



DEPARTMENT OF DEFENSE EXPLOSIVES SAFETY BOARD  
2461 EISENHOWER AVENUE  
ALEXANDRIA, VIRGINIA 22331-0600

DEC 24 1998

DDESB-KO

MEMORANDUM FOR DIRECTOR US ARMY TECHNICAL CENTER FOR  
EXPLOSIVES SAFETY (ATTENTION: SIOAC-ES)

SUBJECT: Safety Site Plan Submittal of Engineering Drawings and Specifications for  
Ammunition/Explosives Standard Earth-Covered Magazines (ECMs)

Reference: Letter from SIOAC-EST (Kenyon L. Williams) to Chairman DDESB, "Safety Site  
Plan Submittal of Engineering Drawings and Specifications for  
Ammunition/Explosives Standard Earth-Covered Magazines (ECMs) (SIOAC  
File No. 1319)," (7 Dec 1998)

The subject site plan forwarded by the reference has been reviewed with respect to  
explosives safety criteria. The site plan requests approval of 799 earth-covered magazines  
located at the Sierra Army Depot as 7-bar ECMs for storage of up to 500,000 pounds explosives  
material.

The ECMs were constructed in 1942, IAW Drawings 652-686 to 652-692. The ECMs were  
called 'STANDARD TYPE (Fully Reinforced)' at the time they were constructed. Originally  
there were 600 each, 80-foot long and 200 each, 60-foot long magazines. Siting requirements at  
that time were to space the ECMs at 400 ft (approximate) intervals. Information provided  
indicates that the 799 extant magazines are properly spaced at approximate 400-foot intervals.

Two issues are addressed in this memorandum, namely the structural robustness and the  
lightning protection system (LPS) of subject magazines.

An ECM constructed IAW Drawings 652-686 to 652-692 is not robust enough to qualify as a  
7-bar magazine. However, it is robust enough to protect its contents if it is spaced about 400-  
foot from a detonation of 500,000 pounds in an adjacent earth-covered magazine.

Present criteria in DoD 6055.9-STD (Chapter 7, Section C.1.c.(2)) requires, "The reinforcing  
bars in adjacent structural elements must be joined in a manner to provide electrical bonding  
between the elements. This is an absolute requirement for facilities that are used to store  
ammunition. Techniques commonly used and approved in the construction industry to join  
reinforcing steel are acceptable for this purpose. The steel arch of an earth-covered magazine  
must be similarly joined to the rebar in the floor." Information in Drawing 652-687 show that  
this requirement is not satisfied for magazines constructed with 'Medium' and 'Rock Only'  
footings. The same drawing implies an intent to satisfy the criteria for other types of footings.



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Recommendations of this site plan are approved with the following provisions:

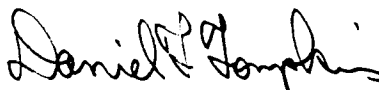
Although the magazines at Sierra Army Depot satisfy NFPA 780 requirements, it is likely that magazines constructed with 'Medium' and 'Rock Only' footings do not satisfy present requirements for electrically continuous reinforcing steel. ECMs at Sierra must be examined for their LPS characteristics before final approval is given. Advise this office of your plans for examining the subject ECMs and of the date you expect the examination to be completed.

Magazines constructed IAW Drawings 652-686 to 652-692 are approved for the storage of up to 500,000 pounds of explosives provided they are spaced at approximately 400-foot intervals from each other and provided they are shown to satisfy the LPS requirements noted above.

Records at DDESB show that magazines, similar in design and spacing, to those at Sierra were also constructed at Anniston, Letterkenny, Milan, Portage, Red River, San Jacinto, Seneca, Umatilla, and Wingate. The content of this memorandum is also applicable to these other sites.

A copy of the complete site plan package and this letter of approval must be retained as a permanent record at the installation. Master planning documents and installation drawings must be updated to show these clear zones.

Point of contact is Dr. Chester E. Canada, DDESB-KT2 (PH: 703-325-1369, FAX: 703-325-6227, E-MAIL: canadce@hqda.army.mil).

  
DANIEL T. TOMPKINS  
Colonel, USAF  
Chairman

DDESB-KT2

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The subject site plan forwarded by the reference has been reviewed with respect to explosives safety criteria. The site plan requests approval of 799 earth-covered magazines located at the Sierra Army Depot as 7-bar ECMs for storage of up to 500,000 pounds explosives material.

The plan for examination of the magazines at Sierra and like magazines elsewhere can, and probably should, be statistical in nature. Such examination will require a lengthy period and will likely be costly. The desirability of DDESB's participation in the planning stages appear self-evident. I recommend such participation if DDESB is given the opportunity.

*Dr. Chester E. Canada*  
Dr. Chester E. Canada, DDESB-KT2