2072'-10", a distance of 25'-4". The chase is divided into 7 separate volumes by vertical beams with fire proofing. The chase is enclosed on one side by the west concrete wall of the Control Room and on three sides by two layers of gypsum wall board see Figures 1 and 2.

A total of 9 separate sub floor trenches extend from the west wall chase to the control boards. The trenches are recessed into the concrete floor and are covered with steel plates. All trenches are sealed at their entrance into the control boards.

At the approximate elevation of 2070'-0", 6 cable trays project east from the wall board enclosure to route cables over the Control Room area and up into the Cable Spreading Room. These trays are provided with sealed covers and are sealed where they penetrate the wall board and the floor of the upper cable spreading room.

The overall free volume is approximately 480 cubic feet. The Halon system supplies a total of 110 pounds of agent to the enclosure. This produces a theoretical uniform concentration of 36% by volume, see Figure 3.

TESTING AND RESULTS:

The Halon 1301 system serving the Control Room Cable Chase and Trench area was discharged to verify compliance with design requirements and was monitored for agent concentrations for 10 minutes in accordance with acceptance criteria. The system failed to maintain the required 5% minimum concentration in the upper elevation of the chase but experienced significantly high concentrations in the concealed trench, for the duration of the test.

Freon gas was used in lieu of Halon 1301 in accordance with standard industry practices. The appropriate adjustments in agent charge were taken into account; 82% by weight of Halon 1301 per NFPA 12A (1975) section A-1-7.4(a).

Two CH3F recording gas analyzers were used to monitor concentrations at selected nodal points. Each analyzer monitors three points (see Figure 1 for nodal point locations). The analyzers printed out data on strip charts for permanent record.

The test was conducted with the analyzers set on their 0-10% Halon 1301 scale. Readings taken for the lower and intermediate elevations remained above the 10% level for the full 10 minute test. Readings taken for the upper elevation were above 10% for the first 3 minutes and then dropped quickly to below 5% at about 3 1/2 minutes.

To support subsequent evaluation of test results, the analyzers were switched at approximately 1 1/2 minutes, to their 0-100% CO_2 scale, just after the 10 minute test. Readings on this setting produced concentration values capable of being evaluated at levels above 10%. The CO_2 scale values were equated to Halon 1301 values through the use of a calibration curve provided by the analyzer manufacturer. See Figure 4 for a plot of test results.

Subsequent values taken in the CO_2 range after the test at 11 1/2 minutes were extrapolated back to the 10 minute mark in order to determine appropriate concentrations for the lower and intermediate elevations.

ACCEPTANCE BASES:

The Halon 1301 suppression system for the Control Room cable chase and trench area is considered acceptable for meeting the intent of NRC Branch Technical Position (BTP) APCSB 9.5-1 subsection F.2. The BTP requires a total flooding Halon 1301 system for fire suppression in concealed areas of the Control Room in which cables are routed. The Halon system for SNUPPS complies with the subject requirement; justification and engineering observations are as follows:

Basis 1. A total flooding Halon 1301 environment is provided for the trench portion of the chase and trench network. The trenches are the only areas that are concealed in the sense implied by BTP APCSB 9.5-1. The wall chase is provided with access panels at multiple elevations thus allowing surveillance of the chase cables.

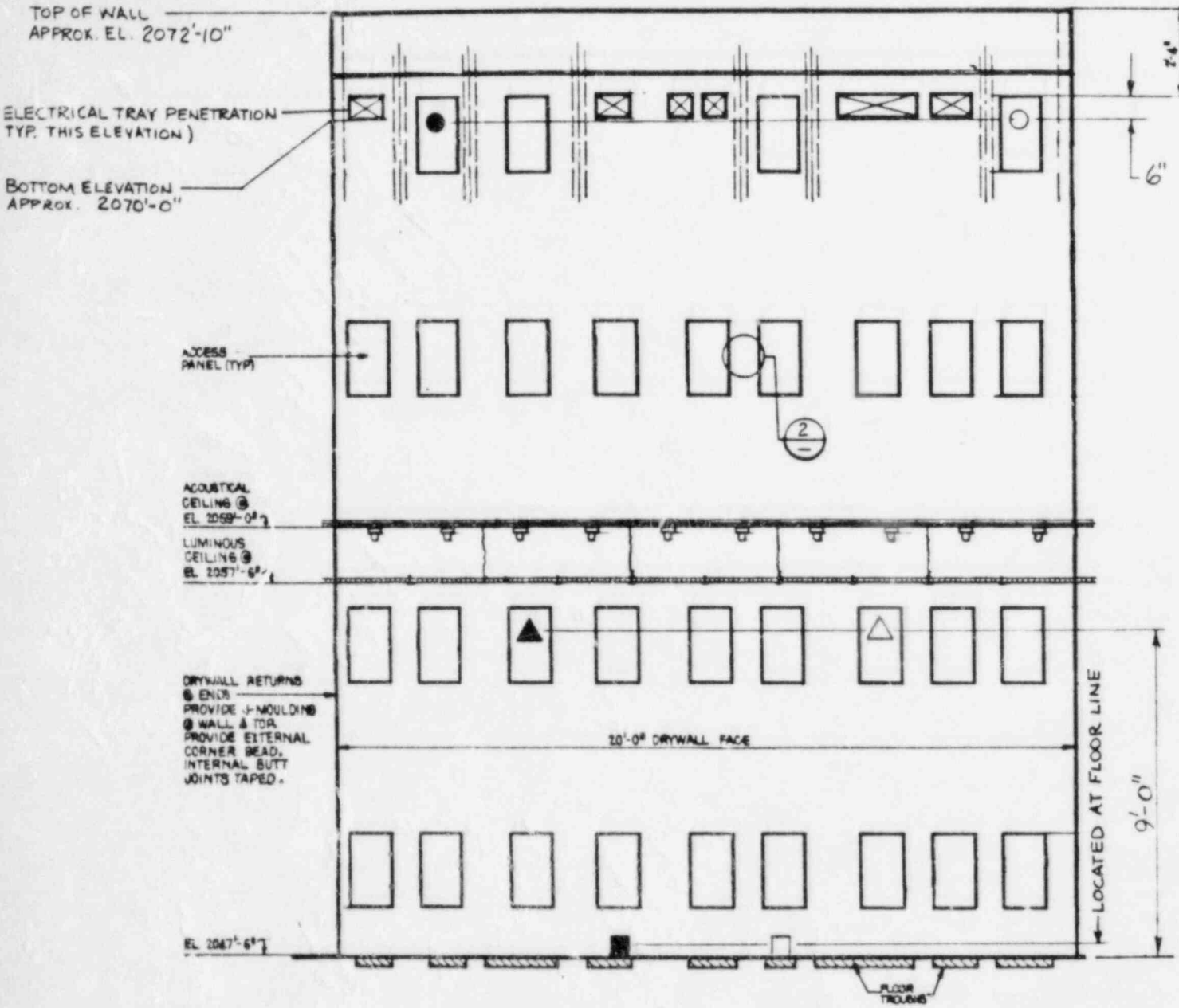
Base 2. Concentrations in the upper chase elevations, based on data taken during preop testing has been calculated to be less then 5% concentration in approximately the top 5 feet. Sufficient Halon 1301 concentrations are maintained elsewhere for 10 minutes throughout the trench and chase area.

Basis 3. The cables within the chase and trench areas are IEEE-383 qualified and are not subject to fire propagation without a constant heat source. There are no heat sources within the chase or trenches.

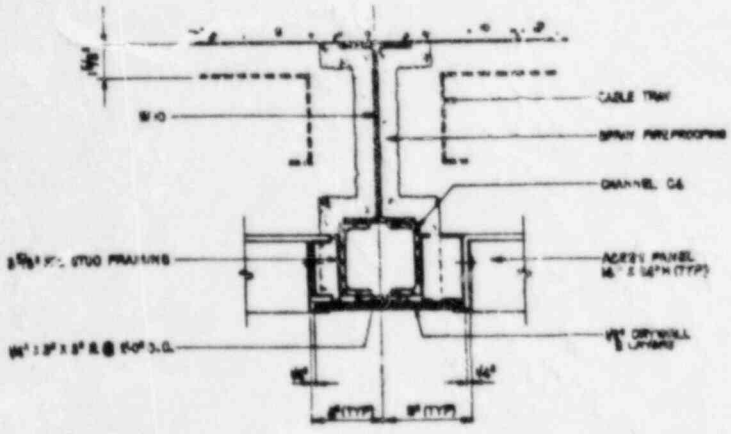
Basis 4. The cables in the chase and trenches are used for instrumentation purposes, no power cable is routed through the space. The probability of a cable generated fire is remote.

Basis 5. Early warning ionization type fire detection is provided within the chase and trench enclosure. This early warning feature allows a rapid response to possible fire development in the space.

Basis 6. A redundant reserve Halon bank is available for manual discharge to extend the period of maximum coverage should it be determined necessary. The reserve bank and associated controls are located in the vestibule (Room 3616) which is located within about 70 ft. of the control room proper.



DRYWALL PARTITION - WEST WALL - RM NO. 9601



DETAIL 2

NODAL POINTS

● ○ HIGHEST ELEVATION NODAL POINTS
▲ △ INTERMEDIATE ELEVATION NODAL POINTS
■ □ LOWEST ELEVATION NODAL POINTS

Figure 1

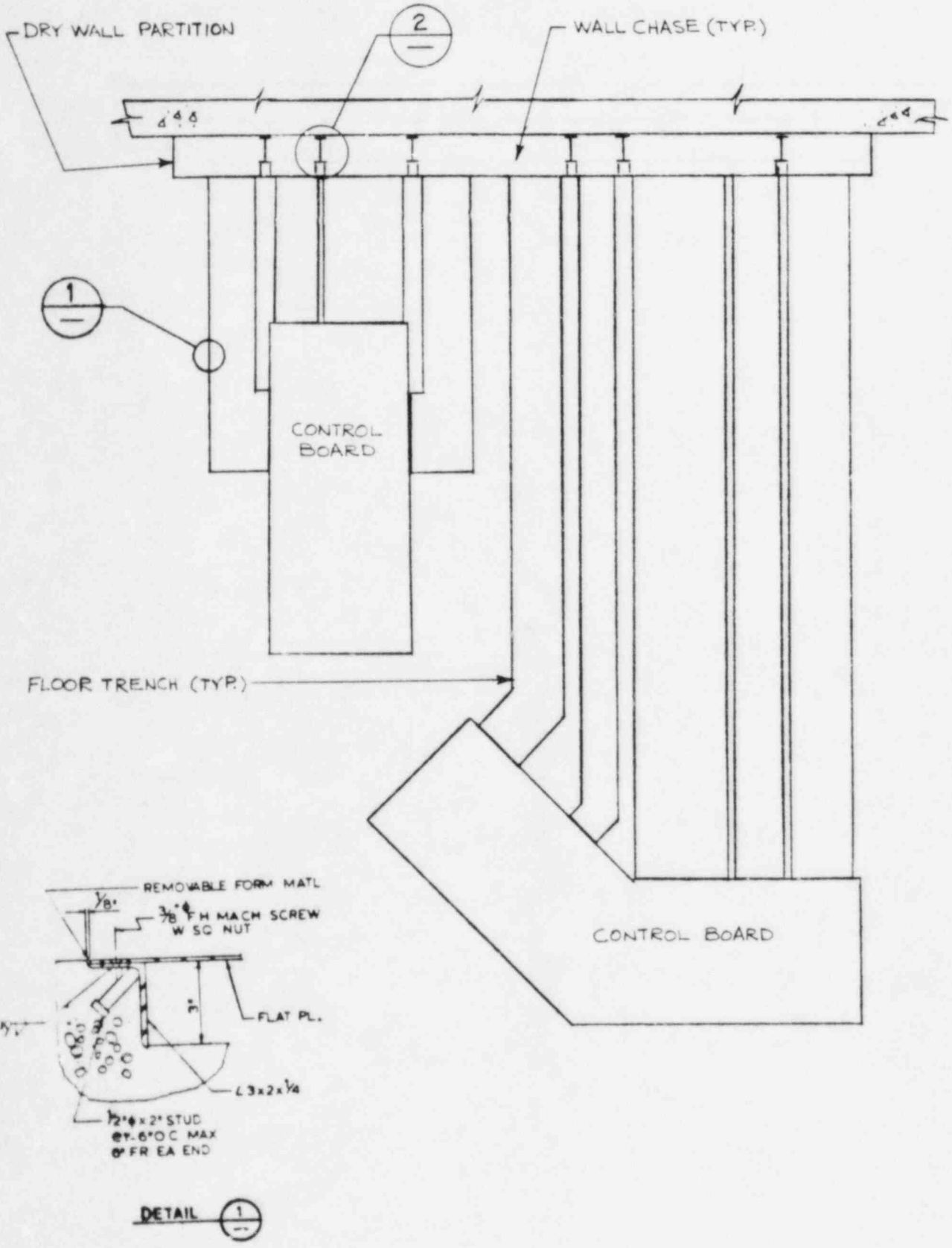

DRY WALL PARTITION
2
—
WALL CHASE (TYP.)
1
—
CONTROL BOARD
FLOOR TRENCH (TYP.)
CONTROL BOARD
REMOVABLE FORM MATL
1/8"
3/8"ϕ FH MACH SCREW W SQ NUT
3"
FLAT PL.
L 3x2x1/4
1/2"ϕ x 2" STUD @ 6"O C MAX @ FR EA END
DETAIL 1 —

Figure 2

NET FREE VOLUME

TRENCH VOLUME (Ft^3) = 43
WALL VOLUME (FT^3) = 415
TRAY VOLUME (FT^3) = 22

TOTAL VOLUME (FT^3) = 480

UNIFORM DESIGN CONCENTRATION
(PER NFPA 12A)

$$C = \frac{W\ S\ 100}{V\left(1 + \frac{WS}{V}\right)}$$

C = % HALON 1301 BY VOLUME

S = SPECIFIC VOLUME (FT^3/LB.)

V = VOLUME (FT^3)

W = HALON 1301 WEIGHT (LBS.)

$$C = \frac{110\ (2.5101)\ 100}{480\left(1 + \frac{110(2.5101)}{480}\right)}$$

C = 36.5% HALON 1301

Figure 3

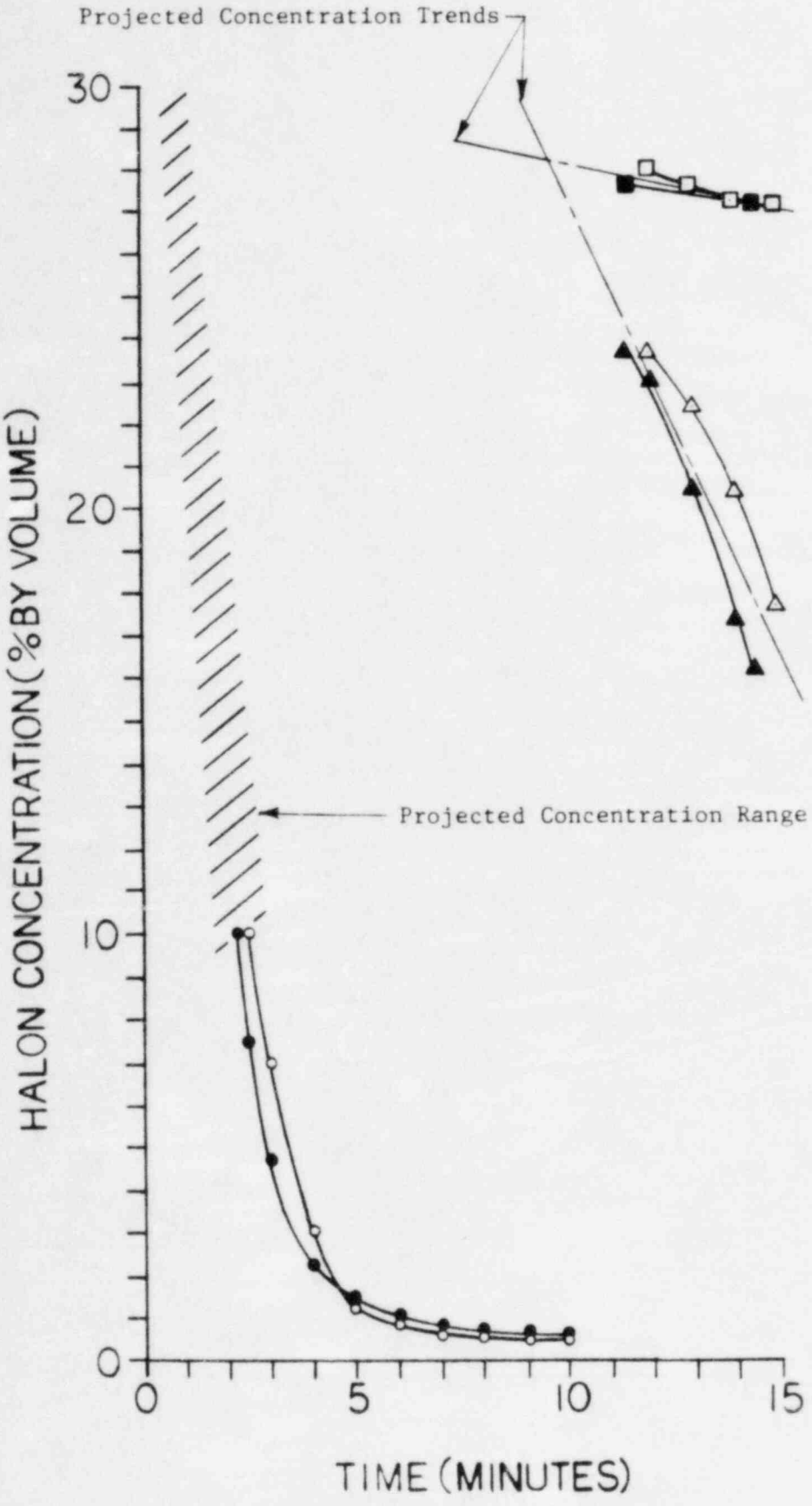


Figure 4

● ○ HIGHEST ELEVATION NODAL POINTS
▲ △ INTERMEDIATE ELEVATION NODAL POINTS
■ □ LOWEST ELEVATION NODAL POINTS