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CHAPTER 2

PLANNING, PROGRAMMING, AND EXPLOSIVES SITE PLAN APPROVAL

2.1 General

This chapter discusses the planning, programming, and explosives site plan (ESP) approval processes for munitions facility projects and describes the roles and responsibilities of the organizations involved in developing and approving munitions projects. The purpose of this chapter is to improve understanding among the functional players regarding roles, responsibilities, and functions of the inter-disciplinary team members.



Figure 2.1
A Multi-discipline Project Team
Facilitates the Planning
Process

Using a team approach upon project initiation ensures a well communicated and coordinated process. The team should include representatives from civil engineering (CE), munitions, weapons safety, security forces, communications, bio-environmental, and other organizations identified in the planning process. Early coordination with the Air Force Major Command (MAJCOM), Air Force Safety Center (AFSC), and the Department of Defense Explosives Safety Board (DDESB) is critical and should be accomplished through the appropriate installation level points of contact (POCs). The Wing/Installation Commander will provide the final approval for the facility requirements at the installation level.

2.2 Planning Process

Planning is essential to meet mission requirements while satisfying established facility, safety, and operational criteria. Due to the potentially lengthy ESP approval process, it is very important the planning/programming and ESP processes are initiated concurrently to prevent delays in actual construction. As shown in Figure 2.2, the munitions facility planning and approval process consists of the following five steps:

1. Identify Needs
2. Establish/Validate Requirements
3. Evaluate Alternatives
4. Select Preferred Alternative
5. Obtain Approvals



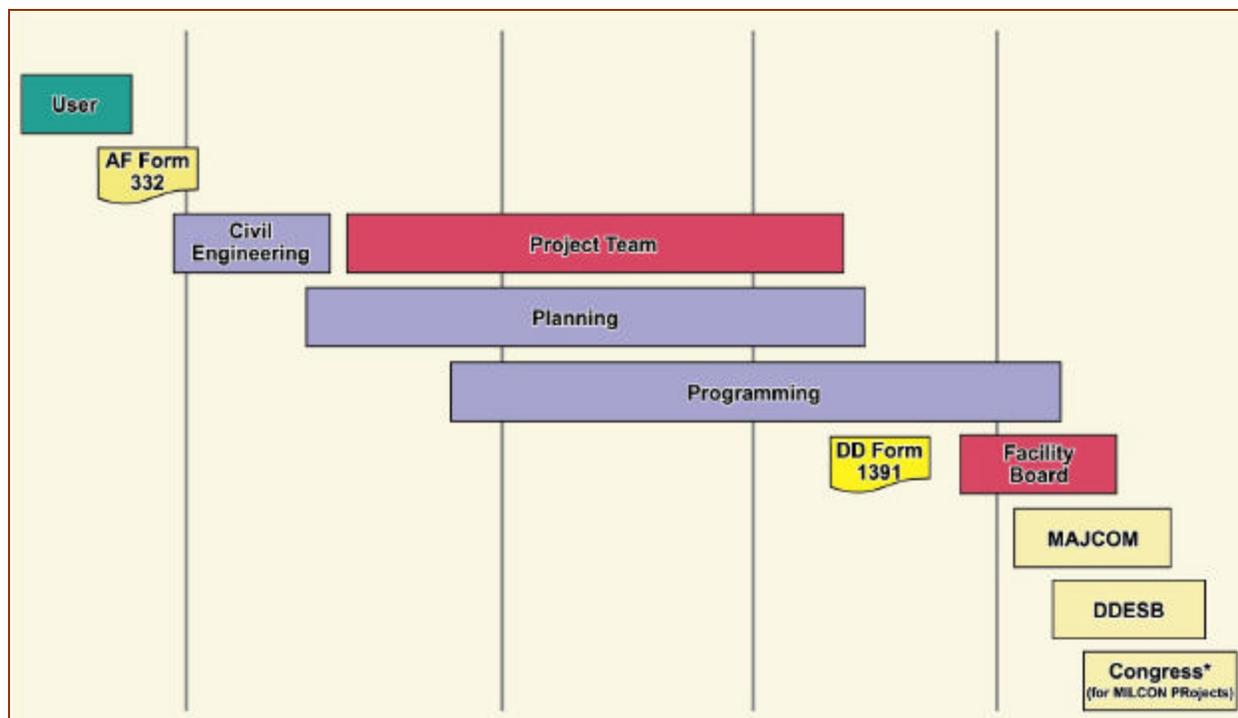


Figure 2.2
Munitions Facility Approval Process

2.2.1 Identify Needs

The planning process begins with the functional user submitting an [AF Form 332](#), **Base Civil Engineer Work Request** to the Base Civil Engineer (BCE). The requestor uses this form to identify proposed actions necessary to meet mission requirements and provides the basic information and justification that the BCE needs to evaluate the request and verify the need for the facility action. Specific needs are validated through:

1. Interviews with the requesting unit
2. Project team input
3. Air Force guidelines consultation
4. Review and evaluation of existing facilities

It may help to review [AFI 36-2217](#), *Munitions Requirements for Aircrew Training*, [AFCAT 21-209, Volume 1](#), *Ground Munitions*, and [AFI 10-503](#), *Base Unit Beddown Program*, as a precursor to calculating current and future needs.



Quantity-Distance (Q-D)

Q-D refers to the relationship between the quantity of explosive materials and the separation distance required to provide a certain degree of protection from an accidental explosion.

Q-D distances are measured from Potential Explosion Site (PES) to Exposed Site(s). The formula, $D=K \times \sqrt[3]{W}$, is used to calculate Q-D requirements, where:

D = required distance in feet;

K = protection factor depending on the risk assumed or permitted;

$\sqrt[3]{W}$ = cube root of the net explosive weight (in pounds).

Please refer to [AFMAN 91-201](#) for more information on K factors and calculating Q-Ds.

Types of Q-D separations are defined in Chapter 5 of this document.

Explosives Clear Zone

The area around a PES that is determined by the required inhabited building distance (IBD) separation. The IB separation will be based on the sited, waived, exempted, or actual explosives limits of the PES site, whichever is greatest.

2.2.2 Establish/Validate Requirements

Based on information provided by the user on [AF Form 332](#), the BCE will match the request with the appropriate facility type using CE Real Property Category Codes (Cat Codes) and conduct a facility needs assessment.

2.2.3 Evaluate Alternatives

CE and the Weapons Safety Manager (WSM) will consider alternatives to new construction such as renovation, replacement, or reassignment/conversion of facilities to meet the facility requirement. Each alternative will be evaluated using the following siting factors:

1. **Location.** Munitions storage and handling facilities should be sited within the installation's explosives clear zone. The facility location, where possible, should avoid creating Quantity-Distance (Q-D) violations. In some cases, a munitions facility may be located outside the explosives clear zone (or an installation may not have one established), and will require an explosives license (e.g., an armament shop, load crew training facility, and rocket check out and assembly facility). For additional information on licensing requirements, see [AFMAN 91-201](#), *Explosives Safety Standards*.
2. **Natural Environment.** The area should be assessed for grade, drainage, wetlands, flood plains, highly erodible soils, and shrink/swell conditions. See Section 3.2, "Site Design" for details.
3. **Size.** Site size depends primarily on the planned facility's function, square footage, and Q-D requirements. Site size calculations must accommodate anti-terrorism and force protection criteria, parking, and munitions handling and loading requirements and vehicle movement.
4. **Orientation.** As much as possible, the designer should orient the facility to take full advantage of the local site climate, considering factors such as wind, glare, and solar loading on the building and its physical plant equipment when possible. Facility orientation is also influenced by the Q-D requirements on the selected site as outlined in [AFMAN 91-201](#).
5. **Access.** The site should have adequate space to develop vehicle and pedestrian systems that allow for functional site access, circulation, and parking. The roadway network within the munitions storage area (MSA) should provide more than just one egress route from munitions facilities. It must also provide direct access to and from approved explosives traffic routes.



6. **Site Utilities.** The designer should ensure adequate potable water, sanitary sewer, electrical, and communications services to the site are provided as required by the facility function. Design and installation of site utilities must be in accordance with installation, MAJCOM, Air Force, and Department of Defense (DoD) standards. See Chapter 3, “General Design Standards” for more details on these items.
7. **Landscaping.** Vegetation control and landscaping should be used to enhance security and safety requirements. Erosion control is a primary use of new landscaping.
8. **Fire Protection.** When considering site utilities, the designer should ensure an adequate water supply (quantity and pressure) is available to suppress potential fires. If adequate supplies of water are not available to the location, alternative fire protection methods, such as dry chemical extinguisher, should be considered. The site must be large enough to accommodate firebreaks and allow direct vehicular access for firefighting equipment.
9. **Security and Force Protection.** When selecting sites, consider anti-terrorism/force protection stand-off requirements, resource protection, communications, and electronic security. Planning must include security measures (e.g., use of natural and man-made barriers, site distance, etc.) to meet Force Protection Condition (FPCON) requirements based on the type of assets located in the storage, operational, and administrative facilities.
10. **Work Flow.** The site should be designed to accommodate the efficient input and output of the munitions assets being inspected, stored, or maintained. Consider requirements for loading docks and government owned vehicle (GOV)/equipment parking locations.
11. **Functional Relationships.** Facilities should be located to enhance the supplier-customer relationship (e.g., ready use storage area in close proximity to the flight line, missile maintenance facility proximate to the missile storage facility, etc.) and minimize the distance between functions while complying with Q-D criteria.

The considerations listed above provide a basic framework for the project team in determining the optimum facility site.

2.2.4

Select Preferred Alternative

The project team will select a preferred alternative based on analysis of the alternatives identified. A risk assessment should be made of the impact on the mission if a mishap occurs using the Operational Risk

Force Protection Stand-Off Requirements

A distance between an asset and a threat is referred to as a *stand-off distance*. There is no ideal stand-off distance; it is determined by the type and level of the threat, the type of construction, and desired level of protection. See [UFC 4-010-01](#), *DoD Minimum Antiterrorism Standards for Buildings*, [DODI 2000.16](#), *DoD Antiterrorism Standards*, and the [U.S. Air Force Installation Force Protection Guide](#).



Management (ORM) process as outlined in the text box on page 2-7. Compensatory measures (e.g., earth barricades, etc.) should be factored into site improvements to minimize the damage of a maximum credible event (MCE). A MCE is defined as the largest quantity of explosives expected to explode at one time when an item in a stack or group of items is initiated or when explosives are stored at less than intermagazine distance apart. In determining the preferred alternative, the project team will consider other factors including cost, feasibility, and project completion date. The selected alternative must provide a workable solution for all involved parties without compromising the base's mission, safety, or the project's feasibility.

2.2.5 Obtain Approvals

The Wing/Installation Commander assumes responsibility for the risk associated with siting explosives operations and facilities. These risks are formalized in the ESP package submitted to the DDESB for approval.

2.3 Explosives Site Plan (ESP)

Cardinal Principle of Explosives Safety

Expose the minimum number of people to the minimum amount of explosives for the minimum amount of time. (AFMAN 91-201)

The Cardinal Principle of Explosives Safety is the foundation for selecting the right location for munitions facilities. The ESP is the product of the explosives site planning process for constructing or renovating explosives-related munitions facilities within the explosives clear zone. It details plans for locating explosive operations and facilities to minimize the potential effects of an accidental explosion on other assets, capabilities, and surrounding areas. The ESP is a key document used by management to enhance the safety of activities in an explosives clear zone and the areas surrounding a potential explosion site (PES). Figure 2.3 illustrates the ESP approval process.

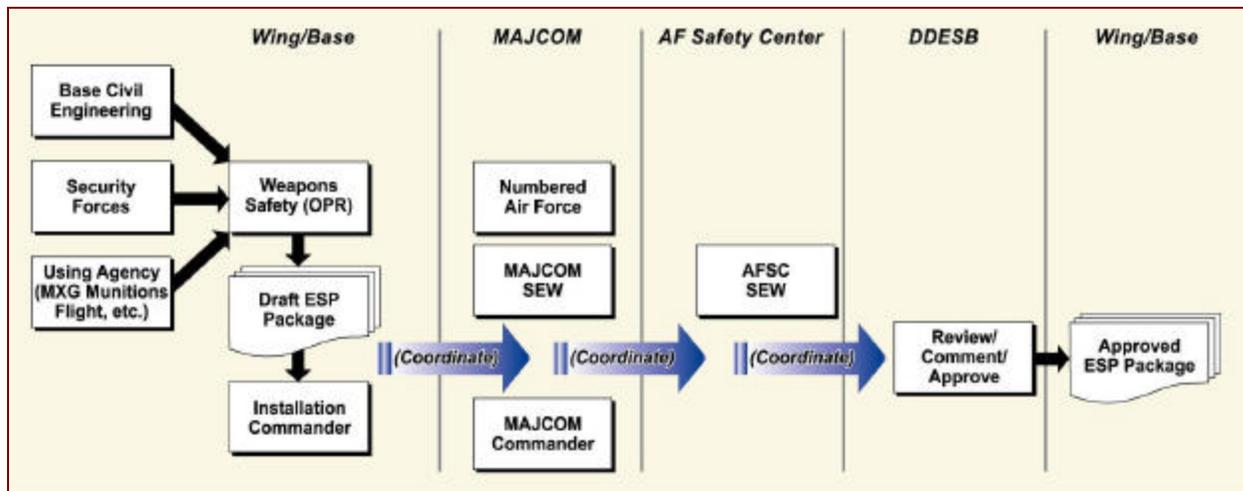


Figure 2.3
ESP Approval Process



An ESP is required whenever:

1. new facilities or operations are added,
2. the facility function is changed inside the installation's explosives clear zone, and/or
3. any new construction that will involve storage, maintenance, or other operations involving explosives.

An ESP is not required where a license has been issued to store munitions outside the MSA. It is extremely important to establish the ESP at the onset of the planning/programming process so the location may be assessed for impacts on Q-D requirements of munitions-related facilities and operations.

2.3.1 Explosives Site Plan Package

The installation WSM prepares and submits ESP packages with assistance from civil engineering, munitions, and other organizations. An ESP package contains all of the information necessary for the MAJCOM, AFSC, and DDESB reviewers to determine whether DoD and Air Force explosives safety requirements are met. [AFMAN 91-201](#) and [DoD 6055.9-STD](#), *DoD Ammunition and Explosives Safety Standards*, contain the primary instructions for siting explosives facilities. The former provides detailed and systematic guidance for preparing an ESP package for submission, while the latter provides direction on the Services' explosives safety requirements. The exact content of an ESP package may vary depending on the operation/facility being sited, but in general will include some or all of the following documents described in the following sections.

2.3.1.1 AF Form 943, Explosives Safety Site Plan/Waiver/ Exemption

This form includes a brief facility/operations description along with proposed explosives limits, location, and the hazard/class of the explosives to be stored or maintained in the facility. It also lists all exposed sites (ES) and PESs affected by Q-D requirements for the proposed facility. A comparison of the actual distance of the ES from the PES will determine if a Q-D violation exists, and if a waiver, exemption, or deviation is required (see Chapter 5, "References, Forms, Abbreviations and Acronyms, and Terms"). An evaluation of the proposed action must include the following:

1. **Impact on Mission if Mishap Occurs.** This section of the [AF Form 943](#) analyzes the effects of an MCE on the future of a mission, other facilities, and human health and safety. The level of risk the commander will assume with the new facility/operation is determined based on the MCE.

Additional Resources for Explosives Site Plans (ESP)

The following web site links provide additional information useful in the development of an ESP.

[Assessment System for Hazard Surveys \(ASHS\)](#)

A computer-generated tool that automates the site planning process.

[AFI 32-7062](#), USAF

Comprehensive Planning- Defines BCE roles and responsibilities regarding explosives site planning.

[OO-ALC Weapons Safety Home Page](#)

Provides several automated tools to calculate Q-D requirements for the ESP.

[Department of Defense Explosives Safety Board](#)

(DDESB)- Contains general information relating to DoD explosives safety policy decisions, explosives site planning, and links to other sites.

[Air Force Civil Engineer Support Agency](#)

(AFCESA)- Provides useful product and service information regarding lightning protection systems (LPS) and electrical ground systems.

[Air Force Safety Center](#)

(AFSC)- Provides Air Force-level review of all ESPs.



Operational Risk Management (ORM)

- For methods in reducing or eliminating risks in support of the ORM six-step process, refer to [AFPAM 90-902](#), *Operational Risk Management (ORM) Guidelines and Tools*.
- Use [AFMAN 91-201](#) and [AFI 90-901](#), *Operational Risk Management (ORM)*, as the primary source documents to calculate mission requirements and risks associated with a facility project.
- The following six-step ORM process applies to the ESP: (The entire ORM process and mandated training for all Air Force personnel is found in [AFI 90-901](#).)
 1. Identify the hazards.
 2. Assess the risk.
 3. Analyze risk control measures.
 4. Make control decisions.
 5. Implement risk controls.
 6. Supervise and review.

2. **Action Taken to Minimize Risk.** This section of the AF Form 943 explains compensatory measures implemented to minimize the damage of a MCE.
3. **Justification or Impact on Mission if Site Plan is not Approved** This section of the AF Form 943 explains why the proposed facility is required and justifies why this action is recommended. It explains the mission impact if the requested action is not approved.

2.3.1.2 Transmittal Letter

The transmittal letter explains the purpose of the ESP, identifies explosives safety issues, describes compensatory measures, and clarifies other issues affecting the project.

2.3.1.3 Commander's Risk Assessment

If the PES and ES relationship does not meet Q-D criteria, the Base/Wing Commanders will perform a project risk assessment to be summarized in the exception decision nomograph to be attached to the transmittal letter. Refer to [AFMAN 91-201](#) for guidance in preparing the nomograph. Projects not meeting Q-D criteria will require an exemption waiver.

2.3.1.4 Map

The ESP must contain a map illustrating proposed facilities and all PESs and ESs covered by the ESP.

2.3.1.5 Facility Drawings

Drawings should show applicable safety and protection features. If required, these drawings must show, as a minimum, the applicable safety and protective features to include dividing walls, vent walls, firewalls, roofs, operational equipment, ventilation systems and equipment, hazardous waste disposal systems, lightning protection and static grounding systems, process equipment, windows, floor layout, auxiliary support structures, and general construction materials.

2.3.1.6 Exception to Policy Letter

Departure from the standards in [AFMAN 91-201](#) may necessitate an exception to policy letter. Such exceptions may necessitate a Q-D waiver or exemption (i.e., not able to meet Q-D criteria), or a deviation from explosives safety policy (e.g., lacking lightning protection, too large of rocks in igloo earth covering material, etc.) if it is not possible to meet all of the rules of AFMAN 91-201 for the munitions facility construction project. The WSM will determine if an exception is needed to depart from the rules stipulated in [AFMAN 91-201](#).

1. **Waiver.** Applies to short-term violations of Q-D requirements that will be resolved within 5 years. The waiver includes proposed corrective action and anticipated get-well date.



2. **Exemption.** A relatively long-term departure from Q-D criteria (takes more than 5 years to resolve, or is a permanent departure from Q-D standards). If not a permanent exception, the exemption shall include a proposed fix date and plan of action to correct the deficient situation.
 - a. Use the [AF Form 943](#) to submit waivers and exemptions. The approval level for the waivers and exemptions varies depending on the duration of the problem, mission, level of risk, and period of time since a facility was constructed.
3. **Deviation.** Submit a deviation request when Q-D criteria are not compromised but there is a deficiency in meeting the other standards in [AFMAN 91-201](#). Use a memorandum to up-channel deviations to the approval level determined by the MAJCOM.

2.3.2 ESP Organization Responsibilities

The responsibilities of the personnel involved in the preparation and approval of the ESP are detailed below.

2.3.2.1 Using Organization

The using organization identifies a space or facility requirement based on a new mission, expanding mission, or the inadequate/substandard condition of current facilities. The using organization submits the requirement to CE via the [AF Form 332](#). The using organization coordinates with the organizations identified in the installation's Facility Project Manager Handbook. The using organization will maintain a copy of their submittals on file.

2.3.2.2 Civil Engineer

CE processes the [AF Form 332](#). CE will assist the WSM by providing the maps and/or drawings as applicable. CE will also ensure the WSM is apprised of all proposed actions planned within the explosives clear zone before design and construction begins.

2.3.2.3 Weapons Safety Manager

The WSM is notified of the facility requirement during the [AF Form 332](#) coordination process. The WSM determines the need for an ESP and coordinates with the using organization and the BCE to prepare the ESP. The WSM submits an ESP package using the Assessment System for Hazard Surveys (ASHS) whenever possible, or manually prepares an [AF Form 943](#). See [AFMAN 91-201](#) for an example of a completed AF Form 943. The WSM will maintain a file of all approved ESPs.



2.3.2.4 Wing/Installation Commander

The Wing/Installation Commander reviews the project plan and may or may not concur with the action. The Commander may offer recommendations, changes, or request further analysis. The Wing/Installation Commander's signature on the AF Form 943 represents his/her acceptance of all explosives safety risks, with or without exceptions, contained in the ESP package.

Air Force Safety Center (AFSC)

AFSC is the Air Force OPR for missile, nuclear, explosives, flight, space, and ground safety matters. AFSC analyzes and determines the application of safety standards for storage, transportation, and maintenance of munitions and construction of facilities for the USAF. They are the OPR for AFMAN 91-201, *Explosives Safety Standards*, and they serve as the Air Force review authority for all explosives site plans prior to submittal to the DDESB.

2.3.2.5 MAJCOM Weapons Safety Office (SEW)

The ESP package is forwarded to the MAJCOM/SEW with an information copy sent to the respective Numbered Air Force. The MAJCOM/SEW reviews the ESP package and may request clarification from the originator if questions arise or additional information is needed.

2.3.2.6 MAJCOM Commander

After the MAJCOM/SEW reviews and concurs with the ESP, the ESP is forwarded to the MAJCOM Commander for his/her signature on the AF Form 943. Upon MAJCOM Commander concurrence, the MAJCOM/SEW forwards the ESP to the Air Force Safety Center. (AFSC).

2.3.2.7 Air Force Safety Center Weapons Safety Staff (AFSC/SEW)

AFSC/SEW is tasked with the primary responsibility for Air Force explosives safety. AFSC/SEW reviews all ESPs prior to forwarding them to the DDESB for approval.

2.3.2.8 Department of Defense Explosives Safety Board (DDESB)

The DDESB reviews and approves all ESPs prior to any construction. The DDESB will notify AFSC/SEW via a letter of approval. In an event the ESP is disapproved, the DDESB provides a memorandum explaining the reason for disapproval.

Department of Defense Explosives Safety Board (DDESB)

The DDESB provides objective advice to DoD agencies regarding safety aspects of ammunition and explosives (including chemical agents) development, manufacturing, testing, handling, transportation, storage, maintenance, demilitarization, and disposal. As such, the DDESB is the executive agent for reviewing, evaluating, and approving the explosives safety aspects of all plans for siting, constructing, and modifying munitions facilities.

The DDESB maintains a list of pre-approved definitive drawings for many munitions facilities, which can facilitate the initial planning and design phase of the project. [Technical Paper \(TP\) Number 15](#), *Approved Protective Construction* (Version 1.0), provides a partial list of pre-approved definitive drawings of magazines, underground munitions storage facilities, barricades, barricaded module storage, and protective aircraft shelters. Additional pre-approved DDESB definitive design drawing information is located in [DoD 6055.9-STD](#), *DoD Ammunition and Explosives Safety Standards*.



2.4 Programming

Two primary appropriation programs exist for funding munitions facilities improvements and construction: Military Construction (MILCON) and Operations and Maintenance (O&M). The appropriate funding program is determined during the programming process based on the cost and type of work. Funding to support capital facility requirements at OCONUS locations, such as North Atlantic treaty Organization (NATO) or host nation support funding, may have unique programming requirements.

Accurate project cost estimates are essential to successful project development and execution. Typically, cost estimates are developed using parametric cost estimating tools such as the [Parametric Cost Engineering System \(PACES\)](#), as well as unit costs published in the [OSD Pricing Guide](#) or [Historical Air Force Construction Cost Handbook](#) found on the Air Force Civil Engineer Support Agency (AFCESA) web site. For more information on cost analysis, refer to [AFMAN 32-1089](#), *Air Force Military Construction and Family Housing Economic Analysis Guide* and Unified Facilities Criteria ([UFC 3-701-03](#)), *DoD Facilities Pricing Guide*.

The guidance and criteria for project funding approval varies by project type. The following sections summarize basic procedures of the typical appropriation programs.

2.4.1

Military Construction (MILCON)

MILCON applies to new construction or adaptive reuse construction activities that change the use and/or layout of an existing facility where

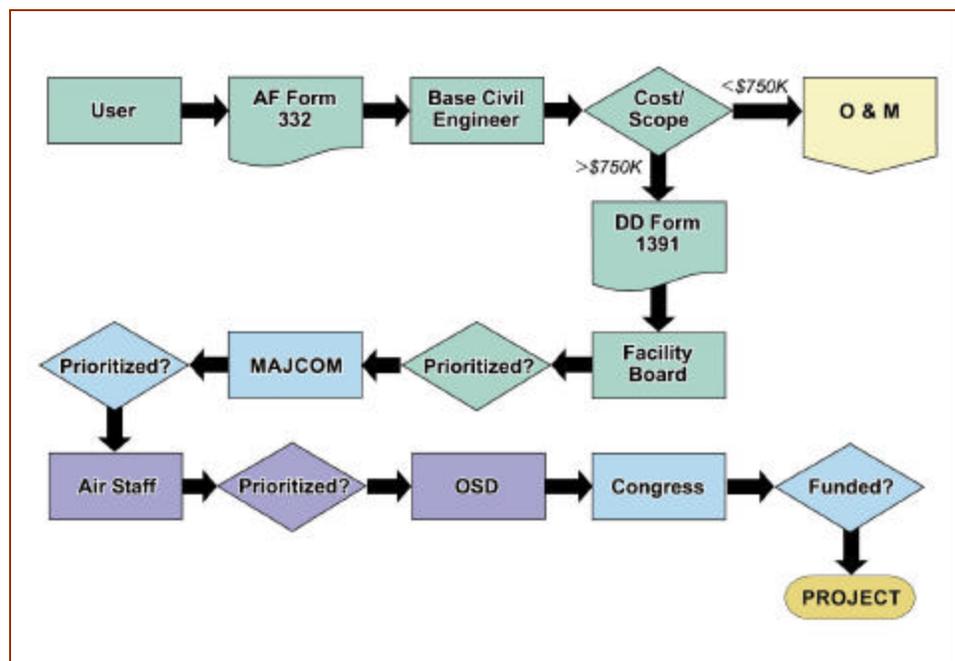


Figure 2.4
MILCON Approval Process



costs exceed \$750,000. All MILCON projects require specific planning, programming, and budgeting actions to comply with congressional requirements. [AFI 32-1021](#), *Planning and Programming Military Construction (MILCON) Projects*, provides instructions to MAJCOMs and installations on how to plan, develop, and obtain approval for MILCON projects. The following is a short summary of the MILCON approval process. This process is illustrated in Figure 2.4, “MILCON Approval Process.”

CE is responsible for all programming actions and project approvals. Project programming begins at the installation level with the development of the [DD Form 1391](#), **FY__ Military Construction Data**. The DD Form 1391 is developed by CE with input from the user and other involved agencies to identify requirements, provide a cost estimate, and justify the project.

The following items must be included with the DD Form 1391 package.

1. **Location Plan.** A map showing the location of the project and its relationship to the overall installation and surrounding areas.
2. **Site Plan.** A single line drawing or section from the base map showing the details of the immediate site.
3. **Facility Drawing.** A single line drawing of the proposed facility layout.
4. **Deficiency Detailed Data Sheet (D3 Sheet).** Details the movement of personnel and functions from sending and receiving facilities. This provides an accounting for space that is demolished, constructed, or reconfigured.
5. [AF Form 813](#), **Request for Environmental Impact Analysis.** This is a checklist that includes environmental and planning issues, and is normally completed by the Environmental Flight of CE.
6. **Certificate of Compliance.** A Certificate of Compliance must be completed by the Environmental Flight of CE and signed by the BCE and the Wing/Installation Commander certifying that all required environmental actions have been addressed.

Since the DD Form 1391 and ESP are usually completed simultaneously, a copy of the ESP submittal package should be included with the required programming documents.

2.4.2 Operations and Maintenance (O&M) Program

Maintenance, repairs, renovations, and minor construction projects are funded through the O&M program. Minor construction is defined as new construction, modification, or renovation that does not exceed \$750,000. O&M projects may be approved locally or at the MAJCOM,



depending on the level of authority delegated to the base from the MAJCOMs.

1. [AFI 32-1032](#), *Planning and Programming Appropriated Funded Maintenance, Repair, and Construction Projects*, provides instructions to plan and program unspecified minor construction projects and real property maintenance and repair projects.
2. **Programming O&M Projects**. The DD Form 1391 for O&M projects is an abbreviated form of the MILCON document. It consists of the front page of the DD Form 1391 that cites the project description and cost estimate.
3. **Project Description**. Same as the MILCON document.
4. **Cost Estimate**. Same as the MILCON document.
5. **Environmental Assessment**. An [AF Form 813](#) is required; however, it is not part of the DD Form 1391.

