US Army Corps
of Engineers
Huntsville Center

# MODULAR STORAGE MAGAZINE, BOX-TYPE , EUROPEAN VERSION STD 421-80-13 WITH SLIDING DOOR

US Army Corps
of Engineers
Huntsville Center

| No. | Description | Revisions | Date | Appr. |
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Designed by: JMU
Drawn by: JMU
Checked by: RSW
Project Engineer/Architect: Jeff Coulston
Date: AUGUST 2018
Scale:
Drawing code:

U. S. ARMY CORPS OF ENGINEERS
ENGINEERING AND
SUPPORT CENTER,
HUNTSVILLE, ALABAMA

MODULAR STORAGE MAGAZINE
BOX-TYPE, EUROPEAN VERSION

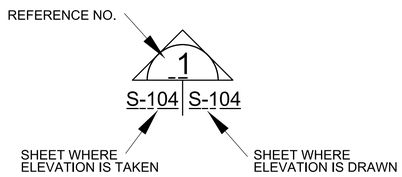
COVER SHEET

Sheet reference number:
G-001
Sheet 1 of 25

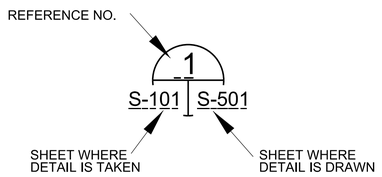
## GENERAL ABBREVIATIONS

| | |
|---|---|
| AFF | ABOVE FINISHED FLOOR |
| ALUM | ALUMINUM |
| APPROX | APPROXIMATELY |
| BLDG | BUILDING |
| BOTT | BOTTOM |
| BRG | BEARING |
| CIP | CAST-IN-PLACE |
| CJ | CONTROL JOINT |
| CL | CENTER LINE |
| CMU | CONCRETE MASONRY UNIT |
| CP | CENTER POINT |
| COL | COLUMN |
| COORD | COORDINATE |
| CONC | CONCRETE |
| CONT | CONTINUE, CONTINUOUS |
| DIA | DIAMETER |
| DIAG | DIAGONAL |
| DIM | DIMENSION |
| EA | EACH |
| ELEV | ELEVATION |
| EF | EACH FACE |
| EJ | EXPANSION JOINT |
| EQ | EQUAL |
| E.W. | EACH WAY |
| (E) OR EXIST | EXISTING |
| EXT | EXTERIOR |
| FTG | FOOTING |
| FV | FIELD VERIFY |
| GALV | GALVANIZED |
| HD | HEADED |
| HT | HEIGHT |
| INT | INTERIOR |
| ID | INSIDE DIAMETER |
| LLH | LONG-LEG HORIZONTAL |
| LLV | LONG-LEG VERTICAL |
| MIN | MINIMUM |
| MANF | MANUFACTURER |
| NTS | NOT TO SCALE |
| O.C. | ON CENTER |
| OD | OUTSIDE DIAMETER |
| OH | OPPOSITE HAND |
| R | RADIUS |
| REINF | REINFORCEMENT |
| REQ'D | REQUIRED |
| SF | SQUARE FEET |
| SHT | SHEET |
| SIM | SIMILAR |
| SOG | SLAB-ON-GRADE |
| STIFF | STIFFENER |
| TYP | TYPICAL |
| UON | UNLESS OTHERWISE NOTED |
| VIF | VERIFY IN FIELD |
| WWF | WELDED WIRE FABRIC |
| WWR | WELDED WIRE REINFORCEMENT |
| W/ | WITH |
| WP | WORKING POINT |

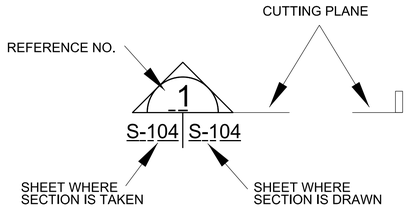
## DRAWING SYMBOLS




### ELEVATION REFERENCE




### DETAIL REFERENCE




### SECTION CUT

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| | S-703 | 19 | XXXXXX | DOOR PLATE ELEVATIONS |
| | S-704 | 20 | XXXXXX | HIGH SECURITY HASP |
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| | E-102 | 23 | XXXXXX | LIGHTNING PROTECTION SYSTEM |
| | E-103 | 24 | XXXXXX | LIGHTNING PROTECTION SYSTEM |
| | E-104 | 25 | XXXXXX | LIGHTNING PROTECTION SYSTEM |

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INDEX, SYMBOLS,
& ABBREVIATIONS

Sheet reference number:
G-002
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1.0 DESIGN CRITERIA:

A. BUILDING CODES AND SPECIFICATIONS:

1. INTERNATIONAL BUILDING CODE 2015 (IBC) AS MODIFIED BY UFC 1-200-01
2. AMERICAN CONCRETE INSTITUTE (ACI 318)
3. AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC 13th ED.)
4. AMERICAN WELDING SOCIETY, A.W.S.

B. LIVE LOADS

ROOF---------- 4.80 kPa (100 PSF)
FLOOR----------4.80 kPa (100 PSF)

SNOW LOAD:

GROUND SNOW LOAD (Pg) = 2.87 kPa (60 PSF)
IMPORTANCE FACTOR (I) = 1.2
EXPOSURE CATEGORY (Ce) = 1.0
THERMAL CATEGORY (Ct) = 1.0

C. WIND LOAD:

BASIC WIND SPEED: 225 km/h (140 MPH)
IMPORTANCE FACTOR (I): 1.15
EXPOSURE CATEGORY: C
ENCLOSURE CLASSIFICATION: ENCLOSED

D. EARTHQUAKE:

RISK CATEGORY=III
Ie= 1.25
Ss= 1.1
Sds= 0.78
S1 = 0.52
Sd1 = 0.52
SITE CLASS: D (ASSUMED)
BASIC SEISMIC-FORCE RESISTING SYSTEM=
INTERMEDIATE PRECAST SHEAR WALLS, R = 4
SEISMIC DESIGN CATEGORY= D
ANALYSIS PROCEDURE = EQUIVALENT LATERAL FORCE PROCEDURE

E. SOILS

SOIL DENSITY (Ɣ): 1922 kg/m3 (120 PCF)
ANGLE OF INTERNAL FRICTION OF THE SOIL (Φ) : 30 DEGREES
EQUIVALENT FLUID PRESSURE (EFP) AT-REST : 293 Kpa (60 PSF) PER FOOT OF DEPTH
EQUIVALENT FLUID PRESSURE (EFP) ACTIVE : 195 Kpa (40 PSF) PER FOOT OF DEPTH

2.0 GENERAL

2.1 CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO CONSTRUCTION/FABRICATION. CONTRACTOR SHALL NOTIFY CONTRACTING OFFICER OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

2.2 THE STRUCTURE (MEMBERS AND CONNECTIONS) HAS BEEN DESIGNED TO SUPPORT IN-PLACE DESIGN LOADS ONLY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LIMITING CONSTRUCTION LOADS SUCH THAT THESE LOADS DO NOT EXCEED THE DESIGN LOADS NOTED ABOVE.

2.3 IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE CONSTRUCTION METHODS, PROCEDURES, AND SEQUENCES TO ENSURE STABILITY AND SAFETY DURING CONSTRUCTION. THE CONTRACTOR SHALL TAKE NECESSARY PRECAUTIONS TO PROTECT AND MAINTAIN THE STRUCTURAL INTEGRITY OF ALL NEW AND EXISTING CONSTRUCTION AT ALL STAGES.

2.4 SECTIONS AND DETAILS SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE CONSIDERED TYPICAL FOR SIMILAR CONDITIONS THAT DO NOT HAVE A SPECIFIC SECTION INDICATED.

2.5 THE CONTRACTOR SHALL COORDINATE STANDARD DRAWINGS WITH THE VENDOR/MANF. SHOP DRAWINGS TO VERIFY SIZES AND LOCATIONS OF OPENINGS, SLEEVES, INSERTS, DEPRESSIONS, FINISHES, SLOPES, ETC. ANY DISCREPANCY SHALL BE BROUGHT TO THE ATTENTION OF THE CONTRACTING OFFICER.

2.6 SEE CIVIL SITE LAYOUT DRAWINGS (PART OF SITE ADAPTION) FOR ACTUAL FINISHED FLOOR ELEVATIONS (F.F.E.) FOR ALL BUILDINGS. ELEVATIONS SHOWN IN STRUCTURAL DOCUMENTS WILL BE BASED ON REFERENCED F.F.E. EQUAL TO 0.0, U.O.N.

2.7 ANY DISCREPANCIES BETWEEN DRAWINGS, SPECIFICATIONS, REFERENCE STANDARDS, OR GOVERNING CODE, THE MORE STRINGENT REQUIREMENTS SHALL GOVERN. CONTRACTOR SHALL NOTIFY THE CONTRACTING OFFICER OF DISCREPANCIES AND OBTAIN DIRECTION PRIOR TO PROCEEDING.

2.8 CONTRACTOR SHALL PROVIDE TEMPORARY SHORING AND BRACING OF ALL STRUCTURAL WORK, AND SOIL EXCAVATION AS REQUIRED. SHORING AND BRACING SHALL NOT BE REMOVED UNTIL ALL FINAL CONNECTIONS HAVE BEEN COMPLETED IN ACCORDANCE WITH THE DRAWINGS, AND MATERIALS HAVE ACHIEVED DESIGN STRENGTH.

2.9 ALL DIMENSIONS SHOWN ARE IN MILLIMETERS (MM) UNLESS OTHERWISE SHOWN.

3.0 FOUNDATIONS

3.1 SEE CIVIL DRAWINGS AND SPECIFICATIONS (PART OF SITE ADAPTION) FOR EARTHWORK PREPARATION OF FOUNDATIONS INCLUDING THE REMOVAL OF ORGANIC MATERIALS, COMPACTING SOILS BENEATH STRUCTURES, BACK FILL REQUIREMENTS FOR OVER EXCAVATION AND REMOVAL OF UNSUITABLE MATERIALS.

3.2 MAXIMUM ASSUMED NET SOIL BEARING PRESSURE USED FOR DESIGN: 192 kPa (4000 PSF)

3.3 ASSUMED UNIT WEIGHT OF SOIL USED FOR DESIGN: 1922 kg/m^3 (120 PCF)

3.4 ALL FOUNDATION BEARING SURFACES SHALL BE REVIEWED BY THE GEOTECHNICAL ENGINEER PRIOR TO PLACING CONCRETE TO ENSURE THEIR COMPLIANCE WITH THE PRESSURES NOTE ABOVE.

3.5 ALL FOOTINGS SHALL PROJECT AT LEAST 460 INTO UNDISTURBED NATURAL SOIL OR COMPACTED ENGINEERED FILL HAVING A SOIL BEARING PRESSURE THAT MEETS OR EXCEEDS THAT SPECIFIED ABOVE.

3.6 ALL DISTURBED EARTH UNDER FOOTINGS SHALL BE REPLACED WITH LEAN CONCRETE.

3.7 CONCRETE SHALL NOT BE PLACED OVER FROZEN SOIL OR FOOTING EXCAVATIONS SUBJECTED TO WATER.

4.0 CONCRETE

4.1 ALL CONCRETE WORK INCLUDING DETAILING, FABRICATION, PLACEMENT OF REINFORCING, MIXING, HANDLING, PLACING, FINISHING, AND CURING SHALL CONFORM TO THE FOLLOWING DOCUMENTS OR EUROPEAN EQUIVALENT:

ACI 301----------"STANDARD SPECIFICATIONS FOR STRUCTURAL CONCRETE"
ACI 315----------"MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES"
ACI 318----------"BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE"

4.2 ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 30 Mpa (C30/37) AT 28 DAYS, U.O.N. ALL CONCRETE SHALL CONFORM TO EN 1992-1-1, SECTION 3.1.

4.3 REINFORCING BARS SHALL BE DEFORMED TYPE CONFORMING TO BS EN 10080, GRADE B500A OR B500C. GRADE B500C REQUIRED IN PRECAST ROOF PANELS.

4.4 FABRICATE AND PROVIDE BAR SUPPORTING ACCESSORIES IN ACCORDANCE WITH ACI MANUAL OF STANDARD PRACTICE AND C.R.S.I. SPECIFICATIONS. REINFORCING SHALL NOT BE WELDED IN ANY MANNER U.O.N. IN CONSTRUCTION DOCUMENTS.

4.5 REINFORCING BARS SHALL BE CONTINUOUS WITH CLASS "B" TENSION LAP SPLICES COMPLYING WITH ACI 318M, U.O.N.

4.6 CONCRETE COVERAGE OF REINFORCEMENT FOR CAST-IN-PLACE CONSTRUCTION U.O.N.:

CONCRETE CAST AGAINST EARTH:.....75mm (3 INCHES)
FORMED CONCRETE EXPOSED TO EARTH OR WEATHER:
ø16 BAR AND LARGER.....50mm (2 INCHES)
ø14 BAR AND SMALLER.....40mm (1 1/2 INCHES)
CONCRETE NOT EXPOSED TO WEATHER:
SLABS, WALLS, JOISTS.....25mm (1 INCHES)
BEAMS AND COLUMNS.....40 mm (1 1/2 INCHES)
SLAB ON GRADE.....MID-DEPTH OF SLAB

4.7 PROVIDE REINFORCING BARS IN CONCRETE FOOTINGS TO MATCH THE SIZE AND SPACING OF THE HORIZONTAL REINFORCING AT ALL CORNERS AND INTERSECTIONS OF STRIP FOOTINGS. PROVIDE LEG LENGTH EQUIVALENT TO CLASS "A" TENSION LAP SPLICE U.O.N.

4.8 PROVIDE DOWEL TO FOUNDATION WITH 90 DEGREE HOOK TO MATCH SIZE AND SPACING OF VERTICAL REINFORCING AT ALL PEDESTALS, WALLS, AND COLUMNS.

4.9 FOOTINGS AND SLABS SHALL HAVE NO HORIZONTAL JOINTS (POURED TO THEIR FULL DEPTHS IN ONE OPERATION). ANY STOP IN CONCRETE WORK SHALL BE BULKHEAD AND KEYED, U.O.N.

4.10 REINFORCEMENT SHALL NOT BE BENT OR STRAIGHTENED IN A MANNER THAT WILL DAMAGE THE MATERIAL. BARS WITH WITH KINKS OR IMPROPER BENDS SHALL NOT BE USED.

4.11 REINFORCEMENT SHALL BE CONTINUOUS THROUGH ALL CONSTRUCTION JOINTS, BUT DISCONTINUOUS THROUGH ALL CONTROL JOINTS, U.O.N..

4.12 ALL FORMED CONCRETE SURFACES THAT ARE EXPOSED TO VIEW SHALL HAVE SURFACE IRREGULARITIES LESS THAN 13 mm WITHIN A 1.5 METER LENGTH WHEN MEASURED WITH A STRAIGHT EDGE. CONCRETE BELOW GRADE OR NOT EXPOSED TO VIEW SHALL HAVE SURFACE IRREGULARITIES LESS THAN 25mm WITHIN A 1.5 METER LENGTH WHEN MEASURED WITH A STRAIGHT EDGE.

4.13 REFER TO GEOTECHNICAL REPORT FOR RECOMMENDATIONS RELATIVE TO SUBGRADE PREPARATION FOR SLAB ON GRADE WORK.

5.0 STRUCTURAL STEEL

5.1 STRUCTURAL STEEL FABRICATION, ERECTION, AND CONNECTION DESIGN SHALL CONFORM TO A.I.S.C.'S "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS" OR EUROPEAN EQUIVALENT.

5.2 STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING DESIGNATIONS FOR THE DOOR CONSTRUCTION:

STEEL CHANNELS, ANGLES, PLATES AND BARS.....BS EN 10025, S355
RECTANGULAR, SQUARE, AND ROUND HSS.....BS EN 10025, S355

5.3 STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING DESIGNATIONS FOR ALL OTHER CONSTRUCTION:

W SHAPES.....BS EN 10025, S235
STEEL CHANNELS, ANGLES, PLATES AND BARS.....BS EN 10025, S235
RECTANGULAR, SQUARE, AND ROUND HSS.....BS EN 10025, S235

5.4 STRUCTURAL FASTENERS SHALL CONFORM TO THE FOLLOWING DESIGNATION:

HEADED STUDS.....ISO 13918:2008 (414 MPa MIN. TENSILE STRENGTH)

5.5 BOLTED CONNECTIONS SHALL CONFORM TO BS EN ISO 898-1:2013. ALL HIGH-STRENGTH BOLTS SHALL BE M20[10.9] UNLESS OTHERWISE NOTED.

5.6 WELDED CONNECTIONS SHALL CONFORM TO AWS D1.1 "STRUCTURAL WELDING CODE-STEEL". MINIMUM SIZE FILLET WELDS SHALL BE 5 UNLESS OTHERWISE NOTED AND ELECTRODES SHALL BE E70xx. WELDERS SHALL BE QUALIFIED IN ACCORDANCE WITH AWS.

5.7 ALL EXTERIOR STEEL EXPOSED TO THE WEATHER SHALL BE HOT DIPPED GALVANIZED, UON. MEMBERS NOT REQUIRED FOR CORROSION PROTECTION SHALL RECEIVE ONE COAT OF STANDARD PRIMER PAINT. DO NOT PRIME OR PAINT SURFACES WHICH ARE TO RECEIVE FIELD WELDED HEADED SHEAR STUDS. PROVIDE 75 MINIMUM CONCRETE COVER FOR ALL STEEL BELOW GRADE AND PAINT WITH 2 COATS OF COAL TAR EPOXY. EPOXY COATING SHALL BE IN ACCORDANCE WITH EN ISO 12944-5.

5.8 ALL STIFFENERS AND GUSSETS PLATES SHALL BE MINIMUM 10 THICK, UNLESS OTHERWISE NOTED.

6.0 STRUCTURAL PRECAST CONCRETE

6.1 ALL PRECAST ELEMENTS NOT DETAILED ON DRAWINGS SHALL BE DESIGNED FOR THE SPAN AND CONCRETE AND CONSTRUCTION LOADING CONDITIONS SHOWN ON THE DRAWINGS BY A LICENSED STRUCTURAL ENGINEER. ALL DESIGN CALCULATIONS, INCLUDING THE DESIGN OF ALL STRUCTURAL ELEMENTS AND LIFTING POINTS SHALL BE SUBMITTED TO THE CONTRACTING OFFICER FOR REVIEW PRIOR TO THE START OF FABRICATION.

6.2 THE PRECAST MANUFACTURER SHALL BE RESPONSIBLE FOR COORDINATION OF ALL DISCIPLINES AS THEY EFFECT THE PRECAST ELEMENTS.

6.3 THERE SHALL BE NO FIELD CUTTING OF PRECAST ELEMENTS WITHOUT THE APPROVAL OF THE CONTRACTING OFFICER.

6.4 CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH AT TWENTY-EIGHT DAYS OF 30 MPa (C30/37).

6.5 ALL GROUT SHALL BE NON-SHRINK, NON-METALLIC WITH F'c = 35 Mpa (5000 PSI).

7.0 LIGHTNING PROTECTION SYSTEM (LPS)

7.1 ALL METAL PARTS, TO INCLUDE REINFORCEMENT IN FLOOR, PRECAST WALLS AND ROOF PANELS, LOUVERS, VENTILATORS, DOORS AND DOOR FRAME, SHALL BE MADE ELECTRICALLY CONTINUOUS BY BONDING (CLIPPING, BRAZING OR TACK WELDING) AT 1500 LINEAR MILLIMETERS INTERVALS. ELECTRICAL CONTINUITY SHALL BE PROVIDED ACROSS FLOOR EXPANSION AND ISOLATION JOINTS TO FOUNDATION PEDESTALS AND PRECAST ROOF PANELS, AND BETWEEN PRECAST WALLS AND CONCRETE PEDESTAL FOOTING SHALL BE PROVIDED DURING CONSTRUCTION. ACCEPTABLE CONTINUITY METHODS ARE REINFORCING BARS (MINIMUM OVERLAP SHALL BE 20 BAR DIAMETERS), COPPER STRAPS, ETC. SEE ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION REGARDING LPS.

DESIGNER NOTES: TO BE REMOVED WHEN PREPARING CONSTRUCTION DRAWINGS FOR SITE ADAPTION OF THIS DESIGN.

1. THE MAGAZINE HAS BEEN ANALYZED FOR THE LOADS LISTED ON THIS SHEET AND DETERMINED TO BE ADEQUATE UNDER THESE LOADINGS. HOWEVER, THE DESIGNER SHOULD VERIFY THE STRUCTURE FOR THE SITE-SPECIFIC LOADING CRITERIA. IF SITE-SPECIFIC LOADS EXCEED THESE LISTED ON THIS SHEET, THE DESIGNER SHOULD ADDRESS ALL DEFICIENCIES THAT DO NOT MEET CURRENT BUILDING CODES.
2. FOUNDATIONS SHALL BE REVISED TO REFLECT SPECIFIC SITE SOIL CONDITIONS INCLUDING LOCAL SITING, TOPOGRAPHIC CONDITIONS, AND FROST PENETRATION DEPTHS.
3. STRUCTURAL COMPONENTS, WITH THE EXCEPTION OF THE FOUNDATION (FOOTINGS), SLAB-ON-GRADE, AND WING WALLS SHALL NOT BE MODIFIED WITHOUT THE APPROVAL OF THE CONTRACTING OFFICER, WHO SHOULD CONSULT WITH THE U.S. ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE (STRUCTURAL BRANCH). STRUCTURE HAS BEEN DETERMINED TO BE ADEQUATE FOR THE DESIGN CRITERIA LISTED ON THIS SHEET.
4. SHEETS S704 (HIGH SECURITY HASP) AND S704(A) (ILD) IDENTIFY TWO DIFFERENT LOCKING SYSTEMS. THE DESIGNER SHALL VERIFY WITH THE CONTRACTING OFFICER THE CORRECT LOCKING SYSTEM REQUIRED AND REMOVE THE REDUNDANT SHEETS FROM THE CONSTRUCTION CONTRACT DOCUMENTS FOR THE SYSTEM NOT USED.

STRUCTURAL DESIGNATION (7-BAR) NOTES:

1. ANY DEVIATION FROM THE STANDARD APPROVED DESIGN DRAWINGS FOR THE CONCRETE HEADWALL, STEEL DOOR, CONCRETE ROOF OR THEIR SUPPORTS WITHOUT WRITTEN APPROVAL FROM THE DEPARTMENT OF DEFENSE EXPLOSIVE SAFETY BOARD (DDESB) MAY REQUIRE THE MAGAZINE TO BE CONSIDERED AN UNDEFINED MAGAZINE AND MAY SEVERELY RESTRICT THE ALLOWABLE STORAGE CAPACITY.
2. IF CONSTRUCTED PER THESE DRAWINGS, FACILITY MEETS BLAST-RESISTANT DESIGN CRITERIA FOR A 7-BAR STRUCTURAL DESIGNATION PER DOD 6055.09-M AND NATO AASTP-1. THIS DESIGNATION IN NO WAY IMPLIES VALIDATION OF THE DESIGN AGAINST OTHER LOAD CASES.

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GENERAL NOTES

Sheet reference number:
S-001
Sheet 3 of 25

## SPECIAL INSPECTION SCHEDULE/VERIFICATION

| ITEM | EXTENT OF INSPECTION [1] | REFERENCE | COMMENTS/SCOPE |
|---|---|---|---|
| **CONCRETE CONSTRUCTION** | | | |
| REINFORCING STEEL PLACEMENT | P | ACI 318: 3.5, 7.1-7.7 | INSPECT SIZE, SPACING, COVER, POSITIONING AND GRADE OF REINFORCING STEEL. VERIFY THAT REINFORCING BARS ARE FREE OF FORM OIL OR OTHER DELETERIOUS MATERIALS. INSPECT BAR LAPS AND MECHANICAL SPLICES. VERIFY THAT BARS ARE ADEQUATELLY TIED AND SUPPORTED ON CHAIRS OR BOLSTERS |
| WELDING OF RIENFORCEMENT | C, P | AWS D1.4, ACI 318:3.5.2 | VISUALLY INSPECT ALL REINFORCING STEEL WELDS. VERIFY WELDABILITY OF REINFORCING STEEL. INSPECT PREHEATING OF STEEL WHEN REQUIRED. |
| CONCRETE PLACEMENT | C | ACI 318: 5.9, 5.10 | INSPECT PLACEMENT OF CONCRETE. VERIFY THAT CONCRETE CONVEYANCE AND DEPOSITING AVOIDS SEGREGATION OR CONTAMINATION. VERIFY THAT CONCRETE IS PROPERLY CONSOLIDATED |
| SAMPLING AND TESTING OF CONCRETE | C | ASTM C 172<br>ASTM C 31<br>ACI 318: 5.6, 5.8 | TEST CONCRETE COMPRESSIVE STRENGTH, SLUMP, AIR-CONTENT AND TEMPERATURE |
| CURING AND PROTECTION | P | ACI 318: 5.11-5.13 | INSPECT CURING, COLD WEATHER PROTECTION AND HOT WEATHER PROTECTION PROCEDURES |
| FORMWORK | P | ACI 318: 6.1.1 | INSPECT FORWORK FOR SHAPE, LOCATION, AND DIMENSIONS OF THE CONCRETE MEMBER BEING FORMED |
| | | | |
| **PRECAST CONCRETE** | | | |
| PLANT CERTIFICATION/QUALITY CONTROL PROCEDURES | S | | REVIEW OF PLANT OPERATIONS AND QUALITY CONTROL PROCEDURES |
| MIX DESIGN | S | | INSPECT CONCRETE BATCHING OPERATIONS AND VERIFY COMPLIANCE WITH APPROVED MIX DESIGN |
| MATERICAL CERTIFICATION | S | | REVIEW FOR CONFORMANCE TO ACI 318 |
| REINFORCEMENT INSTALLATION | P | | INSPECT SIZE, SPACING, POSITION AND GRADE OF REINFORCING STEEL |
| CONNECTIONS/EMBEDDED ITEMS | P | | INSPECT INTERFACE CONNECTIONS INCLUDING END AND EDGE DOWELING. INSPECT EMBEDMENTS FOR PROPER LOCATION AND WELDING OF CONNECTIONS |
| CONCRETE PLACEMENT | C | ACI 318: 5.9, 5.10 | INSPECT PLACEMENT OF CONCRETE. VERIFY THAT CONCRETE CONVEYANCE AND DEPOSITING AVOIDS SEGREGATION OR CONTAMINATION. VERIFY THAT CONCRETE IS PROPERLY CONSOLIDATED |
| SAMPLING AND TESTING | C | | |
| CURING AND PROTECTION | P | | |
| ERECTED PRECAST ELEMENTS | C | ACI 318: Ch. 16 | INSPECT ERECTION OF PRECAST CONCRETE INCLUDING MEMBER CONFIGURATION, CONNECTIONS, WELDING AND GROUTING |
| | | | |
| **DOOR CONSTRUCTION** | | | |
| FABRICATOR CERTIFICATION/QUALITY CONTROL PROCEDURES | S | | REVIEW OF FABRICATOR'S QUALITY CONTROL PROCEDURES OR AISC CERTIFICATION |
| FABRICATOR INSPECTION | P | | INSPECT IN-PLANT FABRICATION, OR REVIEW FABRICATOR'S APPROVED INDEPENDENT INSPECTION AGENCY'S REPORTS |
| | | | |
| **SPECIAL ITEMS RELATED TO THE OTHER EXPLOSIVES SAFETY RELATED ITEMS** | | | |
| REBAR FARADAY-SHIELD | P | DWGS E-101; E-102 | INSPECT REINFORCING STEEL TO ENSURE ELECTRICAL CONTINUITY BETWEEN THE CAP, WALLS, SLAB AND FOUNDATION THROUGH BONDING WELDS. DOCUMENT BONDS WITH PHOTOS AND CONTINUITY TEST. |
| ECM GROUNDNG | P | DWGS E-101; E-102 | VISUALLY INSPECT TO ENSURE ECM FOUNDATION IS BONDED TO THE GROUNDING SYSTEM. DOCUMENT WITH PHOTOS. |
| GROUNDING SYSTEM | P | DWGS E-101; E-102, NFPA 780, | VISUALLY INSPECT GROUNDING SYSEM CONDUCTORS TO ENSURE NO DAMAGE, BREAKAGE, OR CORROSION HAS OCCURRED TO THE CONDUCTORS DURING INSTALL AND BEFORE EARTH BURIAL. |
| INDIVIDUAL BONDS | P | DWGS E-101, E-102, NFPA 780, 8.9 | INSPECT ALL BONDS FOR LOOSE CONNECTIONS THAT MIGHT RESULT IN HIGH-RESISTANCE CONNECTIONS. |
| LPS COMPONENTS | P | NFPA 780, 8.9 | INSPECT LPS COMPONENTS FOR SECURE MOUNTING AND PROTECTION AGAINST ACCIDENTAL MECHANICAL DISPLACEMENT. |
| LPS TESTING | S | NFPA 780, 8.9 | PERFORM BONDING TEST ACROSS EACH BOND, AND AN EARTH ELECTRODE TEST OF THE LPS. |
| EARTH COVER | P | DWGS S-301-302 | INSPECT DEPTH GAUGES ON ROOF PRIOR TO EARTH COVER PLACEMENT FOR SIZE AND STABILITY. INSPECT EARTH COVER DEPTH AND SLOPE TO ENSURE A 610 MIN. IS PROVIDED ABOVE STRUCTURE |

**SPECIAL INSPECTION NOTES:**

1 INSPECTION INTERVALS ARE AS FOLLOWS:
**C** - Continuous: The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed
**P** - Periodic: The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work has been or is being performed and at the completion of the work.
**S** - Submittal
2 STRUCTURAL TEST AND SPECIAL INSPECTIONS ARE BASED ON CHAPTER 17 OF THE IBC 2009 EDITION
3 CONTRACTOR SHALL HIRE A QUALIFIED INSPECTION AND TESTING AGENCY TO PERFORM SPECIAL INSPECTIONS AND TESTING IN ACCORDANCE WITH THE IBC. SUBMIT INSPECTION REPORTS TO THE CONTRACTING OFFICER FOR EACH DAY SPECIAL INSPECTIONS AND TESTING IS PERFORMED.

DESIGNER NOTES: TO BE REMOVED WHEN PREPARING CONSTRUCTION DRAWINGS FOR SITE ADAPTION OF THIS DESIGN.

1. SPECIAL INSPECTION SCHEDULE SHALL BE REVISED TO REFLECT SPECIFIC PROJECT REQUIREMENTS IN ACCORDANCE WITH CHAPTER 17 OF THE INTERNATIONAL BUILDING CODE; HOWEVER, AT A MINIMUM THE SPECIAL ITEMS RELATED TO THE 'OTHER EXPLOSIVES SAFETY RELATED ITEMS' SHALL BE INSPECTED AS SHOWN ON THIS SCHEDULE.

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Revisions

| No. | Description | Date | Appr. |
|---|---|---|---|

Date: AUGUST 2018
Scale:
Drawing code:
Date:

Designed by: JMU
Drawn by: JMU
Checked by: RSW
Project Engineer/Architect: Jeff Coulston

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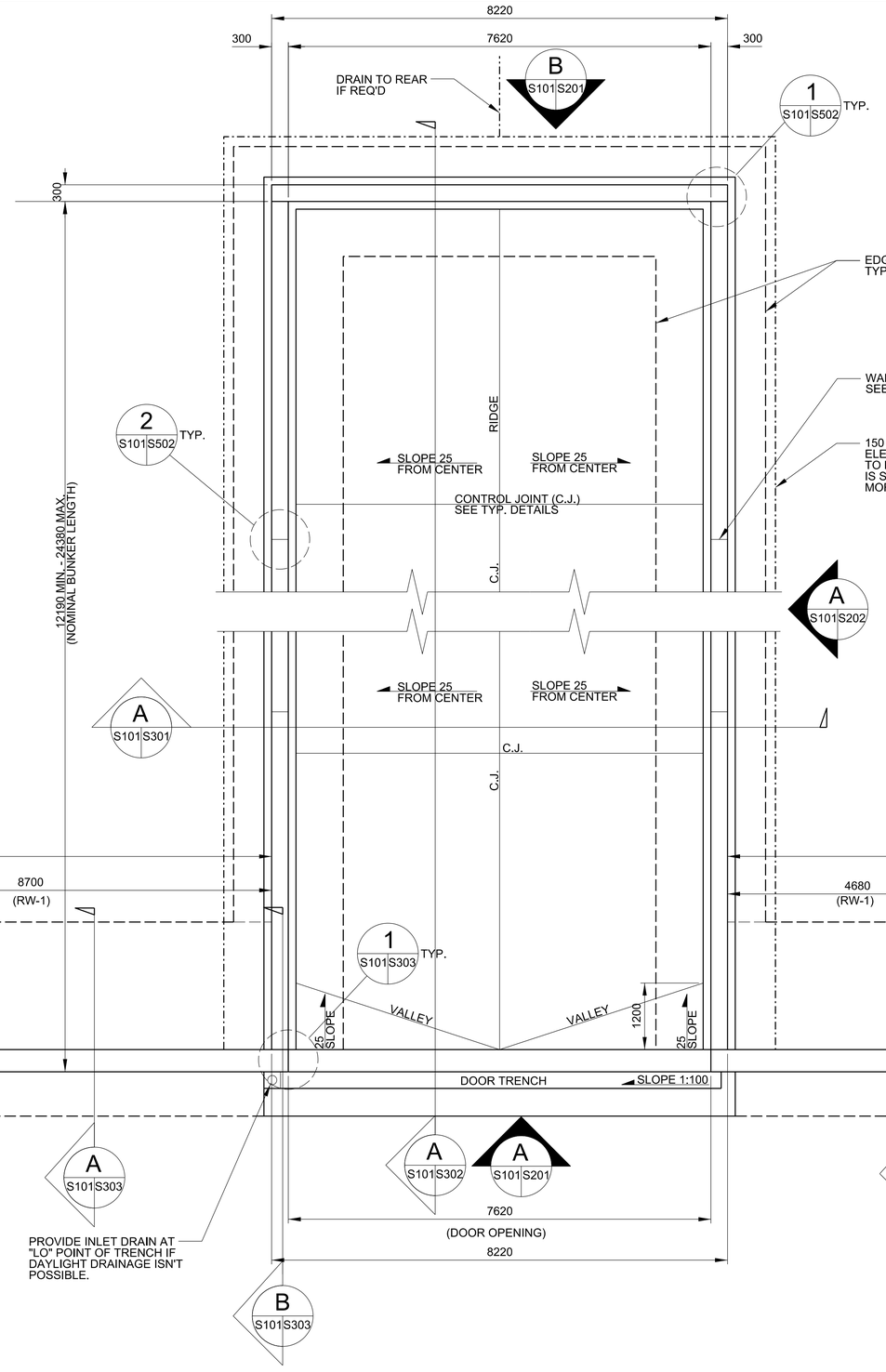
MODULAR STORAGE MAGAZINE
BOX-TYPE, EUROPEAN VERSION

SPECIAL INSPECTIONS

Sheet reference number:
S-002
Sheet 4 of 25




## FOUNDATION PLAN

SCALE: 1:50

N

1. TOP OF SLAB (FINISH FLOOR ELEVATION) = 0.0 U.O.N.
2. SLAB-ON-GRADE: 150 CONCRETE ON 100 CAPILLARY WATER BARRIER AND VAPOR BARRIER, REINFORCED WITH ø12 AT 300 EACH WAY SUPPORTED 50 FROM TOP OF SLAB UNO.
3. PLACE CONTROL JOINTS IN SLAB-ON-GRADE AT 5400 O.C. (MAX.). CONTROL JOINTS SHALL BE COMPLETED AS SOON AS POSSIBLE.
4. PROVIDE 610 OF EARTH COVER MINIMUM ON ROOF.
5. WATERPROOF ALL SURFACES OF THE SHELTER WHICH WILL BE IN CONTACT WITH EARTH FILL AFTER SHELTER IS ERECTED.
6. SIZE, LOCATION, AND QUANTITY OF TILT-UP BRACE ATTACHMENT POINTS AND LIFTING INSERTS TO BE DETERMINED BY CONTRACTOR/PRECAST MANF..
7. IT IS THE RESPONSIBILITY OF THE SITE ADAPTION ENGINEER TO MODIFY THESE DRAWINGS TO MEET LOCAL SITING, FOUNDATION, AND TOPOGRAPHIC CONDITIONS.
8. PANELS MAY BE PRECAST BY A MANUFACTURER SPECIALIZING IN PRECAST OR MAY BE PRECAST AT THE JOB-SITE.
9. ALL DIMENSIONS SHOWN ARE IN MILLIMETERS (MM) UNLESS OTHERWISE NOTED.

1 2 3 4 5m

SCALE 1:50

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| Revisions | | | |
|---|---|---|---|
| No. | Description | Date | Appr. |

Date: AUGUST 2018
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Drawn by: JMU
Checked by: RSW
Project Engineer/Architect: Jeff Coulston

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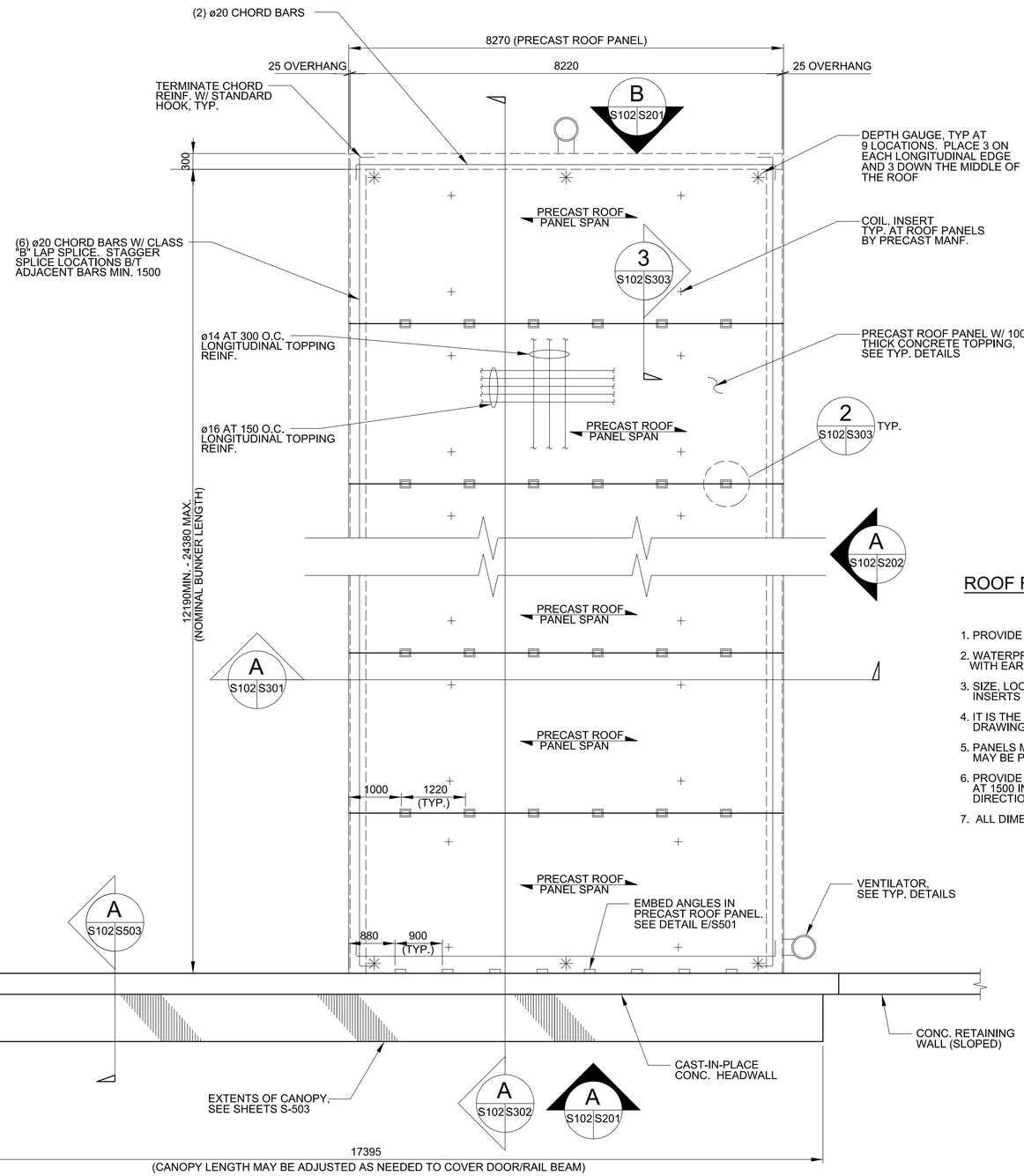
MODULAR STORAGE MAGAZINE
BOX-TYPE, EUROPEAN VERSION

FOUNDATION PLAN

Sheet reference number:
S-101
Sheet 5 of 25




## ROOF FRAMING PLAN

SCALE: 1:50

N

1. PROVIDE 610 OF EARTH COVER MINIMUM ON ROOF.
2. WATERPROOF ALL SURFACES OF THE SHELTER WHICH WILL BE IN CONTACT WITH EARTH FILL AFTER SHELTER IS ERECTED.
3. SIZE, LOCATION, AND QUANTITY OF TILT-UP BRACE ATTACHMENT POINTS AND LIFTING INSERTS TO BE DETERMINED BY CONTRACTOR/PRECAST MANF..
4. IT IS THE RESPONSIBILITY OF THE SITE ADAPTION ENGINEER TO MODIFY THESE DRAWINGS TO MEET LOCAL SITING, FOUNDATION, AND TOPOGRAPHIC CONDITIONS.
5. PANELS MAY BE PRECAST BY A MANUFACTURER SPECIALIZING IN PRECAST OR MAY BE PRECAST AT THE JOB-SITE.
6. PROVIDE ELECTRICAL CONTINUITY WITHIN THE PRECAST ROOF PANELS BY TACK WELDING AT 1500 INTERVALS ACROSS TOP OF STIRRUPS TO END ANGLES IN ONE DIRECTION. IN THE OTHER DIRECTION, TACK WELD #14 BAR FROM BOTTOM PLATE TO #14 REINF.
7. ALL DIMENSIONS SHOWN ARE IN MILLIMETERS (MM) UNLESS OTHERWISE NOTED.

REINFORCING IN ROOF PANELS: USE GRADE B500C ONLY.

1 2 3 4 5m

SCALE 1:50

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|---|---|---|---|
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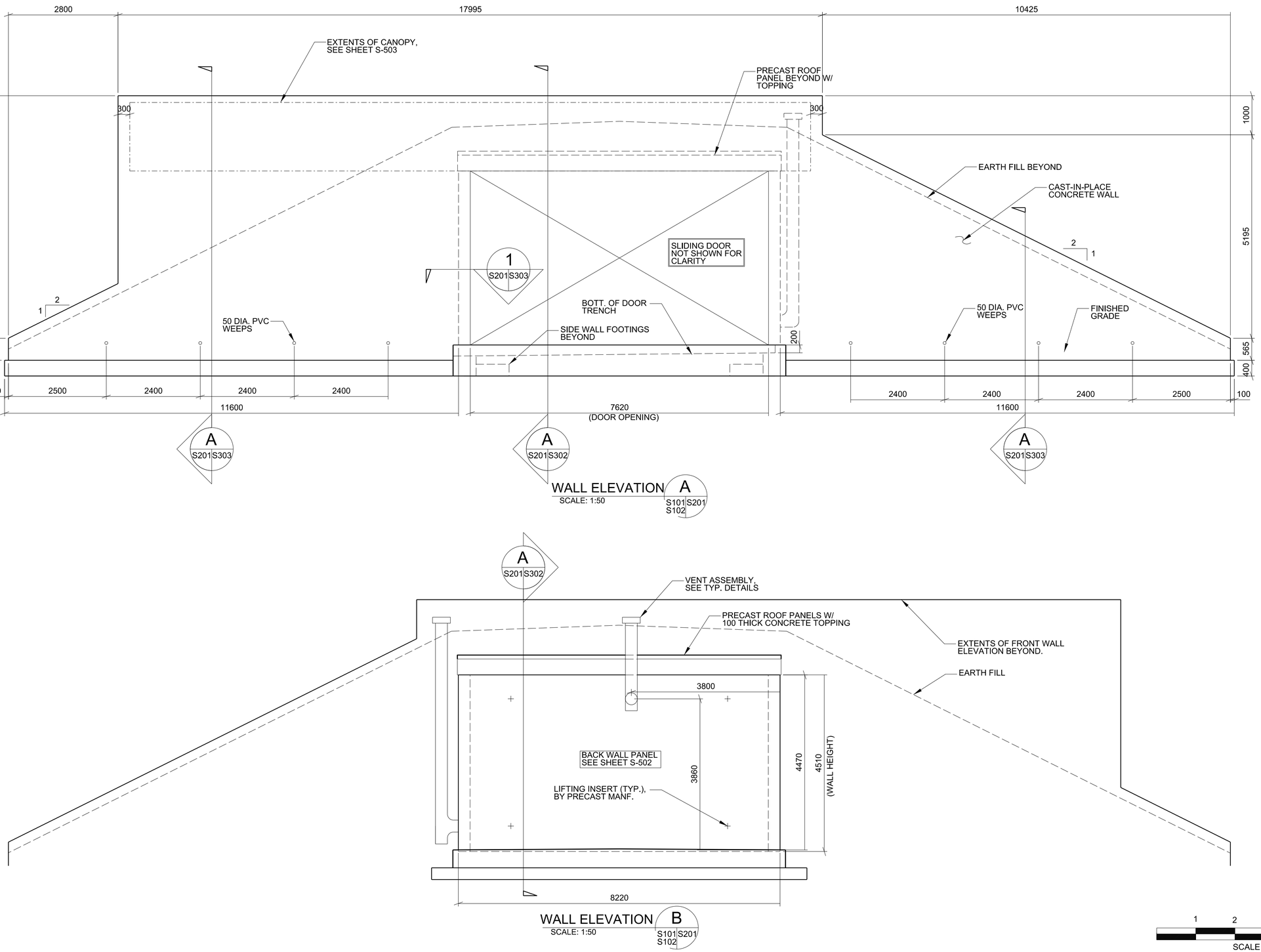
MODULAR STORAGE MAGAZINE BOX-TYPE, EUROPEAN VERSION

ROOF FRAMING PLAN

Sheet reference number:
S-102
Sheet 6 of 25

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| Checked by: | RSW | Drawing code: | |
| Project Engineer/Architect: | Jeff Coulston | Date: | |

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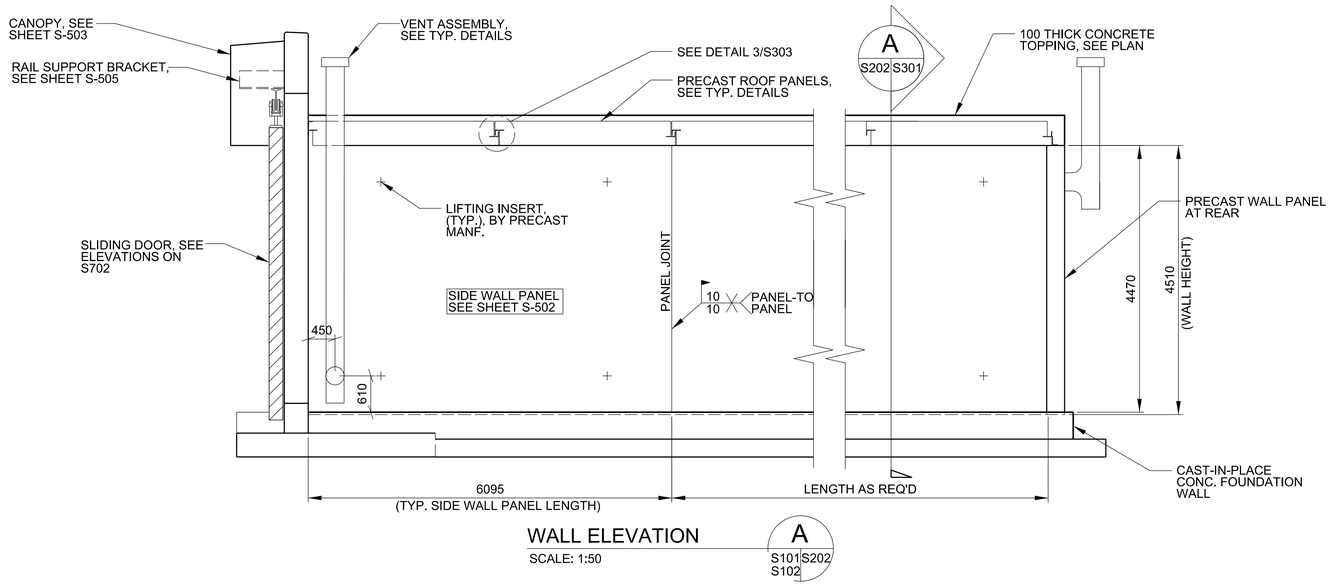
MODULAR STORAGE MAGAZINE
BOX-TYPE, EUROPEAN VERSION

ELEVATIONS

Sheet reference number:

S-201

Sheet 7 of 25




WALL ELEVATION

SCALE: 1:50

A
S101 S202
S102

1 2 3 4 5m

SCALE 1:50

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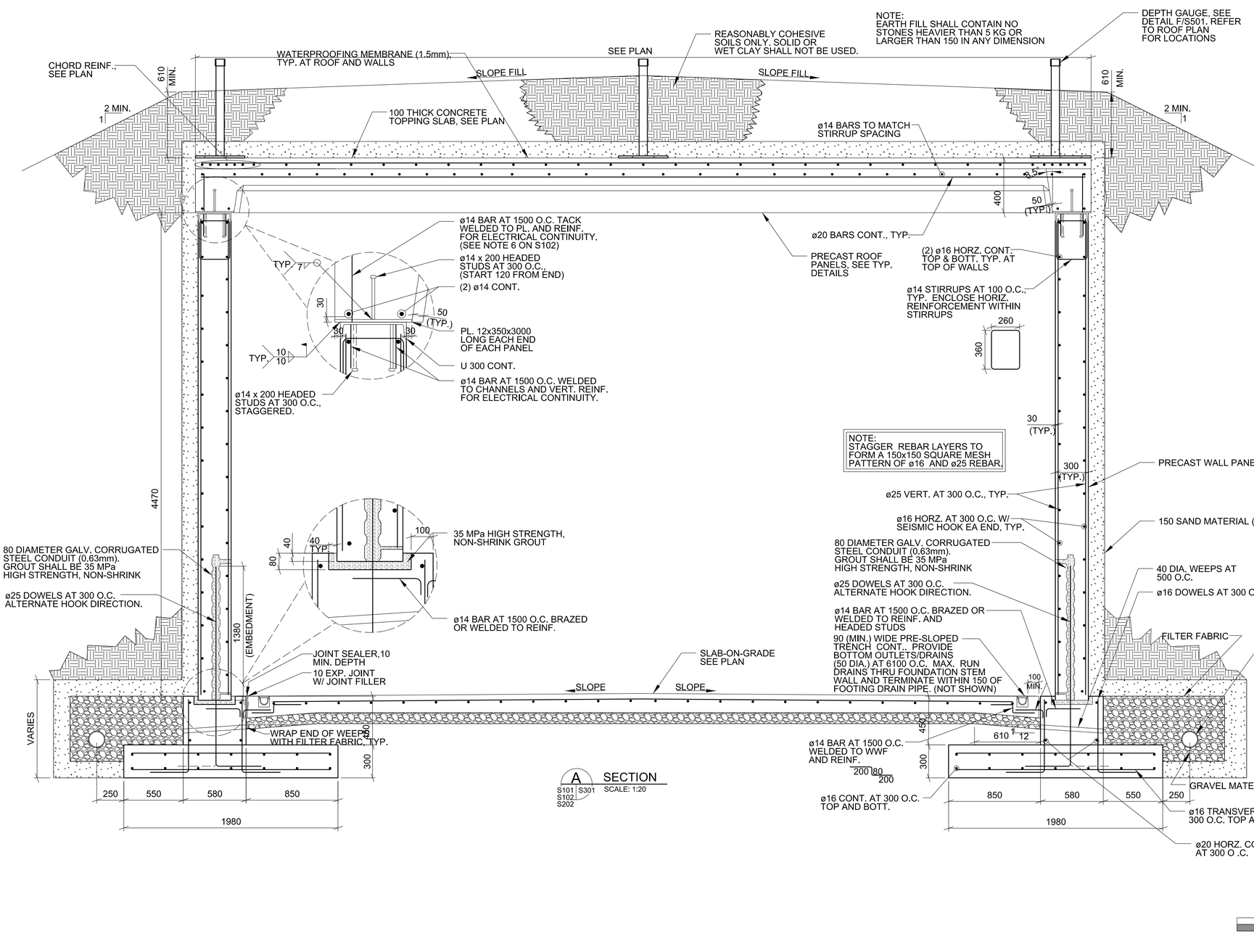
MODULAR STORAGE MAGAZINE
BOX-TYPE, EUROPEAN VERSION

ELEVATIONS

Sheet reference number:

S-202

Sheet 8 of 25

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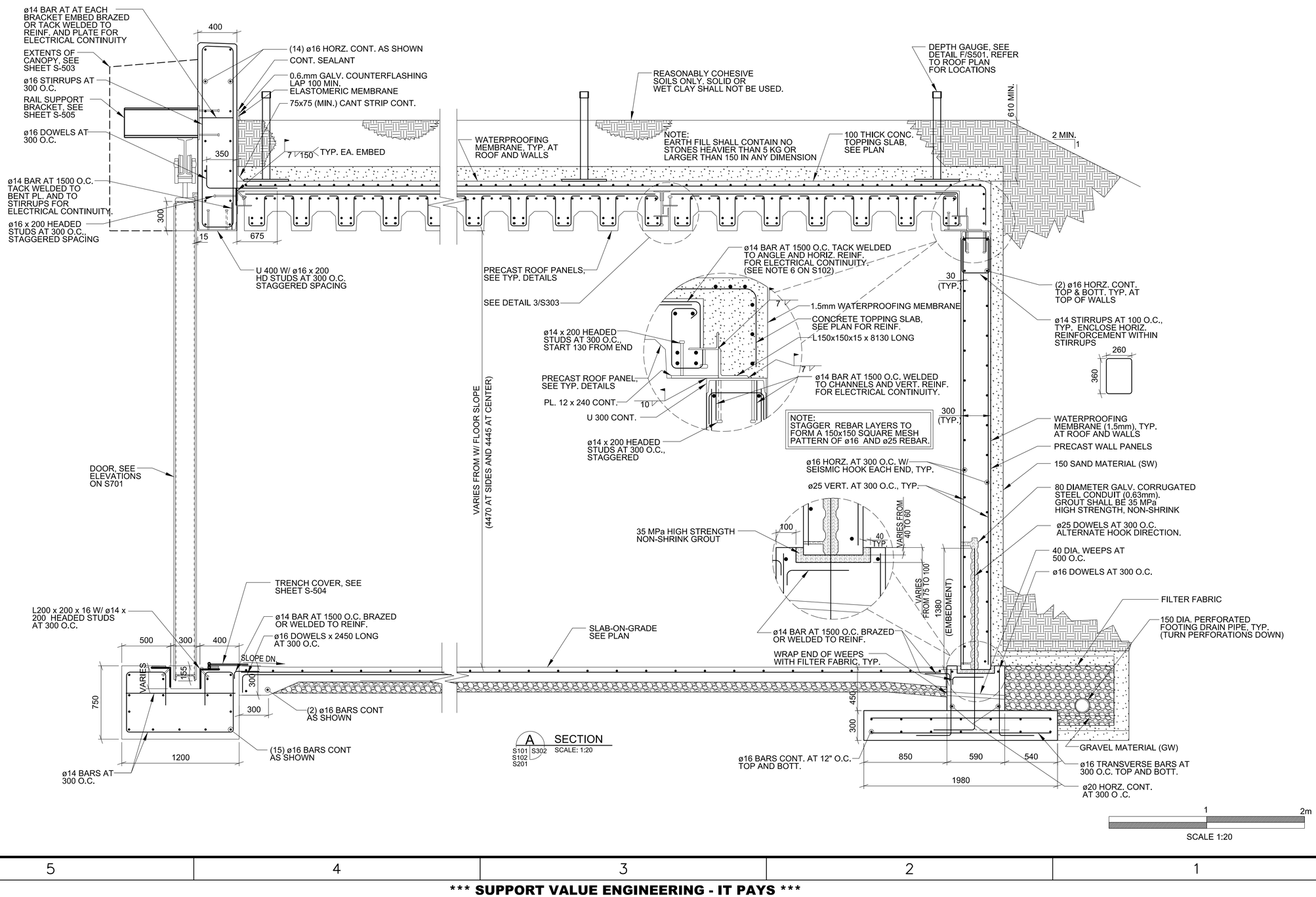
MODULAR STORAGE MAGAZINE
BOX-TYPE, EUROPEAN VERSION

BUILDING SECTION

Sheet reference number:
S-301
Sheet 9 of 25

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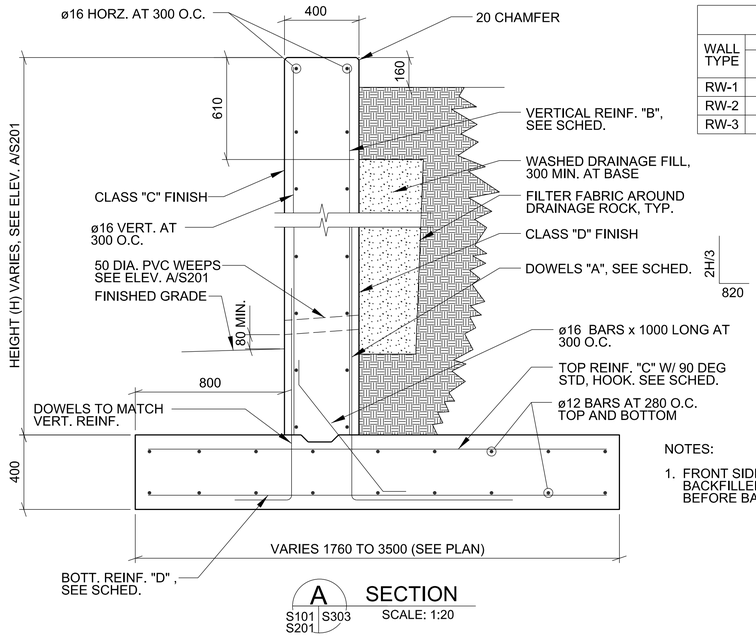
MODULAR STORAGE MAGAZINE
BOX-TYPE, EUROPEAN VERSION

BUILDING SECTION

Sheet reference number:

S-302

Sheet 10 of 25

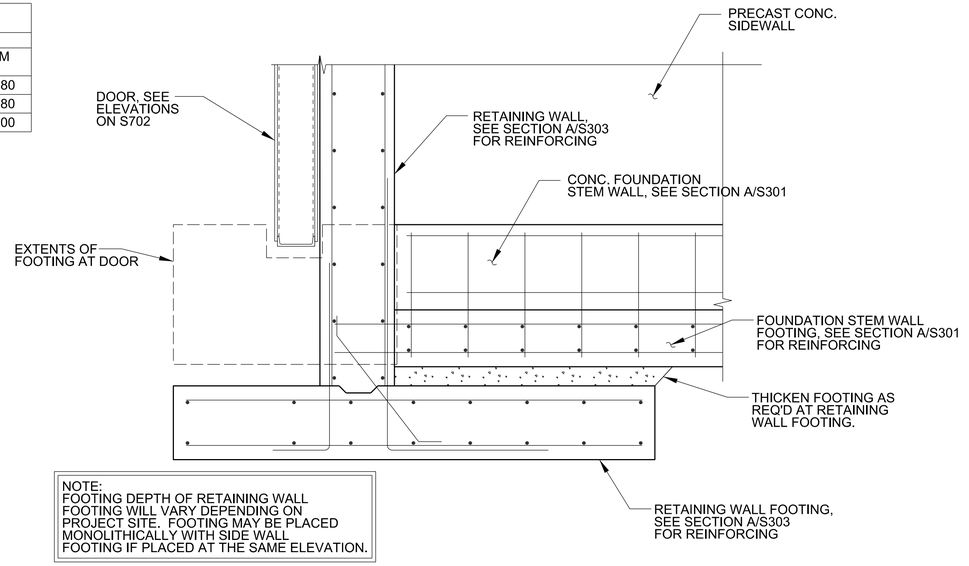



A SECTION
S101 | S303
S201
SCALE: 1:20

| RETAINING WALL SCHED. | | | | |
|---|---|---|---|---|
| WALL TYPE | STEM REINF. | | FOOTING REINF. | |
| | DOWELS "A" | VERTICAL "B" | TOP "C" | BOTTOM "D" |
| RW-1 | ø25 AT 150 | ø20 AT 150 | ø25 AT 150 | ø16 AT 280 |
| RW-2 | ø20 AT 200 | ø20 AT 200 | ø20 AT 200 | ø16 AT 280 |
| RW-3 | ø16 AT 300 | ø16 AT 300 | ø16 AT 300 | ø16 AT 300 |

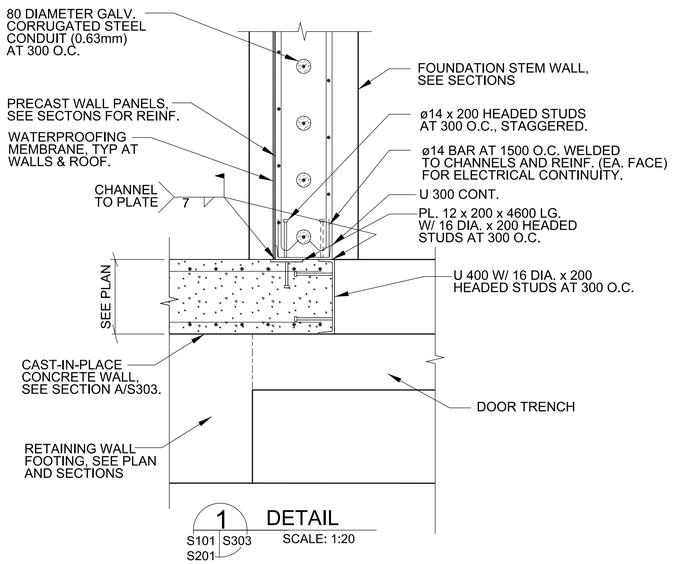
NOTES:

1. FRONT SIDE OF WALL MUST BE BACKFILLED AND COMPACTED BEFORE BACKFILLING BEHIND WALL.

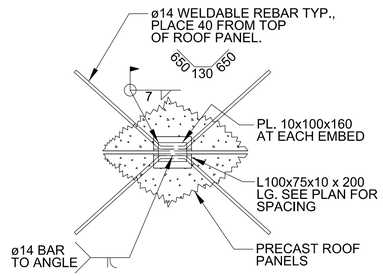



NOTE:
FOOTING DEPTH OF RETAINING WALL FOOTING WILL VARY DEPENDING ON PROJECT SITE. FOOTING MAY BE PLACED MONOLITHICALLY WITH SIDE WALL FOOTING IF PLACED AT THE SAME ELEVATION.

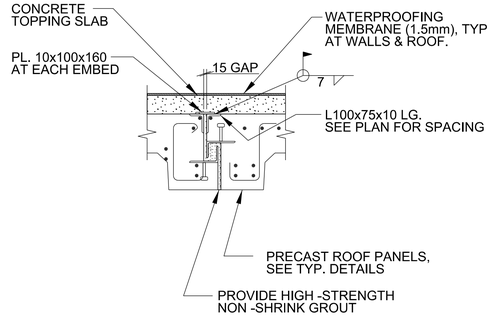
B SECTION
S101 | S303
SCALE: 1:20




1 DETAIL
S101 | S303
S201
SCALE: 1:20




2 DETAIL
S102 | S303
SCALE: 1:20




3 DETAIL
S102 | S303
S202
S302
SCALE: 1:20

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|---|---|---|---|
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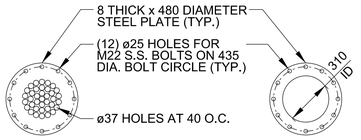
MODULAR STORAGE MAGAZINE
BOX-TYPE, EUROPEAN VERSION

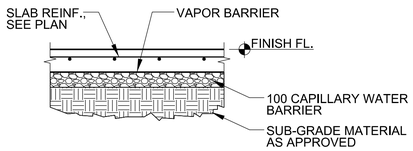
SECTIONS/DETAILS

Sheet reference number:
S-303
Sheet 11 of 25



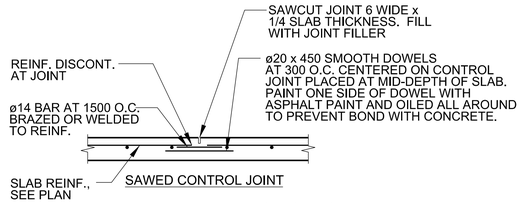

NOTE:
CLASS 150 FORGED FLANGES MAY BE SUBSTITUTED FOR FABRICATED PLATE FLANGES

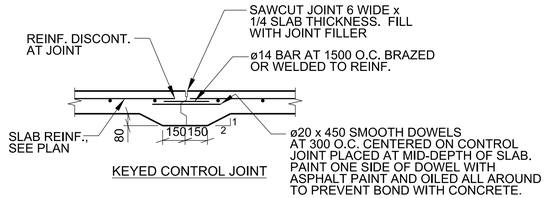
VENTILATOR FLAME PLATE DETAIL — A — S501
SCALE: 1:20




SLAB-ON-GRADE DETAIL — B — S501
SCALE: 1:20

NOTES:
REFER TO GEOTECHNICAL REPORT FOR THE SUBGRADE PREPARATION AND EARTHWORK RECOMMENDATIONS.




SLAB CONTROL JOINT DETAIL — C — S501
SCALE: 1:20

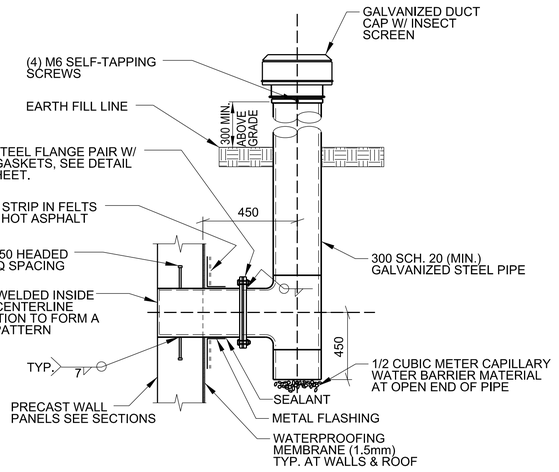
USE EITHER AT CONTRACTOR'S OPTION
SAWCUT JOINTS AS EARLY AS ALLOWED
HAND- TOOL AREAS INACCESSIBLE BY SAW

| SPLICE LENGTHS | | | | | DEVELOPMENT LENGTHS | |
|---|---|---|---|---|---|---|
| BAR SIZE | C30/37 ($f_{ck}$= 30 MPa) | | | | C30/37 ($f_{ck}$= 30 MPa) | |
| | TOP BARS | | OTHER BARS | | TOP BARS | OTHER BARS |
| NO. | A | B | A | B | | |
| ø10 | 500 | 650 | 380 | 500 | 500 | 380 |
| ø12 | 600 | 770 | 460 | 600 | 600 | 460 |
| ø14 | 700 | 900 | 540 | 700 | 700 | 540 |
| ø16 | 790 | 1050 | 610 | 790 | 790 | 610 |
| ø20 | 1250 | 1610 | 950 | 1250 | 1250 | 950 |
| ø25 | 1550 | 2010 | 1200 | 1550 | 1550 | 1200 |
| ø28 | 1750 | 2250 | 1350 | 1750 | 1750 | 1350 |

TOP BARS ARE HORIZONTAL REINF. WITH MORE THAN 300 ON CONCRETE CAST BELOW THE REINF.

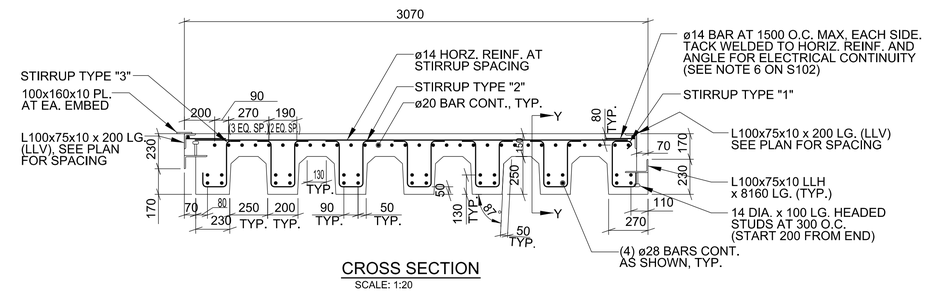
CONCRETE LAP LENGTHS SHALL BE INCREASED 20 PERCENT WHERE EPOXY COATING IS USED.

WHEN LAPPING TWO DIFFERENT SIZE BARS, USE THE LARGER OF THE LAP SPLICE DIMENSION OF THE SMALLER BAR OR THE DEVELOPMENT LENGTH OF THE LARGER BARS

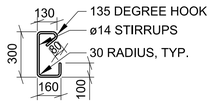



TYPICAL VENT DETAIL — D — S501
SCALE: 1:20

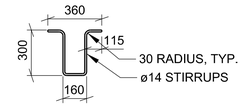
NOTE:
PROVIDE ELECTRICAL CONTINUITY BY WELDING VERTICAL AND HORZ. REINFORCEMENT TO VENT PIPE



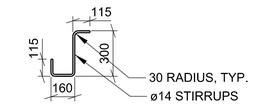

CROSS SECTION
SCALE: 1:20



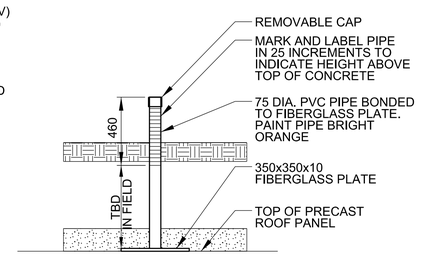

STIRRUP TYPE "1"
SCALE: 1:20



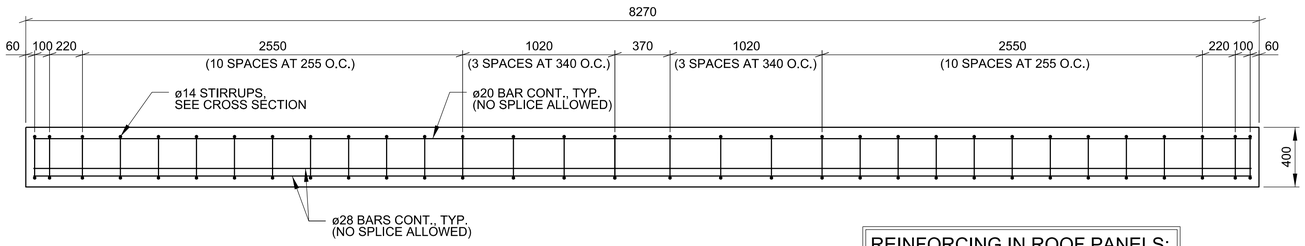

STIRRUP TYPE "2"
SCALE: 1:20




STIRRUP TYPE "3"
SCALE: 1:20




DEPTH GAUGE DETAIL — F — S501
SCALE: 1:20




SECTION Y-Y
SCALE: 1:20

REINFORCING IN ROOF PANELS: USE GRADE B500C ONLY.

PRECAST ROOF PANEL DETAIL — E — S501
SCALE: 1:20

NOTES:
PROVIDE ELECTRICAL CONTINUITY WITHIN THE PRECAST ROOF PANEL BY BONDING AT 1500 INTERVALS ACROSS TOP OF STIRRUPS TO END ANGLES IN ONE DIRECTION. IN THE OTHER DIRECTION, FROM BOTTOM PLATE TO ø14 REINFORCEMENT

1 2m
SCALE 1:20

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| | Revisions | | |

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Project Engineer/Architect: Jeff Coulston

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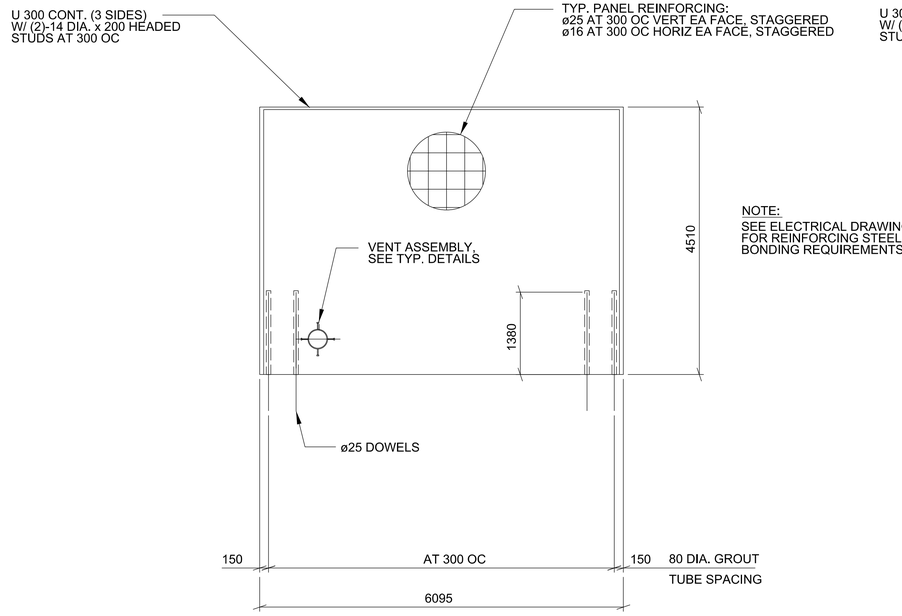
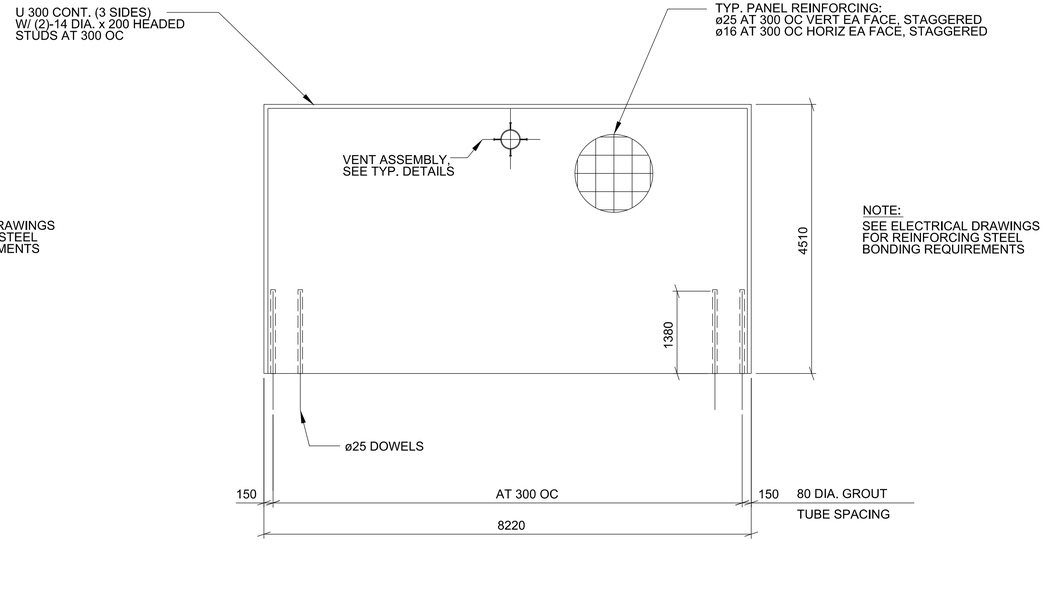
TYPICAL DETAILS

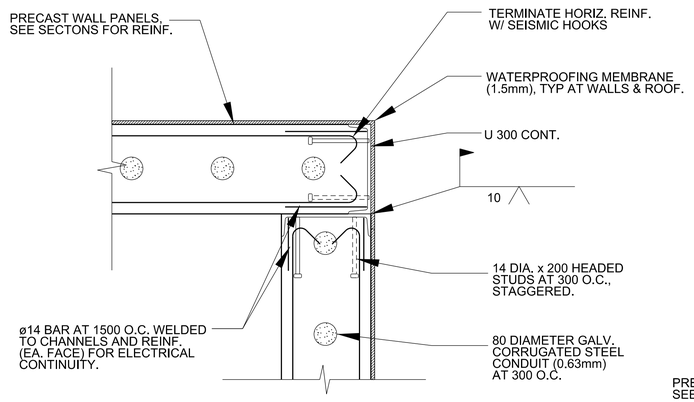
Sheet reference number:
S-501
Sheet 12 of 25



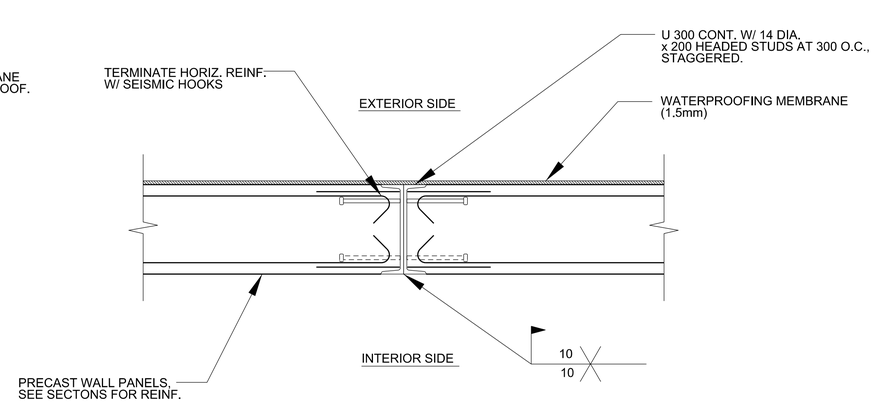

SIDE WALL PANEL ELEVATION (A) S502
SCALE: 1:50




BACK WALL PANEL ELEVATION (B) S502
SCALE: 1:50




1 S101 S502 TYPICAL PANEL-TO-PANEL (AT CORNER) DETAIL
SCALE: 1:10




2 S101 S502 TYPICAL PANEL-TO-PANEL DETAIL
SCALE: 1:10

1 2 3 4 5m
SCALE 1:50

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Scale: AS SHOWN
Drawing code:
Project Engineer/Architect: Jeff Coulston
Date:

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HUNTSVILLE, ALABAMA

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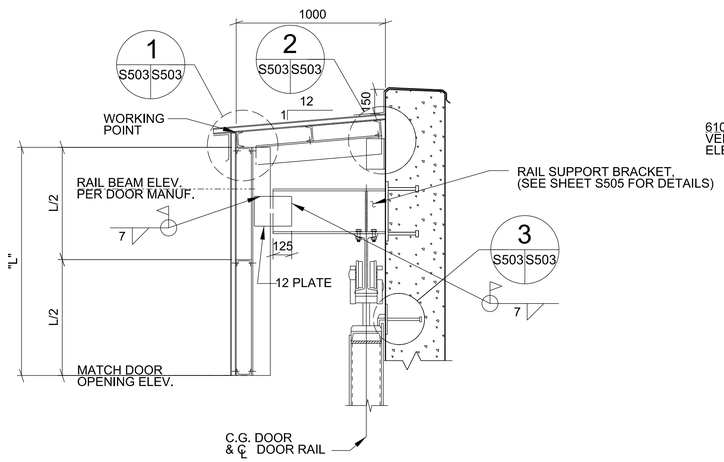
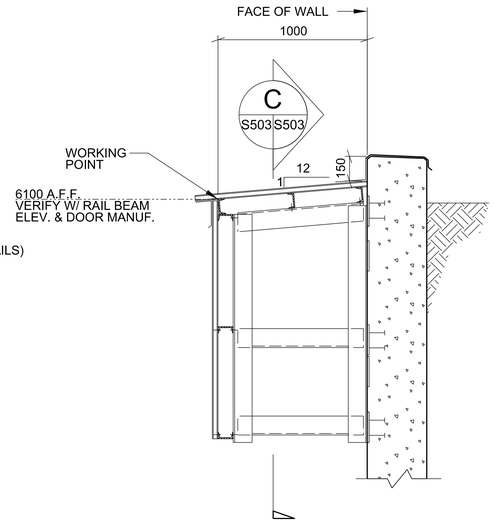
PRECAST WALL PANEL DETAILS

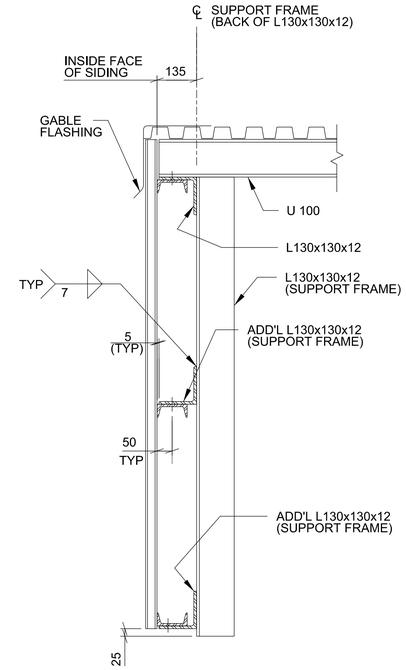
Sheet reference number:
S-502
Sheet 13 of 25




SECTION A
SCALE: 1:20 S503



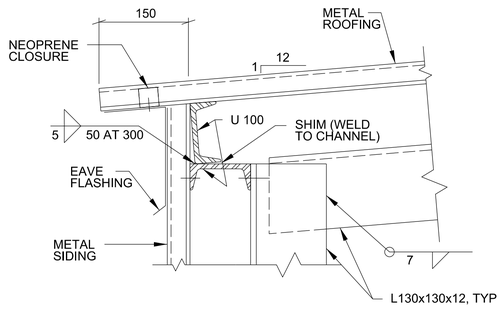

SECTION B
SCALE: 1:20 S503



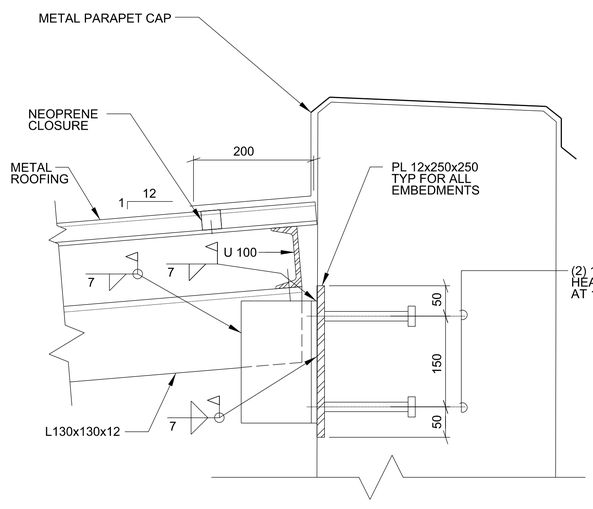

SECTION C
SCALE: 1:10 S503

NOTES:

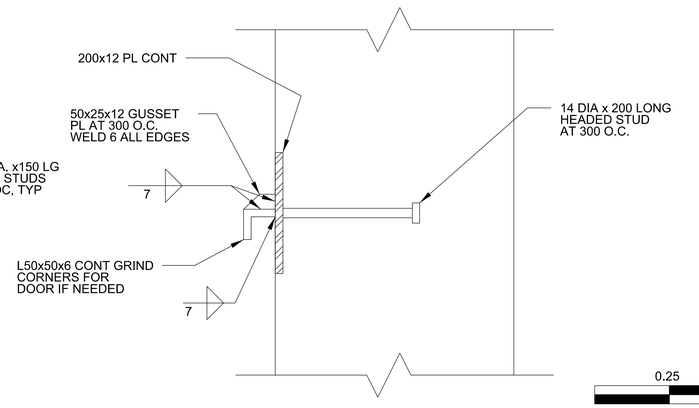
1. CANOPY SUPPORT ANGLES TO BE L130x130x12 U.N.O.. CANOPY SUPPORT ANGLE FRAME SPACING SHALL MATCH RAIL SUPPORT BRACKET SPACING SHOWN ON SHEET S-505 U.N.O.
2. ALL PURLINS AND GIRTS TO BE U 100 AND FASTENED TO ANGLES WITH TWO ø16 HIGH-STRENGTH BOLTS (TYP).
3. FOR SUPPORT BRACKET DETAILS, SEE DWG S-505.




DETAIL 1
SCALE: 1:5 S503




DETAIL 2
SCALE: 1:5 S503




DETAIL 3
SCALE: 1:5 S503

0.25 0.5 0.75 1m
SCALE 1:10

0.5 1 1.5 2m
SCALE 1:20

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Designed by: JMU
Drawn by: JMU
Checked by: RSW
Date: AUGUST 2018
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Drawing code:
Project Engineer/Architect: Jeff Coulston
Date:

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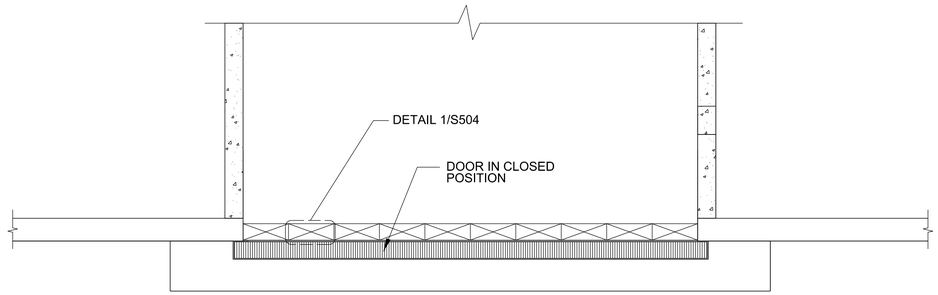
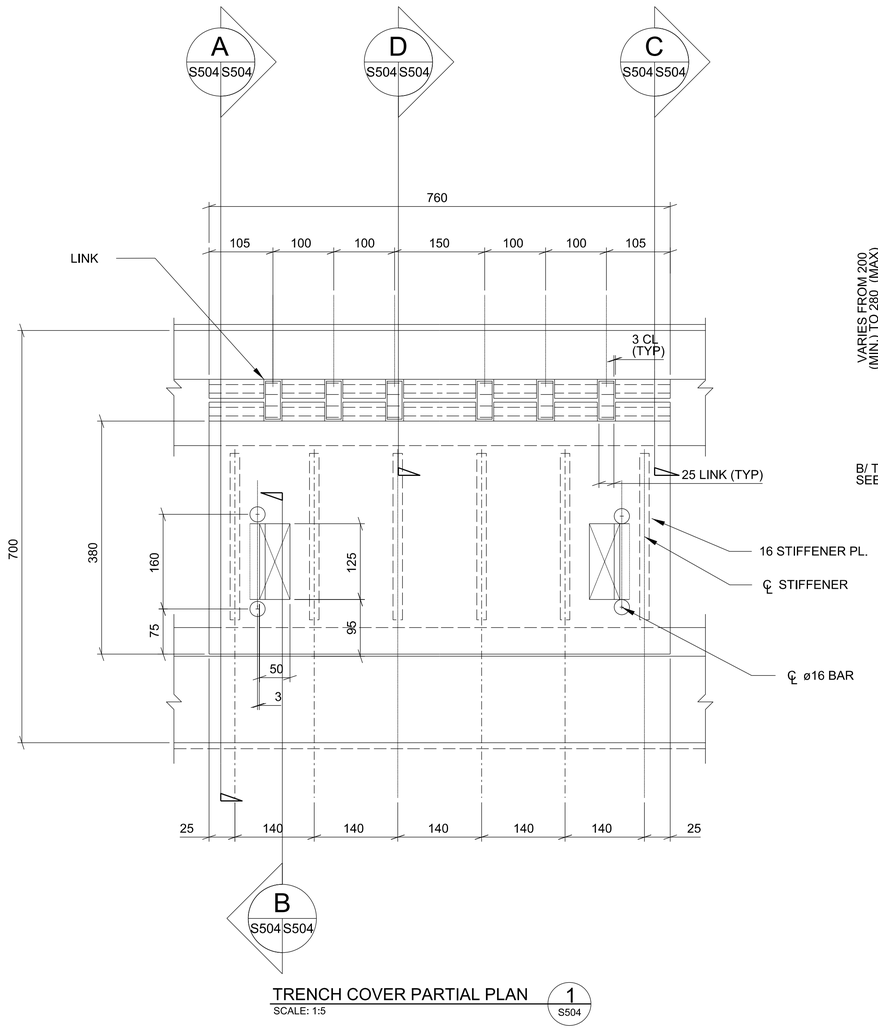
CANOPY SUPPORT DETAILS

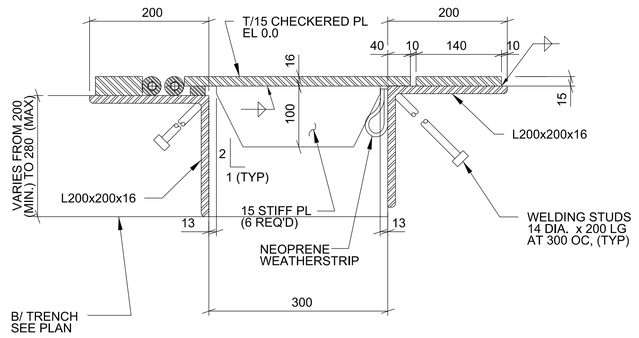
Sheet reference number:
S-503
Sheet 14 of 25




## TRENCH COVER LAYOUT PLAN
SCALE: 1:50

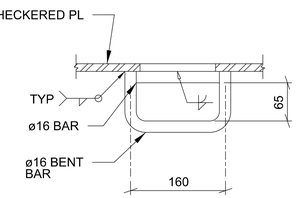



## TRENCH COVER PARTIAL PLAN
SCALE: 1:5 — 1 S504

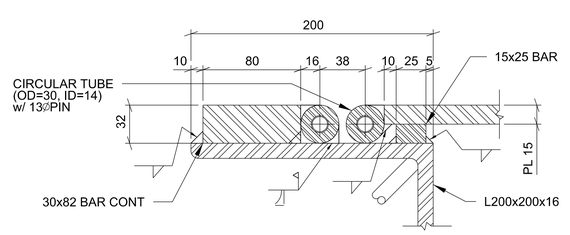



NOTES:
1. TRENCH COVER PLATES SHALL HAVE A MINIMUM fy = 250 MPa
2. TRENCH COVER PLATES AND ATTACHMENTS INCLUDING HINGES AND PINS SHALL BE GALVANIZED.

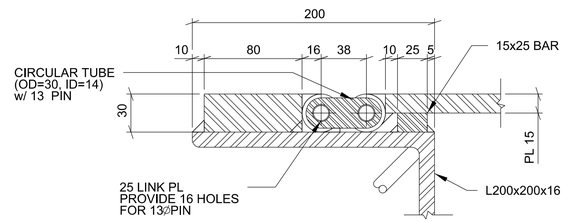
## SECTION A
SCALE: 1:5 — S504




## SECTION B
SCALE: 1:5 — S504




## SECTION C
SCALE: 1:2.5 — S504




## SECTION D
SCALE: 1:2.5 — S504

0.05 0.10 0.15 0.20 0.25m
SCALE 1:2.5

0.1 0.2 0.3 0.4 0.5m
SCALE 1:5

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Project Engineer/Architect: Jeff Coulston

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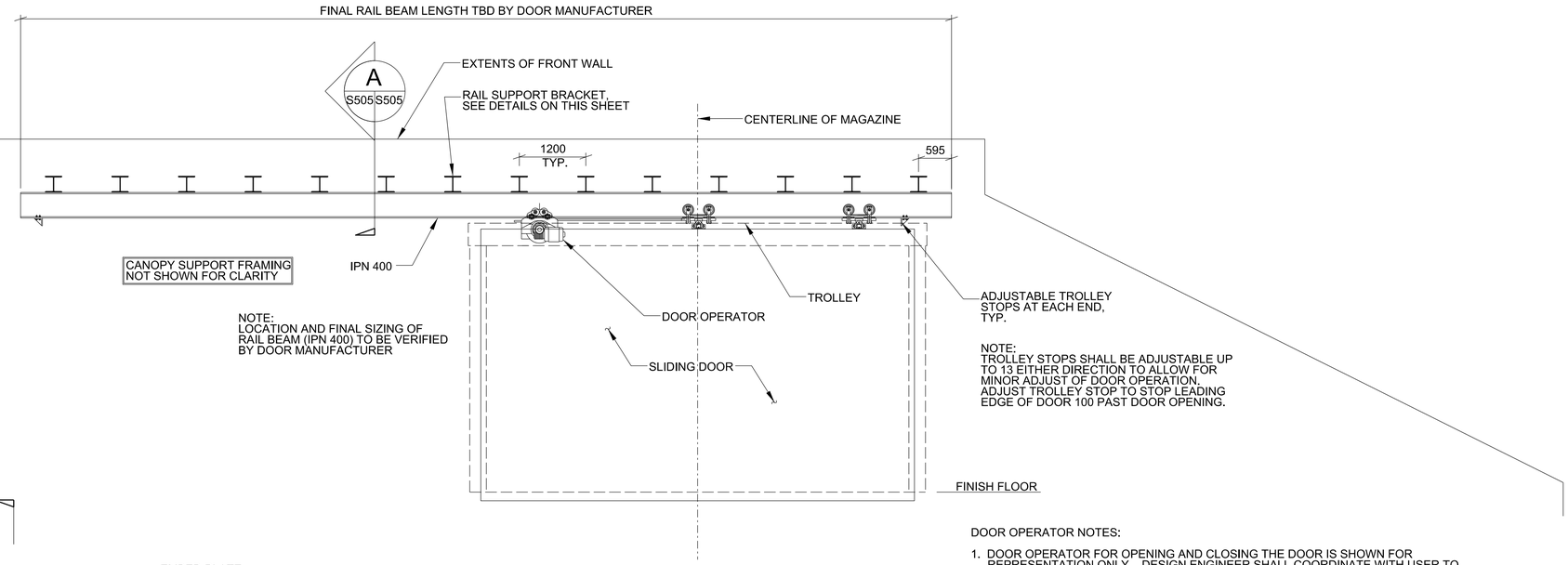
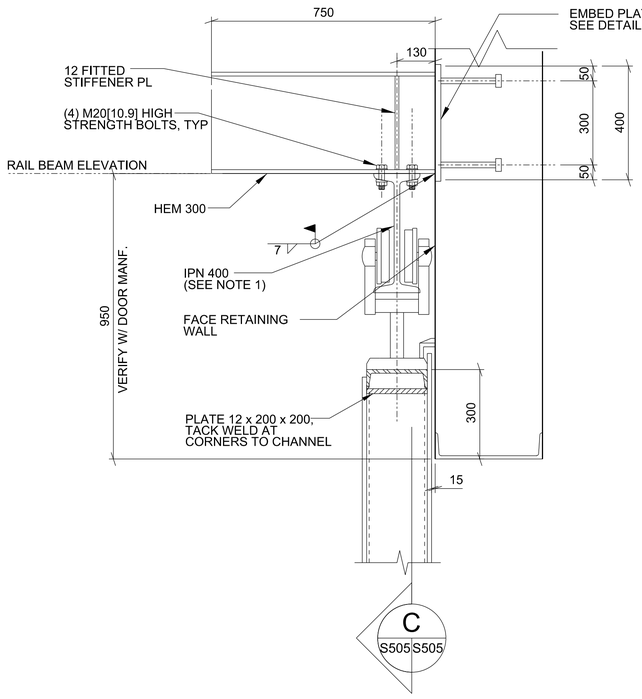
DOOR TRENCH COVER DETAILS

Sheet reference number:
S-504
Sheet 15 of 25

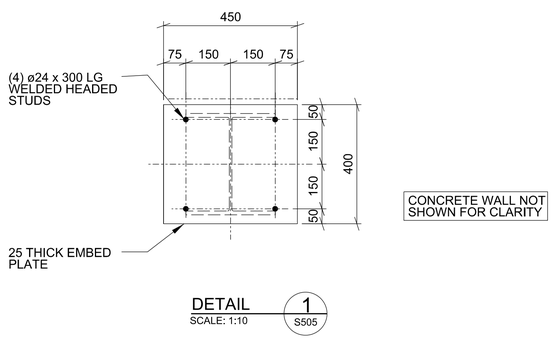



## DOOR ELEVATION VIEW
SCALE: 1:50

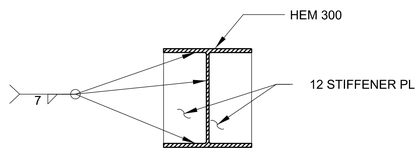



NOTE 1:
LOCATION AND FINAL SIZING OF RAIL BEAM TO BE VERIFIED BY DOOR MANUFACTURER

## SECTION A
SCALE: 1:10 — S505



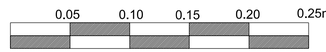

## DETAIL 1
SCALE: 1:10 — S505



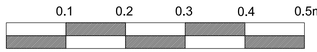

## SECTION C
SCALE: 1:10 — S505

DOOR OPERATOR NOTES:

1. DOOR OPERATOR FOR OPENING AND CLOSING THE DOOR IS SHOWN FOR REPRESENTATION ONLY. DESIGN ENGINEER SHALL COORDINATE WITH USER TO DETERMINE THE PREFERRED MEANS OF DOOR OPERATION, I.E., CHAIN DRIVE, TROLLEY, MANUAL.
2. DOOR OPERATOR MANUFACTURER SHALL COORDINATE WITH DOOR MANUFACTURER TO ENSURE THAT THE OPERATOR AND DOOR ARE COMPATIBLE.
3. A MEANS OF MANUAL OPERATION SHALL BE MADE AVAILABLE IF POWER IS LOST TO THE OPERATOR.
4. DOOR OPERATOR SHALL MOVE DOOR AT A SPEED OF 4 TO 5.5 M//MIN. MAXIMUM SPEED OF DOOR SHALL NOT EXCEED DOOR OPERATOR AND DOOR MANUFACTURER'S RECOMMENDATIONS.
5. MOTOR SHALL OPERATE NORMALLY AT NO MORE THAN 75 PERCENT OF RATED CAPACITY.
6. LIMIT SWITCH SHALL STOP DOOR AT END OF TRAVEL (OPEN AND CLOSED POSITIONS)
7. COMPLETE DOOR OPERATOR SYSTEM (MOTOR, DRIVE GEARS, CHAIN, ETC.) SHALL BE DESIGNED/RATED FOR OUTDOOR USE TAKING INTO CONSIDERATION SITE SPECIFIC ENVIRONMENTAL CONDITIONS SUCH AS EXPOSURE TO CORROSIVE ENVIRONMENTS.



SCALE 1:2.5



SCALE 1:5

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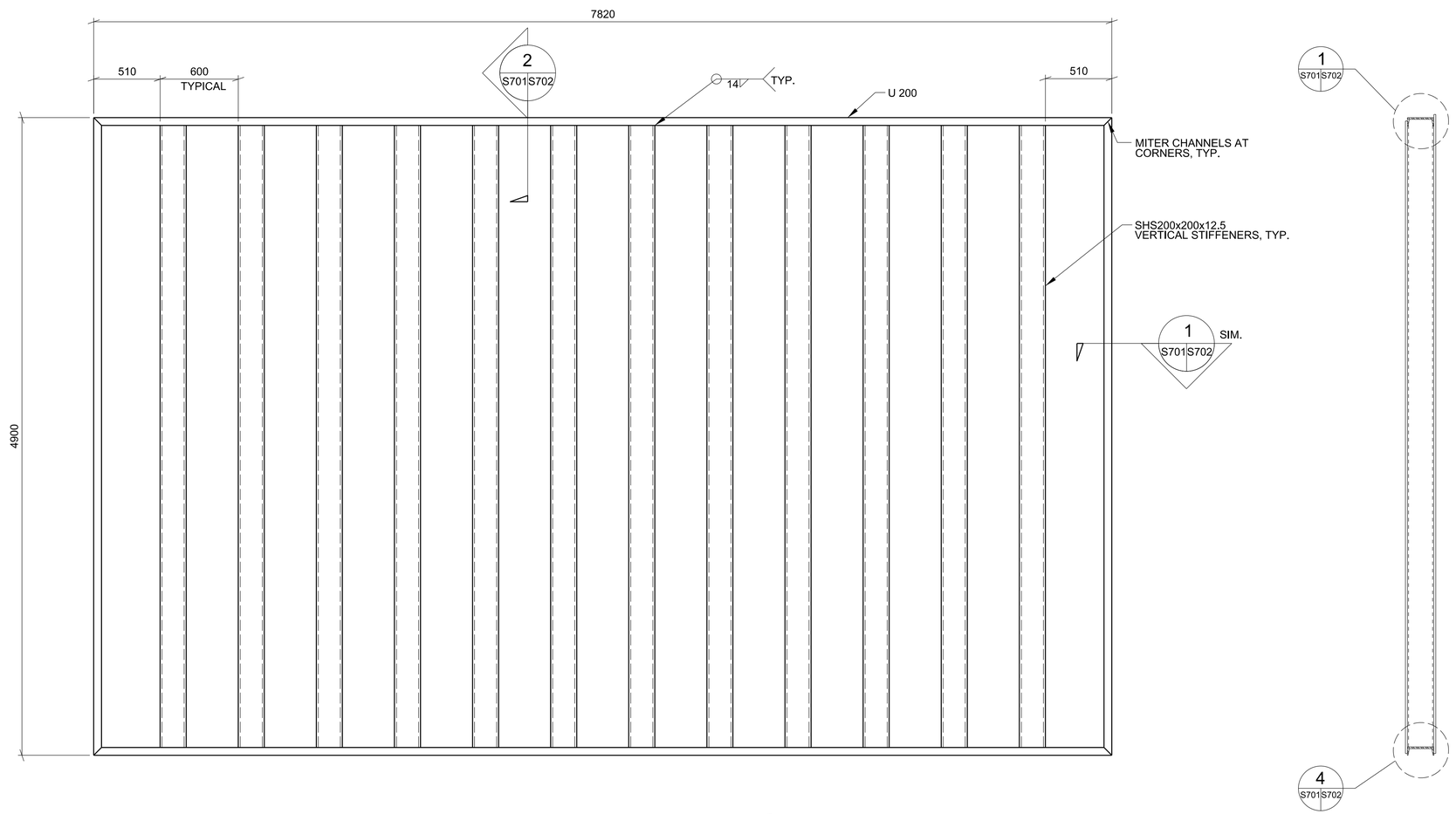
RAIL SUPPORT BRACKET DETAILS

Sheet reference number:
S-505
Sheet 16 of 25







DOOR FRAMING ELEVATION "OUTSIDE VIEW" A
SCALE: 1:20 S201 S701

NOTE:
1. SEE DOOR PLATE ELEVATIONS ON SHEET S703 FOR ATTACHMENT TO FRAMING.
2. SEE DOOR LOCKING DEVICES ON SHEET S704 FOR ADDITIONAL REQUIREMENTS.

ALL STEEL SHAPES OR PLATES SHALL BE GRADE S355 FOR THE DOOR CONSTRUCTION. NO MATERIAL SUBSTITUTION OF OTHER GRADES SHALL BE PERMITTED.

0.5 1 1.5 2m
SCALE 1:20

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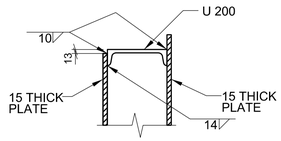
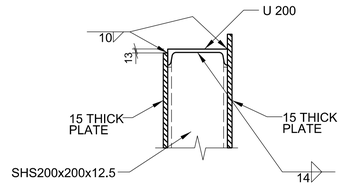
DOOR ELEVATIONS

Sheet reference number:
S-701
Sheet 17 of 25

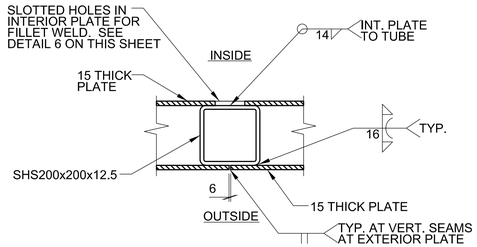



NOTE: AT SIM. CONDITION ROTATE 90° CW.

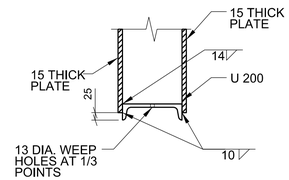
1 DETAIL
S701 S702 SCALE: 1: 10



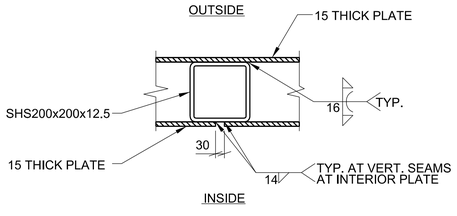

2 DETAIL
S701 S702 SCALE: 1: 10



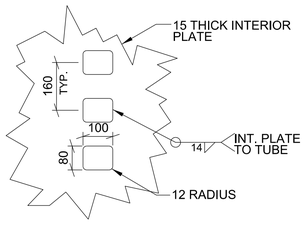

3 DETAIL
S703 S702 SCALE: 1: 10



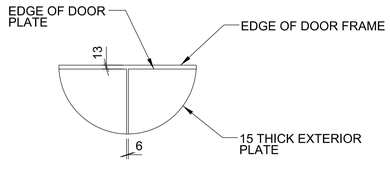

4 DETAIL
S701 S702 SCALE: 1: 10



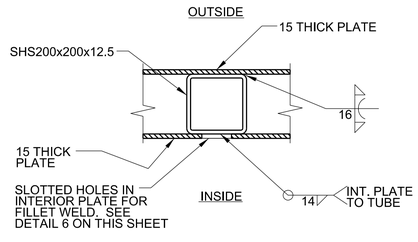

5 COVER PLATE SPLICE DETAIL
S703 S702 SCALE: 1: 10




6 DETAIL
S703 S702 SCALE: 1: 10




7 DETAIL
S703 S702 SCALE: 1: 10




8 DETAIL
S703 S702 SCALE: 1: 10

ALL STEEL SHAPES OR PLATES SHALL BE GRADE S355 FOR THE DOOR CONSTRUCTION. NO MATERIAL SUBSTITUTION OF OTHER GRADES SHALL BE PERMITTED.

0.25 0.5 0.75 1m

SCALE 1 :10

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DOOR DETAILS

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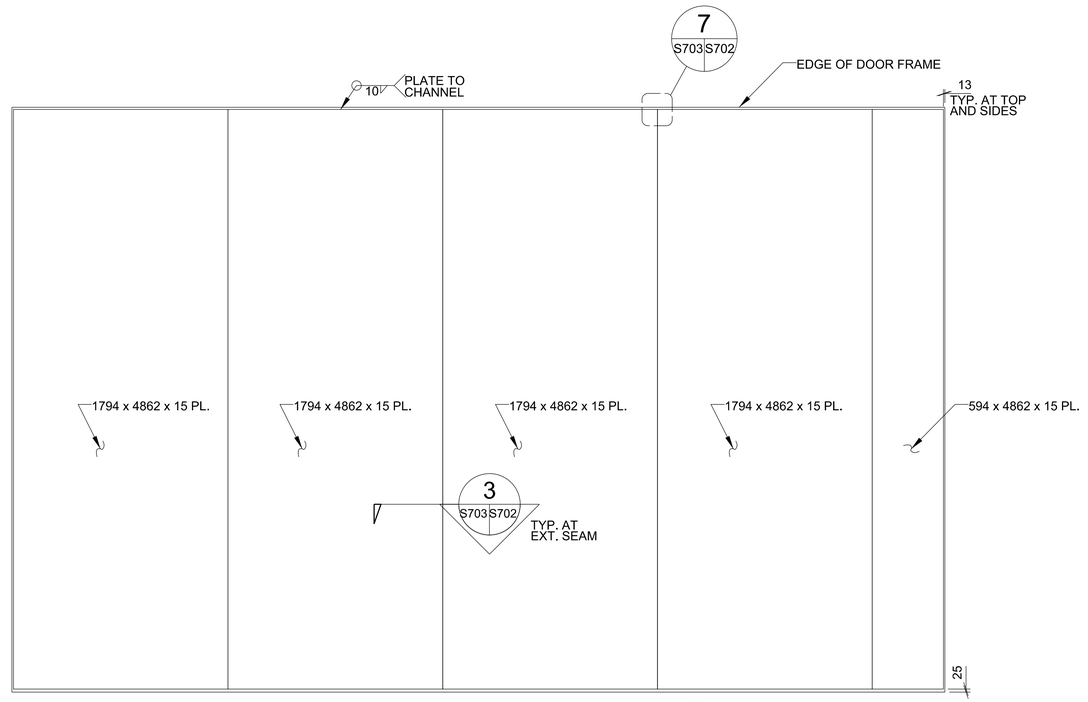
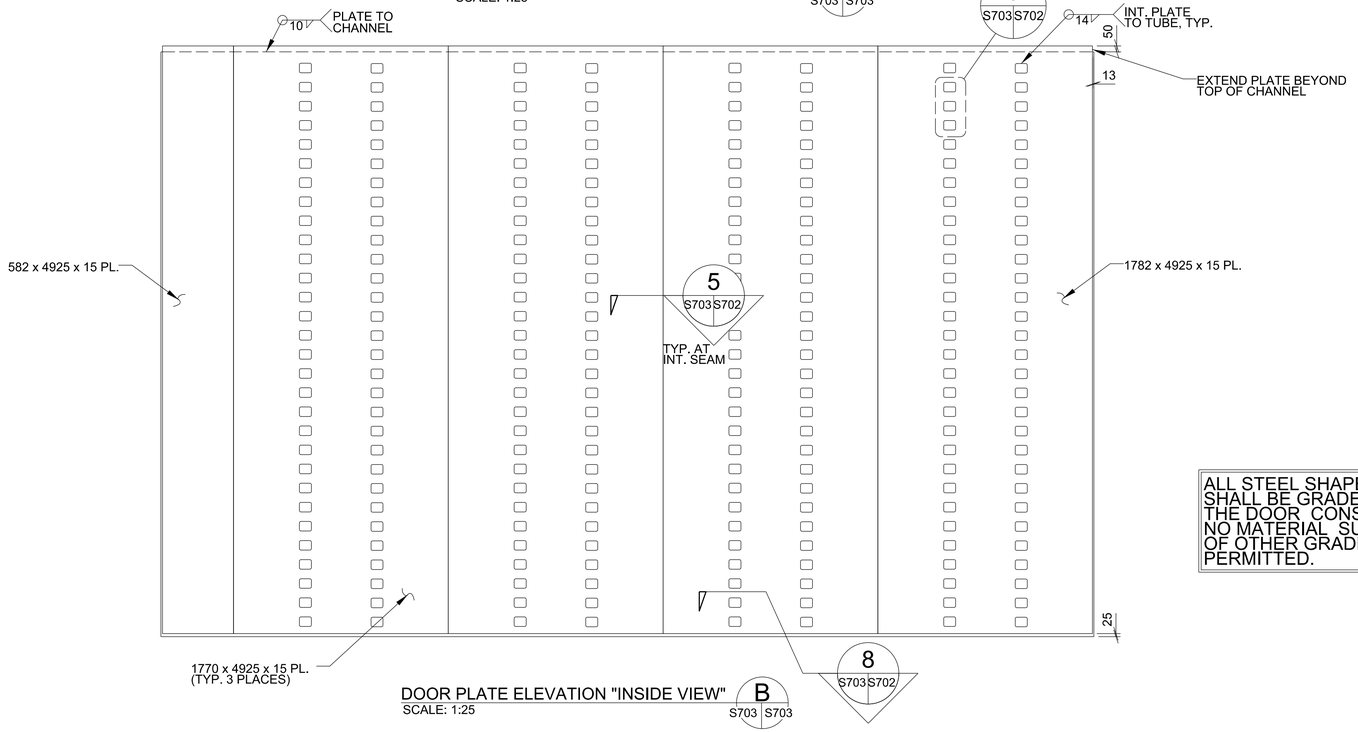
Sheet 18 of 25




DOOR PLATE ELEVATION "OUTSIDE VIEW"
SCALE: 1:25

A
S703 S703




DOOR PLATE ELEVATION "INSIDE VIEW"
SCALE: 1:25

B
S703 S703

ALL STEEL SHAPES OR PLATES SHALL BE GRADE S355 FOR THE DOOR CONSTRUCTION. NO MATERIAL SUBSTITUTION OF OTHER GRADES SHALL BE PERMITTED.

0.5 1 1.5 2 2.5m

SCALE 1:25

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Date:
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Drawn by: JMU
Checked by: RSW
Project Engineer/Architect: Jeff Coulston

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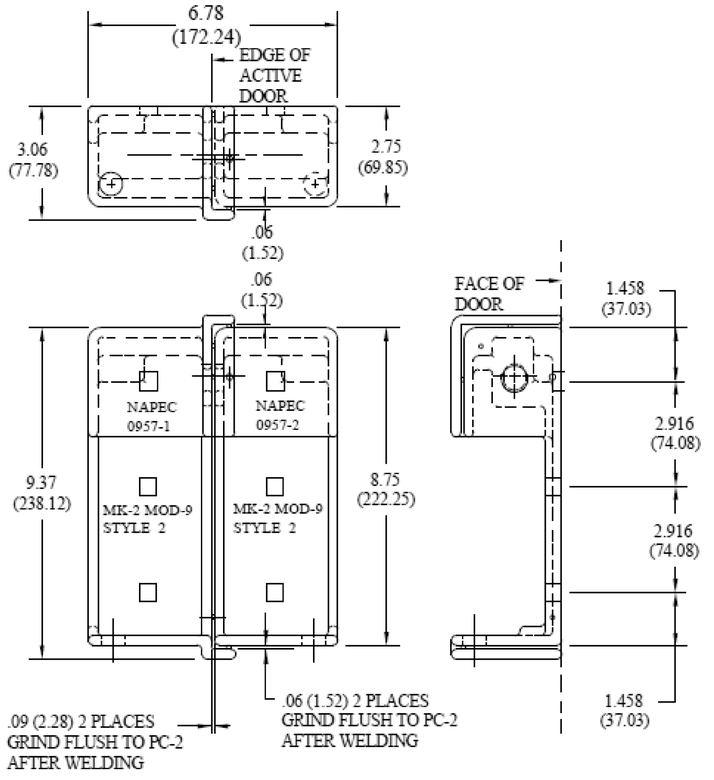
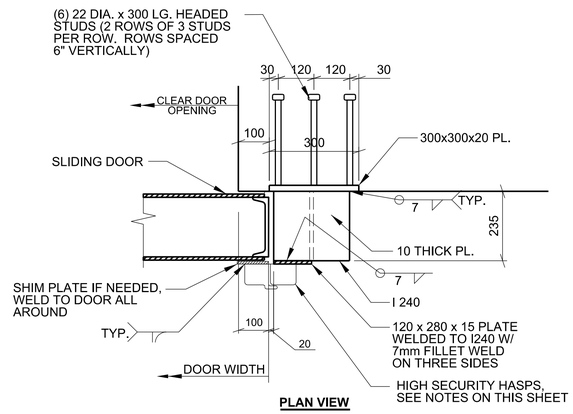
DOOR PLATE ELEVATIONS

Sheet reference number:
S-703
Sheet 19 of 25




HIGH SECURITY HASP A
STYLE 2, MK 2 MOD 9 S704







1 HIGH SECURITY HASPS DETAIL
S701 S704 SCALE: 1:10

HIGH SECURITY HASP NOTES:

1. HIGH SECURITY HASPS SHALL CONFORM TO MILITARY SPECIFICATION MIL-DTL-29181C, STYLE 2-HASP (M29181-02) FOR LEFT HAND SWINGING DOOR. HIGH SECURITY PADLOCKS SHALL CONFORM TO MILITARY SPECIFICATION MIL-DTL-43607J.
2. NO MODIFICATIONS AND/OR DEVIATIONS TO THE DOOR CONSTRUCTION SHOWN IN THE STANDARD DRAWINGS IS PERMITTED TO ACCOMMODATE THE HIGH SECURITY HASP UNLESS APPROVED BY THE U.S. ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE (STRUCTURAL BRANCH).
3. DOOR MANUFACTURER WILL COORDINATE WITH THE GOVERNMENT ON INSTALLATION AND ATTACHMENT DETAILS OF THE HASPS AND PROVIDE THE NECESSARY STIFFENERS AND ADDITIONAL FRAMING (IF REQUIRED) TO ACCOMMODATE THE HIGH SECURITY HASPS.
4. SEE DOOR FRAME AND DOOR DETAILS ON SHEETS S701 - S703.

0.25 0.5 0.75 1.0m
SCALE: 1:10

DESIGNER NOTE: TO BE REMOVED WHEN PREPARING CONSTRUCTION DRAWINGS FOR SITE ADAPTION DESIGN

SHEET S704 (HIGH SECURITY HASPS) AND S704 (A) (ILD) IDENTIFY TWO DIFFERENT LOCKING SYSTEMS. THE DESIGNER SHALL VERIFY WITH THE CONTRACTING OFFICER THE CORRECT LOCKING SYSTEM REQUIRED AND REMOVE THE REDUNDANT SHEETS FROM THE CONSTRUCTION CONTRACT DOCUMENTS FOR THE SYSTEM NOT USED.

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Checked by: RSW
Project Engineer/Architect: Jeff Coulston

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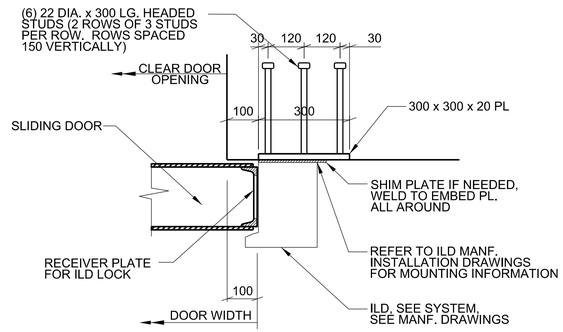
HIGH SECURITY HASP

Sheet reference number: S-704

Sheet 20 of 25


INTERNAL LOCKING DEVICE (ILD) A S704




1 ILD DETAIL
S701 S704 SCALE: 1:10

INTERNAL LOCKING DEVICE (ILD) NOTES:

1. INTERNAL LOCKING DEVICE IS A U.S. GOVERNMENT DESIGNED AND PATENTED LOCKING SYSTEM. THE ILD SYSTEM SHALL BE PURCHASED FROM A GOVERNMENT APPROVED ILD MANUFACTURER WITH COORDINATION OF NAVAL FACILITIES ENGINEERING SERVICE CENTER (NAVFAC ESC) SECURITY ENGINEERING DIVISION. CONTACT CAN BE MADE VIA PHONE BY CALLING 805-982-1212 OR THEIR WEBSITE (https://portal.navfac.navy.mil/portal/page/portal/navfac/navfac_ww_pp/navfac_nfesc_pp/locks/) FOR ORDERING INFORMATION.
2. NO MODIFICATIONS AND/OR DEVIATIONS TO THE DOOR CONSTRUCTION SHOWN IN THE STANDARD DRAWINGS ARE PERMITTED TO ACCOMMODATE THE ILD UNLESS APPROVED BY THE U.S. ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE (STRUCTURAL BRANCH).
3. DOOR MANUFACTURER WILL COORDINATE WITH THE GOVERNMENT ON INSTALLATION AND ATTACHMENT DETAILS OF THE ILD AND PROVIDE THE NECESSARY STIFFENERS AND ADDITIONAL FRAMING (IF REQUIRED) TO ACCOMMODATE THE ILD.
4. SEE ILD MANUFACTURERS INSTALLATION DRAWINGS FOR ADDITIONAL INFORMATION NOT SHOWN IN THESE DRAWINGS.
5. SEE DOOR FRAME AND DOOR DETAILS ON SHEETS S701-S703.

DESIGNER NOTE: TO BE REMOVED WHEN PREPARING CONSTRUCTION DRAWINGS FOR SITE ADAPTION DESIGN

SHEET S704 (HIGH SECURITY HASPS) AND S704(A) (ILD) IDENTIFY TWO DIFFERENT LOCKING SYSTEMS. THE DESIGNER SHALL VERIFY WITH THE CONTRACTING OFFICER THE CORRECT LOCKING SYSTEM REQUIRED AND REMOVE THE REDUNDANT SHEETS FROM THE CONSTRUCTION CONTRACT DOCUMENTS FOR THE SYSTEM NOT USED.

0.25 0.5 0.75 1m
SCALE 1:10

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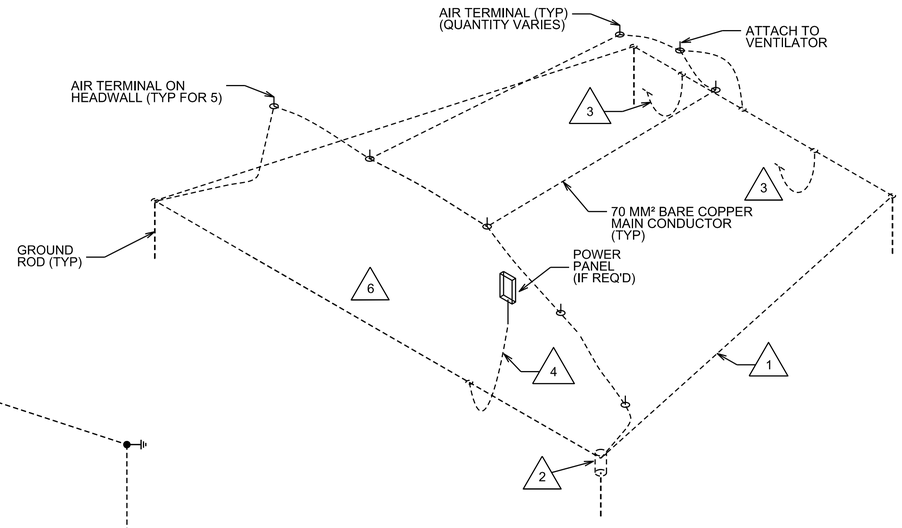
INTERNAL LOCKING DEVICES

Sheet reference number:
S-704(A)
Sheet 21 of 25



STANDARD DESIGN

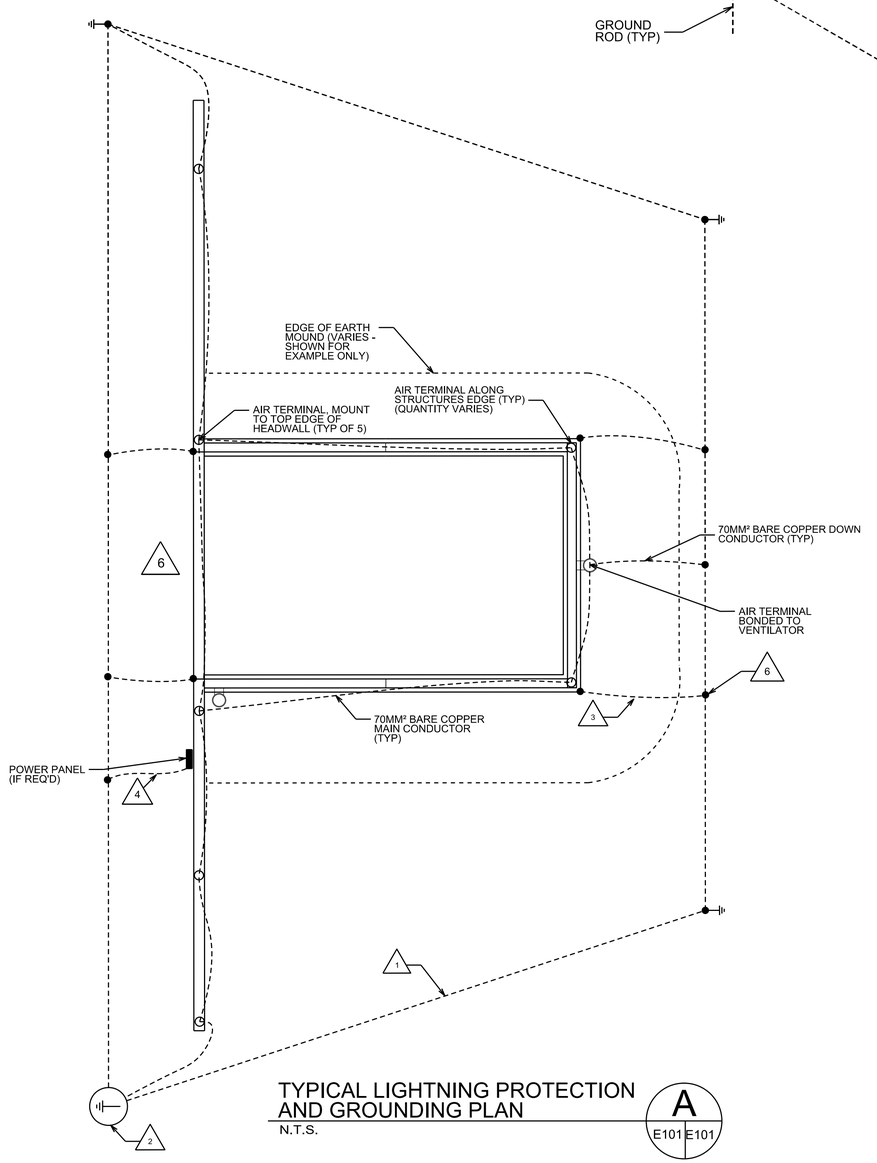



## ISOMETRIC VIEW OF LPS

N.T.S.

NOTE: STRUCTURE NOT SHOWN FOR CLARITY.

B E101|E101




## TYPICAL LIGHTNING PROTECTION AND GROUNDING PLAN

N.T.S.

A E101|E101

### NOTES: (APPLICABLE TO DRAWINGS E-101, E-102, E-103, E-104)

1. DRAWINGS E-101, E-102, E-103, AND E-104 ARE US ARMY CORPS OF ENGINEERS (USACE) STANDARD GUIDANCE FOR LIGHTNING PROTECTION SYSTEM (LPS) DESIGN APPLICABLE TO EARTH COVERED MAGAZINES (ECM). THESE DRAWINGS DO NOT CONSTITUTE A COMPLETE LPS DESIGN. DESIGNER SHALL ADAPT THE STANDARDS TO UNIQUE SITE CONDITIONS, AND CONSULT THE BELOW LISTED CRITERIA TO ENSURE A COMPLETE AND FUNCTIONAL DESIGN. THE COMPLETED LPS INSTALLATION SHALL RECEIVE A UL MASTER LABEL CERTIFICATE OR EQUIVALENT.
2. THE LPS MUST PROVIDE A ZONE OF PROTECTION BASED ON A 30.5M RADIUS STRIKING DISTANCE. THE ZONE OF PROTECTION MUST BE DOCUMENTED USING THE ROLLING SPHERE METHOD (RSM) ANALYSIS OF 30.5M RADIUS. SEE DRAWINGS E-103 AND E-104 FOR TYPICAL RSM ANALYSIS
3. THE LPS SHALL BE MADE OF MATERIALS ACCEPTABLY PROTECTED AGAINST CORROSION AS SPECIFIED IN UL 96.
4. MINIMUM AIR TERMINAL HEIGHT IS AS SHOWN IN METERS, ABOVE THE PROTECTED OBJECT.
5. REINFORCING STEEL IN WALLS, FLOOR SLAB, AND ARCH OR BOX STRUCTURE MUST ALL BE INTERCONNECTED THRU BONDING, AND MUST HAVE A CONTINUOUS PATH TO THE PRIMARY GROUNDING SYSTEM. MINIMUM REBAR OVERLAP IS 20x DIAMETER (20D). METAL VENTILATORS, STEEL DOORS AND DOOR FRAMES SHALL BE BONDED TO THE PRIMARY GROUNDING SYSTEM. PHOTO DOCUMENTATION OF THE REINFORCING STEEL BONDING AND PRIMARY GROUND BONDING IS MANDATORY.
6. INCOMING POWER AND COMM. MUST ENTER THE GROUND AT LEAST 15.5M FROM FACILITY. CABLES AND WIRE MUST BE SHIELDED OR BE INSTALLED IN METALLIC PIPING THAT IS BONDED TO THE PRIMARY GROUNDING SYSTEM AT THE POINT OF ENTRY.
7. INTERIOR ELECTRICAL SYSTEMS SHALL BE DESIGNED BY USER ACCORDING TO SITE CONDITIONS AND USER REQUIREMENTS. USER SHALL DEFINE HAZARDOUS CLASSIFICATION, WHEN REQ'D.
8. PROVIDE SURGE PROTECTIVE DEVICES (SPD) FOR POWER, COMM, AND INSTRUMENTATION PER NFPA 780.
9. CONSIDER ALL MASSES FOR SIDEFLASH POTENTIAL. METAL MASSES WITHIN THE SIDEFLASH DISTANCE SHALL BE BONDED TO THE LPS, OR BE MOVED OUTSIDE THE SIDEFLASH SEPARATION DISTANCE.
10. THE LPS SHALL BE TESTED PER THE BELOW LISTED CRITERIA.
11. EXOTHERMIC WELD ALL GROUNDING CONDUCTOR BONDS AND TERMINATIONS, EXCEPT IN TEST WELLS WHICH REQUIRE BOLTED CONNECTIONS.
12. GROUNDING AND BONDING CABLES MUST BE COPPER.
13. WHERE CONFLICTS EXISTS BETWEEN THESE DRAWINGS AND THE BELOW CRITERIA, THE MOST STRINGENT REQUIREMENT SHALL APPLY.
14. CRITERIA:
    a. DOD 6055.09 - M, VOL.2 - AMMUNITION AND EXPLOSIVES SAFETY STANDARDS
    b. DA PAM 385-64 AMMUNITION AND EXPLOSIVES SAFETY STANDARDS
    c. NFPA 780 STANDARD FOR THE INSTALLATION OF LIGHTNING PROTECTION SYSTEMS
    d. UL 96A INSTALLATION REQUIREMENTS FOR LIGHTNING PROTECTION SYSTEMS
    e. UL 96 STANDARD FOR LIGHTNING PROTECTION COMPONENTS
    f. NFPA 70 NATIONAL ELECTRICAL CODE (NEC)

### KEYED NOTES

1. 120MM² BARE COPPER CONDUCTOR (BCC) GROUNDING SYSTEM ENCIRCLING STRUCTURE'S PERIMETER. INSTALL IN DIRECT CONTACT WITH EARTH, 762MM MIN. BELOW GRADE AND 1M FROM EDGE OF EARTH MOUND.
2. GROUND TEST WELL WITH GROUND ROD. ALL BONDS WITHIN THE TEST WELL SHALL BE BOLTED-TYPE CONNECTIONS. SEE DETAIL B, DWG E-102.
3. BOND FOUNDATION REBAR TO GROUNDING SYSTEM WITH 120MM² BCC. INSTALL CABLE IN PLASTIC CONDUIT WHERE IT PASSES THROUGH CONCRETE (TYP EACH CORNER AND DISTANCES NOT TO EXCEED 18 M). SEE DETAIL C, DWG E-102.
4. WHEN POWER IS REQUIRED, PROVIDE GROUNDING ELECTRODE CONDUCTOR SIZED PER NEC IN PVC CONDUIT.
5. EXOTHERMIC BOND (TYP).
6. BOND SLIDING DOOR USING A CABLE TYPE SYSTEM OR SPRING LOADED REEL THAT PERMITS FULL RANGE DOOR OPERATION. BONDING CABLE SHALL BE STAINLESS STEEL AND REMAIN IN TENSION WHEN EXTENDED. CABLE MUST BE EQUIVALENT TO NFPA 780 CLASS I BONDING CONDUCTOR. BONDING PLATE ATTACHED TO DOOR SHALL BE OF COMPATABLE MATERIAL AND MEET SURFACE AND THICKNESS REQUIREMENTS OF NFPA 780 OR EQUIVALENT. BONDING SHALL ELECTRICALLY CONNECT THE SLIDING DOOR TO THE RAIL BEAM, WHICH IS ELECTRICALLY BONDED TO THE GROUNDING SYSTEM (SEE S-302). DOOR NOT SHOWN FOR CLARITY.

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| Revisions | | | |
|---|---|---|---|
| No. | Description | Date | Appr. |

Designed by: JRD
Drawn by: WJC
Checked by: WLS
Date: AUGUST 2018
Scale:
Drawing code:
Project Engineer/Architect: Jeff Coulston
Date:

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MODULAR STORAGE MAGAZINE
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LIGHTNING PROTECTION SYSTEM

Sheet reference number:
E-101
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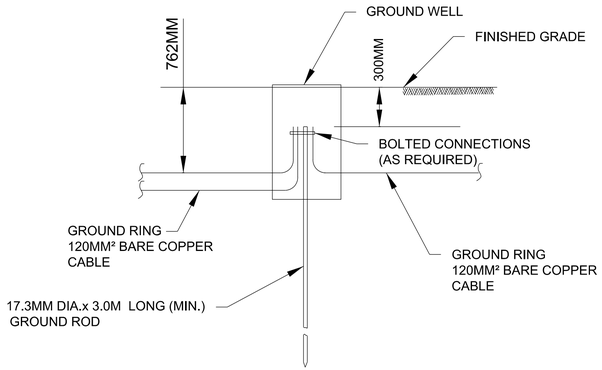
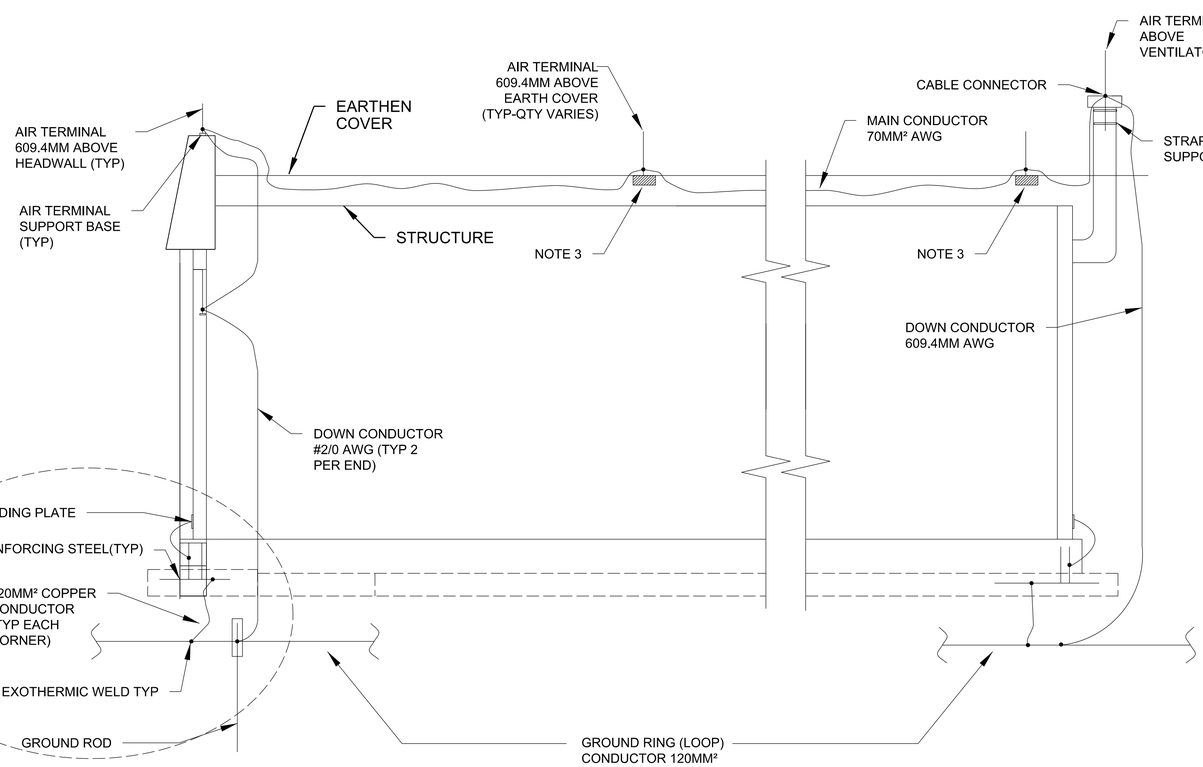



## GROUND ROD TEST WELL DETAIL

N.T.S.

B E102 E102



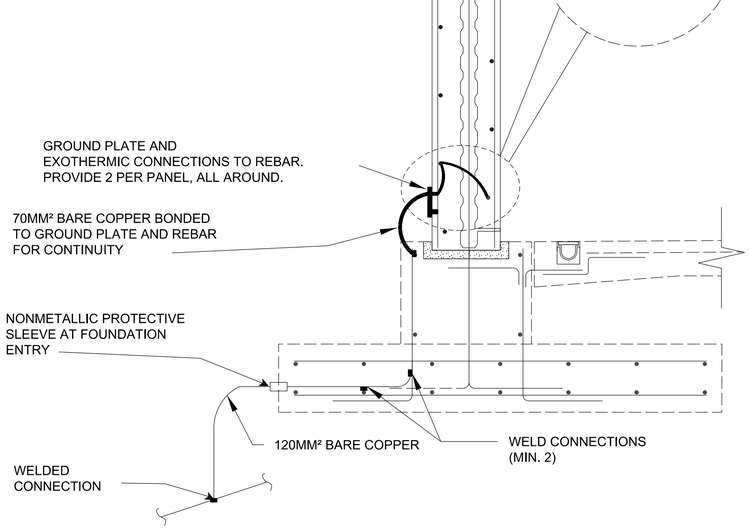

## TYPICAL ECM GROUNDING SECTION

N.T.S.

A E102 E102

NOTES:

1. ALL VENTILATORS MAY NOT BE SHOWN FOR CLARITY. ANY VENTILATORS OR OTHER METALLIC BODIES WHICH RISE ABOVE FINISHED GRADE WITHIN MUNITIONS STORAGE SHALL HAVE AN AIR TERMINAL ATOP AND BONDED TO NEAREST GROUNDING ELECTRODE SYSTEM SIMILARLY AS SHOWN.
2. CONDUCTORS SHALL BE MINIMUM 70MM² AWG UNLESS OTHERWISE NOTED.
3. PROVIDE SOLID CONCRETE BLOCK ON WHICH TO SECURE AIR TERMINAL BASE. PLACE BLOCK AT TOP OF EARTH COVER.
4. SEE STRUCTURAL DRAWINGS FOR REBAR BONDING DETAILS, THAT ESTABLISH ELECTRICAL CONTINUITY BETWEEN STRUCTURAL PANELS.




## TYPICAL REBAR BONDING

SCALE: N.T.S.

C E102 E102

NOTE: REBAR AND CABLE WELDS SHALL BE >32MM

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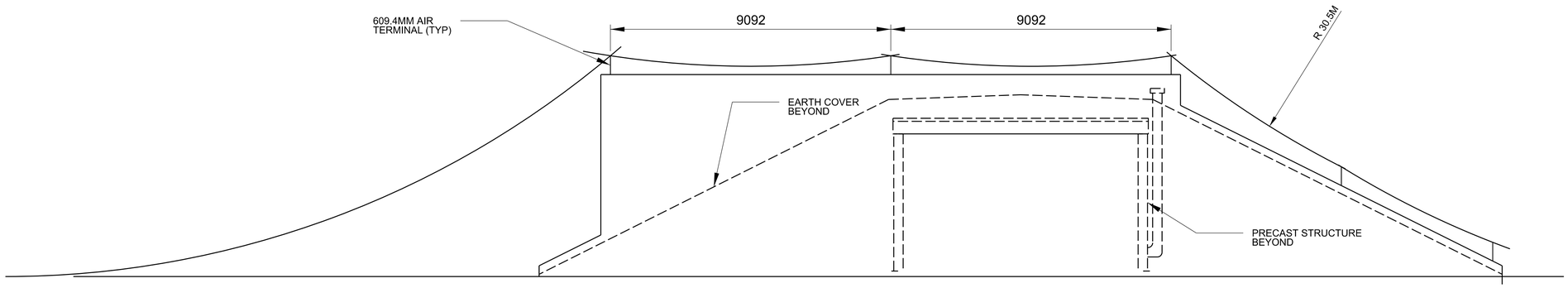
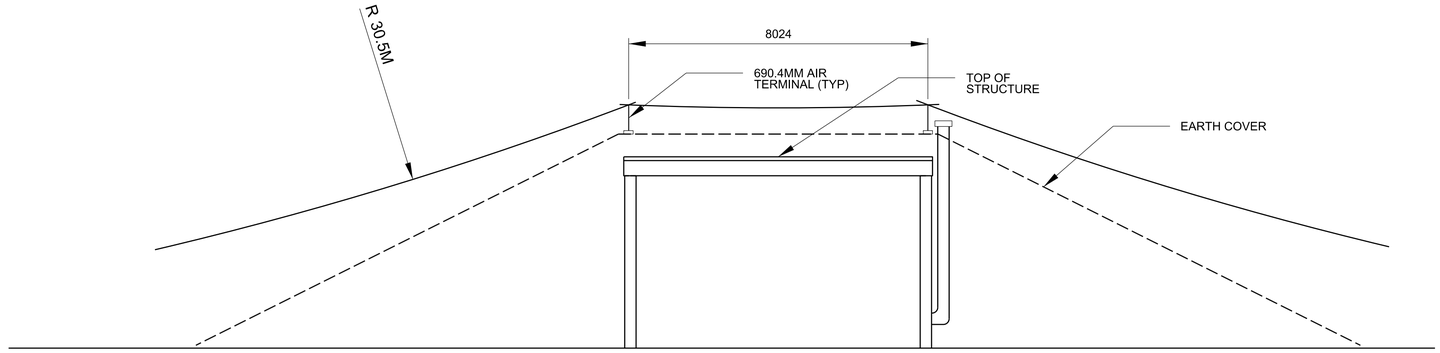



TYPICAL FRONT HEADWALL DETAIL WITH ROLLING SPHERE ANALYSIS

N.T.S

A
E103 E103




TYPICAL CROSS-SECTION DETAIL WITH ROLLING SPHERE ANALYSIS

N.T.S

B
E103 E103

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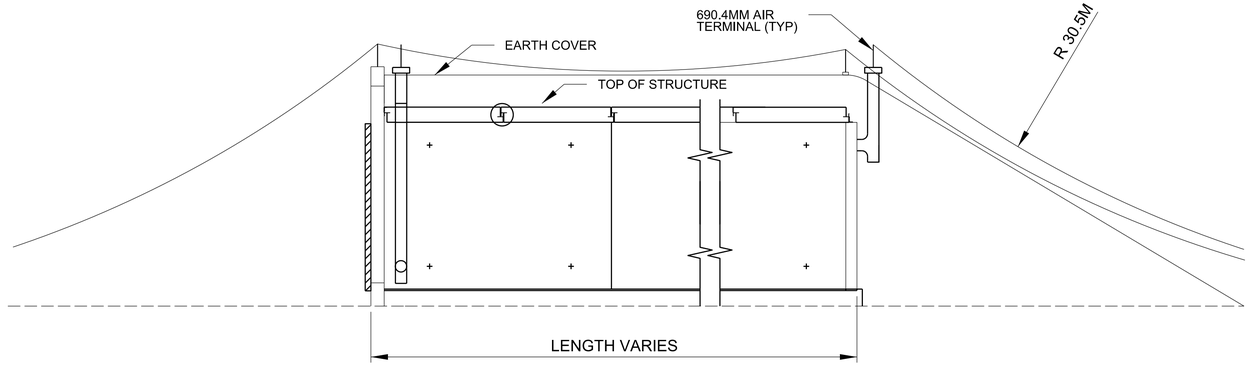


## TYPICAL RSM ANALYSIS DIAGRAM

N.T.S

A
E104|E104

## TYPICAL AIR TERMINAL PLACEMENT FOR EARTH COVERED MAGAZINES

| NOMINAL ECM LENGTH | HEADWALL | SPACED ALONG EDGE | OWNEAR REAR VENT STACK | MINIMUM AIR TERMINAL QUANTITY |
|---|---|---|---|---|
| 12 METERS OR LESS | 4 | 2 | 1 | 7 |
| MORE THAN 12 M, LESS THAN 24 M | 4 | 4 | 1 | 9 |
| 24M OR MORE | 4 | 6+ | 1 | 11+ |

NOTE: 609.4MM AIR TERMINALS UNLESS OTHERWISE NOTED.

NOTES:

1. ALL VENTILATORS MAY NOT BE SHOWN FOR CLARITY. ANY VENTILATORS OR OTHER METALLIC BODIES WHICH RISE ABOVE FINISHED GRADE WITHIN MUNITIONS STORAGE SHALL HAVE AN AIR TERMINAL ATOP AND BONDED TO GROUND SIMILARLY AS SHOWN.
2. GROUNDING CONNECTIONS NOT SHOWN FOR CLARITY.

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