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Engineer Operations:

Echelons Above Corps

This manual provides doctrine to commanders and staffs concerning the employment of engineer units at echelons above corps (EAC). These units will be required to construct, maintain, and rehabilitate the logistical infrastructure needed for operational sustainment of the combat forces. Some EAC engineer units may operate as far forward as the corps rear area, but generally most will operate in the communications zone (COMMZ).

The EAC engineer structure will vary depending on the size of the combat force being supported, the maturity of the theater, the availability of host nation support, and the intensity of the conflict. Engineer EAC missions will change as the theater expands and must be accomplished in nuclear, biological, chemical, and electronic warfare environments.

This manual addresses specific actions EAC engineer units must plan and conduct. The doctrine presented is applicable to combined, joint, and contingency operations.

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This publication was prepared by the US Army Engineer School, the proponent is United States Army Training and Doctrine Command (TRADOC). It reflects the current thought of the US Army Engineer School and augments existing doctrinal and training literature.

Unless otherwise stated whenever the masculine or feminine gender is used both men and women are included.

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Chapter 1

Theater Overview

An adequate theater sustainment base is essential for success on the AirLand battlefield. An army's ability to marshal, transport, and distribute large quantities of materiel and to maintain assigned personnel and equipment can make the difference between victory and defeat in high- or mid-intensity conflict. In a low-intensity conflict, a more austere sustainment base is adequate, but is still essential for success.

Sustaining large forces in combat has become a significant challenge. World War II, Korea, and Vietnam clearly demonstrate that extensive sustainment bases are required to allow the generation of adequate combat power at the decisive time and place. The complexity of modern weapon systems makes the focus on sustainment bases even more essential.

The difficulty of establishing a theater sustainment base will depend greatly upon the extent and nature of the civil and military infrastructure existing in the theater before hostilities start. In well-developed theaters, such as Central Europe, military forces can begin operations quickly without having to construct the needed sustainment base. In contingency theaters in less-developed regions of the world, the sustainment base must be constructed at the same time as combat and sustainment forces are deploying. In forward-deployed theaters, such as Europe or Korea, wartime host nation support agreements have been negotiated to assist in operating and maintaining the sustainment base. Reception facilities will be most critical during the initial transition to a wartime posture.

AIRLAND BATTLEFIELD

The AirLand battlefield will be a most demanding environment that will severely test the abilities of the engineer soldier. Such an environment will place great stress on individual ingenuity, initiative, and competence. Engineer leaders and soldiers will be hard pressed to meet the battlefield's many demands. To be successful, engineer leaders must thoroughly understand the supported commander's intent and concept of operation. They must see their portion of the battlefield and act intuitively based on their understanding of the supported commander's plan. Success will depend upon the leadership, resourcefulness, and competence of the engineer leader. Engineer leaders must be technically proficient in a vast range of construction tasks as they construct or repair the sustainment base.

Interruptions in communications by distance and an ever increasing enemy capability to degrade the use of the electromagnetic spectrum demand that engineer leaders develop the ability to act independently in carrying out the commander's intent. Leaders must develop and practice innovative techniques to convey information and orders. Decentralized execution of tasks must be the practice. Subordinate leaders must act on their own initiative within the parameters of the commander's intent in the absence of communications.

The potential for chemical, biological, or nuclear attack poses a great threat to the sustainment infrastructure. Logistics activities provide lucrative targets with their stockpiles of critical supplies and repair facilities. Tactical employment of nuclear weapons would magnify the destructive character of operations on the AirLand battlefield. Not only would units and facilities be exposed to nuclear fires and their associated hazards, but lines of communication (logistic routes) (LOC) would be blocked by debris miles from ground zero. The electromagnetic pulse (EMP) would make communications more difficult at just the time they are needed. Persistent chemical agents can contaminate facilities, buildings, equipment, and terrain and complicate construction and repair efforts.

The four basic tenets of AirLand Battle doctrine **– initiative, agility, depth, and synchronization –** are basic to operational and tactical success on the battlefield and establish the framework for arranging sustainment. Engineer commanders at echelons above corps are key to ensuring an adequate

sustainment base interconnected with a transportation network. These engineer leaders support the tactical commanders' ability to achieve the tenets of AirLand Battle doctrine by adhering to the following sustainment imperatives: **anticipation, integration, continuity, responsiveness, and improvisation.**

Engineer commanders and staffs must anticipate future events and requirements by understanding the commanders' plans and foreseeing events as operations develop. They must clearly see their portion of the battlefield. Priorities may change as events unfold and logistical infrastructure facilities, command and control facilities, and air/aviation facilities are damaged. While continuing to support current operations, engineer leaders and their staffs must plan for future operations. Engineer leaders must acquire the self-confidence to operate independently and learn to sense what needs to be done and do it without hesitation.

Engineer commanders and staffs must fully **integrate** their plans with those of the sustaining forces they support. Engineer missions will be executed in accordance with theater priorities which may involve joint operations or missions executed in conjunction with host nation forces. Engineer operations must also be fully integrated into any theater deception plans.

Engineer commanders and staffs must plan for continuous operations. Sustainment cannot be interrupted without degrading the combat power of a force. This requires multiple port facilities, airfields, and LOCs. Engineer leaders must ensure the sustainment base provides continuous support to forward elements.

Engineer commanders and staffs must be **responsive** to the needs of the sustainment base commanders. This requires close, continuous coordination and anticipation of sustainment base requirements. It also requires careful planning and decentralized execution.

Engineer commanders and staff must learn to improvise to provide responsive support. They must be innovative and aggressive in seeking solutions to problems. They must be highly trained and flexible in dealing with unforeseen problems. They must make maximum use of host nation resources to reduce transportation requirements and avoid delays.

THEATER ARMY ORGANIZATION

The theater is organized into a combat zone and a COMMZ as depicted in Figure 1. The COMMZ begins at the corps rear boundary and extends to include the area needed to provide the sustainment base.

There are two types of support organizations in the COMMZ. These are –

- ***area-oriented organizations*** with geographic responsibilities such as Theater Army Area Commands (TAACOM) and area support groups (ASG),
- ***mission-oriented organizations*** such as the engineer command (ENCOM), medical command (MEDCOM), or transportation command (TRANSCOM).

The number of TAACOMs and ASGs assigned to a theater depends on the size of the theater in terms of the force in the theater, the workload, and the geographical area.

The theater army is organized to support deployed US Army forces and, if required, other US Services and allied forces. Reception of deploying reinforcing forces is a major theater army mission as well as serving as the sustainment base for forward combat forces. The theater army commander delegates area and rear operations responsibilities to the TAACOM commanders, and they in turn delegate to the ASG commanders. Engineer units in the COMMZ execute engineer missions under the control of the ENCOM, but execute rear combat operations under the operational control of the respective ASG when the rear area situation dictates.

Support to forward-deployed forces normally involves combined operations in which US forces operate with allied military forces in an established theater. The North Atlantic Treaty Organization (NATO) and Korea (Combined Forces Command) are examples of US forces forward-deployed in a foreign country under an existing allied command structure. Wartime host nation support is

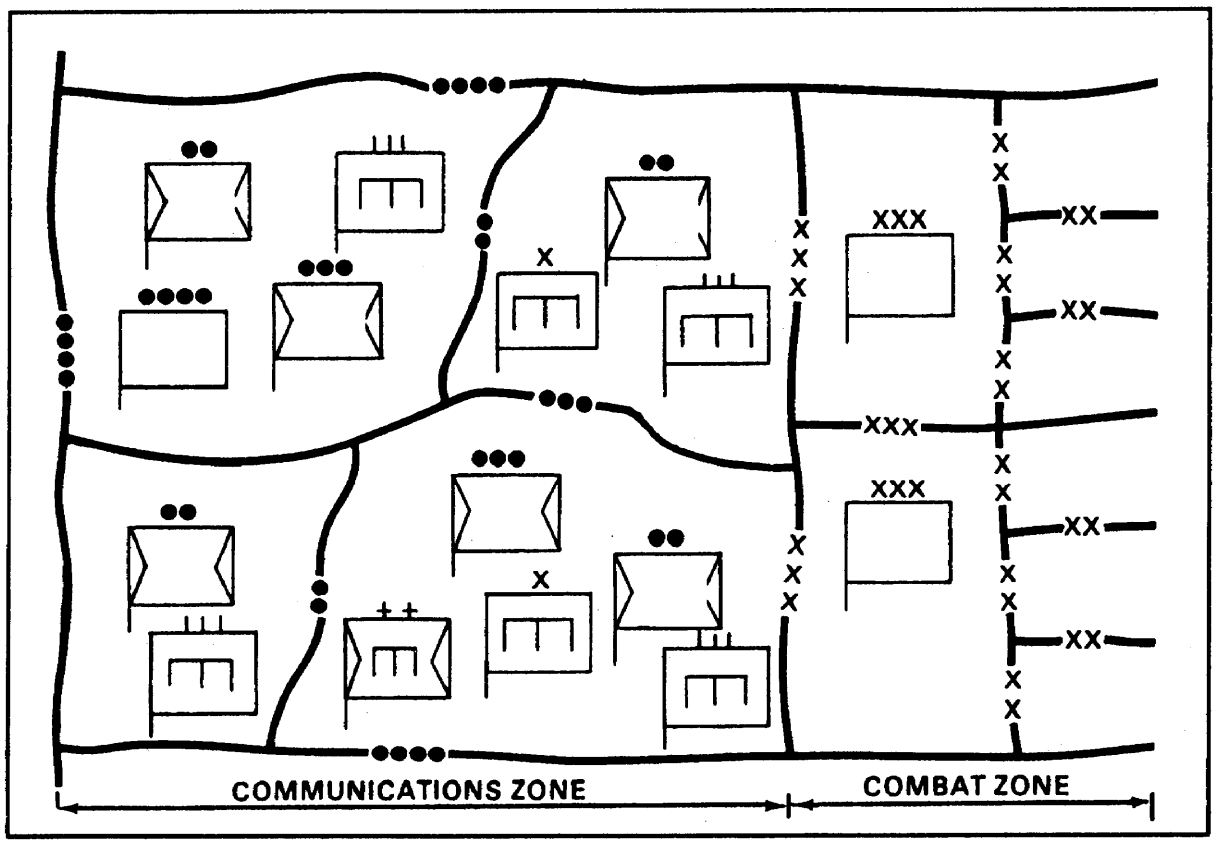


Figure 1. **Theater Zones**

usually available to support forward-deployed forces, and an existing peacetime sustainment base can be expanded to meet wartime requirements. Engineers in the COMMZ must be prepared, however, to provide support to deployed forces in the COMMZ, the corps rear area and, on order, the forward combat zone.

Support to contingency forces may or may not involve combined operations, but does involve the creation of a sustainment base where none existed. Host nation support usually will not be available, and if present can be expected to be limited. Additionally, the existing infrastructure may not meet the needs of supporting combat service support (CSS) units. A base development plan must be developed to manage the establishment of support facilities– even though they may be temporary. Base development is discussed in Chapter 7.

THEATER ARMY ENGINEER ORGANIZATION

The central organizational framework for theater operational sustainment is the theater army. The ENCOM commands and controls the theater army engineer force. However, depending on the nature of the contingency and the organization of the theater, field armies, corps, or even divisions may find themselves responsible for planning and conducting operational sustainment functions. In those latter cases, smaller engineer forces may be assigned, and the theater army engineer force may be a brigade or group.

Engineer forces at EAC are responsible for constructing maintaining and rehabilitating the theater sustainment base. This includes support to other services and agencies and allied military forces in joint or combined theaters of operation. The ability of CSS units to perform sustainment

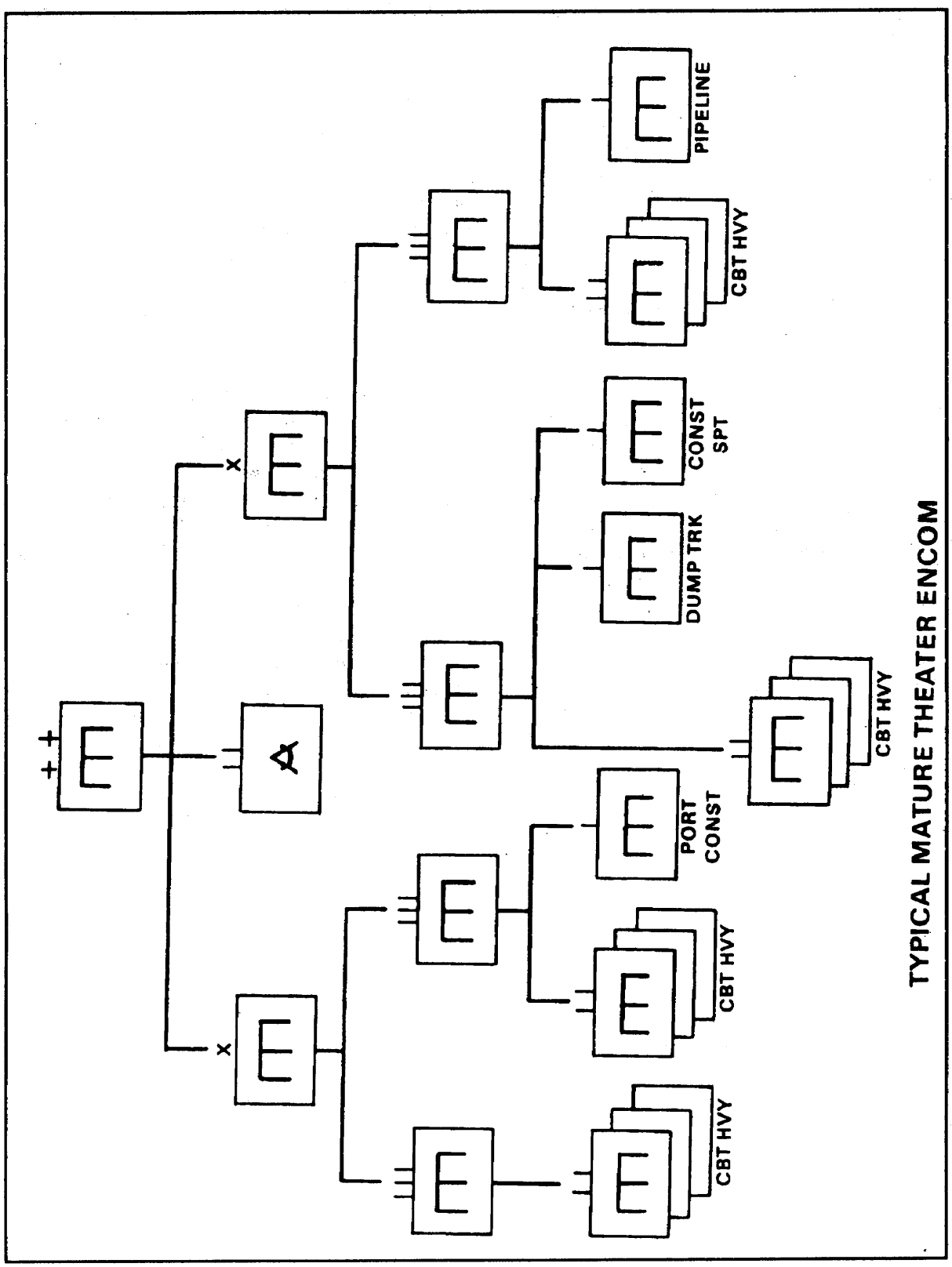
operations as well as movement and sheltering of combat/combat support units while in the rear areas is dependent on adequate, responsive engineer support.

The number and type of EAC engineer units depend upon the size of the sustainment base required, the availability of existing support infrastructure in theater, the availability of host nation support, and the perceived enemy threat to the rear area. The engineer force structure is tailored according to theater requirements. Repair and facilities modification requirements dominate in well developed theaters, while new construction requirements will be more important in less developed theaters.

The ENCOM is normally composed of two or more engineer brigades and at least one topographic battalion. It is a subordinate command of the theater army. The ENCOM plans, coordinates, and manages theater army engineer activities in the COMMZ, and commands and controls EAC engineer units. A typical mature theater ENCOM is shown in the chart on the facing page. Each brigade has two or more engineer groups, and each group has two or more battalions and selected construction support units. The structure of each group and brigade is tailored to support the geographic area and expected missions within their area of operations. Specialized construction and construction support units are assigned to the theater based on specific workload factors.

Port construction companies are assigned to the ENCOM generally on the basis of one per major port. Pipeline construction support companies are assigned based on the estimated length of tactical pipelines required. Construction support companies are assigned to each brigade as the needs for quarry and bituminous pavement requirements dictate. Dump truck company augmentation is generally one per brigade. Engineer teams, such as quarry, well drilling, concrete paving, and asphalt paving, may also be assigned as dictated by the conditions in the theater. The organizational structure of EAC engineer units is shown in Appendix A.

Engineer support in the COMMZ is provided on a mission basis in accordance with theater priorities. Engineer units at EAC provide topographic support to the theater; troop construction and repair support to all US elements in the COMMZ; contract construction support; and, as required, they provide engineer support in the corps rear area on a task basis. Based on the policies and priorities established by the theater commander, the ENCOM commander determines the relative priority of Army and other service support. Engineer units may also be tasked to provide support to host nation or other allied military forces. The overall theater construction policy is established by the theater commander.


TYPICAL MATURE THEATER ENCOM
PIPELINE
CBT HVY
CONST SPT
DUMP TRK
CBT HVY
PORT CONST
CBT HVY
CBT HVY
A
X
X
++

Chapter 2

Engineer Support Concepts

Engineer units are deployed to those locations in a theater where the greatest or highest priority missions are likely to occur. They are used to satisfy theater requirements in accordance with theater construction policies and procedures.

THEATER CONSTRUCTION MANAGEMENT

Theater construction, to include major repairs, is a highly complex mission requiring a management capability that spans all service requirements and assets. To accomplish the necessary construction, the theater commander must set the theater construction priorities and policies, allocate theater construction capability, manage construction materials procurement and use, assess construction progress, and plan for future construction. Current laws governing military construction provide only limited relief from reporting requirements in wartime.

Depending on the size of the theater, construction management may be controlled at theater level by a theater wartime construction manager or the theater may be divided into regions with Regional Wartime Construction Managers (RWCM). If designated, RWCMs exercise operational control over all US construction resources in the region. An example of a large theater divided into construction management regions is shown in Figure 2. In smaller contingency theaters, wartime construction management is often performed at theater level. If the ENCOM is designated as the RWCM, it usually designates subordinate wartime construction managers as depicted in the chart

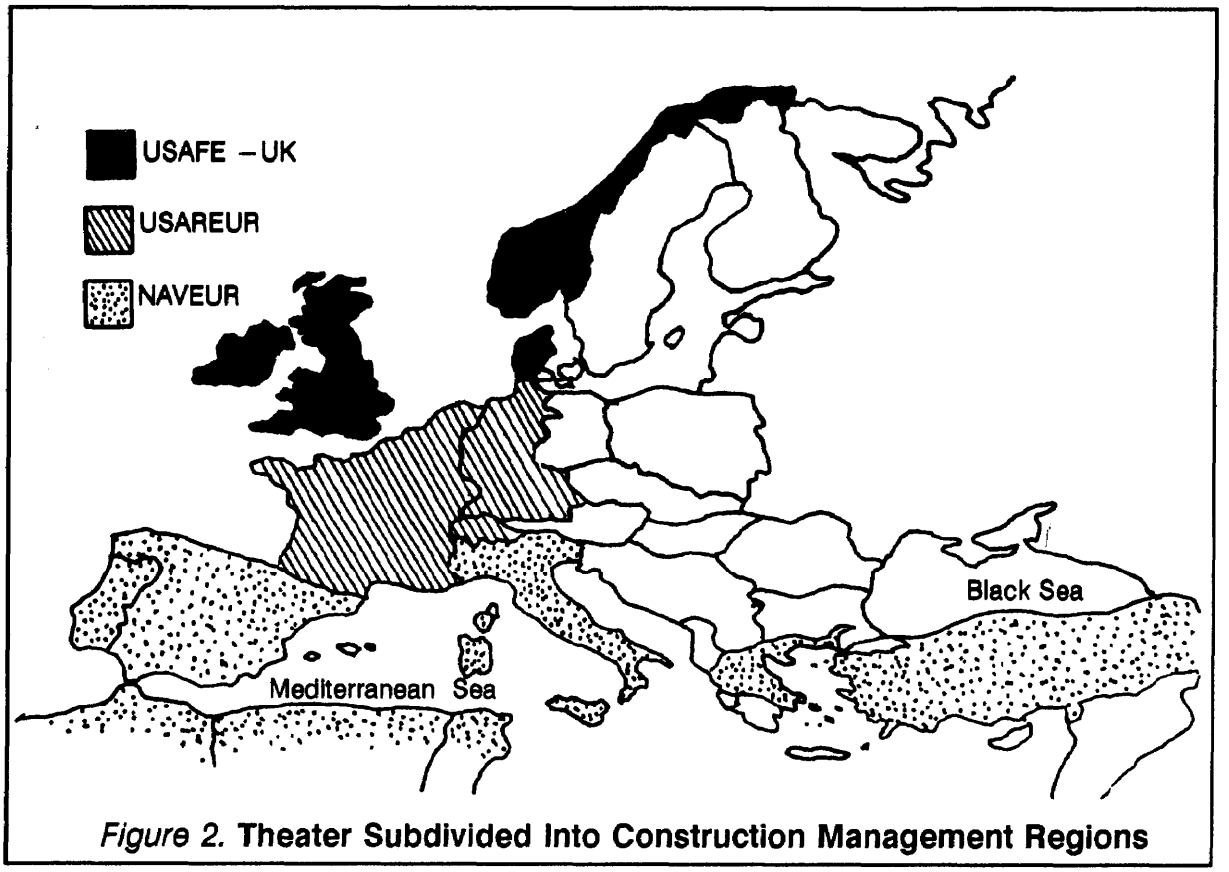
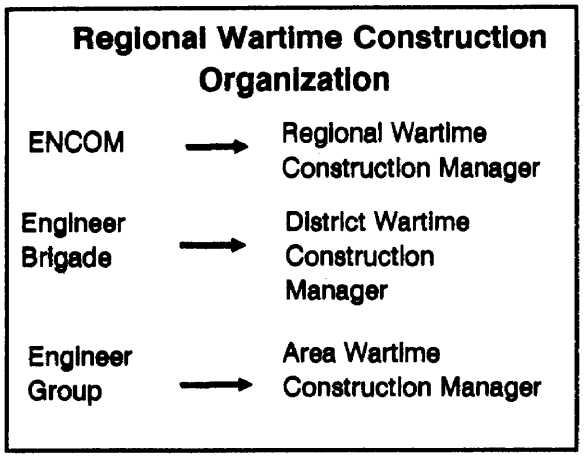


Figure 2. **Theater Subdivided Into Construction Management Regions**



above. The principal responsibilities of the RWCM are as follows:

- Manage troop construction,
- Manage contract construction.
- Integrate prioritized projects from all component commanders into construction program for region.
- Prioritize US requests for host nation construction support in region.

ORGANIZATION

Army engineer support for facility or installation operation and maintenance in the COMMZ is provided on an area basis by the ASG and on a mission basis by ENCOM units in accordance with priorities established by the theater commander. Area boundaries of ENCOM subordinate units normally coincide with ASG and TAACOM boundaries. In a mature theater, an engineer brigade is normally in general support of each TAACOM, and an engineer group is normally in general support of each ASG. This organizational structure may be modified for a contingency theater depending on the organization of the COMMZ and size of the EAC engineer force.

Engineer battalions and separate companies are generally employed on a task basis. Separate companies and detachments may operate directly under a group headquarters or may be placed under the control of a battalion, depending on the unit's mission. Major restoration, repair, and construction support and topographic support are provided by the ENCOM, while most real property maintenance activities (RPMA) support is provided by the ASG with its assigned/attached assets. An ENCOM unit may also be tasked by the ENCOM to support airbases or other service installations either on a direct support or general support basis. The relationship between the TAACOM and the ENCOM is shown in the chart on the next page. Direct and general support relationships are also shown.

General Support (GS).

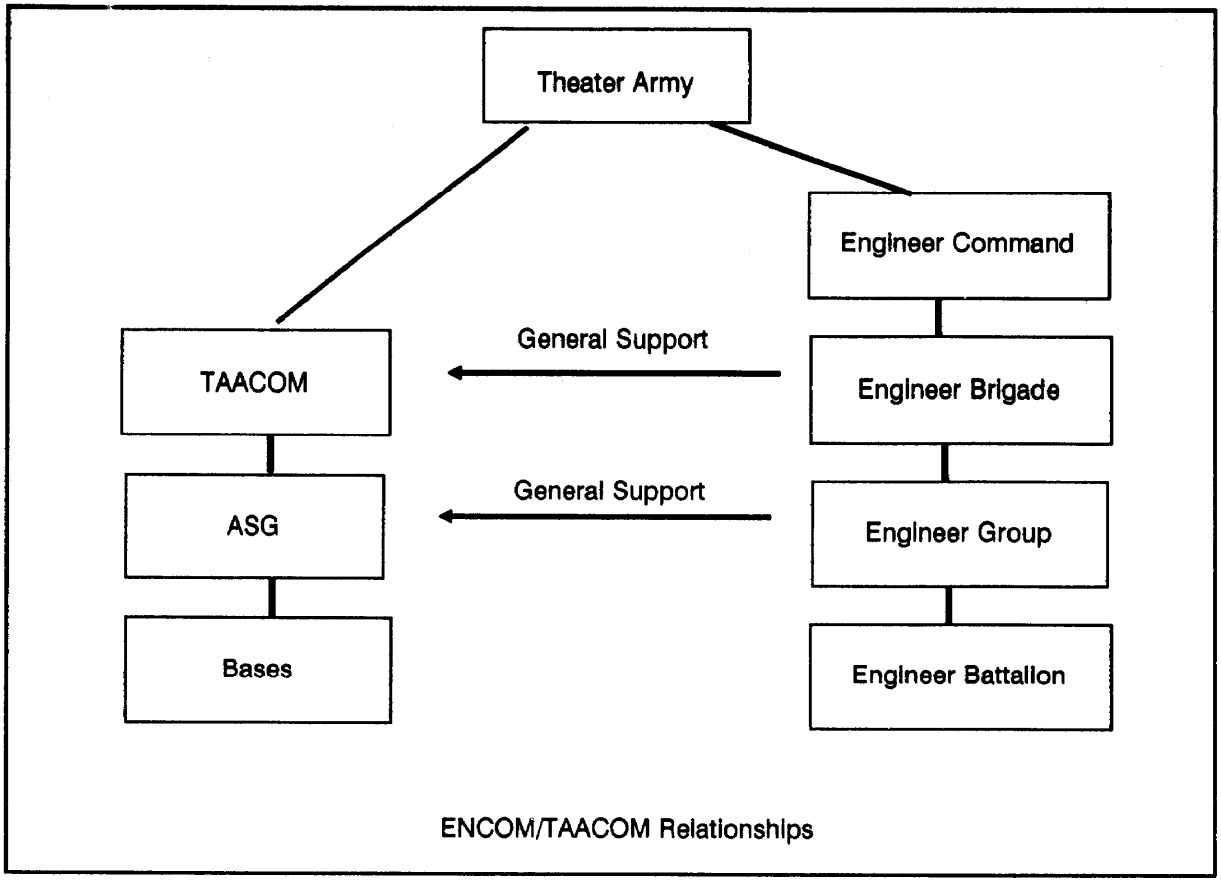
An engineer element in a GS role is commanded by its parent unit; maintains liaison and communications with supported and parent units may be task organized by its parent unit; can be used only to support the parent force as a whole (may be given area or task assignments); responds to support requests from its parent unit; has its work priority established by the supported unit; has its spare work effort available to its parent unit; requests additional support from its parent unit; and receives logistical support from its parent unit.

Direct Support (DS).

An engineer element in a DS role is commanded by its parent unit; maintains liaison and communications with supported and parent units; may be task organized by its parent unit; provides dedicated support to a particular unit (may be given area or task assignments); responds to support requests from its supported unit; has its work priority established by the supported unit; has its spare work effort available to its parent unit; requests additional support from its parent unit; and receives logistical support from its parent unit.

ARMY SUPPORT CONCEPT

All requests for engineer support from Army installations or ASG subordinate elements are sent to the ASG where they are prioritized before being forwarded to the supporting engineer group. The ASGs normally provide RPMA support with organic RPMA resources or request support from their supporting engineer group if the RPMA requirements exceed the ASG capabilities. Some



ENCOM/TAACOM Relationships

RPMA support may be available from the host nation, and the ASG makes the necessary coordination with the host nation.

Major restoration or construction projects are forwarded to the supporting engineer group. The engineer group serves as the principal construction manager for its area of operations and executes missions in accordance with the theater construction policy and theater priorities. In this role, the engineer group commander serves as the Area Wartime Construction Manager (AWCM), as described previously. Tasks that cannot be completed responsively by the engineer group are elevated by both the ASG and the group and sent to the TAACOM/engineer brigade level for resolution. If the host nation can provide the needed support and the ASG has sufficient contracting authority, the ASG should coordinate through its civil affairs team with the host nation instead of requesting support from the engineer group.

Other requirements for engineer support may come through the ENCOM. The ENCOM coordinates closely with the theater army movement control agency to determine critical line of communication requirements. The ENCOM also closely coordinates with the theater army petroleum group for pipeline support requirements. Both types of missions are tasked to the engineer brigades for execution.

The engineer combat heavy battalions are assigned missions on a task basis. These missions may involve the repair or construction of specific facilities or the maintenance of a specific road. Design of new facilities or selection of appropriate standard facility designs is generally performed at group or brigade level, while site adaption of standard designs and determination of repair requirements are normally done at battalion level. Construction directives are published by the headquarters performing the design and passed through

channels to the executing battalion. These construction directives contain the specifications and drawings needed to construct the facility. The battalion in turn issues specific construction directives to its companies for execution.

Port construction companies may be issued construction directives for execution or may be placed in support of a combat heavy battalion. Construction support companies, dump truck companies, and pipeline construction support companies generally operate in support of combat heavy battalions. Engineer units below group level normally establish their bases of operation near their assigned projects. Engineer companies organic to the combat heavy battalion often operate away from the battalion headquarters.

In a forward-deployed theater, such as Europe, COMMZ installation Directorate of Engineering and Housing (DEH) activities provide most routine RPMA support. In a contingency theater, such capabilities will not exist and ENCOM assets may be required to augment ASG utilities assets. Electricity and water production in some theaters are the host nation's responsibility. Where the host nation is unable to provide this support, the ASG provides required electrical support and the ENCOM establishes needed wells. Chapter 8 provides further discussion of RPMA support.

Rear combat and any emergency area damage control (ADC) missions, such as fire fighting, may be tasked to the engineer group directly by the ASG rear tactical operations center (TOC). Other ADC and any damage repair missions are prioritized by the AWCM (group commander) in accordance with theater priorities. Chapter 4 contains detailed discussion of rear operations. An example operation plan (OPLAN) for a combat heavy battalion is at Appendix E.

TOPOGRAPHIC SUPPORT CONCEPT

Theater topographic support is provided by the topographic battalion(s). If the theater has an ENCOM, the topographic battalion is assigned to the ENCOM. Theater topographic priorities are established by the theater commander. Topographic support includes terrain analysis and nonstandard topographic map production (survey, cartography, and associated reproduction).

The topographic battalion is tailored to meet the requirements of the particular theater. This unit supplements and enhances the Defense Mapping Agency (DMA) effort by compiling data from various sources into special-purpose topographic products. Special-purpose products include maps, map overprints, overlays, terrain studies, photomaps, other geographic and nongeographic portrayals of the terrain, and geodetic survey support for precise positioning of weapons, command and control, and communications systems.

AU standard topographic products used in support of combat operations are provided by the DMA or by host nations through international agreements.

The topographic battalion is configured with a headquarters and headquarters company (HHC), and two to five topographic companies depending on the number of corps in the theater. One topographic company is normally placed in direct support of each corps. Terrain teams are placed in direct support of each division and possibly each separate maneuver brigade. A topographic company will be in general support of the theater. Specialized teams, such as photomapping and map reproduction platoons, graphics support squads, and survey and topographic equipment maintenance teams are included, as necessary, to tailor the topographic battalion to the needs of the theater. Distribution of standard maps is through the general supply company in each ASG. Distribution of nonstandard map products will be carried out by topographic assets.

Theaters will have a topographic planning and control team assigned to the ENCOM, if available, or to the theater army engineer staff. This team provides overall management, planning, and coordination of topographic support to the theater army in the absence of an ENCOM. It could also exercise operational control of the theater topographic battalion. Topographic support concepts are explained in detail in *Field Manual (FM) 5-105.*

AIR FORCE SUPPORT CONCEPT

Army engineer units may also be tasked to support airbases in the COMMZ. Most missions will involve the restoration of damaged pavement and repair of control towers, hangars, fuel systems, utilities, and other support facilities. The Air Force is primarily responsible for emergency repair of the runways, but Army engineer units may be tasked to provide support for requirements exceeding Air Force capabilities as theater priorities dictate. Emergency repairs are those efforts that enable aircraft to be launched or recovered within four hours following an enemy attack. Called rapid runway repair (RRR), these emergency repairs are normally accomplished through the employment of airbase civil engineering troop assets.

Army Regulation (AR) 415-30 establishes the following Air Force support missions for Army engineer units:

- Assisting in emergency repair.
- Repairing and restoring damaged facilities beyond emergency repair.
- Developing and constructing new bases.

The theater Air Force manager of airbase damage repair is the survival recovery center (SRC) which contains representatives from civil engineering, explosive ordnance disposal (EOD), security police, and other commands. The SRC functions similar to the theater army rear TOC and coordinates closely with the ENCOM. Each numbered air force establishes an engineering and service readiness center (ESRC) that is responsible for coordinating activities at its subordinate airbases that include beddown, airbase damage reporting, project review, and resource allocation decisions. The engineer brigades are in general support of the numbered air forces and maintain close liaison with any ESRCs that are located in their areas of operation. The engineer groups in turn maintain close liaison with the base civil engineers of any airbases in their areas of operation.

Airbase requests for emergency repair support above the capabilities of Air Force civil engineer units will go directly to the engineer battalion or company in direct support of that airbase. If no engineer battalion or company is in direct support, the request will go through Air Force channels to the numbered air force to the Army engineer brigade in general support of that numbered air force. The Army engineer brigade responds in accordance with the theater construction priorities. In some instances, Army engineer units may be employed on airbases performing preattack missions. In these cases, they will respond directly to the base civil engineer in supporting airbase recovery operations. Airbase commanders not satisfied with the engineer battalion or company response elevate the issue to the numbered air force ESRC for coordination with the engineer brigade commander. The relationship between the Air Force and the ENCOM is shown in the chart on page 23.

An engineer battalion or company tasked with supporting an airbase generally operates in direct support of the airbase commander and responds to the base civil engineer. Priorities of effort are established by the base commander through the base civil engineer.

Air Force requests for engineer support beyond emergency repair and new construction are prioritized by the numbered air force and forwarded to the engineer brigade for integration into the brigade's backlog of construction projects. Projects are prioritized in accordance with the overall theater priorities and passed to the engineer group for execution. The engineer group determines how long an engineer battalion or company remains working on an airbase, but the base civil engineer determines what projects are to be worked on as long as the engineer unit remains on the airbase.

SUPPORT TO OTHERS

Subordinate ENCOM units maybe tasked to support the US Navy or Marine Corps, allied military forces, or the host nation. Navy and Marine Corps taskings would be submitted to the nearest engineer brigade. Allied military and host nation requests would be submitted to the nearest ASG. These additional support requirements would be integrated into the theater priority system and managed by the RWCMs. Typical missions include area damage

control and repair, facility construction and repair, and road and bridge construction and repair.

MISSIONS

Typical EAC engineer missions include the following

- Plan, design, construct, or rehabilitate
  - -Airfields, ports, pipelines, bridges, roads, railroads, and inland waterways.
  - -Hospitals, troop camps, enemy prisoner of war and civilian internee compounds, bulk petroleum storage and distribution systems, dry cargo and ammunition storage areas, and equipment maintenance facilities.
  - -Missile sites, air defense emplacements, protective shelters, and local security measures.
- Perform runway emergency repairs that exceed Air Force capabilities.
- Conduct rear operations missions, to include ADC.
- Augment ASG RPMA capabilities.
- Provide topographic and military geographic intelligence support.
- Maintain critical LOCS.
- Manage selected critical theater Class IV construction materials.
- Manage host nation and contract engineering effort.

Chapter 3

Command and Control

The command and control process begins and ends with the commander. The process is used to produce estimates of the situation and make decisions regarding how assigned tasks can best be accomplished. Command and control facilities, which include command posts and supporting automation and communications systems, provide the means to process and transmit information and orders.

Each echelon of command must establish and train a continuity of operations plan (COOP). The COOP will provide for the designation of an alternate headquarters and procedures to be followed if the primary and alternate headquarters are destroyed. Backup procedures (including manual) must be established to ensure continuity of operations if automation support fails.

Clear command relationships are essential to a proper functioning command and control system. The system must discriminate from the vast amounts of data available those essential information elements required by the commander to make timely decisions. This also requires timely reporting from subordinate units.

ORGANIZATION

In a mature theater, the ENCOM exercises command and control over all theater army engineer assets not assigned to the corps or ASGs. The ENCOM commander generally does not serve as the theater army engineer on the theater army commander's staff. Subordinate elements may be placed in general support or direct support of COMMZ units or airbases, but remain under the command of the ENCOM. Selected units may also be assigned missions in the corps rear area, but they remain under ENCOM command. Base RPMA activities will remain under the control of base commanders. Composite or support engineer units composed of engineer detachments (such as utilities and fire fighting) will be under the command of the ASGs.

In a contingency theater, the senior engineer headquarters may be a brigade or a group depending upon the size of the force supported and the availability of host nation support. The composite or support engineer battalions and detachments may remain under engineer command and control depending on the organization of the COMMZ. The basic command and control concepts, however, are applicable regardless of the size of the engineer force.

Contractor operations will be under the control of contracting officers. Contract construction is performed by various service/construction agents throughout the world. Each service has its own geographic areas of operation; but in any one area, there is only one design/construction agent. The Department of Defense (DOD) has assigned regional contract construction responsibilities as follows:

- The Army Corps of Engineers is responsible for Northeast and Central Asia, Central and Northern Europe, North and South America, the Middle East, and Northeast Africa.
- The Navy Facilities Engineering Command is responsible for the Iberian Peninsula, the South Pacific, the Caribbean Sea, Antarctica, Southeast Asia, and the Mediterranean Basin.
- The Air Force Regional Civil Engineer is responsible for the United Kingdom.

Contract management offices may operate in support of the engineer brigades and groups or operate independently depending on the nature of the contingency and the theater location.

ENGINEER COMMAND

The ENCOM exercises command and control by establishing boundaries, support relationships, and construction policies; allocating resources; issuing construction directives; establishing fiscal management procedures; and evaluating progress

reports. The ENCOM performs the following missions:

- Planning, coordinating, and supervising general troop and contract construction or rehabilitation support to the Army and other services and allies within the COMMZ, and construction support in the corps rear area on a task basis as required.
- Allocating construction resources (engineer troops, contractors, materials, and equipment) to projects.
- Prioritizing the use of engineer assets.
- Coordinating topographic and military geographic intelligence support to the theater army.
- Providing technical assistance to RPMA activities throughout the COMMZ.
- Managing selected construction material stocks.

The ENCOM organizes its subordinate units based on anticipated missions. The engineer brigades likewise analyze their areas of operations and organize their subordinate groups based on anticipated missions. The separate engineer companies may be attached to or placed under the operational control of combat heavy battalions depending on the mission. This is the normal operating relationship for a dump truck company. Construction support companies usually support the group as a whole. A port construction company would be placed under the operational control of a combat heavy battalion or attached, if the battalion were given a major port mission. Pipeline construction companies generally operate in support of a combat heavy battalion for pipeline or petroleum, oils, and lubricants (POL) facility missions only.

COMMUNICATIONS

The principal means of communication within the COMMZ in a mature theater is through the Theater Communications System (Army) (TCS(A)). This is an integrated command and area nodal communications system emphasizing common user access. The TCS(A) is capable of handling secure and nonsecure voice, record (to include facsimile), and data requirements. It is the primary means of communication down to engineer group level.

Communications support is provided via a multiaxis network throughout the COMMZ. This network consists of command links, area signal nodes, area links interconnecting the nodes, and subscriber links connecting subscribers to the area nodes as shown in Figure 3. The area links provide service on a common-user, geographic area basis via the area nodal system.

These area links and nodes interconnect the theater army with its subordinate commands, such as the ENCOM or TAACOM, and their subordinate units, such as engineer brigade or ASG, on a common-user basis. The area signal nodes are geographically dispersed throughout the COMMZ. The brigades and groups normally will establish their headquarters where they can establish communications with a TCS(A) area node. In some theaters, such as Europe, the host nation commercial telephone system may be used as an alternate means of communications. Courier systems will be required to carry bulky written products and computerized information and as a contingency in the event a nuclear detonation renders TCS(A) inoperable.

The principal means of communication in a contingency theater are by radio, radioteletype and courier, As the theater matures, a TCS(A) capability may become available. Host nation telephone systems may also be available in some contingency theaters.

Group to battalion communications are normally by radioteletype, radio, and courier in all theaters. Each group must establish communications with the supported ASG, its higher headquarters (engineer brigade), and its subordinate battalions. Communications with the ASG must include both the ASG engineer and the rear TOC.

Internal battalion communications are primarily by secure radio. Each battalion should establish a communications network similar to that shown in the chart on page 15. If the battalion is employed on an airbase, communications are established with the base civil engineer instead of the rear

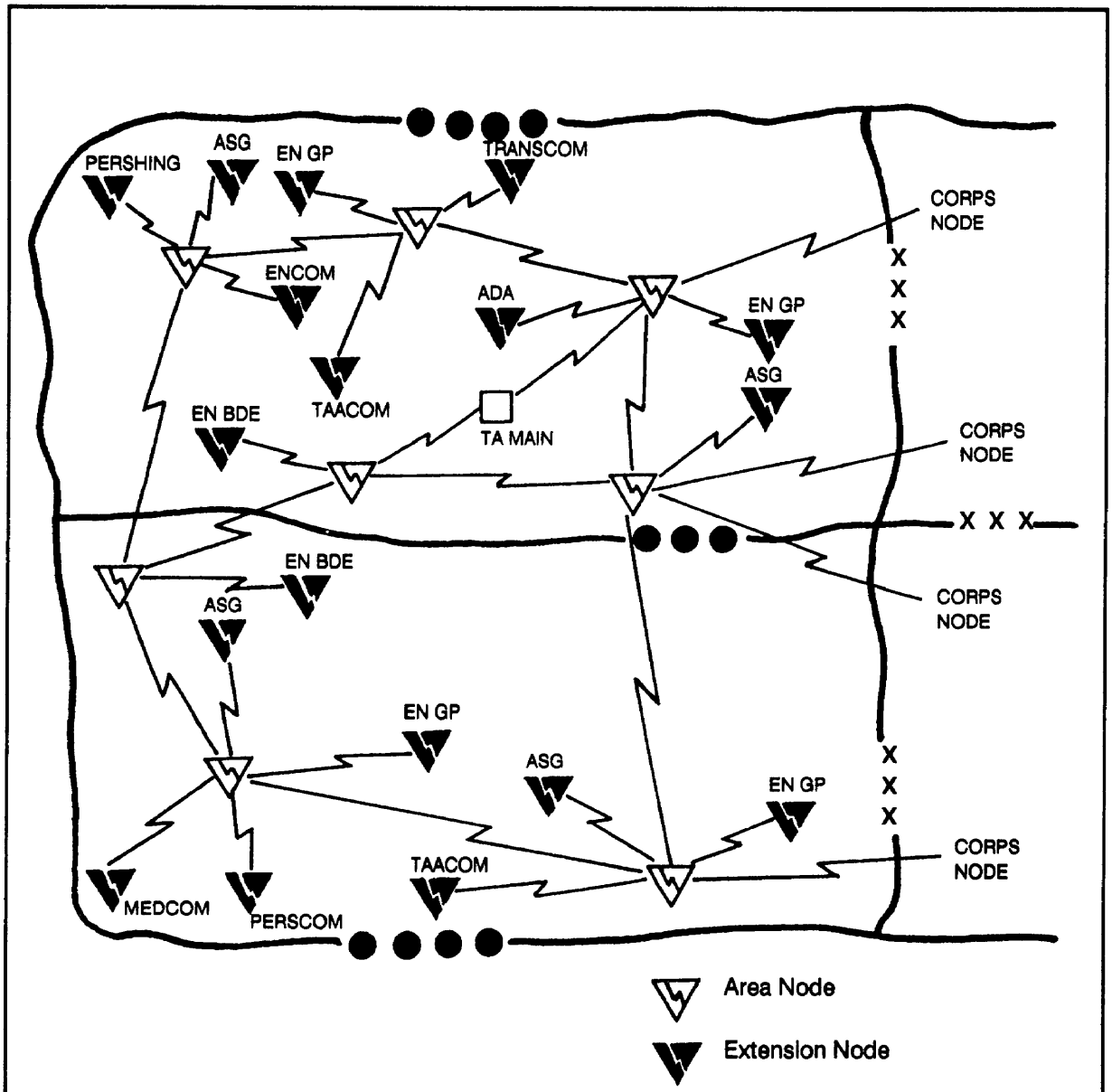


Figure 3. Army Command and Area Communications System

TOC or base cluster operations center (BCOC). A liaison element should also be established at the base civil engineer's operations center.

An engineer company operating on an airbase must establish communications with both its parent battalion and the base civil engineer. The company must also establish a liaison element at the base civil engineer's operations center. Internal company communications are primarily radio and wire.

PROCEDURES

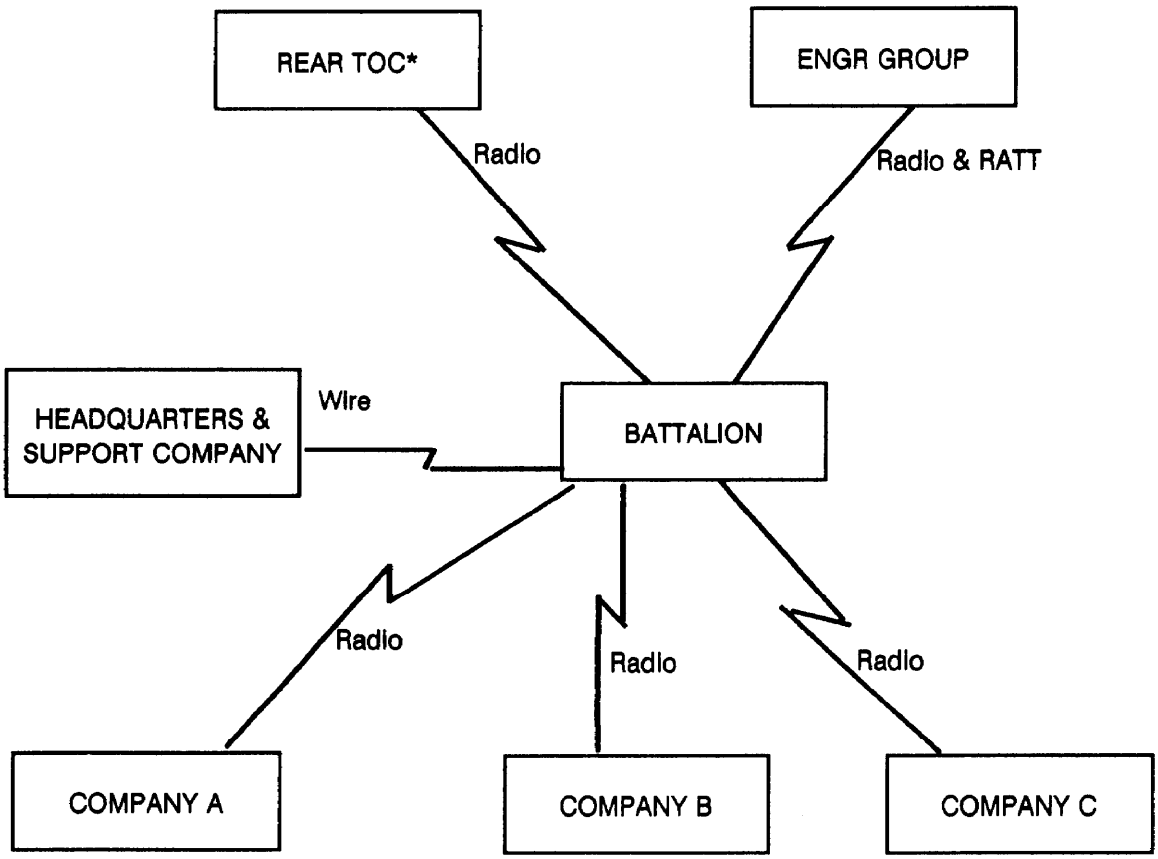
The theater commander establishes construction standards and policies which guide engineer operations in theater, whether they be performed by Air

Force, Navy, or Army units. These standards and policies provide for the allocation of limited resources to accomplish the most vital tasks. The theater commander also establishes priorities for various types of facilities. These theater priorities guide subordinate engineer elements in prioritizing the missions given them.

The engineer brigade receives missions from higher headquarters (ENCOM) and requests from the TAACOM and the numbered air forces which the brigade supports. The engineer groups receive missions from their higher headquarters requirements (brigade) and requests from the ASG, if they are supporting one. Each engineer headquarters must prioritize its requirements in accordance with the theater priorities and elevate any conflicts up the chain of command for resolution.

The engineer brigades, groups, and battalions establish standing operating procedures (SOP) to guide their operations. These SOPS usually contain the following reporting requirements:

- Personnel status
- Project status
- Equipment status
- Construction material status
- Intelligence information
- Level of commitment (workload versus assets)



EAC Engineer Battalion Communications Network

Chapter 4

Rear Operations

Engineer units operating in rear areas will be exposed to various threats that commanders must consider when establishing operating bases and organizing their forces. This is true whether they are operating in a mature theater in a high-intensity environment or in an undeveloped theater in a low-intensity environment. Engineer units may operate from bases that have definite perimeters or from base clusters that have no defined perimeter.

REAR AREA THREAT

The threat to COMMZ units ranges from individual acts of sabotage, to the insertion of battalion-sized or larger forces, to air and missile attacks that may include nuclear, biological, chemical (NBC) munitions. To provide structure and describe the threat, three levels of threat activity have been defined as listed below. They serve as a guide when planning the rear operations.

- **Level I:** Those self-defense measures taken by a base/base cluster to defeat the threat.
- **Level II:** Those threats beyond the capability of a base/base cluster, which can be defeated by a response force, normally military police, with supporting fire.
- **Level III:** Those threats which necessitate the command decision to commit the combined arms tactical combat force to defeat the threat.

These threat activities do not occur in a specific order nor is there a necessary interrelationship between threat levels. The rear area may face all threat levels at one time.

NUCLEAR, BIOLOGICAL, CHEMICAL THREAT

A coordinated enemy attack of the COMMZ may well include NBC warfare. Few munitions can disrupt operations as extensively as NBC. The effects cover large areas, and they are capable of causing enormous destruction and massive casualties.

The principal initial effects of a nuclear detonation are blast, thermal radiation, and nuclear radiation. Other initial effects are EMP and transient radiation effects on electronics (TREE) which can damage a variety of electronic equipment. Blast causes most of the destruction created by a nuclear detonation. Exposed troops can be crushed by overpressures or injured by flying debris. Personnel inside structures can be injured by their collapse. The intense heat starts fires in buildings and forests. Nuclear radiation causes massive casualties. Fallout can also produce casualties, delay movements, and deny terrain to units that are unprepared to detect residual radiation and protect themselves from its effects.

Biological agents consist of disease-producing germs and toxins. These agents may be dispersed as aerosols by artillery or aircraft spray. The aerosol form allows them to be spread rapidly by the wind and cover large areas. Harmful germs may also be spread by the release of infected vectors. Germs and toxins can be used to cause injury, death, and disease among humans, animals, and plants. They also may cause deterioration of materials and contaminate supplies.

Chemical agents may be delivered in a variety of forms: gas, liquid, or aerosol. They can be disseminated by aircraft, artillery, rockets, and missiles. The severity of the effect depends on the dose received. Chemical agents fall into four categories: nerve agents, blister agents, blood agents, and choking agents. Persistent chemical agents may contaminate supplies and equipment and restrict the use of terrain and facilities for hours and days.

Because of the potential for enemy use of NBC agents, engineer soldiers may have to work in a high mission-oriented protection posture (MOPP) for extended periods of time. Protective clothing will degrade mission performance, and personnel will take significantly longer to do a specific job. Commanders should consider the additional time required to accomplish missions in an NBC environment and integrate this aspect into operational planning.

COMMAND AND CONTROL

The rear TOCs are responsible for planning, coordinating, and controlling all rear operations. These rear TOCs are established at theater army, TAACOM, and ASG levels. Engineer units maybe tasked to perform any or all of the following rear area functions under the control of the rear TOC:

- Rear area security.
- Rear combat operations.
- Area damage control.

Terrain management within an ASG's area of responsibility is performed by the rear TOC. All unit moves and siting of bases and bivouac sites must be coordinated with the rear TOC. All engineer units are responsible for their own security. Except for transient units, all engineer units will be assigned to a base cluster or will establish a base of their own.

A base consists of one or more units occupying a position with a definite perimeter. The senior officer in a base, who might be an engineer unit commander, is the base commander. The base commander is responsible for establishing defense plans for the base, to include ensuring protection of the force and reacting to any threat against the base. To accomplish this responsibility, the commander establishes a base defense operations center (BDOC) from available base assets. The BDOC is the tactical operations center for the base and the focal point for base rear operations. The BDOC may be staffed solely by members of the senior commander's headquarters, or it may include representatives from each of the tenant units. Each tenant normally provides an appropriate share of the staff of the BDOC to provide for continuous operation. Its mission is to plan, direct, coordinate, integrate, and control all base defense efforts.

The BDOC maintains close contact with the ASG rear TOC to ensure it has updated intelligence regarding the rear area threat. This requires a dedicated communications link between the BDOC and the rear TOC. Since the BDOC is an ad hoc organization, the base commander must ensure that complete SOPs are prepared to guide staff members.

The base commander ensures that all personnel occupying the base are well trained in the basic defense techniques required to establish a viable defensive perimeter. He prepares a base defensive plan and identifies a reaction force to augment the defensive posture of the base. This reaction force is designed for internal security and reinforcement of the base. Only in extreme circumstances will a base defense reaction force be committed outside the base. The base commander also ensures that adequate protective measures are taken. These measures may include camouflage, construction of protective structures, installation of wire fences, and installation of protective minefield.

Engineer units operating on an airbase are integrated into the base defense structure and may be tasked with reacting to enemy activity against the base. The airbase operations center coordinates any such requirements with the base civil engineer.

When bases are geographically grouped to provide mutual support, the rear TOC clusters them and the senior officer in the cluster is usually designated the cluster commander. The base cluster commander establishes a BCOC that operates 24 hours a day. The BCOC is an ad hoc organization staffed and equipped from units within the cluster. The base cluster commander is normally the commander of a battalion-sized unit or larger. Engineer battalion commanders may serve as base cluster commanders. The base cluster commander integrates individual base defense plans into a base cluster defense plan and identifies a base cluster reaction force. Base clusters generally have no defined perimeter or access controls and are normally aligned with host nation governmental or national boundaries when possible.

Base and base cluster commanders are responsible for the defeat of all Level I threats. In cases of Level II and Level III attacks, the base engages enemy forces and delays them until a reinforcing

military police and/or tactical combat force (possibly host nation forces) arrives and assists in defeating the incursion. Engineer units may be tasked by the rear TOC to react to Level II threats as a part of a rear area response force. This may involve terminating selected engineer missions and reorganizing to counter the threat. Rear area response forces are also used to contain or slow Level III threats until tactical combat forces arrive to defeat the threat.

Engineer groups placed in general support of an ASG will be under the control of the ASG rear TOC for rear combat operations. If the rear TOC tasks significantly impact on the execution of engineer missions, the engineer group must notify its higher headquarters. The engineer group and its subordinate units will not be assigned geographic areas of responsibility for rear area security other than for the defense of bases or base clusters that they occupy. Engineer units are also responsible for the security of all their work sites, but may have military police or other unit assistance. Host nation assets may be available for work site security. If so, coordination must be made through the ASG rear TOC.

ENGINEER OPERATIONS IN SUPPORT OF REAR AREA SECURITY

The engineer group supporting an ASG may be asked to construct protective structures or base security fences and deliberate protective minefield. These tasks must be integrated into the prioritized project list based on the TAACOM/engineer brigade master priority list. Depending upon the theater priorities, engineer units may be tasked to construct hardened command posts; protective positions for air defense units, communications sites, ammunition storage, fuel storage, or aviation sites; and protective minefield and wire obstacles. Requests for engineer support of rear area security operations are received and prioritized by the ASG in the same manner as for other types of engineer construction missions described in Chapter 6. When available, host nation resources are used to augment the engineer units. Host nation support is coordinated through the ASG rear TOC.

ENGINEER REAR COMBAT OPERATIONS

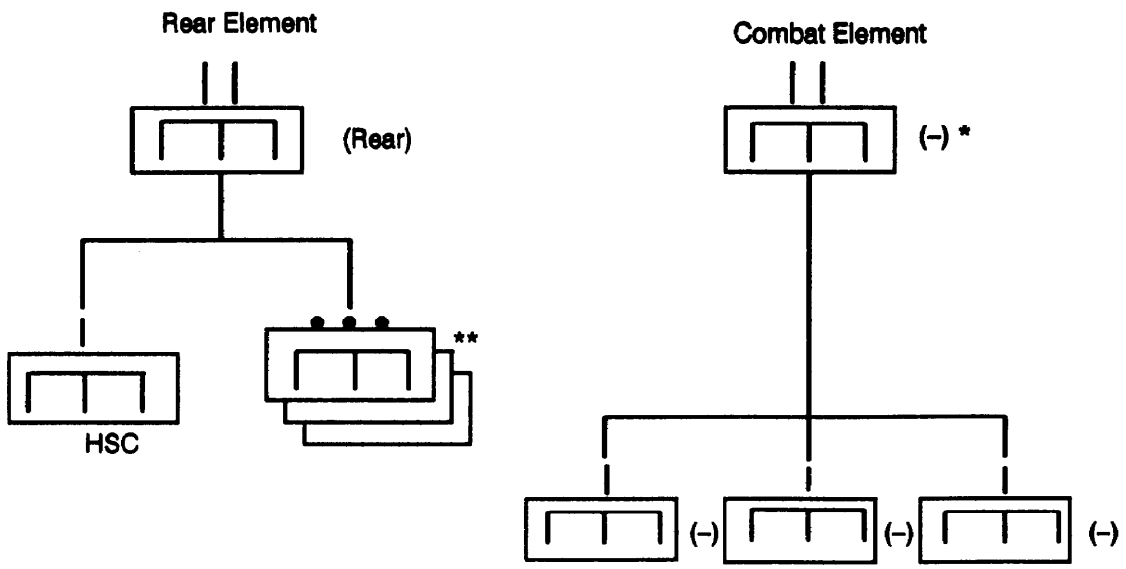
Selected engineer units may be tasked to cease their engineer missions and react to a Level III threat which may be outside their base or base cluster as a part of a response force. This mission is normally given only to the combat heavy battalions. These battalions reorganize into combat and rear elements in accordance with unit SOPS. An example of a possible reorganization is shown in the chart on page 19. The combat element consists of the three platoons from the engineer line companies and a battalion command and control element. This combat element is basically a light infantry force transported on dump trucks. The remainder of the battalion constitutes the rear element that occupies the base perimeter under the control of the battalion executive officer while the response force reacts to the enemy threat.

The rear TOC must coordinate such missions with the supporting engineer group, which in turn tasks a specific engineer unit. The group will notify the engineer brigade of all such combat operations and their impact on the execution of assigned engineer missions. Unit SOPS must define the specific actions to be taken as the engineer unit organizes a response force to react to the threat. Military police units usually participate in such response forces.

ENGINEER AREA DAMAGE CONTROL OPERATIONS AND REPAIR

Area damage control is defined as those measures taken before, during, and after hostile action to reduce the probability of damage and to minimize its effects. All engineer support of ADC is coordinated with the engineer group by the ASG rear TOC. Maximum use should be made of any host nation capabilities. All host nation support is coordinated through the ASG civil affairs team. Base and base cluster commanders are responsible for developing ADC plans in coordination with the ASG rear TOC. In most instances, bases and base clusters will have to rely on their own assets; but engineer units may be used in critical situations, depending on the priority of their other work.

Engineer units develop SOPS that provide the composition of ADC teams. The number and size



* Headquarters element consists of battalion Commander, Command Sergeant Major, S2, S3, medical personnel, recon teams, and communications personnel

** Line company headquarters platoons (supply, mess, and maintenance sections)

Reorganization for Rear Combat Operations

of the teams depend on the rear TOC ADC plan. The basic unit is an engineer squad equipped with squad tools, air compressors, dozers, and a crane or wrecker. From the squad, the team can be increased to the size of a platoon, company, or battalion depending on the situation. Principal missions involve clearing the LOCs of rubble and debris, fighting fires and floods, salvaging equipment, rescuing people, and preparing sites for deliberate decontamination operations.

Emergency ADC missions are tasked to the engineer group directly by the ASG rear TOC. Other ADC missions, to include preattack measures and any damage repair missions, are prioritized by the wartime construction manager as discussed earlier in Chapter 2. Engineers coordinate for military police support for traffic control and EOD support for unexploded ordnance support with the ASG rear TOC.

Engineer units may also be tasked to perform ADC missions in support of the Air Force as discussed in Chapter 2. Emergency repair requests would be received by the engineer groups, while beyond emergency repair requests would be received by the engineer brigades. When operating on the airbase, mission priorities are established by the base civil engineer.

Engineer units execute rear area restoration missions in accordance with the theater construction priorities. Typical missions include power restoration and production, rubble clearance, removal of blown down trees, and repair of critical facilities and installations due to conventional or nuclear weapon use.

Additional information regarding ADC can be found in *FM 5-104.*

Chapter 5

Host Nation Interface

In a forward-deployed theater, the theater commander, in conjunction with allies and host nations, identifies wartime facility and construction requirements for US forces as part of the warplanning effort. Construction requirements are initially identified in the joint civil engineering support plan (CESP). Subsequent analyses further refine construction requirements and provide a basis for force structuring, procurement, and establishing host nation agreements. The goal is to reach host nation support agreements in peacetime to provide as many as possible of the facilities needed in the COMMZ. This is especially critical in a contingency, bare base theater. In a contingency theater, initial construction requirements are identified in the joint CESP. See Appendix C for a description of the CESP. Host nation construction support usually involves providing land, facilities, construction support, manpower, equipment, materials, and services. All host nation support must be substantiated with written agreements.

REAL ESTATE

The Department of State establishes real estate policies for the theater. The theater army engineer establishes policies for the acquisition, maintenance, and disposal of real estate in the COMMZ. This includes both leased and rent-free facilities. In some theaters, US Army Corps of Engineers (USACE) elements may operate in support of the ENCOM in executing the real estate program. This is particularly true in forward-deployed theaters. Real estate teams may be assigned to each ASG or to the senior engineer headquarters. These teams coordinate with host nation agencies for the acquisition and disposal of real estate,

Real estate planning must be initiated as campaign plans are developed to ensure adequate facilities are provided to sustain the combat force. Property acquired in the COMMZ must be documented under the applicable provisions of Status of Forces Agreements (SOFA). Local host nation officials can help identify available facilities or land that meet military requirements. Civil affairs and real estate personnel must work through host nation governments to settle agreements with property owners. Real estate acquisition is more difficult in contingency operations, but must be coordinated with the host nation government. Real estate is required for airbases, base camps, logistics complexes, and quarry and borrow sites.

Property is generally acquired in the COMMZ by requisition, and all transactions are documented thoroughly under the provisions of theater directives. Procedures will be used that provide the property required while ensuring the legal rights of owners are protected. Requisitioning should be done through local authorities.

Real estate policies and procedures are discussed in more detail in *FM 5-104.*

SUPPORT

Wartime host nation support agreements that have been negotiated for forward-deployed theaters such as Europe and Korea provide host nation construction support such as facility modification, LOC maintenance and repair, and utilities services. Such host nation support is used wherever possible to free US engineer units for more critical missions. Support agreements should be negotiated in peacetime on an asset basis. Assets may be facilities, contracts, or equipment.

The host nation may provide construction organizations to repair or construct facilities in the COMMZ. Construction materials (such as concrete, asphalt, aggregate, timber, and steel) and contract labor may also be available. Host nation assets may be available for local rear area security and for transporting construction materials. In contingency theaters, especially those where little planning has been accomplished, engineer reconnaissance elements must be dispatched early in the operation to identify available host nation assets.

Chapter 6

Construction Planning and Management

Broad plans and policies for construction in the theater are established by the theater commander in consonance with guidance from the Joint Chiefs of Staff (JCS). They are based on coordinated planning by construction representatives from all service components. Theater construction policies establish theater construction standards and priorities and establish the theater construction management structure.

Depending on the size of the theater, construction management may be exercised at the theater commander's level or may be delegated to several RWCMs as discussed in Chapter 2. Engineer units perform their construction missions under the control of the RWCM which may or may not be an ENCOM. Engineer units deploying to Central Europe will be under ENCOM control, while those deploying to the United Kingdom will be under Air Force control. Likewise, contingency theaters may be under theater, Army, Air Force, or Navy construction management.

THEATER STANDARDS OF CONSTRUCTION

Generally, wartime facility requirements will be satisfied, in priority, by–

- maximum use of existing facilities (US or host nation controlled);
- modification of existing facilities rather than new construction;
- austere design and construction techniques;
- minimum US engineer effort (maximum use of host nation labor and contracting); and
- identical facility designs and standards for all services.

Theater armies deployed to developed areas should be able to capitalize upon an established infrastructure and maximize the use of existing facilities. Construction management will focus on facility modification and battle damage repair. Host nation support in manpower, equipment, and materials should be maximized.

Those armies deployed to a lesser developed area of operations must rely more upon construction of new austere facilities. The construction management will focus on *initial standard* (up to 6 months expected use) or *temporay standard* (up to 24 months expected use) construction and battle damage repair. Host nation support should be sought but may be less available than in developed areas.

THEATER PRIORITIES OF CONSTRUCTION

Engineer work requirements in the COMMZ will normally exceed capabilities until the theater is fully matured. The establishment of a broad priority system by the theater commander will assist in applying resources against only those tasks most critical to battlefield success. The chart below provides a framework for assessing the priority of required engineer support.

Engineer Support Priorities in Theater

Priority	Implications of Nonsupport
1	High loss of life or combat defeat
2	Degraded combat effectiveness or increased vulnerability on the battlefield
3	Degraded noncritical CSS

ARMY REGIONAL WARTIME CONSTRUCTION MANAGEMENT ORGANIZATION

Where the theater army is designated as the RWCM, the function is delegated to the senior theater army engineer commander, who is usually the ENCOM commander. The management of all construction, repair, and facility modification in the COMMZ is exercised through the RWCM system which provides centralized control with decentralized execution. This system manages all troop, contract, and host nation construction/repair operations in the COMMZ. Such a system ensures that theater construction assets are employed in accordance with theater priorities. Responsibilities of the RWCM are –

- Manage troop construction;
- Manage contract construction;
- Integrate prioritized projects from all component commanders into construction; program for region;
- Prioritize US requests for host nation construction support in region.

Positioned within the established theater support structure, the ENCOM with its brigades and groups provides the framework for the organization. Defining a part of the theater as a region, the TAACOM's area of responsibility as a district, and the ASG's area of responsibility as an area, the following organization is formed:

- The ENCOM, as the theater senior army engineer organization, is designated the RWCM.
- The engineer brigade, as the engineer organization at the TAACOM level, is designated the District Wartime Construction Manager (DWCM).
- The engineer group, as the engineer organization at the ASG level, is designated the AWCM.

The chart on page 23 shows this organization. These designations result in engineer commanders becoming wartime construction managers in their areas of operations.

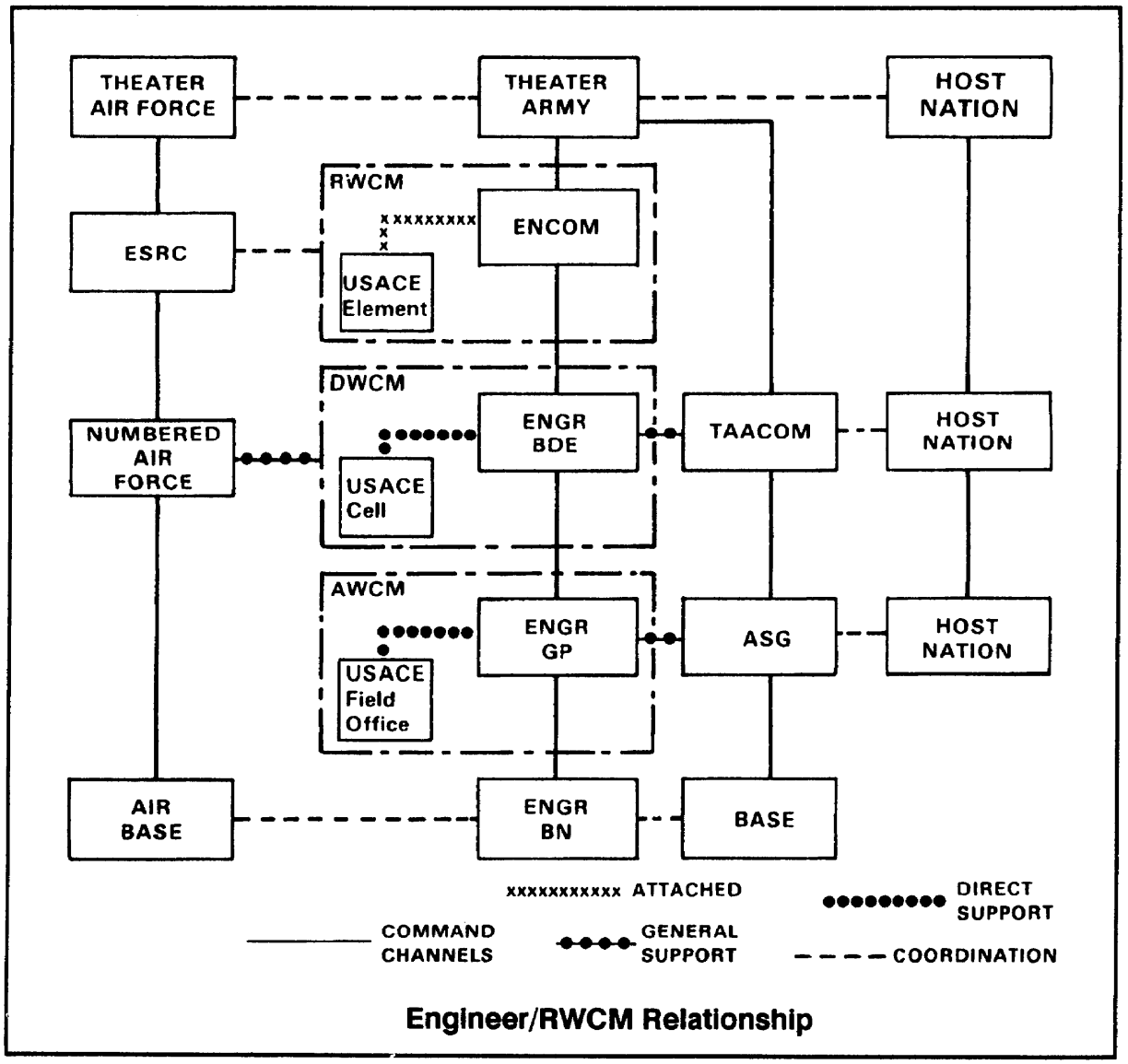
To assist the commanders in accomplishing their responsibilities, each unit organization is provided by table(s) of organization and equipment (TOE) with a section to manage construction as shown in Appendix A. The construction management section oversees the total construction workload – troop, contract, and host nation. Host nation construction management is coordinated through the ASG host nation support element. Officers and noncommissioned officers are provided by TOE to control troop and host nation efforts. Support by a USACE construction contract management organization provides control of that work accomplished by contract. In a forward-deployed theater, this USACE support is provided by personnel currently staffing an existing USACE organization in that theater, such as US Army Engineer Division Europe in Central Europe and US Army Engineer Division Pacific Ocean in Korea. In a contingency theater, this USACE support will be determined by the Department of the Army and USACE.

REGIONAL WARTIME CONSTRUCTION PROCEDURES

Decentralized execution of the wartime construction management program necessitates that work requests enter the system at the lowest feasible level. Alignment along area support boundaries provides established conduits through the *landlord* ASGS. All US Army requests for engineer work are submitted to the ASG. If the ASG cannot accomplish the work with its organic assets, it prioritizes the requests and provides them to the supporting engineer group/AWCM. Host nation requests for US engineer support are received by the ASG civil affairs team and passed to the engineer group/AWCM for execution.

The engineer group/AWCM enters these requests into its workload in accordance with the established theater priorities and accomplishes them by troop, contract, or host nation effort as applicable. Work that cannot be foreseeably accomplished is entered into a construction/repair backlog and passed to the engineer brigade/DWCM for resolution.

Work requests from other US Services (such as the Air Force) are submitted directly to the engineer brigade/DWCM in charge of the area of operations. The brigade/DWCM prioritizes them in



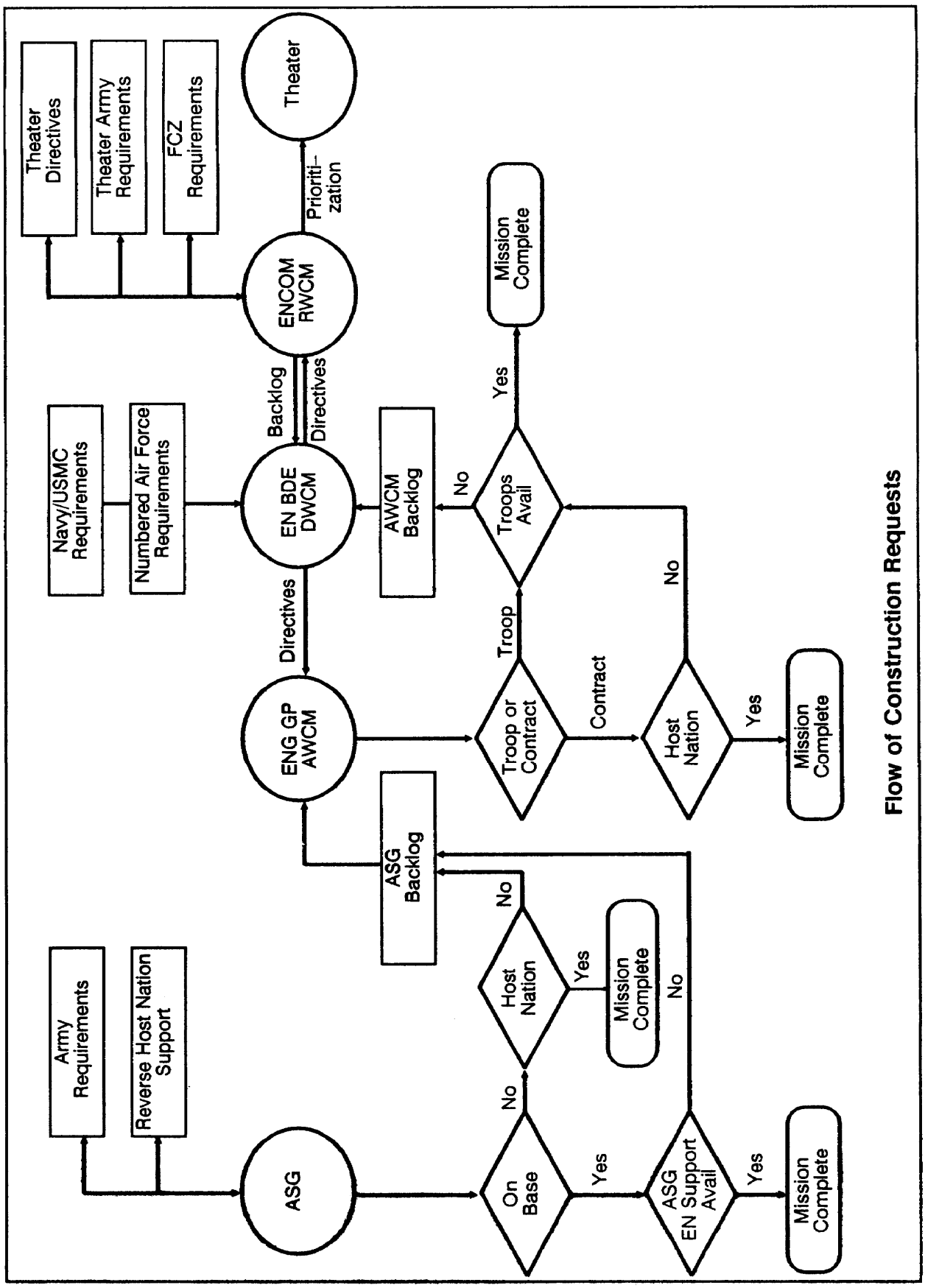
Engineer/RWCM Relationship

accordance with the theater priorities and provides them to the engineer group/AWCM supporting the area in which the work is required. Work that cannot be foreseeable accomplished is passed to the ENCOM/RWCM for resolution.

The ENCOM/RWCM may receive priority work from the theater army base development plan. This work must be prioritized and passed to the appropriate engineer brigade/DWCM for accomplishmen. Additionally, submitted brigade/DWCM backlogs may be redistributed to other engineer brigades/DWCMs not fully committed.

This two-way flow of backlog and tasking identifies required workload to each level of the wartime construction management organization. Objective scheduling can be done by the engineer group/AWCM in accordance with the theater priorities. Only an exceptional case need be referred to higher headquarters to settle a question of priority.

The chart on page 24 summarizes the procedures.


Theater Directives
Theater Army Requirements
FCZ Requirements
Theater
Prioriti-zation
ENCOM RWCM
Backlog
Directives
Navy/USMC Requirements
Numbered Air Force Requirements
EN BDE DWCM
AWCM Backlog
No
Troops Avail
Yes
Mission Complete
Directives
Troop
No
ENG GP AWCM
Troop or Contract
Contract
Host Nation
Yes
Mission Complete
ASG Backlog
Army Requirements
Reverse Host Nation Support
ASG
No
On Base
Yes
No
Host Nation
Yes
Mission Complete
No
ASG EN Support Avail
Yes
Mission Complete
Flow of Construction Requests

GENERAL CONSTRUCTION PRINCIPLES

The following principles should be followed when planning construction projects in a theater of operations:

- Construction should be accomplished within the allotted time and use a minimum of materials, equipment, and manpower.
- Maximum use should be made of the installations and facilities described in the Army Facilities Components System (AFCS) and other standard drawings when they are applicable, See Appendix B for a description of AFCS.
- Simple, flexible designs should be used.
- Designs should incorporate available materials, either locally procured or normal supply items.
- Construction standards must not exceed those established by the theater commander.
- Existing facilities should be repaired or modified before new ones are constructed.
- Only the minimum facilities consistent with military necessity should be provided.
- Planning must avoid creating lucrative targets; facilities should be dispersed.
- Camouflage and deception must be planned during initial site selection and construction.

TROOP CONSTRUCTION MANAGEMENT

Any theater-specific standard designs that are required are generally developed at ENCOM and engineer brigade level for use throughout the theater. Any base development plans that are required are also usually developed at ENCOM and engineer brigade level. Construction directives may be issued at ENCOM and engineer brigade level, but normally only for large installation requirements, such as a base camp or logistical facility.

Design of new facilities (other than roads, hardstands, or similar horizontal facilities that are usually designed at battalion level) is generally performed by the engineer group. These designs are based on site reconnaissance and coordination with the facility user. The designs normally incorporate AFCS facilities or theater standard designs. Building components are standardized whenever possible to facilitate template production methods.

Engineer groups issue construction directives to subordinate battalions that contain the specifications and drawings needed to construct the new facility. These directives are generally for construction only. Occasionally, groups will issue directives for design and construction, These are normally limited to upgrade or repair of existing facilities or site adaptation of standard designs. The group staff inspects battalion projects for compliance with plans, specifications, and sound construction practices. If support from a construction support company, dump truck company, pipeline construction support company, or port construction company is required, the engineer group issues a separate directive to that company specifying the particular support it is to provide.

The engineer battalion reviews the construction directive received from the group and issues a similar construction directive to one of its companies for execution. An example format for a construction directive is shown on page 26. The company in turn tasks the mission to its platoons. The platoon leader and platoon sergeant analyze the project, perform a site reconnaissance, prepare a construction schedule, and develop or verify the bill of materials (BOM). A critical path method (CPM) network diagram is usually used to analyze the project and develop the construction schedule to include resource requirements. The platoon leader requests through the company operations section any survey support, such as site layout, or soils testing support required from battalion. The BOM, construction schedule, and any additional personnel or equipment support required are reviewed by the company commander and the construction officer prior to submission to battalion. The platoon leader develops a construction drainage plan for the work site, a quality control plan, a safety plan, and a site security plan. Project planning documents include –

- Construction Schedule
- Bill of Materials
- Construction Drainage Plan

Example Format for Construction Directive

SUBJECT: Construction Directive No.
TO:
1. MISSION: Describe the project and provide all available information.
2. PRIORITY: Use standard theater priority notation.
3. LOCATION: Either a definite location or a general area.
4. SCHEDULE: Available starting date and required completion date.
5. MANPOWER: Either additional or indigenous labor support available.
6. EQUIPMENT: Additional equipment support available.
7. ATTACHMENTS: Any unit attachments and duration of attachment.
8. MATERIALS: Any special instructions pertaining to construction materials.
9. COORDINATION: Authorize direct coordination with required units and agencies.
10. ADMINISTRATION:
    a. Progress Report: Frequency per unit SOP.
    b. Construction Schedule: When submission is required.
11. SPECIAL INSTRUCTIONS: Use if applicable.

FOR THE COMMANDER:

Adjutant

- Quality Control Plan
- Safety Plan

The battalion S3 reviews all project BOMs for accuracy and passes them to the S4 for requisitioning. Logistics procedures are further described in Chapter 9. The S3 also incorporates the individual project schedules into a battalion master construction schedule. This schedule is used to manage construction in the battalion and cross-level resources. The battalion S3 periodically inspects each project to ensure that quality control standards are achieved. Inspection reports are prepared and filed in project folders in accordance with battalion SOPs. At the completion of each project, a final inspection is conducted by the battalion S3 to ensure the project is completed in accordance with plans and specifications. As-built drawings are prepared by the battalion S3 and given either to the ASG engineer section or to the base civil engineer on an airbase. Final project reports are prepared and submitted by the engineer company in accordance with the battalion SOP. New facilities are transferred to the supporting RPMA agency using DD Form 1354 (Transfer and Acceptance of Military Real Property).

An example format for a battalion construction SOP is shown in the chart on pages 27 and 28.

TROOP CONSTRUCTION MANAGEMENT DURING AIRBASE DAMAGE REPAIR

Troop construction management for airbase damage repair is similar to that described in the previous section, except the engineer group would not publish a construction directive but would issue an operation order (OPORD) placing a battalion or company in direct support of the base civil engineer who would determine task priorities. Missions are tasked to companies and platoons using construction directives as previously explained. Project designs are approved by the base civil engineer before work starts. Construction materials for airbase work are generally obtained through the base civil engineer and not through Army supply channels.

Example Format for Construction SOP

1. General
   a. Command and staff responsibilities
   b. Project directives
   c. Plans and specifications
   d. Coordination with Army agencies outside the unit (such as DEH, area engineer, ASG)
   e. Coordination with other US agencies (such as US Air Force and Department of State)
2. Premobilization
   a. Site investigation procedures
   b. Design constructibility review
   c. Phasing requirements
   d. Material procurement
   e. Equipment scheduling
   f. Construction management
      (1) Schedules
      (2) Quality control/quality assurance
         (a) Materials tests
         (b) Inspection
   g. Preconstruction conference
   h. Convoys
   I. Project safety
3. Mobilization and Construction
   a. Administrative and logistical support for unit
      (1) Billeting
      (2) Messing
      (3) Communications
      (4) Transportation
      (5) Maintenance Support
      (6) Medical Support
      (7) Troop Morale and Recreation
   b. Project/Site Layout
      (1) Construction area
      (2) Vehicle/equipment parking areas, to include security
      (3) Material storage/laydown areas, to include security
      (4) Project office
      (5) Tool storage, to include security
      (6) Traffic pattern
      (7) Messing/break areas
      (8) Latrines
      (9) First aid station
      (10) Project sign and briefing boards

c. Construction progress meetings
d. Quality control/quality assurance procedures
e. Design change authorization
f. Safety inspections and reporting procedures
g. Incident reports and reporting procedures
h. Project reports and files
(1) Man-hours
(2) Equipment
(3) Materials
(4) Funds
(5) Project progress/schedule
(6) Shop drawings
(7) Plans and specifications revisions
i. Visitor procedures

4. Phase-Down/Project Close-Out
a. Prefinal inspection (if applicable)
b. Deficiency correction
c. Final inspection (includes total job site)
d. Ribbon cutting ceremony (if applicable)
e. Transfer of responsibility
(1) DD Form 1354
(2) As-built drawings
(3) Warranty compliance (if applicable)

5. Theater Specific Requirements
a. Host nation agreements
(1) Labor—host nation and third nation
(2) Equipment
(3) Code compliance
(4) Material procurement process
(5) In-country travel
(6) Architect/engineer (A/E) firms
(7) Construction contractors
b. Coordination with host nation agencies
(1) Ministry of Defense
(2) State agencies
(3) Local agencies
(a) environmental
(b) political
(c) economic
(d) public relations

Chapter 7

Base Development

Operations projection and support bases are crucial to executing theater missions. Operations projection bases are those which directly support combat operations such as Air Force tactical fighter airbases. Support bases are logistics oriented and are typified by Army logistics bases found in the COMMZ. The theater commander's plans and operations are made possible and yet constrained by his bases and local infrastructure. The location of the bases and nature of the facilities on the bases determine how effectively and efficiently combat operations can be sustained in the supported area of operations (AO). All requirements for construction represent an additional investment of scarce resources and precious time. For this reason, base development and AO infrastructure are given careful consideration in the theater commander's selection of a course of action (COA).

Base development planning is an ongoing process. The theater base development plan results from concurrent planning by the theater staff and Service component staff considering strategic plans and resources. The ENCOM staff is responsible for the more detailed planning for each base. In peacetime, the theater commander develops contingency plans for various scenarios. The logistics support planning is general in, nature and only done to the extent necessary to identify resource requirements and assess OPLAN supportability. In a wartime environment, strategic changes may cause a shift in theater objectives to a new AO. This in turn will generate a requirement for new bases and/or major construction projects at existing bases in the new AO. Under these circumstances, base development planning will be more general in support of the development of COAs and then detailed by the ENCOM to support the selected COA.

BASE DEVELOPMENT PLANNING

A base development plan is developed to ensure the timely availability of facilities required to sustain the deployed force. The first step in developing a base development plan is to determine what facilities are required. The following factors must be considered in determining facility requirements:

- Total force structure to be supported.
- Expected duration of force deployment.
- Types of equipment to be employed.
- Mission and operational objectives.
- Number of days of supply to be stocked in theater.
- Standards of construction.
- Theater hospitalization policy.
- Theater climatic conditions.
- Time phasing of force deployment.

The LOCs and utility requirements must also be identified early in the base planning process. The planning factors contained in *FM 101-10-1* and the designs in the AFCS can be used to estimate facility requirements for some logistics functions.

The theater air force commander advises the theater army of the Air Force requirements for construction of airfields and any other facilities and their general location. To ease project planning, the Air Force also provides a general siting plan that includes any special requirements. Aircraft characteristics; broad design, layout, and construction criteria; and definitive drawings, specifications, or other references applicable to theater of operations construction requirements that are unique to the Air Force are included.

Next, an inventory must be made of facilities available in the theater of operations. Where possible, in-country facilities should be used as well as facilities that might be available in neighboring host nations. Existing facilities may require modification to meet military requirements. Existing facility information in contingency theaters can be obtained from Defense Intelligence Agency area studies, the

US embassy, or on-site reconnaissance. In forward-deployed theaters, the inventory of US real property assets provides most of the needed information. Use of host nation facilities must be coordinated with the host nation government by the civil-military staff agencies at the theater army.

The difference between facilities required and facilities available must be addressed in the base development plan. These requirements can be satisfied by new construction, rehabilitation, or substitution by other facilities. The AFCS provides standardized plans for facilities that should be used in determining real estate and construction requirements. Designs in AFCS may need to be modified to accommodate local materials. See Appendix B for a discussion of AFCS. The base development plan must identify the theater priorities for construction or modification of facilities and the interconnecting transportation network. These theater priorities will be used by the construction manager in executing the base development plan. The plan must also identify any real estate required to support new construction. All real estate requirements must be coordinated with the host nation.

The AFCS can be used to determine the engineer force structure required to execute the base development plan. Host nation construction capabilities and contractor availability must also be considered in developing a time-phased plan for constructing the needed facilities. Availability of construction materials from host nation sources must also be determined. Materials not locally available must be programmed for shipment to the theater. Adequate port facilities must be provided early in base development to provide reception facilities for equipment and materials required to execute the plan. This may require the early development of logistics over the shore operations (LOTS) sites and may involve the dredging of ship channels to provide access to ocean-going vessels. Specialized unit requirements such as well-drilling or diving detachments must be identified early in the base development process.

ENGINEER RESPONSIBILITIES

The senior theater army engineer commander, normally the ENCOM commander, usually is tasked with overall responsibility for base development in the COMMZ. The ENCOM staff in coordination with the theater army staff identifies general locations for major facilities and tasks the engineer brigades and groups to do the detailed planning and facility siting. Base development planning is normally not performed below group level.

The engineer group staff reconnoiters the various proposed sites and develops plans and specifications in close coordination with the major logistical commands that will use the facilities. These detailed designs are forwarded through the engineer brigade to the ENCOM for approval and incorporation into the overall theater base development plan.

A time-phased base development plan is thus developed considering facilities needed, construction assets available, and availability of construction materials. This plan is then passed to the RWCM for execution. Construction directives are issued to the engineer battalions in accordance with theater priorities as discussed in Chapter 6.

CHAPTER 8

Real Property Maintenance Activities

The theater commander has overall responsibility for real property maintenance activities (RPMA), He delegates authority to the theater army commander, who further delegates to the theater army area command/area support group with staff responsibility retained by the Theater Army Deputy Chief of Staff for Logistics. The ENCOM provides technical assistance when requested. The TAACOM, through its ASG and installation commanders, usually provides the needed RPMA support. Principal RPMA functions in a theater of operations include operation, repair, and maintenance of facilities and utilities; fire prevention and protection; and refuse collection and disposal. The operation, maintenance, or repair of tactical generators is not an RPMA function.

In forward-deployed theaters, COMMZ installation DEH activities will continue to perform installation RPMA functions. Host nation utilities support may continue to be available. Part of the DEH's local work force may be lost due to host nation mobilization and return of US civilians to CONUS, and additional RPMA resources maybe required. Contract labor is an alternative to fill the shortfall. The RPMA requirements will increase in a contingency theater as the logistical infrastructure is constructed in the COMMZ. Most RPMA support is provided by engineer utilities teams under the ASGs, but limited host nation or contract capability may exist. Local resources must be used to a maximum extent to minimize troop requirements, The ENCOM must be prepared to augment ASG RPMA capabilities, particularly in responding to rear area damage.

ORGANIZATION

Each ASG will have an assigned or attached engineer unit that provides RPMA support to facilities located within the ASG's area of responsibility, The top chart on page 32 shows the organization of a typical ASG. Those RPMA requirements that exceed the ASG capabilities are forwarded to the supporting engineer group/AWCM for execution in accordance with the theater priorities. Technical RPMA guidance is provided to the ASG through the TAACOM as shown in the bottom chart, page 32, The ASG is responsible for providing RPMA support to all Army facilities in its area of operation, to include leased facilities, unless host nation support is available for leased facilities.

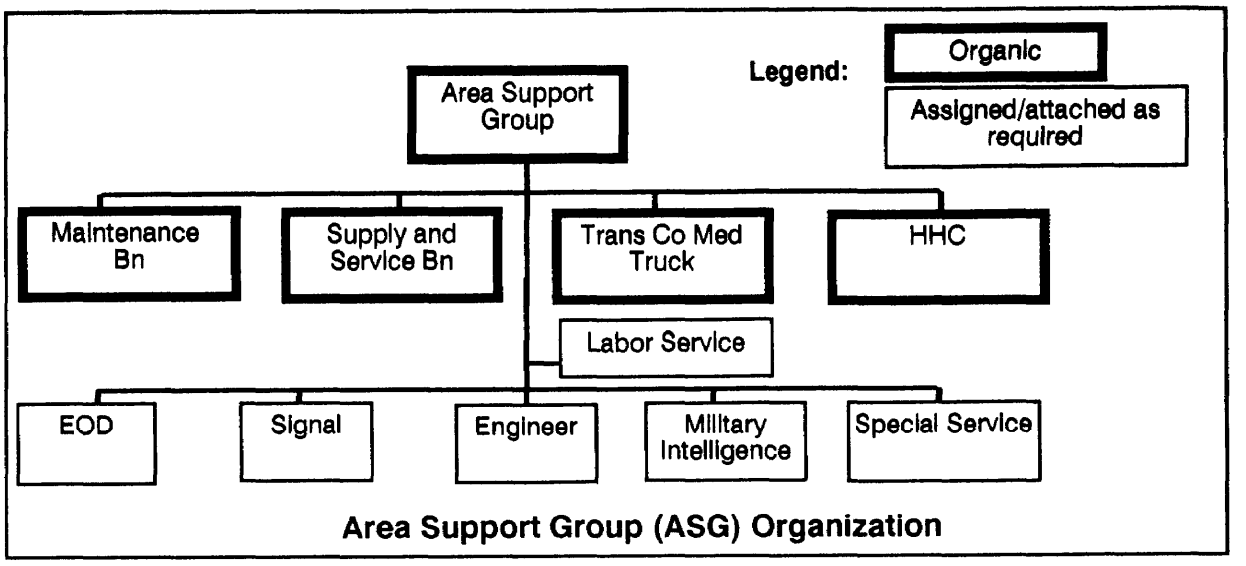
UTILITIES

Electrical power may be available from commercial sources in a mature theater. Power generation capability, however, will be required in most contingency theaters. Distribution systems will be *required* and adequate engineer troops must be provided to do the necessary work. Standby power will be required for critical facilities served with commercial power.

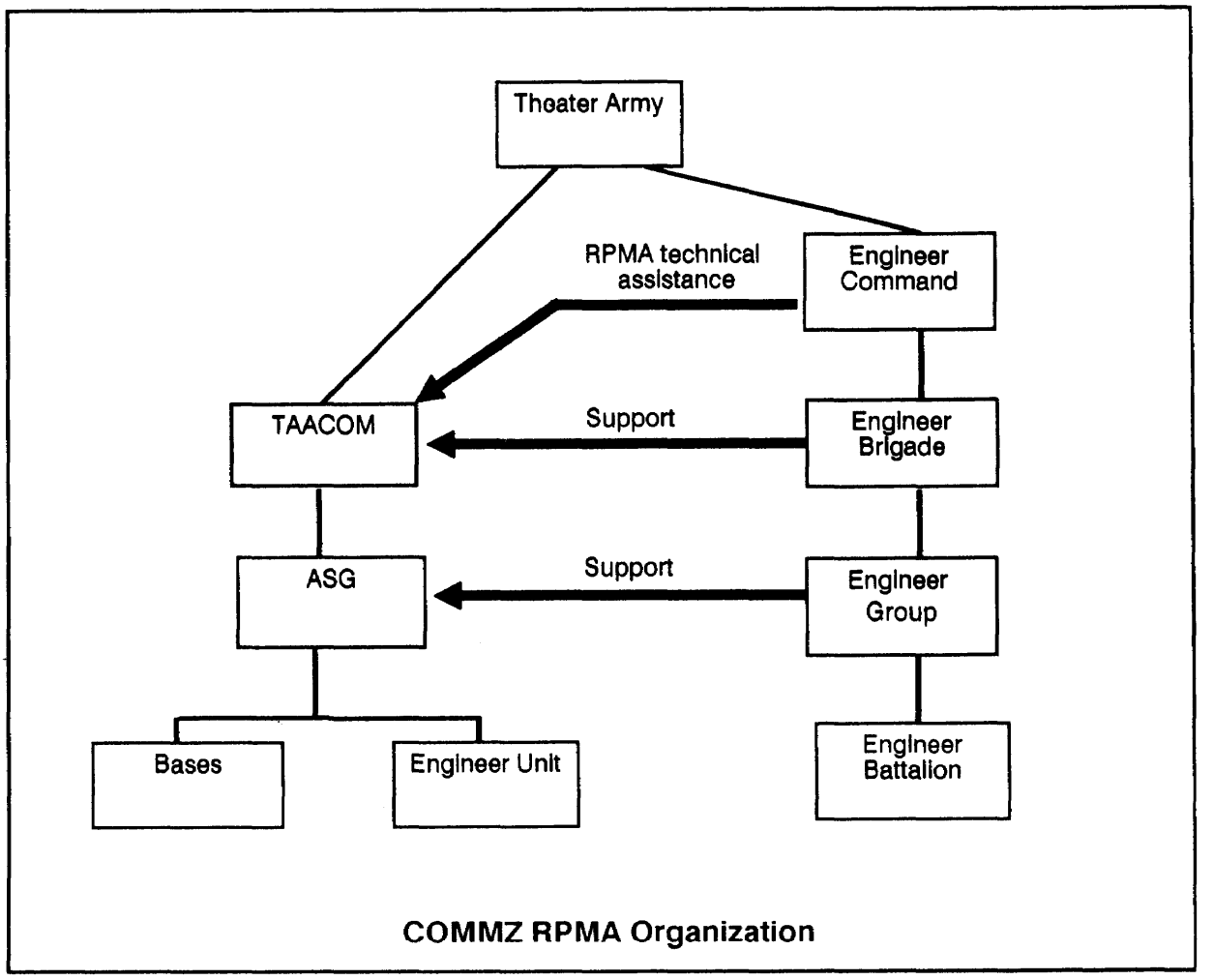
Potable water supply and waste water collection systems will require maintenance at most COMMZ installations and bases. The host nation may provide the water and operate sewage treatment facilities, but ASG RPMA assets are required to maintain the utilities systems on COMMZ installations and bases and to repair limited war damage. Austere water and sanitary facilities will be used for troop bases constructed in a contingency operation.

FIRE PROTECTION

Engineer fire fighting units are assigned to the ASGs to provide needed fire protection that is not available from the host nation or the installation DEHs. These fire fighting units are allocated to the ASGs based on the troop population and size of storage areas.



Area Support Group (ASG) Organization



COMMZ RPMA Organization

REFUSE COLLECTION AND DISPOSAL

The ASGs are responsible for establishing sanitary landfills for their areas of operation. The engineer utilities detachment under the ASG normally establishes and operates the landfill. In many areas, existing host nation landfills can be used, In other areas, contract landfills may be available. Local labor may be used to operate landfills that the ASGs establish. Special considerations must be given to hazardous waste, particularly waste products generated by medical facilities and maintenance operations.

THE ASG ENGINEER UNIT

Engineer units assigned or attached to an ASG will be configured based upon the expected RPMA workload. The degree of nonstandardization among ASGs (coverage area, number and types of units supported, theater of operations) necessitates that engineer unit design be flexible. Task organization of specialized teams from the *TOE 5-500* series facilitates this design. A possible engineer organization will consist of a command and control headquarters, fire fighting team(s), and utilities team(s).

The company-sized command and control headquarters provides command and minimal administrative and logistical support for two or more platoons with an aggregate strength of 80 to 120, The administrative and logistical support is equivalent to that provided by the headquarters of a line company organic to a combat heavy battalion, less mess, maintenance, and communications.

Fire fighting teams will be task organized based upon the ASG facility requirement. A fire fighting headquarters will normally control from three to five fire fighting teams consisting of a combination of water truck, fire truck, brush fire truck, or crash rescue. The organization provides the ASG with the capability to implement fire prevention and fire fighting programs. The organization is dependent upon ASG assets for support in the areas of personnel administrative service, finance service, supply, messing, medical, and unit maintenance.

Utilities teams will be assigned based upon the population serviced by the ASG. Geographic considerations aside, planning factors provide one team for each installation with a population between 2,500 and 4,000. The utilities team is capable of providing facilities engineering support – limited carpentry, masonry, electrical, plumbing, and road maintenance and repair. The team is dependent upon ASG assets for support in the areas of personnel administrative service, finance service, supply, messing, and medical. The team has the capability to perform limited unit maintenance.

Should the size of the ASG necessitate a team task organization that exceeds the command and control capabilities of a single company-sized headquarters, additional company-sized headquarters will be assigned to the ASG. A battalion-sized headquarters capable of providing command and minimal administrative and logistical support could be assigned to control three or more companies.

These ASG engineer units are specialized teams tailored to the specific ASG to accomplish RPMA missions. They are dependent upon the ASG for sustainment support.

PROCEDURES

The staff of the ASG engineer unit headquarters augments the ASG engineer staff in the execution of its RPMA mission. Work orders are submitted to the installation DEH, where available, Work order requirements are executed by the DEH in accordance with the installation commander's priorities. If there is no DEH organization available, work orders are submitted directly to the ASG engineer. Urgent RPMA requirements exceeding ASG capabilities are forwarded to the supporting engineer group for execution in accordance with theater priorities.

New facilities constructed by ENCOM units are transferred to the installation DEH or, if there is no DEH, to the ASG engineer on DD Form 1354. Representatives of the ASG engineer should participate in the final inspection of all such facilities prior to acceptance.

Chapter 9

Engineer Logistics

Engineer units are unable to perform their wartime missions without adequate logistical support. If they are to be successful on the battlefield, engineer commanders must understand the combat service support system and know where to go for required logistical support, Massive requirements for Class IV construction materials distinguish engineer requirements from those of other units in the COMMZ.

Adequate Class IV supplies are central to the ability of EAC engineer units to construct and maintain facilities to support the sustainment base. For this reason, the ENCOM usually plays a key role in managing the allocation of construction materials in theater. Selected critical Class IV construction items are often controlled directly by the ENCOM rather than the theater Army materiel management center (TAMMC),

CONSTRUCTION MATERIALS

In the theater of operations, construction materials may be difficult to obtain. Required construction materials might be supplied from CONUS through the supply system, obtained from local suppliers, extracted from local natural sources, or produced by engineer units, Ideally, construction materials should be procured from sources close to the construction site. But this is often not possible, Because of the time and cost involved in moving construction materials, facility designs should be adapted to make maximum use of locally available materials.

PLANNING CONSIDERATIONS

One of the primary responsibilities of the ENCOM staff is to forecast the types and quantities of engineer materials required for the theater. The CESP is usually used to establish the initial requirements during preconflict planning. Planning during the conflict requires good intelligence as to damage caused by enemy action and a good listing of additional facilities needed. The AFCS can be used as a guide in determining material requirements for needed facilities. In some cases, existing facilities can be modified to meet military requirements. In these cases, material requirements must be estimated,

The ENCOM staff must also determine what materials are available from local sources. These may be from local manufacturers, commercial stockpiles, or host nation government assets. Materials not locally available must either be procured out of theater or produced in theater by engineer units. Materials that fall in the latter category include aggregate, concrete, construction water, asphalt, and lumber. A local procurement system must be established to expedite the procurement of local materials, Procurement of local materials may be restricted in some theaters to avoid inflating the cost of construction materials in the host nation.

DESIGN CONSIDERATIONS

Designers must consider the availability of construction materials when designing projects for the theater of operations. Many designs may not be practical because of logistical considerations. For example, although AFCS designs are adjusted for various climates (temperate, desert, tropic, and arctic), they may be difficult to construct because of the unavailability of required construction materials in the region. Military designers must be knowledgeable of local construction standards and materials commonly used in the particular region. Designs must include the use of local materials or provide flexibility for use of substitute materials.

The construction standard for the theater of operations will be one of the following:

- *Initial Standard* (up to 6 months expected use).
- *Temporary Standard* (up to 24 months expected use).

Since the design life is short, only essential utilities, heating, and cooling will be provided.

This will also reduce engineer material requirements.

CONSTRUCTION CONSIDERATIONS

In the material estimation process, 10 percent is usually added to the estimated quantity as a waste factor. Such a waste factor is already included in the AFCS BOMs, Although this waste may seem minor, the combined effect of material waste will have a significant impact on the supply system. Thus, all involved with actual construction must take steps to limit the waste of construction materials by–

- ordering and using optimum lengths;
- providing for the proper storage, security, and handling of construction materials;
- providing proper worker training to limit waste; and
- reusing materials.

TRANSITION TO WAR

Unlike other classes of supply, Class IV construction materials are not provided based on documented consumption rates, and there are no anticipated surge rates, It may take several months between the initiation of the requisition and the arrival in theater of the material. For this reason, it is crucial that EAC engineers estimate their requirements as soon as possible and initiate requisitions in advance of deployment or operations, if possible. Initial material forecasts are usually submitted by the ENCOM using the AFCS data, the CESP data, and base development plans.

Successful execution of the theater construction program depends on an adequate supply of materials as well as construction capability. Typically, during the early stages of a conflict, war damage repair and construction of mission-essential facilities will dominate engineer construction activities. As the theater matures, more substantial facilities will be required and more construction forces will be available, The ENCOM must ensure that adequate construction materials are forecast to meet anticipated construction requirements, These materials must be flexible enough to meet a variety of construction requirements as engineers respond to changing conditions.

CONSTRUCTION MATERIAL PROCEDURES AT UNIT LEVEL

Construction materials at battalion level are managed by the S4. After the S3 approves project BOMs, they are passed to the S4 for material requisitioning. The S4 orders the construction materials through the ASG general supply company, Selected critical items may require release through the engineer group if they are managed by the ENCOM, Once the required materials are obtained, they are issued to the companies using the approved BOMs. Final BOMs for each project are provided by the S4 to the S3 for inclusion in the project files.

Battalion S4s usually establish a construction materials storage facility and maintain a stockage of common construction items such as lumber, electrical wire and fixtures, nails, and cement. Project materials are stored in this storage area until drawn for use by the companies. Transportation support for the S4 is provided by the S3 tasking subordinate companies to provide haul assets, normally tractors and semitrailers, to support the S4 material haul mission, The S4 is responsible only for moving the materials from the supply point to the battalion storage facility. Companies must transport their own materials from the S4 storage site to the project location.

Separate engineer companies requiring construction materials use similar procedures in obtaining the needed materials through the group S4, An example would be a construction support company requiring asphalt, which may be an ENCOM controlled item. If asphalt is a controlled item, the group S4 must first obtain a release through the engineer brigade before ordering the material through the ASG general supply company.

When working on an airbase, the engineer unit obtains most construction materials through the base civil engineer, If an entire engineer battalion is working on the airbase, the battalion S4 obtains the materials from the Air Force, If a single engineer company is working on an airbase, the

company construction officer coordinates with the base civil engineer for the required materials,

The S4 at battalion, group, and brigade level maintains a listing of construction materials that are available in theater for use by project designers, This procedure ensures that designs incorporate materials that are readily available and ultimately results in rapid completion of construction projects. Construction materials required from host nation sources are requested through the group S4, who coordinates with the civil affairs team at the ASG for the requested support.

MAINTENANCE SUPPORT

An effective maintenance program is essential if EAC engineer units are to provide continuous, responsive support to the COMMZ sustainment base. The performance of effective maintenance will be limited by the extent of NBC contamination encountered and the requirement for maintenance personnel to work in protective clothing. Maintenance supervisors must ensure that preventive maintenance services are performed to ensure equipment remains operational when most needed. Controlled substitution may be required to keep critical equipment operational,

Vehicle repair should be accomplished as far forward as possible, often with the use of contact teams from battalion and company maintenance sections. Equipment in the combat heavy battalion requiring support level maintenance is evacuated to the headquarters and support company (HSC) maintenance platoon. If general support level repairs are required, guidance is obtained from the TAMMC, Usually, the HSC evacuates the equipment to the TAACOM maintenance battalion. Separate engineer companies authorized a direct support maintenance capability execute maintenance operations similar to the combat heavy battalion. Separate engineer companies not authorized a direct support capability evacuate equipment requiring support maintenance to the ASG maintenance battalion,

Class IX repair parts support for the combat heavy battalion and separate engineer companies authorized a direct support capability is from the TAACOM repair parts company. Companies organic to the combat heavy battalion requisition needed repair parts through the HSC. Separate engineer units not authorized a direct support capability order repair parts from the ASG maintenance battalion. Engineer units working on an airbase may obtain limited repairs parts support from the Air Force civil engineering units,

OTHER LOGISTICAL SUPPORT

The EAC engineer units obtain personnel and administrative support from the supporting personnel services company of the TAACOM personnel and administration battalion. Finance support is provided by the TAACOM area finance support center. Medical support, to include medical supplies, is provided by the nearest medical facility. EOD support is provided by TAACOM EOD detachments.

Class I supplies (rations) are provided by Class I supply points operated by the ASG supply and service battalion. Rations are obtained based on unit strength reports that are prepared by the battalion S1. When working on an airbase, engineer units obtain Class I support from the Air Force.

Class II and VH supplies are requisitioned from the ASG supply company by the property book officer at battalion or in the separate companies. Requisitions for regulated or command controlled items are processed through command channels.

Class III supplies (POL) are provided by the Class III supply points operated by the ASG supply and service battalion. This is true for both bulk and packaged products. Requisitions from the property book officer are required to obtain the needed supplies. When working on an airbase, engineer units obtain Class III support from the Air Force.

Class V supplies (ammunition) are obtained from the nearest ammunition supply point operated by the TAACOM ammunition battalion. Requisitions must be processed by the property book officer.

Chapter 10

Unit Operations

This chapter provides an overview of EAC engineer unit operations below group level. The basic force structure building block for the EAC engineer force is the combat heavy battalion which is augmented, where required, to perform specialized missions. Engineer operations in the COMMZ are generally executed at company and platoon level, The purpose of this chapter is to outline how unit operations are conducted in the combat heavy battalion and in the specialized EAC engineer companies. Unit organizations and capabilities are shown in Appendix A, Topographic unit operations are discussed in *FM 5-105.* Technical aspects of the EAC engineer missions are discussed in *FM 5-104* and other specialized manuals listed in the references.

COMBAT HEAVY BATTALION

Most missions given to the combat heavy battalion are issued by the engineer group. Exceptions occur when the battalion is operating in direct support of a base commander on an airbase, when responding to a rear area combat threat under the control of a rear TOC or BCOC, or when given an area responsibility such as maintenance of a section of a critical line of communication,

Missions for the construction of new facilities are usually received by construction directive from group. Design of vertical facilities is generally limited at battalion level, usually restricted to site adaptation of theater standardized or AFCS designs. Most design of horizontal facilities is performed at battalion level. Repair, restoration, area damage control, or rear operations missions are usually received by mission order.

The battalion S3 analyzes the missions and tasks them out to the individual companies based on the task priority and the existing workload of each company. The S3 determines if either personnel or equipment augmentation is required and arranges for any needed augmentation. Coordination is normally made at daily operations meetings between the S3 and the company construction officers. The S3 also notifies the S4 of any critical material requirements, while the companies determine the detailed BOMs. This allows the S4 to order critical items early rather than wait for detailed BOMs. Tactical intelligence and weather data are obtained by the S2 from the rear TOC and passed to the other staff sections and the companies on a daily basis.

The company commander receives missions from battalion and tasks individual platoons for execution. Large missions may require most of the company's assets and be managed at company level, whereas several small missions may be given to one platoon. The company commander analyzes each mission and task organizes the company accordingly, The platoon leader and platoon sergeant are the principal project managers. They conduct site reconnaissances and develop the detailed BOMs and construction schedules, as discussed in Chapter 6. The company construction officer coordinates all external logistical support required by the platoon leader in the execution of the mission. Materials are drawn from the S4 and normally transported to the project site by the platoon, The company commander and platoon leader are responsible for quality control of each construction mission. The platoon leader prepares daily project reports in accordance with the battalion construction SOP, The S3 performs the quality assurance mission by conducting frequent inspections of each project to ensure adequate quality control procedures are being followed.

PORT CONSTRUCTION COMPANY

The port construction company may operate directly under group control, or it may be placed under the operational control of a combat heavy battalion, depending upon its mission. For an extensive port repair mission, it might even be attached to a combat heavy battalion. The company

has a limited design capability in its company headquarters. Missions are executed by the two construction platoons with equipment support from the equipment platoon as required. The company commander receives missions and tasks them to the construction platoons as previously discussed for a combat heavy battalion. The company commander must maintain close coordination with port authorities and terminal units when working in an operating port. Most designs are prepared at ENCOM, engineer brigade, or engineer group level.

CONSTRUCTION SUPPORT COMPANY

The construction support company normally operates under group control and provides quarry and asphalt support to the combat heavy battalions, Additional heavy equipment support is available in the equipment platoon. Specific equipment tasking, to include the paving train, comes from the group S3. The combat heavy battalions normally transport products from both the quarry and asphalt plants. Issues of asphalt and quarry products are generally controlled by the group S4. Construction missions normally are not given to the construction support company,

PIPELINE CONSTRUCTION SUPPORT COMPANY

The pipeline construction support company may operate directly under group control, or it may be placed under the operational control of a combat heavy battalion, depending upon its mission. Pipeline missions are performed by the construction platoons. Specialized equipment support is provided by the equipment platoon. Each construction platoon normally augments and provides technical support to a combat heavy company engaged in a pipeline mission. However, repair, rehabilitation, and limited construction missions may be given directly to the company to perform with its own resources. Pipeline design is performed at group or higher level.

DUMP TRUCK COMPANY

The dump truck company may operate directly under group control, or it maybe placed under the operational control of a combat heavy battalion, depending upon its mission. Haul missions are performed by the dump truck platoons in support of a combat heavy battalion or the separate companies. Tasking is done by either the group or battalion S3.

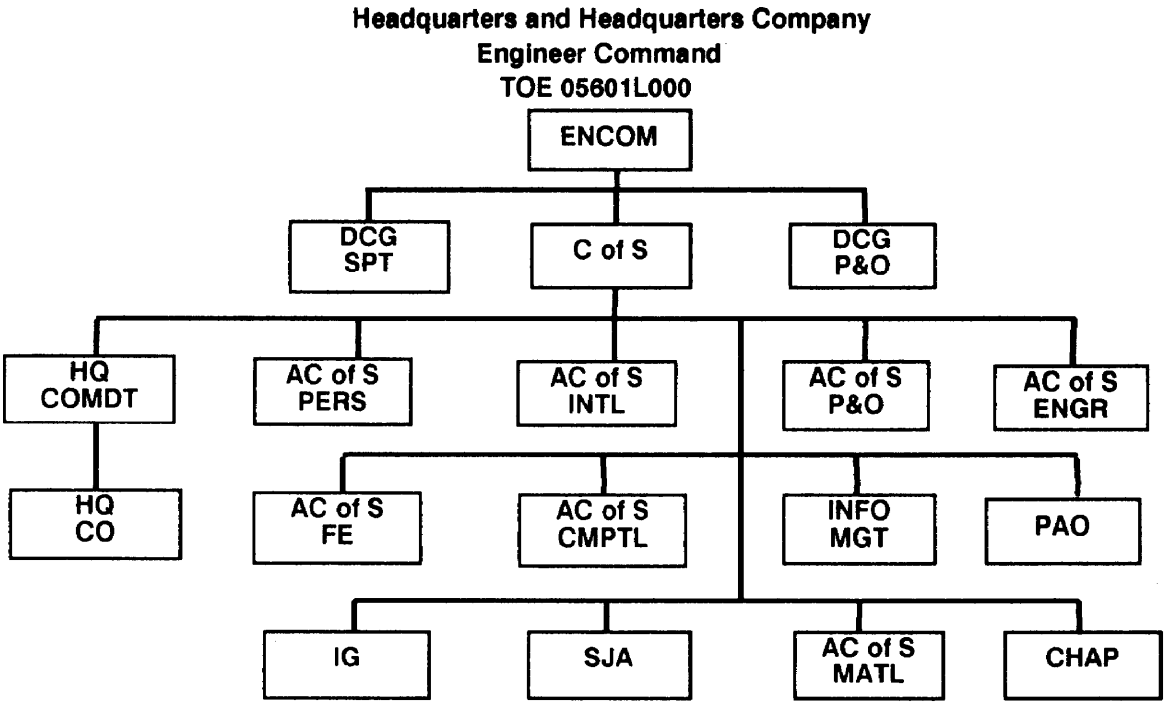
Appendix A

Engineer Organizations

This Appendix provides the organizational structure of the following EAC engineer units:

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Engineer Command 40
Engineer Brigade (Theater Army) 41
Engineer Group (Theater Army) 42
Engineer Battalion (Combat)(Heavy) 43
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Engineer Battalion (Combat) (Heavy) 44
Engineer Company
Engineer Battalion (Combat) (Heavy) 45
Engineer Battalion (Topographic)(Theater Army) 46
Engineer Company (Construction Support) 47
Engineer Company (Port Construction) 48
Engineer Company (Dump Truck) 49
Engineer Company (Pipeline Construction Support) 50



MISSION:

Command; perform operational planning and supervision; and coordinate activities of assigned or attached engineer brigades, groups, and other units engaged in construction, topographic activities, production of military geographic intelligence, and other related activities,

CAPABILITIES:

Plan, coordinate, and supervise general troop and contractual construction support to the Army, other services, and allies within the COMMZ.

Plan, coordinate, and supervise general troop construction support in the rear combat zone on a task basis **as** required,

Allocate engineer troops, materials, and equipment to construction projects,

Provide guidance and technical assistance to units engaged in construction projects.

Coordinate topographic and military geographic intelligence support to the theater army.

Perform comptroller services for the Command,

Supervise contract construction and contract labor (to include US, indigenous, and third-country personnel).

Assist in providing coordinated defense of area or installation in which ENCOM is located.

Perform unit maintenance on organic equipment,

Dependent on others for medical, finance, and personnel administrative services.

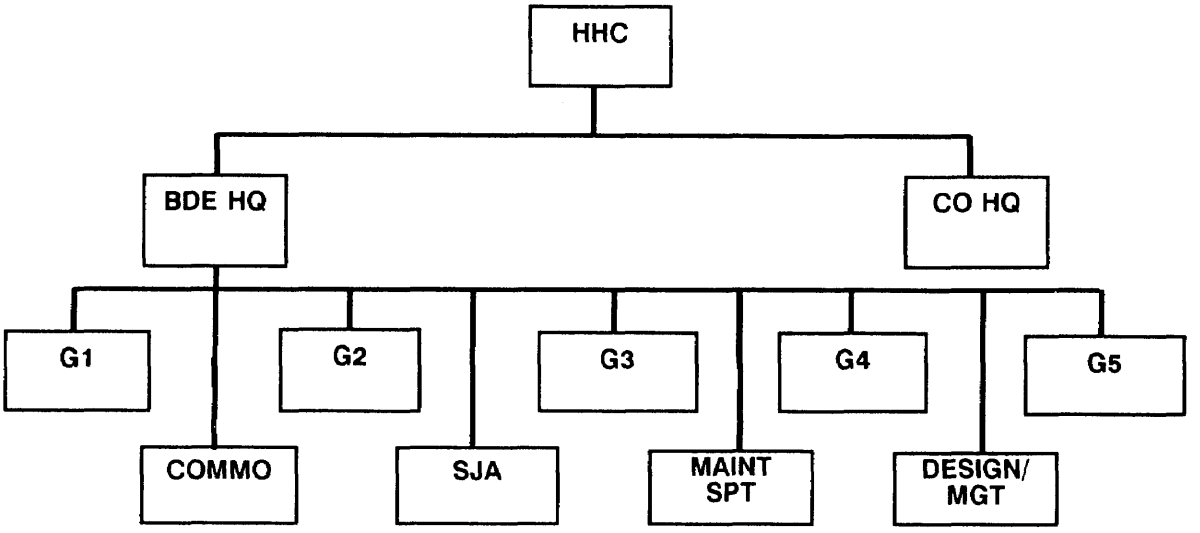
Dependent upon TRANSCOM for transportation support.

Dependent upon theater army for signal support,

PERSONNEL:

119 Officers; 5 Warrant Officers; 179 Enlisted.

Headquarters and Headquarters Company
Engineer Brigade (Theater Army)
TOE 05602L000



MISSION:

Command assigned and attached units and coordinate engineer activities,

Plan and coordinate operations of engineer units engaged in construction, maintenance, and rehabilitation of facilities and LOCsin support of a theater of operations.

CAPABILITIES:

Provide staff planning and supervision for activities of assigned and attached units.

Allocate units and resources in support of engineer operations,

Supervise engineer units engaged in construction, maintenance, and rehabilitation of facilities and LOCs.

Supervise and administer contract construction and contract labor.

Assist in providing coordinated defense for area or installation in which the brigade is located.

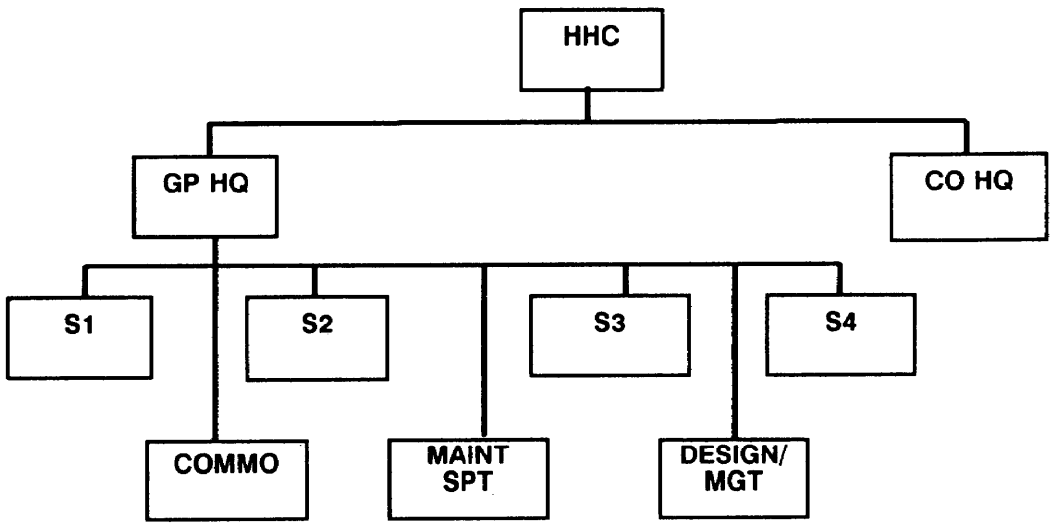
Perform unit maintenance on organic equipment.

Dependent upon others for medical, religious, finance, and personnel administrative services.

PERSONNEL:

43 Officers; 4 Warrant Officers; 98 Enlisted,

Headquarters and Headquarters Company
Engineer Group (Theater Army)
TOE 05412L100



MISSION:

Command assigned and attached units and coordinate engineer activities.

Plan and coordinate operations of engineer units engaged in construction, maintenance, and rehabilitation of facilities and LOCs in support of a theater of operations.

CAPABILITIES:

Provide staff planning and supervision for activities of assigned and attached units.

Allocate units and resources in support of engineer operations.

Supervise engineer units engaged in construction, maintenance, and rehabilitation of facilities and LOCs.

Assist in providing coordinated defense for area or installation in which the group is located,

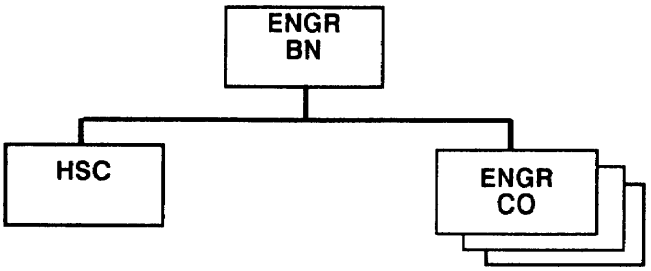
Perform unit maintenance on organic equipment.

Dependent upon others for medical, religious, finance, and personnel administrative services.

PERSONNEL:

27 Officers; 3 Warrant Officers; 75 Enlisted.

Engineer Battalion
(Combat) (Heavy)
TOE 05415L000



MISSION:

Perform construction, maintenance, and rehabilitation of facilities and LOCs in support of the theater of operations.

CAPABILITIES:

Perform engineering tasks such as construction, maintenance, repair, rehabilitation, and modification of airfields, command posts, main supply routes, supply installations, bridges, and other related facilities.

Provide repairs and limited reconstruction of utilities systems,

Conduct area damage clearance and restoration operations.

Perform rear operations, to include combat missions within limitations of organic weapons and equipment,

Provide assistance and support in preparation of protective positions,

Supervise contract labor; assist in supervision of contract construction.

Assist in providing coordinated defense for area or installation in which the battalion is located.

Perform unit maintenance on organic equipment.

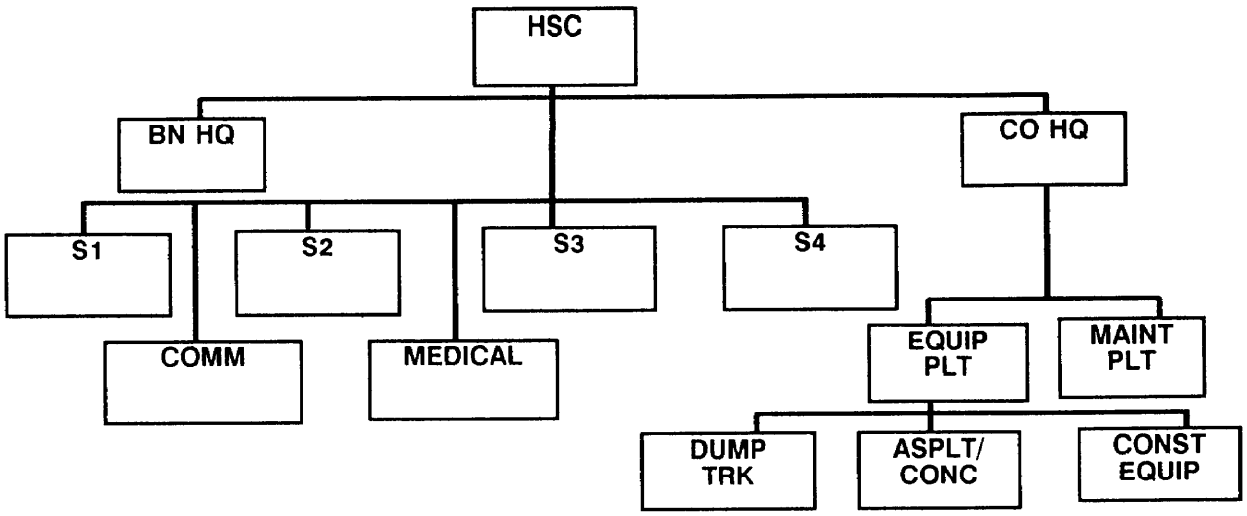
Perform direct support maintenance on organic engineer and power generation equipment,

Dependent upon others for medical, finance, and personnel administrative services,

PERSONNEL:

32 Officers; 3 Warrant Officers; 675 Enlisted,

Headquarters and Support Company
Engineer Battalion (Combat) (Heavy)
TOE 05416L000



MISSION:
Provide command, planning, coordination, and control of combat heavy battalion and any attached

Provide support to the combat heavy battalion with engineer equipment and operators.

Provide direct support maintenance for engineer and power generation equipment organic to the combat heavy battalion.

CAPABILITIES:
Plan, supervise, and coordinate activities of assigned and attached units.

Provide construction layouts, site adaptation, BOMs, and limited capability for construction planning and design.

Conduct engineer ground reconnaissance and preliminary and final surveys for battalion projects.

Provide construction equipment and operators to reinforce the engineer companies.

Provide equipment and specialist personnel to support the engineer companies in limited bituminous operations.

Assist in area damage clearance and restoration operations.

Supervise contract labor; assist in supervision of contract construction.

Perform unit maintenance on organic equipment.

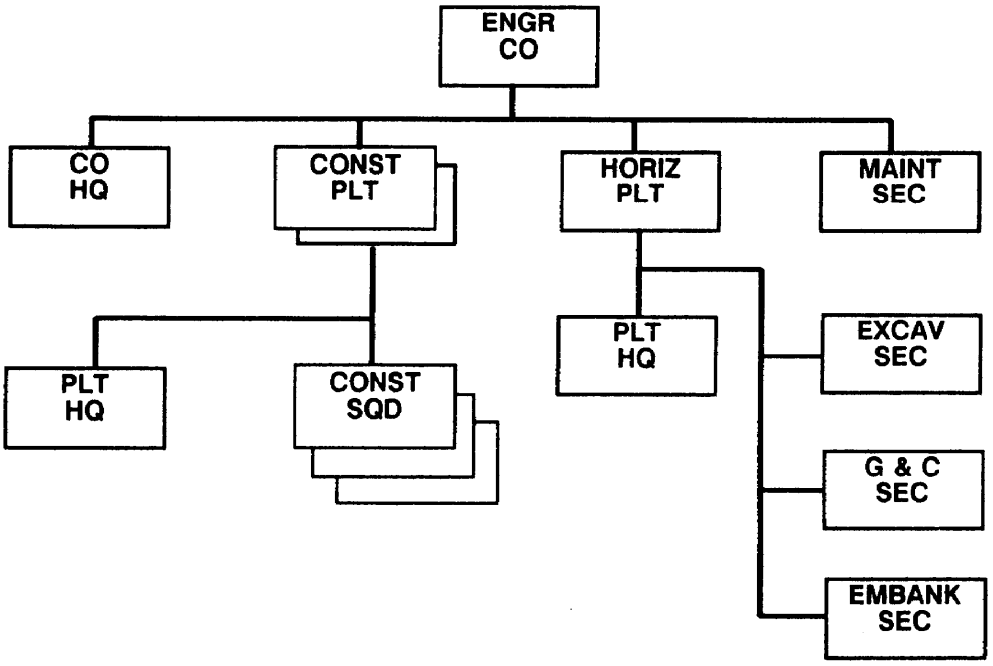
Perform direct support maintenance on battalion's organic engineer and power generation equipment.

Provide repair parts required to support battalion maintenance mission,

Provide unit level administration and supply support to units of the battalion.

PERSONNEL:
17 Officers; 3 Warrant Officers; 216 Enlisted.

Engineer Company
Engineer Battalion (Combat) (Heavy)
TOE 05417L000



MISSION:

Perform construction, maintenance, and rehabilitation of facilities and LOCs in the theater of operations.

CAPABILITIES:

Perform engineering tasks such as construction, maintenance, repair, rehabilitation, and modification of airfields; command posts, main supply routes, supply installations, bridges, and other related facilities.

Provide repairs and limited reconstruction of utilities systems.

Perform rear operations, to include combat missions within limitations of organic weapons and equipment,

Provide assistance and support in preparation of protective positions.

Supervise contract labor.

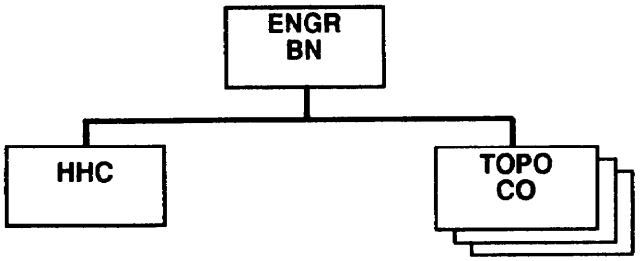
Provide coordinated defense of unit perimeter.

Perform unit maintenance on organic equipment (except communications).

PERSONNEL:

5 Officers, 0 Warrant Officers, and 153 Enlisted.

Engineer Battalion
(Topographic) (Theater Army)
TOE 05605L000



NOTE: Number of topographic companies depends upon the number of corps assigned to the theater.

MISSION:
Provide topographic support to theater elements.

CAPABILITIES:
Provide command and control of battalion units.

Perform surveys and provide survey information required by theater elements.

Produce revised maps, map supplements, overlays, overprints, photomaps, and terrain intelligence material.

Provide terrain intelligence and other terrain data as required.

Maintain terrain data bases for general and special purpose graphics.

Plan and supervise graphic production, revision, reissue, and inventory control.

Maintain liaison with allied topographic units, DMA and appropriate staff elements of supported corps.

Assist in providing coordinated defense of area or installation in which the battalion is located.

Perform unit maintenance on organic equipment.

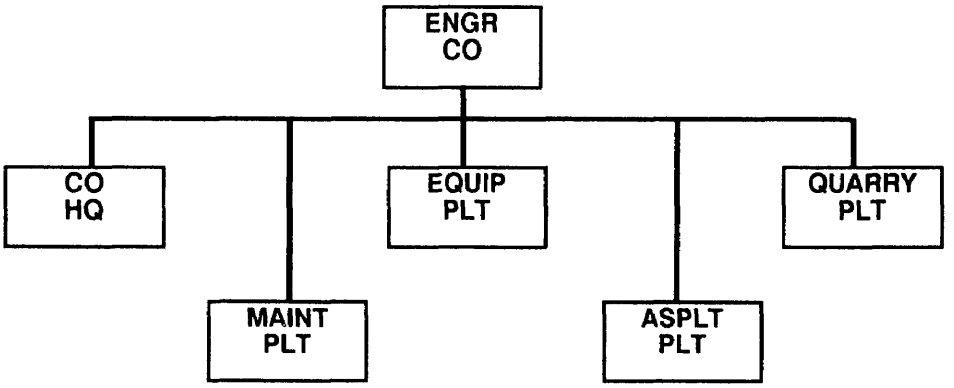
Perform limited direct support maintenance on reproduction equipment.

Dependent upon others for medical, religious, finance, personnel administrative, and direct support maintenance services.

Dependent upon assignment of terrain teams to provide support to corps.

PERSONNEL:
Varies with subordinate units assigned or attached.

Engineer Company
(Construction Support)
TOE 05413L000



MISSION:

Provide rock crushing, bituminous mixing, paving, and other construction support equipment with operators and thereby increase capabilities of an engineer group in major horizontal construction projects such as roads, storage facilities, and airfields.

CAPABILITIES:

Support one engineer group engaged in construction activities.

Provide up to 225 tons per hour of crushed rock and sand from rock quarries and gravel pits on a two-shift operation.

Provide up to 150 tons per hour of washed and sized precrushed rock on a one-shift operation,

Provide equipment with operators to support selected construction on a two-shift operation.

Supervise contract labor; assist in supervision of contract construction.

Provide coordinated defense of unit perimeter.

Perform unit maintenance on organic equipment (except communications),

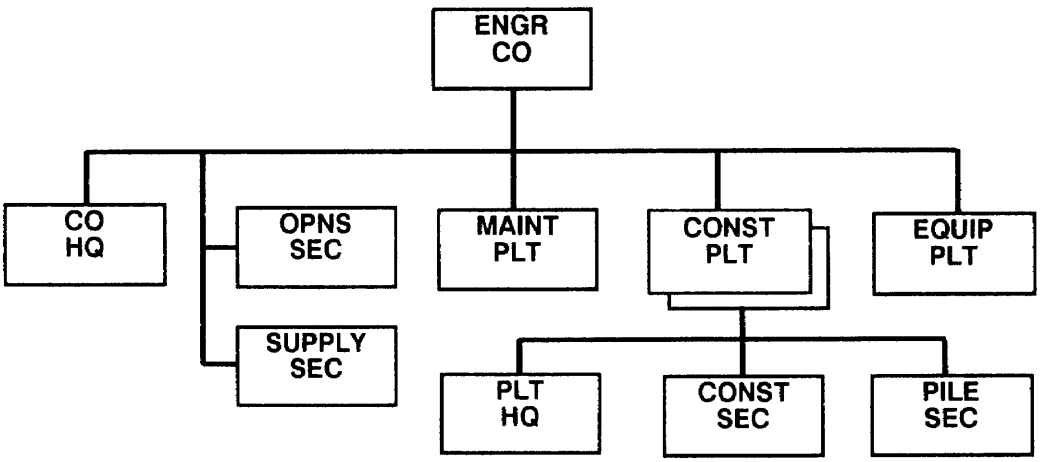
Perform direct support maintenance on organic engineer and power generation equipment.

Dependent upon others for medical, religious, finance, and personnel administrative services.

PERSONNEL:

5 Officers; 1 Warrant Officer; 169 Enlisted

Engineer Company
(Port Construction)
TOE 05603L000



MISSION:
Provide specialized engineer support in developing and maintaining port facilities.

Capabilities:
Construct and maintain offshore facilities, including mooring systems, jetties, breakwaters, and other structures required to provide safe anchorage for ocean-going vessels.

Construct and maintain piers, wharves, ramps, and related structures required for cargo loading and off-loading.

Install and maintain tanker discharge facilities, including POL jetties, submarine pipelines, and limited POL storage facilities in the beach area.

Provide limited dredging and removal of underwater obstructions.

Provide coordinated defense of unit perimeter.

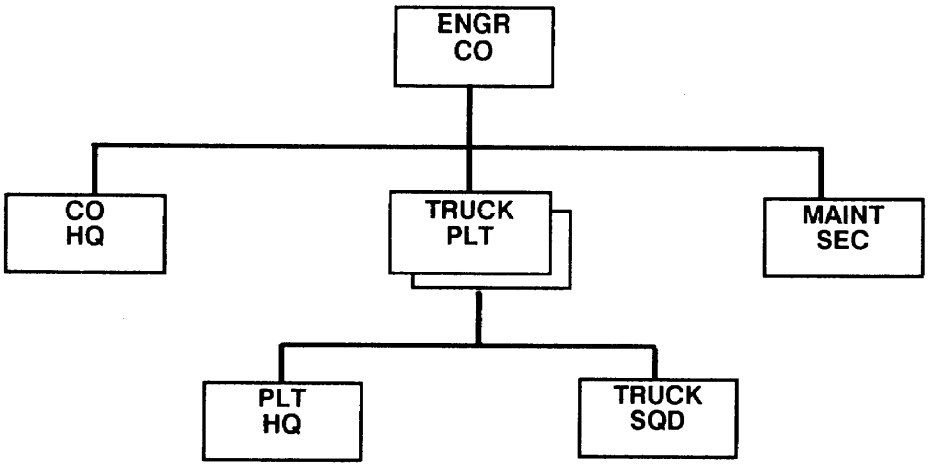
Perform unit maintenance on organic equipment (except communications).

Perform direct support maintenance on organic engineer, marine, and power generation equipment.

Dependent upon others for medical, religious, finance, and personnel administrative services,

PERSONNEL:
8 Officers; 2 Warrant Officers; 196 Enlisted.

Engineer Company
(Dump Truck)
TOE 05424L000



MISSION:
Operate dump trucks for movement of bulk materials in support of other engineer units.

CAPABILITIES:
Provide haul capacity of up to 600 tons of bulk material (gravel, earthfill, and crushed stone) per trip,

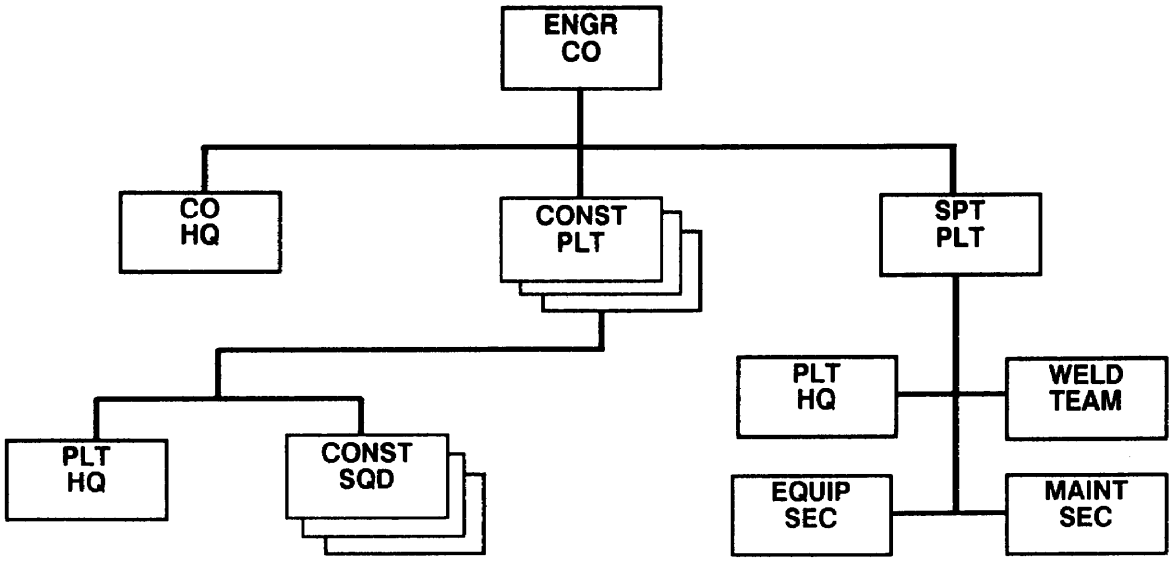
Provide coordinated defense of unit perimeter,

Perform unit maintenance on organic equipment (except communications),

Dependent upon others for medical, religious, finance, personnel administrative services, and direct support maintenance services.

PERSONNEL:
3 Officers; **1** Warrant Officer; 79 Enlisted

Engineer Company
(Pipeline Construction Support)
TOE 05434L000



MISSION:

Provide technical personnel and specialized equipment to assist engineer units in construction, rehabilitation, and maintenance (except organizational maintenance) of pipeline systems.

CAPABILITIES:

Provide advisory personnel to three engineer companies engaged in pipeline construction and pipe-stringing, pipe coupling, storage tank erection, and pump station and dispensing facility construction,

Provide specialized tools, equipment, and operators for above functions on a two-shift operation.

Transport pipeline over unimproved roads.

Provide limited organic construction and rehabilitation capability for pipeline systems.

Provide coordinated defense of unit perimeter.

Perform unit maintenance on organic equipment (except communications).

Dependent upon others for medical, religious, finance, personnel administrative services, and direct support maintenance services.

PERSONNEL:

5 Officers; 1 Warrant Officer; 170 Enlisted

Appendix B

Army Facilities Components System

The Army Facilities Components System (AFCS) is a military engineering construction support system for planners and commanders to use in selecting, planning, and constructing facilities and installations needed in the theater of operations, It has worldwide application and can be used for developed and undeveloped theaters in any geographic area. The system provides standards of construction, construction phasing, standard plans, BOMs, and general guidelines for the construction effort required for given facilities. It also provides data on construction materials and techniques used in a theater of operations.

BACKGROUND

The AFCS was designed in response to the need for an improved construction planning and supply system. Since its inception in 1951, AFCS has grown to a mature military engineering construction support system that includes planning guidance, detailed construction drawings, and computer updated BOMs for over 4,000 facility designs. The AFCS is used by major commands and agencies for their planning, estimating, training, and actual construction activities.

REFERENCES

TM 5-301-1 through -4, Army Facilities Component System – Planning:

This series of four manuals explains the concept and use of the system and contains tables of installations and facilities in the system. Each of the manuals addresses a separate climate zone.

- *TM* 5-301-1 *(Temperate)*
- *TM* 5-301-2 *(Tropical)*
- *TM 5-301-3 (Frigid)*
- *TM 5-301-4 (Desert)*

The TMs 5-301-2, -3, and -4 provide planning data for climatological design variants to the data found in *TM 5-301-1.* The purpose of these manuals is to provide material costs, logistical data, and engineering data for planning construction support. Their planning tables show requirements for real estate (acres), water supply and sewerage (gallons/day), electrical connected loads (kilowatts), aggregates (cubic yards), and construction effort (vertical, horizontal, and general construction manhours).

TM 5-302-1 through -5, Army Facilities Components System – Design:

This multivolume manual contains detailed design drawings for installations and facilities, TM 5-302-1 *through -5* also includes –

- Critical path method (CPM) diagrams for construction management,
- Material procurement process diagrams,

TM 5-303, Army Facilities Components System – Logistic Data and Bills of *Materiel:*

This manual is used by planners, builders, and suppliers to identify materials used to construct the desired facilities. It contains material descriptions, units of issue, quantities required, and National Stock Numbers.

TM 5-304, Amy Facilities Components System – User Guide:

This manual explains how to use the AFCS. It contains terminologies, definitions, requisition and supply procedures, unit productivity data, and example problems, It also provides general guidance and information on theater of operations construction.

Foreign Equivalent Construction Stock Items and Local Building Components:

These are unnumbered publications which provide a country-by-country construction material availability and compatibility and local construction practice listing for the following geographic areas:

- Europe
- The Middle East
- Asia and Africa
- Central and South America

CONSTRUCTION STANDARDS

Joint Chiefs of Staff (JCS) Publication defines only two construction standards for planning, designing, and constructing facilities in support of military contingency operations, Selection of which standard to use is based primarily on the expected duration of the contingency operation and is set by the theater commander. Because of the short design life of AFCS facilities, safety factors are the minimum necessary to ensure personnel and equipment safety in the accomplishment of the mission. The AFCS facility designs are based on the following two JCS standards:

- Initial — design life of up to 6 months
- Temporary – design life of up to 24 months

The choice of which standard to use depends on the availability of resources and the anticipated duration of use.

AUTOMATED AFCS PLANNING

The Theater Army Construction Automated Planning System (TACAPS) is a series of computer programs and data collection procedures designed to provide military planners and commanders with the means to quickly access the AFCS data files and develop plans and requirements for theater or contingency construction projects. The user accesses information from the TACAPS system via a terminal/modem and telephone communications link. The TACAPS provides immediate, accurate AFCS data since the system is continually updated with AFCS changes, The long term application of TACAPS will be to make TACAPS compatible with unit personal computers (that is, TACAPS floppy disks).

THEATER ORIENTED GUIDE SPECIFICATIONS

Theater-oriented guide specifications (TOGS) are a set of specifications designed to be incorporated with the AFCS drawings to make AFCS contract-executable. Each of the TOGS sections covers an item of construction, The TACAPS data base references the appropriate TOGS sections for each AFCS facility design, The TOGS are unique in that they are self-contained without reference to commercial specifications and Federal standards; the language is unambiguous and assumes the contractor is operating in good faith; and the Army assumes the risk for existing site conditions.

PROCUREMENT OF CONSTRUCTION MATERIAL FROM FOREIGN SOURCES

The supply procedures and construction materials identified in *TM* 5-303 are applicable when requisitioning AFCS construction material from the continental United States (CONUS); however, the supply procedures are not applicable for foreign source procurement, Prior to procuring materials, the user should perform engineering design checks to determine whether foreign construction material is compatible with US components. For example, materials and equipment based on the metric dimensioning system should be checked for compatibility.

AFCS FLEXIBILITY

The AFCS uses a building block concept to permit maximum flexibility, The building blocks are items, facilities, and installations.

- Item — An item is any construction material or equipment that makes up a larger product. Each item has an associated National Stock Number, description, unit of issue, and quantity.
- Facility and Subfacility — A facility is a group of items designed to provide a service. It can also be an item of equipment that, as an operating entity, contributes to the performance of a function by providing some type of physical assistance. Each facility has an associated facility number, description, unit of issue, shipping weight, shipping volume, and cost ,
- Installation — An installation is a group of facilities designed to provide some specific service or support to some military function in a theater of operations. Each installation has an associated installation number, shipping weight, shipping volume, and cost.

The AFCS is an excellent tool for detailed construction planning. Using the building block concept, standard AFCS facilities and installations can be modified to accommodate user needs, While the AFCS designs are constructible and functional, modifications may be necessary to accommodate unique user requirements, site conditions, or material availability.

The AFCS remains the principal source of data for planners and builders regarding construction requirements for the theater of operations, It is used as the Army facilities components file for the CESPs for all major OPLANs.

AFCS LIMITATIONS

Users must recognize the following limitations when using AFCS:

- The AFCS is continually under revision; therefore, AFCS publications can quickly become out of date.
- The AFCS is not an authorization document for the prestockage or ordering of construction material.
- The AFCS facilities and installations are not stored in CONUS warehouses awaiting shipment.
- When materials are ordered from CONUS, they are not packaged as one complete facility,

SPECIAL NOTE

The AFCS is managed by the Office of the Assistant Chief of Engineers, (HQDA (DAEN-ZCM)), Washington, DC 20310, with technical (engineering and logistics) support provided by the Huntsville Engineer Division, Huntsville, AL 35807. Either of these offices maybe contacted for assistance on the use of AFCS.

Appendix C

Civil Engineering Support Plan

The civil engineering support plan (CESP) is a jointly produced document found in the logistics annexes of the theater commander's OPLANs. The CESP is COMMZ-oriented and addresses requirements generated by relatively stationary forces. The CESP describes the engineer effort required to support the OPLAN, to include facility and Class IV requirements, critical engineer tasks necessary for OPLAN execution, and an assessment of the engineer capability contained in the OPLAN.

The CESP is derived from the theater commander's concept of operations and construction policies. Each service component then determines its facility requirements based on the time-phased force deployments, the facility assets available in theater, the host nation construction capability, and the US force on the troop list. In accordance with theater construction policies, engineer resources are allocated to war damage repair, new construction, rehabilitation, and maintenance.

AUTOMATED SUPPORT

The automated system established to support CESP development is the CESP generator (CESPG). The purpose of the CESPG is to provide the planner with an automated capability to assess the implications of various alternatives. The input to the CESPG consists of troop deployment and facilities requirements data for each unit designated to be supported by the base development plan, construction priorities for each type of construction, war damage repair estimates, data for deploying theater construction units and their capabilities, facilities components data (such as AFCS), and data on existing facilities. This data is analyzed for each base complex in theater. The CESPG uses algorithms to process the input, identify the facilities shortfall and schedule the construction in accordance with the theater's construction priorities and arrival of the engineer and user units.

ANALYSIS

The CESP is not the output from the CESPG. The theater engineer planner assesses the CESPG data and determines the follow-up measures necessary to balance the assets and resources in theater against the shortfalls. Some options include deferring some construction, moving units to different bases in theater, scheduling engineer units to arrive earlier, identifying a requirement for more host nation support, and planning to use construction contractors. All but the first option require coordination with transportation, operations, and logistics planners, as changes to the deployment and operations plan would be necessary. Ultimately, the CESP becomes the theater commander's statement on the supportability of the OPLAN from a facilities perspective.

CONCLUSION

The CESP is a written plan of the engineer concept of operations. It identifies major facility shortfalls. The CESPG provides the automated analytical capability needed to produce the CESP. The objective is to analyze the deploying force, the existing facility assets, the available resources, and the programmed transportation capabilities to develop an engineer plan. The resulting CESP is a valuable planning tool during preconflict planning, but generally is not used to guide execution during wartime.

Appendix D

Contract Construction

In all theaters, contracts with civilian firms will be required for construction requirements which exceed the manpower, skills, equipment, and construction material production capabilities of military engineer units and installation/base engineering organizations. These contracts may run the full range of services from design to construction to RPMA.

CONSTRUCTION STANDARDS

Contract construction support in the theater of operations will generally be limited to austere facilities constructed to the initial (up to 6 months duration of operations) or temporary (up to 24 months duration of operations) standards provided in the AFCS. Restoration, enlargement, and conversion of existing facilities will be the norm. New construction will be minimal in a mature theater, other than to replace destroyed facilities. Considerable new construction, however, may be required in a contingency theater.

TYPES OF CONTRACTS

Construction contracts overseas may be either direct contracts or indirect contracts. Direct contracts are contracts executed between a US contracting officer and a civilian firm, Indirect contracts are contracts between a US contracting officer and a host nation construction agency. In indirect contracts, requirements are given to the host nation construction agency who in turn contracts with a civilian firm to perform the work. In some countries, host nation agreements stipulate that indirect contacts will be used even during hostilities, Although indirect contracts reduce the staffing requirements for US forces (engineer/technical/administrative personnel), responsiveness is usually slower due to a layering effect. Direct contracts are the preferred method of doing business because the contracting officer has direct control of the contractors' performance. Any of the following types of contracts maybe used:

Design contracts are awarded to architect/engineer (A/E) firms to produce drawings and specifications for a particular requirement. The design provided by the A/E firm maybe awarded to a civilian contractor or given to a military engineer unit for execution, Examples include providing designs for –

- Converting a warehouse to a general maintenance facility.
- Converting a school to a general medical facility.
- Restoring electrical, water, and waste systems for a main operating base.
- Foundation and utilities for a pre-engineered or relocatable building.

Design/bui/d contracts are given to civilian firms for both the design and construction of needed facilities.

Construction contracts are given to civilian firms to construct facilities using government designs (A/E, AFCS, or host nation),

Construction support contracts are used when there is a recurring demand for large quantities of materials in an area. Construction support contracts for materials may include the production, fabrication, transport/delivery, and installation of the following types of construction materials.

- Bulk – concrete, gravel, sand, asphalt,
- Prefabricated — prestressed concrete panels, wall panels, steel sections.
- Building — electrical, plumbing, special equipment, lumber, steel.
- Utilities — culverts, pipelines, transformers.

PROCEDURES

Peacetime

Contract construction is performed by various service design/construction agents throughout the world. Each service has its own geographic area of operation, but in any one area, there is only one design/construction agent – the Army Corps of Engineers, the Navy Facilities Engineering Command, or the Air Force Regional Civil Engineer, In

peacetime, the DOD design and construction agent for a specific geographic region performs contract construction for all services. The Army is responsible for Northeast and Central Asia, Central and Northern Europe, North and South America, the Middle East, and Northeast Africa. The Air Force is responsible for the United Kingdom, The Navy is responsible for the Iberian Peninsula, the South Pacific, the Caribbean Sea, Antarctica, Southeast Asia, and the Mediterranean Basin.

Transition to War

When hostilities are imminent, the design and construction agent will terminate all design and construction except for those projects the theater commander has previously identified as vital for mission success. Vital projects are those which have a *strategic* importance. Depending on the threat and proximity of vital projects to enemy forces, some vital projects may have to be stopped and substitute facilities converted. If the DOD design and construction agent has not terminated operations, the agent will process all requests for contract construction. During the initial stages of transition to a wartime posture, normally about the frost month, the design and construction agent will be primarily concerned with terminating nonvital contracts and evacuating contract files. The DOD design and, construction agent will be operating at reduced manning levels since some civilian employees (US and host nation) will be evacuated or mobilized to other positions. Therefore, the DOD design and construction agent will have a very limited capability to start any new construction contracts during this period.

During Hostilities

When the DOD design and construction agent has completed the transition to a wartime posture, contracting officer's representatives (COR) will be assigned to the wartime construction manager for contract construction. The CORs will have legal authority to supervise the contractors' execution of work. The COR will have additional personnel (project engineer and contract specialists) for contract administration.

Appendix E

Example Rear Area OPLAN

The following example combat heavy battalion EAC rear area operations plan Is provided for use as a guide. The aspects of repair/maintenance/construction and rear operations are included in the example. Provisions for general support to the 119th ASG and direct support to Hessen Homberg Airbase highlight expected engineering requirements in the COMMZ. Paragraphs on rear operations – base, base cluster, and area damage control – highlight the tactical requirements shared by all units in rear operations.

(Classification)

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Frechen, FRG (LB4444)
081500Z June 1987

OPERATION PLAN 2010
References:
a. Map, Series 1501: Sheets NM 31-2, NM 31-3, NM 31-5, NM 31-8, NM 31-9, NM 31-11, NM 31-12, NM 32-1, NM 32-2, NM 32-4, NM 32-5, NM 32-7, NM 32-8, NM 32-10, NM 32-11, NN 31-12, NN 32-10, NN 32-11, edition 3; scale 1:250,000.
b. USAREUR OPLAN 2020 – Support Plan Defense Central Europe.
c. NORTHAG OPLAN 2000 – Defense Plan Northern Europe.
d. 50th ENCOM OPLAN 2010.
e. 48th Engineer Brigade OPLAN 2010.
f. 440th Engineer Group OPLAN 2010.
g. 451st Engineer Battalion (C)(H) FSOP.
h. 451st Engineer Battalion (C)(H) Construction SOP.
Time zone used throughout the plan: ZULU
Task Organization: 451st Engineer Battalion (C)(H)
3d Platoon, 4561st Engineer Company (Dump Truck)

1. SITUATION
a. Enemy Forces.
(1) Enemy forces main attack into NORTHAG sector was slowed by 2d (NL) Corps and 5th (GE) Corps with 2d (NL) Corps receiving the brunt of the attack. 5th (BE) Corps and 11th (UK) Corps were successful in halting supporting attacks in their respective sectors. Severe casualties, compounded by supply, mobility, and refugee problems, prevented the enemy forces from capitalizing on their initial gains. Failure of the attack forced a general realignment of all enemy forces along the HAMBURG-BREMEN-HANNOVER-KASSEL line. It is believed that a general defense has been ordered while units refit/reorganize. A renewed attack, with second echelon army forces moved forward, will probably be initiated in 2-3 days. Enemy forces chemical attacks are continuing. Rear area threat activity is level I; level II and level III activity is possible.
(2) Annex A (Intelligence), 440th Engineer Group OPLAN 2010.
b. Friendly Forces.
(1) US Army Europe (USAREUR) provides support to US Forces in preparation for and during wartime operations within the NATO Command.
(2) 110th Theater Army Area Command (TAACOM) provides combat service support to US Forces as directed by USAREUR.
(3) 119th Area Support Group (ASG) provides combat service support to US Forces in, and passing through, the RCZ portion of NORTHAG. The ASG is a subordinate command headquarters under 110th TAACOM.

(Classification)

(Classification)

(4) 50th Engineer Command (ENCOM) commands and controls all US Army engineer units and elements in the COMMZ/RCZ, and provides combat construction and topographic support within the COMMZ/RCZ and to the corps on a task basis. The CDR, 50th ENCOM acts for the CINCUSAREUR as the Regional Wartime Construction Manager in the Central and Northern Europe Regions (RWCM-CNE).

(5) 48th Engineer Brigade command and controls all US Army engineer units and elements in the 110th TAACOM area of operations. The CDR, 48th Engineer Brigade acts for the CDR, 50th ENCOM as the District Wartime Construction Manager (DWCM) in the 110th TAACOM area of operations.

(6) 440th Engineer Group commands and controls all assigned and attached US Army engineer units in the 119th ASG area of operations. The CDR, 440th Engineer Group acts for the CDR, 48th Engineer Brigade as the Area Wartime Construction Manager (AWCM) in the 119th ASG area of operations.

(7) 453d Engineer Battalion (C)(H) commands and controls all assigned and attached US Army engineer units in the western sector of the 119th ASG area of operations.

c. Assumptions.

(1) Host nation agreements will be honored.

(2) NATO will receive minimum warning time of 30 days prior to initiation of hostilities by opposing forces.

(3) NATO signatory nations will mobilize and deploy forces IAW AFCENT OPLAN 2000 and other supporting plans.

(4) Host countries will remain viable and retain responsibility for protection of the area behind corps rear boundaries.

(5) Units and programmed resupply will deploy as scheduled.

2. MISSION

On order, 451st Engineer Battalion (C)(H) supports NATO operations within the COMMZ as directed and provides general support (GS) on an area basis within NORTHAG in the GE RCZ portion of the COMMZ.

3. EXECUTION

a. Concept of Operations. 451st Engineer Battalion (C)(H) exercises command and control of engineer units assigned and attached. Provide repair/maintenance/construction engineering in a general support (GS) role on a mission basis within the eastern portion of the 119th ASG. Engineer work coordination will be made through the 440th Engineer Group. Respond to ADC engineer support requests from the supported ASG, rear TOC, and BCOC on an area basis. Be prepared to assume the role of base cluster commander and operate a base cluster operations center (BCOC). Be prepared to conduct rear combat operations. Provide one engineer company in direct support (DS) to USAF at Hessen Homberg Airbase. See Annex A (Operations Overlay).

(Classification)

(Classification)

(1) All requests for engineer support on US Army installations will be received and prioritized by the 119th ASG. The ASG will provide support first with assigned engineer resources within their capabilities and then request support from the 440th Engineer Group. The Group will task the 451st Engineer Battalion (C)(H) accordingly.

(2) All engineer requirements submitted by US Army forces off US Army installations will also be received and prioritized by the 119th ASG. When requirements exceed assigned ASG engineer capabilities, the ASG will request support from the host nation through established civil-military coordination (CIMIC) channels. In the event that host nation resources are not available, the request for engineer support will go to the 440th Engineer Group. The Group will task the 451st Engineer Battalion (C)(H) accordingly.

(3) All engineer requirements submitted by the host nation will also be received and prioritized by the 119th ASG. When requirements exceed assigned ASG engineer capabilities, the ASG will request support from the 440th Engineer Group. The Group will task the 451st Engineer Battalion (C)(H) accordingly.

(4) Real property maintenance activities (RPMA) and real estate management activities are the responsibilities of the 119th ASG and 110th TAACOM. Excess requirements, including technical service, will be passed from the 119th ASG to the 440th Engineer Group. The Group will task the 451st Engineer Battalion (C)(H) accordingly.

(5) All engineer requirements of an emergency nature submitted by the USAF at Hessen Homberg Airbase will be received and prioritized by the 440th Engineer Group. The Group will task the 451st Engineer Battalion (C)(H) accordingly.

(6) The 119th ASG will provide logistic support (including Class IV construction materials) to the 451st Engineer Battalion (C)(H).

(7) Austere construction standards will be used IAW the theater engineer support policy. Maximum use will be made of existing facilities including those of host nations, the use of which will be coordinated through the appropriate CIMIC channels. Prefabricated or relocatable structures will be used where possible to reduce levels of new initial/temporary construction requirements.

(8) Forward engineer work lines (EWL) are the corps rear boundaries. Engineer work zones are IAW Annex A (Operations Overlay).

b. Headquarters and Support Company, 451st Engineer Battalion (C)(H), provides normal administrative and logistic support, communications support, medical support, direct support maintenance, and engineer equipment support to all assigned and attached units.

c. Company A, 451st Engineer Battalion (C)(H), provides engineer repair/maintenance/construction support in assigned area of operations. Be prepared to conduct rear area damage control and rear combat operations.

d. Company B, 451st Engineer Battalion (C)(H), provides engineer repair/maintenance/construction support in assigned area of operations. Be prepared to conduct rear area damage control and rear combat operations.

(Classification)

(Classification)

e. Company C, 451st Engineer Battalion (C)(H), provides engineer repair/maintenance/construction support to Hessen Homberg Airbase. Support role to the airbase is direct support (DS). Point-of-contact and tasking authority on the airbase is the base civil engineer. Battalion FSOP governs coordination and support responsibilities.

f. Attachments—3d Platoon, 4561st Engineer Company (Dump Truck)—Provide haul support for engineer construction materials. Priority of support is to Company B and Company A, in order. Be prepared to assist in transporting engineer troops conducting rear combat operations.

g. Coordinating Instructions.

(1) This OPLAN is effective for planning upon receipt; execution on order.

(2) Engineer work executed outside US-controlled installations will be coordinated with the CIMIC team assigned to the ASG.

(3) Be prepared to respond to rear area operational contingencies. On order, conduct rear area damage control operations as directed by this headquarters. Company C will respond to the direction of the airbase commander or his designated representative.

(4) Units located within base clusters will comply with base defense and ADC procedures established by the designated base cluster commander and implemented through the BCOC. Units will provide liaison to the BCOC for engineer ADC support.

(5) Units not located within base clusters will comply with defense and ADC procedures established by the 110th ASG or this headquarters at the minimum. Company C will comply with defense and ADC procedures established by the airbase commander.

(6) Units traveling an MSR or enroute to a work site away from their station will establish communication/contact with the nearest military police (MP) unit for support in the event of contact with enemy ground forces.

(7) Be prepared to conduct rear operations, to include close combat operations. BCOC/rear TOC plans involving units as augmentation response forces will be coordinated with this headquarters as they are developed.

(8) Be prepared to conduct repair/maintenance/construction, ADC, and rear combat operations in an NBC-contaminated environment. The appropriate mission-oriented protection posture (MOPP) will be in effect at all times. MOPP 1 is in effect upon execution of this OPLAN unless specified otherwise at the time. Be prepared to increase MOPP on short notice. Units will defend against the employment of nuclear, biological, and chemical weapons.

4. SERVICE SUPPORT
Annex B (Service Support)

5. COMMAND AND SIGNAL
a.Command.
(1) Battalion CP initially vicinity FRECHEN, FRG (LB440440).

(Classification)

(Classification)

(2) Succession of command is battalion executive officer, battalion operations officer, commander HSC, commander Company A, commander Company B, and commander Company C, in order.

b. Signal.

(1) Current CEOI in effect.

(2) Minimize in effect until lifted by this headquarters.

Acknowledge

E. A. Clouds
LTC, EN
Commanding

OFFICIAL:
/s/
S3

Annexes: A—Operations Overlay (distributed separately)
B—Service Support (distributed separately)

(Classification)

G L O S S A R Y

Acronyms and Abbreviations

A

AC of S Assistant Chief of Staff
ADA air defense artillery
ADC area damage control
A/E architect/engineer
AFCENT Allied Forces Central Europe
AFCS Army Facilities Component System
AG Adjutant General
AO area of operations
AR Army Regulation
ASG area support group
ASPLT asphalt
AWCM Area Wartime Construction Manager

B

BCOC base cluster operations center
BDE brigade
BDOC base defense operations center
BE Belgian
BN battalion
BOM bill of materials

C

C of S Chief of Staff
(C)(H) (combat) (heavy)
CBT combat
CDR commander
CEOI communications-electronics operation instructions
CESP civil engineering support plan
CESPG civil engineering support plan generator
CHAP chaplain
CIMIC civil-military coordination
CINCUSAREUR Commander in Chief, United States Army, Europe
CMDT commandant
CMPTL comptroller
CNE Central and Northern Europe
CO company
COA course of action
COMDT commandant
COMMO communications
COMMZ communciations zone
COMPTL comptroller
CONC concrete
CONST construction
CONUS continental United States
COOP continuity of operations plan
COR contracting officer's representative
CP command post
CPM critical path method
CSS combat service support

D

DA Department of the Army
DCG deputy commanding general
DEH Directorate of Engineering and Housing
DMA Defense Mapping Agency
DOD Department of Defense
DS direct support
DWCM District Wartime Construction Manager

E

EAC echelons above corps
EMBANK embankment
EMP electromagnetic pulse
EN engineer
ENCOM engineer command
ENGR engineer
EOD explosive ordnance disposal
EQUIP equipment
ESRC engineering and service readiness center
EWL engineer work line
EXCAV excavation

F

FCZ forward combat zone
FE facilities engineering
FM field manual
FRG Federal Republic of Germany
FSOP field standing operating procedures

G

G&C grading and compacting
GE German
GP group
GS general support
G1 Assistant Chief of Staff, G1(Personnel)
G2 Assistant Chief of Staff, G2(Intelligence)
G3 Assistant Chief of Staff, G3 (Operations)
G4 Assistant Chief of Staff, G4 (Logistics)
G5 Assistant Chief of Staff, G5 (Civil Affairs)

H

HHC headquarters and headquarters company
HQ headquarters
HQDA Headquarters, Department of the Army
HORIZ horizon
HSC headquarters and support company
HVY heavy

I

IAW in accordance with
IG inspector general
INFO information
INTL intelligence

J

JCS Joint Chiefs of Staff

L

LOC lines of communication (logistic routes)
LOTS logistics over the shore operations
LTC lieutenant colonel

M

MAINT maintenance
MATL materiels
MED medium
MEDCOM medical command
MGT management
MOPP mission-oriented protection posture
MP military police
MSR main supply route

N

NATO North Atlantic Treaty Organization
NAVEUR Navy Europe
NBC nuclear, biological, chemical
NL Netherlands
NORTHAG northern Army group

O

OPLAN operation plan
OPORD operation order

P

P&O Plans and Operations
PAO Public Affairs Office
PERS personnel
PERSCOM personnel command
PLT platoon
POL petroleum, oils, and lubricants

Q

QSTAG Quadripartite Standardization Agreement

R

RATT radio teletypewriter
RCZ rear combat zone
RPMA real property maintenance activities
RRR rapid runway repair
RWCM Regional Wartime Construction Manager

S

SEC section
SOFA Status of Forces Agreement
SOP standing operating procedure
SPT support
SQD squad
SRC survival recovery center
SJA Staff Judge Advocate
STANAG Standardization Agreement
S1 Adjutant (US Army)
S2 Intelligence Officer (US Army)
S3 Operating and Training Officer (US Army)
S4 Supply Officer (US Army)

T

TA theater army
TAACOM Theater Army Area Command
TACAPS Theater Army Construction Automated Planning System
TAMMC theater Army materiel management center
TC training circular
TCS(A) Theater Communications System (Army)
TM technical manual
TOC tactical operations center
TOE table(s) of organization and equipment
TOGS theater-oriented guide specifications
TOPO topographic
TRADOC United States Army Training and Doctrine Command
TRANSCOM transportation command
TREE transient radiation effect on electronics
TRK truck

U

UK United Kingdom
US United States
USACE United States Army Corps of Engineers
USAF United States Air Force
USAFE United States Air Force, Europe
USAREUR United States Army, Europe
USMC United States Marine Corps

REFERENCES

RELATED PUBLICATIONS

Related publications are sources of additional information. They are not required to understand *FM 5-116.*

Army Regulation (AR)

415-30	Troop Construction and Engineering Support of the Air Force Overseas

Department of the Army Form (DA Form)

2028	Recommended Changes to Publications and Blank Forms

Department of Defense Form (DD Form)

1354	Transfer and Acceptance of Military Real Property

Field Manuals (FM)

3 4	**NBC** Protection
3-5	NBC Decontamination
3-100	NBC Operations
5-100	Engineer Combat Operations
5-103	Survivability
5-104	General Engineering
5-105	Topographic Operations
8-8	Medical Support in Joint Operations
8-10	Health Service Support in a Theater of Operations
8-21	Health Services Support in a Communications Zone
9-6	Ammunition Service in the Theater of Operations
10-60	Subsistence Supply and Management in Theaters of Operations
10-67	Petroleum Supply in Theaters of Operations
14-6	Comptroller/Finance Services in Theaters of Operations (Keystone)
1 9 4	Enemy Prisoners of War, Civilian Internees and Detained Persons
20-32	Mine/Countermine Operations
41-10	Civil Affairs Operations
55-1	Army Transportation Services in a Theater of Operations
55-60	Army Terminal Operations
63-4	Combat Service Support Operations - Theater Army Area Command
90-14	Rear Battle
100-2-1	Soviet Army Operations and Tactics
100-2-2	Soviet Army Specialized Warfare and Rear Area Support
100-2-3	The Soviet Army Troops, Organization, and Equipment
100-5	Operations
100-10	Combat Service Support
100-16	Support Operations: Echelons Above Corps

101-5	Staff Organization and Operations
101-5-1	Operational Terms and Symbols
101-10-1	Staff Officers' Field Manual: Organizational, Technical and Logistical Data

Standardization Agreements (STANAG)

STANAGS are available upon request from Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

STANAG	**Corresponding** QSTAG	
2014	506	Operation Orders, Warning Orders and Administrative/Logistic Orders
2079	527	Rear Area Security and Rear Area Damage Control
2096	530	Reporting Engineer Information in the Field

Training Circular (TC)

5-340	**Air** Base Damage Repair (Pavement Repair)

Technical Manuals (TM)

5-301-1	Army Facilities Components System - Planning (Temperate)
5-301-2	Army Facilities Components System - Planning (Tropical)
5-301-3	Army Facilities Components System - Planning (Frigid)
5-301-4	Army Facilities Components System - Planning (Desert)
5-302-1	Army Facilities Components System - Design, Volume **1**
5-302-2	Army Facilities Components System - Design, Volume 2
5-302-3	Army Facilities Components System - Design, Volume 3
5-302-4	Army Facilities Components System - Design, Volume 4
5-302-5	Army Facilities Components System - Design, Volume 5
5-303	Army Facilities Components System - Logistic Data and Bills of Materiel
5-304	Army Facilities Components System - User Guide
5-315	Firefighting and Rescue Procedures in Theaters of Operations
.5-330	Planning and Design of Roads, Airbases, and Heliports in the Theater of Operations
5-343	Military Petroleum Pipeline Systems
5-360	Port Construction and Rehabilitation

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