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PROCEDURE FOR TESTING
OF
IN-PLACE MATERIALS IN EXISTING MASONRY WALLS



All items and services specified herein which are designated Category I are classified nuclear safety items and devices and are required to comply with requirements of 10 CFR 21.

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GAITHERSBURG POWER DIVISION		FLORIDA POWER & LIGHT COMPANY TURKEY POINT UNITS 3 & 4		PROCEDURE NO.			REV.		
				5177-294-CP-2			0		

1944

LATEST PROCEDURE REVISION NO. 0

INDIVIDUAL PAGE REVISION INDEX SHEET

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PROCEDURE FOR TESTING
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PROCEDURE FOR TESTING
OF
IN-PLACE MATERIALS IN EXISTING MASONRY WALLS

1.0 SCOPE

1.1 General

This procedure covers the method for testing concrete masonry units, masonry prisms, and grout in existing masonry walls. This procedure applies to the masonry walls identified and listed in Attachment 1 and Attachment 2.

1.2 Items Included

- a. Sampling
- b. Cutting, removal, and transportation of specimens
- c. Prism tests
- d. Masonry block tests
- e. Grout tests

1.3 Items not Included

- a. Repair of walls (see Procedure 5177-(later))
- b. Inspection (Inspection to be provided by Owner per Section 7.0)
- c. Evaluation of test results

2.0 APPLICABLE DOCUMENTS

- 1. ASTM E 105-58 (1975) Probability Sampling of Materials
- 2. ASTM E 447-80 Compressive Strength of Masonry Prisms
- 3. ASTM C-617-76 Capping Cylindrical Concrete Specimens
- 4. ASTM C 42-77 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
- 5. ASTM C 39-79 Compressive Strength of Cylindrical Concrete Specimens
- 6. ASTM C 140-80 Sampling and Testing Concrete Masonry Units
- 7. Uniform Building Code (UBC) 1979 Section 2404
- 8. Building Code Requirements for Concrete Masonry Structures (ACI 531-79)
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3.0 QUALITY STANDARDS

- 3.1 This procedure covers items and services that have safety-related functions in a nuclear power plant. FPL's Quality Assurance Program shall govern all safety-related items and services included in and/or performed under the requirements of this procedure for safety-related and non-safety-related walls.

4.0 SAMPLING

4.1 Selection of Walls

- 4.1.1 Safety related walls are listed in Attachment 1 and non-safety related walls are listed in Attachment 2. During Bulletin 80-11 work, the walls have been determined to be safety-related if there are safety-related items in proximity to and/or penetrating through and/or attached to wall. However, there was no difference in construction materials or workmanship of these walls when originally built. Therefore, test samples may be taken from walls listed in Attachment 1 and/or Attachment 2. The thickness, type of construction (2 cell or 3 cell concrete masonry units) and presence of grout shall be determined using Procedure 5177-294-CP-1 as required before taking test specimens from walls shown in Attachment 2.
- 4.1.2 6", 8" and 12" thick ungrouted and unreinforced walls shall be selected for testing masonry unit/mortar prism specimens and testing concrete masonry units.
- 4.1.3 8" grouted unreinforced walls shall be selected for testing grout specimens.
- 4.1.4 In addition to the walls listed in Attachment 1 and Attachment 2, test specimens may be obtained from walls which are being removed.

4.2 Number of Samples

- 4.2.1 For masonry prism tests: minimum of three samples from each type of wall (6", 8", and 12" two-cell and 8" three-cell hollow masonry walls).
- 4.2.2 For concrete masonry unit tests: minimum of six unit samples from each type of wall (6", 8", and 12" two-cell and 8" three-cell hollow masonry walls).
- 4.2.3 For grout test: minimum of three samples from 8" grouted walls.

4.3 Location of Test Samples on the Walls

Suitable locations and sizes of test prisms, masonry test units and test grout cores are to be selected by Field Engineering and are to be approved by Project Engineering prior to cutting.

After Project Engineering approval, the side of the masonry wall that has sufficient working space for the cut shall be selected, and the approved test cut locations shall be marked on this face of the wall.

5.0 CUTTING, REMOVAL, AND TRANSPORTATION OF SPECIMENS

5.1 Saw cutting or test coring must be done by competent and skilled craftsmen. The cutting or coring machine shall be anchored properly. A sharp blade shall be used to avoid damaging the sample. All specimens shall have identification number tags. Field shall keep a record of each specimen as shown in Attachment 5.

5.2 Visual Inspection

Before saw cutting or coring, a visual inspection shall be performed. The masonry wall area from which test specimen is to be obtained shall be free from any cracks.

5.3 Cracked or damaged samples shall not be transported to the laboratory.

5.4 The sequence of the operations shall be as follows:

5.4.1 For Masonry/Mortar Prism Specimen:

5.4.1.1 Samples are to be obtained only from hollow masonry units.

5.4.1.2 The test specimen shall have a final configuration as shown on Alternate 1 of Attachment 4 for 6", 8" and 12" thick masonry walls. Alternate 2 of Attachment 4 may be used to obtain test specimens for 8" and 12" masonry walls. A larger portion of wall may be cut and removed if so desired by field; the specimen removed shall then be cut to the final configuration as shown in Attachment 4.

5.4.1.3 Care must be exercised that the saw cutting, handling, and removal do not damage the test prism and that the sample is representative of the subject masonry wall.

- 5.4.1.4 The cut portion of the wall shall be adequately supported by steel plates and/or plywood boards to prevent any damage during and after cutting.
- 5.4.1.5 After the prism is removed from the wall and cut (if necessary) to its final configuration, tightly wrap the prism with wire ties or steel straps to keep the supporting steel plates and/or plywood boards in place and to keep the joints from being disturbed.
- 5.4.1.6 The prism shall be further protected or insulated against jarring as necessary to prevent breakage of the bond between the units.
- 5.4.1.7 The prism shall be transported to the laboratory under extreme caution, in such a manner as not to break the bond between mortar and masonry.
- 5.4.1.8 During transportation and storage of the prisms, the specimens shall be kept in their vertical position as shown in Attachment 4.
- 5.4.1.9 Alternate methods of obtaining and transporting prisms require prior review and approval by Project Engineering.
- 5.4.1.10 Specimens shall be stored at normal room temperature until testing.

5.4.2 For Concrete Masonry Block Specimen

- 5.4.2.1 Samples are to be obtained only from hollow masonry units.
- 5.4.2.2 The wall shall be cut so as to obtain one complete concrete masonry unit.
- 5.4.2.3 All mortar shall be removed from the joints prior to testing.
- 5.4.2.4 Care shall be taken not to damage the masonry block during saw cutting, removal of mortar, or transportation of specimen.
- 5.4.2.5 Specimens shall be stored at normal room temperature until testing.

5.4.3 For Grout-Core Specimen

- 5.4.3.1 Samples are to be obtained from grouted, unreinforced masonry units.
- 5.4.3.2 Cut a section of wall to obtain a field cut core of grout. Grout test specimen size shall be: $3\frac{1}{2}" \times 3\frac{1}{2}" \times 7"$ high or $3" \times 3" \times 6"$ high or $3" \varnothing \times 6"$ high (cylindrical)
- 5.4.3.3 Height of the specimens shall be in the direction of the wall's height.
- 5.4.3.4 Care shall be taken not to damage the grout during coring, sizing, cutting, or transportation of specimen.
- 5.4.3.5 Specimens shall be stored at normal room temperature and shall be tested dry.

6.0 TESTING

Testing shall be performed by an accredited laboratory. Testing procedures shall be as outlined in Attachment 3.

7.0 INSPECTION


- 7.1 Inspection of items and activities affecting quality shall be in accordance with FPL's Quality Assurance Program. Supervision, inspection, and recording of work under this procedure shall be in accordance with but not limited to the applicable sections of ACI 531-79 code and commentary, Section 4.5, and ASTM E447-80, Section 6.6

LIST OF REPRESENTATIVE MASONRY WALLS
WHERE THIS PROCEDURE MAY BE USED
(FOR SAFETY-RELATED WALLS)

(See also Paragraph 4.1.4)

Thickness of The Wall	WALL IDENTIFICATION NO.											
	FOR PRISM SPECIMENS				FOR MASONRY SPECIMENS				FOR GROUT SPECIMENS			
	2-Cell	Location Fig. No.	3-Cell	Location Fig. No.	2-Cell	Location Fig. No.	3-Cell	Location Fig. No.	2-Cell	Location Fig. No.	3-Cell	Location Fig. No.
6"	C-30-1	2			C-30-1	2						
	C-30-3	2			C-30-3	2						
	C-30-4	2			C-30-4	2						
	C-30-11	2			C-30-11	2						
	C-30-13	2		N/A	C-30-13	2		N/A		N/A		N/A
	C-42-15	3			C-42-15	3						
	C-42-16	3			C-42-16	3						
	C-42-17	3			C-42-17	3						
					C-42-18	3						
8"	C-30-2	2	T-18-5A	11	A-18-6	5	T-18-5A	11	C-18-46	1		
	C-30-8	2	T-31-2A	12	C-30-2	2	T-31-2A	12	C-30-20	2		
	C-30-9	2	T-18-5B	11	C-30-7	2	T-18-5B	11	SG-18-5A	9		
	C-30-12	2	T-31-2B	12	C-30-8	2	T-31-2B	12				
			T-18-6A	11	C-30-9	2	T-18-6A	11				
			T-18-6B	11	C-30-12	2	T-18-6B	11				
	SG-18-5B	10	T-18-7A	11			T-18-7A	11				
			T-18-7B	11			T-18-7B	11				
			T-31-1A	12	SG-18-5B	10	T-31-1A	12				N/A
			T-31-1B	12			T-31-1B	12				
			T-31-3A	12			T-31-3A	12				
			T-31-3B	12			T-31-3B	12				
			T-31-4	12			T-31-4	12				
12"	A-18-2	5			A-18-2	5						
	A-42-1	3		N/A	A-18-5	5				N/A		N/A
					A-42-1	3						

LIST OF REPRESENTATIVE MASONRY WALLS
WHERE THIS PROCEDURE MAY BE USED
(For Non-Safety-Related Walls)
(See also Paragraph 4.1.4)

WALL I.D. NO.	FIG. NO.	REMARKS
SG-18-16A	9	See Paragraph 4.1.1
SG-18-16B	10	
DG-18-7	14	
DG-18-8	14	
DG-18-9	14	
DG-18-10	14	
A-10-1	4	
A-10-2	4	
A-10-3	4	
A-18-9	6	
A-18-10	6	
A-18-18	6	
A-18-19	6	
A-18-11	5	
A-18-12	5	
A-18-13	5	
A-18-15	5	
T-18-2A	16	
T-18-2B	18	
T-18-3A	15, 16	
T-18-3B	17, 18	
T-18-4A	15	
T-18-4B	17	
T-18-11	18	
T-18-12	18	
T-18-13	18	
T-18-14	18	
T-18-15	17	
T-18-16	17	
T-18-17	17	
T-18-18	17	
T-18-19	17	
T-18-20	17	
T-18-21	18	
T-18-22	18	
T-18-23	18	
T-18-24	18	
T-18-25	18	
T-18-26	18	
T-18-27	17	
T-18-28	17	

WALL I.D. NO.	FIG. NO.	REMARKS
T-18-30	16	See Paragraph 4.1.1 ↓
T-18-31	16	
T-18-32	16	
T-18-33	16	
T-18-34	16	
T-18-35	15	
T-18-36	15	
T-18-37	15	
T-18-38	15	
T-18-39	15	
T-18-40	15	
T-18-41	15	

COMPRESSIVE STRENGTH TESTS OF SPECIMENS

1.0 General

This section covers the methods to be used for determining the compressive strength of masonry units, masonry prisms, and grout for existing masonry walls at Turkey Point Plant, Units 3 and 4. Care shall be taken to see that testing surfaces of specimens are parallel, uniform and perpendicular to the longitudinal axis. Loading methods must be such as to ensure uniform compression over the entire specimen.

2.0 Testing

2.1 Testing Masonry Unit Mortar Prism

- 2.1.1 Masonry prism test specimens shall have a configuration as shown in Attachment 4. The value of f' shall be taken as the compressive strength of the specimens multiplied by a correction factor as follows:

Ratio of height to thickness (h/t)	1.5	2.0	2.5	3.0	4.0
Correction factor	0.86	1.00	1.11	1.20	1.30

Factors between those listed shall be determined by direct interpolation.

- 2.1.2 Before making the compression test, cap the bearing surfaces of specimen in accordance with Section 8 of ASTM C140-80. Do not apply load until the capping material reaches a unit strength in excess of the prisms.

- 2.1.3 Test specimens shall be tested in compression in the same manner as set forth for prism testing in ASTM E447-80, Section 6.

2.2 Testing Concrete Masonry Units

Capping and testing of concrete masonry units for compression strength shall be done in accordance with Sections 8 and 9 of ASTM C 140-80.

2.3 Testing Grout Specimens

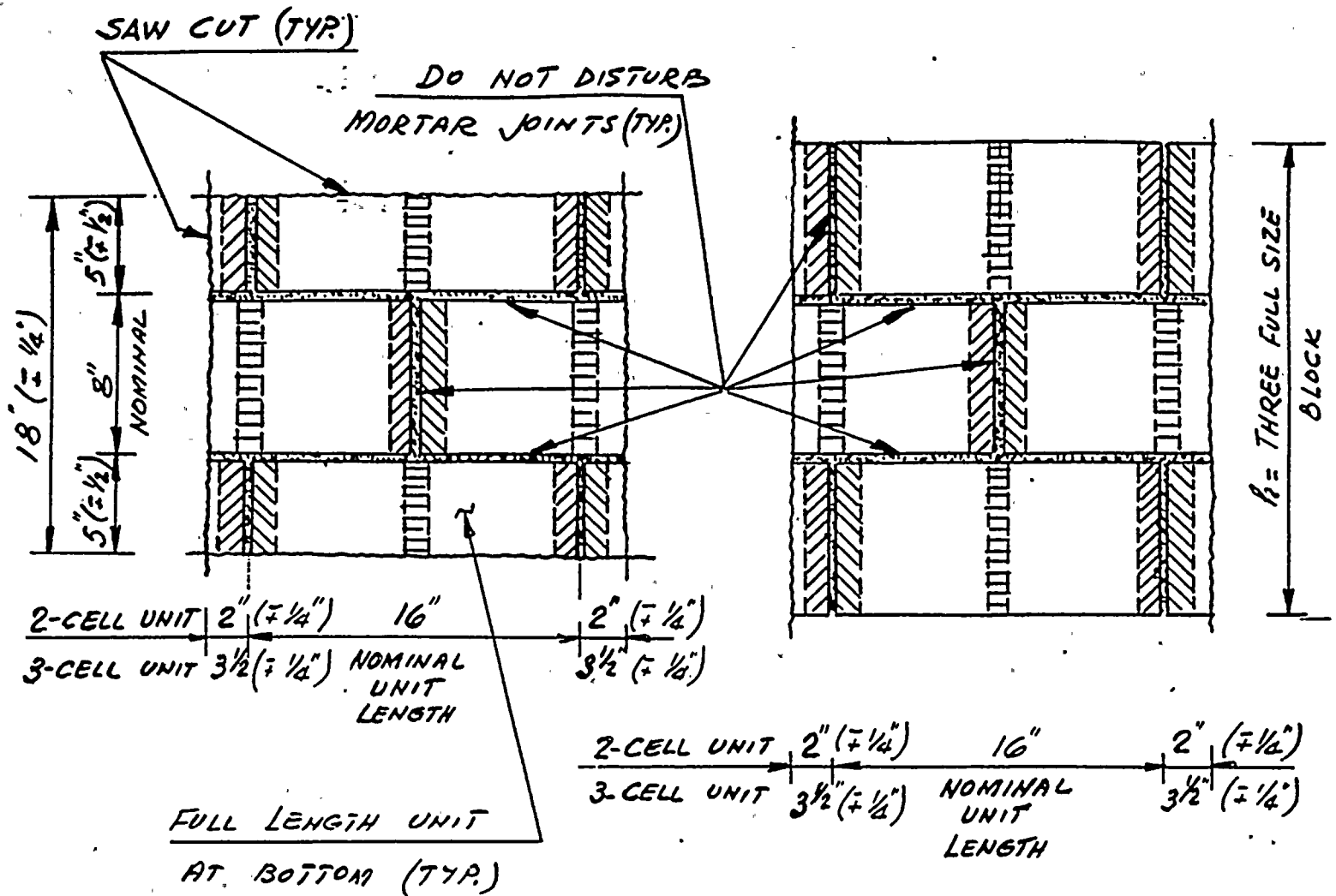
- 2.3.1 Capping and testing of grout specimens shall be done in accordance with ASTM C 42-77.

3.0 Reports

- 3.1 Test reports for masonry unit/mortar prism test shall be prepared in conformance with Section 7 of ASTM E 447-80.

- 3.2 Test reports for masonry unit test shall be prepared in conformance with Section 10 of ASTM C 140-80.

- 3.2 Test reports for drilled core grout test shall be prepared in conformance with Section 6 of ASTM C 39-79.



ALTERNATE 1

(FOR 6", 8" AND 12" THICK WALLS)

ALTERNATE 2

(FOR 8" AND 12" WALLS)

FINAL CONFIGURATION OF

MASONRY/MORTAR PRISM TEST SPECIMENS

NOTE: 2-CELL UNITS ARE SHOWN IN SECTIONS. SAME CONFIGURATION APPLIES FOR 3-CELL UNITS.

SYMBOLS: END WEBS, MIDDLE WEBS, MORTAR AT JOINTS

Height of Specimen for Prism Test

Following is the summary of requirements in applicable codes and standards concerning the height of prism test specimens:

- (1) UBC - 1979, Section 2404 specifies the following:

$$1.5 \leq \frac{\text{Height}}{\text{Thickness}} \leq 5, \text{ but height shall be not less than 12"}.$$

- (2) ACI 531-79, Section 4.4.8, specifies the following:

$$1.33 \leq \frac{\text{Height}}{\text{Thickness}} \leq 3.0$$

- (3) ASTM E 477-80, Section 5.4.2.1, specifies the following:
The height of prism test shall be at least twice the thickness of the prism, a minimum of three units high, and a minimum of 15" height.

The intent of ASTM E 447-80 requirements as noted is to have at least two horizontal mortar joints in a test specimen. The height of prism test specimen as shown satisfies the code requirements for UBC-1979 and ACI 531-79, and also satisfies the intent of ASTM E 447-80.



TEST SPECIMEN RECORD FORM

1. Specimen Identification No. _____
2. Date specimen taken _____
3. Type of specimen (i.e., masonry/mortar prism specimen
or concrete masonry block specimen or grout specimen)

4. Masonry wall identification
Number from which specimen is taken _____
5. Location sketch of test specimen on wall

EL.

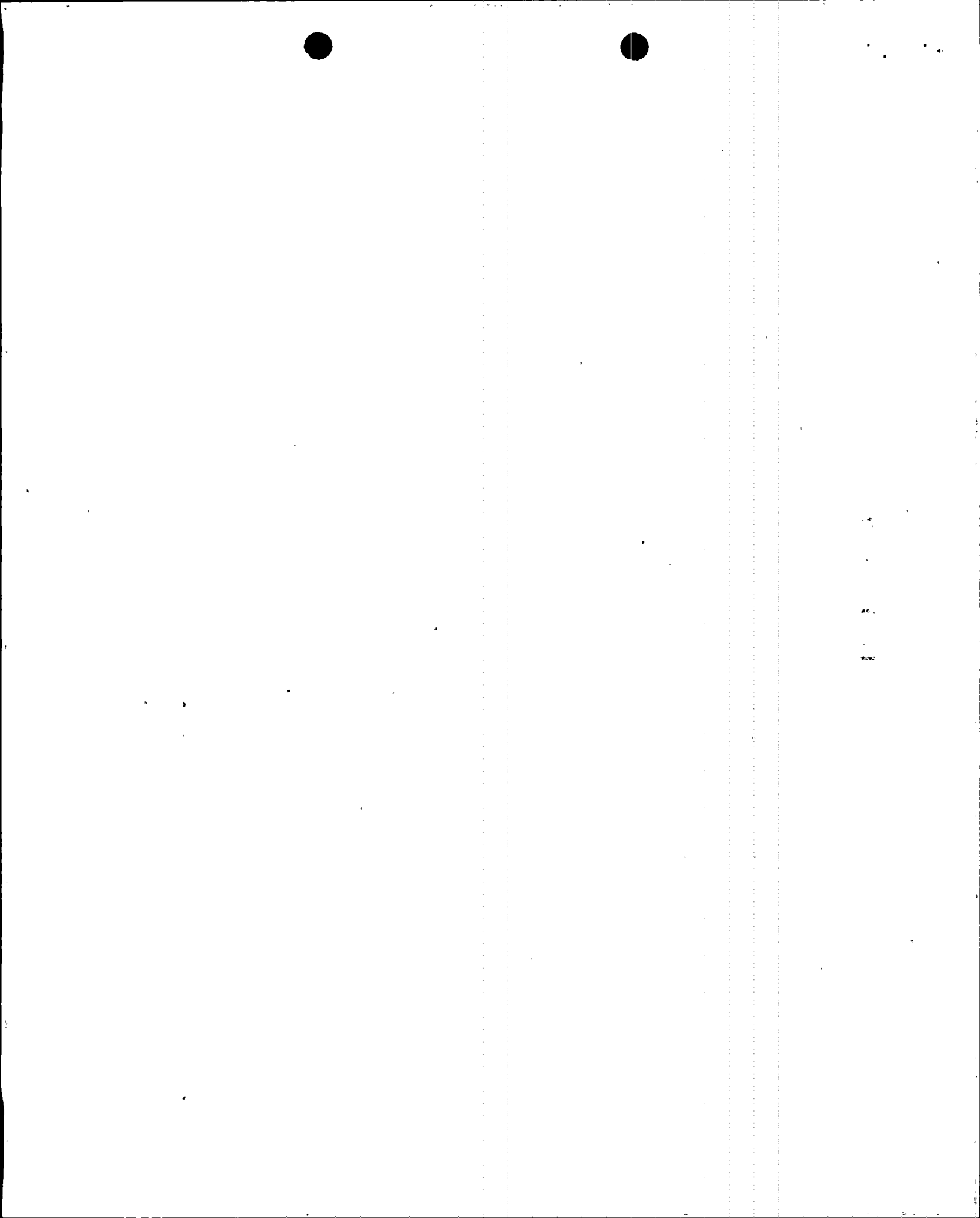


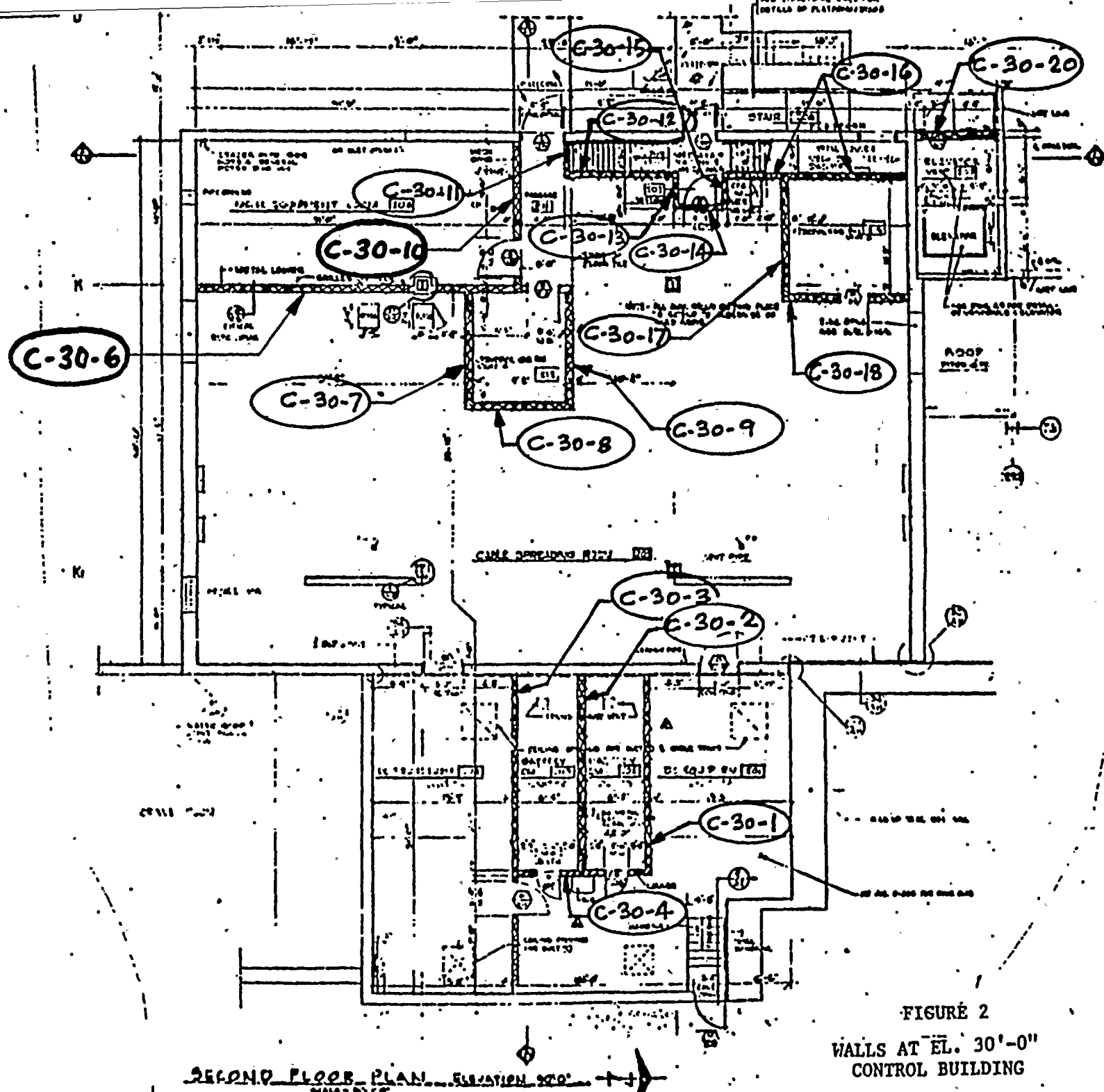
Elevation Looking _____

Inspected by/date _____

Checked by/date _____

- NOTES:
1. Use one form for each test specimen.
 2. Attach additional pages as required.





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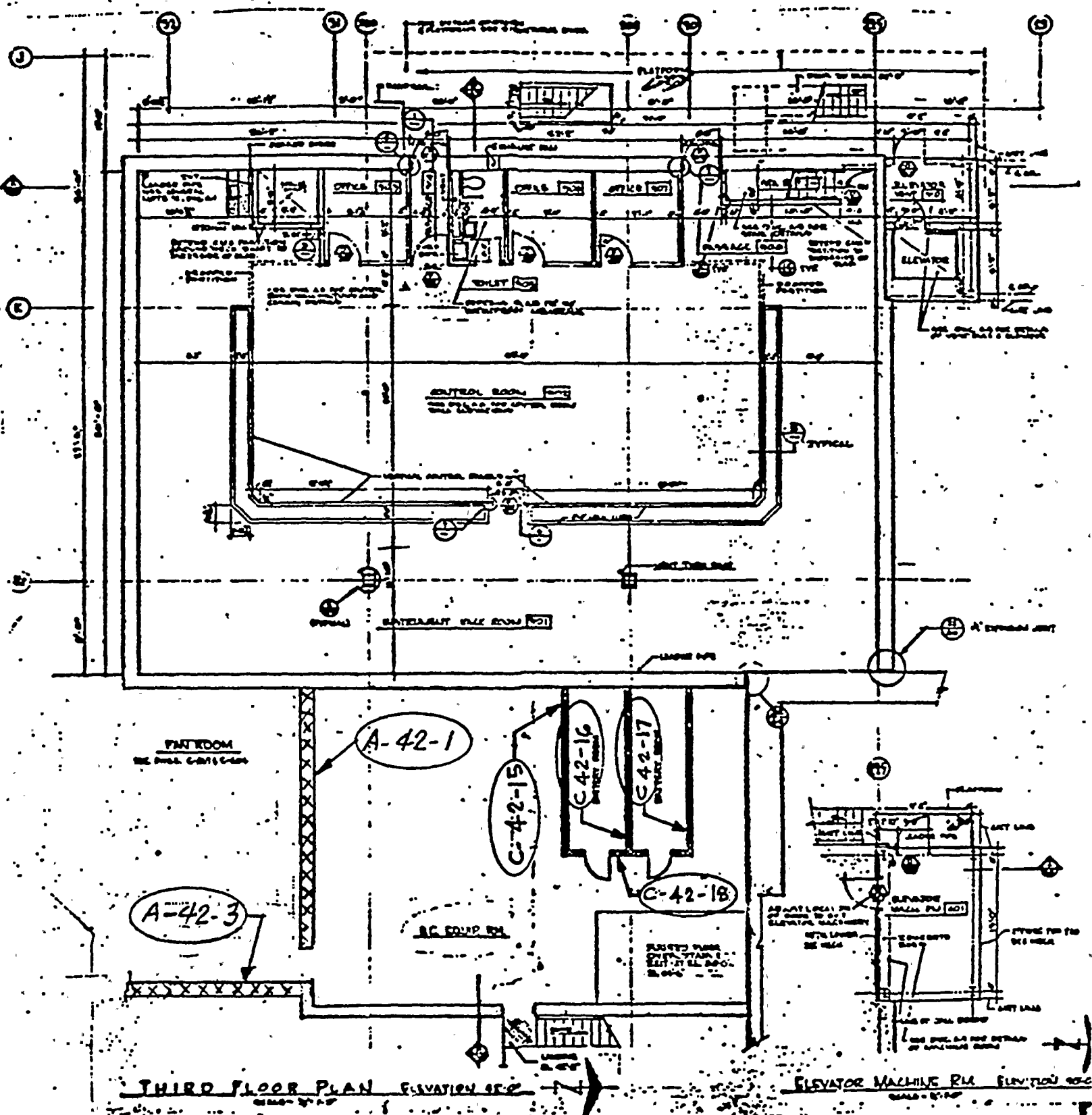
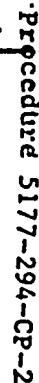
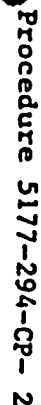


FIGURE 3
WALLS AT EL. 42'-0"
CONTROL BUILDING



Rev. 0



Rev. 0

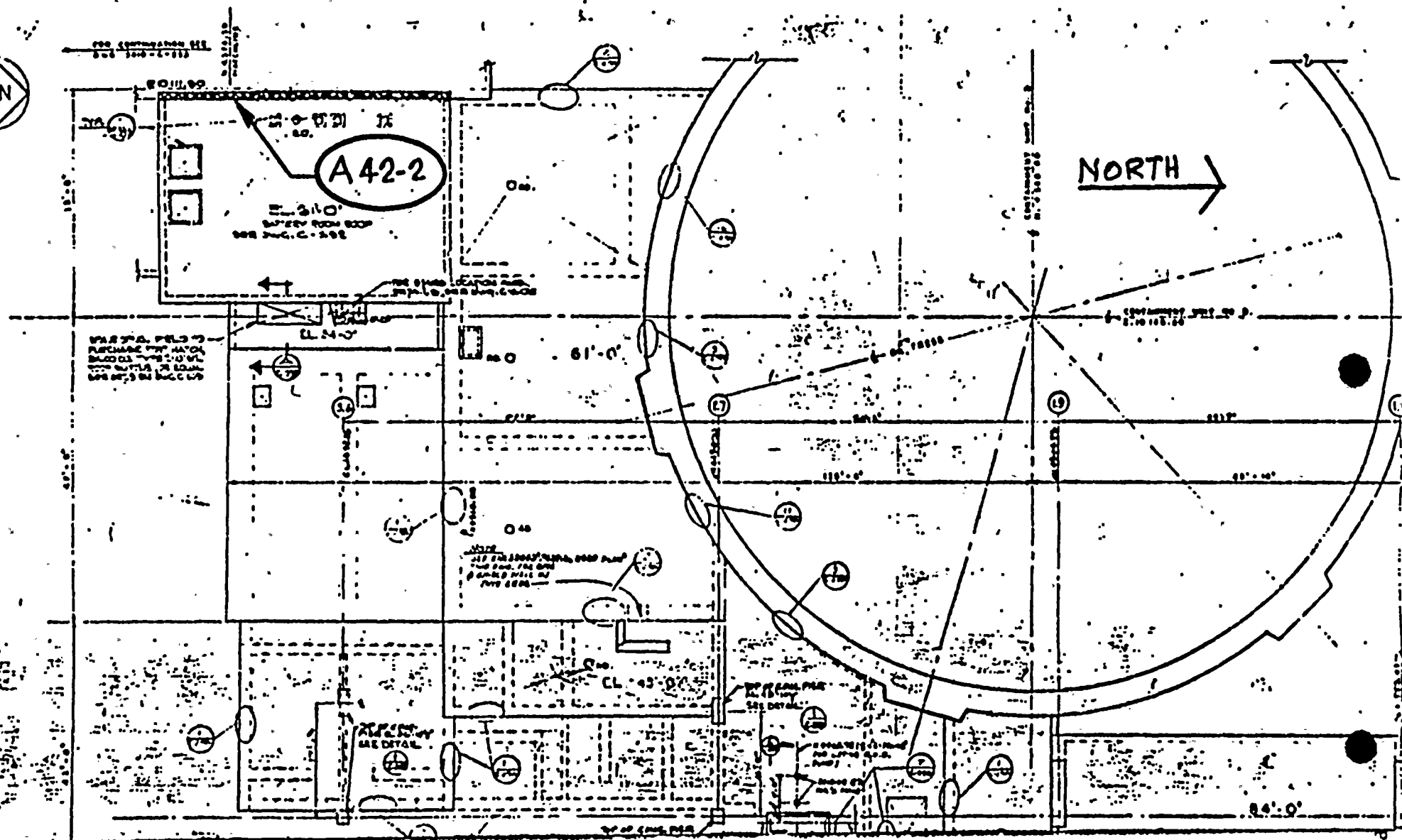


FIGURE 7

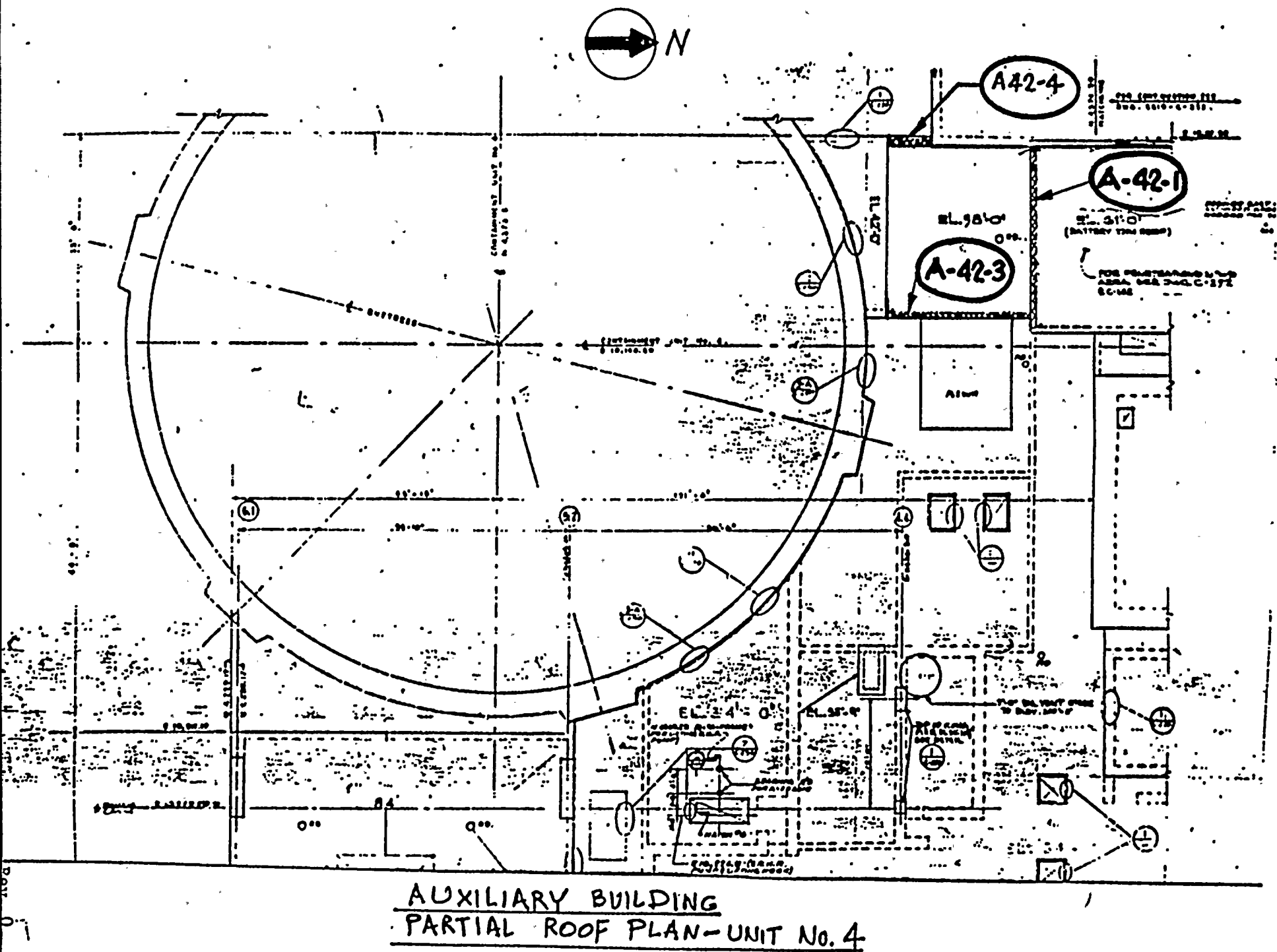
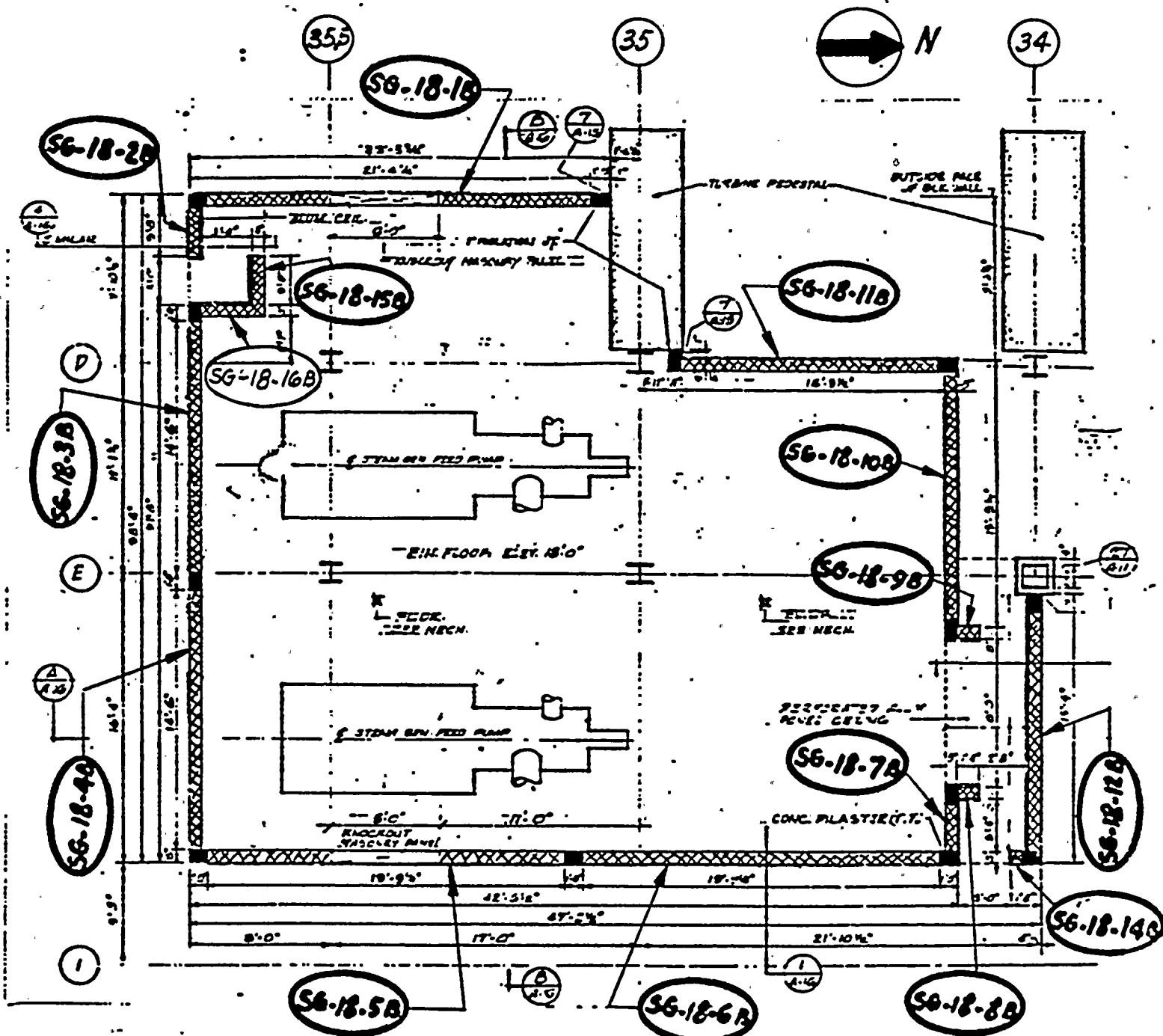


FIGURE 8



STEAM GENERATOR FEED PUMP ENCLOSURE

PLAN AT EL. 18'-0"

UNIT NO. 4

Figure 10

Rev. 0

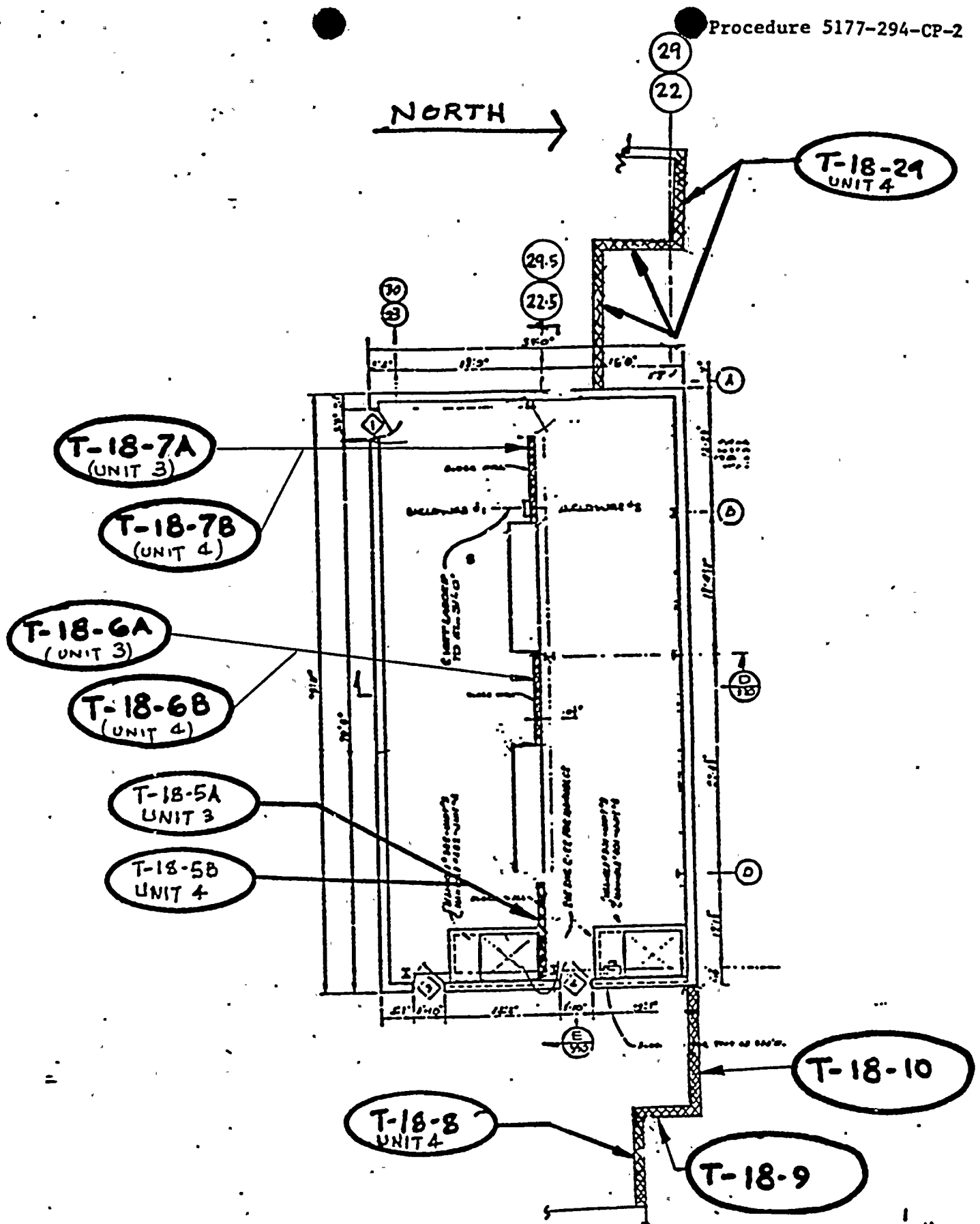
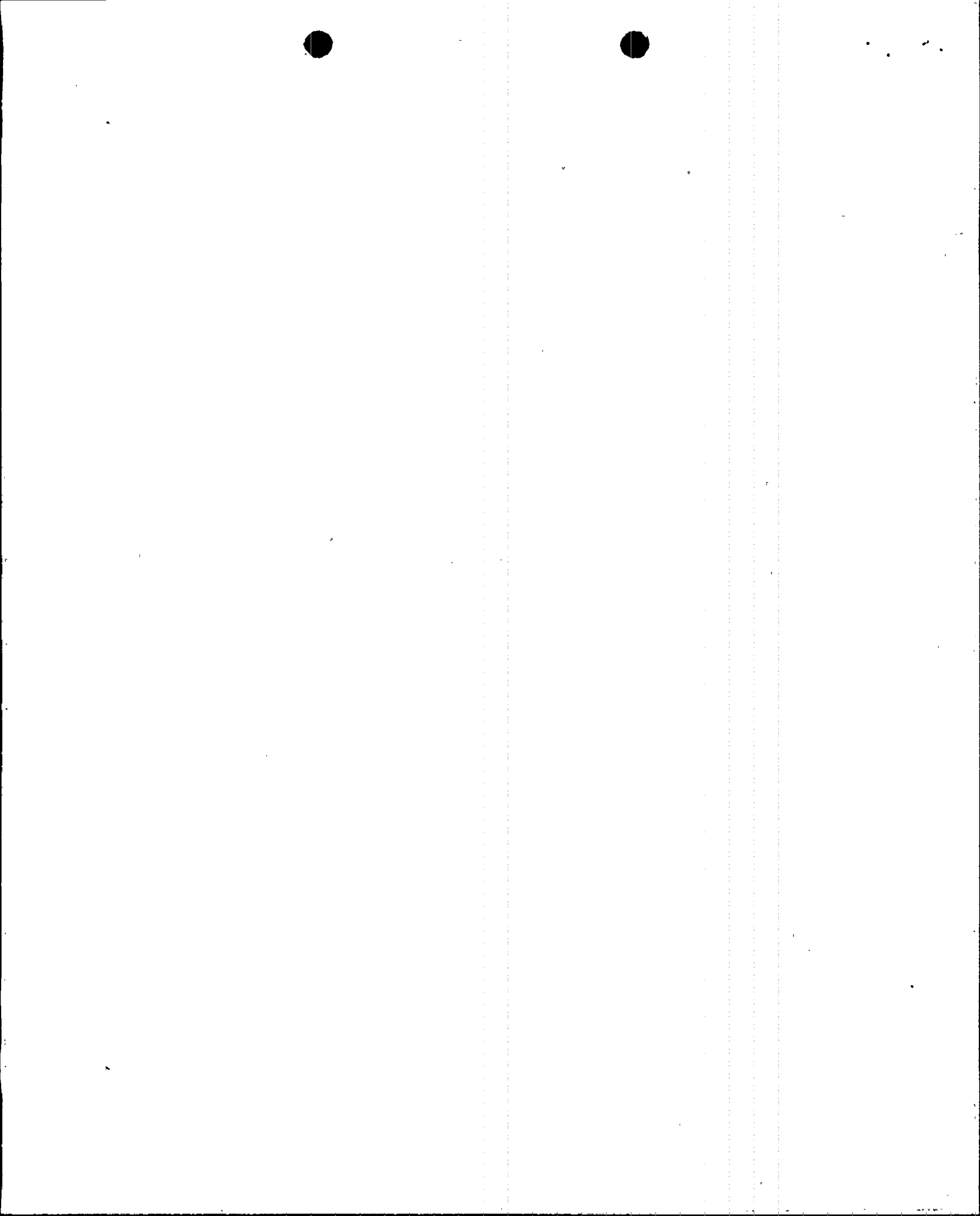
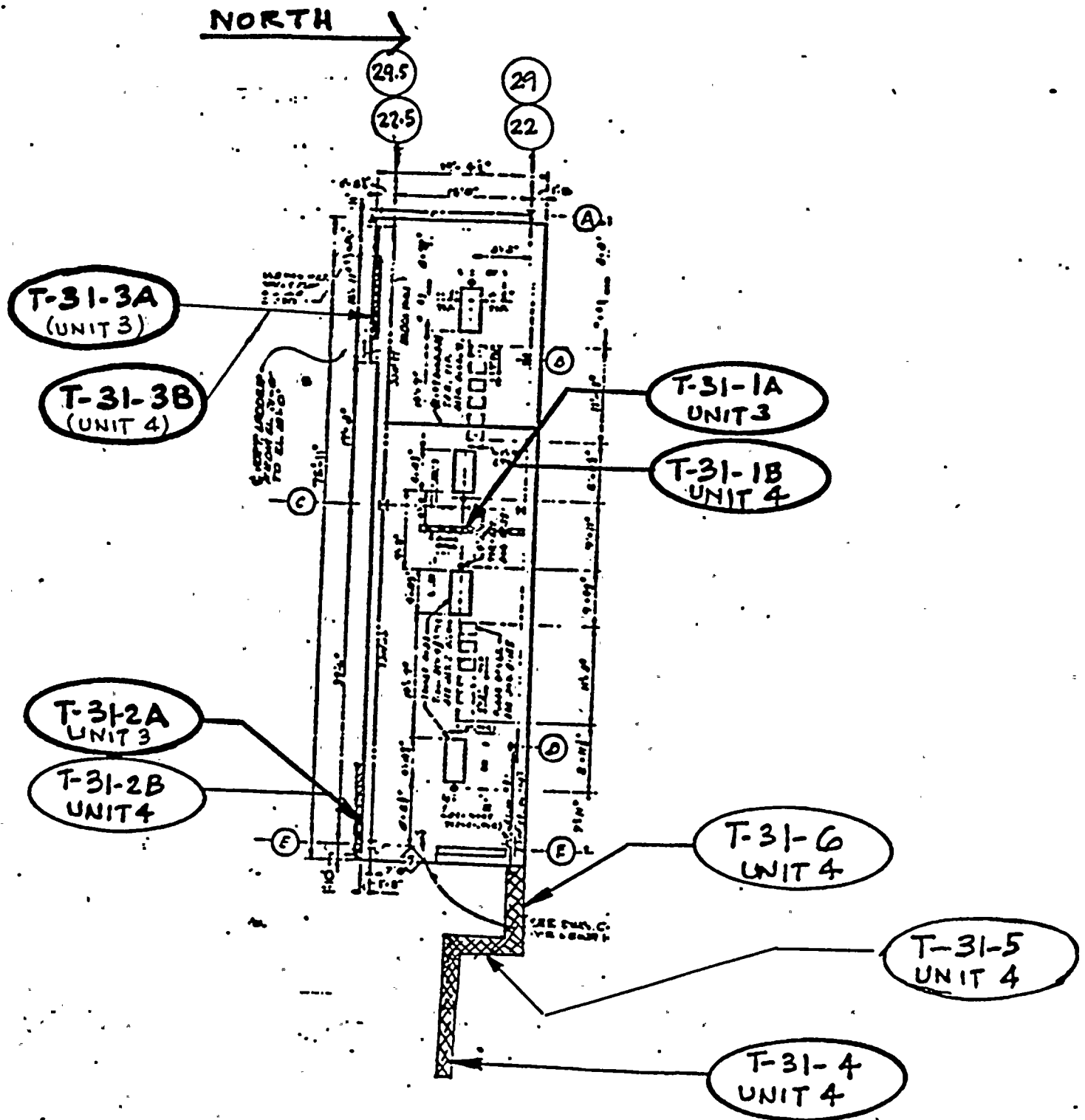


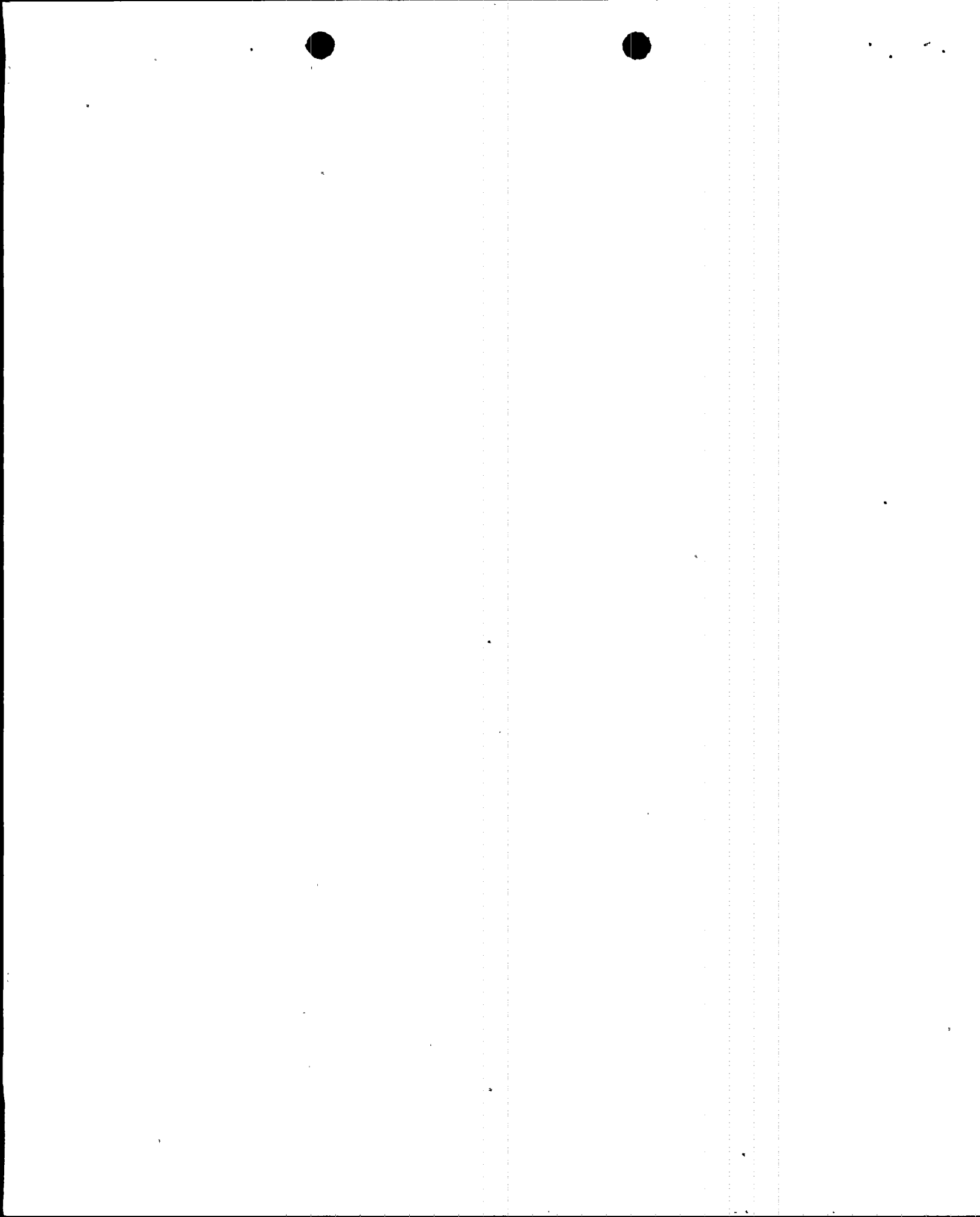
FIGURE 11

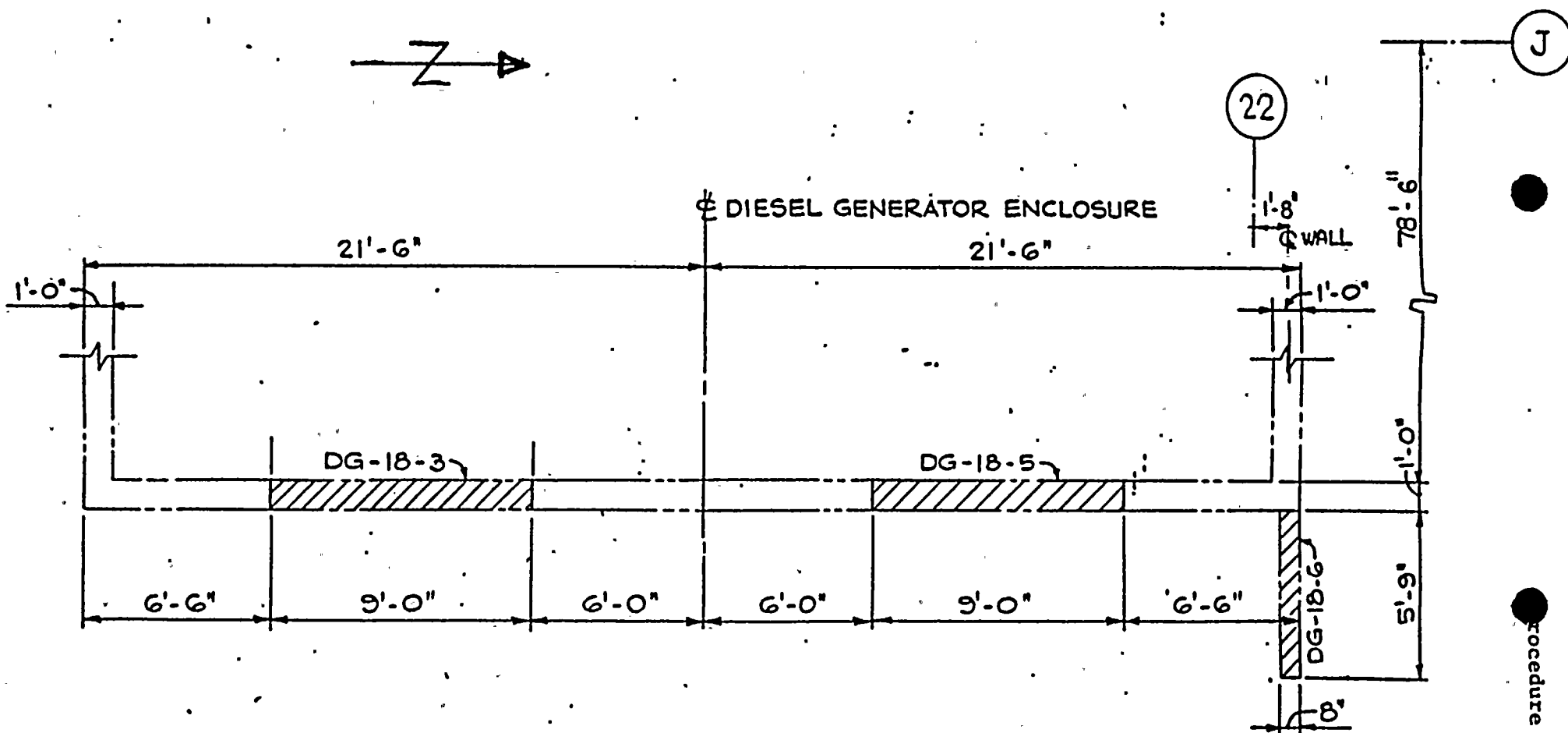




SWITCHGEAR ENCLOSURE -
PLAN OF SLAB @ EL. 31'-0"

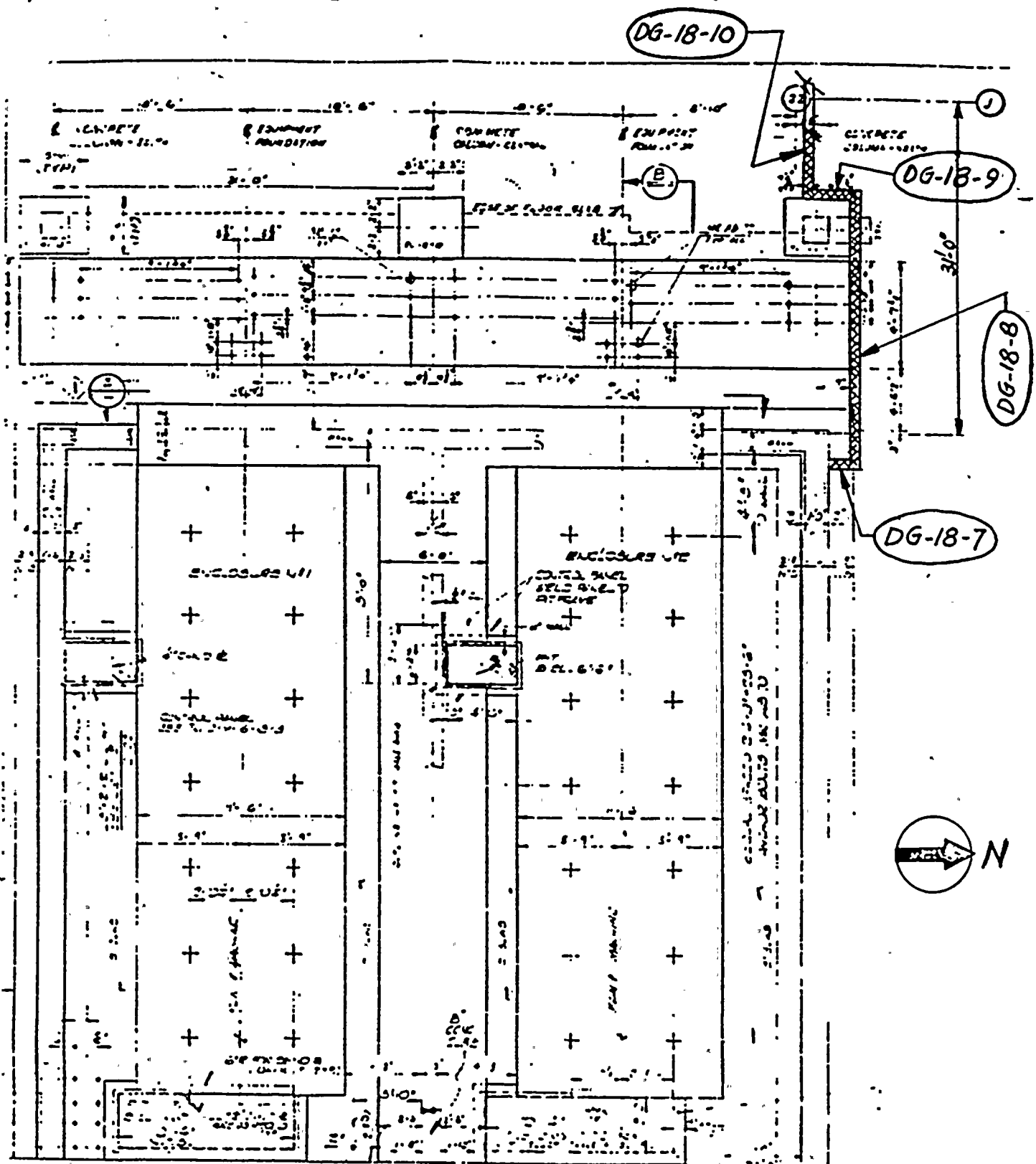
FIGURE 12



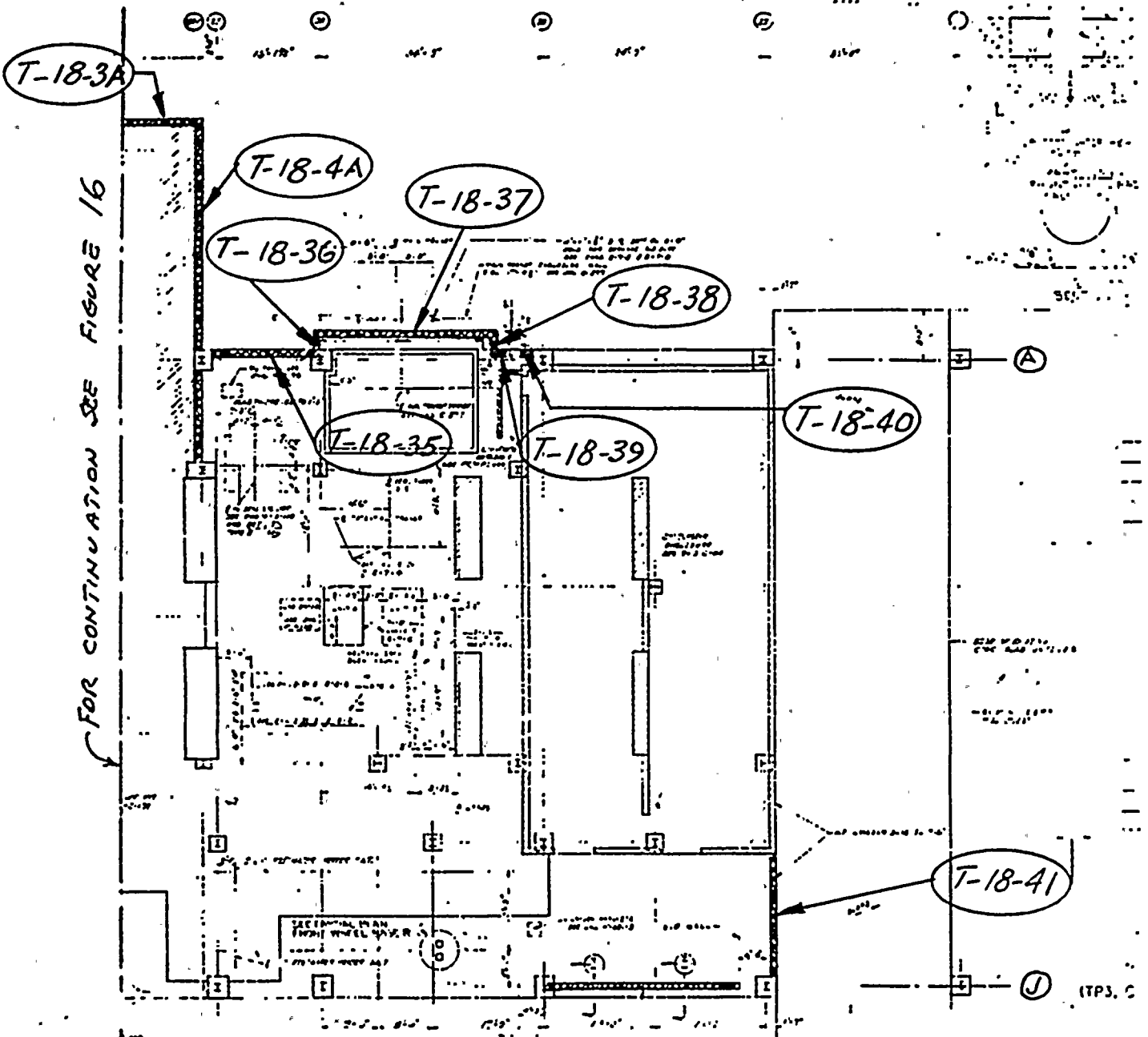


PARTIAL PLAN AT EL. 18'-0"
DIESEL GENERATOR ENCLOSURE

Figure 13



PARTIAL PLAN AT EL 18'-0"
DIESEL GENERATOR ENCLOSURE
 Figure 14



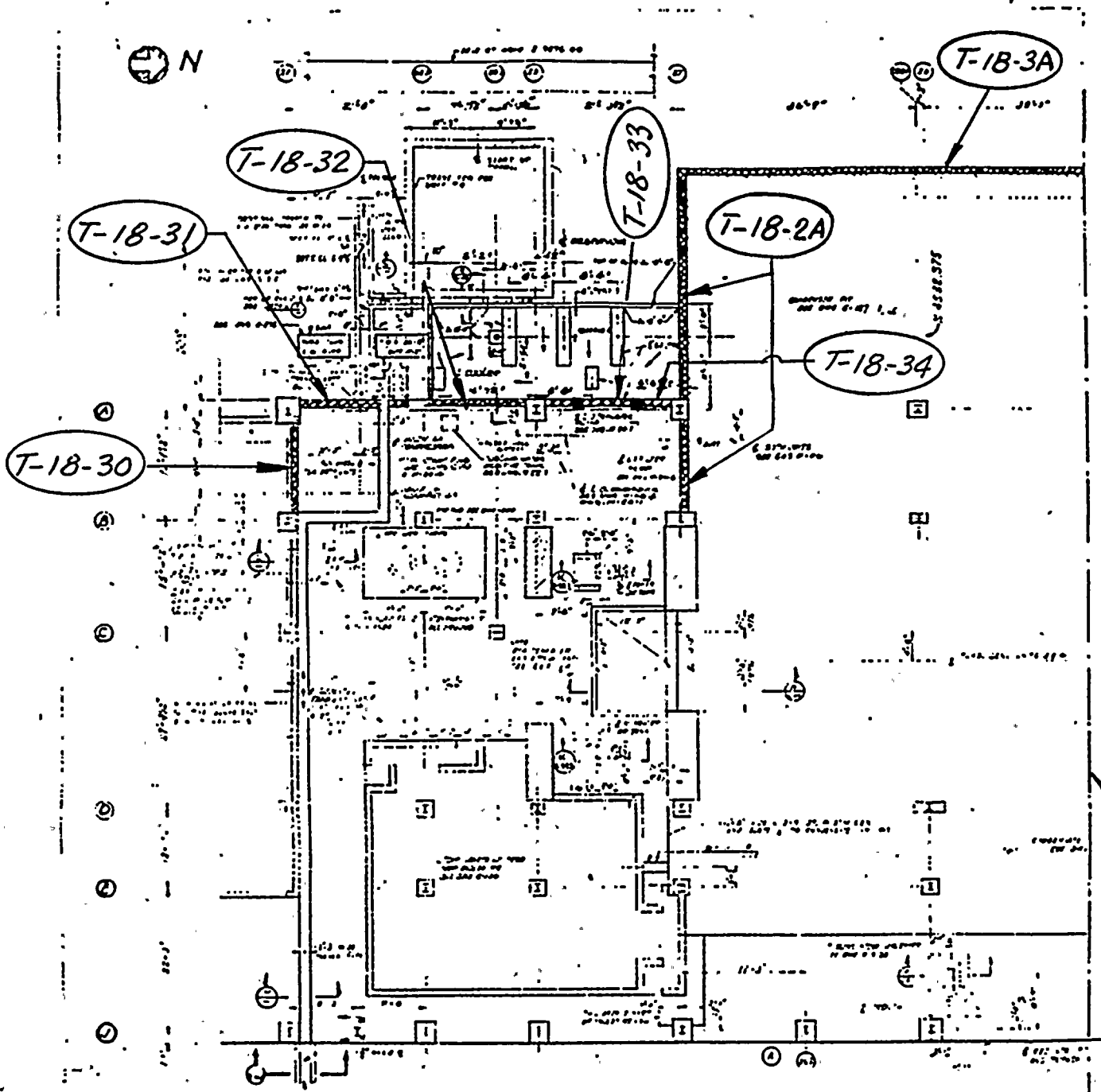
POWERHOUSE GROUND FLOOR EL. 18'-0"

TURBINE GENERATOR AREA

UNIT NO. 3

(Ref. Drawing 5610-C-108)

FIGURE 15

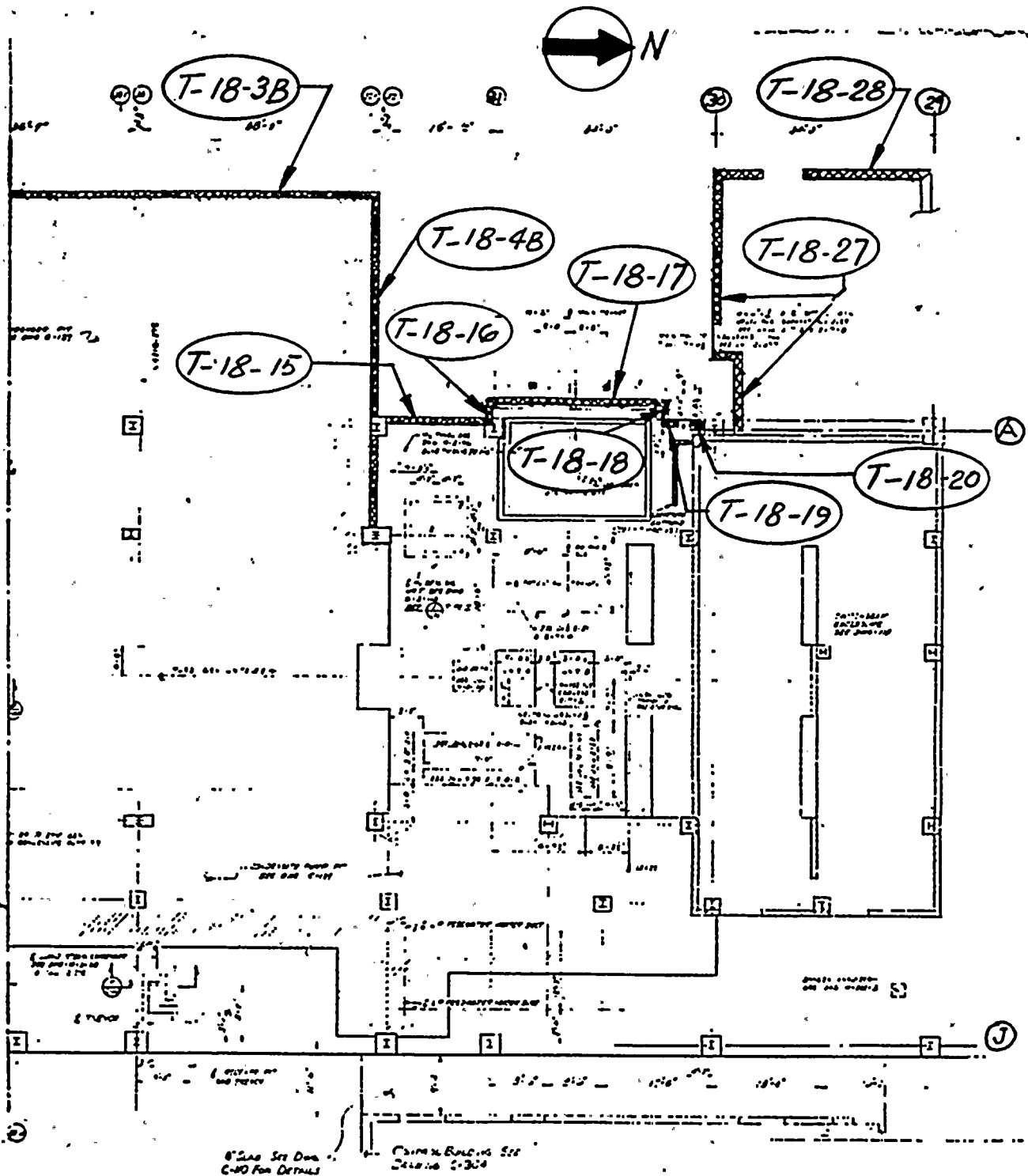


FOR CONTINUATION SEE FIGURE 15

POWERHOUSE GROUND FLOOR EL. 18'-0"
TURBINE GENERATOR AREA
UNIT NO. 3

(Ref. Dwg. 5610-C-108)
 Figure 16

FOR CONTINUATION SEE FIGURE 18

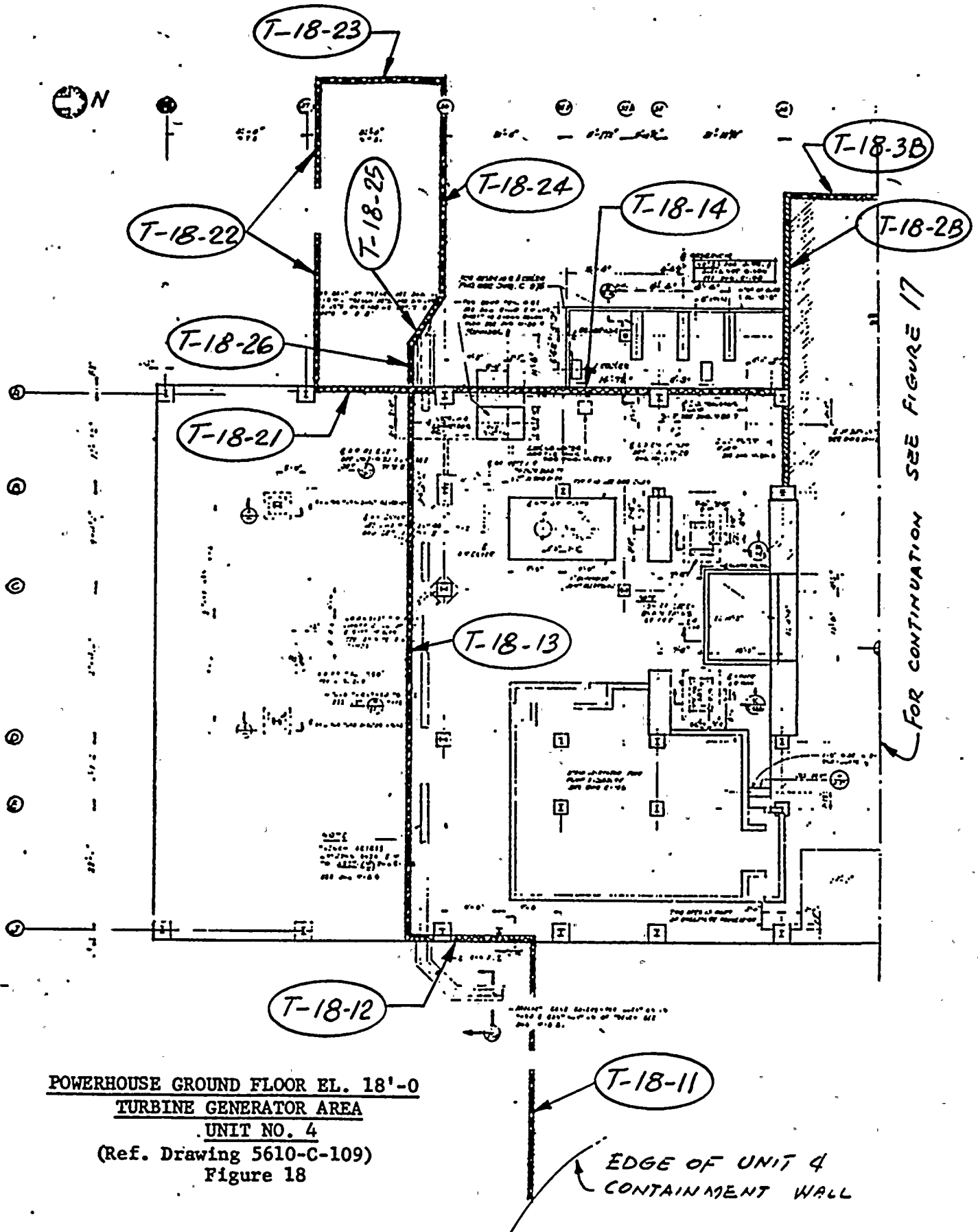


POWERHOUSE GROUND FLOOR EL. 18'-0"

TURBINE GENERATOR AREA

UNIT NO. 4

(Ref. Drawing 5610-C-109)
Figure 17



POWERHOUSE GROUND FLOOR EL. 18'-0

TURBINE GENERATOR AREA

UNIT NO. 4

(Ref. Drawing 5610-C-109)

Figure 18

