OFFICE, CHIEF OF ENGINEERS

CONTRACT NO.

ENGINEERING STUDY
RESISTANT DESIG
BUILDING

PREP

AMMANN

CONSULTIN

NEW

M

APPENDIX H

S, DEPARTMENT OF THE ARMY

DA 49-129-ENG-317

Y OF ATOMIC BLAST
GN FOR SEVERAL
G TYPES

PARED BY

& WHITNEY

NG ENGINEERS

YORK, N.Y.

MAR 1960

2

OFFICE, CHIEF OF ENGINEERS, D

CONTRACT NO. DA 4

ENGINEERING STUDY
RESISTANT DESIGN
BUILDING

PREPARED

AMMANN & W

CONSULTING EN

NEW YORK,

DRAWING L

DWG NO 60-16-01	PROTECTIVE CONSTRUCTION - ADMINISTRATION BUILDING						
SHEETS	1	THRU	9	OF	9	10 PSI	BLAST RESISTANT
SHEETS	1	THRU	9	OF	9	20 PSI	BLAST RESISTANT
SHEETS	1	THRU	3	OF	3	50 PSI	BLAST RESISTANT
DWG NO 60-02-06	PROTECTIVE CONSTRUCTION - COMMUNICATIONS BUILDING						
SHEETS	1	THRU	3	OF	3	10 PSI	BLAST RESISTANT
SHEETS	1	THRU	3	OF	3	20 PSI	BLAST RESISTANT
SHEETS	1	THRU	2	OF	2	50 PSI	BLAST RESISTANT
DWG NO 60-17-01	PROTECTIVE CONSTRUCTION - WAREHOUSE						
SHEETS	1	THRU	3	OF	3	10 PSI	BLAST RESISTANT
SHEET	1			OF	1	20 PSI	BLAST RESISTANT
SHEET	1			OF	1	50 PSI	BLAST RESISTANT
DWG NO 60-17-02	PROTECTIVE CONSTRUCTION - EARTH COVERED, CONCRETE IGLOO						
SHEET	1			OF	1	25 PSI	BLAST RESISTANT
SHEET	1			OF	1	50 PSI	BLAST RESISTANT
SHEET	1			OF	1	100 PSI	BLAST RESISTANT
SHEET	1			OF	1	200 PSI	BLAST RESISTANT
DWG NO 60-18-01	PROTECTIVE CONSTRUCTION - EARTH COVERED, RECTANGULAR						
SHEETS	1	THRU	2	OF	2	25 PSI	BLAST RESISTANT
SHEETS	1	THRU	2	OF	2	50 PSI	BLAST RESISTANT
SHEET	1			OF	1	100 PSI	BLAST RESISTANT
SHEET	1			OF	1	200 PSI	BLAST RESISTANT
DWG NO 60-18-02	PROTECTIVE CONSTRUCTION - EARTH COVERED, DOUBLE BARREL ARCH						
SHEET	1			OF	1	50 PSI	BLAST RESISTANT
DWG NO 60-18-03	PROTECTIVE CONSTRUCTION - EARTH COVERED, DOME						
SHEET	1			OF	1	50 PSI	BLAST RESISTANT
SHEET	1			OF	1	100 PSI	BLAST RESISTANT
SHEET	1			OF	1	200 PSI	BLAST RESISTANT

RS, DEPARTMENT OF THE ARMY

D. DA 49-129-ENG-317

DY OF ATOMIC BLAST IGN FOR SEVERAL NG TYPES

REPARED BY

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LTING ENGINEERS

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RAWING LIST

DWG NO 60-18-04 PROTECTIVE CONSTRUCTION - BURIED, RECTANGULAR
SHEETS 1 THRU 2 OF 2 50 PSI BLAST RESISTANT
SHEET 1 OF 1 100 PSI BLAST RESISTANT
SHEET 1 OF 1 200 PSI BLAST RESISTANT

DWG NO 60-18-05 PROTECTIVE CONSTRUCTION - BURIED, DOUBLE BARREL ARCH
SHEETS 1 THRU 2 OF 2 50 PSI BLAST RESISTANT

DWG NO 60-18-06 PROTECTIVE CONSTRUCTION - BURIED, DOME
SHEETS 1 THRU 2 OF 2 50 PSI BLAST RESISTANT
SHEET 1 OF 1 100 PSI BLAST RESISTANT
SHEET 1 OF 1 200 PSI BLAST RESISTANT

DWG NO 60-18-07 PROTECTIVE CONSTRUCTION - BURIED, CONCRETE IGLOO
SHEETS 1 THRU 2 OF 2 50 PSI BLAST RESISTANT
SHEETS 1 THRU 2 OF 2 100 PSI BLAST RESISTANT
SHEETS 1 THRU 2 OF 2 200 PSI BLAST RESISTANT

CH

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CONSULTING ENGINEERS
111 8TH AVENUE NEW YORK, N.Y.

DEPARTMENT OF THE ARMY

DRAWN BY P.J.W.

TITLE SHEET

DRAWING NUMBER

DATE

SHEET OF

GE

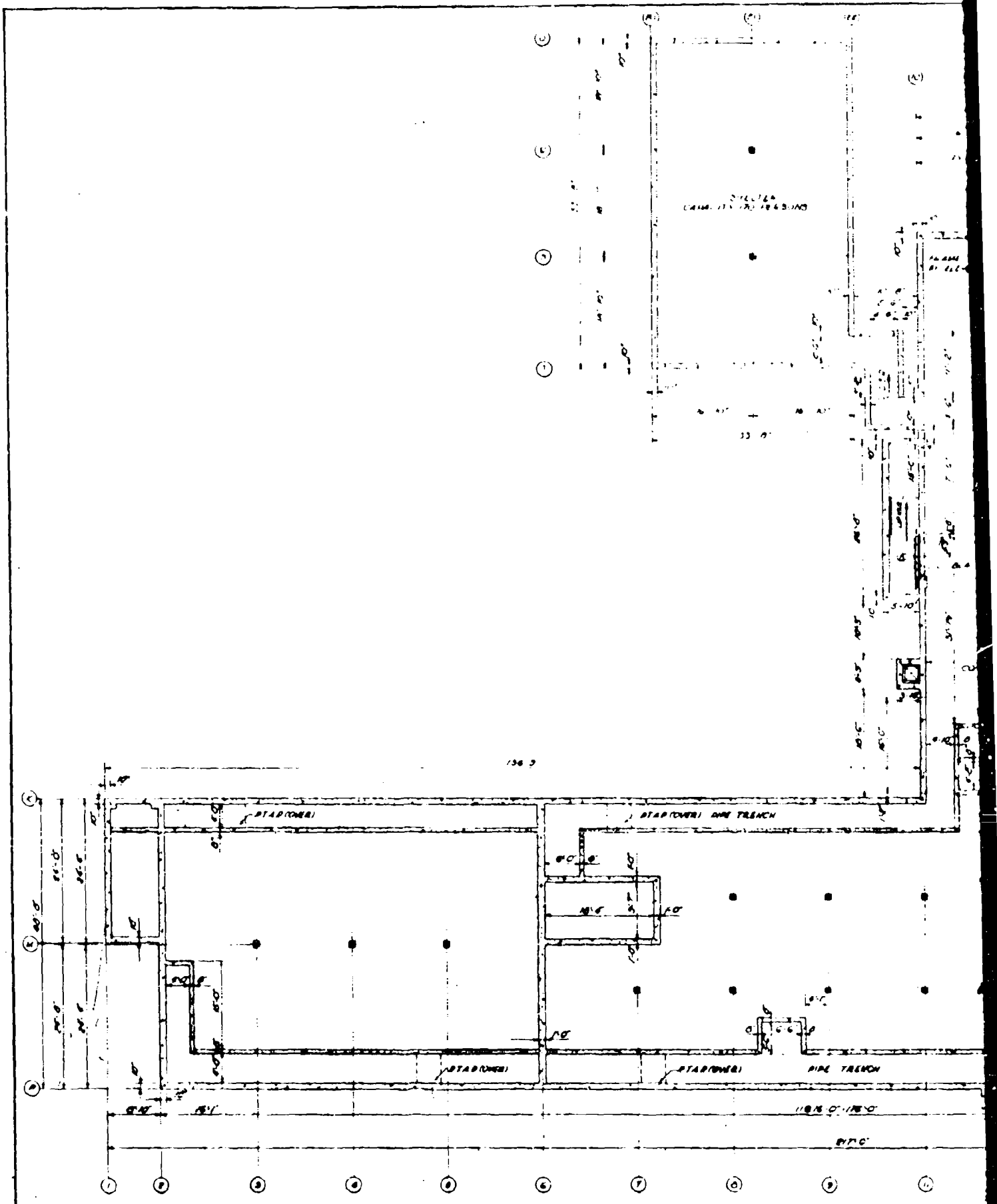
THE FOLLOWING DRAWINGS ARE PART OF A REPORT, "ENGI
DIFFERENT BUILDING TYPES", FEBRUARY 1959, SUMMARIZIN
OF DESIGN FOR ATOMIC BLAST RESISTANCE AND THE ES
LOADINGS. THE ADMINISTRATION, COMMUNICATIONS AND
EXISTING STANDARD TYPE STRUCTURES WITHOUT CHANG
THE NON STANDARD TYPE STRUCTURES, i.e., IGLOO, RE
PRESCRIBED BY OCE. THE DESIGN PROCEDURES, UNLESS
DRAFT OF THE CORPS OF ENGINEERS MANUALS EM 1110-
EFFECTS OF ATOMIC WEAPONS". THESE DRAWING ARE IN
ARE NOT STANDARD DRAWINGS AND ARE NOT INTENDED
FOR PLANNING PURPOSES AND AS THE BASIS FOR DEV
GROUND STRUCTURES THE THICKNESS OF THE WALLS AN
AND THEREFORE IN SOME CASES WILL NOT PROVIDE A
COVERED AND BURIED STRUCTURES AND THE SHELTER
DESIGNED TO PROTECT AGAINST THE INITIAL NUCLEAR
ADEQUATE SHIELDING FROM FALLOUT RADIATION. THE
ADMINISTRATION, COMMUNICATION AND WAREHOUSE BUILDIN
WILL REQUIRE ADDITIONAL ANALYSES WHICH WERE N

1

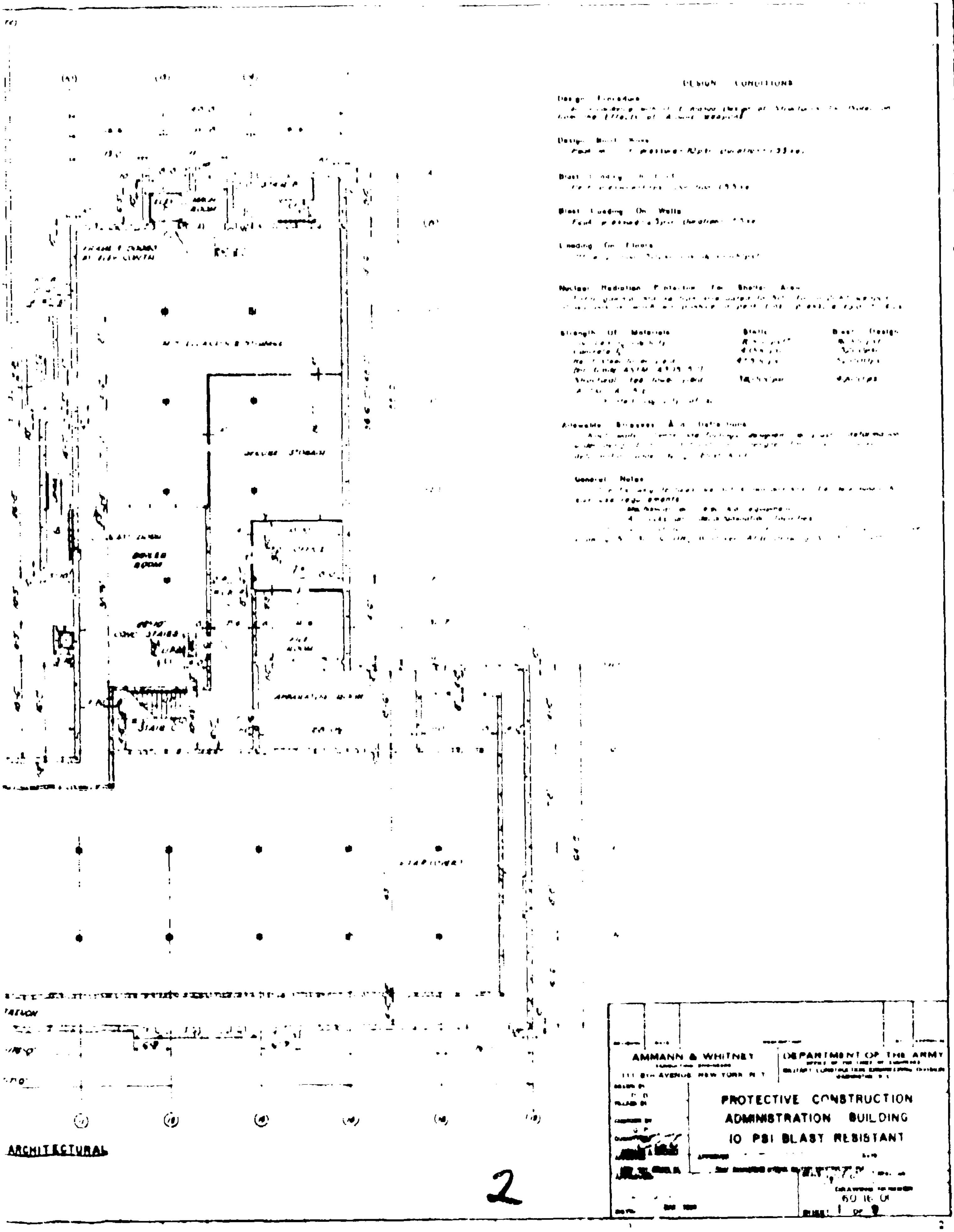
ENERAL NOTES

GINEERING STUDY OF ATOMIC BLAST RESISTANT DESIGN FOR SEVERAL
NG THE RESULTS OF A STUDY TO DETERMINE THE PRACTICABILITY
STIMATED CONSTRUCTION COST FOR A RANGE OF BLAST PRESSURE
WAREHOUSE DRAWINGS ARE BASED UPON THE HARDENING OF
GING THE INTERIOR CONFIGURATIONS. THE INTERIOR CONFIGURATIONS OF
ECTANGULAR, DOUBLE AND DOME, ARE BASED UPON DIMENSIONS
OTHERWISE NOTED IN THE REPORT WERE BASED UPON THE PRELIMINARY
345-413 THROUGH 421, "DESIGN OF STRUCTURES TO RESIST THE
NTENDED TO DEPICT THE RESULTS OF THE DESIGN STUDY ONLY THEY
TO REPRESENT RECOMMENDED DESIGN HOWEVER THEY CAN BE USED
VELOPMENT OF REQUIRED DESIGNS. IN THE DESIGN OF EXPOSED ABOVE
ND ROOF WERE DETERMINED BY BLAST RESISTANCE REQUIREMENTS
ADEQUATE SHIELDING FROM FALLOUT ISOLATION HOWEVER, THE EARTH
AREAS IN THE EXPOSED ABOVE GROUND STRUCTURES HAVE BEEN
AR RADIATION AS NOTED ON THE DRAWINGS AND THEREFORE AFFORD
PROVISION OF ADEQUATE THICKNESS IN THE WALLS AND ROOF OF THE
NGS TO PROVIDE THE REQUIRED SHIELDING FROM FALLOUT RADIATION
NOT INCLUDED IN THIS CONTRACT

2



BASEMENT PLAN - ARCHITECTURAL



DESIGN CONDITIONS
Design Procedure
Blast Loading On Walls
Loading On Floors
Nuclear Radiation Protection For Shelter Area
Strength Of Materials
Static
Blast Design
Allowable Stresses And Deflections
General Notes
BOILER ROOM
STAIR C
APPARATUS ROOM
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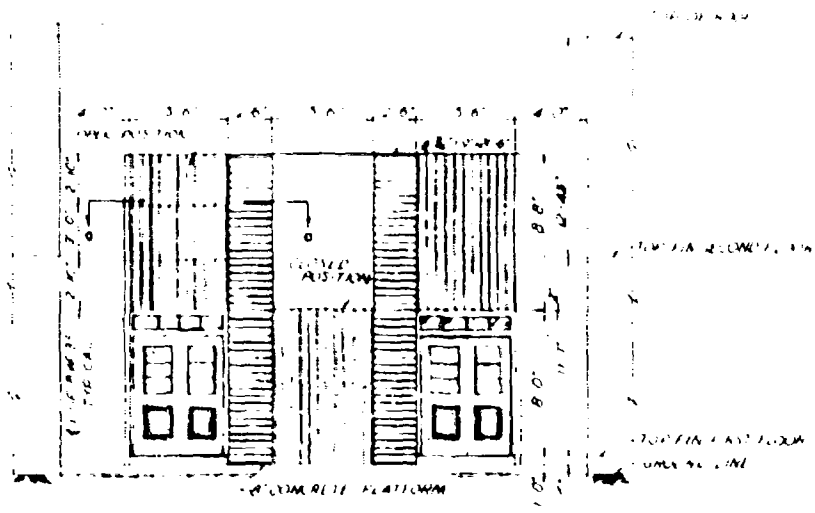
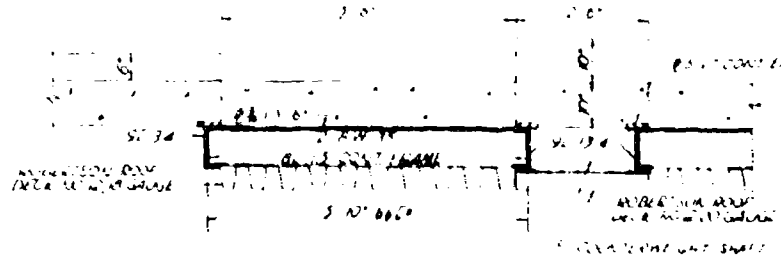
DEPARTMENT OF THE ARMY
PROTECTIVE CONSTRUCTION
ADMINISTRATION BUILDING
10 PSI BLAST RESISTANT
ARCHITECTURAL
2



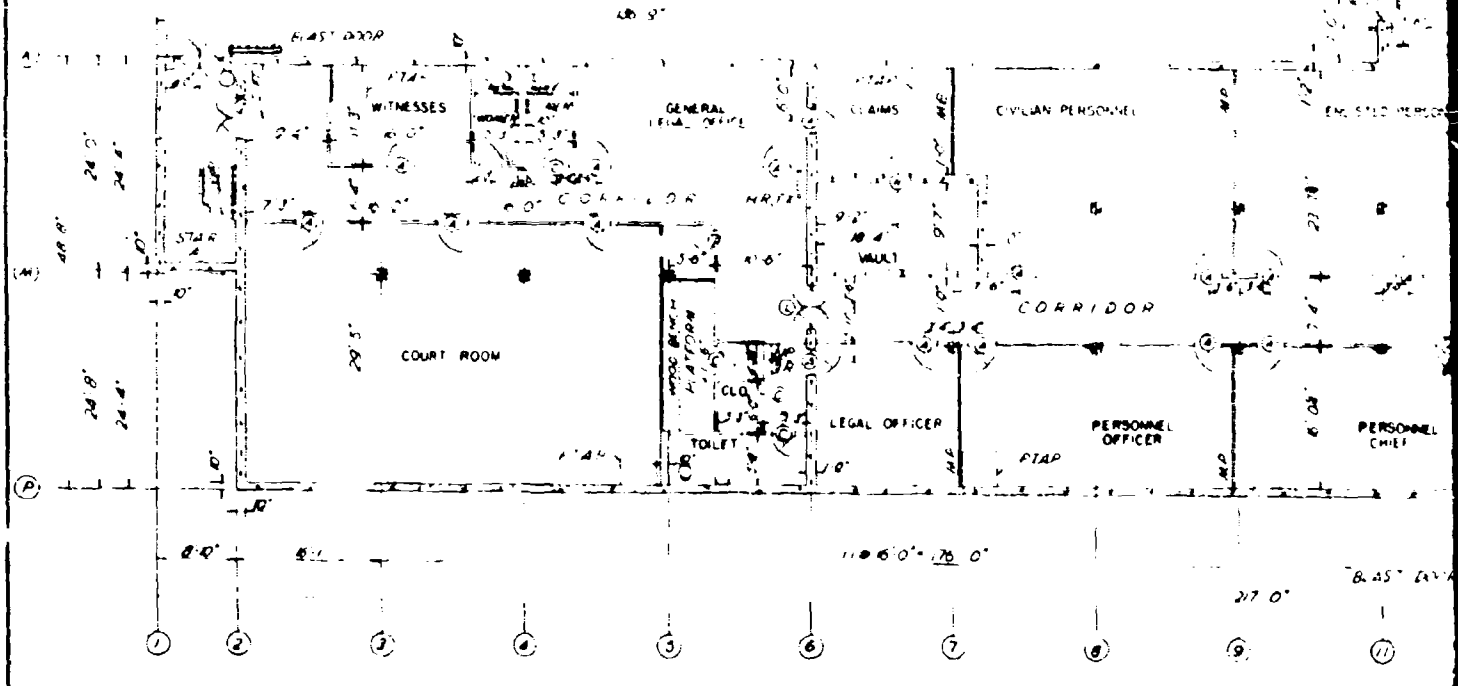
ELEVATION OF MAIN DOORS

SCALE 1/4"=1'-0"



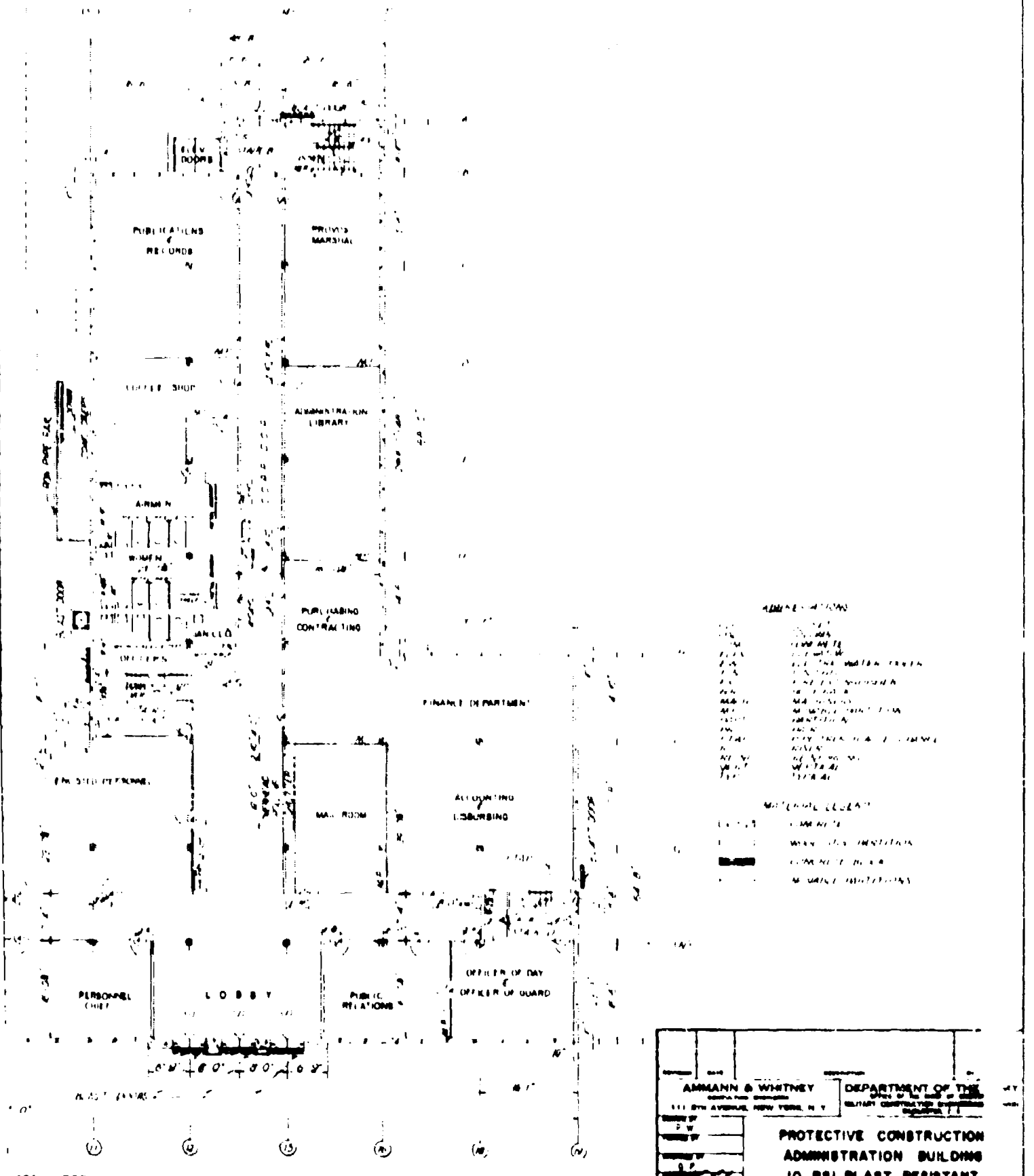
SECTION A-A

SCALE 1/4" = 1' 0"



FIRST FLOOR PLAN - ARCHITECTURAL

SCALE 1/4"=1'-0"



ARCHITECTURAL

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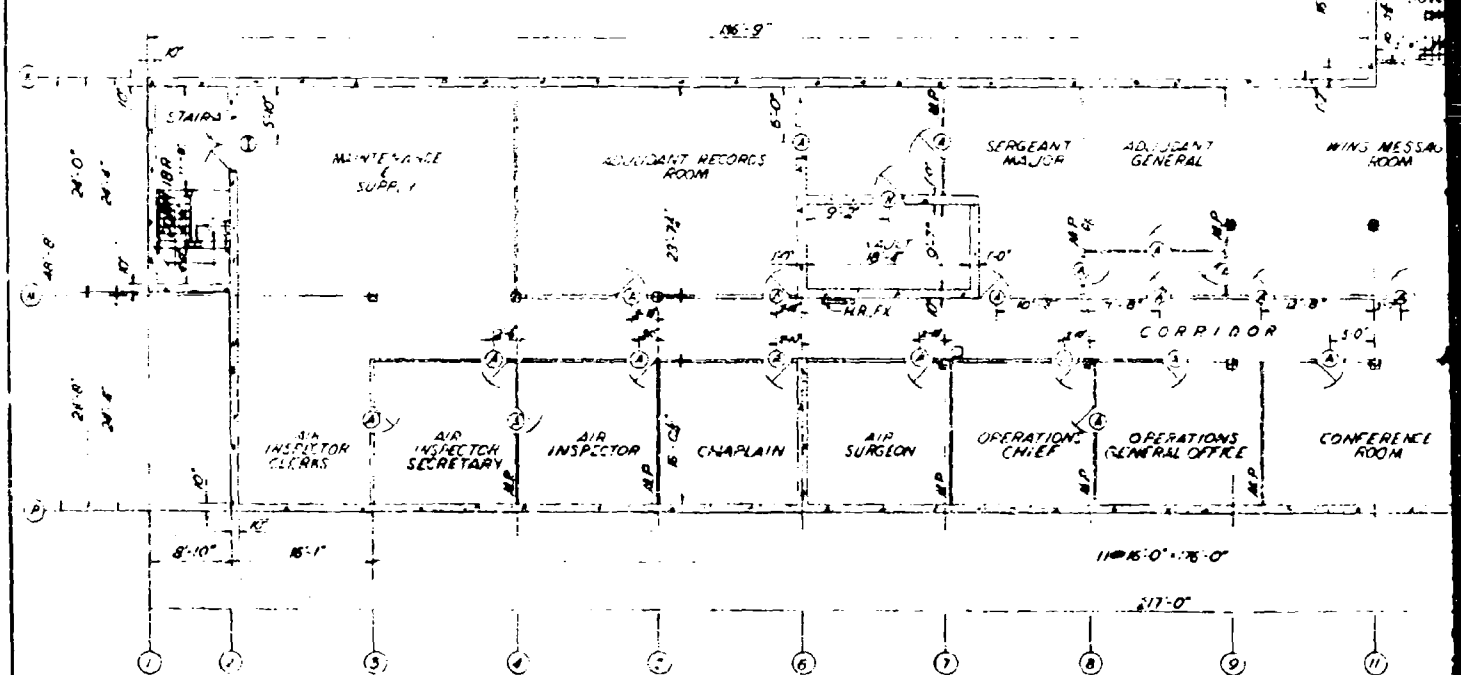
PROTECTIVE CONSTRUCTION
ADMINISTRATION BUILDING
10 PSI BLAST RESISTANT

AS NOTED

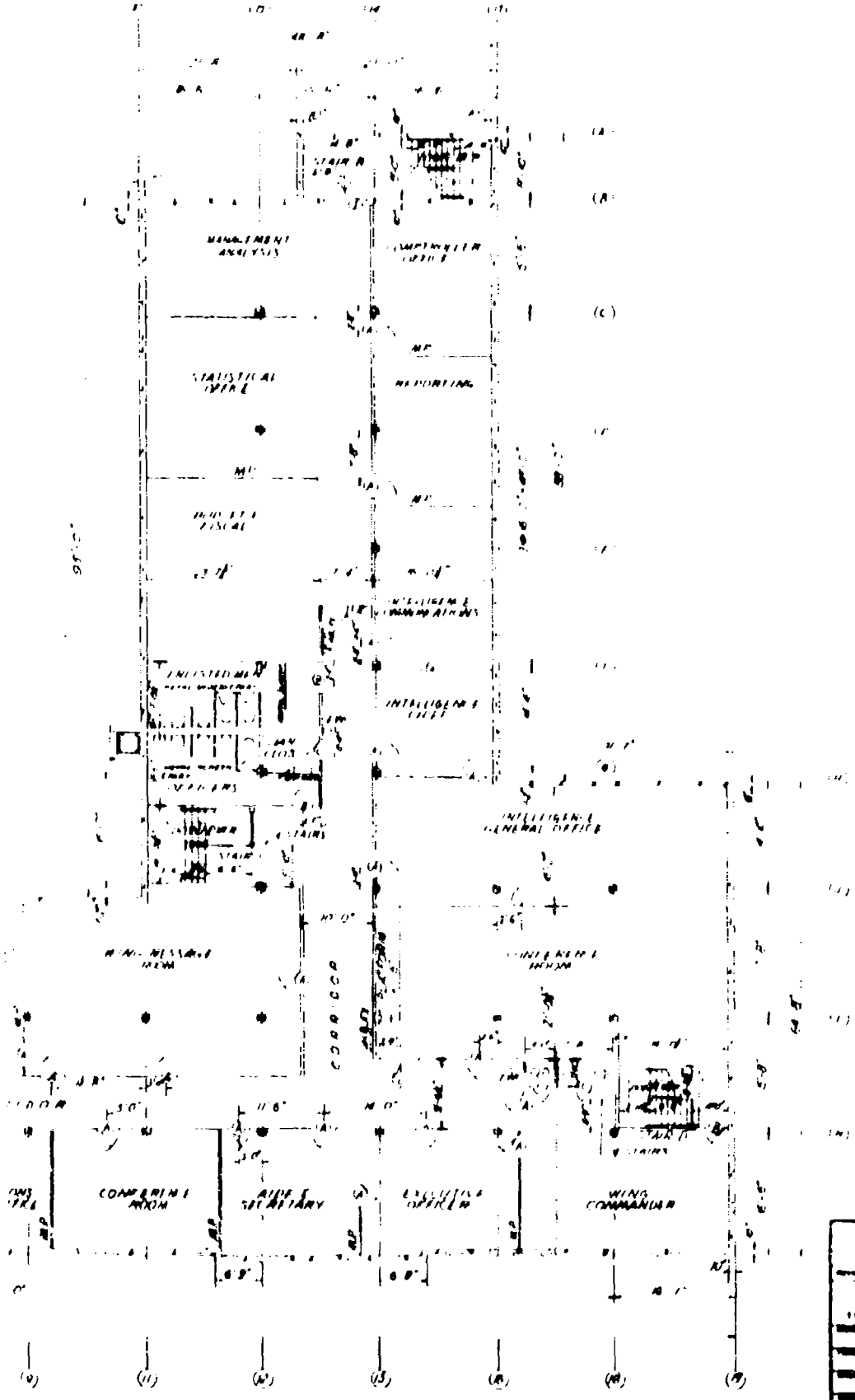
60-A6-01

DOOR SCHEDULE

TYPE	MATERIAL	SIZE	GLASS
	INTERIOR		
A	WOOD	3'-0" x 6'-8" x 1 3/8"	CLEAR
B	WOOD	2'-8" x 6'-8" x 1 3/8"	
C	WOOD	2'-6" x 6'-8" x 1 3/8"	
D	KALAMEIN	3'-6" x 6'-8" x 1 3/8"	CLEAR WIRE
F	WOOD	2'-8" x 6'-8" x 1 3/8"	CLEAR
G	WOOD	2'-6" x 6'-8" x 1 3/8"	CLEAR
H	WOOD	3'-0" x 6'-8" x 1 3/8"	CLEAR
I	KALAMEIN	5'-0" x 6'-8" x 1 3/8" (PR)	CLEAR WIRE
K	KALAMEIN	3'-0" x 6'-8" x 1 3/8"	
L	WOOD	5'-0" x 6'-8" x 1 3/8" (PR)	CLEAR WIRE
M	TIN CLAD	3'-0" x 6'-8" x 1 3/8"	
N	METAL	2'-8" x 6'-6"	
O	KALAMEIN	3'-6" x 6'-8" x 1 3/8"	
	EXTERIOR		
1	WOOD	5'-0" x 6'-8" x 2 1/4" (PR)	CLEAR
2	WOOD	2'-8" x 5'-8" x 2 1/4"	CLEAR
3	WOOD	6'-0" x 7'-1" x 2 1/4" (PR)	CLEAR WIRE
5	WOOD	5'-0" x 7'-1" x 2 1/4" (PR)	CLEAR



SECOND FLOOR PLAN - ARCHITECT



FLOOR PLAN - ARCHITECTURAL

2

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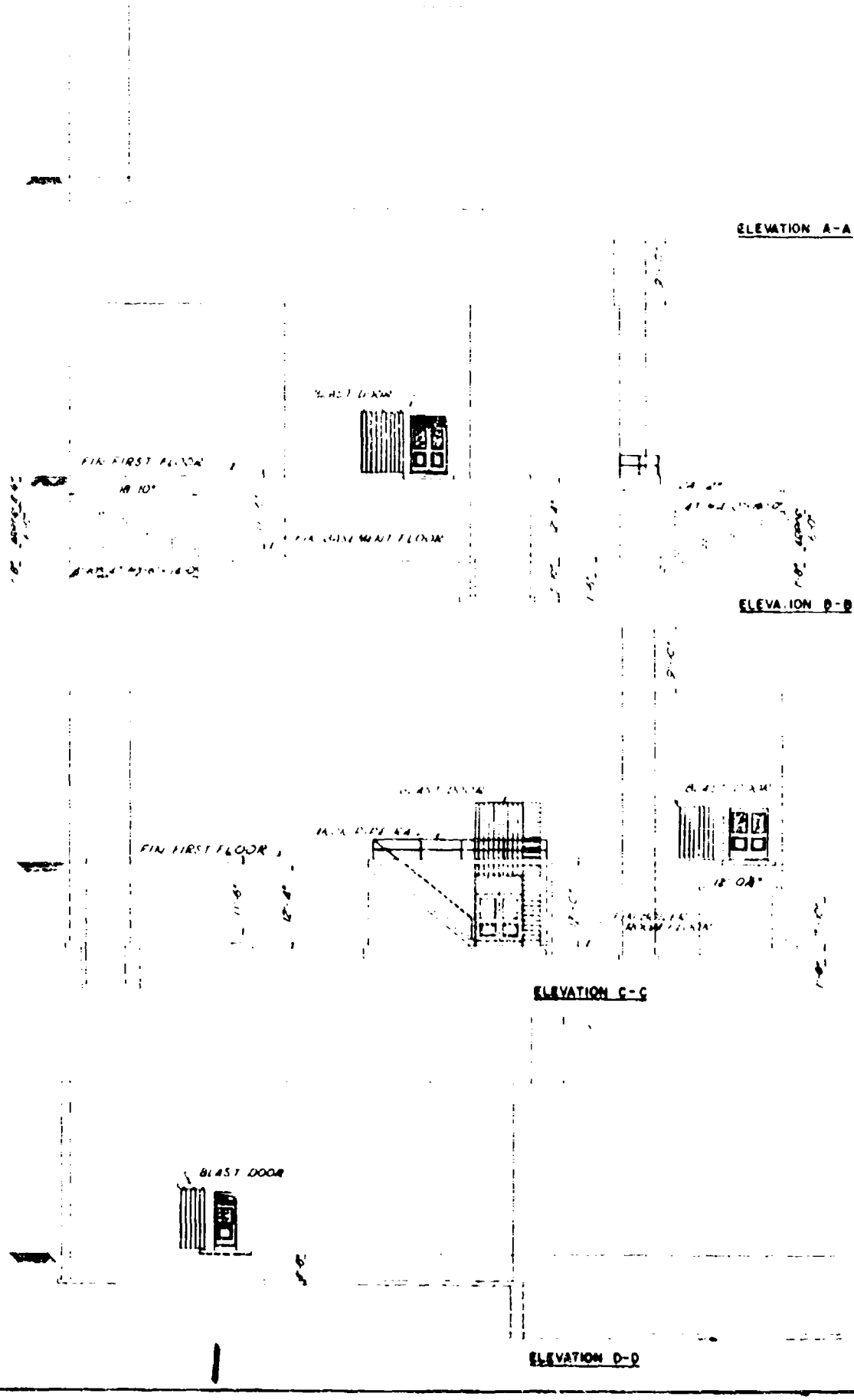
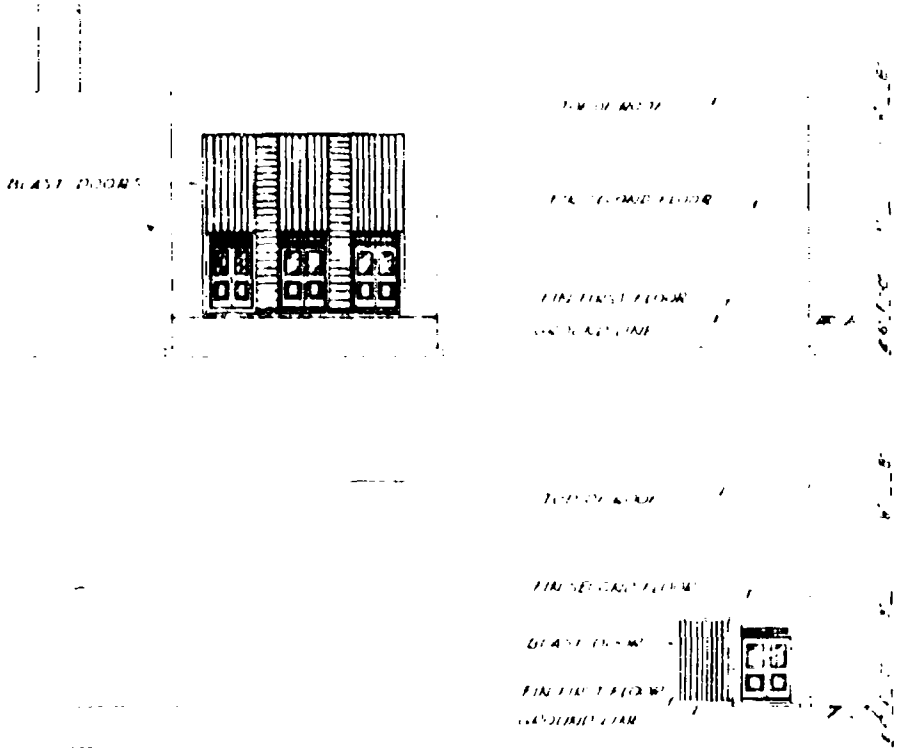
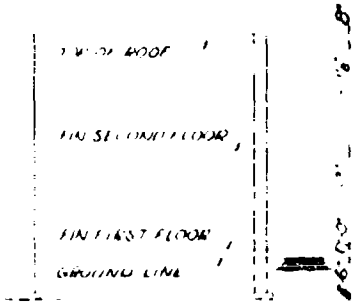
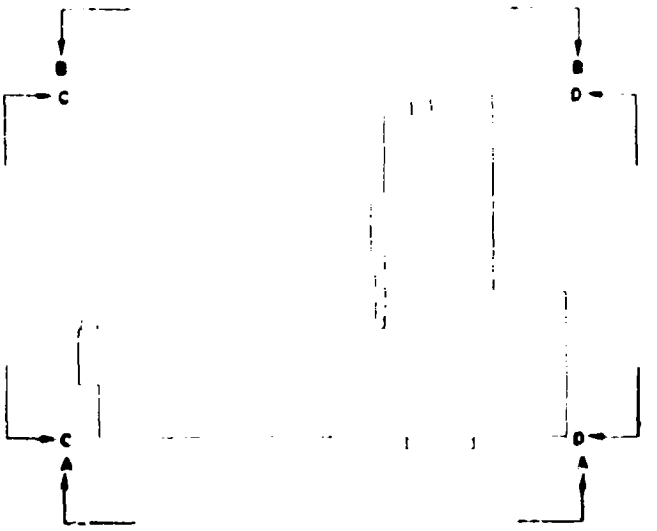
PROTECTIVE CONSTRUCTION
ADMINISTRATION BUILDING
10 PSI BLAST RESISTANT

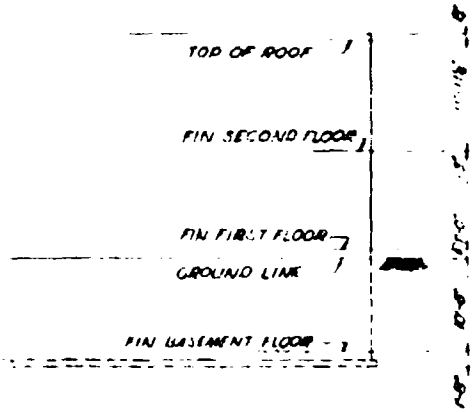
60-18-0


ELEVATION A-A
ELEVATION B-B
ELEVATION C-C
BLAST DOOR
ELEVATION D-D









AMMANN & WHITNEY		DEPARTMENT OF THE ARMY
	PROTECTIVE CONSTRUCTION ADMINISTRATION BUILDING 10 PSI BLAST RESISTANT	
		80-16-01

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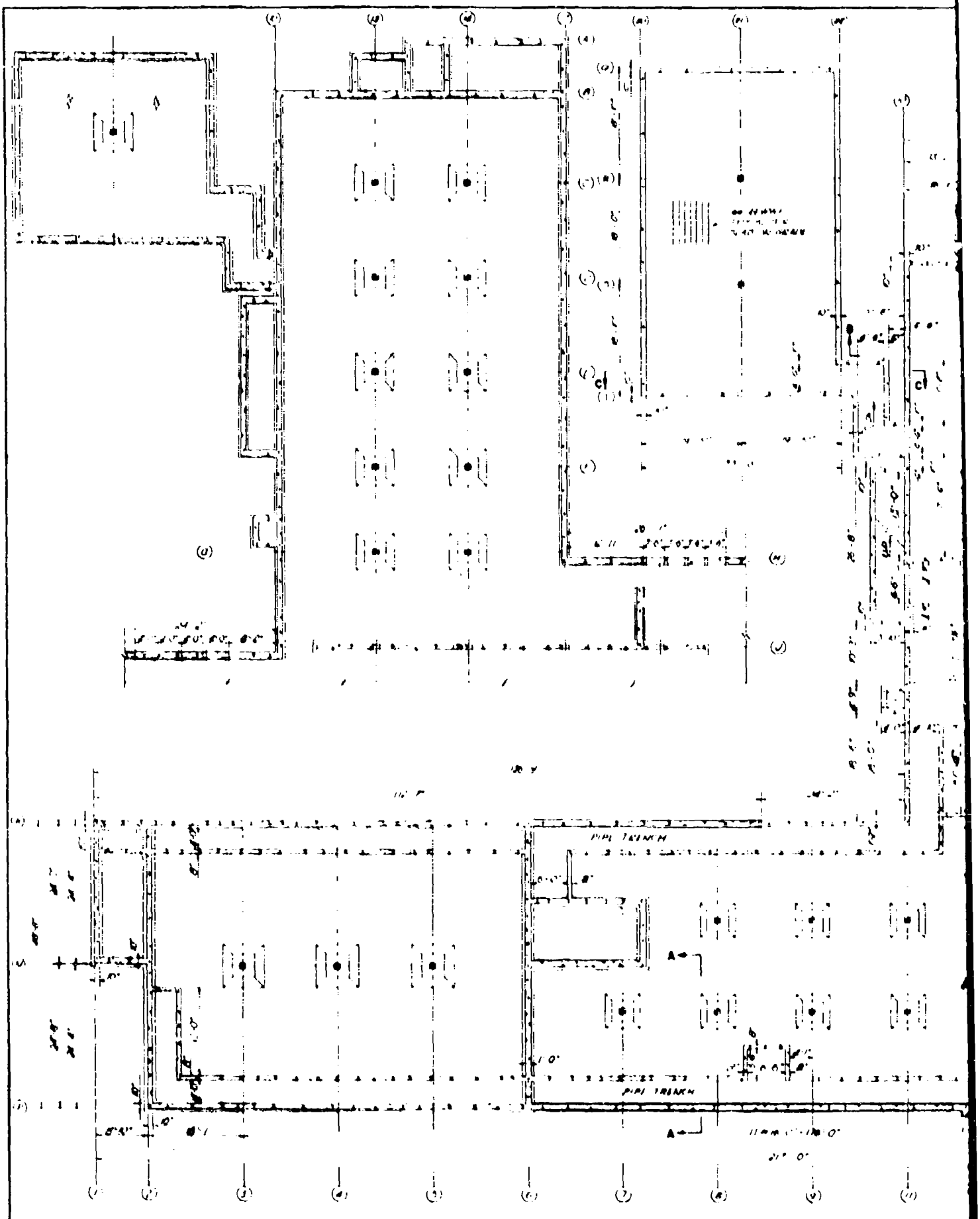
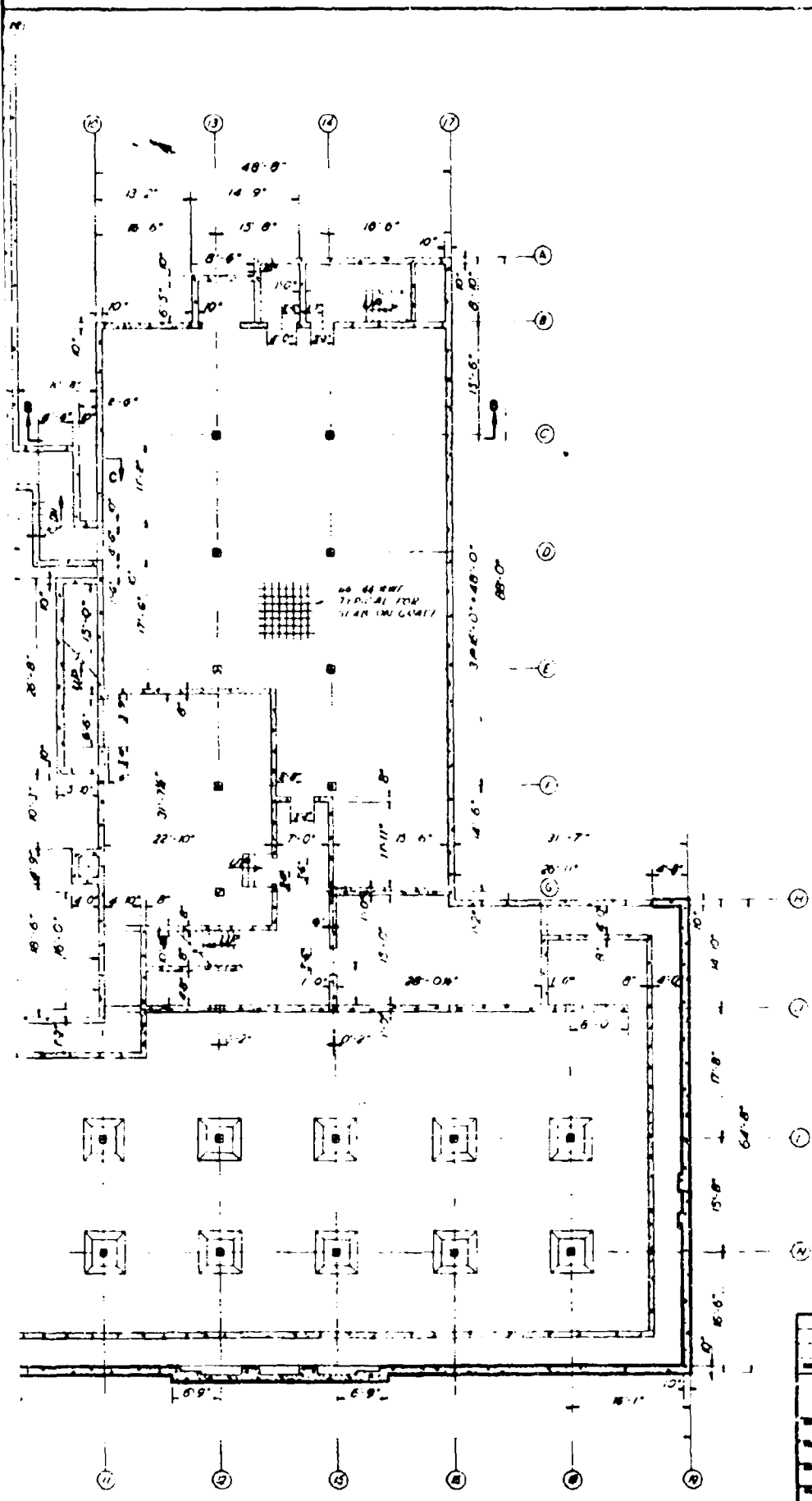


BASEMENT AND FOUNDATION PLAN



TION PLAN

2

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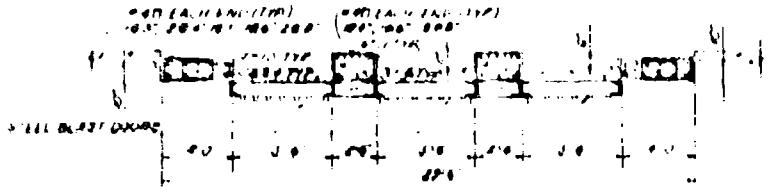
DEPARTMENT OF THE ARMY
CORPS OF THE CHIEF OF ENGINEERS
MIL. AIT CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D.C.

PROTECTIVE CONSTRUCTION
ADMINISTRATION BUILDING
10 PSI BLAST RESISTANT

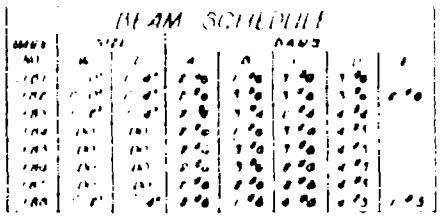
60-48-01

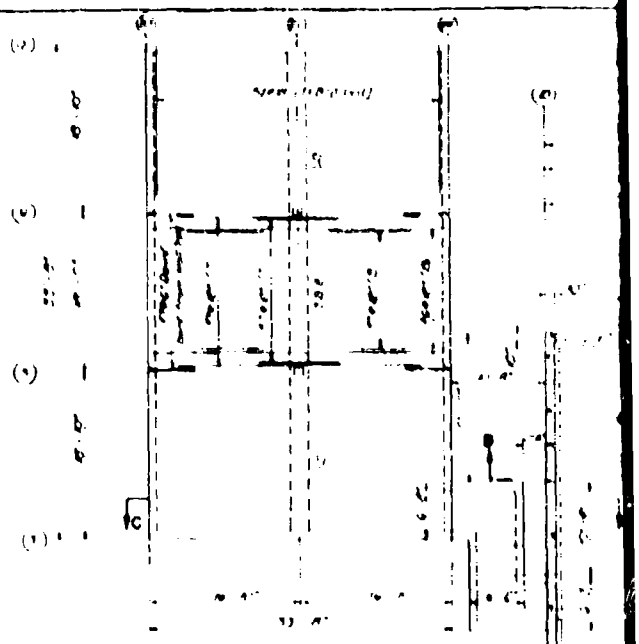


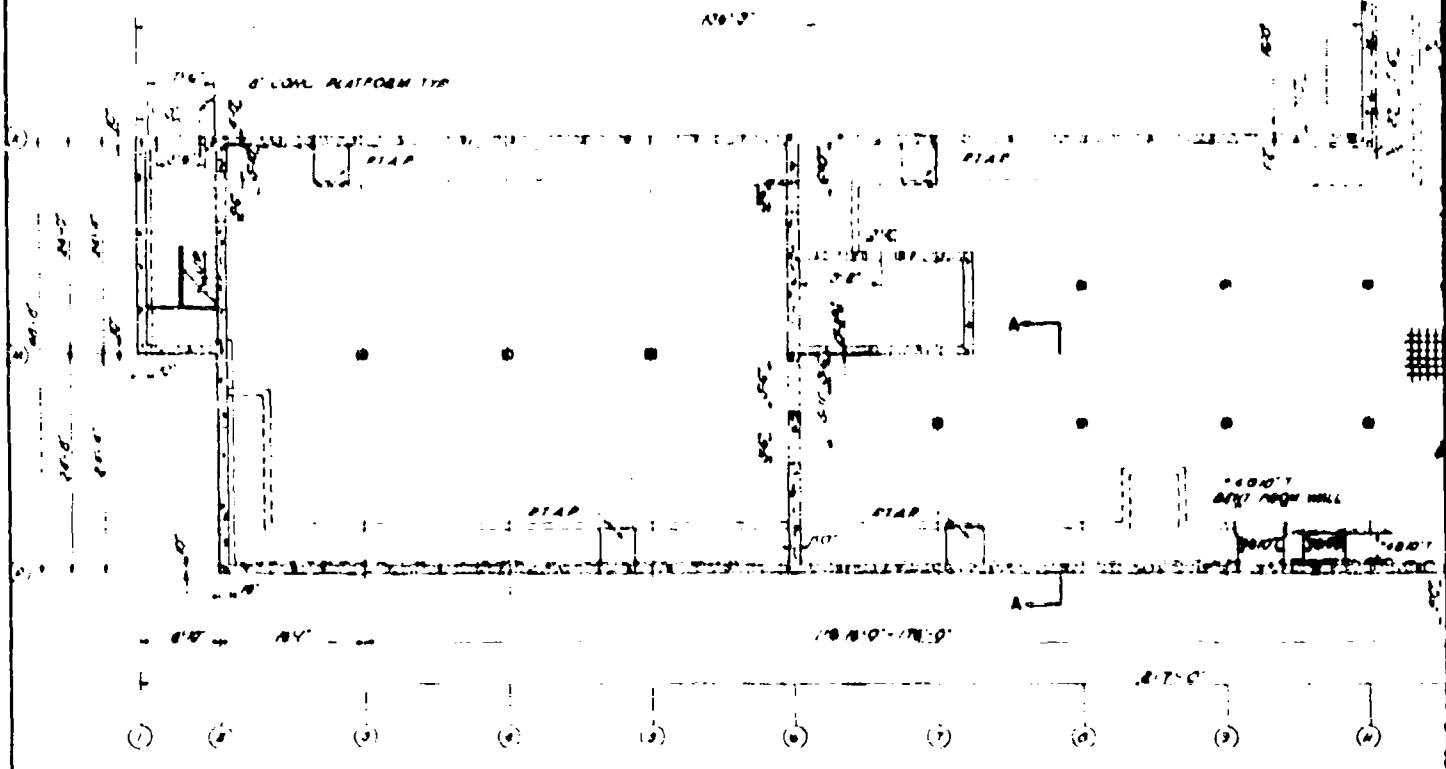
FRAMING DETAIL AT MAIN ENTRANCE

SCALE 1/4"=1'-0"

BEAM SCHEDULE

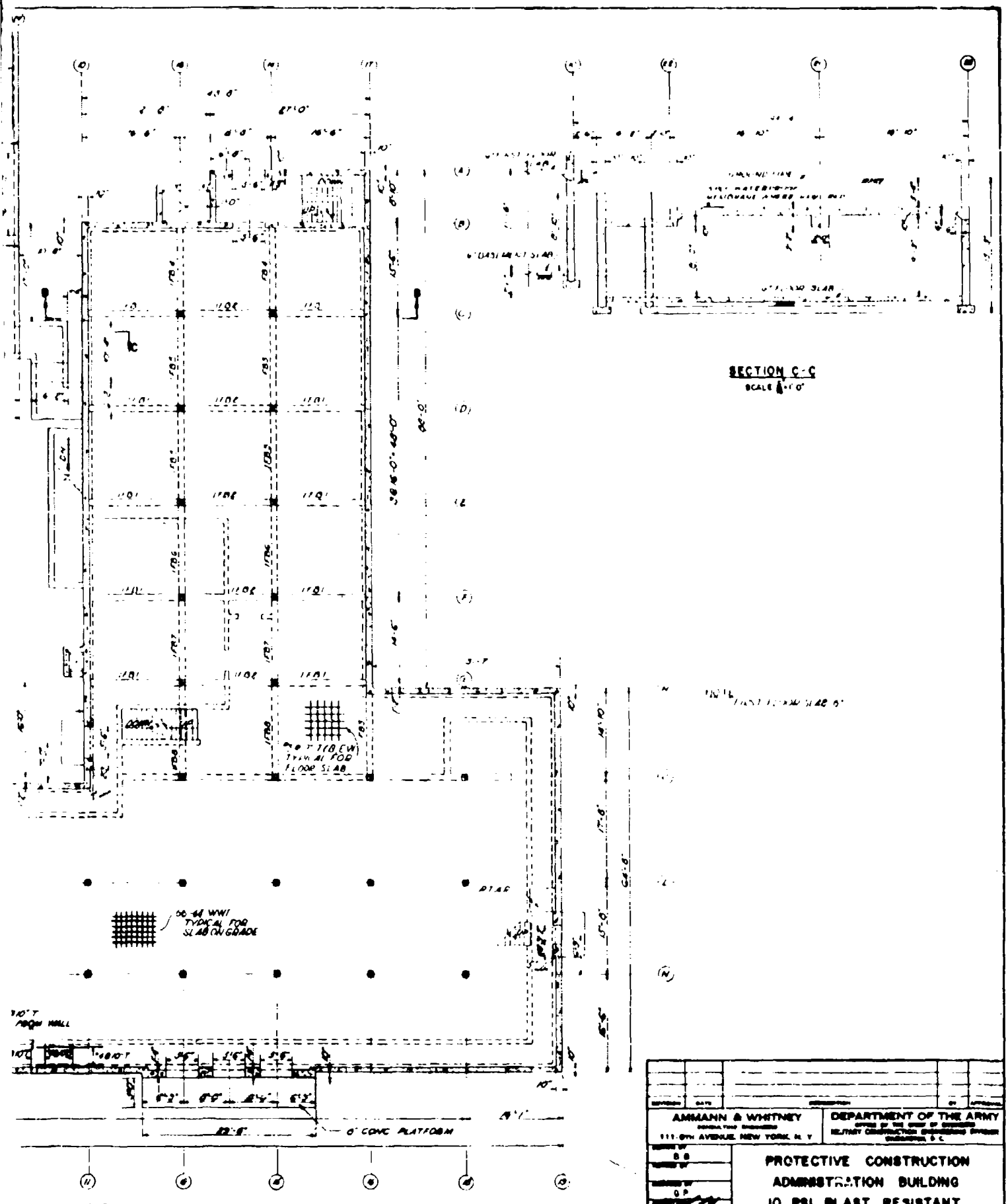






FIRST FLOOR AND SHELTER ROOF FRAMING PLAN

SCALE 1/4"=1'-0"



OF FRAMING PLAN

2

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DEPARTMENT OF THE ARMY
MILITARY CONSTRUCTION ENGINEERING DIVISION

PROTECTIVE CONSTRUCTION
ADMINISTRATION BUILDING
10 PSI BLAST RESISTANT

AS NOTED
60-10-01

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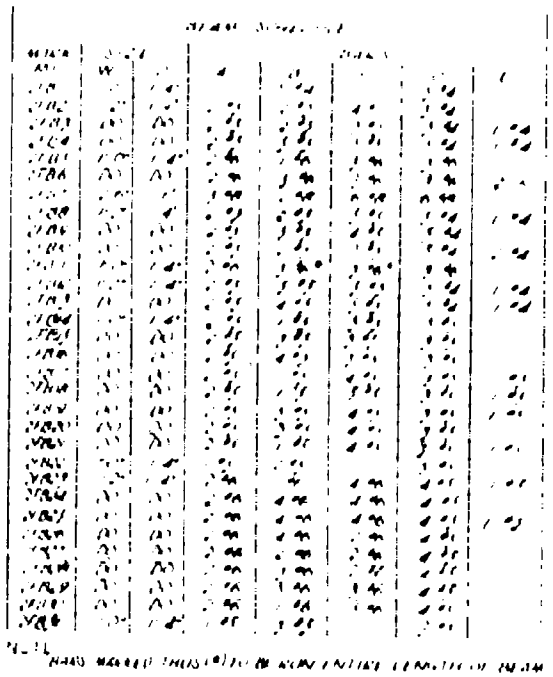
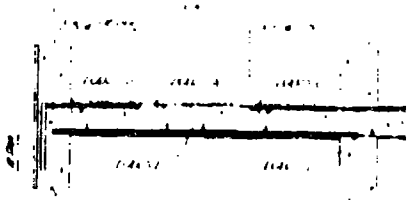
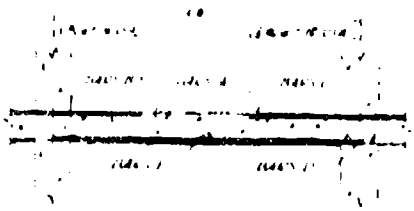
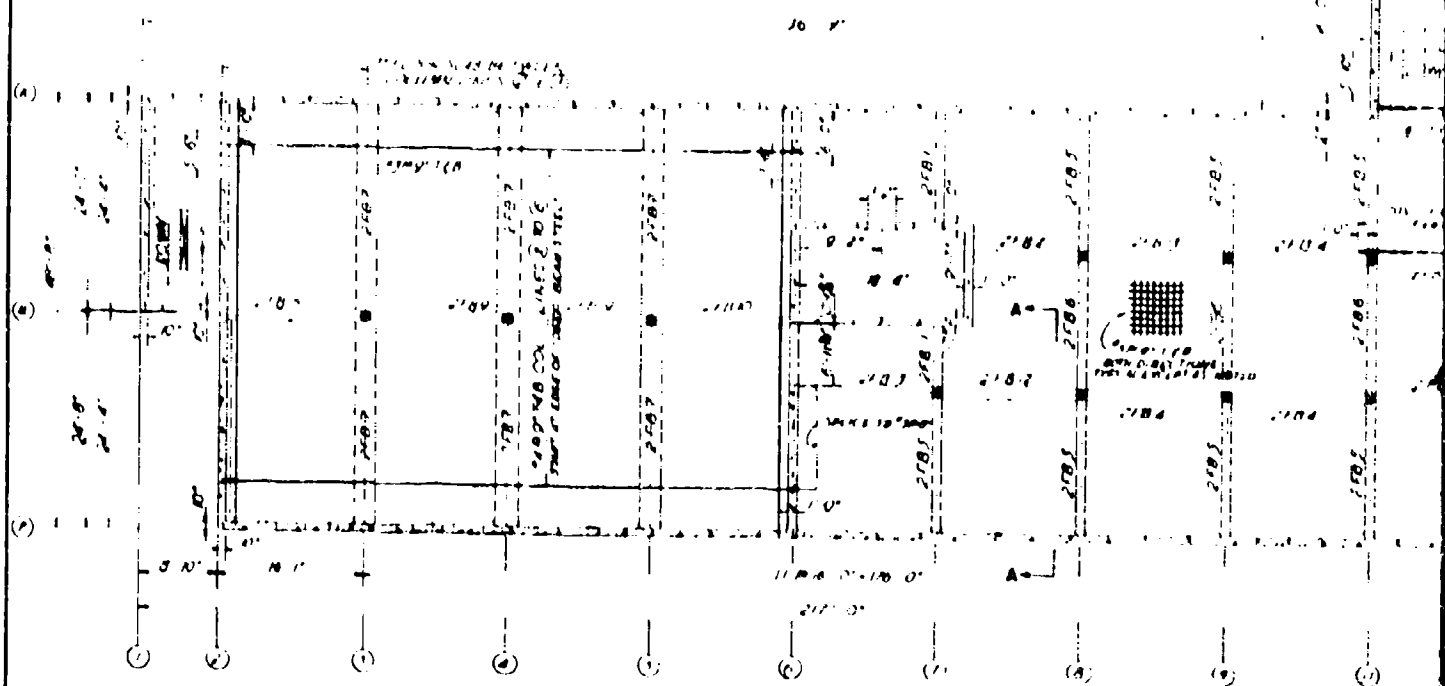




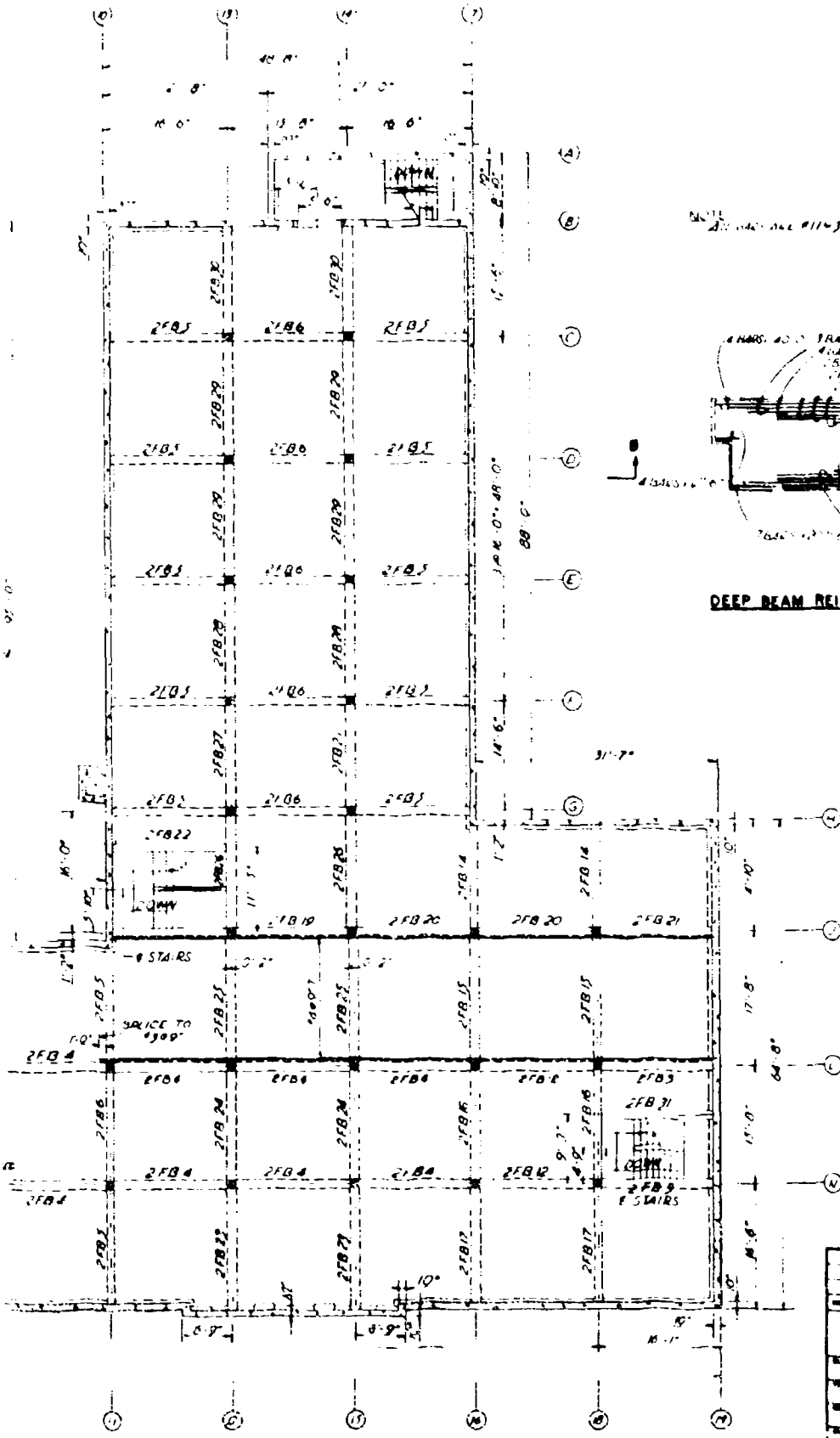
TYPICAL EXTERIOR BEAM DETAILS

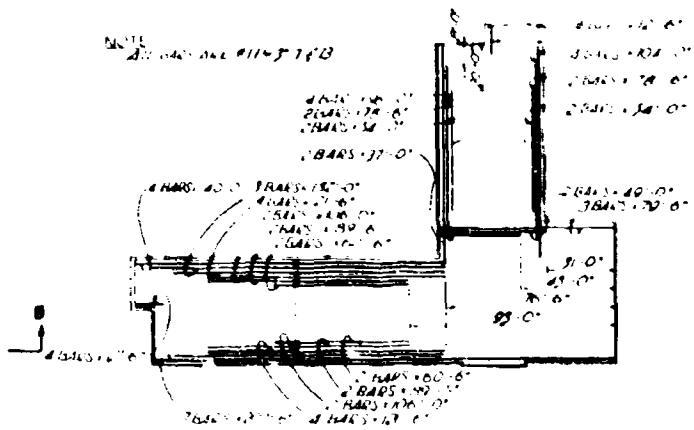


TYPICAL INTERIOR BEAM DETAILS



SECOND FLOOR FRAMING PLAN





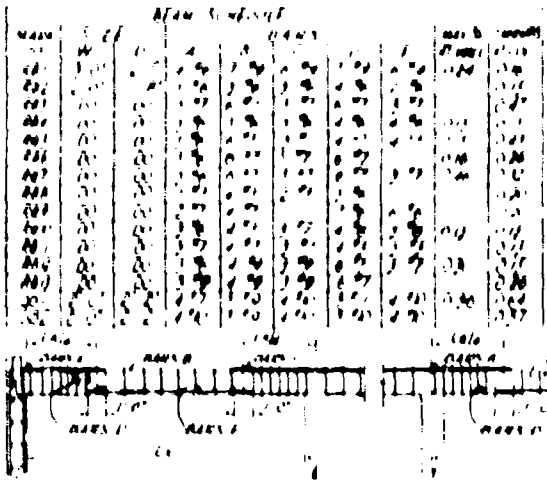
DEEP BEAM REINFORCEMENT — SECOND FLOOR

NOTE
SECOND FLOOR SLAB 6" EXCEPT AS NOTED

AMMANN & WHITNEY	DEPARTMENT OF THE ARMY
111 EIGHTH AVENUE, NEW YORK, N. Y.	
	PROTECTIVE CONSTRUCTION ADMINISTRATION BUILDING 10 PSI BLAST RESISTANT
	60-16-C

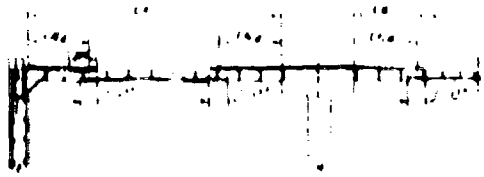
ING PLAN

2

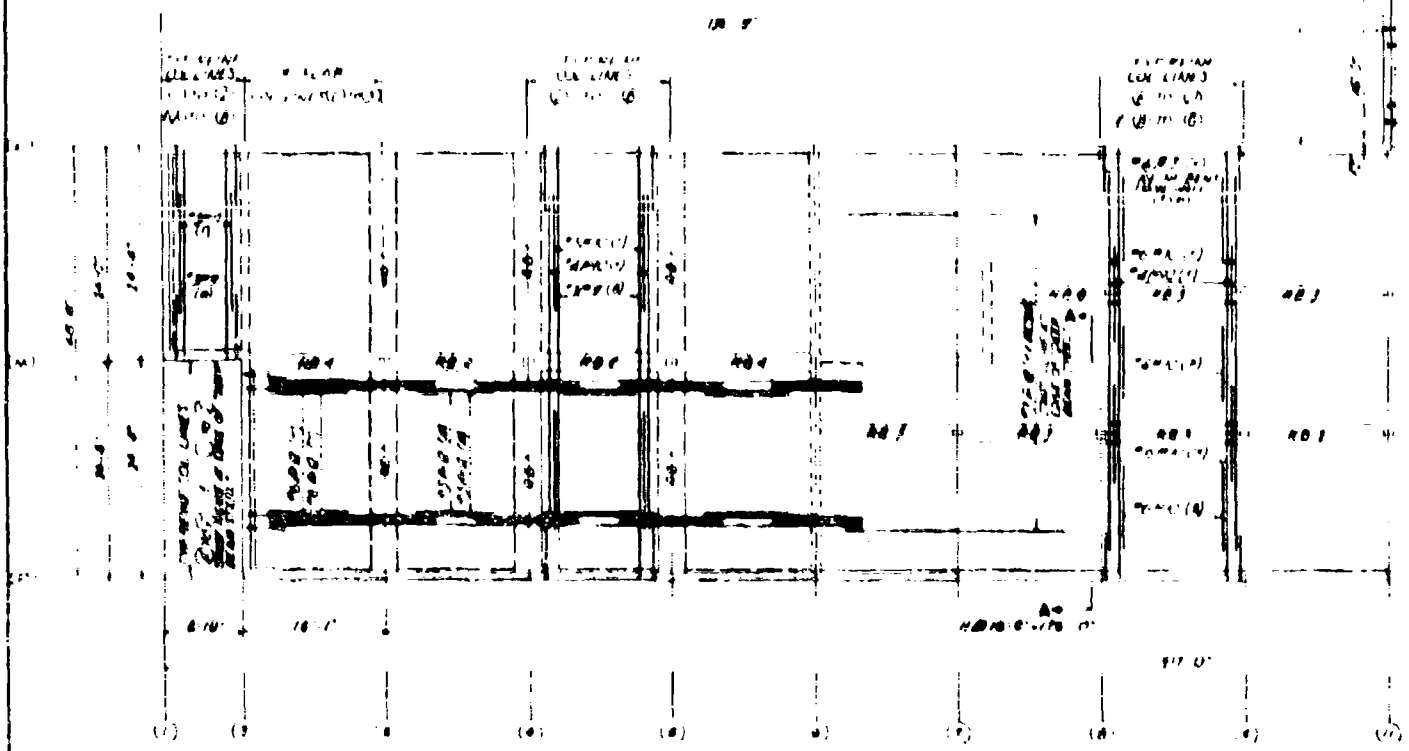


TYPICAL EXTERIOR BEAM DETAILS

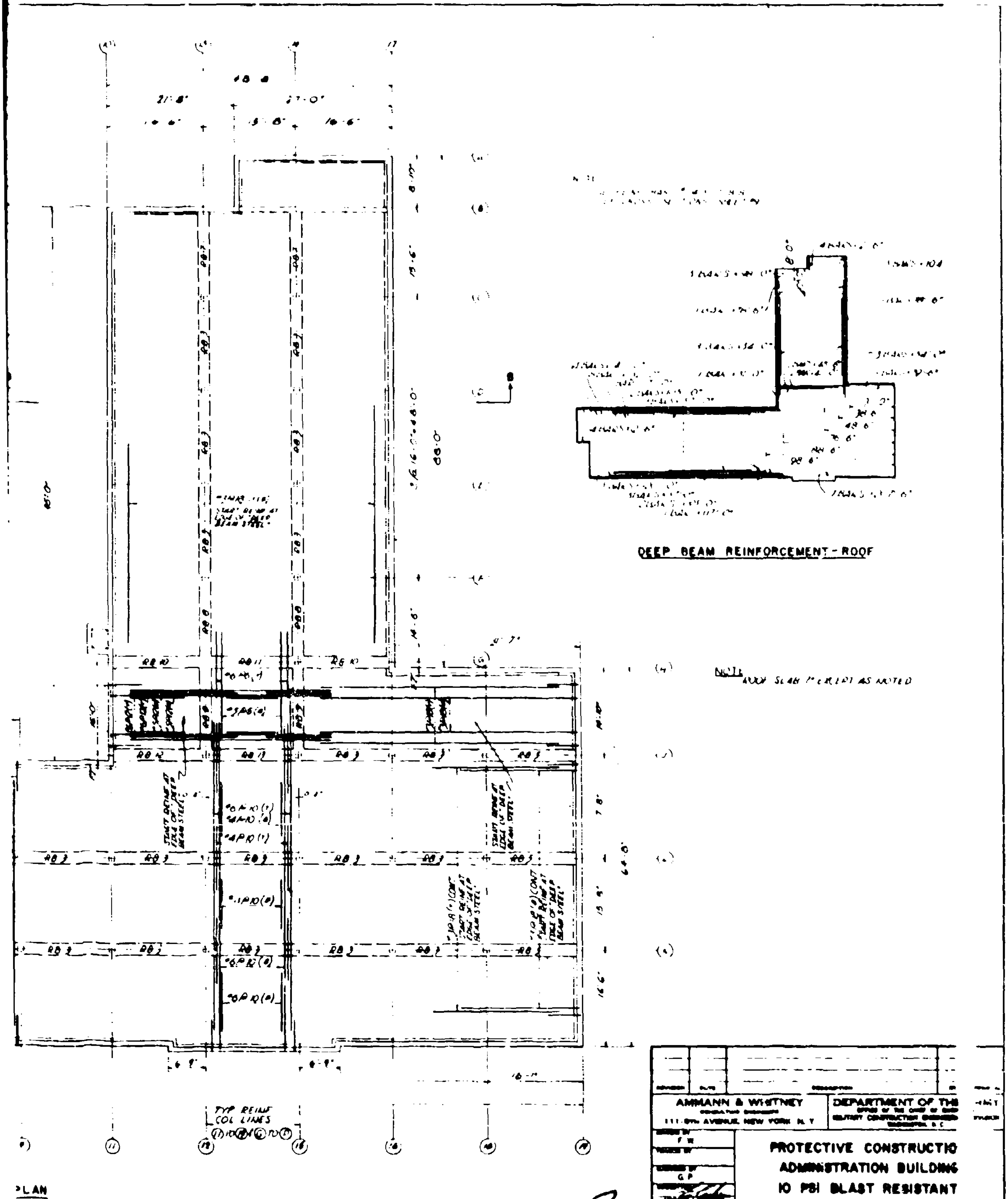
TYPICAL INTERIOR BEAM DETAILS

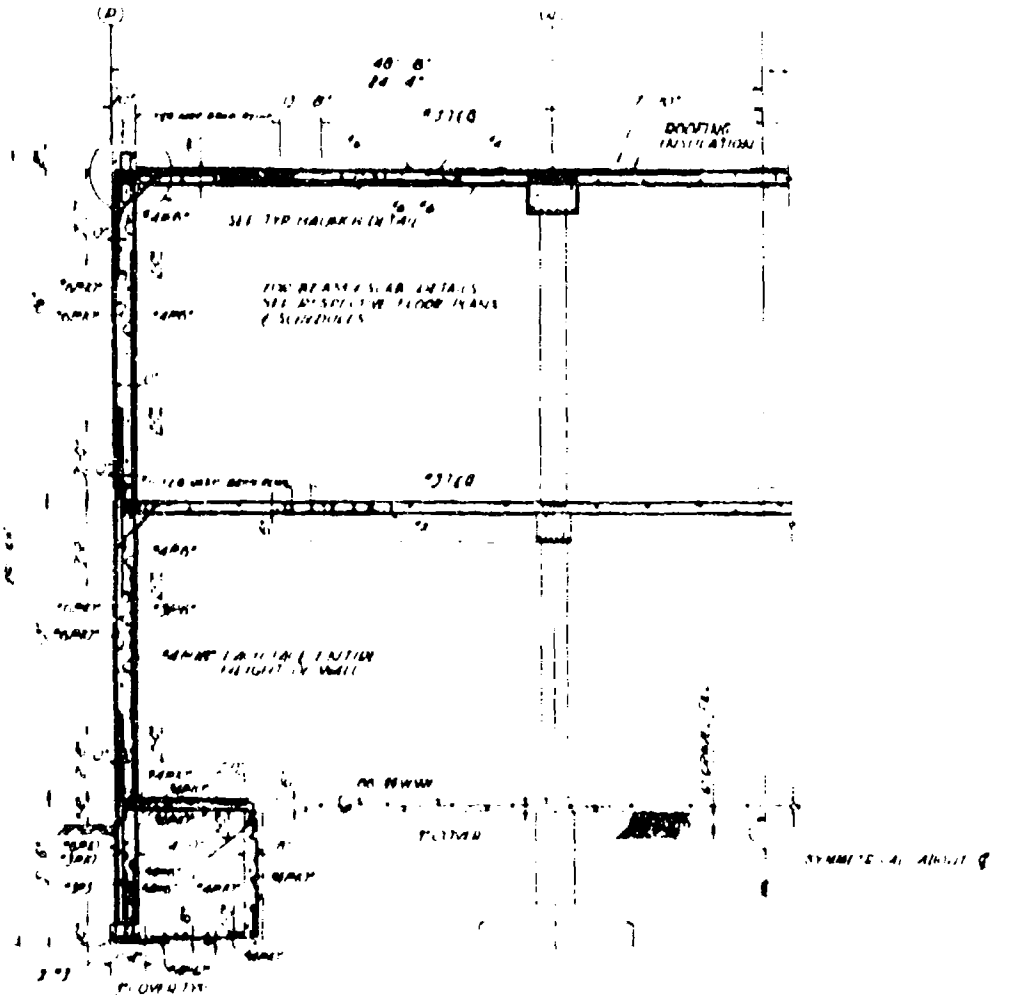


TYPICAL SLAB DETAILS

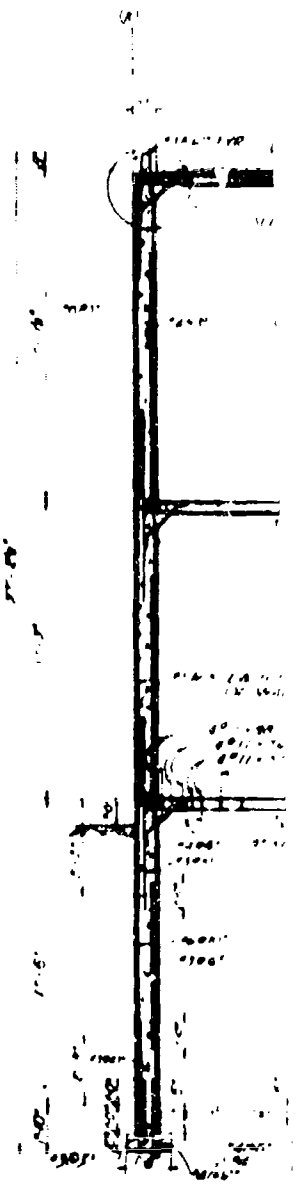


ROOF FRAMING PLAN

 DEEP BEAM REINFORCEMENT - ROOF
NOTE: ROOF SLAB 7" EXCEPT AS NOTED
TYP REINF COL LINES
PLAN
AMMANN & WHITNEY
111 8th AVENUE, NEW YORK, N. Y.
DEPARTMENT OF THE
PROTECTIVE CONSTRUCTIO
ADMINISTRATION BUILDING
10 PSI BLAST RESISTANT
60-16-C1

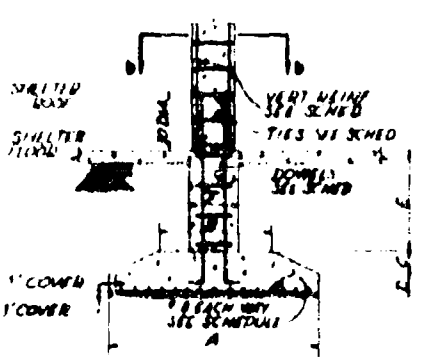


SECTION A-A

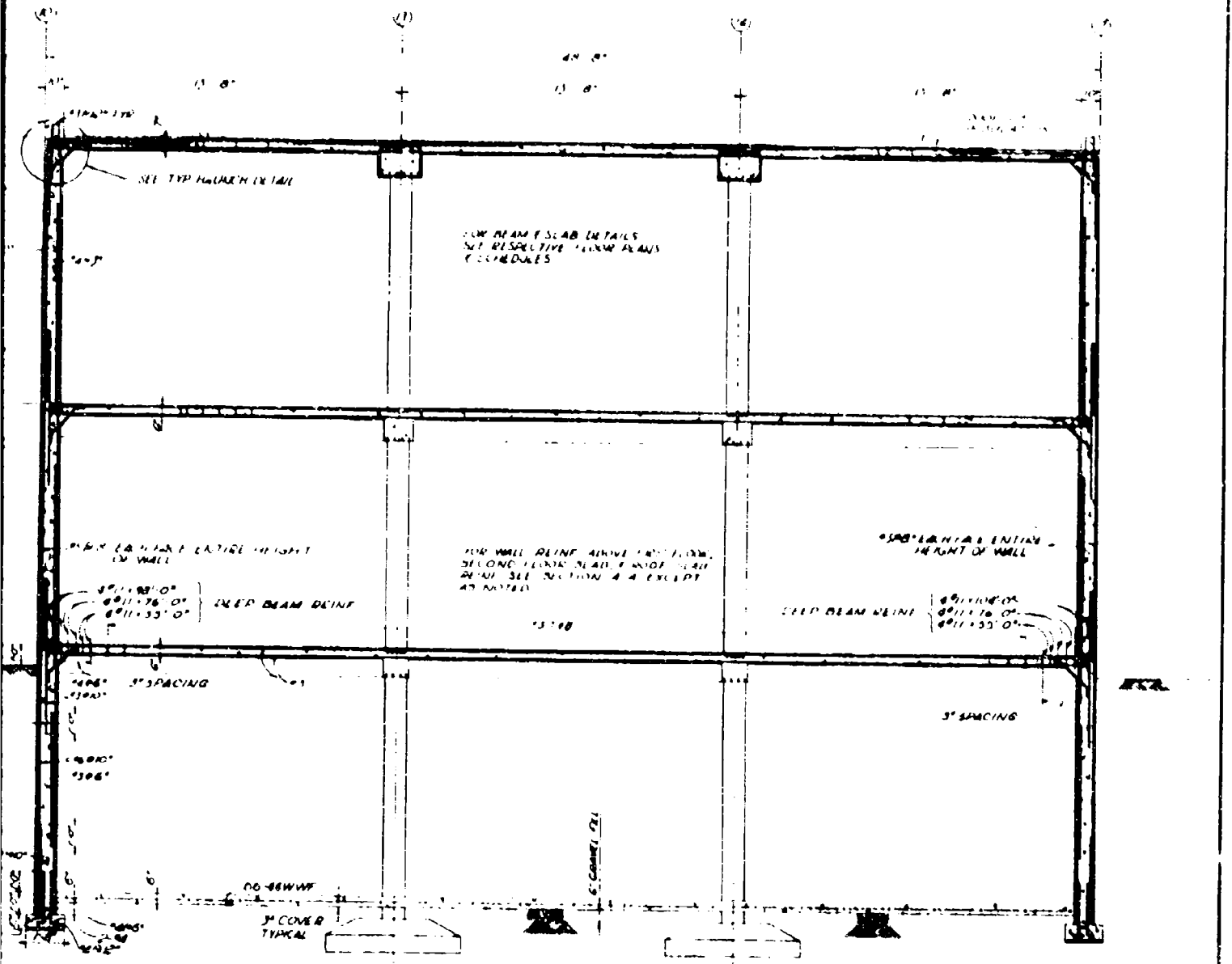


COLUMN & COLUMN FOOTING SCHEDULE

MARK						
SIZE						
VERT REINF						
TIES						
SIZE						
VERT REINF						
TIES						
@ FLOOR &						
SIZE						
VERT REINF						
TIES						
BOTTOM ELEV						
DOWELS						
FOOTING						
REINF EACH WAY						



TYPICAL COLUMN FOOTING

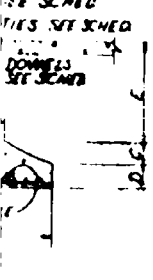


SECTION B-B
SCALE: 1/8" = 1'-0"

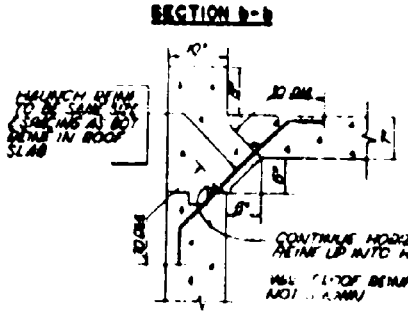
SECTION D-D

NOTE:
CONCRETE COVER TO REINFORCEMENT BARS IS AS FOLLOWS EXCEPT AS NOTED

BEAMS	1½"
SLABS	¾"
EXT WALLS	¾" INSIDE FACE 2" OUTSIDE FACE
INT WALLS	¾"



DOTING



TYPICAL HAUNCH DETAIL
SCALE: 1"=1'-0"

2

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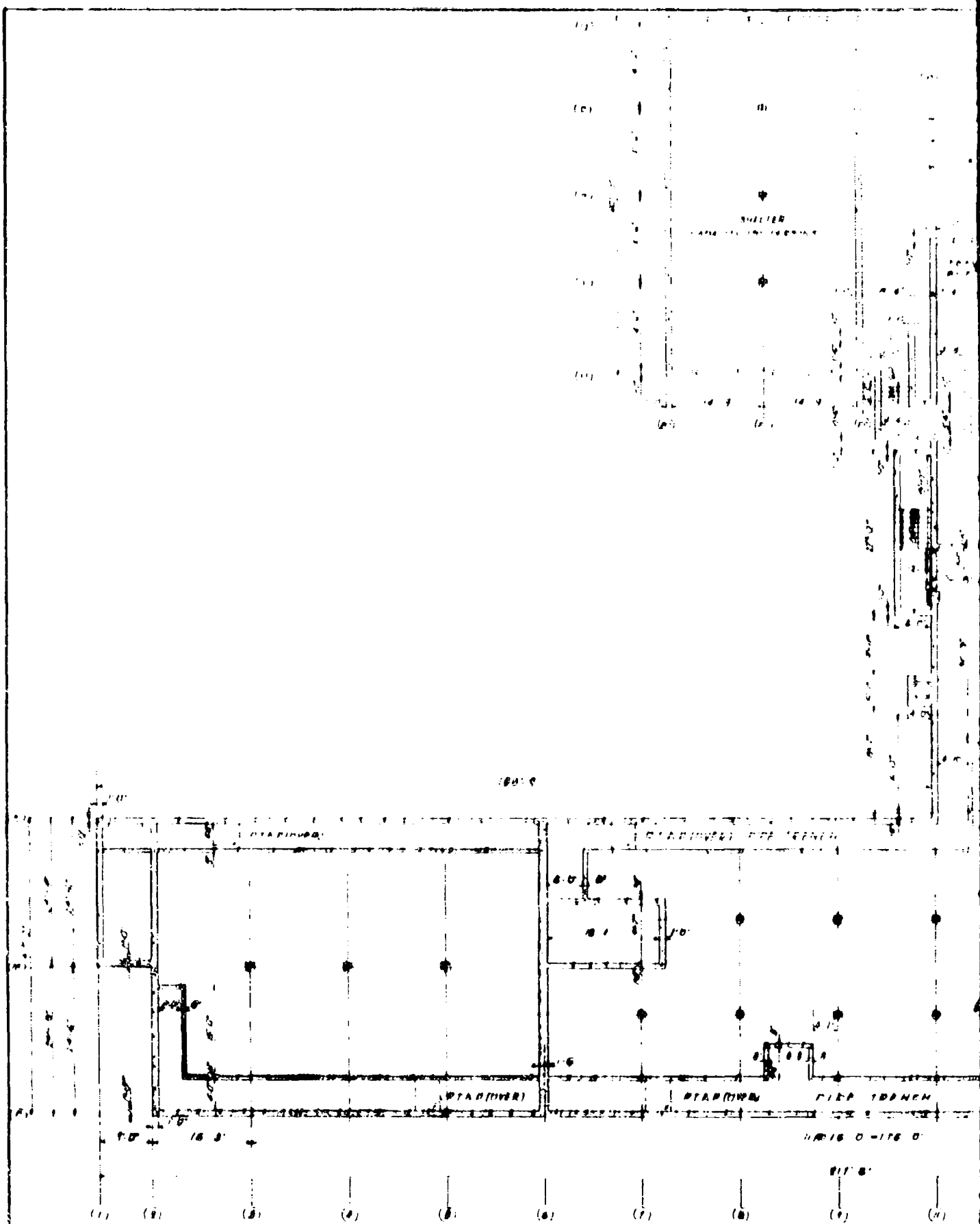
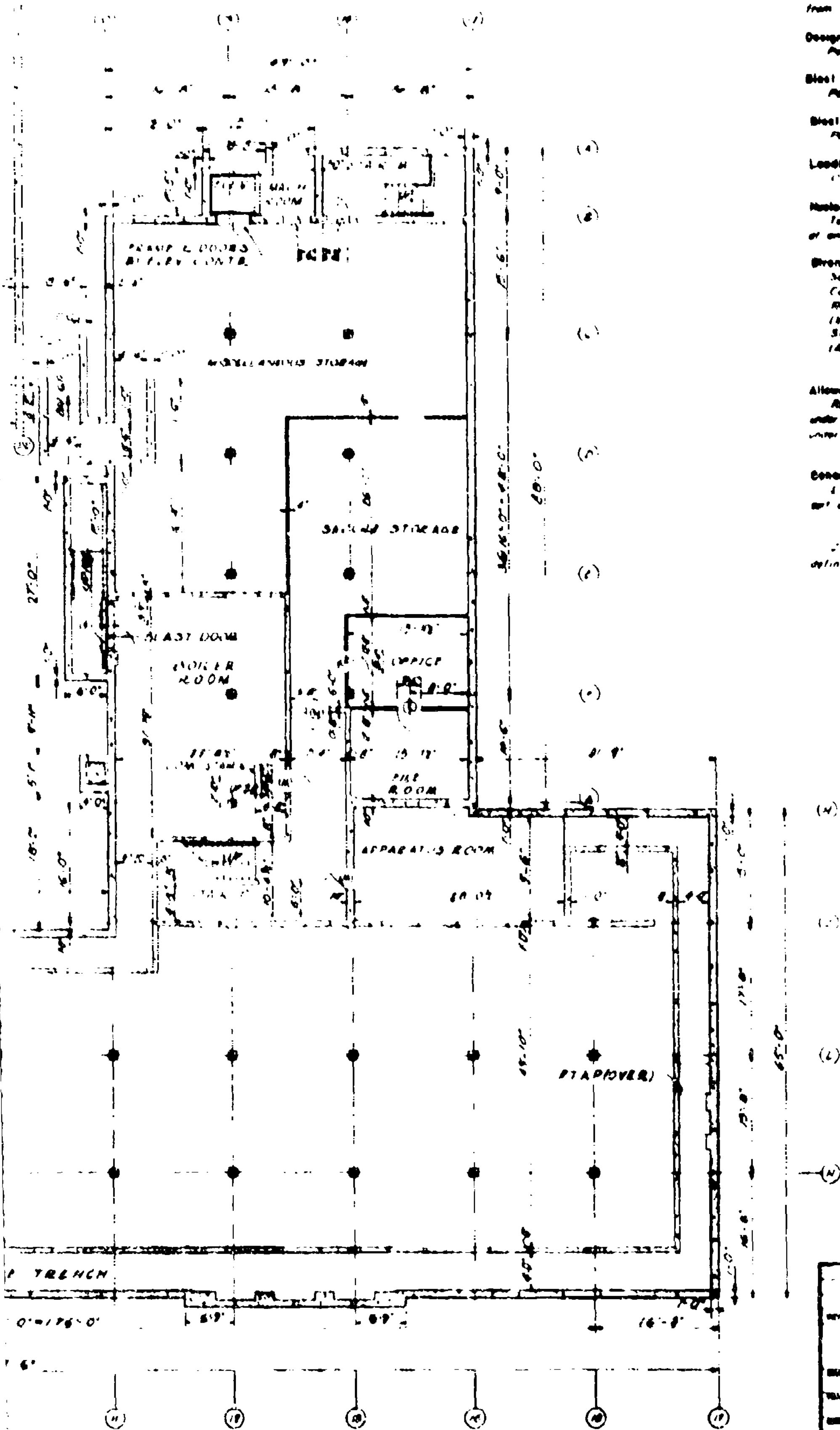
10 PSI BLAST RESISTANT	
	60-19-01

.10



BASEMENT PLAN - ARCHITECTURAL



ARCHITECTURAL

2

DESIGN CONDITIONS

Design Procedure
In accordance with OCE manual, "Design of Structures for Protection from the Effects of Atomic Weapons"

Design Blast Wave
Peak incident pressure · 20psi, Duration · [illegible]

Blast Loading On Roof
Peak pressure 20psi Duration · [illegible]

Blast Loading on Walls
Peak pressure · 58.5psi Duration · [illegible]

Loading on Floors
Office portion · 50psf, Corridors · 100psf

Nuclear Radiation Protection for Shelter Area
Total gamma and neutron attenuated [illegible] for a 20 K.T. weapon at any position which will produce a peak blast pressure equal to 20 psi

Strength of Materials	Static	Blast Design
Soil bearing capacity	8,000psf *	[illegible]
Concrete, f_c'	4,000psi	5,000psi
Reinf. steel, lower yield (int. grade ASTM A305 [illegible])	47,500psi	52,000psi
Structural steel, lower yield (ASTM A7-50)	38,000psi	41,800psi

*rated capacity of soil

Allowable Stresses and Deflections
Roof, walls, columns and footings designed for plastic deformations under design blast load. Blast doors designed for elastic deflection under design blast load.

General Notes
1. The following features are not shown and shall be determined to suit use requirements:
Mechanical and electrical equipment
Air locks and decontamination facilities
2. This design study is based upon Dept. of the Air Force definitive drawing No. [illegible], Whiteman AFB Drawing No. [illegible]

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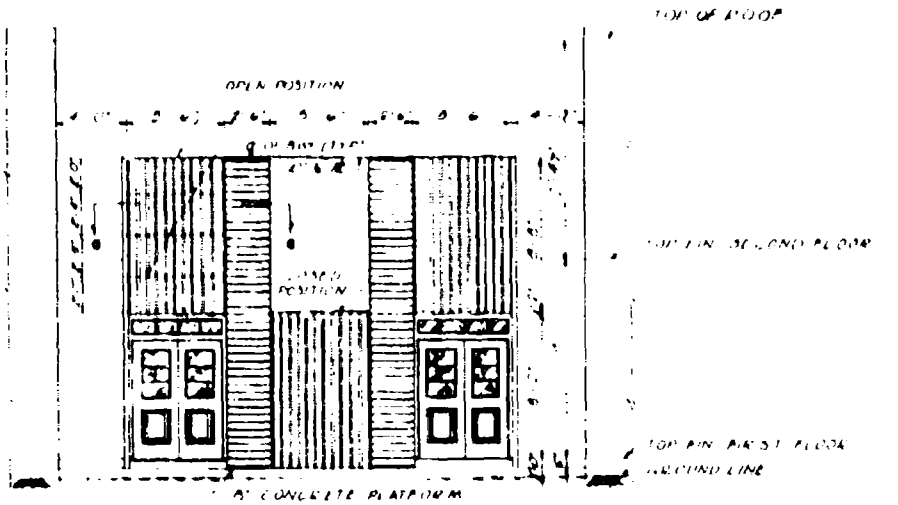
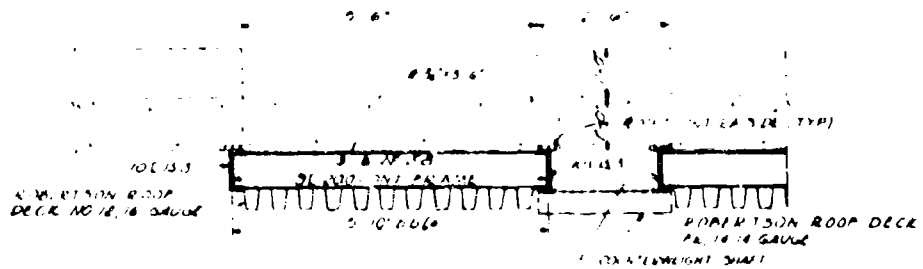
20 PSI BLAST RESISTANT

DRAWING NUMBER 60-16-01

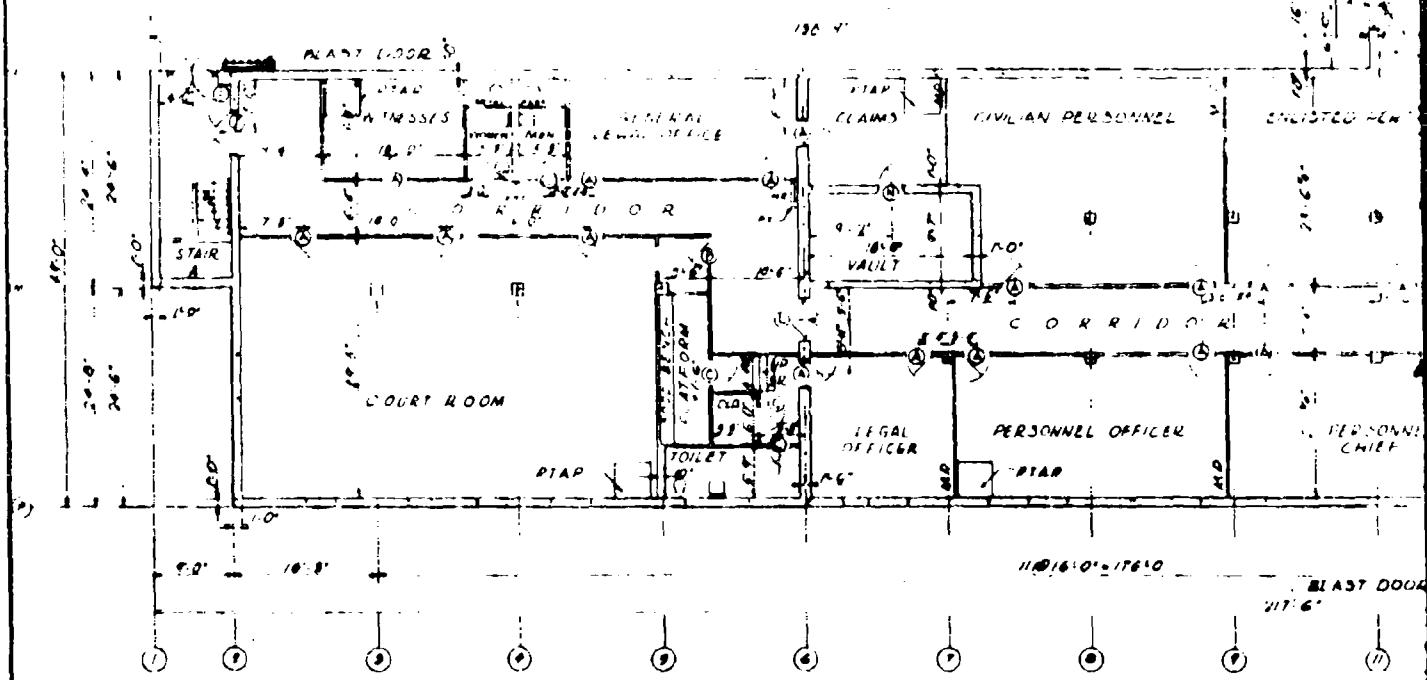
SHEET 1 OF 9



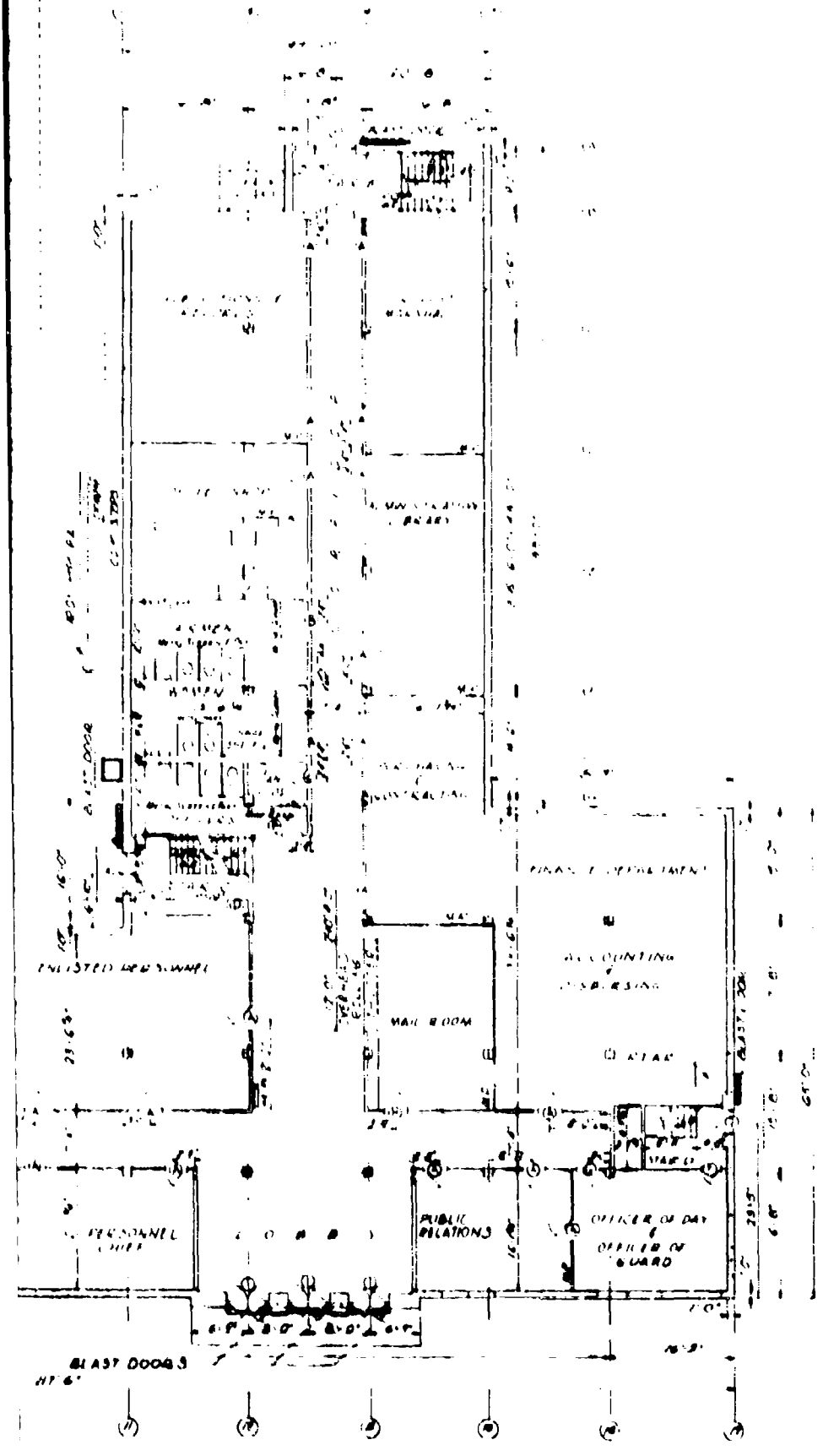
ELEVATION OF MAIN DOORS
SCALE $\frac{1}{2}$"=1'-0"



SECTION a-a
SCALE $\frac{1}{2}$"=1'-0"



FIRST FLOOR PLAN - ARCHITECTU
SCALE $\frac{1}{8}$"=1'-0"



ABBREVIATIONS

MATERIAL LEGEND

CONCRETE

WOOD STUD PARTITIONS

CONCRETE BLOCK

MOVABLE PARTITIONS

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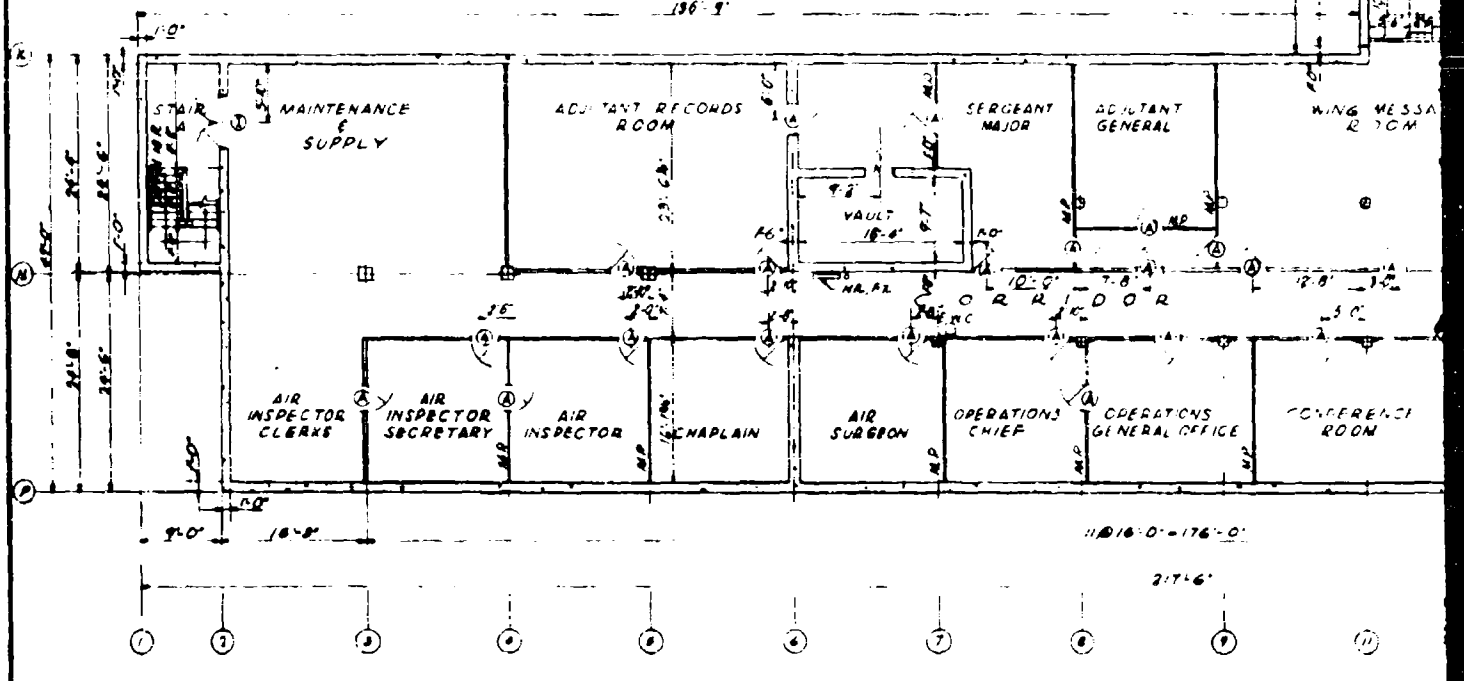
PLAN - ARCHITECTURAL

SCALE: 1/8" = 1'-0"

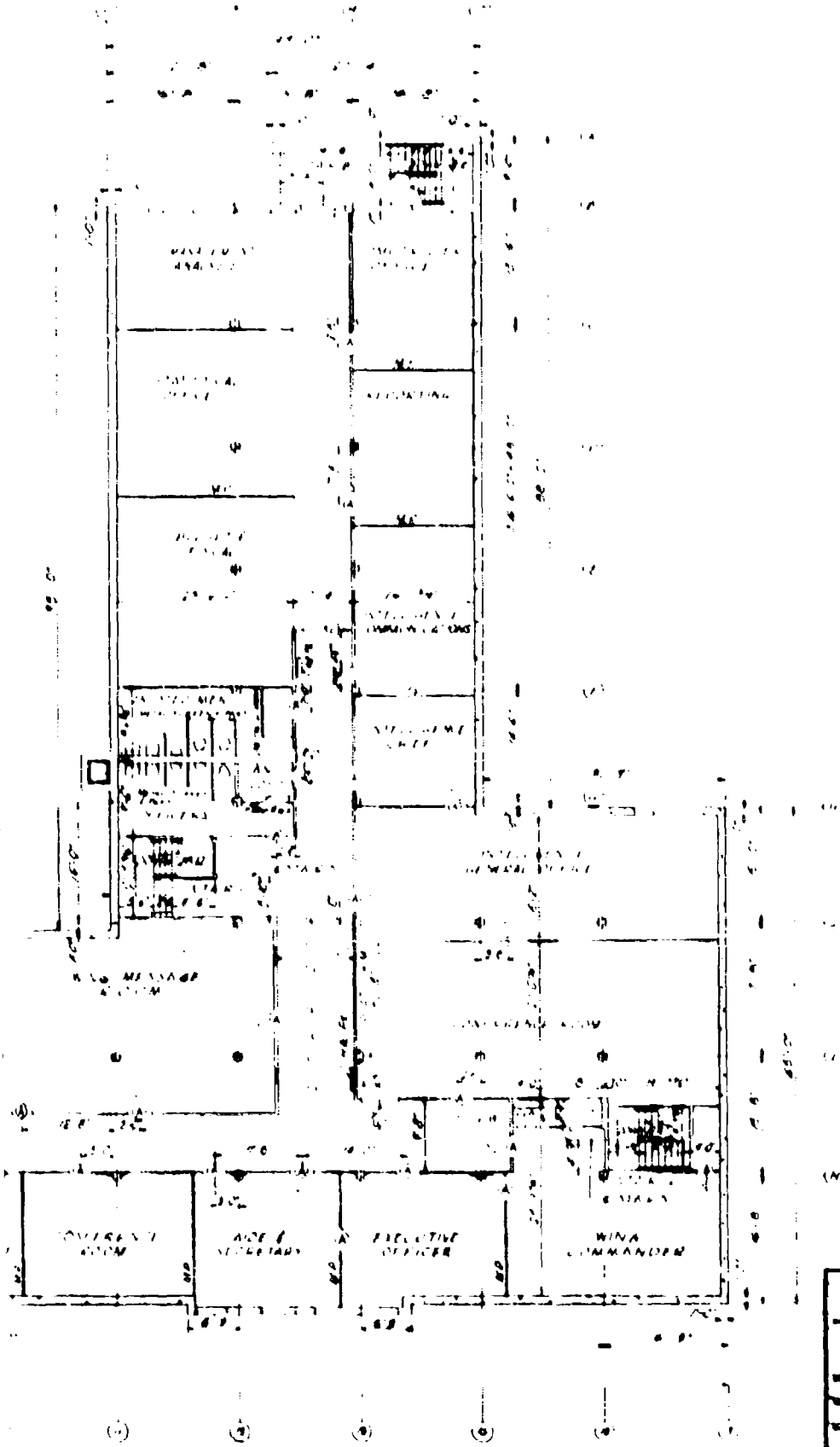
2

DOOR SCHEDULE

TYP	MATERIAL	SIZE	GLASS
	INTERIOR		
A	WOOD	3'-0" × 6'-8" × 1¾"	CLEAR
E	WOOD	2'-8" × 6'-8" × 1¾"	
C	WOOD	2'-6" × 6'-8" × 1¾"	
D	KALAMEIN	3'-6" × 6'-8" × 1¾"	CLEAR WIRE
F	WOOD	2'-8" × 6'-8" × 1¾"	CLEAR
G	WOOD	2'-6" × 6'-8" × 1¾"	CLEAR
H	WOOD	3'-0" × 6'-8" × 1¾"	CLEAR
I	KALAMEIN	3'-0" × 6'-8" × 1¾" (PR)	CLEAR WIRE
K	KALAMEIN	3'-0" × 6'-8" × 1¾"	
L	WOOD	3'-0" × 6'-8" × 1¾" (PR)	CLEAR WIRE
M	TIN CLAD	3'-0" × 6'-8" × 1¾"	
N	METAL	2'-8" × 6'-6"	
O	KALAMEIN	3'-0" × 6'-8" × 1¾"	
	EXTERIOR		
1	WOOD	3'-0" × 6'-8" × 2¼" (PR)	CLEAR
2	WOOD	2'-8" × 6'-8" × 2¼"	CLEAR
3	WOOD	6'-0" × 7'-4" × 2¼" (PR)	CLEAR WIRE
5	WOOD	3'-0" × 7'-4" × 2¼" (PR)	CLEAR



SECOND FLOOR PLAN



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20 PSI BLAST RESISTANT

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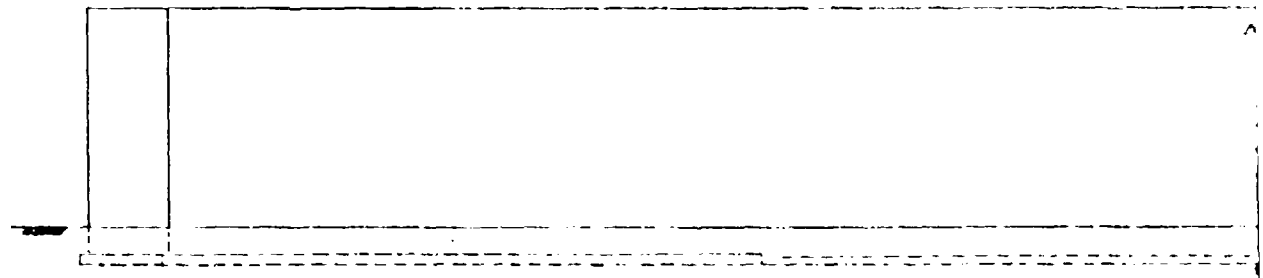
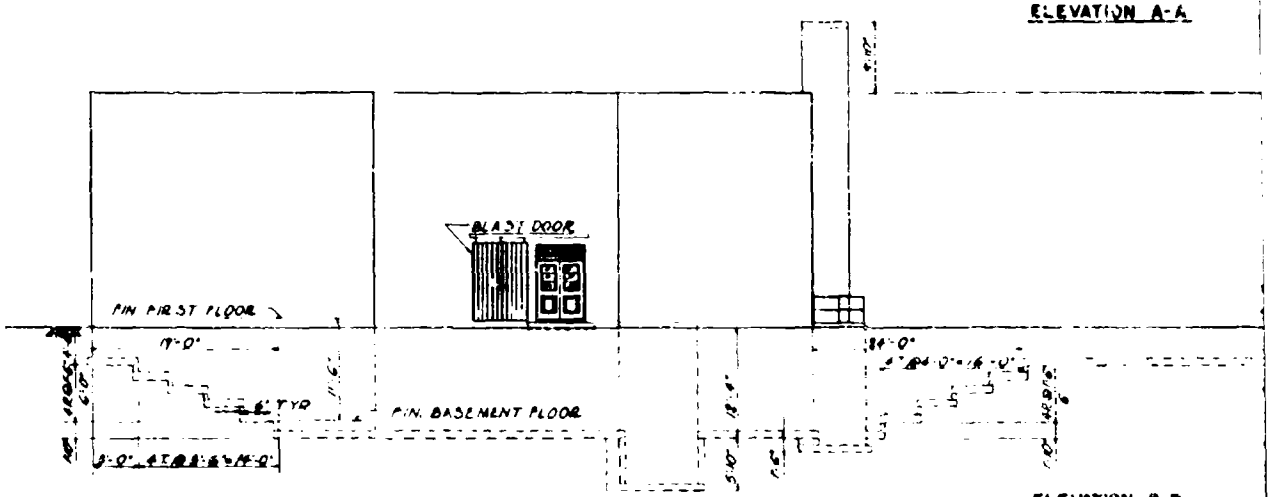
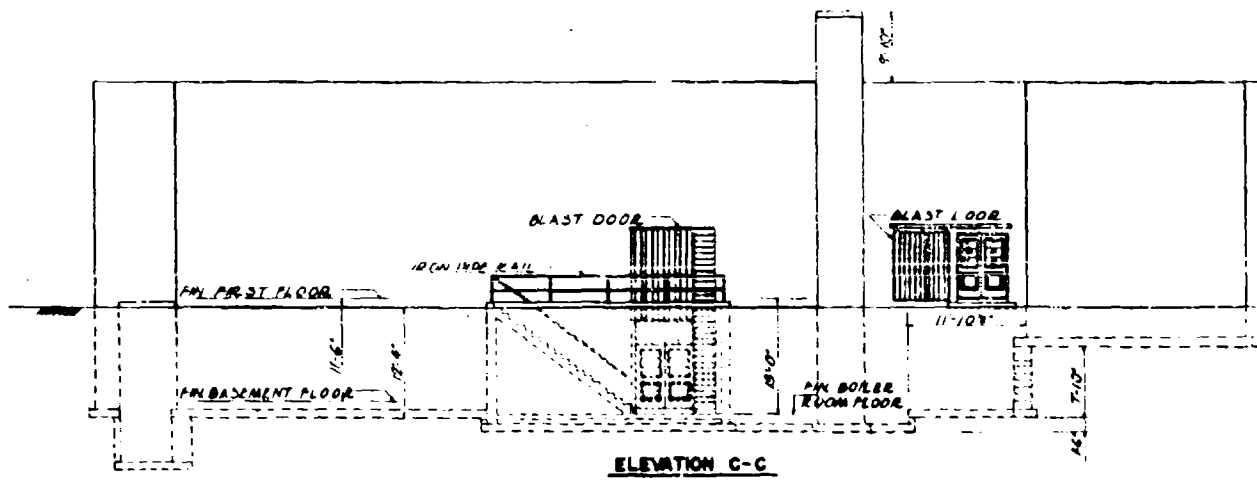


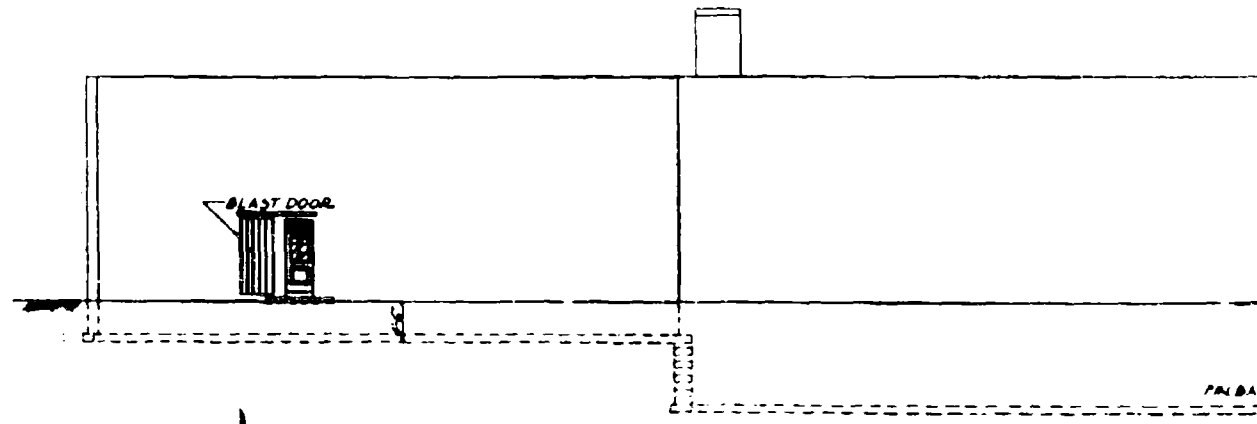
ELEVATION A-A



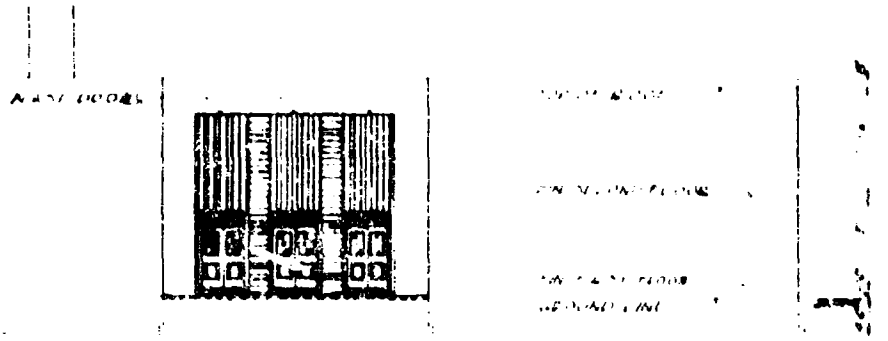
ELEVATION B-B



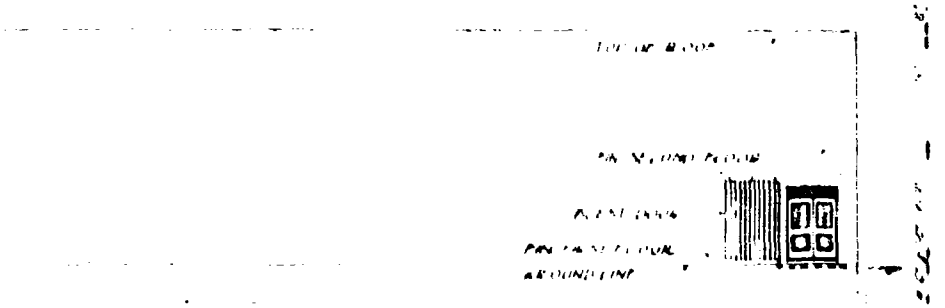
ELEVATION C-C



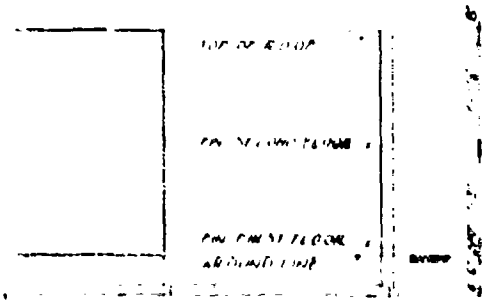
ELEVATION D-D

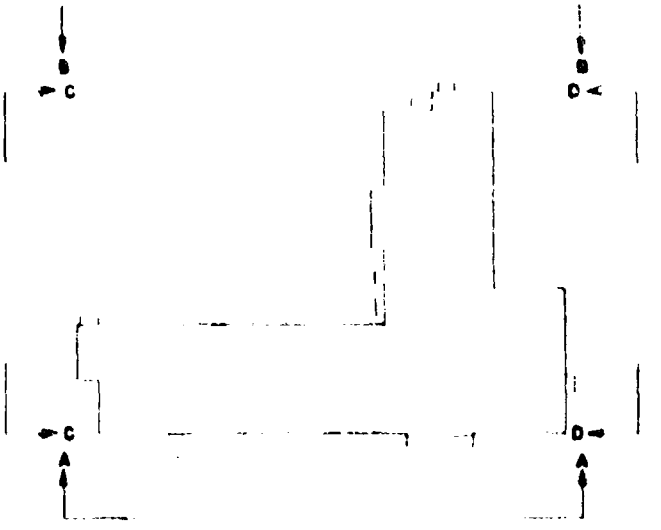


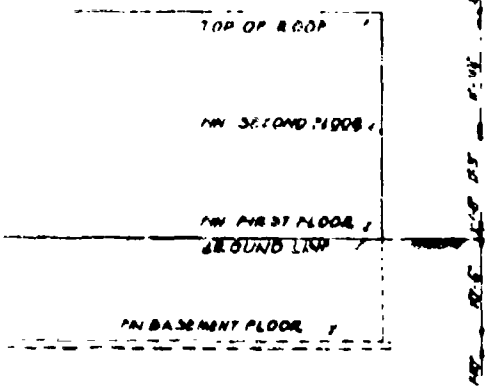
VATION A-A



VATION B-B







2

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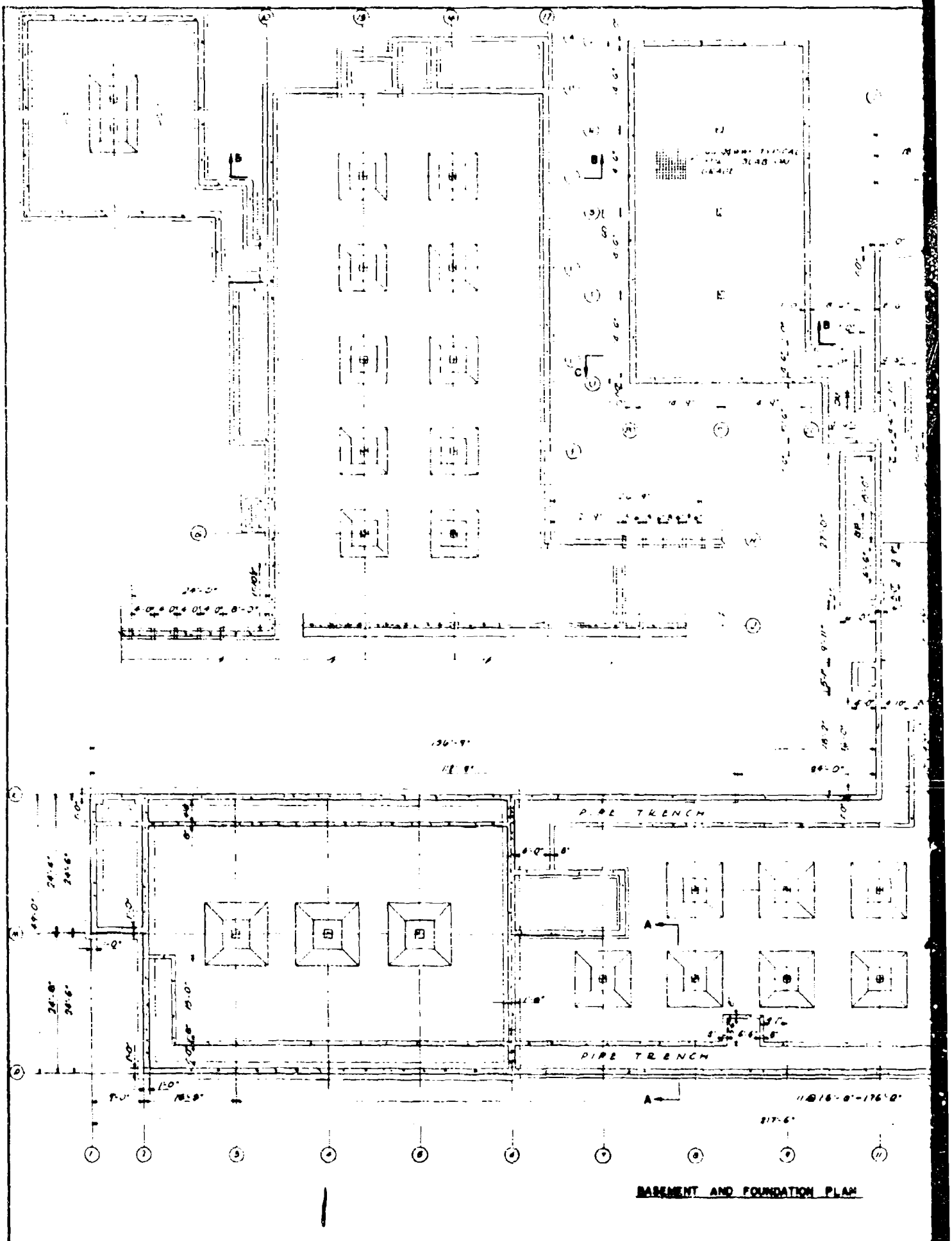
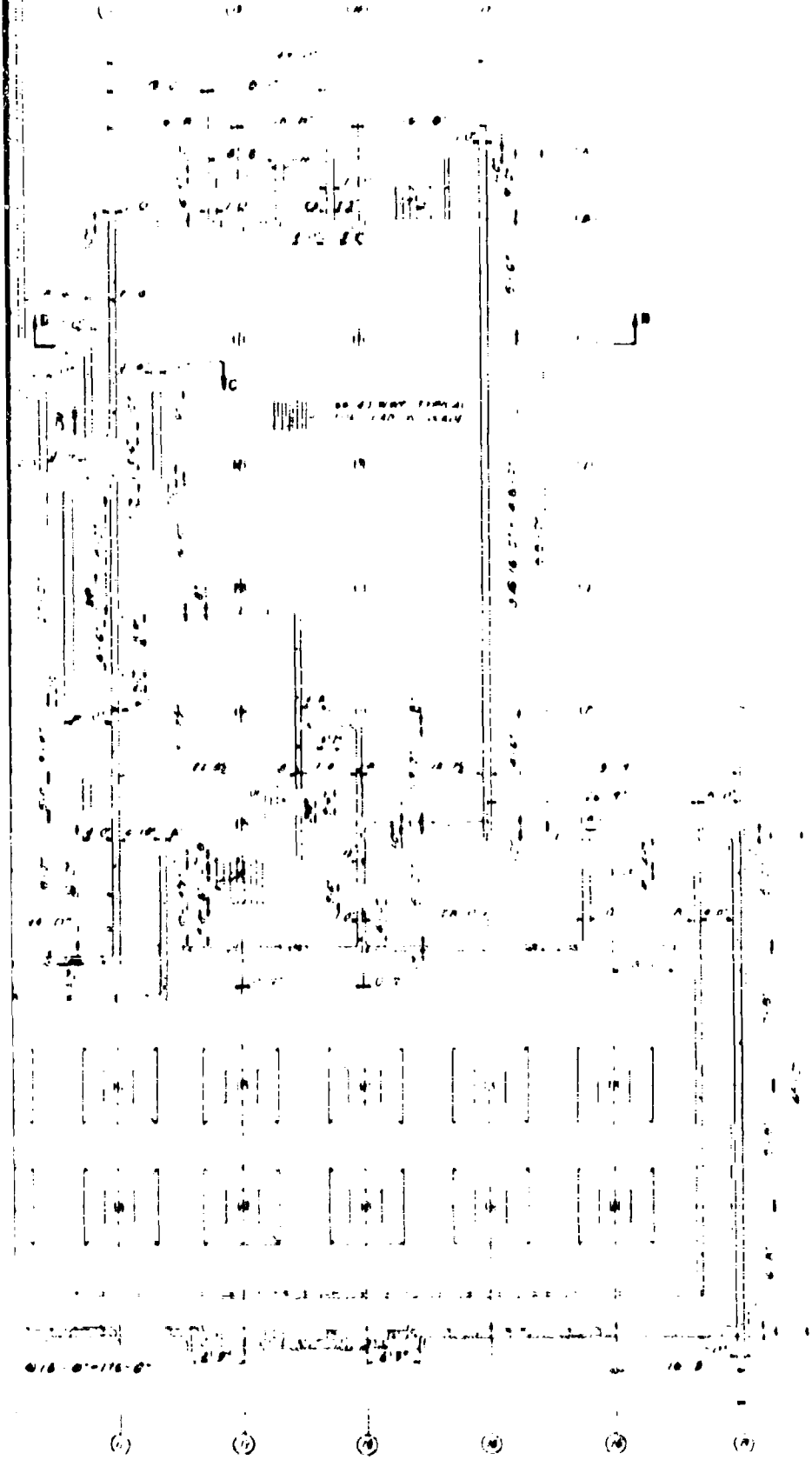
14



BASEMENT AND FOUNDATION PLAN



DN PLAN

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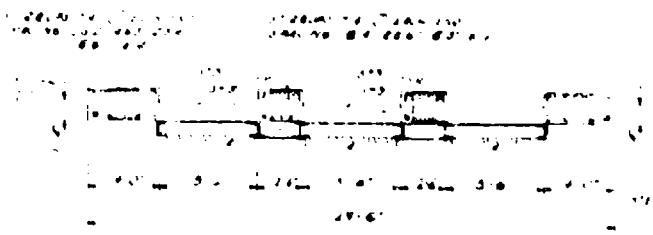
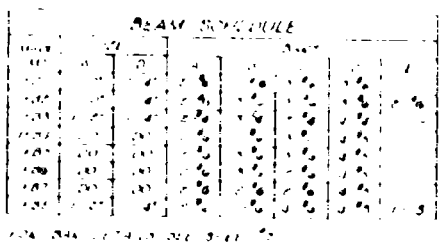
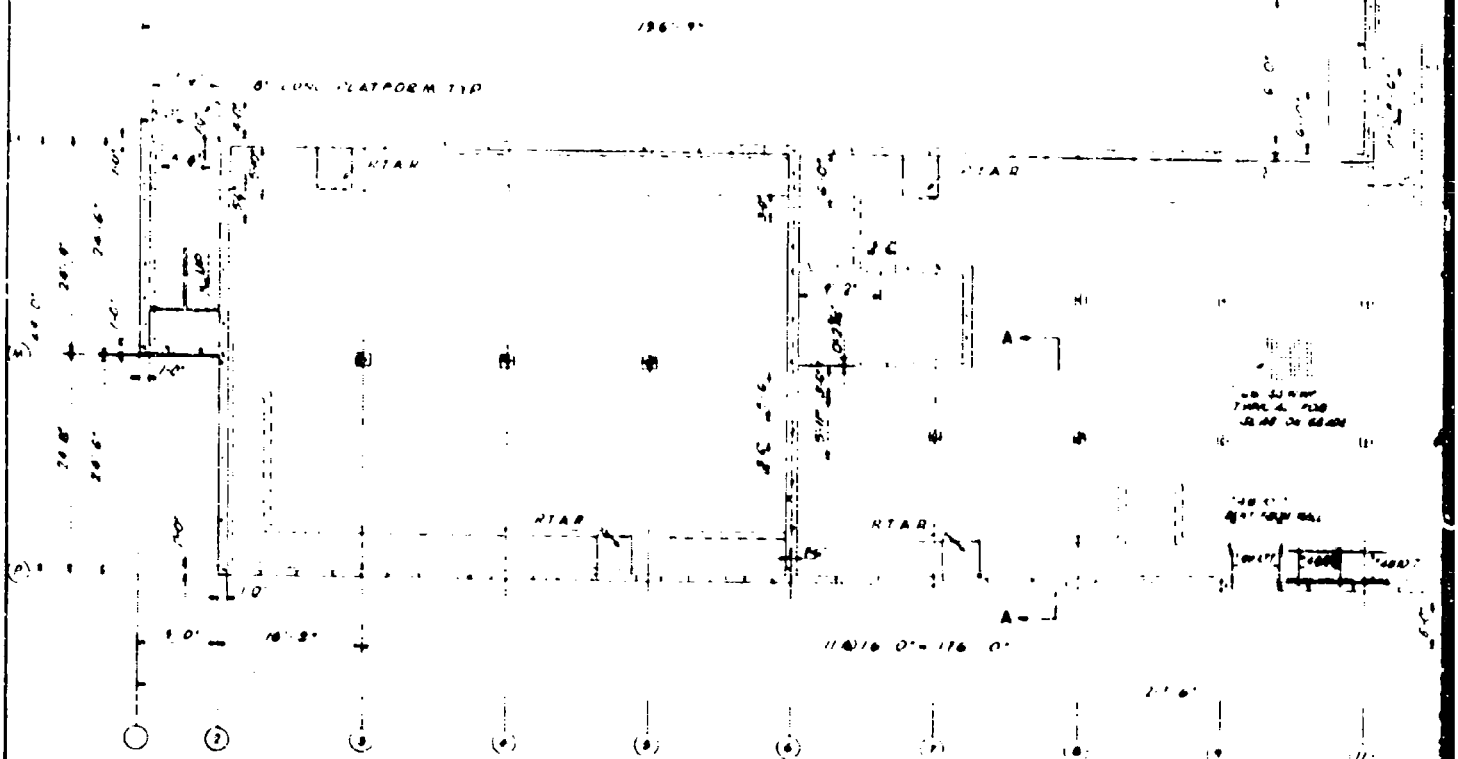
20 PSI BLAST RESISTANT



FRAMING DETAIL AT MAIN ENTRANCE

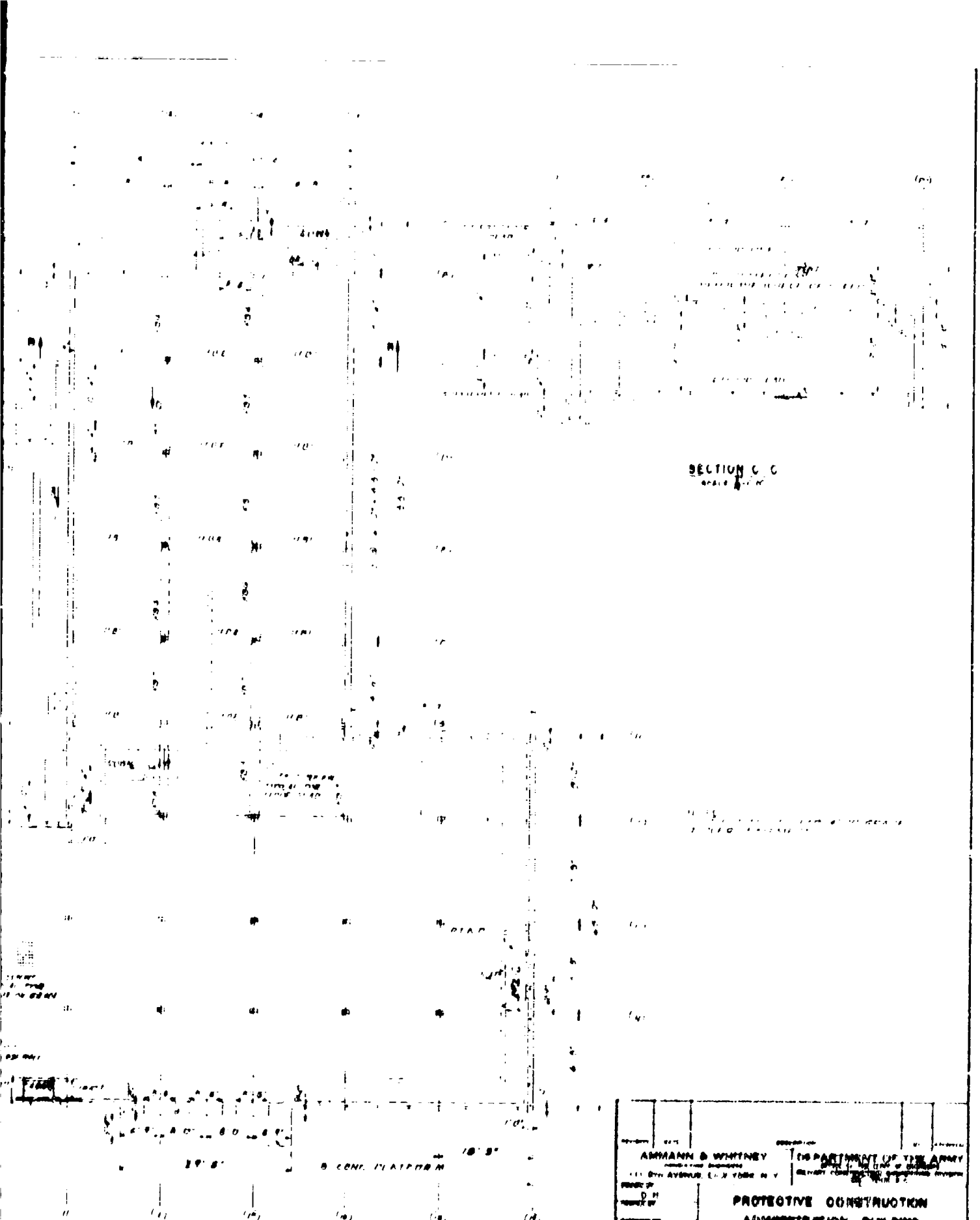
SCALE $\frac{1}{4}$" = 1'-0"





FIRST FLOOR AND SHELTER ROOF FRAMING PLAN

SCALE $\frac{1}{8}$" = 1'-0"



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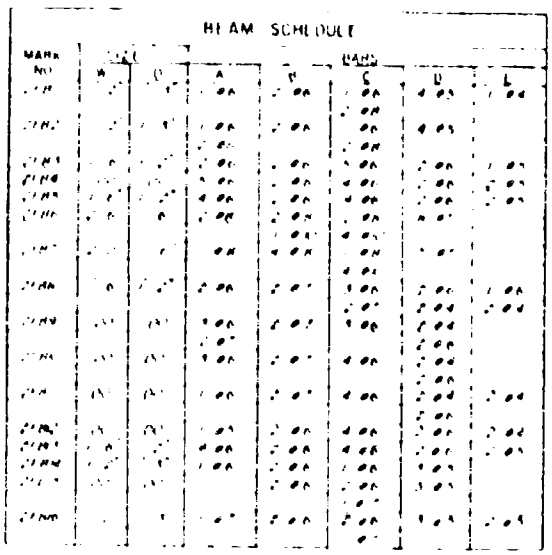
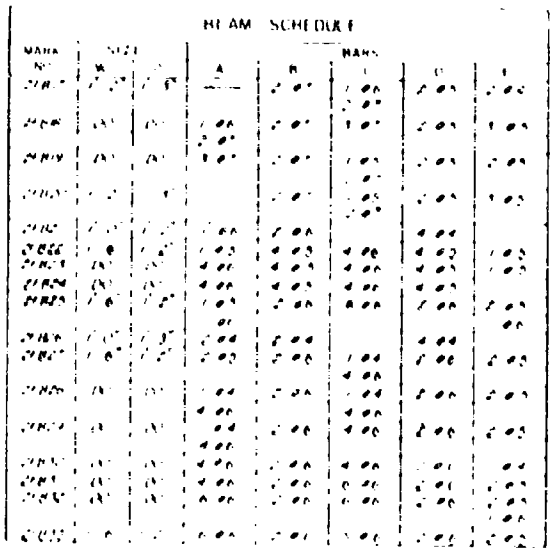
ADMINISTRATION BUILDING
20 PSI BLAST RESISTANT

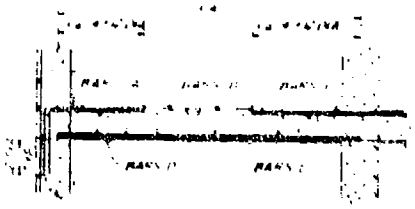
2

BEAM SCHEDULE

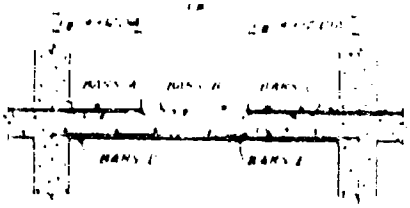


BEAM SCHEDULE



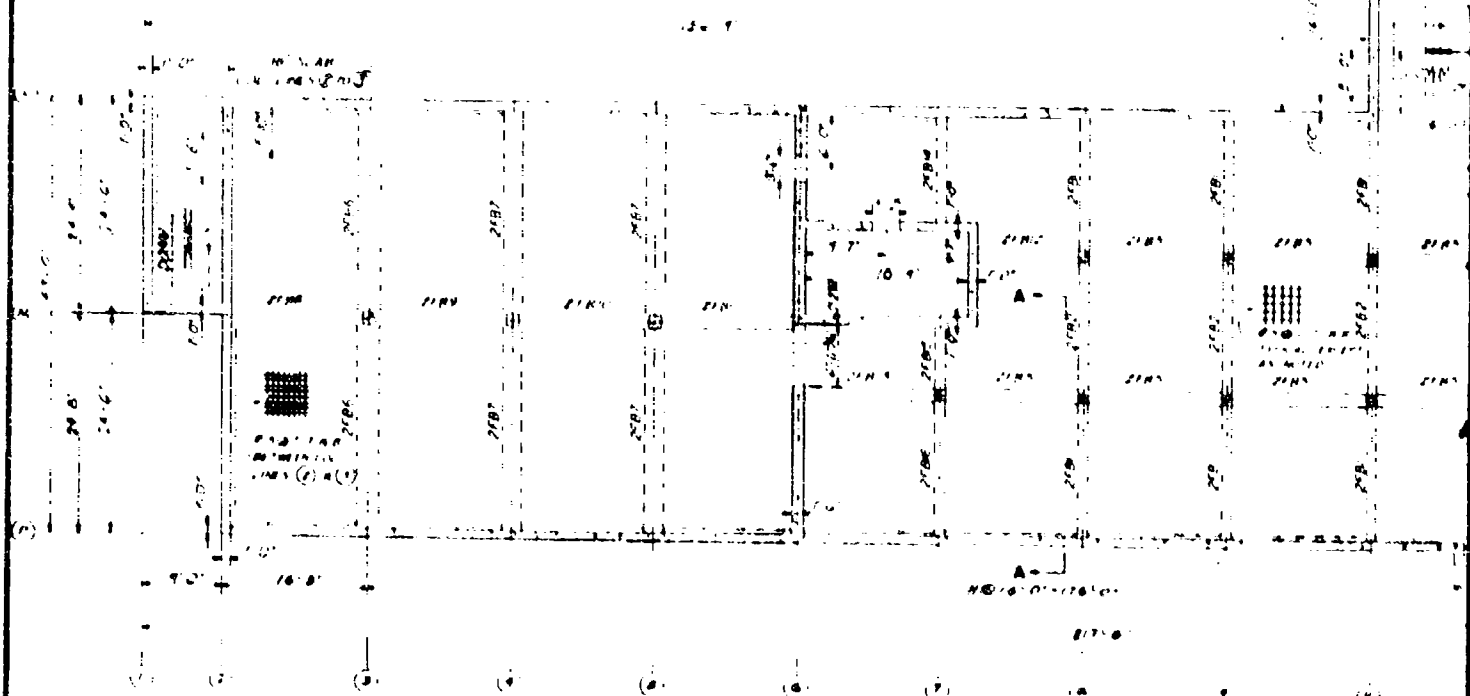


TYPICAL EXTERIOR BEAM DETAILS

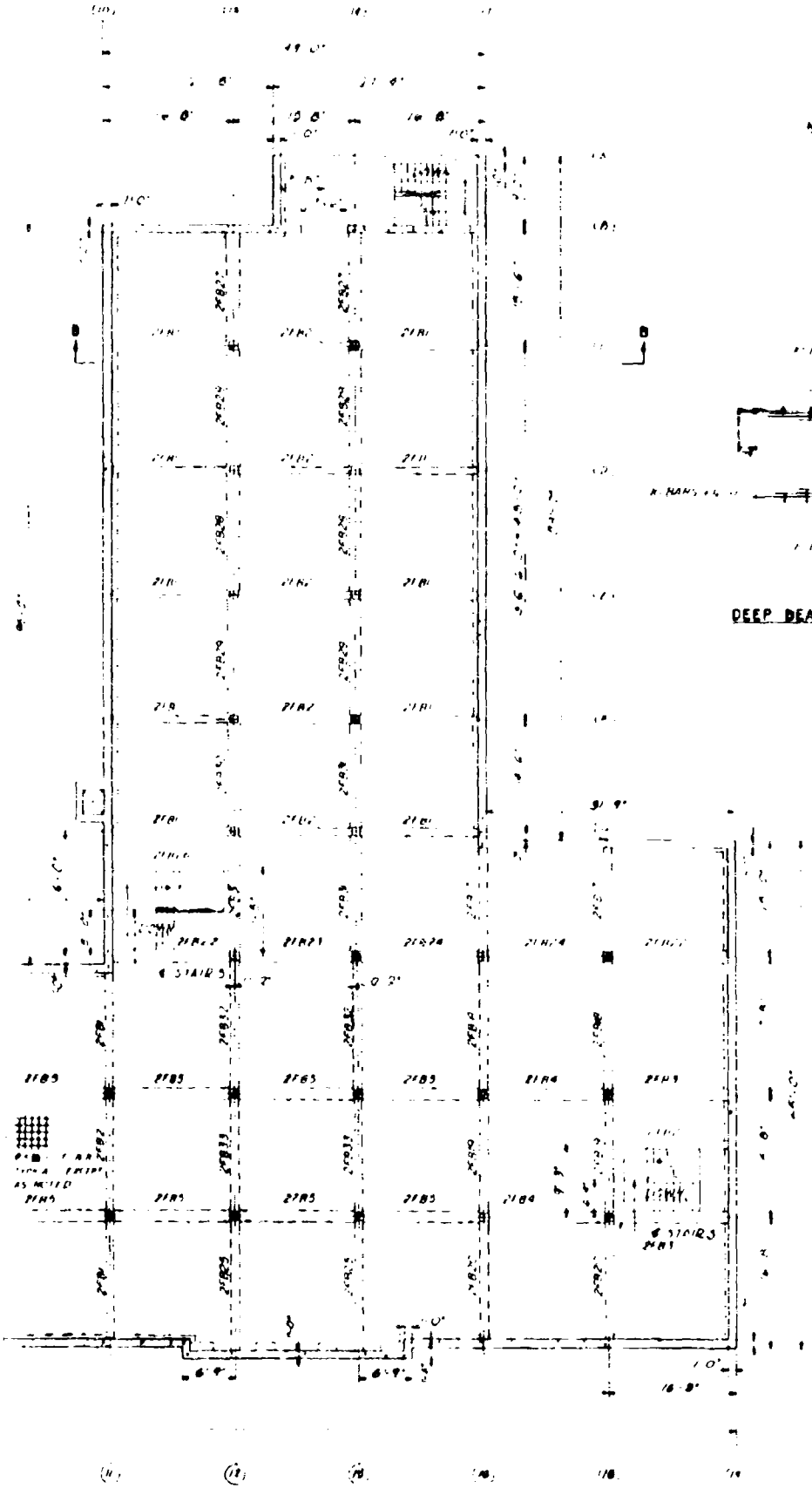


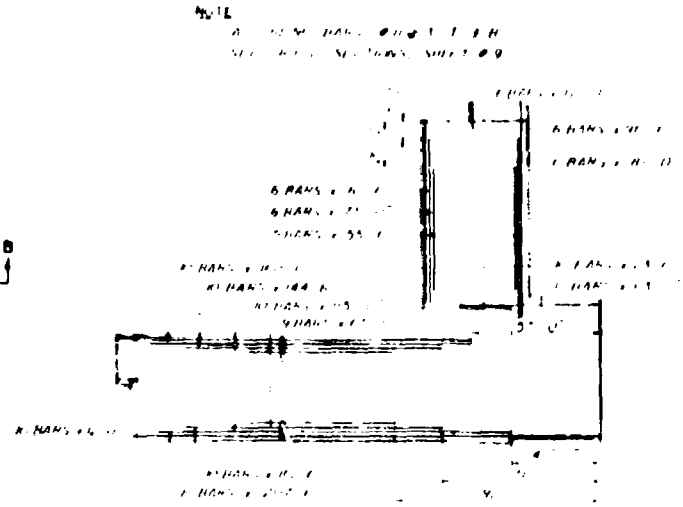
TYPICAL INTERIOR BEAM DETAILS

NOTE



SECOND FLOOR FRAMING PLAN





DEEP BEAM REINFORCEMENT — SECOND FLOOR

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20 PSI BLAST RESISTANT

DRAWING NUMBER
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SHEET 7 OF 9

2

BEAM SCHEDULE

MARK NO	SIZE W	SIZE D	BARS A	BARS B	BARS C	BARS D	BARS E	STIRRUPS AT WALL	STIRRUPS AT COL
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
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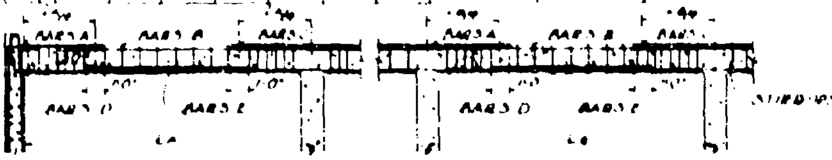
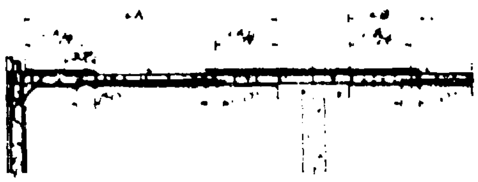


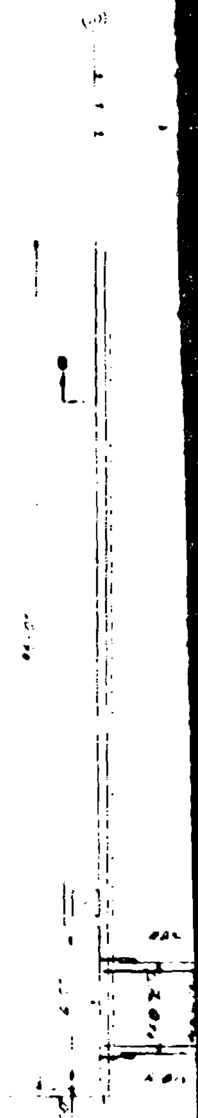
TYPICAL EXTERIOR BEAM DETAILS TYPICAL INTERIOR BEAM DETAILS

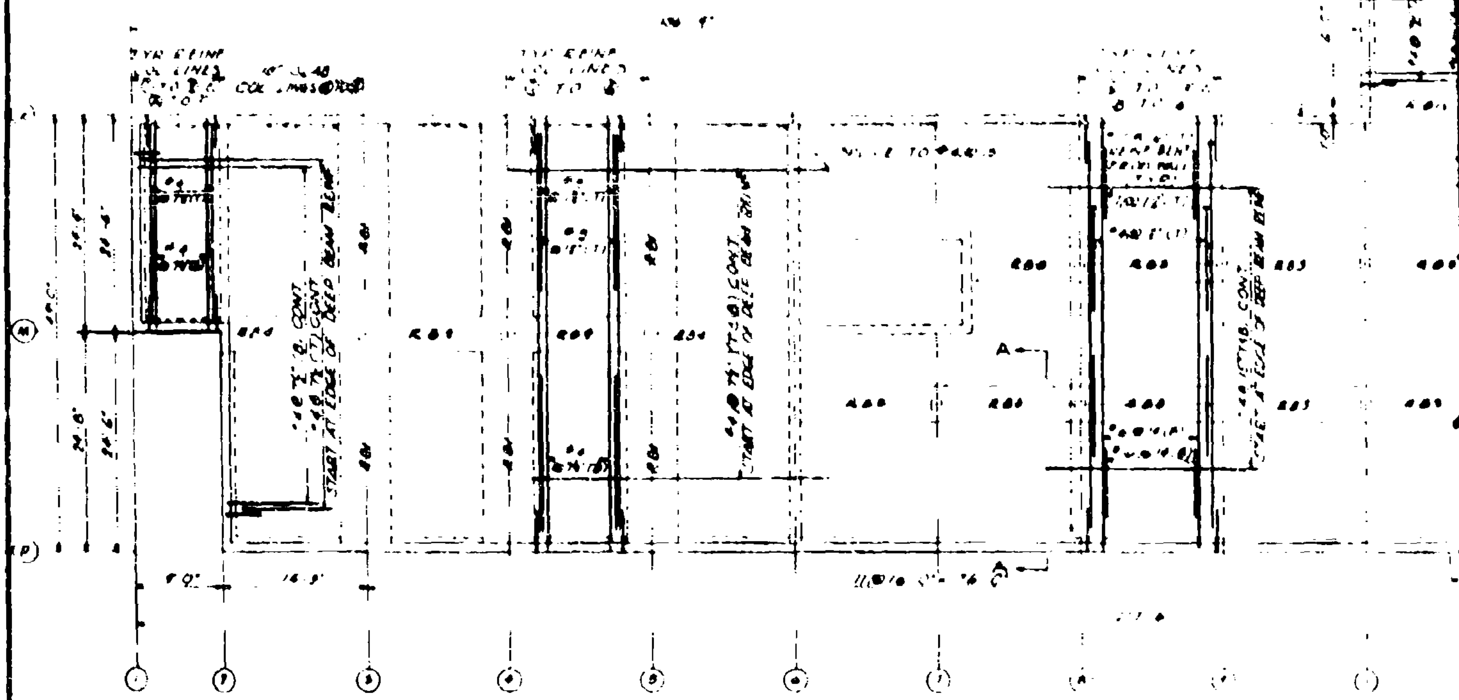


TYPICAL SLAB DETAILS

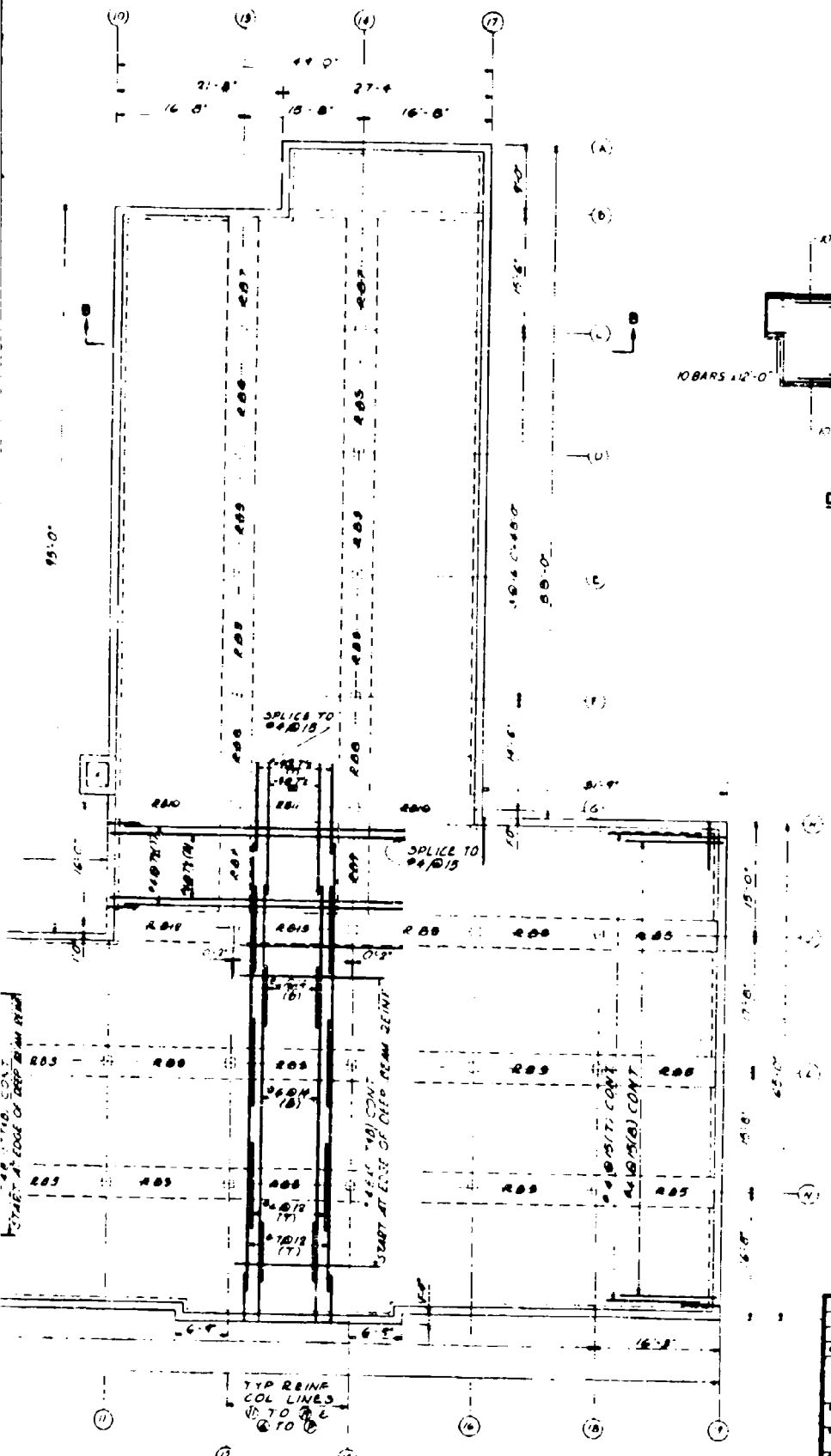
NOTES

1. FOR BEAMS & SLABS ALL REINF. [illegible]
2. FOR BEAMS ANY ALLOWABLE STIRRUPS [illegible]
3. FOR SLABS SUPPORTED ON THREE OR FOUR SIDES USE [illegible] FOR THE SHORT SPAN
4. [illegible] PLAN OF SHELTER SHEET [illegible]



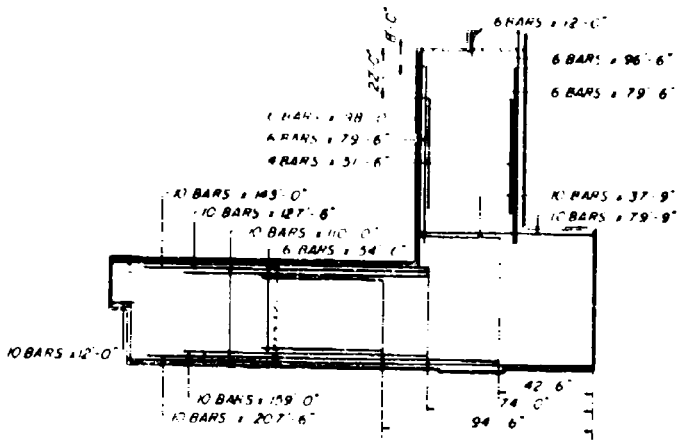


ROOF FRAMING PLAN



PLAN

NOTE
ALL REINF BARS #11@ 3" T & B
SEE CROSS-SECTIONS, SHEET #9



DEEP BEAM REINFORCEMENT — ROOF

NOTE: ROOF SLAB 11" EXCEPT AS NOTED

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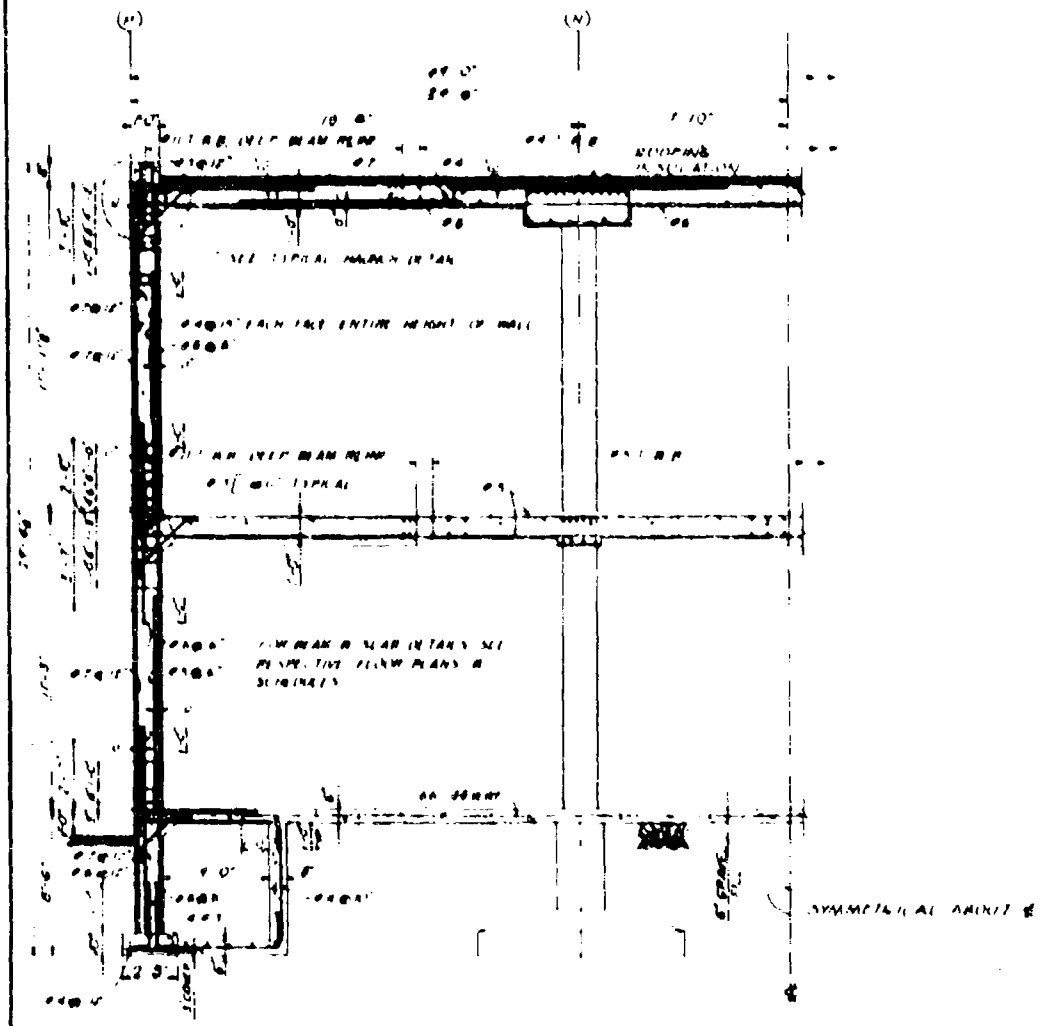
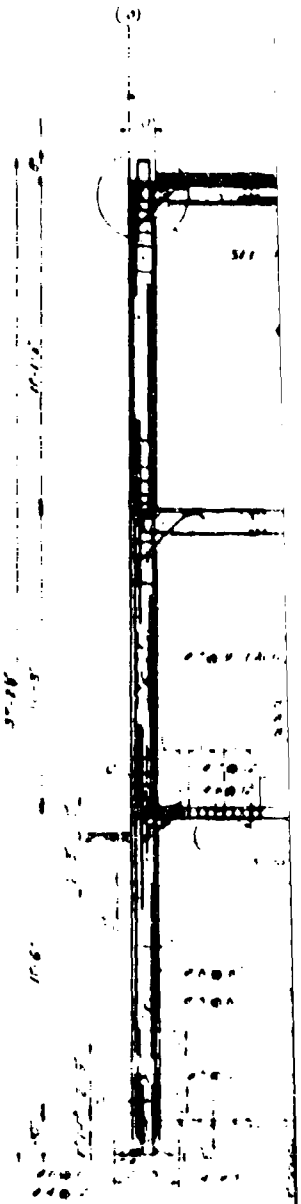
2



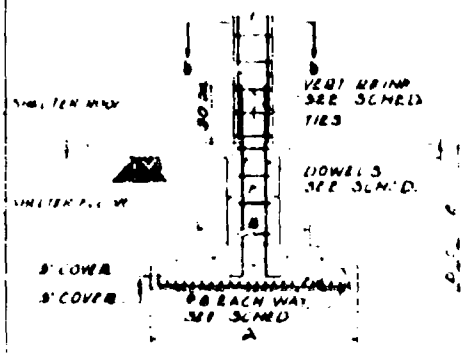
SECTION A–A

SCALE 1/4"=1'-0"

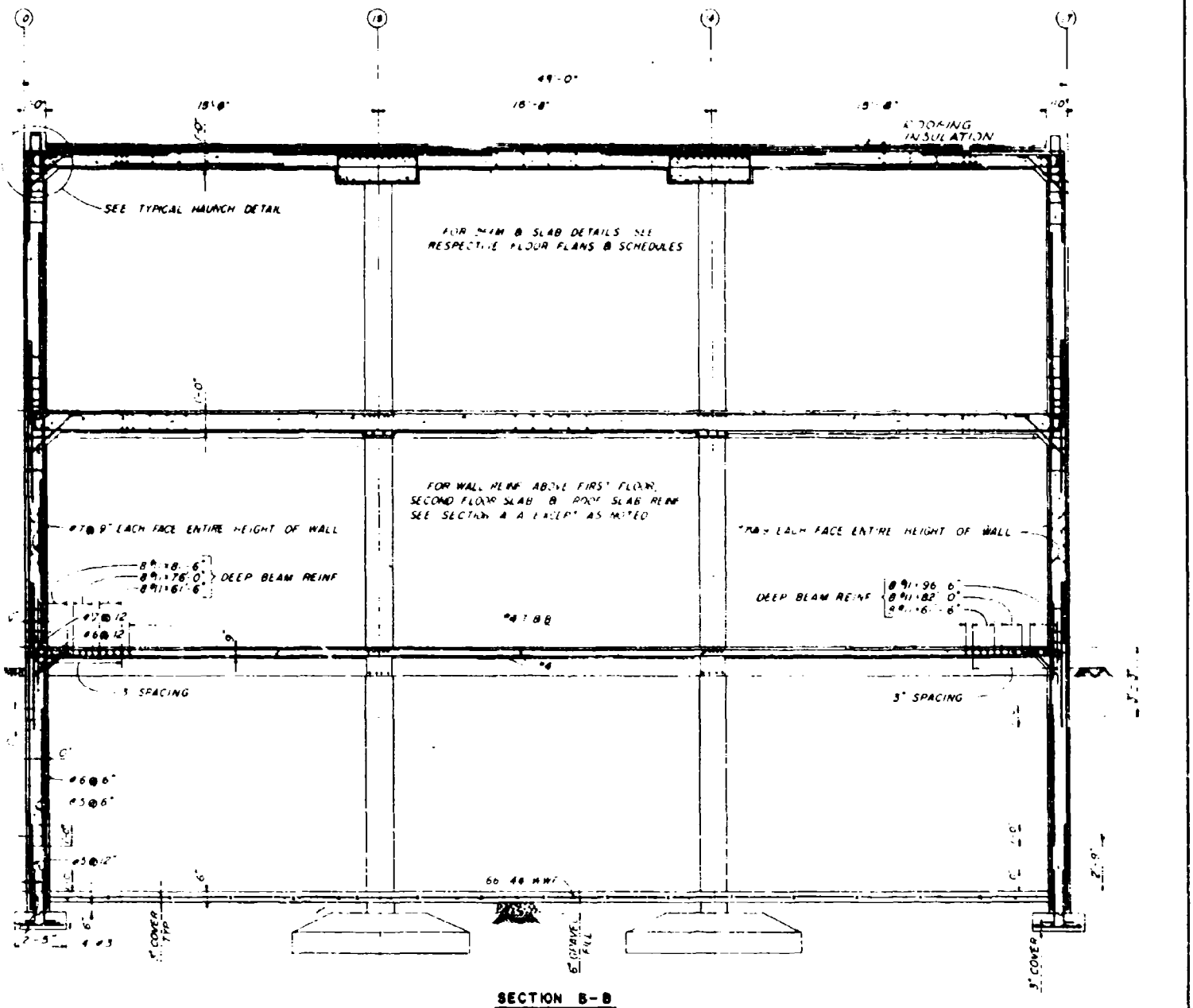


COLUMN & COLUMN FOOTING SCHEDULE

MARK NO.							
ROOF							
SIZE VERT REINF							
2ND FL.							
SIZE VERT REINF							
1ST FL.							
SIZE VERT REINF							
BASEMENT FL.						BOILER RM FLOOR	
DOWELS							
FOOTINGS A							
FOOTINGS B							
FOOTINGS C							
FOOTINGS D							
FOOTINGS E							
REINF EACH WAY							



TYPICAL COLUMN FOOTING



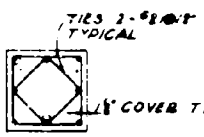
SECTION B-B

SCALE: 1/4"=1'-0"

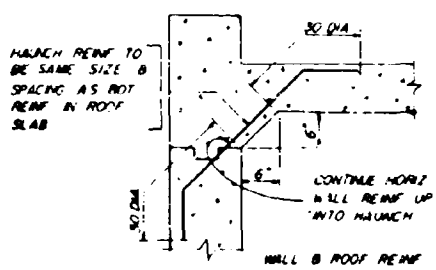
NOTE

CONCRETE COVER TO REINFORCING BARS IS AS FOLLOWS EXCEPT AS NOTED

BEAMS	1½"
FLOOR SLABS	¾"
EXTERIOR WALLS	2" OUTSIDE FACE ¾" INSIDE FACE
INTERIOR WALLS	¾"



SECTION b-b

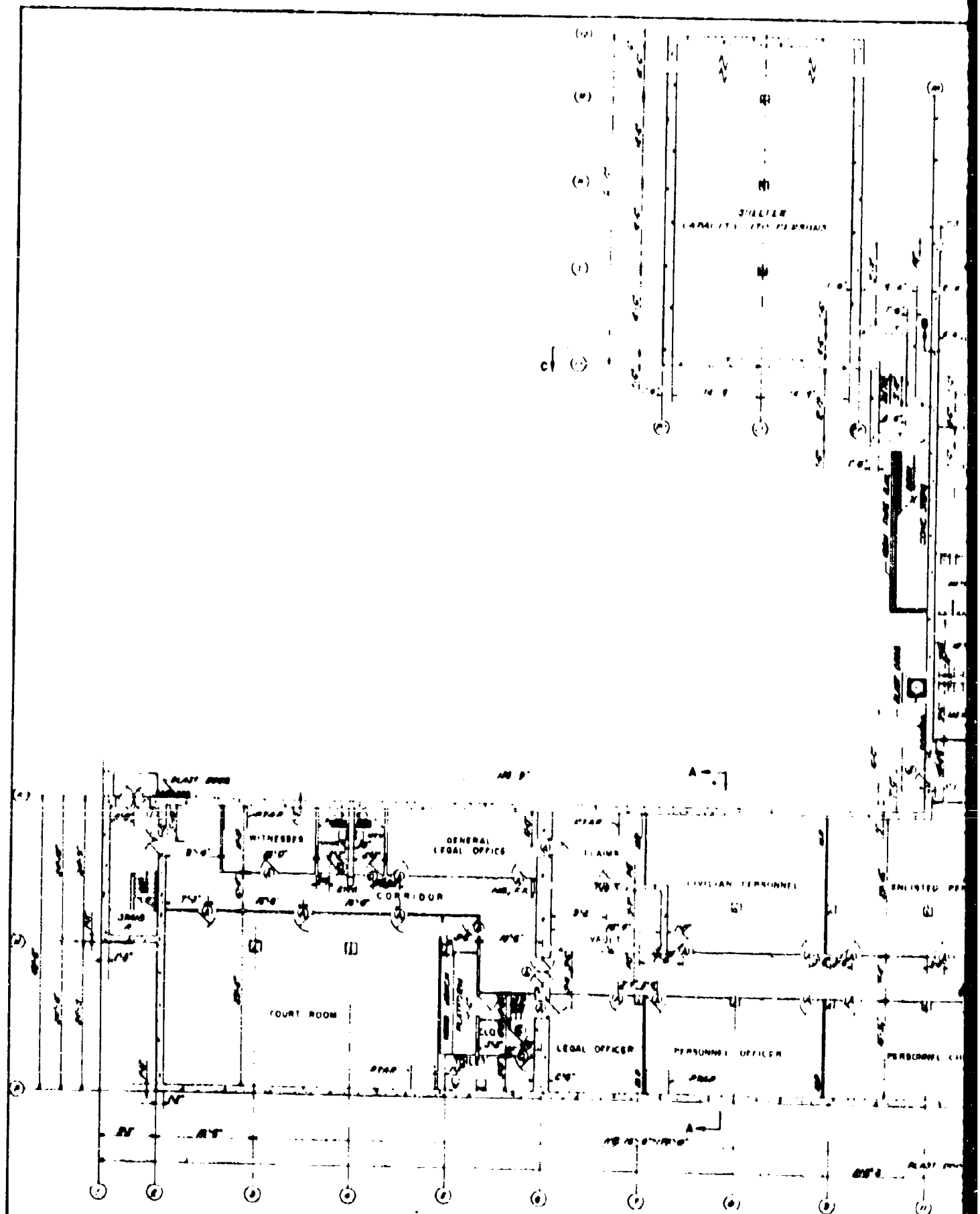


TYPICAL HAUNCH DETAIL

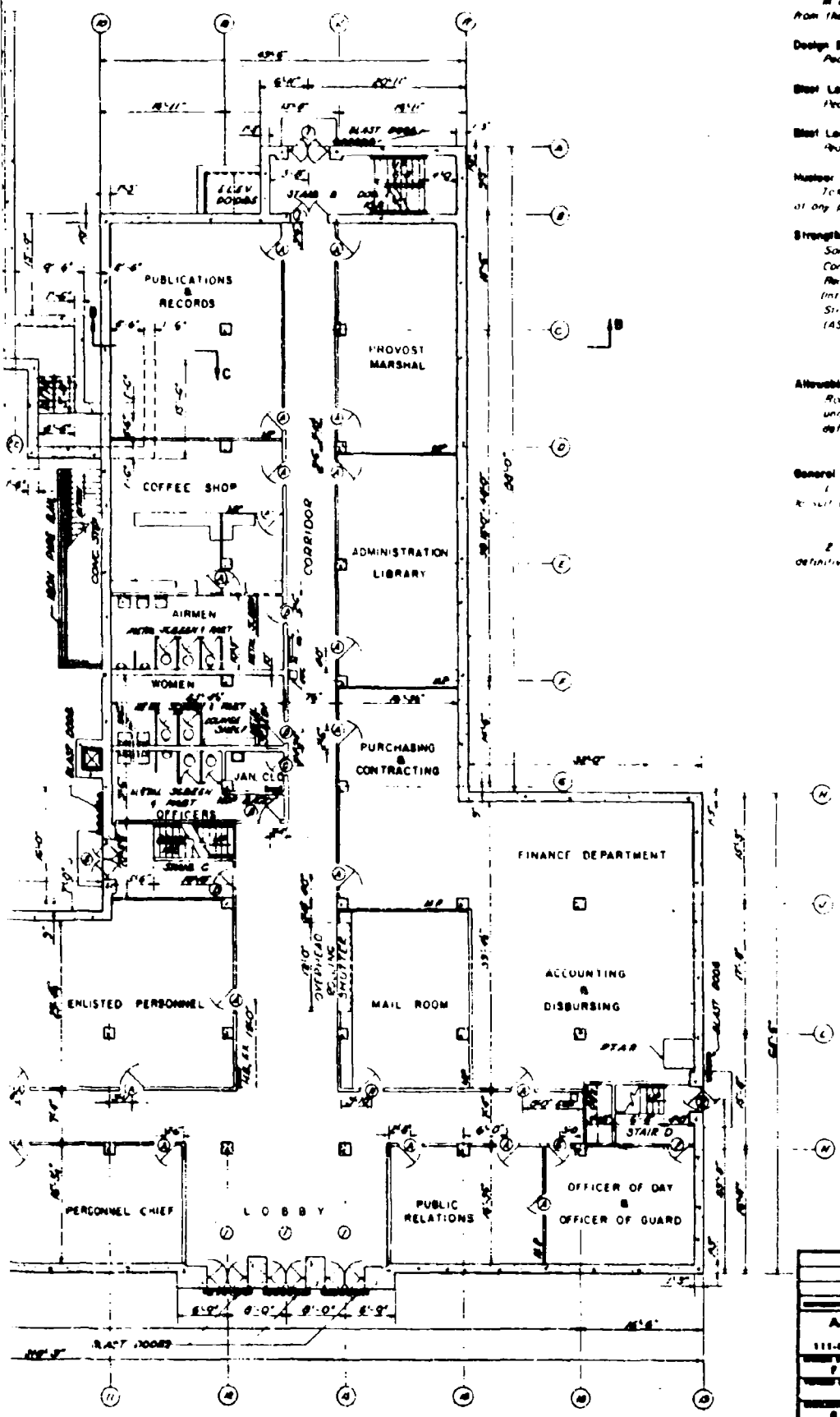
SCALE: 1"=1'-0"

AMMANN & WHITNEY CONSULTING ENGINEERS 111 8TH AVENUE NEW YORK, N.Y.	DEPARTMENT OF THE ARMY OFFICE OF THE CHIEF OF ENGINEERS MILITARY CONSTRUCTION ENGINEERING DIVISION WASHINGTON D.C.
DESIGNED BY D.H. J.S.	PROTECTIVE CONSTRUCTION ADMINISTRATION BUILDING 20 PSI BLAST RESISTANT
DRAWN BY G.P.	
APPROVED	
DATE 8-4-1958	SCALE AS NOTED
	DRAWING NUMBER 60-16-01
	SHEET 9 OF 9

2



FIRST FLOOR AND SHELTER PLAN



ER PLAN

DESIGN CONDITIONS

Design Procedure
In accordance with OCE manual, "Design of Structures for Protection from the Effects of Atomic Weapons"

Design Blast Wave
Peak incident pressure = 30psi, Duration = 1.05 sec

Blast Loading on Roof
Peak pressure = 30psi, Duration = 1.05 sec

Blast Loading on Walls
Peak pressure = 100psi, Duration = 1.05 sec

Maximum Radiation Protection for Shelter Area
Total gamma and neutron attenuated to 5r/hr for a 20KT weapon at any position which will produce a peak blast pressure equal to 30psi.

Strength of Materials

	Static	Blast Design
Soil bearing capacity	8,000psf *	16,000psf
Concrete, f'c	4,000psi	5,800psi
Reinf. steel, lower yield (Int Grade, ASTM A305 50T)	47,000psi	52,000psi
Structural steel, lower yield (ASTM A7 50)	38,000psi	41,600psi

* rated capacity of soil

Allowable Stresses and Deflections
Roof, walls, columns and footings designed for plastic deformation under design blast load. Blast doors designed for maximum elastic deformation under design blast load.

General Notes
1. The following features are not shown and shall be determined to suit use requirements:
Mechanical and electrical equipment
Air locks and decontamination facilities
2. This design study is based upon Dept of the Air Force definitive Drawing No 30-06-08, Westover AFB Drawing No 30-02-08

ABBREVIATIONS

CLO	CLOSET
CONC	CONCRETE
ELEV	ELEVATOR
EWC	ELECTRIC WATER COOLER
FIN	FINISHED
FX	FIRE EXTINGUISHER
HR	HOSE RACK
MP	MOVABLE PARTITION
PART	PARTITION
PTAP	PIPE TRENCH ACCESS PANEL
R	RISERS

MATERIAL LEGEND

CONCRETE
WOOD STUD PARTITION
MOVABLE PARTITION

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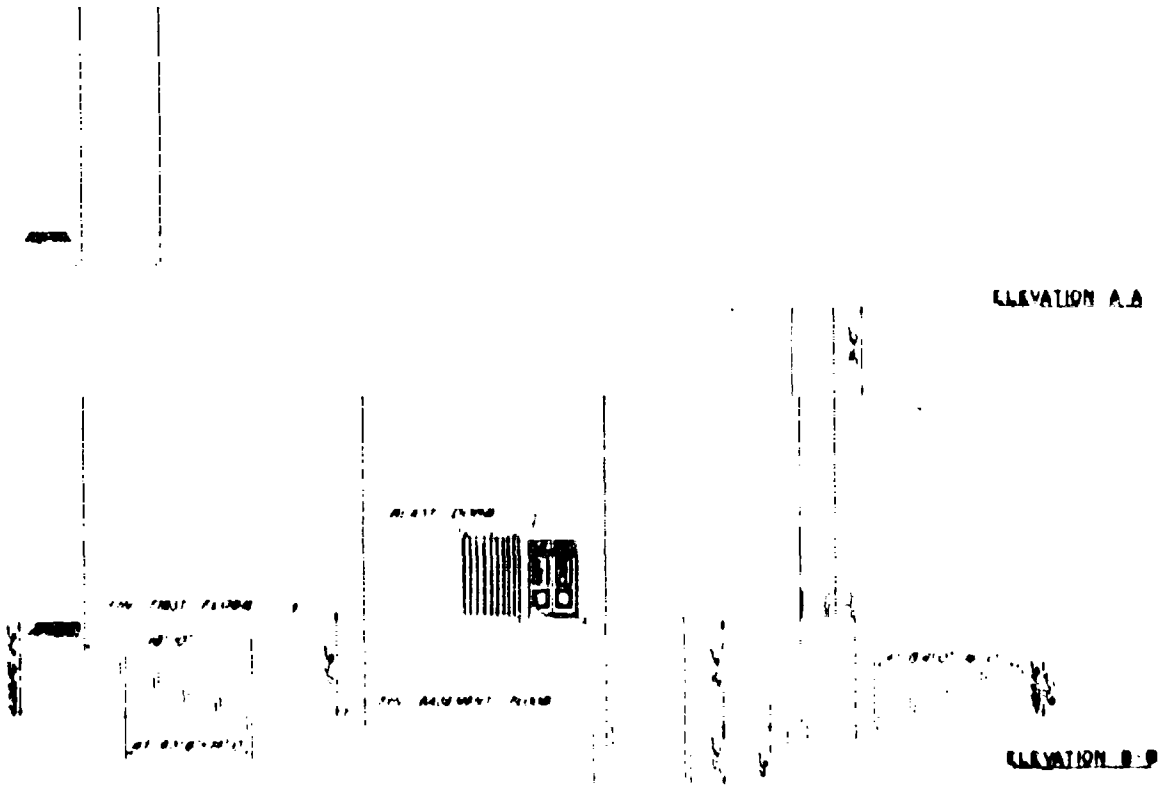
DEPARTMENT OF THE AIR FORCE

PROTECTIVE CONSTRUCTION
ADMINISTRATION BUILDING
30 PSI BLAST RESISTANT

60-16-01
SHEET 1 OF 3

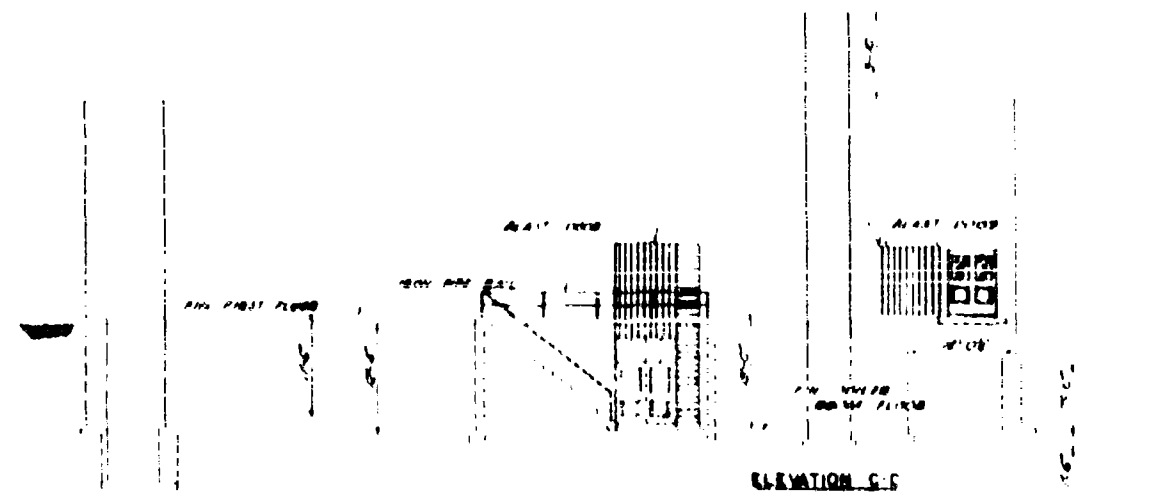
2

30

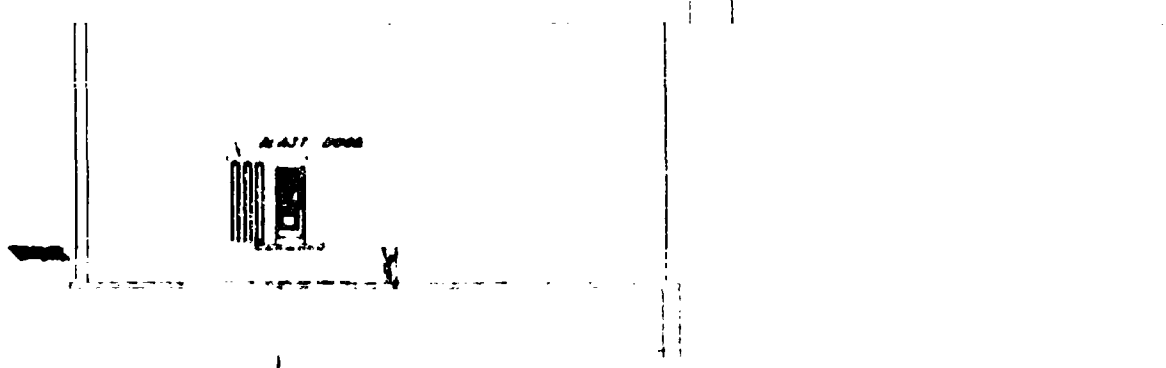


ELEVATION A-A

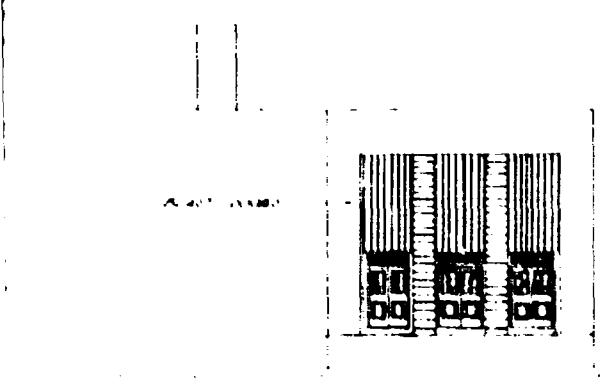
ELEVATION B-B



ELEVATION C-C



ELEVATION D-D



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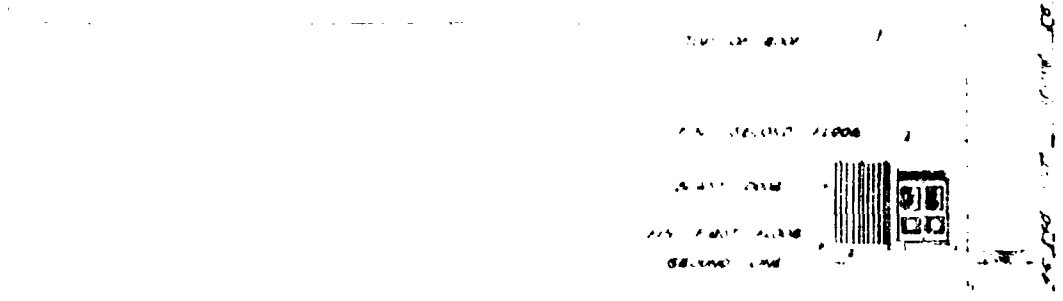
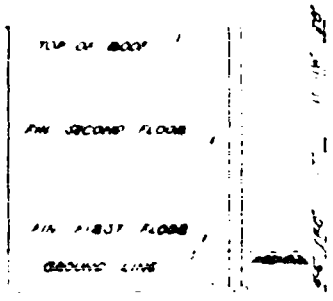
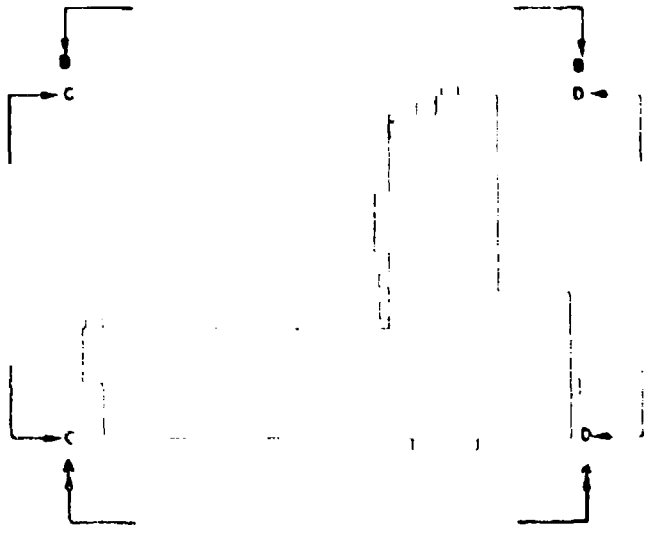
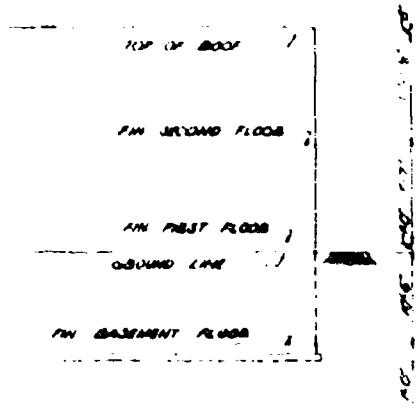


ION B-B







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50 PSI BLAST RESISTANT

60-16-01

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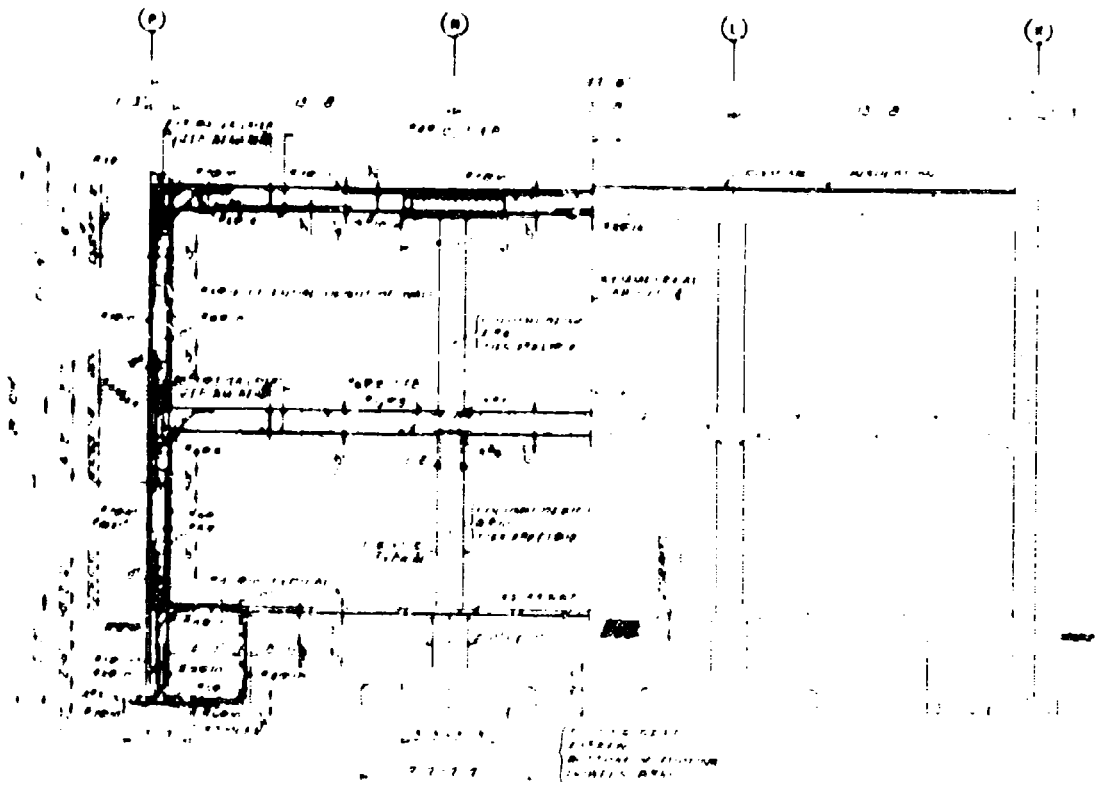
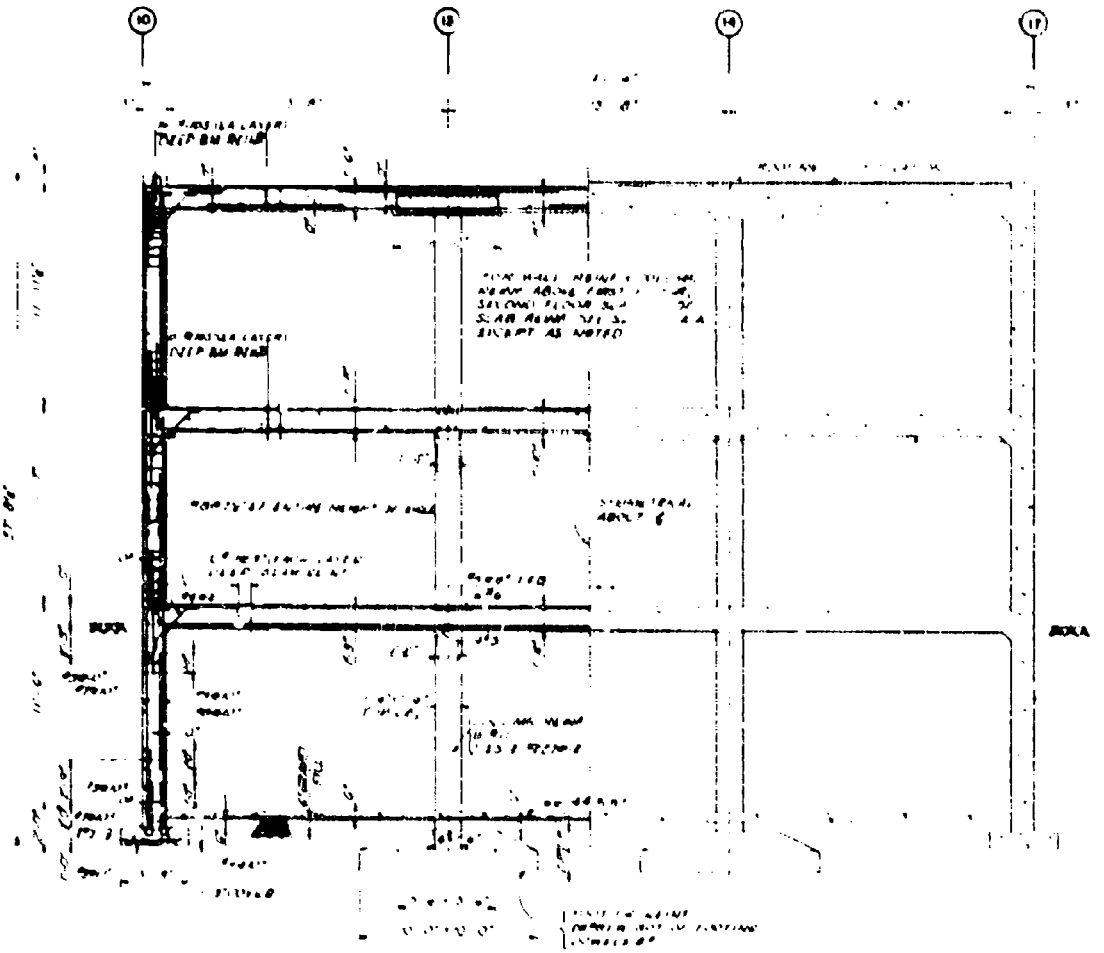


SECTION A-A

SECTION C-C



SECTION B-B

NOTE -

CONCRETE COVER TO REINFORCING BARS IS AS FOLLOWS EXCEPT AS NOTED

BEAMS	2"
FLOOR SLABS	1"
EXTERIOR WALLS	2" OUTSIDE FACE
	1" INSIDE FACE
INTERIOR WALLS	1"

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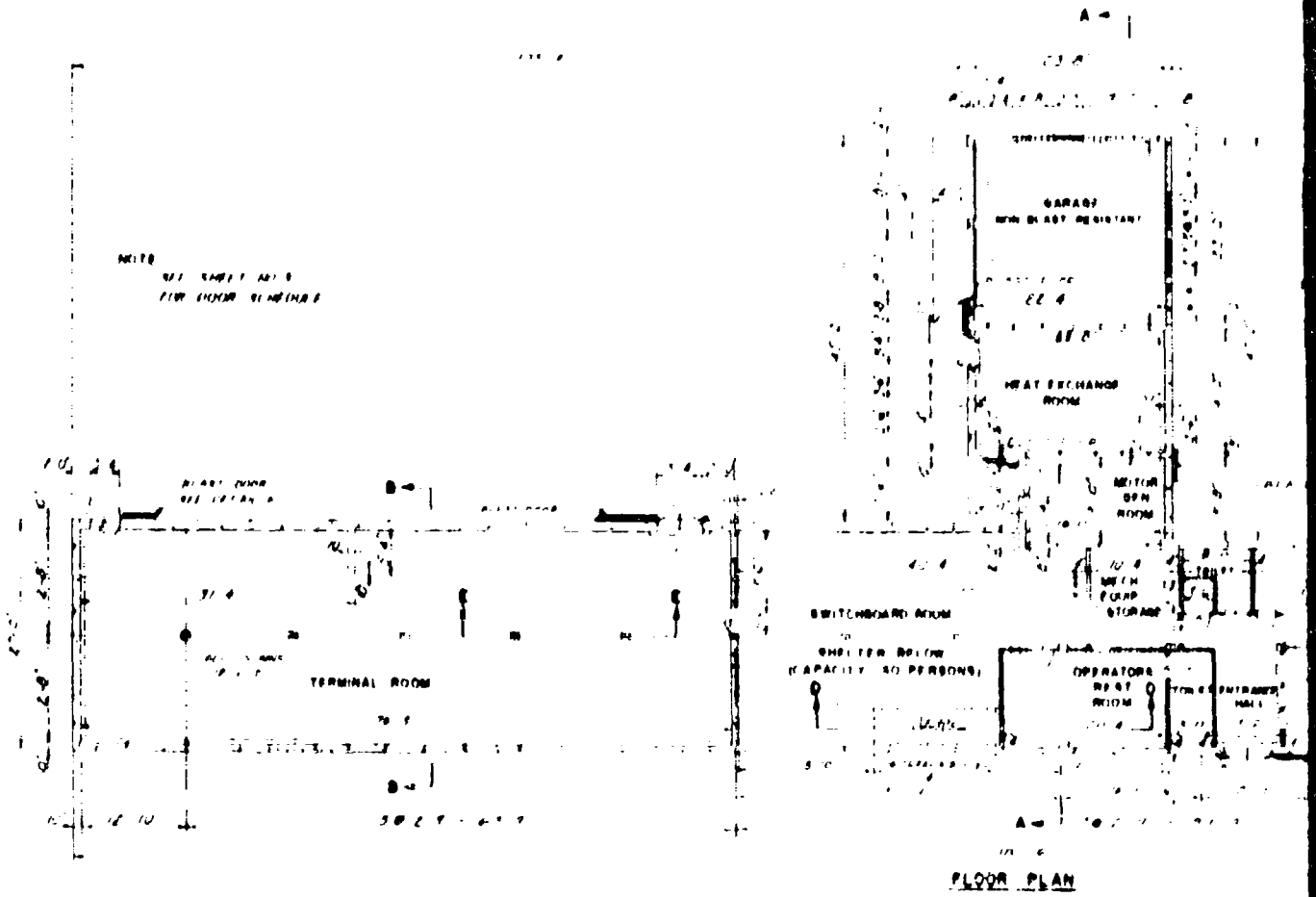
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON D C

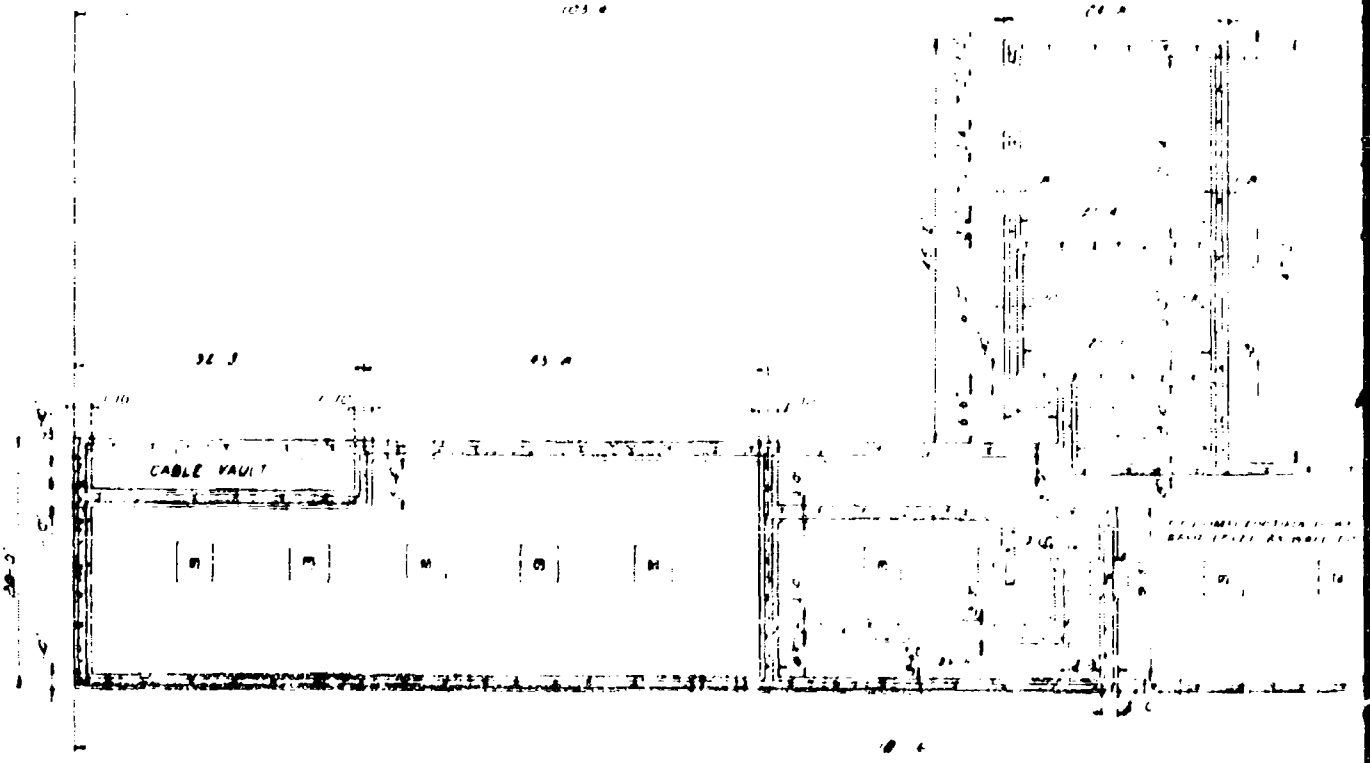
PROTECTIVE CONSTRUCTION
ADMINISTRATION BUILDING
30 PSI BLAST RESISTANT

DRAWING NUMBER
60-16-01
SHEET 3 OF 3

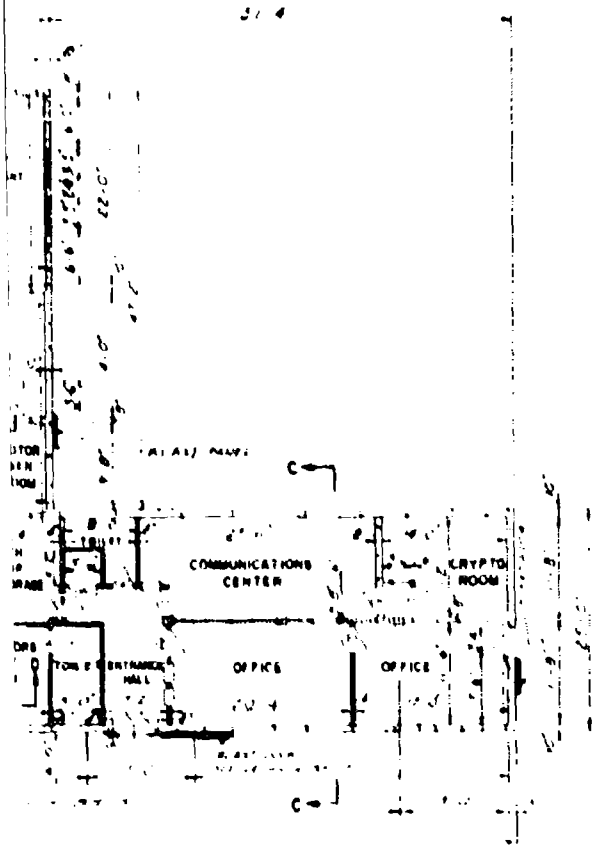
2



FLOOR PLAN



FOUNDATION PLAN



DESIGN CONDITIONS

Design Procedure

Design Blast Wave

Blast Loading on Roof

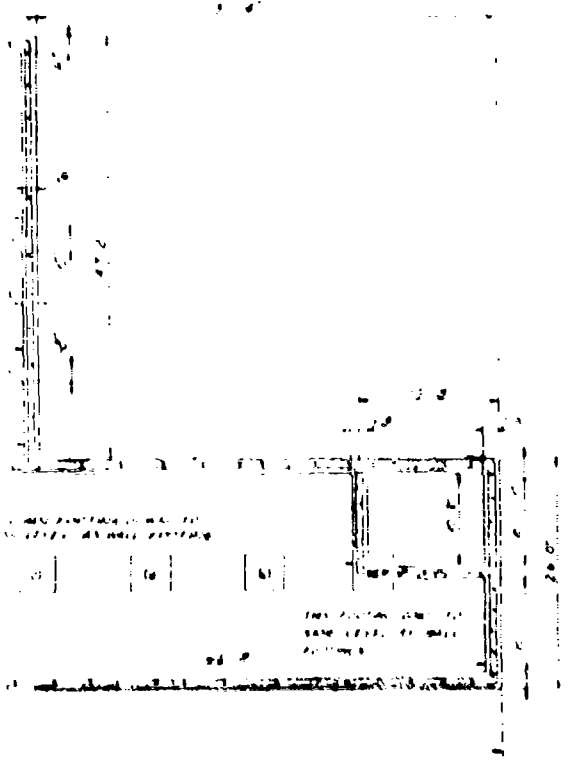
Blast Loading on Walls

Nuclear Radiation Protection for Shelter Area

Strength of Materials	Shells	Steel Design

Allowable Stresses and Deflections

General Notes



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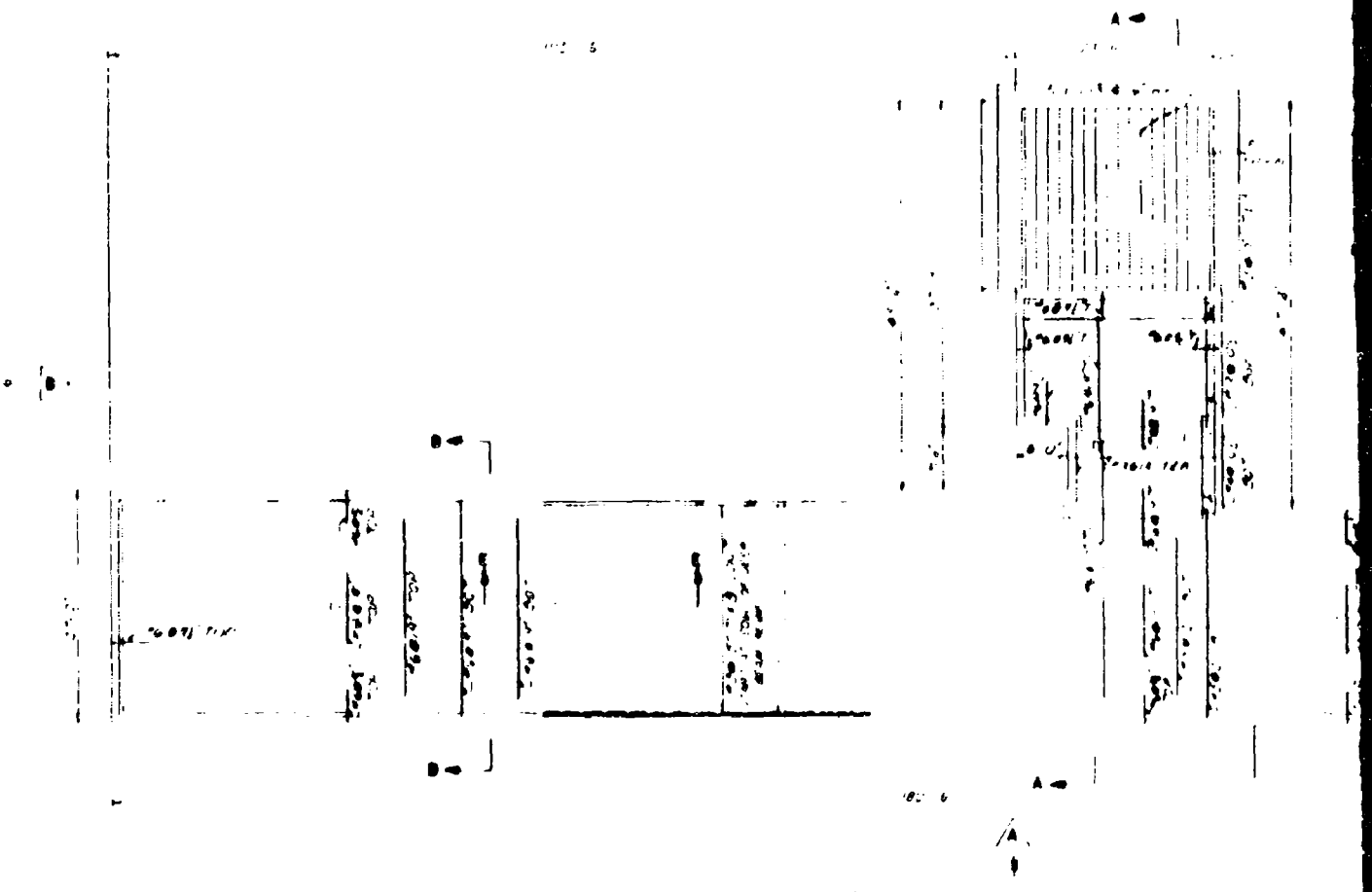
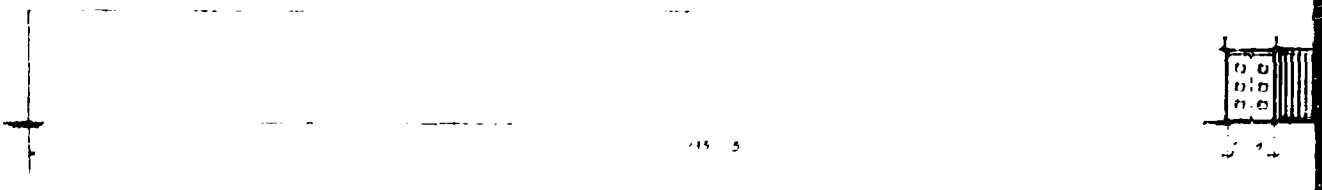
PROTECTIVE CONSTRUCTION
COMMUNICATIONS BUILDING
10 PSI BLAST RESISTANT

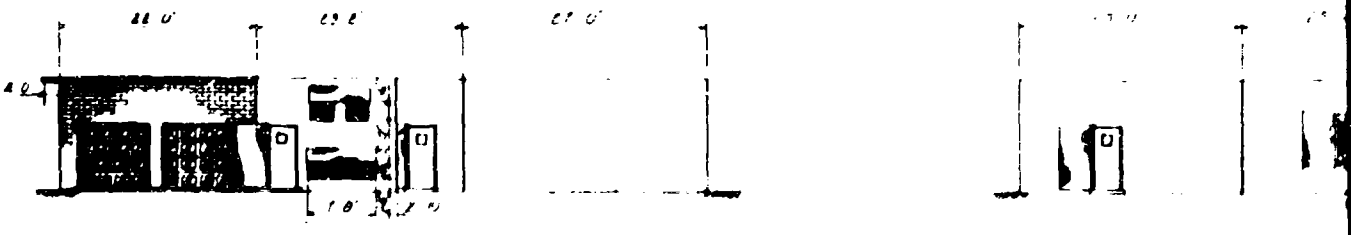
23



ROOF PLAN
SCALE 1/4" = 1'-0"

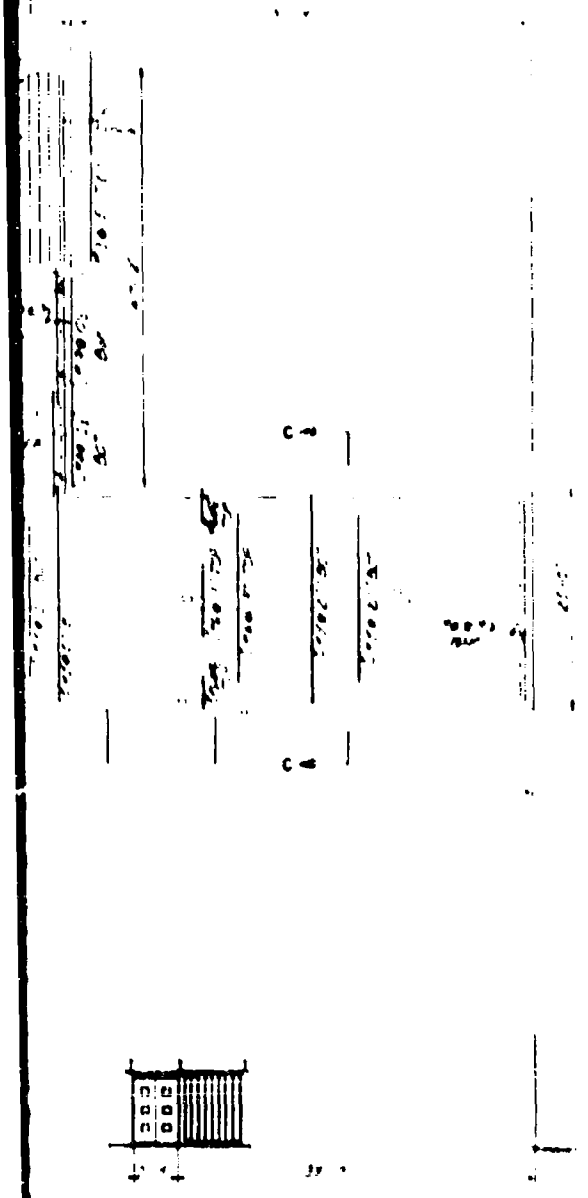


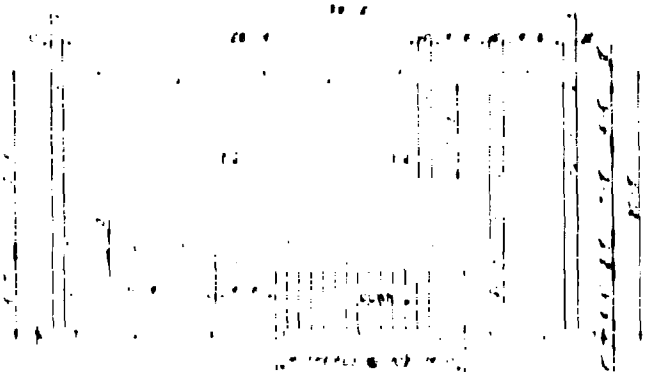
ELEVATION A
SCALE 1/4" = 1'-0"



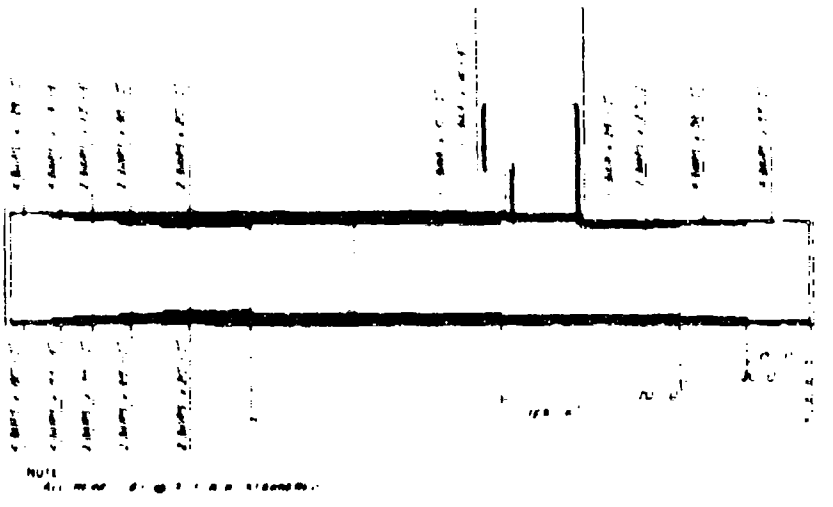
ELEVATION B
SCALE 1/4" = 1'-0"

ELEVAT
SCALE





PLAN OF SHELTER



ROOF SLAB

DEEP BEAM REINFORCEMENT

ELEVATION C

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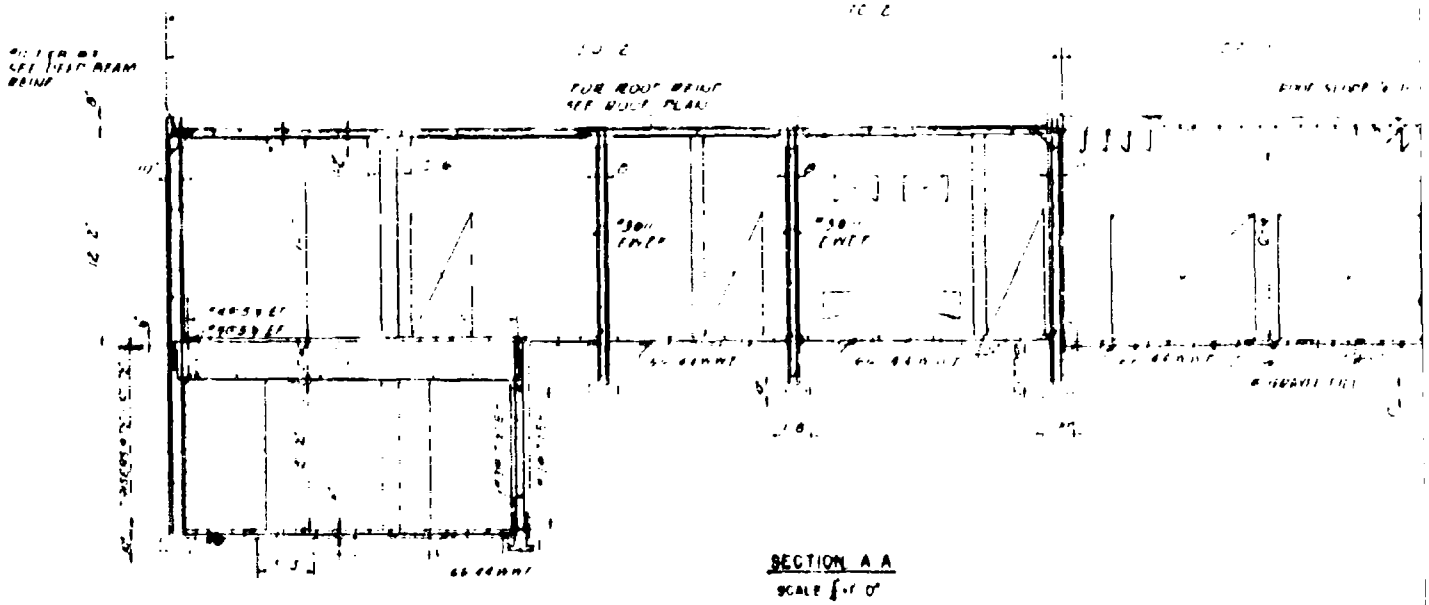
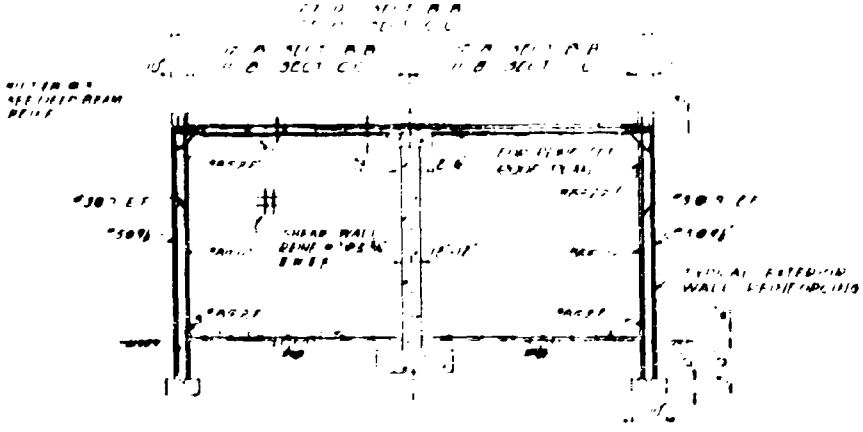
PROTECTIVE CONSTRUCTION	
COMMUNICATIONS BUILDING	
10 PSI BLAST RESISTANT	
AS NOTED	60-08-05

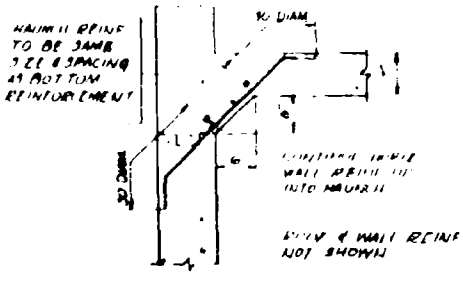


SECTION A A
SCALE 1/4" = 1'-0"

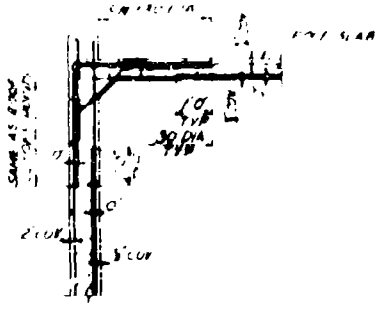


SECTION B-B & C-C
SCALE 1/4" = 1'-0"

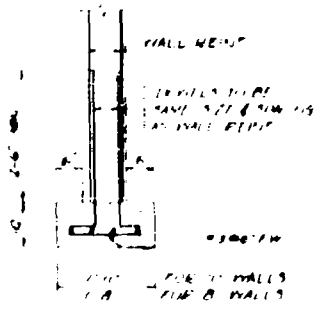
SECTION D D
SCALE 1/4" = 1'-0"



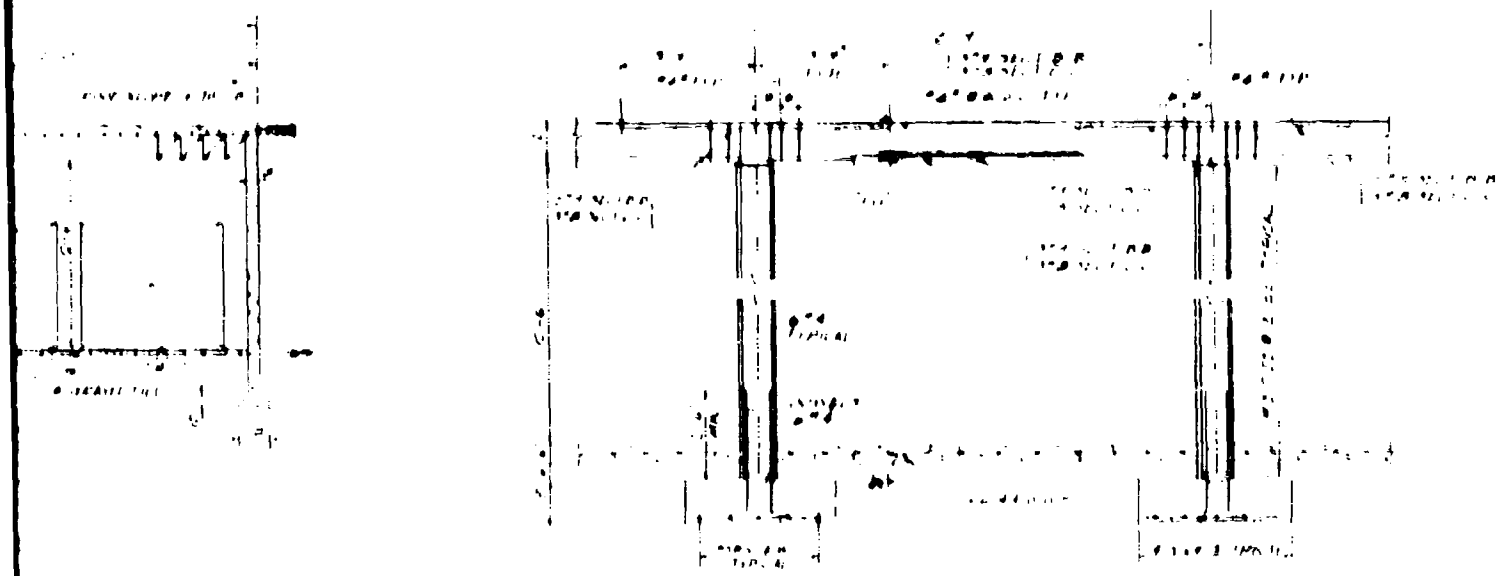
TYPICAL HAUNCH DETAIL
SCALE 1" = 1'-0"



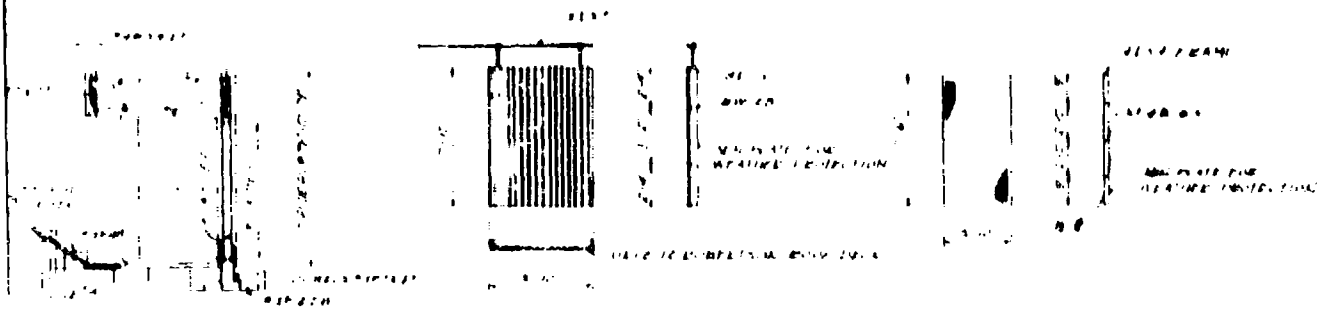
TYPICAL CORNER DETAIL
SCALE 1/4" = 1'-0"



TYPICAL WALL FOOTING
SCALE 1/4" = 1'-0"



SECTION A A



DETAIL B
TYPICAL

DETAIL B
TYPICAL

NOTES

DOOR SCHEDULE

PLAN SYMBOL	SIZE	MATERIAL

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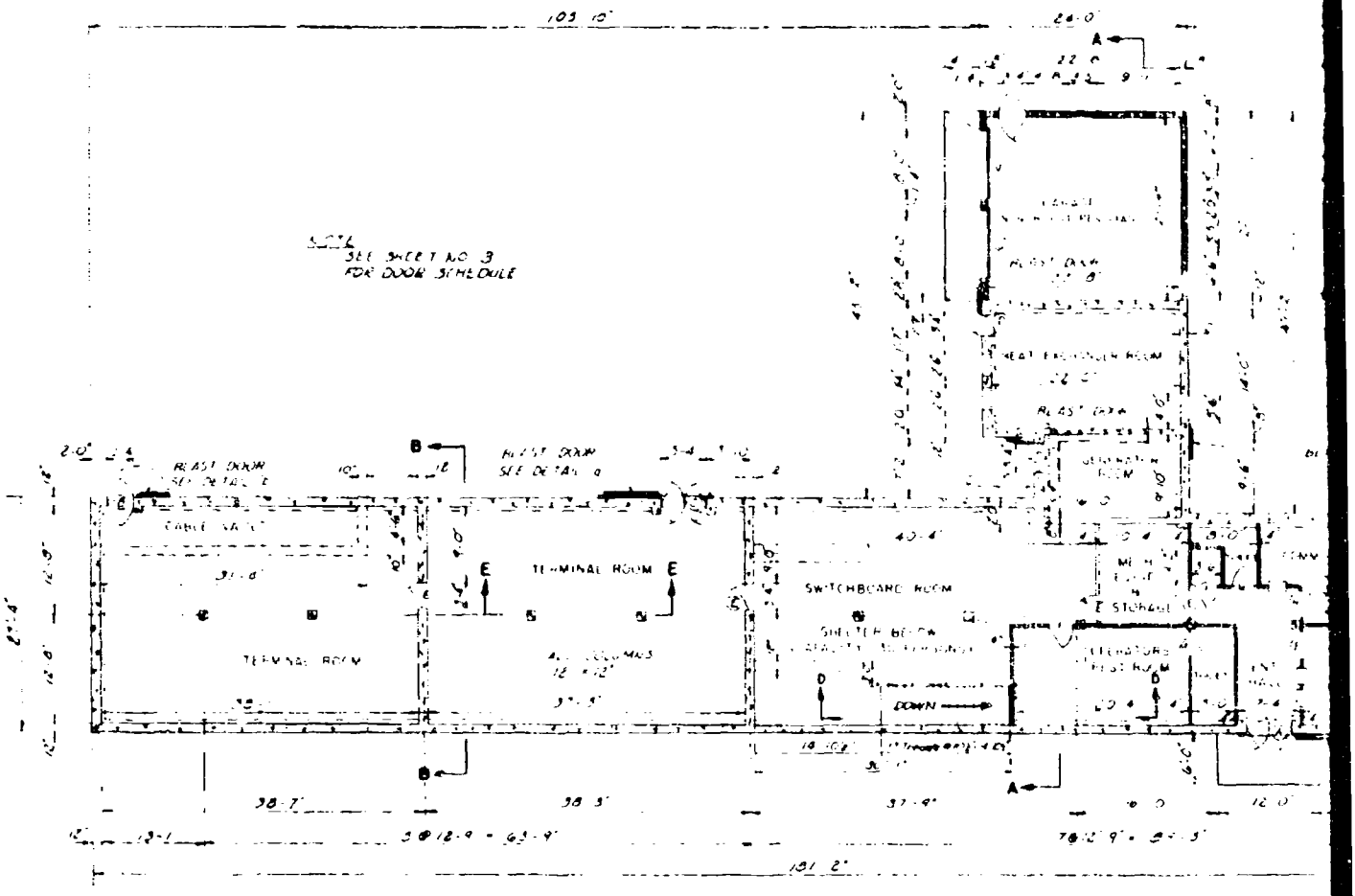
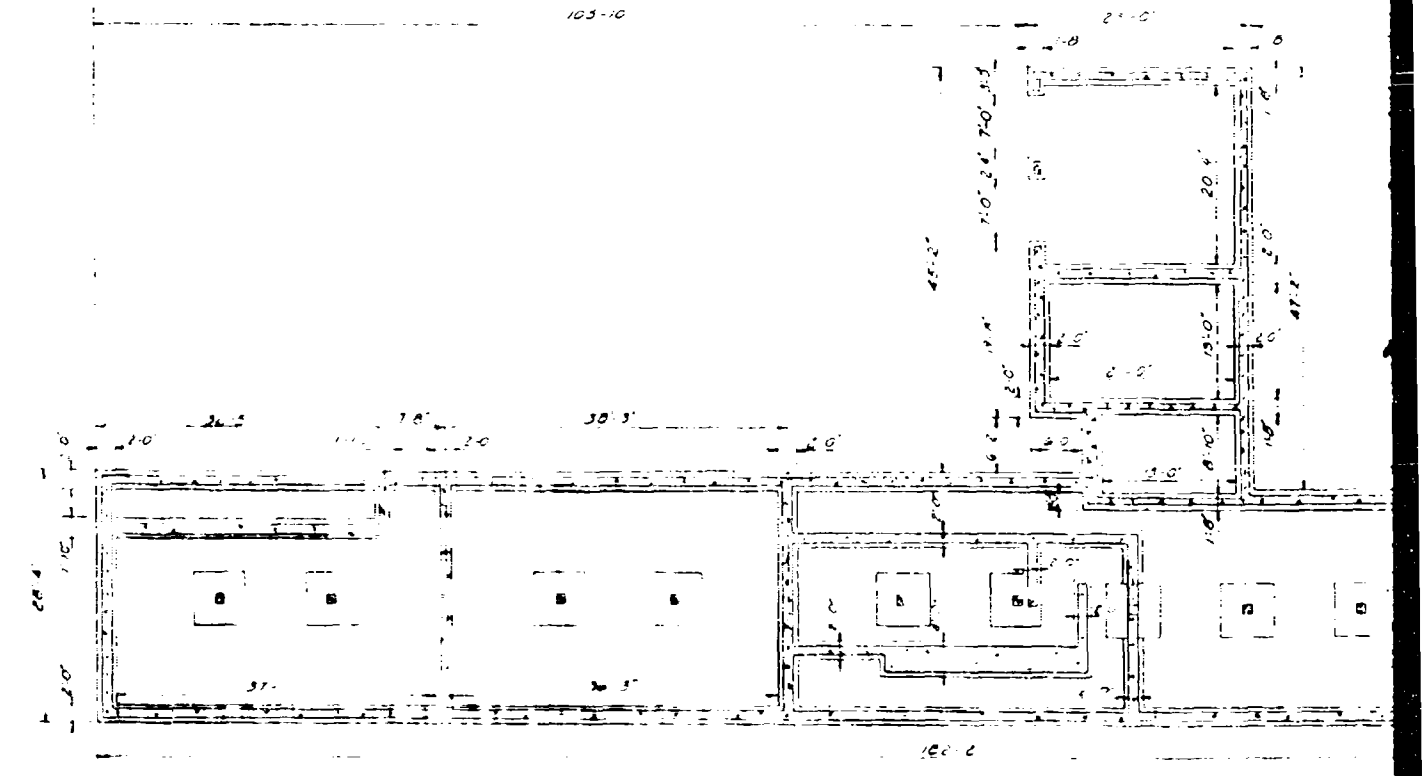
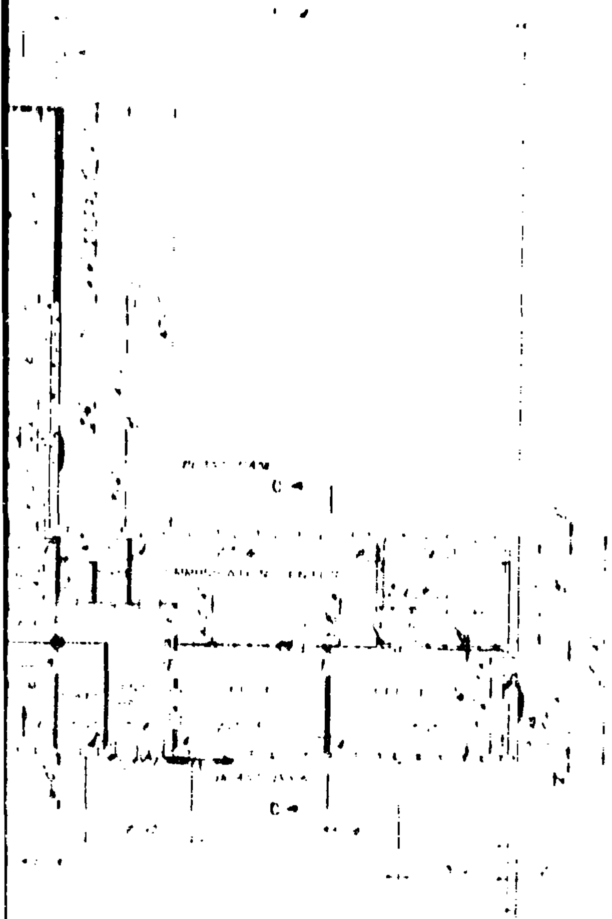
COMMUNICATIONS BUILDING
10 PSI BLAST RESISTANT

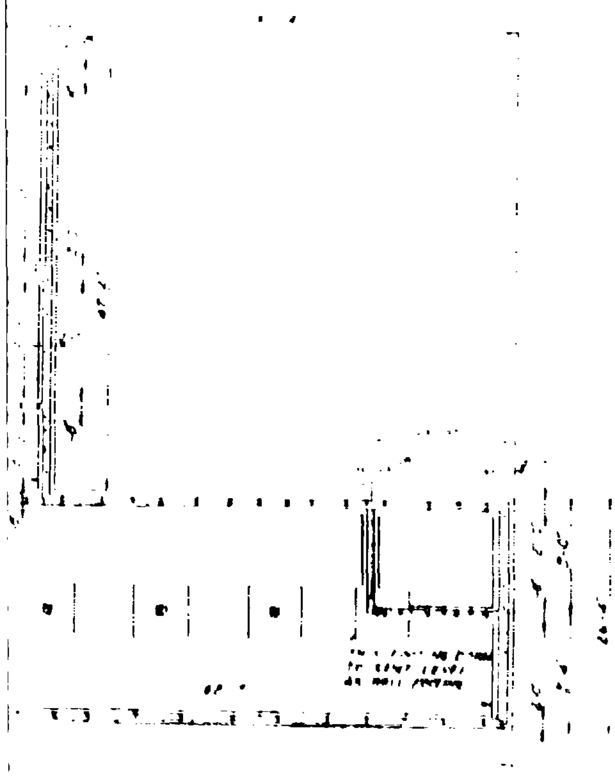


FLOOR PLAN



FOUNDATION PLAN





DESIGN CONDITIONS

Design Procedure

Design Blast Wave

Blast Loading on Roof

Blast Loading on Walls

Nuclear Radiation Protection for Shelter Area

Strength of Materials | Static | Blast Impulse

Allowable Stresses and Deflections

General Notes

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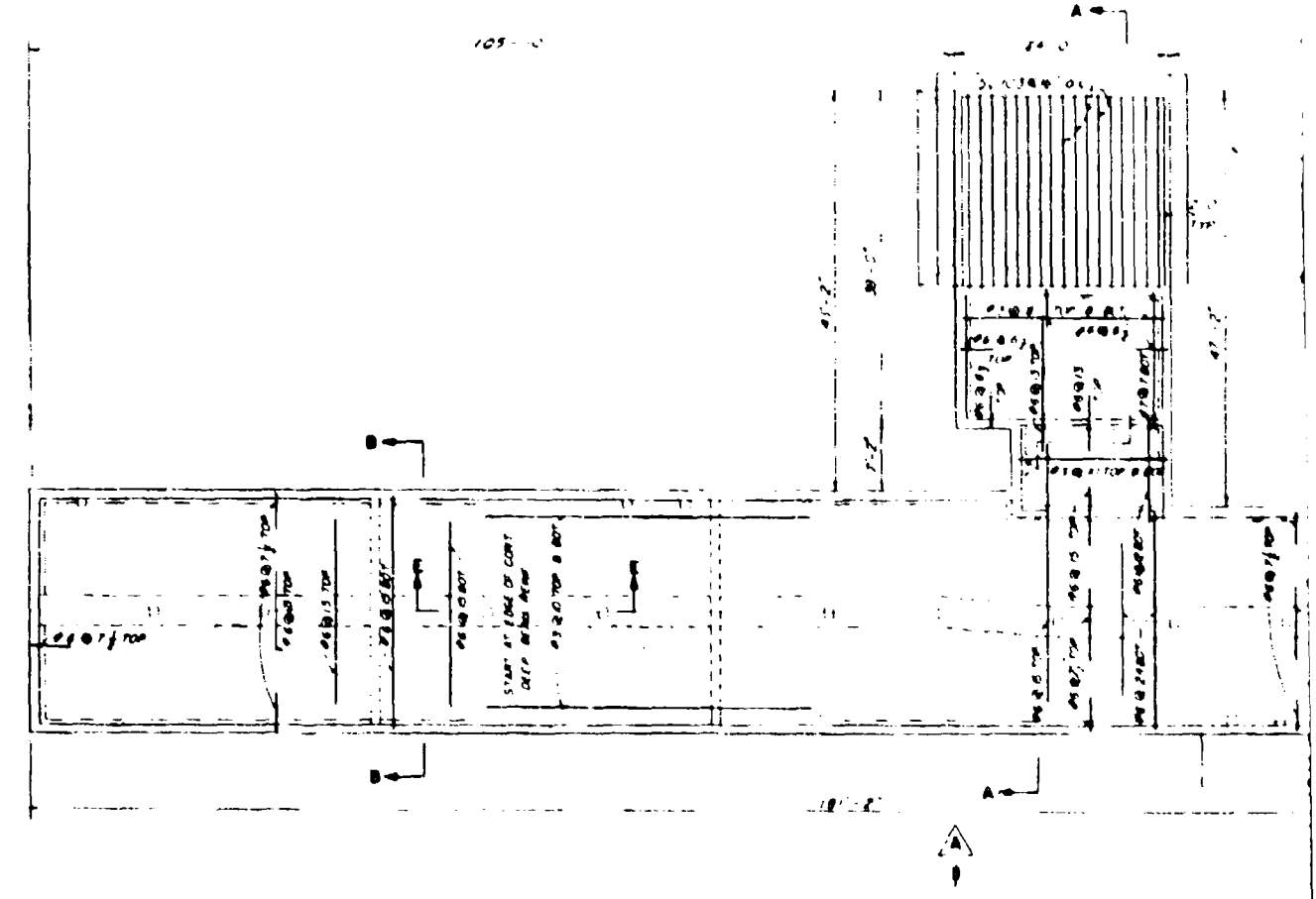
DEPARTMENT OF THE ARMY

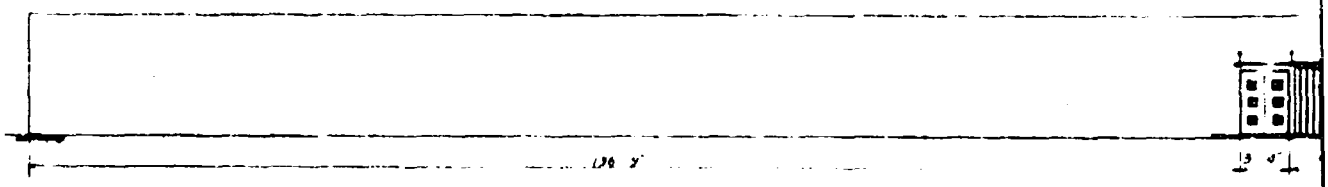
PROTECTIVE CONSTRUCTION
COMMUNICATIONS BUILDING
20 PSI BLAST RESISTANT

SHEET 1 OF 3

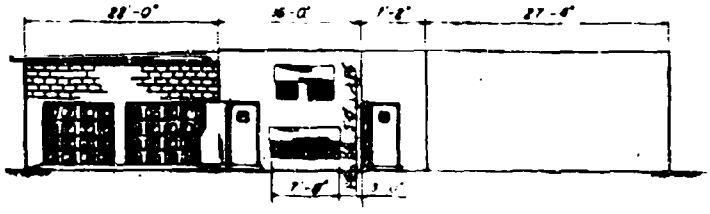
2



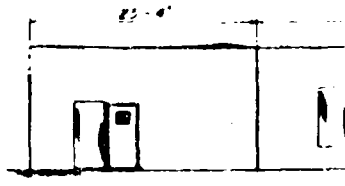
ROOF PLAN



ELEVATION A



ELEVATION B



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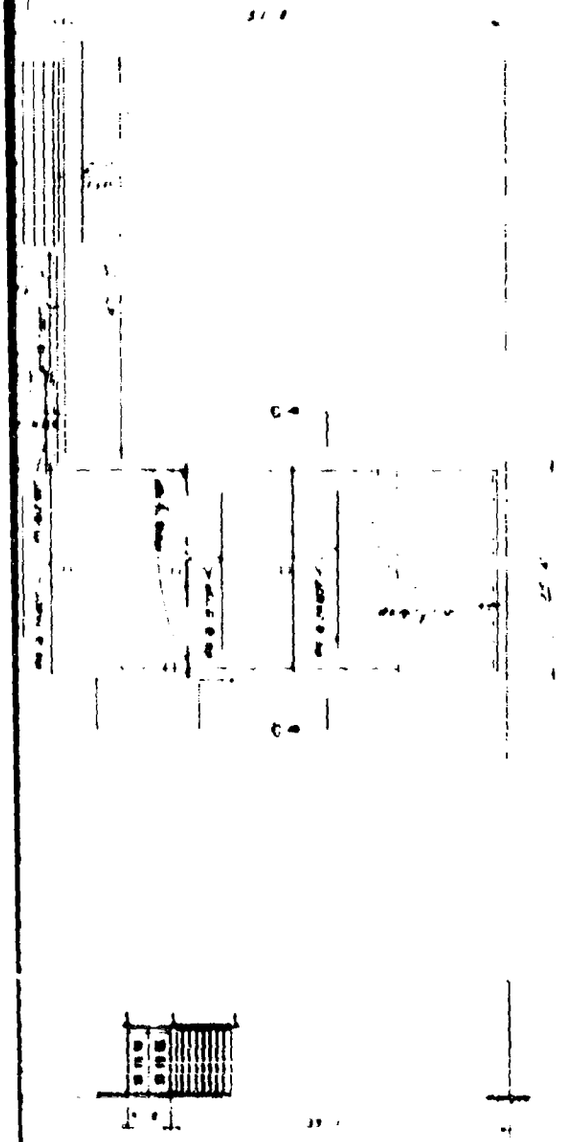
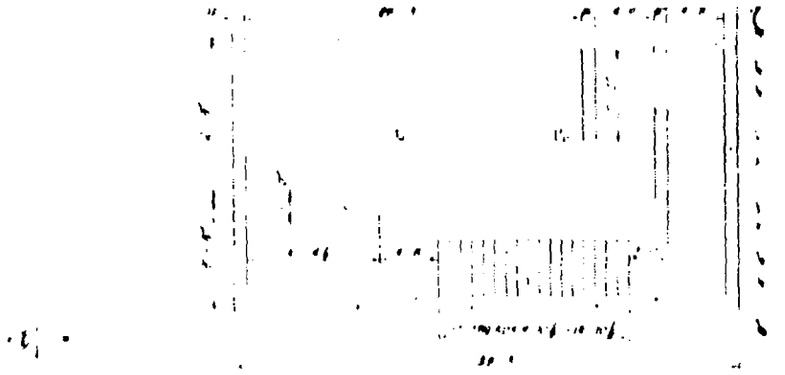
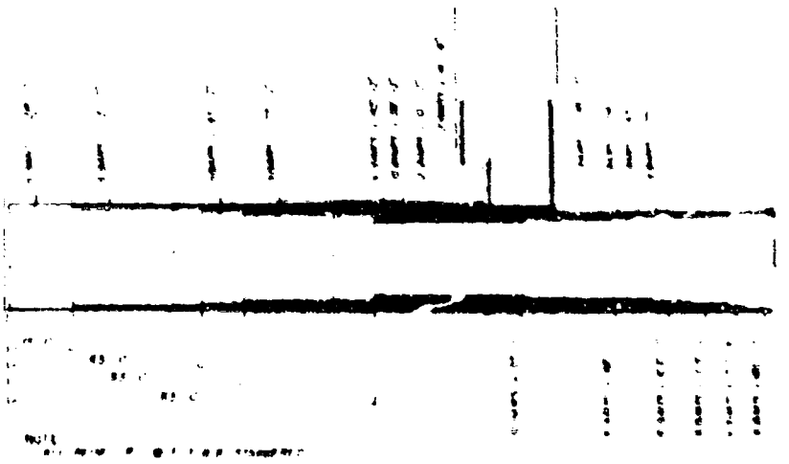
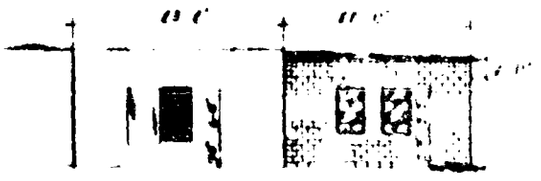




PLAN OF SHELTER



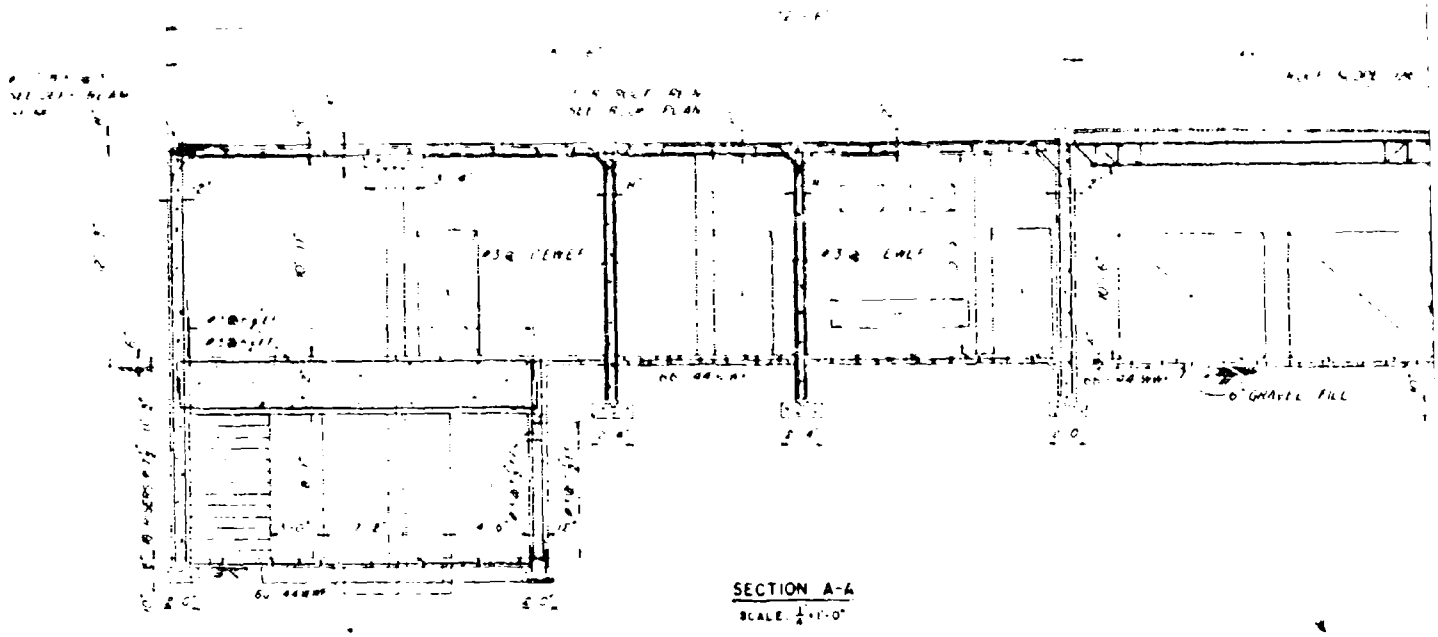
DEEP BEAM REINFORCEMENT



ELEVATION D

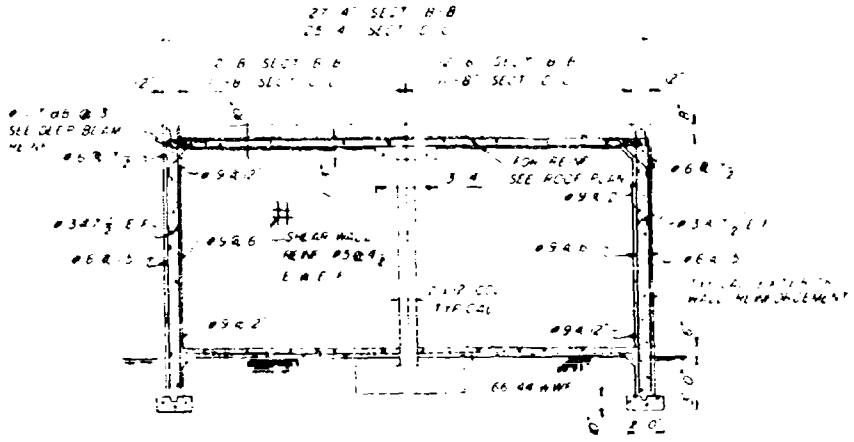
PROTECTIVE CONSTRUCTI
COMMUNICATIONS BUILDIN
50 PSI BLAST RESISTANT

2



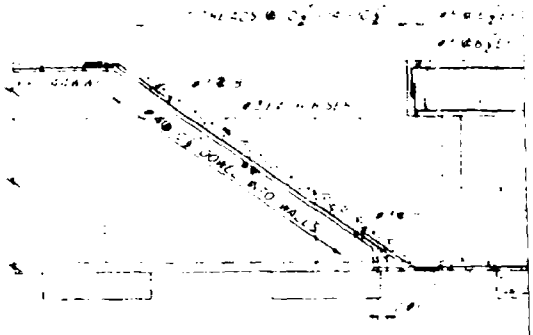
SECTION A-A

SCALE: $\frac{1}{4}$"=1'-0"



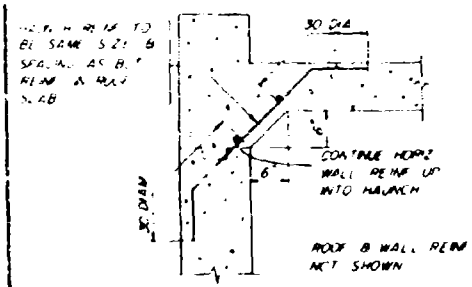
SECTION B-B & C-C

SCALE: $\frac{1}{4}$"=1'-0"



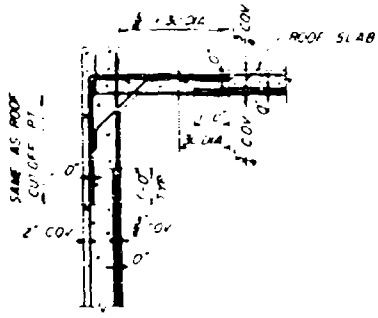
SECTION D-D

SCALE $\frac{1}{4}$"=1'-0"



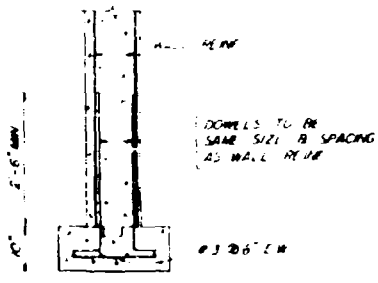
TYPICAL HAUNCH DETAIL

SCALE: 1"=1'-0"



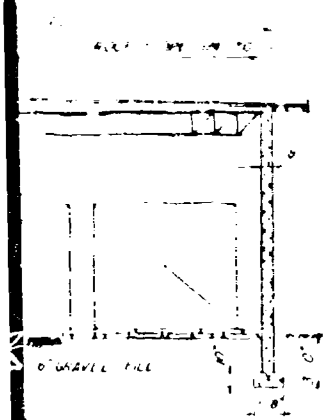
TYPICAL CORNER DETAIL

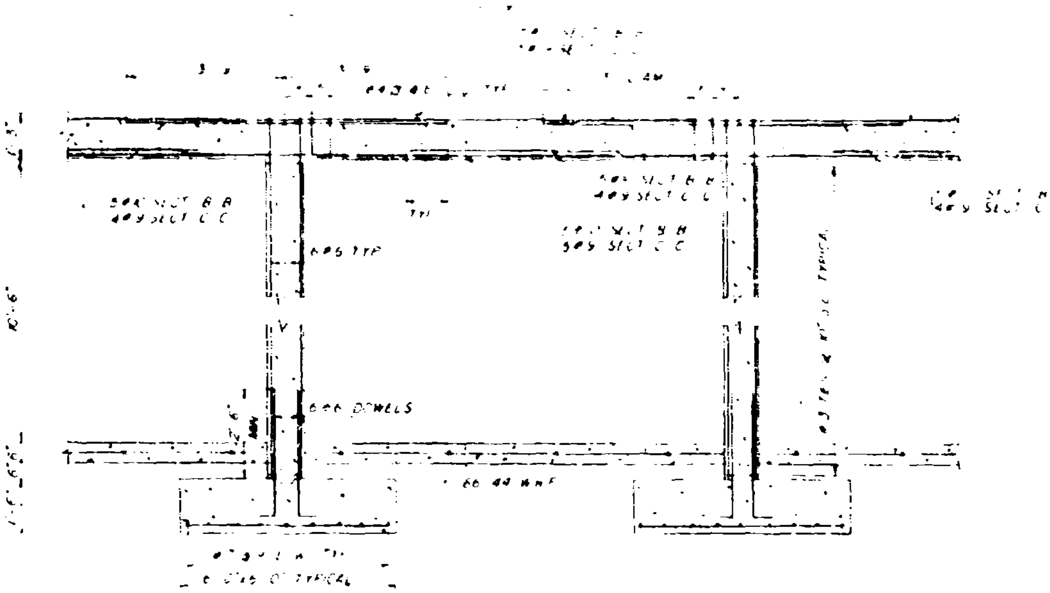
SCALE: $\frac{1}{4}$"=1'-0"



TYPICAL WALL FOOTING

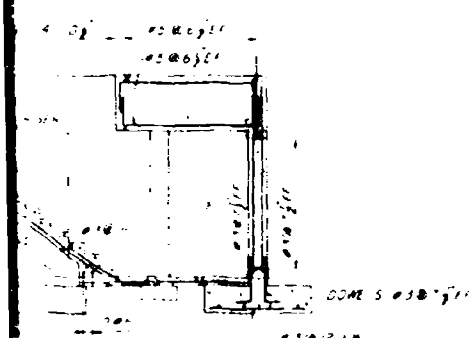
SCALE: $\frac{1}{4}$"=1'-0"





SECTION E-E

SCALE 1/4"=1'-0"

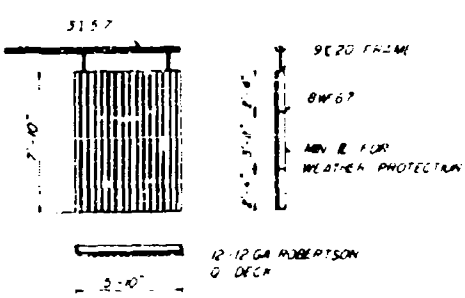


SECTION D-D

DOOR SCHEDULE		
PLAN SYMBOL	SIZE	MATERIAL
A	[illegible]	W P SOLID CORE
B	3'-0"x7'-0"	DO
[illegible]	[illegible]	DO
[illegible]	3'-[illegible]	DO
[illegible]	3'-0"x6'-8"	BIRCH HOLLOW CORE
[illegible]	[illegible]-6"x6'-8"	DO
[illegible]	2'-6"x6'-0"	DO
[illegible]	[illegible]	HOLLOW METAL
[illegible]	6'-[illegible]	WOOD
[illegible]	3'-[illegible]x6'-8"	HOLLOW METAL
	[illegible]	DO

NOTES

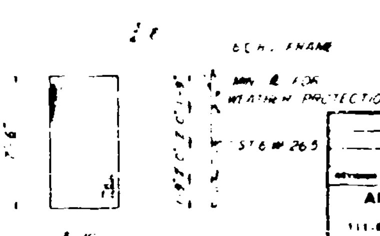
1. FOR BEAMS AND SLABS ALL REINF SPLICES TO BE [illegible] OF 3 [illegible] AT 1/4 PT OF SPAN.
2. FOR BEAMS MIN ALLOWABLE STIRRUPS TO BE [illegible] PERCENT



DETAIL a

TYPICAL

SCALE 1/2"=1'-0"



DETAIL b

TYPICAL

SCALE 1/2"=1'-0"

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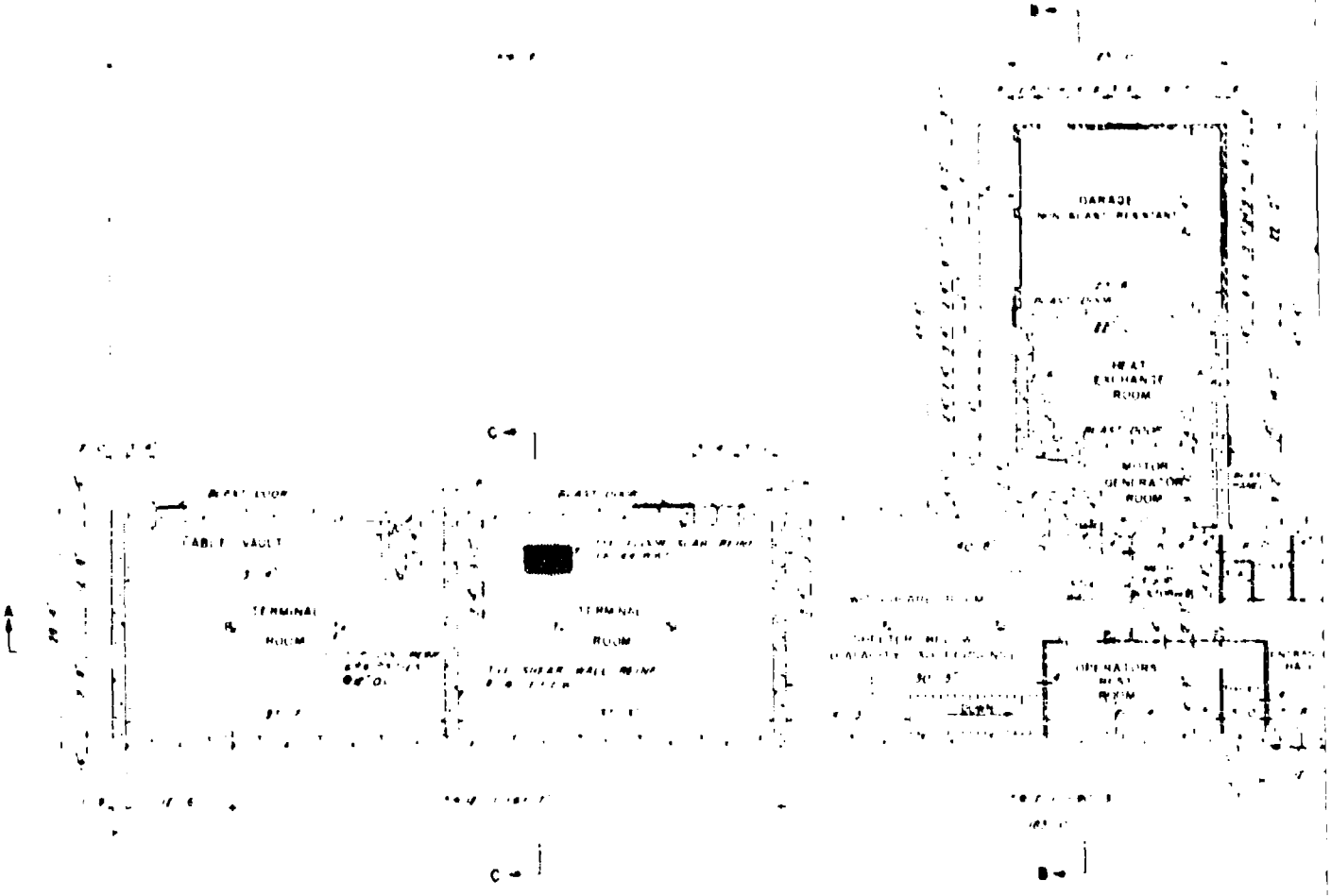
WASHINGTON, D.C.

PROTECTIVE CONSTRUCTION
COMMUNICATIONS BUILDING
20 PSI BLAST RESISTANT

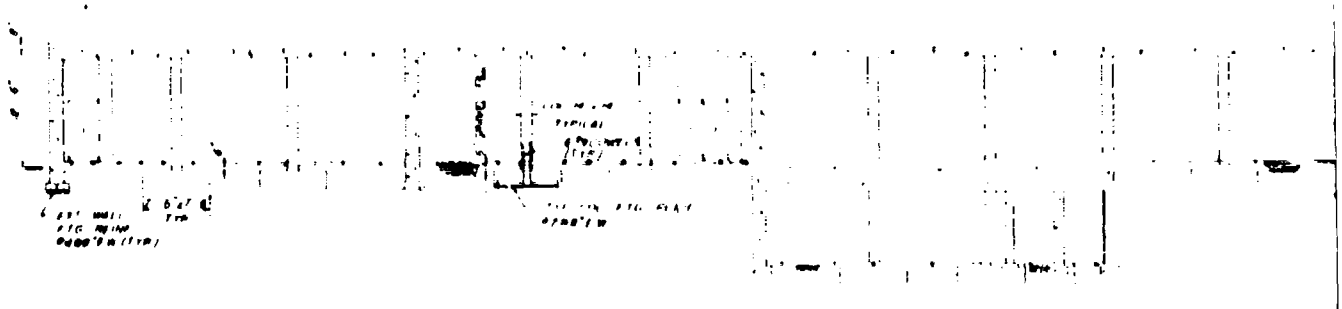
SCALE AS NOTED

DRAWING NUMBER 60-02-55

SHEET 3 OF 3



FLOOR PLAN



SECTION A-A

SECTION B-B

Design Procedure

Design Blast Wave

Blast Loading on Roof

Blast Loading on Walls

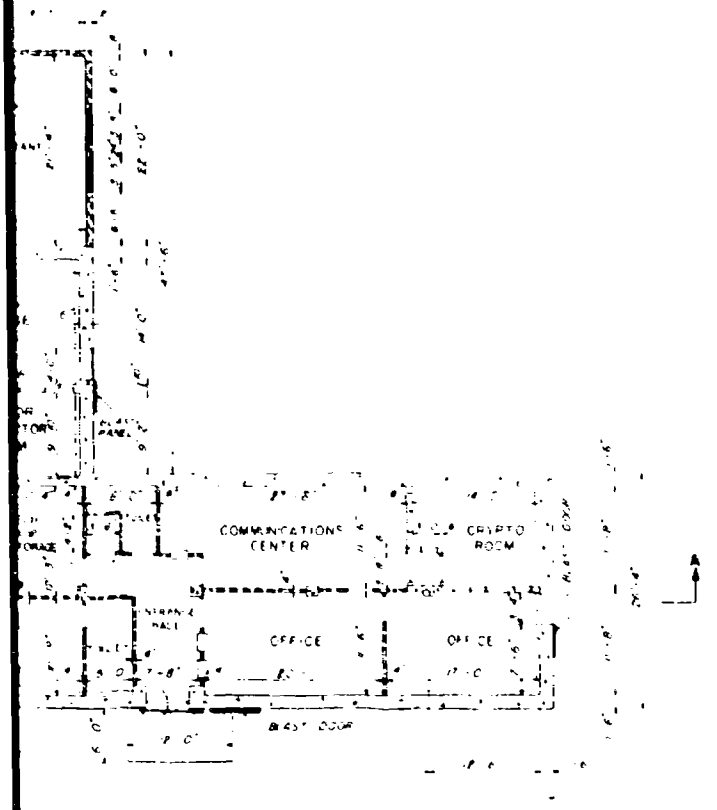
Nuclear Radiation Protection for Shelter Area

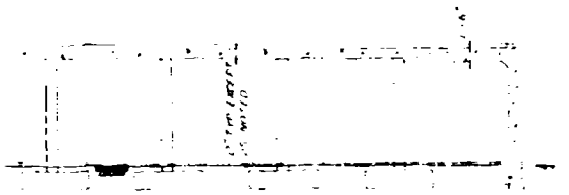
Strength of Materials

	Static	Blast Design
Concrete		
Reinforcing Steel		

Allowable Stresses and Deflections

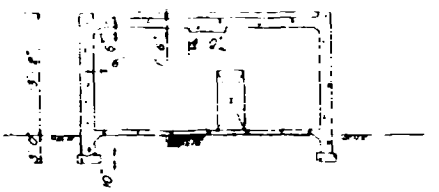
General Notes





LEGEND

- CONCRETE
- EARTH
- CONCRETE BLOCK
- GLASS



SECTION C-C

2

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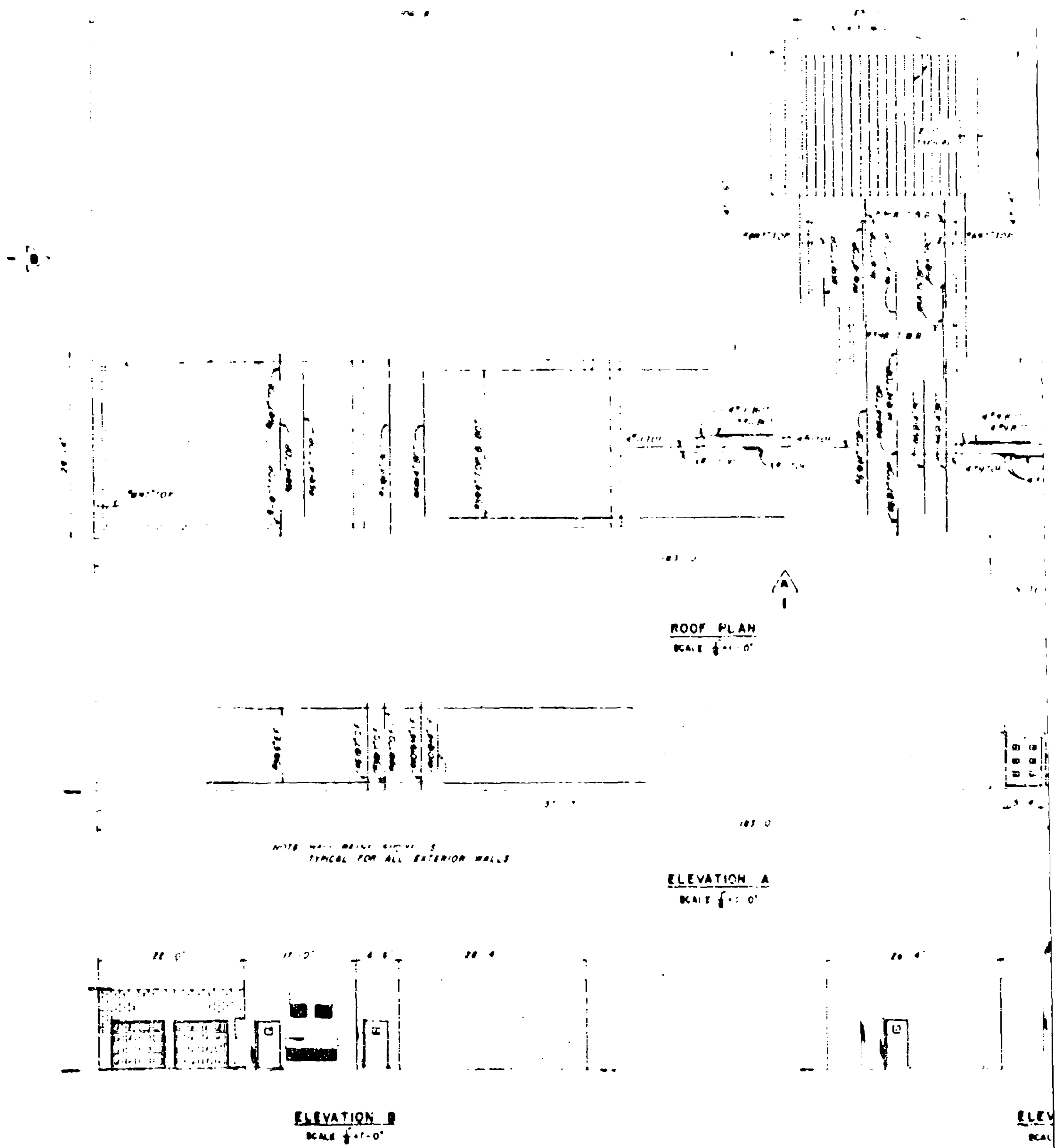
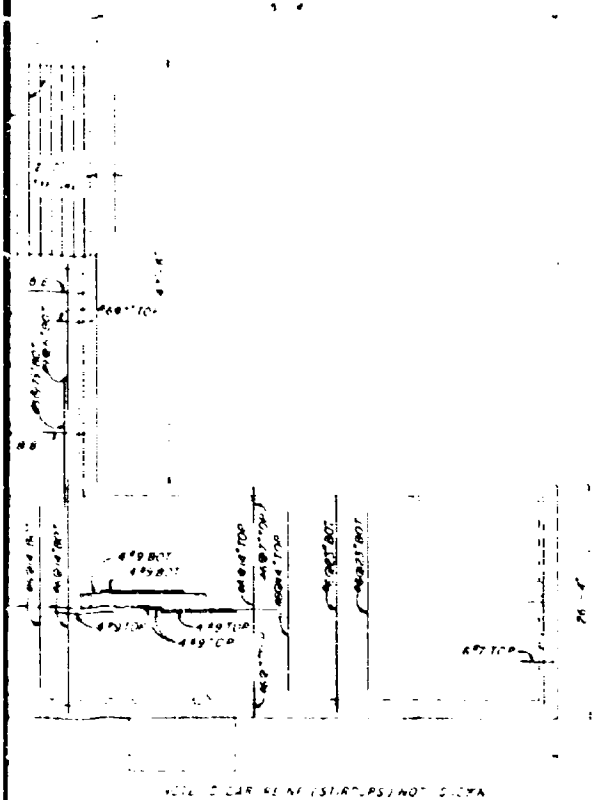
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D.C.

DESIGNED BY J.S.
DRAWN BY
TRACED BY J.F.
CHECKED BY
APPROVED
DATE

PROTECTIVE CONSTRUCTION
COMMUNICATIONS BUILDING
30 PSI BLAST RESISTANT

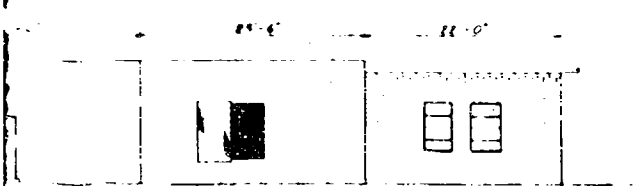
SCALE 1/8"=1'-0"
DRAWING NUMBER 60-02-56
SHEET 1 OF 2


ROOF PLAN
TYPICAL FOR ALL EXTERIOR WALLS
ELEVATION A
ELEVATION B



PLAN OF SHELTER

SCALE $\frac{1}{10}$"=1'-0"



ELEVATION C

SCALE $\frac{1}{8}$"=1'-0"

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WASHINGTON, D.C.

DESIGNED BY J.S.

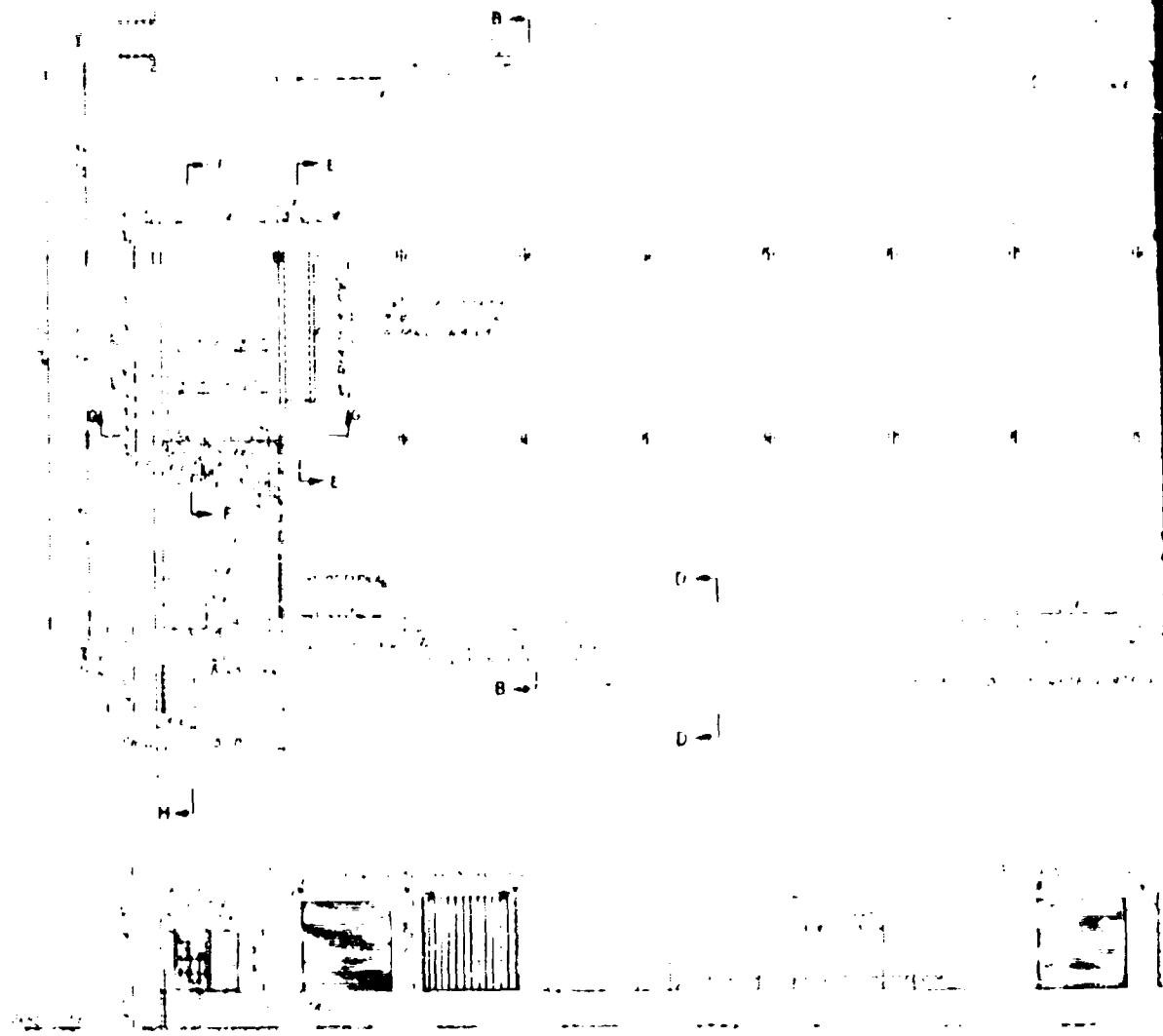
PROTECTIVE CONSTRUCTION
COMMUNICATIONS BUILDING
30 PSI BLAST RESISTANT

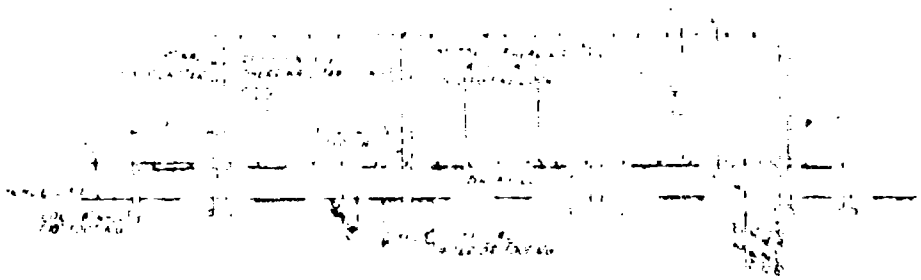
SCALE AS SHOWN

DRAWING NUMBER
60-02-56

SHEET 2 OF 2

30





SECTION A-A

Design Procedure

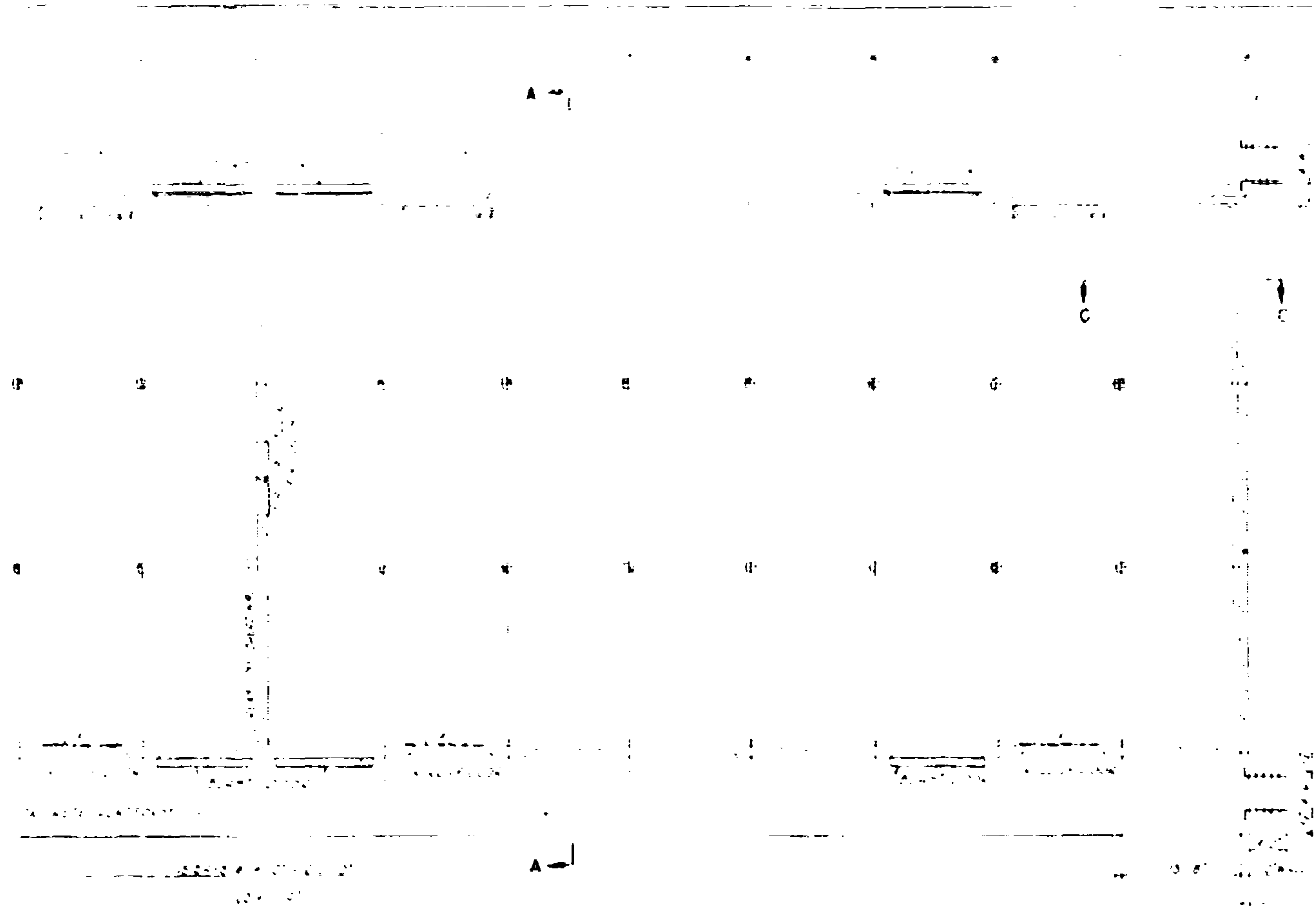
Design Steel Work

Steel Loading on Roof

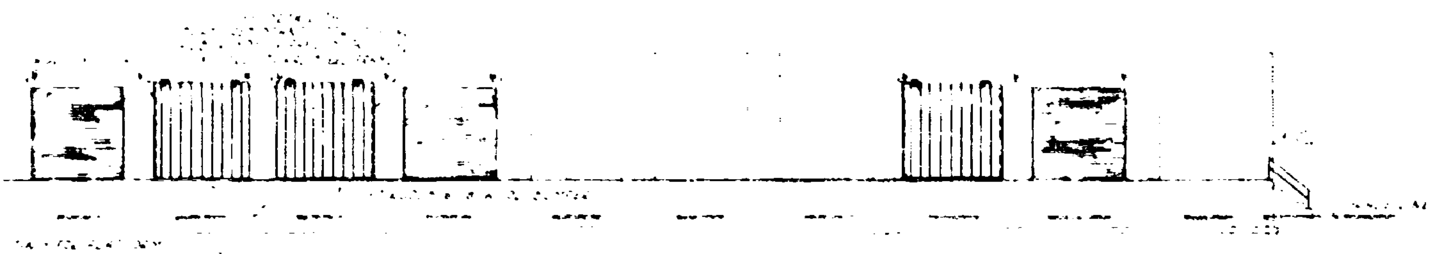
Steel Loading on Walls

Nuclear Radiation Protection

Strength of Materials



FLOOR PLAN



ELEVATION

NOTE

THE 20 AND 30 PSI WAREHOUSES HAVE SHEAR WALLS [illegible] 4 AND 2 [illegible] THICK RESPECTIVELY ON COLUMN LINES 7 AND 12

Design Procedure

In accordance with C.E. manual "Design of Structures for Protection from Effects of Atomic Weapons"

Design Blast Wave

Peak incident pressure = 10 psi. Duration = 1.55 sec.

Blast Loading on Roof

Peak pressure 10 psi. Duration = 1.55 sec.

Blast Loading on Walls

Peak pressure = 25 psi. Duration = 1.55 sec.

Nuclear Radiation Protection for Shelter Area

Total gamma and neutron attenuated to [illegible] for a [illegible] weapon at any position which will produce a peak blast pressure equal to 10 psi.

Strength of Materials	Static	Blast Design
Soil bearing capacity	[illegible]*	[illegible] psf
Concrete f'c	[illegible]	[illegible] psi
Reinf. Steel, [illegible] grade (or [illegible], ASTM A305 [illegible])	[illegible] psi	52,000 psi
Structural Steel, [illegible] (ASTM A7 [illegible])	38,000 psi	46,000 psi

* rated capacity of soil

Allowable Stresses and Deflections

[illegible] designed for maximum [illegible] deformation under design blast load.

General Notes

1. The following features are not shown and shall be determined to suit use requirements:

[illegible] of [illegible] equipment

[illegible] and [illegible]

2. This design study is [illegible] Dept. of the Air Force [illegible] Drawing No. 33 [illegible], [illegible] AFB Drawing No. 33 [illegible]

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PROTECTIVE CONSTRUCTION

WAREHOUSE

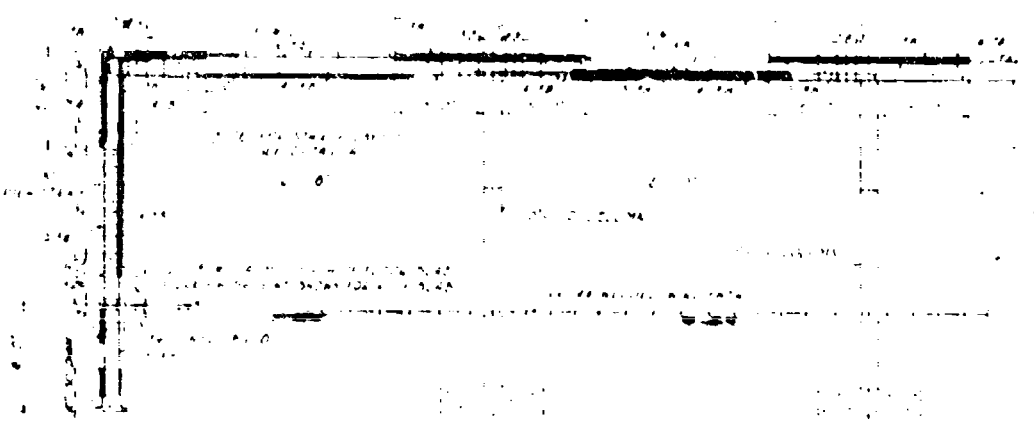
10 PSI BLAST RESISTANT

SCALE 1/8" = 1'-0"

DRAWING NUMBER 60-17-01

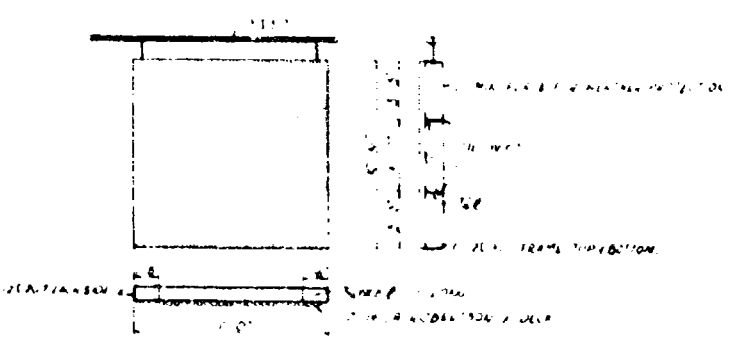
SHEET 1 OF 3

ROOF FRAMING

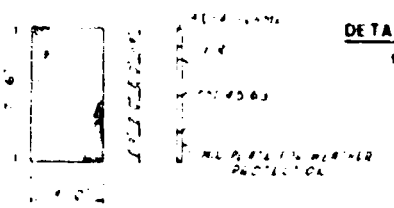


SECTION B-B

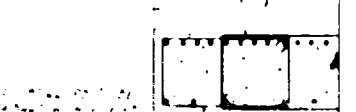
TYPICAL HAUNC



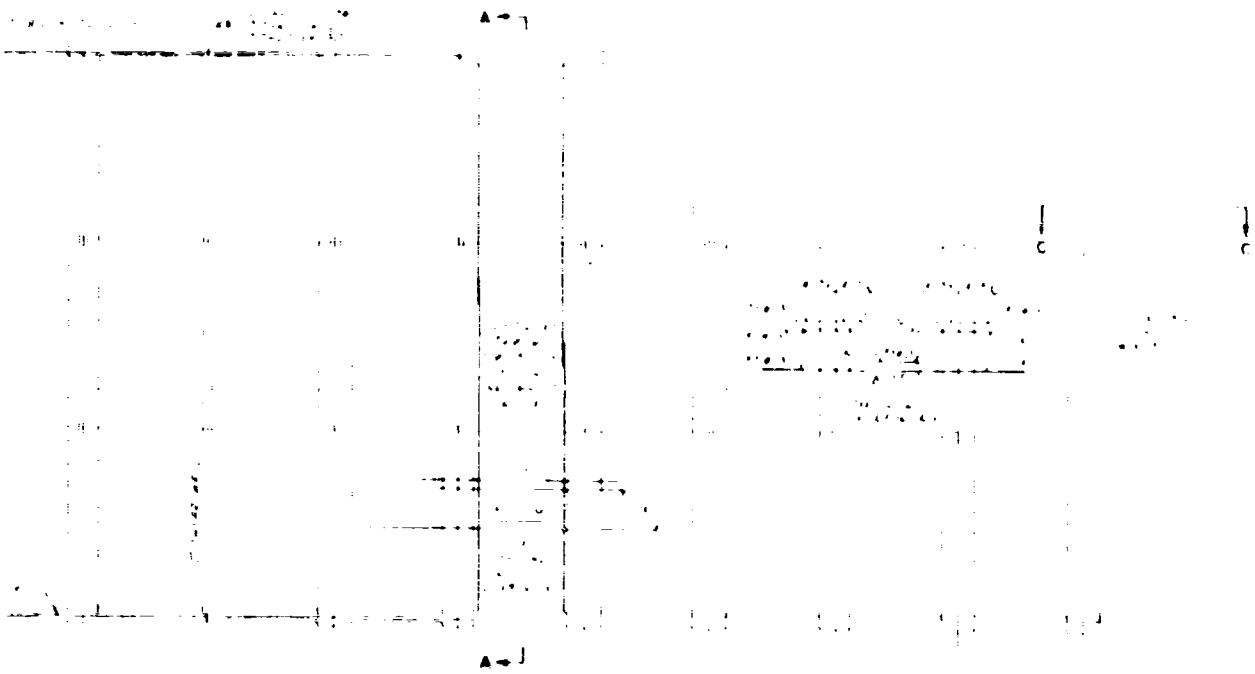
DETAIL B (TYPICAL)



DETAIL C

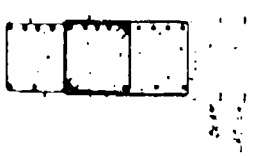


DETAIL A (TYPICAL

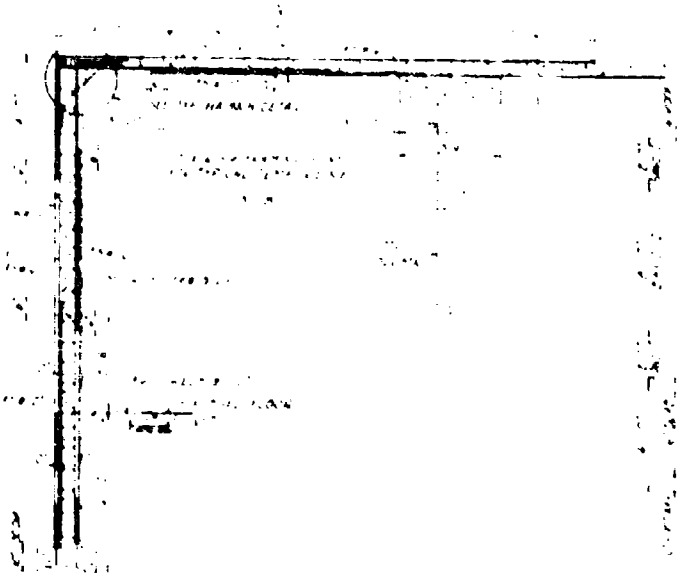


ROOF FRAMING PLAN

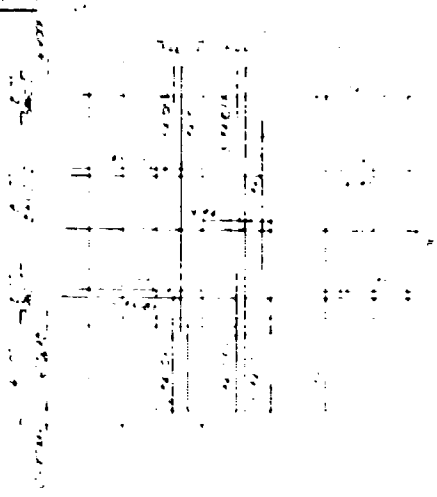
TYPICAL HAUNCH DETAIL



DETAIL A (TYPICAL)



SECTION C-C



FRONT WA[illegible]

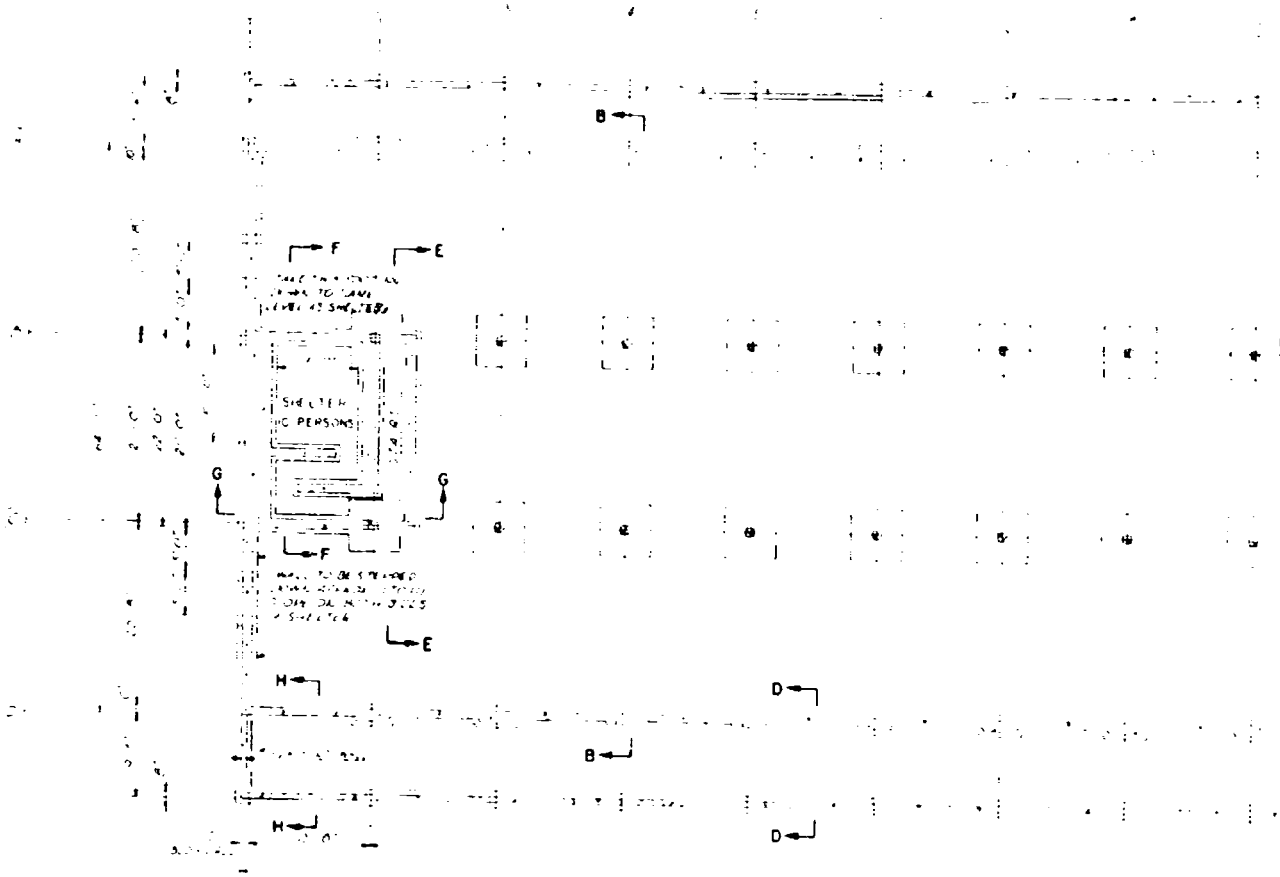
ANMANN & WHITNEY

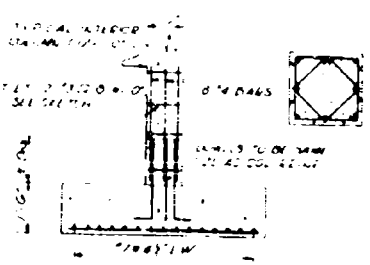
PROTE[illegible]E CONSTRU[illegible]TION

[illegible]AREHOUSE

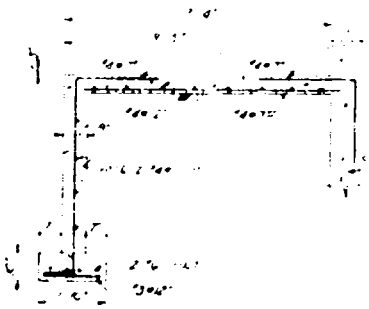
NO P[illegible]AST RES[illegible]NT

2

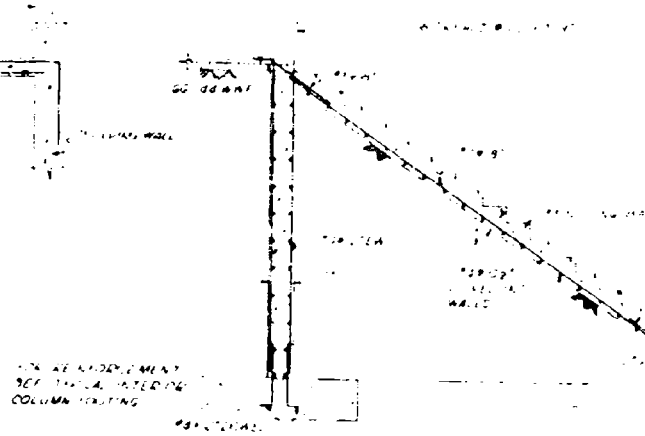




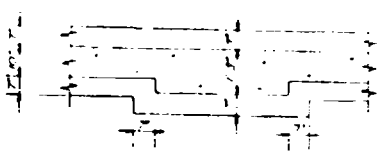
TYPICAL INTERIOR
COLUMN & FOOTING
SCALE - 1/4"=1'-0"



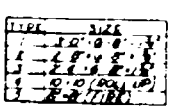
SECTION D-D
SCALE - 1/4"=1'-0"



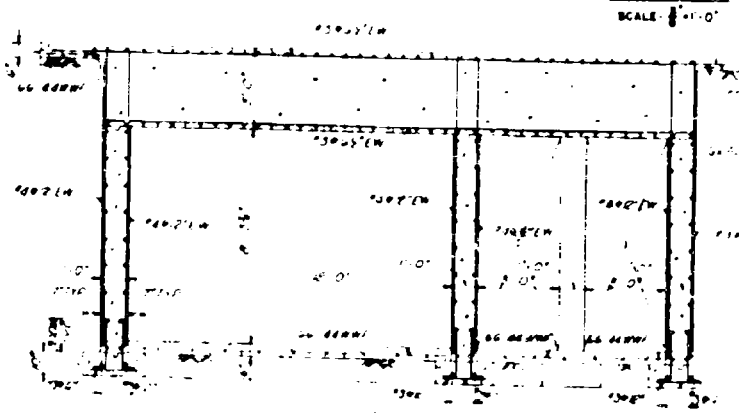
SECTION E-E
SCALE - 1/4"=1'-0"



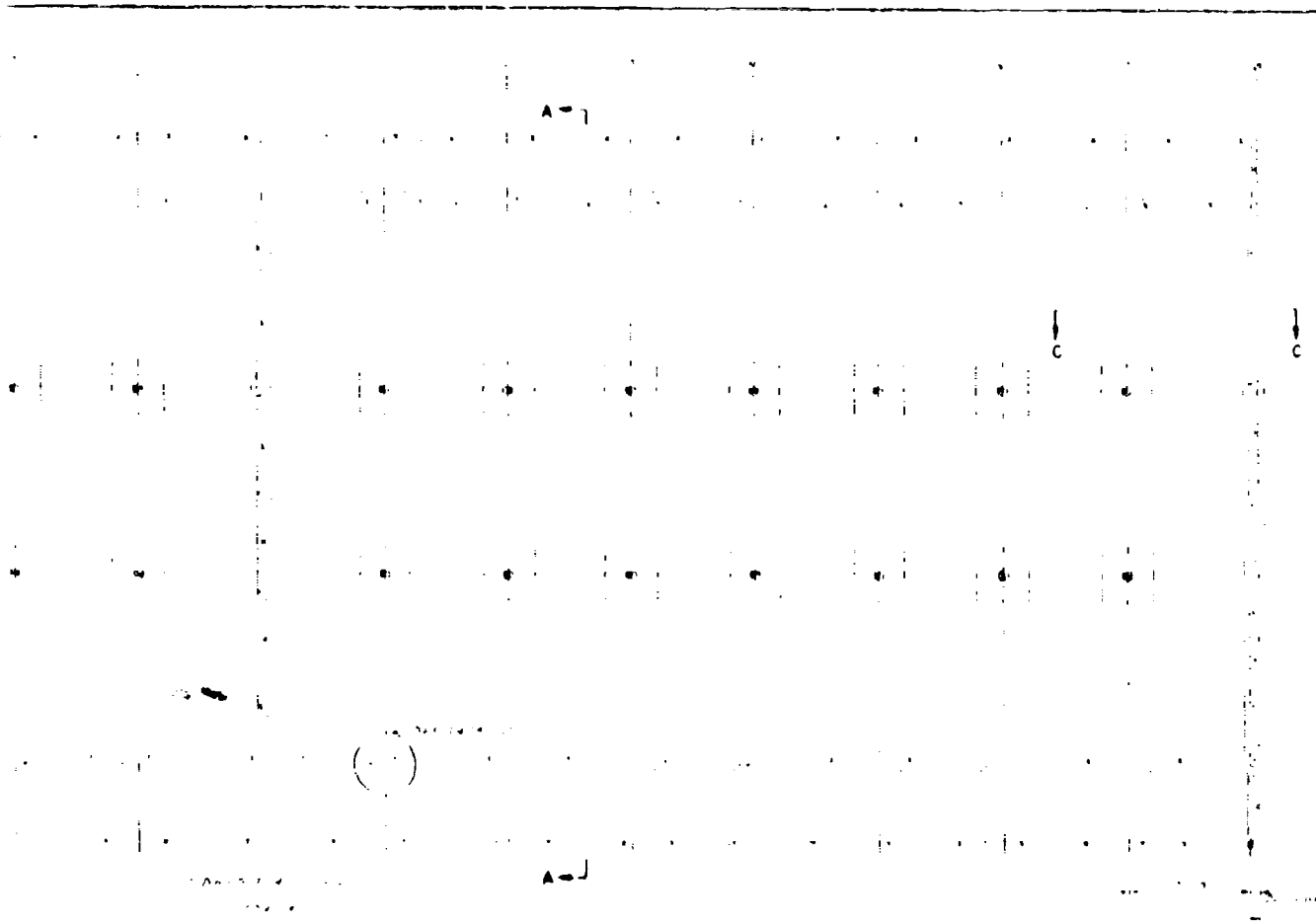
DETAIL D
SCALE - 1/4"=1'-0"



STANDARD TYPE
DOOR SCHEDULE

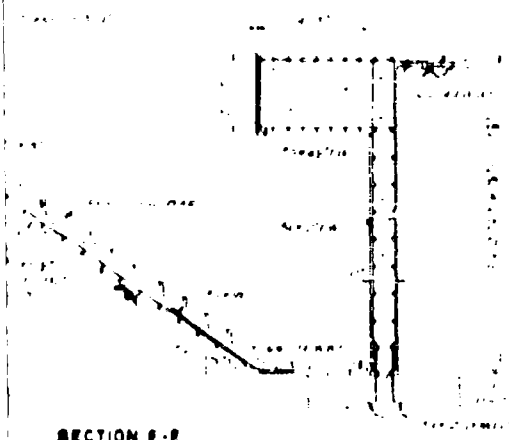


SECTION F-F
SCALE - 1/4"=1'-0"



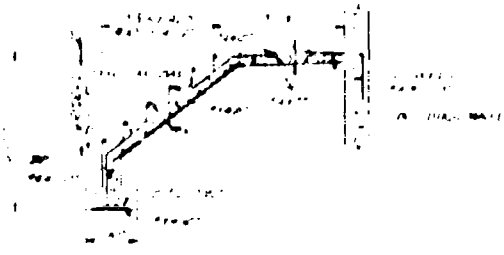
FOUNDATION PLAN

SCALE 1/8" = 1'-0"



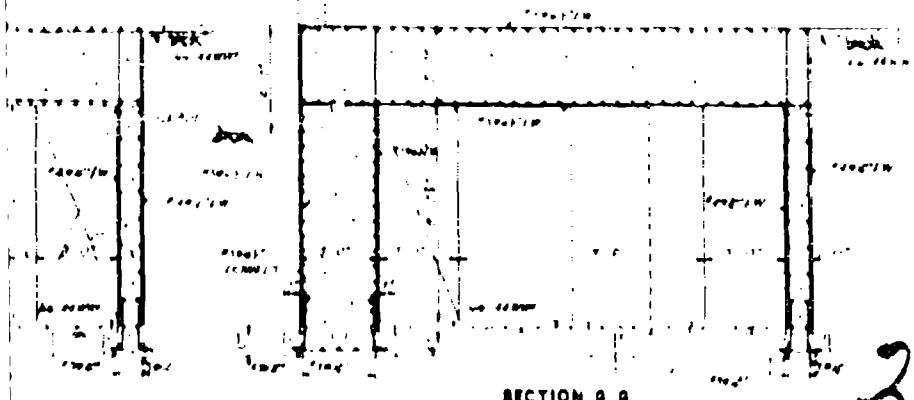
SECTION E-E

SCALE 1/8" = 1'-0"



SECTION H-H

SCALE 1/8" = 1'-0"



SECTION G-G

SCALE 1/8" = 1'-0"

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PROTECTIVE CONSTRUCTION

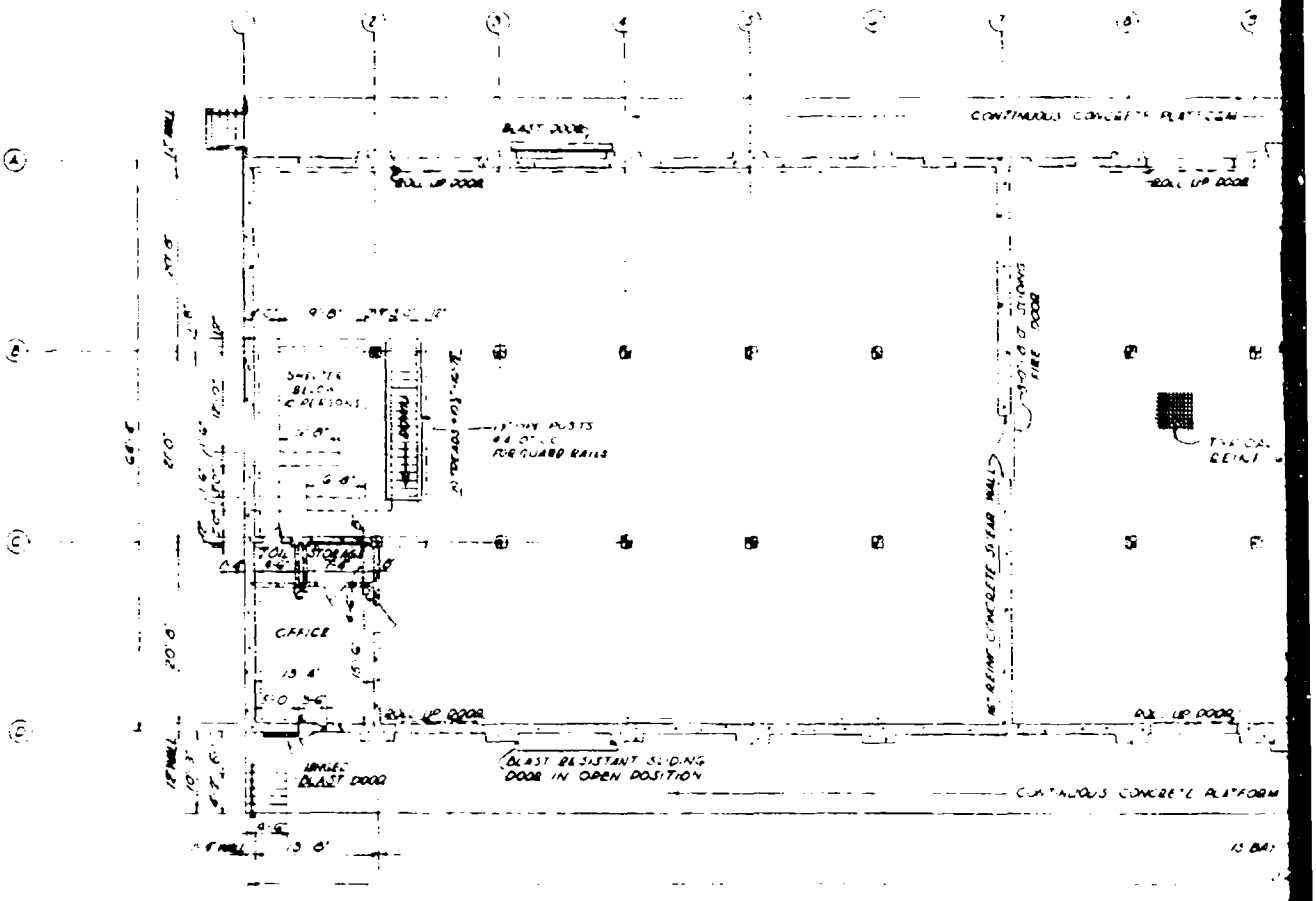
WAREHOUSE

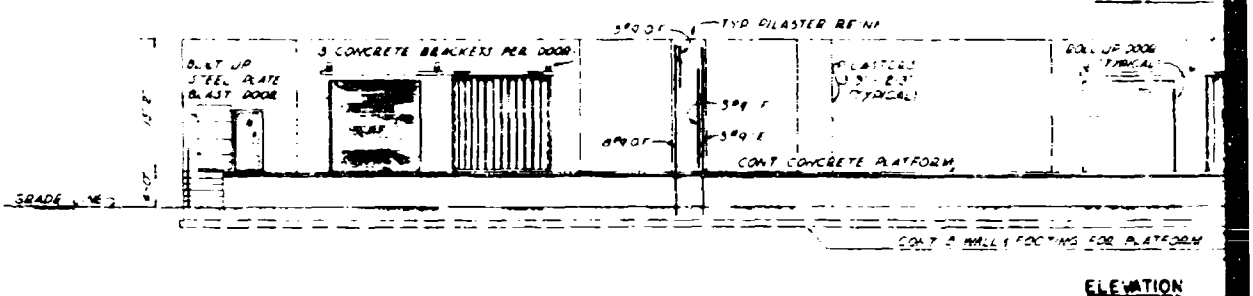
10 PSI BLAST RESISTANT

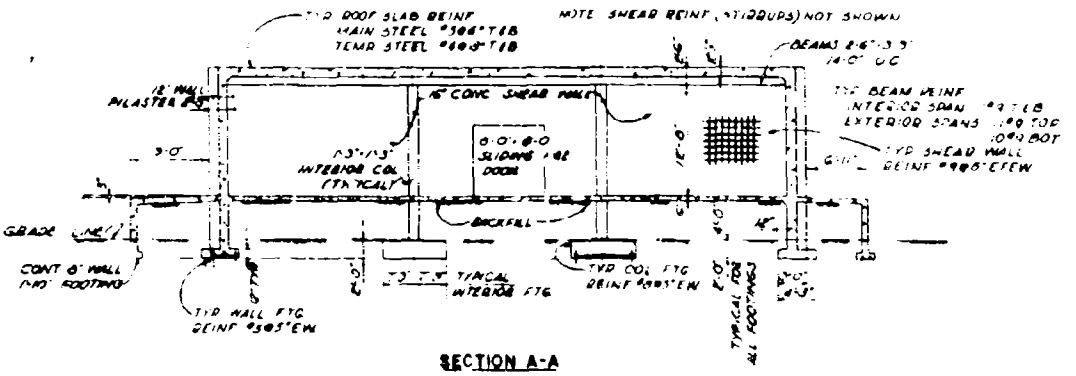
AS NOTED

60-17-01

33


CONTINUOUS CONCRETE PLATFORM
BLAST DOOR
ROLL UP DOOR
ROLL UP DOOR
SHELTER BLOCK WALL
STEEL POSTS @ 6'-0" O.C. FOR GUARD RAILS
TYPICAL REINF
OFFICE
13'-4"
ROLL UP DOOR
ROLL UP DOOR
BLAST RESISTANT SLIDING DOOR IN OPEN POSITION
CONTINUOUS CONCRETE PLATFORM
FLOOR PLAN


3 CONCRETE BRACKETS PER DOOR
BOLT UP STEEL PLATE BLAST DOOR
TYP PILASTER REINF
ROLL UP DOOR TYPICAL
CONT CONCRETE PLATFORM
GRADE
CONT 8" WALL & FOOTING FOR PLATFORM
ELEVATION


TYP ROOF SLAB REINF
MAIN STEEL #5@6"T&B
TEMP STEEL #4@8"T&B
NOTE SHEAR REINF (STIRRUPS) NOT SHOWN
BEAMS 2'-6" x 3'-9" @ 14'-0" O.C.
8" WALL PILASTER
8" CONC SHEAR WALL
TYP BEAM REINF INTERIOR SPAN #7 T&B EXTERIOR SPANS #9 TOP #10 BOT
TYP SHEAR WALL REINF #4@8" EF EW
3'-0"
INTERIOR COL (TYPICAL)
6'-0" x 8'-0" SLIDING AGE DOOR
BACKFILL
GRADE
CONT 8" WALL AND FOOTING
TYP WALL FTG REINF #5@8" EW
TYP INTERIOR FTG
TYP COL FTG REINF #9@8" EW
TYPICAL ALL FOOTINGS
SECTION A-A

DESIGN CONDITIONS

Design Procedure

In accordance with OCD manual "Design of ... for Protection from the Effects of Atomic Weapons"

Design Blast Wave

Peak incident pressure 20 psi ...

Blast Loading on Roof

...

Blast Loading on Walls

Peak pressure ...

Nuclear Radiation Protection for Shelter Area

Total gamma and neutron ... attenuated to ... for a ... weapon at any position which will produce a peak ... pressure equal to 20 psi.

Strength of Materials	Static	Blast Design
Soil bearing capacity	8000 psf*	16,000 psf
...	...	...
... steel ... plate ...	...	...
Structural Steel ...	...	...

* rated capacity of soil

Allowable Stresses and Deflections

...

General Notes

1. The following features are not shown and shall be determined to suit site requirements:

Mechanical and electrical equipment
... and decontamination facilities

2. ...

2

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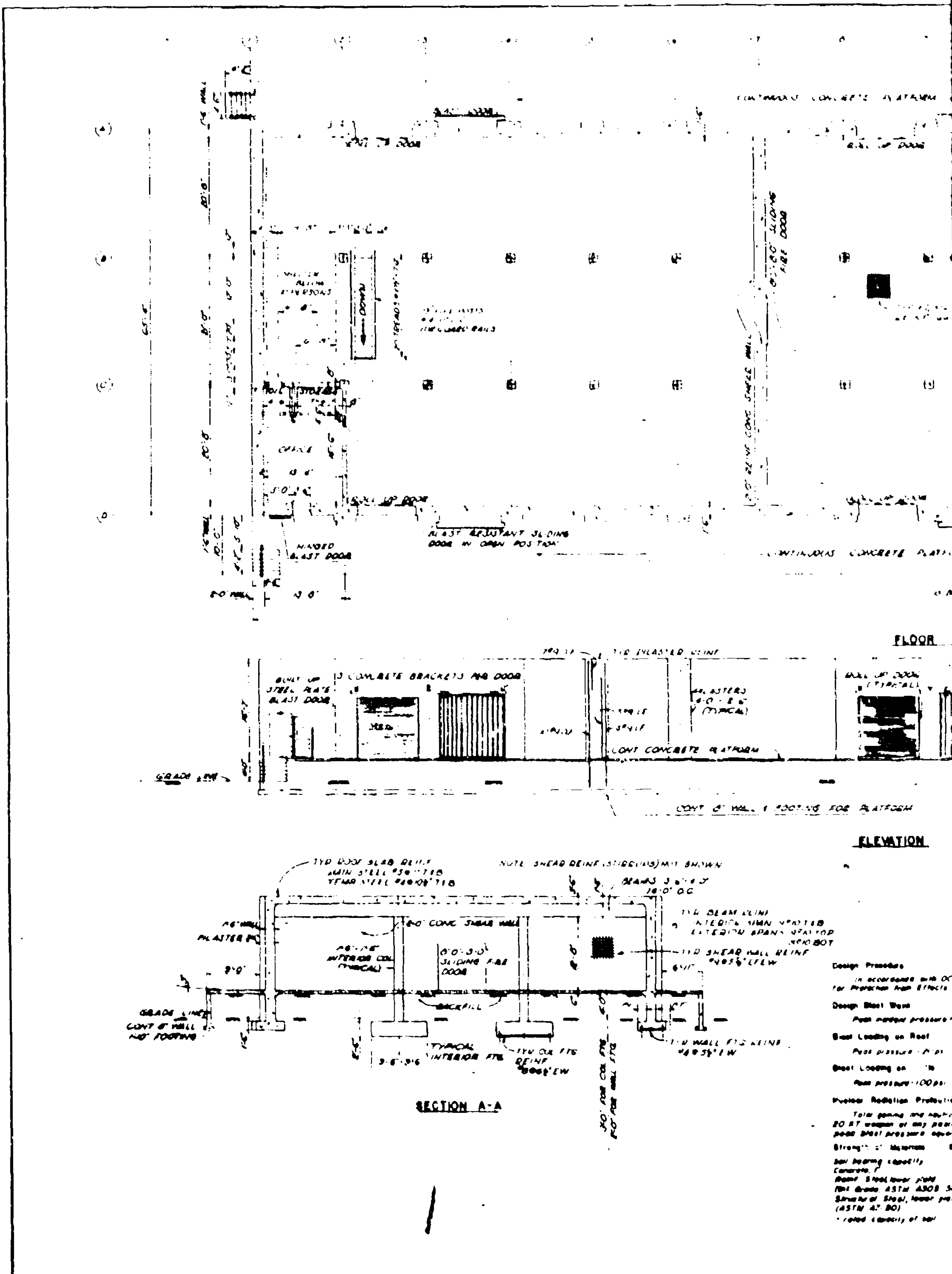
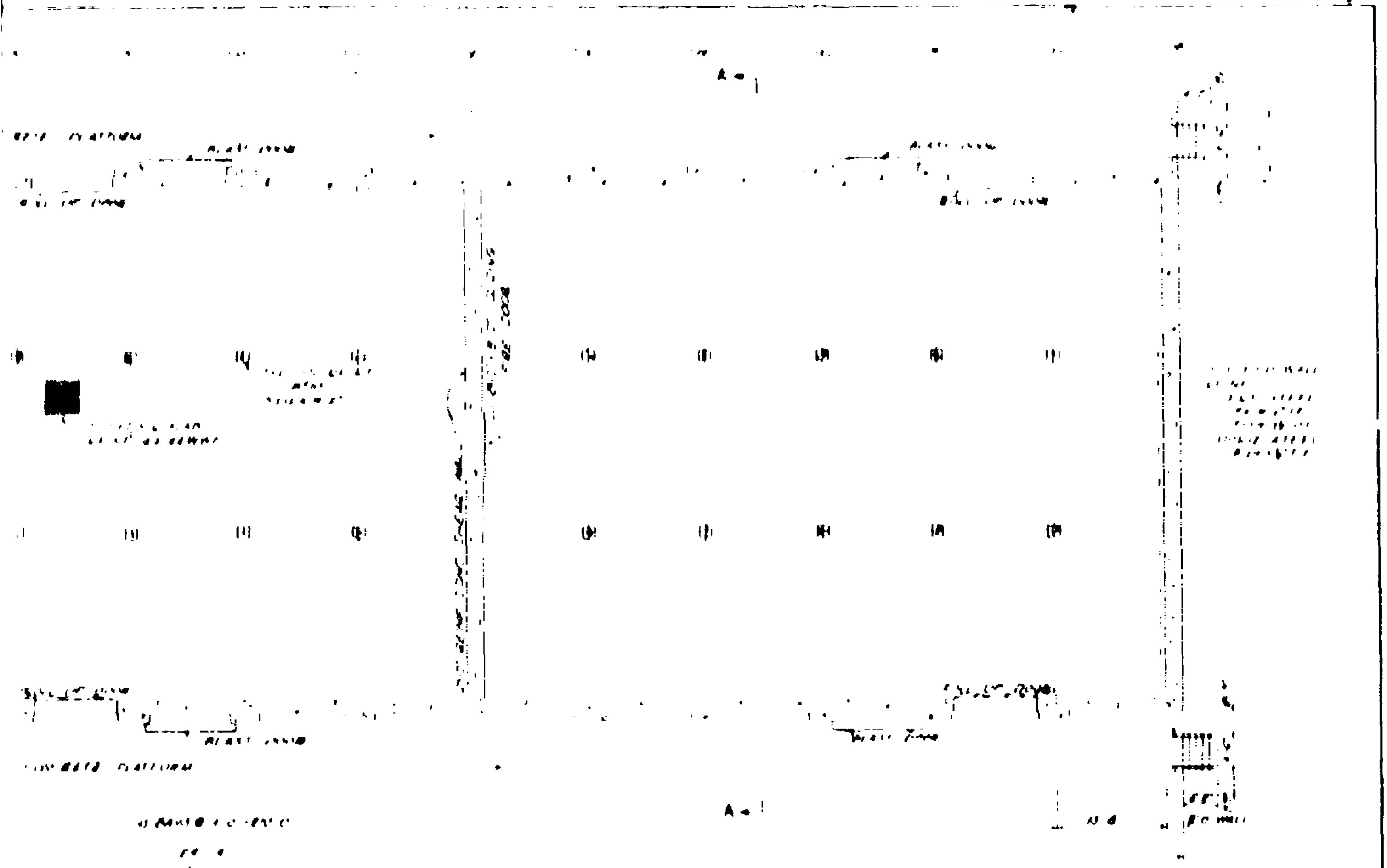
PROTECTIVE CONSTRUCTION
WAREHOUSE
20 PSI BLAST RESISTANT

DRAWING NUMBER 60-17-01

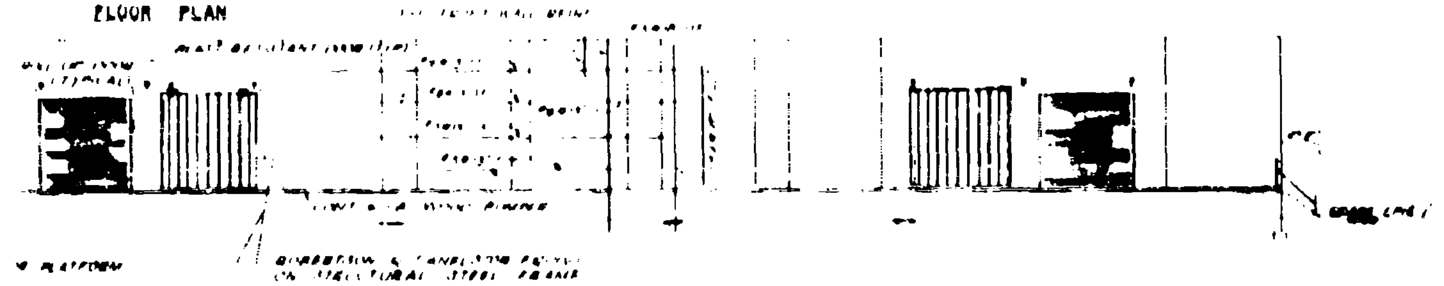
SHEET 1 OF 1



CONTINUOUS CONCRETE PLATFORM
ROLL UP DOOR
SLIDING FIRE DOOR
DOWN
OFFICE
HINGED BLAST DOOR
BLAST RESISTANT SLIDING DOOR IN OPEN POSITION
CONTINUOUS CONCRETE PLATFORM
FLOOR
BUILT UP STEEL PLATE BLAST DOOR
CONCRETE BRACKETS FOR DOOR
TYP PILASTER REINF
PILASTERS (TYPICAL)
CONT CONCRETE PLATFORM
ROLL UP DOOR (TYPICAL)
GRADE LINE
CONT 8" WALL & FOOTING FOR PLATFORM
ELEVATION
TYP ROOF SLAB REINF
NOTE: SHEAR REINF (STIRRUPS) NOT SHOWN
BEAMS
16'-0" O.C.
TYP BEAM REINF
8'-0" CONC SHEAR WALL
INTERIOR COL (TYPICAL)
8'-0" x 8'-0" SLIDING FIRE DOOR
TYP SHEAR WALL REINF
BACKFILL
GRADE LINE
CONT 8" WALL
TYPICAL INTERIOR FTG
TYP COL FTG REINF
TYP WALL FTG REINF
SECTION A-A
Design Procedure
Design Blast Wave
Blast Loading on Roof
Nuclear Radiation Protection
Strength of Materials



FLOOR PLAN



ELEVATION

DESIGN CONDITIONS

Design Procedure

In accordance with OCE manual, Design of Structures ... Protection from Effects of Atomic Weapons

Design Blast Wave

Peak overpressure ... psi; Duration ... sec

Blast Loading on Roof

Peak pressure ... psi; Duration ... sec

Blast Loading on Walls

Peak pressure ... psi; Duration ... sec

Nuclear Radiation Protection for Shelter Area

Total gamma and neutron attenuated ... of any weapon which will produce a ... blast pressure equal to 30 psi

Strength of Materials	Static	Blast Design
... bearing capacity	3,000 psi	10,000 psi
...	4,000 psi	5,200 psi
... Steel, lower yield	47,500 psi	60,000 psi
... Grade ASTM A305 ...		
Structural Steel, lower yield	33,000 psi	42,000 psi
... ASTM A7 ...		
... capacity of soil		

Allowable Stresses and Deflections

[illegible]

General Notes

The following items are not shown and shall be determined to suit use requirements:

[illegible] equipment

[illegible] facilities

[illegible] ... AFB Drawing No. ...

2

AMMANN & WHITNEY

111 8th AVENUE, NEW YORK, N. Y.

DEPARTMENT OF THE ARMY

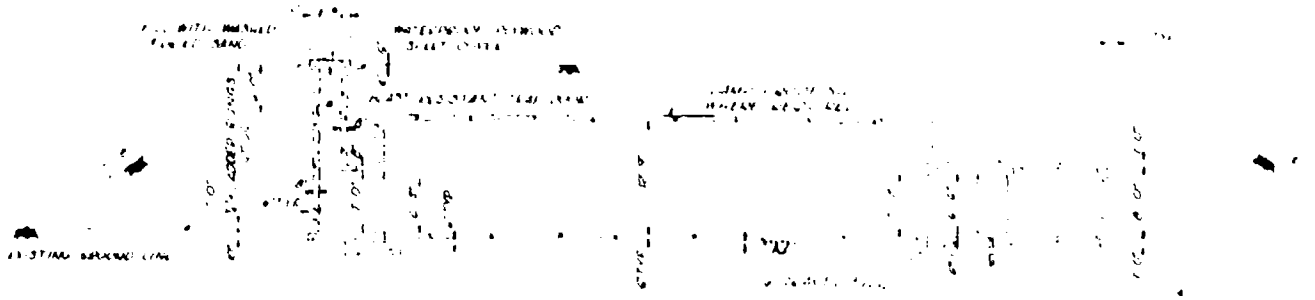
PROTECTIVE CONSTRUCTION

WAREHOUSE

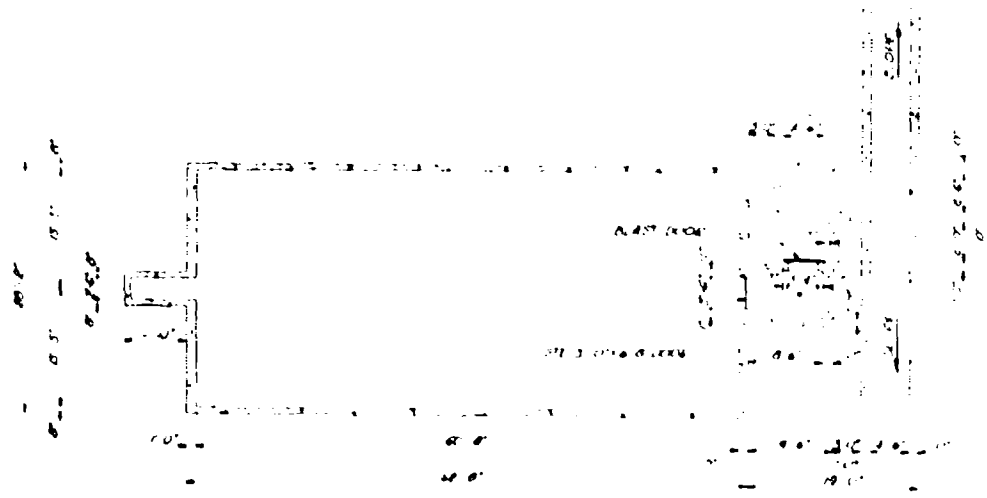
30 PSI BLAST RESISTANT

DRAWING NUMBER 60-17-01

ROOF PLAN
SCALE 1/8"=1'-0"



SECTION A-A
SCALE 1/8"=1'-0"



FLOOR PLAN
SCALE 1/8"=1'-0"

DESIGN CONDITIONS

Design Procedure

Design Blast Wave

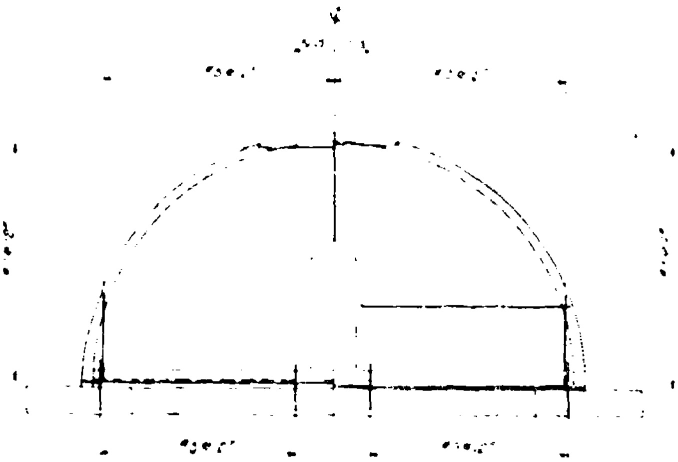
Blast Loading on Arch Surface

Nuclear Radiation Protection

Strength of Materials — Static — Blast Design

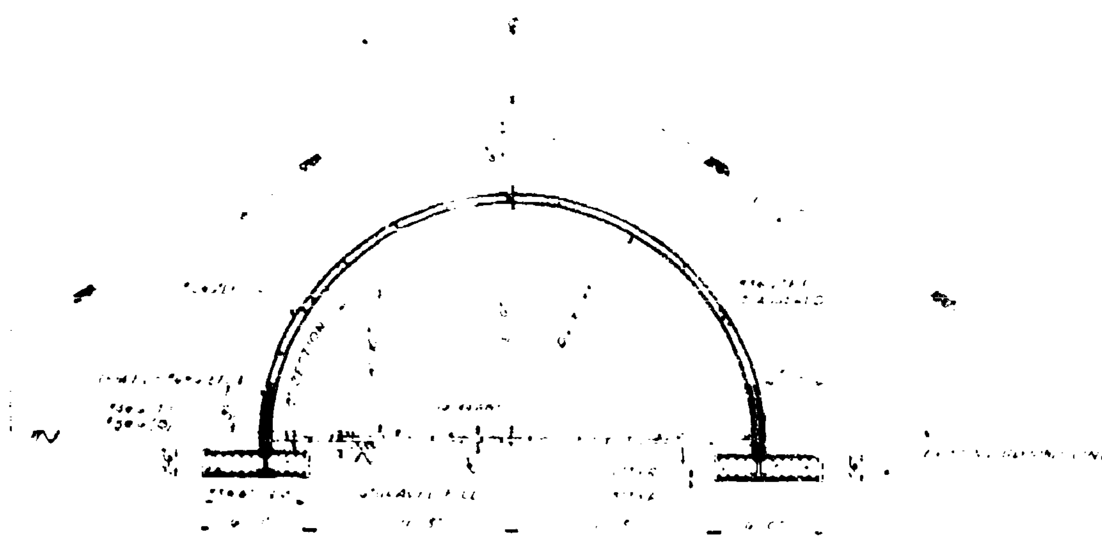
Allowable Stresses and Deflections

General Notes



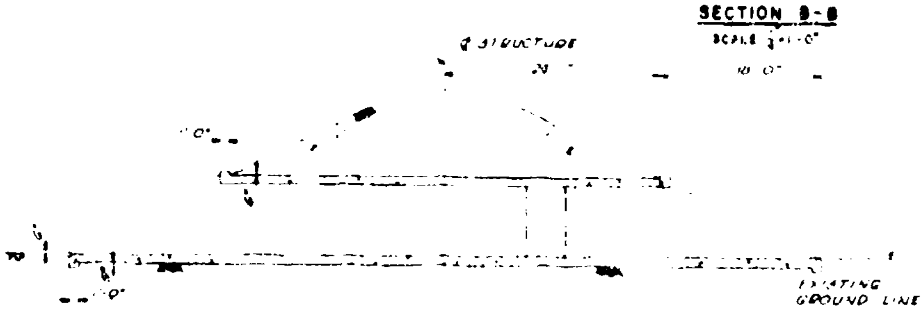
SECTION C-C

SCALE ¼"=1'-0"



SECTION B-B

SCALE ¼"=1'-0"



SECTION D-D

SCALE ¼"=1'-0"

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CONSULTING ENGINEERS
111 8TH AVENUE, NEW YORK, N. Y.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON D. C.

DESIGN BY F.W.

DRAWN BY L.B.

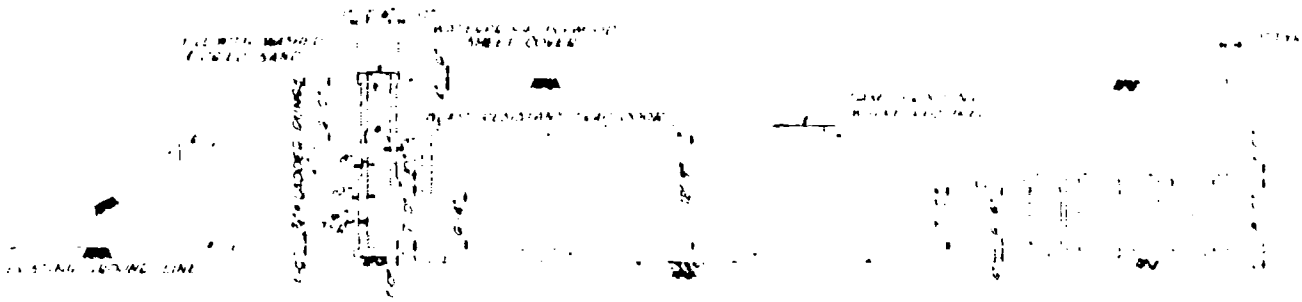
PROTECTIVE CONSTRUCTION
EARTH COVERED
CONCRETE IGLOO MAGAZINE
25 PSI BLAST RESISTANT

SCALE AS NOTED

DRAWING NUMBER 60-17-02

ROOF PLAN

SCALE 1/8" = 1'-0"



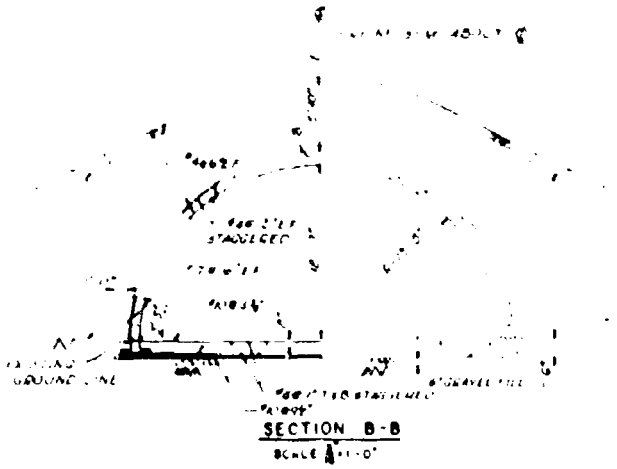
SECTION A-A

SCALE 1/8" = 1'-0"

FLOOR PLAN

SCALE 1/8" = 1'-0"

1



SECTION B-B

SCALE 1"=1'-0"

DESIGN CONDITIONS

Design Procedure

Design Blast Wave

Blast Loading on Arch Surface

Nuclear Radiation Protection

Strength of Materials

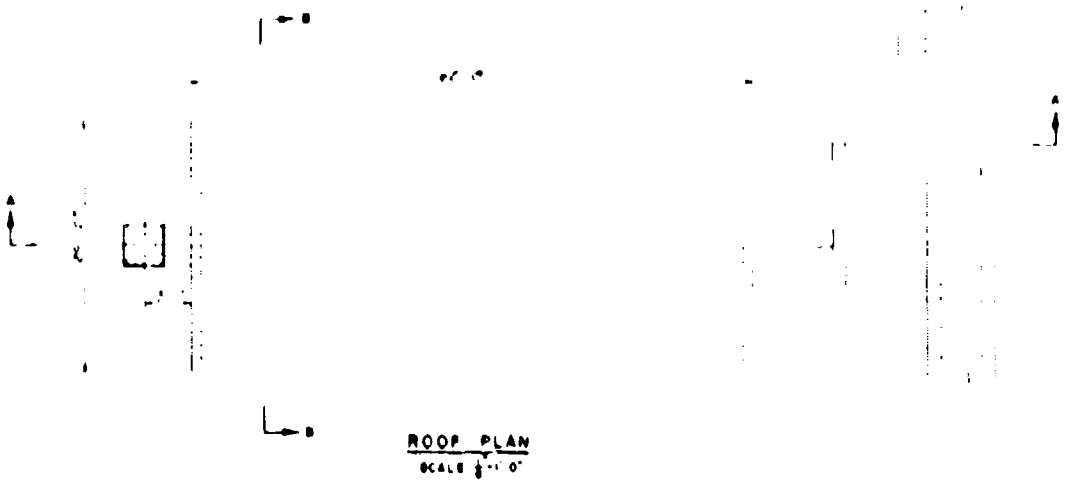
	Static	Blast Design

Allowable Stresses and Deflections

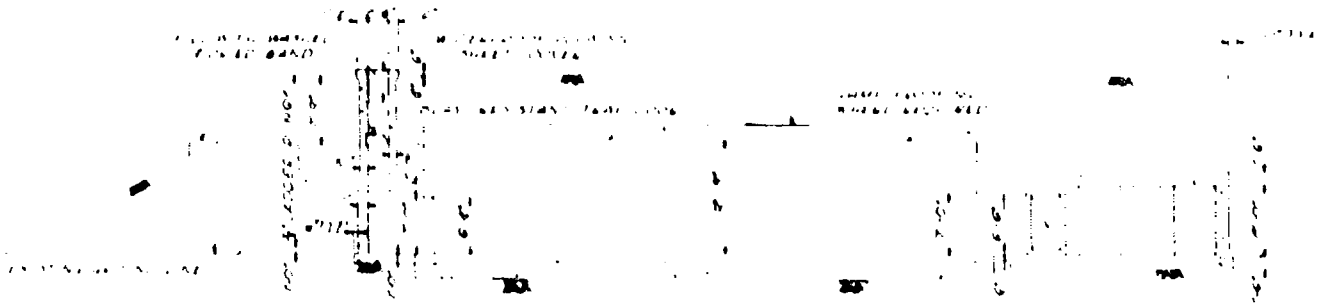
General Notes

AMMANN & WHITNEY CONSULTING ENGINEERS 111 8th AVENUE, NEW YORK, N. Y.	DEPARTMENT OF THE ARMY OFFICE OF THE CHIEF OF ENGINEERS MILITARY CONSTRUCTION ENGINEERING DIVISION
DESIGNED BY F.J.W. TRACED BY CHECKED BY G. APPROVED	PROTECTIVE CONSTRUCTION EARTH COVERED CONCRETE IGLOO MAGAZINE 80 PSI BLAST RESISTANT
DATE DEC 1955	SCALE AS NOTED DRAWING NUMBER 60-17-02 SHEET 1 OF 1

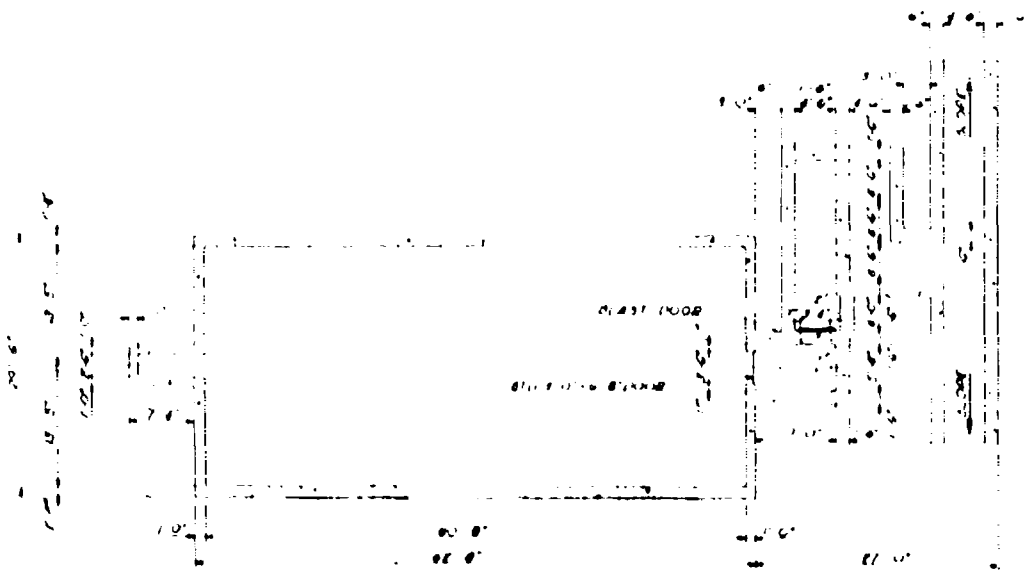
2



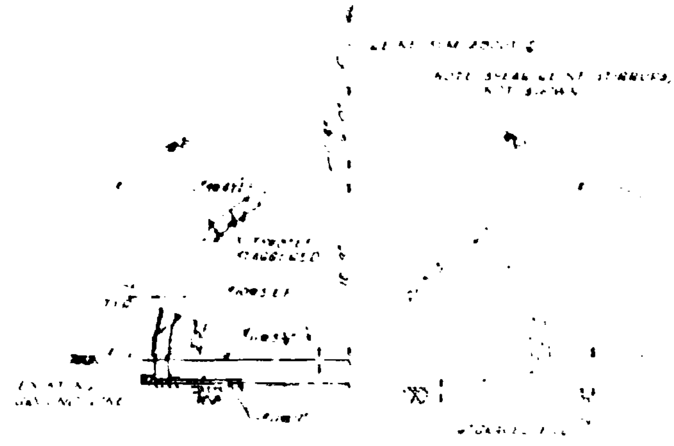
ROOF PLAN
SCALE 1/8" = 1'-0"



SECTION A-A
SCALE 1/8" = 1'-0"



FLOOR PLAN
SCALE 1/8" = 1'-0"



SECTION B-B

SCALE ¾" = 1'-0"

DESIGN C[illegible]

Design Procedure

[illegible]

Design Blast Wave

[illegible]

Blast Loading on Arch Surface

[illegible]

Nuclear Radiation Protection

[illegible]

Strength of Materials

[illegible]

Allowable Stresses and Deflections

[illegible]

General Notes

[illegible]

4. Structure may be lowered [illegible] desired

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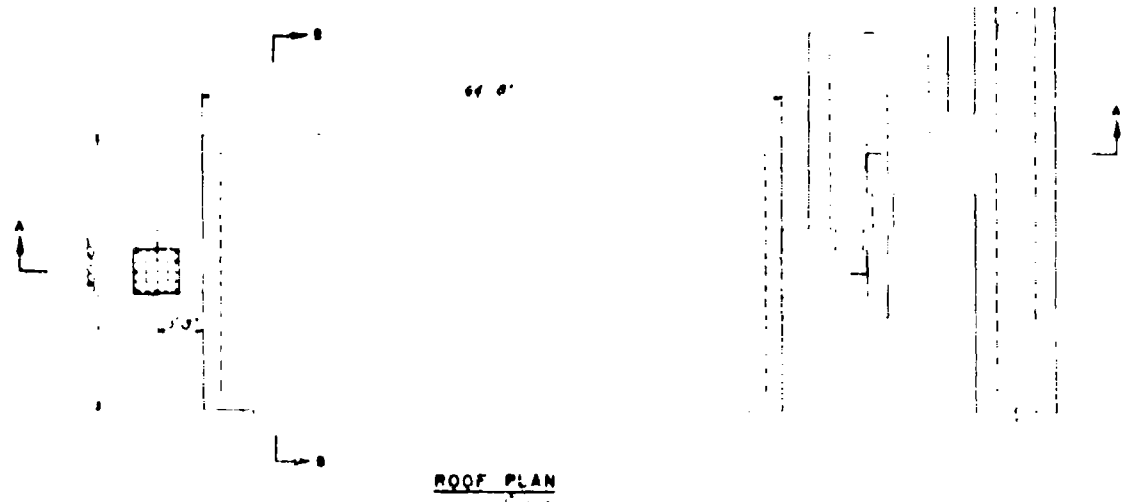
111-8TH AVENUE, NEW YORK, N. Y.

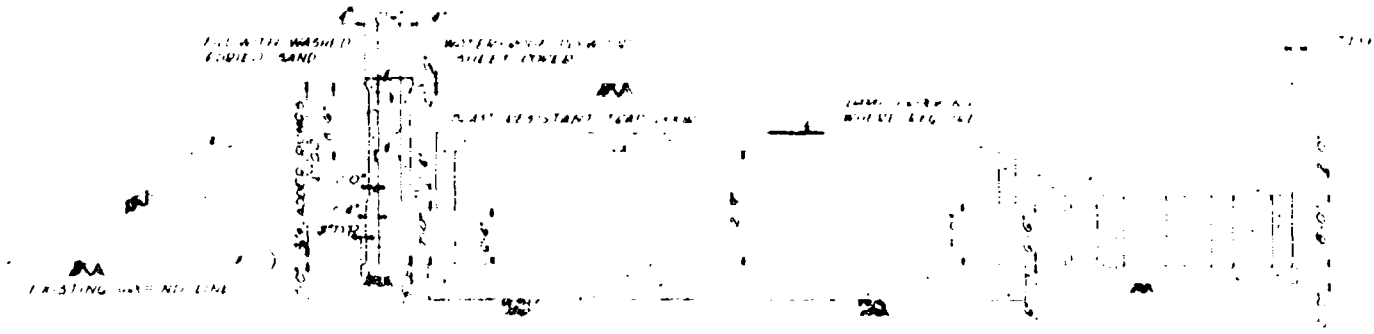
[D]EPARTMENT OF [TH]E ARMY

PROTECTI[V]E CONSTRU[C]TION
EAR[T]H COVERE[D]
CONCRETE IGLOO MAG[A]ZINE
100 PSI [B]LAST RESIS[T]ANT

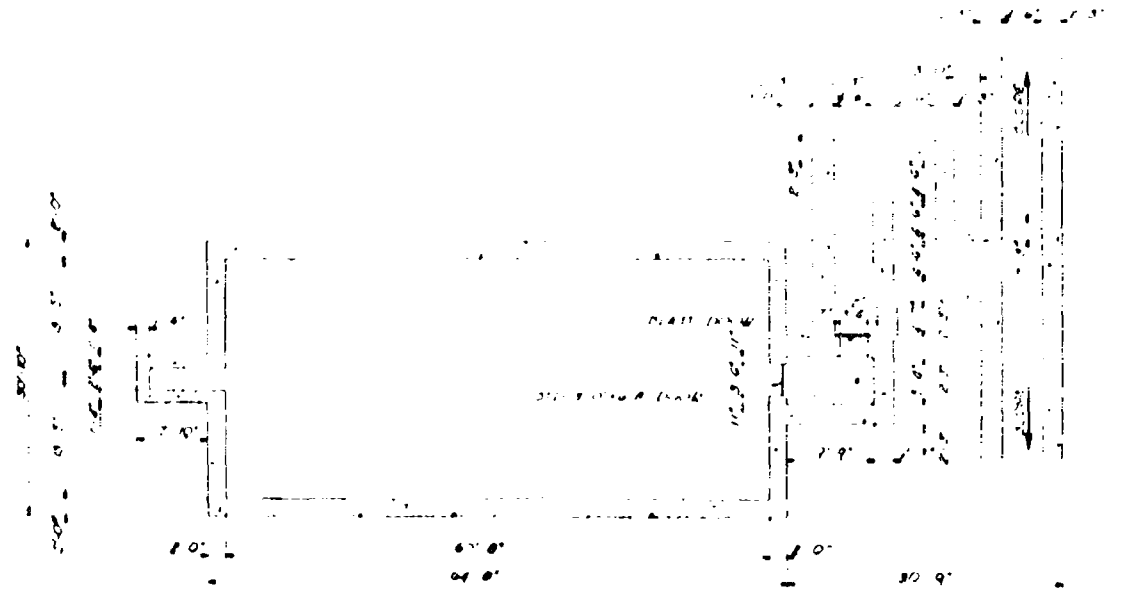
SHEET 1 OF 1



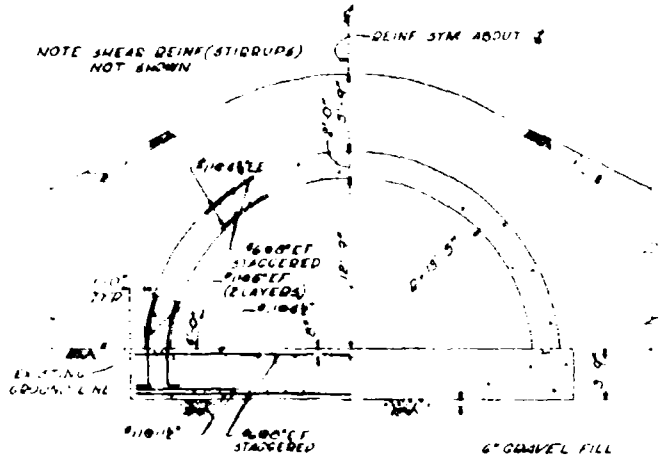
ROOF PLAN
SCALE 1/8" = 1'-0"



SECTION A-A
SCALE 1/8" = 1'-0"



FLOOR PLAN
SCALE 1/8" = 1'-0"



SECTION B-B

SCALE 3/8" = 1'-0"

DESIGN CONDITIONS

Design Procedure

In accordance with OCE manual, "Design of Structures for Protection from the Effects of Atomic Weapons"

Design Blast Wave

Peak incident pressure = 200psi Duration = 0.45sec

Blast Loading on Arch Surface

Peak pressure = 400psi

Nuclear Radiation Protection

Total gamma and neutrons attenuated to 50r for a 500KT weapon at any location which will produce a peak blast pressure equal to 200psi

Strength of Materials	Static	Blast Design
Soil bearing capacity	8,000psf *	16,000psf
Concrete f'_c	5,000psi	6,000psi
Reinf Steel (lower yield (Int Grade, ASTM A305-50T)	47,500psi	52,000psi
Structural steel, (lower yield (ASTM A7-50)	36,000psi	41,600psi

*Rated capacity of soil

Allowable Stresses and Deflections

The foundation, end walls and entrance may be designed for plastic deformation under design blast load. Arch designed for maximum allowable horizontal deflection at crown equal to R/50. Blast door and escape hatch door designed for maximum elastic deformation under design blast load.

General Notes

1. The following features are not shown and shall be determined to suit use requirements:
   - Interior partitions
   - Mechanical and electrical equipment
   - Air locks and decontamination facilities
2. Access ramps may be provided if required for vehicles.
3. Thermal protection to be applied to all exterior doors.
4. Structure may be lowered to balance cut and fill if desired.

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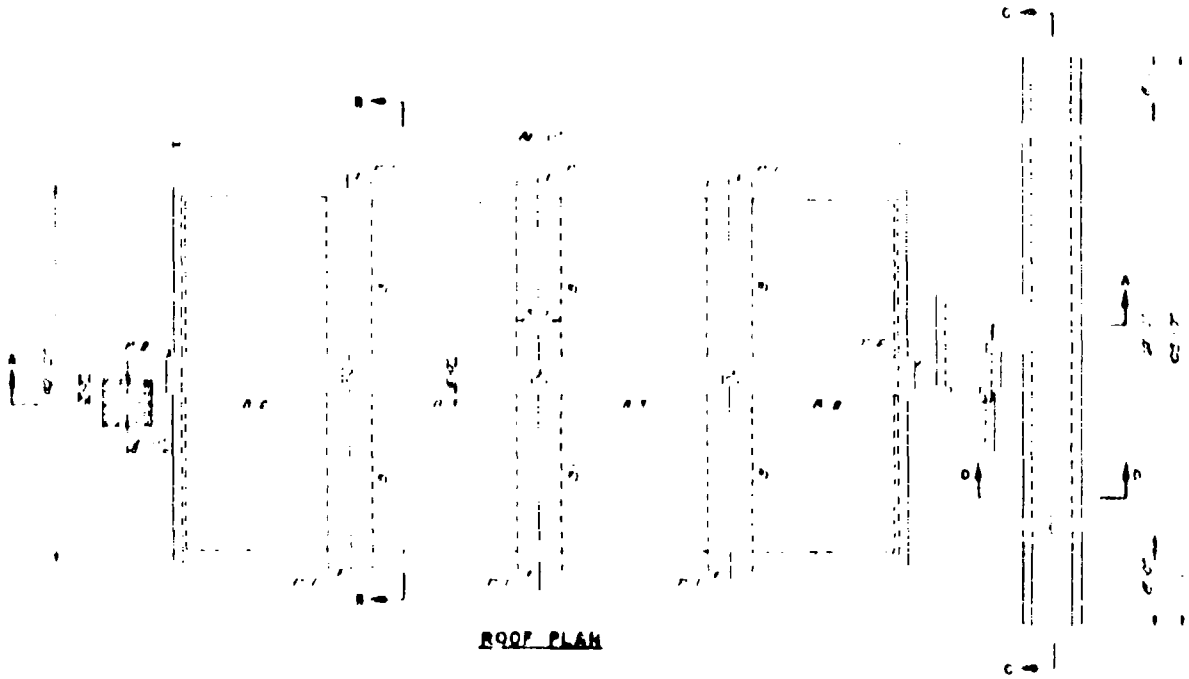
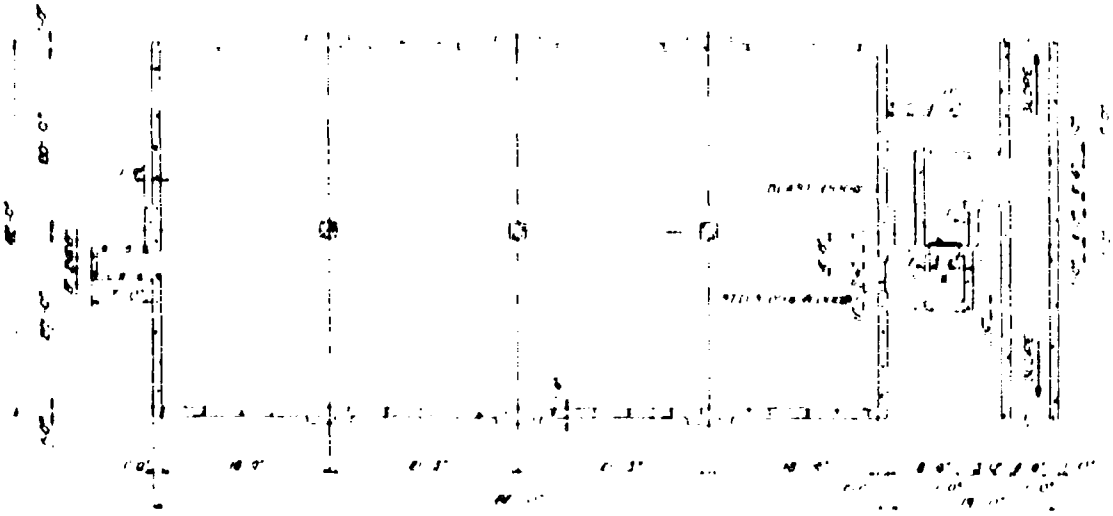
DESIGNED BY F.J.W.	PROTECTIVE CONSTRUCTION EARTH COVERED CONCRETE IGLOO MAGAZINE 200 PSI BLAST RESISTANT
	SCALE AS NOTED
	DRAWING NUMBER 60-17-02
DATE	SHEET 1 OF 1



ROOF PLAN

SECTION A A



FLOOR PLAN

DESIGN CONDITIONS

Design Procedure

In accordance with OCE manual, "Design of Structures for Protection from the Effects of Atomic Weapons"

Design Blast Wave

Peak incident pressure = 25psi Duration = 1.12 sec

Blast Loading on Roof and Walls

Peak pressure [illegible] psi Duration = 1.12 sec

Nuclear Radiation Protection

Total gamma and neutron attenuated to 50r for a 20 K T weapon at any position which will produce a peak blast pressure equal to 25psi

Strength of Materials	Static	Blast Design
Soil bearing capacity	8,000psf*	16,000psf
Concrete, f'c	4,000psi	5,200psi
Reinf. steel, lower yield (Int. Grade, ASTM A15-50T)	47,500psi	52,000psi
Structural steel, lower yield (ASTM A7-50)	38,000psi	41,600psi

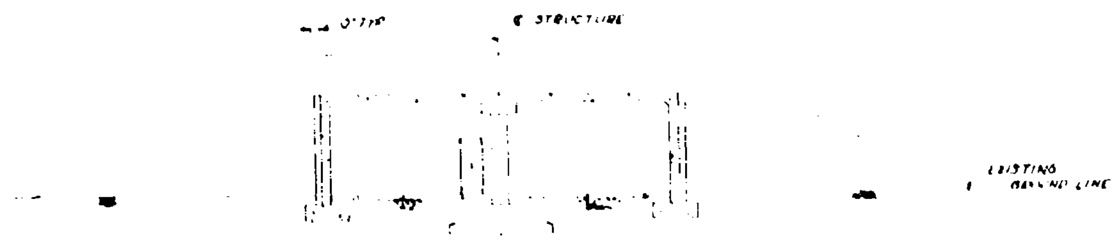
*rated capacity of soil

Allowable Stresses and Deflections

Roof, walls, foundation and entrance way designed for plastic deformation under design blast load. Blast door and escape hatch door designed for maximum elastic deformation under design blast load.

General Notes

1. The following features are not shown and shall be determined to suit use requirements:
   - Interior partitions
   - Mechanical and electrical equipment
   - Air locks and decontamination facilities
2. Access ramp may be provided if required for vehicles.
3. Structure may be varied to balance cut and fill if desired.



SECTION B-B

REVISION	DATE	DESCRIPTION	BY	APPROVAL

AMMANN & WHITNEY
CONSULTING ENGINEERS
111-8TH AVENUE, NEW YORK, N. Y.

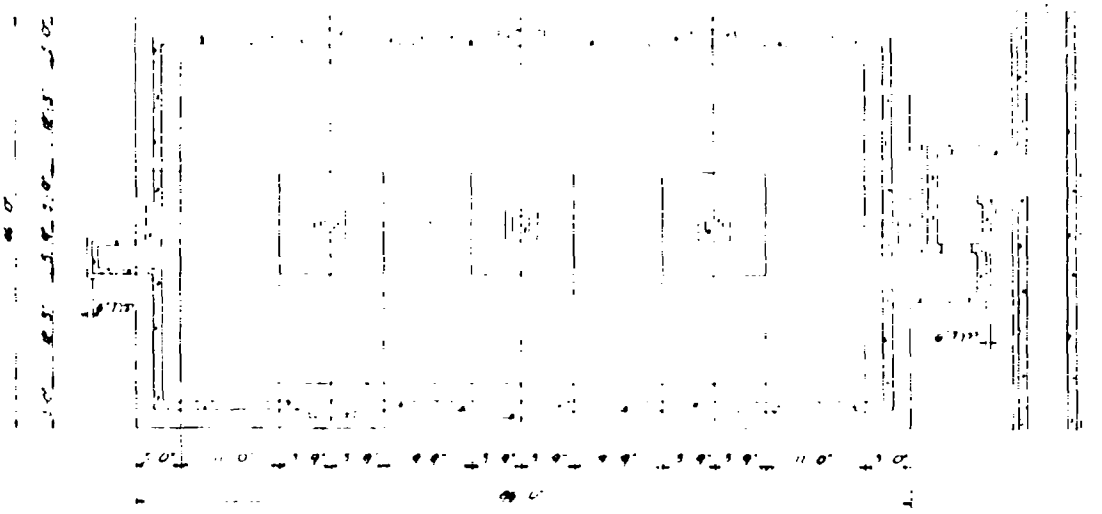
DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D. C.

DRAWN BY: J. S.
CHECKED BY: N. D.

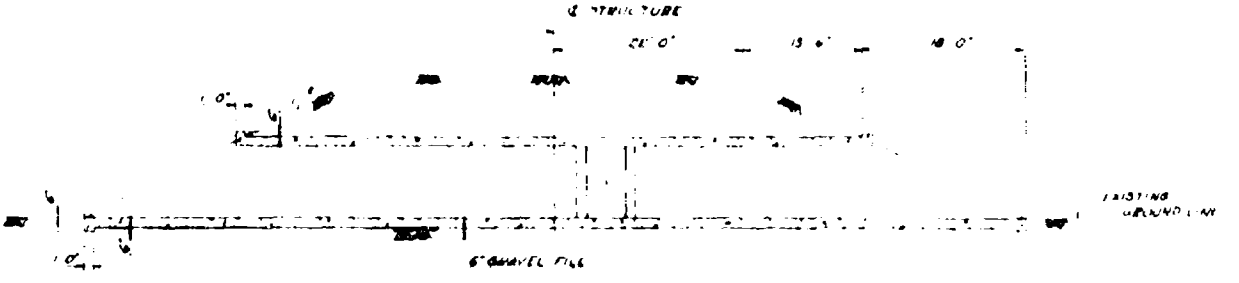
PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
EARTH COVERED, RECTANGULAR
25 PSI BLAST RESISTANT

SCALE: 1/8" = 1'
DRAWING NUMBER: 60-18-01
SHEET 1 OF 2
DATE: [illegible]

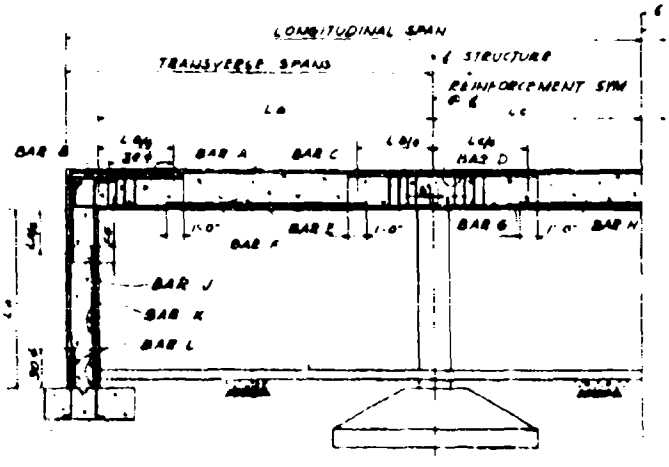
2



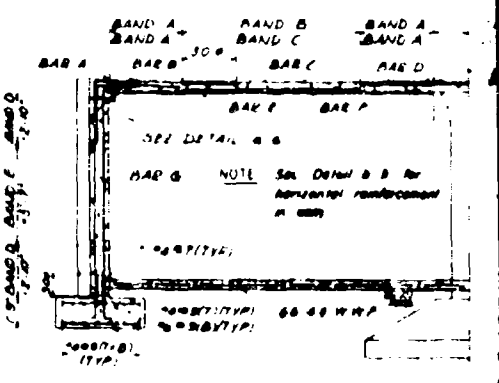
FOUNDATION PLAN
SCALE: $\frac{1}{8}$" = 1'-0"



SECTION C-C
SCALE: $\frac{1}{8}$" = 1'-0"



TYPICAL BEAM & PILASTER DETAIL
SCALE $\frac{1}{2}$" = 1'-0"



TYPICAL ROOF & WALL DETAIL
SCALE $\frac{1}{2}$" = 1'-0"

BEAM & PILASTER SCHEDULE

MARK NO	SIZE B	SIZE D	BARS A	B	C	D	E	F	G	H	J	K	L	MAX % STIRRUPS AT WALL OR ROOF	AT COL
B 1	60"	27"	#9 @	#9 @	#9 @	#9 @	#9 @ 11"	#9 @						0.56	0.56
B 2	48"	27"	#9 @	#9 @	#9 @	#9 @	#9 @	#9 @							
B 3	48"	27"			#9 @	#9 @	#9 @	#9 @						0.93	0.93
P 1	60"	21"	#9 @	#9 @	—	—	—	—	—	—	#9 @	#9 @	#9 @	0.83	
P 2	48"	21"	#9 @	#9 @	—	—	—	—	—	—	#9 @	—	#9 @	0.77	

NOTE: A minimum of 0.13% web reinforcement is required in all beams and pilasters

ROOF SLAB & WALL SCHEDULE

PANEL	BAND	BAR A	B	C	D	E	F	G	H	J	K	L
ROOF	"A"	#9 @ 7"		#9 @ 7"		#9 @ 7"						
	H	#9 @ 7"	#9 @ 7"	#9 @ 7"	#9 @ 7"	#9 @ 7"	#9 @ 7"					
	"A"	#9 @ 7"		#9 @ 7"		#9 @ 7"						
	"C"	#9 @ 7"	#9 @ 7"	#9 @ 7"	#9 @ 7"	#9 @ 7"	#9 @ 7"					
EXTERIOR WALL	A	#9 @ 7"						#9 @ 7"				
	B	#9 @ 7"	#9 @ 7"					#9 @ 7"				
	"D"								#9 @ 7"		#9 @ 7"	
	"E"								#9 @ 7"		#9 @ 7"	
SIDE WALL	A	#9 @ 7"						#9 @ 7"				
	C	#9 @ 7"	#9 @ 7"					#9 @ 7"				
	"D"								#9 @ 7"	#9 @ 7"		#9 @ 7"
	"E"								#9 @ 7"	#9 @ 7"		#9 @ 7"

Note: *Outer layer of steel

DETAIL OF COLUMN FOOTING
SCALE 1/4"=1'-0"

DETAIL OF COLUMN
SCALE 1/4"=1'-0"

SECTION E-E
SCALE 1/4"=1'-0"

SECTION F-F
SCALE 1/4"=1'-0"

DETAIL OF STEEL BLAST DOOR AND FRAME
SCALE 1/4"=1'-0"

SECTION D-D
SCALE 1/4"=1'-0"

DETAIL B-B
SCALE 1/16"=1'-0"

DETAIL B-B
SCALE 1/4"=1'-0"

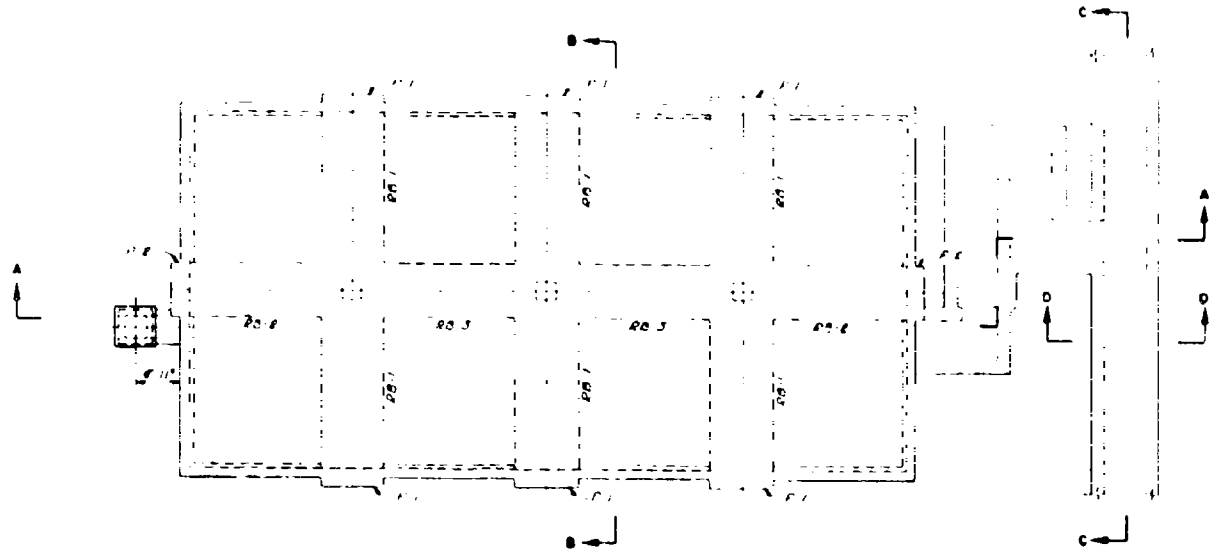
AMMANN & WHITNEY
111 8TH AVENUE, NEW YORK, N. Y.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D. C.

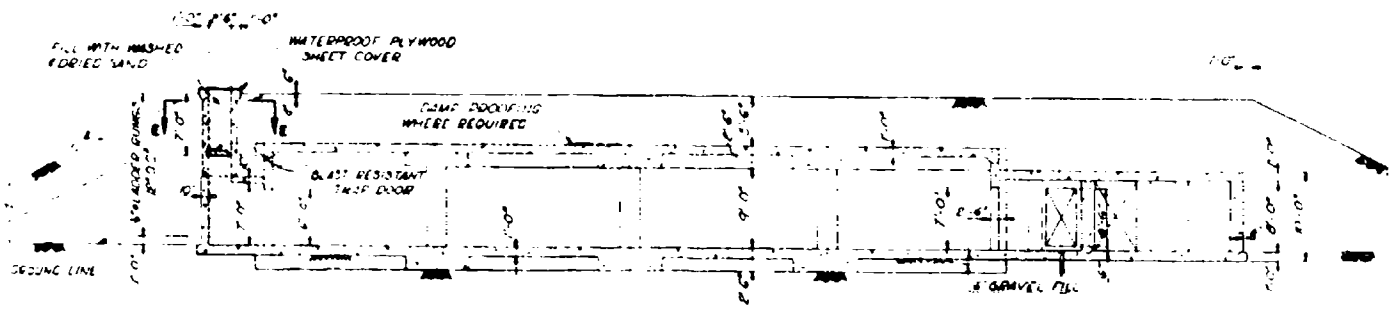
PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
EARTH COVERED, RECTANGULAR
25 PSI BLAST RESISTANT

60-18-01
SHEET 2 OF 2

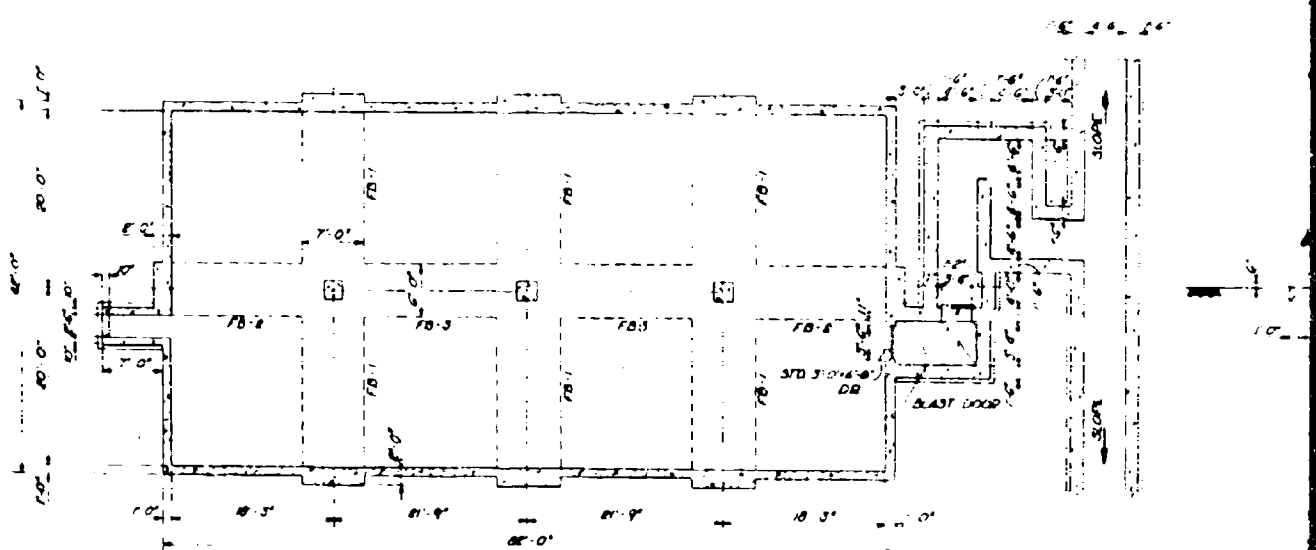
2



ROOF PLAN



SECTION A-A



FLOOR PLAN

DESIGN CONDITIONS

Design Procedure

In accordance with ... manual, "Design of Structures for Protection from the Effects of Atomic Weapons" [illegible]

Design Blast Wave

[illegible] incident pressure ... psi. Duration ... sec.

Blast Loading on Roof

Peak pressure ... 50 psi. Duration ... sec.

Blast Loading on Walls

Peak pressure ... 48 psi. Duration ... 0.85 sec.

Nuclear Radiation Protection for Shelter Area

Total gamma and neutron attenuated to ... for a ... weapon at any position which will produce a peak blast pressure ... [illegible]

Strength of Materials

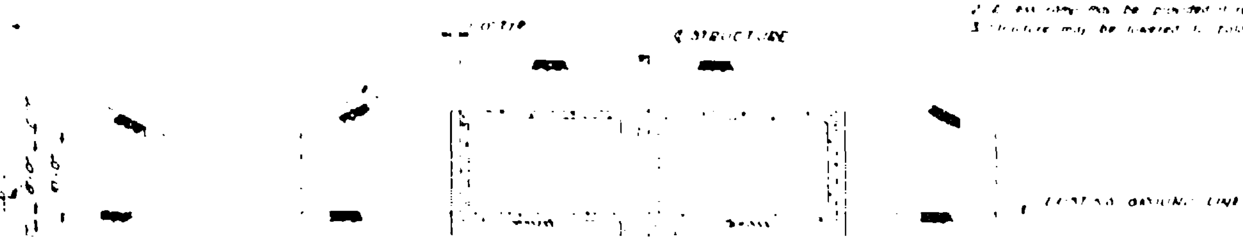
	Static	Blast Design
Soil bearing capacity	[illegible]	[illegible]
Concrete f'c	[illegible]	[illegible]
Reinf. steel, ... yield ... ASTM A ...	[illegible]	[illegible]
Structural steel, ... yield ASTM A ...	[illegible]	[illegible]
*... capacity ...		

Allowable Stresses and Deflections

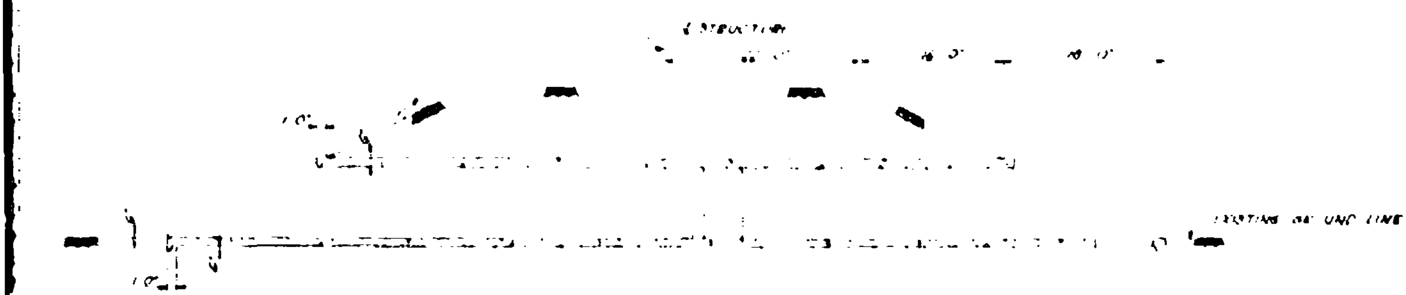
[illegible] may designed for plastic deformation under design blast load ... designed for maximum elastic deformation under design blast load.

General Notes

1. The following features are not shown and shall be determined by ... use requirements:
   - ... partitions
   - Mechanical and electrical equipment
   - Air ... and decontamination facilities
2. ... may be provided if required for vehicles.
3. Structure may be lowered to balance cut and fill if desired.



SECTION B-B



SECTION C-C

REVISION	DATE	DESCRIPTION	BY	APPROVAL

AMMANN & WHITNEY
CONSULTING ENGINEERS
111 8TH AVENUE, NEW YORK, N. Y.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D. C.

DRAWN BY: FJW

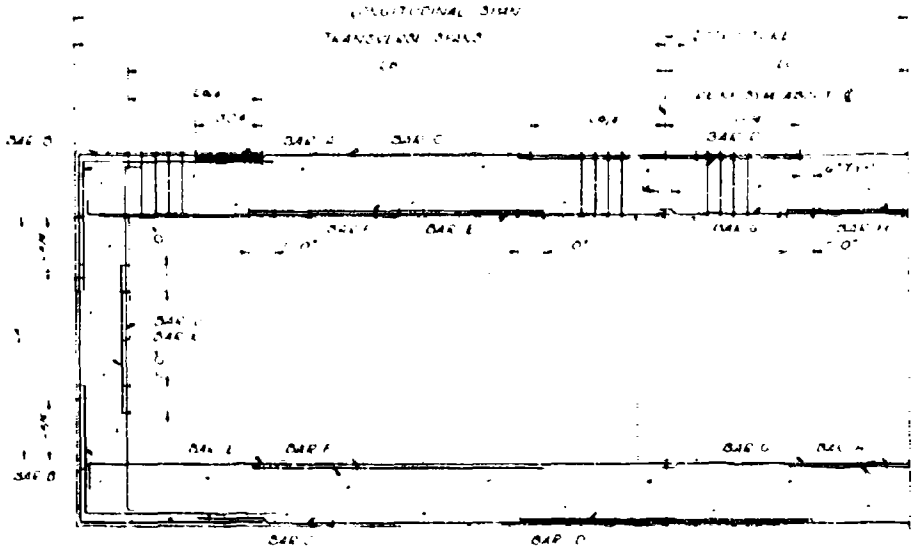
PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
EARTH COVERED, RECTANGULAR
50 PSI BLAST RESISTANT

DATE: ... 1956

DRAWING NUMBER: 50-B-01

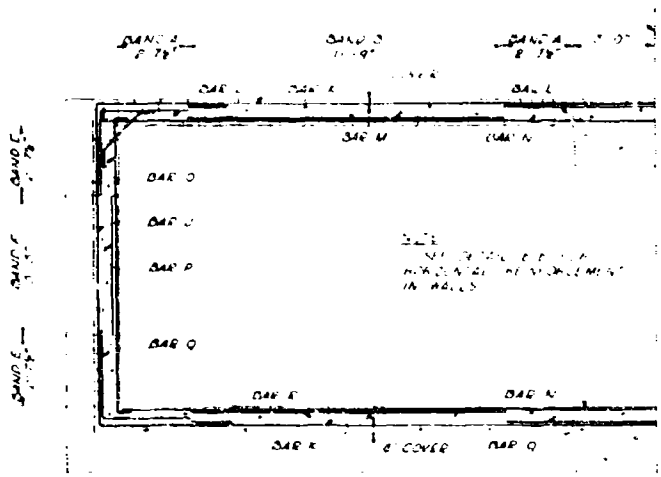
SHEET 1 OF 2

2



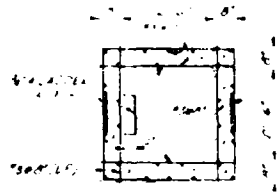
TYPICAL BEAM & PILASTER DETAIL

SCALE 1/2" = 1'-0"



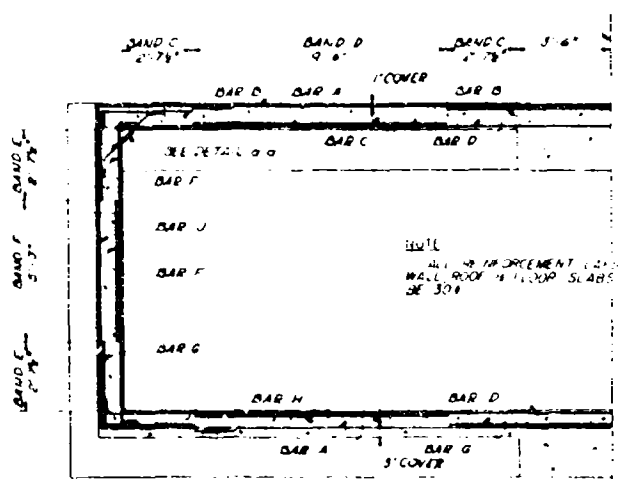
TYPICAL TRANSVERSE SECTION

SCALE 1/2" = 1'-0"



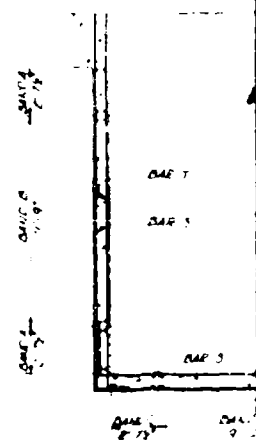
SECTION E-E

SCALE 1/2" = 1'-0"



TYPICAL LONGITUDINAL SECTION

SCALE 1/2" = 1'-0"

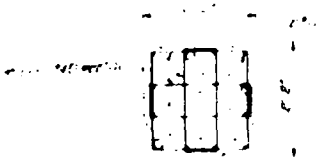


ROOF, FLOOR & WALL SLAB SCHEDULE

PANEL	BAND	BAR A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	MAX % STIRRUPS
ROOF	A																				
	B																				
	C																				
	D																				
FLOOR	A																				
	B																				
	C																				
	D																				
FRONT WALL	A																				
	B																				
	C																				
	D																				
SIDE WALL	A																				
	B																				
	C																				
	D																				
	E																				
	F																				

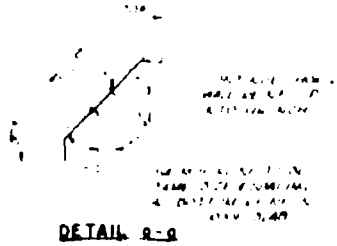
BEAM & PILASTER SCHEDULE

MARK NO	SIZE W	SIZE D	BAR A	B	C	D	E	F	G	H	J	K	MAX % STIRRUPS AT WALL OR ROOF	AT COL



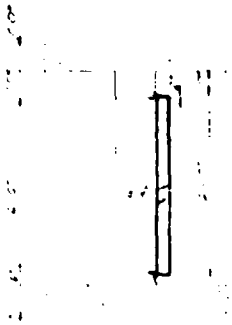
DETAIL OF COLUMN

SCALE 1/2" = 1'-0"



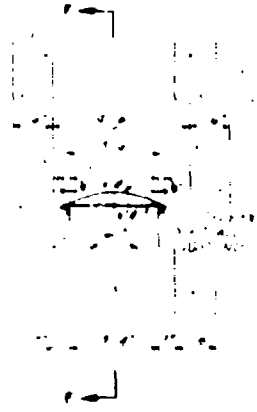
DETAIL Q-Q

SCALE 1/2" = 1'-0"



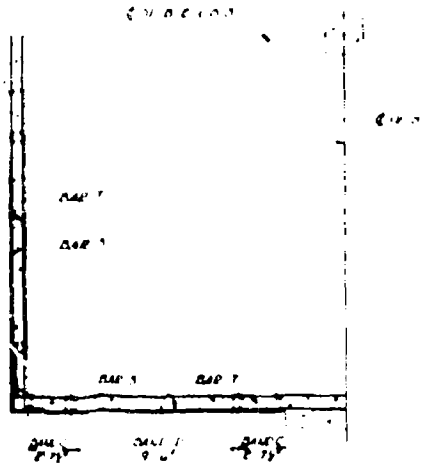
SECTION F-F

SCALE 1/2" = 1'-0"



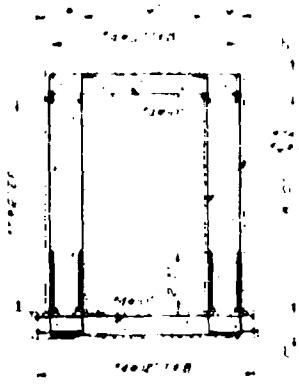
DETAIL OF STEEL BLAST DOOR AND FRAME

SCALE 1/2" = 1'-0"



DETAIL R-R

SCALE 1/2" = 1'-0"



SECTION D-D

SCALE 1/2" = 1'-0"

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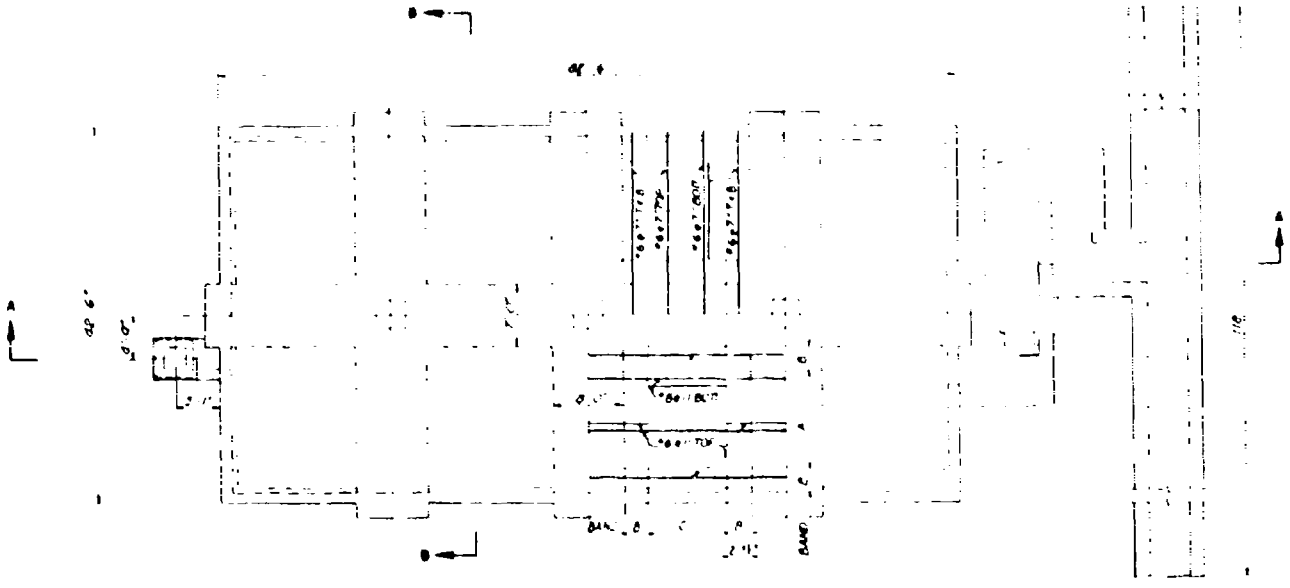
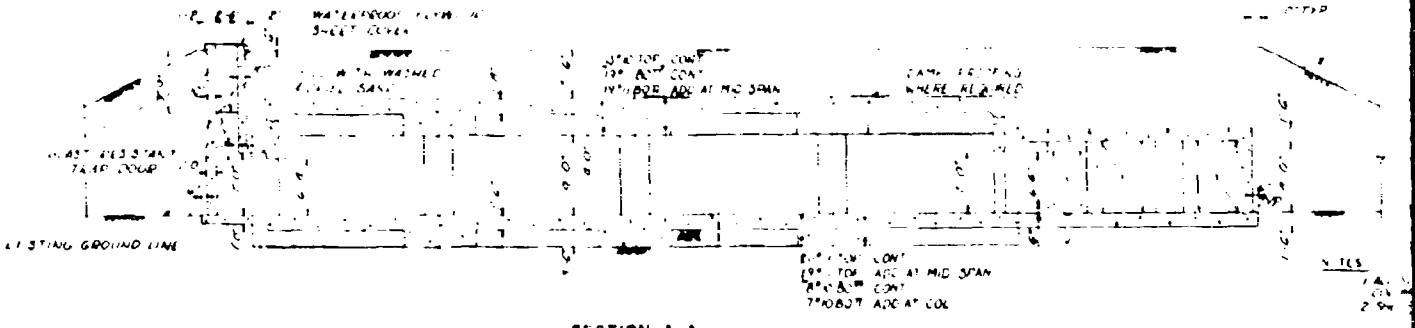
DESIGN BY		
DRAWN BY	PROTECTIVE CONSTRUCTION GENERAL PURPOSE STRUCTURE EARTH COVERED, RECTANGULAR 60 PSI BLAST RESISTANT	
TRACED BY		
CHECKED BY		
APPROVED		
DATE	AS NOTED	
	DRAWING NUMBER 60-10-01	
	SHEET 2 OF 2	

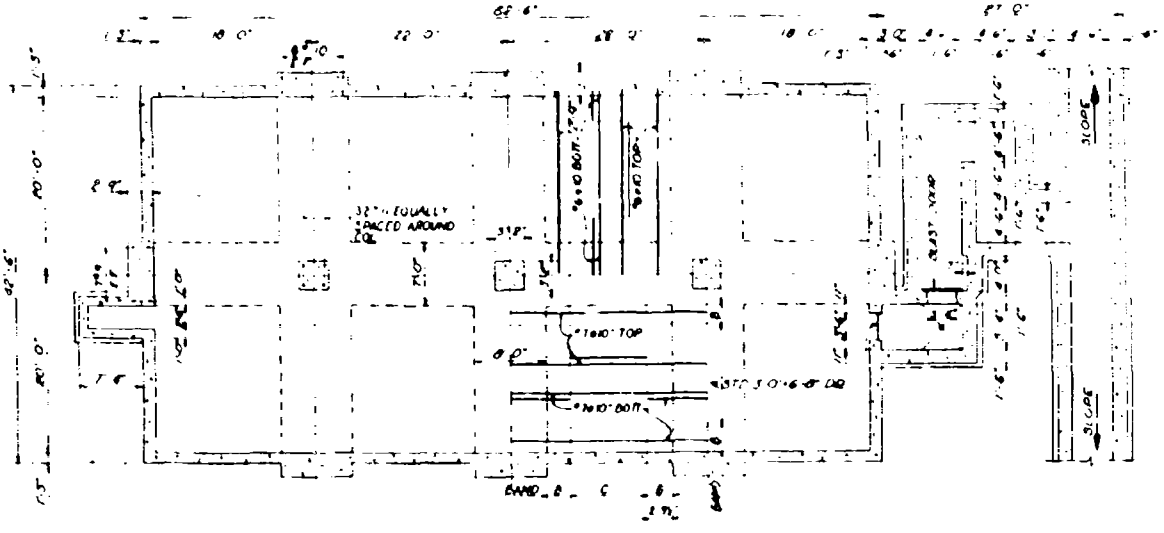
2



ROOF PLAN



SECTION A-A



FLOOR PLAN

DESIGN

Design Procedure

Design Blast Wave

Blast Loading on Roof

Blast Loading on Walls

Nuclear Radiation Protection

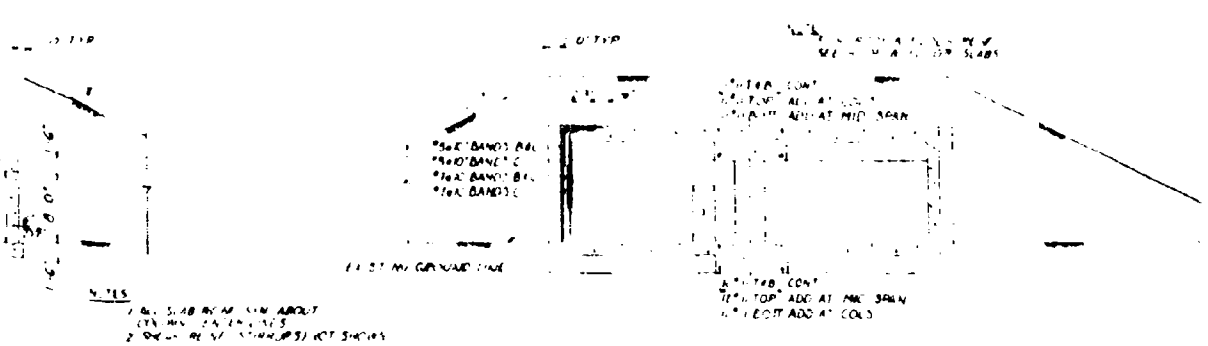
Strength of Materials

	Static	Dyn.	Design

Allowable Stresses and Deflection

General Notes

1. Access
2. Thermal protection to be
3. Structure may be lowered for



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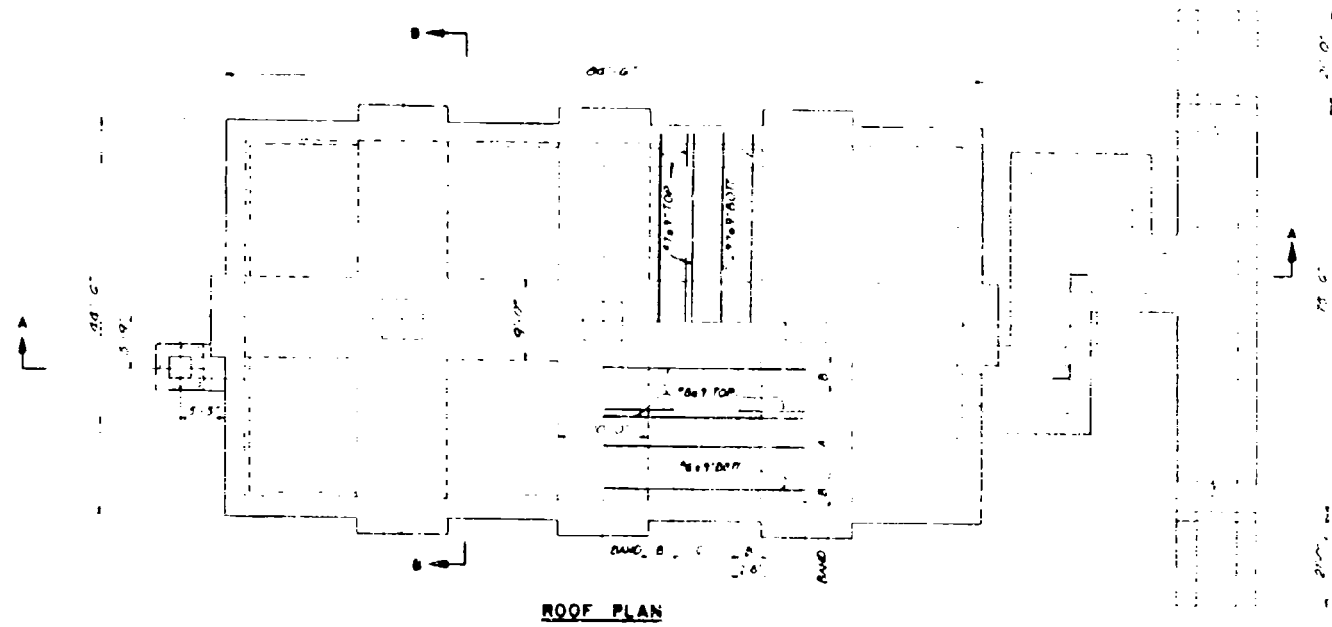
DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF
MILITARY CONSTRUCTION ENGINEERING DIVISION

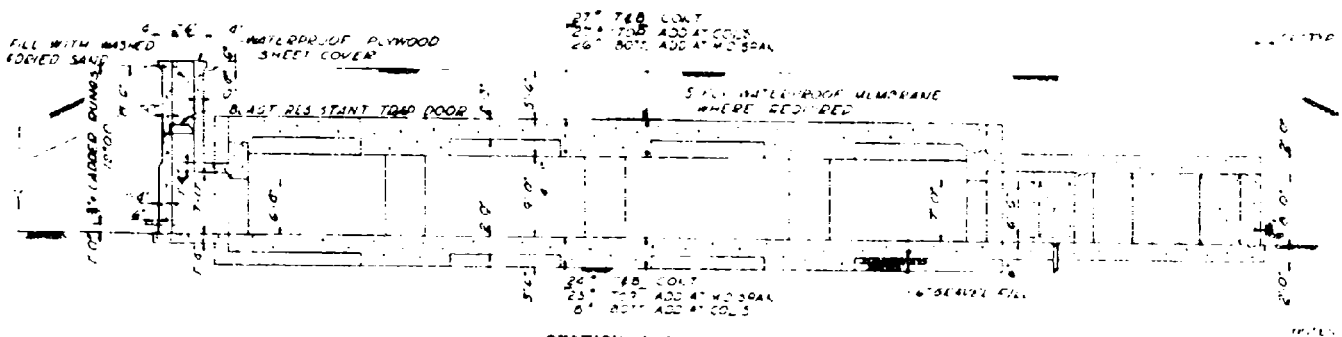
PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
EARTH COVERED, RECTANGULAR
100 PSI BLAST RESISTANT

60-10
SHEET 1 OF 1

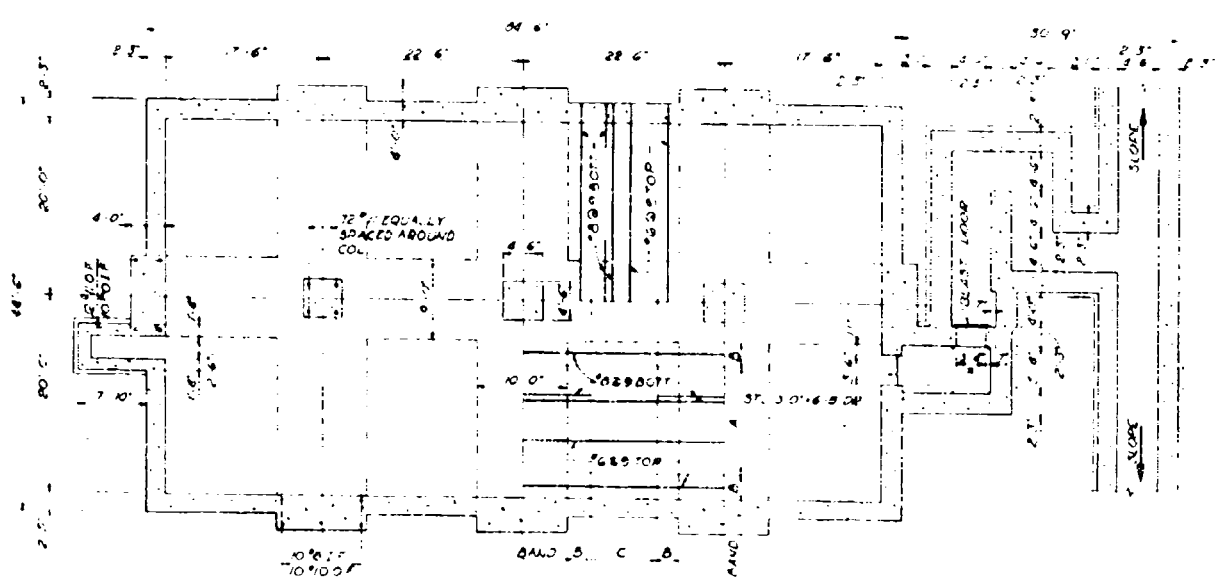
2



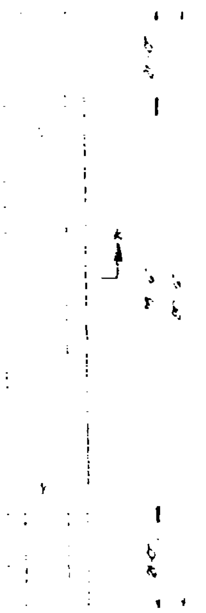
ROOF PLAN



SECTION A-A



FLOOR PLAN



DESIGN CONDITIONS

Design Procedure

Design Blast Wave

Blast Loading on Roof

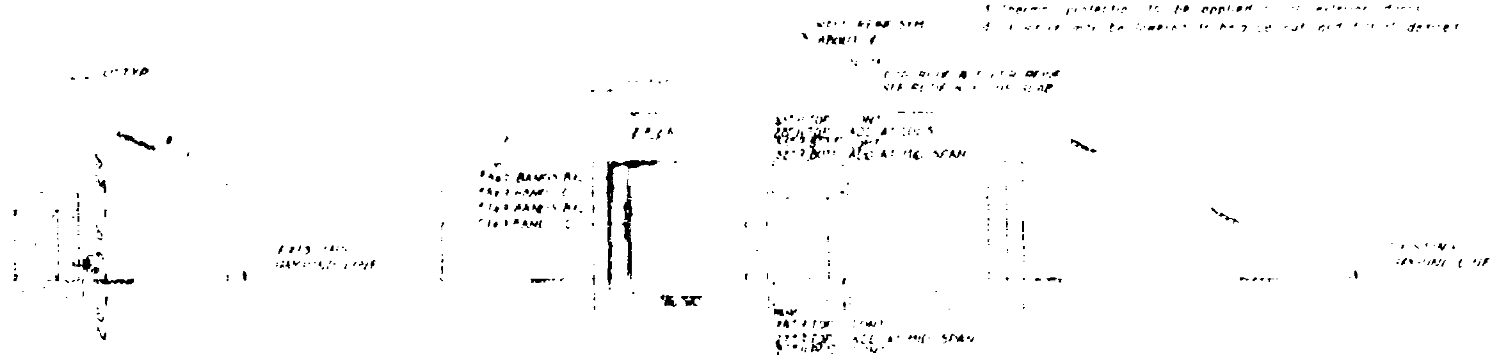
Blast Loading on Walls

Nuclear Radiation Protection for Shelter Area

Strength of Materials	Static	Blast Design

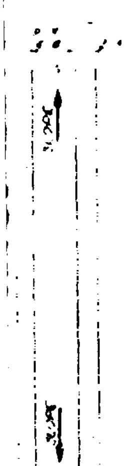
Allowable Stresses and Deflections

General Notes



NOTES:

SECTION



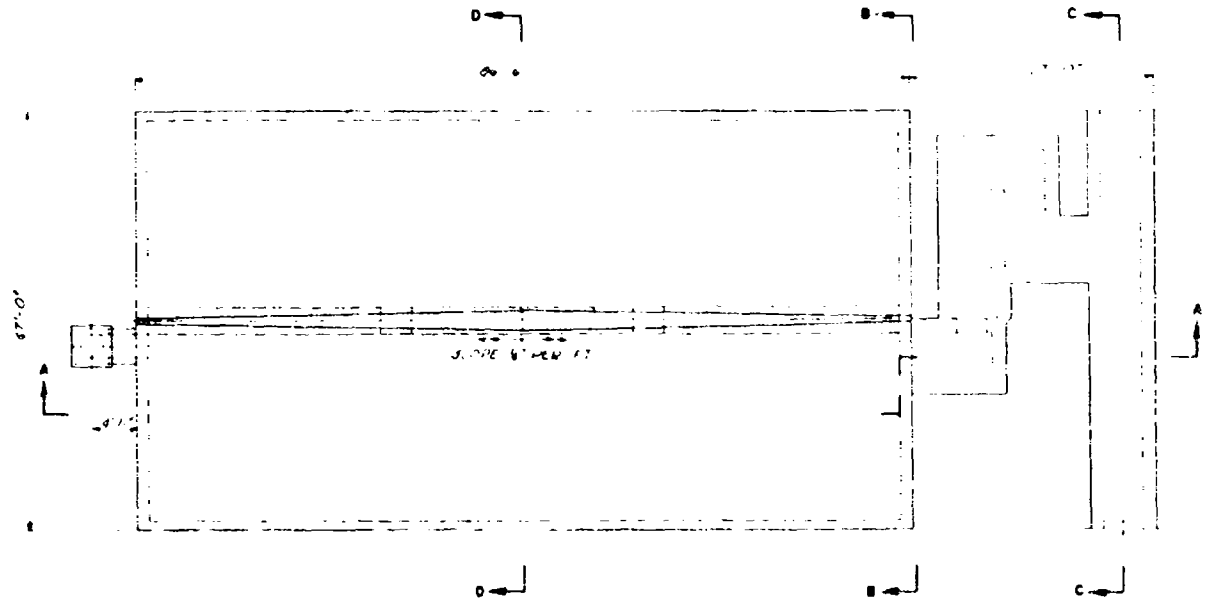
AMMANN & WHITNEY CONSULTING ENGINEERS 111 8TH AVENUE, NEW YORK, N.Y.	DEPARTMENT OF THE ARMY OFFICE OF THE CHIEF OF ENGINEERS MILITARY CONSTRUCTION ENGINEERING DIVISION WASHINGTON D.C.

PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
EARTH COVERED, RECTANGULAR
200 PSI BLAST RESISTANT

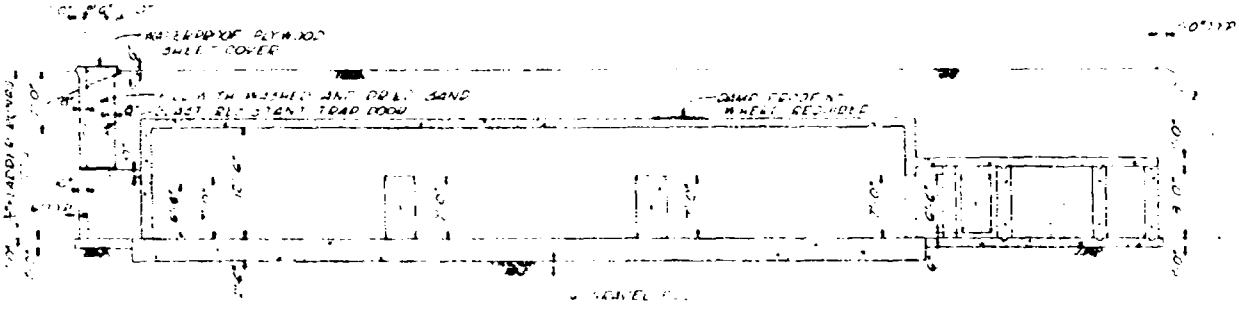
DRAWING NUMBER 60-18-01

SHEET OF

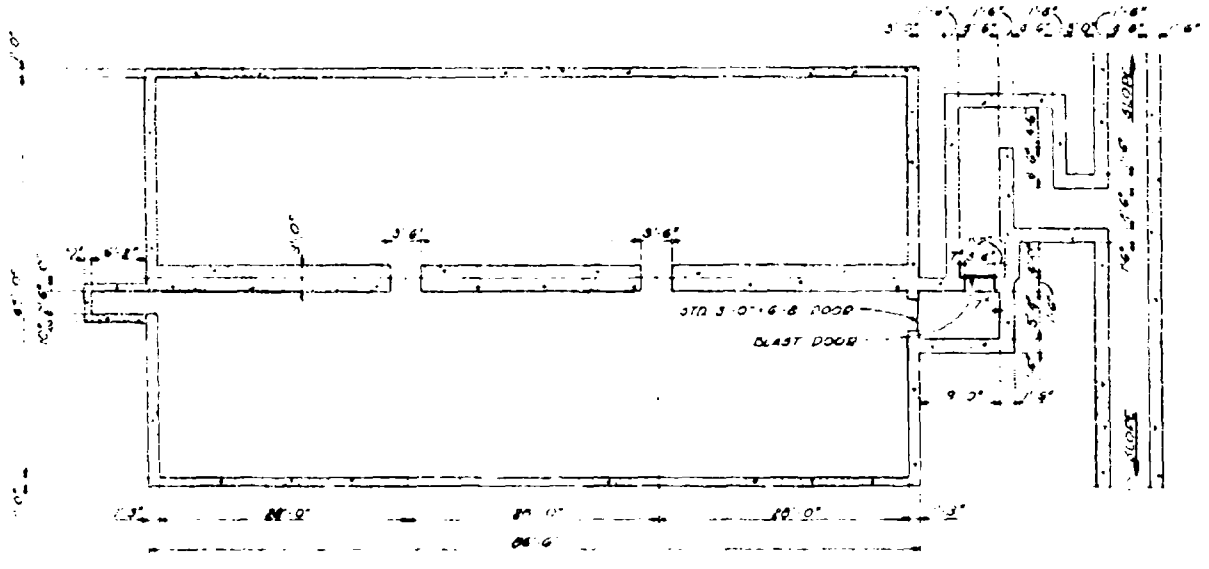
2



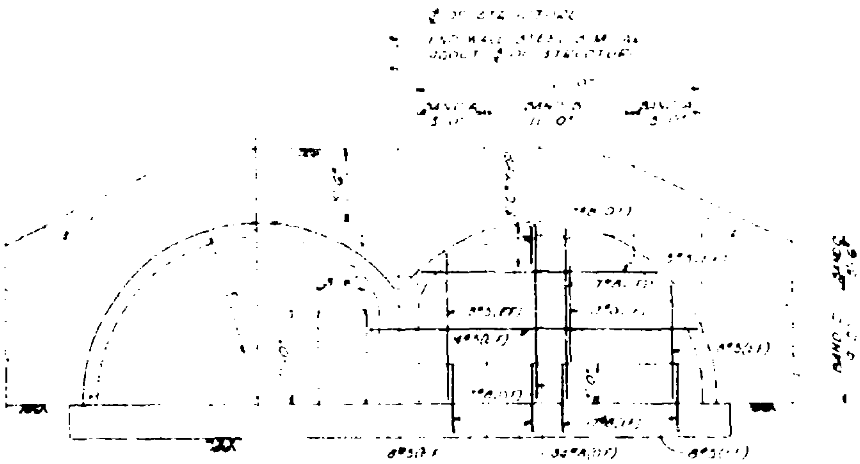
ROOF PLAN
SCALE $\frac{1}{8}$" = 1'-0"



SECTION A-A
SCALE $\frac{1}{8}$" = 1'-0"

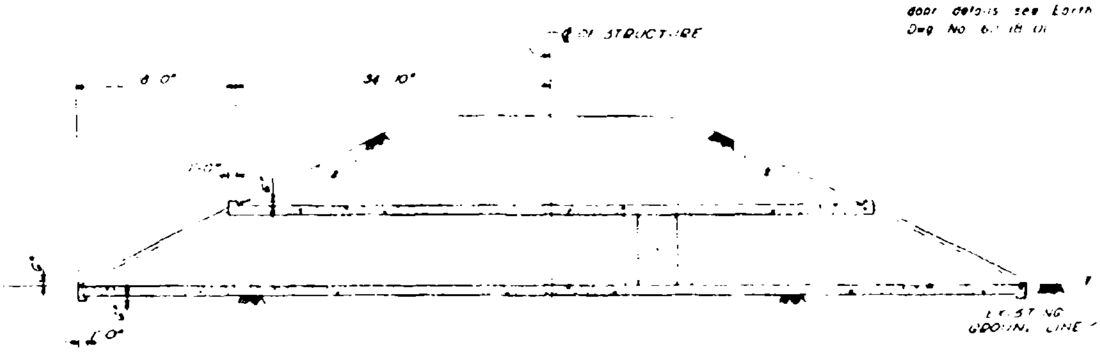


FLOOR PLAN
SCALE $\frac{1}{8}$" = 1'-0"



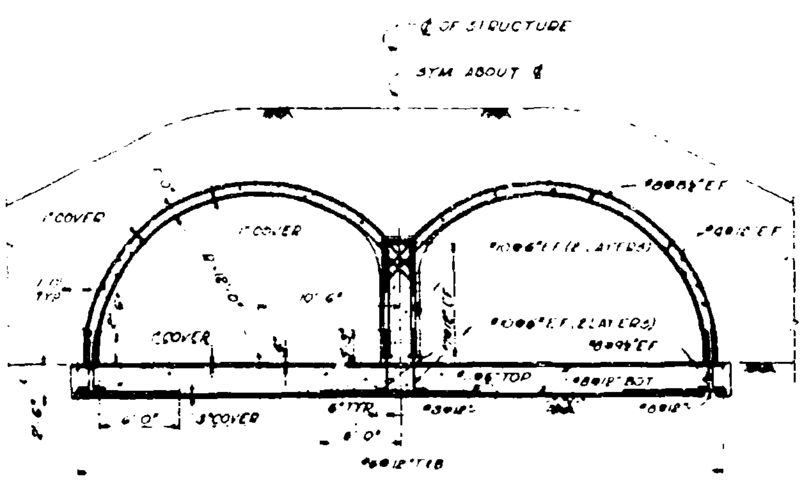
SECTION B-B

SCALE $\frac{3}{16}$" = 1'-0"



SECTION C-C

SCALE $\frac{1}{8}$" = 1'-0"



SECTION D-D

SCALE $\frac{3}{16}$" = 1'-0"

DESIGN CONDITIONS

Design Procedure

In accordance with OCE manual, "Design of Structures for Protection from the Effects of Atomic Weapons"

Design Blast Wave

Peak incident pressure = 50psi Duration = 0.83sec

Blast Loading on Arch Surface

Top pressure = 80 psi

Nuclear Radiation Protection

Total gamma and neutrons attenuated to 50r for a [illegible] KT weapon at any position which will produce a peak blast pressure equal to 50psi

Strength of Materials	Static	Blast Design
Soil bearing capacity	8,000psf *	16,000psf
Concrete f_c	5,000psi	6,500psi
Reinf Steel, lower yield (Int Grade, ASTM A305 50T)	47,500psi	52,000psi
Structural steel lower yield (ASTM A7-50)	[illegible]	41,600psi

*rated capacity of soil

Allowable Stresses and Deflections

The foundation, end walls and entrance way designed for plastic deformation under design blast load. Arch designed for a maximum tangential deflection equal to h/50 where h is as indicated in Section B-B. Blast door and escape hatch door designed for maximum elastic deformation under design blast load.

General Notes

1 The following features are not shown and shall be determined to suit use requirements

- interior partitions
- Mechanical and electrical equipment
- air locks and decontamination facilities

2 Access ramp may be provided if required for vehicles

3 Structure may be lowered to balance cut and fill if desired

4 For entrance way and escape hatch reinforcement and blast door details see Earth Covered Rectangular 5 psi Structure Dwg No 60-18-01

REVISION	DATE	DESCRIPTION	BY	APPROVAL

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CONSULTING ENGINEERS
111-8TH AVENUE, NEW YORK, N.Y.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D.C.

DRAWN BY FJW

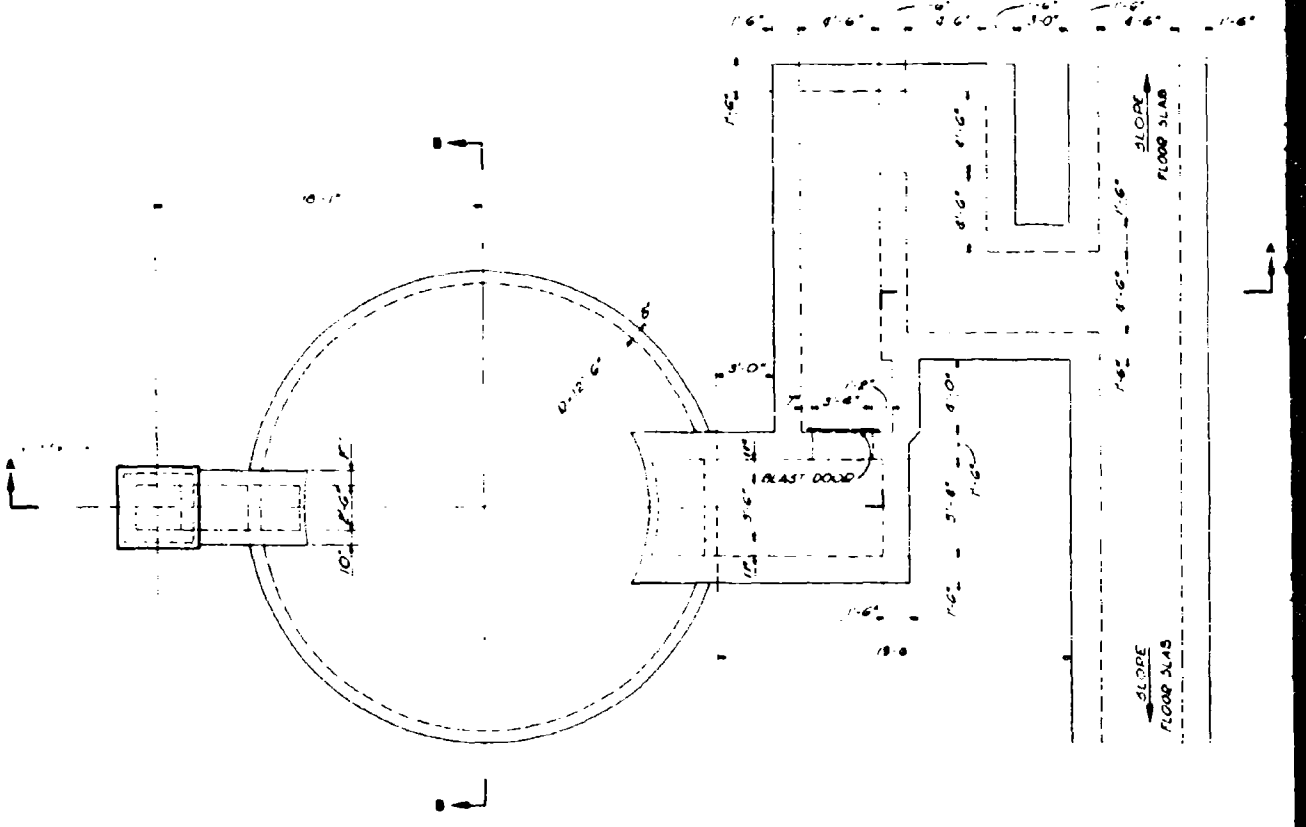
PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
EARTH COVERED
DOUBLE BARREL ARCH
50 PSI BLAST RESISTANT

SCALE AS NOTED

DRAWING NUMBER 60-18-02

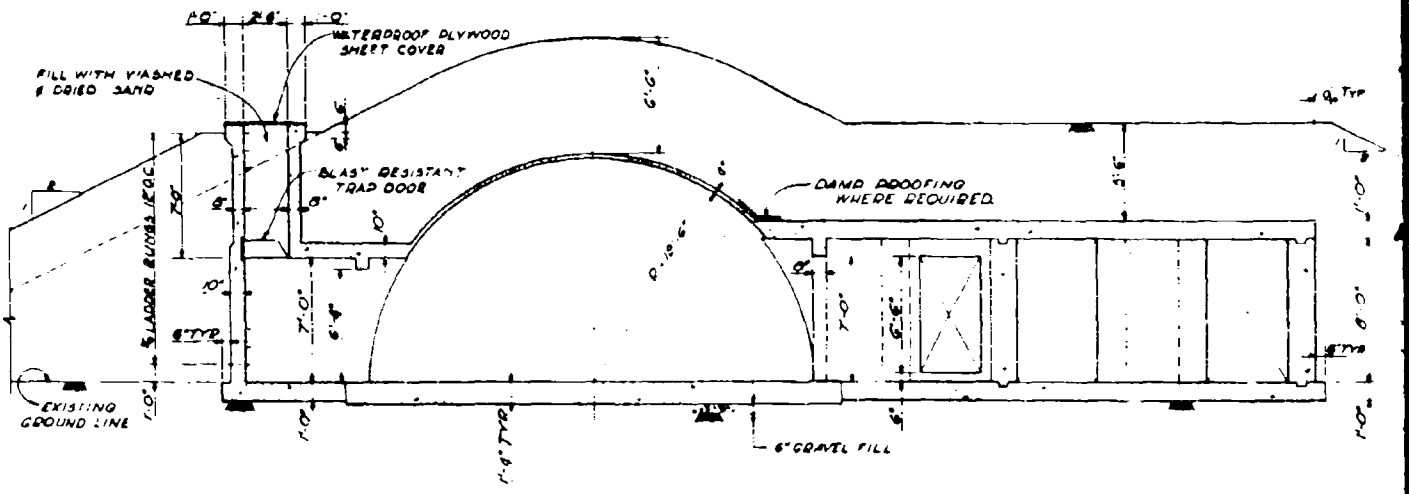
SHEET 1 OF 1

2

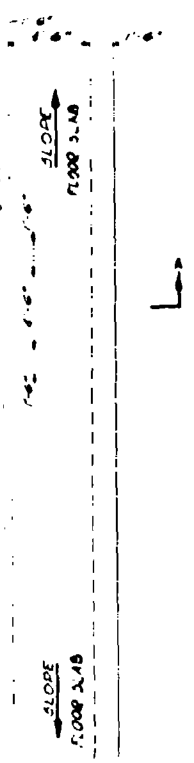


ROOF PLAN

NOTE



SECTION A-A



DESIGN CONDITIONS

Design Procedure

In accordance with OCE manual, "Design of Structures for Protection from the Effects of Atomic Weapons"

Design Blast Wave

Peak incident pressure = 50psi Duration = 0.85 sec

Blast Loading on Dome Surface

Peak pressure = 80 psi

Nuclear Radiation Protection

Total gamma and neutrons attenuated to 50r for a 100KT weapon at any position which will produce a peak blast pressure equal to 50 psi

Strength of Materials

	Static	Blast Design
Soil bearing capacity	8,000psf *	16,000psf
Concrete f'c		
Dome	3,000psi	3,900psi
Remainder of Structure	5,000psi	6,500psi
Reinf Steel, lower yield (Int Grade, ASTM A305-50T)	47,500psi	52,000psi
Structural steel, lower yield (ASTM A7-50T)	38,000psi	41,600psi

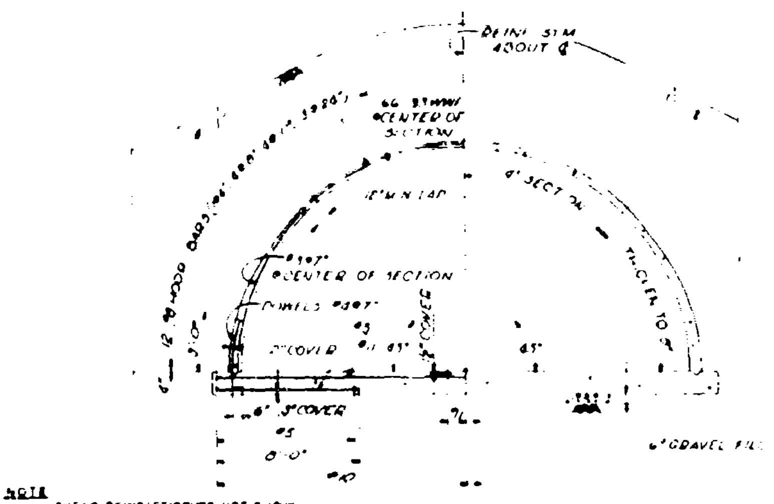
*rated capacity of soil

Allowable Stresses and Deflections

The foundation and entrance way designed for plastic deformation under design blast load. Dome, blast door and escape hatch door designed for maximum elastic deformation under design blast load.

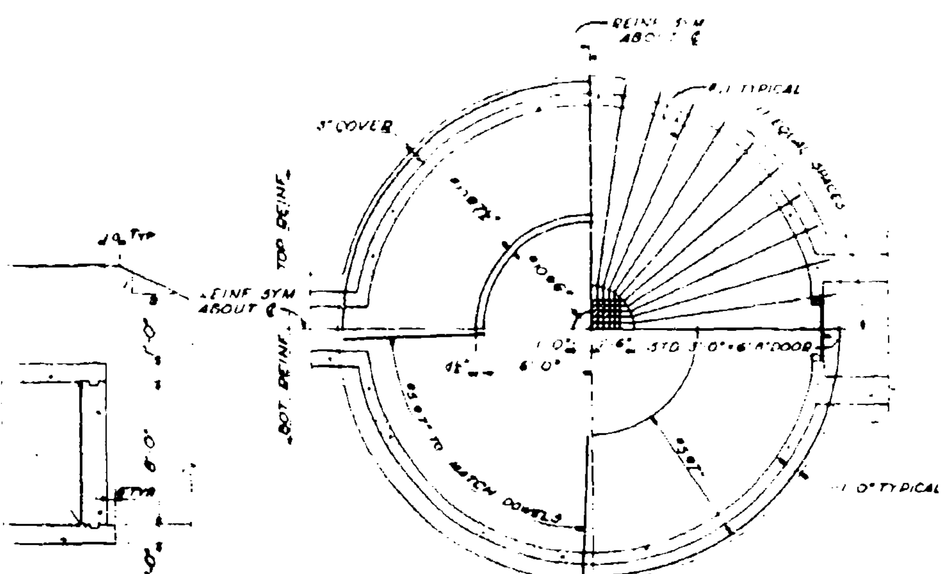
General Notes

1. The following features are not shown and shall be determined to suit use requirements:
   - Interior partitions
   - Mechanical and electrical equipment
   - Air locks and decontamination facilities
2. Access ramp may be provided if required for vehicles.
3. Structure may be lowered to balance cut and fill if desired.
4. For entrance way and escape hatch reinforcement, and blast door details, see Earth Covered Rectangular 50psi Structure Dwg No 60-18-01.



NOTE: SHEAR REINF (STIRRUPS) NOT SHOWN

SECTION B-B

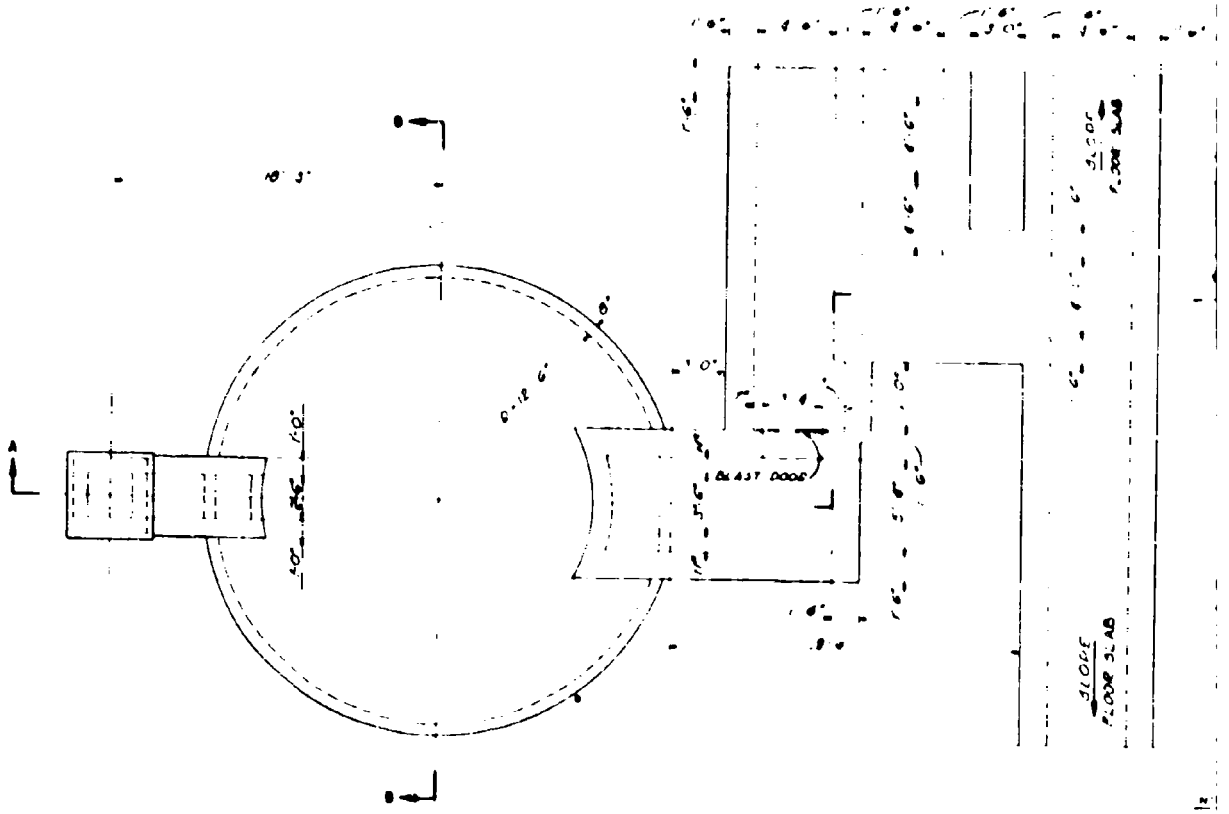


NOTE - ALL BARS CONTINUOUS ABOUT ℄

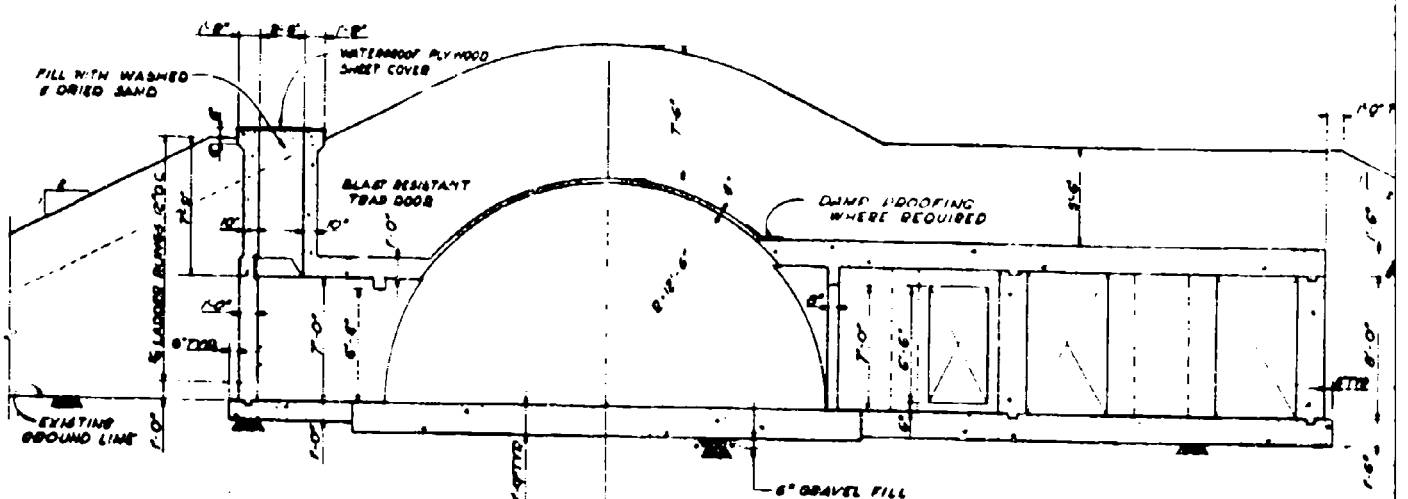
FLOOR SLAB AND FOUNDATION PLAN

AMMANN & WHITNEY CONSULTING ENGINEERS 111-8TH AVENUE, NEW YORK, N.Y.	DEPARTMENT OF THE ARMY OFFICE OF THE CHIEF OF ENGINEERS MILITARY CONSTRUCTION ENGINEERING DIVISION WASHINGTON, D.C.
Designed by F.J.W. / Checked by E.L.	PROTECTIVE CONSTRUCTION GENERAL PURPOSE STRUCTURE EARTH COVERED DOME 50 PSI BLAST RESISTANT
Scale 1/4"=1'-0"	Drawing Number 60-18-03
	Sheet 1 of 1

2



ROOF PLAN



SECTION A-A

DESIGN CONDITIONS

Design Procedure
In accordance with OCE manual, "Design of Structures for Protection from the Effects of Atomic Weapons"

Design Blast Wave
Peak incident pressure = 100psi Duration = 0.64 sec

Blast Loading on Dome Surface
Peak pressure = 155 psi

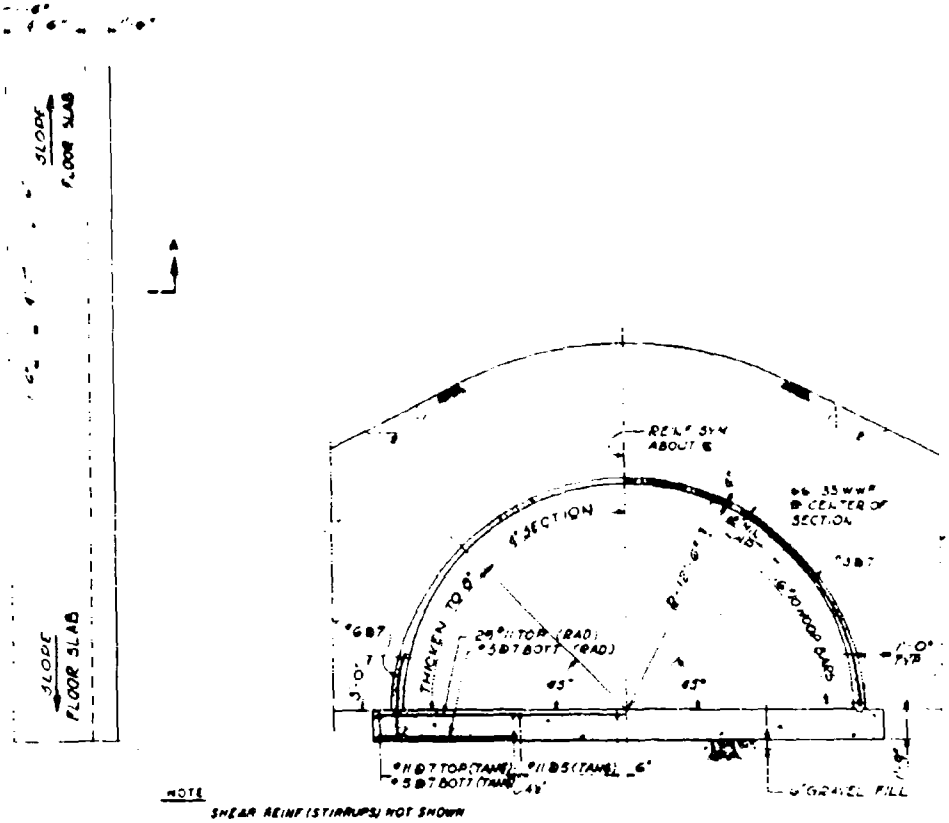
Nuclear Radiation Protection
Total gamma and neutrons attenuated to 50r for a 500 KT weapon at any position which will produce a peak blast pressure equal to 100psi.

Strength of Materials	Static	Blast Design
Soil bearing capacity	8,000 psf *	16,000psf
Concrete f'c		
Dome	4,000psi	5,200psi
Remainder of Structure	3,000psi	6,500psi
Reinf. Steel, lower yield (Int Grade ASTM A305-50T)	41,500psi	58,000psi
Structural steel, lower yield (ASTM A7-90)	38,000psi	41,600psi

* rated capacity of soil

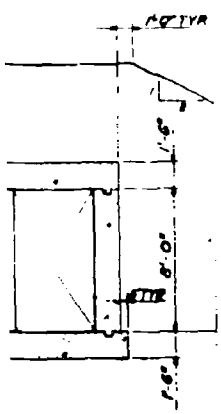
Allowable Stresses and Deflections
The foundation and entrance way designed for plastic deformation under design blast load. Dome, blast door and escape hatch door designed for maximum elastic deformation under design blast load.

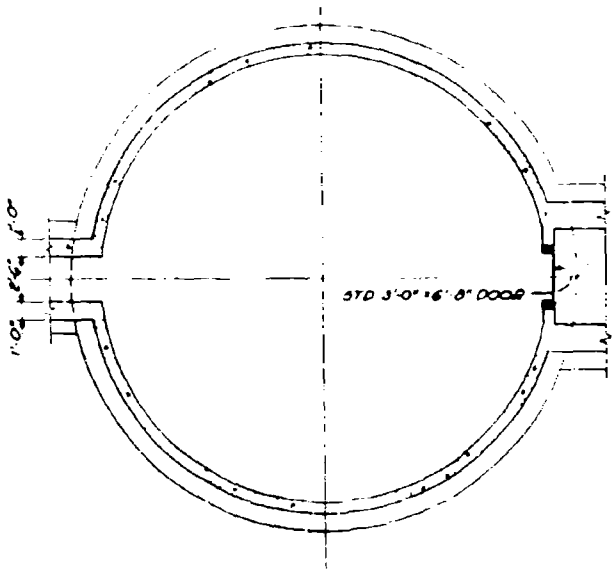
General Notes
1. The following features are not shown and shall be determined to suit use requirements
   - Interior partitions
   - Mechanical and electrical equipment
   - Air locks and decontamination facilities
2. Access ramp may be provided if required for vehicles.
3. Thermal protection to be applied to all exterior doors
4. Structure may be lowered to balance cut and fill if desired



NOTE
SHEAR REINF (STIRRUPS) NOT SHOWN

SECTION B-B





FLOOR SLAB AND FOUNDATION PLAN

AMMANN & WHITNEY
CONSULTING ENGINEERS
111 - 8TH AVENUE, NEW YORK, N. Y.

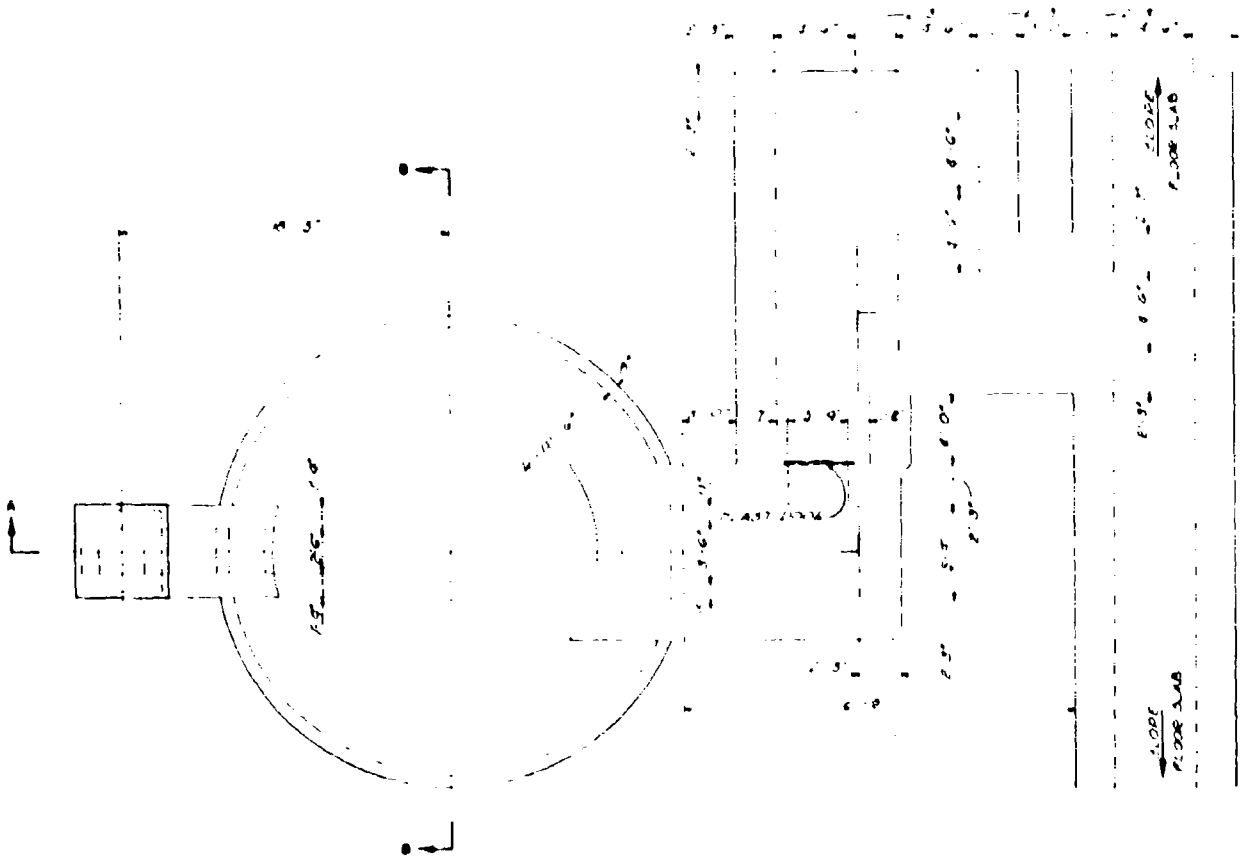
DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D. C.

DRAWN BY: F.J.N.

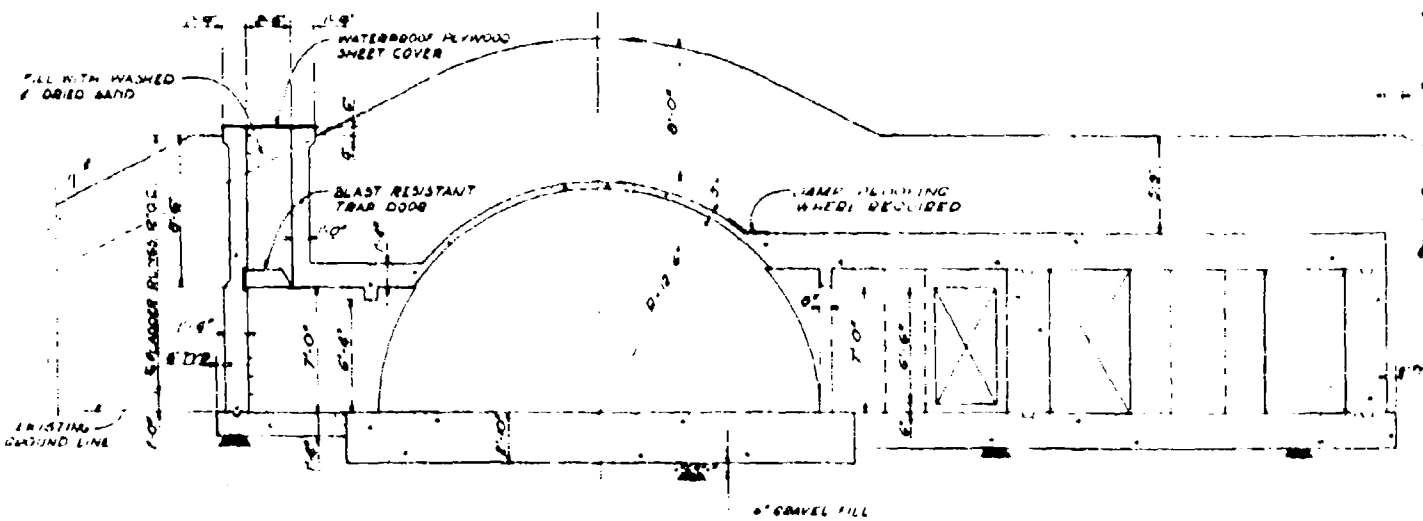
PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
EARTH COVERED DOME
100 PSI BLAST RESISTANT

SCALE: 1/8"=1'-0"
DRAWING NUMBER: 60-10-05
SHEET 1 OF 1

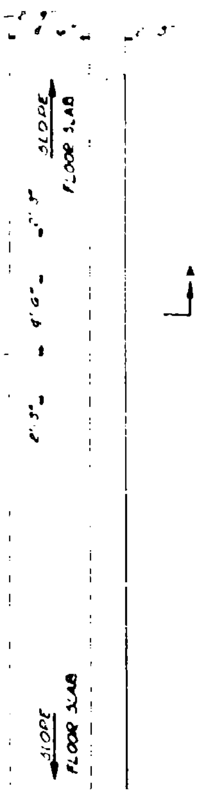
2



ROOF PLAN



SECTION A-A



DESIGN CONDITIONS

Design Procedure

In accordance with OCE manual "Design of Structures for Protection from the Effects of Atomic Weapons"

Design Blast Wave

Peak incident pressure [illegible] psi Duration [illegible] sec

Blast Loading on Dome Surface

Peak pressure [illegible]

Nuclear Radiation Protection

[illegible] gamma and neutrons attenuated to [illegible] weapon of any [illegible] which will produce a peak blast pressure equal to [illegible] psi

Strength of Materials

	Static	Blast Design
Soil bearing capacity	[illegible]*	16,000psf
Concrete f'c	[illegible]	6,500psi
Reinf Steel, lower yield	4[illegible]psi	52,000psi
int grade, ASTM A305 [illegible]		
Structural steel, lower yield	38,000psi	4[illegible]psi
(ASTM A [illegible])		

*rated capacity of soil

Allowable Stresses and Deflections

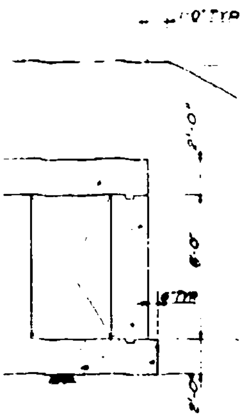
The foundation and entrance way designed for plastic deformation under design blast load. Dome, blast door and escape hatch door designed for maximum elastic deformation under design blast load.

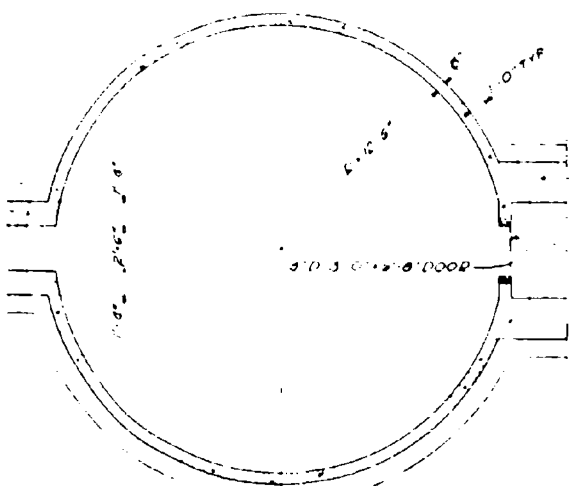
General Notes

1. The following features are not shown and shall be determined to suit use requirements:
   - Interior partitions
   - Mechanical and electrical equipment
   - Air locks and decontamination facilities
2. Access ramp may be provided if required for vehicles.
3. Thermal protection to be applied to all exterior doors.
4. Structure may be lowered to balance cut and fill if desired.

NOTE: SHEAR REINF (STIRRUPS) NOT SHOWN

SECTION B-B

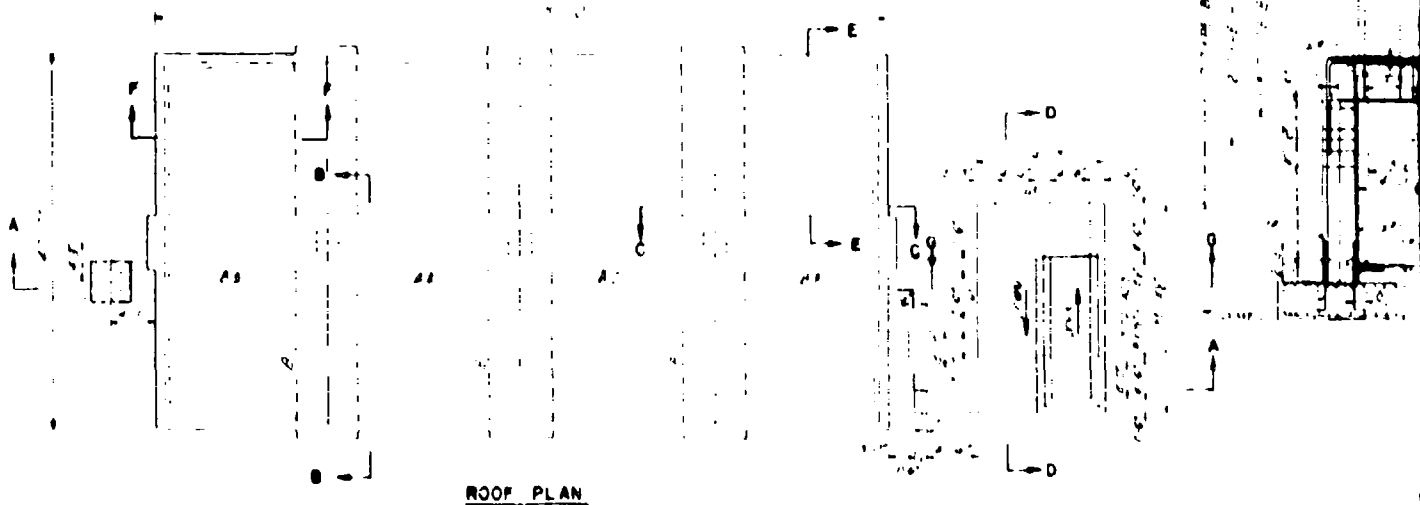




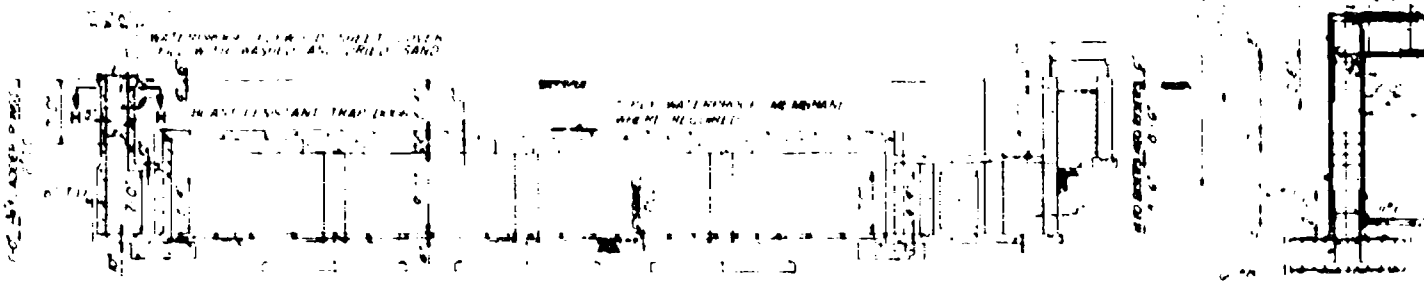
FLOOR SLAB AND FOUNDATION PLAN

2

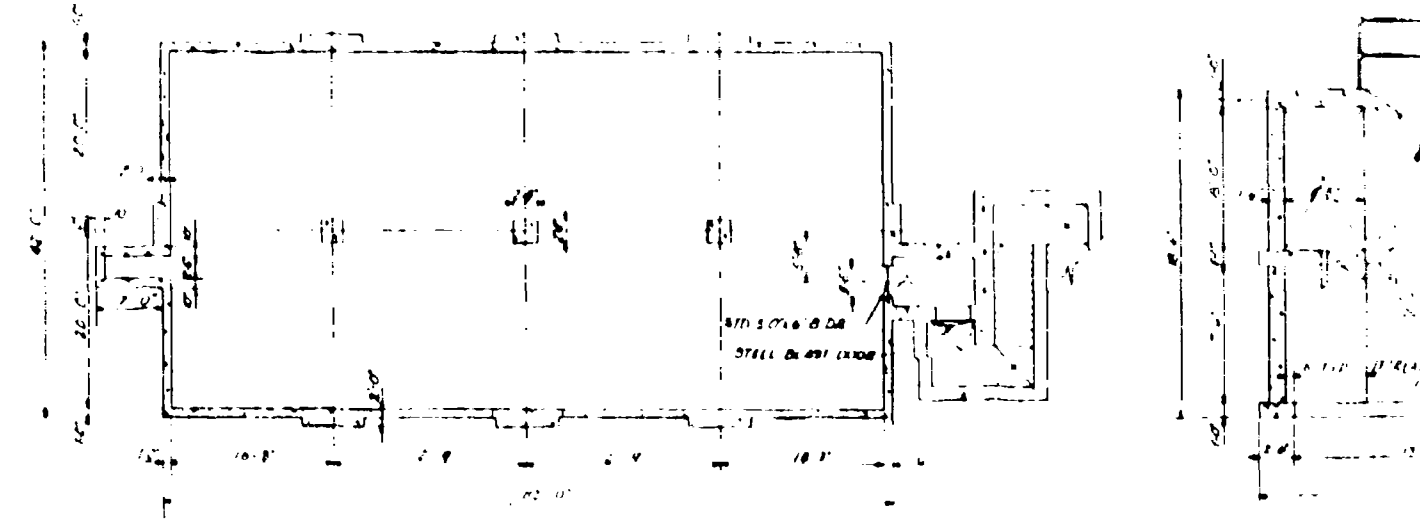
AMMANN & WHITNEY CONSULTING ENGINEERS 111-8TH AVENUE, NEW YORK, N. Y.	DEPARTMENT OF THE ARMY OFFICE OF THE CHIEF OF ENGINEERS MILITARY CONSTRUCTION ENGINEERING DIVISION WASHINGTON, D.C.
FJW LA	PROTECTIVE CONSTRUCTION GENERAL PURPOSE STRUCTURE EARTH COVERED DOME 200 PSI BLAST RESISTANT
	SCALE 1/4"=1'-0"
	DRAWING NUMBER 60-16-08



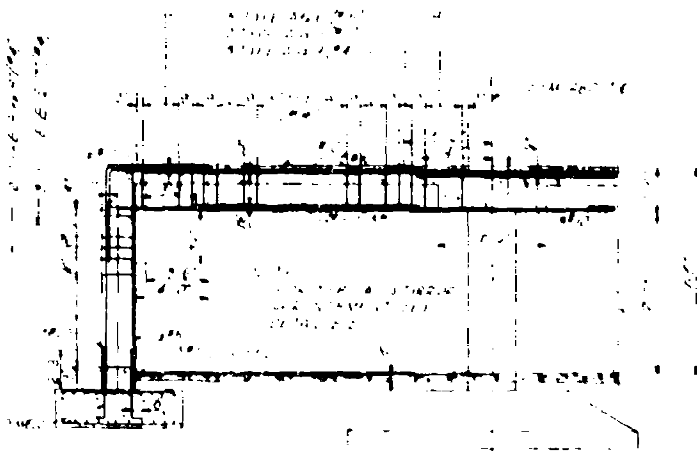
ROOF PLAN
SCALE $\frac{1}{8}$" = 1'-0"



SECTION A-A
SCALE $\frac{1}{8}$" = 1'-0"



FLOOR PLAN
SCALE $\frac{1}{8}$" = 1'-0"



SECTION B-B

SCALE $\frac{3}{8}$"=1'-0"

DESIGN [illegible]

Design Procedure

In accordance with [illegible] manual, "The [illegible] Measures for Protection from the Effects of Atomic Weapons"

Design Blast Wave

Peak incident pressure = 50 psi [illegible]

Blast Loading on Exterior Surface

[illegible] pressure = [illegible] psi [illegible] Duration [illegible]

Design Radiation Protection

Total gamma and neutron attenuation [illegible] for a [illegible] weapon at any location which will produce [illegible] blast pressure equal [illegible] psi

Strengths of Materials

		Blast Design
Soil, bearing capacity	psf*	[illegible] psf
Concrete, f'_c	psi	[illegible] psi
Reinf. Steel, lower yield (Int. Grade, ASTM A305 [illegible])	psi	[illegible] psi
Structural Steel, lower yield (ASTM A7 [illegible])	psi	[illegible] psi

* [illegible] capacity of soil

Allowable Stresses and Deflections

Roof and walls designed for plasti[illegible] under design [illegible] Blast doors, escape hatches, etc., desig[illegible] elastic de[illegible] under design blast load

General Notes

1. The following features are to [illegible] and shall be determine[illegible] and requirements:

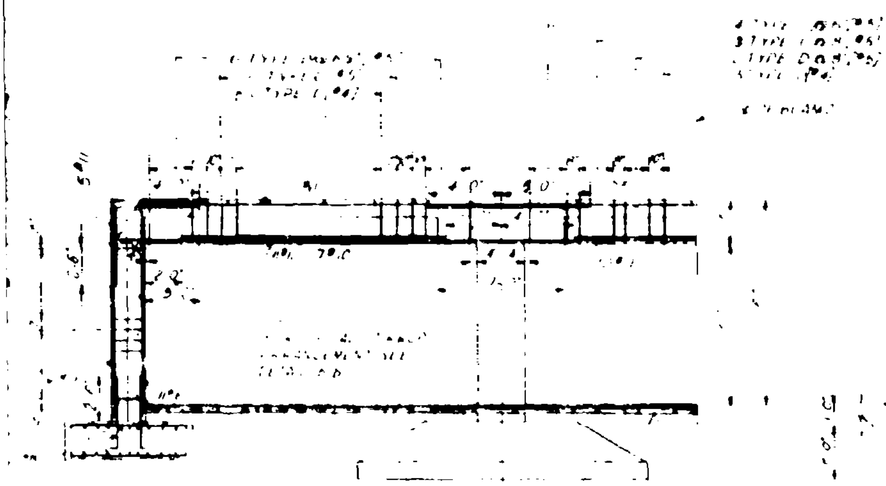
Interior partiti[illegible]

Mechanical and [illegible] equipment

Air locks and d[illegible] facilities

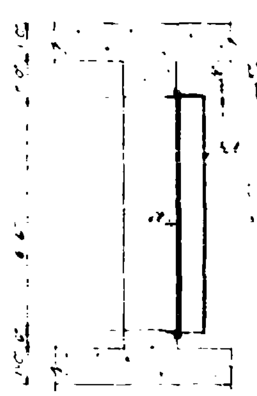
2. Access stairs may be varied as [illegible]

3. Access ramp may be provided if [illegible] for vehicles



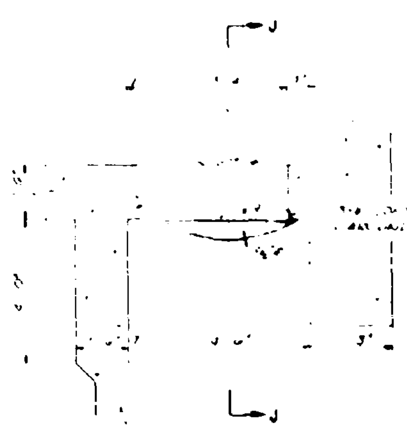
SECTION C-C

SCALE $\frac{3}{8}$"=1'-0"



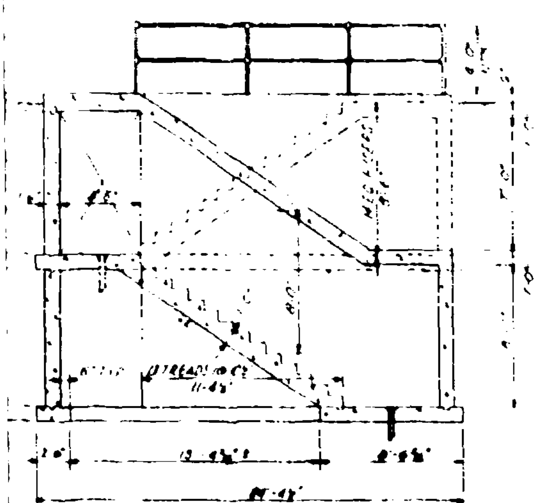
SECTION J-J

SCALE $\frac{3}{8}$"=1'-0"



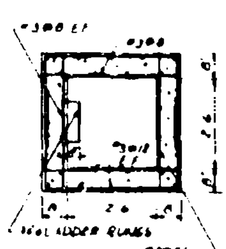
DETAI[illegible] STEEL BLA[illegible]T DOOR AND FRAME

SCALE $\frac{3}{8}$"=1'-0"



SECTION D-D

N.T.S.



SECTION H-H

SCALE $\frac{3}{8}$"=1'-0"

AMMANN & WHITNEY

[illegible] 8TH AVENUE, NEW YORK, N.Y.

DRAWN BY J.S. [illegible]

[illegible]PARTMENT OF [illegible] ARMY

PROTEC[illegible] E CONSTRUC[illegible] ON

GENERAL [illegible]RPOSE STRUC[illegible]URE

BURIE[illegible] RECTANGULA[illegible]

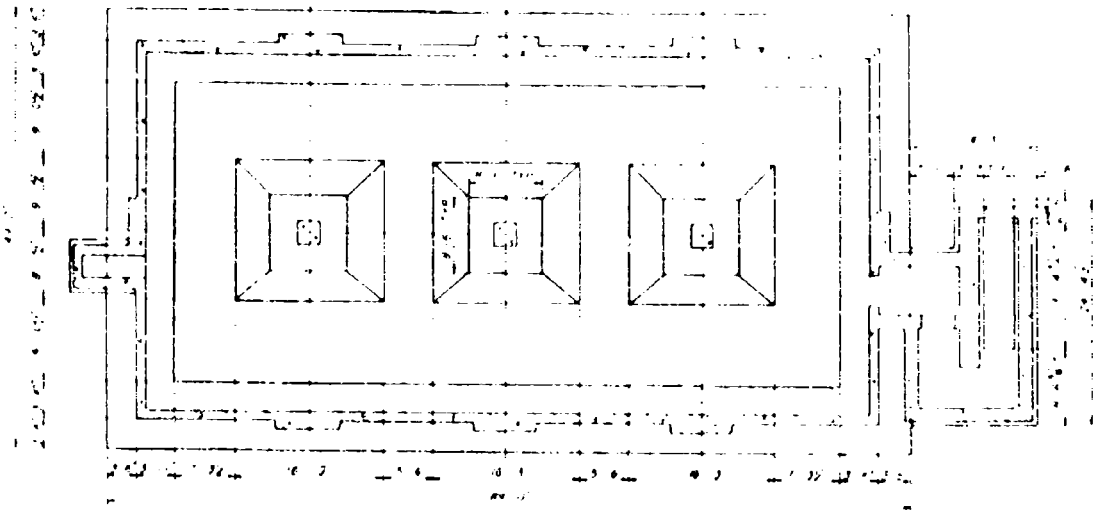
50 PSI [illegible]AST RESISTANT

SCALE: AS NOTED

DRAWING NO. 50-[illegible]-C4

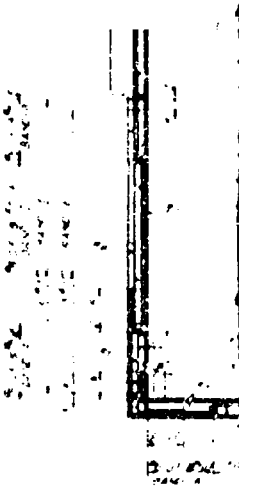
SHEET 1 OF 2

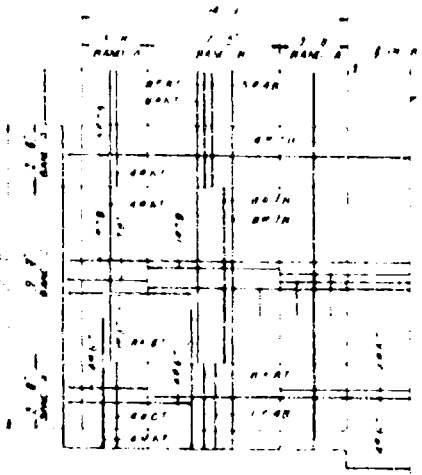
DATE [illegible]



FOUNDATION PLAN

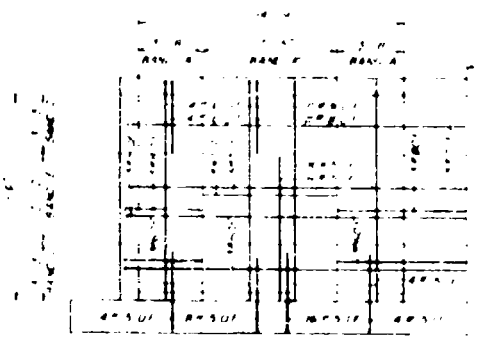
SCALE 1/4"-0"





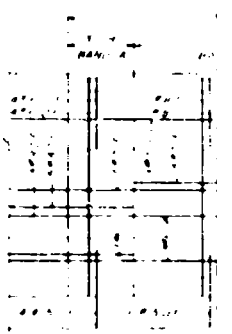
TYPICAL ROOF SLAB

SCALE 1/4"-0"

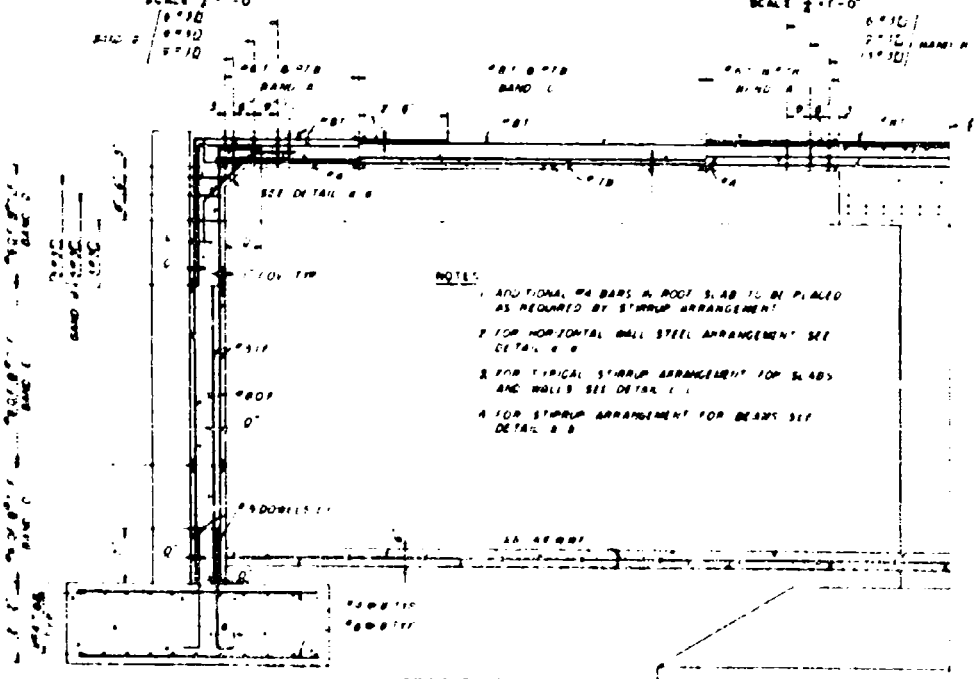


TYPICAL FRONT & REAR WALL

SCALE 1/4"-0"

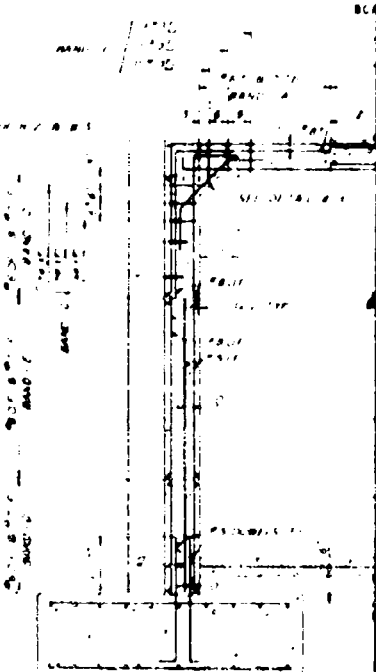


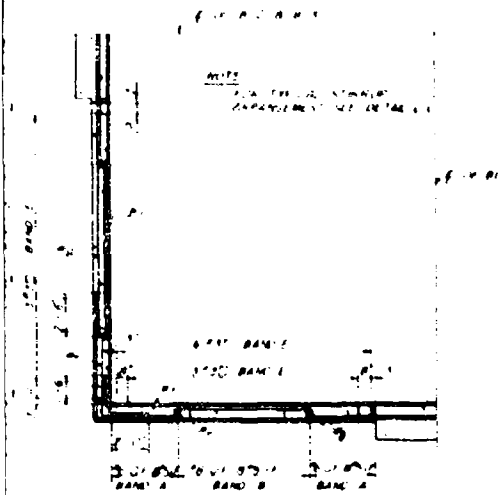
TYPICA



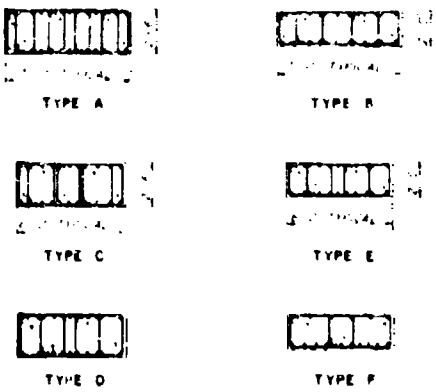
SECTION E-E

SCALE 1/4"-0"

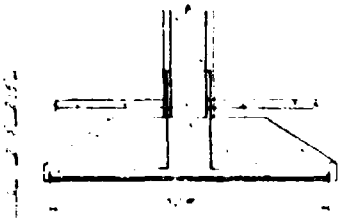




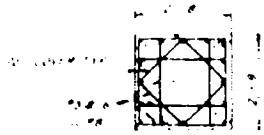
DETAIL a-a
SCALE $\frac{1}{4}$"=1'-0"



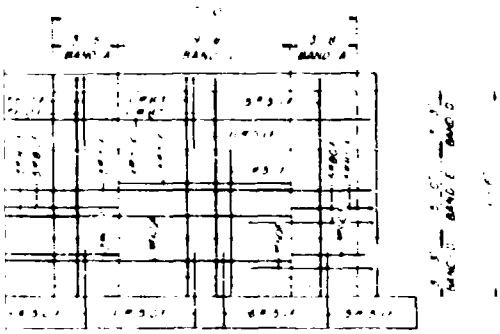
DETAIL b-b
SCALE $\frac{1}{4}$"=1'-0"



DETAIL OF COLUMN FOOTING
SCALE $\frac{1}{4}$"=1'-0"

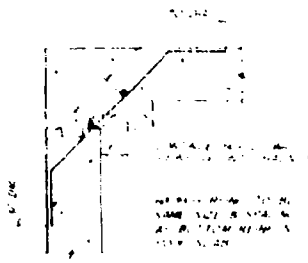


DETAIL OF COLUMN
SCALE $\frac{1}{4}$"=1'-0"

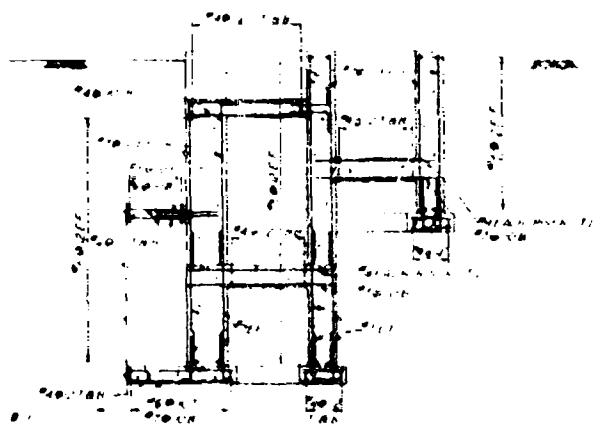


TYPICAL END WALL
SCALE $\frac{1}{4}$"=1'-0"

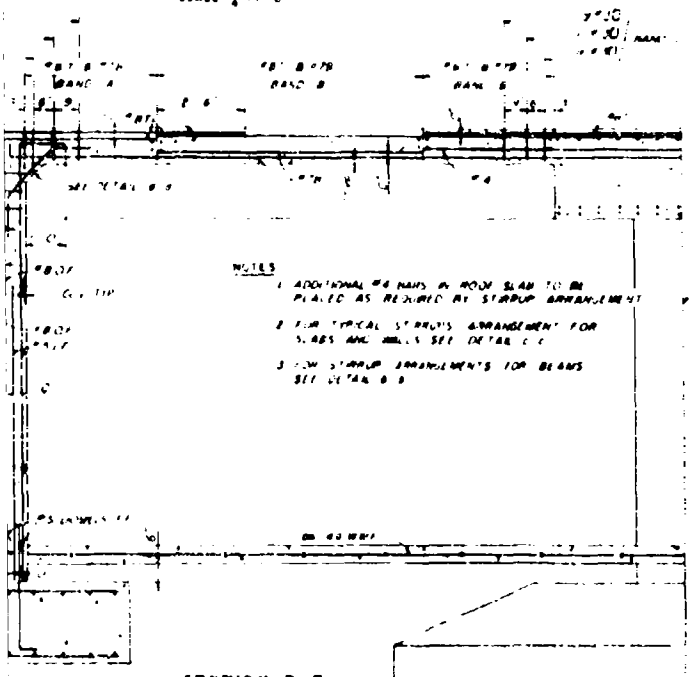
DETAIL c-c
SCALE —"=1'-0"



DETAIL d-d
SCALE $\frac{1}{4}$"=1'-0"



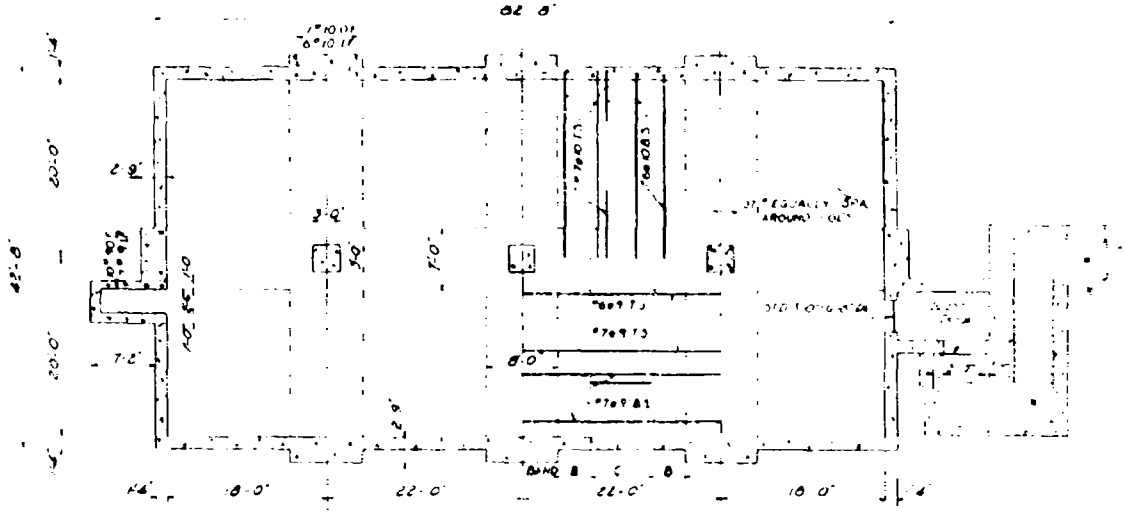
SECTION C-C
SCALE $\frac{1}{4}$"=1'-0"



SECTION F-F
SCALE $\frac{1}{4}$"=1'-0"

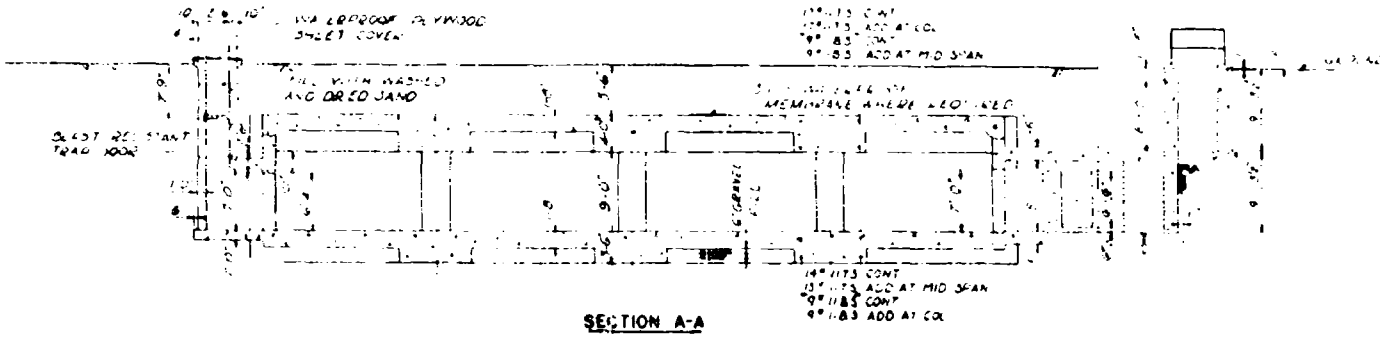
AMMANN & WHITNEY CONSULTING ENGINEERS 111-8TH AVENUE, NEW YORK, N.Y.		DEPARTMENT OF THE ARMY OFFICE OF THE CHIEF OF ENGINEERS MILITARY CONSTRUCTION DIVISION	
DESIGNED BY J.S.	PROTECTIVE CONSTRUCTION GENERAL PURPOSE STRUCTURE BURIED RECTANGULAR 50 PSI BLAST RESISTANT		
DRAWN BY		AS NOTED	
CHECKED BY		DRAWING NUMBER 50-18-04	
APPROVED		SHEET 2 OF 2	
DATE MAY 1956			

2



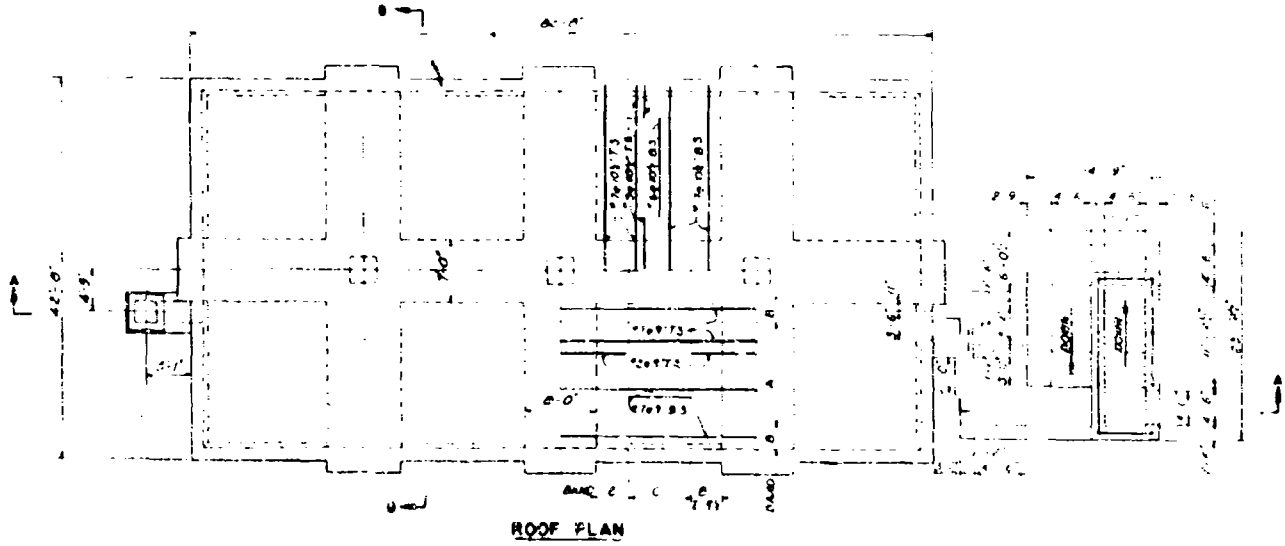
FLOOR PLAN

SCALE: 1/8"=1'-0"



SECTION A-A

SCALE: 1/8"=1'-0"



ROOF PLAN

SCALE: 1/8"=1'-0"

DESIGN CONDITIONS

Design Procedure
In accordance with OCE manual, "Design of Structures for Protection from the Effects of Atomic Weapons"

Design Blast Wave
Peak incident pressure = 100 psi Duration [illegible] 64 sec

Blast Loading On Exterior Surface
Peak pressure = 100psi Duration [illegible] 64 sec

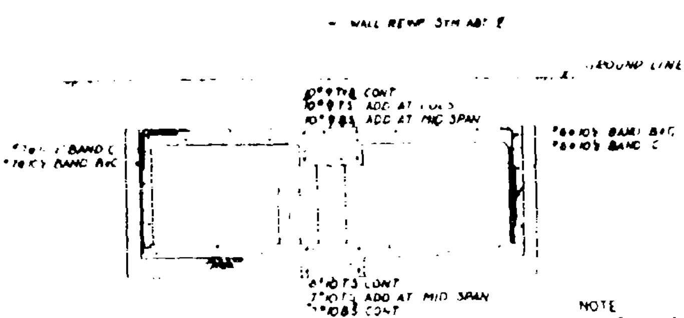
Nuclear Radiation Protection
Total gamma and neutron attenuated [illegible] for a [illegible] weapon at any position which will produce a peak blast pressure equal to 100psi

Strength of Materials	Static	Blast Design
Soil bearing capacity	8000 psf*	16,000 psf
Concrete, f'c	5000 psi	6,500 psi
Reinf steel, lower yield (Int Grade, ASTM A305 50T)	47,500 psi	52,000 psi
Structural steel, lower yield (ASTM A7 50)	38,000 psi	41,600 psi

[illegible] of soil

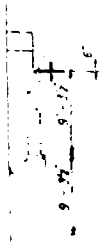
Allowable Stresses and Deflections
[illegible] deformation under design blast load. Blast door and escape hatch door designed for maximum elastic deformation under design blast load

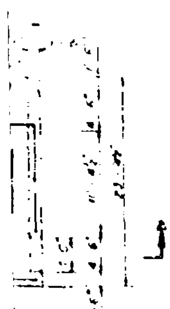
General Notes
1 The following features are not shown and shall be determined to suit use requirements
Interior partitions
mechanical and electrical equipment
Air locks and decontamination facilities
2 Access stairs may be varied as required
3 Access ramp may be provided if required for vehicles
4 [illegible] protection to be applied to all exterior doors



SECTION B-B
SCALE 1/8"=1'-0"

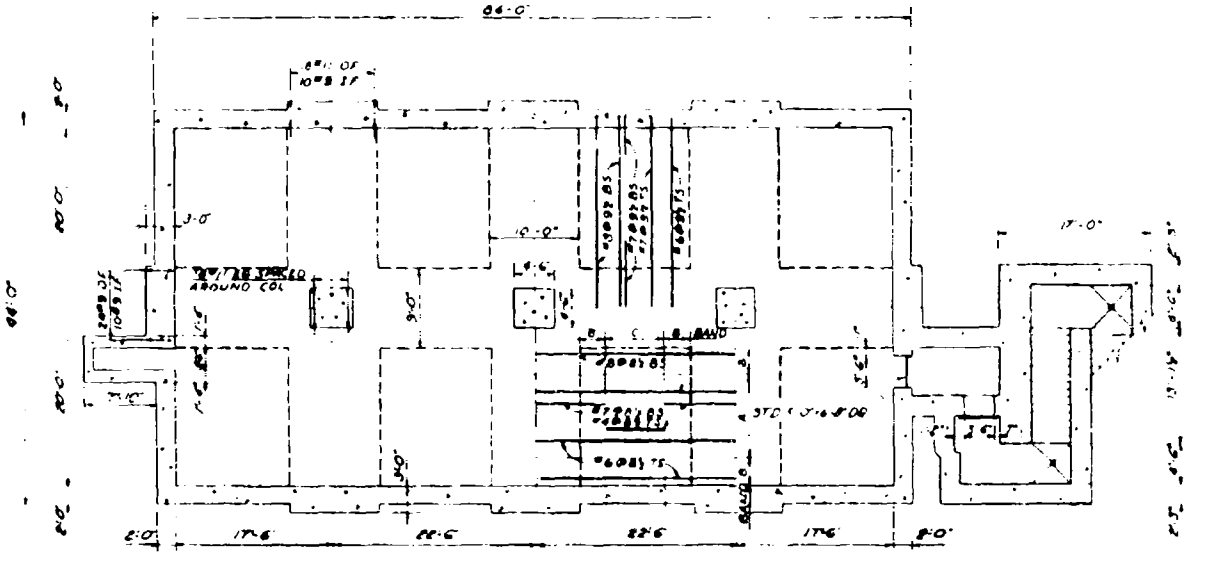
NOTE
For roof and floor reinf see roof and floor plans



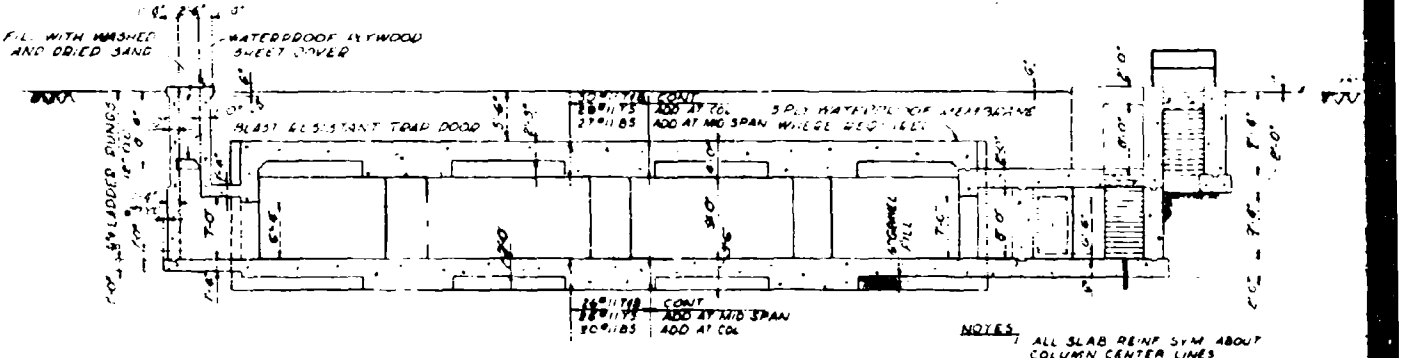


AMMANN & WHITNEY 111 - 8TH AVE. NEW YORK, N. Y.	DEPARTMENT OF THE ARMY MILITARY CONSTRUCTION ENGINEERING DIVISION
B B	PROTECTIVE CONSTRUCTION GENERAL PURPOSE STRUCTURE BURIED RECTANGULAR 100 PSI BLAST RESISTANT
SCALE AS NOTED	DRAWING NUMBER 60-16-04 SHEET 1 OF 1

2

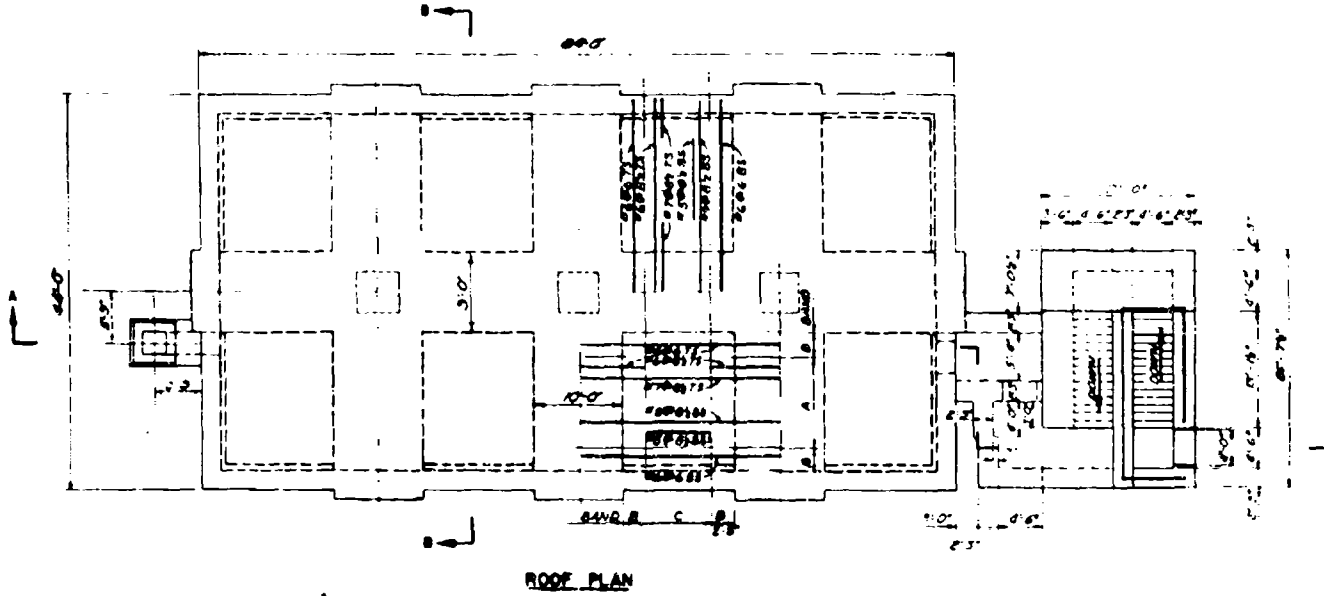


FLOOR PLAN

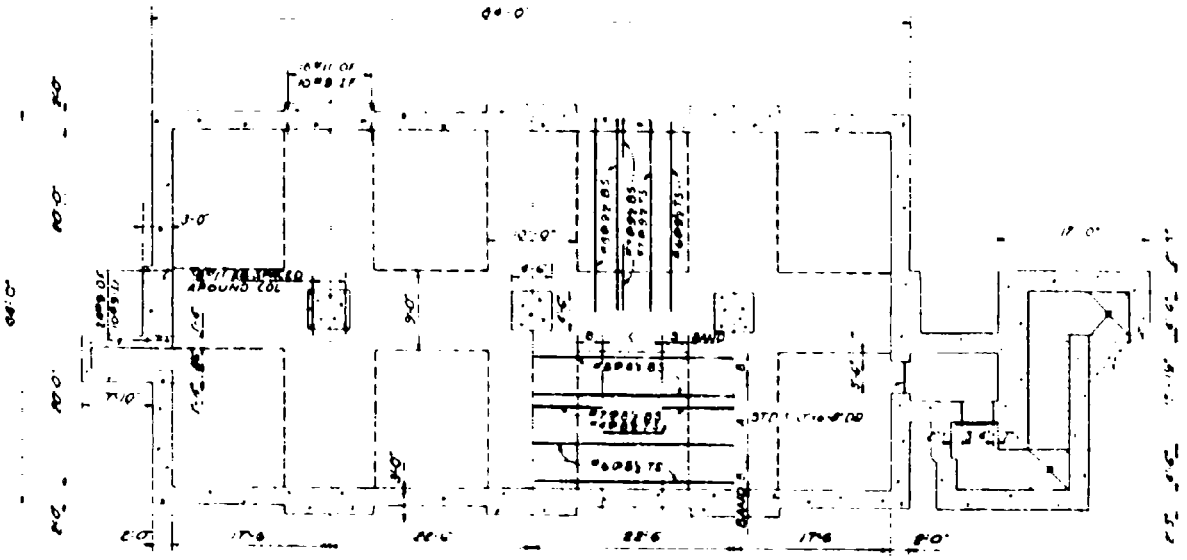


NOTES
1 ALL SLAB REINF SYM ABOUT COLUMN CENTER LINES
2 SHEAR REINF (STIRRUPS) NOT SHOWN

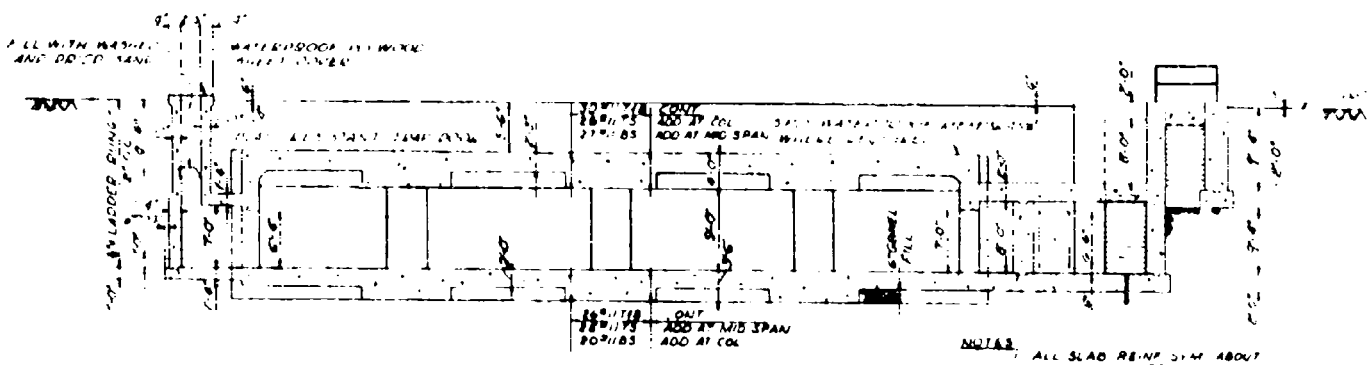
SECTION A-A



ROOF PLAN

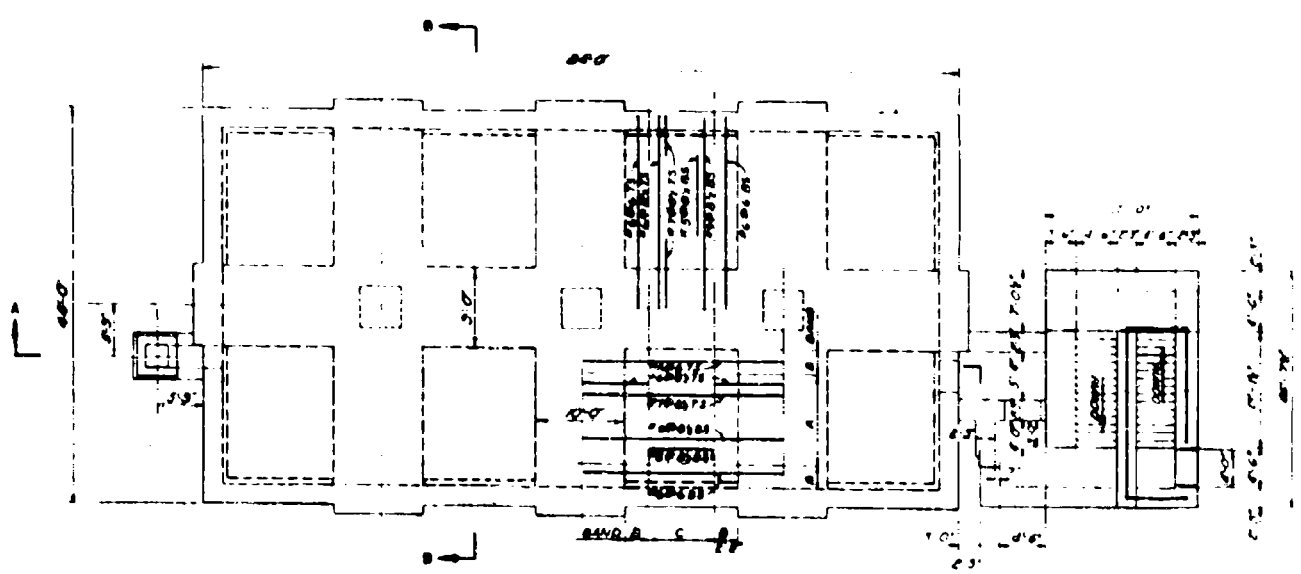


FLOOR PLAN

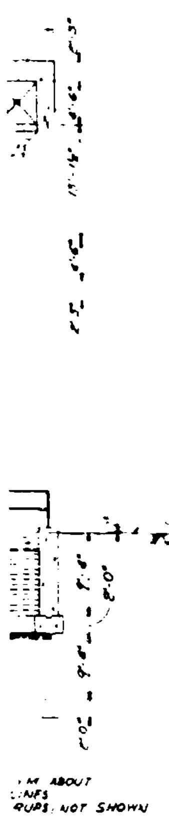


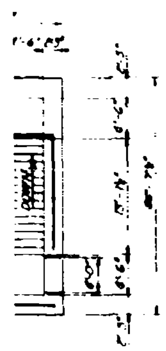
NOTES
1. ALL SLAB REINF. SYM. ABOUT COLUMN CENTER LINES
2. SHEAR REINF. (STIRRUPS) NOT SHOWN

SECTION A-A



ROOF PLAN





DESIGN CONDITIONS

Design Procedure

In accordance with OCE manual, "Design of Structures for Protection from the Effects of Atomic Weapons."

Design Blast Wave

Peak incident pressure = 200psi Duration = 0.45sec

Blast Loading on Exterior Surface

Peak pressure = 200psi Duration = 0.45sec

Nuclear Radiation Protection

Total gamma and neutrons attenuated to 50r for a 500KT weapon at any position which will produce a peak blast pressure equal to 200psi

Strength of Materials	Static	Blast Design
Soil bearing capacity	8,000psf*	16,000psf
Concrete, f'c	5,000psi	6,500psi
Reinf. steel, lower yield (int. grade, ASTM A305-50T)	47,500psi	52,000psi
Structural steel, lower yield (ASTM A7-50)	36,000psi	41,600psi

** Rated capacity of soil*

Allowable Stresses and Deflections

Roof, walls, floor and entrance way designed for plastic deformation under design blast load. Blast doors and escape hatch door designed for maximum elastic deformation under design blast load.

General Notes

1 The following features are not shown and shall be determined to suit use requirements:

Interior partitions

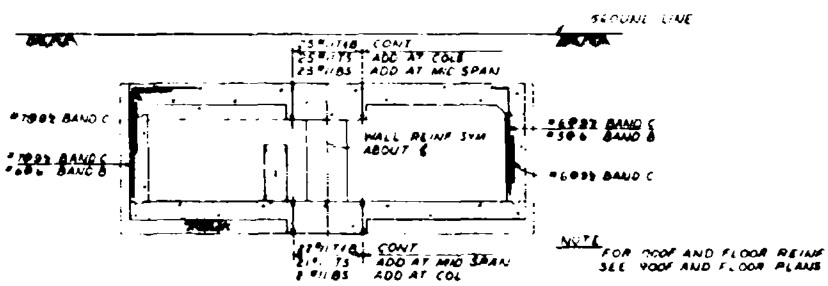
Mechanical and electrical equipment

Air locks and decontamination facilities

2 Access stairs may be varied as required

3 Access ramp may be provided if required for vehicles

4 Thermal protection to be applied to all exterior doors



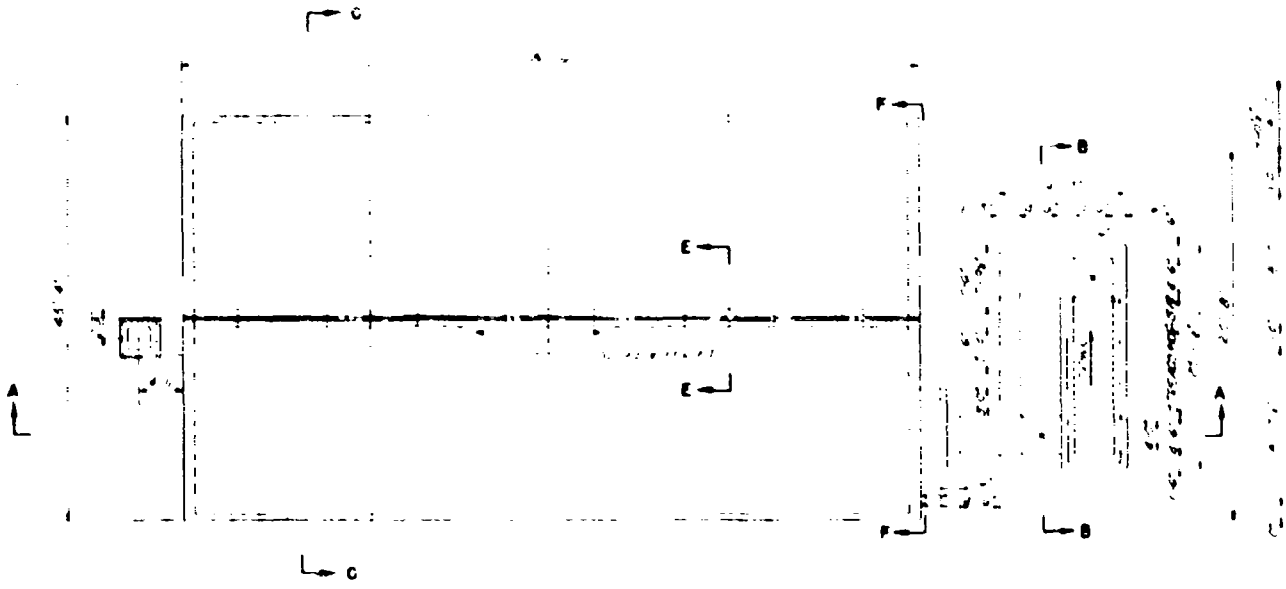
SECTION B-B

REVISION	DATE	DESCRIPTION	BY	APPR

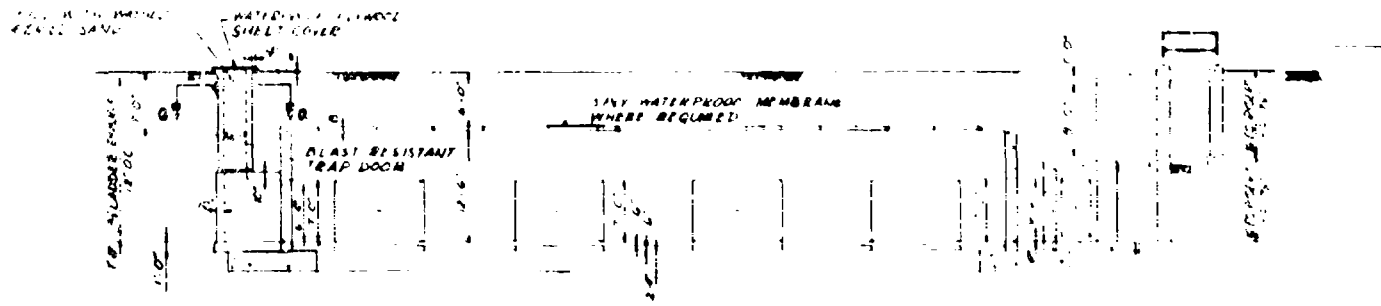
AMMANN & WHITNEY CONSULTING ENGINEERS 111-8th AVENUE NEW YORK, N.Y.	DEPARTMENT OF THE ARMY OFFICE OF THE CHIEF OF ENGINEERS MILITARY CONSTRUCTION ENGINEERING DIVISION WASHINGTON D.C.

DRAWN BY B B	PROTECTIVE CONSTRUCTION
TRACED BY	GENERAL PURPOSE STRUCTURE
CHECKED BY N.D.	BURIED RECTANGULAR
SUBMITTED	200 PSI BLAST RESISTANT
APPROVED	APPROVED / DATE
[illegible]	[illegible]

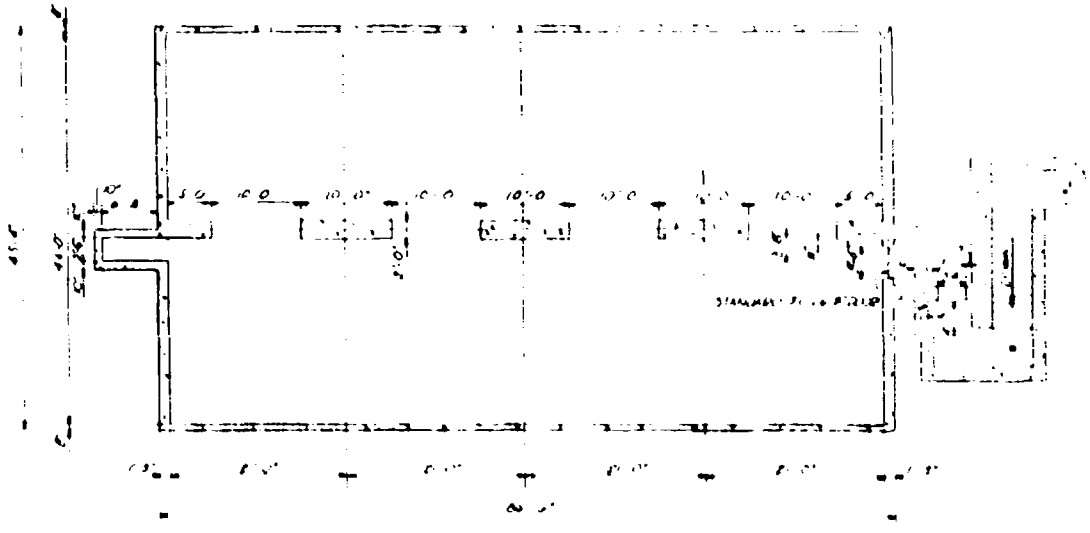
APPROVED:	SCALE ¼"=1'-0"	SPEC. NO.
DATED: [illegible]	DRAWING NUMBER 60-10-04	SHEET 1 OF 1



ROOF PLAN
SCALE $\frac{1}{8}$"=1'-0"



SECTION A-A
SCALE $\frac{1}{8}$"=1'-0"



FLOOR PLAN
SCALE $\frac{1}{8}$"=1'-0"

DESIGN CONDITIONS

Design Procedure

In accordance with OCE manual, "Design of Structures for Protection from the Effects of Atomic Weapons"

Design Blast Wave

Peak incident pressure [illegible]

Blast Loading On Exterior Surface

Peak pressure [illegible]

Nuclear Radiation Protection

[illegible] at any [illegible] peak blast pressure equal to 50 psi

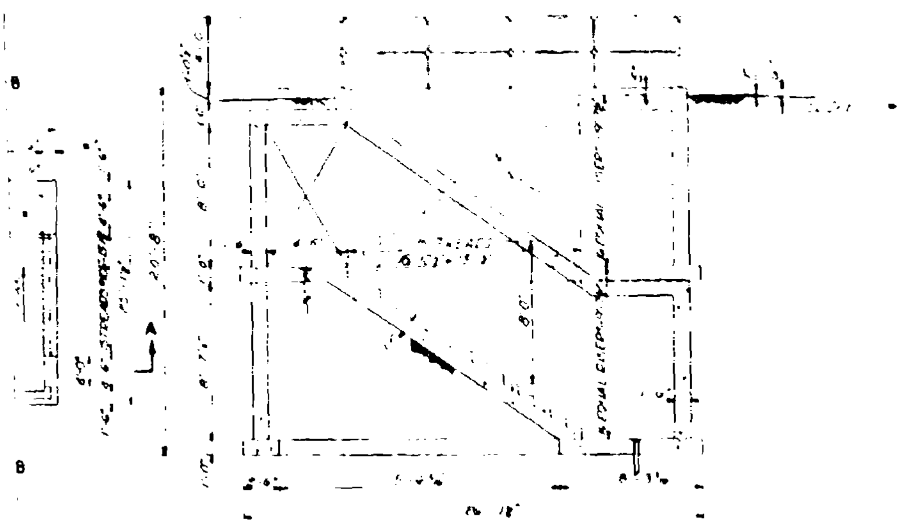
Strength of Materials	Static	Blast Design
[illegible] concrete	[illegible]	[illegible]
Arches	[illegible]	[illegible]
remainder of structure	[illegible]	[illegible]
Reinf. steel, lower yield [illegible]	[illegible]	[illegible]
[illegible] Grade ASTM A [illegible]		
Structural steel, [illegible] yield (ASTM A7 [illegible])	[illegible]	[illegible]
Bearing capacity of soil		

Allowable Stresses and Deflections

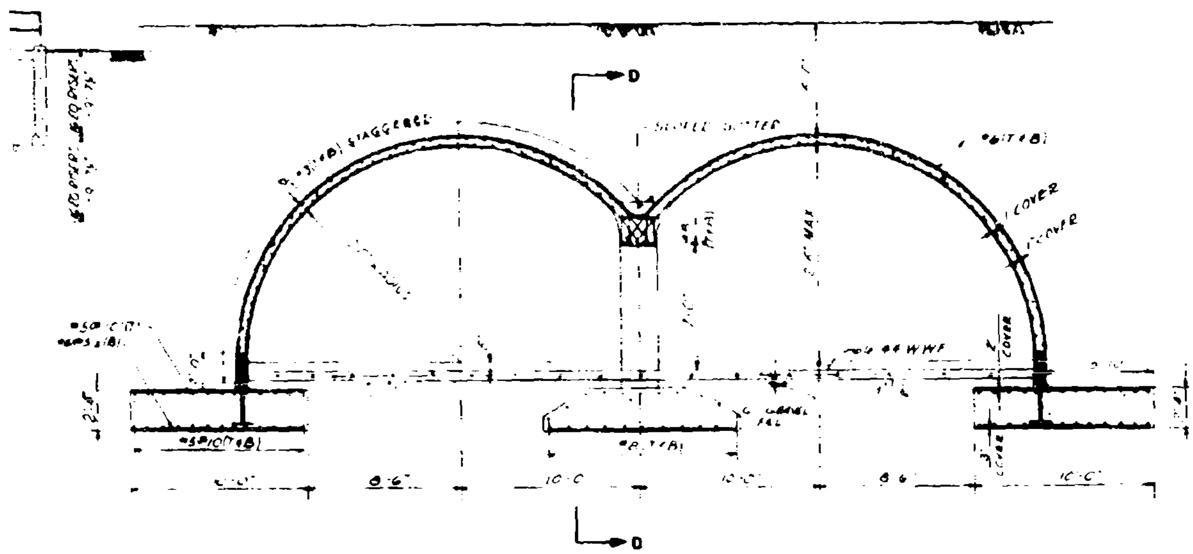
The foundation [illegible] entrance ways designed for [illegible] deformation under design blast load. Arch, blast [illegible] and escape hatch door designed for maximum elastic deformation under design blast load.

General Notes

1. The following features are not shown and shall be determined to suit use requirements:
   - [illegible]
   - Mechanical and electrical equipment
   - Air locks and decontamination facilities
2. Access stairs may be varied as required
3. Access ramp may be provided if required for vehicles
4. For entrance way reinforcement and blast [illegible] details see Buried Rectangular [illegible] Structure Dwg No 60-18-04

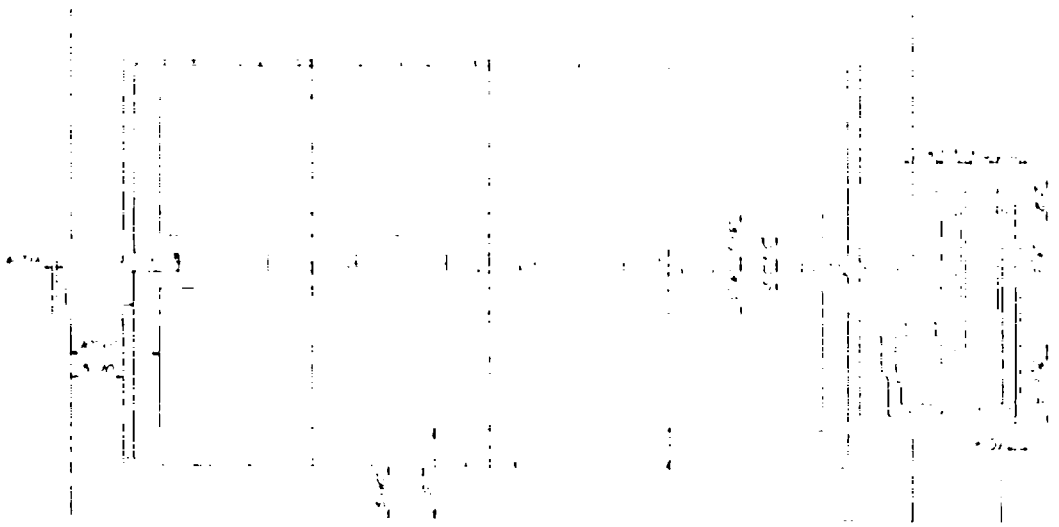


SECTION B-B
SCALE NTS

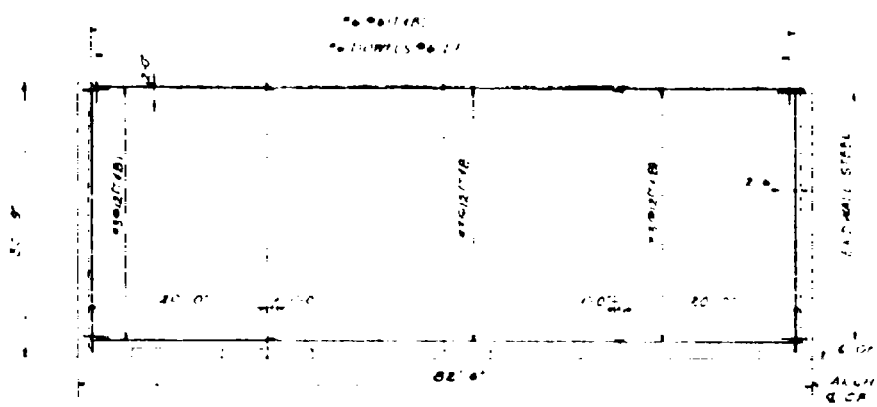


SECTION C-C
SCALE $\frac{1}{4}$" = 1'-0"

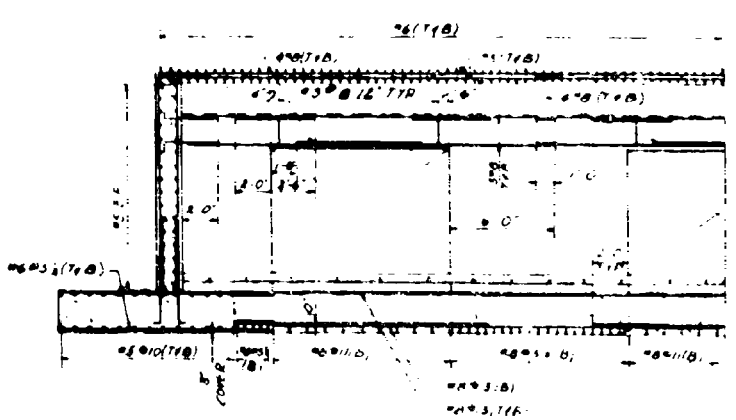
AMMANN & WHITNEY, 111 - 8th AVENUE, NEW YORK, N.Y.	DEPARTMENT OF THE ARMY, OFFICE OF THE CHIEF OF ENGINEERS
DRAWN BY J.S.	PROTECTIVE CONSTRUCTION GENERAL PURPOSE STRUCTURE BURIED DOUBLE BARREL ARCH 50 PSI BLAST RESISTANT
SCALE AS NOTED	DRAWING NUMBER 60-18-02
	SHEET 1 OF 2



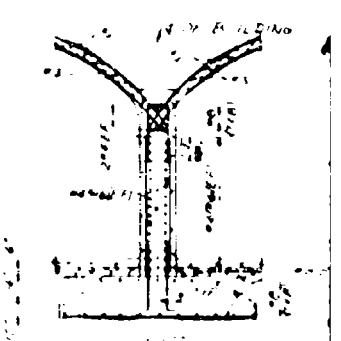
FOUNDATION PLAN
SCALE $\frac{1}{8}$"=1'-0"



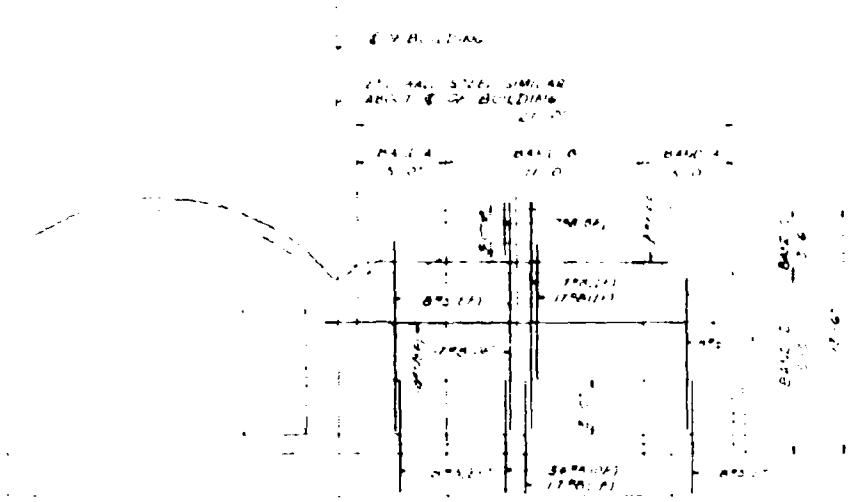
DEVELOPED ROOF PLAN
SCALE $\frac{1}{8}$"=1'-0"



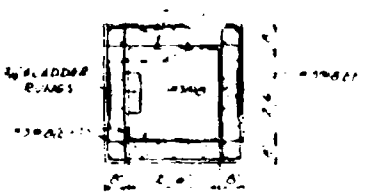
SECTION D-D
SCALE $\frac{1}{8}$"=1'-0"



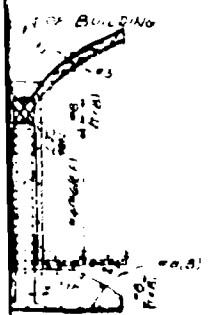
SECTION E-E
SCALE $\frac{1}{8}$"=1'-0"



SECTION F-F
SCALE $\frac{1}{4}$"=1'-0"



SECTION G-G
SCALE $\frac{1}{4}$"=1'-0"



ON E-E
$\frac{1}{4}$"=1'-0"

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OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D.C.

DESIGNED BY JS

PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED DOUBLE BARREL ARCH
50 PSI BLAST RESISTANT

SCALE AS NOTED

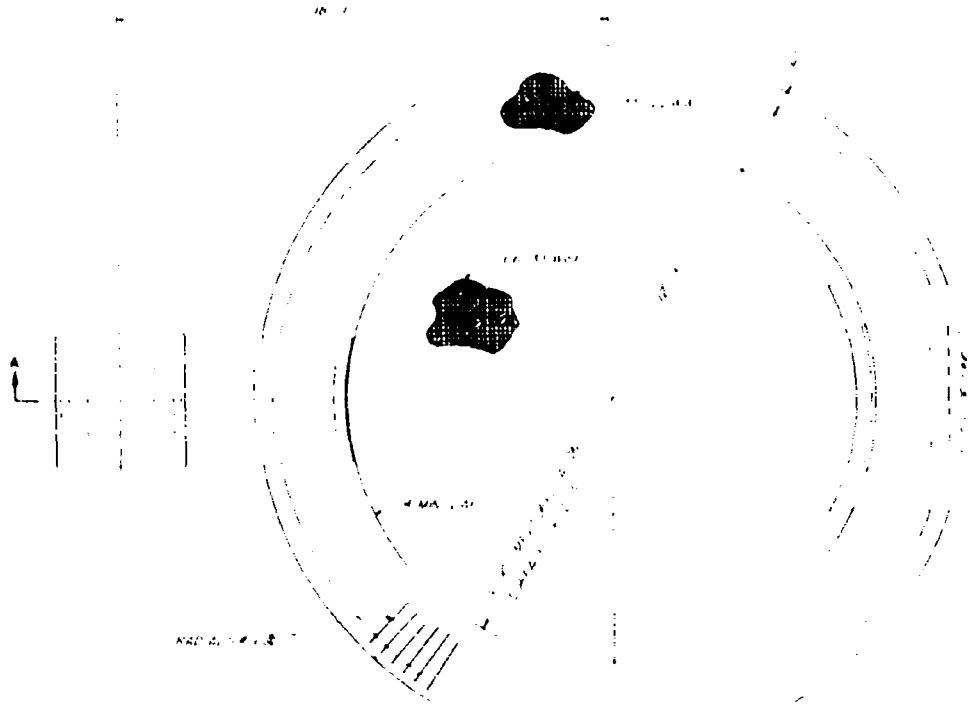
DRAWING NUMBER
60-18-05

DATE MAR 1958

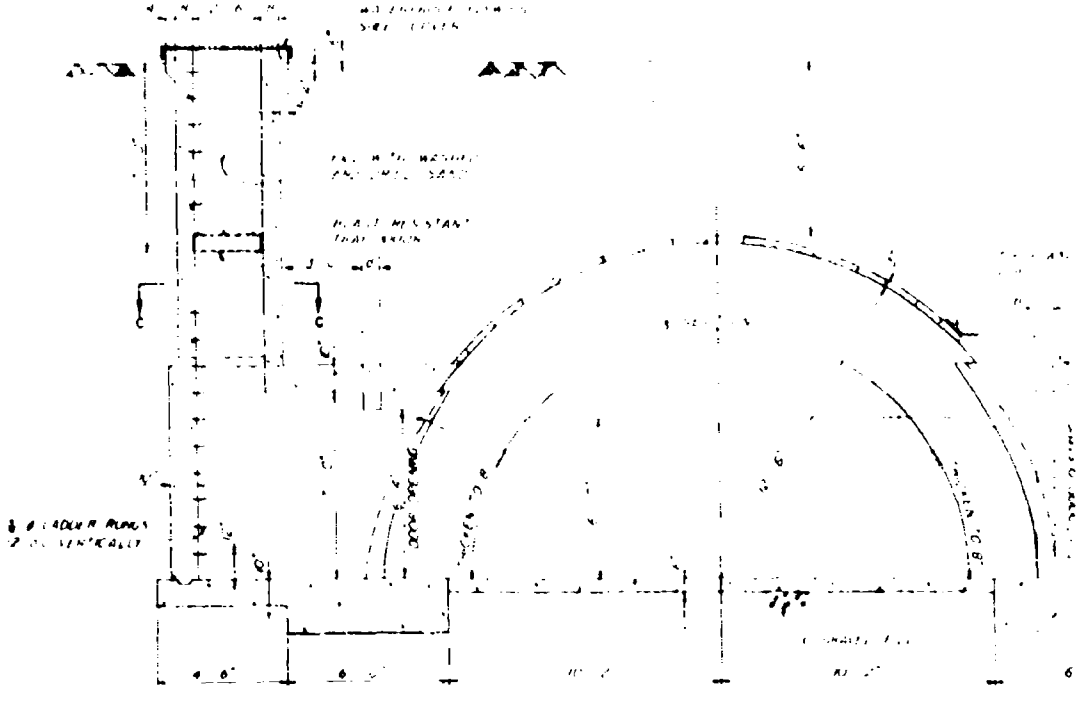
SHEET 2 OF 2

2

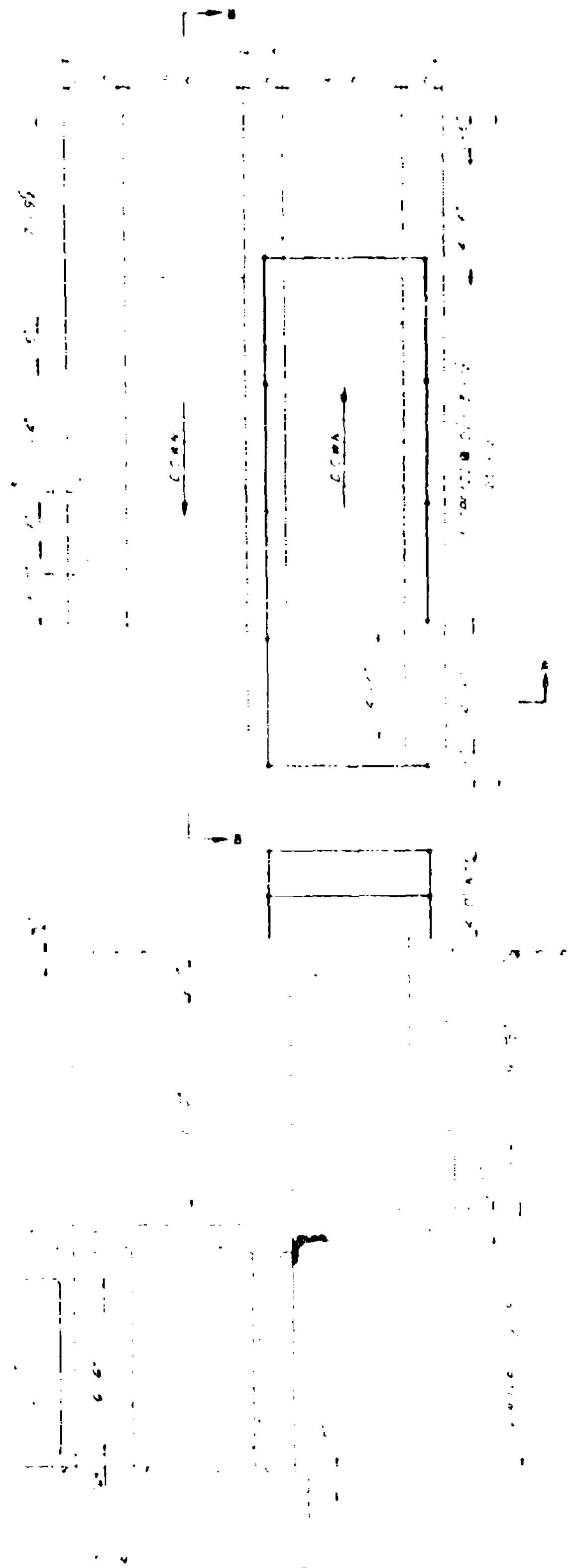
55



ROOF PLAN



SECTION A-A



DESIGN CONDITIONS

Design Procedure

In accordance with O.C.E. manual, "Design of Structures for protection from the Effects of Atomic Weapons"

Design Blast Wave

[illegible]

Blast Loading on Exterior Surface

[illegible]

Nuclear Radiation Protection

[illegible]

Strength of Materials

	Static	Blast design
Soil bearing capacity	[illegible]	[illegible]
Concrete, f'_c		
Dome	5,000 psi	[illegible]
[illegible]	[illegible]	[illegible]
Reinf. steel, [illegible]	[illegible]	[illegible]
[illegible]		
Structural steel [illegible]	[illegible]	[illegible]

Allowable Stresses and Deflections

[illegible]

General Notes

[illegible]

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OFFICE OF THE CHIEF OF ENGINEERS

MILITARY CONSTRUCTION ENGINEERING DIVISION

WASHINGTON D.C.

PROTECTIVE CONSTRUCTION

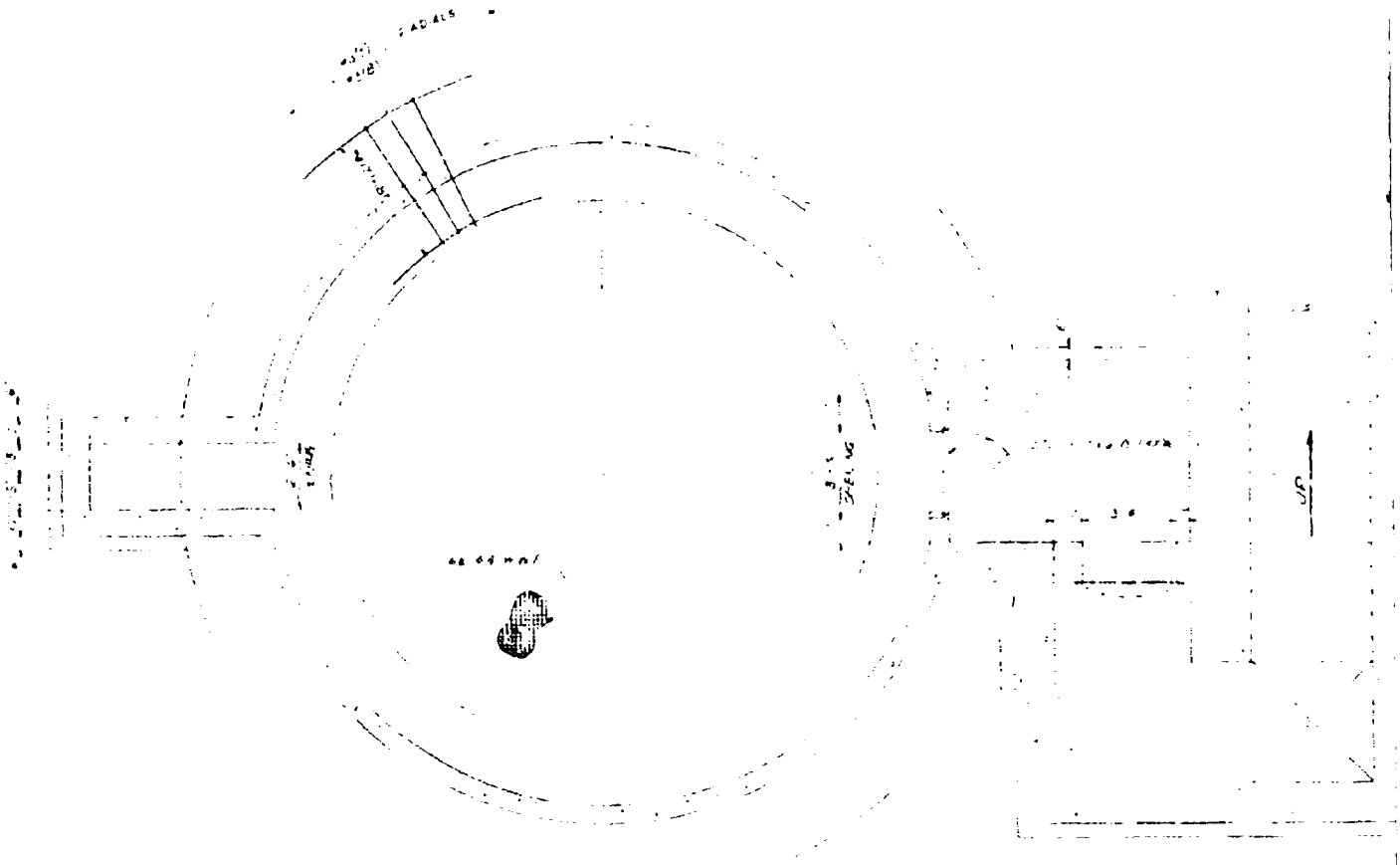
GENERAL PURPOSE STRUCTURE

BURIED DOME

60 PSI BLAST RESISTANT

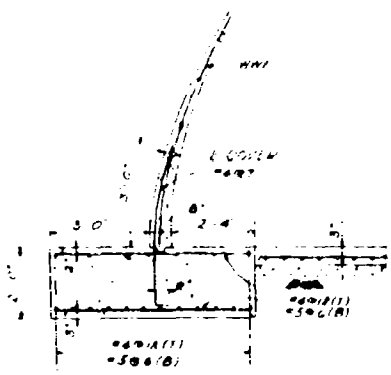
60 - 10 - 06

SHEET 1 OF 2



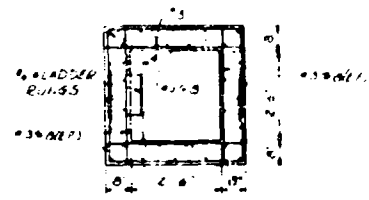
FLOOR SLAB AND FOUNDATION PLAN

SCALE $\frac{1}{4}$"=1'-0"



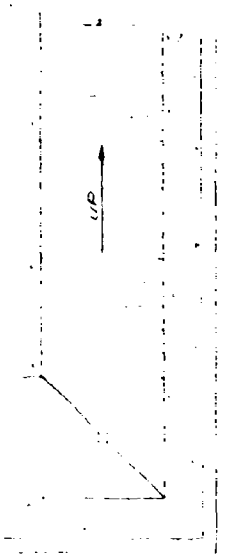
DETAIL OF FOOTING

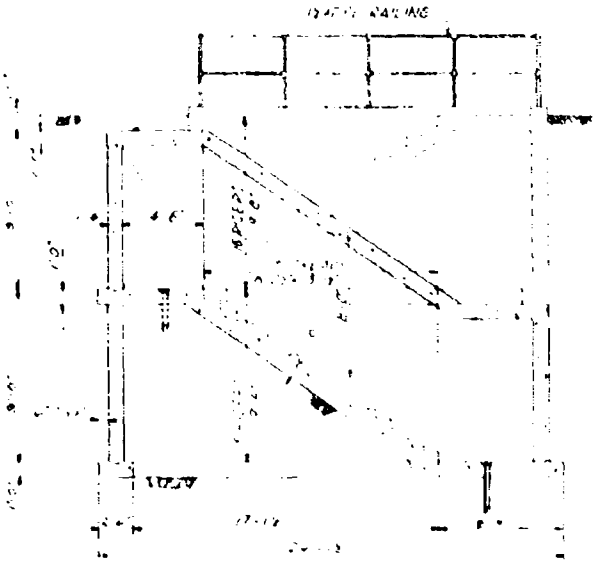
SCALE $\frac{1}{4}$"=1'-0"



SECTION C-C

SCALE $\frac{1}{4}$"=1'-0"





SECTION B-B
NTS

2

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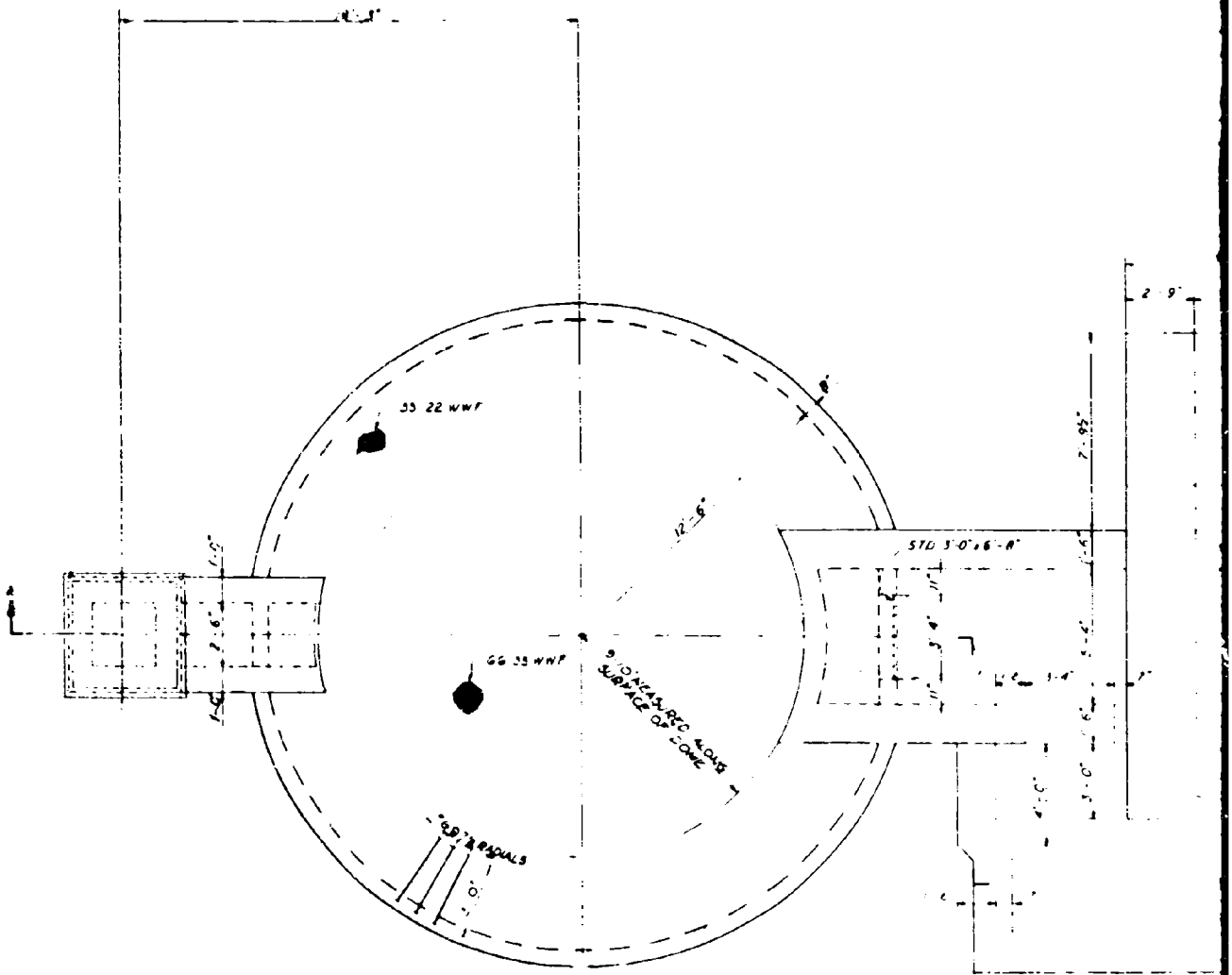
DEPARTMENT OF THE ARMY

PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED DOME
/ 30 PSI BLAST RESISTANT

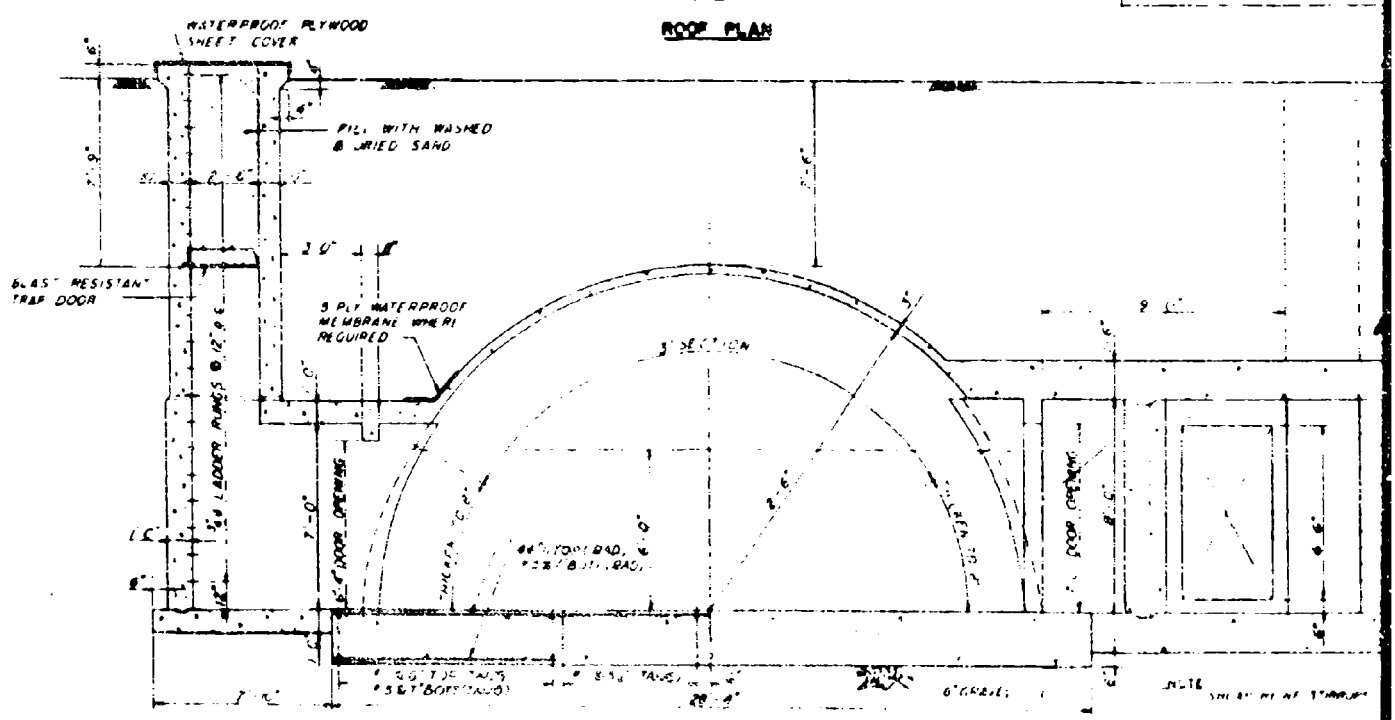
AS NOTED

60-16-06

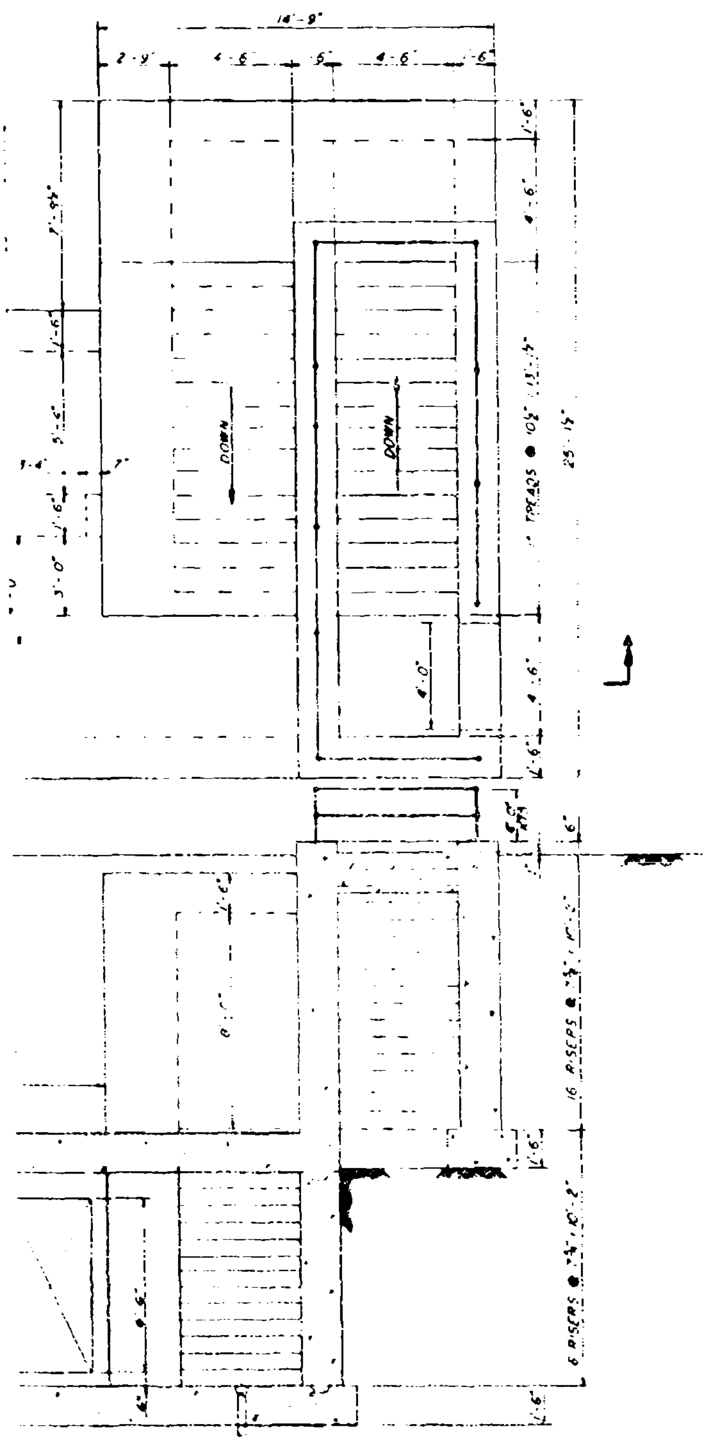
Sheet 2 of 8



ROOF PLAN



SECTION A-A



SHEAR REINF. (STIRRUPS) NOT SHOWN

DESIGN CONDITIONS

Design Procedure

In accordance with OCE manual, "Design of Structures for protection from the Effects of Atomic Weapons."

Design Blast Wave

Peak incident pressure = 100psi; Duration = 0.64 sec.

Blast Loading on Exterior Surface

Peak pressure = 130psi. Duration = 0.64 sec

Nuclear Radiation Protection

Total gamma and neutrons attenuated to 50r for a 200KT weapon at any position which will produce a peak blast pressure equal to 100 psi

Strength of Materials

	Static	Blast Design
Soil bearing capacity	8000 psf*	16,000 psf
Concrete, f'_c		
Dome	3000 psi	3900 psi
Remainder of Structure	5000psi	6500 psi
Reinf. steel, lower yield (Int. Grade, ASTM A305-50T)	40500psi	52,000psi
Structural steel, lower yield (ASTM A7-50)	38,000psi	41,600psi

* rated capacity of soil

Allowable Stresses and Deflections

The foundation and entrance ways are designed for plastic deformation under design blast load. Dome, blast door and escape hatch cover are designed for maximum elastic deformation under design blast load.

General Notes

1. The following features are not shown and shall be determined to suit use requirements.
   - Interior partitions
   - Mechanical and electrical equipment
   - Air locks and decontamination facilities
2. Access stairs may be varied as required.
3. Access ramp may be provided if required for vehicles.
4. Thermal protection to be applied to all exterior doors.

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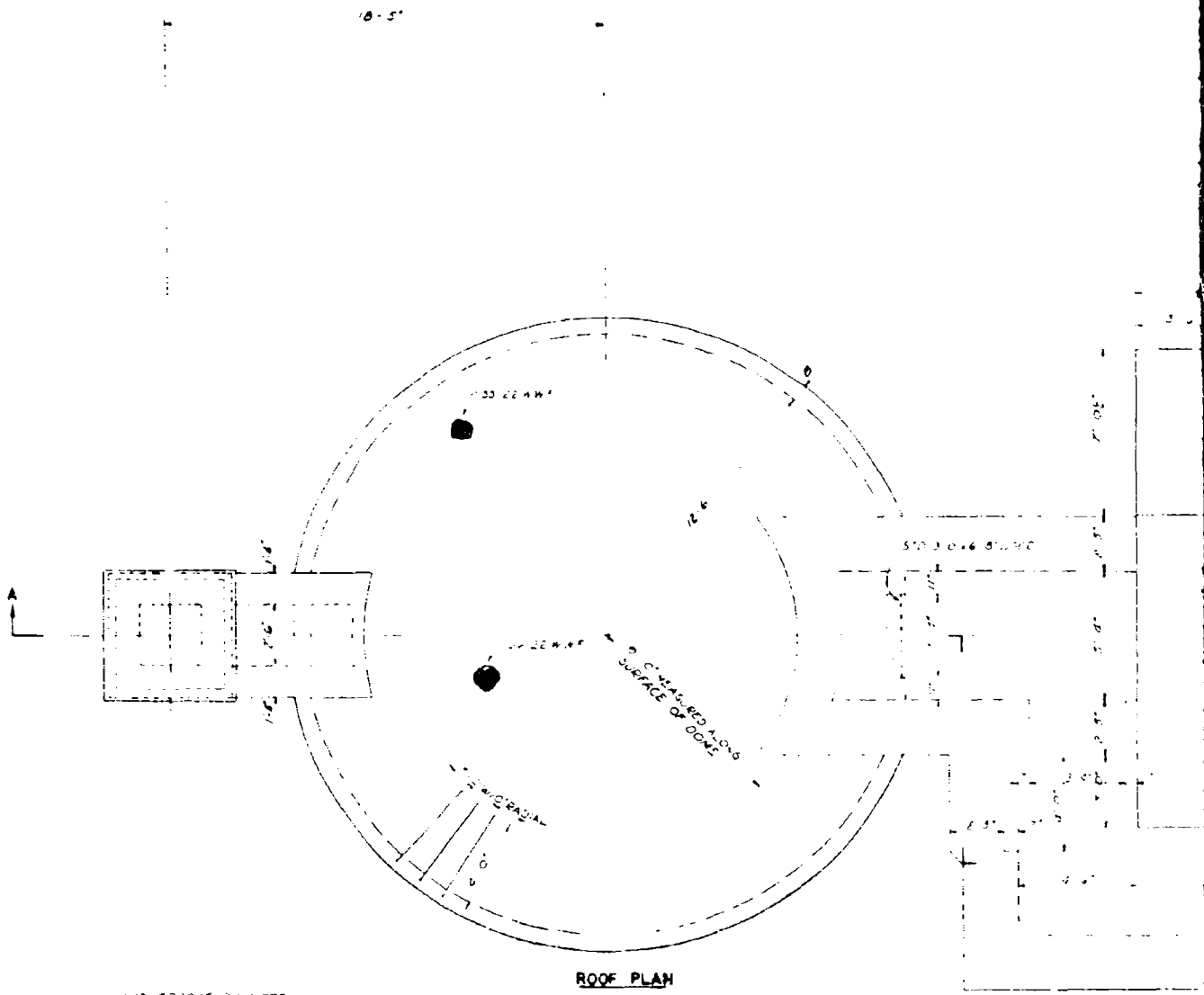
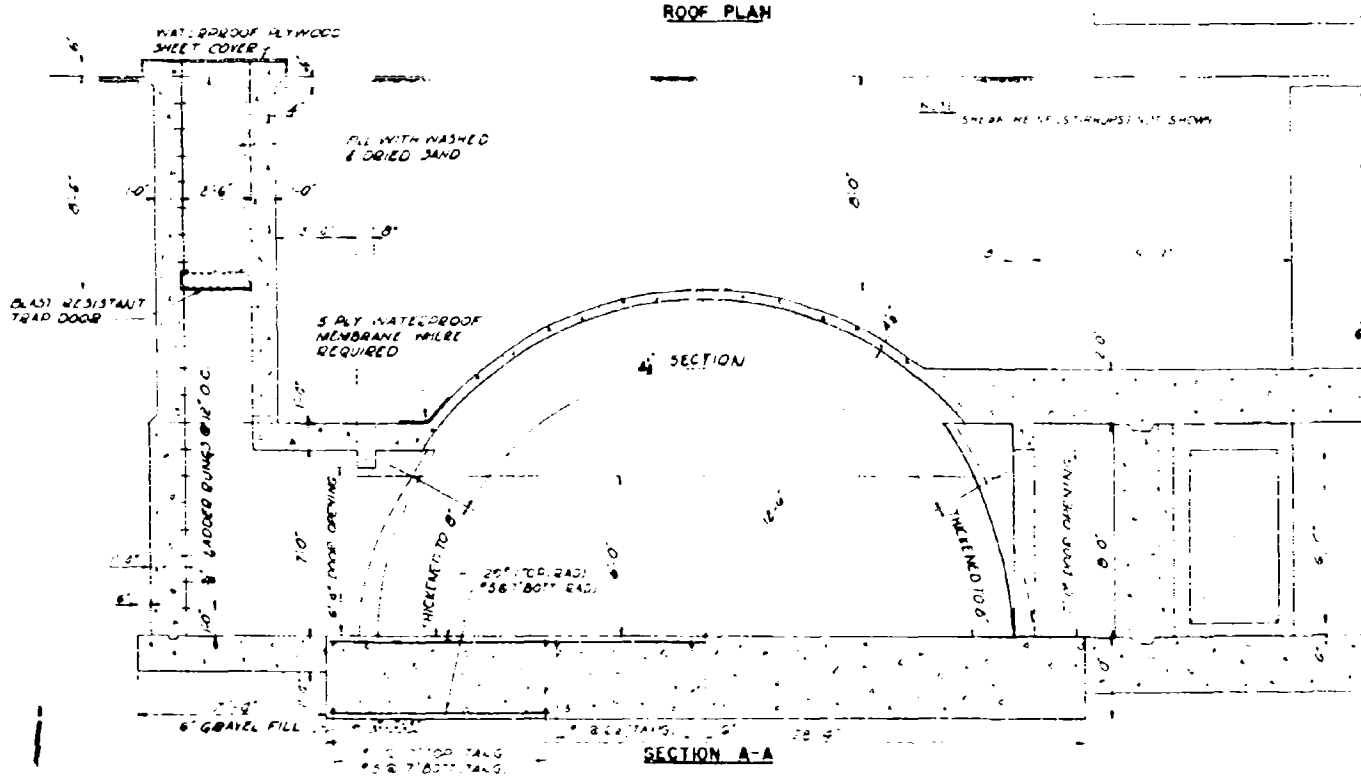
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D. C.

DESIGNED BY: J. S.

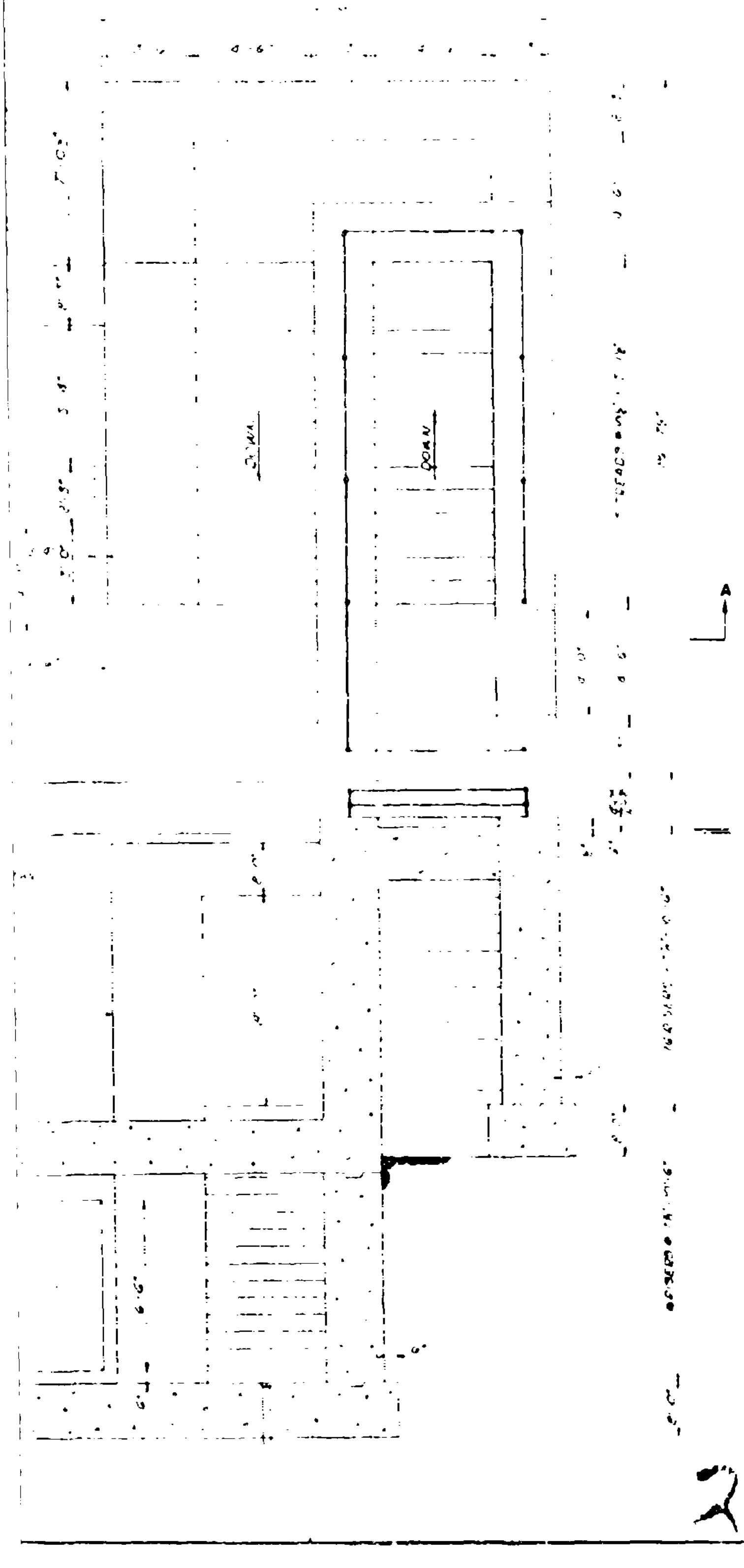
PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED DOME
100 PSI BLAST RESISTANT



ROOF PLAN



SECTION A-A



DESIGN CONDITIONS

Design Procedure
In accordance with OCE manual, "Design of Structures for protection from the Effects of Atomic Weapons."

Design Blast Wave
Peak incident pressure = 200 psi; Duration = [illegible] sec

Blast Loading on Exterior Surface
Peak pressure = 200 psi; Duration = 0.41 sec

Nuclear [illegible] Protection
[illegible] gamma and neutrons attenuated to 50 r [illegible] 5 KT [illegible] of [illegible] which will produce a peak [illegible] 200 psi

Strength of Materials	Static	Blast Design
Soil bearing capacity	[illegible] psi*	[illegible] psi
Concrete, f_c'		
Dome	3000 psi	3900 psi
Remainder of structure	5000 psi	6500 psi
Reinf. steel, lower yield (Int. Grade, ASTM A 305 50T)	47,500 psi	52,000 psi
Structural steel, lower yield (ASTM A7-50)	38,000 psi	41,600 psi

* rated capacity of soil

Allowable Stresses and Deflections
The foundation and entrance [illegible] designed for plastic deformation under design blast load. [illegible] designed for maximum elastic deformation under design blast load.

General Notes
1. The following features are not shown and shall be determined to suit use requirements:
   - Interior partitions
   - Mechanical and electrical equipment
   - Air locks and decontamination facilities
2. Access stairs may be varied as required.
3. Access ramp may be provided if required for vehicles.
4. Thermal protection to be applied to all exterior doors.

REVISION	DATE	DESCRIPTION	BY	APPROVAL

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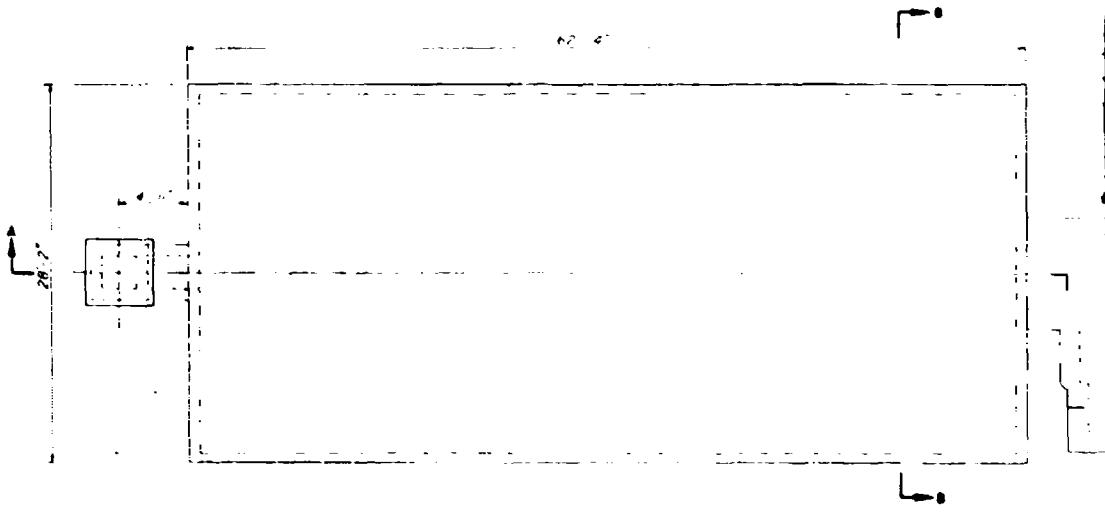
CONSULTING ENGINEERS
111 8TH AVENUE, NEW YORK, N. Y.

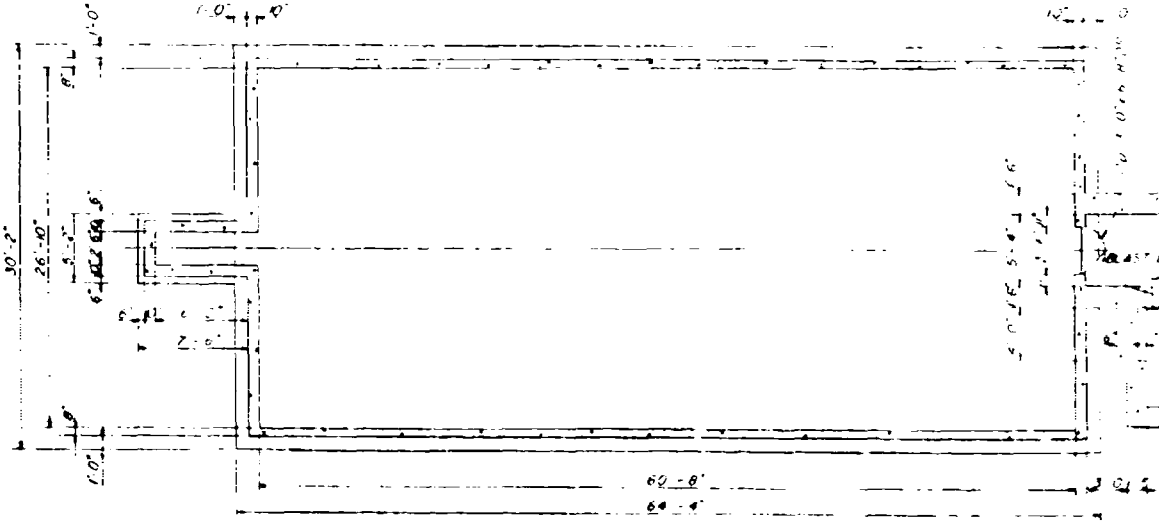
DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D. C.

PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED DOME
200 PSI BLAST RESISTANT

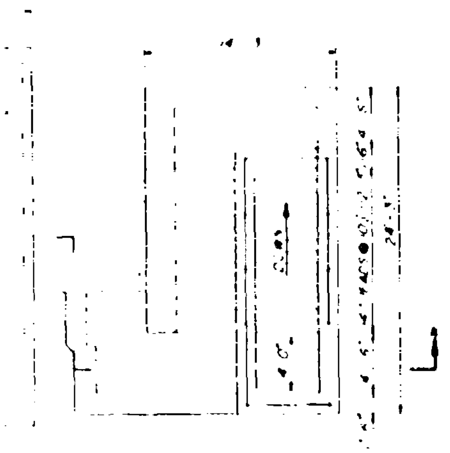
DRAWN BY | TRACED BY | CHECKED BY | SUBMITTED | APPROVED | APPROVED:
DATE: [illegible]
SCALE: 1/8" = 1'-0"
DRAWING NUMBER 60-18-06
SHEET 1 OF 1

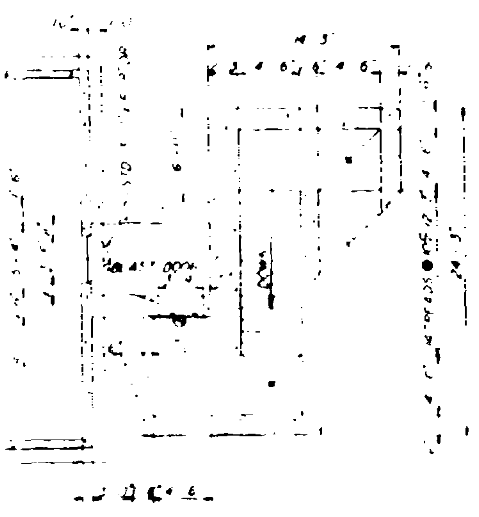


ROOF PLAN



FLOOR PLAN





DESIGN CONDITIONS

Design Procedure

In accordance with OCE manual "Design of Structures for Protection from the Effects of Atomic Weapons"

Design Blast Wave

Peak incident pressure = 90psi Duration 0.85 sec

Blast Loading on Exterior Surface

Peak pressure = 90psi Duration 0.85 sec

Nuclear Radiation Protection

[illegible] gamma and neutrons attenuated to 50r for a 100KT weapon at any position which will produce a peak blast pressure equal to 50psi

Strength of Materials	Static	Blast Design
Soil bearing capacity	8,000 psf*	16,000psf
Concrete, f'c		
Arch	3,000psi	1,900psi
Remainder of structure	5,000psi	6,500psi
Reinf. Steel lower yield	47,500psi	52,000psi
Int. Grade ASTM A15 [illegible]		
Structural Steel lower yield	38,000psi	41,600psi
(ASTM A7 [illegible])		
*rated capacity of soil		

Allowable Stresses and Deflections

The [illegible] and [illegible] and entrance ways designed for plastic deformation under design blast load. [illegible] doors and [illegible] hatch doors designed for maximum elastic deformation under design blast load.

General Notes

The following features are not shown and shall be determined for such use requirements:

Interior partitions
Mechanical and electrical equipment
[illegible] and decontamination facilities

2. Access shaft may be [illegible] if required.
3. Access ramp may be provided if required for vehicles.

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WASHINGTON, D. C.

J S

G P

PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED CONCRETE IGLOO
60 PSI BLAST RESISTANT

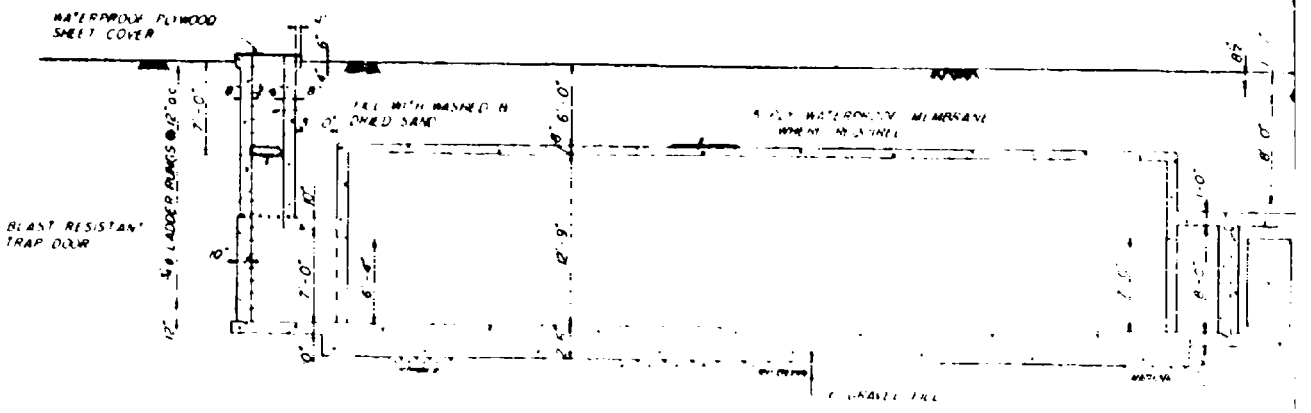
SCALE 3/16" = 1'-0"

DRAWING NUMBER 60-18-07

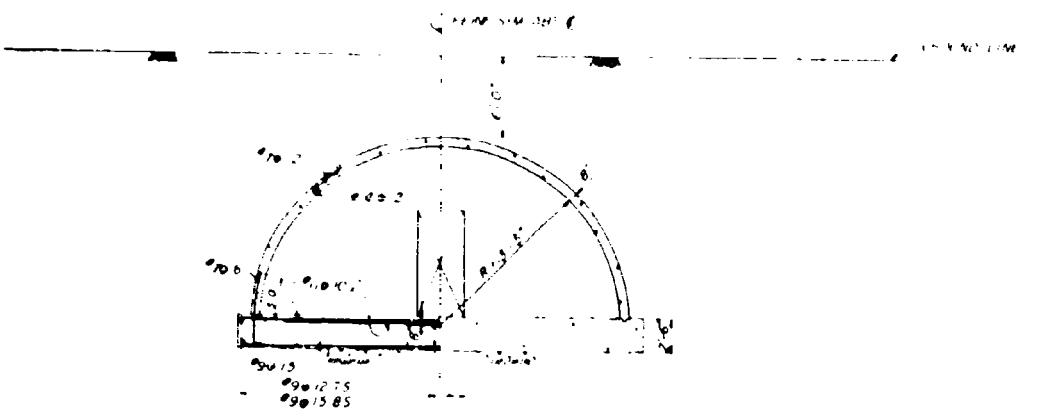
SHEET 1 OF 2

2

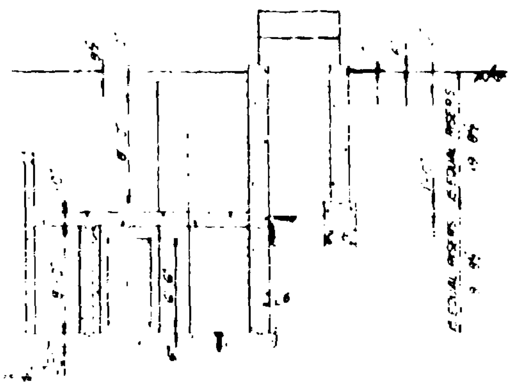
60



SECTION A-A



SECTION B-B



AMMANN & WHITNEY

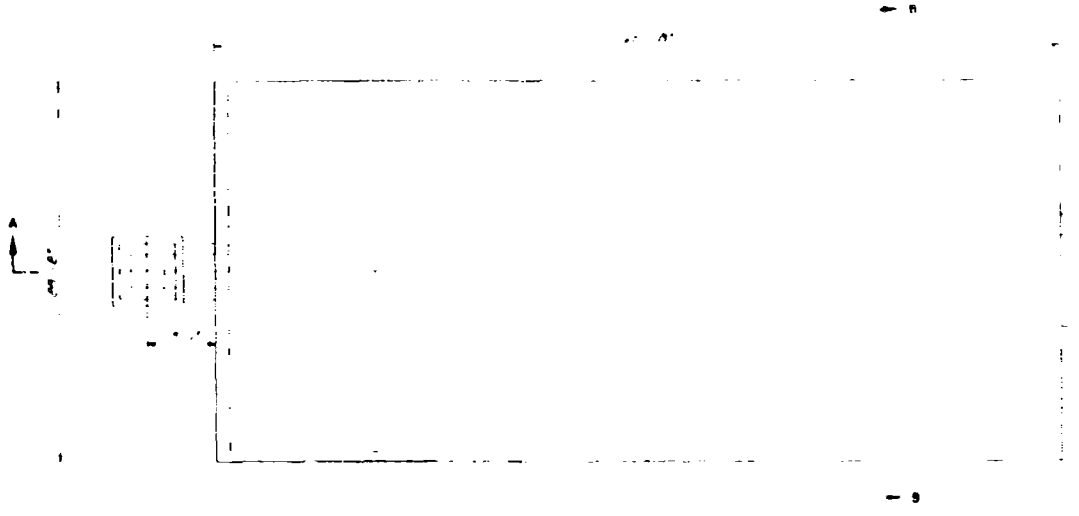
DEPARTMENT OF THE ARMY

PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED CONCRETE IGLOO
60 PSI BLAST RESISTANT

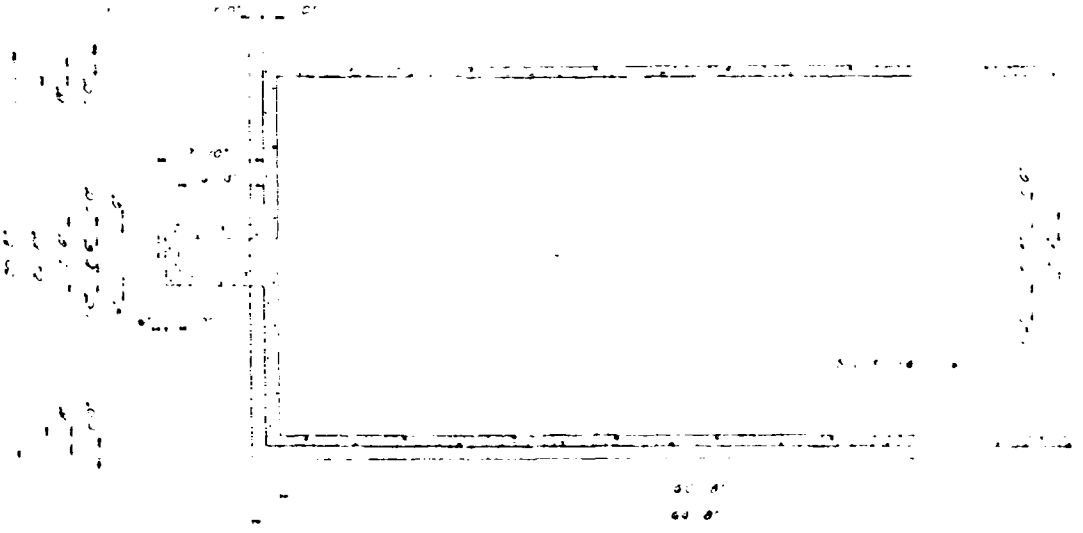
DRAWING NUMBER 60-18-07

SHEET 2 OF 2

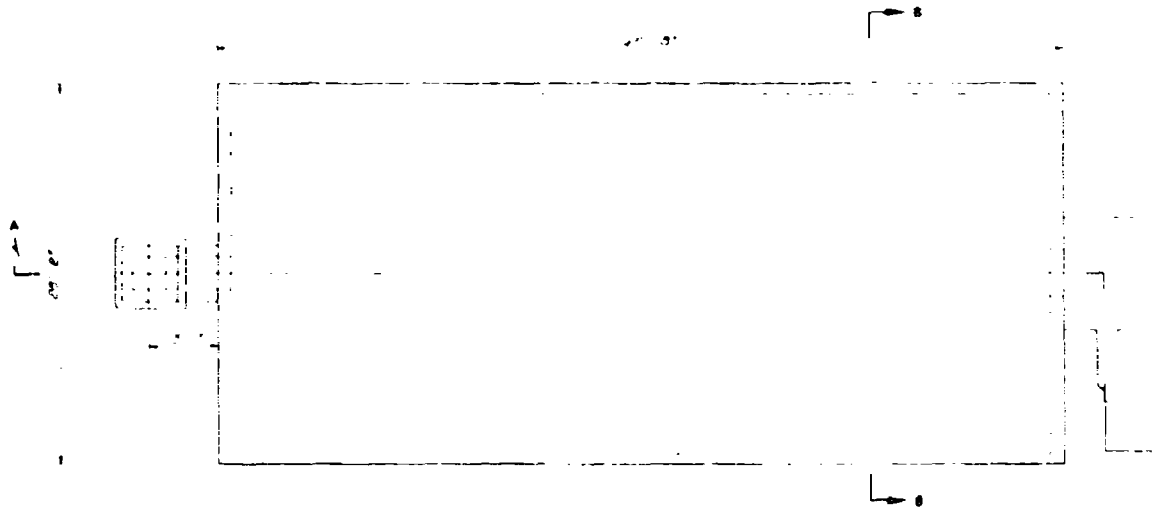
2



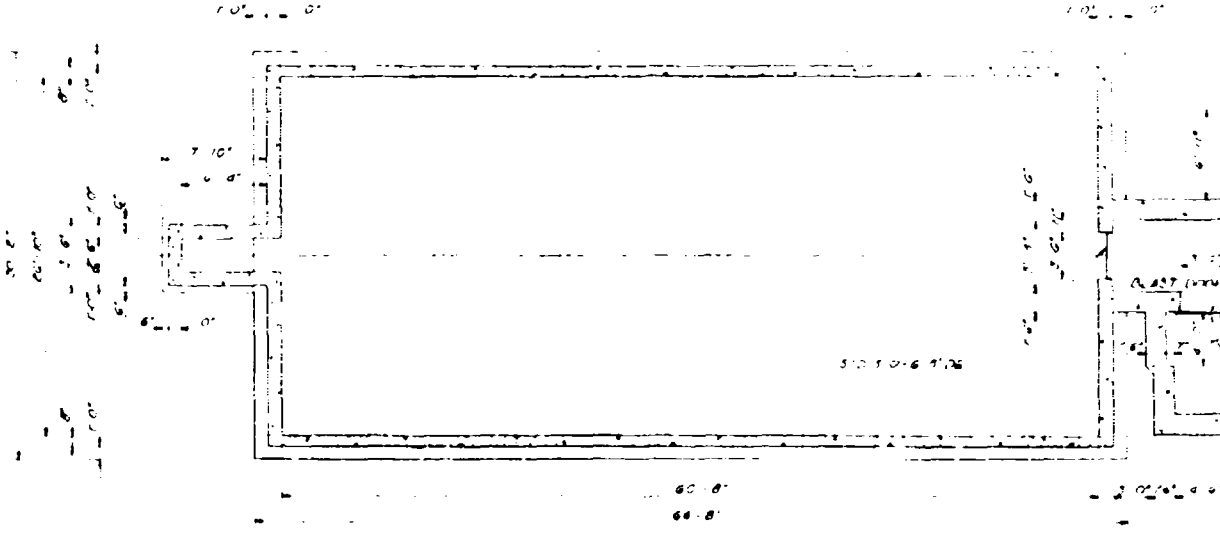
ROOF PLAN



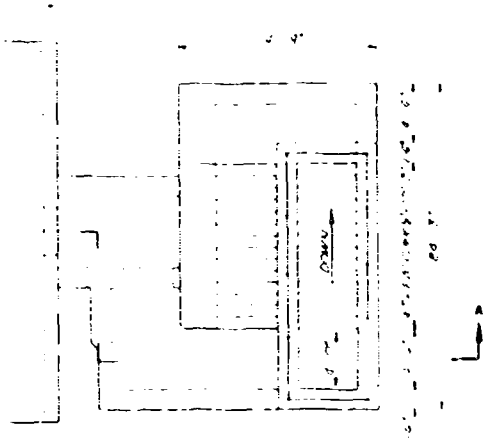
FLOOR PLAN

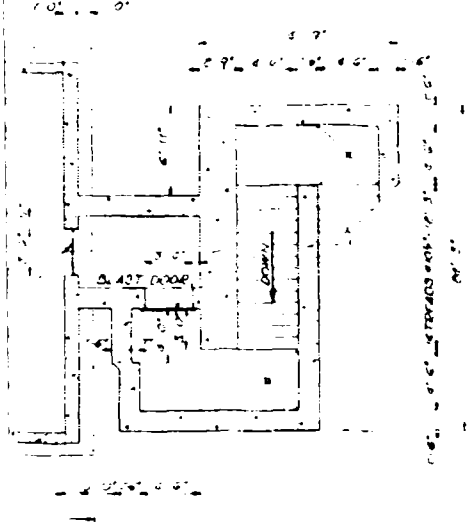


ROOF PLAN



FLOOR PLAN





DESIGN CONDITIONS

Design Procedure

Design Blast Wave

Blast Loading on Exterior Surface

Nuclear Radiation Protection

Strength of Materials	Static	Blast Design

Allowable Stresses and Deflections

General Notes

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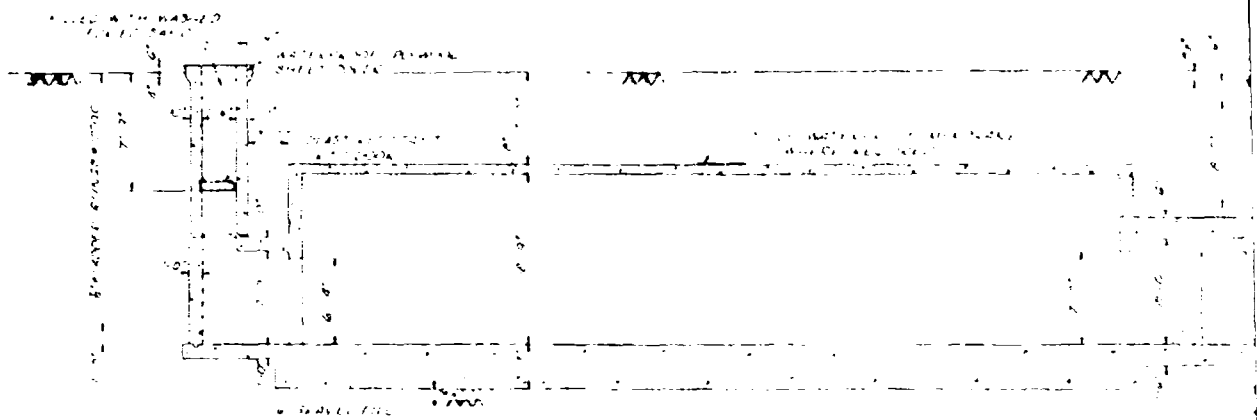
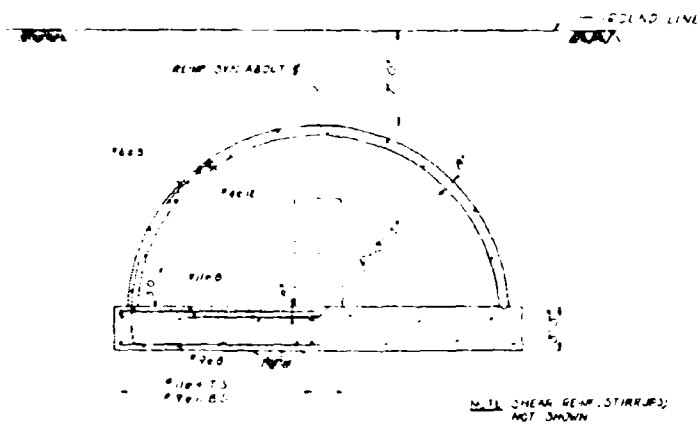
DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON 25, D. C.

PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED CONCRETE IGLOO
100 PSI BLAST RESISTANT

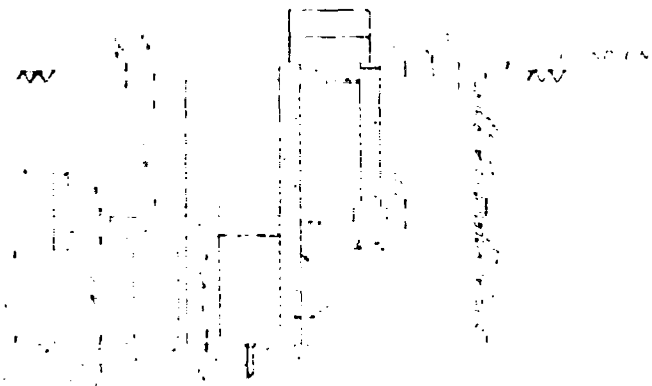
DRAWING NUMBER
60-18-07
SHEET 1 OF 2



SECTION A-A



SECTION B-B



2

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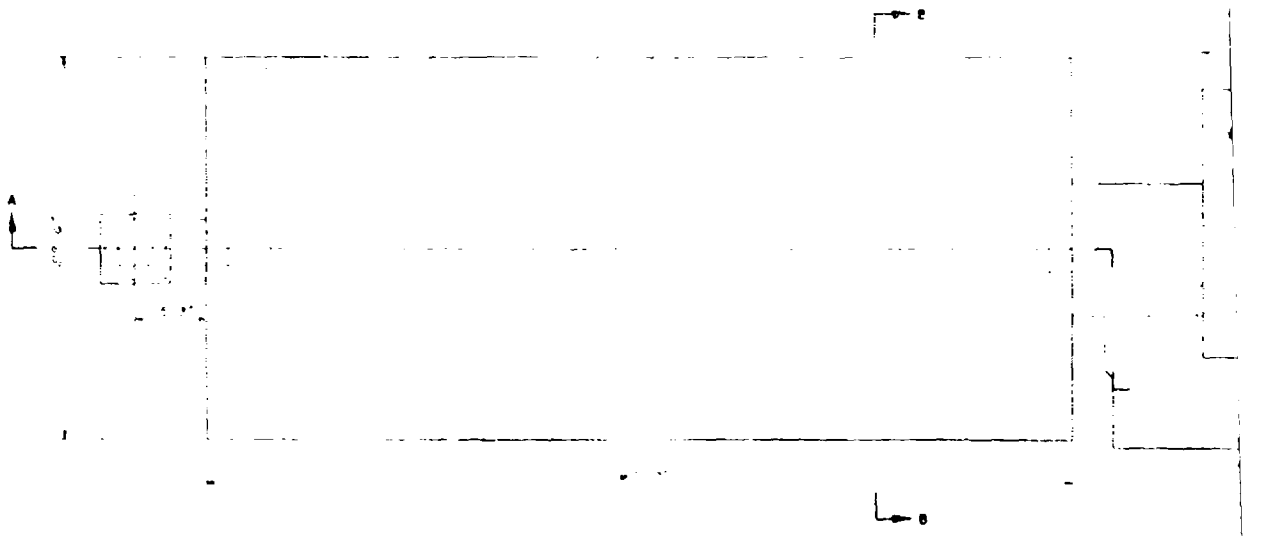
DEPARTMENT OF THE ARMY

PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED CONCRETE IGLOO
100 PSI BLAST RESISTANT

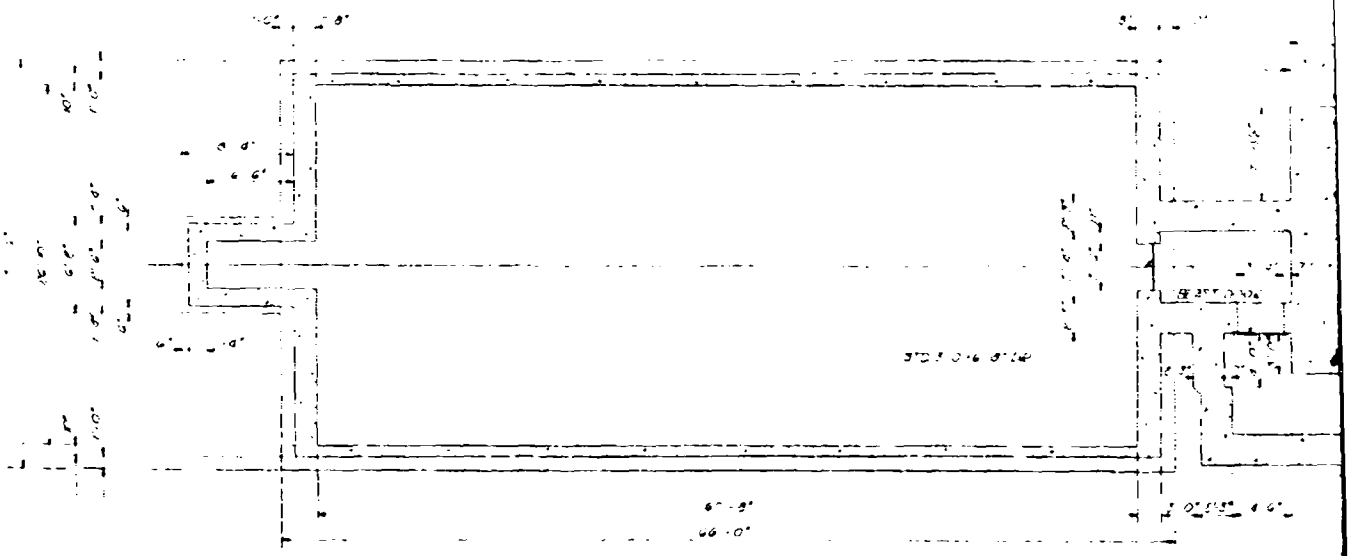
APPROVED

DRAWING NUMBER 60-18-07

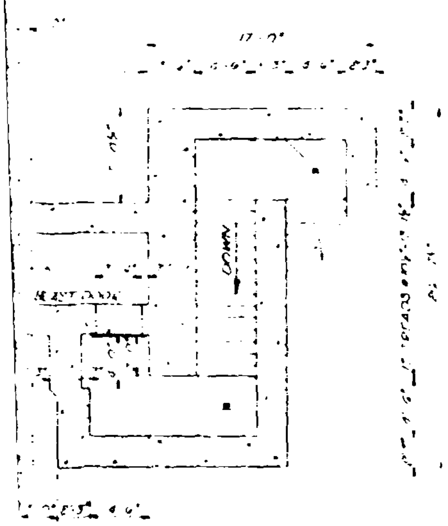
SHEET 2 OF 2



ROOF PLAN



FLOOR PLAN



DESIGN [illegible]

Design Pressure

[illegible]

Design Blast Wave

[illegible] Duration [illegible]

Blast Loading on Exterior Surface

[illegible]

Nuclear Radiation Protection

Total gamma and neutron [illegible] produce a peak static pressure equal [illegible]

Strength of Materials

	Static	Blast Design
[illegible]	[illegible] psf *	[illegible]
Concrete [illegible]		
[illegible]	4,000 psi	[illegible]
[illegible]	[illegible]	[illegible]
Reinf. Steel, [illegible]	40,000 psi	52,000 psi
[illegible] ASTM A15 [illegible]		
Structural Steel, [illegible]	36,000 psi	46,000 psi
(ASTM A7 [illegible])		
* [illegible]		

Allowable Stresses and Deflections

The foundation, [illegible] and entrance [illegible] designed for plastic [illegible] under design blast [illegible] blast door and escape hatch [illegible] designed for [illegible] design blast load.

General Notes

1. The following features are not shown and shall be determined to suit use requirements:

   Interior partitions
   Mechanical and electrical equipment
   A[illegible] locks and decontamination facilities

2. Access stairs may be [illegible] as required.
3. Access ramp may be provided if required for vehicles.
4. The [illegible] protection to be [illegible] doors.

REVISION	DATE	DESCRIPTION	BY	APPROVAL

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111 8TH AVENUE, NEW YORK, N.Y.

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON D.C.

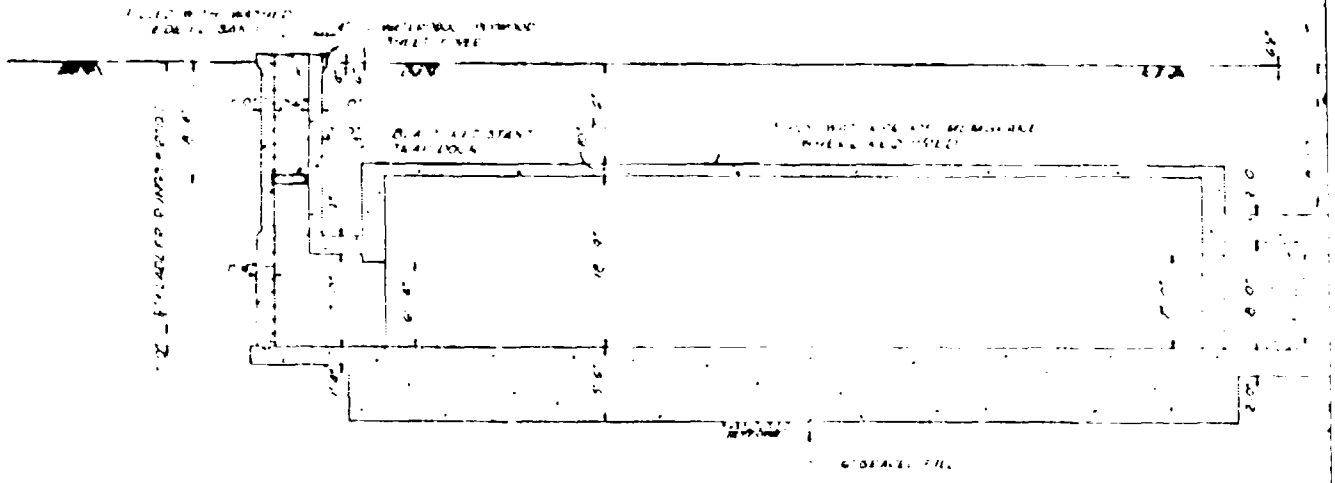
DRAWN BY FJH
TRACED BY
CHECKED BY GEP
SUBMITTED
APPROVED

PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED CONCRETE IGLOO
200 PSI BLAST RESISTANT

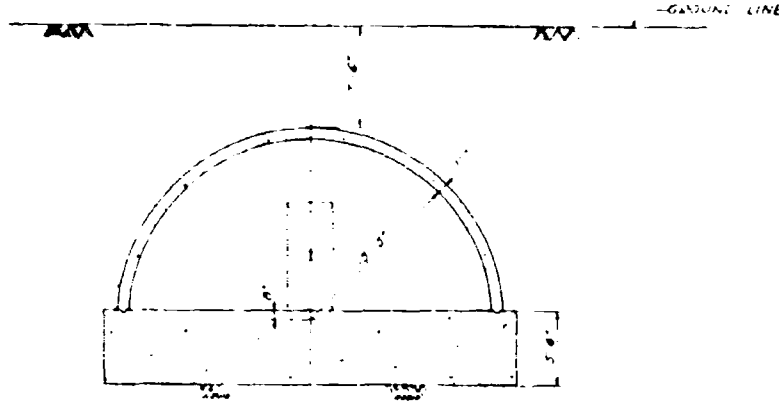
SCALE 3/16" = 1'-0"
DRAWING NUMBER 60-18-07
SHEET 1 OF 2

DATE [illegible] 1960

2



SECTION A-A



SECTION B-B

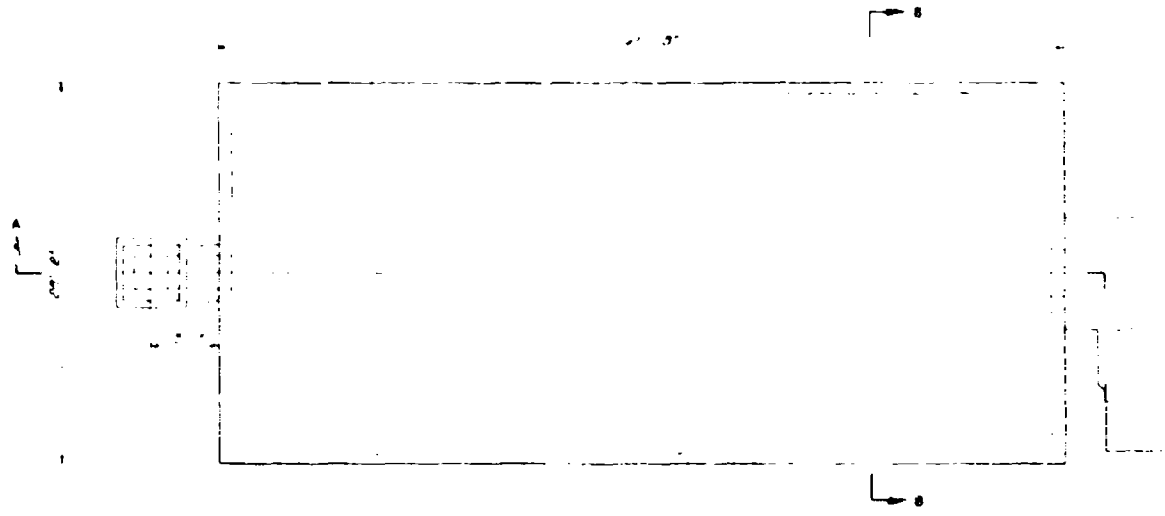
AMMANN & WHITNEY

DEPARTMENT OF THE ARMY

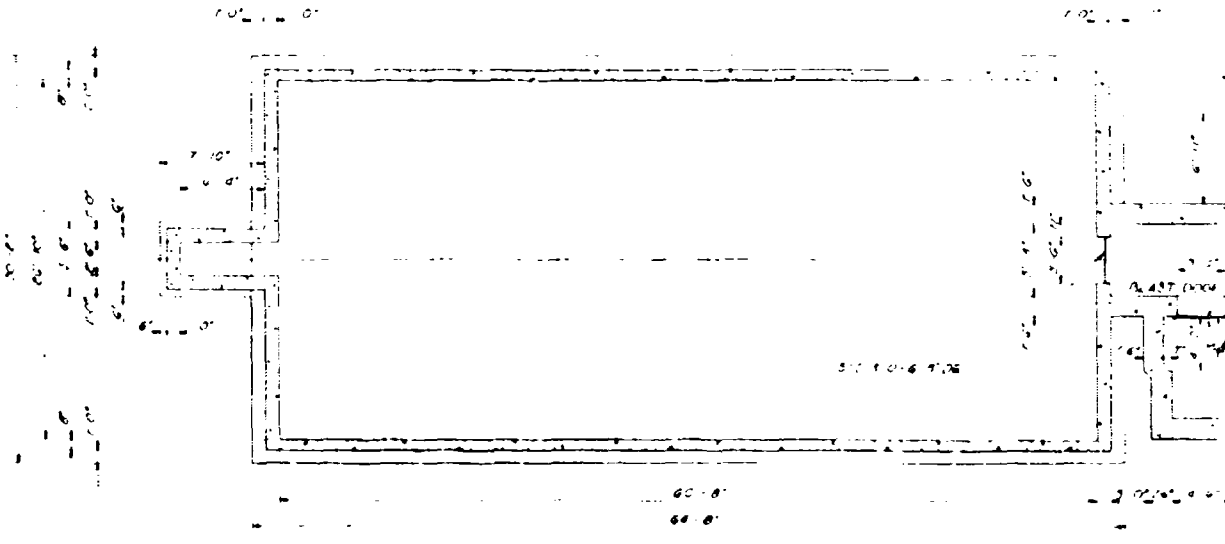
PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED CONCRETE IGLOO
200 PSI BLAST RESISTANT

60-15-07

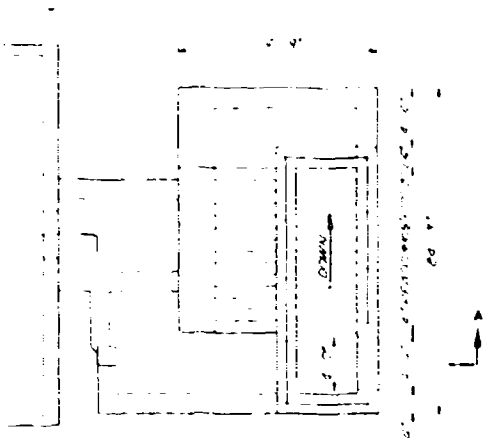
SHEET 2 OF 2

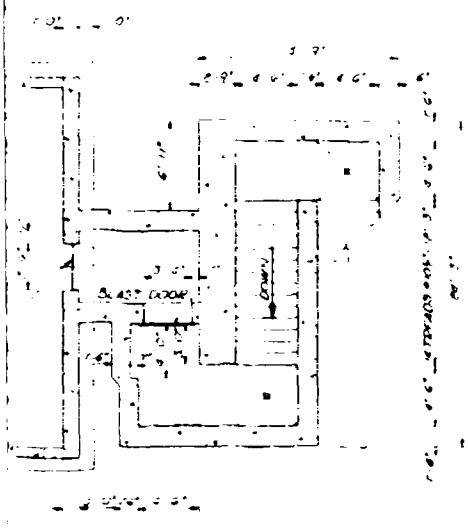


ROOF PLAN



FLOOR PLAN





DESIGN CONDITIONS

Design Procedure

Design Blast Wave

Blast Loading on Exterior Surface

Nuclear Radiation Protection

Strength of Materials	Static	Blast Design

Allowable Stresses and Deflections

General Notes

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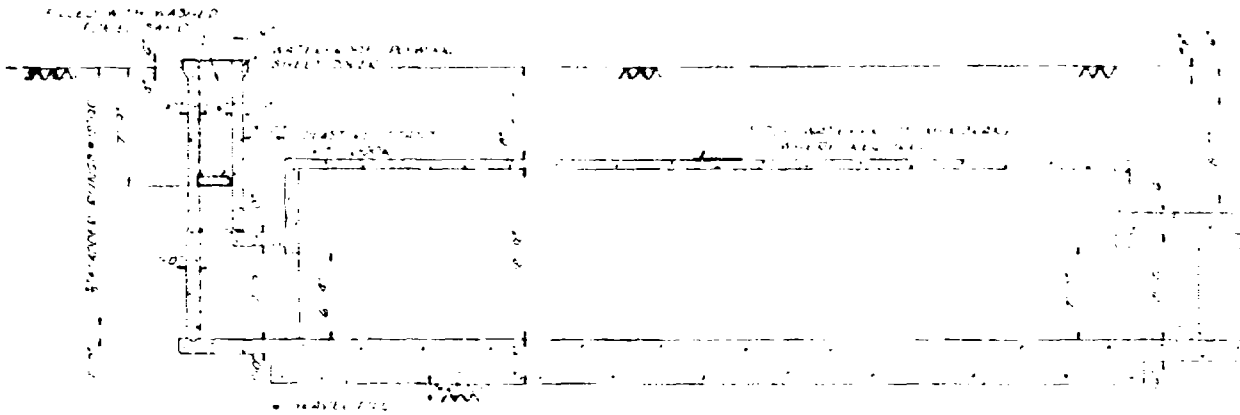
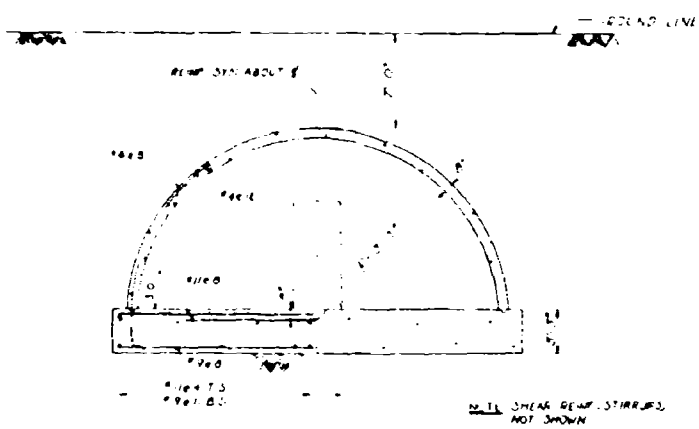
MILITARY CONSTRUCTION ENGINEERING DIVISION
WASHINGTON, D. C.

PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED CONCRETE IGLOO
100 PSI BLAST RESISTANT

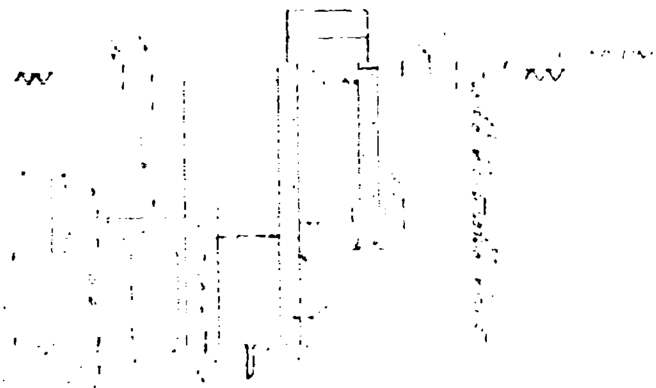
DRAWING NUMBER
60-18-07
SHEET 1 OF 2



SECTION A-A



SECTION B-B



2

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DEPARTMENT OF THE ARMY

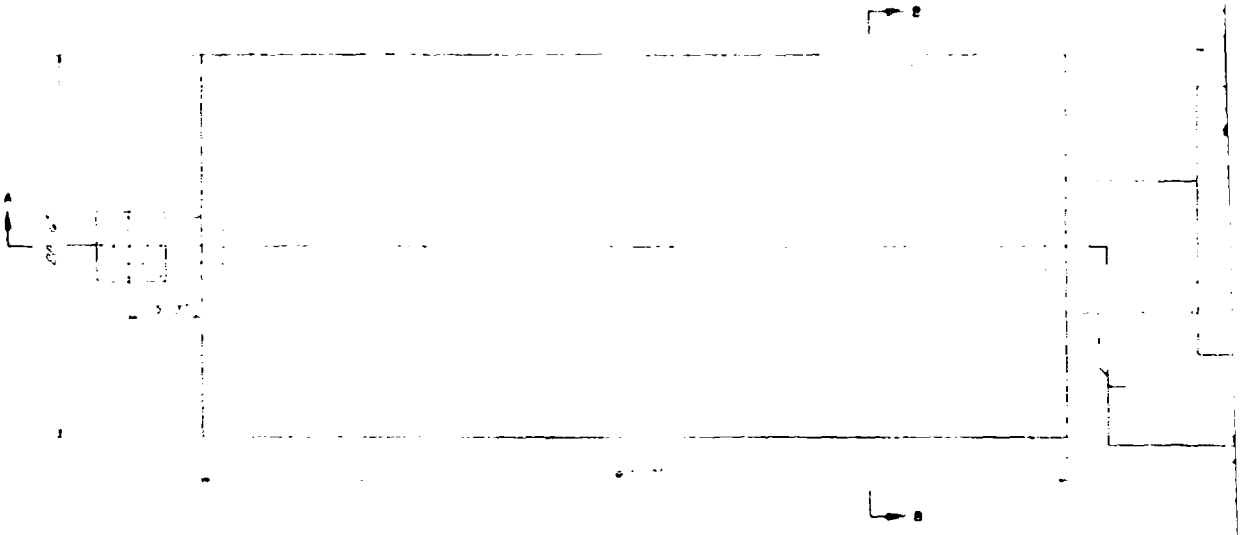
PROTECTIVE CONSTRUCTION
GENERAL PURPOSE STRUCTURE
BURIED CONCRETE IGLOO
100 PSI BLAST RESISTANT

APPROVED

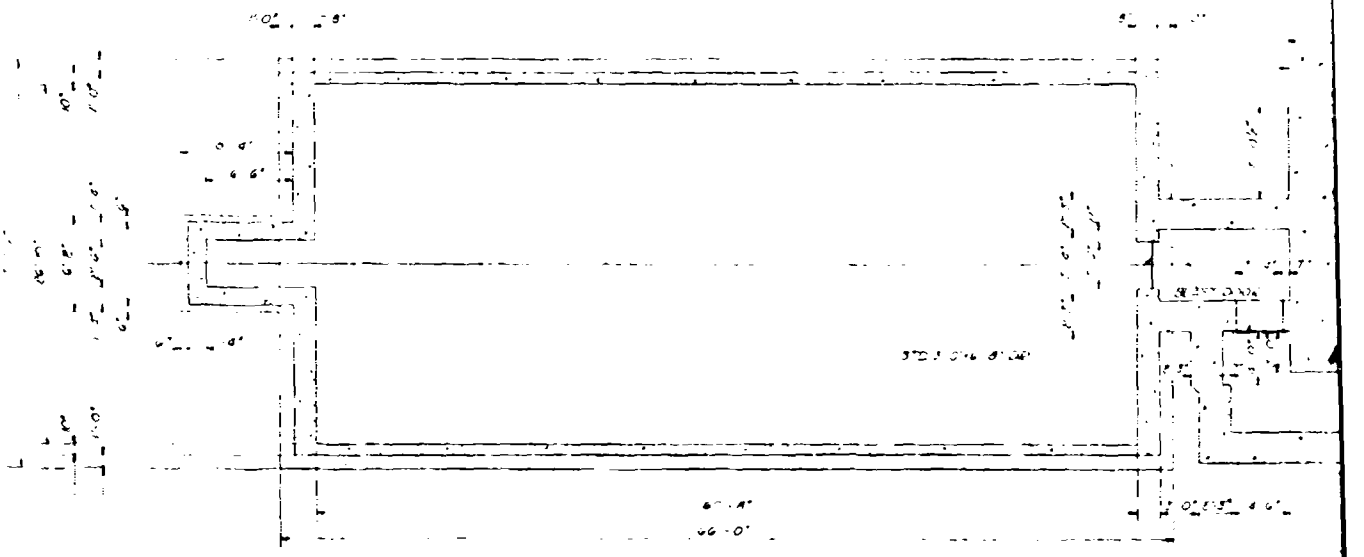
SCALE 3/16" = 1'-0"

DRAWING NUMBER
60-18-07

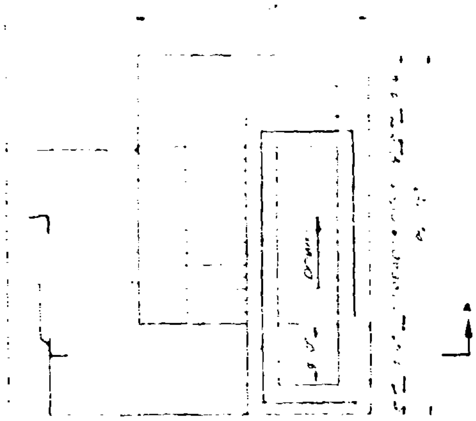
SHEET 2 OF 2

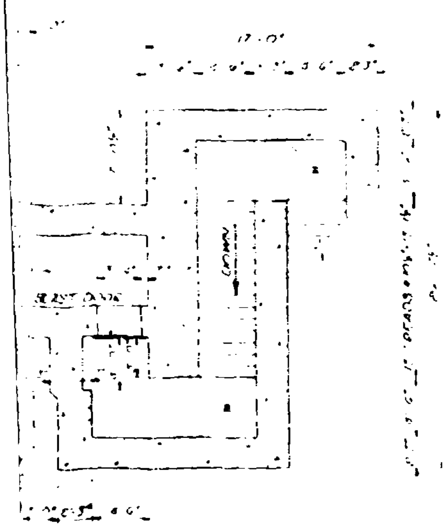


ROOF PLAN



FLOOR PLAN





DESIGN CONDITIONS

Design Procedure

[illegible]

Design Blast Wave

[illegible]

Blast Loading on Exterior Surface

[illegible]

Nuclear Radiation Protection

[illegible] ... produce a peak blast pressure equal ... [illegible]

Strength of Materials

	Static	Blast Design
[illegible]	[illegible]	[illegible]
Concrete		
[illegible]	4,000 psi	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	4,500 psi	[illegible]
[illegible] ASTM [illegible]		
[illegible]	38,000 psi	4,600 psi
ASTM A7 [illegible]		
[illegible]		

Allowable Stresses and Deflections

The [illegible] ... designed for [illegible] ... under design blast ... blast door and ... designed for ... design blast load.

General Notes

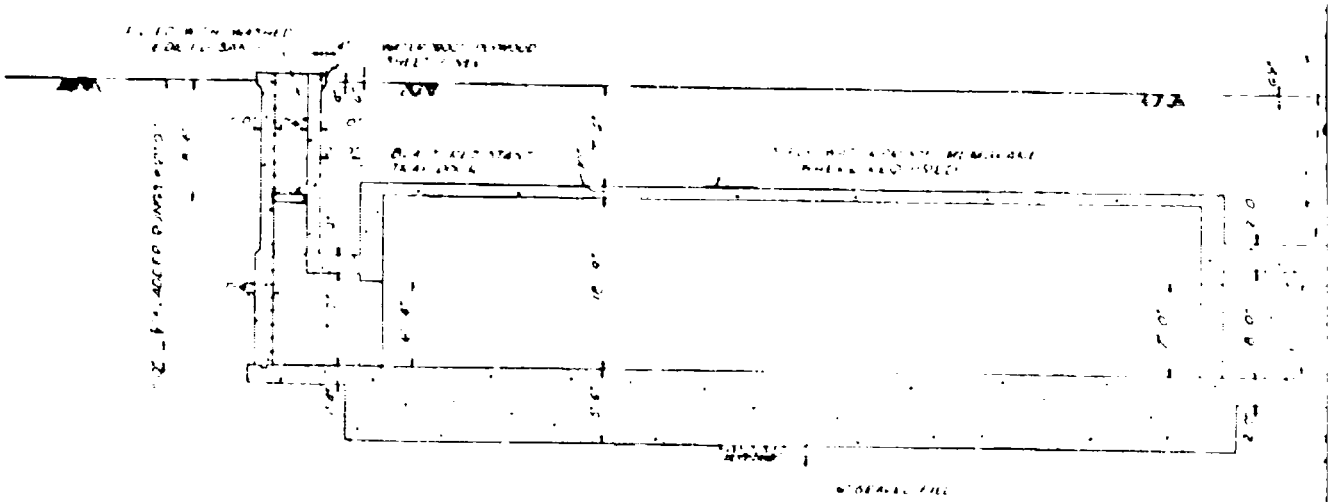
1. The following features are not shown and shall be determined to suit user requirements:

Interior partitions
Mechanical and electrical equipment
Air locks and decontamination facilities

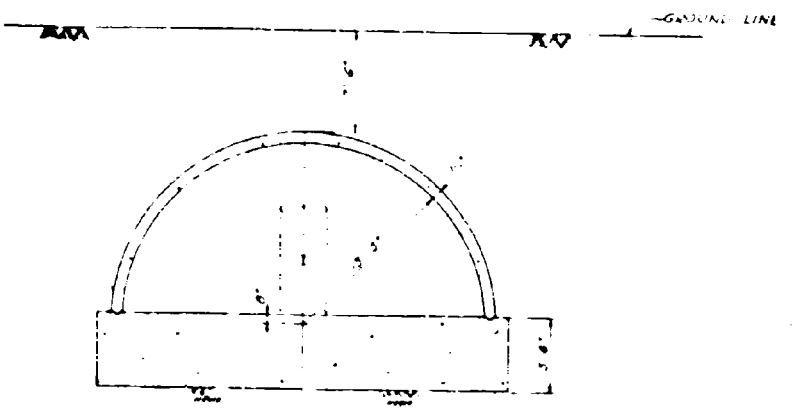
2. Access stairs may be [illegible] as required.
3. Access ramp may be provided if required for vehicles.
4. The [illegible] to be [illegible] of doors.

AMMANN & WHITNEY CONSULTING ENGINEERS 111-8TH AVENUE NEW YORK, N.Y.	DEPARTMENT OF THE ARMY OFFICE OF THE CHIEF OF ENGINEERS MILITARY CONSTRUCTION ENGINEERING DIVISION WASHINGTON D.C.
DRAWN BY	PROTECTIVE CONSTRUCTION
TRACED BY	GENERAL PURPOSE STRUCTURE
CHECKED BY	BURIED CONCRETE IGLOO
SUBMITTED	200 PSI BLAST RESISTANT
APPROVED	SCALE 3/16" = 1'-0"
DATE	DRAWING NUMBER 60-18-07
	SHEET 1 OF 2

2



SECTION A-A



SECTION B-B

AMMANN & WHITNEY		DEPARTMENT OF THE ARMY	
	PROTECTIVE CONSTRUCTION GENERAL PURPOSE STRUCTURE BURIED CONCRETE IGLOO 200 PSI BLAST RESISTANT		
		DRAWING NUMBER 60-10-07	
		SHEET 2 OF 2	

2