

TDS-NAVFAC EXWC-CI-1401

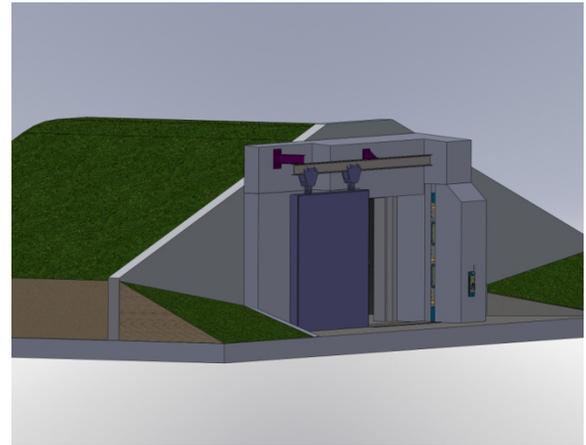
**New Earth Covered Magazine (ECM) Design**

**December 2013**

## **Technology Description**

The U.S. Navy Physical Security Enterprise and Analysis Group (NPSEAG) tasked the Naval Facilities Engineering and Expeditionary Warfare Center (EXWC) to develop new designs for a family of four modular earth-covered magazines. The requirements for this effort are supported by the Naval Ordnance Safety and Security Agency (NOSSA) and the Navy Munitions Command (NMC).<sup>1</sup>

The new Modular Earth Covered Magazine (ECM) designs are constructed from a combined system of pre-cast concrete panels and cast-in-place concrete. Each of the four Modular ECMs may be described as a reinforced concrete box structure with rear, side and front walls. The maximum interior dimensions of this Modular ECM are 80 feet long by 27 feet wide by 14.66 feet tall. Based on user requirements, the magazine may be built in 20-foot, 40-foot 60-foot or 80-foot lengths. Soil cover includes roof soil and sloped earth berms extending from the side and rear walls of the magazine



## **Value to the Warfighter**

The new Modular ECM designs satisfies conventional design codes, protective construction design criteria, ordnance-handling requirements, and enhanced physical security protection criteria. The design objective is to take advantage of modularity to fit the mission, rather than constructing an assortment of large Earth Covered Magazines (ECMs). Subdividing the total explosives weight among smaller Modular ECMs allows a significant reduction in land encumbered by the explosives safety quantity distances.

The new door and locking system provides a level which meets and can exceed the required access delay for high threats as defined in DoD 5100.76M. Integrated sensors provide intrusion detection and situational awareness in the magazine area.

<sup>1</sup>

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### **Economics of the Technology: ROI or Payback**

To support P-220 MILCON, NOSSA and NMC conducted an initial assessment of the Standard Modular ECM to brief CNO and ASN (I&E) on the use of this ECM design. Based on the assessment, the new Standard Modular ECM, with a reduced design explosive weight for each single facility, allows the land encumbered by ordnance storage facilities and their required explosives safety quantity distances to be reduced by up to 80%.

State of the art pre-cast, improved strength concrete combined with cast in-place concrete allows for rapid, economic construction of multiple smaller facilities, offering a potential savings of 25-50%. The objective is to build two Standard Modular ECM for the cost of one Navy Type C ECM.

### **Technology Transition Documentation**

NAVFAC Atlantic and NAVFAC EXWC obtained initial DOD Explosives Safety Board approval for the Navy Standard Modular Earth Covered Magazine (ECM) design drawings on 23 Jan 2013. These drawings are supporting the P-220 and P-425 MILCON projects.

NAVFAC EXWC has published a technical report which: (1) identifies policy and technology gaps for AA&E storage logistics, (2) defines the physical security, seismic, operational safety, and explosives safety standards, and (3) recommending the design path forward for a final, standardized, DDESB-approved design.

### **Specific Applications**

The Type C and Type D ECMs provide excellent service for the majority of Navy ordnance storage requirements, the Navy and Marine Corps need a less expensive large sliding door RC Box ECM that would permit the construction of 2 or more 7 bar rated RC Box ECM for the cost of Type C or D ECMs. The driver for this requirement is the need to break required ordnance load into multiple smaller loads to reduce the maximum creditable event (MCE) to 45,000 class/division (C/D) per magazine with a resulting minimum inhabited building distance (IBD) of 1250 feet.

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