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MAINE YANKEE ATOMIC POWER COMPANY •
ENGINEERING OFFICE
TURNPIKE ROAD (RT. 9)
WESTBORO, MASSACHUSETTS 01581
617-366-9011

B4.1.1
WMY 80-149

November 4, 1980

United States Nuclear Regulatory Commission
Office of Inspection and Enforcement
Region I
631 Park Avenue
King of Prussia, Pennsylvania 19406

Attention: Mr. Boyce H. Grier, Director

References: (1) License No. DPR-36 (Docket No. 50-309)
(2) USNRC Letter to MYAPC dated May 8, 1980; IE Bulletin No. 80-11
(3) MYAPC Letter to USNRC, dated June 30, 1980 (WMY 80-103)

Subject: Response to IE Bulletin 80-11: "Masonry Wall Design"

Dear Sir:

Your letter, Reference (2) identified a potential problem with the structural integrity of concrete masonry walls. Our letter, Reference (3) provided the information requested in Items 1, 2a, and 3 of the subject bulletin. Attached hereto is Maine Yankee's response to Item 2.b. which provides details regarding the function of the masonry walls, construction specifications, and the re-evaluation methodology.

Manpower requirement statistics have been requested in recent bulletins, and since the manpower expended in response to this bulletin has been significant, we have elected to provide the following estimates associated with this bulletin:

Manpower Requirements	Hours
Bulletin Response	350 Manhours
Corrective Actions	500 Manhours

It should be clearly understood that this information is not adequate to enable a value impact assessment. We believe a determination of the safety improvement, as a result of this bulletin, would be necessary before the staff could perform an accurate value impact assessment.

We trust this information is satisfactory; however, should you require additional information, please contact us.

Very truly yours,

MAINE YANKEE ATOMIC POWER COMPANY

W. P. Johnson
Vice President

RHG/kab

COMMONWEALTH OF MASSACHUSETTS)
)ss
COUNTY OF WORCESTER)

Then personally appeared before me, W. P. Johnson, who, being duly sworn, did state that he is a Vice President of Maine Yankee Atomic Electric Company, that he is duly authorized to execute and file the foregoing request in the name and on the behalf of Maine Yankee Atomic Electric Company, and that the statements therein are true to the best of his knowledge and belief.

Robert H. Groce Notary Public
My Commission Expires September 14, 1984

ATTACHMENT 1

Submittal of Information Required by IE Bulletin 80-11

Item 2.b.i: Refer to reference (a), Table 1 for the complete list of masonry walls in proximity to safety-related equipment.

1. Service Building, Switchgear Room El. 45'-6", Battery No. 1 & 2 Area

The Battery No. 1 & 2 area is separated from the remainder of the switchgear room by three 12-inch thick, hollow block walls. Refer to drawing 11550-FA-1B for the relative location of these walls. The function of these walls is to act as a partition separating the battery room from the rest of the switchgear room. The south wall is 14'-10" high and the west walls are approximately 12'-6" high. The south wall is mortared to the bottom of the 2'-0" thick roof slab while the west walls are mortared below one of the roofs 21" wide concrete support beams. The walls are single wythe and essentially unreinforced. The blocks were purchased under Specification #MYS-1469 (see Attachment #2) and met ASTM C90 (Grade A) standards. Since prisms test records were not available, the compressive strength (f'm) was assumed to equal 1350 psi in accordance with the 1979 Uniform Building Code Section 2404.D.3. The mortar strength used in any particular wall is not readily discernable from existing historical records particularly since the specification calls for either Type M or Type N. Workers involved in supervising the construction of the block walls believe that the stronger mortar (Type M), was used in safety-related areas, and that Type N was used in the remaining non-safety related areas. Since we could not document this belief, we conservatively assumed that Type N was used throughout our analysis.

2. Service Building, Cable Tray Room El 35'-0", Battery No. 3 & 4 Area

The Battery No. 3 & 4 area is separated from the remainder of the Cable Tray Area by four, 12-inch thick, hollow block walls. Refer to drawing 11550-FA-1B for the relative location of these walls. The function of these walls is to act as a partition separating the battery room from the rest of the cable tray room. The north and south walls are 9'-3" high and are mortared below the El. 45'-6" slab. The west walls are 7'-0" high and are mortared below a 30" wide concrete support beam. The walls are of single wythe construction, unreinforced and are constructed of the same materials as the battery room, discussed in item 1.

3. Service Building, Cable Tray Area, El. 35'-0", Elevator Enclosure

Two 12-inch thick block walls separate the elevator from the Cable Tray Area. Refer to drawing 11550-FA-1B for layout of these walls. The function of these walls is to provide general occupational safety. Both walls are approximately 8'-8" high and extend to the bottom of the El. 45'-6" elevator steel framing (W12, W14). The horizontal clear span lengths of the south and west walls are 7'-10" and 9'-4" respectively. The walls are unreinforced, single wythe, and are constructed of the same materials as the battery rooms.

4. Service/Turbine Building, El. 35'-0", C-line Between Colo 7-8

A 12-inch thick, hollow block wall separates the unprotected cable tray area and the elevator from the turbine building. Refer to drawing 11550-FA-1B for the location of this wall. The function of this wall is to act as a partition dividing the cable tray area from the turbine building. The wall is 7'-4" high and extends to the bottom of the El 45'-6" floor framing (W30). The wall is unreinforced, single wythe and is constructed of the same materials as the battery rooms.

5. Service Building, Control Room Bathroom Walls, El. 21'-0"

Two of the control room bathroom walls (south and east walls), are in proximity to the rear of the control panel. Refer to 11550-FA-1A for the layout of these walls. The function of these walls is to provide privacy. The walls are ten feet high, free at the top and are constructed of eight inch thick hollow concrete block purchased and installed in accordance with Specification MYS-1469.

6. Service Building, Cable Tray Area, El. 35'-0" & 39'-0", 7-line

The south wall of the cable tray area is composed of 8" thick hollow block interrupted by the El. 39'-0" ventilation and air conditioning equipment room floor framing. Refer to drawing 11550-FA-1B, section 1-1 for the location of these walls. The lower section of this wall is approximately fifteen inches high and is restrained at its top by a steel channel attached to the underside of a W27. The upper portion of this wall is approximately 32 inches high and is supported similarly to the lower section. The vertical joints at the columns are caulked in accordance with the specification. The function of this wall is to act as a partition separating the unprotected cable tray area from the ventilation and air conditioning room.

7. Service Building, El. 45'-6", South Wall (7-line) Between E & F Lines

This wall panel acts as a partition separating the unprotected switchgear area from the ventilation and air conditioning equipment room. Refer to 11550-FA-1B for wall location. The wall is constructed of 12-inch thick hollow block and is thirteen feet four inches high. It rests on the El. 45'-6" slab and is supported at the top by a steel channel attached to the underside of a roof girder. The vertical joints at the columns are caulked. The wall is unreinforced and is constructed of the same materials as the battery rooms.

8. Primary Auxiliary Building, El. 36'-0", Waste Gas Surge Drum Area

This removable block wall is constructed of 12-inch thick solid blocks which are stacked without mortar in an "L-shaped" opening in the waste gas surge drum's 2'-6" thick concrete wall. Refer to drawing 11550-FA-11A for the location of this wall. The purpose of this wall is to provide an opening to allow for the possible replacement of equipment. It also provides radiation shielding for the waste gas surge drum. The "L-shaped" opening can be described as being two rectangles, one being 13'-8" by 5'-0" and the other being 3'-0" by 4'-8". As a

result of this bulletin, a deflection shield has been installed to prevent blocks from falling into the surge drum area.

9. Primary Auxiliary Building, El. 36'-0", Charcoal Filter Area

The south and east block walls surrounding the non-nuclear safety class charcoal filters are the only multi-wythe block walls near safety-related equipment at Maine Yankee. The walls are eighteen inches thick and are constructed of two eight inch blocks, fully grouted, separated by a two inch grout center core. The walls are 12'-0" high, free at the top, and surround the charcoal filters as shown on drawing 11550-FA-11A. The walls were grouted in accordance with the specification and are essentially unreinforced. Wall ties are mentioned in the specification as being No. 20 U.S. gage galvanized crimped steel 3/4-inch wide, but spacing was not detailed on the construction drawings. Inspection with an R-meter produced some readings but no readily discernable pattern, therefore, the wall was analyzed as unreinforced. The major function of these walls is to provide radiation shielding for the charcoal filters. In addition to its shielding function there is a pipe support anchored to the east wall at its intersection with the south wall. This support is a dead load hanger for the 2" diameter hydrogen purge line (incorrectly identified as 4" diameter in Reference (a). A 1" diameter degassifier vent cooler vent line is also attached to the same embedded plate as are two 2" diameter conduits.

Item 2.b.ii

The construction practices employed in the construction of Maine Yankee's block walls are discussed in detail in Specification MYS-1469 under the heading of "Workmanship." These detailed instructions, coupled with our consultant's on-site engineering supervision, ensured block wall construction of high quality.

Item 2.1.iiia

In order to insure that safety-related systems in the proximity of block walls were not endangered by the collapse of the block walls, our re-evaluation effort used conservative load combinations to determine the wall's state of stress and conservative allowable stress criteria to accept these calculated stresses.

In general each wall panel was analyzed individually using working stress design. Analyzed loadings include dead, live, seismic inertia, seismic displacement, and the effects of attached safety and non-safety class equipment. In all cases, the controlling load combination was the combined effects of SSE inertia + SSE displacement. The typical analytical procedure follows.

a) Determine panel boundary conditions.

b) Calculate panel's fundamental frequency, f_1 .

c) Select the peak acceleration from the appropriate curve in the frequency range between f_1 and $f_1/2$ to account for uncertainties in block properties. ARS curves at the top and bottom of the wall with 2% damping

were studied and the larger value was chosen.

d) Increase selected acceleration by a 1.3 factor to account for the effects of higher modes. Computer studies of wall panels similar in geometry to those being re-evaluated show first mode contributions of 99%; thus, an increase factor of 1.05 would be sufficient. We used the 1.3 factor for added conservatism.

e) Calculate stresses due to SSE seismic inertia.

f) Calculate stresses due to attached equipment (dead load and SSE inertia) and add them absolutely to those calculated in step (e).

g) Calculate stresses due to SSE displacements and add them absolutely to those calculated in step (f).

h) Compare total computed stress with ACI 531-79 allowables. ACI 531-79, "Building Code Requirements for Concrete Masonry Structures," is a widely used, and highly respected code nationwide. Its values of allowable stress are substantiated by testing done by the ACI and the NCMA (National Concrete Masonry Association). In general, the ACI allowable stresses have factors of safety of 3 to 4 over the applicable test results. Considering the abnormal severity of a SSE event these factors of safety could be reasonably reduced and an increase of 1.5 to 1.67 over the given ACI allowables taken. Although we feel that this increase is defendable we did not use it but rather chose to limit our SSE induced stresses to ACI allowables.

i) If computed stresses are less than ACI allowables, verify boundary assumptions and accept the wall as-is.

j) If computed stress is greater than the ACI allowables, determine if any technical specifications are affected, design and install required modifications to bring the panel within ACI allowables.

Due to mortar's relative weakness in tension perpendicular to the bed joint, the combination of SSE inertia and displacement often results in mid-span cracking for those walls whose aspect ratio result in their spanning vertically. When safety-related equipment is endangered only by the collapse of these cracked walls, a more detailed investigation of the effect of this cracking was undertaken. Based upon tests conducted by Gabrielson, Kaplan and Wilton (References b, c, & d), it has been shown that confined wall panels exhibit a great degree of additional capacity and stability after initial cracking. This additional strength is due to the shallow arch action illustrated in Figures 1 and 2 of Attachment 3. In order for the wall to collapse out of plane, when confinement is provided top and bottom, either a shear or compression failure must occur in conjunction with the initiating tensile cracks. The full scale test program described in References b-d confirmed that confined block and brick walls did indeed undergo arch action and withstood pressure loadings as high as 19 psi, equivalent to about 34 g. These walls cracked in flexure but did not fail, and then withstood many cycles of reverse loadings with maximum equivalent to accelerations greater than 1 g. Considering these test results along with the field evidence cited by the authors it was decided to use the rigid arching analysis where the boundaries were appropriate (i.e., the battery room west walls). It was

decided to limit the peak bearing pressure on the face of the blocks to the ACI allowable of 0.33 f'm (445 psi) which as mentioned previously has a built-in factor or safety of 3 to 4. In actuality the peak compressive stress determined by our re-evaluation due to arch action was 74 psi or approximately .05 f'm. Arch action was not used for walls which were not vertically confined or for wall with gaps at the top.

Item 2.b.iiib

The few major equipment loading (loadings greater than 100 pounds) were applied to the single wythe block walls by the use of through bolts and backing plates. The potential for block pullout and/or local shear failure was investigated and stresses were found to be well within ACI allowables.

The hydrogen purge line pipe support, mentioned in section 2.b.ii.9, is attached to the charcoal filters area's double wythe wall by six 1/2" diameter drilled in anchors. The total load on this support, dead + SSE, resulting from the 2" diameter purge line, the 1" diameter vent line, and the two conduits is approximately 175 pounds. Local bolt loads and face block stresses were all well below allowables.

The double wythe wall surrounding the charcoal filters was analyzed assuming that shear transfer between the wythes would occur, and then the resulting collar joint stress was determined. The resulting SSE collar joint shear stress was 3.7 psi. Even though allowable stresses for collar joints are not contained in the ACI code this low value for the abnormal SSE loading appears quite conservative and was accepted on that basis.

References: (a) Response to IE Bulletin No. 80-11, "Masonry Wall Design" WMY 80-103

(b) Gabrielson, B. L., K. Kaplan, C. Wilton, "A Study of Arching in Non-Reinforced Masonry Walls" Report 748-1, Scientific Service, Inc., Redwood City , California, March, 1975.

(c) Gabrielson, B. L., Wilton, K. Kaplan, "Response of Arching Walls and Debris from Interior Walls Caused by Blast Loading," URS 7030-23, URS Research Co., San Mateo, California, February 1975.

(d) Gabrielson, B. L., C. Wilton, "Shock Tunnel Tests of Arched Wall Panels," URS 7030-19, URS Research Co., San Mateo, California, December 1974.

J.O.No. 11550
MYS-1469

May 23, 19[illegible]

SPECIFICATION

FOR

CONCRETE BLOCK AND BRICK MASONRY

FOR

MAINE YANKEE ATOMIC POWER STATION

MAINE YANKEE ATOMIC POWER COMPANY

WISCASSET, MAINE

STONE & WEBSTER ENGINEERING CORPORATION

BOSTON, MASSACHUSETTS

J.O.No. 11550
MYS-1460

SPECIFICATION

FOR

CONCRETE BLOCK AND BRICK MASONRY

FOR

MAINE YANKEE ATOMIC POWER STATION

MAINE YANKEE ATOMIC POWER COMPANY

WISCASSET, MAINE

-:-

Stone & Webster Eng. Corp., Engrs. Boston, Mass., May 23, 1960

GENERAL

Furnish, deliver, unload, haul and erect the concrete and light-weight concrete block masonry walls for the Maine Yankee Atomic Power Station, of the Maine Yankee Atomic Power Company at Wiscasset, Maine.

SCOPE OF WORK

The scope of work is shown on the following drawings:

X 11550-FA-1A - Plans - Sh 1 - Service and Auxiliary Boiler Area
X 11550-FA-1B - Plans - Sh 2 - Service and Auxiliary Boiler Area
X 11550-FA-1C - General Arrangement - Service Building - El. 21 ft-0 in.
— 11550-FA-2[illegible] - East Elevation - Turbine Building
— 11550-FA-3[illegible] - Wall Sections - Sh 1 - Turbine Building
— 11550-FA-3[illegible] - Wall Sections - Sh 2 - Turbine Building
— 11550-FA-3C - Wall Sections - Sh 1 - Service and Auxiliary Boiler Area
— 11550-FA-3D - Wall Sections - Sh 2 - Service and Auxiliary Boiler Area
— 11550-FA-4A - Girt Details - Turbine, Service, and Auxiliary Boiler Area
X 11550-FA-5A - Elevator Enclosure Det'ls - Service and Turbine Building
X 11550-FA-5B - Elevator Enclosure Det'ls - Reactor Containment
X 11550-FA-6B - Door Frame Det'ls - Sh 1
— 11550-FA-7A - Flashing Details - Turbine, Service, and Auxiliary Boiler Area
X 11550-FA-9A - Misc. Details - Sh 1 - Turbine and Service Building
11550-FA-9B - Misc. Details - Sh 2 - Turbine and Service Building

11550-FA-10A - Floor and Roof Plans - Office Building
11550-FA-10B - Elevations and Wall Sections - Office Building
11550-FA-10C - Misc. Details - Sh 1 - Office Building
11550-FA-10D - Misc. Details - Sh 2 - Office Building
11550-FA-12A - Floor and Roof Plans - Fuel Building and RCA-Storage
11550-FA-12B - Elevations - Fuel Building and RCA Storage
11550-FA-12C - Wall Section and Misc. Dets - Fuel Building and RCA Storage
STD-FA-1A - Door Frame Details
STD-FA-2A - Sash Details, Parapet & Flashing Details
STD-FA-6A - Ladder Details
STD-FA-7A - Concrete Masonry Walls
STD-FA-8A - Pressed Metal Door Frame Details

and such other drawings as may hereafter be furnished or approved by the Engineers to explain the work in greater detail.

WORK INCLUDED

In addition to the furnishing and erection of the masonry walls, this specification covers furnishing and installing the following:

Wall ties
Control joints
Through-wall flashing
Hardware cloth or other metal joint reinforcing
Calked joints
Loose lintels, sills and jambs
Strap anchors welded to the beams and columns and extending into the masonry wall

Materials to be furnished by others but installed under this specification include the following:

Frames for doors, grilles, louvers, exhaust fans, sash, etc., required to be built into the masonry but which are not fastened to the structural steel framing and girts

WORK NOT INCLUDED

Others will erect all:

Concrete work
Plasterwork
Tile walls or facing tile set on the blocks
Finish painting

REFERENCE OF STANDARD SPECIFICATIONS

Whenever the letters ASTM are used herein, reference is to The American Society for Testing and Materials, and in all cases of reference to their specification, the revision in effect at the date of the original issue of the job specification shall apply.

MATERIALS

General

The following materials shall be in accordance with the requirements of ASTM Specification as noted below and amended herein:

Portland Cement	C150 (Types I or III)
Aggregate for Masonry Mortar	C144
Hydrated Lime for Masonry Purposes	C207 (Type S)
Mortar for Unit Masonry	C270 (Type M or N)
Masonry Units	
Hollow Load Bearing Partitions and Walls	C90 (Grade A)
Hollow Nonload Bearing Partitions	C129
Solid Units	C145 (Grade B)
Aggregate for Masonry Grout	C404 (Size No. 8)
Concrete Building Brick	C55 (Grade B)
Miscellaneous Iron	A36
Reinforcement	A305 and A615 Grade 40
Wire for Reinforcement	A82
Brick	C62 (Grade SW)

Concrete Block Masonry Units

All concrete block masonry units shall be of a quality at least equal to the local building code and the requirements of this specification.

Concrete blocks shall be steam cured. They shall be delivered to the building site in a dry condition and shall be protected against wetting prior to laying in the walls.

All units shall be furnished in the sizes indicated on the drawings. Special units shall be provided as called for on the drawings or as required to form control joints, corners, returns or to maintain the bond.

Masonry Cement

The use of prepared masonry cement or masonry cement mortar will not be permitted without the written approval of the Engineers.

Masonry Sand

Masonry sand shall be uniformly graded from coarst to fine with all of the material passing a No. 4 mesh sieve, and not more than 25 per cent passing a No. 50, and not more than 5 per cent passing through a 100 mesh sieve.

Water

The water used shall be clean and free from injurious amounts of oil, acid, alkalies, organic matter or other substances deleterious to concrete or mortar. Drinking water is generally acceptable.

Admixture

Admixtures, other than plasticizers, shall not be used without the specific approval of the Engineers.

Plasticizers such as "Omicron," as manufactured by the Master Builders Company or "Hydratite Plus," as manufactured by the A.C. Horn Company, shall be added to Type M mortar. Plasticizers may be used for Type N mortar if found desirable for better workability.

Concrete for Filling of Voids

For filling cores of block and lintel blocks, pea gravel grout composed of 1 part portland cement, not more than 1/4 part hydrated lime, 2 to 3 parts fine aggregate and 1 to 2 parts pea gravel shall be used. In no case shall the sum of the fine and coarse aggregate exceed 4 times the sum of the separate volume of the cement and lime used.

Wall Ties

Wall ties shall be formed of not lighter than No. 20 U.S. gage galvanized crimped steel, 3/4 in. wide, or equal, as approved by the Enginee

Hardware Cloth

Hardware cloth shall be 1/4 in. mesh, galvanized and cut in strips 1 in. narrower than the concrete units for which it is to be used.

Through-wall Flashing

Through-wall flashing shall be Wasco copper-fabric flashing, as manufactured by the American Cyanamid Company, Building Products Division, consisting of 3 oz copper sheet between two layers of asphalt saturated cotton fabric, or equal, as approved by the Engineers.

Elastic Cement or Calking Compound

Where elastic cement or calking compound is specified or called for on the drawings, in connection with masonry work, it shall be as manufactured by the Plastic Products Company, Jersey City, New Jersey, or equal, as approved by the Engineers.

Storage of Cement

Cement stored at the job shall be kept in a watertight building and kept off the ground. Tarpaulin covers shall not be considered suitable protection. Cement which has caked shall not be used.

WORKMANSHIP

Laying

All masonry walls shall be true and plumb and built to the dimensions indicated on the plans. Such special units shall be provided and placed as may be required to form all corners, returns, jambs and offsets and maintain the proper bond. Where no bond or pattern is indicated the walls shall be laid in straight uniform courses with the units in the courses above regularly breaking joints with the courses below. All workmanship shall be of the highest grade.

No masonry units shall be laid in freezing weather, unless they are warm and dry and the proper protection and heat provided.

All mortar shall be mixed not less than 3 min in a drum type mixer. All mortar shall be used within 1 hr from the time cement is added to the mix. Retempering will not be permitted. No antifreeze liquid, salts or other substances shall be used in mortar to lower the freezing point.

It is recognized that variations in the characteristics of various acceptable ingredients, including building sands, often have considerable effect upon the workability and suitability of mortar mixes. The proportions of the mix may be modified when the masonry work gets under way and the actual ingredients are at hand and can be tried out. No permission to modify the mortar mix will be granted by the Engineers in advance of the actual delivery to the job and trial there of the mortar ingredients.

Unless otherwise indicated on the drawings, lintels above openings shall be carried a minimum of 8 in. beyond each side of the opening for bearing. Through-wall flashing shall be carried 6 in. beyond each side of the opening. At door and other openings in interior partitions where no precast concrete or reinforced grouted lintel is indicated on the drawings, hardware cloth extending 2 ft beyond each face of the opening shall be placed in the first and second course above the opening. Hardware cloth extending 2 ft beyond each face of the opening shall be placed in the first and second course below all openings in interior partitions.

Mortar joints shall be 3/8 in. thick with full mortar coverage on vertical and horisontal face shells. Vertical joints shall be shoved tight. Courses shall be laid out so that they occur at the undersides of sills and lintels. Where the top of the masonry is not shown to be freestanding, it shall be built solidly against the underside of the roof deck, girts or beams above. Where masonry is built into or around steel columns "Elastite" fiberboard, as manufactured by Philip Carey Mfg. Company, or equal, shall be placed against all sections of the webs and flanges of the steel columns in contact with the masonry to reduce the risk of expansion cracks in the masonry.

Mortar joints on all masonry walls shall be struck off flush with wall surface. Joints exposed to the weather shall be struck flush with wall surface and when partially set shall be compressed and compacted with a pointing tool to form a concave joint as approved by the Engineers.

All joints on the inside face of exterior walls and both faces of partitions shall be struck and neatly tooled to give a flat, smooth surface.

Joints between masonry and door, sash or other frames around openings in masonry work shall be pointed with calking and pointing compound. Pointing shall be firmly forced into the joints and neatly finished.

Work required to be built in with the masonry work, including steel work, anchors, wall plugs, and other accessories shall be built in as the work progresses. Unless otherwise required by the design, all spaces around built work shall be completely and solidly filled with masonry and the spaces between the masonry work and steel work well filled with mortar.

Bearing plates, lintels and similar steel members shall be set and solidly bedded in mortar in their designated positions.

Pockets, chases, recesses and other breaks in masonry work shall be constructed where and as shown on the drawings or in accordance with instructi given prior to the laying of the units. Pockets and other openings in masonry work, formed for the concealment of other work, shall be closed with masonry after such other work has been installed and when directed.

All wall flashing shall be built in with the masonry work and shall be installed in strict accordance with the manufacturer's instructions. Laps shall be made at least 6 in. and shall be sealed between layers and over the top with mastic. When set in joints they shall be set in mortar and the units above shall be bonded in mortar to give the mortar joint the same thickness as other joints in the adjacent units.

Reglets for flashing, where shown or directed, shall be raked out 1 1/2 in. deep.

Attention is called to the fact that tight joints are absolutely necessary for exterior walls in order to secure watertight exterior masonry walls. Bed joints must be full and level and not furrowed. Head joints should be carefully buttered to fill the joints tightly. If all the joints in the exposed faces of the walls are tightly filled, there is little possibility of leakage.

Where interior concrete masonry partitions meet other interior partitions or exterior walls, a masonry bond or the equivalent in approved metal ties shall be provided.

When units are indicated as filled on the drawings, the grout shall be well tamped so that all voids are completely filled with mortar. Reinforcement shall be provided as required.

Concrete Block

The first course of concrete blocks shall be laid in a full bed of mortar and vertical end joints slushed full of mortar. On top of the first course and each succeeding course of exterior walls only, place a continuous layer of hardware cloth, lapping end joints not less than 1 in. Place a full bed of mortar on top of the hardware cloth and after buttering end ribs, blocks shall be set and shoved to position against preceding block, and vertical joints shall be slushed full of mortar to eliminate cavities between blocks. Hardware cloth shall not pass through vertical control joints. Furrowing of the mortar bed will not be permitted.

Indiscriminate wetting of concrete block shall not be permitted. Block and weather conditions at the time of laying shall determine whether the block shall be wetted or not. If conditions are such that the block will draw excessive amounts of water from the mortar, the block shall be wetted. It is preferable for block to be wetted 3 to 24 hr prior to laying. In no case shall block be laid with water standing on the surface.

Brick

The office building and gate house brick shall be solid Coral Blend A as manufactured by the Belden Brick Company, Canton, Ohio, or approved equal. Brick shall conform to ASTM-C62 Grade SW and shall have an initial rate of water absorption not exceeding 20 g per min per 30 sq in. With brick of this type no wetting shall be done prior to laying.

Except where otherwise shown or specified, brick work shall be laid in stretcher courses with every sixth course a bonding course consisting of headers. The bonding shall extend through the wall from face to face. Running bond or other brick work which is impracticable to bond with brick headers, shall be bonded to backing with wall ties. Ties shall be spaced no more than 16 in. vertically and 24 in. horizontally. Ties shall be galvanized and of a type approved by the Engineers. Ties shall extend to 1/2 in. from the face of walls and shall extend at least 4 in. into the backing wall.

Acoustic Concrete Block

All acoustic concrete block shall be 6 in. Soundblox Type A as manufactured by the Proudfoot Company, Inc. of Greenwich, Connecticut. They shall meet the current ASTM C-90 requirements for "Hollow Load - Bearing Masonry Units."

Soundblox units shall be laid in running bond with the open side of the cavities facing downward. The slots shall be exposed toward the transformers. Care shall be taken to insure that the slots are kept free of mortar or debris above the mortar joints. Otherwise acoustic block shall be subject to the same requirements as concrete block.

Waterproofing

The exterior face of all concrete block exterior walls except acoustic concrete block walls shall be waterproofed.

Waterproofing shall be a surface treatment of two coats of a silicone type colorless waterproofing such as Daracone, as manufactured by the Dewey and Almy Chemical Division of W. R. Grace & Co., or equal, as approved by the Engineers. Waterproofing shall be applied in strict accordance with the manufacturer's instructions.

Protection of Masonry

Masonry shall at all times be protected from damage by the weather and by other work. Special precaution shall be taken to prevent the freezing of mortar. Masonry work shall be covered by boards, tarpaulins, or waterproof paper as directed by the Engineers, where necessary, to prevent disfiguration caused by rain, drippings from mortar, or cement, or damage from other classes of work.

Cleaning of Masonry

All masonry work shall be cleaned at the completion of the work. All mortar droppings, dirt and stains caused by the masonry work shall be removed, not only from the masonry surfaces, but also from all materials adjacent to masonry which may have been spotted or stained by masonry erection. A dilute solution of muriatic acid and water may be used to clean masonry units. Wire brushes may be used on concrete masonry units.

Painting

Others will paint all surfaces of structural steel framing and miscellaneous ironwork which are in contact with masonry and are not accessible after erection with one good coat of "Valdura" asphalt paint, as manufactured by American-Marietta Company, or equal, as approved by the Engineers, in addition to the shop coat before being enclosed in masonry work. Should any steel framing or iron work be covered before the application of the paint, the masonry work shall be removed and replaced.

Built-in Work

Frames, lintels and sills shall be carefully set, true to line, plumb and level on a full bed of mortar, and they, along with door bucks and other built-in work, shall be maintained in their proper position and no braces or stages shall be removed from them until they are securely supported and fastened by the masonry.

Control Joints

Control joints shall be provided every 50 ft for exterior masonry walls and every 25 ft for interior masonry walls. No reinforcing or hardware cloth shall pass through control joints. Rapid Control Joint as manufactured by Dur-O-Wal Products Inc. of Syracuse, New York, or approved equal, shall be installed at all control joints. The joints shall be calked with compound colored to match adjacent mortar joints.

PRECAST CONCRETE SILLS

Manufacture

All precast concrete sills used in this work shall be the product of a manufacturer having capacity and facilities for furnishing the quality, sizes and quantities of cast stone required, and whose products have been previously used and exposed to the weather with satisfactory results for a period of not less than five years.

All precast concrete shall preferably be cast in sand molds, but other methods of manufacture may be used, subject to the approval of the Engineers. All precast concrete shall be well cured and kept moist for at least two weeks (six weeks, if possible) after manufacture and shall be protected from too rapid drying out and from freezing. Other methods of curing may be used if approved by the Engineers. Precautions shall be taken in the curing to prevent the formation of surface hair cracks.

No material shall be set in place until it has attained the age of at least three weeks, and under no circumstances shall any precast concrete be set in place before it has attained the strength hereinafter specified.

All precast concrete shall be suitably reinforced with metal reinforcement, whether or not called for on the drawings. This reinforcement shall be sufficient to care for the weight of the material during storage, transit, and handling before erection, and for the weight of the precast concrete and superimposed loads after erection in the building. Sufficient reinforcement shall be provided to prevent shrinkage cracks. Reinforcement called for on the drawings must be provided. Not less than four No. 3 rods shall be used in each piece, with No. 9 wire ties 12 in. on center. Reinforcement shall not be spliced.

All precast concrete members shall conform to the sizes, details and profiles shown on the approved drawings, except that a tolerance of 1/8 in. will be allowed. Any member whose dimensions exceed this tolerance may be rejected by the Engineers. All plane surfaces shall be smooth and even without warps or bulges, and all edges shall be sharp and truly formed. No broken, chipped or checked material will be accepted.

All exterior sills shall be provided with a groove drip on the underside, unless otherwise specified, and all members having exposed horizontal surfaces shall be finished with a wash on top. Reglets, rebates, slots, etc. shall be provided as required for setting windows, and as indicated on the drawings to allow for the installation of the work of other contractors in setting and securing their work to or in connection with the precast concrete members.

The minimum average compressive strength of precast concrete units at the age of 28 days shall be 5,000 psi and the average absorption at the age of 28 days shall be not less than 3 and not more than 7 per cent of water by dry weight of the specimen.

The color and texture of the finish shall match that of Indiana Oolithic limestone.

Care shall be taken during shipping and handling to avoid chipping of corners and edges, soiling and otherwise marring or discoloring the surfaces to be exposed. The precast members shall be properly protected during transit. Any pieces which are broken or damaged at the time of delivery shall be rejected and replaced.

Setting Precast Concrete Sills

All beds shall be accurately dressed and no concave surfaces will be permitted. Each precast concrete member shall rest on a full bed of mortar in sufficient amount to fill out to the edges of the piece on all sides.

All bed and vertical joints shall be of a maximum width of 3/8 in., except where otherwise indicated.

All anchors and ties required for the proper anchorage of trim shall be furnished and set.

The repairing of chipped or damaged members will not be permitted.

Mortar for setting precast concrete sills and lintels shall conform in all respects to the mortar specified for masonry.

Through-wall flashing extending 6 in. beyond each face of the opening shall be installed under all precast concrete sills.

Where joints occur on top of precast concrete sills, the upper portion of the joint shall be filled with elastic calking compound of the same color as the mortar joints. The joints shall be filled slightly above the surface to allow for slump and the material applied with a gun.

All exposed faces of stones after cleaning shall be treated with two coats of silicone type colorless liquid waterproofing of a brand approved by the Engineers. The application of this waterproofing must not change the color or general appearance of the stone treated.

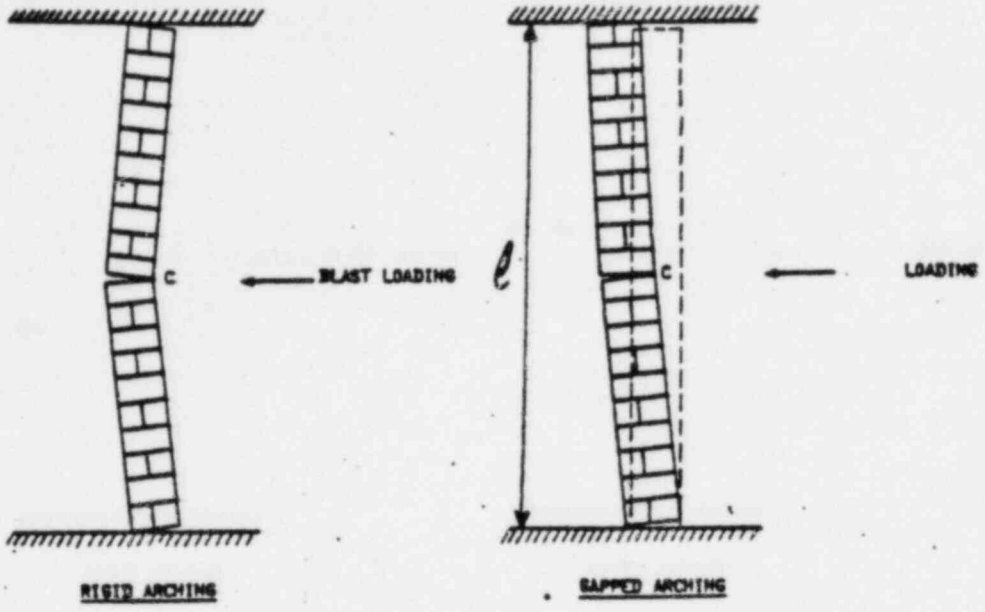


Fig. 1. Sketch Illustrating the Differences in Motion Between Rigid and Gapped Arching.

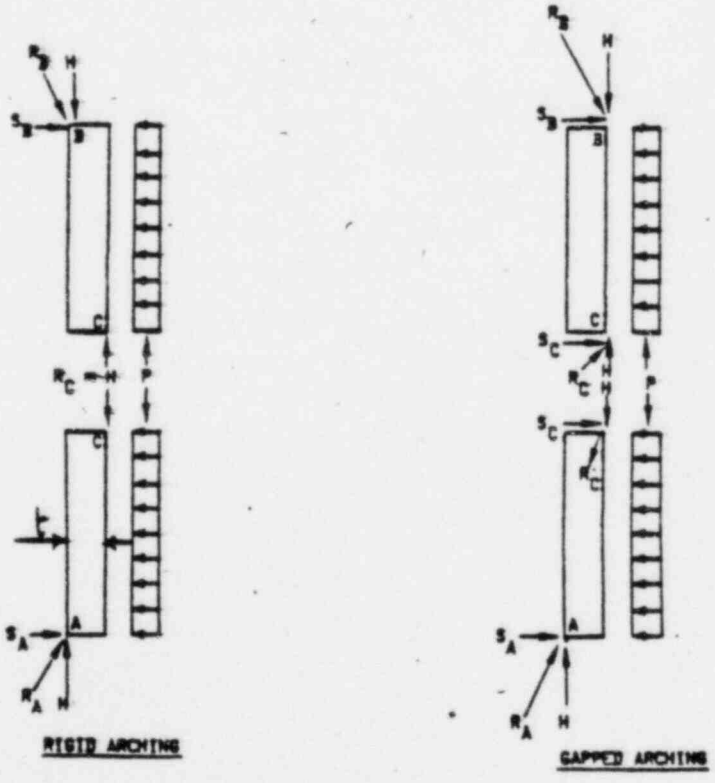


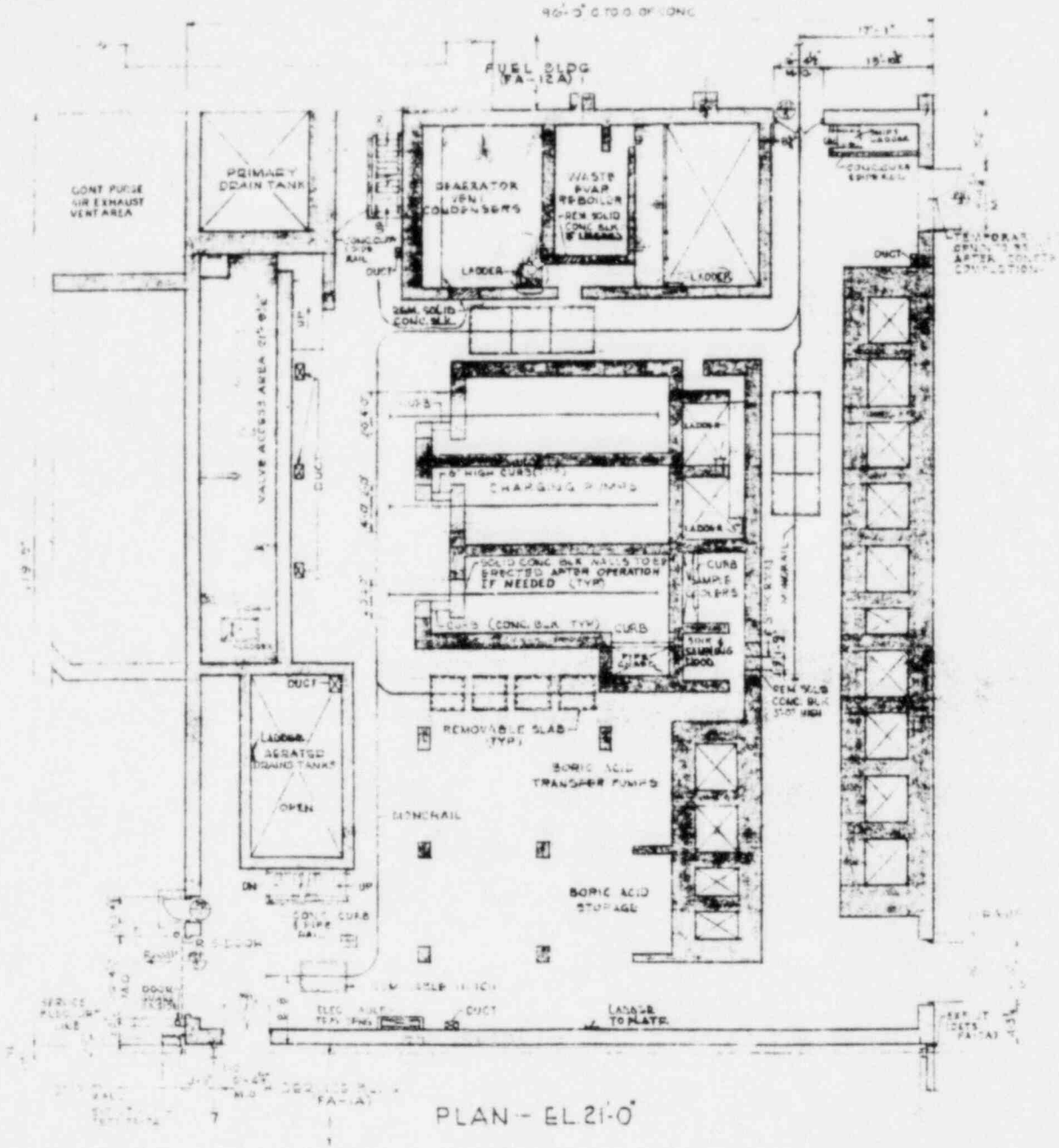
Fig. 2. Free Body Diagrams Showing Forces in Rigid and Gapped Arching.

PRINTS

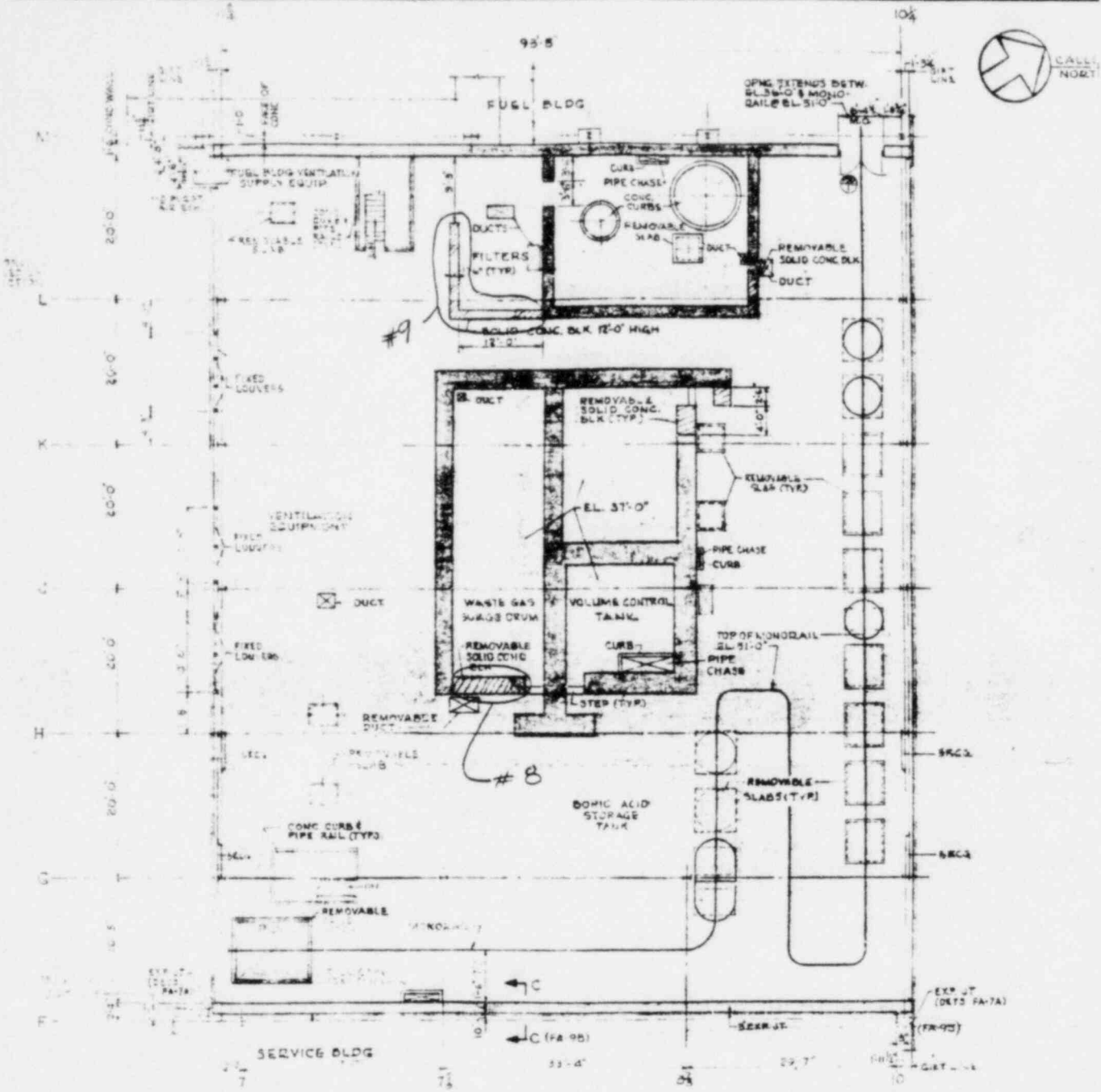
11550-FA-1B

11550-FA-1A

11550-FA-11A


FUEL BLDG (FA-12A)
PRIMARY DRAIN TANK
CONT PURGE AIR EXHAUST VENT AREA
DEAERATOR & CONDENSERS
WASTE EVAP REBOILER
REM SOLID CONC BLK
LADDER
VALVE ACCESS AREA
CHARGING PUMPS
SOLID CONC BLK WALLS TO BE ERECTED AFTER OPERATION IF NEEDED (TYP)
CURB (CONC BLK TYP)
CURB
REMOVABLE SLAB (TYP)
BORIC ACID TRANSFER PUMPS
MONORAIL
BORIC ACID STORAGE
AERATED DRAIN TANK
OPEN
DUCT
ELEC AUX TRANSF
LADDER TO PLATF
FA-1A

PLAN - EL 21'-0"



PLAN - EL. 36'-0"

NOTES:
SCALE: 1/8" = 1'-0"
GEN. NOTES FA-11B
CONC. - FC-24 SERIES;
STRUCTURAL STL. - FS-20A.

FOR INFORMATION ONLY

FLOOR PLANS
PRIMARY AUXILIARY BUILDING

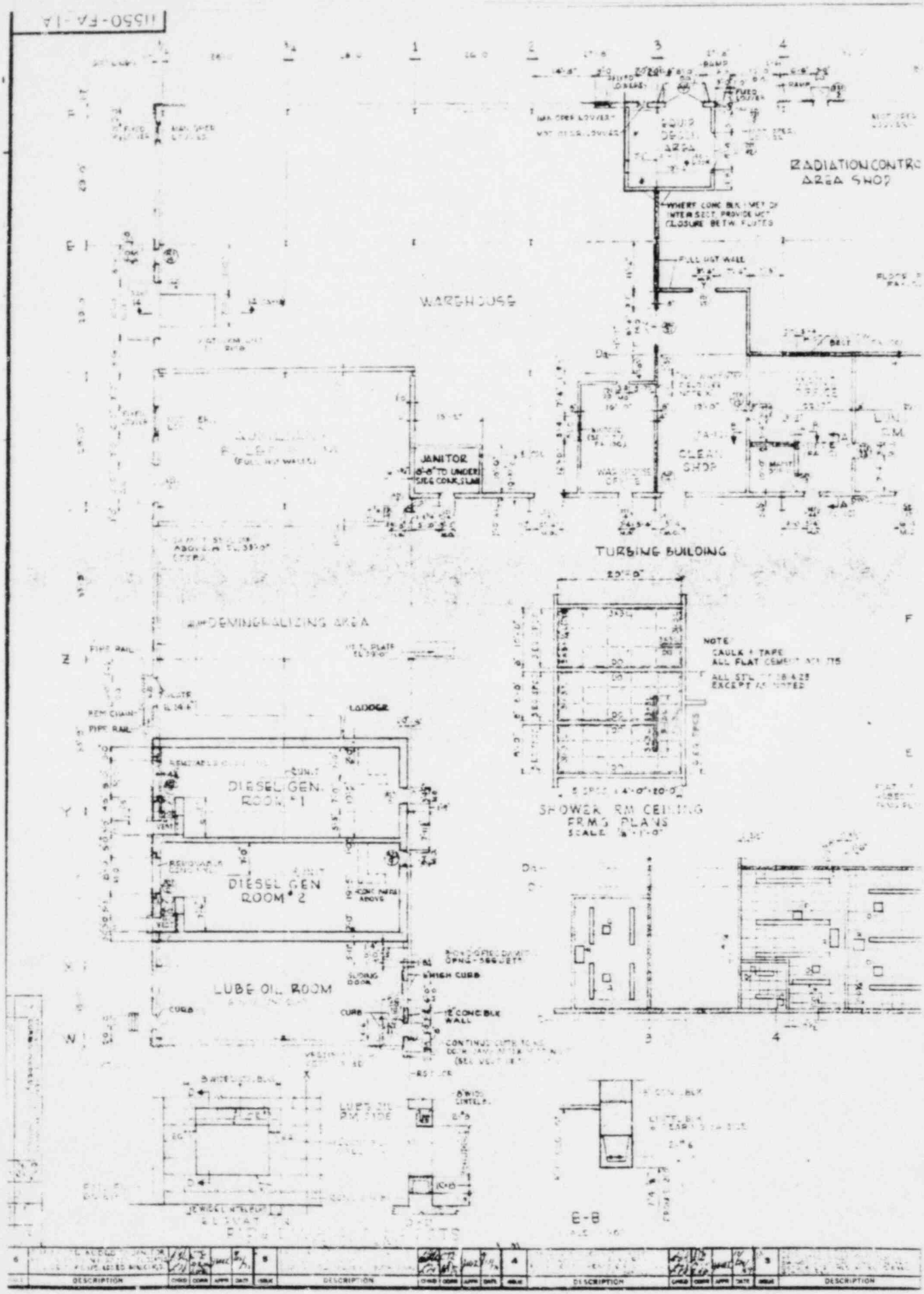
ATOMIC POWER STATION
MAINE YANKEE ATOMIC POWER COMPAN
WISCASSET, MAINE

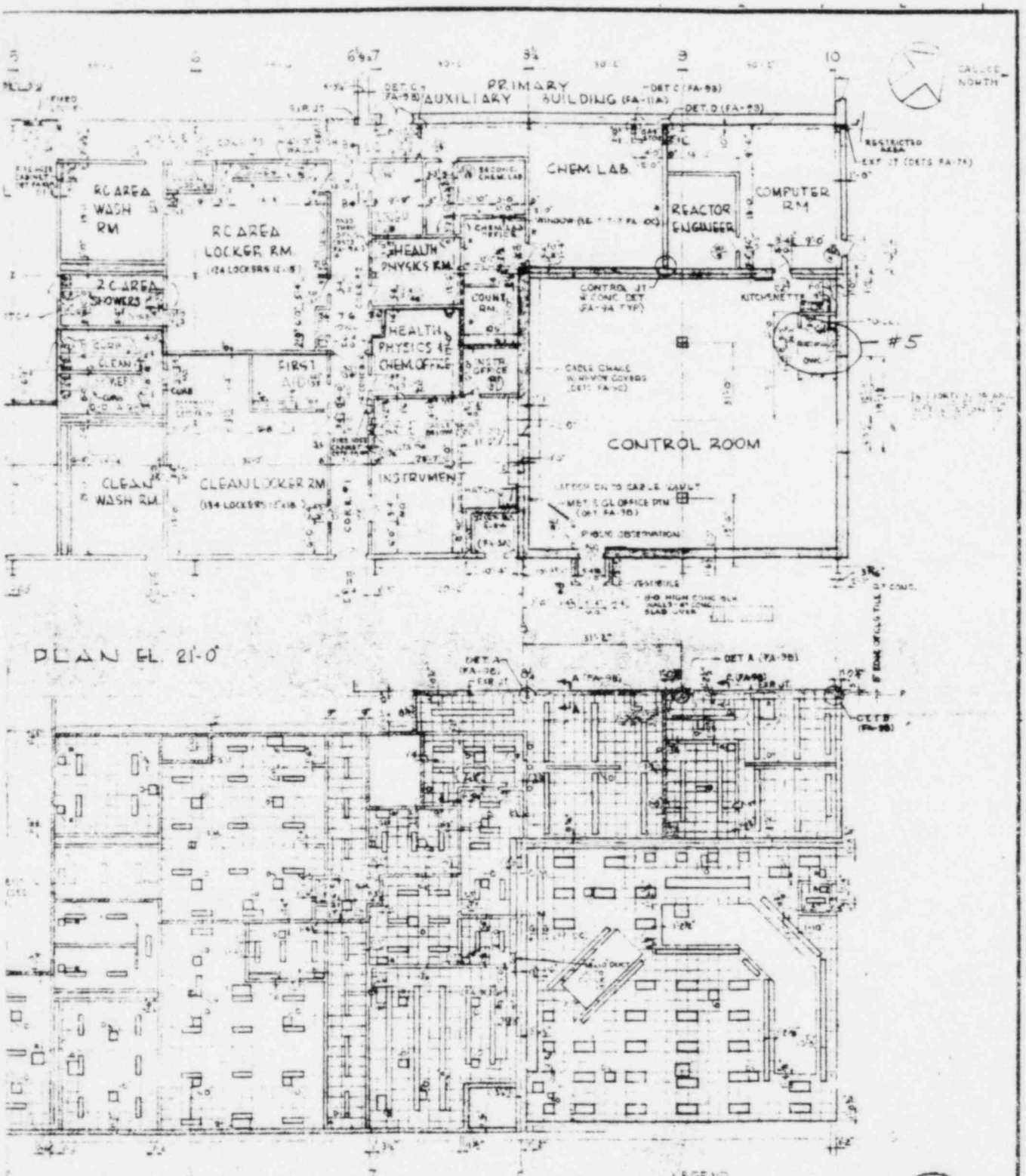
ORIGINAL ISSUE

DESCRIPTION

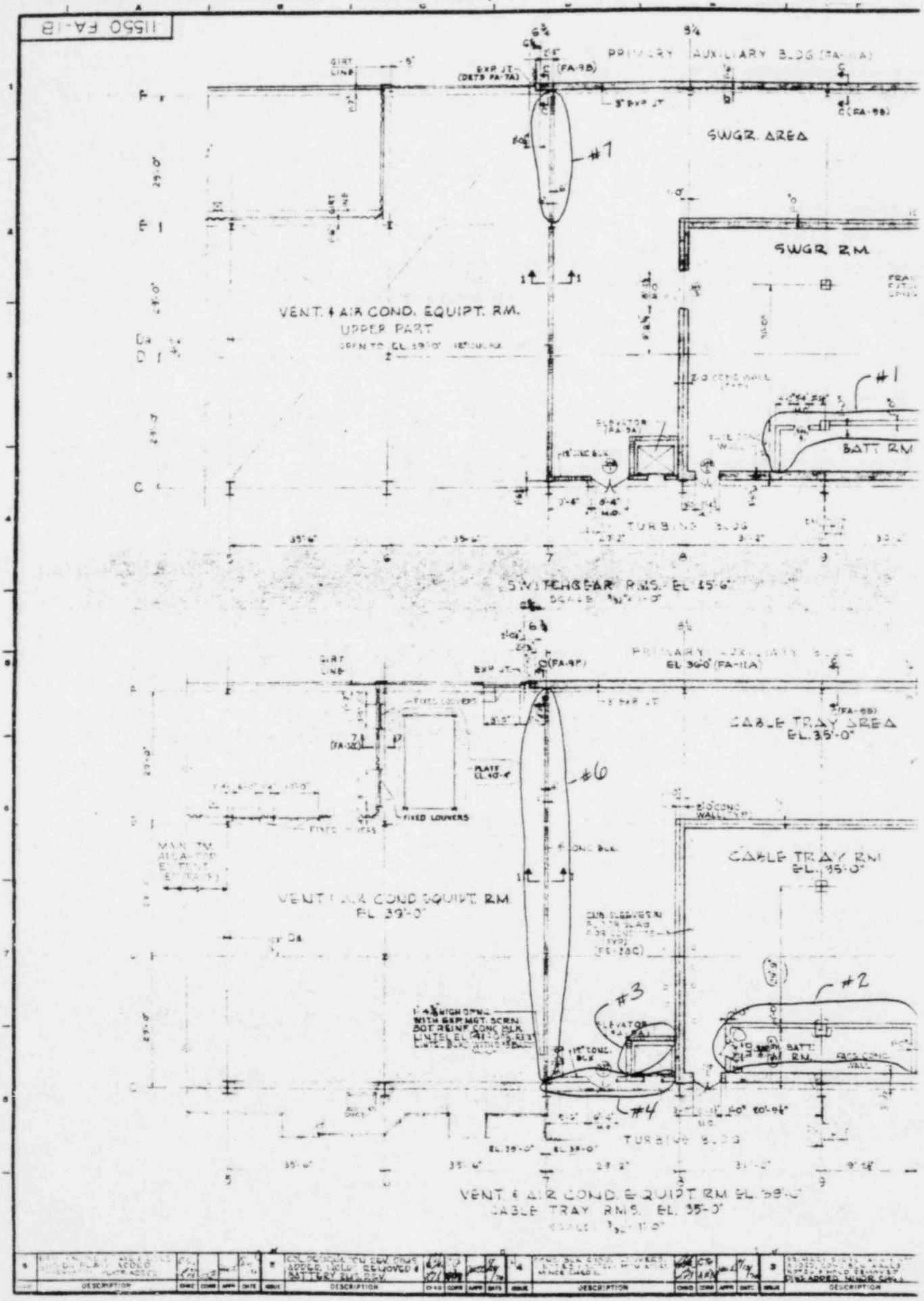
STONE & WEBSTER ENGINEERING CORPORATION
BOSTON, MASS.

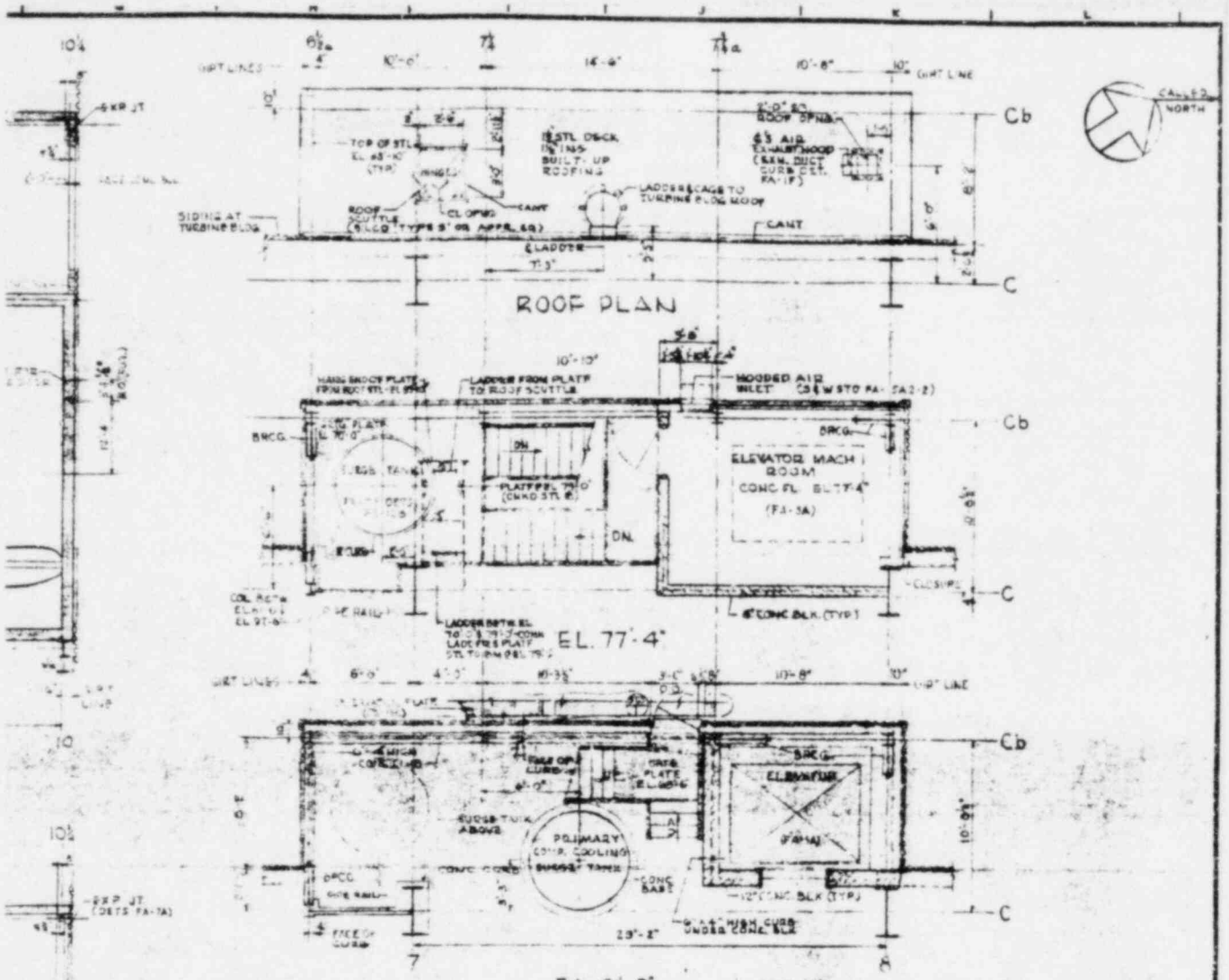
DRAWING NUMBER 11550-FA-11A

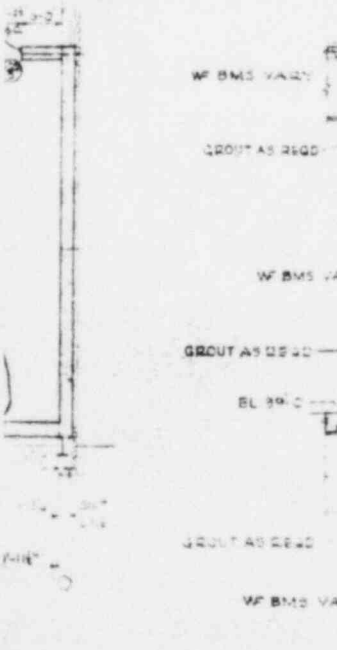

RADIATION CONTRO
AREA SHOP
WAREHOUSE
JANITOR
CLEAN SHOP
TURBINE BUILDING
DEMINERALIZING AREA
DIESEL GEN. ROOM #1
DIESEL GEN ROOM #2
LUBE OIL ROOM
SHOWER RM CEILING FRMG PLANS
SCALE
NOTE
CAULK + TAPE
ALL FLAT CEMENT
ALL STL
EXCEPT AS NOTED
LOUVER
PIPE RAIL
CHAIN
CURB
HIGH CURB
CONC BLK WALL
E-8


PRIMARY AUXILIARY BUILDING (FA-11A)
CHEM. LAB
COMPUTER RM.
REACTOR ENGINEER
RC AREA WASH RM.
RC AREA LOCKER RM.
HEALTH PHYSICS RM.
2 C AREA SHOWERS
HEALTH PHYSICS & CHEM. OFFICE
COUNT RM.
FIRST AID
CONTROL ROOM
#5
CLEAN WASH RM.
CLEAN LOCKER RM.
INSTRUMENT
PLAN EL. 21'-0"
REFLECTED CEILING PLAN
LEGEND
FOR INFORMATION ONLY
PLANS - SH 1
SERVICE & AUX BOILER AREA
ATOMIC POWER STATION
MAINE YANKEE ATOMIC POWER COMPANY
WISCASSET, MAINE
STONE & WEBSTER ENGINEERING CORPORATION
BOSTON, MASS.
11550-FA-1A

11550 FA-1B


PRIMARY AUXILIARY BLDG (FA-11A)
SWGR. AREA
SWGR RM
VENT. & AIR COND. EQUIPT. RM.
UPPER PART
#1
#7
BATT RM
TURBINE BLDG
SWITCHGEAR RMS. EL 45'-6"
PRIMARY AUXILIARY BLDG
EL 360' (FA-11A)
CABLE TRAY AREA
EL. 35'-0"
#6
FIXED LOUVERS
CABLE TRAY RM
EL. 35'-0"
VENT. & AIR COND. EQUIPT. RM
EL 39'-0"
#3
#2
#4
TURBINE BLDG
VENT. & AIR COND. EQUIPT RM EL 39'-0"
CABLE TRAY RMS. EL. 35'-0"





NOTES
SCALE: AS NOTED
GEN. NOTES: (FA-1A)
FLOOR FINISH: MONO. CONC. UNLESS NOTED
STL. FRMG. PLANS:
LADDER DETS: S4W STD. FA-5A4, FS-5A4-1.
FIXED LOUVER DETS (FA-9B

FOR INFORMATION ONLY

PLANS SH. 2
SERVICE & AUX. BOILER AREA
ATOMIC POWER STATION
MAINE YANKEE ATOMIC POWER COMPANY
WISCASSET, MAINE
STONE & WEBSTER ENGINEERING CORPORATION
BOSTON, MASS.
11550 FA-1B