

THE GENERAL BOARD
United States Forces, European Theater

EQUIPMENT FOR ENGINEER UNITS

MISSION: Prepare Report on the Requirements for Engineer Equipment and Make Appropriate Recommendations Where Changes or Additions Are Necessary.

The General Board was established by General Orders 128, Headquarters European Theater of Operations, US Army, dated 17 June 1945, as amended by General Orders 182, dated 7 August 1945 and General Orders 312 dated 20 November 1945, Headquarters United States Forces, European Theater, to prepare a factual analysis of the strategy, tactics, and administration employed by the United States forces in the European Theater.

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APO 408

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CHAPTER 1

INTRODUCTION

1. Purpose. The purpose of this study is to determine the requirements for new types of equipment for engineer units, the necessity for modification of presently authorized equipment, and necessary changes in existing bases of issue.

2. Scope.

a. The study includes those items for which a need has been indicated by a considerable number of engineer units, and the presence of which would have added materially to the successful prosecution of engineer work. Because of its importance the item of generators for medical units is included.

b. As this study has been limited to discussion of the needs of the engineer component of a field army, no consideration has been given to the equipment of engineer aviation units, since those units were assigned integrally to the air force in the European Theater. It is assumed that necessary recommendations for modification of aviation engineer equipment will be submitted through air force channels and that coordination of suggested changes on items of common use will be undertaken by the War Department.

REQUIREMENTS AND RECOMMENDATIONS

3. Engineer Combat Reconnaissance Vehicle.

a. Reasons Required. To insure expeditious accomplishment of engineer ground reconnaissance missions by providing adequate protection for reconnaissance personnel.^{1,2,3} No armored vehicles are presently authorized the engineer unit of an infantry division.⁴

b. Special Characteristics.¹ A vehicle should be provided that is similar to, and the latest development of, the standard ordnance car, armored, utility, M-38, in body design and armament, with full track, increased bottom armor, and proper armament. The space inside the hull should be adequate to provide for a crew of four and for storage of various items of engineer equipment.

c. Recommended Basis of Issue. Eight per engineer regiment of the infantry division. Four per engineer regiment of the armored division.

4. Engineer Armored Squad Vehicle.

a. Reasons Required. To provide suitable armored transportation for personnel of the armored engineer regiment engaged in the accomplishment of engineer tasks.^{1,2} In the past the engineers were forced to use the infantry personnel carrier which accommodates only twelve men with no space for tools and equipment. The vehicle provided an engineer squad must be large enough to accommodate the equipment as well as the personnel of the squad.

b. Special Characteristics.¹ A vehicle should be designed on the basic components of the light tank but with power plant located in the forward part of the hull, seats for the driver and assistant driver on either side of the power plant, and a hull door in the rear. The performance of the vehicle should be not less than, and in general superior to, that of the light tank. Sufficient space should be provided to accommodate fourteen men and basic engineer tools and equipment. The vehicle should be equipped with proper armament.

c. Recommended Basis of Issue. The vehicle should be issued to the armored engineer regiment on the basis of one per squad in the line companies, and in addition, should replace all present command and maintenance vehicles.

5. Engineer Special Armored Vehicle (Engineer Tank).

a. Reasons Required. To assure expeditious accomplishment of engineer work of a special nature by providing adequate protection for engineer personnel. Experiences have proved the necessity for this type of vehicle.^{2,5,6,7,8,9,10}

b. Special Characteristics.^{2,10} This should be a tank of the medium series currently used by the armored units, modified to adapt it to engineer requirements, and equipped with proper armament. The modification should consist of installing a hull door in each side and in the rear and change of the gun and mount and ammunition racks to provide stowage space for demolitions and other engineer equipment. It should have sufficient space inside the hull to accommodate a crew of six men and 1,200 pounds of explosives, and should have the following

attachments:

- (1) A launcher for projecting a 30-pound demolition charge up to a distance of 300 yards and designed so the charges can be loaded and fired from within the tank without exposing the crew.
- (2) A dozer blade for repairing bridge approaches and for clearing paths through rubble and natural and artificial obstacles, as well as for other missions requiring a dozer under fire. The dozer should have attachments for placing prepared charges against walls and other obstacles, and consideration should be given to providing for attachment of removable teeth to the blade for use in mine removal in soft ground and sand.
- (3) Attachments to permit it to mount, when required for special missions, a short span bridge and a rocket launcher.
- (4) Snake pushing and pulling attachments.

c. Recommended Basis of Issue. Four per engineer regiment of the infantry division. Four per engineer regiment of the armored division.

6. Engineer Reconnaissance Planes.

a. Reasons Required. To provide an expeditious means of securing urgent engineer intelligence at army and corps level.^{2,5,11} In the past the engineers have had to depend on the use of air force and artillery planes for the accomplishment of reconnaissance missions.⁶ In many cases the delays caused by higher priority missions and lack of planes resulted in important engineer information being obtained too late to be of value. For units such as engineer combat regiments which are moving constantly, a type of helicopter would be preferable, as minimum size landing areas would have to be provided.

b. Special Characteristics.¹

- (1) Liaison-type plane: Should be equipped with suitable vertical and oblique camera mounts and with seats for pilot and engineer observer.
- (2) Helicopter-type aircraft: Should be equipped similarly.

c. Recommended Basis of Issue.

- (1) Liaison-type: Two per headquarters, engineer command, corps.
- (2) Helicopter-type: Two per engineer combat regiment, corps.

7. Dump Trucks.

a. Reasons Required. To provide sufficient dump trucks in engineer units for the expeditious accomplishment of certain engineer missions.⁶ There was a demonstrated critical shortage of dump trucks in the European Theater for road construction and maintenance, and

for the hauling of certain types of equipment, such as panel bridging, which can be unloaded rapidly, without damage, by means of the dumping mechanism.^{12,13} As large a potential reserve of dump trucks as possible must be assured. This can be done by substituting, in all engineer units, 2½-ton dump trucks for 2½-ton cargo trucks.^{13,14}

b. Special Characteristics. None.

c. Recommended Basis of Issue. Substitution of 2½-ton dump trucks for 2½-ton cargo trucks in all engineer units.

8. Rock Crusher.

a. Reasons Required.² To provide rock crushing facilities for use of army and corps engineer units. Experience has shown the need for this equipment in the operation of quarries and gravel pits.⁶ It is too cumbersome to be made organic in engineer combat units, but provisions for such facilities are made in the separate study on engineer organization which recommends the formation of the engineer depot battalion in the army echelon.¹⁵

b. Special Characteristics. None.

c. Recommended Basis of Issue. Eight rock crusher teams with equipment as shown in T/O & E 5-500 should be integrated into headquarters and service company, engineer depot battalion.¹⁵

9. Truck Mounted Cranes.

a. Reasons Required. To provide additional means of moving engineer material and supplies. Experience has shown that the amount of lifting equipment in engineer units is inadequate to handle the enormous demands placed upon it.⁶ This condition existed in depot units and in combat units engaged in engineer operations such as bridging.^{14,16}

b. Special Characteristics. None.

c. Recommended Basis of Issue. In addition to present authorizations for other engineer units:

H/S Company, Engineer Depot Bn	10	3/4	Cu Yd	Truck Mounted Cranes	
Engineer Dump Operating Company	1	3/8	"	"	"
Divisional Engineer Units					
Per H/S Company	1	3/8	"	"	"
Per Line Company	1	3/8	"	"	"
Non-divisional Engineer Combat Bns					
Per H/S Company	1	3/8	"	"	"
Per Line Company	1	3/8	"	"	"

10. Multiprinter (Mapping Equipment).

a. Reasons Required.¹ To provide the necessary means for the expeditious processing of negatives in the quantities desired.

b. Special Characteristics.¹ The multiprinter for reproduction of photo prints to various scales should have the following characteristics:

- (1) This unit should be installed in two 2½-ton van type trucks for mobility.

- (2) The process for initial exposure through developing, washing, drying and cutting to size should be automatic, but should permit the processes of developing and drying to be carried on simultaneously.
- (3) It should be possible for either roll aerial negatives or cut process negatives, such as full tone photographs of mosaics, to be contact printed or enlarged up to an 18 inch by 18 inch size.
- (4) The unit should permit the correction of exposure after the first print and not be wasteful of paper.
- (5) The output, unless stopped to change negatives, should be approximately 600 copies per hour, using roll photographic paper up to 20 inches in width and 600 feet in length.
- (6) No appreciable loss of detail should be evident.
- (7) Provision should be made for superimposing grids at either 1:20,000 or 1:25,000 scale with numerals, in the automatic process.

c. Recommended Basis of Issue. Two per reproduction company of engineer topographic battalion. If aerial photograph reproduction units are authorized at corps and army level, multiprinters in sufficient quantity will be required.¹⁷

11. Lithographic Presses.

a. Reasons Required. To provide engineer topographic units with adequate means of lithographic printing to supply the needs of field armies. The present Harris 20 inch by 22½ inch press is too small to meet operational requirements.¹

b. Special Characteristics. None. A press equivalent to the present Wobendorfer 22 inch by 29 inch is considered adequate, but should be improved to provide better registration.^{1,18}

c. Recommended Basis of Issue. Substitution of a 22 inch by 29 inch press for the Harris 20 inch by 22½ inch press in topographic units.¹⁸

12. Water Hauling Equipment.

a. Reasons Required.¹ Water hauling equipment is required to transport water to using units efficiently and with the least possible danger of contamination. The use of special purpose water hauling equipment has several advantages over the alternative method of transporting water in five gallon cans on general purpose vehicles:

- (1) Less exposure of water to sources of contamination.
- (2) The greater unit capacity of the special purpose equipment which results in a smaller number of vehicles required for transportation of water and therefore a decreased traffic load on the supply roads.
- (3) The greater speed with which the special purpose water hauling equipment can be loaded and unloaded

and the resultant decrease in traffic congestion at water points.

b. Special Characteristics. None.

c. Basis of Issue.

(1) Water supply company: No change.

(2) All units of all branches: One 250-gallon, 2-wheel, trailer mounted, water tank per company mess.¹⁹

13. Purification Equipment (Unit), Diatomite Filter. This equipment was not used in the European Theater. From published characteristics of this type filter, it is believed that it would have satisfied existing requirements better than the present type.⁶ No changes in basis of issue are necessary.

14. Purification Equipment (Bulk), Line Chlorinator.

a. Reasons Required. In the European Theater there were numerous instances in which towns and industrial installations were occupied by troops and in which the water supply installations were found to be largely intact, except for chlorination facilities. In such cases it would often have been possible to chlorinate the entire system by means of a line chlorinator.¹¹

b. Special Characteristics. The line chlorinator should be of the measuring pump type suitable for feeding turbid solutions of calcium hypochlorite in quantities sufficient to chlorinate water at rates of from two to 100 gallons per minute. It should be hydraulically operated, fully automatic, with adjustable proportioning feed, and designed for installation in pressure pipe systems from 3/4 inch to 6 inch diameter. The automatic portable hypochlorination unit presently authorized engineer water supply companies appears adequate except that it should be enclosed in an insulated cabinet to prevent freezing.¹¹

c. Basis of Issue.

(1) Water supply company: No change.

(2) Should be stocked in army depots as class IV items.

15. Dollies for Transporting Storm and Assault Boats.

a. Reasons Required.¹¹ To provide other than manual means for transport of storm and assault boats from final assembly areas to launching sites. The present system of hand carrying is undesirable as it results in the men becoming fatigued at a time when subsequent operations will require maximum physical efficiency. Carts for this purpose were improvised by Seventh US Army. They were adaptations of the carts used for transporting the 4.2 inch chemical mortar.

b. Special Characteristics. The transportation developed for this purpose should be light, simple and easily transportable.

c. Recommended Basis of Issue. Should not be organic, but available as class IV items of engineer equipment.

16. Generator Sets for Hospitals.

a. Reasons Required. To provide adequate electric power for the efficient operation of medical units and installations. Experience has demonstrated that the generator capacity provided is insufficient to meet the power requirements.¹¹

b. Special Characteristics.^{11,20} Generators should be trailer mounted and diesel engine driven. A more dependable $1\frac{1}{2}$ kw generator should be developed. All generator sets should include appropriate electric lighting accessories.

c. Recommended Basis of Issue. ¹¹

Unit	T/O & E	Generators			
		Present Authorization		Recommended Authorization	
		Number	KW	Number	KW
Evacuation Hospital, Semi-mobile	8-581	3	3	2	15
Evacuation Hospital	8-580	2	15	2	30
Medical Clearing Co, Separate	8-28	1	$1\frac{1}{2}$	1	3
Hq & Hq Det, Medical Group	8-22	0	-	1	$1\frac{1}{2}$
Hq & Hq Det, Medical Bn	8-26	0	-	1	$1\frac{1}{2}$
Medical Collecting Co, Separate	8-29	0	-	1	$1\frac{1}{2}$
General Hospital	8-550	0	-	4	30
Station Hospital	8-560	0	-	4	30

17. D-7 Angledozer.

a. Reasons Required. The R-4 angledozer proved to be too light for the work that had to be accomplished.²¹ Equipment with at least the capacity of the D-7 must be provided.²²

b. Special Characteristics. Experience may prove the tilt-dozer to be preferable to the angledozer.⁶

c. Recommended Basis of Issue. Substitution of the D-7 angledozer, with suitable trailer and prime mover, for the R-4 angledozer in all engineer units.

18. Communication Equipment.

a. Reasons Required.²¹ Operations in the European Theater proved engineer communications to be inadequate. A much greater use was made of the telephone than had been anticipated. Radio equipment was unsatisfactory both in quantity and range. A separate study of engineer communications at corps level has been made, and the basis of issue shown below is in accordance with the communications system proposed therein.²³

b. Special Characteristics. All authorized equipment should conform to the most advanced developments in the communication field.

Corps Engineer Units	Telephone Equipment			Radio Sets	
	Tele-phones	Switch-board	Miles of wire	Continuous Wave*	Frequency Modulated**
Engineer Combat Bn					
Hq & H/S Co	7	18-drop	12	3	3
Each Line Co	2	--	8	1	5
Panel Bridge Transport Co	2	--	4	1	4
Combat Equipment Co	4	--	4	1	4
Ponton Bridge Co, Pneumatic Float	10	6-drop	7	1	4
Engineer Combat Regiment	10	24-drop	25	3	-
Hq & Hq Co, Engineer Command, Corps	15	30-drop	30	2	-
Topographic Co	2	--	4	-	-
Maintenance Co	2	--	4	1	4

Notes:

* Range: Key - 50 miles; Voice - 20 miles.

** Range: 5 - 7 Miles.

19. Mechanical Mud Removal Apparatus.

a. Reasons Required.² To provide an efficient and expeditious means of removing mud from hard surface roads. Such roads predominated in the European Theater. In wet weather the mud tracked onto these roads made them very slippery. Driving became hazardous and mobility incident to operations was seriously curtailed.

b. Special Characteristics. A mechanical device for mud removal should be developed, based on some applicable principle, such as the truck-mounted, rotary brush used for city street cleaning.

c. Recommended Basis of Issue. Should be stocked in engineer depots as class IV items.

20. Bridging.¹ Items of bridging equipment have been considered, but are not included in this report, since new items to replace those found deficient are either available or the study for their replacement is well under way.

21. Organic Transportation of Engineer Units.

a. Discussion. The question of changes in organic transportation in engineer units has been carefully considered. The limited source material available showed a wide divergence of opinion among headquarters and individuals with respect to desired changes.^{2, 7, 8, 21, 22} The opinions expressed were, of necessity, based on the unsound premise of maintaining the status quo in engineer organizations. They did not take into consideration the following factors which cannot be evaluated at present, but which eventually will affect materially the allocation of transportation equipment: changes in sizes of units, changes in quantities and types of personnel-carrying special equipment, elimination of some existing units and organization of new types, changes in unit missions and assignments, and changes in

carrying capacity of vehicles as the result of developments in the transportation field. Neither sufficient factual data nor the necessary experienced personnel for interview have been available to enable the Engineer Section of the General Board, United States Forces, European Theater, to arrive at sound conclusions or make adequate detailed recommendations regarding transportation in engineer units.

b. Recommendations. It is recommended that the organic transportation of engineer units be reviewed by the War Department.

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