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# Calculation of Manpower Requirements For Vehicle Maintenance at U.S. Army Installation Directorates of Engineering and Housing, Based on Air Force, Navy, and Army Reserves Staffing Techniques

by  
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Manpower requirements for the vehicle maintenance section under the Director of Engineering and Housing (DEH) at U.S. Army installations are determined by applying a staffing formula which was developed for activities performing maintenance on real property. However, a staffing method specifically for Army DEH vehicle maintenance sections is needed. Since there is much demand for revised guidance, the Office of the Chief of Engineers suggested investigating staffing techniques already in use.

As part of research to develop recommendations for the future revision of the Army's staffing guide for vehicle maintenance shops, the work reported here compared various staffing procedures used for vehicle maintenance in the U.S. Air Force, U.S. Navy, and U.S. Army Reserve with those used in the U.S. Army, and developed a proposed staffing guide based on the comparison.

Based on the results of the research, the proposed staffing guide should provide an average representation of the quantity and types of personnel the DEH vehicle maintenance sections need. Future revisions to the staffing guide should reflect actual Army historical data and improved efficiency of the shops due to the advent of the commercial activities (CA) process.

Recommended improvements to the guide include developing and implementing a computer-based management system with bar coded entry in the DEH vehicle maintenance sections and investigating the possibility of using fuel consumption as a utilization rate for some types of vehicles.

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Recommended improvements to the guide include developing and implementing a computer-based management system with bar coded entry in the DEH vehicle maintenance sections and investigating the possibility of using fuel consumption as a utilization rate for some types of vehicles.

*Keywords: ground vehicles; maintenance management; staffing levels; maintenance personnel; personnel management; military facilities; (KT)*

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## FOREWORD

This investigation was performed for the U.S. Army Engineering and Housing Support Center (USAEHSC) under Project 4A162731AT41, "Military Facilities Engineering Technology"; Task Area C, "Operations Management and Repair"; Work Unit 056, "DEH Equipment Maintenance Management." The USAEHSC Technical Monitor was Mr. Walter Seip, CEHSC-FB-I.

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# **CALCULATION OF MANPOWER REQUIREMENTS FOR VEHICLE MAINTENANCE AT U.S. ARMY INSTALLATION DIRECTORATES OF ENGINEERING AND HOUSING, BASED ON AIR FORCE, NAVY, AND ARMY RESERVES STAFFING TECHNIQUES**

## **1 INTRODUCTION**

### **Background**

Manpower requirements for the vehicle maintenance section\* under the Directorate of Engineering and Housing (DEH) at U.S. Army installations are determined by applying a staffing formula which was developed for activities performing maintenance on real property. However, a staffing method specifically for Army DEH vehicle maintenance sections is needed. To be most effective, the system would incorporate the age, type, and amount of use of vehicles in a fleet to determine manpower requirements.

The Deputy Chief of Staff for Personnel Initiative MS3 (Manpower Staffing Standards System) called for an investigation of staffing techniques in the Army. Although this study is in progress, it will not address vehicle maintenance staffing until the early 1990s. Since there is much demand for revised guidance now, the Office of the Chief of Engineers suggested the idea of investigating staffing techniques already in use. A comparison with the methods used by the U.S. Air Force (USAF), U.S. Navy (USN), and U.S. Army Reserves (USAR) was proposed as an important step in determining manpower requirements for the DEH's vehicle maintenance section. This comparison could help the U.S. Army determine whether its maintenance shops are overstaffed, understaffed, or on target with respect to the other organizations' shops. The results will form the basis for establishing a revised staffing guide and a Most Efficient Organization (MEO) for commercial activities (CA) reviews. Previous U.S. Army Construction Engineering Research Laboratory (USA-CERL) work on this subject was reported in USA-CERL Interim Report P-86/09.<sup>1</sup>

### **Objective**

The objective of this research is to develop recommendations for the future revision of the Army's staffing guide for vehicle maintenance shops. The objective of this report was to compare various staffing procedures used for vehicle maintenance in the USAF, USN, and USAR with those used in the U.S. Army and to present a proposed staffing guide, based on the comparison.

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\*Vehicle maintenance sections are staffed in the same way as portable equipment item maintenance shops. The term "vehicle maintenance" is used in this report for convenience to mean both sections.

<sup>1</sup>Patrick J. Tanner and Kaan R. Aytogu, *Vehicle Maintenance Manpower Requirements for Army Installation Directorates of Engineering and Housing Based on Air Force, Navy, and Army Reserves Staffing Techniques*, USA-CERL Interim Report P-86/09/ADA172181 (U.S. Army Construction Engineering Research Laboratory [USA-CERL], 1986).

## **Approach**

To accurately compare the staffing techniques, each technique was used to determine staffing needed to meet the Army workload, then compared with existing Army staffing levels. Comparisons were based on authorized staffing. Furthermore, input requirements were determined for staffing techniques used by the USAF, USN, and USAR. After the input requirements were determined, the necessary data were collected from the DEH vehicle maintenance organizations at various Army installations. The data were stored in a microcomputer and computations were made to determine manpower requirements using USAF, USAR, and USN staffing methods. Some adjustment factors were developed to permit meaningful comparisons between the U.S. Army staffing methods and those of the other services. A staffing comparison with the National Guard's technique was not possible since it is under revision.

## **Scope**

This report makes the step from comparison to recommendation by presenting a proposed staffing guide. However, it does not address task scheduling, which is an operational problem that depends on maintenance requirements, available work force, and existing workload.

## **Mode of Technology Transfer**

The recommendations generated by this research will be used by the Office of the Deputy Chief of Staff for Personnel (DCSPER) in developing an interim staffing guide that can be implemented at the DEH vehicle maintenance shops. The recommended staffing levels will also be helpful to installation DEHs required to establish an MEO for CA reviews. The staffing guide is to be used in generating staffing levels of mechanics and overhead positions.

## 2 STAFFING METHODS AND APPLICATION FOR DEHs

For the analysis, manpower requirement techniques used by the USAF, USN, and USAR were reviewed. Adjustment factors were developed for computing the manpower requirements for DEH maintenance shops based on these methods.

### U.S. Air Force Staffing Method

The USAF uses Air Force Manpower Standards (AFMS) to compute the manpower required to accomplish the tasks described in Appendices A through D for varying levels of workload in vehicle maintenance. The AFMS apply to all active USAF installations performing all levels of maintenance on vehicles. These standards are based on the concept of vehicle equivalents: a "vehicle equivalent" is defined as a unit of measure that denotes the maintenance complexity of a vehicle or equipment item based on the maintenance complexity of a sedan (general-purpose and commercial design).

The USAF uses four different standards to compute manpower requirements. These standards apply to specific manpower requirements:

1. AFMS 4241--mechanics
2. AFMS 4240A--maintenance controllers
3. AFMS 4240B--materiel controllers
4. AFMS 4240--maintenance managers.

In addition to these four AFMS, the USAF uses another standard--Tactical Air Command Manpower Standard (TACMS) 4241 for groups that perform organizational maintenance\* only.

#### AFMS 4241--Mechanics

AFMS 4241 computes the number of mechanics needed to perform the tasks described in Appendix A. This standard authorizes a 100 percent in-house capability for vehicle maintenance operations. For installations that use contract services in part to maintain vehicles, contract personnel equivalents are determined to adjust in-house manpower requirements. Contract man-year equivalents are calculated based on the same specifications, level of effort, and performance standards indicated in the statement of work. After they are determined, these equivalents are subtracted from the total manpower requirements. AFMS 4241 uses the Standard Man-hour Equation (Equation 1) to compute the total required man-hours per month:

$$Y_1 = 470.8 + 4.6571X_1 \quad [\text{Eq 1}]$$

where  $Y_1$  is the total required man-hours per month and  $X_1$  is the total number of vehicle equivalents for vehicles and equipment items assigned to the maintenance shop, regardless of owning command or using organization.

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\*A definition of this term appears in the glossary at the end of this report.

To use the Standard Man-hour Equation, first list all assigned vehicles and equipment items. Then, using Air Force Manual (AFM) 77-310, Volume 2,<sup>2</sup> determine the vehicle equivalents for each vehicle and equipment item. Multiply the quantity by the vehicle equivalent for each vehicle and equipment item to yield the total number of vehicle equivalents ( $X_1$ ). Once  $X_1$  is known, compute the total required man-hours ( $Y_1$ ) using Equation 1. Next, compute the number of required manpower spaces ( $Z_1$ ) by dividing the total man-hours per month by a man-hour availability factor (MAF). This factor is obtained from the definition of available time in Equation 2:

$$\text{Available time} = \text{Assigned time} - \text{Nonavailable time} \quad [\text{Eq 2}]$$

Tables 1 and 2 show calculations for monthly assigned and nonavailable time, respectively, for USAF military personnel. The USAF uses 167.929 hr/month as assigned time and 22.7618 hr/month as nonavailable time for its personnel. Based on these values and Equation 2, the available time is 145.1672 hr/month. This value is used as the MAF in calculating  $Z_1$ . For civilian personnel, a figure of 145 hr/month is used as the MAF. Table 3 shows the calculation for civilian MAF. Once the MAF is defined, the number of manpower spaces ( $Z_1$ ) can be computed using Equation 3:

$$Z_1 = \frac{Y_1}{\text{MAF}} \quad [\text{Eq 3}]$$

Table 1

Calculation of Monthly Assigned Time for USAF Military Personnel\*

Variables	Time
Calendar days/mo	+ 30.4375**
Holidays/mo	- 0.7500
Relief days/mo	- 8.6964***
Total assigned days/mo	20.9911
Total times hr/day	x 8.0
Total assigned hr/mo	167.9290

\*Based on CONUS/OS data for a normal 40-hr work week (8 hr/day, 5 days/wk).

\*\*Calculated as 365.25 days/yr ÷ 12 mo.

\*\*\*Calculated as 365.25 days/yr ÷ 7 days/wk = 52.178571 wk/yr ÷ 12 mo = 4.348214 wk/mo x 2 relief days/wk = 8.6964284 relief days/mo.

<sup>2</sup>Air Force Manual (AFM) 77-310, Vol 2, *Vehicle Maintenance Management* (15 March 1983).

Table 2

Calculation of Monthly Nonavailable Time for USAF Military Personnel\*

Nonavailable Activities		Days
<u>Leave</u>		
In unit	9.7330	
Subtotal		9.7330
<u>PCS Related</u>		
In-out processing	0.6366	
Family settlement	1.0090	
Subtotal		1.6456
<u>Medical</u>		
Pregnancy related	0.1745	
Inpatient and quarters	1.6695	
Outpatient	0.4711	
Physicals	0.1996	
Dental	0.3966	
Subtotal		2.9113
<u>Organizational Duties</u>		
Commander's call	0.9123	
Physical fitness testing	0.1152	
CBPO (counseling/reviews)	0.7670	
Boards and councils	0.4224	
Subtotal		2.2169
<u>Additional Duties</u>		
Board or group rep	0.1592	
Program mgr/monitor/coordinator	0.2762	
Details	0.7594	
Sponsor/intro	0.2190	
Subtotal		1.4138

\*Based on CONUS data for a normal 40-hr work week.

**Table 2 (Cont'd)**

<b>Nonavailable Activities</b>	<b>Days</b>
<b><u>Education and Training</u></b>	
Testing	0.4300
Ancillary training	1.5208
PME	1.1385
AFIT/AU	0.2845
TDY tech training survey	0.2526
Subtotal	4.4714
<b><u>Social Actions</u></b>	
Drug rehabilitation	0.0111
Alcohol rehabilitation	0.0227
Subtotal	0.0338
<b><u>Miscellaneous</u></b>	
Voting	0.0691
Court	0.2287
AWOL/deserter	0.0382
Subtotal	0.3360
<b><u>Overseas Only</u></b>	
Car shipment	n/a
Non-PCS-related household move	n/a
Subtotal	n/a
<b>TOTAL NONAVAILABLE TIME</b>	<b>22.7618</b>

Table 3

Calculation of Man-hour Availability Factor  
for Civilian Personnel

Congressionally mandated workyear	=	2087 hr/yr
Less holidays (10 x 8 hr = 80 hr)	=	2007 hr/yr
÷ 12 months	=	167.25 hr/month
Total Nonavailable Civilian Time	=	22.25 hr/month
Monthly Man-hour Availability Factor	=	167.25 - 22.25 = 145.0 hr

Computing DEH Needs Using AFMS 4241

When manpower requirements were calculated for Army maintenance organizations using the USAF technique, the civilian MAF (145 hr/month) was used instead of the military value (145.1672 hr/month). Also, since the AFMS are designed based on USAF maintenance organizations doing all levels of maintenance, an adjustment factor,  $a_1$ , was developed for Army maintenance organizations that perform both organizational- and intermediate-level\* maintenance. Finally, another adjustment factor,  $a_2$ , was needed for the required manpower strength to authorized manpower strength. Appendix E describes how  $a_1$  and  $a_2$  were derived. After these adjustments, the number of manpower spaces needed for Army maintenance organizations based on the USAF method is:

$$Z_{1 \text{ adjusted}} = (a_1)(a_2) \frac{Y_1}{\text{MAF}_{\text{civilian}}} \quad [\text{Eq 4}]$$

Equation 4 gives the number of authorized manpower spaces for DEH organizations performing organizational- and intermediate-level maintenance. Once the number of manpower spaces is known, the distribution of skills among those spaces is obtained from the tables in Appendix F.

AFMS 4240A—Maintenance Controllers

AFMS 4240A computes the number of maintenance control personnel needed to perform the tasks described in Appendix B. It uses Equation 5 to compute total required man-hours per month ( $Y_2$ ):

$$Y_2 = \frac{X_2}{0.4908 + 0.0001127X_2} \quad [\text{Eq 5}]$$

\*This term is defined in the glossary.

where  $X_2$  is the average monthly number of vehicles and equipment items assigned to the maintenance shop. Once  $Y_2$  is computed, the number of manpower spaces ( $Z_2$ ) can be calculated using Equation 6:

$$Z_2 = \frac{Y_2}{MAF} \quad [\text{Eq 6}]$$

#### Computing DEH Needs Using AFMS 4240A

Using the civilian MAF of 145 hr/month, and adjustment factors  $a_1$  and  $a_2$ , Equation 6 takes the final form:

$$Z_{2 \text{ adjusted}} = (a_1)(a_2) \frac{Y_2}{MAF_{\text{civilian}}} \quad [\text{Eq 7}]$$

Equation 7 yields the number of authorized manpower spaces for maintenance control personnel such as vehicle maintenance control and analysis technicians, vehicle maintenance control and analysis specialists, administration specialists, and apprentice administration specialists. Once the number of manpower spaces is known, the distribution of skills among manpower spaces is found using the tables in Appendix G.

#### AFMS 4240B—Materiel Controllers

AFMS 4240B computes the number of materiel control personnel needed to perform the tasks described in Appendix C. It uses Equation 8 to compute total required man-hours per month:

$$Y_3 = \frac{X_2}{0.8886 + 0.0005856X_2} \quad [\text{Eq 8}]$$

where  $Y_3$  is the total required man-hours per month and  $X_2$  is the average monthly number of vehicles and equipment items assigned. After  $Y_3$  is determined, the number of manpower spaces ( $Z_3$ ) can be computed using Equation 9:

$$Z_3 = \frac{Y_3}{MAF} \quad [\text{Eq 9}]$$

#### Computing DEH Needs Using AFMS 4240B

Using the civilian MAF of 145 hr/month and adjustment factors  $a_1$  and  $a_2$ , Equation 9 takes the following form:

$$Z_{3 \text{ adjusted}} = (a_1)(a_2) \frac{Y_3}{MAF_{\text{civilian}}} \quad [\text{Eq 10}]$$

Equation 10 yields the number of authorized manpower spaces for materiel control personnel such as inventory management supervisors, inventory management specialists, and apprentice inventory management specialists. Once the number of manpower spaces is known, the distribution of skills among manpower spaces is located using the tables in Appendix H.

### AFMS 4240—Maintenance Managers

AFMS 4240 computes the number of management personnel needed to perform the tasks described in Appendix D. It uses Equation 11 to compute total required man-hours per month:

$$Y_4 = 87.38 + 1.536 (Z_{2 \text{ adjusted}} + Z_{3 \text{ adjusted}}) + 0.08106X_2 \quad [\text{Eq 11}]$$

where  $Y_4$  is the total required man-hours per month,  $Z_{2 \text{ adjusted}}$  is the number of manpower spaces computed by AFMS 4240A,  $Z_{3 \text{ adjusted}}$  is the number of manpower spaces computed by AFMS 4240B, and  $X_2$  is the average monthly number of vehicles and equipment items. After computing  $Y_4$ , compute the number of manpower spaces  $Z_4$  using Equation 12:

$$Z_4 = \frac{Y_4}{\text{MAF}} \quad [\text{Eq 12}]$$

### Computing the DEH Needs Using AFMS 4240

Using the civilian MAF of 145 hr/month and adjustment factors  $a_1$  and  $a_2$ , Equation 12 takes the following form:

$$Z_{4 \text{ adjusted}} = (a_1)(a_2) \frac{Y_4}{\text{MAF}_{\text{civilian}}} \quad [\text{Eq 13}]$$

Equation 13 yields the number of authorized manpower spaces for maintenance management personnel such as vehicle maintenance manager, vehicle maintenance superintendent, and supervisor. Once the adjusted  $Z_4$  is computed, determine staffing using the manpower table in Appendix I.

Next, with the calculated values for the adjusted  $Z_1$ ,  $Z_2$ ,  $Z_3$ ,  $Z_4$ , find the total number of authorized manpower spaces for Army maintenance organizations by using Equation 14:

$$Z = Z_{1 \text{ adjusted}} + Z_{2 \text{ adjusted}} + Z_{3 \text{ adjusted}} + Z_{4 \text{ adjusted}} \quad [\text{Eq 14}]$$

At this stage, a comparison can be made between staffing based on the USAF method and authorized U.S. Army manpower strength. This comparison will show if the U.S. Army maintenance organizations which perform organizational- and intermediate-level maintenance are overstaffed, understaffed, or on target based on the USAF method. Chapter 3 gives the results of this comparison.

## TACMS 4241

This standard computes the number of manpower spaces needed to perform the tasks described in Appendix J for organizational maintenance shops. It applies only to organizational maintenance shops responsible for maintaining vehicles and equipment items for which the total vehicle equivalents are less than 2942.2. Appendix K explains in detail how the total vehicle equivalent limit of 2942.2 was developed. TACMS 4241 uses Equation 15 to determine total required man-hours per month:

$$Y_5 = 338.4 + 4.702X_3 \quad [\text{Eq 15}]$$

where  $Y_5$  is the total required man-hours per month and  $X_3$  is the total number of vehicle equivalents for assigned vehicles and equipment items.

### Computing DEH Needs Using TACMS 4241

Determine  $Y_5$  using the civilian MAF of 145 and adjustment factors  $a_1$  and  $a_2$ , then compute the authorized manpower spaces using Equation 16:

$$Z_{5 \text{ adjusted}} = (a_1)(a_2) \frac{Y_5}{\text{MAF}_{\text{civilian}}} \quad [\text{Eq 16}]$$

Equation 16 yields the number of authorized manpower spaces such as vehicle maintenance superintendents, vehicle maintenance supervisors, vehicle maintenance mechanics, vehicle maintenance control and analysis technicians, inventory management specialists, and apprentice vehicle maintenance mechanics. After computing the number of manpower spaces, find the distribution of skills among spaces using the tables in Appendix L.

### U.S. Navy Staffing Method

This method is outlined in NAVFAC P-300, *Management of Transportation Equipment*<sup>3</sup> and the *Materials Handling Equipment Maintenance Manual*.<sup>4</sup> The USN uses Man-hour Input Standards (MIS) to compute the staffing requirements for vehicle maintenance. These input standards cover the direct labor needed to maintain a unit in a safe, reliable condition throughout its economic life. These standards include the labor hours required to correct or prevent malfunctions or deterioration (except those resulting from accidents) through lubrication; cleaning and washing; installing tires and batteries; and removing, replacing, and repairing major and minor components, subassemblies, parts, and accessories. These standards do not cover major overhaul and rebuilding of the complete unit.

In the procedure for determining direct maintenance man-hour input for manpower requirements, the first step is listing the numbers of vehicles and equipment items assigned to the maintenance organization (regardless of the owning command or using organization) by equipment category code (ECC). Appendix M lists ECCs. The next step

<sup>3</sup>*Management of Transportation Equipment*, NAVFAC P-300 (Naval Facilities Engineering Command, Alexandria, VA, November 1982, revised 1 February 1984).

<sup>4</sup>*Materials Handling Equipment Maintenance Manual*, SPCC Publication 10490 (Department of the Navy, Ships Parts Control Center [SPCC], Mechanicsburg, PA).

is to use the MIS table in Appendix N to determine the required MIS for a particular vehicle or equipment item. These MIS values are based on three different categories, depending on the ECC. For some vehicles, such as pickup cargo trucks, MIS is based on 1000 mi of operation. For others, such as a semitrailer tank, the MIS is based on 1 hr of operation, and for still others, such as a centrifugal pump, it is based on the quantity. Equations 17 through 19 are used to compute the required annual man-hours, depending on the ECC:

$$\text{Annual Man-hours} = \frac{\text{Unit target*}}{\text{mile}} \times \text{Quantity} \times \text{MIS/mi} \quad [\text{Eq 17}]$$

$$\text{Annual Man-hours} = \frac{\text{Unit target}}{\text{mile}} \times \text{Quantity} \times \text{MIS/hr} \quad [\text{Eq 18}]$$

$$\text{Annual Man-hours} = \frac{\text{Unit target}}{\text{mile}} \times \text{Quantity} \times \text{MIS/yr} \quad [\text{Eq 19}]$$

Once the annual man-hours are computed using Equations 17 through 19 for all assigned vehicles and equipment items, the total required annual man-hours can be determined for the maintenance shop by summing the individual annual man-hour requirements for each assigned vehicle and equipment item.

Then, using Equation 20, the required number of mechanics is computed:

$$\text{Required mechanics} = \frac{(\text{Total annual manhours})}{(\text{Effective MAF})} \quad [\text{Eq 20}]$$

The USN defines the Effective MAF as 91 percent of the MAF and uses an annual MAF of 1728 hr/yr, which is designed for military personnel. For a civilian workforce, the MAF would be 1676 hr/yr. Therefore, the effective man-hour availability factor for civilian personnel is:

$$\text{Effective MAF civilian} = (91\%)(1676) = 1525.16 \text{ hr/yr}$$

When the above figure is substituted into Equation 20, the expression becomes:

$$\text{Required mechanics} = \frac{(\text{Total annual manhours})}{(1525.16)} \quad [\text{Eq 21}]$$

Once the number of required mechanics is determined, the number of authorized mechanics can be calculated using an adjustment factor,  $a$ , which relates authorized staffing to required staffing:

$$\text{Authorized mechanics} = (a) \times (\text{Required mechanics}) \quad [\text{Eq 22}]$$

When the number of mechanics needed is known, the USN staffing technique computes overhead labor based on a ratio,  $a_3$ , of three overhead personnel to 10 mechanics. Overhead personnel include foremen, administrative technicians, parts attendants, and supply clerks. The number of required overhead positions is multiplied by the adjustment factor  $a_3$  to determine the number of authorized overhead positions. The total number

\*This term is defined in the glossary.

of authorized manpower spaces for the maintenance organization is determined by summing the number of authorized mechanics and overhead personnel.

At this stage, a comparison can be made between staffing based on the USN method and authorized U.S. Army manpower strength. Chapter 3 gives the results of this comparison.

### U.S. Army Reserves Staffing Methods

USAR uses an annual man-hour allowance (AMA) to compute manpower requirements for vehicle maintenance. Vehicle maintenance in USAR is performed under the Area Maintenance Support Activity (AMSA) as discussed in detail in DA Pamphlet 570-560.<sup>5</sup> This staffing technique, like the others, calculates the required number of manpower spaces for vehicle maintenance organizations. The staffing method described in DA Pamphlet 570-560 considers only maintenance organizations that perform organizational maintenance; therefore, it does not apply to organizations performing support maintenance. For this reason, comparisons were made only for organizational maintenance cases. The USAR procedure for computing manpower requirements starts with the AMA (see tables in Appendix O). By using Equation 23, the total AMA for each type of equipment item and vehicle assigned is determined:

$$\text{Total AMA for vehicle/equipment} = \text{Quantity of vehicle equipment} \times \text{AMA} \quad [\text{Eq 23}]$$

Once the total AMA is computed for each vehicle and equipment item, the total AMA for the maintenance organization can be computed by adding each individual allowance. After the total AMA has been computed for the maintenance organization, the number of required mechanics can be calculated using Table 4. Note that Table 4 applies only to organizational maintenance. Furthermore, manpower requirements determined using this table include allowances for direct labor, inspection, technical assistance, and travel time. (Technical Manual 38-750-1 and Army Regulation 140-5 contain details.<sup>6</sup>) An example of interpolating using Table 4 is:

<u>Equipment Description</u>	<u>Quantity</u>	<u>AMA</u>	<u>Total AMA</u>
Truck and truck tractor, 2-1/2 ton	20	72.5	1450
Station wagon	10	49.3	493
Sedan	90	24.4	2196
Truck, 2-1/2 ton cargo	25	45.0	1125
Total AMA =			5264

<sup>5</sup>DA Pam 570-560, *Staffing Guide for U.S. Army Reserve Technicians* (HQ, Department of the Army, 1 June 1978).

<sup>6</sup>Technical Manual 38-750-1, *The Army Maintenance Management System (TAMMS) Field Command Procedures* (HQ, Department of the Army, 29 December 1978); Army Regulation 140-5, *Service Manager's Handbook* (HQ, Department of the Army, 14 October 1983).

Table 4

Required Mechanics Based on Total AMA\*

Yardstick	Annual Man-hour Allowance (AMA)	4230	7050	22515	39950
	Manpower Requirement	3	5	15	25
	Interval Rate	0.00071	0.00065	0.00059	

\*Source: DA Pam 570-560, *Staffing Guide for U.S. Army Reserve Technician* (HQ, Department of the Army, 1 June 1978), Table 560-41a, p 2-16.

The total AMA of 5264 is between 4230 and 7050 in Table 4, which translates into a manpower requirement yardstick of three to five with an interval rate of 0.00071. Then, the number of manpower spaces is computed as:

$$3 + (5264 - 4230)(0.00071) = 3 + 0.734 \approx 4.$$

In this example four mechanics are needed.

For comparison the authorized staffing was used instead of required staffing. Therefore, adjustment factor  $a_4$  was used the same way as the factor  $a_3$  in Equation 22. (The adjustment factor  $a_4$  is based on data from the USAR.<sup>7</sup> It is discussed in Appendix P.)

$$\text{Authorized mechanics} = (a_4) \times (\text{Required mechanics}) \quad [\text{Eq 24}]$$

In addition to mechanics, USAR also considers overhead personnel for vehicle maintenance manpower requirements. These personnel include foremen, maintenance administrative technicians, tools and parts attendants, and supply clerks. DA Pam 570-560 requires one foreman for each organization with six to 20 maintenance technicians, plus one for each additional 15 technicians. For organizations with fewer than six mechanics, supervision is provided by a mechanic. This pamphlet also requires one maintenance administrative technician for six or more technicians, one supply clerk for six or more technicians, and one tools-and-parts attendant for 15 to 44 technicians. Organizations with 45 or more technicians require two tools-and-parts attendants. The number of overhead positions authorized is determined by multiplying the number of required overhead positions by  $a_4$ . The number of manpower spaces authorized for the maintenance organization is determined by totaling authorized mechanics and overhead personnel.

<sup>7</sup>Letter from Carolyn J. Rosenberg, Assistant Adjutant General, HQ FORSCOM, Fort McPherson, GA, to Kaan Aytogu, USA-CERL, subject: Manpower Strength for Vehicle Maintenance, dated 8 February 1985.

### 3 RESULTS AND ANALYSIS

Lists of all DEH vehicles and equipment items with authorized and actual staffing were collected from the DEH maintenance shops at the following FORSCOM and TRADOC installations: Forts A. P. Hill, Benning, Bliss, Campbell, Chaffee, Devens, Dix, Eustis, Greely, Hood, Indiantown Gap, Knox, Lewis, Leonard Wood, McCoy, Monroe, Pickett, Richardson, Rucker, Sheridan, Sill, Stewart, Riley, Wainwright, and Leavenworth; Carlisle Barracks; 193rd Infantry Brigade (Panama); and the Presidio of San Francisco. For each vehicle and equipment item, vehicle equivalents (for the USAF technique) and annual man-hour requirements (for the USAR technique) were assigned. These data from the 28 installations, totaling 2 megabytes of information, were entered into a microcomputer for a staffing requirements analysis.

In collecting the data, it was noted that some information required to be documented by Army Regulation 750-37<sup>8</sup> was not available.

Manpower requirement techniques used by the USAF and the USAR were applied to the above FORSCOM and TRADOC installations ("Panama" is used in the tables instead of "193rd Infantry Brigade") to make the following six comparisons:

1. Authorized Army staffing versus authorized USAF staffing
2. Authorized Army staffing versus authorized USN staffing
3. Authorized Army staffing versus authorized USAR staffing
4. Actual Army staffing versus actual USAF staffing
5. Actual Army staffing versus actual USN staffing
6. Actual Army staffing versus actual USAR staffing.

#### **Application of USAF Technique for DEH Vehicle Maintenance Shops**

Since the USAF staffing method uses the vehicle equivalent concept to determine manpower requirements, required staffing was computed first using the information gathered from DEH maintenance shops at the FORSCOM and TRADOC installations. These computations were made using AFMS 4241, 4240A, 4240B, and 4240 as adjusted in Chapter 2 for DEH maintenance shops doing organizational and intermediate (direct and/or general support) maintenance. For the DEH shops doing only organizational maintenance, TACMS 4241 was used for the computations. Table 5\* shows results of the computations for manpower requirements at DEH maintenance shops using the USAF technique. Note that the following assumptions apply to the figures in Table 5:

1. Depot-level maintenance activity is insignificant; hence, adjustment factor  $a_1$  is 1.0 (Appendix E).

<sup>8</sup>Army Regulation 750-37, *Sample Data Collection: The Army Maintenance Management System* (Headquarters, Department of the Army, November 1982).

\*Tables for this chapter begin on p 23.

2. Required and authorized USAF staffing are the same; hence, adjustment factor  $a_2$  is 1.0 (Appendix E).

3. The civilian man-hour availability factor is 145 hr/month (Table 3 shows details).

4. The actual USAF staffing is 110 percent of the authorized staffing.<sup>9</sup>

Table 6 shows the relationships between Army and USAF staffing. These results show that authorized staffing for DEH maintenance shops is 43 percent of the authorized USAF staffing. In addition, actual Army staffing is 39 percent of actual USAF staffing. Thus, based on the USAF method, DEH vehicle maintenance shops are understaffed.

#### **Application of USN Technique for DEH Vehicle Maintenance Shops**

The USN staffing method uses the MIS concept to determine manpower requirements. The MIS method requires the use of annual mileage and hourly usage totals for the vehicle/equipment, and since this data was not available from the installations, target annual utilization standards were used. The utilization standards for mileage are listed in the current DOD 4500.36, and the utilization standards for hours were gathered through interviews with personnel in DEHs, USN Chesapeake Field Division, Naval Shop Parts Control, and Crane Naval Weapons Support Center (Appendix Q lists the utilization standards). Table 7 shows the results of the computations for manpower requirements at the DEH maintenance shops using the USN technique. The following assumption applies to the figures in Table 7: required and authorized USN staffing are the same, hence, adjustment factor  $a_3$  is 1.0.

Table 8 shows the relationships between Army and USN staffing for the DEH maintenance shops. These results show that the Army's authorized staffing for DEH vehicle maintenance shops is 93 percent of the authorized USN staffing. Moreover, the actual Army staffing is 92 percent of the actual USN staffing. So, according to the USN's method, the Army is very slightly overstaffed.

#### **Application of USAR Technique for DEH Vehicle Maintenance Shops**

The USAR staffing method uses the AMA concept to determine manpower requirements. Using the information gathered from DEH maintenance shops at the FORSCOM and TRADOC installations, required staffing was computed only for the DEHs which perform organizational maintenance alone, since the USAR technique considers only this facet. For DEHs performing both organizational and intermediate maintenance, an adjustment factor,  $a_4$ , was developed for use with the USAR technique (Appendix P gives the details for developing  $a_4$ ). Table 9 shows the results of the computations for manpower requirements at DEH maintenance shops using the USAR technique. The following assumptions apply to the figures in Table 9:

1. Depot-level maintenance activity is insignificant (see Appendix E for details).

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<sup>9</sup>Letter from David C. Rowe, COL, USAF; Chief, Requirements Division--Directorate of Manpower and Organization, to Kaan Aytogu, USA-CERL, subject: Manpower Requirements Information, dated 5 March 1985.

2. Sixty-six percent of the required USAR staffing is authorized; hence  $a_4$  is 0.66 (USAR-supplied data).

3. Authorized and actual USAR staffing are the same.<sup>10</sup>

Table 10 shows the relationships between Army and USAR staffing for the DEH maintenance shops. These results show that the Army's authorized staffing for DEH vehicle maintenance shops is 130 percent of the authorized USAR staffing. Moreover, the actual Army staffing is 127 percent of the actual USAR staffing. Based on USAR's method, the Army is overstaffing its DEH vehicle maintenance shops.

### Analysis

The results of these comparisons vary widely with respect to the Army's current staffing policy--the USAF method would increase the DEH workforce by some 30 percent, and the USAR would decrease the DEH workforce by about 60 percent.

The USN method closely approximates the current DEH staffing. On this basis, the USN staffing guide could be used as a staffing guide for the Army.

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<sup>10</sup>Letter from Carolyn J. Rosenberg, Assistant Adjutant General, HQ FORSCOM, Fort McPherson, GA, to Kaan Aytogu, USA-CERL, subject: Manpower Strength for Vehicle Maintenance, dated 8 February 1985.

Table 5

**Staffing Comparisons for DEH Vehicle Maintenance Shops  
Using Army and USAF Techniques**

Installation	Major Command*	Maintenance Performed by DEH**	Authorized Army Staffing	Actual Army Staffing	Authorized Air Force Staffing	Actual Air Force Staffing
A.P. Hill	T	O	4	4	18	20
Benning	T	O	25	24	39	43
Bliss	T	O	16	14	24	26
Campbell	T	O + I	19	19	36	40
Carlisle Barracks	T	O	2	2	9	10
Chaffee	T	O	8	8	14	15
Devens	F	O + I	9	9	38	42
Dix	T	O + I	14	13	47	52
Eustis	T	O	11	11	16	18
Greely	F	O + I	6	6	15	17
Hood	F	O + I	26	26	66	73
Indiantown Gap	F	O + I	3	3	14	15
Knox	T	O + I	24	24	34	37
Leavenworth	T	O	13	13	17	19
Leonard Wood	T	O	12	8	24	26
Lewis	F	O + I	19	19	60	66
McCoy***	F	O + I	6	8	21	23
Monroe	T	O	5	5	9	10
Panama	F	O + I	47	47	64	70
Pickett	T	O	3	3	16	18
Presidio of SF	F	O + I	5	6	14	15
Richardson	F	O + I	14	14	27	30
Rucker	T	O	15	14	27	30
Sheridan	F	O + I	8	8	43	47
Sill	T	O	19	19	57	63
Stewart	F	O + I	23	23	42	46
Riley	F	O + I	14	14	70	77
Wainwright	F	O + I	10	10	20	22

\*T = TRADOC, F = FORSCOM.

\*\*O = organizational maintenance, I = intermediate (direct and/or general support) maintenance.

\*\*\*Reflects data before consolidation under Directorate of Industrial Operations.

**Table 6**

**Army Versus Air Force Staffing for DEH Vehicle Maintenance Shops**

Authorized Army staffing (overall)	=	[43%]	Authorized Air Force staffing
Actual Army staffing (overall)	=	[39%]	Actual Air Force staffing
Authorized Army staffing for DEHs doing org maint only	=	[54%]	Authorized Air Force staffing
Actual Army staffing for DEHs doing org maint only	=	[45%]	Actual Air Force staffing
Authorized Army staffing for DEHs doing org and int maint	=	[40%]	Authorized Air Force staffing
Actual Army staffing for DEHs doing org and int maint	=	[36%]	Actual Air Force Staffing
Authorized Army staffing for TRADOC DEHs	=	[49%]	Authorized Air Force staffing
Actual Army staffing for TRADOC DEHs	=	[42%]	Actual Air Force staffing
Authorized Army staffing for FORSCOM DEHs	=	[39%]	Authorized Air Force staffing
Actual Army staffing for FORSCOM DEHs	=	[36%]	Actual Air Force staffing

Table 7

Staffing Comparisons for DEH Vehicle Maintenance Shops  
Using Army and USN Techniques

Installation	Major Command*	Maintenance Performed by DEH**	Authorized Army Staffing	Actual Army Staffing	Authorized Navy Staffing	Actual Navy Staffing
A.P. Hill	T	O	4	4	11	11
Benning	T	O	25	24	21	21
Bliss	T	O	16	14	11	11
Campbell	T	O + I	19	19	13	13
Carlisle Barracks	T	O	2	2	3	3
Chaffee	T	O	8	8	6	6
Devens	F	O + I	9	9	15	15
Dix	T	O + I	14	13	31	31
Eustis	T	O	11	11	7	7
Greely	F	O + I	6	6	4	4
Hood	F	O + I	26	26	24	24
Indiantown Gap	F	O + I	3	3	4	4
Knox	T	O + I	24	24	12	12
Leavenworth	T	O	13	13	8	8
Leonard Wood	T	O	12	8	13	13
Lewis	F	O + I	19	19	40	40
McCoy***	F	O + I	6	8	8	8
Monroe	T	O	5	5	3	3
Panama	F	O + I	47	47	20	20
Pickett	T	O	3	3	10	10
Presidio of SF	F	O + I	5	6	4	4
Richardson	F	O + I	14	14	9	9
Rucker	T	O	15	14	10	10
Sheridan	F	O + I	8	8	16	16
Sill	T	O	19	19	42	42
Stewart	F	O + I	23	23	25	25
Riley	F	O + I	14	14	31	31
Wainwright	F	O + I	10	10	7	7

\*T = TRADOC, F = FORSCOM.

\*\*O = organizational maintenance, I = intermediate (direct and/or general support) maintenance.

\*\*\*Reflects data before consolidation under Directorate of Industrial Operations.

**Table 8**

**Army Versus USN Staffing for DEH Vehicle Maintenance Shops**

Authorized Army staffing (overall)	=	[93%]	Authorized Navy staffing
Actual Army staffing (overall)	=	[92%]	Actual Navy staffing
Authorized Army staffing for DEHs doing org maint only	=	[93%]	Authorized Navy staffing
Actual Army staffing for DEHs doing org only	=	[86%]	Actual Navy staffing
Authorized Army staffing for DEHs doing org and int maint	=	[94%]	Authorized Navy staffing
Actual Army staffing for DEHs doing org and int maint	=	[95%]	Actual Navy staffing
Authorized Army staffing for TRADOC DEHs	=	[95%]	Authorized Navy staffing
Actual Army staffing for TRADOC DEHs	=	[90%]	Actual Navy staffing
Authorized Army staffing for FORSCOM DEHs	=	[92%]	Authorized Navy staffing
Actual Army staffing for FORSCOM DEHs	=	[93%]	Actual Navy staffing

Table 9

Staffing Comparisons for DEH Vehicle Maintenance Shops  
Using Army and USAR Techniques

Installation	Major Command*	Maintenance Performed by DEH**	Authorized Army Staffing	Actual Army Staffing	Authorized Navy Staffing	Actual Navy Staffing
A.P. Hill	T	O	4	4	6	6
Benning	T	O	25	24	16	16
Bliss	T	O	16	14	11	11
Campbell	T	O + I	19	19	12	12
Carlisle Barracks	T	O	2	2	4	4
Chaffee	T	O	8	8	5	5
Devens	F	O + I	9	9	15	15
Dix	T	O + I	14	13	12	12
Eustis	T	O	11	11	9	9
Greely	F	O + I	6	6	3	3
Hood	F	O + I	26	26	20	20
Indiantown Gap	F	O + I	3	3	3	3
Knox	T	O + I	24	24	13	13
Leavenworth	T	O	13	13	13	13
Leonard Wood	T	O	12	8	15	15
Lewis	F	O + I	19	19	15	15
McCoy***	F	O + I	6	8	5	5
Monroe	T	O	5	5	3	3
Panama	F	O + I	47	47	20	20
Pickett	T	O	3	3	5	5
Presidio of SF	F	O + I	5	6	4	4
Richardson	F	O + I	14	14	19	19
Rucker	T	O	15	14	12	12
Sheridan	F	O + I	8	8	13	13
Sill	T	O	19	19	20	20
Stewart	F	O + I	23	23	14	14
Riley	F	O + I	14	14	20	20
Wainwright	F	O + I	10	10	10	10

\*T = TRADOC, F = FORSCOM.

\*\*O = organizational maintenance, I = intermediate (direct and/or general support) maintenance.

\*\*\*Reflects data before consolidation under Directorate of Industrial Operations.

**Table 10**

**Army Versus USAR Staffing for DEH Vehicle Maintenance Shops**

Authorized Army staffing (overall)	=	[130%]	Authorized Army Reserves staffing
Actual Army staffing (overall)	=	[127%]	Actual Army Reserves staffing
Authorized Army staffing for DEHs doing org maint only	=	[125%]	Authorized Army Reserves staffing
Actual Army staffing for DEHs doing org maint only	=	[116%]	Actual Army Reserves staffing
Authorized Army staffing for DEHs doing org and int maint	=	[130%]	Authorized Army Reserves staffing
Actual Army staffing for DEHs doing org and int maint	=	[132%]	Actual Army Reserves staffing
Authorized Army staffing for TRADOC DEHs	=	[126%]	Authorized Army Reserves staffing
Actual Army staffing for TRADOC DEHs	=	[119%]	Actual Army Reserves staffing
Authorized Army staffing for FORSCOM DEHs	=	[124%]	Authorized Army Reserves staffing
Actual Army staffing for FORSCOM DEHs	=	[126%]	Actual Army Reserves staffing



## **Preventive Maintenance**

The maintenance man-hours reflect the number of vehicles/equipment that are a part of a comprehensive Preventive Maintenance (PM) program. The accuracy of the staffing guide depends upon the establishment and upkeep of the PM program. The purpose of PM is to keep equipment in a safe and reliable condition, with maximum equipment availability and minimum cost of maintenance and capital equipment. Vehicles/equipment should be scheduled for inspection and servicing in accordance with the time, mileage, and operating hours of the manufacturer's recommended service interval. This should occur at least every 12 months or 12,000 mi (whichever occurs first) for on-road vehicles, and every 2 months for off-road vehicles.

## **Leased Equipment**

All leased equipment that is under control of the maintenance shop, regardless of the owner, should have the repair estimates calculated in the same manner as those that are owned and maintained by the Government, unless stated otherwise in the lease agreement.

## **Equipment Excluded from Staffing Guide**

Due to the inability to accurately forecast man-hour input standards for them, pushmowers, chain saws, and edgers are not included in the staffing guide. This is due to the wide range of use patterns at the installations. Therefore, the maintenance requirements for equipment types will be determined locally.

## **Computer Operators**

The use of computers for data management will require a computer operator. The duties of a computer operator should be taken into account when determining manpower distribution. Depending on the workload and the shop structure, these duties can be handled by the clerk/dispatcher or someone in another overhead position.

## **Sample Calculation**

In the following example, DEH vehicle maintenance section personnel requirements are determined for a shop that is assigned one hundred 3/4-ton pickup trucks, ten 5-ton dump trucks, three overhead maintenance trucks, six motorized road graders, two rotary sweepers, and one towed sheepsfoot roller. To do the computations, follow these three steps.

1. List all vehicle type quantities as follows:

<u>Equipment type</u>	<u>Quantity</u>
TRK 3/4T PICKUP	100
TRK 5 TON DUMP	10
TRK OVRHD MAINT	3
GRADER RD MOTOR	6
SWEEPER ROTARY	2
ROLLER SHEEPSFT	1

2. Select from Appendix M the corresponding NAVFAC Equipment Code and Alpha Code and list as follows:

<u>Equipment type</u>	<u>Quantity</u>	<u>NAVFAC Equip. Code</u>	<u>Alpha Code</u>
TRK 3/4T PICKUP	100	0326	H
TRK 5 TON DUMP	10	0602	M
TRK OVRHD MAINT	3	0725	O
GRADER RD MOTOR	6	4420	S
SWEEPER ROTARY	2	5720	S
ROLLER SHEEPFST	1	4620	T

3. Select from Appendix Q the corresponding Utilization Target Standard for those Alpha Codes listed. For those Alpha Codes not listed, calculate the Utilization Target Standard using historical data. Also, select from Appendix N the corresponding Maintenance man-hour input standard hours and type. Then use Equations 17, 18 and 19 to calculate the required annual man-hours for each vehicle type. Add the annual man-hours for all vehicles to obtain the total annual man-hours as follows:

<u>NAVFAC Equip. Code</u>	<u>Utilization</u>	<u>x</u>	<u>Quantity</u>	<u>x</u>	<u>Maint. Man-Hours</u>	<u>Annual Man-Hours</u>
0326	7 (7,000 mi)		100		3.5	2450
0602	6 (6,000 mi)		10		9.2	552
0725	1 unit		3		127	381
4420	385 hrs		6		.244	564
5720	385 hrs		2		.288	387
4620	180 hrs		1		8	<u>1440</u>

Total Annual Man-Hours = 5774 hrs

4. Use Equation 25 to determine the required mechanic positions:

$$\text{Required mechanics} = 5774 / 1740 = 3.31$$

5. Use Table 11 and select the mechanic and overhead positions and their distribution.

## 5 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the research, the proposed staffing guide should provide a good average representation of the quantity and types of personnel the DEH vehicle maintenance sections need. However, as is the case with many staffing guides, local exceptions will be necessary.

The staffing guide should be revised in the future to reflect: (1) actual Army historical data that becomes available due to the implementation of computer management systems within the shops; and (2) the improved efficiency of the shops due to the advent of the Commercial Activities (CA) process.

Two other recommendations are made for improving the guide.

1. One difficulty encountered in developing this staffing guide was the lack of accurate and comprehensive historical data. A computer-based management system with bar coded entry should be developed and implemented in the DEH vehicle maintenance sections. The system would simplify data entry, ensure more accurate data collection, eliminate paper records, and provide other management advantages.

2. To more accurately estimate vehicle repair requirements in future staffing guides, the possibility of using fuel consumption as a utilization rate for some types of vehicles should be investigated. Using fuel consumption instead of miles or hours in some types of vehicles should provide a more accurate reflection of the amount of work required of a vehicle and thus a more accurate estimate of its breakdown rate.

## **APPENDIX A:**

### **DESCRIPTION OF TASKS FOR AFMS 4241**

1. General-Purpose Vehicle and Equipment Maintenance and Repair. Receives vehicles or equipment; assigns work; researches technical publications; obtains tools and equipment; repairs general-purpose vehicle or equipment; cleans maintenance area; returns tools, equipment, and unused material and parts; documents completed work; picks up and delivers vehicle or equipment.

2. Base Maintenance or Construction Vehicle and Equipment Maintenance and Repair. Receives and inspects base maintenance or construction vehicles or equipment; assigns work; researches technical publications; obtains tools, equipment, and material; performs scheduled service; performs repair; performs inspection; cleans maintenance area; returns tools, equipment, and unused material and parts; documents completed work; picks up and delivers vehicle or equipment; performs maintenance control duty; performs quality assurance inspection.

3. Fire Department Vehicle and Equipment Maintenance and Repair. Receives and inspects fire department vehicles or equipment; assigns work; researches technical publications; obtains tools, equipment, and material; performs scheduled service; performs repair; performs inspection; cleans maintenance area; returns tools, equipment, and unused material and parts; documents completed work; picks up and delivers vehicle or equipment; performs maintenance control duty; performs quality assurance inspection.

4. Refueling Vehicle and Equipment Maintenance and Repair. Receives and inspects refueling vehicles or equipment; assigns work; researches technical publications; obtains tools, equipment, and material; performs scheduled service; performs repair; performs inspection; cleans maintenance area; returns tools, equipment, and unused material and parts; documents completed work; picks up and delivers vehicle or equipment; performs maintenance control duty; performs quality assurance inspection.

5. Material-Handling Vehicle and Equipment Maintenance and Repair. Receives and inspects material-handling vehicles or equipment; assigns work; researches technical publications; obtains tools, equipment, and material; performs scheduled service; performs repair; performs inspection; cleans maintenance area; returns tools, equipment, and unused material and parts; documents completed work; picks up and delivers vehicles or equipment; performs maintenance control duty; performs quality assurance inspection.

6. Special-Purpose Vehicle and Equipment Maintenance and Repair. Receives and inspects special-purpose vehicles or equipment; assigns work; researches technical publications; obtains tools, equipment, and material; performs scheduled service; performs repair; performs inspection; cleans maintenance area; returns tools, equipment, and unused material and parts; documents completed work; picks up and delivers vehicles or equipment; performs maintenance control duty; performs quality assurance inspection.

7. Nonvehicular Equipment Maintenance and Repair. Receives and inspects nonvehicular equipment; assigns work; researches technical publications; obtains tools, equipment, and material; services equipment; performs adjustment; performs repair; performs inspection; cleans maintenance area; returns tools, equipment, and unused material and parts; documents completed work; picks up and delivers equipment; performs maintenance control duty.

8. Paint Shop. Receives and inspects special-purpose vehicles or equipment; assigns work; researches technical publications; obtains tools, equipment, and material; prepares vehicle or equipment; paints vehicles or equipment; finishes vehicles or equipment; cleans maintenance area; returns tools, equipment, and unused material and parts; documents completed work; performs work completion checkover; picks up and delivers vehicles or equipment.

9. Body Shop. Receives and inspects special-purpose vehicles or equipment; assigns work; researches technical publications; obtains tools, equipment, and material; removes damaged parts; repairs damaged parts; replaces repaired parts; removes nonreparable parts; installs new parts; performs welding; removes damaged glass and/or windows; installs new glass and/or windows; fabricates and installs special items; performs corrosion control treatment on vehicles or equipment; returns tools, equipment, and unused material and parts; documents completed work; picks up and delivers vehicles or equipment; performs work completion checkover.

10. Upholstery Repair. Inspects damaged upholstery in vehicles or equipment; assigns work; researches technical publications; obtains tools, equipment, and material; removes damaged items; repairs damaged items; replaces repaired items; cleans maintenance area; returns tools, equipment, and unused material and parts; documents completed work; performs work completion checkover.

11. Machine Shop. Receives and inspects special-purpose vehicles or equipment; assigns work; researches technical publications; obtains tools, equipment, and material; performs machine-shop repair; cleans maintenance area; returns tools, equipment, and unused material and parts; documents completed work; picks up and delivers vehicles or equipment.

12. Minor Maintenance. Receives vehicles or equipment; reviews work order; assigns work; researches technical publications; obtains tools, equipment, and material; performs minor maintenance or adjustment; completes winterization program; performs inspection; checks vehicles or equipment operation; cleans maintenance area; returns tools, equipment, and unused material and parts; documents completed work; picks up and delivers vehicles or equipment.

13. Diagnostic Section. Determines maintenance requirement; performs quality assurance inspection.

14. Scheduled Service. Performs lubrication; checks filter; checks differential; performs a look-phase inspection; annotates the minor maintenance work order; annotates vehicle or equipment work order.

15. Battery Service. Services battery; performs test; charges battery; repairs battery.

16. Tire Repair. Repairs tire; removes and replaces vehicle or equipment wheels; maintains stock of tires; recommends tire recapping; annotates vehicle or equipment work order; annotates minor maintenance work order.

17. Mobile Maintenance. Receives call; performs onsite maintenance; performs emergency repair; obtains wrecker service; maintains bench stock; annotates vehicle or equipment work order; annotates minor maintenance work order.

18. Supervision. Administers personnel; supervises personnel; reviews incoming distribution; reviews outgoing distribution; reviews reports and statistical data; develops budget estimate; inspects facility; investigates accidents or incidents; receives and assists visiting officials.

19. Meeting. Prepares for meetings; conducts or attends meetings.

20. Training. Administers training; develops training material; conducts training; receives training; maintains training record.

21. Supply. Processes equipment request; conducts inventory; maintains custodial document.

22. Equipment Maintenance. Maintains shop equipment; maintains assigned vehicles.

23. Cleanup. Prepares work area; puts work away; cleans work area.

## **APPENDIX B:**

### **DESCRIPTION OF TASKS FOR AFMS 4240A**

1. Workload Control. Controls scheduled maintenance; controls unscheduled maintenance; informs vehicle maintenance officer (VMO) or superintendent of out-of-standard vehicle out-of-commission (VOC) rate; maintains the maintenance officer status board; updates delayed maintenance list; monitors awaiting maintenance; monitors delayed maintenance; monitors quality deficiency report program; controls time compliance technical order (TCTO) actions; monitors vehicle deadlined for parts (VDP) action; develops annual scheduled maintenance plan; initiates vehicle abuse action; initiates and maintains work order control register; maintains vehicle historical record; monitors cannibalization requirements; initiates contract maintenance actions; monitors warranty program; monitors depot repair requirements; documents accident repair actions; processes repair waiver and vehicle disposition action requests; monitors vehicles or equipment in replacement codes A through J; performs yard check; receives new vehicles; monitors and maintains listing; maintains file of completed work orders; processes data for vehicle transfer.
2. Data Analysis. Reviews raw data; processes machine runs; conducts special studies; prepares and conducts briefings; prepares inquiries for base-level inquiry system (BLIS); develops graphic aids; processes records; maintains historical record files (jacket); monitors man-hour reporting system.
3. Data Support. Provides keypunch support; performs card embossing; issues and controls imprinter.
4. COPARS Documentation. Receives sales slips; verifies dollar sales; forwards contractor-operated parts store (COPARS) information; checks vendor's monthly invoices; forwards packages to VMO or superintendent; reports off-base fuel purchases.
5. Technical Library. Determines requirements; orders technical publications; maintains publication index and technical order (TO) file cards; maintains technical publications; performs inspection; reports weekly status.
6. Supervision. Administers personnel; supervises personnel; reviews incoming distribution; reviews outgoing distribution; reviews reports and statistical data; develops budget estimates; inspects facility; investigates accidents or incidents; receives and assists visiting officials.
7. Administration. Types communication; processes unclassified distribution; maintains unclassified correspondence files; maintains unclassified publication files; maintains stock of blank forms; maintains status chart or bulletin board; maintains time and attendance cards; maintains appointment records; acknowledges visitors.
8. Meeting. Prepares for meetings; conducts or attends meetings.
9. Training. Administers training; develops training material; conducts training; receives training; maintains training record.
10. Supply. Processes equipment requests; conducts inventory; maintains custodial documents; obtains expendable supplies.

11. Equipment Maintenance. Maintains office equipment; maintains shop equipment.
12. Cleanup. Prepares work area; puts work away; cleans work area.

## APPENDIX C:

### DESCRIPTION OF TASKS FOR AFMS 4240B

1. Materiel Control. Requisitions parts or supplies; maintains stock listings; processes accountable item turn-in; reviews mission capability (MICAP) and vehicle deadlined for parts (VDP) supply listings; maintains bench stock; performs contractor-operated parts store (COPARS) actions; coordinates time compliance technical order (TCTO) requirements; performs local purchase actions; performs local manufacture actions; uses contractor-operated civil engineer supply store (COCESS); monitors special level requests; monitors tool issue; monitors parts; monitors repair cycle assets.
2. Tool Crib. Issues and receives tools upon request; maintains suspense files; inspects and maintains tools; schedules precision measurement equipment (PME); performs tool crib inventory.
3. Supervision. Administers personnel; supervises personnel; reviews incoming distribution; reviews outgoing distribution; reviews reports and statistical data; develops budget estimates; inspects facility; investigates accidents or incidents; receives and assists visiting officials.
4. Administration. Processes unclassified distribution; maintains unclassified correspondence files; maintains unclassified publication files; maintains stock of blank forms; maintains status chart or bulletin board; maintains time and attendance cards; maintains appointment records; acknowledges visitors.
5. Meeting. Prepares for meetings; conducts or attends meetings.
6. Training. Administers training; develops training material; conducts training; receives training; maintains training record.
7. Supply. Processes equipment requests; conducts inventory; maintains custodial documents; obtains expendable supplies.
8. Equipment Maintenance. Maintains office equipment; maintains shop equipment.
9. Cleanup. Prepares work area; puts work away; cleans work area.

## **APPENDIX D:**

### **DESCRIPTION OF TASKS FOR AFMS 4240**

1. **Management.** Manages work center activity; manages vehicle maintenance contracts; administers personnel; manages personnel; drafts communications; reviews incoming distribution; reviews outgoing distribution; reviews reports and statistical data; develops budget estimates; inspects facility; investigates accidents or incidents; receives and assists visiting officials; approves or disapproves cannibalization requests; monitors maintenance of technical library; resolves technical problems; establishes vehicle maintenance priority plan; reviews workload; ensures technical inspection completion; ensures submission of deficiency reports; approves or disapproves vehicle deadlined for parts (VDP) condition; identifies replacement coded vehicles; conducts or attends meetings.
2. **Technical Representative of the Contracting Officer (TRCO).** Furnishes technical assistance; prepares contract specifications; develops evaluation guides; monitors contractor-operated parts store (COPARS) operation; prepares authorization letters; attends meetings; reviews and certifies COPARS billing costs; reviews and certifies COPARS billing package.
3. **Supply.** Processes equipment requests; conducts inventory; maintains custodial documents; obtains expendable supplies.
4. **Equipment Maintenance.** Maintains office equipment; maintains shop equipment.
5. **Cleanup.** Prepares work area; puts work away; cleans work area.

## APPENDIX E:

### DETERMINATION OF ADJUSTMENT FACTORS $a_1$ AND $a_2$

Adjustment factor  $a_1$  is used to eliminate the influence of intermediate maintenance in the staffing data. It can be derived by:

$$a_1 = \frac{OM}{OM \& IM}$$

where OM is the organizational maintenance workload and IM is the intermediate maintenance workload performed by the maintenance shop. Maintenance data collected from Forts Benning, Lewis, and Dix indicate that only 1 percent of the total maintenance cases involve intermediate maintenance activity. Assuming this figure is insignificant,  $a_1$  is equal to 1.0.

Information gathered from the USAF Chief of Manpower Requirements Division\* indicated that authorized USAF staffing is the same as required USAF staffing; hence, adjustment factor  $a_2$  is 1.0.

$$a_2 = \frac{\text{Required Manpower}}{\text{Authorized Strength}}$$

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\*Letter from David C. Rowe, COL, USAF; Chief of Requirements Division - Directorate of Manpower and Organization; to Kaan Aytogu, USA-CERL, subject: Manpower Requirements Information, dated 5 March 1985.

**APPENDIX F:**

**MANPOWER SPACES FOR AFMS 4241**

<u>Air Force Specialty Title</u>	<u>Grade</u>	<u>Manpower Requirement Distribution</u>					
Vehicle Maintenance Supervisor	TSgt	1	1	1	1	1	1
Vehicle Maintenance Mechanic	SSgt	2	3	3	3	3	4
Vehicle Maintenance Mechanic	Sgt	5	5	6	6	7	7
Apprentice Vehicle Maintenance Mechanic	A1C	2	2	2	3	3	3
<b>Total</b>		<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>
Vehicle Maintenance Supervisor	MSgt	1	1	1	1	1	1
Vehicle Maintenance Supervisor	TSgt	1	1	1	1	1	1
Vehicle Maintenance Mechanic	SSgt	4	4	4	4	4	5
Vehicle Maintenance Mechanic	Sgt	8	8	9	9	10	10
Apprentice Vehicle Maintenance Mechanic	A1C	3	3	3	4	4	4
<b>Total</b>		<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>	<b>21</b>
Vehicle Maintenance Supervisor	MSgt	1	1	1	1	1	1
Vehicle Maintenance Supervisor	TSgt	1	1	2	2	2	2
Vehicle Maintenance Mechanic	SSgt	5	5	5	5	5	6
Vehicle Maintenance Mechanic	Sgt	11	12	12	13	13	13
Apprentice Vehicle Maintenance Mechanic	A1C	4	4	4	4	5	5
<b>Total</b>		<b>22</b>	<b>23</b>	<b>24</b>	<b>25</b>	<b>26</b>	<b>27</b>

**Air Force**  
**Specialty Title**                      **Grade**                      **Manpower Requirement Distribution**

Vehicle Maintenance Supervisor	MSgt	1	1	1	1	1	1
Vehicle Maintenance Supervisor	TSgt	2	2	2	2	3	3
Vehicle Maintenance Mechanic	SSgt	6	6	6	6	6	7
Vehicle Maintenance Mechanic	Sgt	14	14	15	16	16	16
Apprentice Vehicle Maintenance Mechanic	A1C	5	6	6	6	6	6
<b>Total</b>		<b>28</b>	<b>29</b>	<b>30</b>	<b>31</b>	<b>32</b>	<b>33</b>

Vehicle Maintenance Supervisor	MSgt	1	1	1	1	1	1
Vehicle Maintenance Supervisor	TSgt	3	3	3	3	4	4
Vehicle Maintenance Mechanic	SSgt	7	7	7	7	7	8
Vehicle Maintenance Mechanic	Sgt	17	17	18	19	19	19
Apprentice Vehicle Maintenance Mechanic	A1C	6	7	7	7	7	7
<b>Total</b>		<b>34</b>	<b>35</b>	<b>36</b>	<b>37</b>	<b>38</b>	<b>39</b>

Vehicle Maintenance Supervisor	MSgt	1	1	1	1	1	2
Vehicle Maintenance Supervisor	TSgt	4	4	4	4	4	4
Vehicle Maintenance Mechanic	SSgt	8	8	8	9	9	9
Vehicle Maintenance Mechanic	Sgt	20	20	21	21	22	22
Apprentice Vehicle Maintenance Mechanic	A1C	7	8	8	8	8	8
<b>Total</b>		<b>40</b>	<b>41</b>	<b>42</b>	<b>43</b>	<b>44</b>	<b>45</b>

**Air Force**  
**Specialty Title**                      **Grade**                      **Manpower Requirement Distribution**

Vehicle Maintenance Supervisor	MSgt	2	2	2	2	2	2
Vehicle Maintenance Supervisor	TSgt	4	4	4	4	4	4
Vehicle Maintenance Mechanic	SSgt	9	9	9	10	10	10
Vehicle Maintenance Mechanic	Sgt	23	23	24	24	25	26
Apprentice Vehicle Maintenance Mechanic	A1C	8	9	9	9	9	9
<b>Total</b>		<b>46</b>	<b>47</b>	<b>48</b>	<b>49</b>	<b>50</b>	<b>51</b>

Vehicle Maintenance Supervisor	MSgt	2	2	2	2	2	2
Vehicle Maintenance Supervisor	TSgt	4	4	4	4	4	4
Vehicle Maintenance Mechanic	SSgt	10	11	12	12	12	12
Vehicle Maintenance Mechanic	Sgt	26	26	26	27	28	28
Apprentice Vehicle Maintenance Mechanic	A1C	10	10	10	10	10	11
<b>Total</b>		<b>52</b>	<b>53</b>	<b>54</b>	<b>55</b>	<b>56</b>	<b>57</b>

Vehicle Maintenance Supervisor	MSgt	2	2	2	2	2	2
Vehicle Maintenance Supervisor	TSgt	4	4	5	5	5	5
Vehicle Maintenance Mechanic	SSgt	12	13	13	13	13	13
Vehicle Maintenance Mechanic	Sgt	29	29	29	30	31	31
Apprentice Vehicle Maintenance Mechanic	A1C	11	11	11	11	11	12
<b>Total</b>		<b>58</b>	<b>59</b>	<b>60</b>	<b>61</b>	<b>62</b>	<b>63</b>

**Air Force  
Specialty Title                      Grade                      Manpower Requirement Distribution**

Vehicle Maintenance Supervisor	MSgt	2	2	2	2	2	2
Vehicle Maintenance Supervisor	TSgt	5	5	6	6	6	6
Vehicle Maintenance Mechanic	SSgt	13	14	14	14	14	14
Vehicle Maintenance Mechanic	Sgt	32	32	32	33	34	34
Apprentice Vehicle Maintenance Mechanic	A1C	12	12	12	12	12	13
<b>Total</b>		<b>64</b>	<b>65</b>	<b>66</b>	<b>67</b>	<b>68</b>	<b>69</b>

Vehicle Maintenance Supervisor	MSgt	2	2	2	2	2	2
Vehicle Maintenance Supervisor	TSgt	6	6	6	6	6	6
Vehicle Maintenance Mechanic	SSgt	15	15	15	15	15	15
Vehicle Maintenance Mechanic	Sgt	34	35	36	37	37	37
Apprentice Vehicle Maintenance Mechanic	A1C	13	13	13	13	14	14
<b>Total</b>		<b>70</b>	<b>71</b>	<b>72</b>	<b>73</b>	<b>74</b>	<b>75</b>

Vehicle Maintenance Supervisor	MSgt	3	3	3	3	3	3
Vehicle Maintenance Supervisor	TSgt	6	6	6	6	6	6
Vehicle Maintenance Mechanic	SSgt	16	16	16	16	16	17
Vehicle Maintenance Mechanic	Sgt	37	38	39	40	40	40
Apprentice Vehicle Maintenance Mechanic	A1C	14	14	14	14	15	15
<b>Total</b>		<b>76</b>	<b>77</b>	<b>78</b>	<b>79</b>	<b>80</b>	<b>81</b>

**Air Force**  
**Specialty Title**                      **Grade**                      **Manpower Requirement Distribution**

Vehicle Maintenance Supervisor	MSgt	3	3	3	3	3	3
Vehicle Maintenance Supervisor	TSgt	6	7	7	7	7	7
Vehicle Maintenance Mechanic	SSgt	17	17	17	18	18	18
Vehicle Maintenance Mechanic	Sgt	41	42	42	42	42	43
Apprentice Vehicle Maintenance Mechanic	A1C	15	15	15	15	16	16
<b>Total</b>		<b>82</b>	<b>83</b>	<b>84</b>	<b>85</b>	<b>86</b>	<b>87</b>

Vehicle Maintenance Supervisor	MSgt	3	3	3	3	3	3
Vehicle Maintenance Supervisor	TSgt	7	8	8	8	8	8
Vehicle Maintenance Mechanic	SSgt	18	18	18	19	19	19
Vehicle Maintenance Mechanic	Sgt	44	44	45	45	45	46
Apprentice Vehicle Maintenance Mechanic	A1C	16	16	16	16	17	17
<b>Total</b>		<b>88</b>	<b>89</b>	<b>90</b>	<b>91</b>	<b>92</b>	<b>93</b>

Vehicle Maintenance Supervisor	MSgt	3	3	3	3	3	3
Vehicle Maintenance Supervisor	TSgt	8	8	8	9	9	9
Vehicle Maintenance Mechanic	SSgt	19	19	19	19	20	20
Vehicle Maintenance Mechanic	Sgt	47	48	48	48	48	49
Apprentice Vehicle Maintenance Mechanic	A1C	17	17	18	18	18	18
<b>Total</b>		<b>94</b>	<b>95</b>	<b>96</b>	<b>97</b>	<b>98</b>	<b>99</b>

<u>Air Force Specialty Title</u>	<u>Grade</u>	<u>Manpower Requirement Distribution</u>					
Vehicle Maintenance Supervisor	MSgt	3	3	3	3	4	4
Vehicle Maintenance Supervisor	TSgt	9	9	9	9	9	9
Vehicle Maintenance Mechanic	SSgt	20	21	21	21	21	21
Vehicle Maintenance Mechanic	Sgt	50	50	50	51	51	52
Apprentice Vehicle Maintenance Mechanic	A1C	18	18	19	19	19	19
<b>Total</b>		<b>100</b>	<b>101</b>	<b>102</b>	<b>103</b>	<b>104</b>	<b>105</b>

**APPENDIX G:**

**MANPOWER SPACES FOR AFMS 4240A**

<u>Air Force Specialty Title</u>	<u>Grade</u>	<u>Manpower Requirement Distribution</u>					
Vehicle Maint Con & Analysis Technician	MSgt				1		1
Vehicle Maint Con & Analysis Technician	TSgt	1	1	1	2	2*	2
Vehicle Maint Con & Analysis Technician	SSgt		1	1	1	1	1
Vehicle Maint Con & Analysis Specialist	Sgt	1	1	1	1	1	1
Administration Specialist	SSgt				1	1	1
Administration Specialist	Sgt	1	1	1	1	1	1
<b>Total</b>		<b>3</b>	<b>4</b>	<b>4</b>	<b>6</b>	<b>7</b>	<b>7</b>

\*One TSgt may be changed to one MSgt at those locations in TAC that have a constant mobility requirement.

Vehicle Maint Con & Analysis Technician	MSgt	1	1	1	1	1	1
Vehicle Maint Con & Analysis Technician	TSgt	2	2	2	2	3	3
Vehicle Maint Con & Analysis Technician	SSgt	1	2	2	2	2	2
Vehicle Maint Con & Analysis Specialist	Sgt	2	2	2	3	3	3
Administration Specialist	SSgt	1	1	1	1	1	1
Administration Specialist	Sgt	1	1	1	1	1	2
Apr Administration Specialist	A1C		1	1	1	1	
<b>Total</b>		<b>8</b>	<b>10</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>12</b>

**Air Force  
Specialty Title**

**Grade Manpower Requirement Distribution**

Vehicle Maint Con & Analysis Technician	MSgt	1	1	1	1	1	1	1
Vehicle Maint Con & Analysis Technician	TSgt	3	4	4	5	5	5	6
Vehicle Maint Con & Analysis Technician	SSgt	3	3	3	3	3	4	4
Vehicle Maint Con & Analysis Specialist	Sgt	3	3	4	4	4	4	4
Administration Specialist	SSgt	1	1	1	1	1	1	1
Administration Specialist	Sgt	2	2	2	2	3	3	3
Apr Administration Specialist	A1C	1	1	1	1	1	1	1
<b>Total</b>		<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>

**APPENDIX H:**

**MANPOWER SPACES FOR 4240B**

<u>Air Force Specialty Title</u>	<u>Grade</u>	<u>Manpower Requirement Distribution</u>						
Inventory Management Supervisor	MSgt				1	1	1	
Inventory Management Specialist	TSgt				1	1	1	1
Inventory Management Specialist	SSgt		1	1	1	1	1	1
Inventory Management Specialist	Sgt	1	2	2	2	2	2	2
Apprentice Inventory Management Specialist	A1C			1	1	1	2	2
<b>Total</b>		<b>1</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>7</b>

**APPENDIX I:**

**MANPOWER SPACES FOR AFMS 4240**

<u>Air Force Specialty Title</u>	<u>Grade</u>	<u>Manpower Requirement Distribution</u>			
Transportation Officer	Cpt		1	1	1
Vehicle Maintenance Manager	CMSgt			1	1
Vehicle Maintenance Superintendent	SMSgt	1	1		
General Purpose and Body Maintenance Supervisor	TSgt			1	2
Total		1	2	3	4

## **APPENDIX J:**

### **DESCRIPTION OF TASKS FOR TACMS 4241**

1. General-Purpose Vehicle and Equipment Maintenance and Repair. Receives and inspects general-purpose vehicles or equipment; assigns work; researches technical publications; obtains tools, equipment, or material; performs scheduled service; performs repair; performs inspection; cleans maintenance area; returns tools, equipment, and unused material and parts; documents completed work; picks up and delivers vehicles or equipment.

2. Special-Purpose Vehicle and Equipment Maintenance and Repair. Receives and inspects special-purpose vehicles or equipment; assigns work; researches technical publications; obtains tools, equipment, or material; performs scheduled service; performs repair; performs inspection; cleans maintenance area; returns tools, equipment, and unused material and parts; documents completed work; picks up and delivers vehicles or equipment.

3. Material-Handling Vehicle and Equipment Maintenance and Repair. Receives and inspects material-handling vehicles or equipment; assigns work; researches technical publications; obtains tools, equipment, or material; performs scheduled service; performs repair; performs inspection; cleans maintenance area; returns tools, equipment, and unused material and parts; documents completed work; picks up and delivers vehicles or equipment.

4. Nonvehicular Equipment Maintenance and Repair. Receives and inspects nonvehicular equipment; assigns work; researches technical publications; obtains tools, equipment, or material; services equipment; performs adjustment; performs repair; performs inspection; cleans maintenance area; returns tools, equipment, and unused material and parts; documents completed work; picks up and delivers equipment.

5. Paint Shop. Receives and inspects vehicles or equipment; assigns work; researches technical publications; obtains tools, equipment, or material; prepares vehicles or equipment; paints vehicles or equipment; finishes vehicles or equipment; cleans maintenance area; returns tools, equipment, and unused material and parts; documents completed work; performs work completion checkover; picks up and delivers vehicles or equipment.

6. Body Shop. Receives and inspects damaged vehicles or equipment; assigns work; researches technical publications; obtains tools, equipment, or material; removes damaged parts; repairs damaged parts; replaces repaired parts; removes nonreparable parts; installs new parts; performs welding; removes damaged glass or windows; installs new glass or windows; fabricates and installs special items; performs corrosion control treatment on vehicles or equipment; cleans maintenance area; returns tools, equipment, and unused material and parts; documents completed work; performs work completion checkover; picks up and delivers vehicles or equipment.

7. Upholstery Repair. Inspects damaged upholstery in vehicles or equipment; assigns work; researches technical publications; obtains tools, equipment, or material; removes damaged items; repairs damaged items; replaces repaired items; cleans maintenance area; returns tools, equipment, and unused material and parts; documents completed work; performs work completion checkover.

8. Battery Service. Services battery; performs test; charges battery; repairs battery.
9. Tire Repair. Repairs tires; maintains stock of tires; removes tires from vehicle scheduled for disposal; recommends tire recapping; annotates vehicle and equipment work orders; annotates minor maintenance work orders.
10. Mobile Maintenance. Receives calls; performs emergency repairs; provides wrecker service; annotates vehicle and equipment work orders; and annotates minor maintenance work order.
11. Materiel Control. Requisitions parts and supplies; processes accountable item turn-in; reviews mission capability (MICAP) and vehicle deadlined for parts (VDP) supply listings; maintains bench stock; performs contractor-operated parts store (COPARS) actions; coordinates time compliance technical order (TCTO) requirements; performs local purchase actions; performs local manufacture actions; monitors special level requests; monitors tool issue; monitors parts; monitors repair cycle assets.
12. Tool Crib. Issues and receives tools upon request; maintains suspense file; inspects and maintains tools; schedules precision measurement equipment (PME); performs tool crib inventory.
13. Workload Control. Controls scheduled maintenance; controls unscheduled maintenance; informs maintenance officer (MO) or superintendent of out-of-standard vehicle out-of-commission (VOC) rate; maintains the maintenance control status board; updates delayed maintenance status; monitors awaiting maintenance; monitors delayed maintenance; monitors quality deficiency report program; controls time compliance technical order (TCTO) actions; monitors vehicle deadlined for parts (VDP) actions; develops annual scheduled maintenance plan; initiates vehicle abuse actions; initiates and maintains work order control register; maintains vehicle historical records; monitors cannibalization requirements; initiates contract maintenance actions; monitors warranty program; monitors depot repair requirements; documents accident repair actions; processes repair waiver requests or vehicle disposition action requests; monitors vehicle or equipment in replacement codes A through J; performs yard checks; receives new vehicles; monitors and maintains listings; maintains file of completed work orders; processes data for vehicle transfer.
14. Data Analysis. Reviews raw data; processes machine runs; processes records; maintains historical record file (jacket).
15. Technical Library. Determines requirements; orders technical publications; maintains publication index and technical order (TO) file cards; maintains technical publications; performs inspection; reports weekly status.
16. Quality Assurance. Performs inspection; documents deficiency; reschedules vehicle or equipment.
17. Vehicle Control. Acts as unit vehicle control officer, ensures vehicles are used for intended purposes; investigates accident or abuse cases, rotates vehicles within unit to meet daily needs; ensures vehicles are secured when not in use; ensures vehicles not frequently used are exercised at least monthly.
18. Driver Training and Licensing. Reviews drivers' qualifications; trains operators; submits paperwork for licensing to host vehicle operations section.

19. Convoy Management. Organizes convoys; plans Remain Overnight (RON); coordinates with local authorities; plans route; conducts convoy safety program.

20. Register Equipment Management System (REMS) Liaison. Signs and accounts for vehicles; submits priority buying; prepares paperwork for new vehicles; submits paperwork for annual recertification of vehicles.

21. Supervision. Administers personnel; supervises personnel; reviews incoming distribution; reviews outgoing distribution; reviews reports and statistical data; develops budget estimates; inspects facility; investigates mishap or incident; receives and assists visiting officials.

22. Administration. Types communications; processes unclassified distribution; maintains unclassified correspondence files; maintains classified material; maintains unclassified publication files; maintains classified publication files; operates copying machine; maintains stock of blank forms; maintains status chart or bulletin board; maintains time and attendance cards; provides stenographic service; maintains appointment records; acknowledges visitors; processes automatic data processing (ADP) cards.

23. Meeting. Prepares for meetings; conducts or attends meetings.

24. Training. Administers training; develops training material; conducts training; receives training; maintains training records.

25. Supply. Processes equipment requests; conducts inventory; maintains custodial documents; obtains expendable supplies.

26. Equipment Maintenance. Maintains office equipment; maintains shop equipment; maintains assigned vehicles.

27. Cleanup. Prepares work area; puts work away; cleans work area.

28. Mobility. Performs mobility processing; loads equipment; unloads equipment; performs predeployment inspection; refuels vehicles.

29. Site Erection and Disassembly. Erects tent; disassembles tent; camouflages site.

30. Travel. Travels by military vehicle; travels by military aircraft.

31. Life-Support Equipment. Prepares life-support equipment; loads life-support equipment; unloads life-support equipment; performs tent maintenance; maintains living facility; maintains accessory equipment.

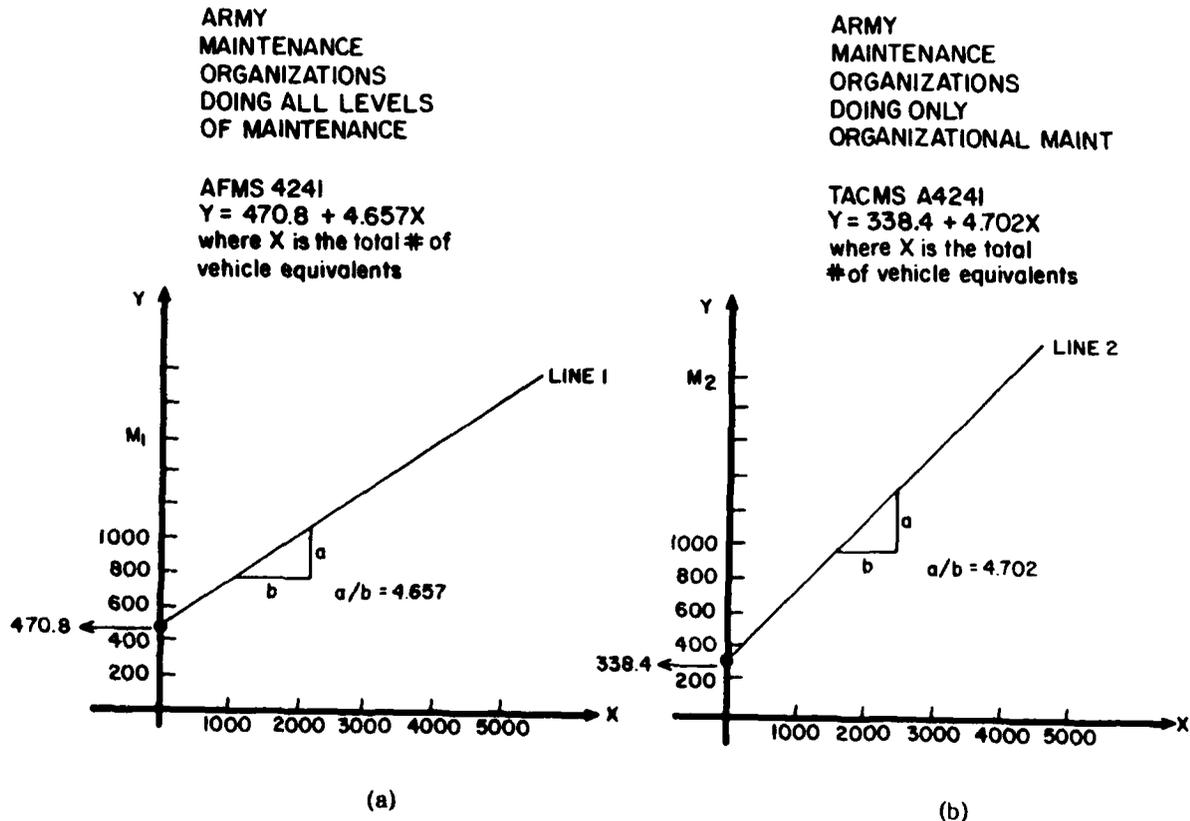
**APPENDIX K:**

**DETERMINATION OF UPPER LIMIT FOR  
TOTAL VEHICLE EQUIVALENTS (X)  
WHEN TACMS 4241 IS USED**

In Figure K1, there is a single point where lines 1 and 2 intersect. This point is found by setting the equations for the two lines equal to each other and solving for the variable x. Thus, using the data given above Figure K1:

$$470.8 + 4.657X = 338.4 + 4.702X \text{ ----> } X = 2942.2$$

Figure K2 shows the intersection. For total vehicle equivalents of 2942.2 and greater, TACMS 4241 should not be used since, beyond this point, the equations will yield greater man-hours for organizational maintenance than for all levels of maintenance. Thus, TACMS 4241 will be used only if total vehicle equivalents are less than 2942.2.



**Figure K1.** Plots of (a) All Levels of Maintenance (AFMS 4241) and (b) Organizational Maintenance Only (TACMS A4241).

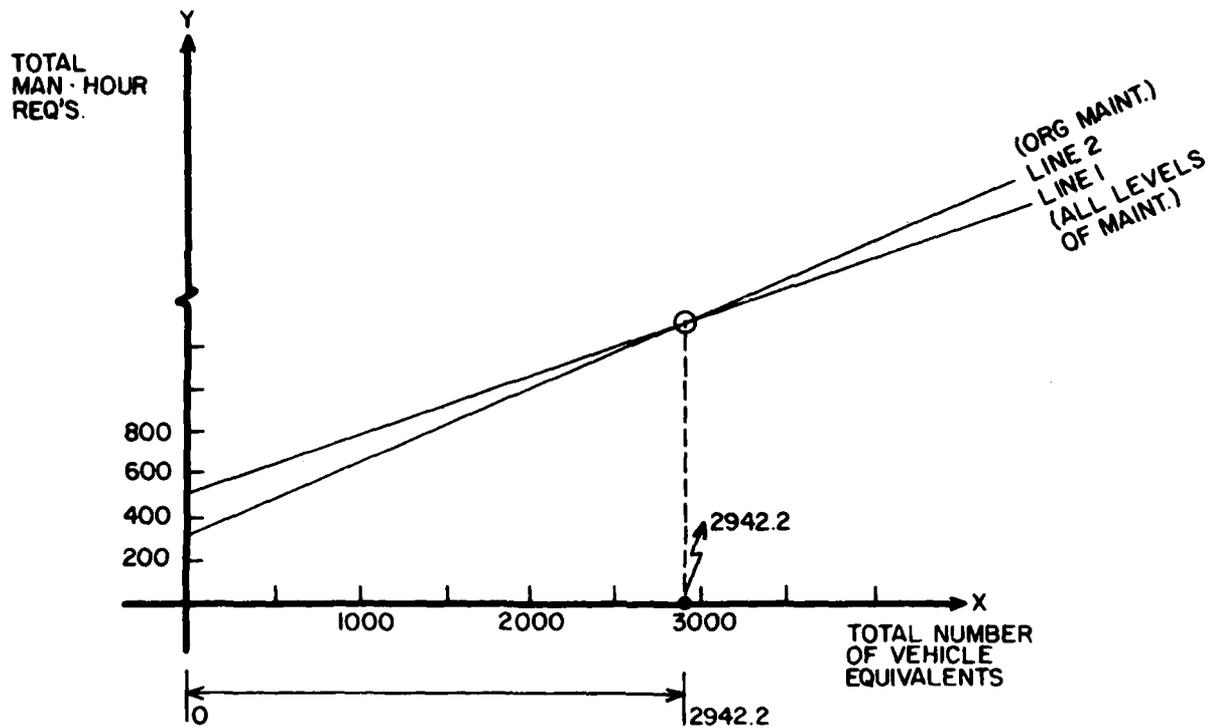


Figure K2. Intersection of All Maintenance Levels (Line 1) With Organizational Maintenance Only (Line 2).

**APPENDIX L:**

**MANPOWER SPACES FOR TACMS 4241**

<u>Air Force Specialty Title</u>	<u>Grade</u>	<u>Manpower Requirement Distribution</u>																
Vehicle Maintenance Supervisor	MSgt												1	1	1	1	1	1
Vehicle Maintenance Supervisor	TSgt	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Vehicle Maintenance Mechanic	SSgt	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3		
Vehicle Maintenance Control and Analysis Technician	SSgt												1	1	1	1	1	
Vehicle Operator/Dispatcher	SSgt												1	1	1	1	1	1
Vehicle Maintenance Mechanic	Sgt	1	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Inventory Management Specialist	SSgt														1	1	1	1
Apprentice Vehicle Maintenance Mechanic	A1C		1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	
<b>Total</b>		<b>3</b>	<b>5</b>	<b>5</b>	<b>7</b>	<b>7</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>13</b>	<b>14</b>					

APPENDIX M:

EQUIPMENT CODES USED BY THE U.S. NAVY

NAVFAC Equip. Code	Alpha Code	NAVFAC Abbreviated Description	NAVFAC Expanded Long Description	GVW
P-1 LINE ITEM 01				
PASSENGER-CARRYING VEHICLES				
0060	B	BUS BOC 12-PASS	BUS, MOTOR, BOC, 12-PASS, AIRPORT, 4X2	
0061	B	BUS BOC 16-20 P	BUS, MOTOR, BOC, 16-20 PASS, 4X2	10,000
0062	B	BUS BOC 29-30 P	BUS, MOTOR, BOC, 29-30 PASS, 4X2	14,000
0063	B	BUS BOC 36-60 P	BUS, MOTOR, BOC, 36-60 PASS, 4X2	19,000
0065	C	BUS BOC 45P F/C	BUS, MOTOR, BOC, 45-PASS, FORWD CON, 4X2	24,000
0066	C	BUS BOC 45P F/C	BUS, MOTOR, BOC, 45-PASS, RR LD AMB CONV 4X2, FORWARD CONTROL	
0067	C	BUS BOC 45P F/C	BUS, MOTOR, BOC, 45-PASS, SD LD AMB CONV 4X2, FORWARD CONTROL	
0070	D	BUS INTEG TRANS	BUS, MOTOR, INTEG, 35-47 PASS, DED, CITY TRANSIT, 4X2	
0071	D	BUS INTEG CONVR	BUS, MOTOR, INTEG, 37-47 PASS, W/AMB CON 4X2, DED OR GED	
0102	A	SEDAN INTERM 4D	AUTO, SEDAN, INTERMED, 5-PASS, 4-DR, 4X2	
0103	A	SEDAN SUBCOM 2D	AUTO, SEDAN, SUBCOMPACT, 2-DR, 4X2	
0104	A	SEDAN COMPAC 4D	AUTO, SEDAN, COMPACT, 5-PASS, 4-DR, 4X2	
0105	A	SEDAN LIGHT 4D	AUTO, SEDAN, LIGHT, 5-PASS, 4-DR, 4X2	
0114	A	SEDAN COMPAC 4D	AUTO, SEDAN, COMPACT, LAW ENFORCEMENT 5-PASS, 4-DR, 4X2	
0200	E	STA WAGON LIGHT	AUTO, STA WAGON, LIGHT, 6-8PASS, 4D, 4X2	
0202	E	STA WAG INTERM	AUTO, STA WAGON, INTERMED, 6-8 PASS, 4X2	
0210	E	STA WAG COMPACT	AUTO, STA WAGON, COMPACT, 5-PASS, 4X2	
0220	E	STA WAG SUBCOM	AUTO, STA WAGON, SUBCOMPACT, 2/4-DR, 4X2	
P-1 LINE ITEM 02				
TRUCKS				
0205	F	STA WAG AMB CON	AUTO, STA WAGON, W/AMBULANCE CONVER, 4X2	
0297	F	AMBULANCE FORGN	AUTOMOBILE, AMBULANCE, FOREIGN, 4X2	
0299	F	AMBULANCE LIGHT	AUTOMOBILE, AMBULANCE, METRO, 4X2	
0302	O	TRK 1/4-T JEEP	TRUCK, UTILITY, MILITARY, WWII, 4X4	3,500
0305	H	TRK 1/4-T UTIL	TRUCK, UTILITY, COMMERCIAL, 4X4	3,500
0307	O	TRK 1/4-T UTIL	TRUCK, UTILITY, M-SERIES, W/NO WINCH 4X4	3,500
0308	H	TRK 1/4-T UTIL	TRUCK, UTILITY, COMMERCIAL, 4X2	3,500
0311	H	TRK 1/2-T CARRY	TRUCK, CARRYALL, 8-PASSENGER, 4X2	4,800
0312	H	TRK 1/2-T PANEL	TRUCK, PANEL, 4X2	4,800
0313	G	TRK 1/2T PICKUP	TRUCK, CARGO, PICKUP, 4X2	4,800
0314	F	AMBULANCE CONV	TRUCK, PANEL, AMBULANCE CONVERSION, 4X2	4,800
0315	H	TRK 1/2-T MULTI	TRUCK, MULTISTOP DELIVERY, 4X2	4,800
0316	G	TRK 1/2T PICKUP	TRUCK, CARGO, PICKUP, 4X4	5,000

NAVFAC Equip. Code	Alpha Code	NAVFAC Abbreviated Description	NAVFAC Expanded Long Description	GVW
0317	H	TRK 1/2-T CARRY	TRUCK, CARRYALL, 8-PASSENGER, 4X4	5,000
0318	H	TRK 1/2-T PANEL	TRUCK, PANEL, 4X4	5,000
0319	G	TRK PICKUP COMP	TRUCK, CARGO, PICKUP, COMPACT, 4X2	3,800
0320	O	TRK M-STOP FWDC	TRUCK, MULTISTOP, FORWARD CONTROL, 4X2 SIT/STAND DRIVE, A/C MAINTENANCE	4,000
0322	H	TRK 3/4T PICKUP	TRUCK, CARGO, PICKUP, 4X2	5,800
0325	O	TRK 3/4-T CARGO	TRUCK, CARGO, M-SERIES, W/VO WINCH, 4X4	5,800
0326	H	TRK 3/4T PICKUP	TRUCK, CARGO, PICKUP, 4X4	5,800
0327	H	TRK 3/4T P/U 4D	TRUCK, CARGO, PICKUP, 6M, 4-DR, 4X2	5,800
0328	H	TRK 3/4T P/U 4D	TRUCK, CARGO, PICKUP, 6M, 4-DR, 4X4	5,800
0329	H	TRK PANEL F/C	TRUCK, PANEL, FORWARD CONTROL, GED, 4X2	6,200
0330	H	TRK CARRYAL F/C	TRUCK, CARRYALL, F/C, 8-PASS, GED, 4X2	6,200
0331	F	AMBUL FIELD MIL	TRUCK, AMB, FIELD, MIL, 4-LITTER, 4X4	7,000
0332	F	AMBUL FIELD COM	TRUCK, AMB, FIELD, COM, 4-LITTER, 4X4	10,500
0333	F	AMB CONV COM FC	TRUCK, AMB CONV, COM, 2-LITTER, FC, 4X2	7,500
0334	O	TRK 3/4T WEAPON	TRUCK, UTILITY, WEAPON CARRIER, 4X4	5,800
0335	H	TRK VAN COMP ET	TRUCK, VAN, COMPACT, W/ELEV TOP, FC, 4X2	3,800
0336	O	TRK PAN PAD WAG	TRUCK, PANEL, PADDY WAGON, FC, 4X2	6,200
0341	I	TRK 1-T PANEL	TRUCK, PANEL, 4X2	7,000
0342	I	TRK 1-T PICKUP	TRUCK, CARGO, PICKUP, 4X2	7,000
0343	I	TRK 1-T STAKE	TRUCK, STAKE, 4X2	7,000
0344	I	TRK 1-T CARGO	TRUCK, CARGO, 4X4	7,000
0345	I	TRK 1-T MULTIST	TRUCK, MULTISTOP DELIVERY, 4X2	7,000
0346	O	TRK M-STP FC AM	TRUCK, MULTISTOP, F/C, AIRCRAF MAIN, 4X2 GED	7,000
0348	I	TRK 1-T PICKUP	TRUCK, CARGO, PICKUP, 4X4	7,000
0349	I	TRK 1-T PANEL	TRUCK, PANEL, 4X4	7,000
0350	I	TRK 1-T CARRYAL	TRUCK, CARRYALL, 8-PASSENGER, 4X4	7,000
0352	O	TRK 1-T BOMB	TRUCK, BOMB SERVICE, 4X4	7,000
0355	I	TRK 1-T P/U 4D	TRUCK, CARGO, PICKUP, 6M 4-DR, 4X4	7,500
0360	O	TRK 1-1/4T CARG	TRUCK, CARGO, M-SERIES, W/VO WINCH, 4X4	8,900
0362	I	TRK VAN HI-VOL	TRUCK, VAN, F/C, HI-VOL, 4X2	8,000/ 10,000
0420	J	TRK 1-1/2T MSTP	TRUCK, MULTISTOP DELIVERY, 4X2	14,000
0421	J	TRK 1-1/2 T C&C	TRUCK, CAB & CHASSIS, 4X2	14,000
0423	J	TRK 1-1/2T DUMP	TRUCK, DUMP, 4X2	14,000
0424	J	TRK 1-1/2 T EXP	TRUCK, EXPRESS, 4X2	14,000
0426	J	TRK 1-1/2T STAK	TRUCK, STAKE, 4X2	14,000
0428	J	TRK 1-1/2 T VAN	TRUCK, VAN, 4X2	14,000
0438	O	TRK BOMB SERVIC	TRUCK, BOMB SERV, W/HYD SWING CRANE, 4X4 (MODELS MJ2 & MJ3)	14,000
0439	O	TRK CARGO BOMB	TRUCK, CARGO, BOMB SERVICE, M-SER, 4X4 (MODEL MJ3)	16,000
0441	J	TRK 2-T C&C	TRUCK, CAB & CHASSIS, 4X2	16,000
0443	J	TRK 2-T DUMP	TRUCK, DUMP, 4X2	16,000
0445	J	TRK 2-T STAKE	TRUCK, STAKE, 4X2	16,000
0446	J	TRK 2-T TRACTOR	TRUCK TRACTOR, 4X2	16,000

NAVFAC Equip. Code	Alpha Code	NAVFAC Abbreviated Description	NAVFAC Expanded Long Description	GVW
0449	J	TRK 2-T VAN	TRUCK, VAN, 4X2	16,000
0450	O	TRK 2-T VAN RFG	TRUCK, VAN, REFRIGERATOR, 4X2	16,000
0455	J	TRK 2-T STAKE	TRUCK, STAKE, 4X4	16,000
0456	J	TRK 2-T DUMP	TRUCK, DUMP, 4X4	16,000
0457	J	TRK 2-T VAN	TRUCK, VAN 4X4	16,000
0521	K	TRK 2-1/2 T C&C	TRUCK, CAB & CHASSIS, 4X2	19,000
0523	K	TRK 2-1/2T DUMP	TRUCK, DUMP, 4X2	19,000
0525	K	TRK 2-1/2T STAK	TRUCK, STAKE, GED, 4X2	19,000
0527	K	TRK 2-1/2T VAN	TRUCK, VAN, 4X2	19,000
0530	K	TRK 2-1/2T TRAC	TRUCK TRACTOR, DED, 4X2	19,000
0532	O	TRK 2-1/2T CARG	TRUCK, CARGO, WITH OR WITHOUT WINCH, 6X6	19,000
0533	O	TRK 2-1/2T DUMP	TRUCK, DUMP, M-SERIES, 6X6	19,000
0534	O	TRK 2-1/2T STAK	TRUCK, STAKE, 6X6	19,000
0535	O	TRK 2-1/2T TRAC	TRUCK TRACTOR, 6X6	19,000
0536	O	TRK 2-1/2 T VAN	TRUCK, VAN, M-SERIES, 6X6	19,000
0537	O	TRK 2-1/2 T C&C	TRUCK, CAB & CHASSIS, M-SERIES, 6X6	19,000
0539	O	TRK 2-1/2T CARG	TRUCK, CARGO, W/VO WINCH, M-SERIES, 6X6 24-VOLT	19,000
0545	L	TRK 3-1/2T TRAC	TRUCK TRACTOR, 4X2	22,000
0580	M	TRK 5-T DUMP	TRUCK, DUMP, 6X4	34,500
0582	M	TRK 5-T STAKE	TRUCK, STAKE, 6X4	34,500
0583	M	TRK 5-T TRAC DE	TRUCK TRACTOR, DED, 4X2	24,000
0587	O	TRK 5-T DUMP ML	TRUCK, DUMP, M-SERIES, 24-VOLT, 6X6 (M-51)	30,000
0588	O	TRK 5-T CARGO M	TRUCK, CARGO, M-SERIES, 24-VOLT, 6X6 (M-54)	30,000
0590	O	TRK 5-T VAN RFG	TRUCK, VAN, REFRIGERATOR, 4X2	24,000
0591	O	TRK 5-T C&C MIL	TRUCK, CAB & CHASSIS, M-SERIES, 6X6 (M-40)	30,000
0601	M	TRK 5-T C&C	TRUCK, CAB & CHASSIS, 4X2	24,000
0602	M	TRK 5-T DUMP	TRUCK, DUMP, 4X2	24,000
0603	M	TRK 5-T STAKE	TRUCK, STAKE, 4X2	24,000
0604	M	TRK 5-T TRACTOR	TRUCK TRACTOR, 4X2	24,000
0605	M	TRK 5-T VAN	TRUCK, VAN, 4X2	24,000
0606	M	TRK 5-T TRACTOR	TRUCK TRACTOR, 4X4	24,000
0607	O	TRK 5-T TRACTOR	TRUCK TRACTOR, 6X6	36,000
0609	M	TRK 5-T TRACTOR	TRUCK TRACTOR, 6X4	34,500
0613	M	TRK 7-1/2T STAK	TRUCK, STAKE, 6X4/6X6	36,000
0614	M	TRK 7-1/2T TRAC	TRUCK TRACTOR, 4X2/6X2	34,000
0615	O	TRK 7-1/2 T PM	TRUCK, PRIME MOVER, 6X6	34,000
0616	O	TRK 7-1/2T TT Y	TRUCK TRACTOR, YARD SPOTTER, DED, 4X2	32,000
0617	M	TRK 7-1/2T TRAC	TRUCK TRACTOR, 6X4	34,000
0620	M	TRK 10-T TRACTR	TRUCK TRACTOR, 4X2	40,000
0623	M	TRK 10-T TRACTR	TRUCK TRACTOR, DED. 4X2	40,000
0624	M	TRK 10-T VAN	TRUCK, VAN, 4X2	40,000
0625	M	TRK 10-T TRACTR	TRUCK TRACTOR, 4X4	40,000
0630	M	TRK 10-T TRACTR	TRUCK TRACTOR, 6X4	40,000

NAVFAC Equip. Code	Alpha Code	NAVFAC Abbreviated Description	NAVFAC Expanded Long Description	GVW
0631	M	TRK 10-T DUMP	TRUCK, DUMP, 6X4/6X6	45,000
0632	M	TRK 10-T STAKE	TRUCK, STAKE, 6X4	40,000
0633	M	TRK 10-T TRACTR	TRUCK TRACTOR, DED, 6X4	44,500
0636	M	TRK 10-T STAKE	TRUCK, STAKE, DED, 6X4	40,000
0638	N	TRK 15-T TRACTR	TRUCK TRACTOR, 6X6	48,000
0643	N	TRK 15-T STAKE	TRUCK, STAKE, 6X4	45,000
0644	N	TRK 15-T DUMP	TRUCK, DUMP, 6X4/6X6	50,000
0645	N	TRK 15-T TRACTR	TRUCK TRACTOR, 6X4	51,000
0649	N	TRK 25-T TRACTR	TRUCK TRACTOR, DED, 6X4 (25-TON)	64,000
0701	O	TRK CARGO AMPHI	TRUCK, CARGO, AMPHIBIAN, CRWLR/PRT SWAMP BUGGY	
0704	O	TRK AMMO HNDLG	TRUCK, AMMUNITION, W/HYD CRANE, 4X2/4X4	24,000
0705	Q	TRK AF CON TOWR	TRUCK, AIRFIELD CONTROL TOWER, MOBILE	
0707	Q	TRK A/FLD MAINT	TRUCK, AIRFIELD MAINT/AMMO TRANSPORTER	
0708	O	TRK PLATFM UTIL	TRUCK, PLATFORM, UTILITY, 3 OR 4-WHEEL, GED/EMD, 250 TO 1,000-LB PAYLOAD CAPACITY	
0709	O	TRK FLD SERVNG	TRUCK, FIELD SERVICING WITH COMPLETE LUBRICATION & FUEL SERVICE EQUIPMENT	16,000
0710	O	TRK LUBRICATION	TRUCK, LUBRICATION SERVICE	
0711	O	TRK ARMORED	TRUCK, ARMORED (PAYROLL)	
0713	O	TRK TIRE SERVNG	TRUCK, TIRE SERVICING	19,000
0715	O	TRK MULTI-PURP	TRUCK, MULTIPURP, PIPELINE CONST, M-SER M45/M45A2 CHASSIS (SPECIAL FEATURES: CARGO, PERSONNEL CARRIER, OR FLATBED WITH "A" FRAME)	19,000
0717	O	TRK VAN REFRIG	TRUCK, VAN, REFRIGERATOR (EXCEPT CODES 0450 AND 0590)	
0719	O	TRK FOOD/BEVRGE	TRUCK, FOOD/BEVERAGE, WINDOW SERVICE	
0722	O	TRK UTIL MAINT	TRUCK, MAINT, TELEPHONE/UTILITY, 4X2/4X4	8,400
0723	O	TRK P&L CONSTR	TRUCK, MAINT, POLE/LINE CONSTR, GED, 4X2	16,000
0724	O	TRK STAKE W/LDR	TRUCK, STAKE/PICKUP, W/LADDER, GED, 4X2 HAND OPERATED (NOT FIRE TRUCK)	16,000
0725	O	TRK OVRHD MAINT	TRUCK, OVRHD MAINT, AERIAL SERV PLTFM W/HYDR BOOM	24,000
0730	O	TRK WRECKER	TRUCK, WRECKER, COMMERCIAL/M-SERIES	24,000
0731	Q	TRK LDR AC HILF	TRUCK, LODR, A-C, W/WINCH/RAMP, HI-LIFT 2-9 TON (SPECIAL WEAPONS)	39,500
0732	O	TRK CARG HILIFT	TRUCK, CARGO, HIGHLIFT	
0733	O	TRK DUMP HILIFT	TRUCK, DUMP, HIGHLIFT	
0734	O	CARRIER PERSONN	TRUCK, CARRIER, PERSONNEL, TRACKED (CONV)	
0735	O	TRK REEL PWRD	TRUCK, REEL HANDLING/TENSIONING, POWERED	
0738	O	TRK FLTBD OILFL	TRUCK, FLATBED, OILFIELD	
0739	O	TRK FLTBD OILFL	TRUCK, FLATBED, OILFIELD, COMM, 4X2/6X4	34,500
0740	O	TRK FLATBED	TRUCK, FLATBED, 4X4	17,000

NAVFAC Equip. Code	Alpha Code	NAVFAC Abbreviated Description	NAVFAC Expanded Long Description	GVW
0742	O	TRK TANK GEN PU	TRUCK, TANK, W/O GAGES, GP, 500-999 GAL (WATER, REGULAR GAS, DIESEL, ETC.)	
0743	Q	TRK TNK AV LUBE	TRUCK, TANK, AVLUBE OIL DISPEN, 500-599G WITH OR WITHOUT HEATING ELEMENT	16,000
0744	Q	TRK TNK AVGAS/J	TRUCK, TANK, AVGAS/JET, 1000-1499 GAL	
0746	O	TRK TANK GEN PU	TRUCK, TANK, W/O GAGES, GP, 1000-1499G (WATER, REGULAR GAS, DIESEL, ETC.)	
0750	Q	TRK TNK AVGAS/J	TRUCK, TANK, AVGAS/JET, 2000-2999 GAL	
0751	O	TRK TANK GEN PU	TRUCK, TANK, W/O GAGES, GP, 2000-2999G (WATER, REGULAR GAS, DIESEL, ETC.)	28,000
0752	Q	TRK TNK AVGAS/J	TRUCK, TANK, AVGAS/JET, 3000-4999 GAL	
0753	O	TRK TANK 3000 G	TRUCK, TANK, W/O GAGES, GP, 3000-GAL/UP (WATER, REGULAR GAS, DIESEL, ETC.)	
0754	O	TRK TANK FUEL	TRUCK, TANK, FUEL, 2200-GAL, 6X4	30,000
0756	Q	TRK TNK AVGAS/J	TRUCK, TANK, AVGAS/JET, 6X4, 5000-GAL/UP	56,000
0757	O	TRK TANK WATER	TRUCK, TANK, WATER, 1000-1499 GALLONS	
0758	O	TRK TANK WATER	TRUCK, TANK, WATER, 2000-2999 GALLONS	
0759	O	TRK TANK WATER	TRUCK, TANK, WATER, 3000-GALLONS & UP	
0902	Z	MOTORCYCLE 2WHL	MOTORCYCLE, SOLO, 2-WHEEL	
0903	Z	MOTORCYCLE 3WHL	MOTORCYCLE, PACKAGE DELIVERY, 3-WHEEL WITH SIDE CAR (ALSO SERVICE VEHICLE)	
0905	Z	SCOOT PK 3-4WHL	SCOOTER, MOTOR, PKG DELIVERY, 3-4 WHEEL WITH SIDE CAR	
0907	Z	SLED SNOWMOBILE	SLED, SELF-PROP, GED, SNOWMOB, SKI-STEER	
5820	S	TRK COMPAC 16CY	TRUCK, REF COLL, COMPACTION 16-25 CU YD	39,500
5830	S	TRK HOIST/HAUL	TRUCK, MAT HNDLG, HOIST/HAUL, 2-12 CU YD	
5831	S	TRK HOIST/FKLFT	TRUCK, MAT HNDLG, HOIST, FORKLIFT, G/DED	32,000
5833	S	TRK H/H TO 45CY	TRUCK, MAT HNDLG, HOIST/HAUL TO 45-CU YD	51,000
5835	S	TRK HOIST/COMP	TRUCK, REF COLL, COMPACT, W/HOIST, 24-CY	39,500
P-1 LINE ITEM 03 TRAILERS				*Payload lbs
0090	P	SEMI W/PAS CONV	SEMITRAILER, W/PASSENGER BUS CONVERSION	14,000
0800	P	TRLR 1T 2W MAIN	TRAILER, MAINTENANCE, UTILITY, 2-WHEEL	* 1,000/ 2,000
0801	P	TRLR 1/4T 2W CG	TRAILER, CARGO, 2-WHEEL	* 500/ 1,999
0802	P	TRLR 1T 2W CARG	TRAILER, CARGO, 2-WHEEL	* 2,000/ 2,999
0803	P	TRL LUBE SERVIC	TRAILER, LUBRICATION SERVICE	
0804	P	TRLR 1-1/2T 2WH	TRAILER, CARGO, 2-WHEEL	* 3,000/ 3,999
0805	P	TRLR 2-5T 2-4WH	TRAILER, 2 OR 4-WHEEL	* 4,000/ 10,000
0808	P	TRLR MAINT PLAT	TRAILER, MAINTENANCE PLATFORM, HYDRAULIC	
0809	P	SEMI LOWBED HYD	SEMITRAILER, LOWBED, HYDRL DROP TABLE (WITH OR WITHOUT)	

NAVFAC Equip. Code	Alpha Code	NAVFAC Abbreviated Description	NAVFAC Expanded Long Description	*Payload lbs
0810	P	SEMI 10-T STAKE	SEMITRAILER, STAKE, 1-AXLE	* 20,000
0811	P	SEMI 10-T VAN	SEMITRAILER, VAN, 1-AXLE	* 20,000
0812	P	SEMI 14-T STAKE	SEMITRAILER, STAKE, 1 OR 2-AXLE	* 22,000/ 28,000
0813	P	SEMI 12-T VAN	SEMITRAILER, VAN, 1 OR 2-AXLE	* 24,000
0814	P	SEMI 19-T STAKE	SEMITRAILER, STAKE, 1 OR 2-AXLE	* 38,000
0815	P	SEMI 19-T VAN	SEMITRAILER, VAN, 2-AXLE	* 38,000
0816	P	SEMI 20-T STAKE	SEMITRAILER, STAKE, 2-AXLE	* 40,000
0817	P	SEMI 20-T VAN	SEMITRAILER, VAN, 2-AXLE	* 40,000
0818	P	SEMI 40-T STAKE	SEMITRAILER, STAKE, 2-AXLE	* 80,000
0819	P	SEMI 12T VAN RF	SEMITRAILER, VAN, REFRIGERATOR, 1-2 AXLE	* 24,000
0820	P	SEMI 20T VAN RF	SEMITRAILER, VAN, REFRIGERATOR, 2-AXLE	* 40,000
0821	P	SEMI 14-T LOBED	SEMITRAILER, LOWBED, 4-WHEEL	* 28,000
0822	P	SEMI 20-T LOBED	SEMITRAILER, LOWBED, 4-WHEEL	* 40,000
0823	P	SEMI 25-T LOBED	SEMITRAILER, LOWBED, 4-WHEEL	* 50,000
0824	P	SEMI 30-T LOBED	SEMITRAILER, LOWBED, 4-WHEEL	* 60,000
0825	P	SEMI 35-T LOBED	SEMITRAILER, LOWBED, 2-AXLE	* 62,000/ 70,000
0826	P	SEMI 50-T LOBED	SEMITRAILER, LOWBED, TRUNNION AXLE	* 100,000
0827	P	SEMI 60-T LOBED	SEMITRAILER, LOWBED, TRUNNION AXLE	* 120,000
0828	P	SEMI 75-T LOBED	SEMITRAILER, LOWBED, TRUNNION AXLE, 8WHL	* 150,000
0829	P	DOLLY TRLR CONV	DOLLY, TRAILER CONVERTER	
0830	P	TRLR 14-T STAKE	TRAILER, STAKE, 1-AXLE	* 28,000
0831	P	TRLR 14-T VAN	TRAILER, VAN, 1-AXLE	* 28,000
0833	P	TRLR 14-T LOBED	TRAILER, LOWBED, 4-WHEEL	* 28,000
0834	P	TRLR 20-T LOBED	TRAILER, LOWBED, 4-WHEEL	* 40,000
0835	P	TRLR 25-T LOBED	TRAILER, LOWBED, 4-WHEEL	* 50,000
0839	P	TRLR 60-T LOBED	TRAILER, LOWBED, 8-WHEEL	* 120,000
0840	P	TRLR 85-T LOBED	TRAILER, LOWBED, 8-WHEEL	* 170,000
0841	P	TRLR 20-T STAKE	TRAILER, STAKE, 2-AXLE	* 40,000
0842	P	TRLR 15-T BOLST	TRAILER, BOLSTER, PIPE/POLE	* 30,000
0843	P	TRLR 5-T CRL/PL	TRAILER, CABLE REEL/POLE	* 10,000
0844	P	TRLR FILTERING	TRAILER, FILTERING, PORTABLE	
0845	P	TRLR 1/4T CA SP	TRAILER, MAINTENANCE, CABLE SPLICER	
0848	T	TRLR/SEMI DUMP	TRAILER/SEMITRAILER, DUMP, REFUSE	
0852	P	TRLR MAINT TELE	TRAILER, MAINTENANCE, TELEPHONE	
0853	P	TRLR/SEMI MISC	TRAILER/SEMITRAILER, MISC/EXHIBIT/TRNG RECRUITING/GENERAL SERVICE/UTILITY, ETC.	
0858	P	TRLR STOCKROOM	TRAILER, VAN, STOCKROOM	
0862	P	TRLR TILTDECK	TRAILER/SEMITRAILER, TILTDECK, LOWBED 2 OR 4-WHEEL	* 12,000/ 28,000
0864	P	TRLR DEHUMID	TRAILER, DEHUMIDIFIER	
0880	P	TRLR TANK 400-G	TRAILER, TANK, W/O GAGE/PUMP, 2WHL, 400G GENERAL PURPOSE (WATER, REGULAR GAS, DIESEL, OIL SALVAGE, ETC.)	1,500
0881	P	TRLR TNK 5/600G	TRAILER, TNK, W/O GAG/PUMP, 2-4W, 5/600G GENERAL PURPOSE (WATER, REGULAR GAS, DIESEL, OIL SALVAGE, ETC.)	

NAVFAC Equip. Code	Alpha Code	NAVFAC Abbreviated Description	NAVFAC Expanded Long Description	GVW
0882	P	TRLR TANK 600-G	TRAILER, TNK, W/PUMP, 2-4 WHEEL, 600-GAL GENERAL PURPOSE (WATER, REGULAR GAS, DIESEL, OIL SALVAGE, ETC.)	
0883	P	TRLR TANK 500-G	TRAILER, TANK, W/O GGS, 2-4 WHL, TO 500G GENERAL PURPOSE (WATER, REGULAR GAS, DIESEL, OIL SALVAGE, ETC.)	
0884	P	SEMI TNK 1-2K G	SEMITRAILER, TANK, W/O GAGES, 1000-1999G GENERAL PURPOSE (WATER, REGULAR GAS, DIESEL, ETC.)	
0886	P	SEMI TNK 2-3K G	SEMITRAILER, TANK, W/O GAGES, 2000-2999G GENERAL PURPOSE (WATER, REGULAR GAS, DIESEL, ETC.)	
0887	Q	SEMI TNK 2-3K G	SEMITRAILER, TANK, AVGAS/JET, 2000-2999G	
0888	P	SEMI TNK 3-4K G	SEMITRAILER, TANK, W/O GAGES, 3000-3999G GENERAL PURPOSE (WATER, REGULAR GAS, DIESEL, ETC.)	
0890	P	SEMI TNK 4-6K G	SEMITRAILER, TANK, W/O GAGES, 4000-5999G GENERAL PURPOSE (WATER, REGULAR GAS, DIESEL, ETC.)	
0891	Q	SEMI TNK 4KUP G	SEMITRAILER, TANK, AVGAS/JET, 4000-G UP	
0892	P	SEMI TNK 6KUP G	SEMITRLR, TANK, GP, W/O GAGES, 6000-G UP GENERAL PURPOSE (WATER, REGULAR GAS, DIESEL, ETC.)	
0898	P	SEMI LB W/WINCH	SEMITRAILER, LOWBED, W/GED WINCH ON GSNK (MINE TRANSPORTER)	
5840	T	SEMI/TRLR REFUS	SEMITRAILER/TRAILER, REFUSE COLLECTION	
5842	T	SEMI REFUSE CMP	SEMITRAILER, REFUSE COLLECT, COMPACTION	

NOTE: For reference purposes the tonnage cross reference to Gross Vehicle Weight (GVW) may be converted approximately as follows:

Truck, 1/2 ton, 4x2	4,800 GVW
Truck, 1/2 ton, 4x4	5,000 GVW
Truck, 3/4 ton, 4x2 or 4x4	5,800 GVW
Truck, 1 ton, 4x2 or 4x4	7,000 GVW
Truck, 1 1/2 ton, 4x2 or 4x4	14,000 GVW
Truck, 2 ton, 4x2 or 4x4	16,000 GVW
Truck, 2 1/2 ton, 4x2 or 4x4	19,000 GVW
Truck, 3 ton, 4x2	21,000 GVW
Truck, 5 ton, 4x2 or 4x4	24,000 GVW
Truck, 5 ton, 6x4	30,000 GVW
Truck, 6 ton, 4x2	28,000 GVW
Truck, 7-7 1/2 ton, 4x2	32,000 GVW
Truck, 7-7 1/2 ton, 4x4	34,000 GVW
Truck, 10 ton, 4x2, 4x4, or 6x4	40,000 GVW
Truck, 15 ton, 6x4	45,000 GVW
Truck, 20 ton, 6x4	51,000 GVW

NAVFAC Equip. Code	Alpha Code	NAVFAC Abbreviated Description	NAVFAC Expanded Long Description
P-1 LINE ITEM 04			
CRUSHING, MIXING, BATCHING, & GVV PAVING EQUIPMENT			
2110	T	PLANT BATCHING	PLANT, BATCHING, AGGREGATE
2111	T	UNIT GRAD CNTRL	UNIT, GRADATION CONTROL, AGGREGATE
2120	T	PLANT BATCHING	PLANT, BATCHING, CEMENT/CEMENT W/AGGREG
2200	T	CRUSHER ROCK	CRUSHER, ROCK & SCREEN PLT, PORT, 2-UNIT
2210	T	PLANT WASHING	PLANT, WASHING, AGGREGATE, SAND/GRAVEL
2220	T	FEEDER AGGREG	FEEDER, AGGREGATE, CONVEYOR OR PORTABLE
2225	T	FEEDER FINES BI	FEEDER, FINES, BITUMINOUS MIX (E.G., BARBER GREEN MODEL 811A OR EQUAL)
2300	S	FINISHER ASPHLT	FINISHER, PAVING, ASPHALT
2325	T	PAVER CURB	PAVER, CURB
2340	T	GRINDER CONCRT	GRINDER, PAVEMENT, CONCRETE, SELF-POWER
2410	T	MIXER ASPHALT	MIXER, ASPHALT PLANT
2415	T	MIXER ROAD MAT	MIXER, ROAD MATERIAL, ASPHALT, S-P/TOWED WITH OR WITHOUT DRYER
2416	T	MIX-SPRD SLURRY	MIXER-SPREADER, BITUM SLURRY, TRUCK MTD (ASPHALT PAVEMENT SEALING MACHINE)
2420	S	MIXER TRANSIT	MIXER, TRANSIT, CONCRETE, TRUCK MOUNTED
2425	T	PLANT CONCRETE	PLANT, CONCRETE, MIX/BATCH, COMPLT, TRLR
2430	S	MXR CONCR LT3]S	MIXER, CONCRETE, PORTABLE, UNDER 3]-S
2431	S	MXR CONCR 3]-SK	MIXER, CONCRETE, PORTABLE, 3]-S (CU FT)
2432	S	MXR CONCR 7]-SK	MIXER, CONCRETE, PORTABLE, 6-7 S (CU FT)
2433	S	MXR CONCR 11]-SK	MIXER, CONCRETE, PORTABLE, 10-11 S (CFT)
2434	S	MXR CONCR 16]-SK	MIXER, CONCRETE, PORTABLE, 14-16 S (CFT)
2462	T	CONCR SPRA/SNBL	SPRAYER/SANDBLASTER, CONCRETE, W/WO MXR, PUMP, CONCRETE (CEMENT) GUN
2470	S	SAW CONCRETE SP	SAW, CONCRETE, SELF-POWERED
2520	S	DISTRIB ASPHALT	DISTRIBUTOR, ASPHALT, TRUCK/TRAILER MTD
2521	S	DISTRIB WATER	DISTRIBUTOR, WATER, TRUCK OR TRAILER MTD 28,000 STREET FLUSHER OR SPRINKLER
2522	T	BUGGY CONCRETE	BUGGY, CONCRETE, SELF-PROPELLED
2530	T	SPREADR AGG TWD	SPREADER, ROCK AND AGGREGATE, TOWED
2540	T	SPRDR LOOSE MAT	SPREADER, LOOSE MATERIAL, TOWED GED/DED, 6" TO 150" SPREAD WIDTH
2610	T	CONVEYOR BELT	CONVEYOR, AGGREGATE, BELT OR TROUGH TRAILER MOUNTED
2735	T	HEATER ASP TOOL	HEATER, ASPHALT TOOL, TRAILER MOUNTED
2740	T	KETTLE BITUMEN	KETTLE, HEATING, BITUMEN, SKID/TRLR MTD
2760	T	KETTLE JOINT SL	KETTLE, HEATING, RUBBERIZED JOINT SEALER
2840	T	GROUTER MUD JAK	GROUTER, MUD JACK

NAVFAC Equip. Code	Alpha Code	NAVFAC Abbreviated Description	NAVFAC Expanded Long Description
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P-1 LINE ITEM 05

DRILLING AND BLASTING EQUIPMENT

3100	S	COMPRES 104-CFM	COMPRESSOR, AIR, PORTABLE, 60-104 CFM 100 LB PRESSURE, SKID/TRAILER/TRUCK MOUNTED
3110	S	COMPRES 125-CFM	COMPRESSOR, AIR, PORTABLE, 105-125 CFM 100 LB PRESSURE, SKID/TRAILER/TRUCK MOUNTED
3111	S	TRAC/CMP 125CFM	TRACTOR AIR COMPRESSOR, PRT, 125-CFM 100 LB PRESSURE
3130	S	COMPRES 210-CFM	COMPRESSOR, AIR, PORTABLE, 210-CFM 100 LB PRESSURE, SKID/TRAILER/TRUCK MOUNTED
3135	S	COMPRES 250-CFM	COMPRESSOR, AIR, PORTABLE, 250-CFM 100 LB PRESSURE, SKID/TRAILER/TRUCK MOUNTED
3150	S	COMPRES 315-CFM	COMPRESSOR, AIR, PORTABLE, 315-CFM 100 LB PRESSURE, SKID/TRAILER/TRUCK MOUNTED
3155	S	COMPRES 365-CFM	COMPRESSOR, AIR, PORTABLE, 365-CFM 100 LB PRESSURE, SKID/TRAILER/TRUCK MOUNTED
3160	S	COMPRES 500-CFM	COMPRESSOR, AIR, PORTABLE, 500-CFM 100 LB PRESSURE, SKID/TRAILER/TRUCK MOUNTED
3165	S	COMPRES 600-CFM	COMPRESSOR, AIR, PORTABLE, 600-CFM/UP 100 LB PRESSURE, SKID/TRAILER/TRUCK MOUNTED
3530	T	DRILL PNEU DRIF	DRILL, PNEUMATIC DRIFT, WAGON, AUTO FEED
3531	S	DRILL CORE	DRILL, CORE, SKID/TRAILER/TRUCK MOUNTED
3532	S	DRILL PNEU DRIF	DRILL, PNEUMATIC DRIFT, CRAWLER MTD
3630	T	DRIVER PILE S-C	DRIVER, PILE, SELF-CONTAINED
3710	S	AUGER EARTH	AUGER, EARTH, VER/HOR, SKD/TRLR/TRK/TRKD
3720	S	DRILL ROT/PERC	DRILL, WELL, ROTARY/PERCUSSION

P-1 LINE ITEM 06

EARTH MOVING EQUIPMENT

4230	S	CRANE CRWLR 10T	CRANE, CRAWLER, DED, 7-10 TON, 3/4 CY
4240	S	CRANE CRWLR 30T	CRANE, CRAWLER, DED, 20-30 TON, 1-1/2 CY
4250	S	CRANE CRWLR 40T	CRANE, CRAWLER, DED, 30-40 TON 1-3/4-2 CY
4260	S	CRANE CRWLR 60T	CRANE, CRAWLER, DED, 45-60 TON, 2-1/2 CY
4270	S	CRANE CRWLR 75T	CRANE, CRAWLER, DED, 65-75 TON, 3-4 CY
4305	T	CABLE LAYER UG	CABLE LAYER, UNDERGROUND, TOWED
4310	S	DITCHER WHL/LDR	DITCHER, WHEEL/LADDER, WHEEL/CRAWLER MTD
4320	T	ROOTER/HARROW	ROOTER, ROAD; HARROW, DISC, TOWED
4330	S	EXCAVATOR W/TBM	EXCAVATOR, MULTIPUR, W/TEL BOOM, TRK MTD (E.G., GRADALL)

NAVFAC Equip. Code	Alpha Code	NAVFAC Abbreviated Description	NAVFAC Expanded Long Description
4410	T	GRADER RD TOWED	GRADER, ROAD, TOWED
4420	S	GRADER RD MOTOR	GRADER, ROAD, MOTORIZED, GED/DED
4530	S	LOADER FULL-TRK	LOADER, SCOOP, FULL-TRACK, SHOVEL DOZER
4531	S	LOADER SCOOP WH	LOADER, SCOOP, WHEEL MOUNTED
4540	S	LOADER SNOW	LOADER, SNOW, BELT/BUCKET, CRWLR/WHL MTD
4610	T	ROLLER WOBBLE	ROLLER, WOBBLE WHEEL, PNEUMATIC TIRE
4615	S	ROLLER OSCIL SP	ROLLER, OSCILLATING, SELF-PROPELLED, PRT
4620	T	ROLLER SHEEPSFT	ROLLER, SHEEPSFOOT, TAMPING, TOWED
4621	T	ROLLER GRID TWD	ROLLER, GRID, TOWED
4622	S	ROLLER GRID/SEG	ROLLER, GRID/SEGMENTED, SELF-PROPELLED
4625	T	COMPACTOR VBR	COMPACTOR, VIBRATOR, EARTH OR AGGREGATE
4630	S	ROLLER TANDEM	ROLLER, ROAD, TANDEM, S-P, ALL SIZES
4635	S	ROLLER VIBRATE	ROLLER, ROAD, VIBRATING, S-P, ALL SIZES
4640	S	ROLLER 3-WHEEL	ROLLER, ROAD, 3-WHEEL, S-P, ALL SIZES
4710	T	SCRAPER TWD 5CY	SCRAPER, CARRYALL, CABL/HYD, TWD, 3-5 CY
4730	T	SCRAPR TWD 12CY	SCRAPER, CARRYALL, CABL/HYD, TWD, 12-CY AND UP
4731	T	SCRAPR TWD 18CY	SCRAPER, CARRYALL, 2-WH UNV HCH, 14-18CY TOWED, WITHOUT DOLLY
4750	S	TRAC-SCRPR 24CY	TRACT-SCRPR, INTG, S-P, 1-2 ENG, 15-24CY
4760	S	TRK DUMP OFF-HI	TRUCK, DUMP, OFF-HIGHWAY
4770	T	TRLR DUMP EARTH	TRAILER, DUMP, EARTH-MOVE, WHL/CRWLR MTD
4809	S	TRC CRAWLR 10HP	TRACTOR, CRAWLER, GED/DED, 10 DBHP WITH OR WITHOUT ATTACHMENTS
4810	S	TRC CRAWLR 34HP	TRACTOR, CRAWLER, GED/DED, 10-34 DBHP WITH OR WITHOUT ATTACHMENTS
4820	S	TRC CRAWLR 49HP	TRACTOR, CRAWLER, GED/DED, 35-49 DBHP WITH OR WITHOUT ATTACHMENTS
4830	S	TRC CRAWLR 74HP	TRACTOR, CRAWLER, GED/DED, 50-74 DBHP WITH OR WITHOUT ATTACHMENTS
4840	S	TRC CRWLR 109HP	TRACTOR, CRAWLER, GED/DED, 75-109 DBHP WITH OR WITHOUT ATTACHMENTS
4850	S	TRC CRWLR 179HP	TRACTOR, CRAWLER, GED/DED, 110-179 DBHP WITH OR WITHOUT ATTACHMENTS
4851	S	TRC CRWLR 180UP	TRACTOR, CRAWLER, GED/DED, 180-DBHP & UP WITH OR WITHOUT ATTACHMENTS
4865	S	TRAC W/AER PLAT	TRACTOR, WITH AERIAL SERVICING PLATFORM
4872	U	TRC WH IND 19HP	TRACTOR, IND, PRT, WHL, GED, 9-19 DBHP
4873	U	TRC WH IND 29HP	TRACTOR, IND, PRT, WHL, GED, 20-29 DBHP
4874	U	TRC WH IND 39HP	TRACTOR, IND, PRT, WHL, GED, 30-39 DBHP
4875	U	TRC WH IND 49HP	TRACTOR, IND, PRT, WHL, GED, 40-49 DBHP
4876	U	TRC WH IND 50UP	TRACTOR, IND, PRT, WHL, GED, MIN 50-DBHP
4877	U	TRC WH IND MOWR	TRACTOR, IND, WHL, W/AMMO MOWER, 30-DBHP 4X2, TERRA TIRES, LOW PROFILE FOR AMMO MAGAZINES
4891	S	TRC WH 14K PDBP	TRACTOR, WHEEL, INDUST, 7800-14000 PDBP 4-WHEEL DRIVE PRIME MOVER
4892	S	TRC WH 20K PDBP	TRACTOR, WHEEL, INDUST, 14001-20000 PDBP

NAVFAC Equip. Code	Alpha Code	NAVFAC Abbreviated Description	NAVFAC Expanded Long Description
4893	S	TRC WH 27K PDBP	TRACTOR, WHEEL, INDUST, 20001-27000 PDBP
4894	Q	TRC WH OVER 27K	TRACTOR, WHEEL, INDUST, 27001 PDBP & UP

P-1 LINE ITEM 07  
LIGHTING AND POWER GENERATION EQUIPMENT

5110	T	FLOODLIGHT ELEC	FLOODLIGHT, ELECTRIC, TRUCK/TRAILER MTD (GENERATOR)
5113	Q	FLDLGHT AIRFLD	FLOODLIGHT, AIRFIELD, TRAILER MOUNTED
5120	T	GENERATOR 5-9KW	GENERATOR, PORTABLE, GED/DED, 5-9 KW SKID/TRUCK/TRAILER MOUNTED (EXCEPT GENERATORS FOR ELECTRONICS)
5121	T	GENERATOR 10-15	GENERATOR, PORTABLE, GED/DED, 10-15 KW SKID/TRUCK/TRAILER MOUNTED (EXCEPT GENERATORS FOR ELECTRONICS)
5122	T	GENERATOR 16-30	GENERATOR, PORTABLE, GED/DED, 16-30 KW SKID/TRUCK/TRAILER MOUNTED (EXCEPT GENERATORS FOR ELECTRONICS)
5123	T	GENERATOR 31-59	GENERATOR, PORTABLE, GED/DED, 31-59 KW SKID/TRUCK/TRAILER MOUNTED (EXCEPT GENERATORS FOR ELECTRONICS)
5124	T	GENERATOR 60-100	GENERATOR, PORTABLE, GED/DED, 60-100 KW SKID/TRUCK/TRAILER MOUNTED (EXCEPT GENERATORS FOR ELECTRONICS)

P-1 LINE ITEM 08  
MISCELLANEOUS CONSTRUCTION AND  
MAINTENANCE EQUIPMENT

5160	Z	LUBRICATOR PWR	LUBRICATOR, POWER OPERATED, SKID MTD
5170	S	WELDER ARC ELEC	WELDER, ARC, ELEC, GED/DED, SKID/TRLR MT
5171	S	WELDER ARC S-P	WELDER, ARC, ELECTRIC, SELF-PROPELLED
5220	T	PUMP CENTRIFUGL	PUMP, CENTRIFUGAL, 4-INCH OR GREATER
5230	T	PUMP SUMP PORT	PUMP, SUMP, PORTABLE, GED/DED
5240	T	PUMP ROTARY POR	PUMP, ROTARY, PORTABLE, GED/DED
5300	T	DISTRIB BITUMIN	DISTRIBUTOR, BITMINOUS MATRL, TANKLESS SKID/TRAILER MOUNTED
5405	S	CLEANR VAC LEAF	CLEANER, VAC, LEAF/LITTER, TRK/TRLR MTD
5408	Q	CLEANER VAC A/F	CLEANER, VACUUM, AIRFIELD, SELF-PROPEL
5409	S	CLEANER VAC/HYD	CLEANER, BASIN/MANHOLE, VAC/HYD, TRK MTD
5410	Z	CLEANER STEAM	CLEANER, STEAM, HI-PRESS, SKID/TRLR MTD JENNY
5411	T	CLEANER JOINT	CLEANER, JOINT, PAVING
5412	S	CLEANER AUGER	CLEANER, PIPE/SEWER, AUGER/CABLE, TRLR
5413	T	CLEANER SCRAPER	CLEANER, SCRAPER, PORTABLE
5414	S	CLEANER SEP TNK	CLEANER, SEPTIC TANK/CESSPOOL, TRUCK MTD TANK WITH SLUDGE PUMP
5415	Z	CLEANER BOM STM	CLEANER, BOMB, STEAM, TRAILER MOUNTED

NAVFAC Equip. Code	Alpha Code	NAVFAC Abbreviated Description	NAVFAC Expanded Long Description
5416	S	CLEANER WATER J	CLEANER, PIPE/SEWER, WATER JET, TRK MTD
5417	Z	INSP SYS VIDEO	SEWER INSPECTION SYS, VIDEO SEAL/REVEAL
5418	T	CLEANER SANDBLS	CLEANER, SANDBLASTING, PORTABLE
5421	Z	SPRAYER PESTICD	SPRAYER/DUSTER, PESTICIDE, PORTABLE, GED
5428	S	WASHER P/L INS	WASHER, POWERLINE INSULATOR, TRK/TRL MTD
5430	T	MARKER LINE TWD	MARKER, TRAFFIC LINE, ROAD, WHL MTD, TWD
5435	S	MARKER LINE S-P	MARKER, TRAFFIC LINE, ROAD, SELF-POWERED
5440	Z	POWER UNIT TRLR	POWER UNIT, TRAILER MOUNTED
5441	T	BURNER WEED TRLR	BURNER, WEED, GAS-FIRED, TRAILER MOUNTED
5455	Z	PURIFIER WATER	PURIFIER, WATER, SKID/TRUCK MTD
5500	Q	FSU AC TRLR MTD	FUEL SERV UNIT, A-C, TRLR MTD, 600-GPM AIR TRANSPORTABLE
5621	U	MOWER LAWN ROTY	MOWER, LAWN, ROTARY KNIFE, 48" MIN SWATH
5628	U	CUTTER STUMP	CUTTER, STUMP, WHEEL-MOUNTED, TOWED
5630	U	MOWER LAWN REEL	MOWER, LAWN, REEL, 48" MIN SWATH
5635	U	MULCH SEED FERT	MULCHER, SEED/FERTILIZ, SKD/TRK/TRLR MTD GED
5642	U	SHREDDER BRUSH	SHREDDER, BRUSH DISPOSER, GED, TRLR MTD
5643	U	SHRED SOIL PUL	SHREDDER, SOIL PULVERIZER/MIXER, TRLR MT
5650	U	MOWER TOWED	MOWER, HAMMERKNIFE OR SICKLEBAR, TOWED
5660	Z	PLATFORM HILIFT	PLATFORM, MAINT, HI-LIFT, S-P, TELE BOOM (NOT FOR SHIPBOARD USE)
5700	T	SWEEPER/SCRUBBER	SWEEPER OR SCRUBBER, MAIN SWATH 42" MIN
5710	S	SWEEPER MAGNET	SWEEPER, STREET, MAGNETIC, S-P OR TOWED
5720	S	SWEEPER ROTARY	SWEEPER, ROTARY, STREET, PICKUP, S-P
5730	U	SWEEPER LAWN SP	SWEEPER, LAWN, SELF-PROPELLED OR TOWED
5740	T	SWEEPER BROOM	SWEEPER, STREET, REV BROOM, NONP-U, TWD
5745	T	SWEEPER SNOW	SWEEPER, ROTA, SNOW, AIRBLAST, AFLD, TWD,
5750	T	SNOWPLOW ROTARY	SNOWPLOW, S-C, ROTARY/ROTO-WING, TRK MTD SINGLE PURPOSE
5755	T	SNOWPLOW DISPLC	SNOWPLOW, S-C, DISPLACEMENT, TRK MTD (EXCEPT CODE 5757)
5757	T	SNOWPLOW ROLOVR	SNOWPLOW, ROLLOVER, W/VO SANDER, TRK MTD
5790	T	SANDER ST TRK	SANDER, SELF-CONTAINED, STREET, TRK MTD
5795	T	SANDER TRK MTG	SANDER, STREET, FOR TRK MOUNTING/TOWING
5900	T	SHOP WOODWK TRL	SHOP, WOODWORKING, MOBILE, TRAILER MTD
5910	T	SHOP MACH TRLR	SHOP, MACHINE, MOBILE, TRAILER MOUNTED
5912	T	SHOP TRADES TRLR	SHOP, TRADESMAN, MOBILE, TRAILER MOUNTED
5920	T	SHOP MACH TRK	SHOP, MACHINE, MOBILE, TRUCK MOUNTED
6222	T	TAMPER S-P RR	TAMPER, SELF-PROPELLED, RR, TIE/BALLAST
6600	Z	EQUIP MAINT RR	EQUIPMENT, MAINTENANCE, RAILROAD, MISC RR WHEEL MOUNTED (E.G., TIE PULLER, SPIKE HAMMER, ETC.)

NAVFAC Equip. Code	Alpha Code	NAVFAC Abbreviated Description	NAVFAC Expanded Long Description P-1 LINE ITEM 09 FIREFIGHTING EQUIPMENT
0714	X	TRK W/DRY CHEM	TRUCK, CARGO, W/DRY CHEMICAL UNIT INSTL MODIFIED COMMERCIAL
7100	X	TRK FIRE/RESCUE	TRUCK, AIRCRAFT FIREFIGHTING/RESCU, MISC (SPECIFY COMPLETE DESCRIPTION FOR IDENTIFICATION)
7102	X	TRK FIRE/RESCUE	TRUCK, AIRCRAFT FIREFIGHTING/RESCUE WITH MISCELLANEOUS RESCUE EQUIPMENT, AND SKID MTD EXTINGUISHING UNIT
7103	X	TRK FIRE HOSE	TRUCK, FIREFIGHTING, HOSE WAGON
7105	X	TRK FIRE TANK	TRUCK, FIREFIGHTING, TANK, FOAM/WATER
7155	X	TRK FIRE/RESCUE	TRUCK, AIRCRAFT FIREFIGHTING/RESCUE, GO <sub>2</sub> LOW PRES
7160	X	TRK FIRE/RESCUE	TRUCK, AIRCRAFT FIREFIGHTING/RESCUE, 1000-GALLON
7165	X	TRK FIRE/CRASH	TRUCK, FIREFIGHT, CRASH, FOAM, SMALL MB-2
7175	X	TRK FIRE/RESCUE	TRUCK, AIRCRAFT FIREFIGHTING/RESCUE, 400/500-GALLON
7180	X	TRK FIRE/RESCUE	TRUCK, AIRCRAFT FIREFIGHTING/RESCUE, 1500-GALLON
7190	X	TRK FIRE/RESCUE	TRUCK, AIRCRAFT FIREFIGHTING/RESCUE, 2300-GALLON
7195	X	TRK FIRE/RESCUE	TRUCK, AIRCRAFT FIREFIGHTING/RESCUE, 6000-GALLON
7200	X	TRLR FIRE PUMP	TRAILER, FIREFIGHTING, PUMP, 500-GPM
7225	X	AGENT RESUPPLY	AGENT RESUPPLIER, TRUCK/TRAILER MOUNTED
7230	X	FOAMER RESUPPLY	TRAILER, FOAMER/AGENT RESUPPLY/FIREFIGHT
7300	X	TRUCK FIRE MISC	TRUCK, FIREFIGHTING, MISC MOUNTED EQUIP PUMPS, TANKS, ETC. (SPECIFY TYPE)
7310	X	TRK FIRE 500GPM	TRUCK, FIREFIGHTING, PUMPER, 500-GPM
7320	X	TRK FIRE 750GPM	TRUCK, FIREFIGHTING, PUMPER, 750-GPM
7321	X	TRK FIRE 750GPM	TRUCK, FIREFIGHTING, STRUCTURAL, PUMPER, 750-1000 GPM
7330	X	TRK FIRE FOAM	TRUCK, FIREFIGHTING, FOAM GENERATING 1000-GALLON/UP
7340	X	TRK FIRE BRUSH	TRUCK, FIREFIGHTING, BRUSH/GRASS W/TANK
7341	X	TRK FIRE ATTACK	TRUCK, FIREFIGHTING, BRUSH/GRASS, ATTACK COMBINATION PUMPER, 4X4
7400	X	TRK FIRE LADDER	TRUCK, FIREFIGHTING, AERIAL LADDER
7500	X	TRLR GEN FOAM	TRAILER, GENERATOR, SELF-POWERED, FOAM
7501	X	PUMP FIRE PORT	PUMP, FIREFIGHTING, PORTABLE, 500 GPM MIN

NAVFAC Equip. Code	Alpha Code	NAVFAC Abbreviated Description	NAVFAC Expanded Long Description
P-1 LINE ITEM 10 WEIGHT HANDLING EQUIPMENT			
8160	Y	CRANE LCM WHL	CRANE, LANDING CRAFT, WHEEL MOUNTED (E.G., JEHEMMY OR GILHOIST)
8200	Y	CRANE TRK 5-14T	CRANE, TRK MTD, 2-ENG, PRT, 5-14 T CAPY
8205	Y	CRANE TRK 15-24	CRANE, TRK MTD, 2-ENG, PRT, 15-24 T CAPY
8210	Y	CRANE TRK 25-30	CRANE, TRK MTD, 2-ENG, PRT, 25-30 T CAPY
8215	Y	CRANE TRK 31-40	CRANE, TRK MTD, 2-ENG, PRT, 31-40 T CAPY
8218	Y	CRANE TRK 41-50	CRANE, TRK MTD, 2-ENG, PRT, 41-50 T CAPY
8219	Y	CRANE TRK 51-UP	CRANE, TRK MTD, 2-ENG, PRT, 51-T/UP CAPY
8220	Y	CRANE CRU 5-10T	CRANE, CRUISER, 1-ENG, PRT, 5-10 T CAPY
8230	Y	CRANE CRU 11-30	CRANE, CRUISER, 1-ENG, PRT, 11-30 T CAPY
8232	Y	CRANE CRU 31-40	CRANE, CRUISER, 1-ENG, PRT, 31-40 T CAPY
8233	Y	CRANE CRU 41-50	CRANE, CRUISER, 1-ENG, PRT, 41-50 T CAPY
8235	Y	CRANE CRU 60-80	CRANE, CRUISER, 1-ENG, PRT, 60-80 T CAPY
8240	Q	CRANE TRK CRASH	CRANE, TRUCK, CRASH, AIRCRAFT (E.G., STERLING MODEL DD150 OR EQUIVALENT)
8242	Q	CRANE CRASH ITG	CRANE, CRASH, NONREVLV, S-P, INTEGRAL (BUWEPS DESIGN)
8244	Q	CRAN CRASH AC SH	CRANE, CRASH, AC, W/TELE BOOM, SHBD, WHL TRACTOR MOUNTED, WITH FRONT PUSHER PLATE
8246	Y	CRANE HYD 20-30	CRANE, TRK MTD, HYD BOOM, 20-30 TON CAPY GED/DED
8249	Y	CRANE HYD 51-UP	CRANE, TRK MTD, HYD BOOM, 51-TON/UP
8250	Y	CRANE TORPEDO	CRANE, TORPEDO, PRT, TRUCK/TRAILER MTD
8252	Y	CRANE CARR TORP	CRANE, CARRIER, TORPEDO HANDLING, DED
8253	Y	CRANE WHL 15T/UP	CRANE, HYD, SWING CAB, WHL, 4X4, 15-T/UP
8254	Y	CRANE WHL 5-35T	CRANE, HYD BOOM, WHL MTD, 4X4, 5-35 TON
8410	Y	CRANE LOC 15-30	CRANE, RAILROAD, LOCO, 15-30 TON CAPY
8420	Y	CRANE LOC 31-50	CRANE, RAILROAD, LOCO, 31-50 TON CAPY
8430	Y	CRAN LOC 51-200	CRANE, RR, LOCO WRECKING, 51-200 TON CAP
8800	Z	UNIT PROPELLING	UNIT, PROPELLING, MARINE, OUTBD, GED/DED

P-1 LINE ITEM 31  
RAILWAY EQUIPMENT

6100	V	CAR RR MISC SER	CAR, RAILROAD, MISCELLANEOUS SERVICE
6110	V	CAR RR BOX	CAR, RAILROAD, BOX
6120	V	CAR RR FLAT STD	CAR, RAILROAD, FLAT, STANDARD
6130	V	CAR RR GONDOLA	CAR, RAILROAD, GONDOLA, SOLID BOTTOM
6140	V	CAR RR HOPPER	CAR, RAILROAD, HOPPER, SIDE/BOTTOM DUMP
6150	V	CAR RR DUMP	CAR, RAILROAD, DUMP, AIR/MANUALLY OPER
6160	V	CAR RR DEP CTR	CAR, RAILROAD, FLAT, DEPRESSED CENTER
6210	W	CAR RR M-O-W	CAR, RAILROAD, MOTOR, MAINTENANCE-OF-WAY
6220	W	CAR RR INSP/MNT	CAR, RAILROAD, INSPECTION/MAINTENANCE
6230	W	CAR RR MNT/GANG	CAR, RAILROAD, MOTOR, MAINT/SECTION GANG
6240	W	CAR SPOTTER R-R	CAR SPOTTER, ROAD-RAILER, PRT, SELF-PROP

NAVFAC Equip. Code	Alpha Code	NAVFAC Abbreviated Description	NAVFAC Expanded Long Description
6250	W	CAR RR AUTORAIL	CAR, RAILROAD, AUTORAILER
6310	V	HANDCAR RR	HANDCAR, RAILROAD
6320	V	PUSHCAR RR	PUSHCAR, RAILROAD
6340	V	CAR RR CABOOSE	CAR, RAILROAD, CABOOSE
6370	V	CAR RR COACH	CAR, RAILROAD, COACH
6400	V	CAR RR TANK GP	CAR, RAILROAD, TANK, GENERAL PURPOSE
6530	W	LOCO RR 40-59 T	LOCOMOTIVE, RAILROAD, 40-59 TON
6540	W	LOCO RR 60-80 T	LOCOMOTIVE, RAILROAD, 60-80 TON
6560	W	LOCO RR 101T-UP	LOCOMOTIVE, RAILROAD, 101-TON/UP
6580	W	LOCO RR MINE	LOCOMOTIVE, RAILROAD, MINE

P-1 LINE ITEM 96  
SHIP'S WASTE AND OIL POLLUTION  
ABATEMENT EQUIPMENT

8911	Z	OIL SKIMMER SM	OIL SKIM SYS, SMALL, PORT, 50GAL STORAGE FOR USE WITH EXTERNAL POWER SUPPLY
8912	Z	OIL SKIMMER MED	OIL SKIM SYS, MEDIUM, TRLR MTD, FLOAT HD
8916	Z	OIL SKIMMER LGE	OIL SKIM SYS, LARGE, FLOATING, SELF-PROP
8935	Z	OIL/WTR SEPRATR	OIL/WATER SEPARATOR SYS, RAFT SVC, 6000G STORAGE CAPACITY

P-1 LINE ITEM 97  
SPECIAL PURPOSE EQUIPMENT

GVW

0095	O	LAB MOBILE S-P	LAB, INERTIAL, MOBILE, SELF-PROPELLED (INTEGRAL BUS TYPE)	
0098	O	MOBILE MED/DENT	UNIT, MED/DENTAL, MOBILE, SELF-PROP, 4X2 INTEGRAL BUS TYPE	
0099	O	MOBILE MED XRAY	UNIT, X-RAY, MED, MOBILE, SELF-PROP, 4X2	
0126	A	SEDAN SP PURP	AUTO, SEDAN, SPEC PURP, LAW ENFORCEMENT	
0303	O	TRK 1/4-T ELEC	TRUCK, ELECTRONICS UNIT, 4X4	3,500
0310	O	TRK 1/2-T ELEC	TRUCK, ELECTRONICS UNIT, 4X2	4,800
0324	O	TRK 3/4-T ELEC	TRUCK, ELECTRONICS UNIT, 4X2	5,800
0340	O	TRK 1-T ELEC	TRUCK, ELECTRONICS UNIT	7,000
0409	O	TRK MINIVAN REC	TRUCK, MINIVAN, F/C, RECRUIT, GED, 4X2	6,200
0410	O	TRK VAN RECRUIT	TRUCK, VAN, F/C, RECRUIT, CUST, GED, 4X2	12,000
0430	O	TRK 1-1/2T ELEC	TRUCK, ELECTRONICS UNIT, 4X2	14,000
0520	O	TRK 2-1/2T ELEC	TRUCK, VAN, ELECTRONICS UNIT, 4X2	19,000
0526	K	TRK 2-1/2T TRAC	TRUCK TRACTOR, 4X2	19,000
0540	O	TRK 2-1/2T BOMB	TRUCK, BOMB SERV, M-SERIES, 6X6 (M27 or M27B1)	19,000
0550	O	TRK 4-T ELEC	TRUCK, ELECTRONICS UNIT	22,000
0570	O	TRK 5-T AMPHIB	TRUCK, AMPHIBIAN, LARC-5, 4X4, 5-TON (REPLACEMENT FOR DUKW CODE 0531)	
0610	O	TRK 5-6 T ELEC	TRUCK, VAN, ELECTRONICS UNIT	24,000
0618	O	TRK 7T/UP ELEC	TRUCK, VAN, ELECTRONICS UNIT	34,000

NAVFAC		NAVFAC		
Equip. Code	Alpha Code	Abbreviated Description	NAVFAC Expanded Long Description	
0703	O	TRK 3-T WP/SERV	TRUCK, GUIDED MISSILE/WEAPONS SERVICING WITH SERVICING PLATFORM (MO/1)	21,000
0706	Q	TRK TRANS PILOT	TRUCK, TRANSPORTER, PILOTS W/PRESS SUITS	
0720	O	TRUCK MISCEL	TRUCK, MISC, EXHIBIT/TRAINING/RECRUITING /DISPLAY/GENERAL SERVICES/UTILITY, ETC.	
0721	O	TRK VAN CAL/SER	TRUCK, VAN, TEST FAC/CALIBRATION SERVICE (GAS TURBINE ENGINE TEST FACILITIES)	
0736	O	TRK TARGET RETR	TRUCK, TARGET RETRIEVING	
0760	O	TRK HYD PEROXID	TRUCK, TANK, HYDROGEN PEROXIDE	
0761	O	TRK PURE WATER	TRUCK, TANK, PURE WATER, NUCLEAR	
0806	P	TRAILER HELIUM	TRAILER, HELIUM	
0807	P	TRLR CHASS BOAT	TRAILER, CHASSIS, BOAT	
0846	P	TRLR TANK LOX	TRAILER, TANK, LIQUID OXYGEN, 150-500GAL	
0847	Q	SEMI DRES/BRIEF	SEMITRLR, VAN, DRESSING/BRIEFING/ALERT FOR AIR CREWS WEARING FULL PRESSURE SUITS	
0849	Q	TRLR OPER FLITE	TRAILER, OPERATIONAL FLIGHT TRAINER	
0851	P	TRLR HOUS/LAB/O	TRAILER, HOUSE/LABORATORY/OFFICE/PHOTO -GRAPHIC/RESEARCH/DISASTER CONTROL	
0855	P	TRLR DENT PR/OP	TRAILER, DENTAL, PREVENTIVE/OPERATING	
0856	P	SEMITRLR DENTAL	SEMITRAILER, DENTAL UNIT	
0859	P	TRLR P DENT TRT	TRAILER, PREVENTIVE DENTISTRY TREATMENT	
0860	P	TRLR AIR CONDIT	TRAILER, AIR CONDITIONER	
0865	Q	TRAILER WING	TRAILER, WING	
0868	P	TRLR TARG RETRV	TRAILER, TARGET RETRIEVING	
0871	P	TRLR 1/2-T ELEC	TRAILER, CHASSIS, ELECTRONICS, 1/2-TON	
0872	P	TRLR 3/4-T ELEC	TRAILER, CHASSIS, ELECTRONICS, 3/4-TON	
0873	P	TRLR 1-3 T ELEC	TRAILER, CHASSIS, ELECTRONICS, 1-3 TON	
0874	P	TRLR 4-7 T ELEC	TRAILER, CHASSIS, ELECTRONICS, 4-7 TON	
0875	P	TRLR 8-13T ELEC	TRAILER, CHASSIS, ELECTRONICS, 8-13 TON	
0876	P	TRLR 14T/UP ELC	TRAILER, CHASSIS, ELECTRONICS, 14-TON UP	
0878	P	TRLR INSTRUMENT	TRAILER, CHASSIS, ELECT, INSTRMT/DIRECTR	
0879	P	TRAILER ANTENNA	TRAILER, ELECTRONICS, ANTENNA	
0885	P	TRLR PURE WATER	TRAILER, TANK, PURE WATER, NUCLEAR	
0893	Q	SEMI MISS TRANS	SEMITRAILER, GUIDED MISSILE TRANSPORT	
0896	Q	TRLR MISS HNDLG	TRAILER, MSL HNDLG, LAUNCH/ERECT/TRANSPT	
0897	P	TRLR LOX VAPOR	TRAILER, LIQUID OXYGEN VAPORIZING SYSTEM	
0899	P	TRLR LIQ NITROG	TRAILER, TANK, LIQUID NITROGEN	
0908	Z	GOLF CART S/S	GOLF CART (SPECIAL SERVICES ONLY)	
3175	Z	COMPRESSOR HEL	COMPRESSOR, HELIUM, PORTABLE, SKID/TRLR	
5135	Z	GENERATOR ELEC	GENERATOR, PORTABLE, ELECTRONIC, 400-HZ SKID/TRUCK/TRAILER (ALL SIZES)	
5498	Z	LAUNDRY TRL MTD	LAUNDRY, TRAILER MOUNTED	
5797	Q	SCRUBBER SHIPDK	SCRUBBER, SHIPDECK, SELF-PROPELLED, DED TRUCK MOUNTED	
8241	Q	CRAN CRSH AC SH	CRANE, CRASH, AC, NONREVOLV, S-P, SHIPBD	
8243	Q	CRANE CRASH HEL	CRANE, CRASH, HELICOPTER, WHL TRACTR MTD WITH DOZER ATTACHMENT FOR SHIPBOARD USE	
8700	Z	WINCH DRUM PWR	WINCH, DRUM, POWER OPERATED, GED/DED	

NAVFAC Equip. Code	Alpha Code	NAVFAC Abbreviated Description	NAVFAC Expanded Long Description
P-1 LINE ITEM 98 ABC WARFARE DISASTER PREPAREDNESS DECONTAMINATION EQUIPMENT			
5420	Z	SPRAYER DECONTM	SPRAYER, DECONTAM, GED, TRK/SKD/TRL MTD
P-1 LINE ITEM 99 MOBILE UTILITY SUPPORT EQUIPMENT (MUSE)			
2732	Z	BOILER ST 300HP	BOILER, STEAM, PORTABLE, 300-HP/UP
5125	Z	GEN 101-150 KW	GENERATOR, PORTABLE, GED/DED, 101-150 KW SKID/TRUCK/TRAILER (EXCEPT ELECTRONICS GENERATORS)
5126	Z	GEN 251-499 KW	GENERATOR, PORTABLE, GED/DED, 251-499 KW SKID MOUNTED (EXCEPT ELECTRONICS GENERATORS)
5127	Z	GEN 500-750 KW	GENERATOR, PORTABLE, GTE/DED, 500-750 KW SKID/TRUCK/TRAILER (EXCEPT ELECTRONICS GENERATORS)
5128	Z	GEN 151-250 KW	GENERATOR, PORTABLE, GED/DED, 151-250 KW SKID/TRUCK/TRAILER (EXCEPT ELECTRONICS GENERATORS)
5130	Z	GEN 751-KW & UP	GENERATOR, PORTABLE, GTE/DED, 751-KW/UP SKID/TRAILER (EXCEPT ELECTRONICS GENERATORS)
5150	Z	SUBSTA MOBILE	SUBSTATION, MOBILE, W/TRANSF & FEED SECT
5155	Z	TRANSFORMER MOBL	TRANSFORMER, MOBILE, 750-KVA/UP
5157	Z	DIST SYSTEM PWR	DISTRIBUTION SYSTEM, POWER, TRAILER MTD
5450	Z	DISTILLER MOBIL	DISTILLER, WATER, SKID MTD, GED/DED/EMD
5530	Z	AIR CONDIT MOBL	AIR CONDITIONER, MOBL, SKID, GED/DED/EMD
6700	Z	CAR RR BAT CHG	CAR, RAILROAD, BATTERY CHARGING, GED/DED

**APPENDIX N:**

**MAN-HOUR INPUT STANDARDS USED BY THE U.S. NAVY**

NAVFAC Equip. Cost Code	Alpha Code	Maintenance man-hour input Standard hours				NAVFAC Equip. Cost Code	Alpha Code	Maintenance man-hour input Standard hours			
		Man-hours	Per					Man-hours	Per		
			1,000 Miles	Hour	Unit (annual)				1,000 Miles	Hour	Unit (annual)
0060	B	7.00	X			0302	O	35			X
0061	B	7.00	X			0303	O	35			X
0062	B	7.00	X			0305	H	3.50	X		
0063	B	7.00	X			0306	F	5.90	X		
0065	C	11.20	X			0307	O	35			X
0066	C	11.20	X			0308	H	3.50	X		
0067	C	11.20	X			0310	O	28			X
0070	D	11.20	X			0311	H	3.50	X		
0071	D	11.20	X			0312	H	3.50	X		
0090	P	45			X	0313	G	2.80	X		
0095	O	42			X	0314	F	5.90	X		
0098	O	42			X	0315	H	3.50	X		
0099	O	42			X	0316	G	2.80	X		
0102	A	2.40	X			0317	H	3.50	X		
0103	A	2.40	X			0318	H	3.50	X		
0104	A	2.40	X			0319	G	2.80	X		
0105	A	2.40	X			0320	O	29			X
0114	A	2.40	X			0322	H	3.50	X		
0200	E	2.40	X			0324	O	35			X
0202	E	2.40	X			0325	O	35			X
0205	F	5.90	X			0326	H	3.50	X		
0210	I	2.40	X			0327	H	3.50	X		
0220	E	2.40	X			0328	H	3.50	X		
0297	F	5.90	X			0329	H	3.50	X		
0299	F	5.90	X			0330	H	3.50	X		

NAVFAC Equip. Cost Code	Alpha Code	Maintenance man-hour input Standard hours				NAVFAC Equip. Cost Code	Alpha Code	Maintenance man-hour input Standard hours			
		Man-hours	Per					Man-hours	Per		
			1,000 Miles	Hour	Unit (annual)				1,000 Miles	Hour	Unit (annual)
0331	F	5.90	X			0423	J	4.80	X		
0332	F	5.90	X			0424	J	4.80	X		
0333	F	5.90	X			0426	J	4.80	X		
0334	O	28			X	0428	J	4.80	X		
0335	H	3.50	X			0430	O	48			X
0336	O	63			X	0438	O	45			X
0340	O	55			X	0439	O	50			X
0341	I	4.40	X			0441	J	4.80	X		
0342	I	4.40	X			0443	J	4.80	X		
0343	I	4.40	X			0445	J	4.80	X		
0344	I	4.40	X			0446	J	4.80	X		
0345	I	4.40	X			0449	J	4.80	X		
0346	O	63			X	0450	O	58			X
0348	I	4.40	X			0455	J	4.80	X		
0349	I	4.40	X			0456	J	4.80	X		
0350	I	4.40	X			0457	J	4.80	X		
0352	O	45			X	0520	O	62			X
0355	I	4.40	X			0521	K	7.00	X		
0360	O	58			X	0523	K	7.00	X		
0361	F	5.90	X			0525	K	7.00	X		
0362	I	4.80	X			0526	K	7.00	X		
0409	O	48			X	0527	K	7.00	X		
0410	O	48			X	0530	K	7.00	X		
0420	J	4.80	X			0532	O	70			X
0421	J	4.80	X			0533	O	70			X

NAVFAC Equip. Cost Code	Alpha Code	Maintenance man-hour input Standard hours				NAVFAC Equip. Cost Code	Alpha Code	Maintenance man-hour input Standard hours			
		Man-hours	Per					Man-hours	Per		
			1,000 Miles	Hour	Unit (annual)				1,000 Miles	Hour	Unit (annual)
0534	O	70			X	0613	M	9.20	X		
0535	O	70			X	0614	M	9.20	X		
0536	O	70			X	0615	O	92			X
0537	O	70			X	0616	O	92			X
0539	O	70			X	0617	M	9.20	X		
0540	O	70			X	0618	O	92			X
0545	L	8.90	X			0620	M	9.20	X		
0550	O	91			X	0623	M	9.20	X		
0570	O	246			X	0624	M	9.20	X		
0580	M	9.20	X			0625	M	9.20	X		
0582	M	9.20	X			0630	M	9.20	X		
0583	M	9.20	X			0631	M	9.20	X		
0587	O	92			X	0632	M	9.20	X		
0588	O	92			X	0633	M	9.20	X		
0590	O	191			X	0636	M	9.20	X		
0591	O	96			X	0638	N	11.20	X		
0601	M	9.20	X			0643	N	11.20	X		
0602	M	9.20	X			0644	N	11.20	X		
0603	M	9.20	X			0645	N	11.20	X		
0604	M	9.20	X			0649	N	11.20	X		
0605	M	9.20	X			0701	O	260			X
0606	M	9.20	X			0703	O	169			X
0607	O	92			X	0704	O	42			X
0609	M	9.20	X			0705	Q	.019		X	
0610	O	92			X	0706	Q	.023		X	

NAVFAC Equip. Cost Code	Alpha Code	Maintenance man-hour input Standard hours				NAVFAC Equip. Cost Code	Alpha Code	Maintenance man-hour input Standard hours			
		Man-hours	Per					Man-hours	Per		
			1,000 Miles	Hour	Unit (annual)				1,000 Miles	Hour	Unit (annual)
0707	Q	.027		X		0740	O	42			X
0708	O	35			X	0742	O	34			X
0709	O	239			X	0743	Q	.017		X	
0710	O	251			X	0744	Q	.023		X	
0711	O	36			X	0746	O	48			X
0713	O	70			X	0750	Q	.034		X	
0714	X	.034		X		0751	O	70			X
0715	O	70			X	0752	Q	.044		X	
0717	O	98			X	0753	O	92			X
0719	O	25			X	0754	O	92			X
0720	O	25			X	0756	Q	.044		X	
0721	O	28			X	0757	O	48			X
0722	O	28			X	0758	O	70			X
0723	O	204			X	0759	O	92			X
0724	O	127			X	0760	O	35			X
0725	O	127			X	0761	O	35			X
0730	O	39			X	0800	P	3			
0731	Q	.019		X		0801	P	3			X
0732	O	45			X	0802	P	3			X
0733	O	127			X	0803	P	7			X
0734	O	34			X	0804	P	3			X
0735	O	48			X	0805	P	4			X
0736	O	39			X	0806	P	6			X
0738	O	28			X	0807	P	4			X
0739	O	34			X	0808	P	3			X

NAVFAC Equip. Cost Code	Alpha Code	Maintenance man-hour input Standard hours				NAVFAC Equip. Cost Code	Alpha Code	Maintenance man-hour input Standard hours			
		Man-hours	Per					Man-hours	Per		
			1,000 Miles	Hour	Unit (annual)				1,000 Miles	Hour	Unit (annual)
0809	P	20			X	0835	P	17			X
0810	P	17			X	0839	P	22			X
0811	P	20			X	0840	P	25			X
0812	P	17			X	0841	P	11			X
0813	P	20			X	0842	P	11			X
0814	P	15			X	0843	P	6			X
0815	P	17			X	0844	P	11			X
0816	P	17			X	0845	P	3			X
0817	P	20			X	0846	P	4			X
0818	P	15			X	0847	Q	.817		X	
0819	P	28			X	0848	T	34			X
0820	P	34			X	0849	Q	.002		X	
0821	P	17			X	0851	P	8			X
0822	P	20			X	0852	P	3			X
0823	P	22			X	0853	P	11			X
0824	P	24			X	0855	P	11			X
0825	P	28			X	0856	P	11			X
0826	P	32			X	0857	P	8			X
0827	P	34			X	0858	P	5			X
0828	P	48			X	0859	P	17			X
0829	P	4			X	0860	P	11			X
0830	P	11			X	0862	P	11			X
0831	P	11			X	0864	P	11			X
0833	P	7			X	0865	Q	.003		X	
0834	P	8			X	0868	P	11			X

NAVFAC Equip. Cost Code	Alpha Code	Maintenance man-hour input Standard hours				NAVFAC Equip. Cost Code	Alpha Code	Maintenance man-hour input Standard hours			
		Man-hours	Per					Man-hours	Per		
			1,000 Miles	Hour	Unit (annual)				1,000 Miles	Hour	Unit (annual)
0871	P	6			X	1100	R	.057		X	
0872	P	3			X	1110	R	.062		X	
0873	P	7			X	1120	R	.041		X	
0874	P	4			X	1200	R	.090		X	
0875	P	7			X	1210	R	.123		X	
0876	P	5			X	1220	R	.045		X	
0878	P	17			X	1230	R	.077		X	
0879	P	11			X	1240	R	.057		X	
0880	P	4			X	1300	R	.099		X	
0881	P	5			X	1310	R	.150		X	
0882	P	8			X	1320	R	.098		X	
0883	P	4			X	1330	R	.150		X	
0884	P	8			X	1340	R	.160		X	
0885	P	31			X	1350	R	.123		X	
0886	P	11			X	1360	R	.050		X	
0887	Q	.008		X		1370	R	.055		X	
0888	P	14			X	1380	R	.056		X	
0890	P	31			X	1390	R	.043		X	
0891	Q	.027		X		1400	R	.070		X	
0892	P	34			X	1410	R	.029		X	
0893	Q	.005		X		1420	R	.038		X	
0896	Q	.005		X		1430	R	.099			
0897	P	11			X	1500	R	.138		X	
0898	P	17			X	1600	R	.024		X	
0899	P	3			X	1610	R	.028		X	

NAVFAC Equip. Cost Code	Alpha Code	Maintenance man-hour input Standard hours				NAVFAC Equip. Cost Code	Alpha Code	Maintenance man-hour input Standard hours			
		Man-hours	Per					Man-hours	Per		
			1,000 Miles	Hour	Unit (annual)				1,000 Miles	Hour	Unit (annual)
1800	R	.081		X		2425	T	600			X
1810	R	.210		X		2430	S	.005		X	
1820	R	.106		X		2431	S	.018		X	
1830	R	.210		X		2432	S	.024		X	
1840	R	.122		X		2433	S	.027		X	
1850	R	.231		X		2434	S	.043			
1860	R	.231		X		2462	T	244			X
1870	R	.276		X		2470	S	.043		X	
1900	R	.070		X		2520	S	.146		X	
2110	T	158			X	2521	S	.113		X	
2111	T	27			X	2522	T	8			X
2120	T	70			X	2530	T	5			X
2130	T	12			X	2535	S	.207		X	
2200	T	383			X	2540	T	5			X
2210	T	98			X	2542	T	164			X
2220	T	10			X	2610	T	28			X
2225	T	5			X	2615	T	52			X
2300	S	.325		X		2620	T	164			X
2325	T	3			X	2625	T	125			X
2340	T	12			X	2720	T	118			X
2410	T	168			X	2730	T	28			X
2415	T	88			X	2735	T	17			X
2416	T	150			X	2740	T	17			X
2417	T	88			X	2745	T	109			X
2420	S	.028		X		2750	T	14			X

NAVFAC Equip. Cost Code	Alpha Code	Maintenance man-hour input Standard hours				NAVFAC Equip. Cost Code	Alpha Code	Maintenance man-hour input Standard hours			
		Man-hours	Per					Man-hours	Per		
			1,000 Miles	Hour	Unit (annual)				1,000 Miles	Hour	Unit (annual)
2760	T	56			X	4330	S	.400		X	
2840	T	11			X	4340	S	.500		X	
3100	S	.041		X		4410	T	8			X
3110	S	.043		X		4420	S	.244		X	
3111	S	.064		X		4530	S	.228		X	
3130	S	.108		X		4531	S	.182		X	
3135	S	.108		X		4540	S	.040		X	
3150	S	.108		X		4610	T	10			X
3155	S	.108		X		4615	S	.193		X	
3160	S	.210		X		4620	T	8			X
3165	S	.210		X		4621	T	8			X
3530	T	34			X	4622	S	.316		X	
3531	S	.195		X		4625	T	13			X
3532	S	.195		X		4630	S	.112		X	
3630	T	123			X	4635	S	.140		X	
3710	S	.079		X		4640	S	.169		X	
3720	S	.281		X		4710	T	15			X
4230	S	.210		X		4730	T	25			X
4240	S	.491		X		4731	T	34			X
4250	S	.540		X		4750	S	.363		X	
4260	S	.644		X		4760	S	.259		X	
4270	S	.701		X		4770	T	132			X
4305	T	7			X	4805	S	.260		X	
4310	S	.175		X		4809	S	.059		X	
4320	T	7			X	4810	S	.077		X	

NAVFAC Equip. Cost Code	Alpha Code	Maintenance man-hour input Standard hours				NAVFAC Equip. Cost Code	Alpha Code	Maintenance man-hour input Standard hours			
		Man-hours	Per					Man-hours	Per		
			1,000 Miles	Hour	Unit (annual)				1,000 Miles	Hour	Unit (annual)
4820	S	.126		X		5170	S	.069		X	
4830	S	.210		X		5171	S	.148		X	
4840	S	.280		X		5220	T	13			X
4850	S	.417		X		5230	T	15			X
4851	S	.422		X		5240	T	22			X
4860	S	.092		X		5300	T	21			X
4865	S	.231		X		5405	S	.130		X	
4872	U	.092		X		5408	Q	.217		X	
4873	U	.101		X		5409	S	.223		X	
4874	U	.111		X		5411	T	5			X
4875	U	.118		X		5412	S	.043		X	
4876	U	.127		X		5413	T	8			X
4877	U	.250		X		5414	S	.175		X	
4878	Q	.092		X		5416	S	.153		X	
4891	S	.168		X		5418	T	10			X
4892	S	.231		X		5428	S	.269		X	
4893	S	.441		X		5430	T	6			X
4894	Q	.472		X		5435	S	.140		X	
5110	T	17			X	5441	T	7			X
5113	Q	.062		X		5500	Q	.069		X	
5120	T	21			X	5515	T	17			X
5121	T	24			X	5621	U	.135		X	
5122	T	33			X	5628	U	.135		X	
5123	T	35			X	5630	U	.201		X	
5124	T	53			X	5635	U	.077		X	

NAVFAC Equip. Cost Code	Alpha Code	Maintenance man-hour input Standard hours				NAVFAC Equip. Cost Code	Alpha Code	Maintenance man-hour input Standard hours			
		Man-hours	Per					Man-hours	Per		
			1,000 Miles	Hour	Unit (annual)				1,000 Miles	Hour	Unit (annual)
5642	U	.186		X		5912	T	5			X
5643	U	.008		X		5920	T	95			X
5650	U	.016		X		6100	V	11			X
5700	T	42			X	6110	V	15			X
5701	Q	.020		X		6120	V	9			X
5710	S	.056		X		6130	V	19			X
5720	S	.288			X	6140	V	19			X
5730	U	.022		X		6150	V	25			X
5740	T	25			X	6160	V	14			X
5745	Q	125			X	6210	W	.029		X	
5750	T	214			X	6220	W	.020		X	
5755	T	182			X	6222	T	70			X
5757	T	272			X	6230	W	.034		X	
5790	T	112			X	6240	W	.063		X	
5795	T	17			X	6250	W	.038		X	
5797	Q	.119		X		6310	V	4			X
5820	S	.179		X		6320	V	6			X
5830	S	.238		X		6340	V	20			X
5831	S	.252		X		6370	V	56			X
5833	S	.209		X		6400	V	10			X
5835	S	.228		X		6520	W	.125		X	
5840	T	74			X	6530	W	.185		X	
5842	T	77			X	6540	W	.281		X	
5900	T	5			X	6550	W	.561		X	
5910	T	5			X	6560	W	.701		X	

NAVFAC Equip. Cost Code	Alpha Code	Maintenance man-hour input Standard hours				NAVFAC Equip. Cost Code	Alpha Code	Maintenance man-hour input Standard hours			
		Man-hours	Per					Man-hours	Per		
			1,000 Miles	Hour	Unit (annual)				1,000 Miles	Hour	Unit (annual)
6580	W	.042		X		8205	Y	.351		X	
7100	X	.094		X		8210	Y	.421		X	
7102	X	.084		X		8215	Y	.505		X	
7103	X	.070		X		8218	Y	.808		X	
7105	X	.056		X		8219	Y	.948		X	
7155	X	.280		X		8220	Y	.266		X	
7160	X	.445		X		8230	Y	.293		X	
7175	X	.385		X		8232	Y	.497		X	
7180	X	.609		X		8233	Y	.672		X	
7190	X	.609		X		8235	Y	.790		X	
7195	X	.609		X		8240	Q	.448		X	
7200	X	.069		X		8241	Q	.983		X	
7225	X	.595		X		8242	Q	.878		X	
7230	X	.016		X		8243	Q	.570		X	
7300	X	.098		X		8244	Q	.570		X	
7310	X	.084		X		8246	Y	.386		X	
7320	X	.105		X		8249	Y	.771		X	
7321	X	.210		X		8250	Y	.448		X	
7330	X	.210		X		8252	Y	.245		X	
7340	X	.112		X		8253	Y	.203		X	
7341	X	.126		X		8254	Y	.161		X	
7400	X	.210		X		8260	Y	.438		X	
7500	X	.057		X		8410	Y	.392		X	
8160	Y	.336		X		8420	Y	.448		X	
8200	Y	.351		X		8430	Y	.525		X	

APPENDIX O:

ANNUAL MAN-HOUR ALLOWANCES USED BY THE U.S. ARMY RESERVES

Table O1  
Armament Annual Man-hour Allowances

<i>Item</i>	<i>Annual man-hours</i>
<b>Weapons</b>	
Rifles and Shotguns .....	35
Rifle, Recoiless, 105MM/106MM .....	36
Guns, submachine .....	25
Guns, machine (all types) .....	.97
Pistols, auto and revolver (all types) .....	.17
Launcher, grenade, 40MM .....	.08
Launcher, rocket, 3.5 inch .....	.17
Mounts, machine gun (all types except multiple) .....	.17
Launcher M203 .....	.08
Trainer, 14-5, M31 .....	35
Mortar, 107MM, SP, FT, M84, M106 .....	.97
Mortar, 81MM, SP, FT, M125 .....	.66
Mortar, 81MM (Not Track Mtd) .....	.66
Mortar, 107MM (Not Track Mtd) .....	.97
Rifle, recoiless, 90MM .....	25
<b>Towed Artillery</b>	
Howitzer, 75MM (towed) .....	34.5
Howitzer, 105MM (towed) .....	34.5
Howitzer, 155MM (towed) .....	51.8
Howitzer, 8 inch (towed) .....	51.8
Launcher, rocket, multiple, 115MM/4.5 inch (towed) .....	8.6
Launcher, rocket, 762mm (towed or truck mtd) .....	25.9
<b>Self Propelled Artillery</b>	
Howitzer, 105MM, M108 .....	34.5
Howitzer, 155MM, SP, M109 .....	69.1
Howitzer, 8 inch, SP, M110 .....	69.1
Gun, 40MM, AA, Dual SP, M42A1 .....	34.5
Gun, 175MM, SP, M107 .....	69.1
Howitzer, 155MM, SP, M44 .....	69.1
Howitzer, 8 inch, SP, M55 .....	69.1
<b>Tank Guns</b>	
Gun, Tank, 90MM veh mtd cbt M48 series .....	34.5
Gun, tank, 105MM, veh mtd cbt M60 series .....	34.5
Gun, Combat Engineer Vehicle, 165MM .....	51.8
<b>Miscellaneous</b>	
Dispenser, Riot Control hel or veh mtd M6 .....	31.5
Dispenser, Riot Control, M2, XM33 .....	16.6
Flame Thrower, M12A17, M9 .....	42.5
Simulator, 90MM .....	34.5
Armored Reconnaissance/Airborne Assault Vehicle M551 .....	103.6

Table O2

## Vehicle Annual Man-hour Allowances

Item	Annual man-hours
<b>Combat Vehicles</b>	
Carrier Personnel, M59 .....	98.7
Carrier, Personnel, FT (APC), M113 .....	98.7
Carrier, Command, FT M577 .....	50.7
Carrier, Cargo, FT M548, M116 .....	73.0
<b>Self Propelled Weapons Vehicle</b>	
Launcher, SP trk mtd, 762MM .....	123.4
Howitzer, SP, FT, 105MM .....	123.4
Howitzer, SP, FT, 155MM .....	123.4
Howitzer, SP, FT, 8 inch .....	123.4
Gun, SP, FT, 40MM, AA, M42 or M42A1 .....	123.4
Gun, SP, FT, 175MM .....	123.4
Mortar, SP, FT (all types) .....	98.7
<b>Tank Vehicles</b>	
Tank, Combat, FT 90MM .....	172.7
Tank, Combat, FT 105MM .....	172.7
Combat, engineer vehicle, FT .....	172.7
Tank, combat FT (Flame thrower) .....	172.7
Launcher, Tank Chassis, Bridge Transporter .....	172.7
<b>Assault Vehicles</b>	
Armored Recon/Airborne Vehicle M551 .....	172.7
<b>Recovery Vehicles</b>	
Tank, Recovery Vehicle, Med FT, M88 .....	172.7
Tank, Recovery Vehicle, Lt, FT, M578 .....	82.0
<b>Other FT Vehicles</b>	
Tractor, High Speed, FT M4, M5, M8 .....	98.7
<b>Commercial Vehicles</b>	
Sedans .....	24.4
Station Wagons .....	49.3
Truck 1/4 thru 1 Ton (Except 1/2 Ton PU) .....	33.0
Truck 1/2 Ton Pickup Only .....	33.9
Truck, Carryall, Truck Sedan or Panel Delivery .....	29.7
Ambulances .....	49.3
Bus, Body on Chassis (29 Pass) .....	72.5
Bus, Body on Chassis (37 Pass) .....	72.5
Bus, All 38 Pass and Up .....	72.5
Truck and Truck Tractors, 1 1/2 T, Truck Tractor, 2T .....	72.5
Truck and Truck Tractor, 2 1/2 T .....	72.5
Truck and Truck Tractor, 3 T to 4 T .....	72.5
Truck and Truck Tractor, 5 to 10 T .....	72.5
Truck and Truck Tractor, 11 T and Over .....	111.0
Scooter, Motor GED .....	12.5
Truck, Dump, 2 1/2 T thru 10 T .....	98.7

**Table O2 (Cont'd)**

<i>Item</i>	<i>Annual man-hours</i>
<b>Tactical and Support Vehicles</b>	
Truck, 1/4 T, all types .....	33.4
Truck, 3/4 T Ambulance .....	49.3
Truck, 3/4 T all other types .....	35.0
Truck, Platform, 1/2 T .....	49.3
Truck, 2 1/2 T Cargo .....	45.0
Truck, 2 1/2 T Dump .....	72.5
Truck, 2 1/2 T Van .....	74.3
Truck, 2 1/2 T Wrecker .....	72.5
Truck, 2 1/2 T Fuel Tanker .....	58.3
Truck, 2 1/2 T all other .....	49.3
Truck, 5 to 9 T Cargo and all others except Dump & Wrecker .....	54.2
Truck, 5 to 9 T Dump .....	55.1
Truck, 5 to 9 T Wrecker .....	98.0
Truck, Cargo 10 Tons .....	111.0
Truck 1 1/2 T M715, Ambulance M725 .....	49.3
Truck 1 1/2 T M561, M792 .....	35.8
Truck Tractor, 2 1/2 T to 9 T .....	34.6
Truck Tractor, 10 T to 14 T .....	59.7
Truck Tractor, 15 T and over .....	111.0
Lark V (5 Ton) .....	431.8

**Table O3**

**Dollies, Trailers, and Semitrailers  
Annual Man-hour Allowances**

<i>Item</i>	<i>Annual man-hours</i>
Chassis, Trailer, All types .....	9.9
Dolly, 2 Whl, Less than 10 T .....	9.9
Dolly, 4 Whl, 10 T and over .....	1.7
Trailer, Under 1 1/2 T .....	5.4
Trailer, 1 1/2 T to under 2 1/2 T .....	7.8
Trailer, 2 1/2 T and over .....	7.3
Semi-Trailer, Tank, Fuel Serv, 5,000 Gal, 12 T .....	19.8
Semi-Trailer, up to and incl 25 T .....	10.1
Semi-Trailer, All over 25 T .....	46.4

Table O4

## Engineer Annual Man-hour Allowances

## Special Purpose Equipment

Item	Annual man-hours
Auger, earth	19.0
Boat, Bridge Erection, 19 to 27 Ft GED	61.7
Bridge, Armor Vehicle Launching (AVLB)	24.7
Bridge, Floating, Highway, Alum Deck	49.3
Bridge, Floating, C1 60, 135 Ft	72.5
Bridge, Floating, Raft Section Lt	24.7
Bridge, Steel, C1 60, Bailey	49.3
Bridge, Floating, Mob Assault Amphb	49.3
Bridge, Ferry Unit, End, Bay Amphb	62.2
Bridge, Ferry Unit, Interior, Bay Amphb	62.2
Crane, Shovel, Crawler Mtd, 10 to 12 1/2 T	46.0
Crane, Shovel, Crawler Mtd, 40 T	325.6
Crane, Shovel, Truck Mtd, 10 to 20 T	64.0
Crane, Shovel, Wheel Mtd, 7 Ton, w/24 Ft Boom	137.7
Crane, Tractor Mounting, 3 3/4 to 5 Ton	8.9
Crane, Tractor Towed, 20 Ton	4.4
Crane, Wheel Mtd, 5 T, DED, RT, AT	137.7
Crane, Wheel Mtd, 20 T, DED, RT	95.5
Crushing and Screen Plant, 35 TPH	216.8
Crushing and Screen Plant, 75 TPH	370.1
Crusher, Jaw, Gas Drvn, 15 TPH	123.4
Ditching Machine, Air Droppable	62.2
Ditching Machine, GED or DED Trlr Mtd	62.2
Grader, Road, Motorized, DED 6 x 4	65.7
Grader, Road, Motorized, DED 4 x 4	151.0
Hammer, Pile Driver, Self Pwr	24.7
Intrrenching Machine, Combat, High Speed, Whl Mtd	62.2
Loader, Bucket Type, DED or FLD, 3 Cu Yd per min	129.8
Loader, Scoop Type, DED 4 Whl 1 1/2 to 2 1/2 Cu Yd	73.2
Mixer, Rotary Tiller, DED	12.0
Pipeline Equipment Set, Const, Trk Mtd	8.9
Pneumatic Tool and Compressor Outfit, 210 CFM Trk or Trl Mtd, or 250 CFM	75.5
Pneumatic Tool and Comp Outfit for 600 CFM Comp	13.3
Ramp, Loading, Mobile Assault	62.2
Rock Drilling Equipment	26.7
Roller, Motorized, GED Med to Hvy	28.3
Roller, Towed, Pneu Tired, 4 Whl, 35 to 50 T	26.7
Roller, Towed, Pneu Tired, 13 Whl	77.1
Roller, Towed, Sheepsfoot, 2 and 3 Drums	13.3
Router, Road, Cable Operated	13.3
Scraper, Earth Moving, Towed, 7 1/2 to 18 Cu Yd	75.5
Sweeper, Rotary, Towed GED	22.2
Tractor, Ft DED, Case Mdl 1150	133.3
Tractor, Full Tracked, DED Air Transportable	106.6
Tractor, Ft, DED, Lt and Med (D6/7, TD 18/20)	84.6
Tractor, Full Tracked, DED Hvy (D8 or TD 24)	62.2
Tractor, Walking, Power Drvn, Whl Mtd, 20 HP, DDF, DTF	75.5
Tractor, Wheeled, Ind, DED, 14,025 to 20,000 DBP	142.1
Tractor, Wheeled, Ind, DED, 20,025 to 27,000 DBP	173.2
Tractor, Wheeled, Ind, GED, 3,000 to 7,775 DBP	106.6
Truck, Forklift, Rough Terrain DED	138.2
Material Handling Equipment	
Crane, Truck, Wise	98.7
Forklifts	53.2
Warehouse Tractors	106.6
Charger, Battery GED 28V	37.0
Flood Light Set, Elec. Ptbl, 5 KW	44.4
Generator Set, GED 15 to 4.2 KW	37.0
Generator Set, GED, 5 to 10 KW	44.4
Generator Set, DED, or GED, 15 to 64 KW	61.7
Generator Set, DED or GED, 65 to 100 KW	69.1

Table O5

Electronics and Communications  
Annual Man-hour Allowances

Telephones, Teletype Equipment and Switchboards

Item	Annual man-hours
Carrier System AN/TCC-7	5.1
Central Office Tele. Man. AN/MTC-7	10.1
Central Office Tele. Man. AN/MTC-1 Less Pwr	45.7
Central Office Tele. Man. AN/MTC-3 Less Pwr	45.7
Central Office Tele. AN/TTC-7	43.2
Teletypewriter Set. AN/PGC-1	20.3
Coder Group, AN/UPA-39, FSN 5840-548-7673	10.1
Message Center, AN/GSO-80	30.5
Operations Center, Commo, AN/MSC-31, Less Pwr*	60.9
Operations Central, AN/MSC-32, Less Pwr*	60.9
Panel, Patching, Commo, SB/611, SB/675, TSC 76*	10.1
Radio Set, AN/GRC-26*	50.8
Radio Set, AN/GRC-45*	45.7
Radio Set, AN/GRC-122*	50.8
Radio Set, AN/GRC-142*	45.7
Radio Set, AN/VRC-29*	45.7
Radio Set, AN/VSC-1, -2, -3* (Equivalents for Teletype Portion Only)	45.7
Repeater Telephone, AN/TCC-11	5.1
Switchboard, SB-22 and BD-71	2.1
Switchboard, SB-88/P (TA-207 when Sep TOE Line item)	4.1
Telephone, Field All. Incl AN/VIAI on Cbt Veh	1.0
Telegraph-Telephone Terminal, AN/TCC-14	5.1
Telephone Terminal, AN/TCC-50, -61, -62*	5.1
Telegraph-Telephone Terminal, AN/MCC-6, AN/TCC-69*	71.2
Teletypewriter Op Central, AN/MGC-19	441.8
Teletypewriter (Not Component of Other Equip)	20.3
Teletypewriter Central Office, AN/MGC-9	80.3
Teletypewriter Central Office, AN/MGC-17	120.4
Terminal, Telegraph, AN/MSC-29*	213.4
Terminal, Telegraph, AN/TSC-58	60.9
Terminal, Telegraph, TH-5	2.1
Terminal, Telephone/Telegraph, AN/TCC-3, -23, -29	7.1
Teletypewriter Relay, AN/MGC-23	884.2
Terminal, Telegraph, AN/TCC-4, -20	5.1
Terminal, Telegraph, TH-22/TG	1.0

Radio Sets

Coder Burst, Transmission Group, AN/GRA-71	20.3
Communications Central, AN/TSC-26	355.7
Multiplexer, AN/TCC-13	5.1
Radio Set, AN/ARC-27, Veh Mtd	10.1
Radio Set AN/GRC-3, -5, -7, -109	15.3
Radio Set AN/GRC-4, -6, -8	14.2
Radio Set AN/GRC-9, -87	20.3
Radio Set, AN/GRC-19, -106	40.7
Radio Set, AN/GRC-26*	50.8
Radio Set, AN/GRC-41	35.5
Radio Set, AN/GRC-46*	45.7
Radio Set, AN/GRC-125	40.7
Radio Set, AN/GRC-122*	24.1

\* Denotes equipment for which man-hours vary depending on whether it is an end item or a component.

**Table O5 (Cont'd)**

<i>Item</i>	<i>Annual man-hours</i>
Radio Set, AN/GRC-142*	19.9
Radio Set, AN/GRC-160*	18.1
Radio Set, AN/GRR-5	10.1
Radio Set, AN/PRC-6, PRR-9, PRT-4	3.1
Radio Set, AN/FRC-93*	10.1
Radio Set, AN/PRC-8, -9, -10, -25, -74, -74B, -77	3.1*
Radio Set, AN/PRC-52	5.1
Radio Set, AN/TRC-29, -77	18.8
Radio Set, AN/TRC-34	18.2
Radio Set, Terminal, AN/TRC-35	81.3
Radio Set, AN/URC-4	2.1
Radio Set, AN/URC-10	2.1
Radio Set, AN/VRC-7	11.2
Radio Set, AN/VRC-8, -9, -10	10.1
Radio Set, AN/VRC-12	14.2
Radio Set, AN/VRC-13, -14, -15	13.2
Radio Set, AN/VRC-16, -18	12.2
Radio Set, AN/VRC-17	11.2
Radio Set, AN/VRC-19	15.3
Radio Set, AN/VRC-20	14.2
Radio Set, AN/VRC-21, -22	16.3
Radio Set, AN/VRC-24	20.3
Radio Set, AN/VRC-29	13.1
Radio Set, AN/VRC-30	25.4
Radio Set, AN/VRC-34, -35	20.3
Radio Set, AN/VRC-43	11.2
Radio Set, AN/VRC-44, -45	15.3
Radio Set, AN/VRC-46	11.2*
Radio Set, AN/VRC-47	14.2
Radio Set, AN/VRC-48, -49	15.3
Radio Set, AN/VRC-53	18.1
Radio Set, AN/VRC-54	25.4
Radio Set, AN/VRC-55	35.5
Radio Set, AN/VRQ-1, -2, -3	15.3
Radio Set, AN/VSC-1, -2, -3*	18.1
Radio Set, SCR 543	15.3
Radio Set, AN/SCR-8	10.1*
Recorder, Azimuth, RD-54TP	30.5
Recording Set, Weather Data, AN/TMO-5A	20.3
Repeater Set, Radio, AN/TRC-41	30.5
Repeater, Tele, AN/TCC-8	4.1
Amplifier, Radio Freq, AM-4306/PRC, AM-1881/V	15.3
Control Group, AN/GRA-6, AN/GSA-7	17.3
Facsimile Set, AN/TXC-1	17.7
Intercommunication Station AN/VIA-1, -4, AN/VIC-1	18.1
Radio Set, Control Group OA-1754/GRC	18.1
Radio Set, Civil Dist, SSB or Equiv	10.1
Radio Set, Control Group, AN/GRA-39 and 74	18.0
Radio Repeater Set, AN/MRC-64, AN/TRC-110*	40.7
Radio Terminal Set, AN/MRC-69, AN/TRC-121*	77.2
Radio Terminal Set, AN/MRC-73, AN/TRC-117,* -112	38.6
Radio Set, AN/GR-2	20.3
Repeater Set, Radio AN/TRC-3, -4, -24	20.3
Repeater, Telephone, AN/MCC-3	40.7
Radio Teletypewriter Set, AN/GRC-142, -122	45.7
Receiver, Radio R-394/U	2.1
Receiving Set, Radio AN/MRR-8	50.2
Transmitting Set, Radio AN/MRT-9	35.6
Coder-Burst Trans Grp, AN/GRA-71	15.3

\* Denotes equipment for which man-hours vary depending on whether it is an end item or a component.

Table O5 (Cont'd)

<i>Item</i>	<i>Annual man-hours</i>
<b>Radar and RAWIN Sets</b>	
Interrogator Set, AN/TPX-19, -26'	20.3
Radar Set, AN/GSS-1	91.5
Radar Set, AN/MPO-4, -10	101.6
Radar Set, AN/PPS-4, AN/TPN-8	20.3
Radar Set, AN/TPS -33 (Both less PWR)	101.6
RAWIN Set, AN/GMD-1	35.5
Radiosonde Base Line Check Set, AN/GMM-1A	21.3
Target Set, Radar, AN/UPM-38	50.8
<b>Miscellaneous Electronics Equipment</b>	
Alarm Set, Anti-Intrusion, AN/GSO-151	20.3
Central Office Set, TC-2 and TC-4	60.9
Computer, Gun Direction, M18 (FADAC)	3.9
Detecting Set, Truck Mtd (Less Truck)	10.1
Dark Room Photo, Port AN/TFQ-7	10.1
Detecting Set, Mine, Metallic or Non-Metallic, Ptbl	3.1
Dosimeter, IM-9, IM-93, IM-147	.5
Flash Ranging Set, AN/GRC-1	60.9
Guided Missile Set, ENTAC-1	3.1
Helmet, CVC	2.6
Radiac Set AN/PDR-27 and AN/PDR-39	.5
Sound Ranging Set, GR-8	15.3
Power Supply (all types) Rectifiers, Vibrators and Battery Chargers Not GED	2.1
Projector, Motion Picture	4.1
Projector, Slide or Opaque	2.1
Reproducer, PA System, Recorder Reproducer, Public Address Set	3.1
Reproducer, Signal Data, AN/GSO-64	7.0
Test Sets (all types)	3.1
Trainer, Code	6.1

Table O6

Miscellaneous Equipment Annual Man-hour Allowances

Item	Annual man-hours
Air Conditioner, 9,000 BTU to 60,000 BTU	17.8
Air Conditioner, Trlr Mtd, GED, 26,500 BTU	26.7
Bakery Plant, Trlr Mtd, M1945 (Includes Trlrs and Gen)	86.4
Bath Unit, GED, Ptbl, 8 to 24 Shw Hd	21.7
Cleaner Steam	12.4
Cleaning Machine, Fuel Can and Drum	77.1
Compressor, Air, Elec, 1.2 to 25 Cfm, Low Psi	17.8
Compressor, Air, GED, 3 1/2 to 60 Cfm, Low Psi	77.1
Compressor, Air, GED, 105 Cfm or Over, Low Psi	62.2
Compressor, Rotary, Pwr Drvn, DSI, 600 Cfm, and GED	66.6
Compressor, Air, Pwr Drvn, Flame Thrower, M4	32.0
Decontamination Appr, Pwr Drvn	27.9
Delousing Outfit, Pwr Drvn, 10 Gun	46.9
Dispenser, Riot Control, M106 GED	13.3
Distributor, Bituminous Material, GED, All	38.0
Distributor, Water, Trk or Trlr Mtd, GED, 100-400 GPM	57.7
Diving Equipment Set, 100 to 200 Ft Depth	77.1
Dryer Mixer, Bitum-Concrete, Gas Drvn, 3 TPH	61.0
Drilling Machine, Percussion, Skid Mtd GED	8.9
Drilling Machine, Rot, Skid, Gen 4 7/8-6 7/8	13.3
Fuel System Sup Point, Ptbl, 60,000 Gal	151.0
Heater, Hot Oil, Semi-Trlr Mtd, Dsl Drvn	6.0
Heater, Water, Liq Fuel, 4410-00-642-5656/4410-00-212-6285	27.6
Heater Duct Type, Ptbl, 250,000 to 400,000 BTU	77.1
Hypochlorination Unit	13.3
Kettle, Heating, Bitum, GED, Trlr Mtd, 165 Gal	11.0
Laundry Unit, Trlr Mtd	69.1
Lubricating and Servicing Unit, Trlr Mtd, GED	77.1
Melter, Asphalt, 900 GPH	44.4
Mixer, Concrete, GED, Trlr Mtd, 6 to 16 Cu Ft	77.1
Outboard Motor, 5 to 25 BHP	17.8
Press, Track Pin and Bushing	10.9
Propelling Unit, Outboard, DED 165 HP	88.8
Pump, Centrifugal, Base-Mtd, Elec Drvn, 1/2 to 2 HP	4.4
Pump, Centrifugal, Deep Well, GED, 2000 GPM, 200 Ft	66.6
Pump, Centrifugal, GED, Base Mtd, 50 to 166 GPM	53.3
Pump, Centrifugal, GED, Base Mtd, 167 to 500 GPM	75.5
Pump, Centrifugal, GED, Whl Mtd	88.8
Pump, Centrifugal, Pneu Drvn, 50 to 175 GPM	44.4
Pump, Reciprocating, Diaphragm; power drvn, 100 GPM	22.2
Pumping Assy, Flammable Liq, Bulk Trans, 350 GPH	75.5
Reel Unit, All (Gas Eng Drvn), (Elec Drvn)	17.8
Refrigeration Unit GED	77.1
Saw, Abrasive Disk, Masonry, GED	13.3
Saw, Chain GED All	13.3
Saw, Circular, Table, 16 in. GED	13.3
Saw, Band, Woodwork Elec; Saw, Chain, Pneu; Saw, Ptbl, Elec; Saw, Cir Ptbl, Pneu; Saw, Radial, Overarm, Elec; Saw, Recipro, Ptbl, Pneu	4.4
Searchlight Set All	17.8
Shower Unit, Safety, Rocket Propel, Neutral	4.4
Snow Machine (Snowmobile) LIN 01728A	13.3
Snow Removal Unit, Rotary	49.3
Spray Outfit, w/Compressor (all)	39.9
Sprayer, Insecticide, Gas Drvn	77.1
Spreader, Aggregate, Towed, 8 Ft Spread	25.0
Svc Unit, Trk Mtd, Flame Thrower	49.3
Tank and Pump Unit, Liquid Trk Mtd	49.3
Tool Outfit, Pioneer Ptbl, Elec, Tools, Less Gen	17.8
Water Purification Equipment Set, 600 GPH	17.8
Water Purification Equipment Set, 1500 GPH	22.2
Water Purification Equipment Set, 3000 GPH	26.7
Welder, Elec Arc, All Types	17.8

**APPENDIX P:**

**DETERMINATION OF ADJUSTMENT FACTOR  $a_4$**

Using the maintenance data gathered from the DEH shops at Forts Benning, Dix, and Lewis, the following equation was obtained:

$$\frac{(\text{Organizational maintenance})}{(\text{Organizational maintenance})+(\text{Direct and/or general support maintenance})} = 0.963.$$

For those DEH organizations doing organizational and intermediate (direct and/or general support) maintenance, the following adjustment factor,  $a_4$ , must be introduced before applying the USAR technique, which considers only organizational maintenance:

$$a_4 = \frac{1}{0.963} = 1.04.$$

**APPENDIX Q:****UTILIZATION STANDARDS**

<b>Group Code</b>	<b>Description</b>	<b>Standard Utilization</b>
G	Truck Pickup: 1/4 and 1/2 Ton	9,000 miles
H	Truck Carryall and Panel Truck: 1/4 - 3/4 Ton Truck and Truck Tractor	9,000 miles
I	1 Ton	9,000 miles
J	1 1/2-2 Ton	8,000 miles
K	2 1/2 Ton	8,000 miles
L	3-4 Ton	7,000 miles
M	5-10 Ton	6,000 miles
N	11 Ton and over	7,000 miles
O	Miscellaneous Equipment	1 unit
S	Construction Equipment	385 hours
T	Ground Maintenance Equipment	180 hours
U	Powered Railway Equipment	760 hours
Y	Weight Handling Equipment	180 hours

Sources: (for miles) DOD 4500.36R, *Management, Acquisition and Use of Motor Vehicles* (Department of Defense, 21 July 1981) and (for hours) interviews with personnel at DEHs, USN Chesapeake Field Division, Naval Shop Parts Control, and Crane Naval Weapons Support Center.

## GLOSSARY

**Effective Shop Labor Rate:** hourly labor rate which includes administrative and operational overhead costs.

**Intermediate maintenance--**maintenance operations which include:

1. Diagnosis and isolation of materiel or module malfunctions, adjustment, and alignment of modules when readily completed with assigned tools.
2. Repair of unserviceable, economically repairable materiel, which is beyond the capability of using activities. It will be on a repair and return to user basis.
3. Module and component disassembly and repair which are normally limited to tasks requiring cleaning and replacement of seals, fittings, transistors and resistors, replaceable parts, common hardware, or repair kits as authorized by the maintenance allocation chart of the respective module or component.
4. Evaluation of polluting emissions from internal combustion engine powered material and the necessary adjustment, replacement or repairs to keep these emissions within established standards.
5. Performance of light body repairs to include straightening, welding, sanding, and painting of skirts, fenders, and body and hull sections.
6. Provision of quick reaction materiel readiness and technical assistance support to organizational maintenance elements including:
  - a. Inspection of maintenance operations and materiel of supported activities to determine the efficiency and effectiveness of these operations and detect materiel failures.
  - b. Advising the instructing personnel of these elements on the proper methods of performing organizational maintenance.
  - c. Providing highly mobile maintenance support teams to perform or assist in the performance of authorized malfunction diagnoses, adjustment, alignment, and repair/replacement of modules and end items onsite as required.
7. Evacuation of unserviceable end items and modules to designated facilities of the same or higher categories of maintenance when their repair is beyond the authorized capability/capacity.

**Organizational maintenance:** maintenance operations that include:

1. Inspections by sight and touch of external and other easily accessible components; lubrication, cleaning, preserving (to include painting), tightening, and minor adjustments to easily accessible mechanical, electrical, hydraulic, and pneumatic systems.

2. Diagnosis and isolation of materiel malfunctions which can be readily traced to a defective module by easy-to-use and interpret external diagnostic and fault isolation devices such as automatic test equipment.
3. Replacement of modules authorized by the maintenance allocation chart on a time change basis or those identified as worn, damaged, or otherwise defective which (a) can be easily removed and installed with easy-to-use tools and (b) do not require critical adjustment, calibration, or alignment before or after installation.
4. Replacement of easily accessible unserviceable parts usually not requiring special tools or test material (e.g., knobs, lamps, fan belts, wheels, tires, filter elements, firing pins, gauges, and expandable antennas).
5. Maintenance evacuation of malfunctioning materiel and modules (properly preserved, protected, or tagged), which are beyond authorized capability or capacity to repair or replace, to selected supporting maintenance facilities for repair or exchange for like serviceable materiel when these activities cannot provide the required support onsite.

**Unit target mile:** the number of miles a vehicle is driven in its lifetime, used as a basis for calculating manhour requirements. Could be predicted mileage by category of vehicle.

**Vehicle equivalent:** a unit of measure denoting the maintenance complexity of a vehicle or item of equipment based on the maintenance complexity of a sedan, general-purpose, commercial design.

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