APPENDIX 8-1

PCAPP EDS SITE SUPPORT EQUIPMENT

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APPENDIX 8-1
PCAPP EDS SITE SUPPORT EQUIPMENT

1.0 SITE SUPPORT EQUIPMENT AND STRUCTURES

Figure Appendix 8-1-1 shows the Pueblo Chemical Agent-Destruction Pilot Plant (PCAPP) Explosive Destruction System (EDS) layout of the Environmental Enclosures and identifies the site support equipment and structures described in this appendix. **Figure Appendix 8-1-2** shows an EDS Phase 2 Unit R (P2R) within an Environmental Enclosure. The EDS site construction was completed under the Division Facility Construction Certification (FCC) process to ensure specified design was followed and constructed. The process also helps ensure the appropriate level of quality is achieved.

1.1 Foundation Design/Concrete Pads

1.1.1 Foundation Design. The following design information is compiled and excerpted from U.S. Army Corps of Engineers documents for PCAPP EDS site development and from the following:

- "A Geotechnical Investigation for Explosive Destruction System" dated December 12, 2013, prepared by North American Testing, Inc.

- Specification 03 30 00, Cast in Place Concrete, dated March 2014, Merrick & Co. Interim Submittal.

These documents are provided electronically on compact disk in **Appendix Attachment 8-1-1** of this attachment.

Three concrete pad foundations will be constructed at the PCAPP EDS site. **Figure Appendix 8-1-1** shows the concrete pad layout along with the Environmental Enclosures that will be placed on the pads. Even though it is planned to have only two EDS units onsite at the moment, the third concrete pad will provide a ready option should a third unit be deemed necessary, which would then be added by the permit modification process. These foundations will be constructed based on the soil information contained in the geotechnical investigation. The geotechnical investigation evaluated subsurface soil conditions to provide recommendations pertaining to the foundation design, site grading, and paving.

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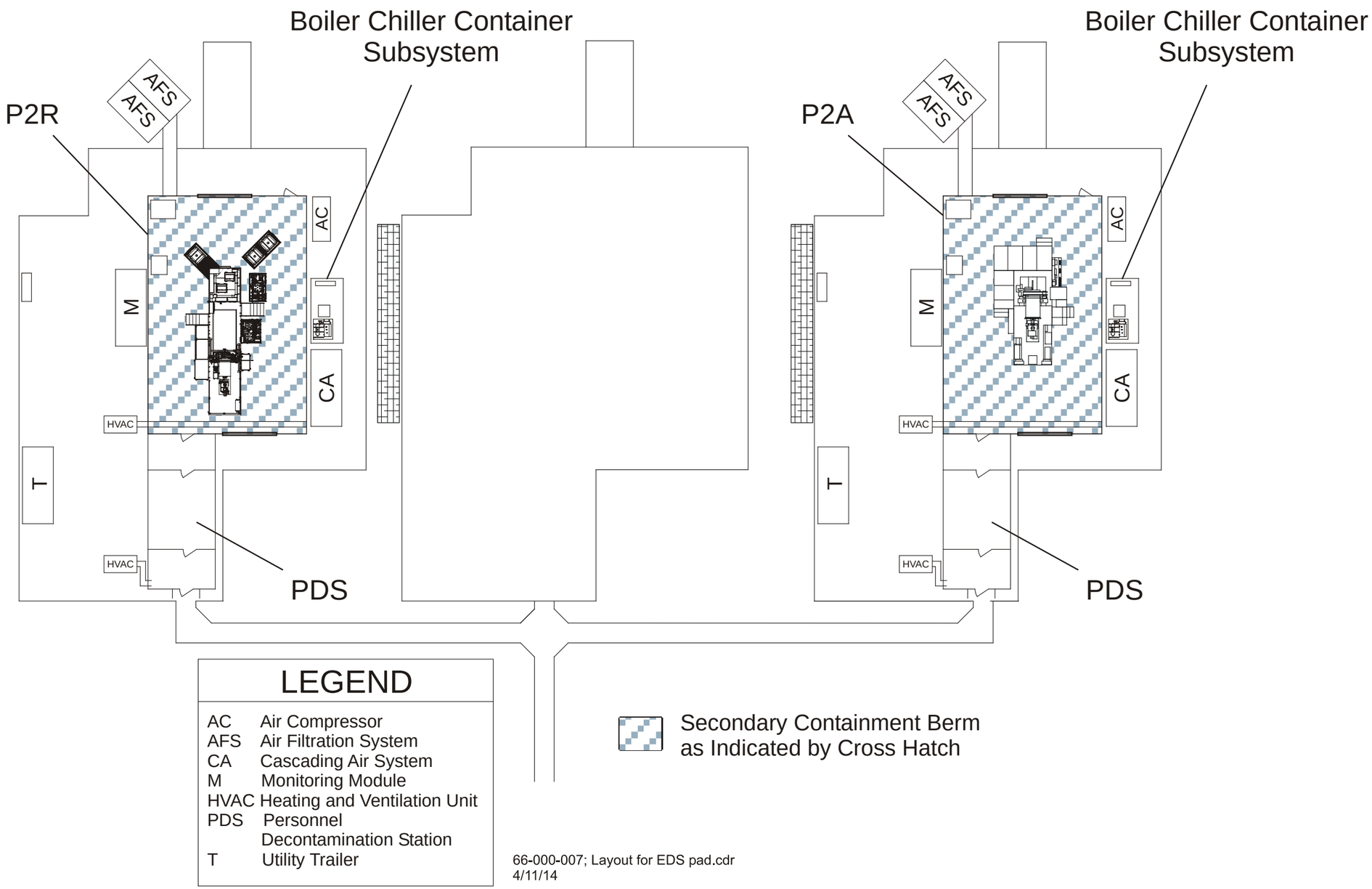

Figure Appendix 8-1-1. Layout for Environmental Enclosures

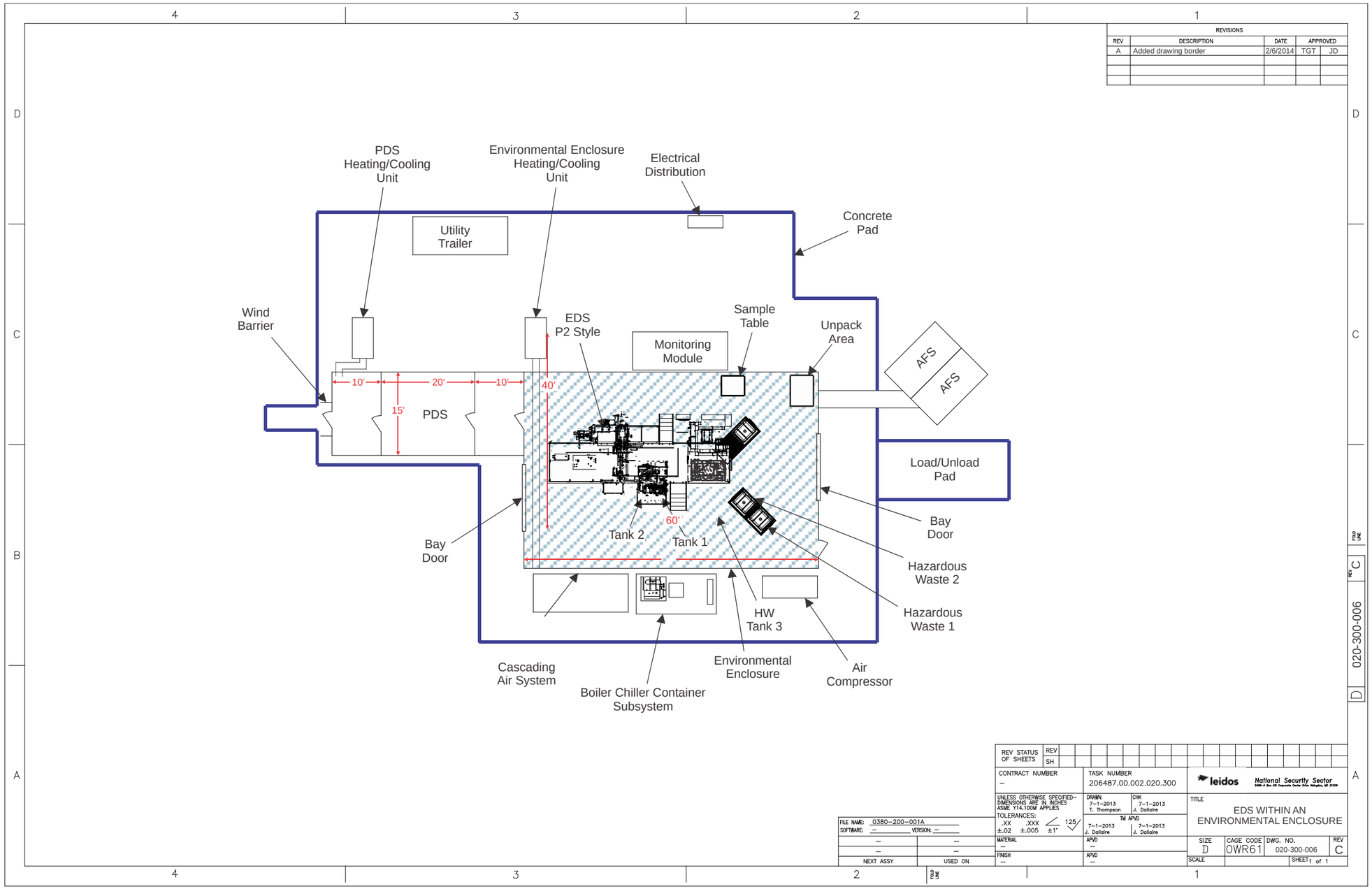

Figure Appendix 8-1-2. EDS Within an Environmental Enclosure

For soil testing at the PCAPP EDS site, five borings were drilled with a 4-inch diameter continuous flight auger. Samples of the subsurface soils were obtained by use of a 2-inch I.D. California liner sampler for clayey soils and a 1.5-inch I.D. Split-Barrel Sampler for sandy soils. In addition to obtaining samples, Standard Penetration Tests in accordance with American Society for Testing and Materials (ASTM) D 1586 were performed. Below the surfacing materials, sandy clays are generally present to depths up to approximately twelve (12) feet below existing grade. The materials have somewhat variable Plasticity Index values, which varied from sixteen (16) to twenty-two (22). Moisture contents were found to vary significantly from 2.1% to 14.2%. Generally, the materials are tan to brown in color. The materials in this stratum are considered collapsible and expansive and will likely be difficult to process and compact. Extremely high dry strengths are possible with these materials, which is likely aided by the cementing of calcium carbonate. In addition, the materials were found to both swell and consolidate depending on the specific *in-situ* properties. Materials were found to swell up to 2.1% and consolidate at 2.3%. Physical properties of the soil samples taken at the PCAPP EDS site are provided in **Table Appendix 8-1-1**.

Over excavation shall be backfilled in accordance with the Geotechnical Report. Fill and backfill materials shall be as recommended by the Geotechnical Report and approved by the Geotechnical engineer. Utility trench backfill shall be mechanically compacted in accordance with the Geotechnical Report and approved by the Geotechnical engineer or designee. Structural fill and backfill shall be compacted to a minimum of 95% dry density at moisture content between -2% and 0% of the optimum moisture content as determined by the ASTM D 1557. Soil profile detail and general construction notes are provided in **Figure Appendix 8-1-3** (Merrick & Company drawing S-001).

The foundation system is designed to support the enclosure superstructure reactions and fabric base connection, and transfer these loads to the competent bearing strata in the underlying soils, via a shallow foundation system. Per the preliminary geotechnical recommendations provided by the report, the recommended foundation system for the PCAPP EDS enclosure is a shallow foundation system, consisting of continuous and isolated spread footings, slab-on-grade floors, and turned down slabs- or thickened slabs-on-grade. Footings, turned-down slab edges and thickened slab edges shall extend 3 feet below adjacent finished grade. Foundations and slabs-on-grade shall bear on a minimum of 3 feet of compacted structural granular fill. Positive drainage away from building foundations will be provided to minimize foundation and slab movement, as well as maintain containment of interior slabs at doorways. The perimeter foundation stem wall is 6 inches above the exterior finished pavement to allow for proper fabric connection. Construction joints or sawed joints are provided to help control slab cracking due to shrinkage in the slab on grade floor slab. Expansion joints between slab on grade and foundation walls is

Table Appendix 8-1-1. Physical Properties of Soil Samples

PHYSICAL PROPERTIES OF SOIL SAMPLES

Client: Komada
Project: EDS

Job No. 13-79
Date: 12/5/2013

Boring No	Depth Ft	Classification Unified	Particle Size Distribution 3"	1"	1/2"	No 4	No 50	No 200	Atterberg Limits LL	PI	Dry Dens pcf	Moisture %	Swell / Consol	Comments
301	4	CL-sandy				100	83	67	40	22	106.8	14.2		
302	2										110	3.5	S=2.1	
302	19	SP-SM			100	94	21	7	NV	NP		11.2		
303	2	CL-sandy				100	88	68	30	17		11.3		
303	9	SM				100	60	16	NV	NP		5.3		
304	2	CL w/ sand				100	94	73	30	17	94.8	6.3		
304	4										93	6.8	C=2.3	
305	2	CL-sandy				100	88	67	30	16	96.7	4.6		
305	4										109	2.1	S=2.1	
306/307	0-4	CL-sandy				100	76	55	33	19		5.8		

Source: A Geotechnical Investigation for "Explosive Destruction System"; North American Testing, Inc.; December 12, 2013

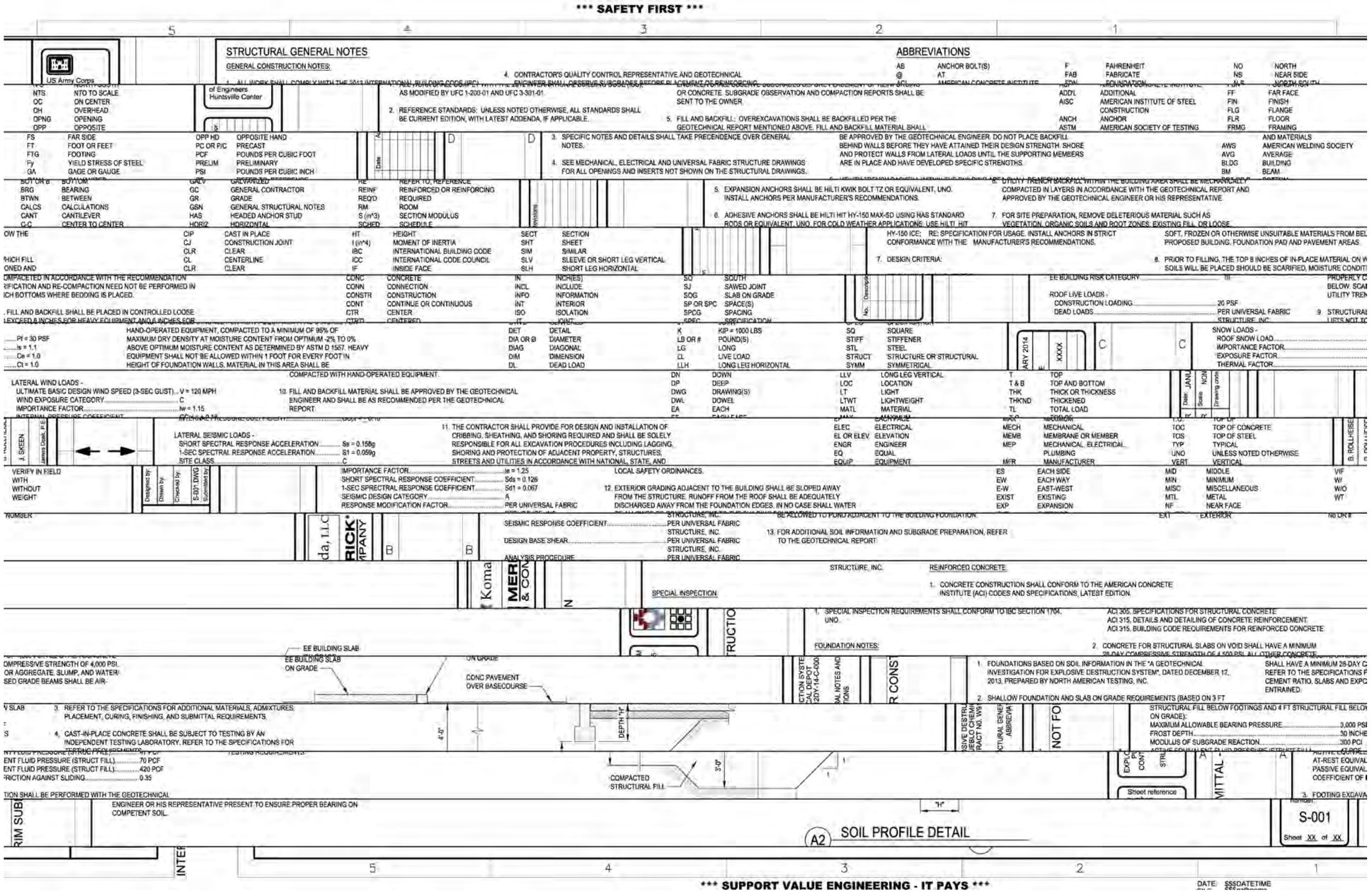

Figure Appendix 8-1-3. Structural General Notes and Abbreviations

provided to control edge cracking and allow for differential settlement. Slabs-on-grade shall be cast over 3 feet of structural fill. Cast-in-place (CIP) reinforced concrete foundation pads will be provided for exterior equipment and interior heavy equipment. Reinforced concrete housekeeping pads poured integral with the slab-on-grade and pavements will be provided for lightly-loaded equipment.

The following shallow foundation and slab on grade requirements are based on a structural fill of 3 feet below footings and 4 feet below slab on-grade:

- Maximum allowable Bearing Pressure: 3,000 pounds per square foot (PSF)
- Frost Depth: 30 inches
- Modulus of Subgrade Reaction: 300 pounds per cubic inch
- Active Equivalent Fluid Pressures (structural fill): 47 pounds per cubic foot (PCF)
- At rest Equivalent Fluid Pressures (structural fill): 70 PCF
- Passive Equivalent Fluid Pressures (structural fill): 420 PCF
- Coefficient of Friction against Sliding: 0.35.

Slab thickness will be 6 inches on grade with #5 reinforced bars at 12 inches on center each way, over a vapor barrier and 3 feet prepared structural fill subgrade per the Geotechnical Report Recommendations.

Minimum live loads will be in accordance with the International Building Code 2012, as follows:

- Environmental Enclosure structure forklift load: 15-kip axle-load, 6 operations per day over 10 year minimum.

- Environmental Enclosure structure roof: 20 PSF per American Society for Civil Engineers (ASCE) 7.

Minimum dead loads will be in accordance with specification ASCE 7 and Unified Facilities Criteria (UFC) 3-301-01.

1.1.2 Secondary Containment. The concrete pads do not perform a secondary containment function for the following reasons:

- Secondary containment is provided by separate built in containment pans for the EDS Containment Vessel and Reagent Supply Subsystem.

- Individual secondary containment will also be provided for the liquid waste containers and hazardous waste tank.

- The entire enclosure floor space will be covered by a portable secondary containment system with berm that is in addition to the containment described above.

The portable secondary containment system will provide an additional 700 gallons net liquid containment for the entire environmental enclosure floor space area. See **Table Appendix 8-1-2** for additional information on secondary containment volumes.

Table Appendix 8-1-2. Full Floor Space Secondary Containment for PCAPP EDS Environmental Enclosure

Full Environmental Enclosure Floor Secondary Containment				
Item	Width	Length	Height	Volume
Secondary Containment (gross)	40.0 ft	60.0 ft	0.042 ft	748 gal
Displacement Volumes				
Reagent Supply	5.3 ft	6.6 ft	0.042 ft	11 gal
Waste Subsystem	4.6 ft	10.4 ft	0.042 ft	15 gal
Tank Skid Subsystem	4.7 ft	8.0 ft	0.042 ft	12 gal
Trailer Tires	1.0 ft	2.0 ft	0.042 ft	5 gal
Trailer Leveling Jacks	2.0 ft	2.0 ft	0.042 ft	5 gal
Secondary Containment (net)				700 gal

Assumptions for Table Attachment D-1-2:

1) 7.48 gallons = 1 cubic foot
2) Assume each trailer tire footprint is 1 ft x 2 ft and total of 8 tires.
3) Assume each trailer leveling jack footprint is 2 ft x 2 ft and total of 4 jacks.
4) Assumed berm height is 0.5 inch.

The secondary containment system will be made of polypropylene and is compatible with the liquids to be managed in the Environmental Enclosure (for example, polypropylene is compatible with monoethanolamine [MEA]). **Figure Appendix 8-1-4** depicts an example of the type of portable secondary containment system with berm that will be used in the Environmental Enclosures.

For floor coatings, a polyurea coating such as Versaflex FSS 45DC (or approved equal) will be used. A Versaflex FSS 45DC product data sheet is provided electronically on disk in **Appendix Attachment 8-1-1** of this attachment. The floor coating is an added protection factor to assure that any spills will not permeate downward to soils underneath.

More detailed information on the foundation design is provided in Merrick & Co. drawing S-101, Foundation and Slab Plan (**Figure Appendix 8-1-5**). The Merrick & Co. Construction Quality Assurance/Quality Control Plan is provided electronically on compact disc in **Appendix Attachment 8-1-1** of this attachment.

1.1.3 Concrete Mix Design. All testing of concrete aggregate will be in accordance with ASTM C33/C33M, of Portland cement in accordance with ASTM C150/C150M, air-entraining

Figure Appendix 8-1-4. Example Secondary Containment Berm to Be Placed in the PCAPP EDS Environmental Enclosure

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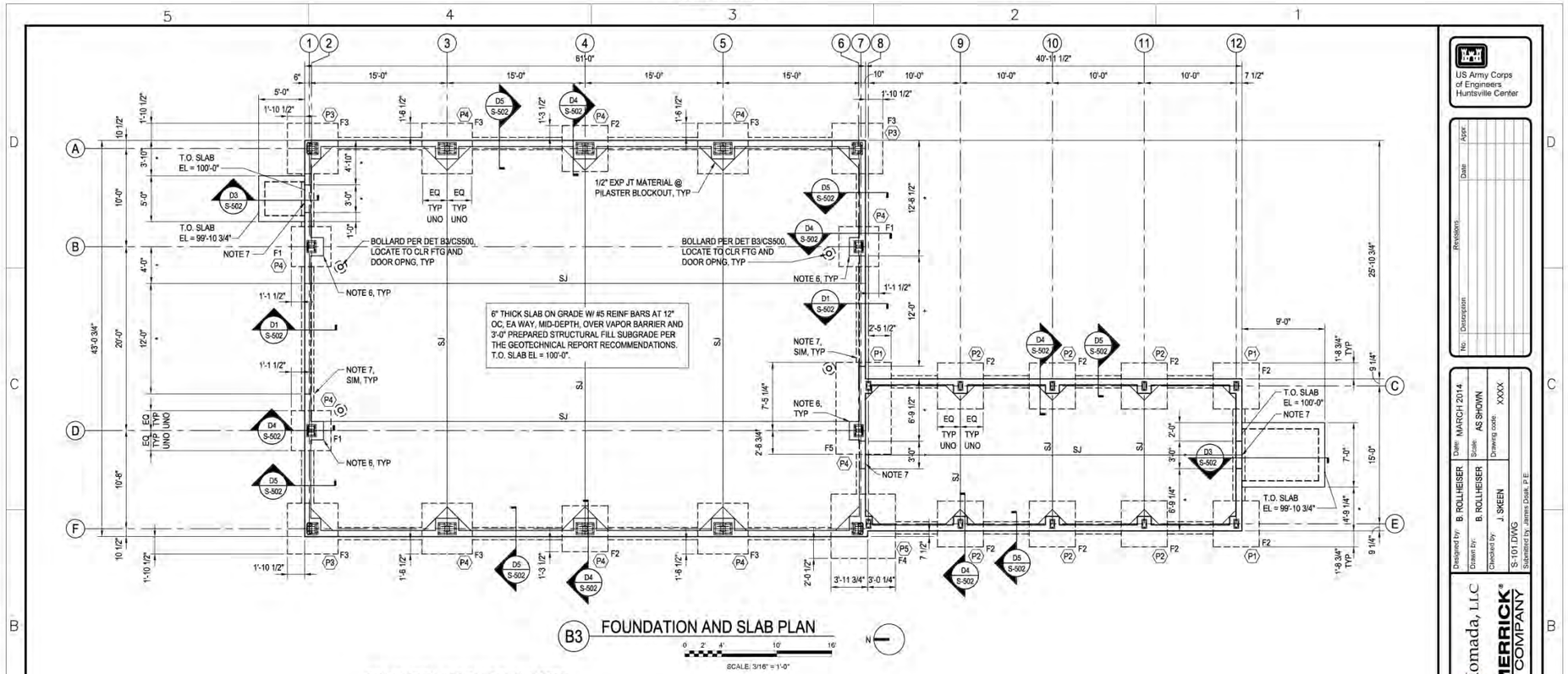

FOUNDATION AND SLAB PLAN NOTES:

1. FOR TYPICAL SLAB ON GRADE DETAILS, SEE SHEET S-501.
2. COORDINATE SLAB AND FOUNDATION WALL OPENINGS AND PENETRATIONS, HOUSEKEEPING PADS AND EQUIPMENT FOUNDATIONS WITH THE CIVIL, MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS.
3. TOP OF SLAB ELEVATIONS 100'-0" = CIVIL FINISH FLOOR ELEVATION. RE: CIVIL DRAWINGS.
4. PROVIDE SAWED JOINTS AS SHOWN.
5. * DIMENSIONS ARE DEPENDENT ON THE STRUCTURE DOOR SIZE AND LOCATION PROVIDED. COORDINATE DOOR OPENING SIZES AND LOCATIONS, ANCHOR BOLTS SIZES AND CONFIGURATIONS, AND BASE PLATES SIZED AND LOCATIONS WITH UNIVERSAL FABRIC STRUCTURES, INC. DRAWINGS.
6. PROVIDE (2) #4 DIAGONAL BARS AT RE-ENTRANT SLAB CORNERS PER DETAIL A3/S-501.
7. PROVIDE ADDITIONAL REINFORCING AT DOORWAYS PER DETAIL D3/S-502.
8. SLAB ON GRADE CONCRETE SHALL BE WET-CURED AND SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH, F'c, OF 4500 PSI. REFER TO SPECIFICATION SECTION 03 30 00 CAST-IN-PLACE CONCRETE. SLABS ON GRADE CONCRETE SHALL HAVE A MINIMUM TENSILE STRENGTH OF 600 PSI.
9. ALL EXPOSED CORNERS SHALL HAVE A 3/4" CHAMFER.
10. SLAB ON GRADE FLOOR COATING:
PROVIDE VERSAFLEX FSS 45DC OR APPROVED EQUAL. COATING MATERIAL SHALL BE A FAST SET, RAPID GELLING, 100% SOLIDS, FLEXIBLE, TWO-COMPONENT POLYUREA ELASTOMER SPRAY COATING.

FOOTING / PILASTER SCHEDULE

FOOTING TYPE	DIMENSION	B.O. FOOTING EL.	FOOTING REINFORCING
F1	4'-4" SQ x 1'-2" THK	97'-0"	(5) #5 EA WAY, T&B
F2	5'-0" SQ x 1'-2" THK	97'-0"	(6) #5 EA WAY, T&B
F3	5'-6" SQ x 1'-2" THK	97'-0"	(6) #5 EA WAY, T&B
F4	7'-0" SQ x 1'-2" THK	97'-0"	(8) #5 EA WAY, T&B
F5	6'-0" x 10'-0" x 1'-2" THK	97'-0"	(7) #5 LONGITUDINAL, (12) #5 TRANSVERSE, T&B
PILASTER TYPE	DIMENSION	T.O. PILASTER EL.	PILASTER REINFORCING
P1	1'-4" x 1'-7" x 1'-10" TALL	100'-0"	(4) #5 VERT W/ STD HK, TIES PER DET B5/S-502
P2	1'-6" x 1'-7" x 1'-10" TALL	100'-0"	(4) #5 VERT W/ STD HK, TIES PER DET B5/S-502
P3	1'-9" x 2'-0" x 1'-10" TALL	100'-0"	(8) #5 VERT W/ STD HK, TIES PER DET B5/S-502
P4	2'-6" x 2'-0" x 1'-10" TALL	100'-0"	(10) #5 VERT W/ STD HK, TIES PER DET B5/S-502
P5	2'-6" x 2'-2 1/2" x 1'-10" TALL	100'-0"	(12) #5 VERT W/ STD HK, TIES PER DET B5/S-502

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY BRENDA G. ROLLHEISER P.E. 33277 ON 12 MARCH 2014

US Army Corps of Engineers Huntsville Center

No. | Description | Revisions | Date | Appr.

Designed by: B. ROLLHEISER | Date: MARCH 2014
Drawn by: B. ROLLHEISER | Scale: AS SHOWN
Checked by: J. SKEEN | Drawing code: XXXX
S-101.DWG
Submitted by: James Dash, P.E.

Komada, LLC
MERRICK & COMPANY

EXPLOSIVE DESTRUCTION SYSTEM
PUEBLO CHEMICAL DEPOT
CONTRACT NO. W912DY-14-C-0005
FOUNDATION AND SLAB PLAN

Sheet reference number: S-101
Sheet 32 of 65

DATE: 03/13/2014
FILE: S-101.DWG

Figure Appendix 8-1-5. Foundation and Slab Plan

admixtures in accordance with ASTM C233/C233M. Base mixture proportions on compressive strength will be in accordance with ASTM C39/C39M and done on specimens fabricated in accordance with ASTM C192/C192M. Materials, design and construction will comply with American Concrete Institute (ACI) 318. Detailing of reinforcement complies with ACI SP-66 in addition to ACI 318. Formwork complies with ACI 347R and ACI SP-4. Further information can be found in Specification 03 30 00, Cast in Place Concrete, Merrick & Co. Interim Submittal which is provided electronically on compact disc in **Appendix Attachment 8-1-1**.

1.1.4 Construction Joint Design. Expansion anchors shall be Hilti KWIK Bolt TZ or equivalent. Adhesive anchors shall be Hilti HIT HY-150 MAX-SD using HAS standard rods or equivalent. For cold weather applications, Hilti HIT HY-150 ICE will be used. Anchors will be installed in strict conformance with the manufacturer's recommendations.

1.1.4.1 Exterior Sealant. For joints in vertical surfaces, ASTM C920, Type S or M, Grade NS, Class 25, Use NT will be used. For joints in horizontal surfaces, ASTM C920, Type S or M, Grade P, Class 25, Use T will be used.

1.1.4.2 Floor Joint Sealant. ASTM C920, Type S or M, Grade P, Class 25, Use T will be used.

1.1.4.3 Preformed Sealant. Preformed sealant of polybutylene or isoprene-butylene based pressure sensitive weather resistant tape or bead sealant capable of sealing out moisture, air and dust when installed as recommended by the manufacturer. At temperatures from minus 30° to plus 160°F, the sealant must be non-bleeding with no loss of adhesion.

Construction joint design is detailed in Merrick & Co. drawings S-501, Concrete Foundation Sections and Details (**Figure Appendix 8-1-6**), and S-502, Foundation Sections and Details (**Figure Appendix 8-1-7**). Construction joint design will be in accordance with specifications Section 03 30 00, Cast in Place Concrete, Merrick & Co. Interim Submittal (provided electronically on compact disc in **Appendix Attachment 8-1-1**).

1.1.5 Reinforced Concrete. Concrete construction shall conform to the following American Concrete Institute codes and specifications:

- ACI 305, Specifications for Structural Concrete

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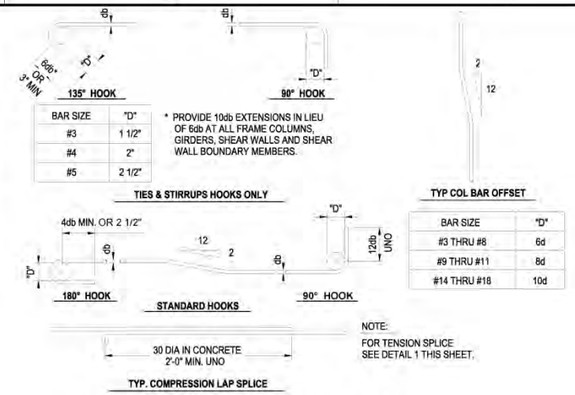
BAR DESCRIPTION AND LOCATION IN STRUCTUTE	CONCRETE STRENGTH psi	BAR SIZE →	#3		#4		#5		#6		#7		#8		#9		#10	
		LAP CLASS →	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
BAR WITH SPACING > 2 x d b CLEAR COVER >d b OR BEAM & COLUMN BARS WITH SPACING > d b CLEAR COVER > d b	GRADE 60																	
	4000	TOP	1'-7"	2'-1"	2'-1"	2'-9"	2'-7"	3'-5"	3'-1"	4'-1"	4'-6"	5'-11"	5'-2"	6'-9"	5'-10"	7'-7"	6'-7"	8'-6"
		BOTTOM	1'-3"	1'-7"	1'-7"	2'-4"	2'-0"	2'-7"	2'-5"	3'-1"	3'-6"	4'-6"	4'-0"	5'-2"	4'-6"	5'-10"	5'-1"	6'-7"
	4500	TOP	1'-6"	2'-0"	2'-0"	2'-7"	2'-6"	3'-3"	2'-11"	3'-11"	4'-3"	5'-7"	4'-11"	6'-5"	5'-6"	7'-2"	6'-3"	7'-3"
		BOTTOM	1'-3"	1'-6"	1'-6"	2'-3"	1'-11"	2'-6"	2'-4"	2'-11"	3'-4"	4'-3"	3'-10"	4'-11"	4'-3"	5'-5"	4'-10"	6'-3"
OTHER CASES	GRADE 60																	
	4000	TOP	2'-4"	3'-1"	3'-1"	2'-9"	3'-11"	5'-1"	4'-8"	6'-1"	6'-9"	8'-10"	7'-9"	10'-1"	8'-9"	11'-4"	9'-10"	8'-6"
		BOTTOM	1'-10"	2'-4"	2'-5"	3'-1"	3'-0"	3'-11"	3'-7"	4'-8"	5'-3"	6'-9"	6'-0"	7'-9"	6'-9"	8'-9"	7'-7"	9'-10"
	4500	TOP	2'-3"	2'-11"	2'-11"	2'-7"	3'-4"	4'-10"	4'-5"	5'-9"	6'-5"	8'-4"	7'-4"	9'-6"	8'-3"	10'-9"	9'-4"	12'-0"
		BOTTOM	1'-9"	2'-3"	2'-4"	2'-11"	2'-10"	3'-9"	3'-5"	4'-5"	5'-0"	6'-5"	5'-8"	7'-4"	6'-5"	8'-3"	7'-2"	9'-11"

NOTES:

1. USE THIS TABLE FOR BAR SPLICES UNLESS SPECIFICALLY DETAILED AND DIMENSIONED ON PLANS.
2. THIS SCHEDULE IS NOT APPLICABLE TO DUCTILE MOMENT FRAME MEMBERS RESISTING SEISMIC FORCES.
3. FOR TENSION DEVELOPMENT LENGTHS "L_d", USE CLASS "B" SPLICE LENGTHS.
4. ALL SPLICES SHALL BE CLASS "B" UNLESS NOTED OTHERWISE ON PLANS.
5. TOP BARS ARE HORIZONTAL REINFORCEMENT WITH MORE THAN 12" OF CONCRETE CAST BELOW BAR.
6. BOTTOM BARS ARE VERTICAL BARS, ALL HORIZONTAL WALL REINFORCEMENT, AND HORIZONTAL REINFORCEMENT WITH LESS THAN 12" OF CONCRETE CAST BELOW BARS.
7. COVER DESIGNATES CLEAR CONCRETE COVER FROM SPLICED BAR TO FACE OF MEMBER. SPACING DESIGNATES CLEAR DIMESION BETWEEN SPLICED BARS.

C5 REINFORCING SPLICE TABLE



C2 REINFORCING BAR BEND DETAIL

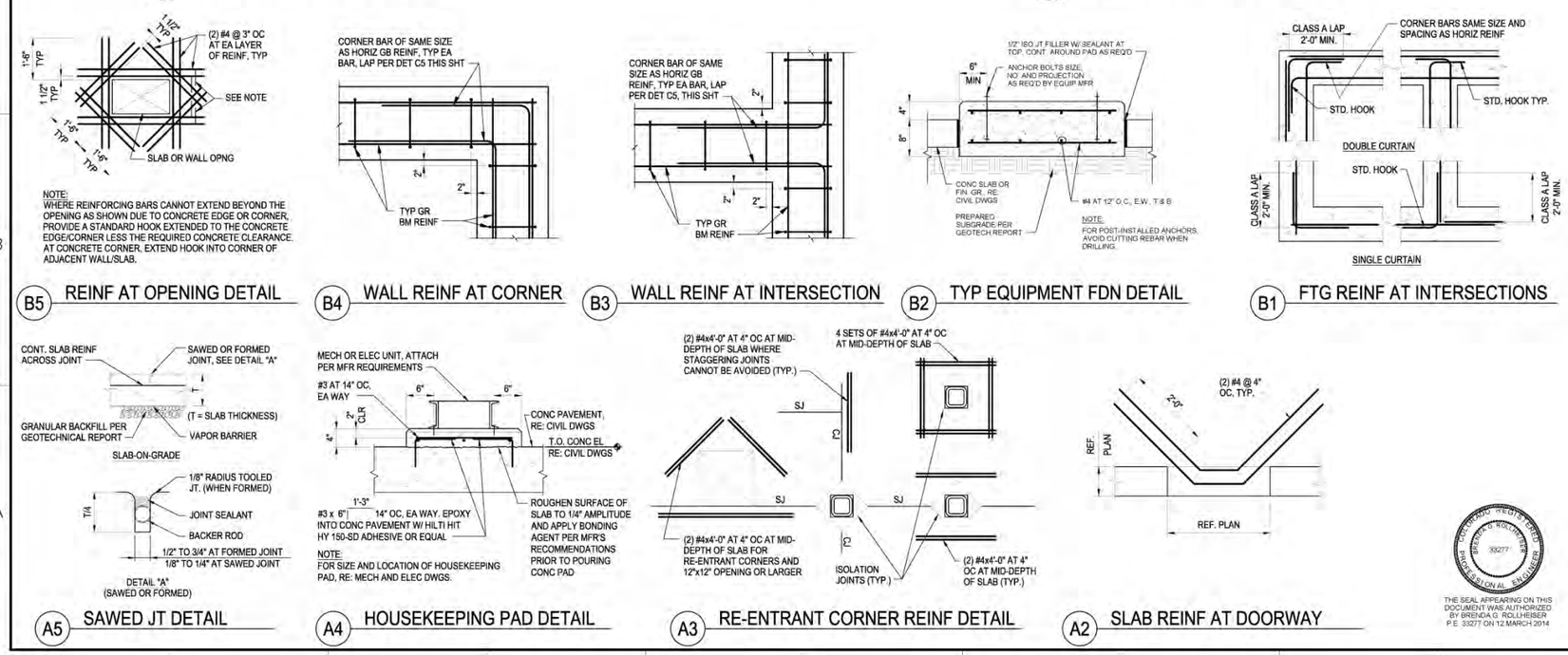


Figure Appendix 8-1-6. Concrete Foundation Sections and Details

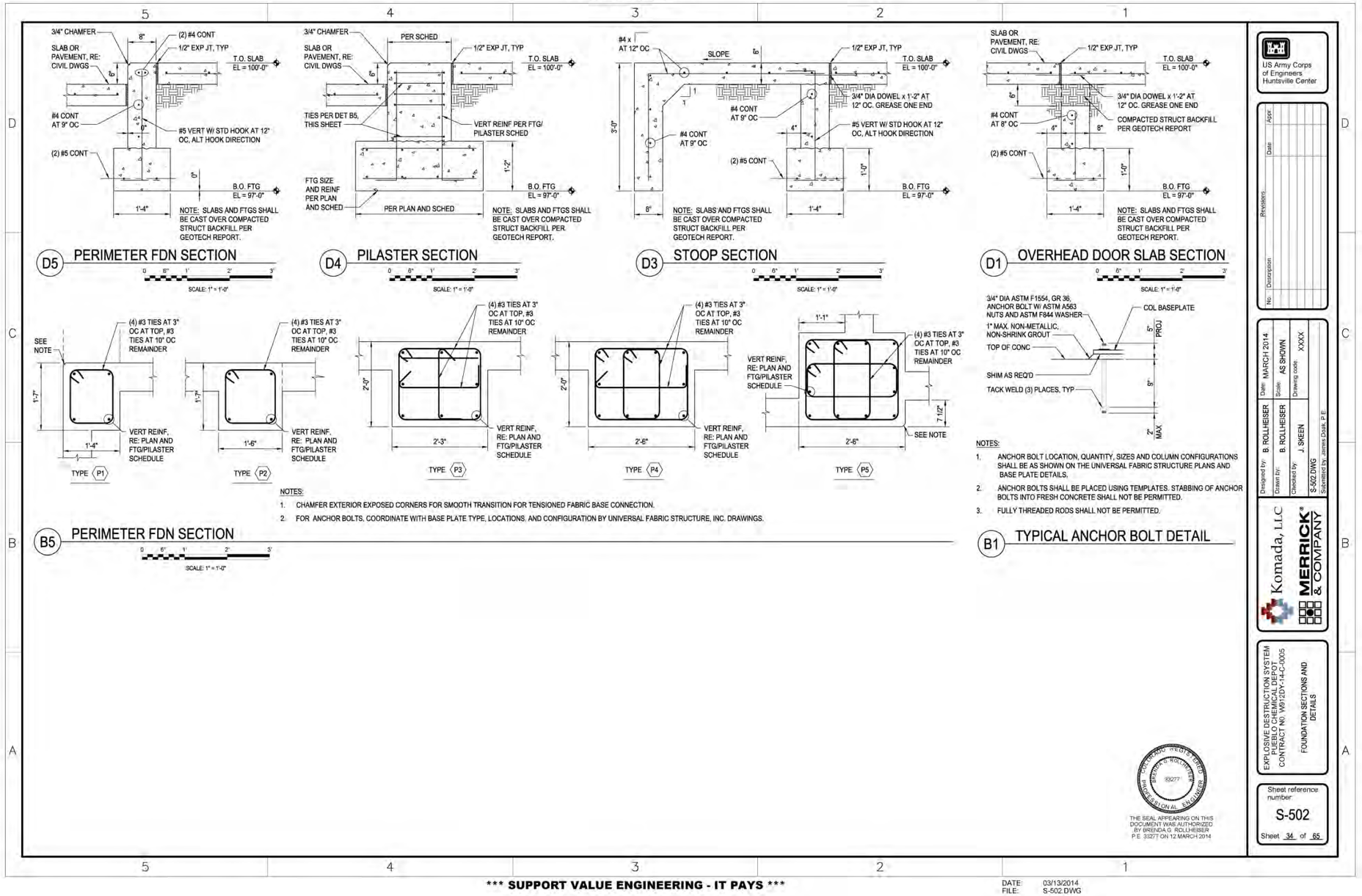


Figure Appendix 8-1-7. Foundation Sections and Details

- ACI 315, Details and Detailing of Concrete Reinforcement
- ACI 318, Building Code Requirements for Reinforced Concrete.

Concrete for structural slabs shall have a minimum 28-day compressive strength of 4,500 pounds per square inch (psi). All other concrete shall have a minimum 28-day compressive strength of 4,000 psi. Further information can be found in Section 03 30 00, Cast in Place Concrete, Merrick & Co. Interim Submittal (provided electronically on compact disc in **Appendix Attachment 8-1-1**).

1.1.6 Reinforcement Design. Reinforcement design is detailed in Merrick & Co. drawing S-501, Concrete Foundation Sections and Details (**Figure Appendix 8-1-6**), and will be in accordance with specifications Section 03 30 00, Cast in Place Concrete, Merrick & Co. Interim Submittal (provided electronically on compact disc in **Appendix Attachment 8-1-1**).

1.2 Bulk Chemical Storage

The chemical MEA is required for the PCAPP EDS site operation. This chemical, as well as others, will be delivered on an as needed basis and stored onsite at the general storage igloo H1101.

1.3 Water Supply and Distribution System

Potable water will be used for process water via a supply line and will be supplied by Pueblo Chemical Depot (PCD) to the PCAPP EDS site.

1.4 Power Generators

The primary power source will be shore power provided by PCD. A backup 800-kilowatt (kW) diesel-powered generator will be used as the emergency power supply should the primary power fail.

1.5 Utility Support Trailer

The PCAPP EDS site will include a Utility Support Trailer consisting of a 5-ton Cargo Sport Trailer with 11,000-pound capacity, a 5 kW portable generator, a workbench, and storage for tools and spare parts.

1.6 Air Compressors

The PCAPP EDS site will have separate air compressors; one will supply air to power the transfer pumps that pump liquids into the EDS Containment Vessel and any liquid wastes out of the EDS trailer secondary containment pan; and the other will be used to supply breathing air.

2.0 ENVIRONMENTAL ENCLOSURE AND SUPPORT SYSTEMS

Each EDS Environmental Enclosure and support systems will be comprised of the following:

- Enclosure structure
- Air Filtration System (AFS)
- Utility systems, including electrical distribution, lighting, water, station air, air conditioning (including heating as applicable), and breathing air.

2.1 Enclosure Structure

Each EDS unit will be placed inside an Environmental Enclosure that provides weather protection and interior environmental control for worker comfort and safety. Each enclosure will have two AFS units side by side (operating in parallel) that contain a carbon filtration unit to maintain a negative pressure within the structure relative to the outside air and to capture any vapors that may result from a release.

The main span of an enclosure will house the EDS unit and provide sufficient additional space for equipment storage and movement without interfering with treatment operations. An unpack area and a Personnel Decontamination Station (PDS) will be provided.

To prevent any spills or leaks from reaching soil, groundwater, or surface water, a portable berm will be placed atop the entire enclosure floor space as described in Section 1.1.2 of this appendix. Additionally, separate secondary containment is provided for the EDS Containment Vessel, Reagent Supply Subsystem, and liquid waste containers. See **Table 8-4** for information on secondary containment provided for the EDS Containment Vessel and Reagent Supply Subsystem. All secondary containment

will have the capacity to hold 100 percent of the volume of the largest container or 10 percent of the total volume of liquids contained within.

The enclosures will be equipped with doors for entrance and egress and will be connected to the AFS units, each consisting of pre-filters, high efficiency particulate air (HEPA) filters, and sulfur-impregnated carbon (SIC) filters along with an agent monitoring system, fan, and ductwork.

The Environmental Enclosure is a tent-like, all-weather, mobile shelter consisting of a series of arched rigid ribs and tentage. The Environmental Enclosure is a commercially available structure that meets the following requirements:

- Memorandum for *U.S. Army Chemical Materials Agency on DDESB Final Approval for Consolidation and Revision of the System Approvals for the Explosive Destruction System (EDS) Phase 1 and Phase 2 Units*, dated 16 September 2010.

- MIL-STD-1472 – *Human Engineering Design Criteria for Military Systems, Equipment, and Facilities*.

- National Electrical Code (NEC), National Fire Protection Association.

The interior volume of an Environmental Enclosure will be 48,000 cubic feet; the airlock interior volume will be 6,500 cubic feet. The structure will be designed so that no life-safety threat is created by the loss of any portion of either the interior or exterior membrane, and the framing will not rely on the tensioning of the exterior membrane for its stability or rigidity. The structural membrane will be designed such that it meets the same load requirements as the structural frame. The minimum membrane safety factors will be (for allowable stress design): 4 for Wind Load, 5 for Snow Load, and 8 for Prestress + Dead Load.

The enclosures will meet the following minimum design criteria per the Universal Fabric Structure (UFS) Permit Drawing Package from Universal Fabric Structures, dated March 2014:

1. Basic Wind Speed: 120 miles per hour; 3-second gust

2. Wind Exposure: Category C

3. Ground Snow Load: Suitable for use in areas of all rated snow loads due to snow shedding performance

4. Occupancy Category: III

5. Collateral Dead Load: 1.0 pound per square foot (vertical projection, equally distributed on frames).

Enclosure design drawings are provided as **Figures Appendix 8-1-8** through **8-1-12**.

Additional information on the Environmental Enclosure design, including framing support, materials of construction, maintenance, and product data sheets are provided in the UFS Permit Drawing Package from Universal Fabric Structures, dated March 2014 (provided electronically on compact disk in **Appendix Attachment 8-1-1**).

2.2 Environmental Enclosure AFS

Each Environmental Enclosure will have two AFS units placed side by side that will operate independently of each other. The AFS minimizes the potential for airborne contaminants released from operating the EDS units.

The AFS contains a modulating flow control damper, a filter housing containing a prefilter, HEPA filter, two high-efficiency gas adsorber (HEGA) filter banks in series, another HEPA filter, and an exhaust fan powered by a motor. The exhaust fan, in conjunction with the modulating damper, maintains a constant flow rate through the carbon filter unit. The filter unit draws air from the Environmental Enclosure. The Environmental Enclosure will be maintained at negative pressure relative to the atmosphere by manually throttling the air intake damper. The carbon filter unit discharges to the environment.

The prefilter is designed to remove large particulate matter from the air stream prior to reaching the downstream HEPA filter. The upstream HEPA filter protects the HEGA filters from particulate matter and the downstream HEPA traps any carbon fines that escape from the HEGA filters. Prefilters, HEPA, and HEGA filters are replaced when the pressure drop across individual filters exceeds established criteria. The carbon bed control efficiency exceeds 99.9 percent for chemical agent.

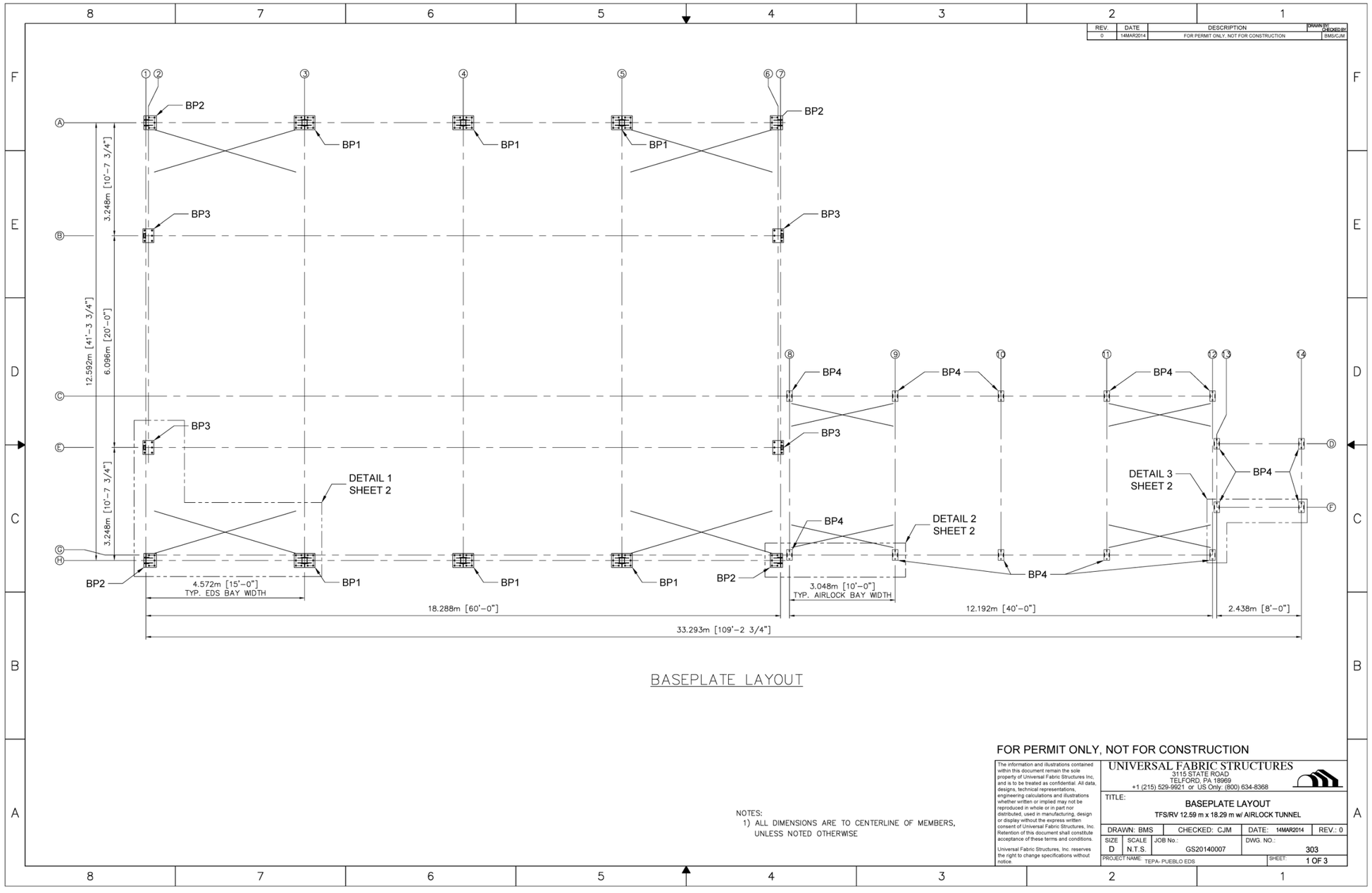


Figure Appendix 8-1-8. Baseplate Layout (Sheet 1 of 3)

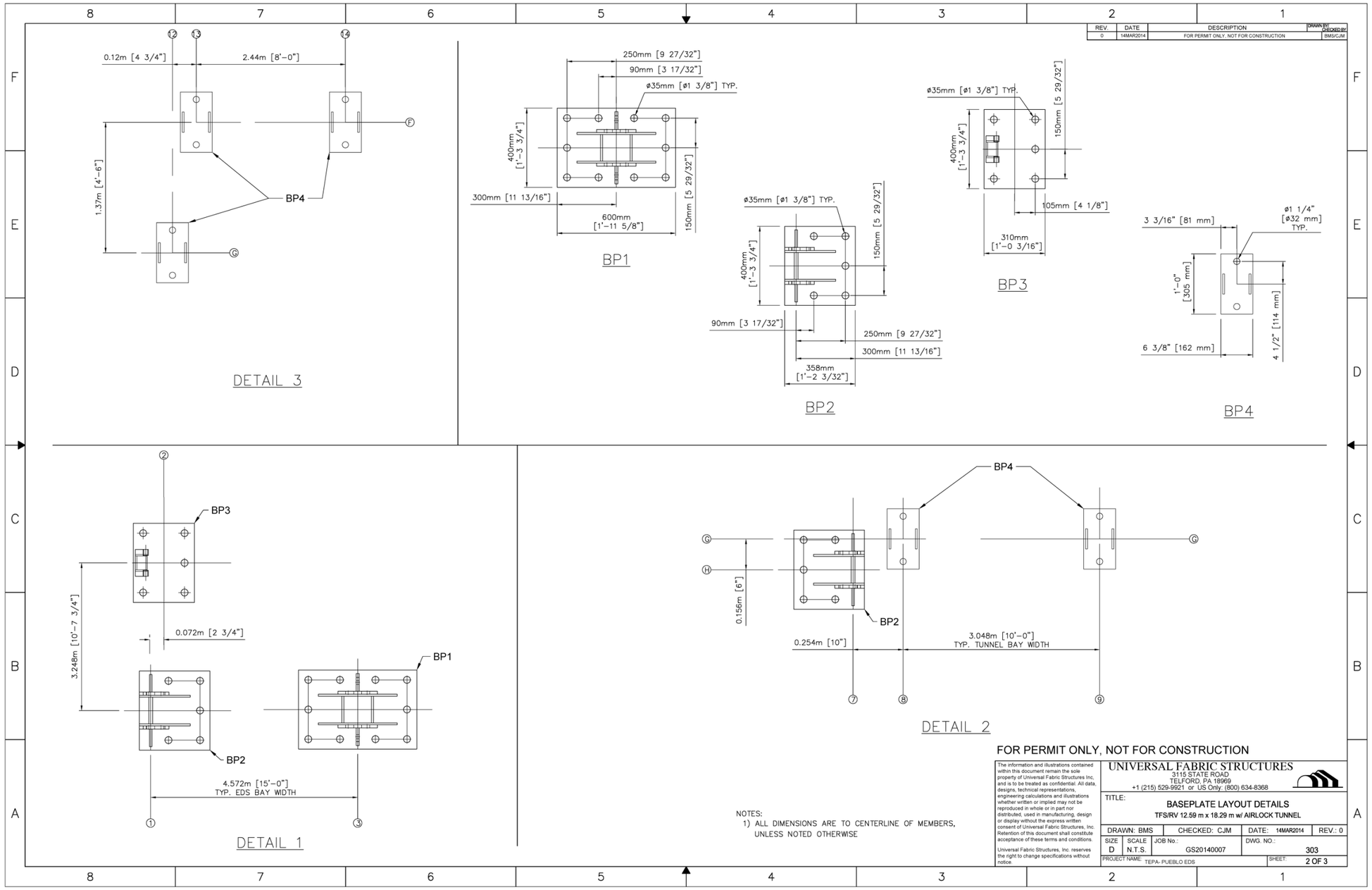


Figure Appendix 8-1-8. Baseplate Layout (Sheet 2 of 3)