National Defense Industrial Association
International Explosives Safety Symposium & Exposition
San Diego, California
August 6-9, 2018

Planning Considerations for Munitions-Related Infrastructure

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Examples of Munitions-Related Infrastructure

- R&D Facilities, laboratories or other similar facilities (energetics related)
- Loading docks where munitions are loaded and offloaded
- Transportation holding yards where munitions are staged
- Maintenance buildings where munitions are inspected, maintained, upgraded, or prepared for shipment
- Explosives operating areas
- Munitions storage facilities
- Aboveground structures such as operating buildings or line offices

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Aging Earth Covered Magazines (ECMs)

Photo credit:
http://www.mcaap.army.mil/_docs/info/Brochure_4_Internet.pdf

Photo credit:
https://www.peoacwa.army.mil/bgcapp/

- Most ECMs are World War II vintage by design and construction
- Pre-1970 structures most likely do not meet current siting or blast design requirements
  - "Grandfathered" – explosives safety site plans not required pre-1970
  - ECM blast load design requirements revised significantly in the 1970s

Old Facilities vs New Weapons/Operations

- Older ECMs may not meet current operational needs
- Existing production facilities being repurposed but blast design features don't meet current requirements

Photo credit: USMC, PM Ammo Marine Corps Systems Command

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Sub-Optimal Planning

- Explosives facilities and exposed facilities within explosives safety arcs
  - Built without site plan approval
  - Site plan approval sought too late to identify major issues
- Facilities can’t be used as intended
  - Explosive weights reduced, operational limitations imposed, etc.
  - Impacts mission and wastes scarce resources

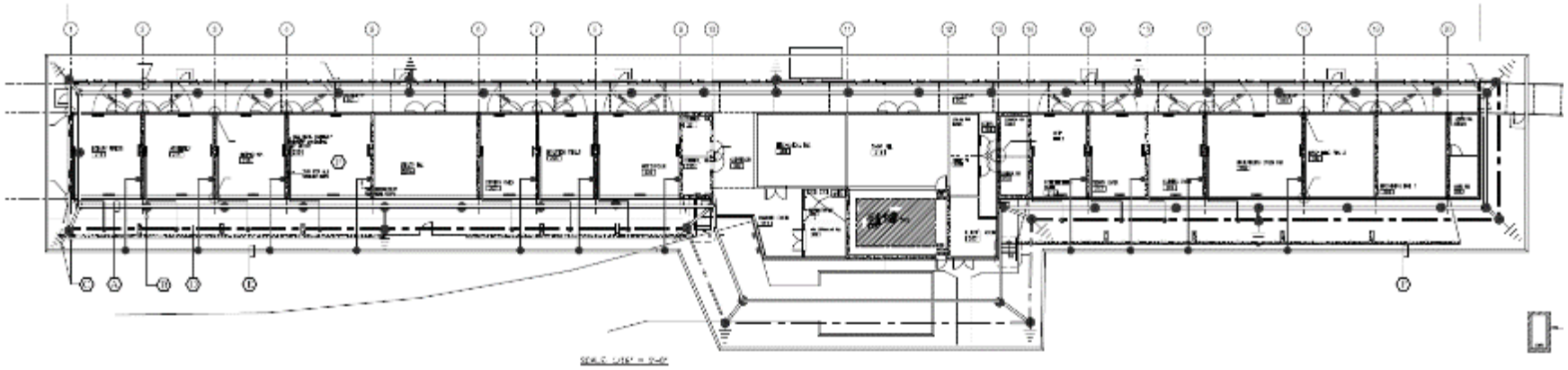

Photo credit: Department of Defense Explosives Safety Board

Photo credit: Air Force photo by Senior Airman Perry Aston

Actions Underway

Action 1 – Determine if the current infrastructure is deficient & plan for replacement

- ECM Infrastructure Assessment Study
- Navy Explosives Facility Planning
- ESS Software & EES Database
- DDESB TP-15 & WBDG
- Standard Designs

ECM Infrastructure Assessment Study

- There are approximately 25,000 ECMs in DoD's inventory, with most built during the World War II era – approaching 75 years of service
- DDESB is sponsoring a comprehensive study of DoD military munitions ECMs to better
  - Understand risks to infrastructure
  - Assess overall "structural health" of ECMs as related to their intended use for storage of explosives
- The study will inform a long-term plan for the assessment, maintenance, and replacement of AE storage facilities including ECMs to
  - Ensure continued ability to support the mission
  - Manage risk
  - Protect the public

DDESB TP-15

- DDESB TP-15, Revision 4
  - Incorporates new approvals
  - Revises ECM tables to pare down Table AP1-1 to current designs that the Services want to limit new construction to
  - Technical draft being finalized
- DDESB TP-15 Future
  - Long-term goal for TP-15 to be an online “living” document for access by approved users, to include background information
- Improve ties to WBDG

Standard Designs

- DDESB FY18 Study – Standard ECM Design Updates
  - Determine and prioritize Service needs for standard ECM designs. Determine which standards are obsolete and which are used and must be maintained. Identify Service AE storage and operational requirements that aren't adequately or efficiently met by current standard designs. The draft TP-15 Rev 4 Table AP1-1 will be the starting point for this task.
  - Implement minor corrections/modifications to recently updated Army standard ECM designs based on lessons learned and RFIs from site-adapted designs.
  - Investigate development of a "small ECM" design. Apply Service input on AE storage and operational needs (minimum interior dimensions, door sizes, explosives limits, etc.) to develop definitive ECM drawings.

Action 2 – Update policy and standards to improve infrastructure planning

- Acquisition/Infrastructure Planning Harmonization Initiative
- Updates to Explosives Safety Policy
- Involvement in UFC Documents
- ECM Design Analysis, Modeling & Testing
- Other DDESB FY18 Studies
- Criteria Development for Tomorrow's Weapons

Involvement in UFC Documents

- UFC 3-340-02, Structures to Resist the Effects of Accidental Explosions (formerly TM 5-1300)
- UFC 4-420-01, Ammunition and Explosives Storage Magazine
  - Initial issue in May 2015
- UFC 3-600-01, Fire Protection Engineering for Facilities
  - Provided updated input for explosives facilities for the 2016 version
- UFC 3-260-01, Airfield and Heliport Planning and Design
  - Provided updated input for explosives facilities that will be incorporated in next version
- UFC 2-100-01, Installation Master Planning
  - In the process of developing comments
- DDESB FY18 Study
  - For the purposes of integrating explosives safety into the DoD facility planning process, conduct a research effort of existing planning and design documentation. Determine in which documents explosives safety is addressed and in what nature. Identify any additional documents where it should be addressed or expanded.

ECM Design Analysis, Modeling & Testing

- DDESB organized an ECM Technical Exchange Forum hosted by USATCES on 13-15 June 2017
- Identified four aspects of ECMs that require further research and investigation:
  - **Legacy Flat-Roof ECMs.** Safely maximize the storage capacity of legacy flat-roof ECMs that do not meet current blast-loading criteria.
  - **ECM Intermagazine Distance Design Loads.** Validate that correct headwall and flat-roof design loads are applied to all new ECM designs.
  - **ECM Debris Hazards.** Investigate the debris hazard generated by an ECM in the event of an accidental detonation & the resulting debris inhabited building distance as a function of ECM direction (i.e., front, side, or rear).
  - **ECM Earth Cover Requirements.** Define a reasonable path forward in the event that the earth cover on top of the ECM becomes less than the required two feet due to erosion & define erosion prevention solutions that have a negligible impact on explosives safety.

Other DDESB FY18 Studies

- Protective Construction Design Roadmap for AE Firms
  - Develop roadmap/state of practice guidance document to be presented at the IESS&E on available criteria/tools for analyzing/designing protective construction for explosives safety applications. Likely points of emphasis include:
    1) Explaining the basis of protective construction criteria (e.g., testing of/accidents involving typical DoD/Service explosives storage/operating configurations).
    2) Highlighting the challenges an AE may face when deviating from these configurations.
    3) Reviewing DDESB's blast effects and protective construction analysis/design guidance documents/criteria, noting their permissible uses/limitations.
- Protective Construction Guidance for HD 1.3
  - Develop a study proposal and/or test plan to develop protective construction guidance for accidental HD 1.3 ignitions. Long-term goals are to:
    1) Develop analytical procedures/guidance for assessing whether thermal hazards will be contained in a typical DoD explosives operating cell (reinforced concrete side and side wall extending through roof) that includes some means for evaluating thermal hazards beyond doors and penetrations in these concrete walls
    2) Develop design criteria for eliminating/mitigating thermal hazards at doors and other penetrations (e.g., acceptable door seal materials/configurations).

Actions Underway

Action 3 – Improve communication

- Develop informational tools and videos
- Promote use of ESS by master planners
- Continue participation in real property and master planning events


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