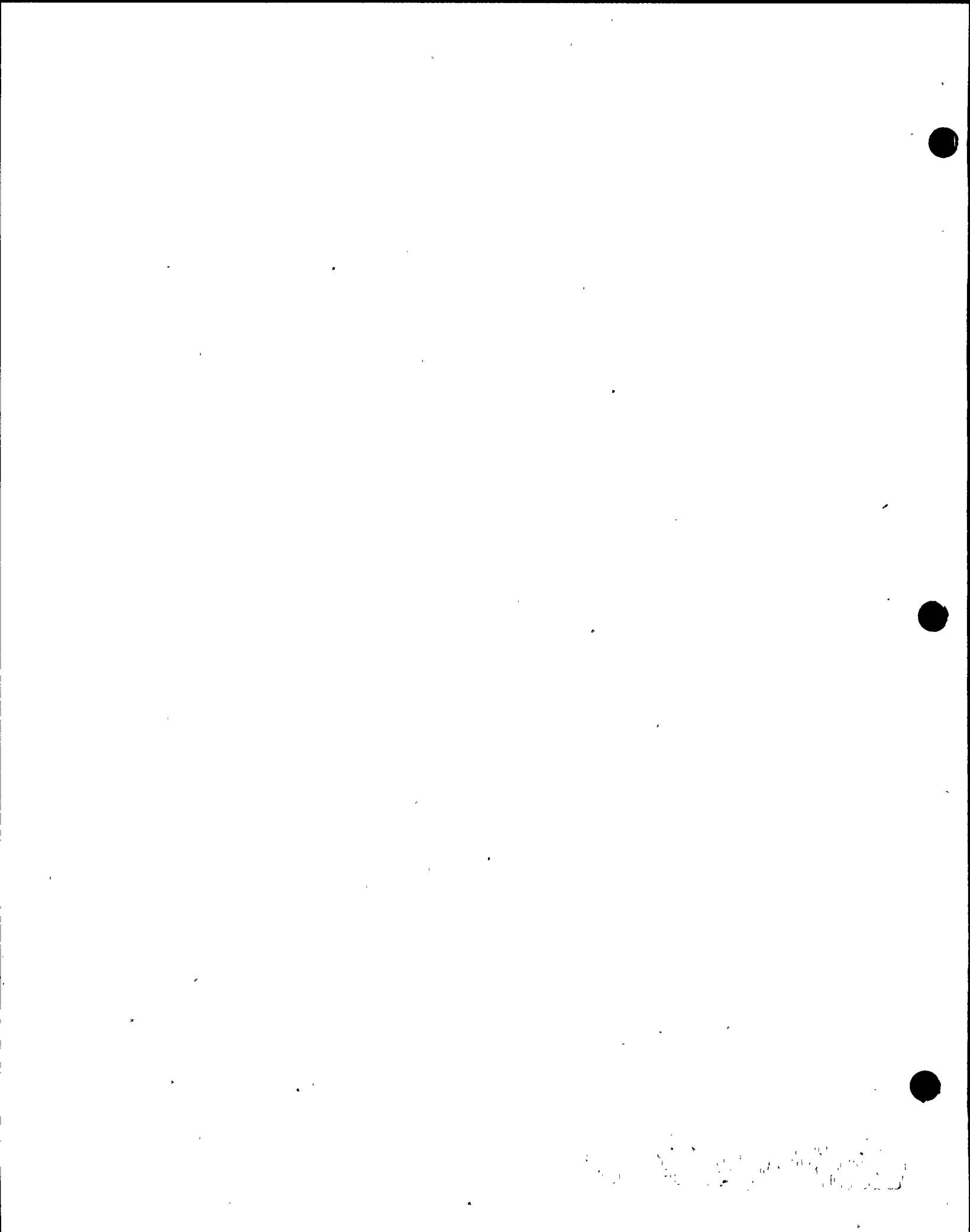


EVALUATION OF THE EFFECTS OF  
HIGH ENERGY LINE BREAKS ON  
CONTROL SYSTEMS

APPENDIX F

FIGURES AND TABLES

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PDR ADOCK 05000387  
P PDR



EVALUATION OF THE EFFECTS OF  
HIGH ENERGY LINE BREAKS ON  
CONTROL SYSTEMS

TABLE F-1

HIGH ENERGY FLUID SYSTEMS IN THE TURBINE BUILDING

| <u>P&amp;ID</u> | <u>SYSTEM</u>                                    |
|-----------------|--|
| M-101           | Main Steam                                       |
| M-102           | Extraction Steam                                 |
| M-103           | Vents and Drains Heaters 1, 2, and Drain Coolers |
| M-104           | Vents and Drains Heaters 3, 4, and 5             |
| M-105           | Condensate                                       |
| M-106           | Feedwater  |
| M-107           | Air Removal and Sealing Steam                    |
| M-116           | Condensate Demineralizer                         |

EVALUATION OF THE EFFECTS OF  
HIGH ENERGY LINE BREAKS ON  
CONTROL SYSTEMS

TABLE F-2

TURBINE BUILDING AREAS WITH HELBS

| <u>656'</u> | <u>676'</u>      | <u>699'</u>      | <u>729'</u>      |
|-------------|------------------|------------------|------------------|
| Area-EL     | Area-EL          | Area-EL          | Area-EL          |
| 1-1         | 1-2 <sup>3</sup> | 1-3              | ---              |
| 2-1         | 2-2 <sup>1</sup> | 2-3 <sup>1</sup> | 2-4              |
| 3-1         | 3-2 <sup>1</sup> | 3-3 <sup>1</sup> | 3-4              |
| 4-1         | 4-2 <sup>1</sup> | 4-3              | ---              |
| 5-1         | 5-2 <sup>1</sup> | 5-3 <sup>1</sup> | 5-4              |
| 6-1         | 6-2 <sup>1</sup> | 6-3 <sup>1</sup> | 6-4              |
| 7-1         | 7-2 <sup>1</sup> | 7-3 <sup>1</sup> | 7-4              |
| 8-1         | 8-2 <sup>1</sup> | 8-3              | ---              |
| 9-1         | 9-2 <sup>1</sup> | 9-3 <sup>1</sup> | 9-4 <sup>1</sup> |
| 10-1        | 10-2             | 10-3             | 10-4             |
| 11-1        | 11-2             | 11-3             | 11-4             |

Control System with Components in TB:

FWCS  
RMCS  
Recirc  
T/G

EVALUATION OF THE EFFECTS OF  
HIGH ENERGY LINE BREAKS ON  
CONTROL SYSTEMS

NOTES FOR TABLE 2

1. Also may be affected by HELB in areas below or above.

| <u>Floor No.</u> | <u>T.B.EI</u> |
|------------------|---------------|
| 1                | 656'          |
| 2                | 676'          |
| 3                | 699'          |
| 4                | 729'          |
| 5                | 762'          |
| 6                | 714'          |

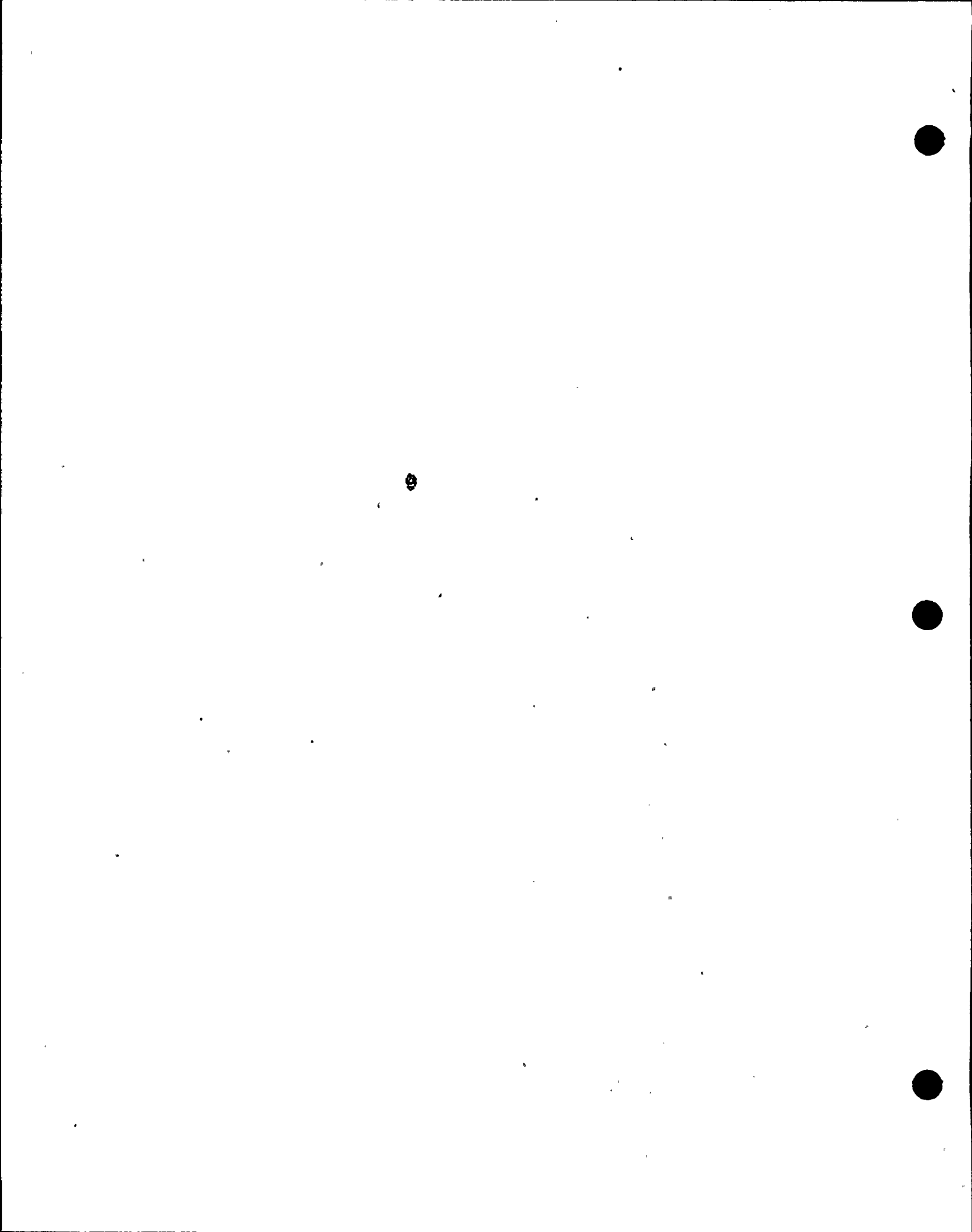
3. Area 1-2 may be affected by a HELB in Area 1-1

EVALUATION OF THE EFFECTS OF  
HIGH ENERGY LINE BREAKS ON  
CONTROL SYSTEMS

TABLE F-3

TURBINE BUILDING HIGH ENERGY LINE BREAK -  
MULTIPLE CONTROL SYSTEM COMMONALITIES

| <u>Plant Area<br/>(Note 1)</u> | <u>Control Systems<br/>Affected (Note 2)</u> | <u>System/HELB<br/>(Note 3)</u>        | <u>Remarks<br/>(Note 4)</u>                            |
|--------------------------------|--|--|--|
| 6-1                            | FW<br>T/G                                    | FW 10"-DBD-104                         | long. break at<br>elbow W&J                            |
| 7-1                            | FW<br>T/G                                    | FW 10"-DBD-104<br>or<br>FW 14"-GBD-109 | long break at<br>elbow, W&J<br>circ. break at elbow, J |
| 8-1                            | FW<br>T/G<br>Recirc.                         | cd 30"-GBD-107                         | circ. break,<br>W&J                                    |
| 10-1                           | FW<br>T/G                                    | FW 12"-GBD-108                         | circ. and<br>long. break, W&J                          |
| 5-2                            | FW<br>T/G                                    | FW 30"-GBD-115                         | long. break<br>at flange (in Area<br>5-1), J           |
| 7-2                            | FW<br>T/G                                    | MS 18"-GFD-102                         | long. or circ.<br>break, W&J                           |
| 10-2                           | T/G<br>FW                                    | FW 20"-JBD-121                         | circ. break, J   |
| 1-3                            | T/G<br>RECIRC                                | FW 20"-GBD-118<br>or<br>MS 24"-DBB-105 | long. break, J<br><br>long. or circ. break,<br>W&J     |
| 2-3                            | T/G<br>RECIRC                                | MS 42" Crossover                       | long. break,<br>W&J                                    |



EVALUATION OF THE EFFECTS OF  
HIGH ENERGY LINE BREAKS ON  
CONTROL SYSTEMS

TABLE F-3

TURBINE BUILDING HIGH ENERGY LINE BREAK -  
MULTIPLE CONTROL SYSTEM COMMONALITIES

| <u>Plant Area<br/>(Note 1)</u> | <u>Control Systems<br/>Affected (Note 2)</u> | <u>System/HELB<br/>(Note 3).</u>       | <u>Remarks<br/>(Note 4)</u>                |
|--------------------------------|--|--|--|
| 3-3                            | T/G<br>RECIRC<br>RMCS                        | MS 42" Crossover                       | circ. break,<br>W&J                        |
| 4-3                            | T/G<br>RECIRC<br>RMCS                        | FW 20"-GBD-118                         | circ. or long.<br>break, J                 |
| 7-3                            | T/G<br>RECIRC<br>RMCS                        | FW 20"-GBD-118<br>or<br>MS 18"-GFD-102 | long. break,<br>W&J<br>long. break,<br>W&J |
| 8-3                            | T/G<br>RECIRC<br>RMCS<br>FW                  | FW 20"-GBD-118                         | long. break,<br>W&J                        |
| 9-3                            | T/G<br>RECIRC                                | FW 20"-GBD-119,<br>or 120, or 121      | circ. or long.<br>breaks, W&J              |
| 10-3                           | T/G<br>RECIRC                                | FW 20"-GBD-121                         | circ. or long.<br>breaks, W&J              |
| 11-3                           | T/G<br>RECIRC                                | FW 20"-GBD-121                         | circ. or long.<br>breaks, W&J              |
| 2-4                            | T/G<br>RMCS                                  | MS 42"-CRD-42                          | circ. or long.<br>breaks, W&J              |



EVALUATION OF THE EFFECTS OF  
HIGH ENERGY LINE BREAKS ON  
CONTROL SYSTEMS

TABLE F-3

TURBINE BUILDING HIGH ENERGY LINE BREAK -  
MULTIPLE CONTROL SYSTEM COMMONALITIES

| <u>Plant Area<br/>(Note 1)</u> | <u>Control Systems<br/>Affected (Note 2)</u> | <u>System/HELB<br/>(Note 3)</u> | <u>Remarks<br/>(Note 4)</u>   |
|--------------------------------|--|---------------------------------|-------------------------------|
| 3-4                            | T/G<br>RMCS                                  | MS 42" crossover                | circ. or long.<br>breaks, W&J |
| 6-4                            | FW<br>RMCS<br>RECIRC<br>T/G                  | MS 42" crossover                | circ. or long.<br>breaks, W&J |
| 7-4                            | FW<br>RMCS<br>RECIRC<br>T/G                  | MS 42" crossover                | circ. or long.<br>breaks, W&J |
| 10-4                           | FW<br>RECIRC<br>T/G                          | FW 18" DBD-101                  | circ. or long.<br>breaks, W&J |
| 11-4                           | FW<br>RECIRC<br>T/G                          | FW Misc. Piping                 | circ. or long.<br>breaks, W&J |

EVALUATION OF THE EFFECTS OF  
HIGH ENERGY LINE BREAKS ON  
CONTROL SYSTEMS

NOTES FOR TABLE 3

1. Indicates plant area and elevation: (See Figures F-1 to F-4)

|            |   |           |         |      |
|------------|---|-----------|---------|------|
| X          | - | Y         |         |      |
| Plant Area |   | Elevation | Y = 1 = | 656' |
|            |   |           | Y = 2 = | 676' |
|            |   |           | Y = 3 = | 699' |
|            |   |           | Y = 4 = | 729' |

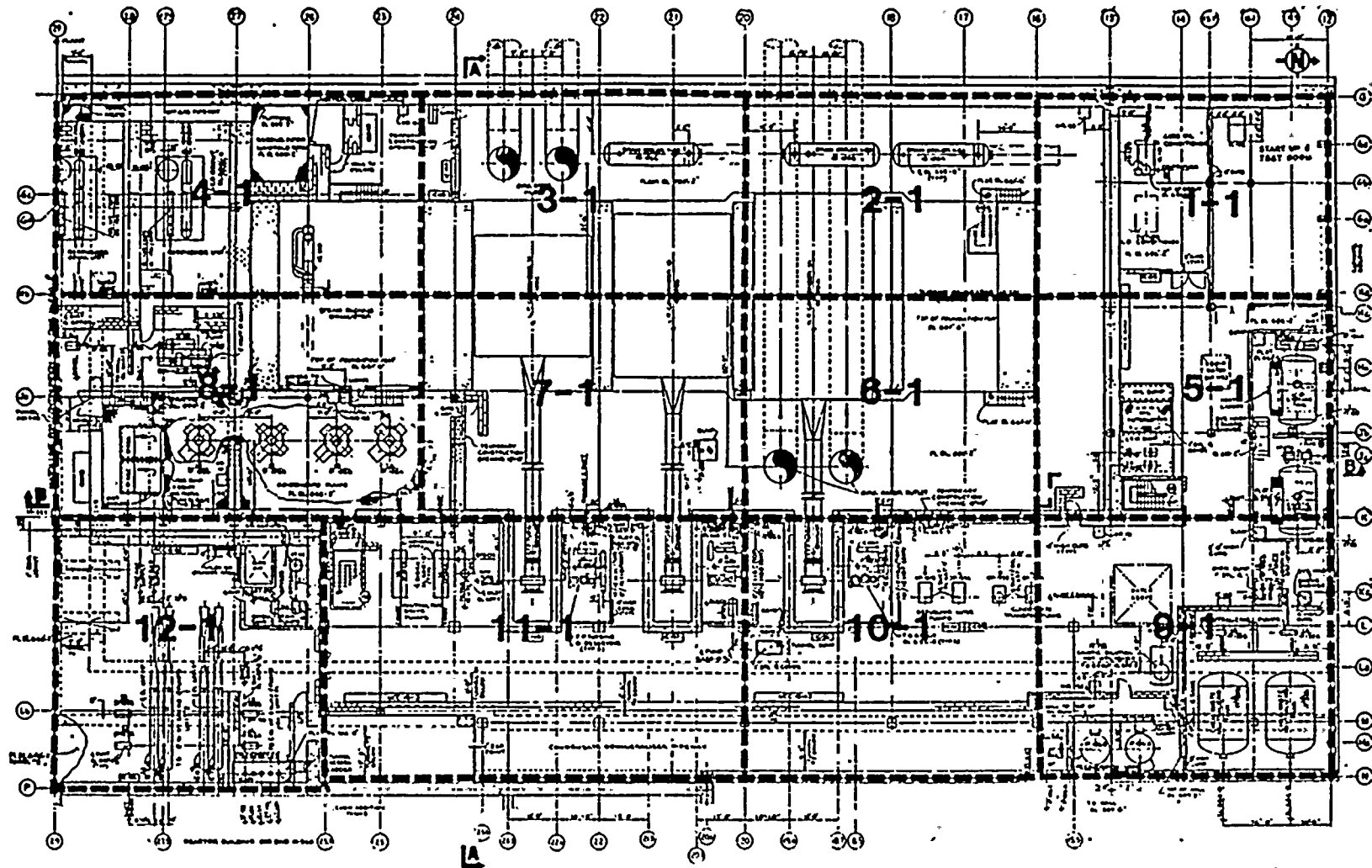
2. FW - Feedwater Flow Control System  
RMCS - Reactor Manual Control System  
RECIRC - Recirculation Flow Control System  
T/G - Turbine Generator control System

3. System:

|    |   |            |
|----|---|------------|
| Cd | - | Condensate |
| MS | - | Main Steam |
| FW | - | Feedwater  |

4. Remarks:

|       |   |                 |
|-------|---|-----------------|
| long. | - | Longitudinal    |
| circ. | - | Circumferential |
| W     | - | pipe whip       |
| J     | - | pipe jet        |



**FIGURE F-1**  
**SUSQUEHANNA STEAM ELECTRIC STATION**  
**UNITS 1 AND 2**  
**HELB/CONTROL SYSTEM STUDY**  
**PLANT AREA DESIGNATIONS**  
**TURBINE BUILDING UNIT 1**  
**PLAN OF BASEMENT EL. 656'-0"**  
**JOB NO. 0160-013-1071**

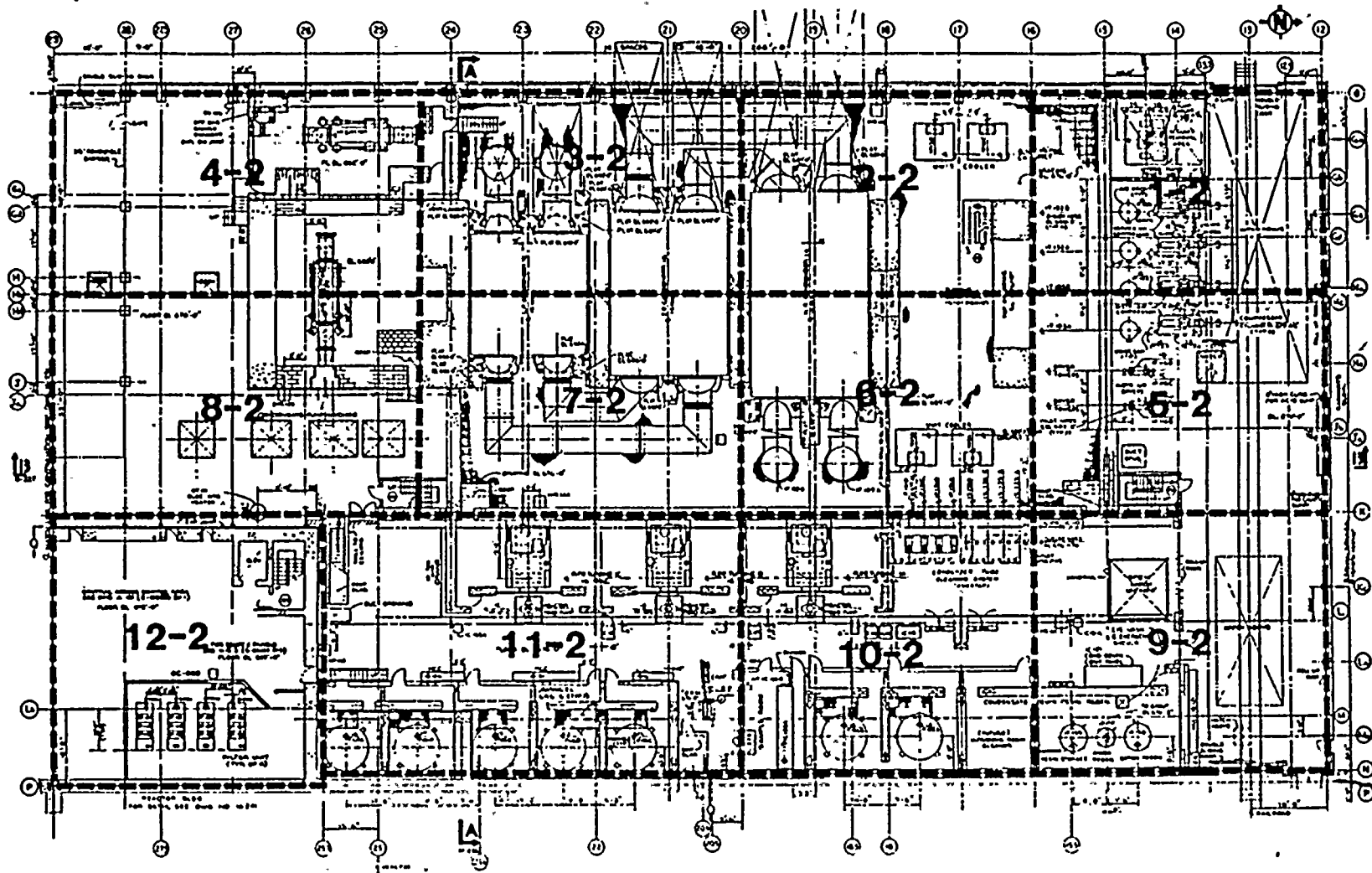
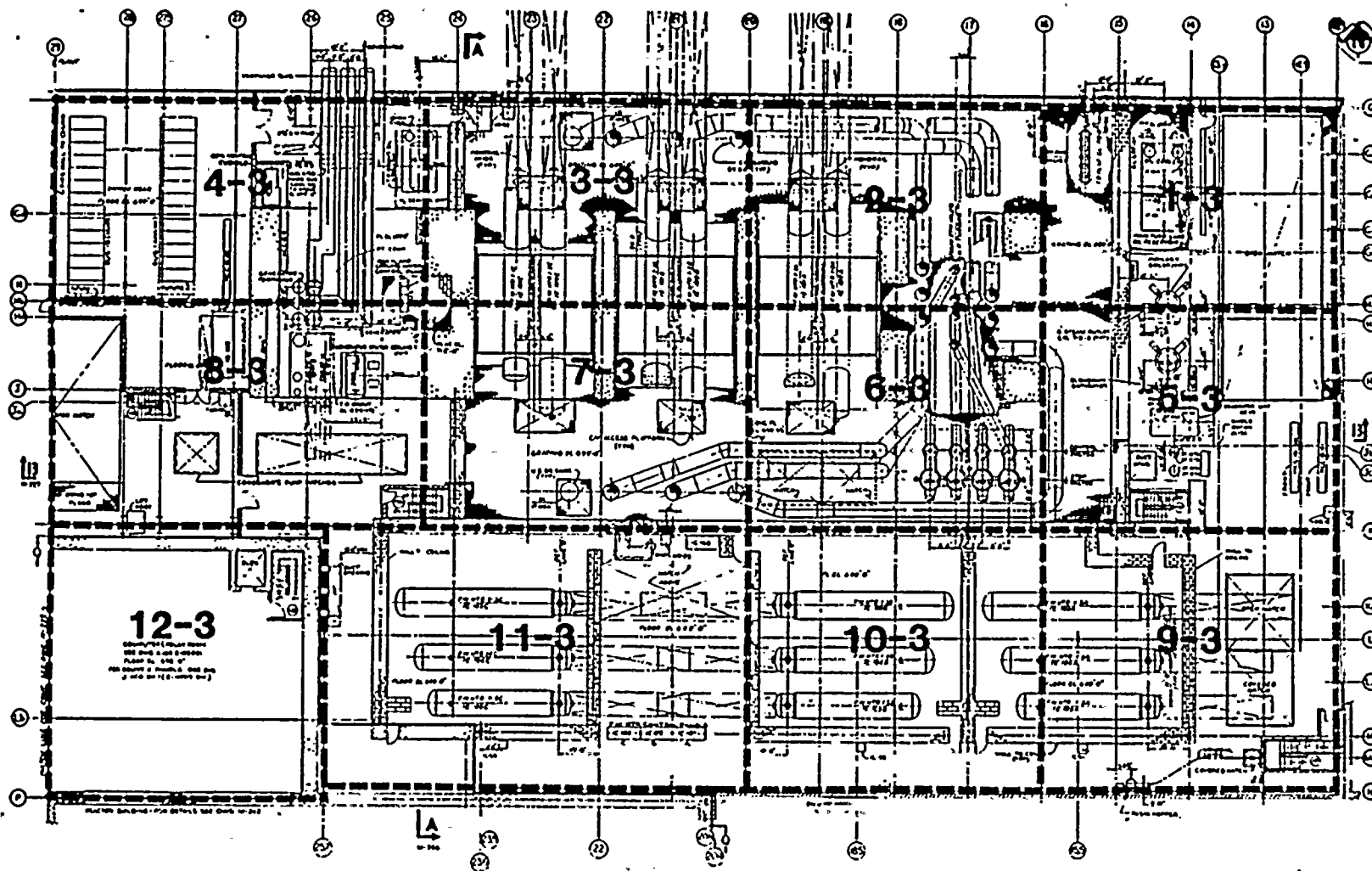


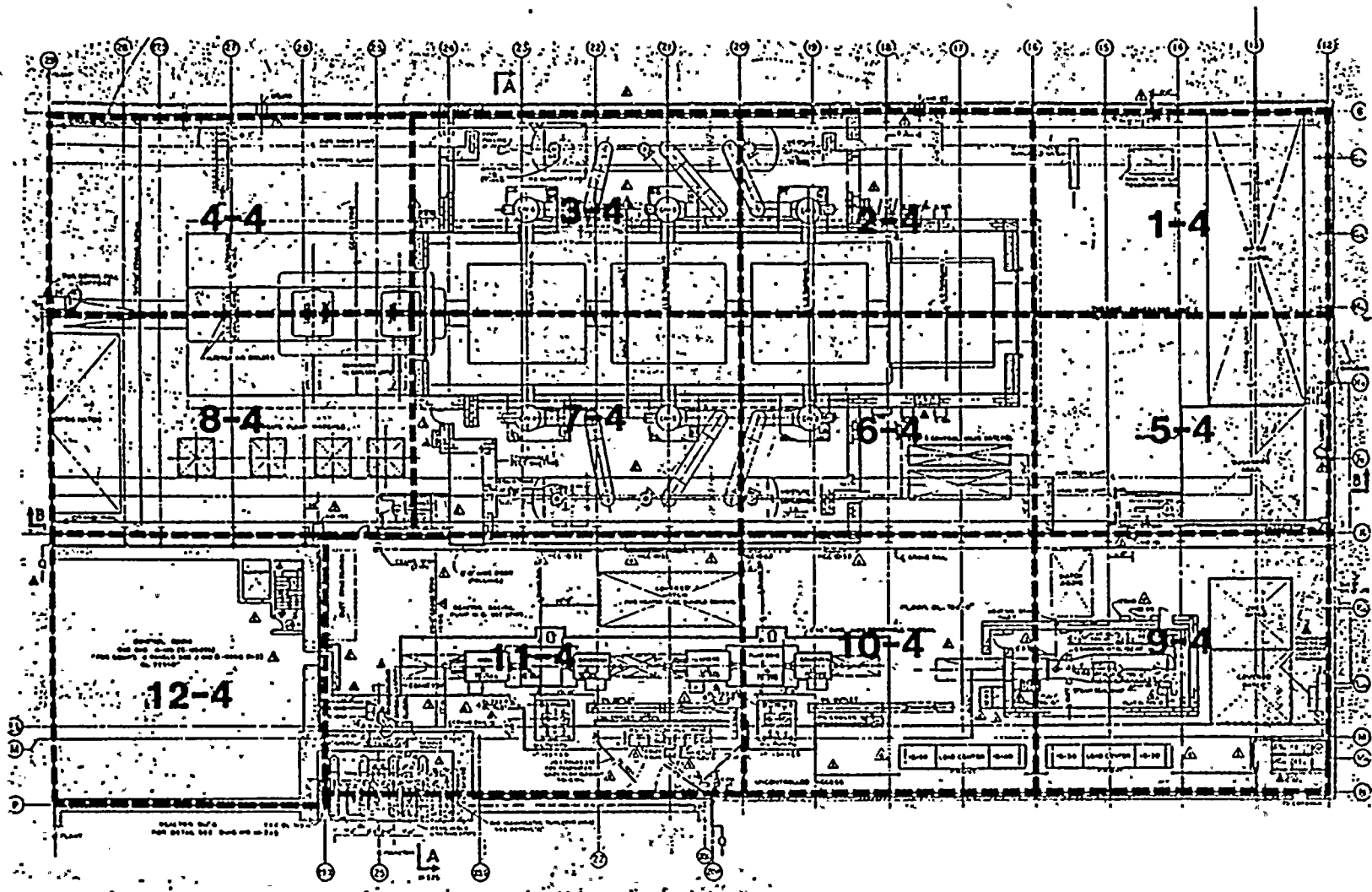
FIGURE F-2

|   |
|---|
| SUSQUEHANNA STEAM ELECTRIC STATION<br>UNITS 1 AND 2<br>HELB/CONTROL SYSTEM STUDY<br>PLANT AREA DESIGNATIONS<br>TURBINE BLDG. UNIT 1<br>PLAN OF GROUND FLOOR<br>EL. 676'-0"<br>JOB NO. 0160-013-1671 |
|---|



**FIGURE F-3**

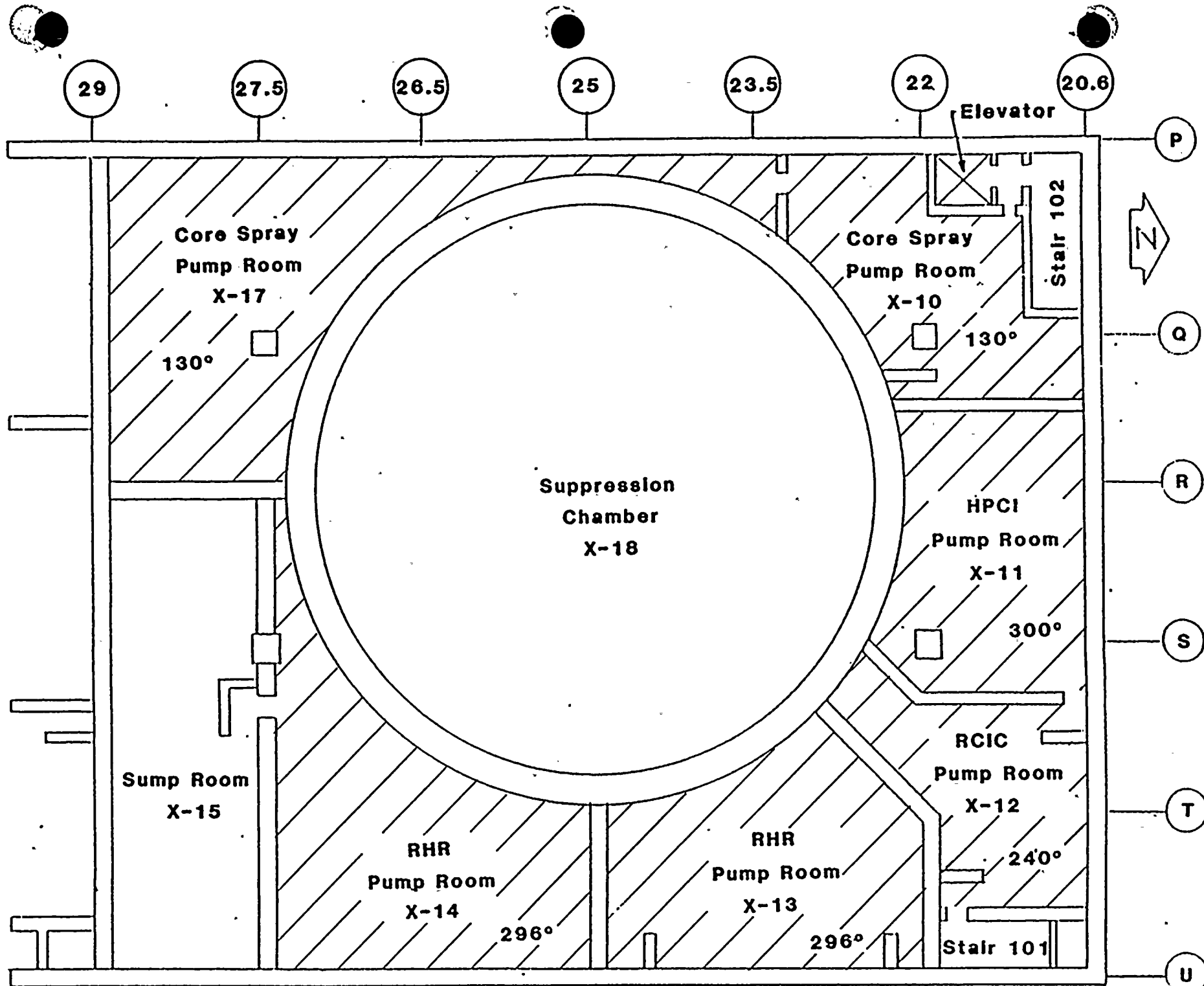
SUSQUEHANNA STEAM ELECTRIC STATION  
 UNITS 1 AND 2  
**HEL/B/CONTROL SYSTEM STUDY**  
 PLANT AREA DESIGNATIONS  
 TURBINE BUILDING UNIT 1  
 PLAN OF MEZZANINE EL. 899'-0"  
 JOB NO. 0160-013-1671



**FIGURE F-4**

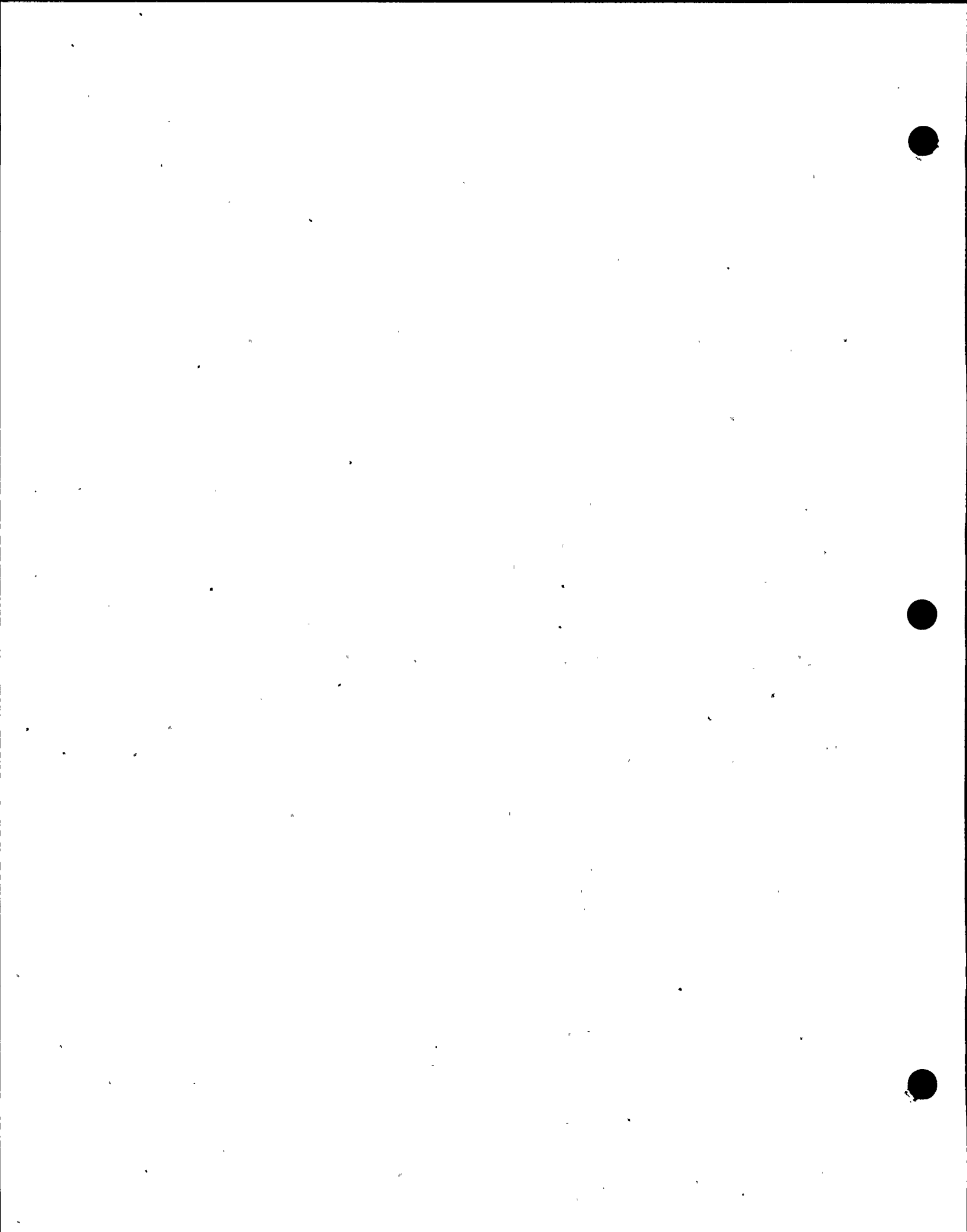
**SUSQUEHANNA STEAM ELECTRIC STATION**  
**UNITS 1 AND 2**  
**HELB/CONTROL SYSTEM STUDY**  
**PLANT AREA DESIGNATIONS**  
 TURBINE BLDG. UNIT 1  
 PLAN OF OPERATING FLOOR EL. 729' 0"  
 JOB NO. 0160-013-1671

HARSH ENVIRONMENT AREAS FOLLOWING HELBS



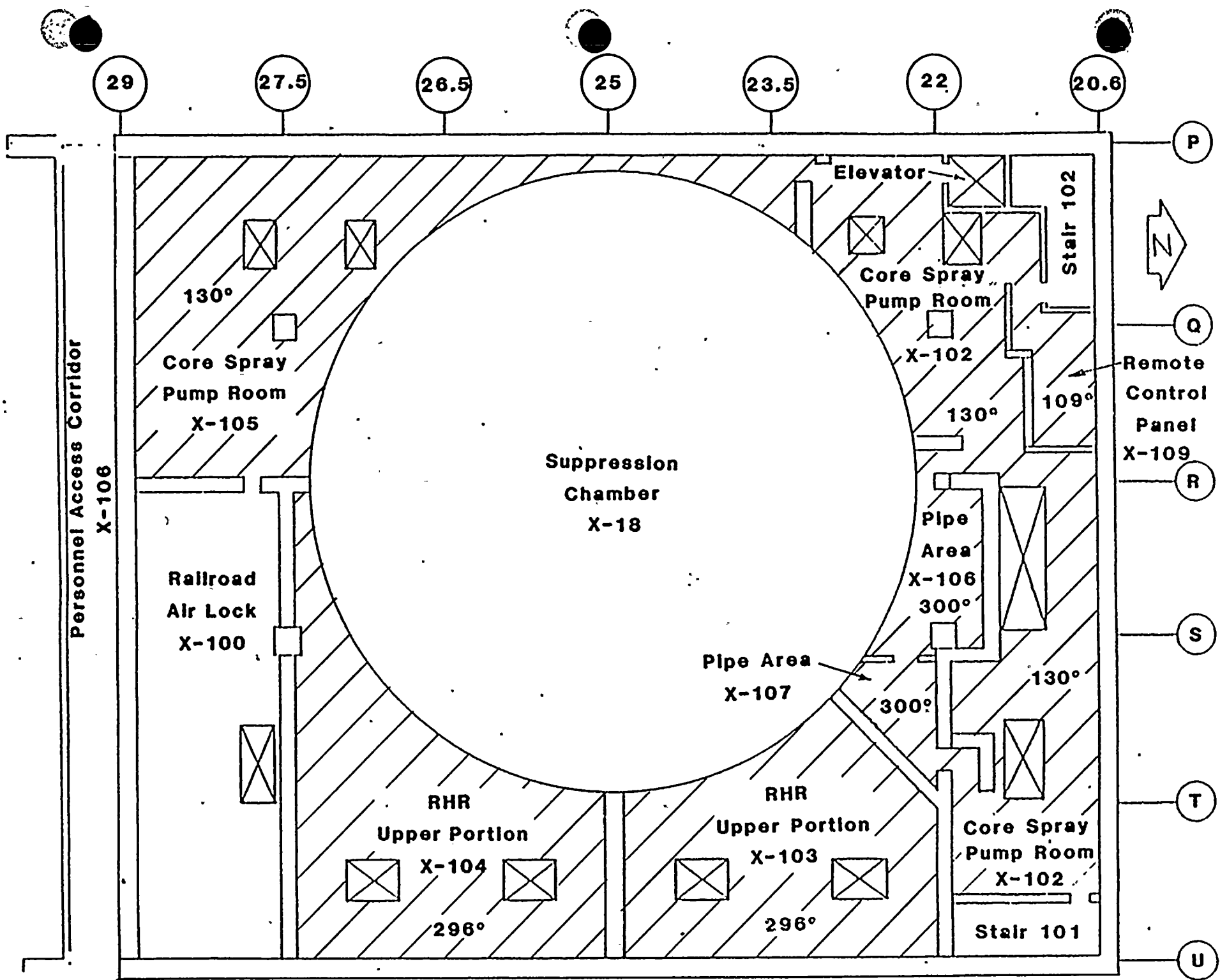
REACTOR BLDG UNIT 1 EL. 645'

FIGURE F-5





HARSH ENVIRONMENT AREAS FOLLOWING HELBS



REACTOR BLDG UNIT 1 EL 670'

FIGURE F-6

HARSH ENVIRONMENT AREAS FOLLOWING HELPS

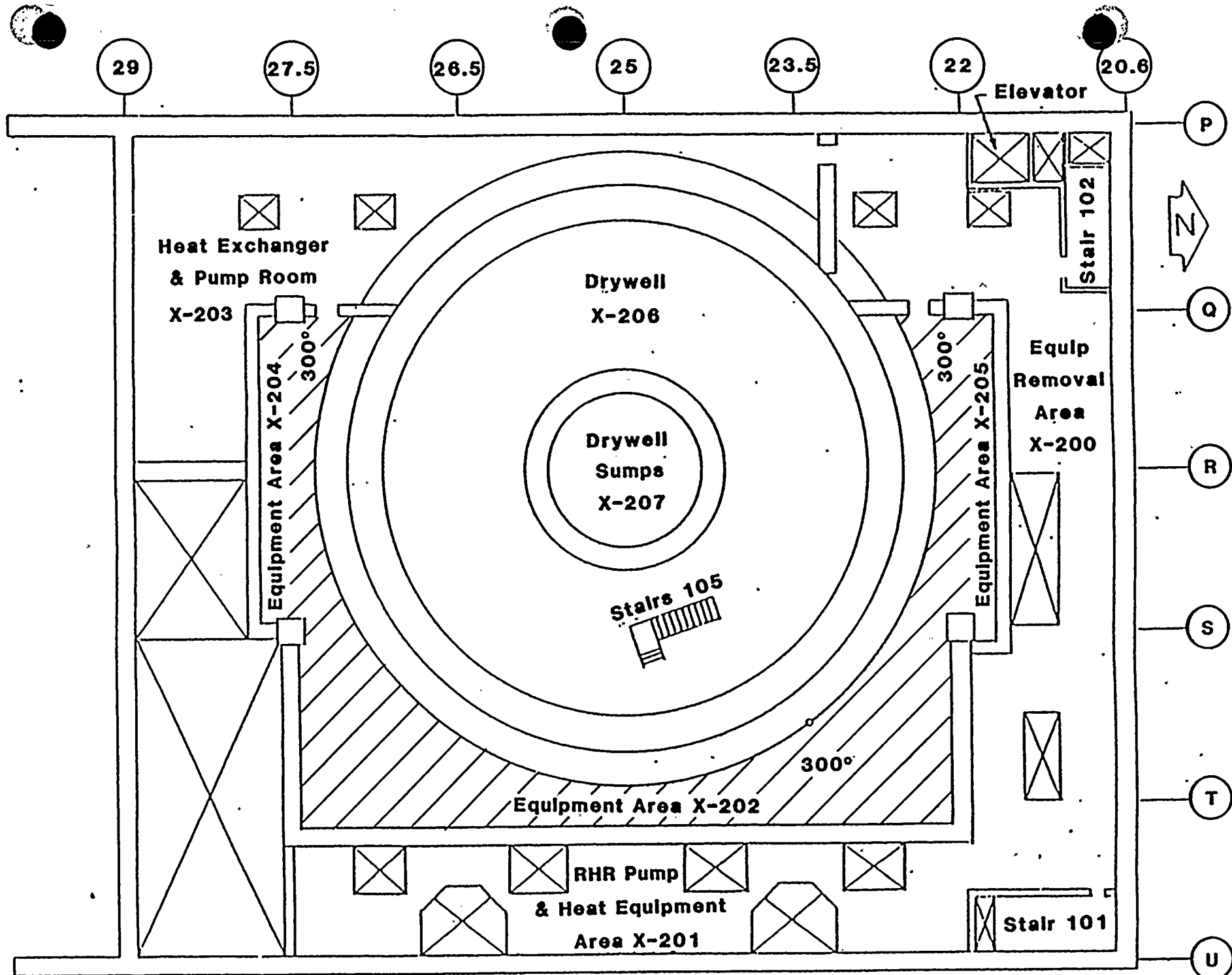
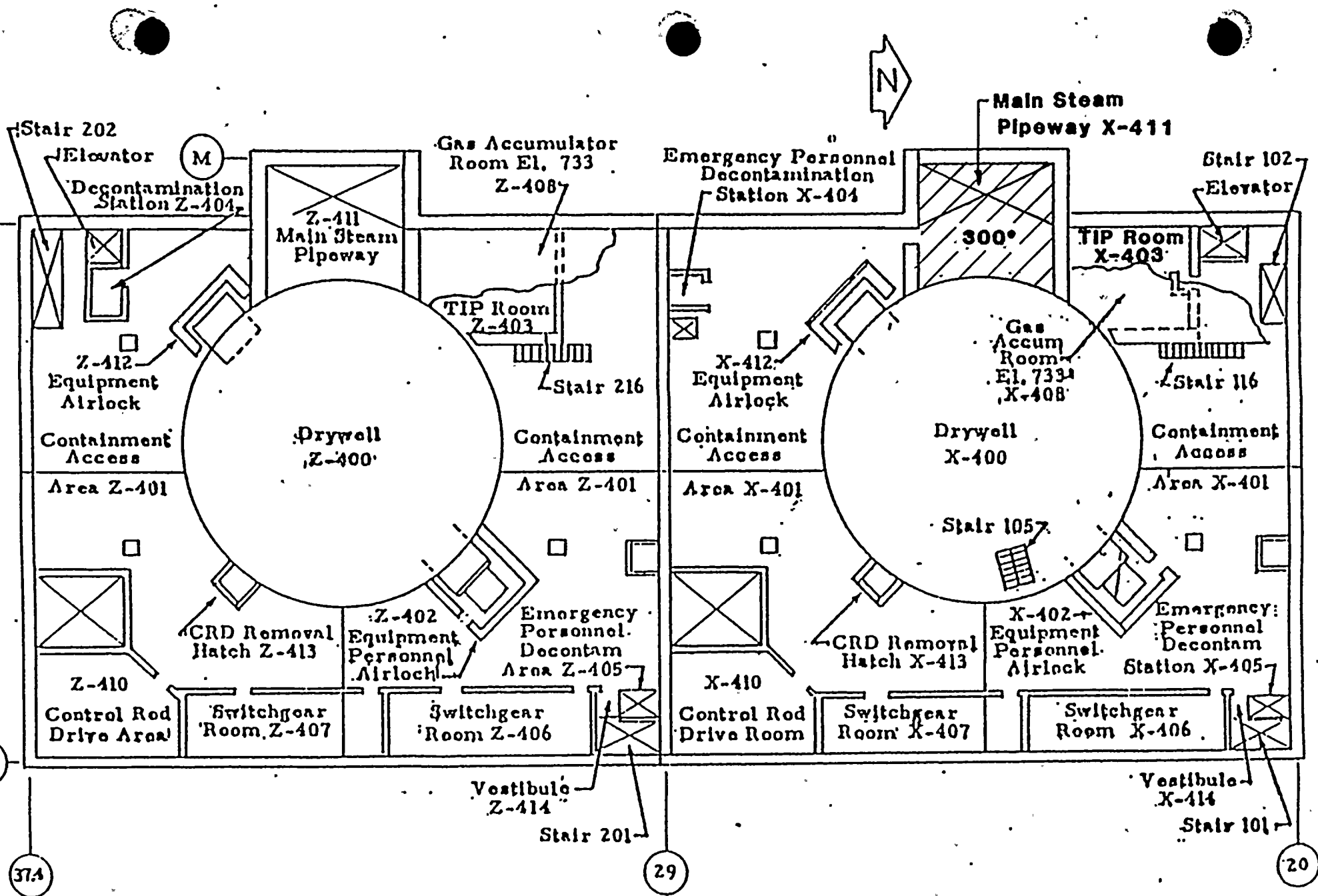


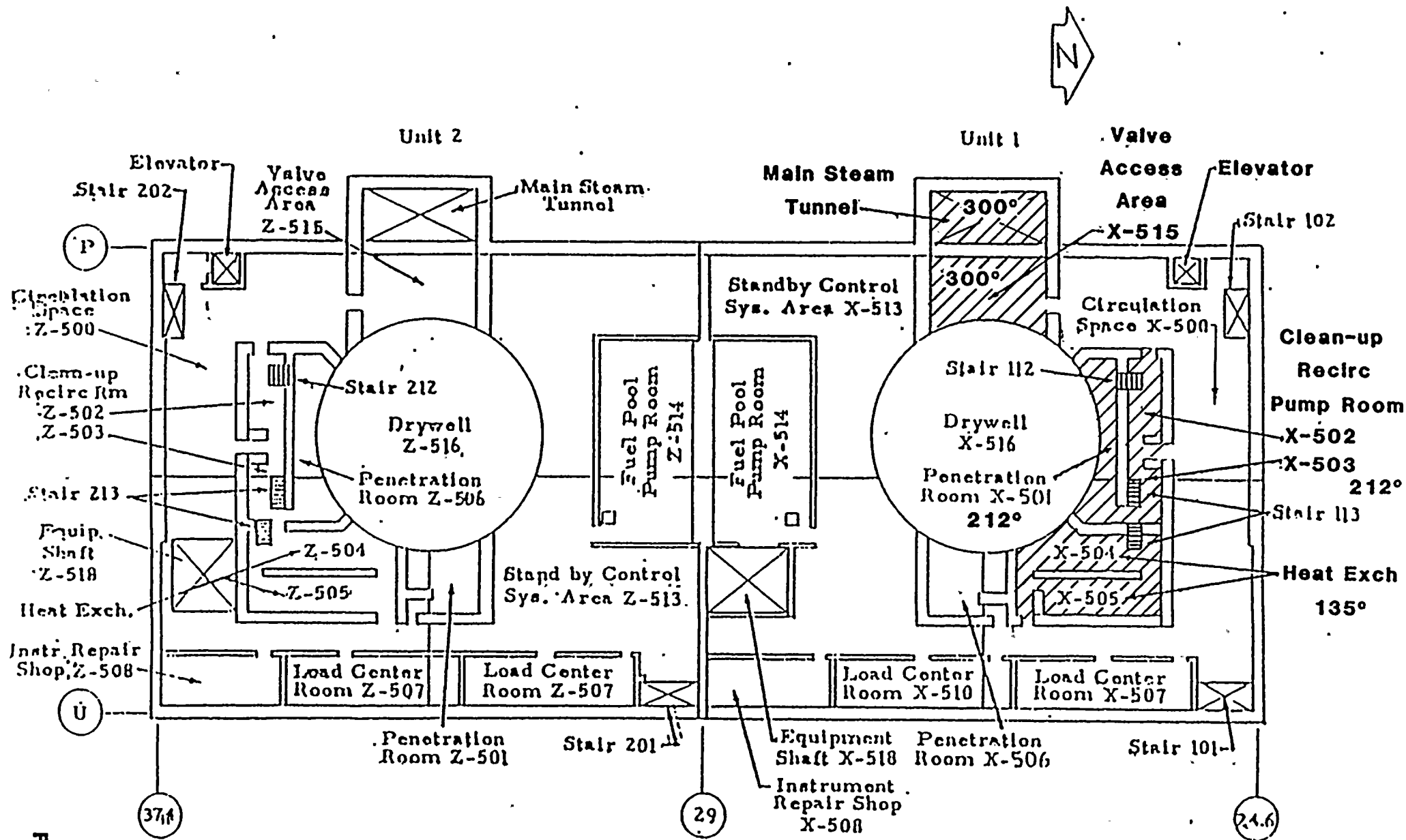
FIGURE F-7



REACTOR BLDG EL 719

HARSH ENVIRONMENT AREAS FOLLOWING HELBs

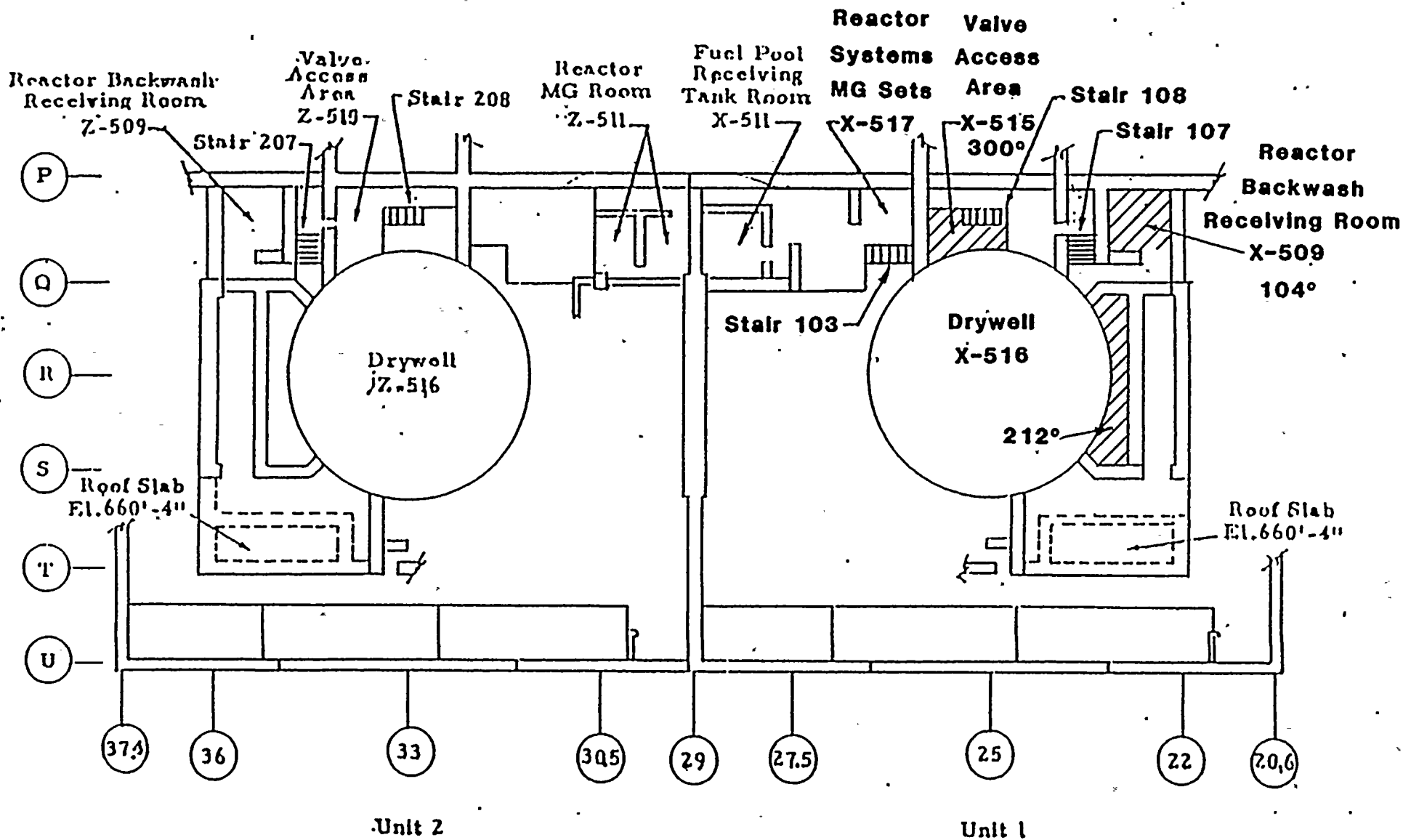
FIGURE F-8



REACTOR BLDG EL 749'

HARSH ENVIRONMENT AREAS FOLLOWING HELBs

FIGURE F-9



REACTOR BLDG EL 761', 762', 764' & 766'

HARSH ENVIRONMENT AREAS FOLLOWING HELBs

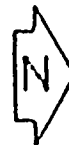
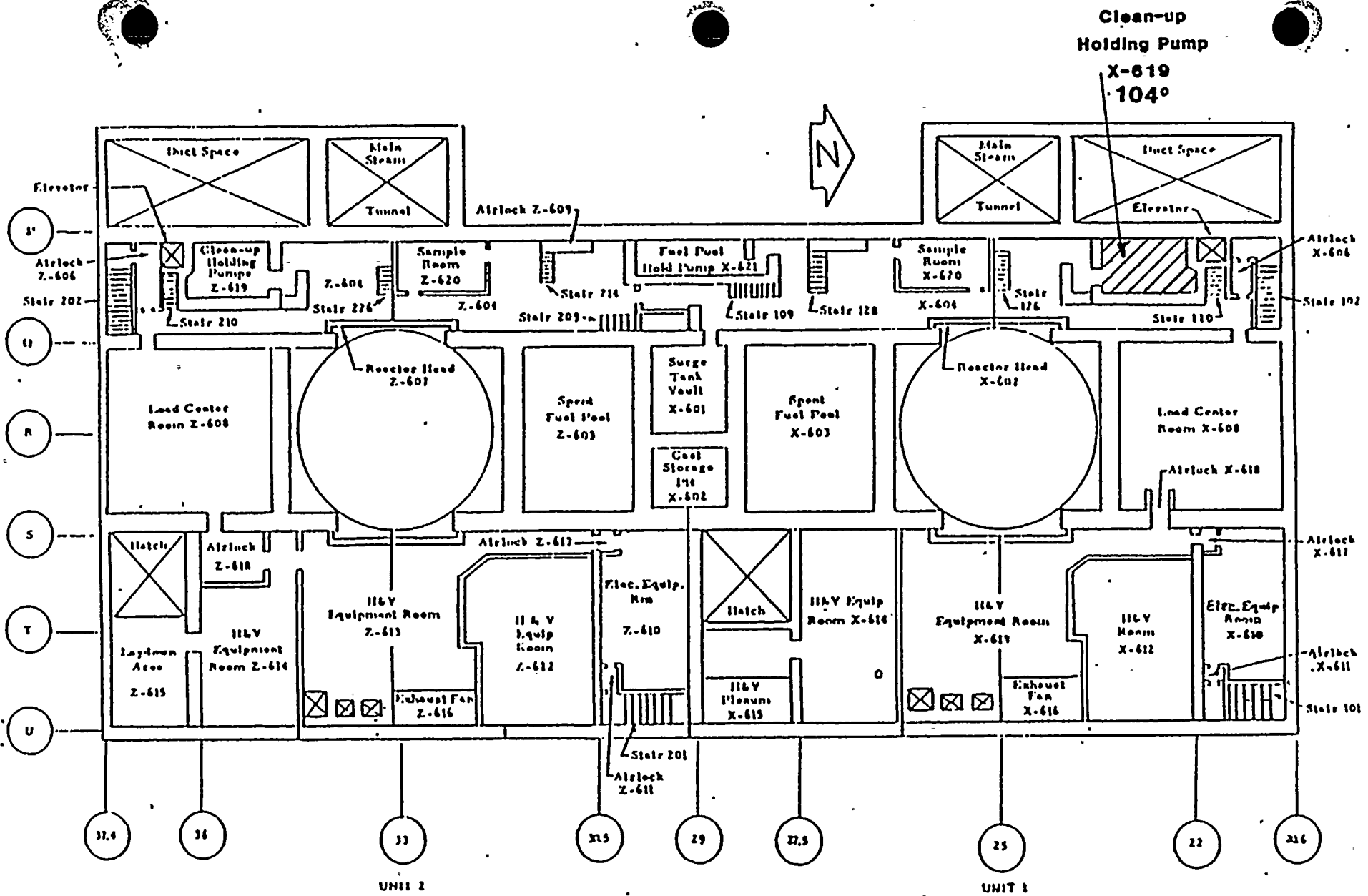


FIGURE F-10

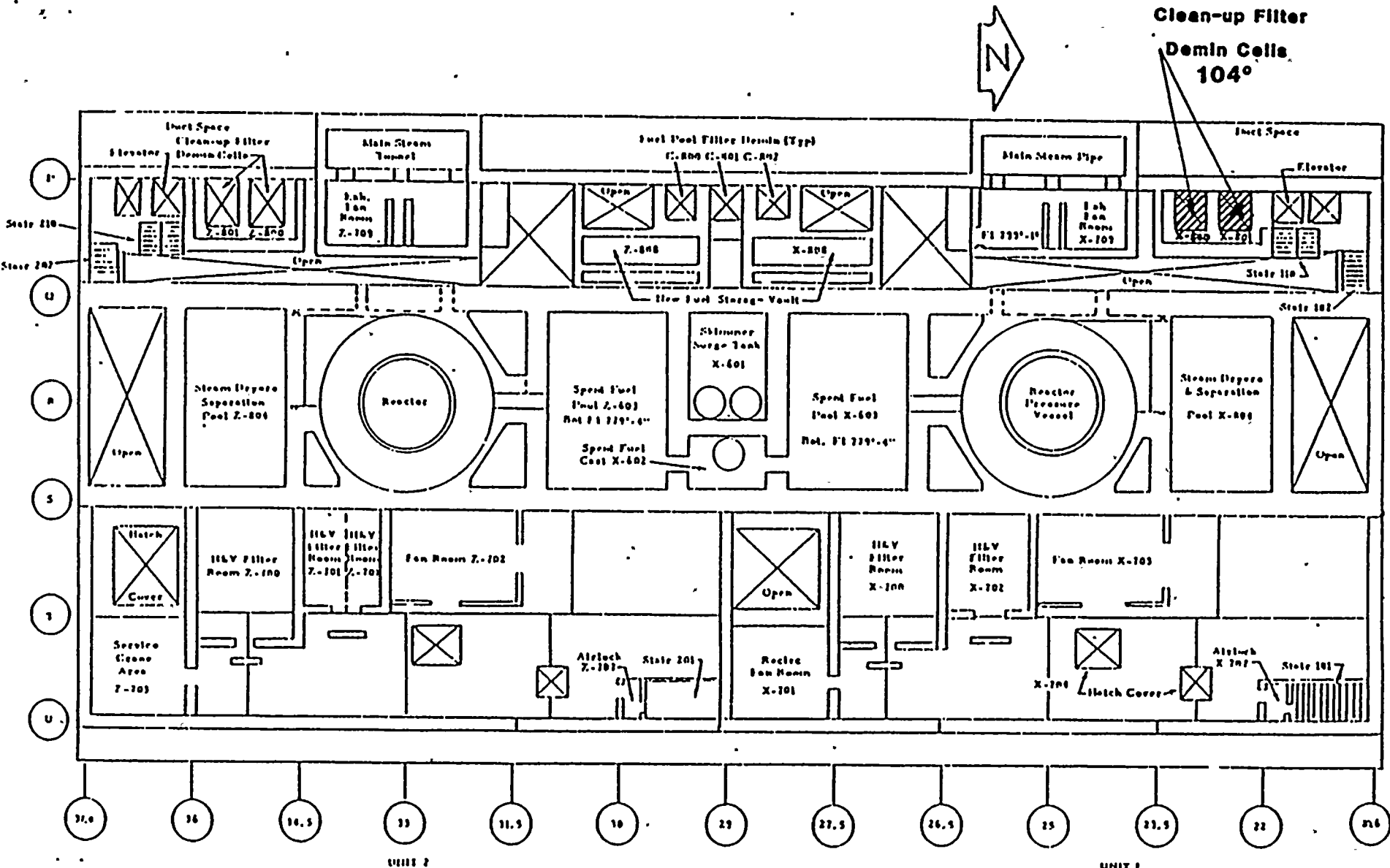




**REACTOR BLDG EL 779'-1"**

**HARSH ENVIRONMENT AREAS FOLLOWING HELBs**

**FIGURE F-11**



**REACTOR BLDG EL 799'**

**HARSH ENVIRONMENT AREAS FOLLOWING HELBs**

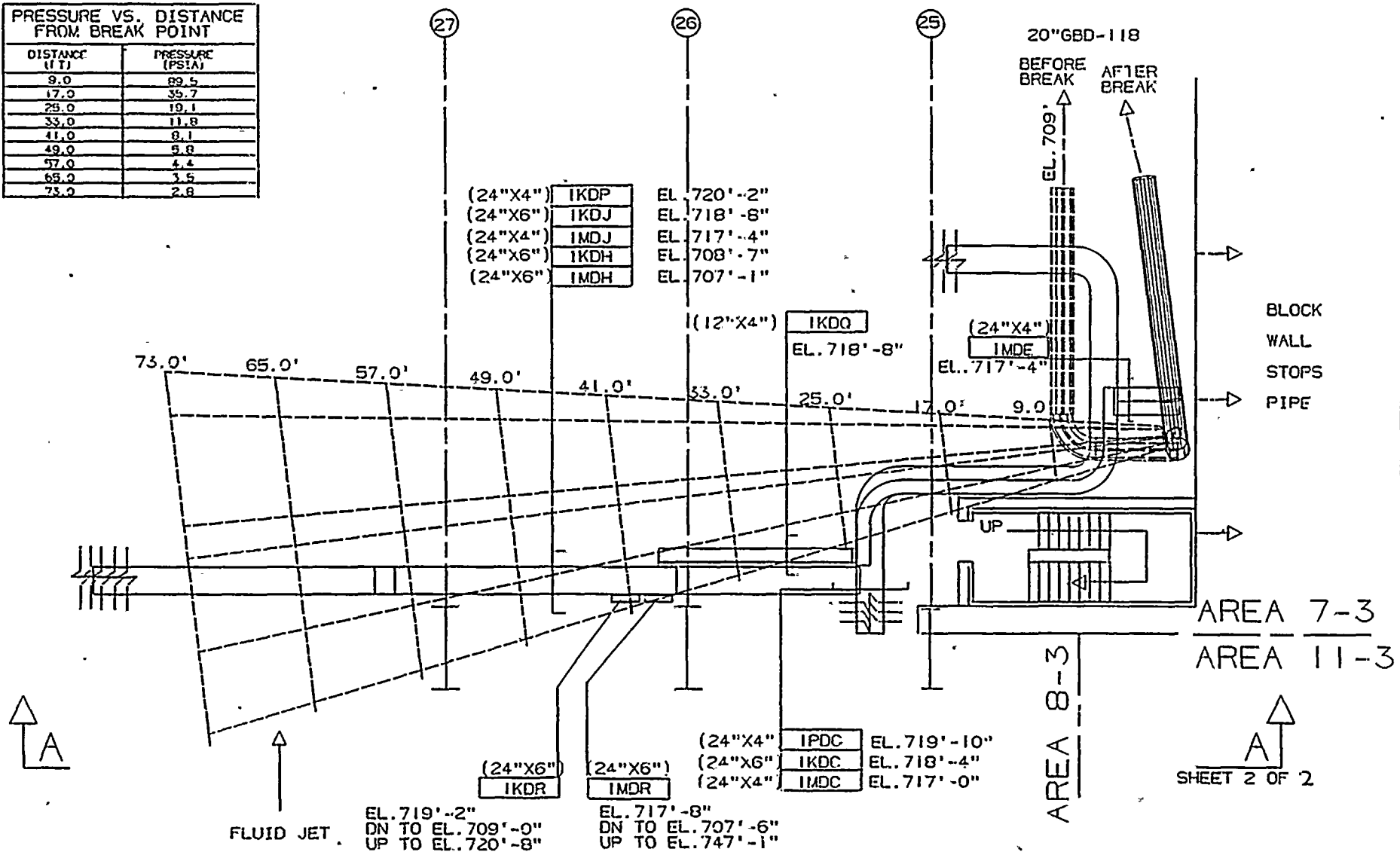
**FIGURE F-12**





**PRESSURE VS. DISTANCE FROM BREAK POINT**

| DISTANCE (FT) | PRESSURE (PSIA) |
|---------------|-----------------|
| 9.0           | 89.5            |
| 17.0          | 39.7            |
| 25.0          | 19.1            |
| 33.0          | 11.8            |
| 41.0          | 8.1             |
| 49.0          | 5.8             |
| 57.0          | 4.4             |
| 65.0          | 3.5             |
| 73.0          | 2.8             |

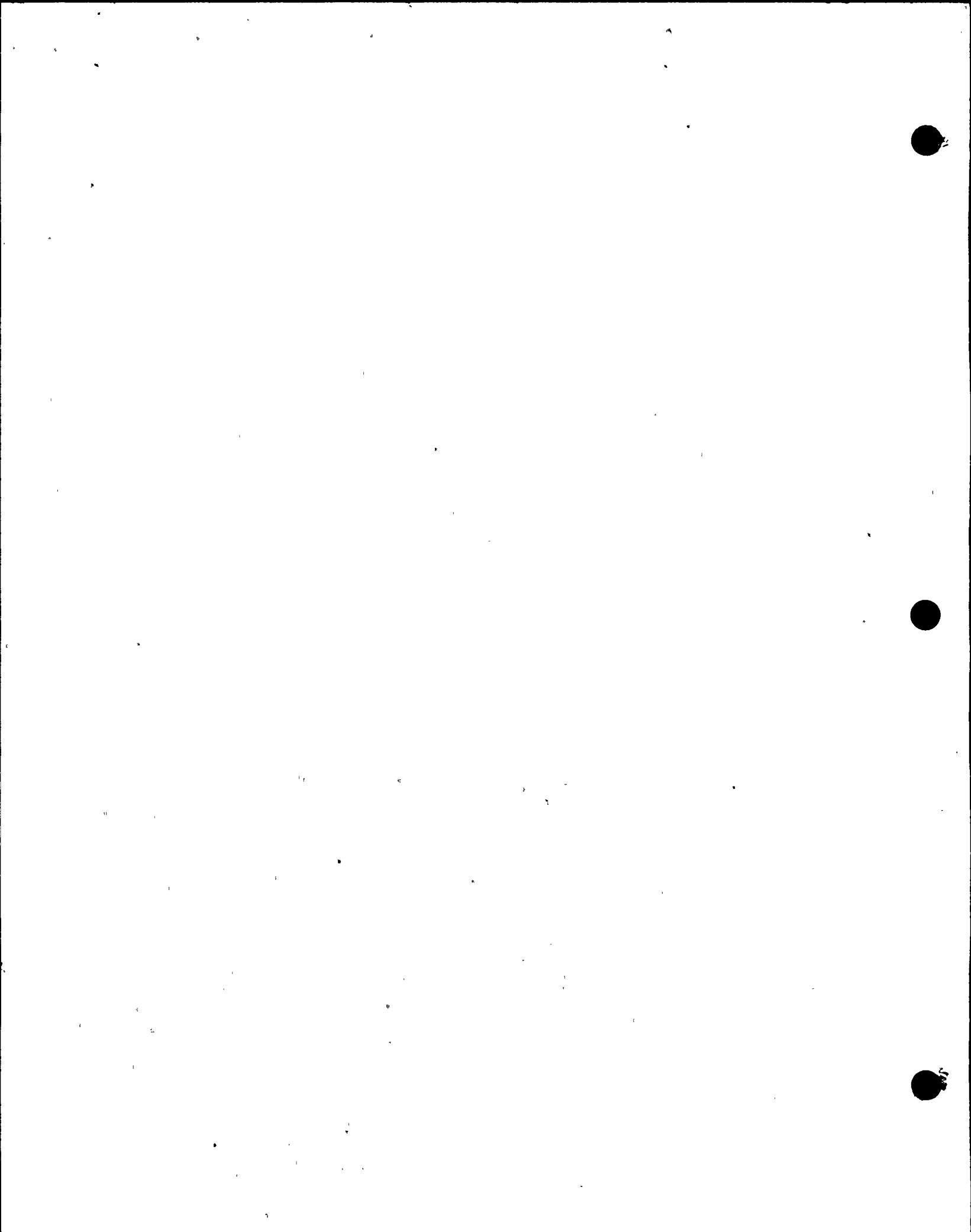


SHEET 2 OF 2

**CONTROL SYSTEMS AFFECTED**  
 1-RECIRC FLOW CONTROL SYS.  
 2-REACTOR MANUAL CONTROL SYS.  
 3-REACTOR F.W. CONTROL SYS.  
 4-TURB. GENER. CONTROL SYS.

**FIGURE F-13**

|  |                                     |
|--|-------------------------------------|
| THE PENNSYLVANIA POWER & LIGHT COMPANY<br>SUSQUEHANNA STREAM ELECTRIC STATION<br>CONTINUING BREAK IN FRESHWATER PIPE<br>20" GBD-118 IN TURBINE BUILDING UNIT 1<br>AREA 8 PLAN OF EL. 600'-0" |                                     |
| DATE: 11/18/78<br>DRAWN BY: [Signature]<br>CHECKED BY: [Signature]   | SCALE: AS SHOWN<br>SHEET NO: 2 OF 2 |
| PROJECT NO: [Blank]<br>DRAWING NO: [Blank]   | REVISIONS: [Blank]                  |



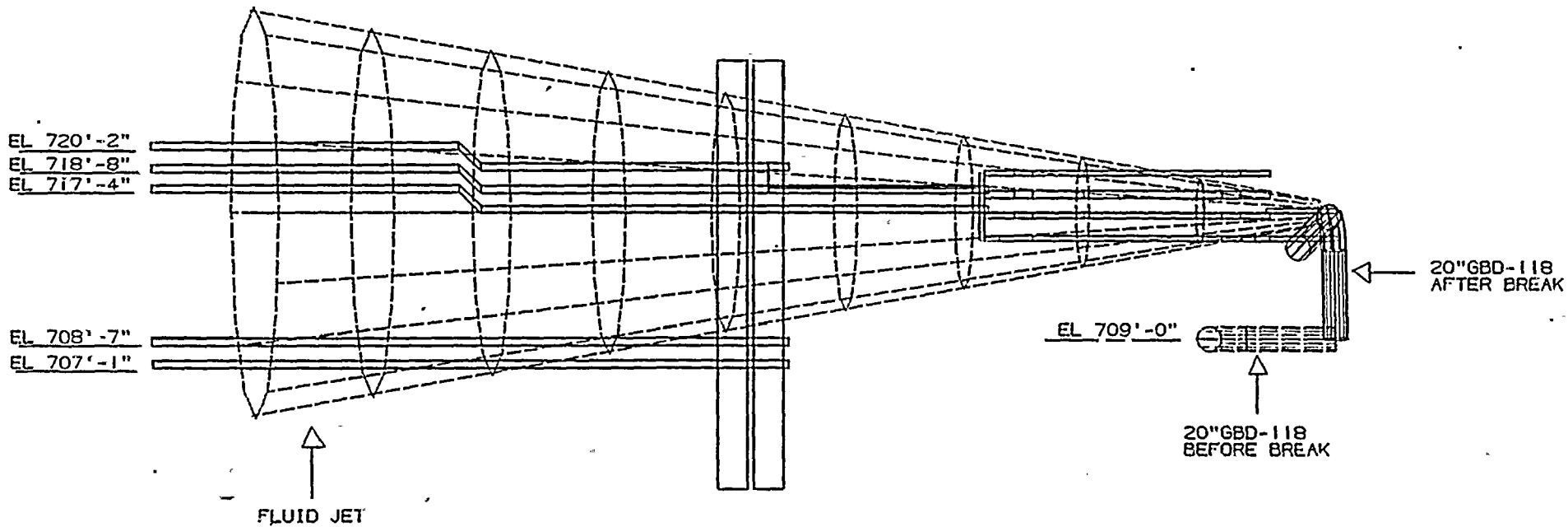


FIGURE F-14

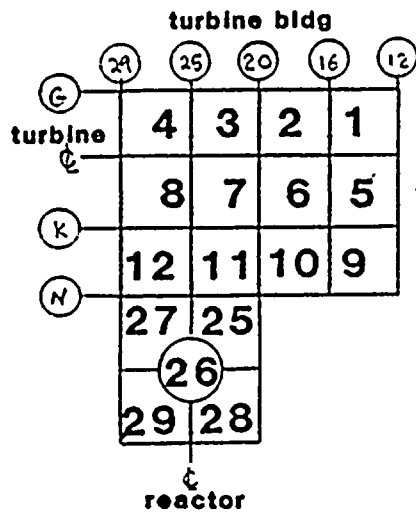
|   |              |        |     |
|---|--------------|--------|-----|
| THE PENNSYLVANIA POWER & LIGHT COMPANY<br>LANCASTER STEAM ELECTRIC STATION<br>CONDITIONAL BREAK IN FEEDWATER PIPE<br>20" GBD-118 IN TURBINE BUILDING UNIT 1<br>4" A B SPEC. 4-A ELEV. ABOVE 600'-0" |              |        |     |
| EDS   | NPS          | 7/75   | KTR |
| NUCLEAR   | 0100-013-002 | 2 OF 2 | 0   |

TABLE C-1 through C-7

Note 1: Plant Area Identification:

X - Y

Indicates Plant Area      Indicates Floor Elevation



**KEY PLAN UNIT 1**

| Floor Level | Turbine Building El. | Reactor Building El. |
|-------------|----------------------|----------------------|
| 1           | 656'                 | 645'                 |
| 2           | 676'                 | 670'                 |
| 3           | 699'                 | 683'                 |
| 4           | 729'                 | 719'                 |
| 5           | 762'                 | 749'                 |
| 6           | 714'                 | 779'                 |
| 7           |                      | 818'                 |
| 8           |                      | 799'                 |