CHAPTER 1

INTRODUCTION

1-1. Scope.

a. Focus. The focus in this pamphlet is on electromagnetic pulse (EMP) produced by nuclear explosions at high altitudes (high-altitude EMP, or HEMP). Herein, the terms EMP and HEMP are used synonymously. In many cases facilities are not targeted for other nuclear effects and a HEMP event is the worst-case scenario for ground-based facilities. Therefore, many protective measures described herein will also protect against some other electromagnetic environments.

b. Subjects not covered. Specific protection methods for other types of EMP, such as source-region EMP and surface-burst EMP are not covered. In addition, this pamphlet does not cover protection against other effects of nuclear explosions (for example, blast overpressure &d thermal/nuclear radiation).

c. TEMPEST problem. The TEMPEST problem is nearly the inverse of the HEMP event. TEMPEST is the unclassified name for the studies and investigation of compromising emanations. Equipment within the facility can be the source of electromagnetic waves and stray currents/voltages with characteristics which are related to the information content of signals being processed. If these unintentional emissions are intercepted and studied, the analyst can reconstruct the original data and could gain access to national security information A proper TEMPEST design, however, will preclude the presence of analyzable signals in uncontrolled areas.

d. Common treatment. Thus, HEMP and TEMPEST protective measures must each control electromagnetic energy, the former protecting system equipment from externally generated signals and the latter containing emissions from internal sources. The functional similarities imply that a common treatment can be employed for the two purposes.

1-2. Application. Information in this pamphlet is applicable to engineers responsible for the design, construction, and maintenance of mission-critical facilities, such as those supporting the command, control, communications and intelligence network. The information is relevant to new construction as well as to additions, upgrades, and retrofits to existing facilities.

1-3. References. This pamphlet is intended to stand alone and, as such, no additional references should be required to understand the material herein. However, only a small sample of the material published on HEMP and TEMPEST can be highlighted here. Because different facilities will have differing requirements for protection, supplementary sources are listed at the end of

most chapters to assist the engineer in designing protection on a case-by-case basis.

1-4. Background.

a. Reliance on electronic technology. Military facilities are becoming increasingly reliant on automated systems that take advantage of modern electrical and electronic technology. Facilities are equipped with state-of-the-art computerized systems for expeditious, reliable, and cost-effective operations. However, the electromagnetic (EM) properties of many electronic components can make entire systems susceptible to upset or permanent damage due to the environmental effects of EMP. Systems are also susceptible to the compromise of security information by the unintentional intelligence-bearing emanations of electromagnetic signals. Thus, with the benefits of automation has come an increased vulnerability.

b. Early planning. Techniques to protect a facility are usually selected during the early design phase. If it is anticipated that a facility may someday acquire equipment that must be protected, early planning can avoid costly retrofitting later. The decision to harden will be based on the interaction of mission criticality, electromagnetic environment, security requirements, and costs.

c. Far-reaching effects. HEMP is dangerous because this event has far-reaching effects at distances where other nuclear environments are either nonexistent or inconsequential and because of its high level of broad spectral energy. However, the spectrum included under HEMP does not cover all EM environments. For example, the characteristic pulse risetime and possible conducted current waveforms for lightning differ from those for HEMP; thus, hardening against HEMP does not necessarily protect against lightning.

d. Evolving technology. It is important to note that this field is relatively new and that technical expertise is still evolving. Therefore, it is the designer's responsibility to stay current with new developments to assure the most cost-effective reliable configuration for vital military fixed facilities.

1-5. Pamphlet organization. At the beginning of each subsequent chapter, there is an outline. The purpose of the outline is to provide more detail on the chapter's content than is ordinarily appropriate in a table of contents.