FM 5-134

DEPARTMENT OF THE ARMY FIELD MANUAL

THE ARMORED ENGINEER BATTALION

DEPARTMENT OF THE ARMY

MARCH 1954

AGO 4129B—Feb

FIELD MANUAL
No. 5–134

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *2 March 1954*

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PART ONE
INTRODUCTION
CHAPTER 1
GENERAL

1. Purpose

The purpose of this manual is to provide a guide for officers and noncommissioned officers of the armored engineer battalion in the performance of their duties.

2. Scope

This manual contains specific material on the organization, mission, employment, operational methods, training, equipment, administration, logistics, communication, and special problems of the armored engineer battalion. It is based upon T/O&E 5–215, T/O&E 5–216, T/O&E 5–217, and T/O&E 5–218. Minor changes in T/O&E will not affect the manual, since organization and equipment are not discussed in detail.

CHAPTER 2
ORGANIZATION AND EQUIPMENT

3. Mission

The mission of the armored engineer battalion is to facilitate the movement of the armored division, and to increase its combat effectiveness by means of general engineer work.

4. Organization of Armored Division

a. The armored division (fig. 1) consists of a division headquarters, three combat command headquarters, four armored infantry battalions, three tank battalions (90-mm gun), a tank battalion (120-mm gun), a reconnaissance battalion, an armored engineer battalion, division artillery, and supporting troops. The division artillery has a headquarters and headquarters battery; three armored field artillery battalions, 105-mm howitzer, SP; one armored field artillery battalion, 155-mm howitzer, SP; an antiaircraft automatic weapons battalion, SP; and a medical detachment. Supporting troops include signal and military police companies, and the division trains. The division trains comprise a headquarters and headquarters company; medical, quartermaster, and ordnance battalions; a replacement company; and a band.

b. The combat commands are designed to execute specific combat missions assigned by the division commander. Tank and armored infantry battalions are attached according to the requirements of a particular mission. Combat support and service units may be attached or placed in support, depending upon the mission. Frequently the combat commands form two or more reinforced battalions, requiring a further breakdown of supporting units.

5. Organization of Engineer Battalion

The armored engineer battalion consists of a headquarters, headquarters and service company, four identical armored engineer companies, a bridge company, and a medical detachment (fig. 2).

6. Equipment

a. Tool and Equipment Sets. Operating squads and platoons have sets of pioneer and carpenter tools and demolition equipment. A supplementary equipment set, armored engineer battalion, in-

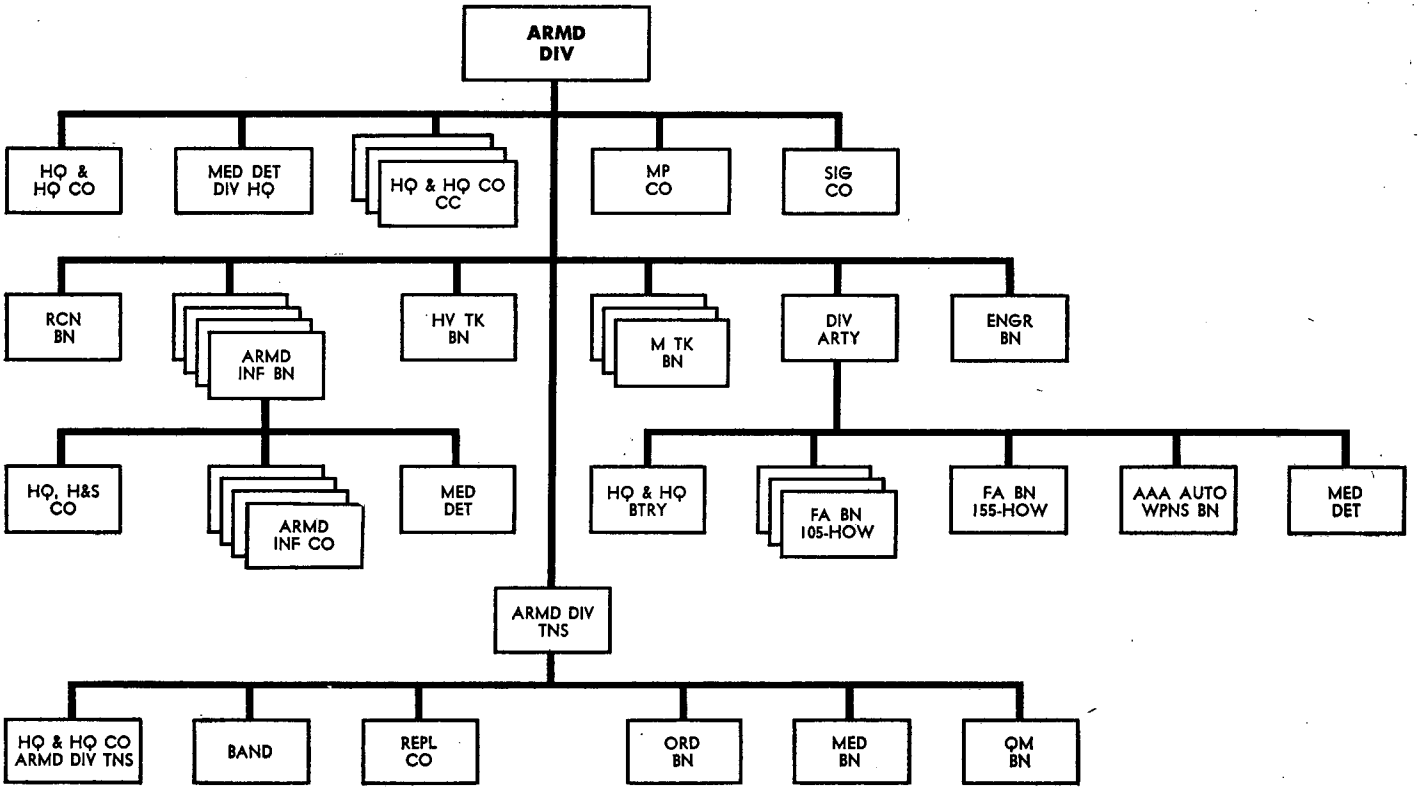


Figure 1. Organization of the armored division.

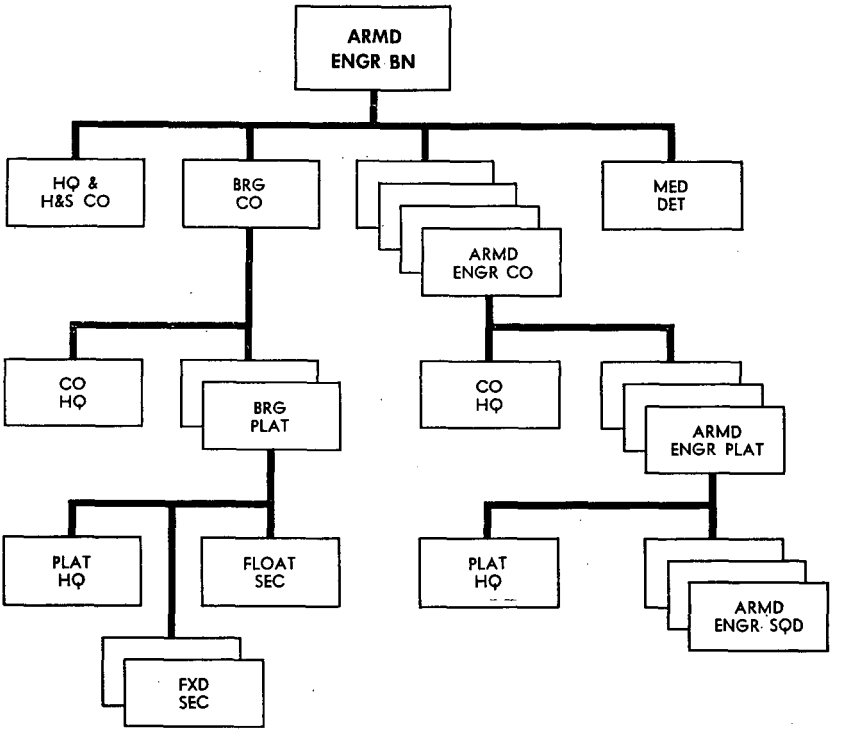


Figure 2. Organization of the armored engineer battalion.

cluding special purpose tools, supplies, and explosives is carried by headquarters and service company.

b. Minefield Equipment. Mine detectors and minefield marking equipment, together with a basic load of antitank and antipersonnel mines, are carried by the battalion.

c. Construction Equipment. The battalion has the following heavy construction equipment: air compressors, truck mounted; crane shovels, truck-mounted; graders, road, motorized; tractors, crawler, with angledozer; tractor, crawler, with bucket loader; and welding equipment, electric, trailer-mounted.

d. Stream-Crossing Equipment. The bridge company is equipped with and transports 576 feet of bridging capable of supporting divisional loads. This consists of two sets (288 ft. each) of the widened steel treadway bridge, which is used to construct fixed and floating bridges, rafts, or combinations thereof. The bridging is transported on heavy military bridging trucks and 2½-ton bolster-body trucks and trailers. Each bridge platoon carries a utility boat to assist in erection of the bridge, and 21 assault boats with 8 outboard motors.

e. Armored Vehicles. Each armored engineer company has six armored utility vehicles. Six squads, with their equipment, are therefore mounted in armored utility vehicles, which provide them with the same mobility and armor protection as the armored infantry which they support. The remaining three squads are transported in 2½-ton dump trucks.

f. Material Hauling Equipment. For movement of road building and repair materials and other class IV engineer supplies, there are 2½-ton dump trucks in the battalion. Pole-type trailers are available for hauling lumber and heavy timber, although a certain number are normally designated to carry assault boats. The 20-ton semitrailers used for transporting crawler-type tractors may be used also for hauling class IV engineer supplies.

g. Water Purification Equipment. The battalion is provided with six sets of water purification equipment; two large sets each producing 2,100 gallons an hour, and four smaller sets each capable of producing 900 gallons per hour. Each set provides for the establishment of a water supply point.

h. Individual weapons include the pistol, M2 carbine, M1 rifle, .45-caliber submachine gun, .30-caliber and .50-caliber machine guns, and 3.5-inch rocket launchers.

CHAPTER 3
ASSIGNMENT AND CAPABILITIES

7. Assignment

The armored engineer battalion is the engineer component of the armored division, as indicated in T/O&E 17. There are no non-divisional armored engineer battalions.

8. Capabilities

a. General. In normal operations, the armored engineer battalion provides forward engineer support for the armored division. Engineer work in the division rear area is largely accomplished by corps engineer troops. In major river crossings and other special operations requiring additional engineer effort, a portion of the engineer staff work is performed by the supporting engineer combat battalion or group commander, or by the corps engineer.

b. Capabilities. In its supporting mission, the armored engineer battalion has sufficient personnel and equipment to—

(1) Provide engineer staff planning and supervision, including that required for attached engineer troops.

(2) Conduct engineer reconnaissance.

(3) Construct, repair, and maintain roads, fords, culverts, fixed or floating bridges, ferries, obstacles (including minefields), landing strips, command posts, shelters, and defensive installations.

(4) Execute demolitions, and remove obstacles including minefields.

(5) Assist in assault stream crossings and assault of fortifications.

(6) Provide engineer supply service, including water points.

PART TWO
ORGANIZATION AND OPERATION

CHAPTER 4
BATTALION HEADQUARTERS

Section I. GENERAL

9. Mission

The mission of battalion headquarters is to provide the division engineer special staff section; and command and staff, communications, reconnaissance, supply, and maintenance for the armored engineer battalion.

10. Organization

a. Battalion headquarters consists of the command element and the following staff sections: division engineer, administrative (S1), intelligence (S2), operations (S3), supply (S4), communications, battalion maintenance, and aviation sections (fig. 3).

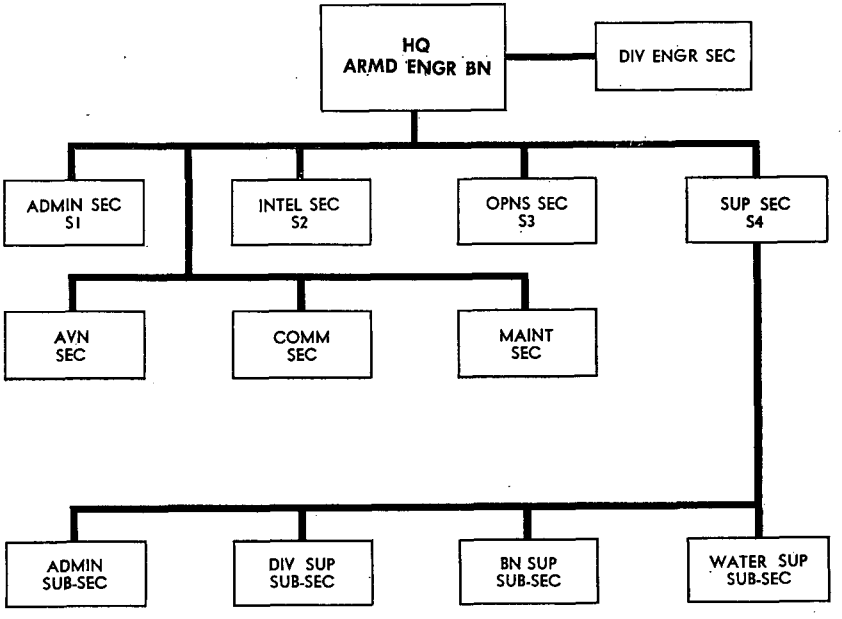


Figure 3. Organization of battalion headquarters, armored engineer battalion.

b. Although the medical detachment is attached to headquarters and service company for administration, it is discussed here with the battalion headquarters section. While officers are carried in the battalion headquarters column of the T/O&E, their duties are described with those of the section in which they work. The duties of enlisted men working in battalion headquarters are also presented with the discussion of their assigned staff sections, although administratively they are a part of the headquarters and service company. The chaplain and enlisted assistant are carried in the administrative section but are discussed here separately.

Section II. COMMAND ELEMENT

11. Organization

The battalion commander and executive officer comprise the command element in battalion headquarters.

12. Duties of Personnel

a. The battalion commander is also a member of the division commander's special staff. His command duties are separate and distinct from his duties as division engineer, each involving different responsibilities. Generally, both his command and staff duties consist of implementing the engineer battalion capabilities listed in paragraph 8.

(1) As battalion commander, he directs, controls, and supervises all units of the battalion, whether organic or attached to the battalion. He is responsible for the preparation of plans, policies, and orders. He visits and inspects his troops and their activities, and conducts personal reconnaissance.

(2) As division engineer, he acts as advisor to the division commander and staff, and keeps them informed of the engineer situation. He helps prepare division plans, policies, and orders; determines requirements of engineer supplies for nonengineer units of the division; maintains close liaison with the division artillery commander and the combat command commanders to anticipate their engineer needs; makes recommendations for the engineer support required from corps, and coordinates planning with the corps engineer. Although the division engineer is not under the command of the corps engineer, technical channels are normally observed.

(3) Since the division engineer has both command and staff responsibilities, either of which may require all his time, he must adopt a method of operation that permits him to

perform his duties properly from two different places. To assist him in his dual role, he has his executive officer and staff at battalion headquarters, and the assistant division engineer (ADE) section at division headquarters. (See app. IV for a guide to dual-role problems.)

b. The executive officer is second in command of the battalion, and is responsible that the commander's policies are carried out. He exercises general supervision over, and coordinates, the work of the battalion staff sections. The executive officer keeps himself informed of the battalion and division situation, and when possible, assists the battalion commander in his functions as division engineer. He usually remains at battalion headquarters when the commanding officer is absent.

Section III. DIVISION ENGINEER SECTION

13. Organization

The engineer section of the division staff consists of the battalion commander, the assistant division engineer (ADE), a combat construction foreman, and a radio operator.

14. Duties of "ADE" and Section Personnel

The assistant division engineer represents the division engineer on the division staff, and is empowered to make minor decisions in his absence. He must be familiar with all the activities of the division and the engineer battalion. An up-to-date situation map containing all available engineer information is maintained by his section at the forward echelon of division headquarters. Under the direction of the division engineer, the assistant division engineer acts as consulting engineer to the division staff sections in the preparation of plans involving engineer work. In general, the assistant division engineer relieves the battalion commander of many of his routine duties at division headquarters, so that he is free to devote much of his effort to commanding the engineer battalion. The ADE is assisted in his duties by the division engineer section.

15. Operations

The engineer section at division headquarters is primarily a special staff section. Ordinarily, it operates at the division forward command post, where it is available to the division commander and staff sections. Through the battalion radio net, the section can contact battalion headquarters or any of the companies. In certain circumstances it may be preferable to group all purely divisional functions under the division engineer section rather

than to parcel them out to battalion staff officers. Some division engineer supply functions, such as map distribution and division engineer supply breakdown, may be handled better by the division engineer section than by the battalion S2 and S4 sections. This entails moving the men and equipment designed to perform these functions to the division engineer section.

Section IV. ADMINISTRATIVE SECTION

16. Organization

The administrative section consists of the adjutant (S1), a military personnel warrant officer, and several enlisted men. Assisting the adjutant are the sergeant major, clerk-typist, stenographer, mail delivery clerk, and radio operator. The warrant officer supervises the work of the personnel sergeant, the personnel administrative supervisor, the personnel management specialist, and personnel administrative clerks.

17. Duties of Key Personnel

a. The adjutant (S1) operates at battalion headquarters. He is responsible to the battalion commander for all personnel and administrative actions of the battalion. His duties are prescribed in FM 5–5 and FM 101–5, and include—

(1) Personnel management and record keeping with respect to reclassification, assignment, pay, promotion, transfer, retirement, and discharge of battalion personnel.

(2) Processing awards of decorations, citations, commendations, and other honors.

(3) Processing applications for leaves.

(4) Maintaining records of military justice procedures.

(5) Maintaining reports of strength, casualties, prisoners of war, and personnel statistics.

(6) Reception of replacements, and their processing to include assignment and quartering.

(7) Movement, internal arrangement, internal organization, and internal operation of battalion headquarters.

(8) Providing morale, welfare, and recreational services.

(9) Maintaining the unit journal.

(10) Operating the unit postal service.

b. The military personnel warrant officer assists the adjutant in personnel matters. He directs the activities of the personnel sergeant, the personnel specialists, and the clerks in the personnel subsection. His duties are prescribed in FM 101–5.

c. The sergeant major is the adjutant's principal assistant for other than personnel matters. He supervises and directs the administrative subsection in the preparation of correspondence, records, forms, reports, and orders. He is the liaison channel between battalion headquarters and the first sergeants.

18. Chaplain

The chaplain provides spiritual guidance for the battalion, and assists the individual soldier in his personal problems. The chaplain's assistant helps the chaplain conduct services, assists with administrative matters, drives the ¼-ton truck, and if qualified, plays the field organ.

Section V. INTELLIGENCE SECTION

19. Organization

The intelligence section consists of the intelligence officer, reconnaissance officer, an intelligence sergeant, engineer reconnaissance sergeants, a map distributor, a chief radio operator, radio operators, a still photographer, a draftsman, and a driver.

20. Duties of Key Personnel

a. The intelligence officer (S2) directs the activities of the intelligence section. He is also the camouflage officer. His section acts as an agency for G2 in the division information collection plan. While seeking specific technical information, engineers may also uncover valuable tactical information. G2 normally sends any engineer data gathered by other agencies to S2. (See FM 101–5 for the general duties of an intelligence officer.) The battalion intelligence officer—

(1) Collects and evaluates engineer information and furnishes and disseminates engineer intelligence; coordinates, with S3 and other staff officers, the assignment of missions to the reconnaissance teams and the light aircraft; and requests reconnaissance patrols from lettered companies as required. S2 must conserve the effort of reconnaissance agencies by specifying which information is of special importance during a stated period, and by issuing definite reconnaissance instructions.

(2) Keeps engineer intelligence records, including the S2 journal, the S2 work sheets, and the S2 situation map. The *S2 journal* contains briefs of important written and oral messages received and sent, as well as notations of periodic reports, orders, and records pertaining to the intelligence section. Items are entered in chronological

order and become a permanent record. The *S2 work sheet* is a systematic arrangement of engineer information received by the intelligence section, with all items on a particular subject grouped together for ready reference and comparison. The work sheet is not a permanent record. It must be kept up to date by prompt insertions, and by removing or striking out items that become obsolete. The *engineer intelligence situation map* is kept by the S2 in collecting and evaluating engineer information and intelligence. This map shows the result of reconnaissance, classification of roads and bridges, potential water-supply sites, sources of local materials, minefield information, results of enemy action, disposition of major enemy units, and other items of engineer intelligence.

(3) Supervises intelligence training. S2 is responsible for training his own intelligence section and for supervising engineer reconnaissance training. He assists the S3 in supervising the intelligence training of all battalion personnel. Training must be carefully planned and supervised so that engineer troops know the scope and purpose of engineer reconnaissance, and fully understand the importance of accurate reconnaissance reports.

(4) Conducts combat intelligence and counterintelligence activities. The S2 has staff responsibility for the planning and execution of combat intelligence and counterintelligence activities in the battalion, including security operations. For example, in cooperation with S1, he is responsible for censorship of postal matter and security requirements for handling messages. He questions enemy personnel and examines captured documents, civilians, and material of immediate importance to the unit.

(5) Procures and distributes maps, photomaps, and aerial photographs. The intelligence officer procures and distributes maps in accordance with general policies established by the division G2 and corps engineer.

(6) Assists the battalion commander. The S2 helps the battalion commander carry out his division engineer functions by furnishing him with detailed information on which to base his recommendations to the division commander.

(7) Coordinates with S3, on battalion psychological warfare operations and training, and defense against enemy propaganda.

(8) Prepares terrain analyses and studies for battalion use, and terrain studies for division use.

b. The reconnaissance officer exercises immediate supervision over the reconnaissance teams. His reconnaissance missions are assigned and coordinated by S2. He instructs and dispatches the reconnaissance teams and personally participates in the more important missions. The engineer reconnaissance sergeant, the driver, and radio operator must be able to take over each others duties in the event of casualties.

c. The intelligence sergeant supervises the activities of the section. He helps the intelligence officer by keeping the intelligence map up to date, preparing reports and records, instructing patrol and reconnaissance parties, preparing correspondence, and performing other intelligence functions.

d. The map distributor receives or picks up maps from the corps map depot. Maps are allotted to the division by army or higher headquarters. The corps map distribution section may make delivery, but more frequently, it will notify the engineer battalion S2 to make the pickup. The map distributor prepares the map breakdown to units in accordance with their needs and with policies established in the division SOP. He distributes the maps to battalion headquarters (depending on division policy) if transportation is available. When transportation is not available, he notifies the major commands and separate units, which pick up their own maps and make further distribution. A 2½-ton truck is generally provided for map pickup, limited storage, and distribution, since a vehicle for this purpose is not included in the engineer battalion T/O&E. The map distributor keeps a small reserve of maps on hand for emergency use and makes timely requisitions for the additional maps needed. Maps no longer required and still in the original package are sent back to the map distributor for return to the corps map distribution section. Although the T/O&E shows the map distributor in the S2 section, the division engineer may find it more desirable to place the map distributor under the assistant division engineer at division headquarters. There the map supply point will be more centrally located, and more accessible to division headquarters and divisional units.

Section VI. OPERATIONS SECTION

21. Organization

The operations section consists of the operations officer (S3), the assistant operations officer (troop information and education officer), an operations sergeant, various specialists, and admini-

strative personnel. The specialists include a combat construction specialist, a construction draftsman, and a construction surveyor. The administrative personnel include a clerk-typist, an information and education specialist, and light truck drivers.

22. Duties of Key Personnel

a. The operations officer (S3) directs and supervises the operations section. He is also the battalion chemical, biological, and radiological (CBR) officer. His general duties as operations and training officer are prescribed in FM 101–5. Typical duties are to—

(1) Plan and supervise battalion training.

(2) Plan the allocation of engineer troops and construction equipment to various tasks, and prepare battalion operation orders. He coordinates his plans with S4, to be sure that the plan of operations is adequately supported by the supply plan.

(3) Keep the engineer operations and situation map current, with information furnished by tactical orders, reports from subordinate units, and personal reconnaissance. The situation map shows all the operational information, such as engineer troop dispositions, projects under way, location of friendly major tactical units, area responsibilities assigned to subordinate units, water points, and support being rendered by other engineer troops. The S3 situation map enables all engineer staff officers to keep informed of the situation, so that they may plan their operations to meet any forseeable contingency.

(4) Utilize his assistants to make technical reconnaissance, designs, and plans for accomplishing engineer tasks.

(5) Conduct training, inspect chemical equipment, and supervise chemical, bacteriological, and radiological (CBR) activities of the battalion.

(6) Recommend security measures for battalion headquarters to the headquarters commandant.

(7) Recommend, when necessary, that requests be made for support by additional engineer troops, or that higher headquarters assume responsibility for engineer work in a portion of the division area.

(8) Plan, in accordance with the S2 section, the assignment of reconnaissance missions to the lettered companies.

(9) Arrange details for movement of the battalion under tactical conditions.

(10) Make a continuing estimate of the situation so that he can make recommendations at any time for the employment of the battalion.

(11) Prepare tactical and technical reports.

(12) Coordinate liaison with supporting engineer units.

(13) Assist the battalion commander in the preparation of command reports.

b. The assistant operations officer assists the S3 in his duties, and is the troop information and education officer. He coordinates and supervises orientation, education, and information activities. He recommends means and methods for disseminating and distributing orientation and information material, and makes facilities available for its presentation. He is assisted in these duties by a troop information and education specialist.

c. The operations sergeant is the senior enlisted man in the section. He helps the operations officer in performing his duties and in supervising section activities.

d. The combat construction specialist inspects battalion construction projects, makes recommendations, and assists in carpentry problems. He helps S3 in drawing up plans and bills of materials. He instructs in battalion-conducted carpentry schools and performs carpentry work for battalion headquarters and headquarters and service company. He receives additional training in chemical, biological, and radiological (CBR) defense; he then assists the operations officer in training, and in supervising battalion CBR activities and equipment.

Section VII. BATTALION SUPPLY SECTION

23. Organization

The supply section is divided into four subsections: administrative, division engineer supply, battalion supply, and water supply.

24. Administrative Subsection

a. Organization. The administrative subsection consists of the supply officer (S4), supply warrant officer, radio operators, and truck drivers.

b. Duties of Personnel.

(1) The supply officer (S4) supervises the battalion supply section and is responsible for its functioning. His duties are prescribed in FM 101–5. In general, he must keep in contact with other members of the battalion staff, the engineer company commanders, the division G4, and all

supporting supply installations. He coordinates and supervises the supply of fortification and construction materials, and the procurement of all engineer supplies and equipment for the division. The only engineer supply points he normally establishes for supported units are those for water and local materials. The S4—

(*a*) In cooperation with S2 and S3, studies and collects information on available local resources, captured enemy engineer supplies, and stocks in local depots under unit control.

(*b*) Advises the battalion commander as to the availability of equipment and materials, and recommends their allocation. He estimates future requirements, and arranges in advance for using units to draw supplies.

(*c*) Recommends the number and location of water points. These recommendations, when approved by the battalion commander and the division G4, are incorporated into drafts prepared by S3 for inclusion in operation and administrative orders.

(*d*) Keeps a continuous inventory of stocks of engineer materials available, and arranges for taking over and distributing them.

(*e*) Allocates transportation (other than organic) to subordinate units, in coordination with interested staff officers.

(*f*) Supervises the procurement of all classes of supply for the battalion, and of engineer supplies for the division.

(*g*) Prepares reports as directed.

(*h*) Assists company commanders with the training of their supply personnel.

(2) The supply warrant officer assists the supply officer in his duties. He supervises the activities of the subsections to insure an even flow of supplies, and sees that supply records are kept correctly and up to date. He is also the battalion food supervisor. As such, he is responsible for procuring and distributing food for the battalion, keeping battalion-level mess records, and inspecting all company mess facilities. He has a ration breakdown sergeant in the battalion supply subsection to assist him with these duties.

25. Division Engineer Supply Subsection

a. Organization. The division engineer supply subsection consists of a division engineer supply sergeant and a supply clerk.

b. Duties of Personnel. The division engineer supply sergeant supervises and directs the activities of the subsection. With the help of the supply clerk, the sergeant processes all requisitions and records for division engineer supply. He requisitions, receives, stores, and supervises the distribution of engineer supplies to all units organic to or attached to the division. As senior noncommissioned officer of the S4 section, he may be assigned additional duties within the supply section.

26. Battalion Supply Subsection

a. Organization. The battalion supply subsection consists of a battalion supply sergeant, ration breakdown sergeant, and senior supply clerk. This section also includes two special electrical device mechanics.

b. Duties of Personnel. The battalion supply sergeant, with the help of the ration breakdown sergeant and supply clerk, edits and consolidates requisitions for all classes of supplies, keeps supply records, and receives, stores, and issues all classes of supplies to the battalion. These supplies include rations, clothing and equipment, petroleum products, signal equipment, and ammunition. The ration breakdown sergeant procures and issues all rations for units within and attached to the battalion. He keeps battalion-level mess records and submits necessary reports. The special electric device mechanics operate and maintain special electric mine-detection equipment.

27. Water Supply Subsection

a. Organization. The water supply subsection consists of a water supply foreman, water supply specialists, and water supply helpers. The specialists and helpers are divided into teams to operate the water points.

b. Duties of Personnel. The water supply foreman directs and supervises the activities of the water supply subsection. He is responsible for the maintenance, installation, and operation of water points. He conducts reconnaissance to locate water points, and recommends schedules for drawing water. With the help of the specialists and helpers, he performs the following duties:

(1) Installs and operates water points.

(2) Maintains and performs minor repairs on the water purification sets.

(3) Operates pumps, stores, and dispenses water.

(4) Performs tests in the field to identify and measure impurities, to determine the treatment required, to check the

effectiveness of treatment, and to insure that the water issued is potable.

(5) Enforces sanitary, traffic, security, and camouflage regulations at water points.

(6) Keeps water supply records and submits necessary reports.

c. Operations.

(1) The allocation of water points and the method of their employment is determined by the tactical situation. The water supply subsection operates several independent teams under the guidance of the water supply foreman. A team is dispatched by the supply officer, with the advice of the water supply foreman and the operations officer, to a particular location, to supply potable water to units designated by the battalion operational plan. Or a water supply team may be attached to a lettered company serving with a combat command. In this case, the water point is located by the combat command S4, on the advice of the engineer company commander or his representative, and the water supply team leader. Movement, control, and protection are responsibilities of the combat command S4. Water point locations are reported by the company commander to the combat command and to the engineer battalion headquarters. Whether sent to a specific location or attached to an engineer company, the team operates alone. Depending upon its location, the team may be attached to an adjacent unit for rations, rations may be delivered by the armored engineer company or battalion headquarters and service company, or prepared on small cooking units by the team.

(2) Cargo trailers from the administrative supply subsection are usually assigned to the water supply subsection, as needed. These are used to carry the water purification sets. One truck and trailer are required to transport each team and its equipment to successive sites. A reserve team is sometimes used to "leap frog" another water point. The new water point is put into operation, and the old equipment is then removed for inspection, maintenance, and repair. This set becomes the reserve set, ready for future operation. Additional mobility and speed in operations may be obtained by bolting parts of the purification unit to the trailer floor. This makes it unnecessary to load and unload, and to connect and disconnect, the whole set for each move.

(3) The water supply foreman, when the situation permits, will visit each water point every day to deliver supplies, food, and mail, and to help the teams with any difficulties that may arise.

Section VIII. COMMUNICATIONS SECTION

28. Organization

The communications section includes the communication officer, communication chief, radio operators, radio mechanic, signal message clerks, and light truck driver.

29. Duties of Key Personnel

a. The communication officer commands the communications section, and as a staff officer, supervises all communication activities and the organizational maintenance of all signal equipment in the battalion (fig. 4). In general he—

(1) Advises the battalion commander and staff on correct signal communication technique.

(2) Prepares plans and supervises the establishment, operation, and maintenance of the engineer communication system.

(3) Supervises technical training of communication personnel.

(4) Offers technical advice and assistance to S4 regarding supply of signal communication materials for the battalion.

(5) Makes recommendations, in coordination with S1, for initial and successive locations of the battalion command post, when not prescribed by higher authority.

(6) Makes recommendations for procuring and replacing signal communication personnel.

(7) Establishes and operates the communications center.

(8) Prepares, or secures from appropriate headquarters, orders, Standing Signal Instruction (SSI), and Signal Operation Instructions (SOI).

(9) Supervises maintenance of signal security in the battalion (coordinates with S2).

(10) Supervises care, maintenance, and repair of signal equipment within the battalion (coordinates with S4 for parts).

b. The communication chief assists the communication officer. He supervises the installation, operation, and maintenance of wire

and radio communication facilities; instructs and trains communication personnel in field communication techniques; and supervises radio operators in operating the battalion net control station (fig. 40).

(1) The communication chief directs and coordinates all phases of communication center operations, to insure that messages are transmitted with the utmost speed, accuracy, and security. He supervises and instructs personnel in the function of a message center and in the performance of individual assignments.

(2) He keeps necessary records pertaining to the operation of wire, radio, and message center activities.

30. Operations

The communications section operates a subordinate station in the division radio command net, which may be used as an alternate battalion net control station; operates the telephone system and message center; and performs organizational maintenance on all Signal Corps equipment in the battalion. Operators are provided for continuous communication service. See FM 17–70 for details.

Section IX. BATTALION MAINTENANCE SECTION

31. Organization

The battalion maintenance section consists of a motor officer, an engineer equipment warrant officer, motor maintenance sergeant, engineer equipment maintenance supervisor, motor sergeant, engineer equipment and track vehicle mechanics, machinist, welders, ordnance parts specialist, wrecker operator, mechanics helpers, and a light truck driver.

32. Duties of Personnel

a. The battalion motor officer exercises immediate supervision over the motor maintenance section. His duties are to—

(1) Advise the battalion commander, his staff and subordinate commanders, on technical aspects of automotive and equipment operation and maintenance.

(2) Direct the supply and operations of the maintenance section.

(3) Direct the training of drivers, mechanics, and operators.

(4) Supervise the preparation of reports and records of equipment and supplies.

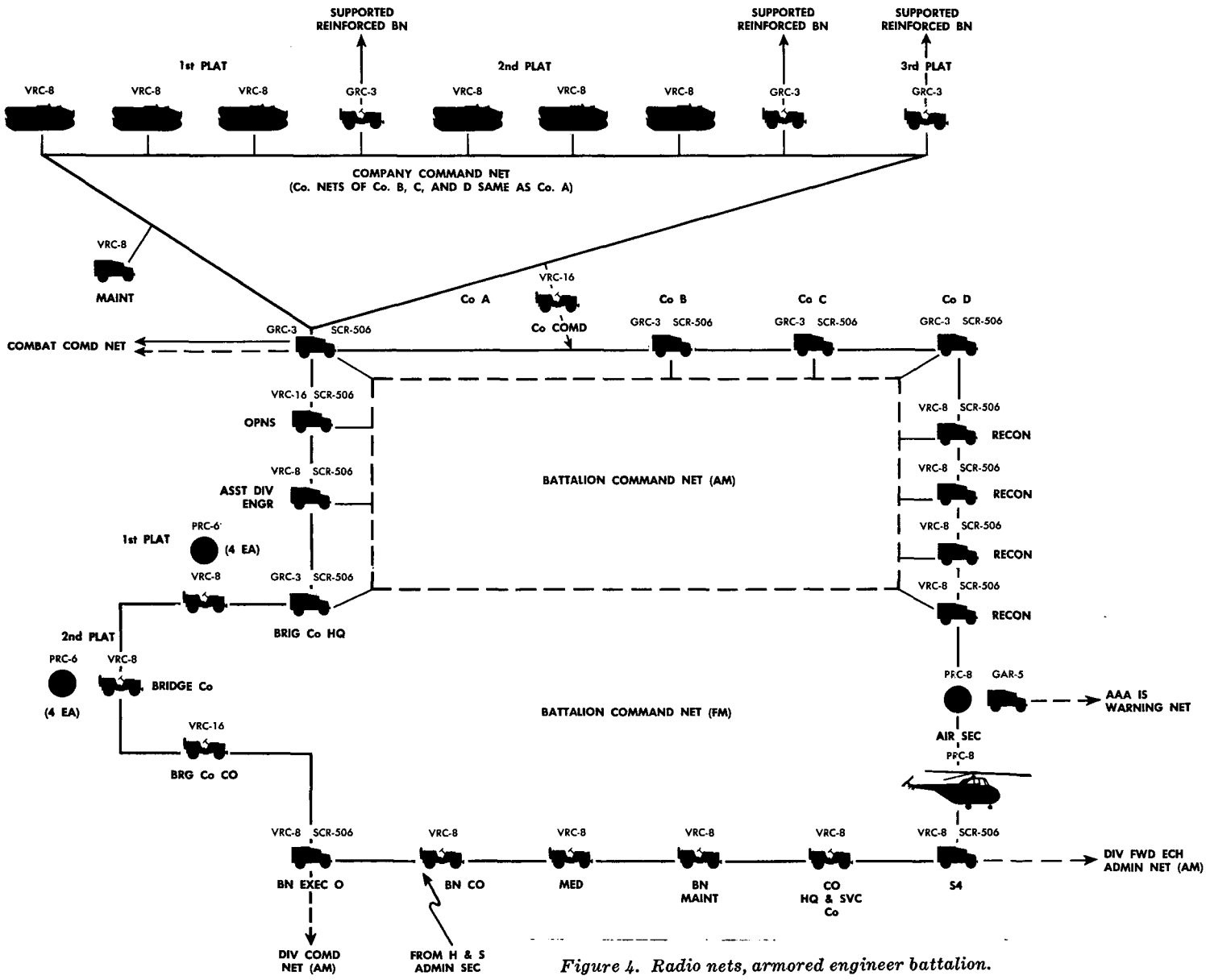


Figure 4. Radio nets, armored engineer battalion.

b. The engineer equipment warrant officer, under the immediate supervision of the motor officer, directs the operation of the motor pool shop, and is a source of technical advice and help for personnel working in the company motor pools and in the battalion shop. His duties are to—

(1) Check incoming repair work to determine the amount and nature of repairs needed.

(2) Set up maintenance schedules for vehicles and equipment in accordance with existing directives.

(3) Assign repair and maintenance work.

(4) Inspect shop operations to insure that repair schedules are maintained and that correct methods are being used.

(5) Check completed work to insure that vehicles and equipment are in proper operating condition before being released from the shop.

c. The motor maintenance sergeant, under the supervision of the motor officer and engineer equipment warrant officer, directs the activities of the motor maintenance section. He helps prepare reports, keeps records and files, and trains personnel. He recommends job assignments and priorities and helps the mechanics perform organizational maintenance and repair.

d. The engineer equipment maintenance supervisor, under the supervision of the motor officer and warrant officer, directs the activities of the engineer equipment mechanics. He assigns and inspects work and gives technical advice and help to the mechanics; prepares necessary reports and keeps records and files of engineer equipment; assists in training equipment operators; and may, under certain circumstances, supervise the use of equipment.

33. Operations

a. The battalion maintenance section provides organizational maintenance for vehicles, outboard motors, chain saws, water purification units, and other battalion equipment. This maintenance does not relieve drivers and operators of their preventive maintenance responsibilities, nor does it relieve the company maintenance sections of their organizational maintenance duties. Monthly and semiannual maintenance inspections are performed by the battalion section; the companies conduct the weekly inspections. The battalion section also conducts spot-check inspections, and helps the battalion commander in his command inspections. For further details about maintenance see TM's 37–2810, 38–660, 5–505, and 9–2810.

b. In general, if parts are readily available, the companies make such repairs as time, tools, and the skill of their mechanics permit. The battalion maintenance section issues parts and repair supplies to the companies. The equipment platoon of headquarters and service company is entirely separate from the battalion maintenance section, and depends on the battalion section for maintenance and repair of its equipment.

Section X. AVIATION SECTION

34. Organization

The aviation section consists of a helicopter pilot, a senior helicopter mechanic, and a helicopter mechanic.

35. Duties of Personnel

a. The helicopter pilot advises the battalion commander and battalion staff on the technical aspects of helicopter operations. He also directs the activities of the section mechanics and supervises their training.

b. The helicopter mechanics are responsible for maintaining the helicopter in operating condition and for all administrative details concerning requisitions, maintenance forms, and other reports.

36. Operations

The battalion helicopter is employed on engineer reconnaissance missions or on special missions for the battalion commander.

Section XI. MEDICAL DETACHMENT

37. Organization

The medical detachment (T/O&E 5–215) consists of a medical officer, medical assistant, noncommissioned assistants, company aid men, aid station attendants, medical aid men, a clerk-typist, and ambulance drivers. No formal organization exists for company aid teams. Aid men are attached to the companies of the battalions according to the anticipated need for their services.

38. Duties of Key Personnel

a. The medical officer commands the battalion medical detachment, and supervises the medical service of the battalion. He serves as advisor to the battalion commander and staff on matters affecting the health of the command. In general, the medical officer—

(1) Instructs battalion personnel in personal hygiene, military sanitation, and first aid.

(2) Makes medical and sanitary inspections and keeps the battalion commander informed of the medical situation in the battalion.

(3) Establishes and operates the battalion first aid station and dispensary.

(4) Requisitions medical supplies and equipment required by the medical detachment.

(5) Prepares the medical plan, including recommendations for location of the battalion aid station.

(6) Verifies the status of medical supplies in all elements of the battalion and takes steps to insure timely replenishment.

(7) Supervises collection and evacuation of wounded.

(8) Supervises preparation of casualty lists, the monthly sanitary report, and other required medical records.

b. The medical assistant, who is a medical service corps officer, helps the medical officer in his administrative duties. The assistant to the medical officer may be directed—

(1) To help the medical officer in providing preventive and first aid services, inspections, and lectures.

(2) To conduct reconnaissance for locating and establishing the medical aid station.

(3) To supervise detachment personnel activities.

(4) To verify immunization records.

(5) To conduct classes in selected subjects to train the medical detachment and other battalion personnel.

(6) To perform medical supply, transportation, and administrative functions.

c. The medical noncommissioned officers, supervised by the medical officer, direct the activities of the detachment, help the medical officer provide preventive and first aid services, inspections, and lectures, and assign tasks to detachment personnel.

39. Operations

The medical officer supervises medical training and sanitation in the battalion. The medical detachment provides company aid men to battalion units, operates a battalion aid station and dispensary, and evacuates casualties to the division clearing company. Dental care for the battalion is centralized in the division medical battalion. Normally, the medical detachment is attached to headquarters and service company for administration, including rations, billeting, maintenance, supply, and personnel matters.

CHAPTER 5
HEADQUARTERS AND SERVICE COMPANY

Section I. GENERAL

40. Mission

The mission of headquarters and service company is to—

a. Furnish men and equipment to the sections of battalion headquarters.

b. Provide company-level administration, and administrative support for battalion headquarters.

c. Provide battalion-level equipment support for the entire battalion and attached units.

41. Organization

Headquarters and service company consists of a company headquarters, the enlisted men who work in battalion headquarters, and the equipment platoon (fig. 5). The organization, duties, and training of personnel in the battalion headquarters sections are given in chapter 2. Company headquarters, and the equipment platoon are discussed in this chapter. The medical detachment is usually attached to headquarters and service company for rations, quarters, administration, and some of its training.

42. Functions

a. Headquarters and service company provides the enlisted men for battalion headquarters. The company feeds, clothes, quarters, pays, and is responsible for the conduct of these men. They are

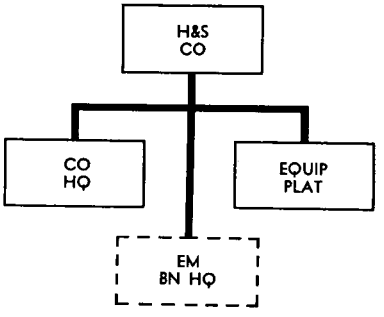


Figure 5. Organization of headquarters and service company.

assigned to battalion headquarters sections, and are under the operational control of the officer heading each section. The presence of these men is required periodically by the company commander, for training, and company administrative matters, but the concurrence of battalion section chiefs is obtained before rosters and schedules for such duties are released.

b. Headquarters and service company provides transportation and maintenance services as needed. It furnishes an equipment pool for the entire battalion, but does not provide battalion level supply or maintenance, since these functions are performed by the respective sections of battalion headquarters.

c. The company has a pool of construction equipment in its equipment platoon. This may be supplemented with class IV equipment from an army engineer depot.

Section II. COMPANY HEADQUARTERS

43. Mission

The mission of company headquarters is to provide command and administrative services for the company; to supervise the conduct, discipline, and appearance of company personnel; and to maintain their health, welfare, and morale. Administratively, the company feeds, clothes, supplies, quarters, pays, and provides recreational equipment for all men in battalion headquarters, in the company, and in the medical detachment.

44. Organization

Company headquarters is organized into command and administrative echelons. Equipment and maintenance functions are discussed in paragraphs 51–54.

Section III. COMMAND ECHELON

45. Organization

The command echelon of headquarters and service company includes the company commander, executive officer, first sergeant, and a driver for the light truck.

46. Employment and Operations

a. Administrative operations of the command section are generally the same as those of the lettered company (see par. 61). Additional problems are presented, however, by the loss of operational control over the men assigned to battalion headquarters during duty hours. Close and cordial relations must be maintained

with the heads of the various staff sections, so that administrative matters concerning staff enlisted personnel are handled properly and without friction.

b. The company commander is usually designated headquarters commandant, and as such he—

(1) Provides for the security of battalion headquarters.

(2) Supervises the physical movement of battalion headquarters, furnishing necessary men and transportation from headquarters and service company.

(3) Supervises the headquarters mess, and the messing and quartering of casuals.

(4) Acts as headquarters billeting officer, in coordination with S1.

(5) Enforces traffic control regulations within the areas of battalion headquarters and headquarters and service company.

(6) For battalion motor marches, he marks routes, and supervises the activities of guides and advance details.

c. The executive officer has duties similar to those of his counterpart in the lettered company (par. 61*c*). He may also be designated project engineer when the equipment platoon is used as a work unit on a special project.

Section IV. ADMINISTRATIVE ECHELON

47. Organization

The administrative echelon of headquarters and service company includes the administrative section, mess section, and supply section.

48. Administrative Section

The administrative section consists of the unit administrator and a company administrative clerk, who have generally the same duties as those described in paragraph 64 for the corresponding personnel of a lettered company. However, in headquarters and service company, the unit administrator is not responsible for the equipment platoon.

49. Mess Section

In addition to the mess operations described in paragraph 65, the mess section also provides a mess for officers of battalion headquarters and casuals.

50. Supply Section

Operations of the supply section are comparable to those of the lettered company supply section, described in paragraph 66.

Section V. EQUIPMENT PLATOON

51. Mission

The mission of the equipment platoon is to provide a pool of equipment, with operators, for the use of the bridge and lettered companies.

52. Organization

The equipment platoon consists of a warrant officer (platoon leader), construction machinery foreman, and equipment operators.

53. Equipment

Platoon construction equipment includes: truck-mounted cranes, with trailers for transporting crane attachments; motorized graders; a truck-mounted air compressor; a light crawler-type tractor equipped with a loader bucket and a bulldozer blade. A 10-ton tractor truck and a 20-ton low bed semitrailer are provided for transporting the crawler type tractor.

54. Operations

a. General. Operations of the equipment platoon are directed by the platoon leader. He is assisted by a construction machinery foreman, and machinery operators. The platoon leader is responsible for the inspection of the vehicles and construction equipment of headquarters and service company; repair work is accomplished by the battalion maintenance section. Equipment is allotted by the battalion commander, who is guided by the recommendations of his S3. Each piece of equipment is assigned to operators who provide continuous operation. This requires two operators for each crane, the tractor, the graders, and an operator for the air-compressor. One operator in each pair serves as driver when the equipment is being moved. During combat, a roving maintenance team is formed by the battalion maintenance section to make frequent contact with each piece of equipment allotted to the lettered companies.

b. Equipment Pool.

(1) The equipment platoon operates as an equipment pool to supplement the equipment of the lettered companies. The

battalion commander allocates equipment to the companies for specific projects, upon the recommendation of his S3 (see example A below). When the project is completed, the equipment is returned to headquarters and service company for repair and reassignment.

(2) The equipment platoon has the supervisory personnel necessary to operate as an independent platoon directly under the battalion staff (see example B below). When this is done, the platoon may be given additional equipment, such as dump trucks, detached from lettered companies or the supply section.

Example A: A combat command operating over a dirt road may require the attachment of a motor grader to its armored engineer company, so that movement will be easier for wheeled vehicles after tracked vehicles have gone over the road.

Example B: An armored division moving over rough terrain or poor roads may require a single main supply road to the combat elements. This type of road requires considerable maintenance. The equipment platoon, supplemented by men and equipment from other battalion elements, could meet this requirement.

(3) Headquarters and service company trains the operators, and battalion maintenance section maintains the equipment. The using company directs how the equipment will be used, unless the platoon is operating directly under S3.

c. Maintenance. The equipment platoon has no mechanics in its organization. The battalion maintenance section is charged with the maintenance of the construction equipment and vehicles of headquarters and service company, including those assigned to sections of battalion headquarters, medical detachment, and equipment pool.

d. Security. The equipment pool must be guarded at all times. This may be accomplished in rear areas by using inclosed equipment parks with a guard to check vehicles in and out through a single gate, plus a system of interior guards. In forward areas and wooded terrain use is made of defilade, dispersion, and camouflage, as well as the security afforded by the use of men and weapons. All personnel must be alert to detect and prevent pilfering and sabotage.

CHAPTER 6

ARMORED ENGINEER COMPANY

Section I. GENERAL

55. Mission

The armored engineer company is an operating component of the armored engineer battalion and the basic administrative unit in the battalion. It is equipped to perform combat engineer tasks and, when reinforced with additional heavy equipment, can also perform heavy engineer tasks. In an emergency, it fights as armored infantry. The company can provide normal engineer support for one combat command, when furnished the necessary bridging.

56. Organization

The armored engineer company has a company headquarters and three platoons. Each platoon has a headquarters and three squads (fig. 6).

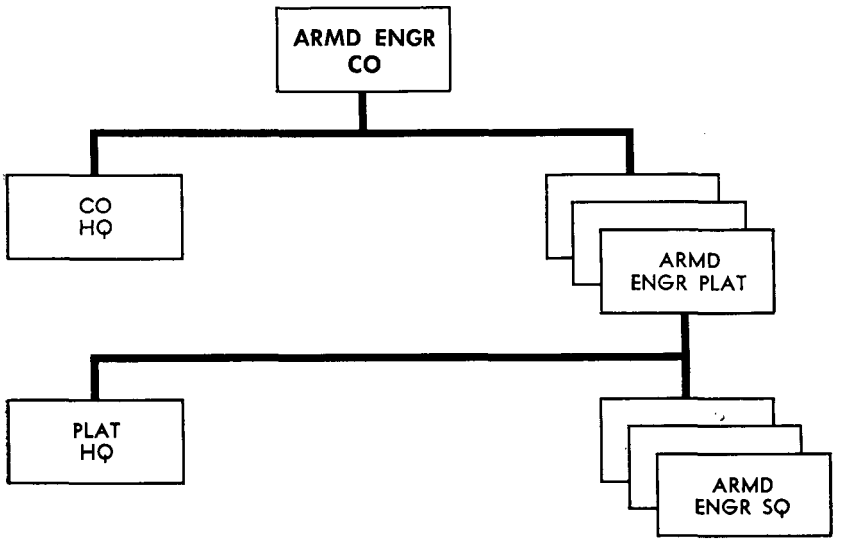
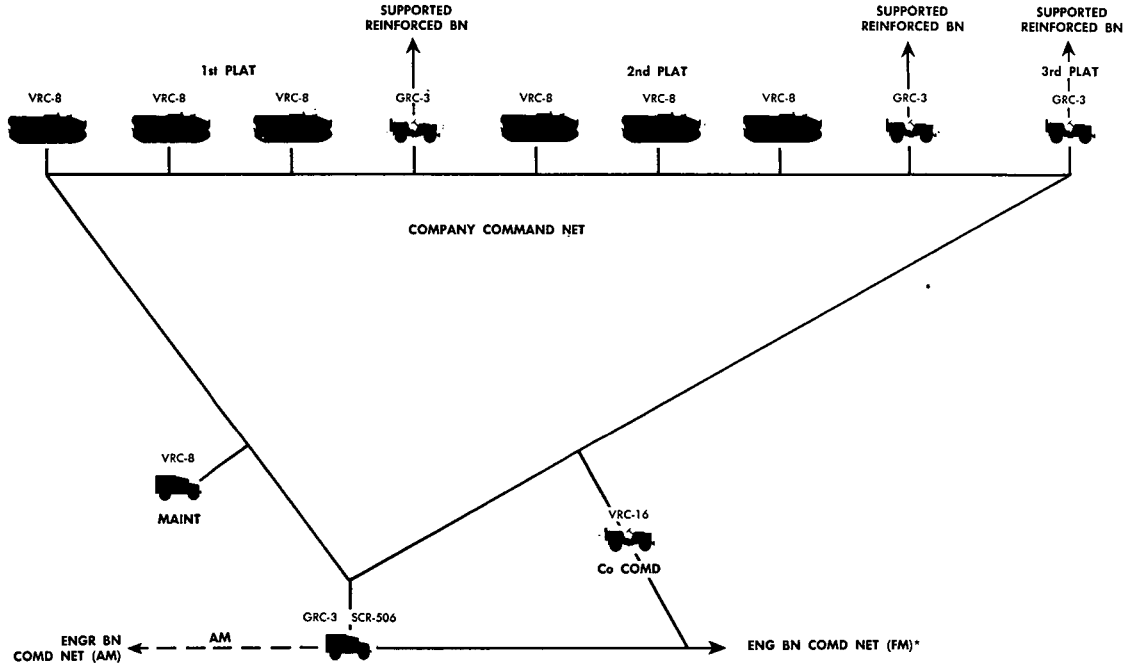


Figure 6. Organization of the armored engineer company.



*When company is in direct support or attached to combat command these radios enter combat command Command Net (FM)

Figure 7. Radio nets, armored engineer company and platoon.

57. Equipment

The company is completely mobile with its organic vehicles. In addition to individual arms, there are machine guns and grenade and rocket launchers. The company also has many items of administrative, operational, and housekeeping equipment. Radios and other signal equipment are provided for communication between squads, platoons, and company headquarters, and between the company and battalion or supported units (fig. 7).

Section II. COMPANY HEADQUARTERS

58. Mission

Company headquarters of the armored engineer company provides command and administration for the company. Command is not limited to physical leadership and direction. It includes planning; it also includes responsibility for the appearance, conduct, and discipline of the men, and safeguarding their health, welfare, and morale.

59. Organization

Company headquarters is formed into a command echelon and an administrative echelon.

Section III. COMMAND ECHELON

60. Organization

The command echelon of company headquarters consists of the command section and the communication section.

61. Command Section

a. The command section consists of the company commander, the executive officer, and the first sergeant.

b. The company commander is responsible to the battalion commander for the administration, training, discipline, supply, appearance, and efficient employment of his company. His specific duties include—

(1) Aiding the battalion commander and staff in developing plans for the employment of his company. When his company is attached to a combat command, the company commander similarly assists the combat commander and his staff, by maintaining close liaison with them, keeping them informed of the situation in his company, and recommending the use to be made of his company in

order that it may most effectively assist the mission of the combat command.

(2) Exercising initiative to keep his company usefully employed when no company missions are assigned.

(3) Analyzing a task, dividing it into its components, and allotting work to his subordinate commanders.

(4) Supervising work to see that: tasks are performed properly; correct methods are used; time schedules are met; supply of materials is maintained; difficulties are anticipated and provided for; platoon commanders are given all possible facilities, including personnel and equipment from company headquarters or battalion, to help them execute their assigned work.

(5) Inspecting to insure that tools, equipment, weapons, transportation, and all classes of supply are properly maintained, used, or stored, and that the mess, supply, communication, administration, and maintenance sections are operating properly.

(6) Conducting continuous engineer reconnaissance, and reporting appropriate information to battalion headquarters and to the unit supported.

(7) Guarding constantly against the excessive use of his men on administrative details, both within his company and by higher echelons.

(8) When the company is attached to or in support of a combat command, serving also as the unit engineer on the staff of the combat command commander.

c. The executive officer, usually the senior lieutenant in the company, is second in command. He assists the company commander in the performance of his duties, makes recommendations on company matters, and assumes command in the company commander's absence. The executive officer must keep constantly informed of the situation, be familiar with the policies of the company commander, and be empowered to make decisions in his name. He may be used as the project engineer on a job requiring two platoons, either simultaneously or on a two-shift basis, to coordinate the work and preserve continuity of effort. He can be designated as a company liaison officer, when required, or as the assistant unit engineer for a unit to which the engineer company or a major fraction thereof is attached. Mess, supply, and transportation are also supervisory responsibilities of the executive officer.

d. The first sergeant is selected by the company commander from among the combat construction foremen (platoon sergeants)

assigned to the company. The first sergeant is designated by a company order and may be relieved by the same means. An individual appointed first sergeant loses that designation when reassigned. The first sergeant is the principal enlisted assistant to the company commander. Under the direction of the unit administrator, he coordinates such company activities as mess, supply, transportation, maintenance, and communication. He helps prepare and maintain records, rosters, correspondence, and reports. He acts as a representative between the company commander and the enlisted men of the company. As a construction foreman, he aids the company commander in inspecting and supervising training and operations. In the absence of all company officers, the first sergeant assumes the duties of the company commander, and also assumes the duties of the unit administrator in his absence.

e. The command section provides leadership and direction for the communication section, administrative echelon, and platoons not detached from the company. When the company is divided for nontactical reasons, company headquarters normally is located with the most centrally located platoon, or with a two-platoon grouping, if one exists. When the company is fighting as armored infantry, company headquarters may be divided into forward and rear command posts, depending upon the tactical situation. In this case, the command section and communication section operate the forward command post, which is set up at the best location for controlling the operating platoons. The administrative echelon operates under the unit administrator in the rear, supporting the forward command post and troops.

62. Communication Section

a. Organization. The communication section consists of a communications chief, radio operators, a radio mechanic, and a driver.

b. Employment and Operations. The section chief is responsible to the company commander for the technical performance and military control of his men. He supervises the operation of the company message center, and insures that messages are sent and received promptly and accurately. The communication section is always employed as part of the command echelon of company headquarters. It provides radio service when required, and may also provide telephone service. Radio service includes operation of one radio in the battalion or combat command net, and one radio as a control station in the company net. Telephone service includes operating telephones at company headquarters and providing wire to the platoon headquarters when the situation re-

quires or permits. Wire from battalion headquarters is provided by the battalion headquarters communication section. When the company headquarters is divided into forward and rear command posts, the communication section goes with the forward element. See figure 7 for company radio net, and figure 4 for battalion radio net.

Section IV. ADMINISTRATIVE ECHELON

63. Organization

The administrative echelon consists of the unit administrator (warrant officer), company administrative clerk, and the mess, supply, and maintenance sections. Its organization is retained, under the unit administrator, even when the company is divided into forward and rear echelons.

64. Administrative Section

a. The unit administrator is the company administrative officer.

b. As assistant to the company commander, he supervises the routine administration of company headquarters. His duties include—

(1) Preparing rosters, reports, correspondence, and unit records.

(2) Advising enlisted men on such matters as savings, war bonds, insurance, family allotments, and other personal matters. He also directs the troop information and education program.

(3) Acting as investigating officer (except for investigations of courts-martial charges under Article 32 of the Uniform Code of Military Justice), and as a member of appropriate courts and boards.

(4) Acting as agent officer or witnessing officer in the payment of troops, when so designated by competent authority.

(5) Assisting in maintaining and policing unit facilities.

c. While the executive officer is responsible for company mess, supply, and transportation, the unit administrator may be required to supervise all or a specified portion of these activities. His duties may include—

(1) Supervising mess accounting and insuring the proper operation of the mess; conducting inventories and checks on the receipt and use of rations, for compliance with regulations and directives; supervising mess sanitation

and the personal hygiene of mess personnel; keeping records of food-handlers' examinations.

(2) Supervising requisition, receipt, storage, issue, salvage, and maintenance of supplies and equipment, both in the supply room and in the hands of unit personnel; checking records of supplies and equipment.

(3) Supervising operation, inspection, and maintenance of company motor vehicles and heavy equipment; advising the executive officer on motor transport problems.

d. Assisting the unit administrator is the company administrative clerk. His duties include typing, filing, maintaining or posting personnel reports, orders, company correspondence, training reports, and similar administrative papers.

65. Mess Section

a. Organization. The mess section consists of a mess steward, cooks, and a cooks' helper.

b. Operations and Employment. The mess steward and cooks are responsible for preparing and serving meals for the company. Ordinarily, the cooks are divided into two shifts which alternate every 24 hours, usually after the noon meal. Sometimes the mess section may have to prepare meals on the move or at several different locations. Men may have to be fed to accommodate around-the-clock work schedules, with many of the meals being served at the work site. The water trailer is kept at the kitchen to supply water for cooking and other mess operations. It may also be used to augment the water in organic water cans.

66. Supply Section

a. Organization. The supply section consists of a supply sergeant, an engineer supply specialist, and armorer, and a light truck driver.

b. Operations and Employment. The supply section prepares requisitions, reports of survey, and other forms related to the receipt, storage, and issue of supplies. The section is also responsible for the repair of weapons and the salvage of unserviceable property. The supply sergeant is directly responsible for keeping the company property books and for the general condition of the supply room. Weapons are repaired and serviced by the armorer. Weapons needing major repairs are sent through the battalion supply section to the appropriate ordnance shops. Except for rations and petroleum products, the company supply section procures supplies from the battalion supply section and reissues them

directly to the using unit or individual. Rations are issued by the battalion supply section directly to the mess section; petroleum products, directly to the equipment and maintenance section. When the company is attached to a higher headquarters, supplies other than engineer items are issued by that headquarters.

67. Equipment and Maintenance Section

a. Organization. The equipment and maintenance section consists of a motor sergeant, mechanics, air compressor operator, and mechanics helper.

b. Operations and Employment.

(1) The motor sergeant is responsible for the inspection of vehicles and equipment. He supervises preventive and organizational maintenance, keeping maintenance rosters. He is responsible for the proper care and use of supplies in the motor pool. Assisting him are the mechanics of his section. There are enough operators to provide double-shift operation for each piece of heavy equipment.

(2) The equipment and maintenance section operates with the company rear echelon. Its functions are: to keep company vehicles and equipment operating, and to furnish equipment support for the company construction effort. The section draws gasoline, oil, and lubricants from battalion supply and makes necessary issues to company vehicles. Under the supervision of the company motor officer (executive officer), the section assists in training drivers and performs vehicle inspections.

Section V. PLATOON

68. Mission

The platoon is the main operational component of the company, but it is not equipped to provide its own administration and supply. It performs pioneering and combat missions in support of other arms and services within the division. With additional equipment, the scope of platoon operations can be greatly increased. In a large-scale operation, the platoon functions as part of the company. In all operations, the platoon headquarters acts as a coordinating and supervising agency for the squads.

69. Organization

The platoon consists of a headquarters and three squads. The platoon headquarters comprises the platoon leader, the platoon

sergeant, an assistant platoon sergeant, a toolroom keeper, tractor operator, and light truck drivers.

70. Operations

a. The platoon leader commands the platoon. He is responsible for the state of training of the platoon, and for the proper performance of the tasks assigned to it. He is also responsible for the discipline, appearance, and welfare of the men in his platoon. He is assisted by the platoon sergeant.

b. The platoon leader analyzes the tasks given to the platoon, and then assigns the work to his subordinates. The efficiency of the platoon depends to a large extent upon the proper assignment of tasks to squads and individuals. In assigning tasks, the platoon leader preserves the integrity of the platoon and squads as much as possible.

c. The platoon accomplishes most when it operates as a unit, under the control of the platoon leader. Since the platoon is not administratively self-sufficient, and has no heavy construction equipment, it functions best when employed as a unit of the parent company. When two platoons are employed together, they work under company supervision; one platoon is not attached to another.

71. Employment

a. When the armored division is conducting offensive operations, it is normal for an armored enginer platoon to be placed in support of the leading reinforced battalions of the committed combat commands.

b. The armored engineer platoon can normally provide adequate engineer support for leading reinforced battalions by utilizing organic tools and equipment and expedient means to overcome obstacles to movement of armor.

Section VI. SQUAD

72. Mission

The squad is the basic unit of the company. Working as a team, it helps to perform the missions assigned to the platoon or company. The squad can work independently only for short periods of time. When the company or platoon is working as a unit, tasks are assigned to each squad.

73. Organization

The squad consists of a squad leader (combat construction foreman), an assistant squad leader, combat construction spe-

cialists, demolition men, pioneers, armored vehicle drivers, and light truck drivers.

74. Operations

Operations of the squad are controlled by the squad leader. He is responsible to the platoon sergeant for accomplishing tasks assigned to the squad. The squad works as a team with individual members performing the required tasks. However, when possible, the specialties of the individuals should be utilized.

75. Employment

The squad is not normally employed away from its platoon. The platoon functions more efficiently when kept intact and employed as a unit. There may be times, however, when squads are given independent missions, such as a mine clearing detail for division headquarters or for a special armored task force operating alone. In some of these situations it may be desirable to attach the squad to the supported unit. Flexibility is the keynote of employment of any size armored engineer unit.

Section VII. EMPLOYMENT AND OPERATIONS

76. Employment

a. Although the amount of engineer support provided to a committed combat command is based on the anticipated engineer work to be accomplished during the operation, the company is normally the supporting unit. How it is employed depends upon the tactical situation, and rigid rules cannot be established. Primarily, the company provides the engineer support required by a particular mission, the terrain, and enemy resistance. Employment also depends upon the number and types of engineer units available for an operation.

b. A combat command normally is composed of two or more reinforced battalions. When these battalions are committed, they require engineer support. A platoon may be detached from the engineer company and placed in support of each leading reinforced battalion. Usually, the platoon takes one fixed section of bridge from the bridge company, in order to have equipment available for short, fixed-span bridging missions. More or less than one fixed section of bridge may be taken, as indicated by planning preceding the operation.

c. When the company is operating under armored engineer battalion control, it can be given one of these three general missions, or any combination of them:

(1) *General support of another unit.* The company supports a unit of the armored division in much the same manner as engineer support is furnished to the units of an infantry division.

(2) *Area assignment.* The company performs all necessary engineer work within a designated area, such as along the main supply route.

(3) *Specific mission.* An example of a specific mission is a river crossing in which the company is assigned the task of erecting a floating bridge. Another example is the assault river crossing of an armored infantry unit.

d. While the company is trained to operate as a unit, the squads and platoons are able to work alone with only nominal control by the company headquarters.

e. Many assignments will demand staggered work hours, continuous operations in shifts, or extended work periods without relief. The company commander must weigh the effects of fatigue against the urgency of the situation.

77. Operations

a. Construction. The company can construct, maintain, and repair small buildings, roads, bridges, culverts, fords, and landing fields for small aircraft. It can install minefields and construct all types of obstacles. When reinforced with additional heavy equipment, the company can also accomplish heavy construction tasks. Most construction jobs required of an armored engineer battalion can be accomplished by any one of the lettered companies; many jobs require only a platoon.

b. Destruction. An extensive destruction program is planned in detail by the company commander, in accordance with specifications from the battalion commander. The platoons then execute the plan, supervised by the company commander. Small but important projects, such as the demolition of a key bridge, are also planned by the company commander, who closely supervises the actual destruction. Items that may be destroyed include buildings, bridges, culverts, waterworks, power stations, supplies, railroad facilities, disabled vehicles, abandoned aircraft, and obstacles of all types (fig. 8).

c. Reconnaissance. General engineer reconnaissance is continuous. The company sends out engineer reconnaissance patrols for the armored engineer battalion or the supported units, as required. Frequently, reconnaissance is made to secure detailed information on a specific subject for a special purpose. The company rarely

Figure 8. Tanks passing through gap in minefield cleared by armored engineers.

executes reconnaissance missions as a unit. Reconnaissance patrols usually consist of platoons, squads, or selected groups of men under an officer or noncommissioned officer, depending upon the mission. Before making his plans for any important mission, the company commander always makes a personal reconnaissance.

78. Security

a. The company commander is responsible for the security of his company at all times except when under specific instructions to the contrary from higher authority. Maximum security benefit should be derived from proximity to other troops but this does not relieve the company commander of his responsibility for security of his company. After making a personal reconnaissance, he normally assigns the security mission to one of the platoons. The size of the security detachment depends upon the terrain, the probability of attack, and the strength and proximity of the enemy. Under certain circumstances, security can best be provided by motorized patrols. When these are used, one platoon is designated as a "ready platoon" which can move out prepared to fight at a moment's notice.

b. The company may be assigned the mission of providing security for the armored engineer battalion. The advance guard for a battalion move is normally a full company. A company commander with the mission of providing flank or rear security to a marching battalion, or security for a battalion bivouac, normally details one platoon to provide the security force.

CHAPTER 7
BRIDGE COMPANY

Section I. GENERAL

79. Mission

The bridge company provides personnel and equipment to transport, maintain and to furnish technical assistance in the erection of the tactical stream-crossing equipment of the armored engineer battalion. In an emergency, the bridge company can construct bridges or rafts with its own personnel, although at a reduced rate. The company may also perform the maintenance required to keep a bridge in operation.

80. Organization

The bridge company is organized with a company headquarters and two identical bridge platoons. Each platoon consists of a platoon headquarters, two fixed sections, and a float section (fig. 9).

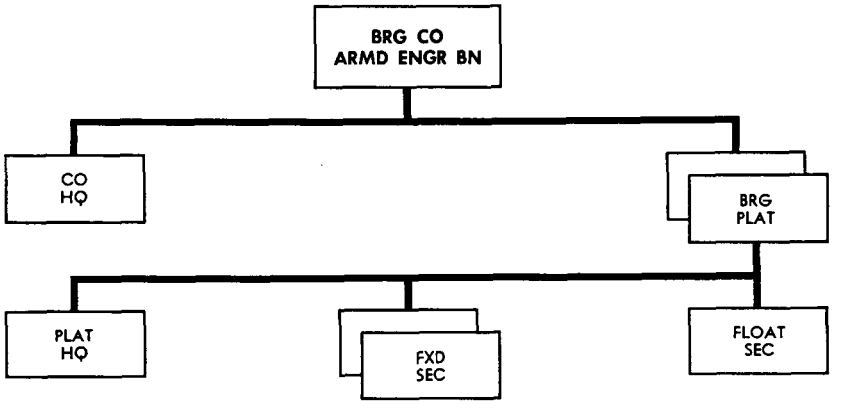


Figure 9. Organization of the bridge company armored engineer battalion.

81. Equipment

The bridge company is completely mobile. Its organic transportation includes bridge trucks and several pieces of heavy engineer equipment especially designed to handle and transport the

division bridging. There are two sets of bridge, floating, treadway, steel, widened, one per platoon. Radios and other items of signal equipment are provided for communication at bridge sites, and for continuous communication between platoons and company, and between company and battalion or supported unit.

Section II. BRIDGE COMPANY HEADQUARTERS

82. Mission

The mission of the bridge company headquarters is to provide command, planning, administration, limited labor, and equipment support for the two bridge platoons.

83. Organization

The company headquarters is divided into command and administrative echelons. This grouping, however, is merely to facilitate control of headquarters personnel, since the bridge company seldom employs forward and rear command posts.

Section III. COMMAND ECHELON

84. Organization

The command echelon of company headquarters contains the command section and the communications section.

85. Command Section

a. The command section consists of the company commander, the executive officer, first sergeant, and drivers.

b. The company commander, executive officer, and first sergeant have the same general duties as the officers and first sergeant of a lettered company. In addition, they inspect and dispatch vehicles with special bridge loads, and serve as consultants in the planning and erection of tactical bridging. These duties require training in specialized bridge vehicles and a thorough knowledge of bridge capacity, layout, construction, parts requirements, and truck-loading plans.

86. Communications Section

a. Organization. The communications section consists of a communication noncommissioned officer (chief) and a radio operator.

b. Employment and Operations. Typical operations and duties of personnel are generally the same as those shown for a lettered company in paragraph 62.

Section IV. ADMINISTRATIVE ECHELON

87. Organization

The administrative echelon of company headquarters consists of the administrative section, the mess section, the supply section, and the equipment and maintenance section.

88. Employment and Operations

a. The employment and operations of the administrative, mess, and supply sections, and the duties of personnel, are similar to those shown in chapter 4 for comparable sections in the lettered company.

b. Operations of the equipment and maintenance section are similar to those of the same section in a lettered company, except that the mechanics also repair bridge equipment. Equipment in the bridge company is used primarily in bridge construction. Close liaison is required between the bridge company maintenance section and the battalion maintenance section to obtain the proper balance in the use of men and equipment, and to secure necessary repair parts and supplies.

Section V. BRIDGE PLATOON

89. Mission

The bridge platoon provides bridging equipment, and technical assistance in bridge construction, to the engineer combat companies. Its flexible organization permits placing the desired amount and type of bridge equipment with each force the division may commit in an operation.

90. Organization

The bridge platoon consists of a platoon headquarters, two fixed sections, and a float section. Each section has a leader and an assistant leader, which facilitates splitting a section when necessary.

91. Employment and Operations

a. General.

(1) The bridge platoon is directed and supervised by the platoon leader, who is assisted by the platoon sergeant. The platoon leader makes engineer reconnaissance, particularly bridge reconnaissance, and assists the bridge company commander in preparing plans for the employment of the platoon. The bridge platoon leader normally pro-

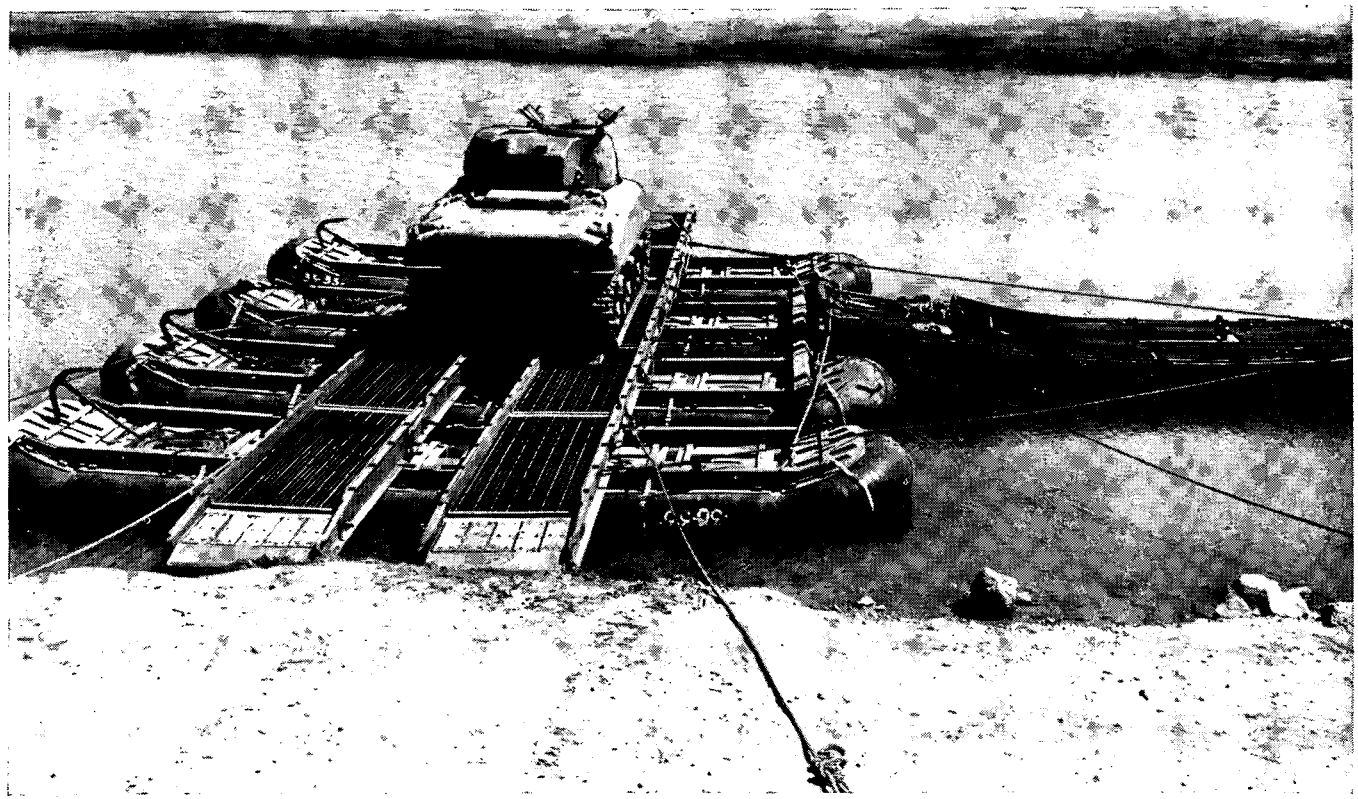


Figure 10. Treadway raft carrying a medium tank.

vides technical assistance to the constructing troops. In some cases, the platoon leader will actually direct and supervise the construction of the bridge, particularly when only bridge platoon personnel are involved in the construction.

(2) The bridge platoon may be employed in part or as a unit with one of the combat commands. Occasionally, when the division is crossing at a single-crossing site, the platoon may be employed as a part of the bridge company. When the platoon or any portion of it is detailed from the bridge company, it is ordinarily attached to one of the lettered companies of the engineer battalion. The full platoon, when detailed from the bridge company, is usually supported by heavy equipment from company headquarters.

b. River Crossing Operations.

(1) In hasty river crossings, the engineer battalion and bridge company headquarters usually are not close enough to provide help in the limited time available. Planning, supplying, and manning the engineer portion of the crossing must be done by the bridge platoon, and by the armored engineer company present with the combat command. A platoon leader from the armored engineer company does the bulk of the reconnaissance and bridge planning, and then supervises the operations of the sections.

(2) The bulk of the bridging supply for a deliberate river crossing is normally provided by corps engineers, allowing the organic bridge to advance with the armored division, thus providing equipment for the gaps and short spans of demolished bridges which will be encountered after the crossing. If the division bridging equipment is used in a deliberate crossing, the platoon functions under the direct control of the company.

Section VI. FIXED BRIDGE SECTION

92. Organization

Each of the fixed bridge sections consists of a section leader, an assistant section leader, bridge specialists, and bridge helpers.

93. Equipment

The fixed bridge section has a 2½-ton truck with bolster body, a pole-type trailer, and 5-ton cargo military bridging trucks. The

combination truck and trailer carries two complete 50-ton trestles, with accessories, four adapters, four chain hoists, and two load binders (load "C"). Each 5-ton cargo truck carries four steel treadways, two plywood treadways, and accessories, including four end wedges, four spacer bars, a spreader bar, and two transverse stiffeners (load "A"), sufficient to construct one 24-foot or two 12-foot bridges. (See T/O&E 5–218.)

94. Employment

The fixed bridge section, in support of a combat unit, may be employed as a section, as any part of a section, or as part of a bridge platoon, depending upon the type and length of bridge required.

95. Operations

a. Control. The fixed section is commanded by a section leader. He is responsible to the platoon commander for the control and conduct of the men in the section. The section leader and his assistant provide technical assistance in loading, constructing, and dismantling the bridge. When it becomes necessary to split the section so that small units of bridging can be constructed simultaneously, the assistant section leader is placed in charge of one of the units. The bridge specialists and bridge helpers are the section truck drivers. They assist and supervise the loading and unloading of the bridge units on the trucks.

b. River-Crossing Operations. Each fixed section has sufficient bridging equipment to erect up to one 70-foot span of fixed bridge (using 72 feet of bridge, with at least one-foot bearing on each bank). The equipment of both fixed sections, using the four 50-ton trestles, can be combined to erect up to one 142-foot span. All of these maximum length bridges can support the division load. For crossing deep or wider rivers, the equipment of the two fixed sections is used with that of the float section to construct a floating bridge or raft.

c. Short-Span Bridging. The equipment of each fixed section is especially adapted to short-span bridging. The equipment (load "A") carried on the 5-ton bridge trucks is sufficient to build fixed bridges of two 34-foot spans, three 22-foot spans, or six 10-foot spans. See tables I and II for clear spans and capacities. One 5-ton truck with load "A," or an entire fixed section, plus a truck-mounted crane, can be attached to an armored engineer combat unit to provide bridging equipment for short gaps, as required. Development is under way to provide equipment and techniques for the erection of short-span bridges without the use of a separate truck crane.

Table I. Capacity for Treadways Unsupported Over Short Gaps

No. of treadways in span	Overall length of span	Clear span ft.	Capacity in tons—type of crossing		
			Safe	Caution	Risk
2 treadways [1]		20	91	110	140
	24 ft.	[2]22	79	94	120
3 treadways		24	69	80	103
		26	50	69	92
		28	53	61	82
		30	48	54	73
	36 ft.	32	44	49	65
		[2]34	40	45	57
4 treadways [3]		36	30	34	50
		38	27	31	46
		40	25	28	43
		42	23	26	40
	48 ft.	44	21	24	37
		[2]46	20	23	34
5 treadways [3]		48	19	22	31
		50	18	21	30
		52	18	20	28
		54	17	19	27
		56	16	18	25
	60 ft.	[2]58	16	18	24
Plywood treadway lane.		Up to 34	16	18	24

[1] For capacities of two-treadway span bridges without transverse stiffeners, decrease capacities by 20 per cent.

[2] Maximum length gap which can be bridged with a single-span treadway is two feet less than the overall bridge length, to allow a minimum bearing length of one foot at each abutment.

[3] For bridge spans longer than 34 feet, normally the plywood treadway is omitted and the bridge width is reduced to the narrow type of erection shown in FM 5–35.

Table II. Maximum Number of Bridges (Minimum Capacity 50 Tons), Maximum Lengths, Built With the Bridge Set, Floating, Steel, Treadway, Widened

Unit	Type bridge	Length of clear span in feet								
		10	22	34	46	58	70	142	150	286
	Short fixed	(6)	(3)	[a](2)						
	Long fixed or With 1 trestle [b] or	1 (2)	(1)	2	1	1				
	With 2 trestles						1			
FLOAT SECTION (One per platoon).	Short fixed	(12)	(6)	[a](4)						
	Floating		(6)	(4)	(3)		(2)	(1)		
	Short fixed	(24)	(12)	[a](8)						
	Long fixed [c] with 1 trestle [b] 2 trestles [b] 4 trestles [b]			(4)	(4)	(4)	2		1	
	FLOATING [d]		(12)	(8)	(6)		(4)	(2)		(1)

[a] Capacity: normal, 40 tons; caution, 45 tons; risk, 57 tons.
[b] Very desirable to place trestles under treadway joints to accommodate trestle settlement and prevent treadway twist. Maximum distance between trestles: 30 feet.
[c] Additional short fixed bridges can be built from remaining parts.
[d] Four 50-ton, 6-float rafts can be built in lieu of floating bridge.
Note. Numbers in parentheses indicate alternate solutions.

d. Security. The section is responsible for its own security. The section leader or his assistant mans the ring-mounted machine gun when the section is on the move. When at work or in bivouac, the section must take maximum advantage of cover, concealment, and camouflage techniques. The section is invariably attached to a larger engineer unit when separated from its own platoon. In such cases, it contributes to the security of the larger unit.

Section VII. FLOAT BRIDGE SECTION

96. Organization

The float bridge section consists of a section leader, an assistant section leader, bridge specialists, bridge helpers, power-boat operator, and outboard motor operators.

97. Equipment

The float bridge section has twelve 5-ton bridge trucks, four of which are equipped with .50 caliber machine guns. Six of these trucks carry float load "A"—four steel treadways, two plywood treadways, four spacer bars, a spreader bar, and miscellaneous accessories. Six trucks carry float load "B"—four pneumatic floats, four saddles, an outboard motor, a bracket motor, and accessories. Three 2½-ton dump trucks are also included in the section. Each carries load "D", consisting of eight anchors, spare wood treadways, spare floats, chests, and accessories. Two of the trucks carry one outboard motor each. All three dump trucks pull 2½-ton utility pole-type trailers, each loaded with seven assault boats.

98. Employment

The float bridge section may be employed as part of the platoon attached to an engineer company, or a portion of the section may be attached to an engineer company, with one of the fixed bridge sections, to construct rafts or short floating bridges.

99. Operations

a. Control. Operation of the float bridge section is the responsibility of the section leader, who is aided by an assistant. The duties of the bridge specialists and helpers are generally the same as those in the fixed bridge section. The outboard motors and bridge erection boat are operated and maintained by outboard motor operators and power boat operator. They instruct other personnel in the care and operation of the motors and boats, and in ferrying techniques.

b. River-Crossing Operations. The float bridge section equipment is used primarily for floating bridges and rafting, and for crossing troops in a hasty river crossing. The maximum length of floating bridge which can be constructed within the float section is 144 feet. Combined with the bridging equipment of the two fixed sections, 288 feet of floating bridge may be assembled. Assault boats and the 27-foot bridge erection boat are available as required. Outboard motors are provided for propelling rafts and double or single assault boats, or for aiding in the construction of the floating bridge.

Section VIII. EMPLOYMENT AND OPERATIONS

100. Employment

The organization of the bridge company is flexible to permit the efficient employment of its components. Bridging equipment necessary for any particular site can be provided by the company. One operation may require a complete platoon and its bridging equipment, another may require all the bridge units, while a third may require only the fixed bridge sections. In some situations, a series of operations may each require a small detachment commanded by a noncommissioned officer.

101. Operations

a. River-Crossing Operations. The company is primarily responsible for transporting the components of the widened steel treadway floating bridge set. When the bridge equipment arrives at the site, another unit usually does the construction work. The bridge company ordinarily furnishes technical supervision and mechanical assistance. At least one truck-mounted crane is provided by the equipment section for each bridge platoon. If the bridge is to remain in place for only a short time, the bridge company may be required to furnish guards and a maintenance detail. If the bridge is picked up while still within or near the divisional area, the bridge company usually furnishes transportation and assists in dismantling and loading. When the bridge is left behind, remaining in use, replacement material is drawn from the nearest engineer depot. Whether the bridge equipment is drawn from a depot or picked up from a crossing site, it must be checked thoroughly for completeness and serviceability. Missing and damaged parts are repaired or replaced. The company assists in furnishing its own security on route and at its dump. Mine detecting and clearance must be done by other engineer units, since the bridge company does not have the necessary equipment.

b. Short-Span Bridging. The bridge company does not participate as a unit in short-span bridging operations. Instead, the company may plan the operation and then designate one of its platoons to furnish the necessary detachment. The need for such an operation may arise while a platoon is in a detached status, in which case the platoon leader does the planning and assigns a detachment to accomplish the mission.

c. Security. The bridge company commander is responsible at all times for the security of his men and equipment. He also may be given responsibility for the security of a rear area, a headquarters, or an equipment park. For security, the company has individual weapons and .50 caliber and .30 caliber machine guns.

d. Supply Hauling. When the division is operating in an area where little bridging is required, the bridge company is sometimes used for other purposes. The company has a large number of vehicles suitable for hauling supplies. The type of supplies hauled depends upon the situation. If the division is moving rapidly it may have requirements for gasoline, rations, or ammunition that overtax its transportation, and the bridge company may be used to haul these items. In a static situation, company trucks may be employed to haul engineer supplies from rear areas to the army depot or to army supply points in the corps zone.

CHAPTER 8

BATTALION OPERATIONS

Section I. GENERAL

102. Employment

The battalion provides engineer support for the armored division. Usually it does not work as a complete unit, except during some phases of training, on an occasional large project, or when the division has a single defensive mission. While in most situations the battalion retains control of some of its elements, it is normal for several companies to be operating independently, without direct battalion control. Companies operating independently are supported by service elements of the battalion.

103. Attachment to Combat Commands

a. In planning a combat operation, the armored division commander forms three combat commands from the units under his control. He allots battalions, or parts of them, to each command, based upon his estimate of the situation. He may designate any of the combat commands as the division reserve to exploit the success of an attacking unit, to conduct or repel a counterattack, and for similar tactical missions. Armored doctrine emphasizes that no attachment of a specific unit is considered normal in forming a combat command. Similarly, the engineer element of a combat command varies with the situation. Normally, an armored engineer company, with necessary bridge elements attached, is employed in support of or attached to each of the combat commands during combat. When the division is operating defensively, the armored engineer battalion may be centralized, with all its elements under battalion control.

b. When a lettered company is operating under battalion control, its elements usually have a greater opportunity to maintain their equipment than when the company is attached to a combat command and constantly on the move. Lettered companies with the engineer battalion continue to perform essential engineer work, but the tasks usually require less frequent movement. Each of the four lettered companies must be prepared for attachment to any one of the three major commands of the division. According-

ly, each company commander should become well acquainted with the commanders and staffs of all three combat commands.

c. Once an operation commences, the need for engineer staff activities lessens, since staffs usually complete most of their work before combat begins. The primary duty of the engineer battalion commander in a combat operation is to aid in the successful execution of the mission. To supervise the activities of armored engineer elements within the combat command (when more than one company and a bridge platoon are attached), the battalion executive officer or S3 may act as a combat command engineer. This frees a company commander from the dual responsibilities of commanding his company and serving as combat command engineer.

d. The armored engineer battalion, less those elements attached to or in support of the combat commands, will usually march with division troops. Engineer elements not attached to a command closely support the engineers with the forward elements. Engineer tasks in the division rear areas are quickly passed to corps engineer troops following closely behind. This allows the armored engineer battalion to move forward rapidly and to concentrate its efforts on keeping the division moving ahead.

104. Standing Operating Procedure

A battalion standing operating procedure (SOP) helps greatly to initiate smooth functioning throughout a newly formed battalion, and to orient incoming personnel. It saves time and effort, increases efficiency, and helps to standardize procedures. A bulky standing operating procedure defeats its own purpose. To be effective, it should be concise, yet informative, understandable, and complete. Appendix II shows a recommended outline for an SOP.

105. Security

Each commander is responsible for the security of his unit. Security includes all measures taken by a commander to protect the unit against enemy interference, surprise, and observation. The measures adopted should be appropriate to the threat; as the danger becomes greater, security measures are increased. For engineers, security measures are required to protect troops and equipment at work, in bivouac, during movement, and in stationary positions. Critical points, such has completed bridges and their approaches, bridges prepared for demolition, bypasses and fords, may require security measures to safeguard them. When necessary, work parties may be protected by infantry or armored elements so that more engineer troops can be released for work

on the project. Details of composition, organization, operations, and nomenclature of security elements are given in FM's 7–10 and 7–20.

Section II. ADMINISTRATIVE MOVEMENTS

106. Engineer Assistance to Other Arms

a. General. The armored division usually requires engineer help for administrative movements. This work generally consists of—

(1) Providing facilities and assistance during loading and unloading at entraining, embarkation, detraining, and debarkation points.

(2) Maintaining roads, particularly after they have been used by track-laying vehicles.

(3) Making warning and directional road signs.

(4) Preparing the new area to receive the unit. This involves providing and improving facilities.

b. Employment. An administrative movement requires that engineers remain at the starting point until the bulk of the division has left. An engineer advance party is provided to prepare the new area before the bulk of the division arrives, and some engineers are sent with each major echelon that moves independently. In general, engineer assistance is limited to work that benefits the division as a whole, or for which engineers are better trained and equipped than other troops. Other units provide their own facilities and labor insofar as practicable.

107. Engineer Work at Entraining Points

a. Types of Work. Engineers at entraining points may—

(1) Construct or strengthen ramps and loading platforms.

(2) Construct or improve routes of approach.

(3) Construct or improve railway spurs and sidings.

(4) Assist troops of other arms in loading and lashing equipment.

b. Loading Facilities. Every effort is made to choose entraining points that require a minimum of new construction or improvement. However, loading ramps and platforms often have to be built. Loading facilities are of two general types: side platform, and end-loading (FM 5–10 and TM 5–280). The truck-mounted cranes of the armored engineer battalion may also be used to assist in loading.

108. Engineer Work on Roads

a. Engineer Reconnaissance. Engineers make a detailed route reconnaissance before a motor march. It is particularly important to determine the load capacities of bridges and roads, and to estimate the density and speed of traffic that the roads can carry without undue wear and tear. Basing his decisions on this information, the division engineer recommends routes to be followed and maximum speeds for both tracked and wheeled vehicles.

b. Engineer Work. Engineer road work for a troop movement usually is completed before the move starts. Such work consists of strengthening existing bridges and making minor repairs to road surfaces. Roads which do not need construction work or extensive repairs should be chosen if possible.

c. Engineers With Advance Elements. Engineer troops accompany advance elements of the force to do whatever work is necessary to meet contingencies on the march. Engineer troops are also located in the march column or columns, to be readily available for work beyond the capacity of the engineers with the advance elements, and to do any maintenance work which becomes necessary as the force advances.

109. Engineer Work at Destination

Troops moving on foot, by truck, or by tanks should be able to move their organic and attached transportation off the road and into their bivouac areas without halting. To make this possible, engineers may construct temporary crossings over roadside ditches and gullies, improve secondary roads and trails, and clear new trails. Engineer work at detraining points is similar to that at entraining points.

110. Movement by Combat Commands

An armored engineer company normally is adequate to support the movement of a combat command. Platoons, and infrequently, squads, of an engineer company may be further placed in support of the leading elements of a combat command, in accordance with the plans of the combat command commander. When a great deal of engineer work is required, the division engineer may be made responsible for a portion of the route of march—usually the rear portion—so that the combat command commander can concentrate his engineer effort further along the route of advance.

111. Traffic Circulation

Engineers assist the military police in traffic circulation by road and bridge reconnaissance, and by supplying road maps, overlays, signs, and markers.

a. Road and bridge reconnaissance is conducted in accord with the principles discussed in FM 5–10. Since the time available for reconnaissance usually is limited, priority is given to the collection of the most essential information. This information must be accurate and up to date, and should include such data as—

(1) Map or sketch of road net, including detours and alternate routes.

(2) Physical characteristics of roads, including the type of surface, road width, and number of lanes.

(3) Location, type, and characteristics of limited roadway surfaces, such as bridges, underpasses, steep grades, and one way defiles. Information on such features should include load-carrying capacity, width, conditions of approach, vertical clearance, and limitations on speed and distance between vehicles.

(4) Mileage between important road intersections.

(5) Location and characteristics of facilities for turning, parking, and halting.

(6) Sections of important roads where engineer assistance is required or may be required because of difficult operating conditions.

b. Engineer Recommendations. Road and bridge data obtained from engineer reconnaissance are applied, by the use of symbols, to a large-scale map or overlay of the area concerned, and submitted to G4 with the engineer reconnaissance report. Included in the report are recommendations for protecting the road net from such abuses as excessive speeds, overloading of roads and bridges, heavy and continuous traffic on roads with poor surface or subgrade, and use of roads in need of repair. The division engineer recommends a traffic-circulation plan consistent with the engineer limitations of the road net and the availability of engineer troops.

c. Supply of maps and overlays is an engineer function. Allotments to units, individuals, and vehicles are established by the engineers as requested by G4.

d. Supply of road signs and route markers in traffic operations is an engineer responsibility. Determining the need for such signs and markers is a responsibility of G4, who coordinates the plans of the division engineer and the provost marshal. Signs are supplied to identify places, mark routes, give traffic regulations, and warn of special road conditions. See FM 5–10 for proper sizes and locations for traffic signs.

112. Battalion Movement

a. General. In administrative movements the armored engineer battalion usually moves as a unit forming an integral part of the division, except for required detachments (par. 120). A move may be by motor, rail, water, or air. For long moves, the battalion prepares its own equipment for shipment in accordance with current directives. For motor and rail movement it also loads its own equipment.

b. Motor March. The battalion is completely mobile in its organic transportation. Routine motor marches will normally be covered by a battalion standing operating procedure, with such items as routes, destinations, initial points, orders of march, and speed, specified separately for each move. (See FM 25–10.)

c. Rail Movement. In training and preparation for movement by rail the engineer battalion must become familiar with packing, boxing, and crating organic equipment, and loading equipment and personnel on railway cars. A battalion rail-movement table and rail-movement annex to the SOP are prepared and kept up to date. Detailed information on rail movements, types, characteristics, and capacities of railway cars, loading plans, and loading scales and tables is found in FM's 5–35, 100–5, 100–10, and 101–10 and AR 55–112.

d. Air Movement. The prime consideration in loading the battalion for air movement is the anticipated employment in the airhead or at the destination. Troops can best be controlled during the operation and after arrival at the landing area if unit integrity is maintained. Key personnel and equipment should be distributed throughout the airlift to minimize the effect of losses. Equipment too heavy or too bulky to be transported by air must be either disassembled for movement and then accompany the follow-up echelon to the destination, or turned in to the appropriate depot. Before emplaning, troops are instructed in the loading and lashing of equipment, in safety regulations on airstrip and in flight, and in the plan of assembly after landing. The battalion rail movement table, with a few modifications, may be used in compiling an air movement table. For further details of movement by air see FM's 71–30, 100–5, 100–10, 101–10, and TM 57–210.

e. Water Movements. Water movement requires special packing, crating, and marking of equipment, and additional training of personnel. Destination, mission, type of operation, anticipated employment on disembarking, available shipping space, and type of vessel are factors which determine whether the unit will be combat loaded or convoy loaded. The same data contained in the

battalion rail movement table, but in slightly different form, can be used for the unit personnel and tonnage table in preparation for movement by water. For additional information on water movements see FM's 31–5, 100–5, 100–10, 101–10 and SR 55–720–1.

Section III. TACTICAL MOVEMENTS

113. General

A march in a combat zone is a tactical march when a column will be employed against the enemy upon making contact, or when interference from the enemy is a possibility. The mission of the column, proximity of hostile ground forces, terrain over which the column will travel, type of enemy resistance expected, and activity of hostile air forces are all factors which will determine the organization and composition of the column. Division tactical march orders are prepared by G3 in coordination with other staff officers, particularly G4 and the division engineer, for the selection of routes and required additional transportation. Basic road spaces for motor elements, as shown in FM 101–10, should be maintained for all divisional elements.

114. Battalion Participation

The armored engineer battalion, in a tactical march, normally will have two-lettered companies and up to two-bridge platoons attached to other march serials of the division. The remainder of the battalion keeps well forward in the column, for support of the forward engineer elements, and usually marches with the division troops serial.

115. Engineers With a Combat Command

Normally when a combat command is advancing independently, one armored engineer company and up to a bridge platoon are attached. When a combat command is in column of reinforced battalions, one platoon of the engineer company, with a fixed bridge section, joins and supports the leading reinforced battalion. When a combat command is moving in more than one column, the leading elements of each column will have supporting engineers and bridging equipment. The amount of engineer support is based on the anticipated engineer work load during the tactical movement. However, it normally consists of an engineer platoon and a fixed bridge section. The rest of the armored engineer company marches in that portion of the column which includes combat command headquarters.

116. Battalion March Unit

When the armored engineer battalion marches as a separate unit, the following conditions apply:

a. Movement. A movement order is issued by the battalion commander giving all pertinent details of the march.

b. Initial Point. An initial point is designated by the battalion commander, and a time set for march serials to reach and to clear it.

c. March Distances. The movement order will specify the normal distance between vehicles in the column during daylight. On night marches, the normal distance between vehicles is that which allows the driver to see the vehicle ahead of him. The normal time interval between march units in the column is 1 minute; between serials, 3 minutes.

d. Rate of March. The rate of march is governed by the speed of the slowest vehicle in the column. This vehicle should be placed at or near the head of the column. During daylight on good roads the rate is 12 to 20 miles per hour for columns containing tracked vehicles, armored vehicles, or heavy engineer equipment; 20 miles per hour for columns containing only wheeled vehicles. For night marches without lights, except in bright moonlight, this rate is reduced to 8 to 10 miles per hour on good roads.

e. Formation for the March. The march formation is governed primarily by the tactical situation. Each company normally forms a march unit. However, when the battalion moves as a unit the companies, less heavy equipment, comprise a serial. Heavy equipment, such as crane shovels and 5-ton trucks with semitrailers, are grouped to form a separate serial. Maintenance personnel march at the end of each serial.

f. Communication. When signal security permits, radio is the principal method of communication while the battalion is on the march. However, visual signals, particularly arm-and-hand and flag signals, are used extensively for column and vehicle control. Messengers are employed occasionally, but only for such purposes as carrying maps and overlays.

g. Road Markers and Guides. Whenever possible, road markers should be used at all points where there may be a question as to the correct route to be taken by a column. Arrangements must be made for personnel serving as markers to be picked up by the last vehicles of the column. The situation may sometimes even require road guides to be used.

h. Halts. Unit SOP's should prescribe that scheduled halts will be made for the last 15 minutes of the first hour, and the last 10 minutes of every succeeding two hours, the time commencing

when the leading element of the column crosses the initial point. March units halt during this period and make no attempt to close up gaps in the column. All drivers and vehicle crews perform their scheduled "at halt" maintenance operations. Since halts for refueling are scheduled in advance, commanders must know the rate of fuel consumption of their units. The distance traveled by the armored engineer battalion before refueling should not exceed 75 miles, or a distance in which more than three-quarters of the capacity of vehicle fuel tanks is expended.

i. Control and Supervision.

(1) Control of the battalion on the march can only be attained by a high degree of training and discipline. Detailed supervision by the battalion staff is necessary to insure that the column is formed according to plan. A staff officer is designated to check the column at the initial point, the arrival of subordinate units, and the order of march. A control vehicle is selected for each march unit of the battalion. A well-marked route, road markers, and road guides, also assist in control of the column and assure smooth movement. Radio is the primary means of control on the march. Factors affecting the use of radio are security, capabilities and limitations of equipment, tactical requirements, terrain, and weather. Other means of control are hand signals, flags, phase lines, and control points.

(2) Supervision of the march column is the responsibility of all battalion officers and noncommissioned officers. Items to check include: condition of vehicles, distances between march units, speed, and general conduct of march units on the move. Necessary corrections are made at once.

j. Security. All movement in the combat zone is governed by strict security regulations, with special attention to the possibility of air attack. Distance between vehicles is greater than in rear areas. Panel sets are kept in readiness for instant use to avoid attack by friendly aircraft. The battalion must be well trained in passive defense against air attack. When there is a possibility of ground attack, as in a fluid situation or when guerillas are operating in the region, tactical plans are made by the battalion commander and subordinate commanders to meet the attack. A system of observers and signals is established. Individual weapons and ammunition are kept in the hands of the troops. Machine guns are manned and rocket launchers are dispersed throughout the column. Tactical considerations, rather than administrative considerations, govern the conduct of march.

k. Night Marches. The battalion must be able to conduct night marches under all conditions. Constant practice offers the most valuable training, and this practice is conducted on unfamiliar roads of all types. Special attention is given to the planning and execution of night marches. The importance of route reconnaissance and the proper use of road guides and markers increases. Control of a night march is facilitated by decreased speed, decreased distance, and increased reconnaissance and security.

Section IV. OFFENSIVE ACTION

117. General

a. The ultimate purpose of offensive action is the destruction of the hostile forces. An armored division attempts to gain this objective in the shortest possible time. Its offensive action is characterized by massed fire power, mobility, speed, violence, aggressiveness, surprise, deception, and ingenuity. The philosophy of armor is that the faster it moves and the quicker it accomplishes its mission, the smaller will be its losses and the more effective will be its gains. The strategy of armor is to plan boldly and well, and then to execute the plan aggressively.

b. Armor seeks to attack the enemy at weak and vulnerable points, over terrain which favors the employment of tanks and other armored units. Then it masses its fire power and all of its strength in a severe thrust against the enemy at the selected point, in order to overrun quickly his organized defense and reach his rear areas, where complete disorganization may be accomplished with relative ease.

c. In the rear of organized enemy positions, armor attains a high degree of freedom of action. It seeks to create a maximum degree of confusion by disrupting enemy communications; destroying command posts, reserves, and supplies; and threatening the integrity of the entire enemy forward lines. Armor relaxes the intensity of its effort only after the final objective has been reached.

118. Types of Offensive Operations

a. General. Offensive operations of an armored division are of two forms; penetration and envelopment. Exploitation and pursuit are phases of offensive operations which may be continuations of either of these forms.

b. Penetration. A penetration is an attack that passes through portion of an area occupied by the enemy's forces, and is directed on an objective in his rear.

c. Envelopment. In an envelopment, the attack is direct against the flank or flanks of the enemy's forces, or in rear of his leading elements or front lines. It seeks to surround the portion of the enemy's forces that is in front of the objective, or to hit the forces on the objective from the side or rear, rather than from the front. There are three variations of the envelopment, all of which employ the same principles in large scale operations: the turning movement, the single envelopment, and the double envelopment.

d. Exploitation Phase. The object of the initial assault on the enemy's position, in either a penetration or an envelopment, is to create an opportunity for a force to exploit the success. The exploitation phase of an operation usually follows a successful penetration or envelopment, and is characterized by rapid advances against lessening resistance. As a rule, the exploiting force is given a physical objective, deep in the enemy rear, to reach with the maximum force in the minimum time. Exploiting forces operating in enemy rear areas seek to employ enveloping attacks against resistance which may be encountered and must be reduced. Turning movements in rear of flanks created by successful penetrations often are employed to cut off enemy forces attempting to withdraw to the rear or to prevent reinforcements and supplies from reaching front-line elements.

e. Pursuit Phase. The pursuit brings continuous direct pressure against retreating enemy forces and includes enveloping or encircling maneuvers to place troops across the enemy's line of retreat. The object of the pursuit is the annihilation of the withdrawing force. Exploiting forces may be assigned pursuit missions as well as missions requiring them to seize physical objectives. Ordinarily, it will be difficult, if not impossible, to accomplish both. The higher command must decide which is the more important, taking into consideration the fact that the capture of a physical objective usually also will accomplish the results of pursuit action, or facilitate the pursuit action which follows.

119. Engineer Work Done by Other Arms

a. Because there are seldom enough engineer troops available to do all the engineer work necessary to assist offensive operations, the other arms do as much of their own engineer work as possible. Heavy equipment assists in the improvement of routes, in stream crossings, and in removal of hedgerows, disabled vehicles, or rubble blocking the advance. Armored infantry may clear a passage through wire and may bridge narrow and shallow streams with local logs or timber, using such expedients to the maximum degree.

b. Supporting engineer units are placed immediately behind the leading element of the supported unit, so that they are readily available to overcome obstacles which cannot be negotiated by the leading elements.

120. General Employment of Engineers

a. The size of the supporting engineer unit depends on the size of the supported unit and the anticipated engineer work during the operation. Engineers normally operate under the supported unit commander. They are seldom attached to or placed in support of individual reinforced companies. Normally, engineers are placed well forward in the column to insure that obstacles are overcome rapidly.

b. The armored division fights with its combat commands. For offensive operations, an armored engineer company, with up to one bridge platoon attached, normally supports each committed combat command. The remainder of the battalion performs general engineer support missions and is prepared to reinforce leading engineer elements with troops, equipment, and supplies. Within the combat command, each leading reinforced battalion is normally supported by an armored engineer platoon and a fixed bridge section.

c. If the situation is such that the armored engineer battalion is unable to perform all the engineer tasks required, the division engineer may request reinforcement. In this case, corps engineer units are usually placed in support of the division.

d. At times, nondivisional engineer units may be attached to the division or to the armored engineer battalion to accomplish a specific mission or missions. For example, in a penetration followed by an exploitation, an engineer combat battalion, army, may be attached to the armored division and work directly under control of the division engineer. At the conclusion of the operation, the battalion is relieved from attachment and returned to the control of its parent unit.

e. It is more usual to have the supporting engineer unit from corps working under parent unit control, in direct support of the armored division. This direct support battalion assists on specific missions, such as bridge building, obstacle construction, road construction, and maintenance, and other tasks requiring engineers. It also assumes responsibility for all work in the division rear, behind a line agreed upon by both engineer battalion commanders. This line is called the "engineer work line."

121. Engineer Missions

In both types of offensive action, engineer missions are relatively the same. In general, the mission is to keep the attack going, and may be considered as threefold:

a. Assisting the movement of armor, armored infantry, and supporting arms.

b. Assisting troops protecting the flanks by creating obstacles on roads and other possible avenues of enemy approach from the flanks.

c. Performing general engineer duties.

122. Control of Engineer Effort

a. Disposition of Engineer Troops.

(1) The division engineer recommends the disposition of engineer troops for each division operation. Engineers may be attached to, or placed in direct support of other elements (see fig. 11).

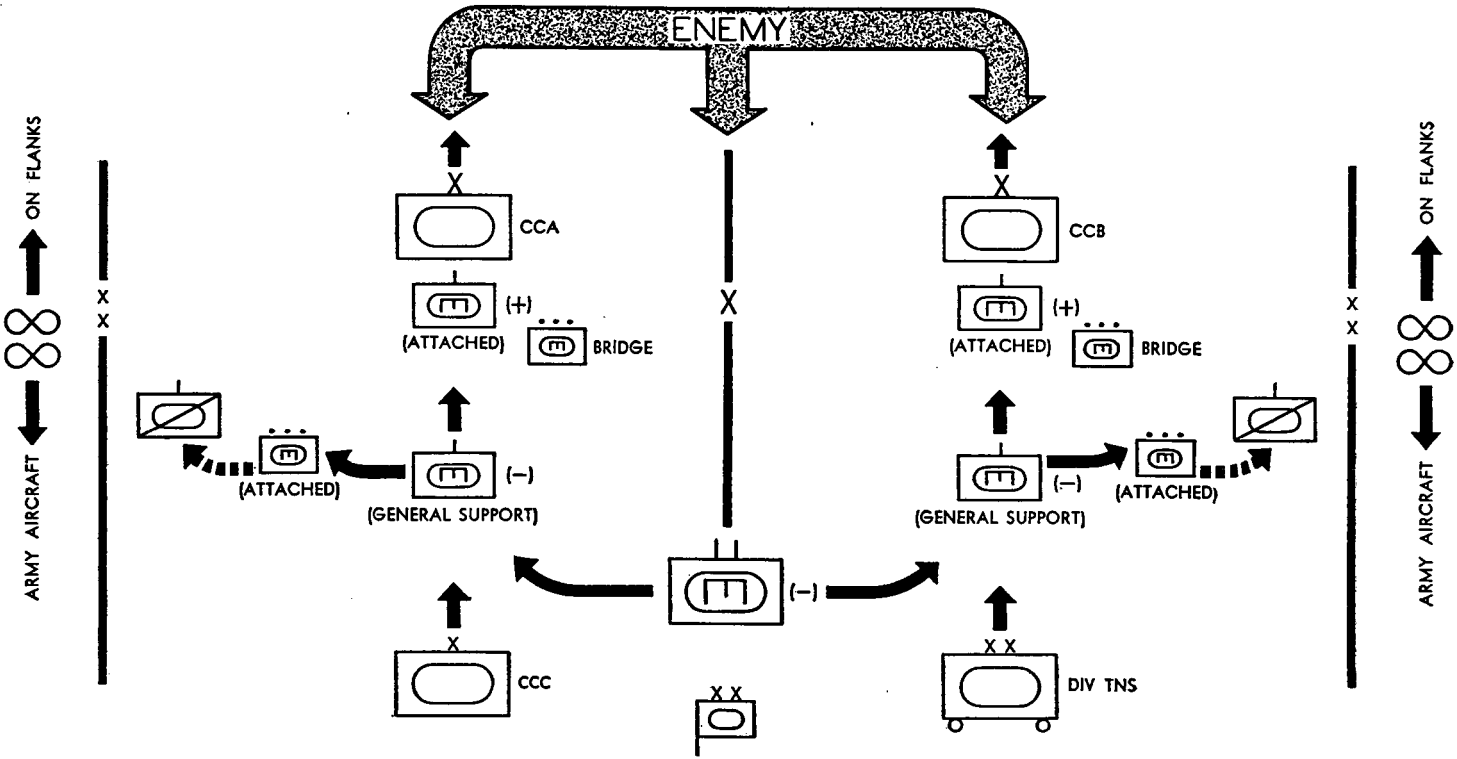
(2) The normal engineer support for a committed combat command is an armored engineer company with attached bridge platoon, including a crane. The remainder of the battalion closely supports the attacking combat commands, and follows in the wake of the forward armored engineer companies.

b. Responsibility for Control. Even though his troops are attached, the division engineer retains responsibility for technical supervision. He maintains liaison with the advanced elements to insure that maximum value is obtained for the engineer effort expended. When in direct support, the method of engineer support remains the same as when units are attached. The only difference is in command responsibility. The engineer unit commander retains control and command of the engineer element, but must adapt his plans and troop employment to the plans of the supported unit or units.

c. Liaison.

(1) Liaison between supporting and supported units, and between adjacent units, must be maintained during the offense to assure cooperation and coordination among all units participating in the operation. Liaison is established as directed by the senior commander.

(2) In addition to his other duties, the assistant division engineer is the chief liaison agent between the armored engineer battalion and division headquarters. Similarly, liaison functions between the supporting engineer com-



NOTE: If CCC is committed third engineer company is attached while the remaining engineer company provides general engineer support.

Figure 11. Typical armored engineer battalion support of the armored division in offensive action.

pany and a combat command are performed by the company commander. He is the staff engineer of the combat command, except when an engineer battalion staff officer has been assigned to that position. The engineer company commander must be familiar with the capabilities and operations of his own company as well as those of the supported combat command. He keeps completely informed on all plans and operations, so that he can give reliable up-to-date information and advice to the combat command commander. The engineer platoon leader supporting each leading reinforced battalion is the engineer staff officer for the reinforced battalion commander, and in this capacity must conduct liaison activities in order to fulfill his dual role of staff adviser and commander.

123. General Engineer Duties

a. In general, the initial mission of the armored engineer battalion includes reconnaissance and preparation of the axial routes of advance. Plans for traffic circulation are formulated, if such control is necessary. The preparation of axial routes may require the rehabilitation of existing roads or trails, or the construction of new roads and trails, always considering the wheeled and tracklaying vehicles and the armored division loads. Consequently, the magnitude of the engineer effort may vary considerably. Pioneer work on advance landing strips for army aircraft is carried out in conjunction with all divisional air sections to insure close liaison and reconnaissance support.

b. Specifically, engineer duties in the offense include—

(1) Conducting engineer reconnaissance and supplying up-to-date maps.
(2) Opening and improving roads and bridges for troop movement, supply, and evacuation.
(3) Assisting in preparation of traffic circulation plans.
(4) Assisting forward movement of tanks, armored infantry, and supporting arms by repairing roads and opening trails, constructing bridges, and removing obstacles.
(5) Locating, marking, and destroying mines.
(6) Assisting in flank security through use of demolitions, minefields, and obstacles.
(7) Constructing advanced landing strips for army aircraft.
(8) Collecting stores of engineer material for use in attack and in consolidation of captured ground.
(9) Locating, marking, and improving sources of potable water supply and access roads thereto.

(10) Advising the supported unit commander on engineer matters.

124. Engineers in the Penetration

Armored engineers normally are attached to each assaulting combat command. The size of the engineer elements attached is governed by the anticipated strength necessary to reduce obstacles and to support the advance of the assaulting forces. Types of bridging equipment and engineer units not organic to the armored engineer battalion may be attached by corps. When necessary, such units may further be attached to combat commands. Bridging must be so positioned that it is instantly available when needed. When the situation warrants, armored engineer detachments can be attached to or placed in support of each leading reinforced battalion. Engineers held under division control have the mission of preparing avenues of advance for the remainder of the division.

125. Engineers in the Envelopment

In the envelopment, engineers must be well forward in the column in order to facilitate the advance of the division. As in the penetration, a company of engineers and up to a bridge platoon are normally attached to each of the major tactical commands to be used in the attack, with the battalion (less detached elements) under division control.

126. Engineers in the Exploitation or Pursuit

a. Division in Column. When the major commands of the division are in column, a lettered armored engineer company, with a bridge platoon attached, normally is attached to the leading combat command; the battalion (less detached elements) usually is kept under division control. If additional bridging is attached to the division by corps, it may be kept under division control until it is needed by the leading combat command, or until a following major command is committed to action or placed on another axis of advance.

b. Division in Line. When two or three combat commands are following independent axes, each is given sufficient engineers and bridging equipment to facilitate movement over its assigned axis.

127. Size of Supporting Engineer Units

a. The size of supporting engineer units for committed armored elements is determined by the situation, after considering the mission, weather, terrain, anticipated enemy obstacles, and road

conditions. However, normal attachments of supporting units are indicated below.

b. If the division advances as a unit, one armored engineer company, with up to a bridge platoon attached, forms part of each leading combat command. The rest of the armored engineer battalion marches with division troops, unless sent forward for a particular task.

c. Within the leading combat command, one armored engineer platoon, and a fixed bridge section from the attached armored engineer company and bridge platoon, join each leading reinforced battalion. The rest of the company and bridge platoon remains with the element containing combat command headquarters.

d. In any case, the commander of the engineer element functions as the unit engineer of the supported unit and maintains liaison with the supported unit commander.

128. Engineer Support for the Reinforced Battalion

a. The armored engineer platoon and fixed bridge section, which normally support the reinforced battalion, are capable of accomplishing such typical tasks as the following:

(1) *Stream crossing.* Constructing and maintaining fords and constructing short fixed spans of bridge.

(2) *Road opening.* Removing disabled enemy vehicles and small amounts of rubble, filling craters, and clearing mines.

(3) *Obstacle removal.* Making gaps in minefields, reducing road blocks, and breaching antitank obstacles.

(4) *Engineer intelligence.* Conducting reconnaissance of opportunity (reporting engineer items for following engineers to investigate and compile estimates).

(5) *Engineer supply.* No supply functions other than arranging for bridge resupply.

b. Engineers supporting the reinforced battalion are normally placed in column behind the leading reinforced company. The fixed bridge section is often split, because the vehicles are cumbersome, so that two bridge trucks accompany the armored engineer platoon, while a third bridge truck and a bolster truck march with the combat trains of the reinforced battalion. Timely reconnaissance and prior planning permit employment of the fixed bridge section as a unit when needed to bridge a major obstacle.

c. In the offense, engineers supporting the reinforced battalion accomplish only work necessary for the advance of the battalion. Additional engineer work required for following armored elements

is accomplished by the engineer company attached to the combat command.

d. The commander of the supporting engineer platoon serves as the engineer staff officer for the commander of the reinforced battalion.

129. Engineer Support for the Combat Command

a. The armored engineer company (with an attached water supply team) and bridge platoon, normally attached to the combat command, can accomplish such tasks as the following:

(1) *Stream crossing.* Constructing long fixed bridges and short floating bridges, and reinforcing existing bridges.

(2) *Road opening.* Filling large craters, removing extensive amounts of rubble and debris, and making minor road repairs.

(3) *Obstacle removal.* Widening minefield gaps and improving the work done by the platoon in overcoming obstacles.

(4) *Engineer intelligence.* Conducting planned reconnaissance (using reports from the platoon as a guide).

(5) *Engineer supply.* Providing potable water for the combat command and attached units.

(6) *Miscellaneous.* Installing landing strips for army aircraft operating with the combat command.

b. Engineers supporting the combat command are normally placed in column behind the leading reinforced battalion. If the combat command is attacking with battalions abreast, the engineer company and bridge platoon are centrally located, immediately to the rear of the leading reinforced battalion, within that portion of the column containing the combat command headquarters.

c. In the offense, engineers supporting the combat command accomplish only work necessary for the advancement of the combat command. Additional engineer work required for following elements of the division is accomplished by the remainder of the engineer battalion.

d. The commander of the attached engineer company serves as the engineer staff officer for the combat command commander. If more than one engineer company is attached for an operation, the engineer battalion S3 or executive officer is normally assigned as the combat command engineer. This relieves the company commanders of additional staff duties and permits them to give full attention to accomplishing assigned engineer missions.

130. Engineer Support for the Armored Division

(For general principles of employment of the armored engineer battalion, see pars. 102–105.)

a. The armored engineer battalion is capable of accomplishing such typical tasks as the following, in addition to those listed in the two preceding paragraphs:

(1) *Stream crossing.* Constructing long floating bridges and prefabricated fixed bridges (with equipment supplied by corps), and making major repairs to damaged bridges.

(2) *Road opening.* Accomplishing major road repairs and minor road construction.

(3) *Obstacle removal.* Removing minefields, and breaching obstacles in fortified zones.

(4) *Engineer intelligence.* Conducting extensive route or area reconnaissance, and accomplishing reconnaissance prior to combat in the planning stage of operations.

(5) *Engineer supply.* Supply all units of the division with water, maps, signs, and engineer class II and IV items.

(6) *Miscellaneous.* Providing recreational facilities, rehabilitating buildings for use by division headquarters, constructing facilities for division supply agencies, and planning in detail the engineer aspects of impending division operations.

b. The armored engineer battalion, less subordinate elements attached to or placed in support of forward armored units, normally marches with division troops. It is so located in the column that the maximum amount of engineer support can be made available in the shortest time to the committed major commands.

c. In the offense, the armored engineer battalion accomplishes only work necessary for the continuing advance of the division. Engineer work in rear areas of the division zone is turned over to corps engineers as soon as possible, in order to insure close, continuous, engineer support by the armored engineer battalion to forward elements of the division.

d. The armored engineer battalion commander is the division engineer, and hence has a dual role, including both staff and command functions. See appendix IV for a discussion of the dual role problem.

131. Engineer Reconnaissance in Offensive Action

a. Advance reconnaissance, before commitment against the enemy, may be performed by the reconnaissance battalion of the armored division, to which an engineer battalion reconnaissance

team may be attached for engineer reconnaissance. This team provides the division engineer with early, reliable engineer information of the terrain over which the division is to operate. Ground reconnaissance is supplemented by air reconnaissance, study of available maps and aerial photographs, and a study of reconnaissance made by other elements of the command. Terrain characteristics which appear favorable to the advance as closely examined, especially for possible enemy use of mines, obstacles, and defending weapons. The information gained provides a basis for estimating the engineer troops, supplies, and equipment needed for the operation. A reconnaissance must be made before a movement, so that the route can be selected, and a traffic circulation plan can be made.

b. Engineer reconnaissance in the offense must be continuous and detailed. Close attention is given to routes of advance, main supply routes (MSR's) and lateral roads, bridges, obstacles, mines, and sources of engineer materials in assigned areas. On the basis of reconnaissance information, plans are made and means provided for overcoming obstacles which are in evidence or which might be met.

c. Air reconnaissance by the battalion commander or his subordinates is very effective during an offense. Road blocks or other obstructions beyond the vision of advancing troops can be located, and timely engineer information can be relayed quickly to support the division more effectively.

d. The engineer platoon leader with each leading reinforced battalion gives the engineer battalion and the division engineer timely notice of engineer work required to reduce or bypass obstacles that cannot be bridged immediately or reduced by his platoon.

e. Continuous engineer reconnaissance, initiated by the engineer platoon leader supporting each leading reinforced battalion, is carried out vigorously by the engineer company attached to the combat command. A battalion reconnaissance team may be attached to the company for this purpose. Upon evaluation by the battalion S2, this reconnaissance information is disseminated to all interested units and agencies.

132. Employment of Engineers on Flank Security

a. Flank security depends on such factors as—

(1) Terrain.

(2) Road net.

(3) Enemy strength, disposition, morale, and mobility.

(4) Availability of friendly reinforcing and reserve units.

(5) Adequacy of communications.

b. Engineers with flank security elements help stop the advance of enemy forces by creating obstacles, road blocks, antitank and antipersonnel minefields, and by improving natural barriers. Since troops of all arms can and do erect obstacles under normal conditions, engineers construct only the more extensive and complicated types. Obstacles prepared by the engineers are integrated into the defensive plans of the commander of the flank security force; these obstacles are covered by weapons of the security force.

Section V. DEFENSIVE ACTION

133. General

a. An armored division is designed primarily for offensive action. Because of its versatility and armament, however, it may be used effectively in a defensive role. In the defense, the armored division, as a member of the corps fighting team, aids the infantry by adding depth to the battlefield, counterattacking, destroying enemy armor, and making counterthrusts. The armored division may resort to defensive combat when the commander wishes to gain time until more favorable conditions develop for an offensive, or to economize forces on one front in order that superior forces can be concentrated for a decision elsewhere. As part of a larger force, the armored division may assume the defense when ordered to do so in accordance with the plan of the corps commander. Under these conditions, the armored division, because of its mobility and fire power, may be used for a delaying action in front of the main battle position, or as a corps reserve with a counterattack mission. There may also be occasions when the armored division must be employed to occupy a sector of the main battle position.

b. When acting more or less independently, the armored division may find it necessary to assume the defense. This may occur when the division is attacked by a superior force while exploiting or pursuing, or when it has reached its objective and must defend until the remainder of the corps reaches the area.

134. Doctrine of Defense

Defensive doctrine includes the selection and organization of a battle position; the use of covering forces to delay and disorganize the enemy advance; and to deceive him as to the true location of the battle position; and the employment of reserves to destroy the enemy by counterattack if he succeeds in penetrating the battle

position. For a more complete discussion of the armored division in defensive operations, see FM 17–100.

135. Types of Defense: Mobile and Sustained

a. Mobile Defense. Mobile defense is the defense of an area or position in which maneuver is employed, with organized fires and skillfully exploited terrain, to seize the initiative from the enemy. The defense usually is composed of an outpost system and reserves. The outpost system is composed of observation posts and strong points of varying strength. The reserve serves as a counterattacking force to destroy the enemy at the most favorable tactical location. Mobile defense is suited particularly to the armored division when it is assigned frontages which are too wide to permit normal sustained-defense organization of the ground by its organic armored infantry, and when it is operating alone.

b. Sustained Defense. A sustained defense is the defense of an area or position aimed at stopping the enemy at the defense line or main line of resistance. Normally, it is employed by infantry divisions, and is employed by the armored division when the assigned sector is not too wide to be defended successfully by the organic armored infantry.

136. Engineer Work Done by Other Arms

In general, defensive positions are laid out and constructed by the troops which will occupy them. Nonengineer troops are trained in, and when time permits usually are able to accomplish, such typical tasks as—

a. Clearing fields of fire.

b. Digging individual foxholes and emplacements for crew-served weapons.

c. Camouflaging personnel, individual defensive positions, and weapon emplacements.

d. Laying mines.

137. General Employment of Engineers

The armored engineer battalion is responsible for accomplishing general engineer work in support of the division. Engineers assist in organizing the ground by providing engineer technicians, mechanical equipment, power tools, engineer materials, engineer advice and labor, and similar assistance. Especially in a sustained defense, technical problems of mine employment, obstacles, demolitions, drainage, clearing fields of fire, camouflage, and excavation may require extensive use of engineers. In the mobile defense, engineers give priority to routes used in the attack by the mobile

reserve to insure their uninterrupted movement. When the attack by the mobile reserve is mounted, engineers have the same duties as in an offensive action. If the armored division is held in reserve in a sustained defensive operation, engineers perform such general duties as water supply, general engineer supply, repair and maintenance of counterattack routes, reconnaissance, and other engineer work.

138. Engineer Missions

Engineer missions in both types of defensive action are relatively the same. In general, the mission is to impede the advance of the enemy, and may be considered as fourfold:

a. Assisting the movement of the reserve in the counterattack (sustained defense) and attack (mobile defense).

b. Increasing the defensive capabilities of combat troops through general engineer work in organizing the ground for defense.

c. Assisting troops protecting the flanks by creating obstacles in roads and in other avenues of approach from the flanks.

d. Performing general engineer duties.

139. Control of Engineer Effort

a. In general, the maximum engineer effort with the least waste of time and equipment is obtained when engineer support is centralized under the senior engineer officer, who is the engineer staff officer for the supported unit commander. Hence, unlike in the offense, portions of the total available engineer troop support are seldom committed to subordinate units or commands defending the locality.

b. Armored engineer elements may be attached to combat commands or they may be kept under control of the armored engineer battalion and support the action of the combat commands. The criterion for attachment or support is the ability of the parent headquarters—that is, the armored engineer battalion—to control and direct the actions of these engineer elements. Engineer elements attached to the combat command usually are kept under combat command control, and are not attached to the reinforced battalions.

c. When the armored division is given a sector for sustained defense, the armored engineer battalion is usually kept under the control of the division engineer and performs missions vital to the division defensive operation (fig. 12). Infrequently, the situation may require that engineer elements be attached to or put in direct support of the combat commands. If engineer elements are placed

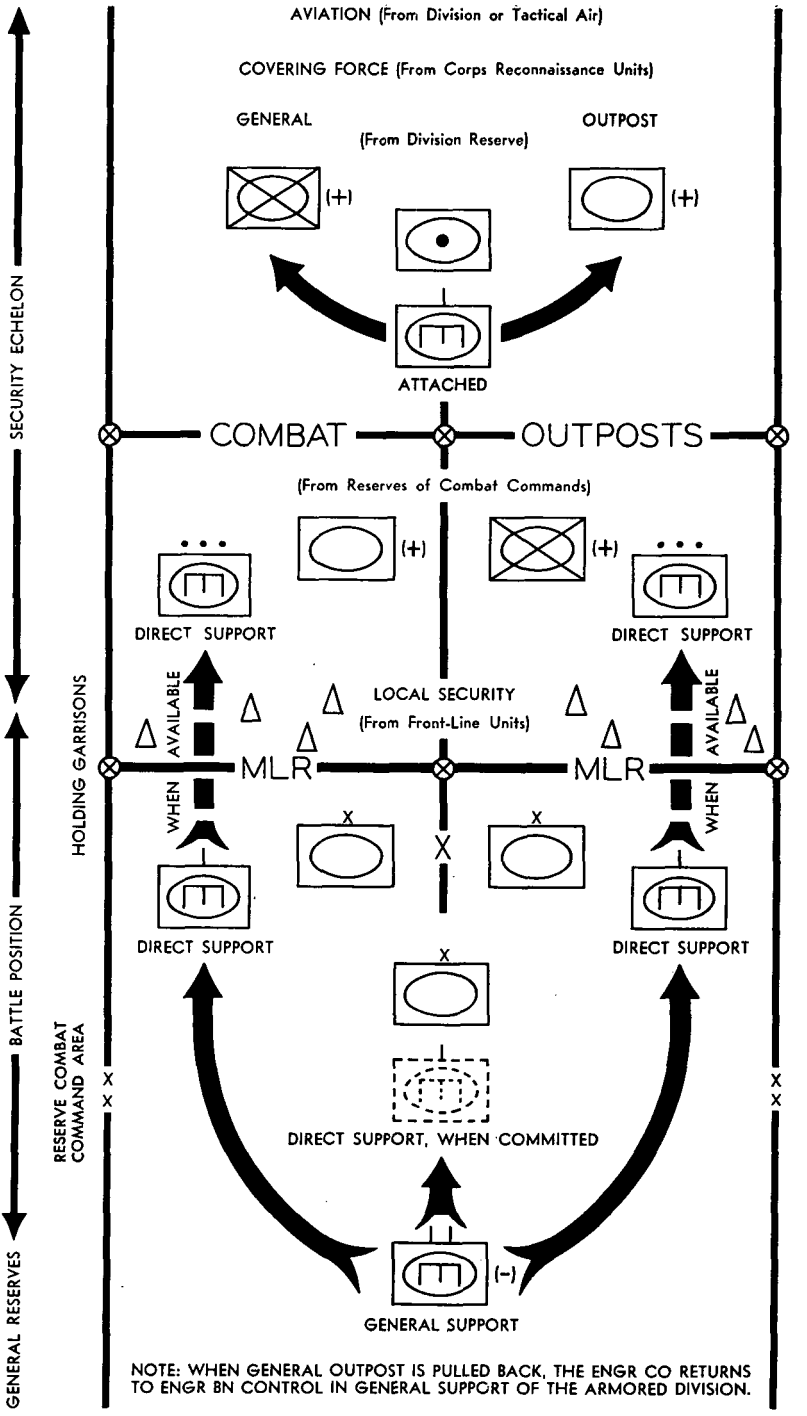


Figure 12. Typical armored engineer battalion support of the armored division in a sustained defensive position.

in support of a counterattacking force, their duties are the same as for offensive combat.

d. Close and efficient liaison must exist between engineer elements and supported units to secure the most effective engineer support.

140. General Engineer Duties

General engineer duties in defensive action include—

a. Conducting engineer reconnaissance.

b. Repairing, maintaining, and improving roads for supply and evacuation, and recommending a traffic circulation plan.

c. Assisting in field works by placing demolitions and constructing command and observation posts, minefields, wire entanglements, and other obstacles.

d. Assisting in flank and rear area security through the use of demolitions and obstructions.

e. Providing water supply facilities.

f. Providing camouflage materials and assisting in their use.

g. Making engineer materials available to units of other arms doing engineer work.

h. Performing heavy earthwork in preparing firing positions.

i. Obtaining and supplying maps.

j. Participating in combat as armored infantry, in emergency situations.

k. Advising the supported unit commander on engineer matters.

141. Engineers in the Mobile Defense

a. General. The mobile defense is characterized by the employment of the bulk of the defending force as a mobile reserve, while forward elements of the force establish a strong point system. The strong point system is composed of a series of strong points of varying strength, with the mission of slowing, stopping, repelling, or canalizing the attacking enemy. Each strong point will send out one or more observation posts (listening posts at night) to provide local security, vital information, and timely warning of the enemy's advance. These strong points will be occupied by forces predominantly armored infantry. The main strength of the mobile defense is the counterattack by a powerful mobile reserve, a force composed predominantly of tanks.

b. Engineer Tasks. Since the attack by a powerful reserve is the heart of the mobile defense, most engineer duties are the same as for the offense. Engineers make necessary repairs or improvements to roads and bridges on all routes selected in conjunction with movement of the mobile reserve. Minefields and other large-scale obstacles are installed or constructed, with special care being taken that attack routes are not blocked or hindered in any way; gaps are provided if necessary. Routes of supply and evacuation are maintained. Engineers may also assist in organizing the ground for strong points, on a secondary priority basis; by erecting close-in obstacles, supervising camouflage activities, and clearing fields of fire.

c. Supply of Tools and Materials. Since the mobile defense consists of a defending force thinly distributed over extended frontages and a highly mobile reserve force, the need for engineer tools and equipment, mines, and fortification materials is relatively great. However, only a limited amount is available. Materials and equipment which are available and can be used immediately are brought up and dumped in a concealed area near the using units.

142. Engineers in the Sustained Defense

(fig. 12)

a. General.

(1) In the sustained defense, the division commander considers features of the sectors to be defended, and assigns tanks and armored infantry elements to the combat commands in the proportion best suited for accomplishment of the mission. Generally, the bulk of the armored infantry occupies the main battle position, while most of the tanks, less elements attached to the armored infantry battalions, are held in reserve for counterattack. The combat commands organize reinforced battalions; each battalion either is assigned an area to be defended or is placed in the combat command reserve.

(2) Sustained defense aims at maintaining the integrity of the battle position by organizing that position and holding it. Security forces, after being driven in by the enemy, are assigned other missions. Units in the battle position organize localities for all around defense. Their purpose is to stop the enemy at the battle position. Defensive positions and fires are organized to prevent penetration of the main line of resistance. The defended

localities that make up the main line of the resistance hold against enemy attack by utilizing the fires of all their units, and supporting fires from the artillery within the division. If the enemy succeeds in penetrating the battle position, his progress is blocked by other localities organized in depth, or by employment of a blocking force. The penetration then is reduced by the counterattack of the reserve, which aims to cut off and destroy the hostile penetrating troops.

b. Engineer Tasks. The commander of the occupying troops specifies the types of defensive positions to be used and the priorities of construction. The unit engineer advises the commander of these matters, when mine techniques, camouflage supervision, supply of engineer materials, and employment of engineer troops are involved. All major construction work is normally executed under engineer supervision. Tasks which the engineers are called upon to accomplish include—

(1) Clearing fields of fire.

(2) Laying antitank and antipersonnel minefields and executing important demolitions, such as bridges.

(3) Preparing obstacles (other than minefields) by construction or destruction.

(4) Preparing routes of movement for reserves and for supply and evacuation.

(5) Preparing individual and crew-served weapon emplacements.

(6) Fighting as armored infantry in emergency situations.

c. Supply of Tools and Materials. The division engineer, through his battalion supply officer, is responsible for supplying materials for field fortifications to all divisional troops. This supply is planned and regulated by the division engineer and executed by the battalion S4. Special tools and heavy equipment, in addition to that in the battalion, may be obtained from corps and army engineer units, or from class IV depots. In sustained defense, the amount of materials required for field fortifications is usually so great that transportation must be furnished by all troop units employed on the work, supporting truck units, and the organic bridge company. Principal materials supplied include sandbags, pickets, barbed wire, timber, chicken wire, camouflage nets and garnishing materials, steel bars, cement, and aggregate. Quantities of materials needed can be estimated by using data given in FM's 5–34 and 5–25. Fortification materials are brought

up by the unit which is to use them or by supporting truck units, and are dumped at or near the positions.

143. Obstacles and Barriers

a. General. In the sustained defense, obstacles are used extensively. Time permitting, the defensive capabilities of the ground are augmented by artificial obstacles and the improvement of natural obstacles, until a barrier zone has been created, through which the enemy cannot penetrate without a costly expenditure of men and materiel.

b. Types of Obstacles. Normally, the use of artificial obstacles is limited by the time, labor, and materials required for construction. The most satisfactory method of constructing an obstacle in ordinary terrain is by demolition of bridges over unfordable streams. The bridges are prepared for demolition and, to prevent them from falling intact into enemy hands, blown on order of the senior local tactical commander. Road blocks on main roads passing through defiles such as heavy woods, cuts and fills, swamps, etc., are very effective. In order to be most effective, all obstacles should be covered by fire. For details of demolition, see FM 5–25, and for field fortifications and barriers, see FM 5–15. In open country, minefields are the most practicable obstacles. For a detailed discussion of minefield technique see FM 5–32. Extensive obstacles and positions are normally prepared with assistance from corps engineer units. Nonengineer troops and civilian labor may be used to aid in the construction, under engineer supervision. Armored infantry or antitank elements defend the obstacles. Defended obstacles are organized into a coordinated system of successive battle positions, and form divisional barriers in depth.

144. Engineer Reconnaissance in Defensive Action

As in offensive operations, engineer reconnaissance in the defense is continuous and detailed. Emphasis is placed on route reconnaissance for counterattack forces, and on engineer reconnaissance throughout the defensive area. When the armored division is assigned a sector for sustained defense, the engineer battalion reconnaissance teams search the area in detail and report all items of engineer interest. This information then becomes the basis for planning obstacles in the division barrier zone; routes of supply, evacuation, and withdrawal, or possible denial operations. In the mobile defense, engineer reconnaissance is accomplished primarily in conjunction with attack plans and is carried out under the direction of the unit engineer, with or without personnel from the engineer battalion reconnaissance section.

145. Employment of Engineers on Flank Security

a. Flank security depends on such factors as—

(1) Terrain.

(2) Road net.

(3) Enemy strength, disposition, morale, and mobility.

(4) Availability of friendly reinforcing or reserve units.

(5) Adequacy of communications.

b. Interior units are secured by coordination with adjacent units. Liaison is maintained with neighboring units so that the defense commander will be kept fully informed of developments in adjacent areas. Maximum use should be made of army aircraft during daytime. If the defending unit has an exposed flank or flanks, reconnaissance troops are used to patrol critical areas and act as contact parties. They may establish observation and listening posts. In the event of a successful enemy attack on the flank, units of the mobile reserve launch an attack. Engineers have the same duties in flank security as in the defense, including the construction of obstacles, the preparation of demolitions, and the laying of minefields. Engineers with the mobile reserve units do essentially the same work as in the offense.

Section VI. RADIOLOGICAL DEFENSE

146. General

a. Injuries to persons from an atomic attack can be divided into four general categories—those caused directly by blast pressure wave; those caused when buildings are wrecked; those caused by burns, either in the wreckage or from radiant heat; and those caused by nuclear radiation, either directly or through residual contamination.

b. Radiological defense is defined as the protective measures taken to minimize damage to persons and materials from an atomic burst. It includes such measures as—

(1) Training, organization, and distribution of personnel.

(2) Preparation and maintenance of fixed and portable structures and equipment.

(3) Teaching of techniques and procedures, including use of detecting equipment, protection or removal of exposed personnel, and decontamination of personnel, equipment, structures, or terrain.

147. Command Responsibilities

Every commander is responsible for training his unit in radiological defense, and for providing protection against radiological hazards. Some aspects of radiological defense are discussed in this section; additional details are given in DA Pamphlet 20–110.

148. Organizational Structure

Most problems of radiological defense are similar to those of defense against chemical attack. Accordingly, radiological defense duties are assigned to the unit gas officers and noncommissioned officers, who are assisted by radiological defense monitors. Trained personnel are thus provided at all levels to assist and advise commanders. To provide a radiological defense organization within the battalion, DA Pamphlet 20–110 establishes the following structure:

a. Unit Radiological Defense Office (Unit Gas Officer). The battalion unit gas officer is also the battalion unit radiological defense officer. Each company commander appoints one radiological defense officer, and at least one qualified alternate from the assigned officers. This provides a total of 15 radiological defense officers in the armored engineer battalion.

b. Unit Radiological Defense Noncommissioned Officer (Unit Gas NCO). The battalion commander appoints one radiological defense noncommissioned officer, and at least one alternate, in battalion headquarters. Each company commander appoints a minimum of two radiological defense noncommissioned officers and two qualified alternates, all selected from the upper four grades.

c. Radiological Defense Monitors. The battalion commander appoints at least one monitor from battalion headquarters; each company commander appoints a minimum of two per company. At least one alternate is appointed for each monitor required. Monitors are selected from the lower four enlisted grades.

149. Before-Burst Operations

a. The division engineer is responsible for the construction of any installations required for radiological defense in the division area. He consults the division radiological defense officer concerning the best protection to be gained through different types of construction, and the location of new shelters and special command posts.

b. The principal effect of atomic warfare on engineer operations is to increase the amount of engineer work to be accomplished. Technical prcedures are generally unchanged. Camouflage assumes added importance, and more camouflage materials are required. Units do their own camouflage work, under the technical supervision of the engineer unit commander. Alternate sources of water supply are located and developed in advance, to reduce to a minimum the necessity for processing contaminated water.

c. When the enemy is capable of employing atomic weapons, the defense is dispersed in relatively great depth. This increases the requirements for defensive minefields and tactical barrier minefields. Engineers supervise and coordinate the installation of these minefields. Fortifications which are particularly complex, or which require extensive engineer work beyond the capacity of the using unit, are constructed by the engineers. Fortifications are designed to protect troops against most air bursts.

d. Additional engineer unit before-burst tasks include—

(1) Surveying area for suitable shelters and sheltered areas.

(2) Dispersing unit personnel, equipment, and supplies consistent with operational practicability.

(3) Covering essential equipment and supplies with canvas or other material for protection against contamination.

(4) Organizing unit medical, rescue, and evacuation teams.

(5) Selecting and preparing an alternate bridge site for each bridge.

(6) Organizing a radiological defense warning system.

(7) Preparing a radiological defense SOP based on that of the next higher headquarters.

150. After-Burst Operations

The engineer mission, in case of an atomic attack, is expected to be essentially the same as for other types of attack, but complicated in practice by the destructive effects of atomic weapons and the additional hazards of residual radiation. Typical afterburst engineer units tasks are to—

a. Perform first aid, rescue, and evacuation tasks.

b. Prepare personnel decontamination stations.

c. Monitor unit areas for the extent and intensity of radiological contamination.

d. Make signs for unsafe areas.

e. Decontaminate essential areas or evacuate to safe areas.

f. Fight fires.

g. Clear debris from essential routes to facilitate relief, supply, and evacuation.

h. Produce a maximum of potable water.

i. Construct alternate roads.

j. Perform other special and general engineer tasks as required.

Section VII. DEFENSE AGAINST GUERILLA FORCES

151. General

An area menaced by guerillas is as much a combat area as a front line. Commanders and units in such an area must maintain the same alert and aggressive attitude as front-line troops. Security measures are taken to safeguard troops, installations, and lines of communications. Vigilant security and sound defensive measures minimize friendly losses, and discourage guerilla operations. (See FM's 31–15 and 31–20.)

152. Troop Security

Troop security is a command responsibility. All echelons must be thoroughly briefed on known or suspected guerilla forces. Combat security measures, including extensive patrolling, are employed on the march, during halts, and in bivouac. Troops in rear areas tend to acquire a false sense of security, even though guerillas threaten them with dangers at times as great as those in forward areas. Guerilla operations are apt to be sporadic, and long quiet periods cause troops to become less alert. Commanders must exercise continuous and methodical supervision to maintain security discipline.

153. Supply Security

Commanders must constantly emphasize that supplies captured, lost, traded, stolen, or thrown away are often recovered by guerillas and used against our forces. Arms and equipment salvaged from battlefields by civilians frequently find their way into guerilla hands.

154. Area Security

Unit areas are secured against guerilla attacks and sabotage with special attention given to the security of arms, ammunition, and other equipment of particular value to guerillas. Fields of fire

are cleared and field fortifications are built and manned by adequate guards supplemented by patrols. Precautions are taken to prevent guards from being surprised and overpowered before they can give the alarm. All soldiers, including headquarters and service personnel, are trained in antiguerilla tactics, and keep their weapons available for instant use. Methods of securing an area are altered frequently, to prevent guerillas from obtaining detailed information about the composition and habits of the defense. Natives are not permitted to enter the area, and those residing in the vicinity are carefully screened or evacuated.

155. Convoy Security

a. By Armed Security Detachments.

(1) Lone vehicles, and convoys not capable of providing their own security, are grouped and escorted through danger areas by armed security detachments. These units are organized and trained to protect convoys from hostile guerilla actions, and usually contain elements of armor, armored infantry, and engineers. The size of the detachment and its composition vary with the topography, the capabilities of the guerilla forces, and the size and composition of the convoy. Traffic through known danger areas is normally controlled by traffic control stations.

(2) The engineer element is placed well forward in the column, to perform such engineer tasks as minor bridge and road repairs, obstacle removal, and detection and removal of mines.

b. By Unit.

(1) When a convoy is not escorted through a danger area by a convoy security detachment, the parent unit organizes its own convoy security. Part of the available troops are placed well forward in the convoy, and a strong detachment rides in a vehicle or vehicles that follow the main body by about three minutes. Radio contact is established between the two groups, if possible. A fairly fast speed is maintained. Defiles are traversed at high speed. Sharp curves, steep grades, or other areas where low speed is enforced, are reconnoitered by foot troops sent ahead. At the first indication of ambush while the convoy is in motion, leading vehicles, if the road appears clear, increase their speed to the maximum consistent with safety, in an effort to run through the ambush area. Drivers of vehicles disabled by enemy fire or mines try

to move their vehicles to the sides or off the roads so that following vehicles are not blocked. Troops from trucks stopped in the ambush area dismount and return fire. Machine guns mounted on vehicles are fired at the enemy. Troops from vehicles that have broken through the ambush, dismount and attack rearward against the flank of the enemy. Upon learning that the main body has been ambushed, the rear guard of the convoy dismounts and attacks forward against the other flank of the enemy position. Both attacking groups take precautions to avoid firing on each other. If the guerillas allow the main convoy to pass through and then ambush the rear guard, troops from the main body return, and relieve the rear guard by an attack against the flank of the ambush position.

(2) Variations of this method may be used to fit the situation, the number of troops and vehicles available, the anticipated strength of the guerilla force, and their method of operation.

Section VIII. RETROGRADE MOVEMENTS

156. General

A retrograde movement is any movement to the rear or away from the enemy. It may be forced by the enemy or it may be made voluntarily. Retrograde movements are covered by mobile security forces which delay and deceive the enemy and prevent interferencs with the movement. These covering forces maintain contact with the enemy, who is forced to fight or maneuver for the ground gained. Retrograde movements include withdrawals from action, retirements, and delaying actions.

157. Engineer Support of Other Arms

a. Engineers are an important element in the covering force of a retrograde movement. Their general duties are similar to those in the defense. Specific duties include—

(1) Participating in denial operations (pars. 158–162).

(2) Delaying the enemy by destroying bridges, blocking roads, demolishing railways, and erecting barriers.

(3) Engaging in combat as armored infantry when required.

b. During retrograde movements, engineers help the other arms to impede the enemy advance as much as possible. This assistance

may include any or all of the duties mentioned in *a* above. Engineers near the end of the retiring column destroy bridges and culverts, block roads, lay mines, destroy supplies, and demolish railways and rolling stock. The time available determines the degree of destruction, and the number of obstacles created. Major obstacles must receive highest priority. Engineers work closely with other elements of the covering force, moving to the rear in leapfrog fashion. The covering force commander, responsible for delaying the enemy advance, prepares a planning table for successive withdrawals, based upon his orders from higher headquarters. Since centralized control is necessary for all elements of the covering force, the engineers are usually placed under the control of the covering force commander.

c. Engineers also assist the movement of retiring columns by performing road and bridge maintenance. Leading elements of the retiring troops must be kept moving toward their destinations; routes must be kept open and clear to allow successive elements to follow. Usually supply trains, including those carrying engineer supplies and equipment are among the first elements to move to the rear. However, to meet the needs of engineers with the security elements, it may be necessary to operate engineer supply points near the covering forces until they withdraw.

Section IX. DENIAL OPERATIONS

158. General

a. A denial operation, by removal or destruction, denies the enemy things that he would otherwise capture and use. A denial operation is a responsibility of all commanders. For a commander having area jurisdiction, denial responsibility includes everything in the area; for other commanders, unless they are specifically ordered otherwise, it includes only the material and supplies assigned to their units.

b. A scorched-earth policy makes an entire area useless to the enemy by removing or destroying everything that could aid him in any way. It is denial carried to the extreme. If the area is friendly, civilians must be evacuated when the scorched-earth policy is applied. This evacuation must be strictly controlled to prevent interference with troop movements. A partial-denial operation, less drastic than the scorched-earth policy, is more often employed.

c. The theater commander decides on the extent to which denial operations will include nonmilitary supplies and facilities. When a denial policy is established, detailed planning and execution involve major problems of engineering and logistics.

159. Responsibility

The division commander is responsible for denial operations within his area. In accordance with the denial policy of higher headquarters, his plan provides for the denial of both military and civilian supplies, equipment, and installations. Denial operations are generally a major task, requiring a high degree of technical skill, and considerable time for detailed planning, careful preparation, and execution. The engineer battalion is particularly suited for executing denial operations, and extensive use is made of engineer equipment and demolitions. Troops of other arms and services are also used. It is a command decision to determine when preliminary work is to be done and when plans will be put into effect. To be successful, a denial operation must be prosecuted ruthlessly. Like other units, the engineer battalion has a standing operating procedure for the destruction of its own supplies and equipment.

160. Items Denied the Enemy

All possible military supplies and equipment are evacuated. The remainder is destroyed. The division and the engineer battalion are interested mostly in the denial of such items as—

a. Military equipment and installations.

b. Military supplies.

c. Communication facilities.

(1) Railroads and rolling stock.

(2) Airstrips.

(3) Bridges.

(4) Highways.

(5) Signal communication items.

d. Certain buildings and structures.

161. Denial by Removal

Evacuation of material is as much a part of any denial operation as destruction. Evacuation must be started early and conducted in accordance with prepared priority lists. Every available means

of transportation must be used to capacity, to save as much supplies and equipment as possible.

162. Denial by Destruction

a. All possible methods of destruction are used. The most common are —

(1) Fire.

(2) Flooding or drenching.

(3) Mechanical methods, such as breaking with a sledge hammer or cutting with an oxyacetylene torch.

(4) Explosives (see FM 5–25).

(5) Contamination.

(6) Projectiles: small arms, artillery, and bombs.

b. So that destruction may be executed at the desired time, personnel to destroy each item must be designated in advance; supplies necessary for the destruction must be estimated and assembled at convenient locations; circumstances under which the destruction is to take place must be definitely prescribed; and, if orders for destruction are to be issued, the means of transmission must be provided.

Section X. RIVER-CROSSING OPERATIONS

163. General

a. Scope. This section presents a general discussion of river-crossing operations, and the tactics and techniques of the armored engineer battalion in these operations. Since the armored division is seldom employed in the assault phase of a deliberate river crossing, detailed information is not given; it may be obtained from FM's 7–40, 31–60, and 100–5.

b. Object and Mission. The immediate objects of an attack on a river line are to get across quickly and economically, and establish one or more bridgeheads to protect the crossing of the remainder of the command. A division usually crosses as part of a larger force. The infantry division usually has one of the following missions: to force the main crossing, to make a secondary crossing, or to make a feint. The armored division, however, is normally a passenger in a deliberate crossing since it is better suited for breaking out of a bridgehead than for forcing a crossing.

164. Types of Crossings

Plans for crossing a stream when all bridges have been destroyed depend upon the strength with which the enemy holds the opposite bank, and the characteristics of the river. There are two general types of crossings—a deliberate river crossing, and a hasty river crossing.

165. A Deliberate River Crossing

a. A deliberate river crossing is necessary if the opposite bank is strongly held or if the natural obstacle is technically difficult. Detailed planning, extensive logistical preparation, and air and ground superiority are required. Overall planning and coordination are performed by corps or higher commands.

b. The armored engineer battalion, in a deliberate river crossing, is normally held out to provide engineer support when the division is committed on the far shore. Some elements of the battalion may be used to operate assault boats during the assault phase or to perform preliminary work on bridge approaches or access roads before the assault. In any case, armored engineers must not be employed where they cannot be withdrawn to accompany the armored division over the river and to provide forward engineer support for combat commands. The organic bridging of the battalion is also held out for support of the combat commands when they are committed on the far shore.

166. Hasty River Crossing

The hasty river crossing is normal for the armored division. It must be boldly executed, to insure surprise and to prevent the organization of strong defense. Detailed reconnaissance and planning are secondary to speed. The one vital consideration is that the tempo of the advance of the armored division must not be disturbed. Frequently, aggressive action will result in the capture of a bridge before the enemy has destroyed it. At other times a damaged bridge can be repaired, a ford can be found and improved, or a ferry service can be established, using local boats and barges. Advance elements get across by expedient means, if normal bridging and equipment are not available. Hasty crossings must be anticipated, and all available river-crossing equipment must be well forward and used promptly. When the opportunity for such a crossing is presented to an advance force, supporting engineer troops assist in the immediate crossing and exploitation. The

armored engineer battalion constructs bridges and other necessary crossing means as soon as possible, to cross additional divisional troops that are rushed forward to expand the initial successes.

167. Crossing Means

a. Every available crossing means (pars. 169–175) is used to cross the maximum troops and equipment in the shortest time. If necessary after the first objective is achieved, rafts or expedient bridges are constructed by the armored engineer battalion. These are used to cross armor, additional personnel, ammunition, heavy weapons, equipment, and necessary vehicles to support the bridgehead and to expand it to the second objective. Construction of fixed or floating bridges is usually started when the second objective is attained, or before, if enemy artillery is light. Achievement of the third objective coupled with local air supremacy, permits the completion of the bridge or bridges, their uninterrupted use in crossing the rest of the division, and the exploitation of successes already attained.

b. If the bridging is left in place, the bridge company immediately obtains replacement bridging from the nearest engineer depot and rejoins the supported unit. On the other hand, although infrequently, the bridging may be disassembled by one of the armored engineer lettered companies, and reloaded on the bridge trucks, which return to the supported unit for the next bridging operation.

168. Desirable River-Crossing Characteristics

The following desirable characteristics are sought in river-crossing operations:

a. Assault-boat crossing sites are located, if possible, where the stream is narrow, the current moderate, and the banks gently sloping. There must be adequate space for simultaneous launching of the desired number of boats. Concealment is desirable for approaches to the launching sites, and for the sites themselves. Frequently, lanes must be cleared and marked to allow movement of boats.

b. Footbridge construction is easier if the site provides a small cleared area on the near bank where bays can be assembled; gently sloping banks on the near shore so that bays can be launched, then connected in the water; and large trees or other anchorages on both banks for float cables and guy cables.

c. Raft sites are normally located downstream from bridge sites, and should be close to existing roads at points where the current is moderate and where banks can accommodate two or more rafts without landing stages.

d. Floating-bridge sites should have—

(1) Short, easily constructed approach roads to existing road nets on both sides.

(2) Moderate current.

(3) Firm stream banks that can support abutments.

(4) Nearby points where floats may be inflated and launched. Normally, pontons are launched downstream of the bridge site. Where tributary streams exist, it may be desirable to float pontons to the bridge from launching sites on the tributary.

(5) Turn-arounds for vehicles at unloading points.

(6) Large trees or other natural anchorages for anchor cable, when used.

(7) Small variations in water level. Allowances must be made for changes in water level and velocity of current caused by floods and tides, particularly for their effect on the anchorage required.

Section XI. STANDARD RIVER-CROSSING EQUIPAGE

169. General

River-crossing equipage organic to the armored engineer battalion is discussed in this section. Information on other river-crossing means is found in FM's 5–132 and 31–60, and in TM 5–271. For additional references see appendix I.

170. The Assault Boat M2

(TM 5–271)

The assault boat is normally used in crossing assault waves of armored infantry. Seven boats are carried (nested) on a pole-type trailer, towed by a 2½-ton truck. The boat (fig. 13) weighs 410 pounds and has a useful displacement of 4,000 pounds; it is 5 feet 4 inches wide and 13 feet 4 inches long. Two assault boats can be fastened together stern-to-stern and powered by an outboard motor. See table III for loading details. Twenty-one assault boats are organic to each bridge platoon.

Figure 13. Assault boat M2 with 3-man crew and assault personnel.

Table III. Assault and Storm Boats

1	2	3	4	5	6	7
River crossing means	Construction party (Engineers)	Maximum loads	Maximum stream velocity	Time in min. for round trip across stream with width of: 300 feet	500 feet	1,000 feet
SMALL BOATS						
Assault boat M2: Single boat	Engineer crew—3 men.	12 riflemen with Ind Equip or any of the following (in addition to crew): 1 rifle Sqd 1 Hv MG Sqd w/gun and 13 boxes Ammo 1 81-mm mortar Sqd w/mortar and 50 rounds Ammo 2 LMG Sqds w/gun and 20 boxes Ammo 2 60-mm mortar Sqds w/mortars and 72 rounds Ammo 1 75-mm rifle Sqd w/rifle and 70 rounds Ammo 1 57-mm rifle Sqd w/rifle and 100 rounds Ammo	4 fps	4	6	10
Two-boat ponton with 25-hp outboard motor.	Engineer crew—2 men.	22 passengers (in addition to crew) 15 passengers (in addition to crew)	7 fps 9 fps	-------	4	6
Storm boat	Engineer crew—2 men.	7 passengers or any of the following (in addition to crew): 7 riflemen 1 Hv MG Sqd w/gun and 9 boxes Ammo 1 81-mm mortar Sqd w/mortar and 24 rounds Ammo 1 LMG Sqd, 2 extra men, gun and 10 boxes Ammo 1 60-mm mortar Sqd, 2 extra men, gun and 36 rounds Ammo.	11 fps	-------	3	4

Table IV. Floating Bridges

1	Type of bridge	Transportation required [a]	Construction time in hours [b] — Stream widths: 160 ft	250 ft	500 ft	1,000 ft	Construction party [c]	Maintenance Crew	Class [d] — Normal crossing [e] (posted capacity) — Stream velocities in feet per second: 3	5	7	9	11	Caution crossing [f] — Stream velocities in feet per second: 3	5	7	9	11	Risk crossing [g] — Stream velocities in feet per second: 3	5	7	9	11	Traffic capacity and vehicular distance for safe crossings in daylight (except as otherwise noted)[h]
2	Foot-bridge M1938.	1–2½t truck per 144 ft. of bridge.	1/4	1/3	1/2	----	1 Plat	1 Sqd	Safe			Unsafe		----	----	----	----	----	----	----	----	----	----	----	Day: 75 men per minute Night: 40 men per minute at normal 2-pace distance.[i]
3	M2 assault boat bridge. — Normal construction.	1–2½t truck and 1 pole tlr per 36 ft. of bridge.	1	1½	2½	----	1 Plat	1 Sqd	8	6	5	----	----	8	6	5	----	----	9	7	6	----	----	200 vehicles per hour; 90-ft distance between vehicles.
4	Reinforced construction.	1–2½t truck and 1 pole tlr per 24 ft. of bridge.	1½	2	3	----	1 Plat	1 Sqd	13	9	7	----	----	13	11	8	----	----	14	12	9	----	----	
5	Widened steel treadway bridge.	1–6t treadway truck per 24 ft. of bridge.	2½	4	7	12	1 tdwy brg co plus 1 combat co.	1 Sqd	50	50	40	30	15	50	50	45	35	20	55	55	50	45	30	
6	M4 bridge.	1–2¼t lwb bolster truck per 15 ft. of bridge (normal const).	3	5	8	14	1 ponton brg co plus 1 or 2 combat cos.	1 Sqd	55/95/(1)	55/95/(1)	55/95/(1)	45/70/(1)	30/40/(1)	60/100/(1)	60/100/(1)	60/100/(1)	50/85/(1)	40/55/(1)	65/105/(1)	65/105/(1)	65/105/(1)	55/100/(1)	45/70/(1)	400 vehicles per hour 90-ft distance between vehicles.
7	Airborne 50-ton divisional.	5–6t treadway trucks per 60 ft. of bridge.	4	6	----	----	1 brg plat plus 1 combat co.	1 Sqd	45	35	30	10	----	50	40	35	15	----	55	50	45	25	----	

[a] Transportation for bridge equipment only. Additional needed for any construction equipment required, and for troops.

[b] Includes unloading and construction only in daylight. Does not include access roads, assembly sites, abutments or anchorages.

[c] Average for trained troops and continuous daylight construction. Allowances are required for specific situations.

[d] Based on abutments at levels within 12 inches of floating bridge deck level.

[e] Vehicle anywhere on width of bridge deck. Speeds—15 mph recommended, up to 25 mph permitted.

[f] Center of vehicle within 12" of bridge centerline. Maximum speed 8 mph. Vehicle spacing 150 ft. No sudden stopping or acceleration.

[g] Center of vehicle within 9" of centerline and with guide. Maximum speed 3 mph. One vehicle on bridge. No stopping, braking or gear shifting.

[h] Traffic capacities are for all traffic moving forward or rearward.

[i] Normal construction / Reinforced construction

[j] Use 2-pace distance for 3 fps only; 1-bay distance for 4 and 5 fps; 2-bay distance for 6 and 7 fps.

Table V. Rafts

1	Type of raft	Number of pontons or floats	Length: Overall including ramps	Length: Available for loading [a]	Construction time [b]	Construction party	Operating crew	Class and number of power units needed [c] — Normal crossing — Stream velocity fps: 3	5	7	9	Class and number of power units needed [c] — Risk crossing — Stream velocity fps: 3	5	7	9	Type of power unit required	Transportation required (for raft equipment only). Additional needed for construction equipment and troops. — No. units	Unit
2	Infantry	3	38′–0″	24′–0″	10 min.	1 plat	1 sqd	8 / 1	8 / 2	4 / 3	----------	10 / 1	9 / 2	5 / 3	2 / (d)	Outboard motors.	1	2½t truck w/pole tlr
3	support	5	50′–0″	35′–9″	15 min.			13 / 1	10 / 2	5 / 3	----------	15 / 1	13 / 2	8 / 3	3 / (d)		2	2½t truck w/pole tlr
4		7	62′–0″	47′–9″	20 min.			13 / 21 / 1	13 / 21 / 2	8 / 13 / 4	----------	16 / 23 / 1	15 / 23 / 2	10 / 16 / 4	5 / (d)			
5	Widened steel treadway	4	64′–11¼″	42′–0″	30 min.	1 plat	1 sqd	35 / 1	35 / 1	35 / 1	20 / 2	45 / 1	45 / 1	40 / 1	25 / 2	27′ bridge erection boats.[e]	3	6t treadway trucks
6		5	76′–11¼″	48′–3″	45 min.			45 / 1	45 / 1	45 / 1	25 / 2	50 / 1	50 / 1	50 / 1	30 / 2			
7	M4 [f]	4	87′–0¾″	51′–8″	1 hr.	1 plat	1 sqd	55 / 1	55 / 1	55 / 1	55 / 1	60 / 1	60 / 1	60 / 1	60 / 1	27′ bridge erection boats.[e]	5	2½t trucks modified
8		6						75 / 1	75 / 1	75 / 1	70 / 2	80 / 1	80 / 1	80 / 1	80 / 2		6	
9		7						90 / 1	90 / 1	90 / 1	85 / 2	95 / 1	95 / 1	95 / 1	95 / 2		7	
10	Airborne 50-ton divisional.	4	87′–0¾″	51′–8″	1 hr.	1 plat	1 sqd	5 / 1	35 / 1	30 / 1	20 / 2	45 / 1	45 / 1	40 / 2	25 / 3	27′ bridge erection boats.[e]	4	6t treadway trucks
11		6	88′–8¾″	53′–4″	1½ hr.			55 / 1	50 / 1	45 / 2	----------	65 / 1	60 / 1	50 / 2	15 / 3		6	

Key

	Number of power units needed Capacity in tons (one or more vehicles).
	Number of power units needed Single vehicle capacity Double vehicle capacity (Vehicles should be approximately equal in weight).

1	Operating characteristics of rafts	2 Stream width feet: 300	3 Stream width feet: 500	4 Stream width feet: 1,000
2	Number of round trips per hr in currents of 5 fps in daylight (reduce 50% for night or adverse conditions).	10	6	4
3	Number of rafts which can be used efficiently at one site.	1	2	2

[a] Measured from outside edge to outside edge of end pontons or floats.

[b] Construction time includes unloading and construction only, does not include preparation of landing sites or construction of access roads.

[c] Capacities are based on loading rafts with center of gravity of loads 6″ *downstream from ¢ of raft and on properly inflated floats.*

[d] One 19′ bridge erection boat per raft, in current of 9 fps.

[e] One 19′ bridge erection boat may be used in currents not over 5 fps. In currents of 5 fps and over, normally two 19′ bridge erection boats may be substituted for one 27′ boat.

[f] Extreme caution is required in loading and unloading vehicles weighing more than 70 tons.

Note. The 19- and 27-foot bridge-erection boats replace the 18- and 25-foot utility boats.

171. Pneumatic Reconnaissance Boat

The pneumatic reconnaissance (fig. 14) boat can be used for stream crossing or far-shore reconnaissance missions, or as an aid in the erection of bridges. It is 7 feet 9 inches long and 3 feet 5 inches wide when inflated. It has two folding paddles. When deflated it is packed in a carrying case 1 foot 9 inches long and 9 inches in diameter (TM 5–271). Three reconnaissance boats are organic to each armored engineer company.

Figure 14. Reconnaissance team crossing the Our River in Luxembourg. (Note rope to facilitate an emergency withdrawal.)

172. Bridge Erection Boat, 27-Foot

a. The 27-foot bridge erection boat (fig. 15) has sufficient power to propel the heaviest types of floating bridge rafts. It is also used for general utility work during bridge construction, and for installing anchorage systems. There is one 27-foot bridge erection boat in the float section of each bridge platoon, or a total of two in the bridge company.

b. Powered by twin gasoline-powered engines, the boat has a two-section aluminum alloy hull, consisting of a bow cargo-carry-

ing section, and a stern section containing the operators' cockpit with the operating controls. The two sections are quickly and easily connected, and can be readily disengaged for transport. The bow section is carried on a standard two-wheel, pole-type, 2½-ton utility trailer towed by a 2½-ton cargo truck. The stern section is carried on the truck body. During transport, each section rests on a special hull-fitting cradle to prevent damage. The sections are loaded and unloaded by a truck crane.

173. Bridge, Floating, Steel, Treadway, Widened

This bridge is found in the bridge company of the armored engineer battalion. It combines the equipage of the steel treadway bridge M2, described in TM 5–272, with the plywood treadways of the standard infantry support raft (see TM 5–271). The 18-ton pneumatic floats support both steel and plywood treadways rigidly joined end-to-end to form three continuous tracks (fig. 16). When conditions prevent the use of floats, the treadways are supported on 50-ton trestles. When inflated, the pneumatic floats are 35 inches in diameter, 38 feet long, and 8 feet 3 inches wide. Steel treadways are 12 feet long and 45½ inches wide. Plywood treadways are 12 feet long and 37 inches wide. One unit of the bridge is 288 feet long, and is organic to each bridge platoon. Capacities of fixed bridges are shown in table I; of floating bridges, in table IV.

174. Infantry Support Raft

(TM 5–271)

a. The infantry support raft is used to ferry vehicles and troops. It can be constructed with equipment organic to the bridge company, but it is seldom if ever employed by the armored division. The raft consists of M2 assault boats paired to form pontons, together with plywood treadways, siderails, siderail clamps, and guy lines. Rafts of various sizes, using from three to seven pontons, can be constructed. Infantry support rafts are propelled by from one to three outboard motors. The number of motors used depends on the size of the raft, but one extra motor is always installed as a spare.

b. The usual infantry support raft is constructed of 6 assault boats connected in pairs to form 3 pontons, and 8 plywood treadways. This raft carries a loaded 2½-ton truck (fig. 17).

c. Characteristics of floating and ferrying equipment are given in table V.

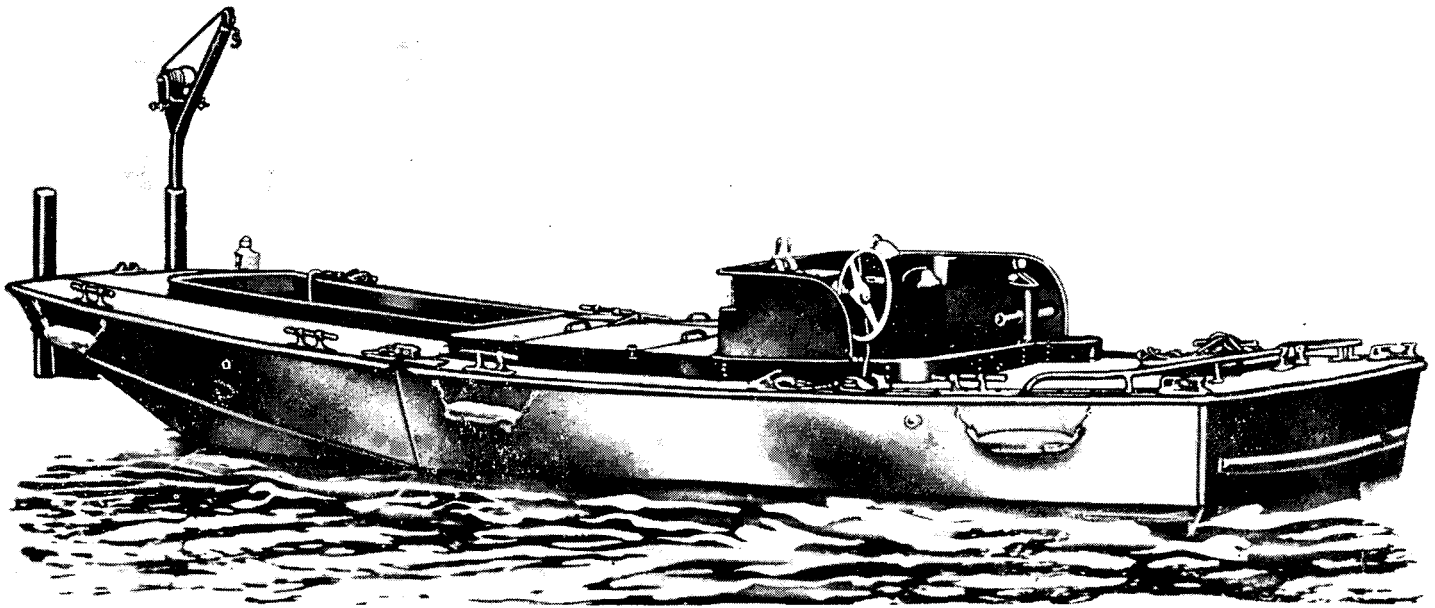


Figure 15. Bridge erection boat.

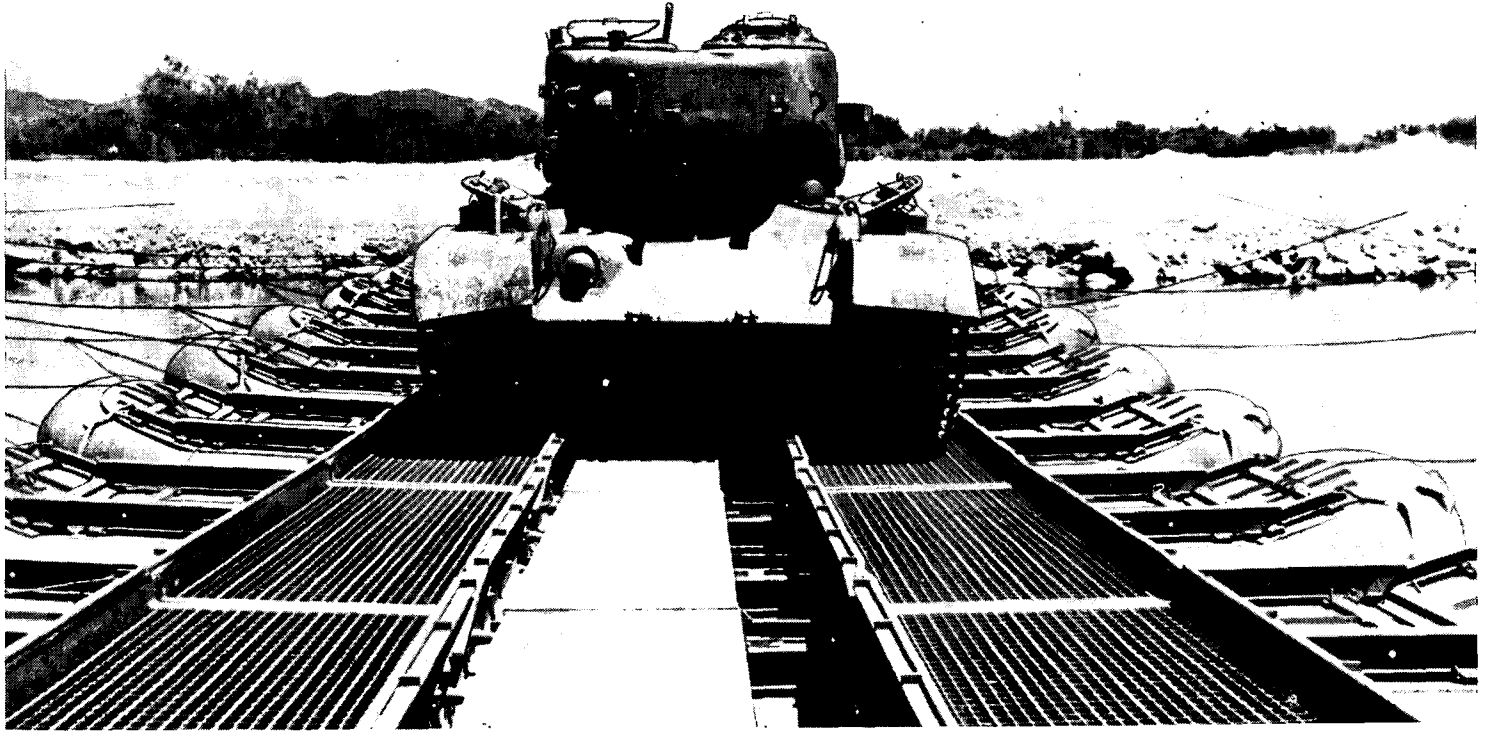


Figure 16. Bridge, floating, steel, treadway, widened.

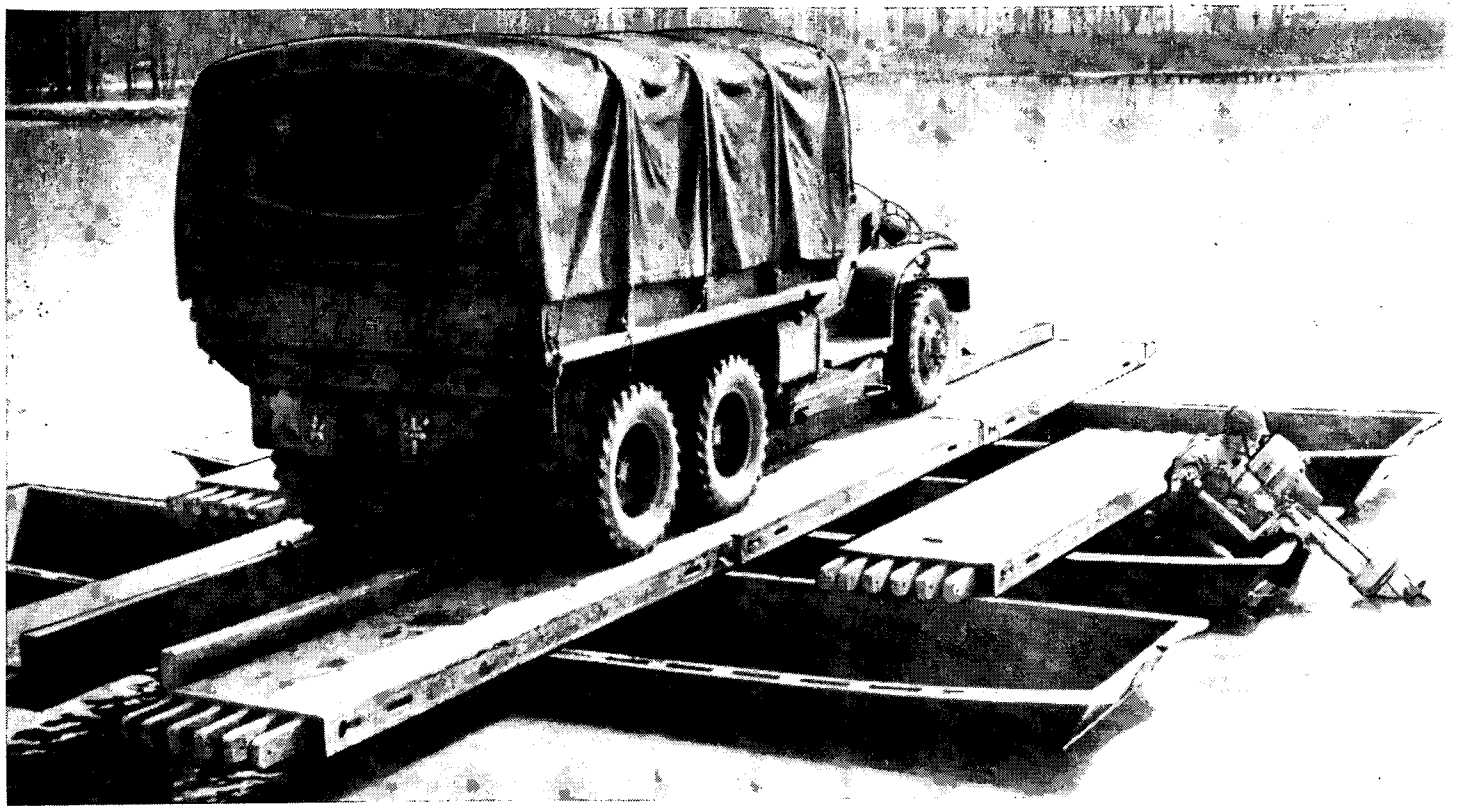


Figure 17. Infantry support raft ferrying 2½-ton truck.

175. References

For technical and tactical procedures and the engineer plan for a deliberate river crossing see FM's 5–132, 31–60, and 100–5.

Section XII. INFANTRY COMBAT

176. General

a. In carrying out their mission, armored engineers occasionally become involved in combat. They may fight to maintain their own security while on the march, in bivouac, or at work. In this type of combat, engineers usually fight in small units of a squad or platoon. In emergencies, combat engineers may be relieved of their engineer work and assigned an armored infantry combat mission. In such a case, the unit staff engineer must advise his commander as to the effect that stopping engineer work will have on the mission of the supported unit. In exploitation missions, and before arrival at the combat command objectives, the combat command commander usually requires the attached engineer company to guard a sector of the perimeter during extensive halts, or at night.

b. The basic tactics of engineers engaged in combat are those of infantry. Armored engineer units have less combat effectiveness than infantry units because their equipment, available supporting weapons and facilities are fewer, and their infantry combat training is not as extensive. For this reason, engineers committed to combat are used primarily in the defense rather than in the offense. To compensate in part for these disadvantages, engineer units are assigned smaller frontages than armored infantry units of corresponding size, and should be provided with fire support from heavy infantry weapons. To insure coordination of supporting fires, engineer units are usually attached to larger armored infantry units.

c. Training of armored engineer units in infantry tactics is based on a plan or SOP covering reorganization for combat. Emphasis is placed on training company officers in the proper employment of supporting mortar and artillery fires. See FM's 7–10, 17–36, 17–40, and 17–42.

d. Reorganization of the armored engineer battalion is normally limited to the battalion less the bridge company. The bridge company, usually is not reorganized. It remains intact, subject to call by the division engineer, for assignment to division engineer missions. Detachments from the headquarters and service company may also be used on engineer missions.

177. General Organization for Combat

a. Modification of Normal Organization. When reorganized for infantry combat, the armored engineer company is capable of furnishing command, rifle, and crew-served weapons elements. (See app. III.) Normal organization is modified to provide effective use and control of crew-served weapons, for security of equipment not needed for combat, and for the special requirements of command, communication, and supply in combat. A standing operating procedure for reorganization is set up by the lettered companies and their platoons to establish definite duties for all personnel.

b. Extent of Reorganization. The extent of reorganization for combat varies with the size of the unit, the time available, and the mission. When engineers are deliberately committed to combat, there is usually time to reorganize before meeting the enemy. Rifle companies are formed, each with a headquarters and three rifle platoons. The platoons consist of a platoon headquarters, three rifle squads, and a weapons squad. When a platoon operating alone becomes involved in combat, however, reorganization must be based on fragmentary orders issued after contact, and must be carried out gradually as opportunity presents itself.

c. Command Echelon. When a reorganized armored engineer unit enters combat, it is divided into forward and rear echelons.

(1) The forward echelon consists of the elements that actually engage in combat, as well as the command, communication, and supply personnel and equipment necessary to control and supply the combat elements. In most situations, light vehicles are needed in the forward echelon for security, communication, ammunition supply, evacuation, and displacement of crew-served weapons.

(2) The rear echelon is commanded by the senior officer or enlisted man present. It consists of personnel and equipment not needed for combat, including kitchen trucks, trucks carrying supplies and equipment and such special vehicles as air compressors, bridge trucks, cranes, tractors, armored utility vehicles, and other heavy equipment. The number of personnel assigned is the minimum necessary to maintain the mobility of the rear echelon, provide for its local security, and perform essential administrative and service functions. Actual composition and location of the rear echelon vary with the situation and size of the unit. In smaller engineer units operating alone, the rear echelon is often close at hand, with only the

vehicle drivers for protection. When engineer units participate in the defense of a position, the rear echelon is usually a considerable distance to the rear, at least beyond the range of enemy light artillery.

d. Engineer Operations. Engineer operations are normally suspended when the unit is committed to combat. Certain types of engineer work, such as water supply, supply of engineer materials, and engineer reconnaissance, may have to be continued by rear echelon personnel.

178. Support Fire Power and Communication Facilities

a. Effective use of engineer units on an infantry combat mission can be increased with additional fire power and means of communication furnished by other units in the combat command. Fire support is best accomplished when armored engineer units are attached to an armored infantry battalion, and employed as part of a combat command. The armored infantry battalion commander is then responsible for furnishing supporting fires. Forward observers from artillery and mortar units join engineer units employed on the front line. Additional antitank protection is also provided by the armored infantry battalion commander.

b. The engineer unit enters the radio net of the unit to which attached, and receives a wire from the switchboard of that unit. Supporting field artillery continues its wire net down to each deployed engineer company. The company communication section lays a line to each platoon, to observation posts, and to outposts. In addition to radio and telephone, messenger, visual, and sound communications are usually essential. Details of signal communication in the armored division are found in FM 17–70.

Section XIII. SPECIAL OPERATIONS

179. General

Engineer responsibilities are basically the same in all operations. Extremes of climate, unusual terrain characteristics and other variable conditions, however, have an important effect upon planning and operations. This section briefly discusses some types of special operations, and the problems which confront an armored engineer battalion in different climates and terrain.

180. Mountain Operations

a. Since the maneuver of armored units is generally restricted in mountainous terrain, the armored division is rarely committed in mountain operations. Similarly, the armored engineer battalion

is poorly equipped for this type of operation, and is seldom trained in it.

b. Road construction and repair, demolitions, and bridging are the principal engineer activities in a mountainous area. In stabilized situations, armored vehicles may be placed in camouflaged positions, and employed to deliver direct fire at extreme ranges. From these positions they can also support the opening phases of an infantry attack by overhead fire. The armored engineer battalion, in such cases, may be called upon to prepare positions, construct access routes and expedient bridging, and supervise camouflage work.

c. Information on mountain operations, training, and the special problems involved is contained in FM's 5–10, 5–132, 70–10, and 100–5.

181. Operations in Snow and Extreme Cold

a. Extreme cold and great quantities of ice and snow create special engineer problems. Snow and ice tend to limit mobility by confinement to route, by natural obstacles, by equipment failures, and by the discomfort and discouragement of troops. In arctic and subarctic regions, routes are more varied in winter, when the ground is frozen, than in summer, which is the period of restricted movement. It is the duty of engineers to maintain the mobility of a command, and to do as much as possible for the comfort of troops. Snow and extreme cold increase the difficulty of engineer tasks, and at the same time demand the utmost economy of tools and material. The main problems in this type of operation are—

(1) Keeping personnel warm.

(2) Moving across ice and snow.

(3) Maintaining supplies and equipment, and especially, keeping equipment in operating condition.

b. For operations in snow and extreme cold, special equipment and techniques are required. See FM's 5–5, 5–10, 31–70, 31–71, 31–72, 31–73, 70–15, 100–5; TM's 5–248, and 5–560, and the special augmentation tables for applicable T/O&E's.

182. Jungle Operations

a. The jungle may be defined as that dense growth, including underbrush, trees, vines, grass, and ferns, found below the timber line in most humid, tropical areas. Jungle climate and terrain emphasize the problems of maintaining engineer equipment, and constructing and maintaining routes of communication.

b. The use of armor in jungle operations is difficult because of the unfavorable terrain, and the lack of roads and space for maneuver. Except along a few existing roads and trails, progress through the thick jungle undergrowth is very slow and laborious. Because of the scarcity and poor quality of roads and trails, the rate of movement of armor and troops often depends upon the ability of engineers to improve or construct roads or trails. Special care must be taken to achieve the best possible drainage. Local expedients are used in construction to a large extent.

c. Watercourses, either relatively flush with the adjacent terrain or following deep, precipitous gulches, further hinder progress. In mountainous terrain adjacent to the jungle, streams that are normally shallow may become raging torrents shortly after a heavy rain. Bridging these water obstacles presents a major problem. Road conditions often prevent bringing up heavy bridging equipment. Fords cannot be depended upon for crossing troops, since rains can make them impassable in a short time. Because of rapid rot and termite danger, a large safety factor should be included in the design and construction of bridges. Bridges are in danger of being washed out by flash floods, and care must be taken to build against this possibility.

d. Defensive positions in the jungle are best laid out as explained in FM 5–15. Barbed wire tied to natural undergrowth and well covered by antipersonnel mines makes a formidable barrier to infantry. The best obstacle to enemy vehicular and tank movement is the jungle itself. Mine warfare is restricted to narrow bands on roads, and occasional minefields in open areas.

e. Bivouac areas with maximum drainage are selected, and should be as free as possible from vermin and insects.

f. Water is usually very abundant, but a special problem is presented by water inhabited by the liver fluke, the cause of schistosomiasis. Bathers, and water supply personnel who handle raw water at the source, are particularly vulnerable to this disease. Untreated water should never be drunk, because of pollution.

g. Camouflage is necessary only when in very close contact with the enemy. Leaves and branches fastened to uniforms, and the darkening of exposed white skin areas, are all that is needed. Jungle camouflage suits are also worn.

h. Maps of jungle areas are scarce, and those available are usually very inaccurate, except for the delineation of coast lines and principal rivers.

i. Communication in the jungle is restricted mostly to messengers and telephone. Even patrols may carry and lay wire. The usefulness of radio is reduced by the screening effect of the jungle.

j. Special problems in troop morale and health arise because of the excessive heat, humidity, prevalence of tropical diseases, and general filth and oppressiveness of the jungle. Maintenance of all types of equipment is also a major problem requiring much time, attention, and effort. Special efforts must be made to counteract these problems if operations in the jungle are to be successful.

k. Additional information on jungle operations is found in FM's 5–5, 5–15, 72–20, 100–5, and TM 5–250.

183. Desert Operations

a. Desert operations are generally the same as those in semiarid or flat terrain with a wide range in temperature. Special engineer problems arise, however, because of the scarcity of water, the lack of natural concealment, increased requirements for maintenance of equipment, and, except in areas of deep sand, unrestricted mobility of tanks and wheeled vehicles.

b. Both air and ground reconnaissance are limited only by enemy activity and darkness. Reconnaissance for water sources and enemy minefields is a major engineer task.

c. There are few roads in the desert to maintain or build. However, if existing roads become cut up from tank movements, road work will be necessary for the passage of wheeled supply vehicles. Maintenance and evacuation of engineer equipment are of major importance.

d. Except in mountainous regions, bridges are rarely necessary. Standard fixed bridging may be used over deep, dry stream beds, and, in the exceptional case, standard floating bridges may be erected over a stream.

e. If a dry stream bed or wadi becomes flooded, troops wait for the flash flood to pass, then cross. If crossing a river becomes necessary, the operation is conducted in the normal manner.

f. Fortifications usually can be bypassed in the desert. Road blocks are ordinarily of little value. Extensive minefields hinder movement and may be used to canalize enemy attacks into areas where other obstacles exist, or where combat is favorable to friendly forces. Control of water sources can do much toward defeating the enemy.

g. The most difficult and most important engineer mission is water supply. This requires continuous and intensive water reconnaissance to locate suitable sources. Water supply personnel must exercise great care in preparing, storing, and issuing water. Transportation of water from water supply points to water distributing points may involve long hauls. A well-guarded pipeline

may be set up and used. The necessity for dispersion of troops requires the use of many distribution points. An adequate reserve of water transportation facilities must be maintained to cover all contingencies. The water supply subsection will normally be reinforced with other troops and vehicles from the engineer battalion. Strict water discipline must be enforced by all echelons.

h. Lack of natural concealment in the desert places special emphasis on camouflage. Protective painting, slow movements, and the covering of all shiny objects are more effective than large camouflage installations. It is impossible to conceal tracks except on rocky ground. To avoid converging tracks, which disclose the locations of such important installations as command posts and water points, vehicles follow designated routes when approaching these localities. Minefield locations are often disclosed by the abrupt turns made by vehicles in avoiding the fields. Proper control of such tracks can be used to deceive enemy air observers.

i. Digging-in of vehicles in bivouac is important. Trucks should be dug in up to the hoods, and tanks up to the top of the tracks. This is especially important when natural cover and concealment are entirely lacking and the bivouac or occupied area is within enemy artillery range, since artillery shell fragments do great damage to tires, motors, bodies, and track suspension. The digging-in of vehicles reduces such damage, except when the enemy is firing proximity-fuzed projectiles. The dozers of the armored engineer battalion and the tank dozers within the tank units are ideally suited for accomplishing digging-in operations in a relatively short time.

j. Additional information on desert operations can be found in FM's 5–31, 31–25, and 100–5.

184. Use of Smoke

a. General. Smoke is sometimes used by engineers to mask operations and to reduce casualties when working in view of the enemy and under conditions which prevent surprise. Smoke is laid either as a screen between the work site and the enemy, or in enemy front-lines and observation posts. Under some conditions of wind and weather, it is possible for engineer troops to lay and maintain an effective smoke screen by using the smoke pots and grenades available through chemical channels. Usually smoke is obtained through the division chemical officer, who plans the smoke mission and makes sufficient smoke available through the use of chemical troops with smoke generators. He may also arrange for smoke operations by aircraft. Engineers may also request that smoke be placed by artillery and mortars. The use of smoke must

be planned carefully, to prevent interference with the operations of friendly troops. When smoke is used, close coordination with adjacent units must be maintained. Skillfully employed, smoke can aid some engineer operations, but if it is used promiscuously and without careful planning, it will be a hindrance. Since small concentrations usually draw enemy fire, smoke should be used only over large areas.

b. Employment.

(1) Smoke may be used to mask such engineer operations as bridge building, river crossing, demolitions, and obstacle clearance, to include the breaching of minefields. It may also be used to blanket enemy supporting fortifications or strong points, while a supported fortification is being reduced.

(2) When engineers are employed as armored infantry they may employ smoke to screen their own movements; to eliminate hostile observation, and to disorganize enemy attacks. Colored smoke is used to indicate targets and to mark front lines for supporting artillery or tactical air force units.

c. For additional information on the use of smoke, see FM's 3–5 and 3–50.

185. Attack of a Fortified Position

a. The attack of a fortified position is conducted by the tank-infantry-artillery-engineer teams. The principal mission of the engineers in the attack of a fortified position is to breach the outer and larger obstacles, such as minefields, wire obstacles, road blocks, and antitank ditches, walls, and traps. Actual reduction of fortifications, and clearing of close-in and minor obstacles is conducted by the tank-infantry-artillery-engineer team but requires closer coordination than the normal operations of the team.

b. Making an effective gap in a strong enemy fortification system requires close coordination among the engineers who make gaps in the line of obstacles, the armored infantry who reduce fortifications, and supporting arms covering the operations with supporting fires. After the fortified line has been breached, rapid construction and maintenance of routes into and through the gap are the primary tasks of the engineers. When ordered by competent authority, engineers render captured forts and pillboxes unsuitable for reoccupation. Additional engineers accompany attack units which follow up the penetration to fan out in pursuit and exploitation in the enemy rear.

c. Before the assault begins, a detailed engineer study is made of the terrain, bridges, and routes of communication, and of such obstacles as minefields, tank traps, and emplacements. From this study, the technique of attack and the requirements for engineer personnel, supplies, and subsequent reconstruction are planned. The information for the study is obtained from ground and air reconnaissance and from a careful study of available maps.

d. The techniques for an operation of this type are specialized, involving teams of combined arms, and close coordination between participating units. Accordingly, complete rehearsals must precede the actual operation.

e. Details of the technique of passing various types of obstacles and conduct of the assault are given in FM's 5–31, 5–32, 31–50, and 100–5, and in TM 5–220.

PART THREE

TRAINING

CHAPTER 9

CONDUCT OF TRAINING

Section I. GENERAL

186. General

This chapter outlines the training required to form an efficient armored engineer battalion. Training is progressive, from basic and advanced individual training through unit, combined, and concurrent training. It must be kept in mind that training never ceases—before, during, and after combat—and that the ultimate goal of all training is success in battle.

187. Responsibility

a. Commanders of all echelons are responsible for training engineer troops assigned or attached to their commands. The engineer battalion commander is responsible for training his battalion, and company commanders are responsible for training their companies. The battalion S3 plans and prepares detailed training schedules for the companies, and makes recommendations to the battalion commander for their application. He also establishes battalion-level schools for officers, noncommissioned officers, and specialists.

b. As a general guide, subject to modification imposed by division training directives, training normally follows the army training programs (ATP's) provided by the Department of the Army. Throughout all training, the application of prior instruction to current training is stressed. Skills once learned must not be allowed to go unused, but must be applied whenever possible, and concurrently with other training.

Section II. TRAINING MANAGEMENT

188. Management

a. Preparation. Every effort must be made to insure that instruction, whether in the classroom, in the field, or on the job,

is carefully prepared and effectively presented. Fundamental training doctrines and principles are outlined in FM's 21–5 and 100–5, and TF 7–295. Detailed instructions for engineer training are presented in field manuals, technical manuals, and army training programs of the engineer (5) series. Special training instructions are published in training circulars and periodic training directives. Department of the Army publications, training films, film strips, and graphic training aids are listed in SR 310–20–3, SR 310–20–4, SR 310–20–5, SR 310–20–6, SR 110–1–1, and FM 21–8. Additional training aids should be prepared as necessary to accomplish the training mission.

b. Equipment. Newly-activated engineer units are normally furnished enough equipment to permit effective training. If the equipment is inadequate, every effort must be made through proper supply channels to obtain whatever is necessary. If needed equipment is still not available, expedients are constructed and used. The training schedule is arranged so that available equipment can be rotated among using units.

c. Training Time. A general breakdown showing total time to be devoted to each subject in a 40 or 48 hour week is given in army training programs. This is the minimum training week. Night operations, bivouacs, and field exercises ordinarily require much additional time. Specific information on the prescribed number of weeks and basic, unit, and combined training periods is published from time to time by the Department of the Army.

d. Training Areas. Although some engineer training can be conducted almost anywhere, a training area should approximate the terrain and climate of the probable theater of operations. Large training areas are necessary, so that training in such subjects as explosives and demolitions can be safely isolated. Training areas should contain a wide variey of soil and terrain conditions; numerous types of roads and bridges; several kinds and sizes of standing timber; lakes and gullies of various types and widths.

e. Supervision. Training requires active personal supervision by higher echelon commanders and their staffs, as well as by the battalion commander and his staff. Each company commander constantly supervises the training of his unit. Administrative personnel must perform their work correctly and promptly, so that details and backlog do not interfere with training. If the battalion commander has a competent administrative staff, he can devote most of his time to the supervision of training, and a minimum to administrative details.

f. Inspections.

(1) Each command level is responsible for the training of its subordinate units. Frequent training inspections are made to check on the progress of training, and to determine what must be stressed to meet required standards. Inspections cover all phases of training. Engineer soldiers are first tested on their military and technical proficiency, and then on their abilities as members of an engineer unit. Actual successful performance by the trainees is the only true test of training.

(2) Inspecting officers must be just, impartial, and constructive in their criticism. They must help and teach, as well as uncover faults. Inspections are timed to avoid interfering with the training program. In this connection, it is desirable for several inspectors to conduct their inspections simultaneously.

Section III. TRAINING PHASES

189. Essential Training Phases

a. Filler personnel assigned to the battalion from reception centers receive basic training applicable to the Army as a whole. The subjects introduced during this phase are common to all privates, regardless of arm or service.

b. The training program for a newly-activated armored engineer battalion is outlined in ATP 5–302 (MOBILIZATION). This program covers the cadre, individual, and unit training phases, from the time the cadre is assembled until the battalion enters field exercises with the armored division.

190. Concurrent Training

a. General. To make training more realistic and effective, arbitrary boundaries between training phases must be avoided. Each subject is related to other subjects, and all subjects are integrated into the team mission. This entails, to some degree, conducting basic and advanced individual, specialist, and unit training concurrently. Reviews of basic subjects are incorporated regularly in the progressive training phases. In many technical exercises, tactical requirements are included, such as providing security for bridge construction projects, and the protection of working parties and obstacles from both ground and air attack. Throughout all phases of training, and particularly during unit training and field exercises, initiative and a sense of responsibility must be developed in officers, noncommissioned officers, and others

who show potential leadership ability. Each commander includes leadership exercises in all training phases, particularly during periods of tactical and technical training. Command is decentralized, and interference with subordinate commanders is kept to a minimum. Everyone is instilled with the importance of making decisions and acting quickly in emergencies not covered by specific orders.

b. Supply Economy. Throughout all training, every opportunity is used to stress supply economy. All engineer personnel must be trained to understand that supply is a crucial factor, particularly in theaters of operations. There must be continuous training and supervision in the conservation, care, and maintenance of supplies and equipment. Definite responsibility is fixed for each item of equipment and supply, in storage or in use. Continued aggressiveness by all commanders and supply personnel is required to stress supply economy and the proper care of government property.

c. Radiological Defense. All military personnel receive orientation in radiological defense. Unit radiological defense specialists receive additional indoctrination and training in unit schools or in radiological defense schools conducted at a higher level. Courses of instruction and training phases are described in SR 350–110–1, and DA Pamphlet 20–110. In addition to required indoctrination courses, unit commanders encourage frank and open discussions of unclassified atomic energy information in troop information programs and similar conferences. This instills the proper respect for atomic weapons, and also refutes irresponsible and misleading rumors.

d. Staff Sections and Administrative Personnel. The engineer battalion must have well-trained and highly-coordinated staff and administrative sections. (See ch. 2 of this manual, and FM 101–5.) Their training, both individually and by sections, is continuous. Additional individual training may be received in special schools conducted by battalion or higher headquarters. Standing operating procedures (SOP's) for these elements, as well as for the operating echelons, are established at the command level, where they can be coordinated with SOP's of higher echelons. Imagination, initiative, realism, and close supervision are necessary in training this type of personnel.

e. Tactical Training. Closely tied-in to all engineer training is progressive instruction in combat principles, applied particularly in conjunction with security on the march, in bivouac, and at work sites. Infantry methods and formations, prescribed in FM's 7–10, 7–17, 7–20, and 21–5, should be used as a guide, but they must be

adapted to engineer strength, armament, and organization. Typical reorganization of armed engineers for combat as infantry is shown in appendix III.

Section IV. COMPANY TRAINING

191. Combat Company Training

a. The company commander plans his training program in accordance with battalion training directives and policies. Proficiency in basic engineering subjects is stressed. Platoon commanders train their own platoons in most subjects, instead of each company officer teaching a separate subject to the entire company. Full advantage is taken of various school quotas for the training of specialists.

b. Company training is of two types. In one type the whole company is engaged on the same project, and all the elements of the company learn to work together as a team. This is practicable for such subjects as infantry combat and construction, particularly expedient road and bridge construction and repairs. In the other type of training the platoons work on different tasks and the command, mess, supply, equipment and maintenance, and communication sections learn how to support these work elements most effectively. This type of company training is practicable for any subject. Both types are vital to the successful operation of the company.

192. Bridge Company Training

The bridge company commander is responsible for the training of his company, and for the training given to individual platoons. Company training is primarily directed toward insuring that all platoon personnel are proficient in loading and unloading, maintaining, and erecting stream-crossing equipment. Training in day and night convoy operation is also best conducted at the company level. Most of the training is concerned with the specialized interests of the platoons and sections.

a. Fixed-Bridge Section Training. Because members of the platoon often work away from the platoon, they must be thoroughly trained in day and night convoy and bridging operations, and in independent missions. Particular emphasis is placed on short fixed-span bridging. The driver of each treadway truck is trained to give technical assistance in the construction of the short fixed bridge with the equipment he carries.

b. Floating-Bridge Section Training. The training of this section generally parallels that of the fixed-bridge section, with

emphasis placed on floating bridges. Members of the section must be able to assist and give technical advice in the erection of the bridging carried on their trucks. The best type of training for this section is to work with other units on bridge training operations, after the members of the float section have mastered bridging techniques, and the proper loading and unloading of their bridge loads.

c. Bridge Platoon Training. Basic training follows the standard pattern. Advanced individual training requires more training time for a bridge platoon than for many other units, because of the heavy individual responsibilities. All members of the platoon must be competent truck drivers, and should be well trained in driver maintenance, emergency repairs, day and night convoy operations, vehicle camouflage, map reading, and driving. In addition, they must be able to fire the .30-caliber and .50-caliber machine guns and the grenade launchers, as well as their individual weapons. They may have to operate a hand radio set, to identify and make elementary repairs to all component parts of the bridge, and to act as bridge guards. Members of each section must know how to load and unload all parts of the bridge section carried by their sections. Key personnel must know the loading plans. All key personnel, all members of the float sections, and as many members of the fixed sections as possible, must be able to operate the outboard motors and assault boats. Motorboat operators must receive sufficient training to make necessary repairs to assault boats. Unit training stresses convoy operations, loading plans, bridge construction and dismantling, and security.

d. Equipment and Maintenance Section Training. Certain basic differences between the motor sections of the lettered companies and the bridge company are reflected in the training given to the equipment section of the bridge company. There are no armored vehicles in the bridge company, which reduces the number of projects that the motor sergeant must supervise. The large number of vehicles needed promptly when a bridge is erected increases the importance of careful scheduling of maintenance and inspection. Convoy discipline in both day and night operations must be highly emphasized in the training of this platoon.

Section V. TRAINING OF OTHER TROOPS IN ENGINEER SUBJECTS

193. Training of Other Arms and Services

a. The engineer battalion is sometimes called upon to conduct a demonstration of mine laying, mine clearing, or bridge construction for nonengineer troops of the division. Such demonstra-

tions are usually staged by squads or platoons. The battalion frequently furnishes individual instructors in engineer subjects for the training of other troops. Subjects taught include mine warfare, use of explosives, camouflage, rigging, field fortifications, and bridge and road building expedients. Instructors are usually selected from the officers or key noncommissioned officers of the lettered companies.

b. When an armored division is activated, individuals and small units receive separate training. Then, when they have become reasonably proficient, combined training starts. The engineer company commander acts as engineer advisor to the combat command commander. When deficiencies in the engineer training of the nonengineer units of the command develop, the company provides additional training. The engineer company commander should insure that commanders of the other units within the combat command understand the mission and capabilities of the armored engineers.

APPENDIX I
REFERENCES

1. Publication Indexes

The following publication indexes should be consulted frequently for latest changes to, or revisions of, the publications listed in this appendix, and for new publications on the subjects covered in this manual:

SR 110–1–1	Index of Army Motion Pictures, Kinescope Recordings, and Film Strips.
SR 310–20–3	Military Publications, Index of Training Publications.
SR 310–20–4	Military Publications, Index of Technical Manuals, Technical Regulations, Technical Bulletins, etc.
SR 310–20–5	Military Publications, Index of Administrative Publications.
SR 310–20–6	Military Publications, Index of Blank Forms and Army Personnel Classification Tests.

2. Special Regulations

SR 55–720–1	Preparation for Oversea Movement of Units (POM).
SR 310–90–1	Military Publications, Distribution and Supply of Publications and Blank Forms.
SR 320–5–1	Dictionary of U.S. Army Terms.
SR 320–50–1	Authorized Abbreviations.
SR 350–110–1	Courses and Programs of Instruction at Army Service Schools.

3. Army Regulations

AR 35–6300	Procurement of Supplies, Services, and Rentals by Organizations Away From Home Stations.
AR 380–5	Safeguarding Military Information.
AR 700–105	Motor Vehicles.
AR 750–5	Maintenance Responsibilities and Shop Operation.

4. Field Manuals

FM 3–5	Characteristics and Employment of Ground Chemical Munitions.
FM 3–50	Smoke-screening Operations.
FM 5–5	Engineer Troops.
FM 5–6	Operations of Engineer Units.
FM 5–10	Routes of Communication.
FM 5–15	Field Fortifications.
FM 5–20	Camouflage, Basic Principles.
FM 5–25	Explosives and Demolitions.
FM 5–32	Land Mine Warfare.
FM 5–34	Engineer Field Data.
FM 5–35	Engineers Reference and Logistical Data.
FM 7–10	Rifle Company, Infantry Regiment.
FM 7–17	The Armored Infantry Company and Battalion.
FM 7–20	Infantry Battalion.
FM 7–24	Communication in the Infantry and Airborne Divisions.
FM 7–30	Service and Medical Companies, Infantry Regiment.
FM 7–40	Infantry Regiment.
FM 9–6	Ordnance Ammunition Service in The Field.
FM 17–32	Tank Platoon and Tank Company.
FM 17–33	Tank Battalion.
FM 17–35	Reconnaissance Battalion, Armored Division.
FM 17–50	Logistics, Armored Division.
FM 17–70	Signal Communication in the Armored Division.
FM 17–100	Armored Division and Combat Command.
FM 20–100	Army Aviation.
FM 21–5	Military Training.
FM 21–8	Military Training Aids.
FM 21–10	Military Sanitation.
FM 21–11	First Aid for Soldiers.
FM 21–25	Elementary Map and Aerial Photograph Reading.
FM 21–26	Advanced Map and Aerial Photograph Reading.
FM 21–30	Military Symbols.
FM 21–40	Defense Against Chemical Attack.
FM 21–105	Engineer Soldier's Handbook.
FM 30–5	(Title classified).

FM 30–15	Examination of Personnel and Documents.
FM 30–21	Aerial Photography, Military Application.
FM 31–20	Operations Against Guerilla Forces.
FM 31–25	Desert Operations.
FM 31–50	Combat in Fortified Areas and Towns.
FM 31–70	Basic Arctic, Manual.
FM 31–71	Operations in the Arctic.
FM 57–30	Airborne Operations.
FM 70–10	Mountain Operations.
FM 72–20	Jungle Warfare.
FM 100–5	Operations.
FM 100–10	Administration.
FM 100–11	FSR Signal Communications Doctrine.
FM 100–20	Command and Employment of Air Power.
FM 101–5	Staff Organization and Procedure.
FM 101–10	Organization, Technical, and Logistical Data.

5. Technical Manuals

TM 5–220	Passage of Obstacles Other than Minefields.
TM 5–223A	Soviet Mine Warfare Equipment.
TM 5–223B	Oriental and European (Except British, French, German, Italian and Soviet) Mine Warfare Equipment.
TM 5–223C	German Mine Warfare Equipment.
TM 5–261K	Bridge Model Training Aid Kit, Floating Bridge M4 and M4A2.
TM 5–271	Light Stream-Crossing Equipage.
TM 5–272	Steel Treadway Bridge, M2.
TM 9–718	Medium Tank M46 and M46A1.
TM 9–722	Tank-Mounting Bulldozer M2.
TM 30–246	Tactical Interpretation of Air Photos.

APPENDIX II

RECOMMENDED OUTLINE FOR AN SOP

(To be used as a check list)

HEADQUARTERS
__th ARMORED ENGINEER BATTALION
APO____ US ARMY

DATE:

STANDING OPERATING PROCEDURE
TABLE OF CONTENTS
(List paragraph numbers and titles)

Section I. GENERAL

1. APPLICATION (To operations, relation to prior SOP's, lower units to conform.)
2. PURPOSE
3. REFERENCES (AR's, SR's, FM's, TM's)
4. RESPONSIBILITY FOR SOP (Preparation, changes, and revisions.)
5. EFFECTIVE DATE

Section II. COMMAND, STAFF, AND LIAISON

6. ORGANIZATION
   a. Normal.
   b. Special internal attachments and organization.
   c. Normal and special, external attachment and support (combat commands, etc.).
7. COMMAND POSTS
   a. Normal location (in relation to next higher headquarters).
   b. Reporting change of location (coordinates and time).
   c. Forward CP's.
      (1) When (situation for which required).
      (2) How (organized).
      (3) Personnel and equipment.
8. STAFF DUTIES
   a. Duties that are special or additional to those in FM's 5–134 and 101–5.

b. Duties of such other important special staff officers as the commander desires to prescribe (par. for each).

9. LIAISON (FM's 5–134 and 101–5)
   a. Duties of liaison officers.
   b. Responsibilities for liaison (with next higher, lower, and adjacent units).

Section III. ADMINISTRATION

10. GENERAL (channels) (TM 12–255)
11. REPORTS
   a. Routine.
   b. Special.
   c. Information concerning submission of reports.
      (1) Title and reports control symbol.
      (2) Form for report.
      (3) Date due.
      (4) Number of copies.
      (5) Negative report required or permissible.
12. PROMOTIONS (Policies)
   a. Officer (SR 140–155–1).
   b. Enlisted.
   c. Battlefield.
13. COURTS-MARTIAL (MCM, US 1951)
   a. Local jurisdiction.
   b. Procedure for submitting cases.
14. MAIL (AR 340–15, SR's 65–160–5, 340–10–1)
   a. Handling of official mail.
   b. Handling of personal mail.
15. LEAVES AND PASSES (AR 600–15)
   a. Policy of command (frequency, conduct, VD policies, etc.).
   b. Authority to grant.
16. JOURNALS AND HISTORY (SR's 345–105–1 and 525–45–1)
   a. Responsibility for unit journal and history.
   b. Maintenance of staff section journals.
17. DISTRIBUTION OF MILITARY PUBLICATIONS (AR 310–90, SR 310–901)
18. HANDLING OF PRISONERS OF WAR (SR 535–10–5)
   a. Reference to FM 27–10.
   b. Special instructions for capturing units.
19. AWARDS AND DECORATIONS (AR 220–315, 600–45, SR 600–45–1)
   a. Channels.

b. Forms.
c. Presentations.

20. ORDERS (FM 101–5)
a. Combat orders.
b. Memoranda of combat orders to S3.

21. BILLETS AND BIVOUACS
a. Billeting policies (occupation and vacating).
b. Billeting party (organization and duties).

Section IV. MOVEMENT

22. GENERAL (Division SOP)

23. MOTOR MOVEMENT (FM 25–10)
a. Preparation of vehicles.
b. Motor marches.
(1) Strip maps.
(2) Route reconnaissance.
(3) Messing and refueling.
(4) Night marches.
(5) Makeup of march units and serials.
(6) Distances to be maintained.
(7) Speeds and rate of march.
(8) Posting of traffic guards during halts.
c. Movement by infiltration.
d. Maintenance on marches and movements.
e. Conduct of personnel during movement.

24. VEHICLE AND EQUIPMENT REGULATIONS
a. Motor pool (AR 700–105).
(1) Dispatch.
(2) Service.
(3) Maintenance.
b. Regulations for administrative vehicles.

25. RAIL MOVEMENTS (AR's 55–130, 55–135, 55–145)
a. Action by S1.
(1) Movement policy.
(2) Troop lists.
(3) Designation of movement control personnel.
b. Action by S2.
(1) Railroad reconnaissance report.
(2) Security.
c. Action by S3.
(1) Determine rolling-stock requirements.
(2) Coordinate loading plans.
(3) Prepare loading schedule and designate areas.

d. Action by S4.
(1) Initiate transportation requests.
(2) Troop and guard mess.
(3) Procurement of blocking dunnage.
(4) Prepare shipping documents.

26. AIR MOVEMENTS (FM 31–40, 57–30, 100–20)
a. Action by S1 (same as par. 25*a*).
b. Action by S2.
Security.
c. Action by S3.
(1) Determine type of craft required.
(2) Coordinate loading plans.
(3) Prepare loading schedule and designate loading areas.
(4) Instruct all personnel in air transportability technique.
d. Action by S4.
(1) Initiate transportation requests.
(2) Assure availability of tie-down devices and material.
(3) Furnish weights of equipment for loading computation.
(4) Arrange for any necessary Air Force supplies.
(5) Prepare shipping documents.

27. WATER MOVEMENT (AR's 55–305, 55–390, SR 55–720–1)
a. Action by S1 (same as par. 25*a*).
b. Action by S2 (same as par. 25*b*).
c. Action by S3.
(1) Determine shipping required.
(2) Coordinate loading plans.
(3) Prepare loading schedule and designate loading areas.
d. Action by S4.
(1) Initiate transportation requests.
(2) Provide for troop mess.
(3) Prepare shipping documents.

28. FOOT MARCHES (FM's 7–10, 7–20, 7–40)

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30. SECURITY DURING MOVEMENT
a. Air guard.
b. Manning of vehicular weapons.
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(1) Air.
(2) Mechanized.
(3) Chemical, bacteriological, and radiological (CBR).

31. SECURITY IN BIVOUAC (FM's 5–20C, 5–31, 7–10, 31–20)
   a. Camouflage.
   b. Mines and booby traps.
   c. Placement of weapons for—
      (1) Air attack.
      (2) Mechanized attack.
      (3) Troops and guerillas.
   d. Joint security.
   e. Security plans.
   f. Sentry posts and outposts.
32. REAR AREA OBSERVATION (FM's 7–10, 7–20)
   a. Formation of rear area observation groups.
   b. Selection of rear area observation posts.
   c. Twenty-four hour manning of posts.
   d. Observation of rear area, when required.
   e. Communications for observation posts.
33. SECURITY OF WORKING PARTIES
   a. Responsibility.
   b. Camouflage of equipment.
   c. Combat readiness.
34. SECURITY WARNING SIGNALS
   a. Air attack.
   b. Airborne attack.
   c. Mechanized attack.
   d. Gas attack.
   e. Chemical, bacteriological, and radiological (CBR) attack.
35. FIRE SAFETY AND FIREFIGHTING (SR 420–510–10)
   a. Plan (general).
   b. Fire personnel and duties.
   c. Safety rules (motor pools, kitchens, etc.).
36. ALERT PLANS
   a. Unit plans.
   b. Alert roster.
   c. Armament and equipment.
   d. Phase system for alert warnings.

Section VI. COMMUNICATION

37. TYPES USED
38. COMMUNICATION BETWEEN UNITS (TM's 11–462, 24–210; FM's 24–22, 24–23; and SR 105–20–3)
   a. Radio.
   b. Telephone (TM 24–210).

c. Responsibility for installation.
d. Visual (FM 24–22).

39. COMMUNICATION PROCEDURES
a. Radiotelephone voice procedure (CCEP 3–2).
b. Signal security.
c. Citation of SOI and SSI of higher headquarters.

40. MAINTENANCE RESPONSIBILITIES OF COMMUNICATION OFFICER (FM's 17–70, 100–11)

Section VII. RECONNAISSANCE, INTELLIGENCE, AND COUNTERINTELLIGENCE

41. RECONNAISSANCE
a. Reconnaissance a continuing function.
b. Essential elements of engineer information.

42. ENGINEER INTELLIGENCE
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c. Dissemination.

43. COMBAT INTELLIGENCE (FM 30–5)
a. Definition of "spot report."
b. "Spot reports" required.
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(2) Marked changes in enemy disposition or situation.
(3) Attack by armored, aircraft, or airborne forces.
(4) New units identified.
(5) Enemy strength, composition, and movement.
(6) Location of enemy installations.
(7) Use of chemicals or new weapons.
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g. Secrecy discipline.
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(1) By unit.
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d. Responsibility for attached units.

46. WATER
a. Authorized sources.
b. Purification by expedient methods.
c. Water economy.

47. CLASS II AND IV
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b. Pick-up procedures.
c. Salvage turn-in procedures.
d. Droppage by "Battle Loss Certificate."

48. CLASS III
a. Method of supply.
b. Fuel sources.

49. CLASS V
a. Method of requisitioning.
b. Forms used and certificates required.
c. Basic load.
d. Salvage.

50. MAINTENANCE OF VEHICLES AND EQUIPMENT (TM 37–2810)
a. Echelons of maintenance.
b. Maintenance officers' responsibilities.
c. Forms used.
d. Priorities.

51. REPAIR PARTS
a. Method of requisitioning; engineer, and ordnance.
b. Maintenance of stock levels.
c. Inspections for maintenance and stock levels.
d. Parts and equipment records.

52. EVACUATION OF VEHICLES AND EQUIPMENT
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53. PURCHASE AND PROCUREMENT (SR 715–5–20, AR 35–6300)
a. Designation and duties of P&C Officer.
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56. SUPPLY (TM's 9–1900, 9–2010)
    a. Ammunition.
    b. Unit Trains.
57. COMMUNICATION
58. MEDICAL EVACUATION (FM's 8–35, 17–50)
59. STATEMENT OF EFFECT ON NORMAL MISSION
    BY ORDER OF LT. COLONEL SPRING

/s/ HAROLD M. BROWN
/t/ HAROLD M. BROWN
Capt CE
Adjutant

OFFICIAL:
/s/ HAROLD M. BROWN
/t/ HAROLD M. BROWN
Capt CE Adjutant

DISTRIBUTION:

RECOMMENDED ANNEXES

1. Wearing of the uniform.
2. Signs.
3. Format for "Daily Engineer Situation Report."
4. Billets and bivouacs.
5. Destruction of classified documents.
6. Staff section SOP's.
7. Headquarters, headquarters and service company loading plan.
8. Reorganization for combat.
9. Alert plan.
10. March table.
11. Battalion radio net.

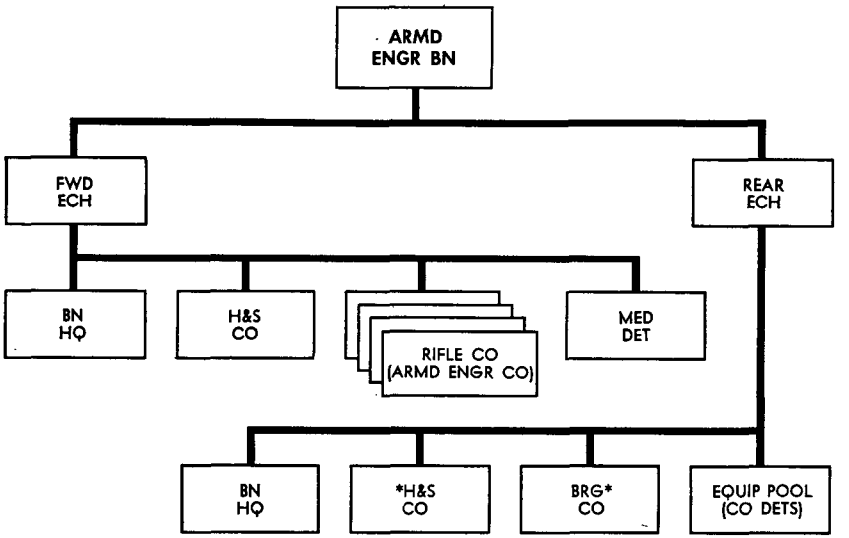
APPENDIX III

REORGANIZATION OF THE ARMORED ENGINEER BATTALION FOR COMBAT AS INFANTRY

Section I. GENERAL

1. Purpose

This appendix is intended to serve as a guide for the reorganization of armored engineer units when the tactical situation requires their use in combat as infantry. It includes the formation of a forward echelon of personnel, weapons, and equipment for combat employment as provisional infantry units. The rear echelon is organized to support the combat employment of the forward echelon (fig. 18). It may in addition be required to provide elements of the battalion for normal engineer missions. This will especially be true of the bridge company, which will usually be retained on engineer tasks. The reorganization plan is intended to make the most effective use of the available personnel, equipment, and organic weapons. It is based on T/O&E 5–215, 26 December 1952. The plan may be modified if necessary to meet



*Note: The bridge company and some personnel of the headquarters and service company may be used by the division engineer on engineer tasks elsewhere.

Figure 18. Typical reorganization of armored engineer battalion for combat as infantry.

the actual tactical situation and the current unit strength and weapons available. Any variation caused by reduced strength should, if practicable, be at the expense of the rear echelon. For additional information, see paragraphs 176–178.

2. Alert

All personnel of the battalion are alerted as soon as orders are received from higher headquarters to commit the battalion as infantry. Upon receipt of such an alert, the reorganization plan becomes effective. Each company commander prepares, in advance, an SOP designed to effect the reorganization of his company as required in the battalion SOP.

3. Weapons

All weapons, both individual and crew-served, organic to the units of the battalion, are utilized. In such an emergency, it cannot be assumed that additional weapons from other components of the armored division will be available for issue.

4. Engineer Work

When committed as infantry, alternate plans may be adopted for engineer work of the battalion, either that engineer work be wholly suspended or that it be greatly curtailed.

a. (1) If engineer work is suspended, all vehicles not needed for combat and all maintenance and engineer equipment are placed in a rear echelon pool guarded by a security detachment.

(2) Even when engineer work is suspended, the battalion continues to be responsible for supplying the division with water, maps, and engineer items.

b. If engineer work is continued, although drastically curtailed, it would usually be assigned to the bridge company and to detachments from the headquarters and service company. If more engineer work is deemed essential, a lettered company may be required. See paragraph 177*d*.

5. Training

During all combat training exercises, the plan for reorganization of the battalion should be carried out fully.

6. Support by Rear Echelon

The battalion combat support system includes a battalion vehicle park, a battalion ammunition supply point, and battalion aid station (see fig. 19). General supply and motor maintenance activities are carried on in the battalion motor park area, which is located in a protected area to the rear, preferably near a road

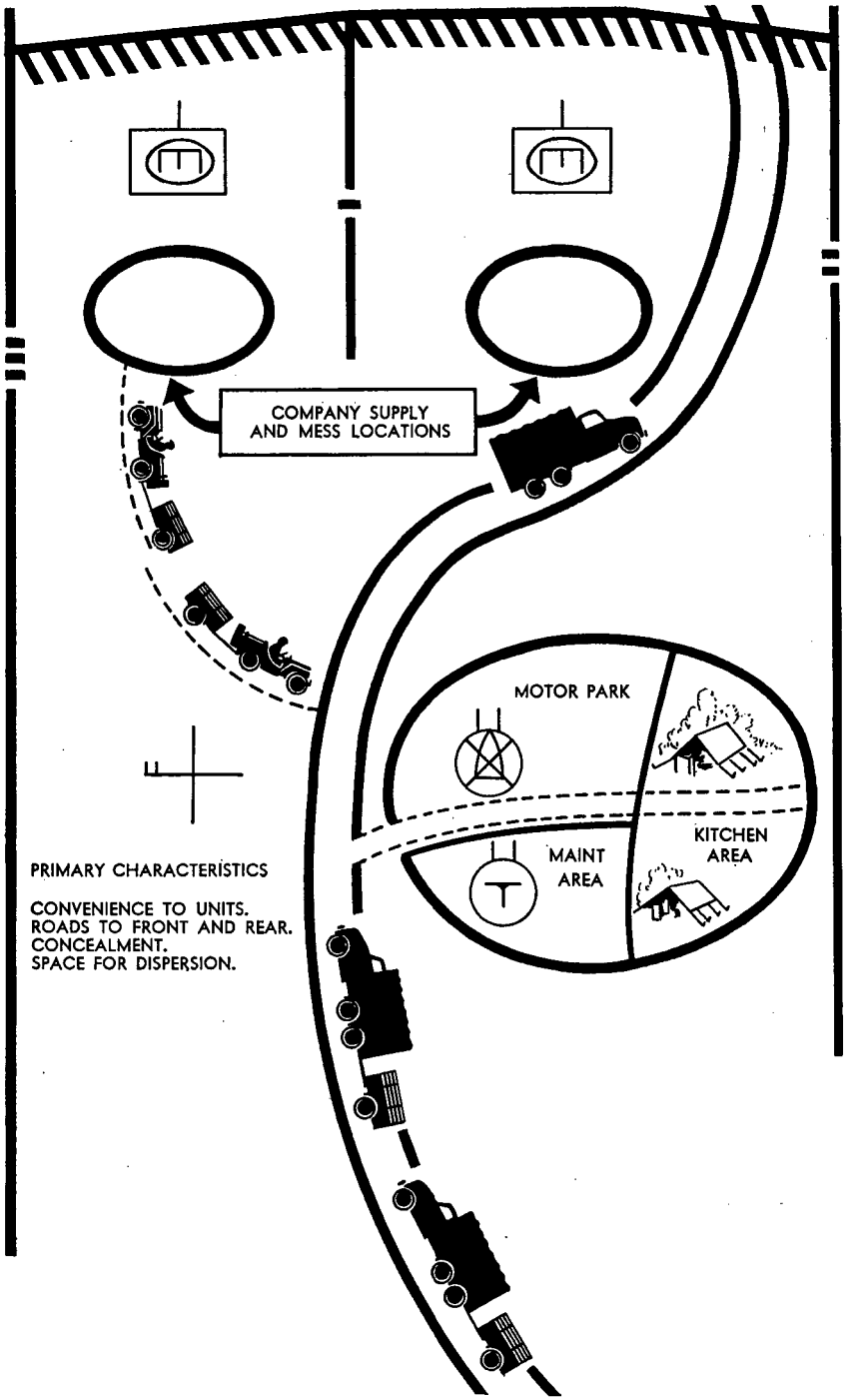


Figure 19. General location of rear echelon supply and combat support installations.

net. The battalion ammunition supply point should, if possible, be located near a road from the rear and at or near routes leading forward to the companies, concealed from hostile ground and air observation, defilated from enemy flat-trajectory fires, and with ample vehicle turn-arounds. It may be located in the battalion motor park area. The medical detachment sets up a battalion aid station where the sick and wounded of the battalion are treated pending their return to duty or evacuation to a medical collecting station. The aid station should be located in rear of where the greatest number of casualties are expected, with cover and concealment, with ambulance turn-around and road net, and away from prominent terrain features or military targets. See also paragraph 177*c*.

7. Fire Support from Other Units

See paragraph 178*a*.

8. Communications

See paragraph 178*b*.

9. Individual Equipment

Each individual prepares full field equipment for retention. All other individual equipment is stored with rear echelon units until released by the battalion commander.

Section II. REORGANIZATION OF THE BATTALION HEADQUARTERS, AND THE HEADQUARTERS AND SERVICE COMPANY

10. Battalion Headquarters

a. Forward Echelon. The forward echelon (fig. 20) of battalion headquarters is under the immediate control of the battalion commander. It operates the battalion command post, providing the staff agencies necessary for the conduct of tactical operations.

b. Rear Echelon. Members of the battalion staff sections not required for the forward echelon become part of the rear echelon. The rear echelon is commanded by the senior officer present and is composed of the elements shown in figure 20.

11. Headquarters and Service Company

a. Forward Echelon. The forward echelon of headquarters and service company consists of the enlisted men necessary to establish, operate, and defend the battalion command post, including its communications and intelligence facilities, and thus provide the battalion commander with the means to control the tactical operations of his battalion. The forward echelon of headquarters and service company is commanded by the company commander. He

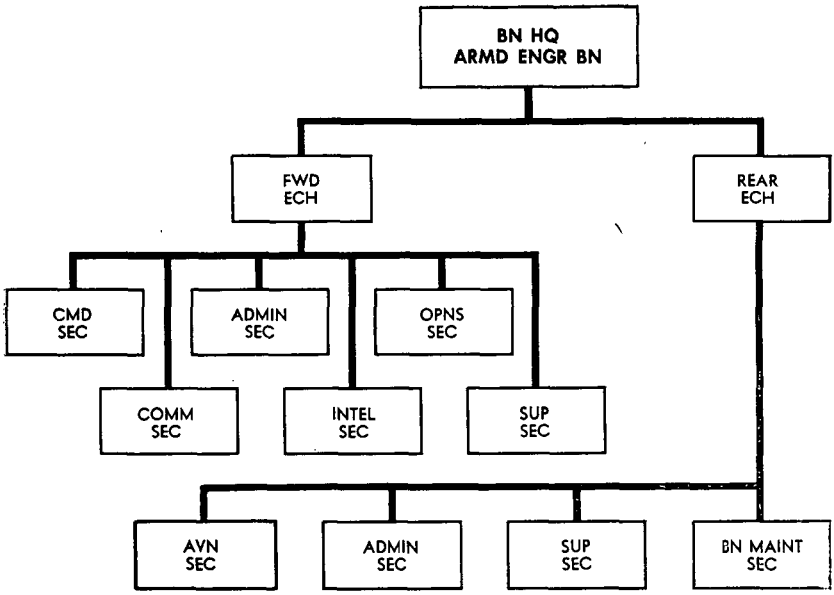


Figure 20. Reorganization for infantry combat of armored engineer battalion headquarters.

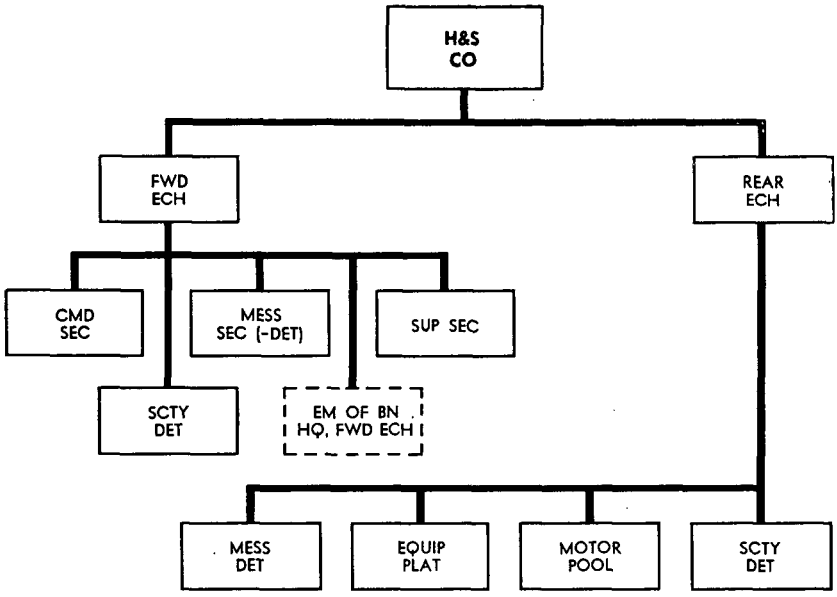


Figure 21. Reorganization of headquarters and service company when the armored engineer battalion is reorganized for combat as infantry.

establishes mess facilities for the command post personnel. He provides a limited number of personnel and weapons for the emergency defense of the command post against enemy attack.

b. Rear Echelon. The rear echelon of headquarters and service company is located with the battalion rear echelon. It is composed of all elements of the company not operating in support of the forward echelon (fig. 21). See paragraph 6 of this appendix. Available personnel of the company may be detached and used by the division engineer on an engineer task elsewhere.

Section III. REORGANIZATION OF THE ENGINEER COMBAT COMPANY

12. Forward Echelon

The forward echelon of company headquarters consists of officers and enlisted personnel organized into command, supply, and communications sections, and the medical aid men. This headquarters directs the employment of the three rifle platoons, each of which contains a platoon headquarters, a weapons squad, and three rifle squads. The company commander decides whether armored utility vehicles are to be used in the forward echelon.

13. Rear Echelon

The headquarters of the company rear echelon is under control of the unit administrator. It consists of the warrant officer and men from company headquarters and the combat platoons. The rear echelon headquarters includes an administrative section, supply section, mess section, and equipment and maintenance section. It operates the company ammunition supply point, which is located as close behind the company as vehicles can be moved without being destroyed by enemy fire. The company mess location is as near as practicable to the personnel of the company; it is usually in the company supply area. The rear echelon also includes any company personnel and equipment not a part of the forward echelon.

Section IV. REORGANIZATION OF ENGINEER COMBAT PLATOON

14. Forward Echelon

The forward echelon of the platoon consists of the platoon headquarters, three rifle squads, and a weapons squad (fig. 22). Platoon headquarters consists of the platoon leader, platoon sergeant, a messenger, and a radio operator who also drives a ¼-ton truck. The platoon sergeant acts also as squad leader of the weapons squad which consists of two three-man machine gun crews and a two-man rocket launcher team. The two .30-caliber machine

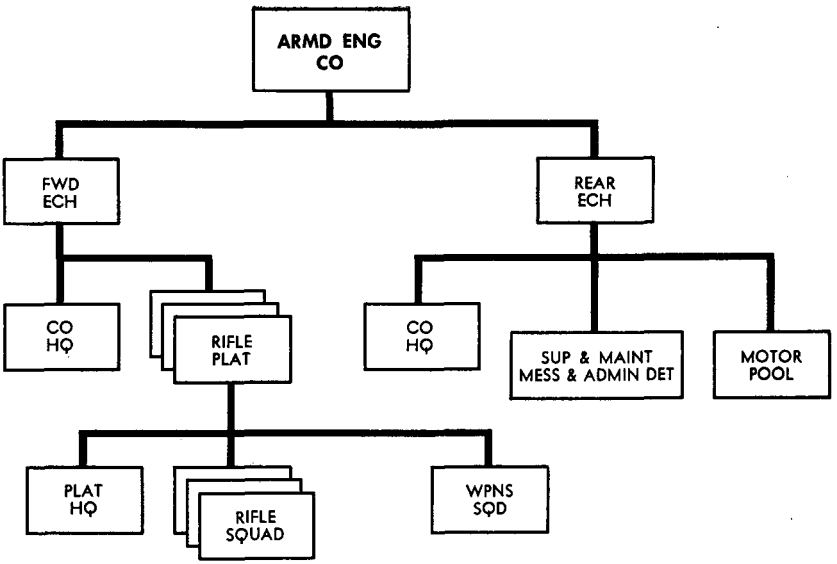


Figure 22. Reorganization of armored engineer company for infantry combat.

guns are organic platoon weapons; the rocket launcher is from the third squad. The platoons with armored utility vehicles are notified by the company commander whether armored utility vehicles are to be used.

15. Rear Echelon

The drivers of platoon vehicles not required by the forward echelon are assigned with their vehicles to the company rear echelon. The platoon toolroom keeper takes charge of the platoon rear echelon, and reports all vehicles to the commander of the company rear echelon.

Section V. REORGANIZATION OF ARMORED ENGINEER SQUAD

16. Forward Echelon

Three men from each of two squads are released to platoon headquarters for organization of a provisional weapons squad. Two men from the remaining squad are released to platoon headquarters to be used as rocket launcher team. A third man from the latter squad is also assigned to platoon headquarters to act as messenger. The remaining seven men in each squad are organized into rifle squads as shown in figure 23. Since the third squad, which furnishes the rocket launcher team to the platoon weapons squad, will have no launcher, it is organized with a squad leader, assistant squad leader, and five riflemen.

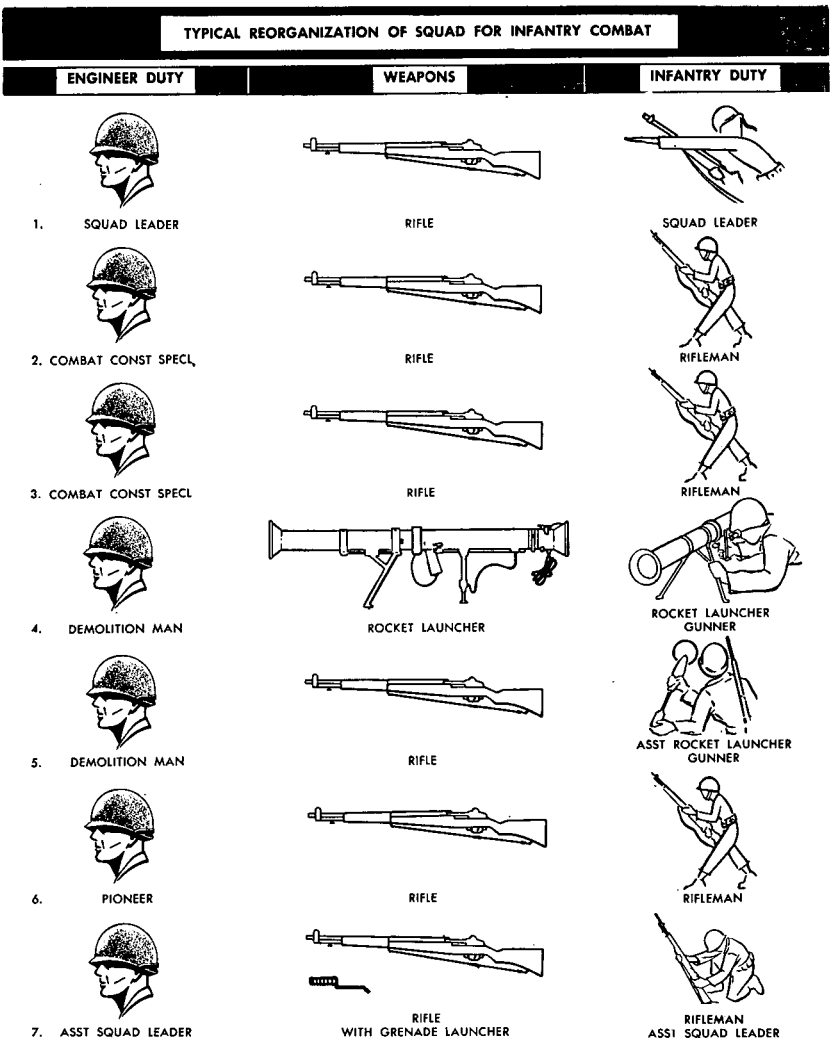


Figure 23. Reorganization of armored engineer squad for infantry combat.

Note. The above assignments of engineer specialists to specific combat assignments are illustrative only. All men should be trained to use each weapon.

17. Rear Echelon

The armored utility vehicle, if not required in the forward echelon, or the dump truck, if any, and individual equipment of each squad are assigned to the company rear echelon, including one driver per vehicle.

APPENDIX IV

GUIDE FOR DUAL-ROLE PROBLEMS

1. The staff and command functions of the division engineer require that he employ a method of operation in combat that will solve two special problems. Subject to the commander's policies, he will have to decide how and where to spend his time and effort to achieve maximum results, and also where to establish his personal headquarters.

2. A method of operation that will solve these dual-role problems in all instances cannot be stated. Factors such as abilities, personalities, and the tactical situation will require that methods vary among divisions and, from time to time, within any one division. Each division engineer will have to develop the best method as the result of his experience in a particular division.

3. Until experience or the division commander's policies indicate otherwise, a general guide for the division engineer is as follows:

a. He should consider that his staff and command responsibilities are of equal importance.

b. He should perform his duties at division and battalion headquarters in a manner that will permit him to spend the greater amount of his time on visits, inspections, and reconnaissance.

c. A location for the division engineer's personal headquarters, that will be proper under all conditions, cannot be prescribed. However, the division engineer should consider that the normal location of his personal headquarters is with his battalion headquarters. When conditions are not normal, he should locate his headquarters where he can best influence the action favorably with engineer means.

4. The following factors may restrict the division engineer in his efforts to follow the general guide outlined above:

a. Incomplete understanding between the division engineer and the division commander and staff.

b. Unfamiliarity of the division commander, division staff officers, and combat commanders with the capabilities and limitations of engineer troops.

c. A fast-moving tactical situation.

d. Intensive planning activity at division headquarters.

e. Attachment of engineer units to combat commands.

f. Poor communications in the battalion, or between division and battalion headquarters.

g. Attachment of corps engineer troops to the division.

5. To diminish the effects of the above factors and to help him in solving his dual-role problems the division engineer should—

a. Always strive to improve his own efficiency, and the efficiency of his staff and the engineer company commanders.

b. Establish and maintain good relations with the division commander, division staff officers, and combat command commanders.

c. Insure that the division commander, his staff, and combat command commanders are familiar with the problems and capabilities of engineer troops.

d. Select an assistant division engineer with such ability and personality that he will secure the division staff's confidence.

e. Delegate routine duties to the assistant division engineer and the battalion staff.

f. Coordinate the engineer effort for the division and its subordinate elements to provide the most effective support consistent with the mission.

g. Insure that the best possible communications are maintained within the battalion, and between division and battalion headquarters.

h. Maintain the battalion headquarters as near as possible to division headquarters.

i. Establish procedures that will result in the continuous exchange of information between himself, the battalion executive officer, and the assistant division engineer.

j. Insure that the assistant division engineer and the executive officer are always able to contact him.

k. Avoid the attachment of corps engineer troops to the division when a support assignment will serve equally well.

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