CONCRETE OVAL-ARCH STD 421-80-09 NARRATIVE

Background:

DDESB approved the COE Drawing 33-15-74 in 1980 as a 7-Bar ECM with an allowable Net Explosives Weight (NEW) up to 500,000 lbs HD 1.1 explosives. The drawings were revised in 1998 including revisions for lightening protection. The internal dimensions are 25’ wide by 90’ maximum (normally length is 60’ or 80’) by 14’ high (largest clearance at the center of the magazine). The magazine has a single entrance with 2 sliding door-size options, 10’-0” wide by 10’-0” high or 8’-0” wide by 8’-0” high.

Purpose:

COE Standard 421-80-09 replaces the previous COE Standard 33-15-74. The new series updates the drawings to meet current AEC CAD standards, improved plan readability, constructability, and correct omissions within the construction drawings. Various inconsistencies with current criteria were recognized in the blast-resistant reinforced concrete elements of the old standard. Therefore, each headwall component has been re-analyzed under the 7-bar blast loading from DoD 6055.09-M paragraph V2.E5.5.2.4.2 using the methodology of UFC 3-340-02. The remaining components are as originally designed in the following documents. The door design is taken from Office, Chief of Engineers, Standard Drawing 33-15-73, designed by Black & Veatch in 1973. The rear wall and arch are taken from US Army Engineer Command, Europe, Drawing 33-15-13, designed by Amman & Whitney in 1963. In addition to the drawings, a conventional structural load analysis was performed to identify some key loading limits, which will assist the designer during the site-adaption process. A new retaining wall design was completed to simplify the design and construction of the wing walls. Many upgrades were made to the drawing package to improve the drawings in an effort to enhance construction of all new magazines.

The following is a condensed list of some notable changes made to the Standard 421-80-09 drawings:

- Modified headwall pilaster flexural reinforcement to be equal on each face
- Pilaster and header beam closed tie spacing was made uniform throughout span
- Added shear stirrups in front wall between floor slab and arch
- Modified main and secondary reinforcement in front wall as required in calculations
- Added longitudinal torsion reinforcement to pilasters
- Added longitudinal skin reinforcement to header beam
- Lightning protection system and grounding design was revised to include rolling ball
- Doors were revised to provide both high security hasps and internal locking devices

- Provided depth gauges at the top of the arch to improve the earth cover inspection process
- Removed key from retaining wall foundation to simplify construction and excavation of soils.
- Eliminated multiple rebar sizes and minimized changes in spacing in the wing wall to ease site adaption design and rebar placement during construction.
- Added general notes to provide information on assumptions made during design and expectations during construction.
- Updated lap slice length and developmental lengths to conform to current ACI standards.
- Changed the S7x15.3 trolley track to S8x18.4 due to the S7x15.3 no longer being produced.
- Provided a detail (see Detail A/S305) to clarify the reinforcement at the header-to-pilaster intersection.
- Replaced the L6x3½”x1/4” angle at the door jambs to L6x3 ½” x 5/16” since it wasn’t an AISC structural shape.
- Replaced the strap anchors with headed studs around door jamb and header, at track bracket, and door extension.
- Revised the references to damp proofing (waterproofing) to waterproofing only.
- Added the #4 bars at 5’-0” o.c. clipped, brazed, or welded to floor and wall reinforcement at the portal and rear walls.