

**MANAGEMENT OF MATERIALS HANDLING EQUIPMENT (MHE)  
NAVSUP PUBLICATION 538 FIRST REVISION**

DEPARTMENT OF THE NAVY  
NAVAL SUPPLY SYSTEMS COMMAND  
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This publication is issued for the information and guidance of all interested personnel of Forces Afloat and Ashore Activities having a direct or related responsibility for the management of Materials Handling Equipment (MHE) and is in accordance with the basic policies and responsibilities assigned by the Secretary of the Navy. It supersedes NAVSUP Publication 538 of October 1981.

This publication has been completely revised to not only include updated maintenance procedures for MHE, but to now serve as the Navy's overall management publication relating to all regulations and procedures common with MHE. This publication has been reviewed and approved.

  
J. S. PRENDERGAST  
Deputy Commander  
Fleet Logistics Operations

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## ABSTRACT OF SIGNIFICANT CHANGES

Ref: (a) NAVSUPINST 10490.33 (series)  
(b) NAVICPINST 10490.4 (series)  
(c) NAVSEA SW023-AH-WHM-010, Third Revision  
(d) Technical Memorandum Number PHST-35-00, "MHE Service Life Extension Program (SLEP); Processing Guide"

1. Amplifies in chapter 2 the administrative policies and centralized maintenance procedures delineated by references (a) and (b).

2. Transitions all technical information and safety regulations previously documented in reference (c) into this publication as it relates to:

a. The approved types of MHE and associated forklift truck attachments into chapter 3.

b. The general operational safety regulations into chapter 5 as it pertains to personnel safety, handling safety, safety during movements, approved MHE safety devices, safety during fueling, color and marking requirements, regulations for using MHE in specific locations ashore and afloat, temporary parking, and MHE storage/stowage requirements.

c. The maintenance, test and inspection program into chapter 8, including the revised daily operator inspection requirements (MHE Inspection Form, figure 8-1) and the annual fork inspection requirements (Fork Maintenance Inspection Form, figure 8-9).

d. The safety precautions supporting battery charging, testing and maintenance into chapter 9.

3. Introduces in chapter 4 the MHE operator licensing program and local instructor requirements for the handling of general supply materials or hazardous materials (other than ammunition and explosives), including a new, standardized MHE Operator's License (figure 4-2). Additionally, appendix B identifies the required training course for MHE operators, tailored to the requirements found in reference (c), but for the handling of general supply materials or hazardous materials.

4. Describes in chapter 6 the Equipment Management and Control System (EMACS) requirements for maintenance personnel to document and maintain records of maintenance and servicing performed on MHE. Also, addresses other equivalent types of shipboard maintenance data management systems that may be used in place of EMACS.
5. Presents in chapter 7 the types of product deficiency reporting methods when discrepancies are detected on new or existing MHE.
6. Publishes in chapter 9 the maintenance and charging procedures for lead-acid batteries.
7. Identifies in chapter 10 estimated time standards for the repair, overhaul and maintenance of MHE, with actual repair time standards from various MHE manufacturers published in appendix E.
8. Documents in chapters 11 and 12 short term and long term MHE storage requirements, respectively, previously addressed in reference (d).

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MATERIALS HANDLING EQUIPMENT (MHE)**



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**15 November 2002**

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### **LIST OF EFFECTIVE PAGES**

The total number of pages in this manual is 544. They are all original revision one pages. The date of issue for all pages in this manual is 15 November 2002.

## FOREWORD

1. This publication documents the management, maintenance, and safe use of industrial Materials Handling Equipment (MHE) and approved attachments at U.S. Navy units ashore and afloat.
2. This publication is not intended to supersede, contravene, or modify any federal, state, municipal or local laws and their supplements. If any provision of this publication appears to conflict with any other published regulation this fact should be reported to Commander, Naval Inventory Control Point (NAVICP), 5450 Carlisle Pike, Code 058133, P.O. Box 2020, Mechanicsburg, PA 17055-0788.
3. Copies of this publication may be obtained as described in [paragraph 1-12](#).
4. This publication supersedes NAVSUP Publication 538 dated October 1981, which should be destroyed. Changes to this publication will be issued as required. Comments or suggestions relative to material to be included in such changes should be forwarded as specified in [chapter 1](#).

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## SAFETY SUMMARY

This publication contains instructions and regulations necessary for the safe usage of Materials Handling Equipment (MHE) at U.S. Navy units ashore and afloat. While the entire content of this publication is a warning to the user, the following warnings appear in the text and are repeated here for emphasis:

### WARNING

Driving MHE down grades with forks or forklift attachments facing downhill may cause MHE instability or possible loss of control. (Page 5-6.)

### WARNING

During maintenance operations, safety devices may be removed or disabled but shall be installed or activated immediately upon completion of the scheduled tasks. (Page 5-8.)

### WARNING

Always wear protective gloves and eye protection, as recommended by the Material Safety Data Sheet (MSDS), prior to filling LPG containers. Consult the manufacturer's recommendations for filling procedures. (Page 5-11.)

### WARNING

Type DS MHE may be used in closed lighters afloat provided they meet federal, state and local regulations for air quality and noise pollution. Each activity must monitor the emissions in accordance with the manufacturer's recommendations to ensure that the exhaust emissions do not exceed the personal exposure limits set forth by federal, state or local regulations. (Page 5-21.)

### WARNING

MHE powered by internal combustion engines may be used in partial operational areas ashore provided they meet federal, state and local regulations for air quality and noise pollution. Each activity must monitor the emissions in accordance with the manufacturer's recommendations to ensure that the exhaust emissions do not exceed the personal exposure limits set forth by federal, state or local regulations. (Page 5-22.)

**WARNING**

When the mast is fully raised, ensure the operator's hands are clear of the controls and the person marking and verifying the height is positioned to the side of the forklift truck. An observer must ensure that all personnel are clear of the mast prior to raising the rated load. (Page 8-18.)

**WARNING**

Do not touch spilled liquids without appropriate personal protective equipment. Spilled liquid is likely to be electrolyte which contains sulfuric acid. (Page 9-3.)

**WARNING**

For units ashore, locally procured battery lifting beams may be used to lift MHE batteries provided they are maintained, inspected, tested and certified in accordance with NAVFAC P-307. (Page 9-6.)

**WARNING**

For units afloat, the Mk 18 Mod 1 Handling Beam, figure 9-3, is issued lift batteries. The battery cover shall be kept closed to prevent the beam from accidentally coming into contact with the battery connecting terminals, causing a short circuit. If battery cover is missing, plywood or other insulating material shall be cut to appropriate dimensions and placed over the battery terminals. (Page 9-6.)

**WARNING**

Only use authorized battery lifting equipment to hoist lead-acid batteries and to connect to the battery lifting lugs. Do not use sling assemblies that would tend to squeeze or stretch the battery tray and lifting lugs as the load is applied. The Mk 18 Mod 1 Handling Beam, figure 9-3, is approved for lifting batteries afloat, while locally procured lifting beams are approved ashore. (Page 9-7.)

**WARNING**

Severe burns can be caused by the sulfuric acid contained in batteries. In case of contact, thoroughly flush affected area with clean water. Obtain medical attention immediately. (Pages 9-10, 9-10, 9-15, and 9-17.)

**WARNING**

An explosion can result from the hydrogen gas produced from battery charging. (Page 9-10.)

**WARNING**

When mixing electrolyte, acid shall be poured into water, not water into acid. (Page 9-11.)

**WARNING**

Never use electrolyte with a specific gravity higher than 1.400. (Page 9-17.)

**WARNING**

Refer to the Material Safety Data Sheet (MSDS) for Grease, Aircraft and Instruments, MIL-PRF-23827. The precautions, procedures and special protection information concerning the grease shall be followed. (Pages 11-2, 11-5, and 12-10.)

**WARNING**

Refer to the Material Safety Data Sheets (MSDS) for Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®. The precautions, procedures and special protection information concerning the lubricant shall be followed. (Page 11-2.)

**WARNING**

Refer to the Material Safety Data Sheet (MSDS) for Compound, Silicone, Soft Film, DC-6 or G-24. The precautions, procedures and special protection information concerning the compound shall be followed. (Pages 11-2 and 12-9.)

**WARNING**

Refer to the Material Safety Data Sheet (MSDS) for CRC Industrial Duty Silicone. The precautions, procedures, and special protection information concerning the silicone shall be followed. (Pages 11-3 and 12-8.)

**WARNING**

Refer to the Material Safety Data Sheet (MSDS) for Lubricating Oil, Engine, MIL-L-21260, Grade 30. The precautions, procedures and special protection information concerning the oil shall be followed. (Pages 11-3 and 12-5.)

**WARNING**

Refer to the Material Safety Data Sheet (MSDS) for Fuel Soluble Lubricity Improver Corrosion Inhibitor, MIL-I-25017. The precautions, procedures and special protection information concerning the corrosion inhibitor shall be followed. (Page 11-3).

**WARNING**

Refer to the Material Safety Data Sheet (MSDS) for CRC 3-36®, or LPS 814, or ALOX 22028CM-3. The precautions, procedures and special protection information concerning the lubricant shall be followed. (Page 11-5.)

**WARNING**

Refer to the Material Safety Data Sheet (MSDS) for Alcohol, Denatured Ethyl, O-E-760. The precautions, procedures and special protection information concerning the cleaning solvent shall be followed. (Pages 11-9 and 12-13.)

**WARNING**

Refer to the Material Safety Data Sheet (MSDS) for Cleaning Compound, P-C-437. The precautions, procedures and special protection information concerning the compound shall be followed. (Page 12-2.)

**WARNING**

Refer to the Material Safety Data Sheet (MSDS) for Antifreeze, A-A-52624. The precautions, procedures and special protection information concerning the antifreeze shall be followed. (Page 12-2.)

**WARNING**

Refer to the Material Safety Data Sheet (MSDS) for Lubricating Oil, Combat/Tactical 15W-40 in accordance with MIL-PRF-2104, or Lubricating Oil, Gear, Multi-Purpose 85W-140 in accordance with MIL-L-2105. The precautions, procedures and special protection information concerning these oils shall be followed. ([Page 12-3.](#))

**WARNING**

Refer to the Material Safety Data Sheet (MSDS) for Preservative, Oil, Light Viscosity, MIL-P-46002, Type 1. The precautions, procedures and special protection concerning the oil shall be followed. ([Page 12-5.](#))

**WARNING**

Refer to the Material Safety Data Sheet (MSDS) for Alcohol, Denatured Ethyl, O-E-760. The precautions, procedures and special protection information concerning the cleaning solvent shall be followed. ([Page 12-13.](#))

The following caution statements appear in the text of this manual, and are repeated here for emphasis:

**CAUTION**

Mast and fork restraint devices must be removed prior to operating components to prevent damage to the MHE. ([Page 8-10.](#))

**CAUTION**

In sub-freezing temperatures, water should be added one hour before charging is completed or at beginning of equalizing charge to ensure proper mixing with the electrolyte. ([Page 9-3.](#))

**CAUTION**

Ensure that only a vertical force is applied to the battery lifting lugs/eyes during the battery lifting test. This is accomplished using several approval battery lifting beams. Do not attach sling assemblies that would tend to squeeze or stretch the battery tray and lifting lugs/eyes when the load is applied. ([Page 9-6.](#))

**CAUTION**

When cleaning battery connections, verify the lead coating is not removed from terminals, exposing copper. (Page 9-8.)

**CAUTION**

Lead-acid batteries shall only be charged by trained and authorized personnel. (Page 9-11.)

**CAUTION**

To avoid damaging the battery, never allow the electrolyte temperature to exceed 115 °F during charging. Reduce or stop current if electrolyte reaches this temperature. (Page 9-11.)

**CAUTION**

Do not continuously exceed a battery beyond 80 percent discharge. Its service life will be greatly diminished. (Page 9-11.)

**CAUTION**

Use only distilled or de-mineralized water for filling lead-acid batteries. (Page 9-15.)

**CAUTION**

Do not add distilled or de-mineralized water until visual inspection shows that top of separators/plates are visible. (Page 9-15.)

**CAUTION**

Prior to battery charging if electrolyte is not visible above the battery plates add distilled water to a level just above the battery plates. (Page 9-15.)

**CAUTION**

Do not overfill battery cells. Overfilling will likely cause electrolyte spillage, which will eventually lead to tray corrosion, ground paths, and loss of battery capacity. (Page 9-15.)

**CAUTION**

Sulfuric acid should never be added to a cell without first ensuring that charging will not restore specific gravity to normal values. (Page 9-16.)

**CAUTION**

Never make a specific gravity adjustment on a cell which does not gas freely on charge. (Page 9-16.)

**CAUTION**

Ensure all cells are gassing prior to starting any gravity adjustment. (Page 9-17.)

**CAUTION**

Only clean a battery with an approved neutralizer/cleaner or a mixture of bicarbonate of soda and water (one pound of bicarbonate to one gallon of water). Ensure cleaning mixture does not get into battery cells. (Page 9-18.)

**CAUTION**

Prior to cleaning a battery, ensure all vent plugs are in place. (Page 9-19.)

**CAUTION**

All batteries should be stored or stowed under cover and in a diked or contained area to prevent any electrolyte from accidentally entering the environment. (Page 9-19.)

**CAUTION**

Batteries and acids should be stored or stowed away from sewer and storm drains and from sources of heat. (Page 9-19.)

**CAUTION**

Leaking or cracked batteries and cells must be provided with adequate containment during storage and transportation. (Page 9-20.)

**CAUTION**

Precautions must be taken to assure hydrostatic lock-up does not occur causing severe engine damage. Spark plugs, fuel injectors, glow plugs, etc., must remain out during this procedure or engine damage may result. (Page 12-6.)

**CAUTION**

Mask friction-type brake linings from overspray. Damage to lining material will result. (Page 12-8.)

## CHAPTER 1

### INTRODUCTION

#### 1-1. PURPOSE

This publication provides administrative regulations, technical instructions, personnel training requirements, safety precautions, operational and preventive maintenance requirements, extended storage procedures, and battery maintenance and charging procedures commonly available for U.S. Navy Materials Handling Equipment (MHE). Also, this publication identifies and describes the approved types of MHE and associated forklift truck attachments. These documented requirements, in conjunction with locally developed instructions, are intended to provide for the safe use of MHE and to extend its in-service life cycle.

#### 1-2. SCOPE

This publication is applicable to all Navy activities ashore and afloat which have MHE. The provisions of this publication apply to Navy-owned MHE assigned to shore activities, land-based operating forces, forces afloat, and Fleet Issue Control Points (FICP's). This publication is not applicable to tactical MHE assigned to deployable Fleet Marine Forces and Marine Corps activities for which the Commandant of the Marine Corps (CMC) has the primary support responsibility under the provisions of MCO P11262.2 (series). For MHE assigned to handle ammunition and explosives, the regulations prescribed in [NAVSEA SW023-AH-WHM-010](#) shall apply.

#### 1-3. CANCELLATION

This publication supersedes and cancels NAVSUP Publication 538, "Materials Handling Equipment: Maintenance Manual," dated October 1981.

#### 1-4. ORGANIZATION OF PUBLICATION

This publication is divided into 12 chapters. [Chapter 2](#) documents the administrative responsibilities from the Program Management down to the user levels of MHE. [Chapter 3](#) identifies and describes the approved types of MHE and associated forklift truck attachments commonly used by the Navy. [Chapter 4](#) lists the processes to select training, license personnel as powered MHE operators, and authorize personnel as local instructors for the purpose of issuing a license for powered MHE operators. [Chapter 5](#) provides the safety precautions associated with operating and maintaining MHE, the approved operational areas, and operator and instructor qualifications. [Chapter 6](#) describes the Equipment Management and Control System (EMACS) preventive maintenance program for recording and maintaining services performed on MHE and indicating specific areas that require servicing. [Chapter 7](#) details the procedures for reporting deficiencies on new or existing MHE. [Chapter 8](#) addresses the basic preventive maintenance practices that will assure the satisfactory performance of MHE. [Chapter 9](#)

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provides recommended guidelines for the maintenance and charging procedures of lead-acid batteries used in all electric-powered MHE. [Chapter 10](#) presents the known time standards, by section according to equipment cost codes for maintenance, for the repair, overhaul and maintenance of MHE to be used with EMACS or other local cost control programs for establishing a measurement and comparison of the actual time consumed during maintenance operations. [Chapter 11](#) describes short term procedures, commonly called “live storage,” for an anticipated MHE storage duration of less than 24 months (2 years). Finally, [chapter 12](#) describes long term procedures, commonly called “dead storage,” for MHE storage of greater than 24 months (2 years).

## 1-5. REFERENCE DOCUMENTS

[Appendix A](#) lists all the documents containing technical or administrative information applicable to and referenced in this publication. These documents are essential for complete understanding of administrative, operating, maintaining and handling MHE. Applicable documents shall be maintained as a collection of current information pertaining to all aspects of MHE operation and maintenance.

## 1-6. MHE OPERATOR TRAINING COURSE

[Appendix B](#) provides the training course established as the minimum requirements that naval personnel must successfully meet prior to being issued a powered industrial MHE license to handle general supplies or hazardous materials (other than ammunition and explosives).

## 1-7. MATERIALS HANDLING EQUIPMENT (MHE) ASSIST CHECKLIST

[Appendix C](#) provides a checklist for afloat and ashore use, as appropriate, to assist the MHE representative and the ship/activity evaluate their MHE operations and to provide needed assistance and information.

## 1-8. SHIPMENT AND TRANSPORTATION OF MHE

[Appendix D](#) provides general shipment and transportation guidelines for MHE intended to be transported on flatbed trailers, or enclosed vans and trailers for short term storage, long term storage, or general truckload requirements. These procedures are presented to ensure that MHE will not be degraded or damaged during shipment.

## 1-9. MANUFACTURER REPAIR TIME STANDARDS

[Appendix E](#) identifies the actual repair time standards provided by the respective industrial MHE manufacturers. These time standards may be used in place of or in conjunction with the general repair time standards documented in [chapter 10](#) for establishing a measurement and comparison of the actual time consumed during maintenance operations using EMACS or other local cost control programs.

## 1-10. TERMS AND DEFINITIONS

The following are terms and definitions that are contained throughout this publication. The reader is encouraged to review and understand these terms and definitions to ensure that they are understood.

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1-10.1. **ACCUMULATED REPAIR EXPENDITURE LIMITS.** Are applicable to the sum of all scheduled inspection and repair costs incurred during the entire life of the item. This includes the price of parts actually consumed in the repair operation, the exchange charge for complete assemblies or subassemblies installed, and direct and indirect (shop charges only) labor involved.

1-10.2. **EQUIPMENT MANAGEMENT AND CONTROL SYSTEM (EMACS).** An automated, server-based application system that allows Navy users of MHE maintain asset visibility and economically manage maintenance.

1-10.3. **MATERIALS HANDLING EQUIPMENT (MHE).** All self-propelled equipment normally used in storage and handling operations in and around warehouses, shipyards, industrial plants, airfields, magazines, depots, docks, terminals, and aboard ships. It includes all self-propelled MHE, such as, but not limited to, warehouse tractors, forklift trucks, platform trucks, pallet trucks, straddle carrying trucks, 463L aircraft loaders, and automated materials handling systems. It also includes non-powered shipboard pallet trucks.

1-10.4. **ONE-TIME REPAIR.** Expenditure limits for MHE are applicable to each complete repair job performed on a unit, with the exception for Service Life Extension Program (SLEP) costs.

1-10.5. **PREVENTIVE MAINTENANCE.** Scheduled maintenance that is the responsibility of and performed by a using organization on its assigned equipment. It consists of the inspection, service, surveillance, adjusting, and lubrication of equipment in order to minimize breakdown and keep the equipment in optimum operating condition.

1-10.6. **REPAIR.** As used in this publication, denotes the procedure or method used to return MHE to operational condition after failure.

1-10.7. **SERVICE LIFE EXTENSION PROGRAM (SLEP).** MHE major overhaul program designed to return equipment to service in like-new (A-4) condition.

### **1-11. REPORTING CONFLICTS, ERRORS AND OMISSIONS IN PUBLICATION**

All users are requested to arrange for the maximum practical use and evaluation of this publication and to the referenced technical manuals. If a conflict exists between this publication and OPNAV or higher echelon instructions, those instructions shall take precedence. If a conflict exists between this publication and any other technical instructions and procedures, the provisions specified in this publication shall take precedence. All conflicts noted shall be reported to the Program Manager at Commander, Naval Inventory Control Point (NAVICP), 5450 Carlisle Pike, Code 058133, P.O. Box 2020, Mechanicsburg, PA 17055-0788 on [NAVSUP Technical Manual Deficiency/Evaluation Report \(TMDER\)](#). To facilitate such reporting, a copy of this TMDER is included at the end of this publication and may be used for completion and submission. All feedback comments will be thoroughly investigated and those who provided the comments will be advised of the outcome. Valid outcomes will be incorporated into the next revision or change to this publication.

## 1-12. OBTAINING COPIES OF THIS PUBLICATION

1-12.1. HARD COPIES. Hard copies of this publication should be ordered via print on demand requisition (MILSTRIP) using the National Stock Number (NSN) assigned to this publication. Requisitions should be forwarded to Document Automation and Production Service (DAPS), 5450 Carlisle Pike, Building 410, P.O. Box 2020, Mechanicsburg, PA 17055-0788, phone number 1-215-697-6257, or by accessing them at [www.daps.dla.mil](http://www.daps.dla.mil) or using the Naval Logistics Library (NLL) website at [www.nll.navsup.navy.mil](http://www.nll.navsup.navy.mil) (password required). Activities may reproduce additional hard copies of this publication for their own use.

1-12.2. CD-ROM COPIES. CD-ROM copies of this publication, which is located on the Explosives Safety Technical Manual (ESTM) CD-ROM, published by [Naval Ordnance Safety and Security Activity \(NOSSA\)](#), should be forwarded to Director, [Naval Surface Warfare Center \(NAVSURFWARCEN\)](#), [Indian Head Division Detachment Earle, Naval Packaging, Handling, Storage, and Transportation \(PHST\) Center](#), Code 71, 201 Highway 34 South, Colts Neck, NJ 07722-5023. Activities may replicate additional CD-ROM's of this publication for their own use.

## 1-13. DISTRIBUTION OF PUBLICATION

Correspondence involving distribution quantities, address changes, etc., should be forwarded to Commander, [Naval Inventory Control Point \(NAVICP\)](#), 5450 Carlisle Pike, Code 058133, P.O. Box 2020, Mechanicsburg, PA 17055-0788.

## 1-14. DATE OF PUBLICATION

The date of this publication, as shown on the title page, is the estimated date of distribution. However, the publication, revision, or change is effective upon receipt, regardless of the date shown on the title page.

## CHAPTER 2

### ADMINISTRATION

#### 2-1. AUTHORITY

By the authority of the [Secretary of the Navy \(SECNAV\)](#) and the [Chief of Naval Operations \(CNO\)](#) instructions, [SECNAVINST 4440.31 \(series\)](#) and [OPNAVINST 4460.1 \(series\)](#), the Naval Supply Systems Command (NAVSUPSYSCOM) has been assigned the overall responsibility for the administration and control of all U.S. Navy Materials Handling Equipment (MHE). As assigned by NAVSUPSYSCOM, the [Naval Inventory Control Point Mechanicsburg \(NAVICP-M\)](#) serves as the overall program manager and life cycle manager for Navy MHE. This also includes the Acquisition Engineering Agency (AEA).

#### 2-2. PROGRAM RESPONSIBILITIES

The following are the MHE Program responsibilities as delineated in NAVSUPINST 10490.33 (series) and NAVICPINST 10490.4 (series).

2-2.1. MHE PROGRAM MANAGER. The MHE program manager, NAVICP-M (Code 058133), will:

- a. Establish Navy-wide procurement, maintenance, and management policies to support programs and allowances authorized by CNO.
- b. Review and incorporate strategic philosophy into program management, provide formal budget preparation guidance and defend the budget.
- c. Review Program Objectives Memorandum (POM) inputs for the new requirements and refer them to the appropriate CNO program sponsor for funding support.
- d. Establish policy for the allocation, administration, and utilization of all assigned equipment, in accordance with the military requirements established by CNO and operational requirements of other commands and offices.
- e. Monitor the implementation of standards for operation and general utilization of Navy MHE.
- f. Administer public laws and regulations relating to the acquisition, use and disposal of MHE.
- g. Review and approve life expectancy and repair limit criteria for MHE.

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h. Oversee the review of MHE specifications in connection with the Department of Defense (DOD) Standardization Program. Approve all new MHE specifications and significant revisions to existing MHE specifications for the Navy.

i. Approve standards for training of MHE operating and maintenance personnel.

j. Through command channels and in coordination with other commands or offices, establish technical and operational standards to comply with appropriate safety regulations.

k. Coordinate requirements for cost accounting and cost reporting procedures with the Comptroller of the Navy and other interested commands and offices.

l. Develop and maintain the policy for MHE Integrated Logistic Support Plans (ILSP).

m. Provide the necessary information on approved installation/modification of Automated Materials Handling Systems (AMHS) or warehouse improvement projects which affect MHE requirements.

n. Review and approve MHE initial allowances and subsequent allowance change requests (ACR's) wherein agreement cannot be reached with the requesting activity, or when significant budgetary impacts may be realized.

o. Provide MHE management capability to all Navy MHE user and managers via the Navy's Equipment and Management Control Systems (EMACS), with the specific responsibilities documented in [paragraph 6-5.1](#).

p. Submit budget requirements and establish program management guidelines for the MHE Service Life Extension Program (SLEP).

q. Oversee the AEA function and fund, task and monitor the MHE In-Service Engineering Agency (ISEA) function.

r. Oversee the management and control of MHE stored as War Reserve Materiel (WRM).

s. Oversee the implementation and management of Fleet Industrial Supply Center (FISC) tasking in the FISC Operating Guide (NAVSUP Publication 601) MHE Template.

**2-2.2. LIFE CYCLE MANAGEMENT RESPONSIBILITIES.** The life cycle manager, NAVICP-M (Code 058133), will:

a. Serve as AEA for the Navy's MHE program.

b. Perform all inventory control functions for MHE assigned to Navy activities, afloat and ashore, to include Fleet Inventory Control Points (FICP's) and WRM.

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c. Through command channels, and in coordination with the appropriate Naval Air (NAVAIR), Naval Sea (NAVSEA), Naval Facility (NAVFAC) Systems Command, or Type Commander (TYCOM), or Military Sealift Command (MSC) with respect to MHE assigned to ships, assist in determining Navy-wide MHE requirements in support of existing programs, previously established allowances, approved allowance changes, new allowances and new programs.

d. Support the Navy's EMACS program, with the specific responsibilities documented in [paragraph 6-5.1](#).

e. Determine, promulgate and monitor standards for activity use in determining requirements for selection, application, operations and utilization of MHE.

f. Develop and defend MHE budgets using inventory, new requirements, replacement and procurement data for submittal as required.

g. Coordinate POM inputs for new requirements and provide as required.

h. Coordinate and consolidate requirements, verify and approve user technical requirements, initiate procurement, and coordinate and monitor consignment and delivery of MHE for the following programs:

(1) Navy replacement program.

(2) Navy Working Capital Fund (NWCF) activities, to include NAVSUP NWCF, and Ships Construction Navy (SCN) programs.

(3) New programs, new allowances, military construction and facility upgrades.

i. Prioritize the delivery of replacement and new MHE based on operational requirements and performance of the activity in meeting utilization goals.

j. Oversee management of WRM MHE stock in accordance with NAVSUP WRM and CNO-approved requirements and guidelines.

k. Monitor utilization of MHE assigned to shore activities and land-based operating forces.

l. Assign Navy Registration Numbers to all Navy MHE.

m. Establish criteria for the replacement, induction into the SLEP, or retirement of MHE using SLEP and DOD guidance.

n. Develop and administer technical and operational standards in compliance with appropriate safety regulations.

o. Manage the exchange, reassignment, and disposal of MHE for the Navy in accordance with current regulations.

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- p. Provide recommended revisions to MHE cost accounting and cost reporting procedures for coordination with the Comptroller of the Navy (NAVCOMPT).
- q. As required, review submissions by activities of other commands (including Navy ships) for procurement of powered MHE, non-powered shipboard pallet trucks, and MHE industrial storage batteries for conformance with military standards and specifications.
- r. Provide acquisition engineering data to the Defense Logistics Agency (DLA) for Federal Supply Classes 3920 (shipboard manual pallet trucks only), 3930 (powered MHE), and 6140 (MHE batteries only) applicable to Navy programs.
- s. Chair provisioning conferences and effect provisioning for Navy MHE by developing and maintaining Allowance Parts Lists (APL's) and Lead APL's.
- t. Develop, maintain, coordinate and manage military and federal specifications and standards for powered and non-powered MHE and submit new specifications and significant revisions to existing specifications for approval. Effect standardization of equipment practical in compliance with procedures established by the DOD Standardization Program. Coordinate specification reviews with the ISEA as required.
- u. Establish and chair a Configuration Control Board (CCB), and retain responsibility for MHE configuration management.
- v. Evaluate manufacturer and repair facilities based on past performance and capabilities to determine "best value" manufacturers.
- w. Develop, approve and maintain MHE technical manual (TM) specifications and standards. Review, evaluate and approve contractor maintenance manuals and technical publications.
- x. Function as the preparing activity and Navy custodian for military and industry specifications and standards applicable to powered and non-powered MHE and industrial storage batteries for electric powered MHE.

**2-2.3. ISEA RESPONSIBILITY.** The Naval Surface Warfare Center (NAVSURFWARCEN) Indian Head Division Detachment Earle, Naval Packaging, Handling, Storage and Transportation (PHST) Center, has been designated by NAVSUP and NAVICP-M to serve as the MHE ISEA. The ISEA will:

- a. Maintain the MHE ILSP and other maintenance plans, procedures and standards to ensure MHE is managed and repaired at the most economical level. Review Lead APL's.
- b. Assist the AEA in reviewing and approving TM's, maintenance manuals, and technical publications for contractual compliance and equipment applicability.
- c. Incorporate Fleet feedback into reviews of military and industry MHE specifications and standards to ensure a balance between Fleet requirements and industry capabilities.

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- d. Conduct technical evaluations, to include user tests, in conjunction with first article tests. Conduct product acceptance tests as required to ensure the protection of Navy interests and concerns. Make recommendations to the AEA as required.
- e. Provide Fleet/user engineering support. Make site visits to users, as required, to analyze and solve MHE problems and assist users in implementing equipment changes. Evaluate user feedback for incorporation into equipment modifications and procurement specifications.
- f. Review of Commercial Item Descriptions (CID's)/Purchase Specifications for the procurement of MHE.
- g. Address safety issues in accordance with NAVSEA Explosives Safety Charter. Incorporate safety-related changes into Military Specifications (MIL-SPECS) and equipment modifications.
- h. Monitor and approve MHE training programs for Navy MHE users. Ensure all training programs are Occupational Safety and Health Administration (OSHA)-compliant with the provisions of [29 CFR 1910.178](#).
- i. Validate allowance requirements for adequacy as they relate to user missions and make recommendations to the MHE program manager for changes.
- j. Develop and maintain SLEP standards for use by MHE holders and depot level repair sites to establish induction and level of effort requirements.
- k. Assist the AEA in reviewing MHE contractor waiver or deviation requests and Engineering Change Proposals (ECP's).
- l. Review technical publications, technical manuals, and maintenance manuals for contractual compliance. Perform validation/verification as required.
- m. In conjunction with the AEA, review and evaluate Quality Deficiency Reports (QDR's) under the warranty or latent defect provisions of MHE procurement contract, and provide recommendations for corrective action to manufacturers and Fleet users.

### 2-2.4. NAVAIR/NAVSEA/NAVFAC SYSTEMS COMMAND RESPONSIBILITIES. As appropriate, NAVAIR, NAVSEA and NAVFAC will:

- a. Establish environmental requirements for handling of hazardous or explosive materials.
- b. Develop and/or recommend design changes necessary to meet new mission requirements for more effective and efficient movement and handling of material.
- c. Advise NAVICP-M of functional, operational or unique requirements.
- d. Advise NAVICP-M of approved initial allowances and provide NAVICP-M with allowance changes as recommended by Fleet commands.

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e. Provide NAVICP-M with funds for procurement of MHE for new ships construction (SCN) and for initial shore-based requirements.

f. Advise NAVICP-M of changes in mission assignments, base closures and decommissioning of ships that affect MHE requirements.

**2-2.5. REGIONAL MHE MANAGER RESPONSIBILITIES.** Regional MHE Managers are established at the following Fleet Industrial Supply Centers (FISC’s): Jacksonville, Norfolk, Pearl Harbor, Puget Sound, San Diego and Yokosuka. **Table 2-1** identifies the respective regional areas supported by each FISC Regional MHE Manager. Regional managers will perform the following functions:

**Table 2-1. FISC Regional Areas**

FISC	Regional Areas
Jacksonville	Alabama, Florida, South Carolina, Georgia, Texas, Mississippi, and the Caribbean Islands (including Naval Station (NAVSTA) Guantanamo Bay, Cuba, and Puerto Rico), Central America, and South America
Norfolk	Minnesota, Wisconsin, Michigan, Illinois, Ohio, Kentucky, Tennessee, West Virginia, Indiana, Virginia, North Carolina, Maryland, Delaware, New Jersey, Pennsylvania, New York, Connecticut, Rhode Island, Massachusetts, New Hampshire, Vermont, Maine, Europe, Africa, Western Asia, Keflavik (Iceland), Middle East, and Azores
Pearl Harbor	Hawaii, Middle Pacific Region
Puget Sound	Washington, Oregon, Idaho, Montana, Wyoming, North Dakota, South Dakota, California (above Oakland), Utah, Colorado, Kansas, Nebraska, Missouri, Iowa, Alaska
San Diego	California (Oakland and below), Nevada, Arizona, New Mexico, Oklahoma, Arkansas, Louisiana
Yokosuka	Asia and Western Pacific

a. Provide new or overhauled replacement units at no cost for shipboard, War Reserve requirements, and other non-NWCF activities, to include NAS’s/NAF’s, submarine bases, NAVFAC’s, Naval bases and magazines, Naval Weapons Stations, Construction battalions, Combat Support Squadrons, Reserve Centers, Training Schools and Battalions, Amphibious bases, Test Facilities, and Naval Hospitals.

b. Provide MHE, as available, on a short term reimbursable basis, to the following activities: industrial-funded shipyards, Naval Aviation Depots (NADEPS), Public Works Centers (PWC), MSC, Printing Services, Naval Air Warfare Centers (NAWC), and Naval Exchanges.

c. Secure contracts for maintenance and repair as required or requested by various regional MHE holders.

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- d. Secure leasing contracts for MHE users for commercially available equipment, as required.
- e. Manage regional inventory databases via EMACS in order to provide required updates to the central database at NAVICP-M. Specific EMACS responsibilities are documented in [paragraph 6-5.2](#).
- f. Provide summaries of regional costs to requesting activities.
- g. Maintain MHE pool inventories to service shipboard and shore-based regional MHE requirements.
- h. With NAVICP-M, manage the regional SLEP process, to include determination of induction candidates, funds management, new procurements, on site acceptance inspection visits, and contract management of SLEP service providers.
- i. Maintain a self-help maintenance and repair program to support Fleet training and maintenance requirements, as applicable.
- j. Coordinate with NAVICP-M approval to procure, sell or obtain by other means MHE.
- k. For base closures, if requested, the FISC Regional MHE Manager will evaluate all MHE assets to be made available and provide recommendations to NAVICP-M as outlined in [paragraph 2-11](#). Once final disposition of the MHE is received from NAVICP-M, the FISC Regional MHE Manager will update the EMACS records as required.
- l. As applicable, maintain and monitor the condition of WRM MHE stock. Coordinate assist movement with NAVICP-M. For any FISC-assigned WRM, the FISC Regional MHE Manager will be responsible for the following:
  - (1) Receipt, storage, periodic maintenance and repairs of WRM MHE.
  - (2) Prepare annual budget requests for the NAVSUP WRM MHE sponsor in accordance with established guidelines to maintain the WRM in A-4 condition or better.
  - (3) Forward any request for loan or issue of WRM MHE to NAVICP-M for resolution/ authorization.
  - (4) Upon notification from NAVICP-M Program Manager or by direction of CNO, issue or transfer WRM MHE.

### NOTE

Refer to NAVSUP Publication 117 for other specific requirements related to WRM.

- m. Assist NAVICP-M in evaluating the annual data call for projected requirements and recommend the most economical means of satisfying the activity's requirements through the SLEP process, shore-based pool, excess MHE or new procurement.

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n. Manage both a shipboard FICP (except FISC Jacksonville) and shore-based pool of MHE assets, with allowances established by NAVICP-M. Both shipboard and shore-based pool assets and funding will be maintained separately from normal FISC assets.

**2-2.6. MAJOR CLAIMANT/TYPE COMMANDER RESPONSIBILITIES.** The major claimant/TYCOM's will:

a. Advise NAVICP-M and the respective FISC Regional MHE Manager of any changes in mission or other functional, operational or unique conditions that may affect MHE requirements for the respective activities. For decommissioning of ships, which includes ships from transferred to MSC, a 90-day prior notification is required.

b. Recommend approval/disapproval of an activity or ship ACR, as described in [paragraphs 2-3.2](#) and [2-3.3](#), prior to forwarding to NAVICP-M. ACR's for shipboard MHE will be forwarded via the appropriate Hardware Systems Command (HSC).

c. Budget and fund new mission or initial allowance requirements. As applicable, fund cognizant user activities for maintenance and repairs of MHE.

d. Ensure respective activities are aware of the MHE SLEP process when considering replacements.

e. Advise NAVICP-M and the appropriate FISC Regional MHE Manager of major ship overhaul schedules to facilitate SLEP/replacement of MHE on board, if warranted.

f. Ensure compliance with EMACS implementation and reporting procedures as defined in [paragraph 6-5.4](#).

g. TYCOM's are responsible for the collection and submission of user utilization, maintenance and repair data to the respective FISC regional level on a quarterly basis, if users are not on-line with EMACS.

h. TYCOM's shall advise the appropriate FISC Regional MHE Manager on any MHE user equipment transfers (cross-decking).

**2-2.7. NAVY MHE USER RESPONSIBILITIES.** All Navy MHE users will:

a. Be responsible for ensuring the completion of preventive maintenance and organizational and intermediate levels of repair on all assigned MHE. Failure to effect and document required Preventive Maintenance Schedule (PMS) efforts/repairs could result in financial assessments for replacement MHE to those commands that would normally receive free issue. All users will be held financially responsible for cannibalized or missing components.

b. Maintain an up-to-date MHE database using EMACS, hard copy procedures or current shipboard maintenance data management systems. Refer to [paragraph 6-5.3](#) for specific responsibilities when using EMACS. Failure to document utilization could result in a review of allowance requirements and possible loss of assets. Afloat units work with the respective TYCOM.

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- c. Work with FISC Regional MHE Managers to recommend new allowance or unit replacement requirements, and to determine SLEP candidate induction dates.
- d. Execute equipment transfers, leases or disposals through regional direction.
- e. NAVICP-M will initiate a yearly data call to determine projected requirements for the upcoming fiscal years. During this data call, MHE users will be required to submit their planned requirements for replacement MHE to NAVICP-M.

### 2-3. MHE ASSIGNMENT

2-3.1. **GENERAL CRITERIA.** MHE will be assigned only to those units ashore and afloat which have approved inventory allowances. MHE allowances are maintained by NAVICP-M and are documented in EMACS. Assets will be supplied by redistribution of excess, from new procurement, rental or lease. Only that MHE needed to carry out the stated mission will be assigned to units ashore and afloat. The MHE selected shall be the best suited by virtue of size, capacity, configuration, and economy of operation.

2-3.2. **ALLOWANCE DEFICIENCIES.** NAVICP-M maintains and controls the issuance of all MHE and maintains the established authorized allowable quantities of MHE ashore and afloat. All requests for MHE to fill current allowances shall be submitted, via the appropriate TYCOM or major claimant, by letter or message to the nearest FISC in accordance with NAVICPINST 10490.4 (series). These requests should be made at least 30 days in advance of the date the MHE will be required. For shipboard MHE, FICP's, located at designated FISC's, will provide replacement MHE from established pools. If requests cannot be satisfied by the nearest FICP, the request will be forwarded to the MHE Program Manager at Commander, Naval Inventory Control Point (NAVICP), 5450 Carlisle Pike, (Code 058133), P.O. Box 2020, Mechanicsburg, PA 17055-0788. The activity's Commanding Officer/Officer-in-Charge (CO/OIC) will certify that the MHE requested does not exceed the authorized allowance.

2-3.3. **ALLOWANCE CHANGES.** If usage indicates that an established allowance should be changed, an Allowance Change Request (ACR), (NAVSUP 1220-2), [figure 2-1](#), shall be completed in accordance with the instructions documented in this paragraph. An ACR is submitted for an increase or decrease to an activity's allowance, non-identical replacement of current on board unit, or a type that is non-standard to current military specifications. It must contain justification indicating the intended use, the economic or other advantages that will accrue, and any other data that will contribute to a thorough understanding and appreciation of the requirements. The requests will be completed and submitted to NAVICP-M (Code 058133) via the respective user's major claimant or TYCOM and the HSC, as appropriate. Appropriate funding will be required from the TYCOM or major claimant in advance of the purchase and prior to issuance of the requested MHE. The following data is required for each ACR:

- a. Current and anticipated workload data.
- b. Mission impact if the additional equipment is not provided.
- c. Estimated utilization in hours per year.

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- d. Anticipated benefits or savings to be derived from use of the new equipment.
- e. Increased productivity (specifics).
- f. Reduction in maintenance costs (dollar value).
- g. Reduction in operating costs (dollar value).
- h. Amortization period.

i. Funding source. New allowances require full funding. For non-identical replacements, the cost differential will be evaluated by NAVICP-M and major claimants/TYCOM's advised if additional funding is required. ACR's also require a complete description of the required equipment.

### 2-3.4. USER REQUESTS FOR MHE.

2-3.4.1. Other Procurement Navy (OPN) Funded Activities. OPN funded activities are authorized new or overhauled replacement units at no cost in accordance with NAVSUPINST 10490.33 (series).

a. Within Authorized Allowance. All OPN user requests for replacement MHE within the FISC region will be handled by the respective FISC Regional MHE Manager with a copy to NAVICP-M. The Regional Manager will be responsible for updating the EMACS data base and tracking the equipment throughout the process. This includes units inducted into the SLEP Program. Any transfers to another FISC region should be coordinated with that region and NAVICP-M should be notified of the transfer action.

b. No Allowance or Over Allowance. All OPN user requests for MHE for which the user does not have an established allowance or will exceed the established allowance must be submitted to NAVICP-M for approval via the respective major claimant. The major claimant will be responsible for concurring with and funding the increase. Any changes/realignments of MHE allowances will be forwarded to NAVICP-M for approval. Similar replacement changes will not require major claimant approval or funding. However, non-identical changes will require such approval and funding.

2-3.4.2. Navy Working Capital Funded (NWCF) Activities. NWCF activities are authorized access to MHE pool assets on an as available short term reimbursable basis in accordance with [paragraph 2-6.2](#). NWCF activities are responsible for funding any new procurements, allowance increases, or SLEP of existing or exchange of MHE assets. By using the SLEP program, NWCF MHE users are required to turn-in an MHE asset capable of being inducted into the SLEP program, unless they intend to have the same unit returned. If no units are turned-in or an existing unit is beyond the capability of maintenance, funding for a new unit will be required. Funded requests for new replacements will be forwarded to NAVICP-M for procurement initiation.

a. Within Authorized Allowance. All NWCF user requests for replacement MHE using the SLEP program will be submitted to the respective FISC Regional MHE Manager with a copy to NAVICP-M. The Regional Manager will be responsible for updating the EMACS data base and tracking the equipment throughout the process.

ALLOWANCE CHANGE REQUEST						Instructions on Reverse	Please Type or Print	
NAVSUP 1220-2 (12-76) S/N 0108-LF-501-2206								
1. FROM:  TO:  VIA:			2. Date/Serial Number					
			3. APL/AEL/RIC Number					
			4. Status of Requested/Allowed Item					
			<input type="checkbox"/> Item Addition or <input type="checkbox"/> Item Deletion		<input type="checkbox"/> Item on Board or <input type="checkbox"/> Item Not on Board			
5. National Stock Number (NSN) or FSCM & Part Number		6. Equipment/Component (E/C) or Item Nomenclature		7. Unit of Issue	8. Unit Price	9. Present Qty. Allowed	10. New Total Qty.	11. Extended Value of Change
12. Justification (Mandatory)								
13. Copy To:				14. Signature:				
15. First Endorsement								
<input type="checkbox"/> Approval Recommended <input type="checkbox"/> Disapproved <input type="checkbox"/> Other								

FIGURE 2-1. NAVSUP 1220-2, Allowance Change Request (Sheet 1 of 2)

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## INSTRUCTIONS FOR PREPARING ALLOWANCE CHANGE REQUEST (ACR)

- Block 1. ADDRESSEE. Complete in the same manner as other official correspondence.
- Block 2. DATE AND SERIAL NUMBER. The serial number will include the ship type/hull number of the ship and a sequential number.
- Block 3. ALLOWANCE PARTS LIST (APL), ALLOWANCE EQUIPAGE LIST (AEL), REPAIRABLE ITEM CODE (RIC) NUMBER (IF AVAILABLE). Enter the APL, AEL, number in this block.
- Block 4. STATUS OF REQUESTED/ALLOWED ITEM. Place an "X" in the appropriate box(es) to show the status of the requested/allowed item(s).
- Block 5. NATIONAL STOCK NUMBER (NSN) OR FEDERAL SUPPLY CODE FOR MANUFACTURERS (FSCM) AND PART NUMBER. Enter the NSN or the FSCM and manufacturer's part number. FSCMs are to be written in accordance with DOD publications H4-1 or H4-2 (Federal Supply Codes for Manufacturers).
- Block 6. EQUIPMENT/COMPONENT (E/C) OR ITEM NOMENCLATURE. Enter nomenclature for each stock number or part number listed in Block 5. Provide nameplate description and all available technical data. If the item listed is a repair part and the APL/AEL/RIC number for the parent equipment/component is not provided in Block 3, give nameplate data, if available, or as a minimum manufacturer's name, item name, drawing or reference number, applicable technical manual and the service application, system or subsystem of the equipment which the repair part supports. (If additional space is required, use Block 12 or separate page.)
- Block 7. UNIT OF ISSUE (U/I). Enter the approved abbreviation for each standard item, as listed in the Navy Management Data List (NMDL). For non-standard items, use the manufacturer's parts list for U/I data. If the U/I is unknown, LEAVE THIS BLANK.
- Block 8. UNIT PRICE. Enter the unit price for each item listed.
- Block 9. PRESENT QUANTITY ALLOWED. Enter present quantity allowed (authorized). Cite source and date of allowance document in Block 12.
- Block 10. NEW TOTAL QUANTITY. Enter the total of the present quantity allowed and the additional quantity requested.
- Block 11. EXTENDED VALUE OF CHANGE. New total quantity less present quantity allowed times Unit Price. (Not required for decreases.)
- Block 12. JUSTIFICATION. Indicate authority for present quantity allowed (Block 9) and reason for requesting change. Completion of this block is mandatory.
- Block 13. COPY TO. Enter abbreviated titles and codes. Addresses are not necessary unless they are not available in the SNDL.
- Block 14. SIGNATURE. Sign in the same manner as other official correspondence.
- Block 15. FIRST ENDORSEMENT. TYCOM'S endorsement should include applicability to other ships and such other information which will assist in further consideration of the request.

NAVSUP 1220-2 (12-76)  
S/N 0108-LF-501-2206

**FIGURE 2-1. NAVSUP 1220-2, Allowance Change Request (Sheet 2 of 2)**

b. No Allowance or Over Allowance. All NWCF user requests for MHE for which the user does not have an established allowance or which will exceed an established allowance must be submitted to NAVICP-M for approval via the respective major claimant. The major claimant will be responsible for concurring and funding the increase. Any requests for changes/realignments of MHE allowances will also be forwarded to NAVICP-M for approval. Funded requests for new replacements will be forwarded to NAVICP-M for procurement initiation.

2-3.5. **OTHER REQUIREMENTS**. Requirements will also be substantiated and detailed for specially protected equipment designated for use in an atmosphere containing a high concentration of abrasive material. All special features will be thoroughly described. Augmentation of equipment will only be effected when an increase in allowance has been approved and funds are secured. MHE users will receive MHE to fill funded allowances for replacement, via their respective FISC Regional MHE Manager or direct vendor delivery.

## 2-4. NEW OR SLEP EQUIPMENT

Upon receipt of new MHE from direct vendor delivery or a SLEP unit from a SLEP facility, the receiving activity will submit a DD Form 1342, "DOD Property Record", [figure 2-2](#), or written confirmation to NAVICP-M with a copy to the respective FISC Regional MHE Manager. This form or written confirmation must contain the USN registration number, manufacturer serial number, capacity, contract number, and the activity's name, address, Unit Identification Code (UIC) and point of contact. The receiving activity must perform an initial receipt inspection and preliminary servicing for each piece of MHE as described in [paragraph 8-4](#).

## 2-5. REPLACEMENT UNITS

Funding for replacement MHE shall be in accordance with NAVSUPINST 10490.33 (series). With the implementation of the SLEP, MHE is first considered for replacement at a minimum of 8 years after original manufacture or last SLEP. However, depending on utilization, availability of repair parts or extenuating circumstances, the replacement cycle will be adjusted accordingly. MHE users will submit a written request to the FISC Regional MHE Manager, citing USN number of the unit to be replaced and indicate if identical, similar or non-identical replacement is required. Upon request from the FISC Regional MHE Manager, MHE users will provide additional information as stated below, where applicable.

2-5.1. **SIMILAR UNITS**. If a similar replacement MHE unit is required with the same Equipment Cost Code (ECC) and lifting capacity, but with minor modifications/variations from the unit being replaced, cite applicable differences.

2-5.2. **NON-IDENTICAL UNITS**. If a non-identical replacement MHE unit is required, the ECC, lifting capacity, minimum lift height, and any other unique features must be indicated on the request. Additionally, if this type of unit is not included in the current MHE allowance, the requesting activity will submit an ACR to NAVICP-M in accordance with the requirements found in [paragraph 2-3.3](#).

### NOTE

Refer to [table 10-1](#) for the respective ECC's assigned to MHE.

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2-5.3. **CANNIBALIZATION.** No cannibalization of any MHE shall be done prior to turn-in to the FISC Regional MHE Manager. MHE users will be responsible for funding any missing parts. Refer to [paragraph 2-8](#) for additional cannibalization requirements.

2-5.4. **NWCF FUNDING.** Funding for new replacement MHE from NWCF activities shall be forwarded to NAVICP-M for procurement.

### **2-6. RENTAL/LEASING OF OPERATING EQUIPMENT**

All rental or leased agreements will be coordinated through the FISC Regional MHE Manager. All costs are the responsibility of the requesting activity. Prior to approving long-term rental or lease of equipment (in excess of one year), the FISC Regional MHE Manager will coordinate with NAVICP-M to investigate alternate methods of satisfying requirements, such as reassignments, loan, consignment from procurement, or repair of dead-lined equipment through a contract or in-house services. Requests for authorization to rent or lease MHE should include the following:

- a. The desired quantities by type of equipment.
- b. The expected duration of the proposed lease or rental arrangement.
- c. The monthly cost per unit.
- d. The intended application.
- e. The reason for leasing.
- f. The anticipated annual use in hours.
- g. The condition, status and use of similar equipment on board.

2-6.1. **OPN FUNDED ACTIVITIES.** The following leasing policy applies to activities that use OPN funds:

- a. MHE is a centrally funded and managed program. Due to this centralization, MHE is assigned to each individual operating activity based on their established allowance. This negates any requirement for loaning or leasing MHE among OPN activities.
- b. Each activity is authorized to assign MHE internally as needed to accomplish or fulfill overall mission requirements.
- c. OPN activities are not authorized to establish pools of MHE for the purpose of leasing equipment to any other activities.

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DOD PROPERTY RECORD												Form Approved OMB No. 0704-0246 Expires Jan 31, 2003					
The public reporting burden for this collection of information is estimated to average 2.5 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0246), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.																	
<b>PLEASE DO NOT RETURN YOUR COMPLETED FORM TO EITHER OF THESE ADDRESSES. RETURN COMPLETED FORM TO THE CONTRACT ADMINISTRATION OFFICE</b>																	
1.	a. ACTIVE	b. INITIAL	c. IDLE	d. CHANGE	2. JULIAN DATE				3. ID/GOVERNMENT TAG NO.								
SECTION I - INVENTORY RECORD																	
4. COMMODITY CODE			5. STOCK NUMBER			6. ACQUISITION COST			7. TYPE CODE	8. YR OF MFG.	9. POWER CODE	10. STATUS CODE	11. SVC CODE	12. COMMAND CODE	13. ADM OFFICE CODE		
14. NAME OF MANUFACTURER								15. MFR'S CODE		16. MANUFACTURER'S MODEL NO.			17. MANUFACTURER'S SERIAL NO.				
18. LENGTH		19. WIDTH		20. HEIGHT		21. WEIGHT		22. CERTIFICATE OF NON-AVAILABILITY NUMBER			23. PEP NO.	24. ARD	25. CONTRACT NUMBER				
26. DESCRIPTION AND CAPACITY																	
CONTINUED ON BACK OF FORM <input type="checkbox"/> YES <input type="checkbox"/> NO																	
SECTION II - ELECTRICAL CHARACTERISTICS																	
a. QTY	b. HORSEPOWER		c. VOLTS		d. PHASE	e. CYCLE	f. AC	g. DC	h. SPEED		i. TYPE AND FRAME NUMBER						
28a. PRESENT LOCATION										28b. DIPEC CONTROL NO.							
										29. POSSESSOR CODE							
SECTION II - INSPECTION RECORD (If explanation is required, respond in Remarks)																	
										YES		NO		YES		NO	
30. Can items be stored and maintained on site for at least 12 months?																	
31. Has item been rebuilt/overhauled? If so, when? <span style="float: right;">Date</span>														42. Must item be repaired/rebuilt/overhauled to perform all functions? <span style="float: right;">\$</span>			
32. Has item been modified from original configuration? If so, explain.														43. Do QC records indicate satisfactory performance? If no, explain.			
33. Was item inspected under power? If no, explain.														44. Are manually operated mechanisms in working order? If no, describe.			
34. Are maintenance costs normal? If no, explain.														45. Are scales, dials, and gauges working and readable? If no, describe.			
35. Are safety devices adequate and satisfactory? If no, explain.														46. Are hydraulic pumps, valves/fittings operating properly? If no, describe.			
36. Are installation instructions available for transfer?														47. Are electronic systems and controls operating properly? If no, explain.			
37. Are operating instructions available for transfer?														48. How many hours was item used by current possessor?			
38. Was item last used on a finishing operation?														49. Explain last use of equipment described in item 26 above.			
39. Will adjustments or calibration correct deficiencies?														50. Estimated cost for packing, crating, handling. <span style="float: right;">\$</span>			
40. Is item severable without damage to components? If not, give their replacement cost. <span style="float: right;">\$</span>														51. Indicate date item will be available for redistribution.			
41. Is item in operable condition?														52. Condition code.			
														53. Operating test code.			
SECTION III - REMARKS																	
54. REMARKS																	
CONTINUED ON BACK OF FORM <input type="checkbox"/> YES <input type="checkbox"/> NO																	
SECTION IV - VALIDATION RECORD																	
55. VALIDATION (Typed name(s) and signature(s))																	

DD FORM 1342, APR 2000

PREVIOUS EDITION MAY BE USED.

**FIGURE 2-2. DD Form 1342, DOD Property Record (Sheet 1 of 2)**

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1.	a. ACTIVE	b. INITIAL	c. IDLE	d. CHANGE	2. JULIAN DATE	3. I.D./GOVERNMENT TAG NO.
<b>SECTION V - NUMERICALLY CONTROLLED MACHINE DATA</b>						
56. CONTROL MFR		57. MODEL		58. SERIAL NO.		59. MFG. DATE
60. CONTROL DESIGN						
a. I.C.		b. CNC		c. STORED PROG.		d. EDIT
e. SOLID STATE		f. VACUUM TUBE		g. OTHER (List)		
61. TYPE NUMERICAL CONTROL SYSTEM				62. DIRECT NC		63. AXES NAMED PER RS-267 FIGURE
a. POSITIONING		b. CONTOURING		c. CONTOURING/ POSITIONING		
a. NO		b. YES (If yes, X (1), (2) and/or (3))				
(1) READER BY-PASS		(2) MGT. DATA		(3) DEDICATED COMPUTER		
64. EIA FORMAT DETAIL						
65. EIA FORMAT CLASSIFICATION SHORTHAND		66. ROTARY MOTIONS UNDER NC (Name and identify)			67. SPECIFY AXES UNDER POSITIONING CONTROL	68. SPECIFY AXES UNDER CONTOURING CONTROL
69. AXES MAXIMUM TRAVEL (Enter axes: X, Y, Z, etc., and specify inches or mm)				70. POSITIONING RATE, MAX		
71. FEED RANGE						
a. ROTARY, RPM		b. LINEAR, XY		c. LINEAR, Z		
72. SPINDLE DATA		a. NO. OF SPINDLES	b. NO. OF SPDL MOTORS	c. HP/SPDL MOTOR	d. TAPER	e. SPEED RANGE
f. NO. OF INCREMENTS		g. TAPE CONTROL				
		(1) YES				
		(2) NO				
73. EIA ASSIGNED "G" FUNCTION CODES (Identify functions in Remarks that are not EIA assigned)						
74. EIA ASSIGNED "M" FUNCTION CODES (Identify functions in Remarks that are not EIA assigned)						
75. INPUT DATA						
a. STANDARD		b. FORMAT		c. CODE		d. DIMENSIONAL INPUT
(1) RS-273		(2) RS-274		(1) WORD ADD		(2) TAB SEQ
(3) RS-326		(3) FIXED SEQ		(4) CL DATA		(3) BINARY
				(1) RS-244aa		(2) RS-358
				(1) INCH		(2) METRIC
				(3) BOTH		
76. TOOL CHANGE DATA						
a. NO. OF TURRETS		b. NO. STATIONS	c. AUTO. CHANGER	d. NO. OF TOOLS	e. SELECTION	f. MAX. TOOL DIA.
		YES	NO	(1) SEQUENTIAL	(2) RANDOM	
77. ROTABLE TABLE DATA						
a. INDEXING		b. NO. OF STOPS		c. POSITIONING, NC	d. NO. OF POSITIONS	e. CONTOURING, NC
(1) MANUAL				(1) YES		(1) YES
(2) NC				(2) NO		(2) NO
78. NO. OF READERS						
79. READER TYPE		80. READER SPEED		81. INTERPOLATION		82. BUFFER STORAGE
a. MECH		b. PHOTO		a. PARABOLIC		b. LINEAR
c. OTHER (List)				c. CIRCULAR		d. NONE
						a. YES
						b. NO
83. THREAD-CUTTING MAX. LEAD.						
84. CUTTER DIA. COMPENSATIONS		85. TOOL OFFSETS		86. READOUTS		
a. NUMBER OF	b. MAX. AMOUNT	a. NO. TOOL OFFSETS	b. MAX. AMOUNT	a. SEQ. NO.	b. POSITION	c. COMMAND DATA
				d. OTHER (List)		
87. FEEDBACK DEVICE						
a. ANALOG		b. NONE				
c. DIGITAL						
89. MOTOR DRIVE		88. MIN. PROGRAMMABLE INCREMENT		90. POST PROCESSOR (Name)		
a. STEPPING		b. DC				
c. HYDRAULIC						
91. DEVELOPED BY (Name)		92. COMPUTER LANGUAGE USED		93. PART PROGRAM LANGUAGE		94. APPLICABLE COMPUTER (Name, Model and Min. Core Storage)
95. REQUIRED MANUALS (Title and Manual Edition)						
96. REMARKS (Features not covered above, functions not EIA assigned, etc.)						

DD FORM 1342 (BACK), APR 2000

**FIGURE 2-2. DD Form 1342, DOD Property Record (Sheet 2 of 2)**

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### d. Leasing Durations.

(1) For leasing requirements less than 30 days per year, the FISC Regional MHE Manager may loan units, if available, from the respective OPN MHE pool at cost or can recommend commercial lease, depending on the best economic alternative.

(2) For leasing requirements greater than 30 days, but less than 1 year, commercial leasing will be used.

(3) For leasing requirements in excess of a 1 year commercial lease, the respective activity should consider establishing their own MHE allowance in accordance with NAVICPINST 10490.4 (series).

**2-6.2. NWCF AND SPECIAL FUNDED PROGRAM ACTIVITIES.** The following leasing policy applies to NWCF and special funded program activities:

a. Each activity is authorized to assign MHE internally as needed to accomplish or fulfill the overall mission requirements.

b. Current local activity leasing guidelines still apply, but if you intend to lease to other activities, you are required to recoup adequate funding to replace your own MHE.

### c. Leasing Durations.

(1) For emergency lease requirements of less than 14 days per year, the FISC Regional MHE Manager may loan units, if available, from their respective OPN MHE pool at cost or can recommend commercial lease, depending on best economic alternative.

(2) For lease requirements greater than 14 days, but less than 1 year, commercial leasing will be used.

(3) For lease requirements in excess of 1 year, commercial lease is required, or the respective activity should consider establishing their own MHE allowance in accordance with NAVICPINST 10490.4 (series).

**2-6.3. FISC REGIONAL MHE MANAGER LEASING GUIDELINES.** The following leasing guidelines apply to each FISC Regional MHE Manager:

a. The regional manager will maintain a small MHE pool to assist customers and to support the operation of the MHE SLEP Program. The actual required pool size will be coordinated and approved by NAVICP-M. The pool will consist of MHE separate from any of the FISC's own MHE assets.

b. The regional manager will follow the leasing guidelines established for each type of funding customer cited in [paragraphs 2-6.1](#) and [2-6.2](#), including their own FISC operations which follow and are under NWCF guidelines.

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c. Lease rate charged to customers should include non-warranty maintenance costs for MHE while in their custody and may include a FISC administrative surcharge. No pro-rated MHE replacement fees are authorized.

d. If the leaser is an U.S. Navy activity and has a continuing requirement for MHE, they should consider establishing their own separate MHE allowance in accordance with NAVICPINST 10490.4 (series). The regional manager will coordinate with NAVICP-M to investigate alternate methods of satisfying requirements, such as reassignments of excess equipment, re-consignments from procurement, or repair/SLEP of dead-lined equipment.

e. Lease periods may be extended if a requesting activity has inducted MHE into the SLEP Program and is awaiting the return of the unit so they can return the leased MHE.

### **2-7. MHE MODIFICATIONS OR ALTERATIONS**

MHE may only be modified or altered using the means outlined in this paragraph. MHE shall not be modified, altered or destroyed in any other way without obtaining written approval from the MHE Program Manager at NAVICP-M (Code 058133). A copy of the proposed modification or alteration shall be forwarded to the Naval PHST Center (Code 71). Ships desiring to modify or alter an item to increase utilization or effectiveness shall submit a justification for the proposed modification or alteration to the Program Manager at NAVICP-M and the Naval PHST Center, via appropriate TYCOM, citing in detail the benefits to be obtained. As part of this justification, ships will include a drawing of the proposed modification or alteration to permit review of feasibility and operational safety. In critical or emergency situations, MHE assigned to forces afloat may be modified, with the CO/OIC's written approval, without prior NAVICP-M/Naval PHST Center approval to meet urgent operational requirements. Justification and details of the modifications will be furnished to NAVICP-M and the Naval PHST Center as soon as practical. Upon receipt of approval, activities shall file a copy in the equipment history file with the record copy of the Shop Repair Order (SRO) or Equipment Repair Order (ERO) used in accomplishing the approved modification or alteration.

### **2-8. CANNIBALIZATION**

Cannibalization of MHE is not authorized, except for under the following conditions:

2-8.1. **FISC REGIONAL MHE MANAGER.** Upon approval by NAVICP-M for disposal, the respective FISC Regional MHE Manager may cannibalize equipment without any further approvals to support the SLEP program. All cannibalized MHE units will have the USN registration number removed.

2-8.2. **AFLOAT.** When operational circumstances dictate, deployed ships are authorized to temporarily cannibalize MHE. However, ships must replace all cannibalized parts prior to turn-in to the appropriate FISC Regional MHE Manager. Ships will be responsible for funding any missing parts.

## 2-9. U.S. NAVY (USN) REGISTRATION NUMBERS

All MHE is identified by a unique 7-digit USN registration number assigned by NAVICP-M and is not to be duplicated throughout the Navy inventory. The USN registration number is painted on each side of the mast and the body of the equipment where applicable. The number usually starts with 11, 12, 13, 14, 15, 16, 18, 19 or 01 depending on the type of equipment. When MHE is received without an USN registration number, the receiving activity will forward a letter or a DOD Property Record (DD Form 1342), [figure 2-2](#), to NAVICP-M containing the following appropriate descriptive data:

- a. Type of equipment (e.g., forklift truck, pallet truck, warehouse tractor, etc.).
- b. Equipment Cost Codes for Maintenance (refer to [table 10-1](#)).
- c. Type of power (e.g., diesel, gas, electric, dual fuel, etc.) and applicable safety rating (e.g., EE, EX, DS, etc.). For electric MHE, provide data on the battery.
- d. Rated capacity (safe working load) in terms of pounds and load center.
- e. Maximum lift height.
- f. Collapsed mast height.
- g. Manufacturer and nameplate data on the equipment.
- h. Model number.
- i. Manufacturer's chassis serial number.
- j. Year of manufacture.
- k. Acquisition Cost.
- l. Contract or document number under which the MHE was delivered (also cite shipment number, Government Bill of Lading (GBL), and date shipped from DD Form 250, [figure 6-2](#), if available).
- m. Test data (e.g., First Article Test, Hi-Shock Test, or proof of safety certification from an accredited laboratory, as stated in [paragraph 5-7d](#)) required for certification of shipboard MHE.
- n. Copy of the technical manual.
- o. Activity assigned custody to include activity name, UIC, activity point of contact, code and telephone number.

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After assignment of a USN registration number, NAVICP-M will advise the requesting activity and the respective FISC Regional MHE Manager. The requesting activity is responsible for marking the assigned USN registration number on the unit as directed.

### 2-10. BUDGETING AND FUNDING

2-10.1. INVESTMENT. The NAVSUPSYSCOM MHE Program Office is responsible for replacement budgeting of MHE for OPN funded activities. The MHE Program Manager initiates the acquisition process for the procurement of MHE under established applicable procurement documents, such as CID's/purchase specifications.

2-10.2. EXPENSE. The appropriate TYCOM or major claimant is responsible for the budgeting of operational and maintenance costs associated with MHE.

2-10.3. SPECIFIC CIRCUMSTANCES. The following shall apply with regard to budgeting and funding for initial requirements, repair/overhaul/preventive maintenance requirements, and NWCF requirements:

a. Initial Requirements. MHE requirements in support of new construction, conversion or for increased mission responsibilities will be budgeted and funded by the major claimant/TYCOM having programmatic and functional responsibility for the acquisition of the initial requirements. All requests for new or increased MHE allowances will be submitted to NAVICP-M, via the MHE user's major claimant, as prescribed in [paragraphs 2-3.2](#) and [2-3.3](#). Upon receipt of approval and funding documentation from the responsible major claimant, NAVICP-M will effect procurement of the initial MHE requirements.

b. Repair, Overhaul and Preventive Maintenance. Budgeting and funding requests for repair, overhaul, and preventive maintenance of MHE should be submitted to the MHE user's major claimant in accordance with established local procedures. Included with submissions should be funding for acquisition of the onboard repair parts required to maintain MHE in operable condition.

c. NWCF Requirements. All NWCF activities are responsible for funding SLEP and/or replacements.

### 2-11. DISPOSITION OF EXCESS AND DISPOSAL OF MHE

All requests for the disposition of excess and disposal of MHE, afloat or ashore, will be submitted to the local FISC Regional MHE Manager on a "Report of Excess Personal Property" (Standard Form 120), [figure 2-3](#), or using the EMACS Program. Units afloat shall coordinate such efforts with their respective TYCOM. The FISC Regional MHE Manager will then evaluate the request and provide recommendations to NAVICP-M for final resolution. In some cases, the equipment may not be needed for shipboard use but would be useful as a shore-based unit which should also be included in the recommendation. In evaluating a request, the FISC Regional MHE Manager should consider the following options:

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PAGE 1 OF

STANDARD FORM 120 REV. APRIL 1957 GEN. SERV. ADMIN. FPMR (41 CFR) 101-43.311	<b>REPORT OF EXCESS PERSONAL PROPERTY</b>	1. REPORT NO.	2. DATE MAILED  //	3. TOTAL COST  \$	
4. TYPE OF REPORT <i>(Check one only of "a," "b," "c," or "d")</i>		<input type="checkbox"/> a. ORIGINAL <input type="checkbox"/> b. CORRECTED	<input type="checkbox"/> c. PARTIAL <input type="checkbox"/> d. TOTAL W/D	(Also check "e" and/or "f" if appropriate)	<input type="checkbox"/> e. OVERSEAS <input type="checkbox"/> f. CONTRACTORS INV
5. TO <i>(Name and Address of Agency to which report is made)</i> THRU			6. APPROPR. OR FUND TO BE REIMBURSED <i>(If any)</i>		
7. FROM <i>(Name and Address of Reporting Agency)</i>			8. REPORT APPROVED BY <i>(Name and Title)</i>		
9. FOR FURTHER INFORMATION CONTACT <i>(Title, Address and Telephone No.)</i>			10. AGENCY APPROVAL <i>(If applicable)</i>		
11. SEND PURCHASE ORDERS OR DISPOSAL INSTRUCTIONS TO <i>(Title, Address and Telephone No.)</i>			12. GSA CONTROL NO.		
13. FSC GROUP NO.	14. LOCATION OF PROPERTY <i>(If location is to be abandoned, give date)</i>	15. REIM.REQD		16. AGENCY CONTROL NO.	17. SURPLUS RELEASE DATE
		YES	NO		//
		<input type="checkbox"/>	<input type="checkbox"/>		

EXCESS PROPERTY LIST					ACQUISITION COST		FAIR VALUE % (h)
ITEM NO. (a)	DESCRIPTION (b)	COND (c)	UNIT (d)	NUMBER OF UNITS (e)	PER UNIT (f)	TOTAL (g)	

**FIGURE 2-3. SF 120, Report of Excess Personal Property**

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- a. Unit beyond capability of maintenance and/or not suitable for SLEP. Disposal and/or cannibalization recommended.
- b. Good SLEP and FISC/FICP pool candidate.
- c. Good FISC/FICP pool candidate. No SLEP required.
- d. Excess to regional requirements.
- e. Excess to regional requirements/SLEP required.
- f. Other.

Upon receipt of the FISC recommendation, NAVICP-M will evaluate and provide written disposition/instructions within 30 days to the activity and the FISC. Any MHE approved for disposal will have the USN registration number removed prior to turn in to preclude re-instatement in the Navy's MHE inventory. No cannibalization of MHE shall be performed prior to turn-in to the FISC Regional MHE Manager. MHE users will be responsible for funding any missing parts. The respective FISC Regional MHE Manager will be required to update the EMACS records as required.

## CHAPTER 3

### TYPES OF INDUSTRIAL MATERIALS HANDLING EQUIPMENT

#### 3-1. GENERAL

The various approved types and selected operational safety specifications of industrial materials handling equipment (MHE) and associated forklift truck attachments are described in this chapter. Refer to [NAVSEA SW023-AH-WHM-010](#) for other approved forklift truck attachments specifically designed to handle ammunition and explosives.

3-1.1. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) DESIGNATIONS. All MHE is identified by alphabetical designators. [NFPA](#) definitions of these designators are as follows:

- a. Type CN. Compressed natural gas-powered, hard rubber or pneumatic tires, having minimum acceptable safeguards against inherent MHE fire hazards.
- b. Type CNS. Type CN MHE with additional safeguards to exhaust, fuel and electrical systems.
- c. Type D. Diesel-powered, hard rubber or pneumatic tires, having minimum acceptable safeguards against inherent MHE fire hazards.
- d. Type DS. Type D MHE with additional safeguards to exhaust, fuel and electrical systems.
- e. Type DY. Type DS MHE that do not have any electrical equipment including the ignition and are equipped with temperature limitation features.
- f. Type E. Electrically-powered, hard rubber or pneumatic tires, having minimum acceptable safeguards against inherent and electrical shock hazards.
- g. Type EE. Type E MHE with the electric motor and all other electrical components completely enclosed.
- h. Type EX. Type EE MHE with the electric motor, all other components, and the fittings designed, constructed, and assembled that they may be used in atmospheres containing specially named flammable vapors, dusts, and under certain conditions, fibers. Type EX MHE are specifically tested and classified for use in Class I, Group D (atmospheres containing flammable vapors, referred to as “explosion proof”), or for Class II, Group G (atmospheres containing combustible dust, referred to as “ignition proof”) locations as defined in [NFPA 70, National Electrical Code \(NEC\)](#).
- i. Type G. Gasoline-powered, hard rubber or pneumatic tires, having minimum acceptable safeguards against inherent MHE fire hazards.

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- j. Type G/CN. Dual-fuel capable MHE meeting type G or type CN requirements.
- k. Type G/LP. Dual-fuel capable MHE meeting type G or type LP requirements.
- l. Type GS. Type G MHE having additional safeguards to exhaust, fuel and electrical systems.
- m. Type GS/CNS. Dual-fuel capable MHE meeting type GS or type CNS requirements.
- n. Type GS/LPS. Dual-fuel capable MHE meeting type GS or type LPS requirements.
- o. Type LP. Liquefied petroleum gas-powered, hard rubber or pneumatic tires, and minimum acceptable safeguards against inherent fire hazards.
- p. Type LPS. Type LP MHE with additional safeguards to exhaust, fuel and electrical systems.

3-1.2. NAVAL DESIGNATIONS. The Department of Navy (DON) has assigned the following MHE alphabetical designators, which are not official [NFPA](#) designators:

3-1.2.1. Manual Pallet Trucks (Afloat). The following descriptions apply to manually-powered pallet trucks approved for use afloat:

- a. Type H. Manually-powered pallet truck modified by the addition of a deadman brake system, salt fog protection, lifting points, tiedown points and shock hardening features. They are available through the Fleet Issue Control Point (FICP) and are marked with a USN registration number.
- b. Type HS. Type H pallet truck modified by the addition of hard/solid non-sparking wheels and a means to dissipate static electric charges, minimally two ground straps or two conductive wheels/tires. They are available through the FICP and are marked with a USN registration number.

3-1.2.2. Manual Pallet Trucks (Ashore). The following descriptions apply to manually-powered pallet trucks approved for use ashore:

- a. Type H. Manually-powered pallet truck with solid wheels/tires that are locally procured.
- b. Type HS. Type H pallet truck modified by the addition of hard/solid non-sparking wheels and a means to dissipate static electric charges, minimally two ground straps or two conductive wheels/tires and are locally procured.

## 3-2. FORKLIFT TRUCKS

There are several kinds of approved forklift trucks available for use. Forklift trucks are mobile wheeled units used to load, lift, and transport different items. Forklifts come equipped with two forks which are secured to the supporting frame. The forks and frame are located in the front of the truck, with the exception of sideloading trucks. Forks move vertically on the supporting frame and can be tilted forward to pick up a load, and backward to stabilize the load. Several attachments are available for use with forklifts and will be presented within this chapter.

Forklift trucks may be powered by batteries, gasoline, liquid propane gas, diesel or compressed natural gas. They may have pneumatic tires for use over rough terrain, or solid rubber tires for use over smooth and hard surfaces. Specific safety features are built into each type of MHE that allow for safe operations in a variety of areas where ammunition and explosives are present. Spark-enclosed (EE) trucks have provisions to ensure that no spark will escape the generator, motor, or switches. Explosion-Proof (EX) trucks are fully enclosed to prevent energy, such as an electrical spark or heat from accidentally escaping to the surrounding atmosphere and initiating an explosion. Type EX trucks come equipped with non-sparking fork coverings. Diesel-powered forklifts are equipped with spark-arresting devices to ensure safe operation in hazardous areas.

Compressed natural gas MHE are approved for operational areas ashore as defined in [paragraph 5-9](#). Operating areas may be required to be equipped with methane detectors that activate audible and visual alarms prior to reaching the lower explosive limit (LEL). Each activity shall refer to the gas detector's recommendations to determine the required quantity of gas detectors and the installation locations. The emissions of methane shall be monitored in accordance with the manufacturer's recommendations to ensure regulatory compliance for safe operation.

**3-2.1. STANDARD FORKLIFT TRUCKS.** Standard forklift trucks are counterbalanced and are equipped with a lifting mechanism that elevates a fork carriage. Two adjustable forks are secured to the fork carriage. An overhead guard is provided for the operator's safety. [Figures 3-1](#) and [3-2](#) provide examples of standard forklift trucks.



**FIGURE 3-1. Type EX Forklift Truck**



**FIGURE 3-2. Low Profile Shipboard Diesel Forklift Truck**

3-2.2. REACHING AND TIERING. This type of forklift truck uses outriggers vice a counterbalance, reducing size and making them suitable for use in confined spaces. The forks, which are mounted on an extendable mechanism, are elevated by means of a lift mechanism. They are electric-powered and have solid tires. Overhead guards are not normally provided on MHE afloat. Manufacturer-installed spinner knobs are acceptable for these trucks. [Figure 3-3](#) illustrates a reaching and tiering forklift truck.



**FIGURE 3-3. Reaching and Tiering Forklift Truck**

3-2.3. **SIDELoader.** This type of forklift truck is used to handle long items. They have flatbed platforms at the end. The uprights for carrying the forks are located in the center. The forks elevate up and down on the mast. The forks and the mast also travel in a vertical and horizontal direction. Some models are equipped with auxiliary forks for extra-long load stabilization. The sideloader has solid tires. [Figure 3-4](#) illustrates a sideloader.



**FIGURE 3-4. Sideloader**

3-2.4. **ROUGH TERRAIN.** This type of forklift truck is intended for operation on unimproved natural terrain as well as the disturbed terrain of construction sites. These trucks are diesel-powered, two-wheel or four-wheel drive, articulate/rigid frame-type vehicles with pneumatic tires. Rough terrains may be either vertical masts, as shown in [figure 3-5](#), variable reach linkage-type, as shown in [figure 3-6](#), or variable reach boom-type, as shown in [figure 3-7](#).

3-2.5. **FRONT/SIDELoader (SWINGMAST).** The front/sideloader, also identified as swingmast, operates as a forklift and sideloader combined. However, most units only swing to one side, usually to the right. [Figure 3-8](#) provides an illustration of a front/sideloader (swingmast). Long loads can be transported parallel to the direction of travel, making them easier to maneuver through narrow doorways and aisles. The truck is available in safe working loads (SWL's) up to 11,000 pounds. Due to their high wheel loading, front/sideloaders are not approved for shipboard use. This truck is electrically or diesel-engine powered.



**FIGURE 3-5. Rough Terrain Forklift Truck (Vertical Mast)**



**FIGURE 3-6. Rough Terrain Forklift Truck (Boom-Type)**



**FIGURE 3-7. Rough Terrain Forklift Truck (Variable Reach Boom-Type)**



**FIGURE 3-8. Front/Sideloader (Swingmast)**

### 3-3. FORKLIFT ATTACHMENTS

Forklift attachments may be installed on MHE in order to perform specific handling operations. The following attachments, found in [NAVSEA OP 2173](#), are approved and are not considered to be an alteration to the MHE. Therefore, approval is not required from the original manufacturer, Naval Surface Warfare Center (NSWC), Indian Head Division Detachment Earle, Navy Packaging, Handling, Storage and Transportation (PHST) Center (Code 71) or [Naval Inventory Control Point Mechanicsburg \(NAVICP-M\)](#) (Code 058133). [Paragraph 3-8](#) provides other approved attachments that are used with MHE during International Organization for Standardization (ISO) container handling operations. Refer to [NAVSEA SW023-AH-WHM-010](#) for additional approved types of forklift truck attachments specifically designed to handle ammunition and explosives.

**3-3.1. MK 12 MOD 0 FORK EXTENSIONS.** These extensions mount directly on the forks and provides approximately 20 inches of additional length to the forks, enabling the forklift to handle loads stacked three-deep on a flatbed conveyance. These extensions permit handling of larger loads with greater load centers. However, the SWL of the forklift is reduced with the use of these extensions. Refer to [NAVSEA SW023-AH-WHM-010](#) for specific SWL's at non-standard load centers. [Figure 3-9](#) illustrates the extensions installed on the forks.

**3-3.2. FORK STOPS.** Fork stops are used to restrict the forks from extending through and beyond a pallet or container and from damaging or tipping over adjacent containers. Typically, 4 x 4 inch lumber is used for all operations. [Figure 3-10](#) illustrates the fork stop positioned on the forks. The overall fork stop length should be the maximum fork separation (outside to outside) plus 8 inches (4-inch overhang on each side). When operational circumstances dictate otherwise, alternate size lumber with varying overhang lengths are considered acceptable provided the overhang will prevent the fork stops from falling off or interfering with the intended operation.

### 3-4. STRADDLE CARRIERS

Straddle carriers are designed to raise, lower, support and transport a load that is positioned inside of the straddle carrier's wheel base. [Figure 3-11](#) illustrates a typical straddle carrier. The lifting system, drive wheels, and steering can be either mechanical or hydraulic. They have pneumatic tires.

### 3-5. PALLET TRUCKS

A pallet truck is designed to pick up and transport palletized loads. Unlike forklift trucks, pallet trucks are not counterbalanced and support the entire load within the wheelbase. Pallet trucks cannot stack. They are used primarily in confined areas where stacking is not required. Pallet trucks may be powered by an electric motor or moved manually. Various attachments are available for use with pallet trucks. The trucks are used in areas that have hard and smooth surfaces such as warehouses and magazines.

**3-5.1. ELECTRIC-POWERED RIDER-TYPE.** These pallet trucks require the operator to ride in a standing position. The truck has forks upon which the palletized load is supported. The truck has solid tires and uses a battery for a power source. [Figure 3-12](#) illustrates a typical electric-powered ride-type pallet truck.

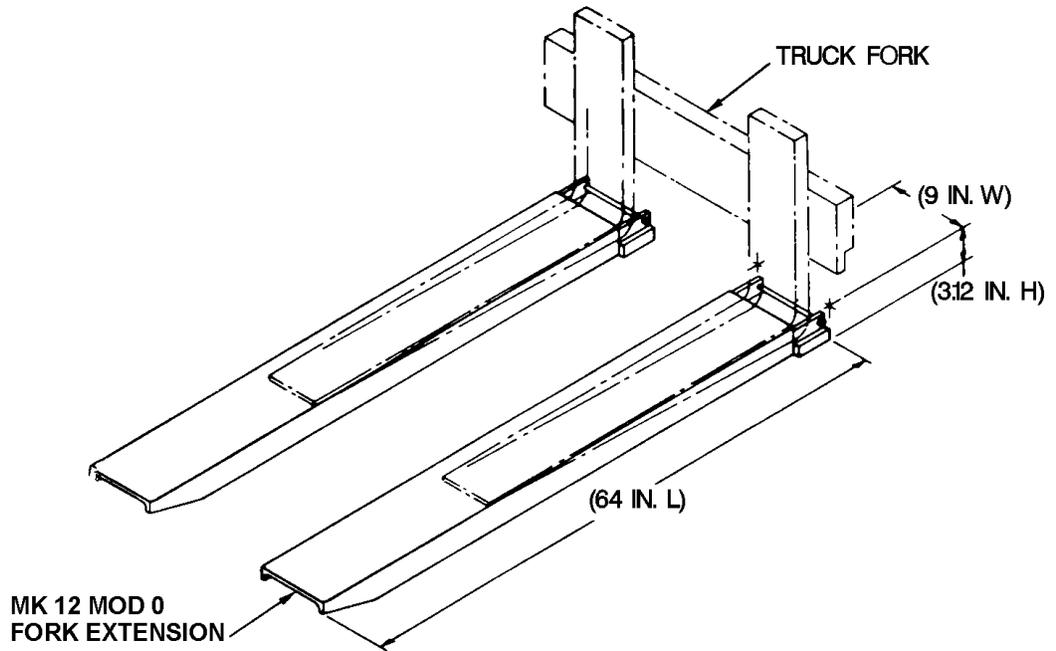


FIGURE 3-9. Mk 12 Mod 0 Fork Extensions

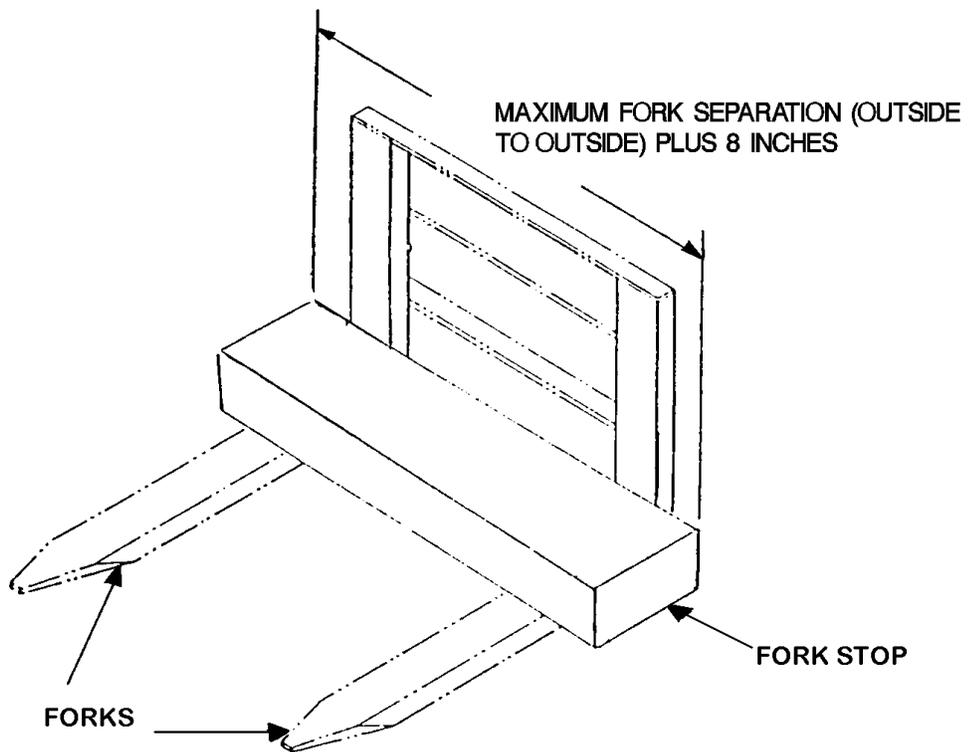


FIGURE 3-10. Fork Stop



**FIGURE 3-11. Straddle Carrier**



**FIGURE 3-12. Electric-Powered Rider-Type Pallet Truck**

3-5.2. **ELECTRIC-POWERED WALKIE-TYPE.** In order to use these pallet trucks, the operator must walk behind the truck while steering by hand. The truck has forks upon which the load is supported. The truck has solid tires and a battery for a power source. [Figure 3-13](#) illustrates a typical electric-powered walkie-type pallet truck.



**FIGURE 3-13. Electric-Powered Walkie-Type Pallet Truck**

3-5.3. **MANUAL PALLET TRUCKS.** These pallet trucks have solid tires, require manual power for locomotion, are equipped with forks that are raised and lowered by a hydraulic or mechanical lift mechanism to support palletized loads, and steering is accomplished by means of a tow handle capable of 90° turns in either direction. [Figure 3-14](#) illustrates a typical manual pallet truck. Refer to [paragraph 3-1.2.1](#) for descriptions of manual pallet trucks used afloat or to [paragraph 3-1.2.2](#) for descriptions of manual pallet trucks used ashore.

### **3-6. PLATFORM TRUCKS**

Platform trucks, like pallet trucks, are designed to support the load on the wheelbase. However, instead of forks, loads are placed on a platform. [Figures 3-15](#) and [3-16](#) illustrate a rider-type and walkie-type platform truck, respectively.



**FIGURE 3-14. Manual Pallet Truck**



**FIGURE 3-15. Rider-Type Platform Truck**



**FIGURE 3-16. Walkie-Type Platform Truck**

### **3-7. WAREHOUSE TRACTORS**

Warehouse tractors are used for towing trailer loads. They are self-propelled vehicles with front wheel steering and rear wheel drive. The tractor is equipped with a coupler in the rear to provide a means of attaching trailers. Several couplers are available such as: single towing eyes for hook hitches, towing eyes for cross chains or hooks, a pin and clevis for trailer loop handles and automatic self-couplers. [Figure 3-17](#) provides an example of an electric-powered tractor with solid tires.

### **3-8. INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO) CONTAINER LIFT TRUCKS**

ISO container handlers or reach stackers are very large, four-wheeled, pneumatic tire lift trucks designed to handle and transport ISO containers ashore. They are internal combustion (but primarily diesel-fueled) units and have a heavy lift capability up to 100,000 pounds. When equipped with various attachments (i.e., container spreaders and below the hook lifting devices), these trucks have the ability to stack 20- to 40-foot long ISO containers 5 high in a row. [Naval Facilities Engineering Command Publication \(NAVFAC\) P-307](#) provides the regulations involving the certification, maintenance, inspection and test requirements for these types of attachments. [Figures 3-18 and 3-19](#) provide typical examples of common ISO container lift trucks.



**FIGURE 3-17. Warehouse Tractor**



**FIGURE 3-18. ISO Container Handler Lift Truck**



**FIGURE 3-19. ISO Container Reach Stacker Lift Truck**

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## CHAPTER 4

### MATERIALS HANDLING EQUIPMENT LICENSING

#### 4-1. GENERAL

This chapter lists the processes to train and license personnel as powered materials handling equipment (MHE) operators and to authorize personnel as local instructors for the purpose of issuing a license for powered MHE operators. The licensing and instructor requirements prescribed in this chapter apply to MHE operators that handle general supply materials (general cargo or stores) and hazardous materials (HAZMAT) other than ammunition and explosives. Local qualification and certification requirements must be satisfied prior to any handling operation. The possession of a valid MHE license does not authorize an operator to respond to a HAZMAT incident, unless properly trained and qualified under local instructions/regulations. Before handling ammunition and explosives, the operator licensing and instructor requirements of [NAVSEA SW023-AH-WHM-010](#) must be met.

#### 4-2. AVOIDANCE OF DUPLICATE TRAINING

If an MHE operator has previously received training to handle ammunition and explosives under the provisions of [NAVSEA SW023-AH-WHM-010](#), no additional training is required to handle general supply materials or HAZMAT provided the following requirements are met:

- a. The same MHE classes and working conditions are encountered.
- b. The operator is familiar with the potential safety hazards associated with the HAZMAT being handled [e.g., understanding the Material Safety Data Sheet (MSDS)] and is aware of local HAZMAT regulations involving fire fighting, emergency response, and containment/clean-up procedures.
- c. The operator has been evaluated and found competent to operate the MHE safely.

#### 4-3. QUALIFICATIONS

The following minimum qualification requirements must be satisfied to license MHE operators.

4-3.1. **MEDICAL.** Personnel shall pass a periodic physical examination, as specified by [Naval Medical Command \(NAVMED\) P-117](#) published by the Bureau of Medicine and Surgery (BUMED). Each MHE operator must possess a current Medical Examiner's Certificate, [figure 4-1](#), or have proof of a current medical examination documented on their license as noted in [paragraph 4-4.1c](#).

4-3.2. **INITIAL OPERATOR TRAINING.** [29 CFR 1910.178](#) requires that all MHE operators be trained to a competency level, not a defined number of hours, and allows flexibility in how training is accomplished. To satisfy this requirement, within the scope of this publication, a comprehensive MHE operator licensing course is contained in [appendix B](#). The following requirements must be followed:



4-3.3. REFRESHER OPERATOR TRAINING. The CO/OIC is responsible for the content, duration and documentation of refresher training. An MHE operator shall attend refresher training whenever:

- a. The operator has been observed to operate MHE in an unsafe manner.
- b. The operator has been involved in an accident or near-miss incident.
- c. The operator has received an evaluation that reveals that the operator is not operating the MHE safely.
- d. The operator has not operated MHE within the past 12 months to verify that job skills have not degenerated.
- e. The operator is assigned to drive a different class, lift code or type of MHE.
- f. A condition in the workplace changes in a manner that could affect safe operation of the MHE.

4-3.4. HAZARDOUS MATERIALS (HAZMAT) TRAINING. If applicable, MHE operators that will be assigned to handle HAZMAT shall attend a training and certification program under local instructions and regulations. As a minimum, MHE operators shall be familiar with the potential safety hazards associated with the HAZMAT being handled (e.g., understanding MSDS's), storage compatibility, and are aware of local procedures involving reporting HAZMAT incidents. Additional training and certification would be required under local direction for those operators who are actually assigned fire fighting, emergency response, or containment/clean-up responsibilities. [Department of Defense \(DOD\) Regulation 4145.19R-1](#) provides detailed HAZMAT storage and handling requirements that may be implemented by activities to establish local instructions.

#### 4-4. LICENSE

A license is required for all powered MHE operators. A license is not required for manually-powered MHE operators.

#### NOTE

The "MHE Operator's License," [figure 4-2](#), replaces Form OF 346, "U.S. Government Motor Vehicle Operator's Identification Card" for the purposes of issuing a license to MHE operators only. This new license will be issued to MHE operators who have satisfactorily completed the initial operator training and to current licensed operators during their next renewal period. A copy of the "MHE Operator's License" is included at the end of this publication that may be used to manually complete and issue.

4-4.1. **MHE OPERATOR'S LICENSE.** The “MHE Operator’s License,” [figure 4-2](#), shall serve as the license and is valid for 3 years provided the medical examination certificate has not expired. Additional licenses may be issued, as required when all related information cannot be annotated on one license. No other equipment, vehicles, etc., shall be annotated on the MHE license. The license shall indicate:

- a. Limitations of the operator due to physical disabilities.
- b. “YES” marked in the “General Supply Authorized” field. The “Explosives Authorized” field shall be left blank.
- c. The Medical Certificate, [figure 4-1](#), is either “ON FILE” or “ON PERSON.”
- d. The MHE classes and lift codes, the safe working loads (SWL’s) and the type designations (e.g., EE, DS, etc.) the license is valid for. An example of an operator trained and licensed to handle 4,000- and 6,000-pound sit-down counterbalanced solid tire rider electric forklift trucks would be: Class/Lift Code is “1/5,” SWL is either “4K & 6K” or “up to 6K” (where K denotes thousands), and the Type Designation is “EE.”

[Table 4-1](#) defines the seven classes and the assigned lift codes for powered industrial MHE, as defined by the Industrial Truck Association, according to their individual characteristics. Each of the different types of powered MHE in a given class has its own characteristics and some inherent hazards (i.e., different control operations or steering capabilities). For example, on some rough terrain forklift trucks (class 7, lift code 1) the frame articulates (moves and rotates) for traversing and turning, while on others the front and rear wheels articulate. To be most effective, training must address these unique characteristics to the specific types of MHE the operator is trained to operate. Therefore, an operator must be trained and evaluated in the safe operation for the types of MHE that the operator will be assigned to operate in the workplace.

For example, if an operator is assigned to operate a sit-down counterbalanced solid tire rider electric truck (class 1, lift code 5), then the operator must be trained and evaluated in the safe operation for that type of MHE. If the same operator is now assigned to operate an stand-up counterbalanced front/sideloader truck (class 2, lift code 4), or a rough terrain forklift truck (class 7, lift code 1), then the operator must be trained and evaluated in the safe operation for those types of MHE as well. Operators who have successfully completed the training and evaluation for each specific type of MHE would not need additional training when they are assigned to operate the same type of MHE made by a different manufacturer. However, operators would need additional training if the applicable truck-related and workplace-related topics, as listed in [29 CFR 1910.178](#), are different for that truck.

4-4.2. **ISSUANCE.** The CO/OIC shall designate in writing the responsible party authorized to issue licenses. This party is also authorized to upgrade a valid MHE license to indicate other classes, types and capacities of MHE based on the operator’s satisfactory demonstration of practical operating skills. Upgraded MHE licenses shall be documented in each operator’s training certificate as shown in [appendix B](#).

4-4.3. **EVALUATION.** In accordance with [29 CFR 1910.178](#), licensed operators must be periodically evaluated (at least once every 3 years) while they operate MHE in the workplace to ensure that their skills remain at a high level and must receive refresher training whenever there is a demonstrated need for it. The evaluator(s) must be familiar with the respective MHE features and operation, and with the workplace conditions/environment. However, they do not need to be licensed as an MHE operator. The CO/OIC will ensure that a process is documented to evaluate MHE operators. An evaluation of an operator's performance can be determined by a number of ways, such as a discussion with the employee, an observation of the employee operating the MHE, a written documentation of previous training, or a performance test. Evaluations shall be documented in each operator's training certificate, as shown in [appendix B](#), and should coincide with the operator's licensing renewal period.

4-4.4. **RENEWAL.** The CO/OIC will ensure that a process is documented to renew the license. The renewal process shall include documentation attesting to the demonstration of the operator's proficiency.

4-4.5. **REVOICATION.** The license may be revoked in writing by the CO/OIC. The reasons for the revocation of and the process required to reissue the license shall be documented.

#### **4-5. INSTRUCTOR TRAINING**

Local activity instructors shall be authorized in writing by the CO/OIC to provide MHE operator training. Authorization should address the following qualifications:

a. Completion of a course providing training to become proficient as an instructor. [Catalog of Navy Training Courses \(CANTRAC\), Course Information Number \(CIN\) A-012-0023, entitled, "Shipboard/Workspace Trainer,"](#) meets this requirement. The CO/OIC may accept other equivalent training or prior instructor experience as meeting this requirement.

b. Possession of the appropriate MHE operators license.

c. All training and evaluations must be conducted by persons with the necessary knowledge, training and experience to train industrial MHE operators and evaluate their competence. An example of a qualified trainer would be a person who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience has demonstrated the ability to train and evaluate powered industrial MHE operators.

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<b>MHE OPERATOR'S LICENSE</b>				Physical Limitations ( <i>e.g., requires corrective lenses, requires hearing aid, etc.</i> )		
Issuing Activity's Name						
Operator's Name			Sex			
Date of Birth		Local Card Number				
Height	Weight	Hair	Eyes	Other Local Requirements		
Date Issued		Date Expires				
<b>LICENSED TO OPERATE</b>						
General Supply Authorized			YES <input type="checkbox"/>	Class/ Lift Code	SWL	Type Designations
Explosives Authorized			YES <input type="checkbox"/>			
Issuing Authority's Signature						
Operator's Signature						
Medical Certificate:						
On File <input type="checkbox"/>		On Person <input type="checkbox"/>				

**FIGURE 4-2. MHE Operator's License**

[CLICK HERE TO REPRODUCE AND ANNOTATE LICENSES FOR ISSUANCE.](#)

Table 4-1. MHE Class Definitions

Class	Lift Code	Description
1	1	Electric, Counterbalanced Rider-Type, Stand Up
	4	Three Wheel Electric Truck, Sit Down
	5	Electric, Counterbalanced Rider, Solid Tires, Sit Down
	6	Electric, Counterbalanced Rider, Pneumatic Tires, Sit Down
2	1	High Lift Straddle
	2	Order Picker
	3	Reach Type Outrigger (e.g., Reaching and Tiering)
	4	Sideloader, Turret Trucks, Swingmast and Convertible Turret/Stock Pickers
	6	Low Lift, Electric Pallet and Platform Truck (Rider)
3	1	Low Lift, Electric Walkie Platform Truck
	2	Low Lift, Electric Walkie Pallet Truck
4	3	Internal Combustion, Counterbalanced Forklift Truck (Solid Tires)
5	4	Internal Combustion, Counterbalanced Forklift Truck (Pneumatic Tires)
6	1	Electric and Internal Combustion, Sit Down Rider Tractor (Solid and Pneumatic Tires)
7	1	Rough Terrain Forklift Truck (Pneumatic Tires)

**NOTE**

Refer to [chapter 3](#) for definitions of MHE type designations.

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## CHAPTER 5

### OPERATIONAL SAFETY REQUIREMENTS

#### 5-1. GENERAL

This chapter describes the general operational safety precautions associated with operating and handling industrial Materials Handling Equipment (MHE) and approved operational areas. Careless or improper operation of MHE may result in personnel injury or property damage even if the approved MHE is used. Therefore, it is imperative that all safety precautions and operator requirements pertaining to the safe operation of MHE detailed in this chapter are applied and strictly enforced. Refer to [NAVSEA SW023-AH-WHM-010](#) for additional operational safety requirements associated with MHE when handling ammunition and explosives.

#### 5-2. DEPARTMENT OF DEFENSE (DOD) OCCUPATIONAL SAFETY AND HEALTH (OSH) PROGRAM.

The operations of an effective on-the-job occupational safety and health program is a line management responsibility at all echelons and shall, to the extent of their authority, comply with OSH program guidance and regulations to provide DOD personnel safe and healthful working conditions. This guidance is provided in [DODINST 6055.1 \(series\)](#). Personnel shall comply with all applicable OSH program rules and regulations documented in [OPNAVINST 5100.19 \(series\)](#) (afloat) or [OPNAVINST 5100.23 \(series\)](#) (ashore). Specifically, this shall include compliance with work safety and health standards, proper use of personal protective equipment and clothing, and proper reporting to DOD management of unsafe conditions, hazardous exposure, or occupational injury or illness. Additionally, [chapter 4](#) of this publication complies with and amplifies the training requirements for powered industrial truck operators in [29 CFR 1910.178](#).

#### 5-3. GENERAL SAFETY REGULATIONS

It is necessary for the protection of personnel that all safety features show no evidence of damage or deterioration that could cause a hazard to safe equipment operation. Further, each type of MHE has particular areas that require safety inspections. Therefore, periodic inspections are necessary to determine if any hazards are apparent. In addition to these safety inspections, the floor/deck and working areas must be free of oil or gasoline spots that could cause accidents due to skidding. All safety devices, discussed in [paragraph 5-4](#), must be properly installed and maintained. Refer to [NAVSEA SW023-AH-WHM-010](#) for additional general safety regulations involving ammunition and explosives handling. Detailed safety requirements and procedures are contained in NAVMAT P-5100 (series) and [DOD Regulation 4145.19R-1 \(series\)](#).

5-3.1. GENERAL SAFETY PRECAUTIONS. The following general safety precautions shall be observed prior to operating or maintaining MHE:

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a. Operators shall perform a daily pre-operational and post-operational safety inspection, as described in [paragraph 8-2.1](#), to ensure the MHE is operating properly. If any MHE is found to be defective, unsafe, or not meeting the safety and operating requirements of this publication, it shall be removed from service until the problem has been properly corrected in accordance with local procedures.

b. Prior to use, all MHE attachments shall be inspected using the applicable manufacturer's technical documentation, or for afloat units, the Maintenance Index Page (MIP) and their associated Maintenance Requirement Cards (MRC's). They shall be properly installed and secured to the MHE in accordance with local procedures.

c. Operators shall not be required to fix or adjust the MHE. However, this rule may be modified at installations where no repairman is employed, and an operator known to have competence to make minor repairs or adjustments is available. In making repairs, the MHE must be made inoperative by removing ignition keys, disconnecting the battery cable (on electrically-powered MHE), or by activating the travel control disconnect device while adjustments or repairs are being performed.

d. MHE shall be kept clean at all times. Special emphasis shall be placed on the removal of rust at load bearing (interface) areas. Rust on these areas and other cosmetic deficiencies, such as chipped or missing paint, shall be corrected as soon as the mission requirements allow and not later than the MHE's next scheduled maintenance interval.

e. In the event that the material being handled is dropped, damaged, or begins to leak, cease all operations, notify personnel in the area, and begin emergency cleanup/containment in accordance with local procedures. Operations shall not resume until approval is granted by the Commanding Officer/Officer-in-Charge (CO/OIC).

f. All MHE shall be secured whenever an emergency or mishap occurs while operating the MHE afloat or ashore, or whenever an emergency arises afloat.

g. It is the responsibility of all personnel operating MHE to be aware of unsafe conditions. All unsafe conditions or materials must be reported. Operators must warn others whom they believe to be in danger of known safety hazards or who fail to observe safety precautions. Supervisors shall be made aware of any injury at the workplace.

h. Operators shall be made aware of their work environment, such as limited door width/height, overhead obstructions (e.g., pipes, light fixtures, sprinkler heads), uneven floor/deck, and limited aisle/ramp/dock widths. This can be accomplished by a complete walk-around by the operator prior to any handling operation (especially newly trained operators or new employees to an activity).

i. Never subject the MHE to unnecessary water from rain, puddles, snow, washing or other water sources.

j. Spinner knobs are not permitted on MHE, except as noted in [paragraph 3-2.2](#).

k. When operating dual-fueled MHE, the gasoline level in the liquid fuel tank shall be checked daily. The MHE shall not be operated unless the gasoline fuel tank is at least 1/4 full.

5-3.2. PERSONNEL SAFETY. The following personnel safety precautions shall be observed prior to operating or maintaining MHE:

- a. During handling operations, MHE operators shall wear all necessary personal protective equipment (PPE), such as non-metallic safety helmets, safety shoes, eye and ear protection, etc., as specified by local instructions.
- b. Personnel shall not stand on or pass under the elevated portion of any MHE, whether the MHE is loaded or empty.
- c. Operators shall make sure that there is sufficient headroom to operate the MHE under beams, lights, pipes, sprinkler systems and all overhead installations.
- d. Operators shall keep well inside the operating compartment, making sure that feet and arms are inside the running lines of the MHE. Do not put arms or legs between the uprights of a mast.
- e. Operators who have completed their prior to use daily safety inspections shall ensure that their hands are not wet or greasy prior to operating MHE.
- f. Stunt driving and horseplay are prohibited. Do not spin wheels or race an engine. Never permit riders on MHE or load.
- g. If the MHE is equipped with an operator restraint system (e.g., seat belt), it may not be removed, it shall be maintained, and it shall be worn for all operations with the exception of shipboard and pierside operations, which shall be at the discretion of the CO/OIC following an operational assessment.
- h. Never leave the driver's seat while the MHE is in motion or when the forks are elevated above the ground/deck.

5-3.3. HANDLING SAFETY. The following general safety precautions must be observed during all handling operations:

- a. Check the load before fully lifting the forks or moving the MHE. Ensure that at least 2/3 of the forks are engaged into the load. Handle only stable or safely arranged and secured loads.
- b. Each of the adjustable forks should always be spaced an equal distance from the centerline of the MHE.
- c. Do not exceed the safe working load (SWL) of the MHE, which is typically at a 24-inch load center to full lift height. Refer to [NAVSEA SW023-AH-WHM-010](#) or the manufacturer's technical manual for load centers greater than 24 inches. Counter-weighting of MHE to increase lifting capacity is prohibited. If the SWL of the MHE is exceeded, it shall be immediately removed from service until all corrective actions have been taken prior to returning MHE back to service. Corrective action to return the MHE to service appears in [chapter 6](#). Use the right MHE for the job as specified in local operating procedures.

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d. Never lift more than one pallet or container unless it is strapped together as a unit load and is within the rated capacity of the MHE.

e. Never lift loosely stacked loads that extends above fork backrest.

f. Approved types of personnel baskets installed on MHE shall not be used for handling ammunition and explosives.

g. Interface between the load and MHE shall be by fork pockets, twist locks, pallets, or similar captured means that will prevent the load from toppling.

h. For optimum stability, forks should be adjusted to the maximum width the load will accept.

i. Insert forks into fork pockets and pallets with care to avoid damage to adjacent loads.

j. Use approved fork stops to prevent forks from protruding beyond the load and damaging neighboring loads. The use of fork stops can exceed the load center for the SWL of the forklift truck.

k. Place the load as close to the mast as possible, then slowly raise the load slightly, and carefully tilt mast backward to stabilize the load.

l. Extreme care shall be used when tilting the load forward or backward, particularly when high tiering. Tilting forward with forks elevated shall be prohibited except to lift a load. An elevated load shall not be tilted forward except when the load is in a deposit position over a rack or stack. Level the load prior to deposit on a rack or stack. When stacking or tiering, only enough backward tilt to stabilize the load shall be used.

m. Forks can be placed partially under loads for lifting, side shifting and placement, or through the corner of a pallet, provided the following conditions are met:

(1) The deck or base surface must be smooth and without obstructions.

(2) No metal-to-metal contact is permissible between the pallet and the deck.

(3) The forks must be sufficiently beneath the pallet to prevent instability.

(4) The load must not exceed the SWL at the rated load center of the forklift truck.

(5) The load must be resting on a stable surface. Partial engagement is not permissible when loads are hanging over a ledge or partially supported by a base tier.

(6) Partial engagement must only be used to move loads 1 or 2 inches in a given direction and not as the primary method of positioning.

(7) Loads will not be bumped in order to be repositioned.

5-3.4. SAFETY PRECAUTIONS DURING MOVEMENTS. For vessels afloat, NAVSEA maintains ship design specifications for maximum deck and ramp loads permitted with MHE. For activities ashore, the appropriate local operating procedures shall indicate the proper MHE for the operation. Refer to [NAVSEA SW023-AH-WHM-010](#) for additional safety precautions during movement of ammunition and explosives. Prior to any movement operation, the following safety precautions must be followed:

- a. Check floors, decks, dockplates, ramps, etc. for breaks, cracks, or other indications of structural weaknesses. All portable dockplates and ramps must be properly secured to prevent any movement during MHE operations. Whenever doubts arise regarding the load capacity, securement or integrity of the operational surfaces, the MHE operator shall cease operations and report the discrepancy in accordance with local procedures.
- b. Prior to any MHE operation, make sure trailers and railcars are properly chocked. Railcars on piers do not require chocking.
- c. Keep one hand on the steering wheel at all times. MHE will not automatically return to straight forward or reverse travel direction.
- d. Observe all traffic and fire regulations, including authorized speed limits. Yield right-of-way to ambulances, fire trucks or other vehicles in emergency situations. Park or store MHE in authorized areas only.
- e. Under all travel conditions, MHE shall be operated at speeds that will allow it to stop in a safe manner.
- f. Keep a clear view in the direction of travel.
- g. Travel with the load as close to floor/deck as practical. Under normal traveling conditions, the forks of loaded or unloaded MHE should be approximately 4 to 6 inches above the ground/floor. The MHE must not be in traveling motion while the load is being raised or lowered except for final positioning.
- h. Do not pass vehicles traveling in the same direction at intersections, blind spots or at other dangerous locations.
- i. Do not travel two MHE abreast unless approved by the CO/OIC.
- j. When following a vehicle, maintain a minimum distance of three MHE lengths between the vehicle in front.
- k. Make all starts, stops, turns, or directional reversals in a smooth manner so as not to shift the load or overturn the MHE.
- l. Operators shall maintain a safe distance from the edge of elevated docks, ramps, platforms, freight cars and safety nets. Operators shall be aware of the “tail swing” motion on rear-steering MHE to avoid driving off the edge of ramps and platforms.

m. Do not drive MHE onto any elevator unless specifically authorized to do so by local written procedures.

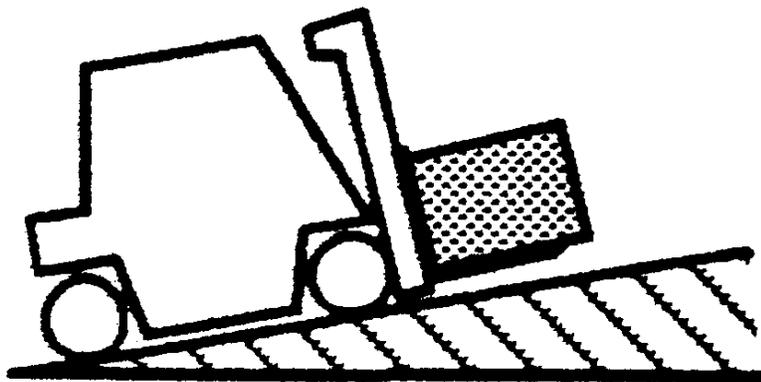
n. Slow down when approaching danger points such as downgrades, curves, narrow travel areas, wet or oiled floors, wet or slippery railroad tracks, and rough travel surfaces. Do not jam on brakes.

**WARNING**

Driving MHE down grades with forks or forklift attachments facing downhill may cause MHE instability or possible loss of control.

o. Ascend or descend grades slowly. On all grades, the forks must be tilted back and raised only as far as necessary to clear the floor/deck or road surface. Do not turn on an incline.

(1) When traveling up or down a grade in excess of 5% (3 degrees) with a loaded forklift truck, keep the load upgrade to maintain control as shown in [figure 5-1](#).



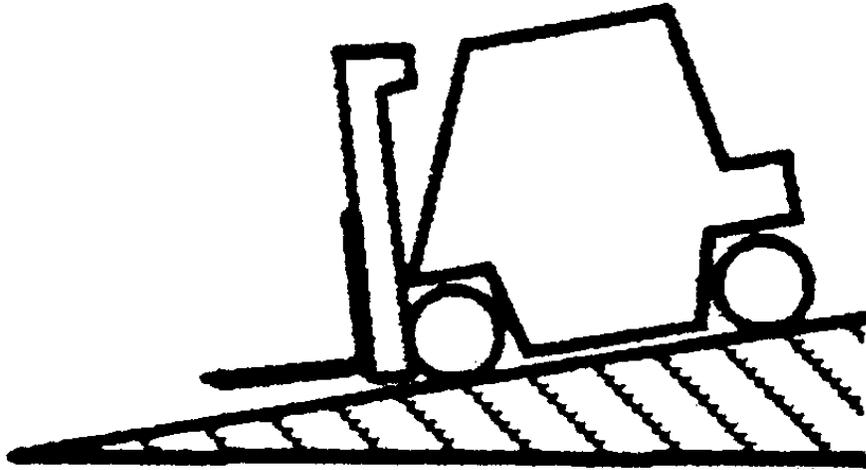
**FIGURE 5-1. Traveling Up or Down Steep Grades with Loaded Forklift Truck**

(2) When operating an unloaded forklift truck on a grade in excess of 5% (3 degrees), keep the counterweight upgrade as shown in [figure 5-2](#).

p. Do not travel with the load in the side shifted position.

q. Sound horn at places such as cross aisles, intersections, congested areas and other locations where vision is obstructed. Also, sound the horn before proceeding around corners or into elevators when the view is obstructed. Operators must sound horn before moving rearward. Stop and sound horn at building exits and entrances.

r. Do not attempt to back up when rear wheels are turned 90 degrees.



**FIGURE 5-2. Operating Unloaded Forklift Truck on Steep Grades**

- s. Do not ride or slip the clutch.
- t. Do not use reverse control plugging for slowing down or stopping unless recommended by the manufacturer.
- u. MHE shall be completely disengaged from the load when MHE is not being operated.
- v. Do not attempt to enter a building through partially opened doors. The doors shall be fully opened and secured before proceeding.
- w. MHE shall not be used for opening or closing railcar door, magazine doors or to disassemble fastened dunnage.
- x. Cross railroad tracks diagonally whenever possible. Do not park closer than 8 feet from the center of the railroad tracks.
- y. Before driving over a dockboard or bridgeplate, be sure it is properly secured from lateral movement. Drive carefully and slowly across dockboards or bridgeplates.
- z. Do not run over loose objects, bumps or potholes on the running surface.
- aa. Never tow or push other MHE, vehicles or freight cars.
- bb. When using a warehouse tractor, never exceed its rated towing capacity. The maximum number of trailers permitted in a trailer train shall be determined by the local CO/OIC.
- cc. All warehouse tractor operators must comply with the following regulations:

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- (1) Do not weave or whip train.
- (2) Allow sufficient time to get into position to make turns and allow for proper clearance of last trailer.
- (3) The height of the load on the trailers shall not obstruct the rear view of the operator nor create the possibility of material falling on the operator.

(4) When a permanent passenger seat is provided, one passenger may be transported. No person shall be allowed to occupy a temporary seat or ride any part of the tractor or trailer. No person shall be permitted to ride the trailer train.

dd. Never drive faster than a spotter can walk.

ee. Spotter requirements are as follows:

- (1) To assist in all MHE requirements, whenever possible.
  - (2) To ensure that the forks are extended at least 2/3 of the length of the forks into the load being lifted.
  - (3) Whenever engaging or disengaging a load, unless a mechanical method is employed to ensure proper load location.
  - (4) Whenever the operator's view is obstructed when driving in any direction, or when moving long loads, such as missile and torpedo containers.
  - (5) Whenever operating a straddle carrier.
  - (6) Must position themselves such that they have a clear view of the operator; a clear view of the load being handled and any obstructions to be avoided; and an unobstructed path to exit the area in case the load shifts, falls or other emergencies.
- ff. When the temperature of any part of the MHE exceeds its normal operating temperature, the MHE shall be removed from service.

### 5-4. SAFETY DEVICES

Several kinds of safety devices, depending on the MHE type, are provided to ensure its safe and efficient operation.

#### **WARNING**

During maintenance operations, safety devices may be removed or disabled but shall be installed or activated immediately upon completion of the scheduled tasks.

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5-4.1. **OVERHEAD GUARDS.** [29 CFR 1910.178](#) requires the use of an overhead guard to protect operators from falling objects. MHE, so equipped, may have the overhead guard removed during handling operations provided the Commanding Officer/Officer-In-Charge (CO/OIC) authorizes, in writing, that the provisions of [29 CFR 1910.178](#) are met. A copy of this authorization shall be maintained in the equipment history file.

5-4.2. **LOAD BACKREST EXTENSION.** [29 CFR 1910.178](#) requires the use of a load backrest extension whenever necessary to minimize the possibility of the load or part of it from falling rearward. MHE, so equipped, may have the load backrest removed during handling operations provided the CO/OIC authorizes, in writing, that the provisions of [29 CFR 1910.178](#) are met. A copy of this authorization shall be maintained in the equipment history file.

5-4.3. **SAFETY BRAKING/DISCONNECT SYSTEMS.** If MHE is equipped with a deadman-type braking system, a seat braking system, or a travel disconnect device, it shall be maintained and operable.

5-4.4. **STATIC DISCHARGE DEVICES.** Type EE MHE shall have at least two tires and wheels constructed of electrically conductive material or some other equivalent static discharge device, such as two electrically conductive ground straps. Type EE MHE must use the same static discharge devices as originally provided by the manufacturer to maintain their accredited laboratory rating. Type EX MHE shall have at least two tires and wheels constructed of electrically conductive material. The use of electrically conductive ground straps, in lieu of conductive tires, is not permitted on type EX MHE. Conductive tires are factory marked "SC" or Static Conductive. It may also have a Underwriters' Laboratory (UL) label. Pallet trucks marked "HS" must have static conductive tires or two electrically conductive ground straps.

5-4.5. **FORK SAFETY CHAINS.** All MHE containing folding-type forks shall be equipped with safety chains and locking pins to prevent the forks from accidentally extending during transport or when not in use. Safety chains and locking pins shall be properly maintained and operable.

5-4.6. **BATTERIES.** Some explosion-proof batteries contain pressurized air or carbon dioxide which is circulated in the confines of the battery box to dilute and dissipate hydrogen gas generated by the battery. These batteries shall not be operated when they fail to comply with the manufacturer's specifications for gas pressures and gas flows. Carbon dioxide purged batteries are being replaced by free ventilation batteries with specially designed cells and porous composition-type tops that emit gas to the outside, but prevent gas or air infiltration.

5-4.7. **BACK-UP ALARM SYSTEM.** On some rough terrain forklift trucks, back-up alarm systems have been installed by the manufacturer. If equipped, they may not be disabled and they shall be properly maintained in accordance with manufacturer's instructions.

5-4.8. **APPROVED DEVICES.** Only special protective devices, such as cabs, windshields, canopies, etc., which have been approved by [Naval Surface Warfare Center \(NAVSURFWARCEN\)](#), [Indian Head Division Detachment Earle, Naval Packaging, Handling, Storage, and Transportation \(PHST\) Center \(Code 71\)](#) shall be used with the MHE. Unauthorized attachments shall be removed from the MHE immediately.

## 5-5. SAFETY DURING FUELING

The following safety precautions apply during the fueling of MHE:

5-5.1. LOCATION. The following areas are authorized for fueling:

5-5.1.1. Afloat. MHE shall be fueled in CO/OIC designated areas only and in accordance with local procedures.

5-5.1.2. Ashore. MHE shall be fueled in accordance with [NAVSEA OP 5](#) requirements for gas-powered vehicles.

5-5.2. GENERAL SAFETY REGULATIONS. The followings are general regulations associated with fueling MHE:

- a. Fueled containers shall not be dropped, thrown, rolled, dragged or overfilled.
- b. Only trained and designated personnel shall refill or exchange fueled containers.
- c. Fueling shall be accomplished from approved dispensing pumps only.
- d. Emergency fueling shall be from approved safety cans only.

5-5.3. COMPRESSED NATURAL GAS (CNG) FUEL CONTAINERS. CNG-powered MHE are fueled by steel or aluminum cylinders that meet the [Department of Transportation \(DOT\)](#) specification requirements of [49 CFR 170 through 179](#). Each container is permanently marked near the end of the container containing the outlet valve by either stamping or labeling the following information:

- a. "CNG Only";
- b. Standard designation (i.e., NGV2-"x");
- c. Service pressure;
- d. Manufacturer's symbol or trademark;
- e. Serial number;
- f. Inspector's symbol or trademark;
- g. Manufacturer's part number;
- h. Month and year of manufacturer;
- i. Maximum design material temperature; and

j. “Do Not Use After \_\_\_\_\_” where “\_\_\_\_\_” is the year during which the 15-year design life will expire.

Each container shall be visually inspected once every 36 months by a qualified person in accordance with the manufacturer’s established inspection criteria and using the appropriate Compressed Gas Association (CGA) pamphlets C-6 (steel), C-6.1 (aluminum - Type NGV2-1), or C-6.2 (for all other materials). Likewise, depending on the DOT specification type, cylinders must be periodically re-qualified by a qualified person in accordance with [49 CFR 173.34](#). Prior to use or before refilling, containers shall be inspected for the following defects: corrosion, dents, pitting, cuts, digs, gouges, bulges, leaks, neck defects, and that it has not been exposed to fire. Additionally, there shall be no debris in or damage to the relief valve or any deterioration, damage or loss of flexible seals in the filling or servicing connection. Reject any container that fails any of these inspection criteria, remove it from service, and, if practical, have it repaired by qualified personnel before re-use. A container shall not be charged in excess of its maximum allowable working pressure at normal operating temperature. CNG fuel containers shall not be used beyond its service (design) life of 15 years from the date of the manufacturer’s marking.

**5-5.4. LIQUEFIED PETROLEUM GAS (LPG) FUEL CONTAINERS.** Propane-powered MHE is fueled by one of two types of containers, American Society of Mechanical Engineers (ASME) tanks or DOT cylinders. Prior to use or before refilling, each type of container shall be inspected for the following defects: corrosion, dents, pitting, gouges, bulges and that it has not been exposed to fire. Also, they shall be examined for leaks (especially all seams and openings) and that the valves (usually by a device) and liquid level gauges are protected from physical damage. Reject any container that fails any of these inspection criteria, remove it from service, and, if practical, have it repaired by qualified personnel before re-use. A container shall not be charged in excess of its maximum allowable working pressure at normal operating temperature.

**WARNING**

Always wear protective gloves and eye protection, as recommended by the Material Safety Data Sheet (MSDS), prior to filling LPG containers.  
Consult the manufacturer’s recommendations for filling procedures.

**5-5.4.1. ASME Tanks.** ASME tanks are built according to the ASME Boiler and Pressure Vessel Code. All tanks share the following characteristics:

- a. The tank capacity is calculated by the maximum amount of water they can hold.
- b. They are constructed of steel.
- c. They contain a marking or metal data plate to identify them.
- d. They have a design pressure of 312.5 pounds per square inch gauge (psig)

No periodic qualification tests are required for ASME tanks.

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5-5.4.2. **DOT Cylinders.** DOT cylinders are built according to DOT specifications under the provisions of 49 CFR 170 through 179. Unlike ASME tanks, cylinders are rated by the maximum amount of propane that can be safely stored in the cylinder (expressed in pounds of propane). For example, a 33# propane cylinder is a cylinder that can safely store 33 pounds of propane. All cylinders are marked to identify them. The propane capacity is never marked on the cylinder. Instead, the water capacity is used to establish the cylinder capacity (42% of the water capacity in pounds). All cylinders must be periodically re-qualified by a qualified person in accordance with 49 CFR 173.34 on one of the three dates after the date of manufacture:

- a. Within 12 years, when a letter does not follow the latest test date on the cylinder (e.g., 6-90S).
- b. Within 7 years, when a letter “S” follows the latest test date (e.g., 6-90S).
- c. Within 5 years, when a letter “E” follows the latest test date (e.g., 6-90E).

Additionally, the relief valve must be replaced with a new or unused valve within 12 years of container manufacture and every 10 years thereafter.

### 5-6. COLOR

All Navy-owned MHE shall be painted yellow in accordance with FED-STD-595, Color No. 13538 or a NAVICP-M approved equivalent. The mast and overhead guard may be painted black, while the forks are commonly painted either black or yellow. Existing green rough terrain forklift trucks shall be painted yellow during the next scheduled painting interval, except for expeditionary force units, war reserve materiel (WRM) assets, construction battalion (CB) assets, and cargo handling battalion (CHB) assets.

### 5-7. MARKINGS

Only the following markings are required for MHE, as applicable. If these markings are not present, the receiving activity shall mark the MHE accordingly. These markings may be applied by painted block lettering or self-adhesive decals in contrasting color. [Figure 5-3](#) shows a typical example of the required markings and location for a shorebase electric forklift truck. [Figure 5-4](#) shows a typical example of the required markings and location for a shipboard electric reach and tier forklift truck. Any other marking, not described below, that is present on the MHE from the original manufacturer or thereafter should be removed or obliterated to avoid any confusion or misinterpretation from a safety standpoint.

a. **Identification Plate/Label.** A manufacturer’s identification plate or label shall be affixed to the MHE containing, as a minimum, the make, model, fork and mast type, and unit serial number.

b. **Weight Test Label.** For new ordnance handling and shipboard MHE, a manufacturer’s label containing the words, “STRUCTURALLY TESTED ‘DATE’ BY ‘MANUFACTURER OR FACILITY’,” shall be present to verify compliance to the procurement contract test requirements. Subsequently, an 18-month periodic weight test certification form, as described in [paragraph 5-7.c](#), shall replace the manufacturer’s weight test label.

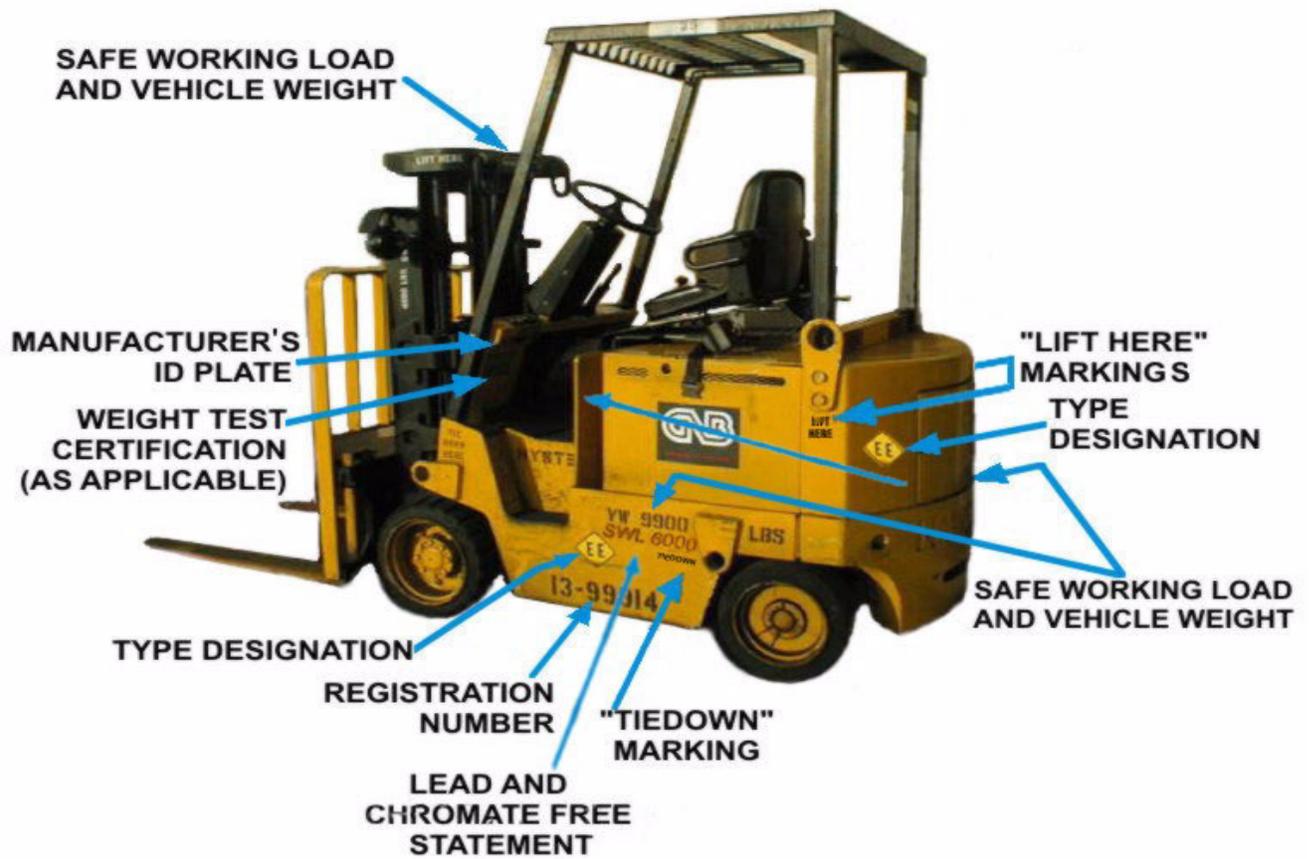


FIGURE 5-3. Shorebase Electric Forklift Truck Markings (Example)

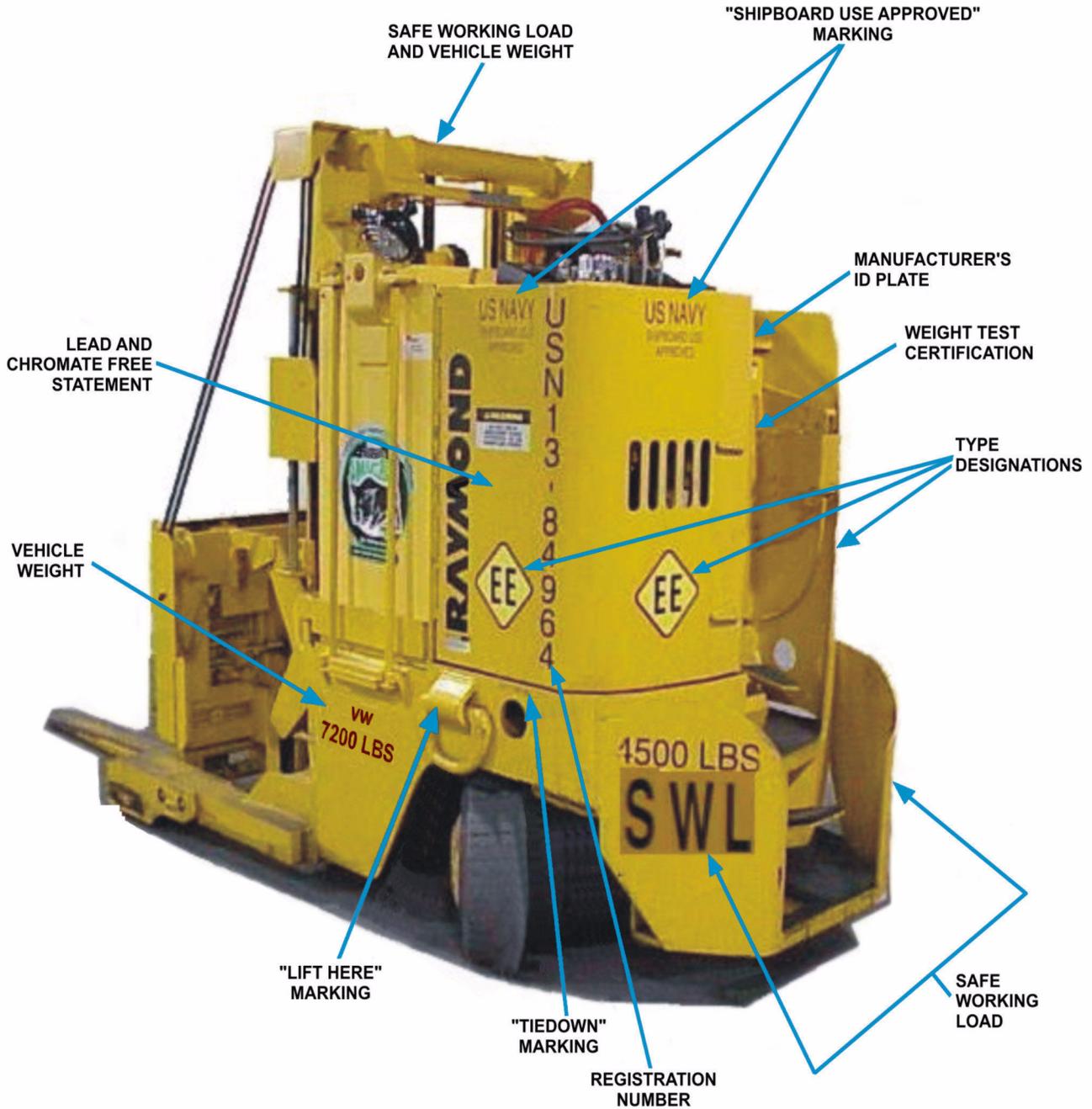


FIGURE 5-4. Shipboard Electric Reach and Tier Truck Markings (Example)

c. Weight Test Certification. For MHE assigned to handle ammunition and explosives, a periodic weight test certification form, [figure 5-5](#), shall be stenciled or labeled in a location that is visible to the operator upon mounting the MHE and shall comply with the periodic testing requirements of [NAVSEA SW023-AH-WHM-010](#).

<b>SAFETY CERTIFICATION/WEIGHT TEST ACCOMPLISHED BY:</b>
<b>IAW NAVSEA SW023-AH-WHM-010</b>
<b>EXPIRES _____</b>

**FIGURE 5-5. Periodic Weight Test Certification Form**

d. Accredited Laboratory Certification. Accredited laboratory certification identification, such as Underwriters' Laboratory (UL) or Factory Mutual (FM). An example of a certification identification plate is provided in [figure 5-6](#). If the MHE certification plate or label is missing or illegible, then a replacement certification plate or label, [figure 5-7](#), may be present containing the unit's serial number, the original accredited laboratory identification, and the type designation (e.g., DS, EE) annotated on it. If neither identification plate exists, contact the Naval Surface Warfare Center (NAVSURFWARCEN), Naval Packaging, Handling, Storage, and Transportation (PHST) Center (Code 71) for further instructions. On older MHE models, this identification may appear on the manufacturer's nameplate.

e. Alphabetical Designations. A 3-inch block alphabetical designation (e.g., EE, DS, D, etc.) shall be visually centered and applied on each side and the rear of the MHE. For H and HS type pallet trucks, the alphabetical designators shall be placed in a conspicuous location with minimum 1-inch block letters.

f. Operator Controls. All operator controls shall be properly and clearly marked.

g. Battery Identification Plate. A battery plate, on electrically powered MHE only, is required to identify the weight, specific gravity, manufacturer, etc.

h. Fuel Type. For shipboard use only, the fuel type shall be marked in 1-inch high letters located near the tank filler. (Example: DIESEL FUEL ONLY).

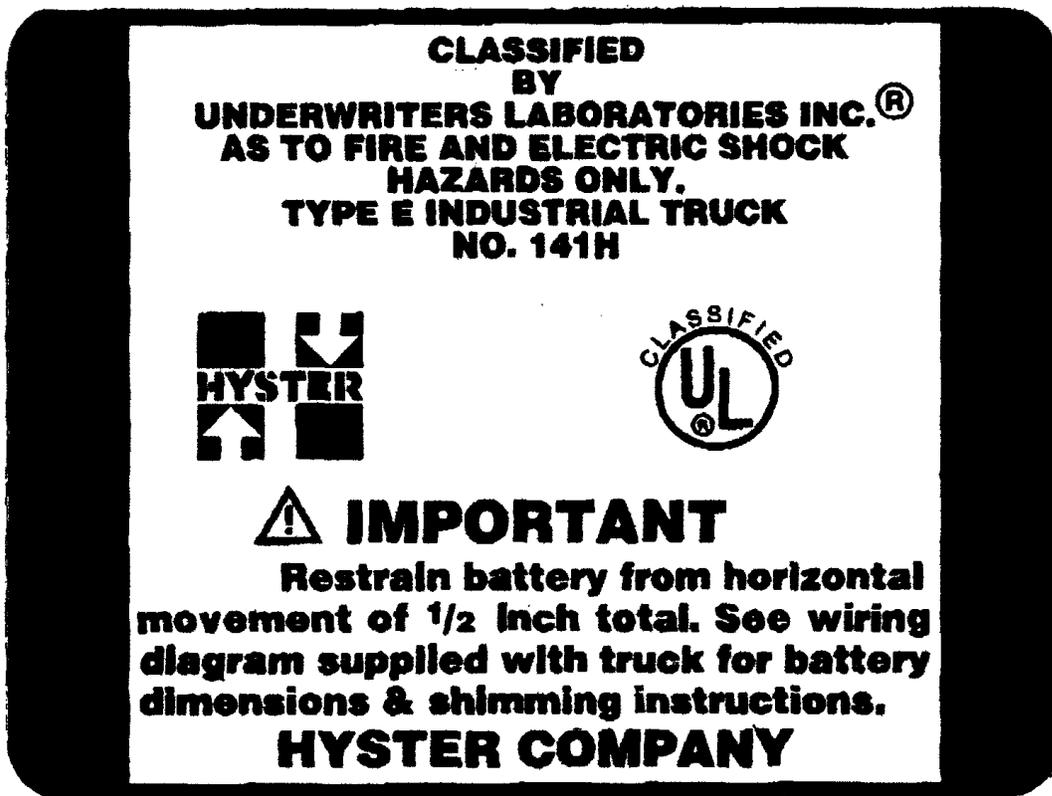
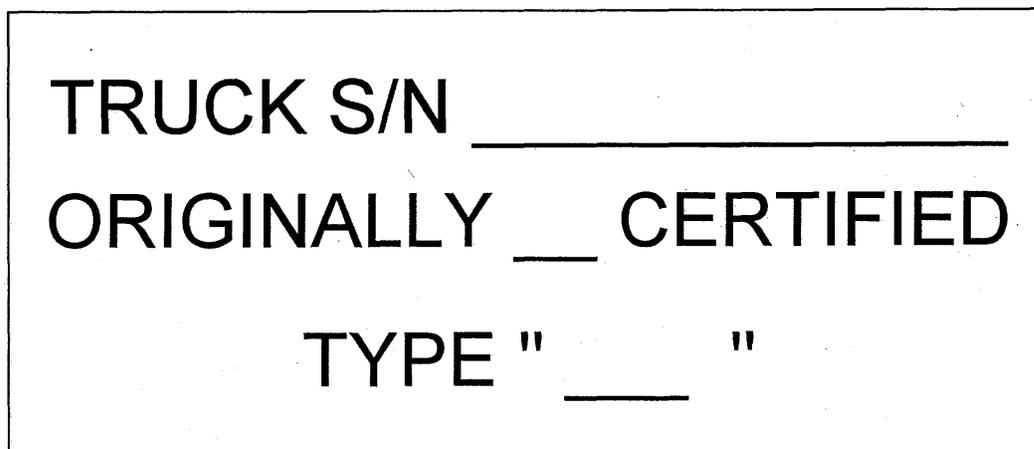


FIGURE 5-6. Typical Example of Accredited Laboratory Certification Plate



RECOMMENDED SIZE: 4" X 1 3/4"

FIGURE 5-7. Replacement Certification Plate

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- i. Warning Decals and Labels. Warning decals and labels, as appropriate, are affixed onto the MHE by the manufacturer to identify potential pinch points or other operator hazards. [Figure 5-8](#) illustrates a typical example of decals and labels affixed onto a shorebase electric forklift truck.
- j. Safe Working Load and Vehicle Weight. The safe working load (SWL) and vehicle weight (VW) shall be clearly printed, in minimum 2-inch high letters, on both sides of the MHE. Additionally, except for all pallet trucks, these markings must be clearly in view of the operator, normally on the mast crossbar, using the largest lettering size that will fit on the area. (Example: SWL 6,000 LBS. VW 10,000 LBS.)

### NOTE

The SWL marking requirement is not applicable to warehouse tractors.

- k. Drawbar Pull Rating. For warehouse tractors ([figure 3-17](#)), the maximum drawbar pull rating (in pounds) shall be marked on the rear of the vehicle.

- l. Registration Number. The unique seven-digit unit serial number (USN), as assigned by NAVICP-M, shall be applied on both sides of the MHE or, if feasible, on the mast in 3-inch high letters. (Example: 13-20000)

- m. SLEP Data Plate. If MHE has undergone a SLEP overhaul, a SLEP data plate in accordance with Commercial Item Description (CID) A-A-50271, with a minimum size of 2-1/2 by 4-1/2 inches, shall be affixed (using mechanical fasteners, adhesive-backed labels/plates, etc.) in the approximate protected area of the manufacturer's data plate. Normally, this is the cowl weldment area of the MHE. The FISC Regional Manager must approve any other data plate locations. The plate shall be Composition A (non-ferrous, base alloy metal), Class 2 (aluminum) or Composition C (photo-sensitive metal) containing the following information: "REMANUFACTURED, Company Name/Activity or Location, and SLEP Date (month and year)."

- n. Lead Free and Chromate Free Paint. Newly procured equipment or existing MHE that has had complete paint removal shall be painted with lead free and chromate free paint. These units shall be labeled with the words, "Painted With Lead Free and Chromate Free Paint On (Month/Year) By (Contractor Name/Facility," clearly printed in a protected location on both sides of the MHE. Lettering shall be a minimum of 1/4 inches in height. Units, especially older models, which do not have this marking and it cannot be verified in the procurement contract, should not be allowed to have this marking requirement unless all existing painting has been removed to the bare metal. However, if the unit does include this marking and the contract verifies it, then the unit may be repainted without removing the paint down to the bare metal and the marking applied as stated above. Touch-up or spot painting does not constitute changing the unit's original marking condition.

- o. Lifting Provisions. If applicable, the lifting provisions shall be identified with 3/4-inch high letters. (Example: LIFT HERE)

- p. Tiedown Points. If applicable, all tiedown points shall be identified with 3/4-inch high letters. (Example: TIEDOWN)

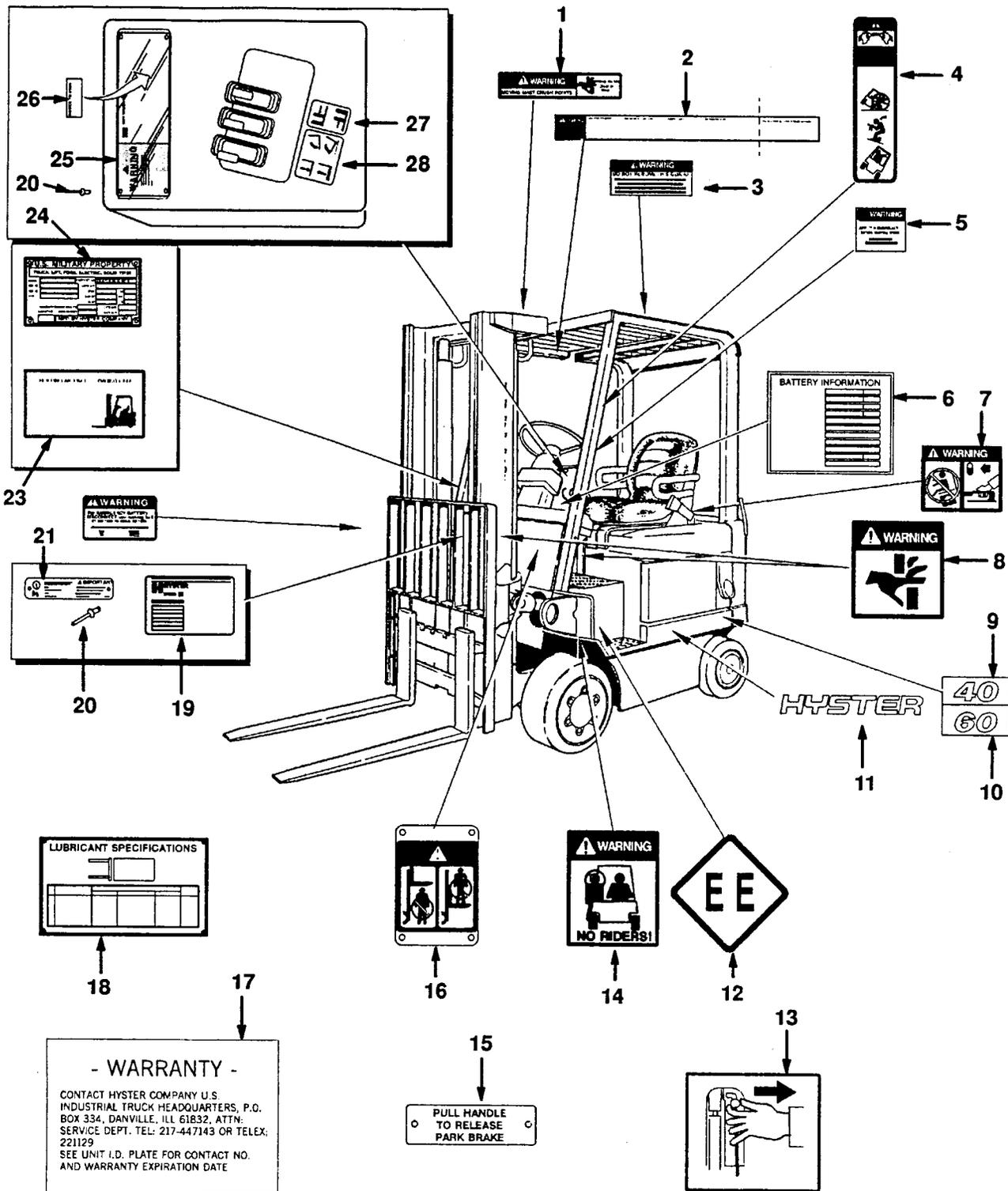


FIGURE 5-8. Warning Decals and Labels (Example) (Sheet 1 of 2)

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<b>INDEX NUMBER</b>	<b>DESCRIPTION</b>	<b>INDEX NUMBER</b>	<b>DESCRIPTION</b>
1	Label-Mast Warning	16	Mast Warning Label
2	Label-Operator Warning	17	Label, Warranty
3	Warning-OHG Impact	18	Chart Lubrication
4	Label-Operator	19	Label-Patents & Trademarks
5	Label-Parkbrake	20	Rivet
6	Battery Plate	21	Original Certification (e.g. UL, FM)
7	Label, Hood Latch	22	Omitted
8	Label-Pinch Point	23	Shipping Data Plate E60XM 36V 102"
9	Model Label-Inch 40	24	Plate-Ident E40XM-MIL 102" Mast 36
10	Model Label-Inch 60	24	Plate-Ident E60XL-MIL 102" Mast 36
11	Label, Hyster	25	Nameplate Cover
12	NFPA Safety Designation	25	Nameplate Label
13	Label, Prop Rod	26	Nameplate Tag
14	Label-No Riders	27	Auxiliary Function Label
15	Label, Park Brake Release	28	Hoist-Tilt Label

**FIGURE 5-8. Warning Decals and Labels (Example) (Sheet 2 of 2)**

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q. Tire Pressure. For pneumatic tires only, the pressure markings for each tire shall be 1-inch letters located on each side of the MHE near the applicable tire. (Example: TP 80 PSI)

r. Fuel Cap. All fuel caps shall be color coded to properly identify the required fuel type. However, JP-5 fuel may be substituted for diesel fuel aboard ship only. [Examples: DIESEL/JP-5 (afloat only) (Green, FED-STD-594 #14090) or GAS (Red, FED-STD-595 #11136)]

s. Shipboard Marking. For shipboard use only, each unit shall be identified with the words, "SHIPBOARD USE APPROVED" in 1-1/2 inch high letters.

t. Striping. Type EX MHE shall have a 6-inch blue diagonal stripe painted at 45 degree angles (top right to bottom left) along both sides and on the rear, as shown in [figure 5-9](#). This stripe shall be in accordance with FED-STD-595, Color No. 15092, or a NAVICP-M approved equivalent.



**FIGURE 5-9. Type EX (Blue Stripe)**

### **5-8. REGULATIONS FOR USING MHE IN SPECIFIC LOCATIONS AFLOAT**

[Table 5-1](#) identifies the types of MHE authorized to handle general supplies in a given operational area afloat. Refer to [29 CFR 1910.178](#) for approved types of MHE authorized afloat when handling hazardous materials (HAZMAT) in given operational areas. Refer to [NAVSEA SW023-AH-WHM-010](#) for approved types of MHE authorized in given operational areas afloat when ammunition and explosives are present. Definitions of operational areas are as follows:

5-8.1. **BELOW DECK**. All stowage compartments within the skin of the ship.

5-8.2. CLOSED LIGHTERS. YFN and modified YFN lighters.

5-8.3. TOP SIDE. All open decks, hangar decks, decks with forced air or flow through ventilation, and open lighters.

**WARNING**

Type DS MHE may be used in closed lighters afloat provided they meet federal, state and local regulations for air quality and noise pollution. Each activity must monitor the emissions in accordance with the manufacturer’s recommendations to ensure that the exhaust emissions do not exceed the personal exposure limits set forth by federal, state or local regulations.

**Table 5-1. Approved MHE Afloat**

Material	Operational Area		
	Below Deck	Closed Lighter	Top Side
General Supply	EE, EX, HS	DS, EE, EX, HS	DS, EE, EX, H, HS

**5-9. REGULATIONS FOR USING MHE IN SPECIFIC LOCATIONS ASHORE**

The activity’s CO/OIC is responsible for determining where the MHE will be used and the potential hazards encountered at each operational area. [Table 5-2](#) identifies the type of MHE authorized to handle general supplies in a given operational area ashore. If an activity desires to use MHE not identified in [table 5-2](#), they are permitted to do so provided a hazards analysis is performed and maintained, and the activity complies with the provisions of [National Fire Protection Association \(NFPA\) 505](#), [29 CFR 1910.178](#) and [OPNAVINST 5100.23 \(series\)](#).

**NOTE**

The use of powered MHE is forbidden in areas where dust vapors are known to, or can reasonably be expected to, reach explosive limits during routine operations (i.e., mixing, bulk weighing, screening, etc.).

Certain types of MHE, as identified in [paragraph 3-2](#), require the installation of gas/vapor detection systems. For MHE not listed in [table 5-2](#), refer to [29 CFR 1910.178](#). Dual-fueled forklift trucks, such as G/CN, GS/CNS, etc., shall only be used in areas authorized by the most restrictive designation.

Refer to [29 CFR 1910.178](#) for approved types of MHE authorized ashore when handling hazardous materials in given operational areas. Refer to [NAVSEA SW023-AH-WHM-010](#) for approved types of MHE authorized in given operational areas ashore when ammunition and explosives are present. Definitions of operational areas are as follows:

5-9.1. **CLOSED.** Buildings, structures, internal rooms and bays, etc., that have restricted ventilation that could allow the formation of a hazardous environment.

5-9.2. **PARTIAL.** Buildings, structures, internal rooms and bays, railcars, motor vehicles, loading ramps, platforms, etc., that have relatively unrestricted ventilation but could allow the formation of a hazardous environment.

5-9.3. **OPEN.** Piers, wharves, areas or structures that may have a roof but has no walls that would not restrict ventilation nor allow the formation of a hazardous environment.

**WARNING**

MHE powered by internal combustion engines may be used in partial operational areas ashore provided they meet federal, state and local regulations for air quality and noise pollution. Each activity must monitor the emissions in accordance with the manufacturer’s recommendations to ensure that the exhaust emissions do not exceed the personal exposure limits set forth by federal, state or local regulations.

**Table 5-2. Approved MHE Ashore**

Material	Operational Area		
	Closed	Partial	Open
General Supply	E, EE, EX, H, HS	CN, CNS, D, DS, DY, E, EE, EX, G, G/CN, G/LP, GS, GS/CNS, GS/LPS, H, HS, LP, LPS	CN, CNS, D, DS, DY, E, EE, EX, G, G/CN, G/LP, GS, GS/CNS, GS/LPS, H, HS, LP, LPS

**5-10. TEMPORARY PARKING**

MHE shall be considered temporarily parked under the following conditions:

a. Whenever the operator leaves the MHE, forks/booms shall be lowered to the floor/deck, controls shall be placed in the neutral position, parking brake shall be set and the ignition switch shall be turned off.

b. Whenever the operator leaves the MHE unattended (is out of sight of the MHE or more than 25 feet away from the MHE, as defined by ASME B56.1), forks/booms shall be lowered to the floor/deck, controls shall be placed in the neutral position, parking brake shall be set, the ignition switch shall be turned off, and the wheels chocked if the MHE is on an incline.

## 5-11. STORAGE OF MHE IN APPROVED OPERATIONAL AREAS ASHORE.

a. The MHE shall meet the requirements of [paragraph 5-10.b](#), and are positioned such that it does not block normal or emergency exits/access. The battery cable connector on electrically-powered MHE shall be disconnected. Keys shall be removed and stored in a controlled limited access area in accordance with local procedures.

b. Liquefied petroleum gas (LPS) and compressed natural gas (CNS) powered MHE shall not be parked near sources of heat, open flames, or similar sources of ignition. LPS type MHE shall not be stored near open pits, underground entrances, elevator shafts or other similar areas. The service valve of LPS or CNS fuel containers shall be closed whenever the MHE is parked overnight or stored indoors.

c. Refer to [NAVSEA SW023-AH-WHM-010](#) for MHE storage requirements when ammunition and explosives are present.

## 5-12. SHIPBOARD STOWAGE OF MHE

MHE shall be stowed aboard ship in authorized areas designated by the CO/OIC under the following conditions:

a. MHE shall meet the requirements of [paragraph 5-10.b](#).

b. MHE shall be stowed in the fore and aft directions, whenever possible.

c. The battery must be disconnected on electrically-powered MHE.

d. A minimum of four tiedowns (e.g., wire rope, chain, universal deck tiedown, etc.) shall be used to secure each MHE. Nylon webbing tiedown assemblies or other nylon-type tiedowns shall not be used to secure MHE. Tiedowns shall be crisscrossed such that the front left tiedown is secured to the deck near the rear left side of the MHE, and the rear left tiedown is secured to the deck near the front left side of the MHE. This process is the same for the right side tiedowns. Stanchion deck tracks are not authorized to tiedown MHE.

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## CHAPTER 6

### EQUIPMENT MANAGEMENT AND CONTROL SYSTEM (EMACS)

#### 6-1. GENERAL

This chapter describes the Equipment Management and Control System (EMACS), which serves as part of the Navy's Materials Handling Equipment (MHE) preventive maintenance program. This program is designed to provide and maintain a record of services performed on MHE and to indicate the specific areas that require servicing. Establishment of this program will eliminate over-servicing that is common when maintenance history is not considered.

#### 6-2. BENEFITS AND FUNCTIONS

The definite maintenance pattern developed from the use of EMACS will provide improved control of maintenance procedures. A typical example of a completed EMACS work order is provided in [figure 6-1](#). The observance of features peculiar to the equipment shall be noted on the EMACS work order of reference in subsequent preventive maintenance inspections. EMACS allows users to perform MHE management on-line. Some of the key benefits for using EMACS are the elimination of hard copy quarterly reports, real time on-line access to inventory and maintenance scheduling, paperwork reduction, and adhoc reporting. The following are a few of the key functions commonly performed while using EMACS:

- a. Equipment identification.
- b. Maintenance tracking.
- c. Quarterly reporting.
- d. Utilization and availability.
- e. Multi-level report capability.

#### 6-3. HARDWARE REQUIREMENTS

All holders of Navy MHE have the capability to manage their inventory and preventive maintenance program using EMACS provided holders possess the following:

- a. A 486 series personal computer (PC) or better.
- b. Internet access (Internet Explorer 5.5 or better).

- c. Windows 98 or better.
- d. Minimum of 100 megabytes (MB) of Random Access Memory (RAM).

Contact the appropriate Fleet Industrial Supply Center (FISC) Regional MHE Manager for EMACS access, password information and training.

**6-4. EMACS TRAINING AND ACCESS**

An account and password is required to access EMACS. Initial or refresher EMACS training may be obtained at no cost from the local FISC Regional MHE Manager. This training may be arranged at a FISC classroom or at a user location where there is sufficient number of students and computers with internet access. After successfully completing the EMACS training, the local FISC Regional MHE manager will provide the user with a user identification (account) and a password. Those ashore commands that choose not to or are unable to implement EMACS electronically will be required to maintain and submit hard copy user worksheets. Afloat units, in conjunction with their type commanders (TYCOM's), may implement and maintain a similar type of shipboard maintenance data management system (e.g., 3M System) containing similar maintenance data information. Table 6-1 provides a list of EMACS user group levels and the types of users assigned to each level. All requests to change authorized access levels in EMACS will be submitted to Naval Inventory Control Point, Mechanicsburg (NAVICP-M) for approval.

**6-5. RESPONSIBILITIES**

The following functions will be performed to assure complete control and management over MHE assets and inventory using the EMACS program.

**Table 6-1. EMACS User Level Groups**

Super User (SU)	Defense Logistics Agency (DLA) EMACS developers, Primary FISC MHE Managers (for their own regional equipment), and NAVICP-M EMACS Coordinator.
Equipment Manager (EM)	NAVICP-M, MHE ISEA, and FISC Personnel (other than primary FISC Regional MHE Managers).
TYCOM(TY)	Type Commanders (for MHE in their regions only).
Inquire Only (Inq)	FISC Regional MHE Managers for other than their own region.
Shop Maintenance (sm)	User and activity maintenance personnel.
Utilization Clerk (uc)	User tracking personnel at Navy activities and FISC's.
Training (trng)	EMACS students in classroom setting.

*Naval Station - Fire Station*

nv\_fisc ulmb7910 EMACS Maintenance Workorder 01/02/07 09:48

EJON RegKey/GSA Type Equip MfgNm UIC/Org Eq Loc Date EOS TmEOS Typ PMdue BaseHr RlsePrevPM PrevMtr MtrRead Date Rlse Time Rlse  
 fs3097 133069326 frk,d,p hyst 62688 lp 166 01/02/06 23:59 p q3 2000 00/12/08 5 55

Preventive Maintenance (quarterly) Cost Account Code: 944021000

Lubrication	Mech	Hours	Mechanical	Mech	Hours	Other	Mech	Hours
service as needed	MM	1.0	make necessary adjustment	MM	0.5	clean as req	MM	0.5
checked all fluid levels			brakes, ck front & rear	MM	1.0	battery clean only		
Total Standard Hours:		1.0	changed oil and filter		1.0			0.5

Meter Change: \_\_\_\_\_ Unscheduled Maintenance Cost Account Code: 944011000

System Mech Hours Maintenance Action Warranty Expires: 97/08/31 One Time Repair Limit: 13770.00

Total Std PM Hrs	Total Act PM Hrs	Overtime PM Hrs	Total Std UM Hrs	Total Act UM Hrs	Overtime UM Hrs	Total EOS Hrs	Date EDP	Time EDP	Date ERM	Time ERM	Total EDP Hrs
2.5	3.0	N/A	0.0	N/A	N/A	3.0	0.00	-	02/05/01	-	0.0

PM Parts Kit Information

Stock Number	Noun	Qty	Stock Number	Noun	Qty	Stock Number	Noun	Qty	Stock Number	Noun	Qty
1377788	filter	1									

Parts Information

Serial Number: d177g15036t

Stock Number	Noun	Unit Cost	Qty	Instld	Source	Stock Number	Noun	Unit Cost	Qty	Instld	Source
1377788	filter	7.60	1		Vista						
9150 00186 6651	Oil/30WT	1.05/6.30	6		Becker						
9150 00485 7316	Grease	39/2.93	7		Becker						
9150 42 000 5138	Spray Lube	30/1.50	5		Becker						
9150 42 000 79 43	Purifier	1.12/2.24	2		State Chemical						

APL: 950006543 Tech Manual NSN: 05321p0004180

Remarks:

Performed By Mike Morgan Inspected By (Signature) Released By (Signature) (SK2) DATE 02-08-01  
 H60xm SW Vogt



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FIGURE 6-1. Typical Example of Completed EMACS Work Order

6-5.1. NAVICP-M. As the central EMACS database manager, NAVICP-M will provide the overall direction and administration for Navy EMACS. In addition, NAVICP-M will maintain and monitor unit and activity allowance records, and review and approve initial MHE allowances and subsequent allowance change requests (ACR's) when significant budgetary impact exists or where an agreement cannot be reached with the requesting activity. For new equipment, upon receipt of DD 250 Form, [figure 6-2](#), NAVICP-M will enter the appropriate equipment data into a temporary shipboard or shore-based Unit Identification Code (UIC) established for each FISC region and will advise the appropriate regional manager of this new receipt. Within fiscal constraints, NAVICP-M will match activity inventories as closely as possible to authorized allowances. NAVICP-M will review requests for system change requests (SCR's), identify and resolve systematic problems at the regional level, and ensure activation of new records as equipment is procured and received by Navy activities.

6-5.2. FISC REGIONAL MHE MANAGERS. All FISC Regional MHE Managers shall maintain a current, regional listing of all MHE users with points of contact in EMACS. They will coordinate the establishment of EMACS accounts with the server administrator, assign level of access to accounts, and provide EMACS user training to all regional users as stated in [paragraph 6-4](#). As required, regional managers will assist NAVICP-M by providing information and technical data relative to their respective regions.

6-5.2.1. New Equipment. The FISC Regional MHE Manager will be notified by NAVICP-M (e.g., message, phone call, DD 1342 Form, [figure 2-2](#), or any other acceptable means of verification) that the new equipment has been physically received in the FISC region. Then the regional manager will perform a UIC transfer from the temporary UIC to the appropriate activity. Additionally, the regional manager will enter all related maintenance schedules and other data required for local regional management.

6-5.2.2. Existing Equipment. For existing equipment, the FISC Regional MHE Manager will ensure utilization, maintenance and repair data is properly entered into EMACS by all user activities. If a user activity is not on-line, the FISC Regional MHE Manager is responsible for entering the required quarterly report data received from each user activity. Likewise, the regional manager will resolve field level user problems and all trouble shooting inquiries, and will submit only systemic and unresolved problems to NAVICP-M. All EMACS SCR's will be submitted to NAVICP-M.

6-5.2.3. War Reserve Materiel (WRM). The FISC Regional MHE Manager will be responsible for maintaining the EMACS database for all WRM assets.

6-5.3. MHE USERS. Daily entries, if appropriate, will be the most effective means to maintain current data on utilization, maintenance tasks performed, cost information, and overall MHE readiness. Ashore MHE users are required to submit quarterly reports to their respective FISC Regional MHE Manager no later than the 15th of the month. For example, the first quarter fiscal year report covering the months of October, November and December would be required to be submitted to the respective FISC Regional MHE Manager no later than January 15. Likewise, afloat MHE users who implement a shipboard maintenance data management system must submit similar quarterly summary reports to the respective FISC Regional MHE Manager as stated above. Failure to submit quarterly reports may affect future availability of MHE assets at that activity. [Figure 6-3](#) provides a typical example of a completed quarterly report. [Figure 6-4](#) is a sample of a pre-printed blank EMACS quarterly report to indicate the required fields to be completed by the MHE user and to be submitted to the respective FISC Regional MHE Manager.

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MATERIAL INSPECTION AND RECEIVING REPORT						Form Approved OMB No. 0704-0248	
<p style="font-size: small;">The public reporting burden for this collection of information is estimated to average 30 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0248), 1215 Jefferson Davis Highway, Suite 1204, Arlington, Va. 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.</p> <p style="text-align: center;"><b>PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE ABOVE ADDRESS. SEND THIS FORM IN ACCORDANCE WITH THE INSTRUCTIONS CONTAINED IN THE DFARS, APPENDIX F-401.</b></p>							
1. PROCUREMENT INSTRUMENT IDENTIFICATION (CONTRACT) NO.		ORDER NO.		6. INVOICE NO./DATE		7. PAGE OF	8. ACCEPTANCE POINT
2. SHIPMENT NO.	3. DATE SHIPPED	4. B/L TCN		5. DISCOUNT TERMS			
9. PRIME CONTRACTOR CODE			10. ADMINISTERED BY CODE				
11. SHIPPED FROM (If other than 9) CODE			FOB:		12. PAYMENT WILL BE MADE BY CODE		
13. SHIPPED TO CODE			14. MARKED FOR CODE				
15. ITEM NO.	16. STOCK/PART NO. (Indicate number of shipping containers - type of container - container number.)	DESCRIPTION	17. QUANTITY SHIP/REC'D*	18. UNIT	19. UNIT PRICE	20. AMOUNT	
<b>21. CONTRACT QUALITY ASSURANCE</b> a. ORIGIN <input type="checkbox"/> CQA <input type="checkbox"/> ACCEPTANCE of listed items has been made by me or under my supervision and they conform to contract, except as noted herein or on supporting documents.  DATE _____ SIGNATURE OF AUTHORIZED GOVERNMENT REPRESENTATIVE TYPED NAME: TITLE: MAILING ADDRESS:  COMMERCIAL TELEPHONE NUMBER:				b. DESTINATION <input type="checkbox"/> CQA <input type="checkbox"/> ACCEPTANCE of listed items has been made by me or under my supervision and they conform to contract, except as noted herein or on supporting documents.  DATE _____ SIGNATURE OF AUTHORIZED GOVERNMENT REPRESENTATIVE TYPED NAME: TITLE: MAILING ADDRESS:  COMMERCIAL TELEPHONE NUMBER:		<b>22. RECEIVER'S USE</b> Quantities shown in column 17 were received in apparent good condition except as noted.  DATE RECEIVED _____ SIGNATURE OF AUTHORIZED GOVERNMENT REPRESENTATIVE TYPED NAME: TITLE: MAILING ADDRESS:  COMMERCIAL TELEPHONE NUMBER:  * If quantity received by the Government is the same as quantity shipped, indicate by (X) mark; if different, enter actual quantity received below quantity shipped and encircle.	
<b>23. CONTRACTOR USE ONLY</b>  _____ _____ _____							

DD FORM 250, AUG 2000

PREVIOUS EDITION IS OBSOLETE

**FIGURE 6-2. DD Form 250, Material Inspection and Receiving Report**

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6-5.4. TYPE COMMANDERS (TYCOM'S). For the EMACS program, TYCOM's will have access to all Unit Identification Codes (UIC's) within their respective Fleet commands and will be responsible for the collection and submission of user data to the FISC Regional MHE Manager level on a quarterly basis. If EMACS is not implemented, TYCOM's will be responsible to ensure that afloat units maintain a maintenance data management system and that quarterly summary reports are submitted to the FISC Regional MHE Manager as described in [paragraph 6-5.3](#).

### 6-6. EMACS CHANGE REQUEST

Any field level user change request or systematic problems encountered with the EMACS program will be sent to the respective FISC Regional MHE Manager for resolution. Any problems that cannot be resolved at the regional level will be forwarded to NAVICP-M for final resolution.

nv\_fisc  
prtwksht:ulme2005

User Worksheets

Page: 1  
01/11/30 09:36

UIC: 0067a	USN/	Reg Key	EJON	Previous Meter Reading	Current Meter Reading	* Monthly Downtime *				Repair Cost Not Reported	Date Last In Shop	Remarks
						EOS Hrs	PM Hrs	UM Hrs	EDP Hrs			
130265930	nvk665			109	121	8.0	4.0	4.0	0.0	\$300.00	11/04/01	
130502972	jdk1774			7	22	3.0	3.0	0.0	0.0	\$ 25.36		New unit received 11/01/01
130567790	ss0431			1282	1312	121.0	8.0	20.0	93.0	\$954.00	10/29/01	
132248273	nv1297			1328	1330	6.0	6.0	0.0	0.0	\$123.45		
132248277	rm1299			1251	1299	4.0	4.0	0.0	0.0	\$ 34.78		
137005354	rm2405			138	210	9.0	3.0	0.0	6.0	\$183.66		Still in shop
137069356	nv5038			653	790	11.0	3.0	0.0	8.0	\$432.87		
137069367	nv5049			469	512	3.0	3.0	0.0	0.0	\$ 121.90		
137088616	nvk453			11	200	12.0	2.0	10.0	0.0	\$ 99.18		
137090115	nv3355			412	440	19.0	8.0	0.0	11.0	\$178.90		
139070285	nvk445			66	100	2.0	0.0	2.0	0.0	\$ 78.23		

Count: 11

Total records selected: 11

Report Complete -- EMACS 7.7

FIGURE 6-3. Example of Completed EMACS Quarterly Report

nv\_fisc  
prtwksht:ulme2005

User Worksheets

UIC: 0067a	USN/	Reg Key	EJON	Previous Meter Reading	Current Meter Reading	* Monthly Downtime *				Repair Cost Not Reported	Date Last In Shop	Remarks
						EOS Hrs	PM Hrs	UM Hrs	EDP Hrs			
130265930			nvk665	109								
130502972			jk1774	7								
130567790			ss0431	1282								
132248273			nv1297	1328								
132248277			rm1299	1251								
137005354			rm2405	138								
137069356			nv5038	653								
137069367			nv5049	469								
137088616			nvk453	11								
137090115			nv3355	412								
139070285			nvk445	66								

Count: 11

Total records selected: 11

Report Complete -- EMACS 7.7

FIGURE 6-4. Blank EMACS Quarterly Report

## CHAPTER 7

### PRODUCT DEFICIENCY REPORTING

#### 7-1. GENERAL

This chapter describes the specific types of reporting methods when deficiencies are noted on new or existing Materials Handling Equipment (MHE). For deficiencies noted on MHE that have undergone the Service Life Extension Program (SLEP), refer to Technical Memorandum No. PHST-35-00.

#### 7-2. MANUFACTURER WARRANTIES

Manufacturer warranties protect the Government by guaranteeing the MHE against defective material, poor workmanship, and inadequate design. Warranties vary with contractor and contracting office. A typical manufacturer's warranty extends for a period of 1 year (ashore) or 18 months (afloat) from the initial date of delivery to the U.S. Navy. However, this warranty limitation does not apply to latent defects that may later become apparent within normal service life expectancy.

#### 7-3. MHE DEFICIENCIES

Activities ashore and afloat shall inspect all new or SLEP MHE in accordance with [paragraph 8-4](#) prior to use to identify any deficiencies. Deficiencies will fall into one of the following categories:

- a. Damage deficiencies sustained in shipment ([paragraph 7-3.1](#)).
- b. Safety deficiencies ([paragraph 7-3.2](#)).
- c. Warranty deficiencies ([paragraph 7-3.3](#)).
- d. Contract deficiencies ([paragraph 7-3.4](#)).
- e. Manufacturer's technical manual deficiencies ([paragraph 7-3.5](#)).

**7-3.1. DAMAGE DEFICIENCIES SUSTAINED IN SHIPMENT.** The Supply Discrepancy Report (SDR) Program is a discrepancy reporting and resolution system. It is a tool to measure the quality of shipper performance and customer support. It is used to report shortages in shipment and transportation damages. Refer to NAVSUP Publication 723 for complete procedures and instructions related to SDR's. The Report of Discrepancy (ROD) (Standard Form 364), [figure 7-1](#), shall still be used to report any SDR until this form is revised. The SDR is processed through the local receiving activity who will seek appropriate resolution of the deficiency with the shipper. Shipper deficiencies and the SDR process are governed by SECNAVINST 4355.18 (series).

7-3.2. SAFETY DEFICIENCIES. MHE containing deficiencies affecting safe operation shall be immediately removed from service until corrective action has been completed. A Product Quality Deficiency Report (QDR) (Standard Form 368), [figure 7-2](#), shall be used by all activities to report unsatisfactory performance or failures attributed to faulty design or material in MHE. The completed QDR shall be forwarded to the MHE Program Manager at Naval Inventory Control Point Mechanicsburg (NAVICP-M) (Code 058133) with a copy to the Naval Surface Warfare Center (NAVWARCEN), Indian Head Division Detachment Earle, Naval Packaging, Handling, Storage and Transportation (PHST) Center (Code 71) for investigation and resolution. For urgent or potential safety deficiencies, a message may be generated and forwarded to NAVICP-M and the Naval PHST Center to expedite the engineering investigation process. NAVICP-M will identify and, if necessary, notify other activities affected by this safety deficiency. After initial reporting of the safety deficiencies, activities shall pursue the same action identified in the following paragraphs for warranty and contract deficiencies. In-house repairs to correct a safety deficiency shall have the manufacturer's authorization.

7-3.2.1. Conditions for Reporting Product QDR's. A Product QDR will be submitted when a deficiency occurs, or recurs, under any of the following circumstances:

- a. Deficiency constitutes a hazard to personnel or equipment regardless of the nature or incidence of failures.
- b. Deficiency involves general unsatisfactory operation or performance of equipment, including new equipment just placed in operation.
- c. Deficiency is due to inadequacy in the design of certain components considered necessary for proper operation, maintenance, or handling of equipment.
- d. Deficiency is due to excessive wear and deterioration for the period of time and conditions under which the item was in use or on hand.
- e. Deficiency is apparently due to faulty material.
- f. Deficiency is due to circumstances other than those indicated above, but is considered to be of sufficient importance to warrant reporting to a higher authority.

7-3.2.2. Preparing QDR's. The following procedures apply to the preparation and submission of Product QDR's, that involve the operation of MHE. This guidance is not intended to change Standard Operating Procedures (SOP's) for all QDR's, but is to ensure more timely and complete processing of problems involving MHE.

- a. Initiation. QDR's which are initiated by the FISC Regional MHE Manager or other shore activities shall be forwarded directly to NAVICP-M (Code 058133) with a copy to the Naval PHST Center (Code 71). QDR's initiated by units afloat shall be completed and forwarded to the appropriate TYCOM, that will determine if a Fleet-wide problem exists, but in any case, the TYCOM will immediately forward the QDR to NAVICP-M (Code 058133). Any defect reported as a casualty report (CASREP) should also be forwarded with the QDR to NAVICP-M (Code 058133).

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## INSTRUCTIONS

DEPARTMENT OF DEFENSE: DLAR 4140.55/AR 735-11.2/NAVSUPINST 4440.127E/AFR 400-54/MCO 4430.3E, Reporting of Item and Packaging Discrepancies, and/or DLAR 4140.60/AR 12-12/NAVSUPINST 4920.9B/AFR 67-7/MCO 4140.1B, Processing Discrepancy Reports Against Foreign Military Sales Shipments. CIVILIAN AGENCIES: See FPMR handbook cited in 19(2)(a).

<b>REPORT OF DISCREPANCY (ROD)</b>				1. DATE OF PREPARATION		2. REPORT NUMBER			
<input type="checkbox"/> SHIPPING <input type="checkbox"/> PACKAGING									
3. TO (Name and address, include ZIP Code)				4. FROM (Name and address, include ZIP Code)					
5a. SHIPPER'S NAME				5b. NUMBER AND DATE OF INVOICE		6. TRANSPORTATION DOCUMENT NUMBER (GBL., Waybill, TCN, etc.)			
7a. SHIPPER'S NUMBER (Purchase Order/Shipmen., Contract, etc.)			7b. OFFICE ADMINISTERING CONTRACT			8. REQUISITIONER'S NUMBER (Requisition, Purchase Request, etc.)			
9. SHIPMENT, BILLING, AND RECEIPT DATA						10. DISCREPANCY DATA			11.
NSN/PART NUMBER AND NOMENCLATURE (a)		UNIT OF ISSUE (b)	QUANTITY SHIPPED/ BILLED (c)	QUANTITY RECEIVED (d)	QUAN- TITY (a)	UNIT PRICE (b)	TOTAL COST (c)	CODE (d)	AC- <sup>2</sup> TION CODE
12. REMARKS (Continue on separate sheet of paper if necessary)									

1 DISCREPANCY CODES		2 ACTION CODES	
<b>CONDITION OF MATERIAL</b> C1 - In condition other than that indicated on release/receipt document C2 - Expired shelf life C3 - Damaged parcel post shipment <b>SUPPLY DOCUMENTATION</b> D1 - Not received D2 - Illegible or mutilated D3 - Incomplete, improper or without authority (Only when receipt cannot be properly processed) <b>MISDIRECTED MATERIAL</b> M1 - Addressed to wrong activity <b>OVERAGE/DUPLICATE SHIPMENTS</b> O1 - Quantity in excess of that on receipt document O2 - Quantity in excess of that requested (Other than unit of issue pack) O3 - Quantity duplicates shipment <b>PACKAGING DISCREPANCY</b> P1 - Improper preservation P2 - Improper packing P3 - Improper marking P4 - Improper unitization	<b>PRODUCT QUALITY DEFICIENCIES</b> Q1 - Deficient material (Applicable to Grant Aid and FMS shipments) <b>SHORTAGE OF MATERIAL</b> S1 - Quantity less than that on receipt document S2 - Quantity less than that requested (Other than unit of issue pack) S3 - Non-receipt of parcel post shipments <b>ITEM TECHNICAL DATA MARKINGS (i.e., Name Plates, Log Books, Operating Handbooks, Special Instructions, etc.)</b> T1 - Missing T2 - Illegible or mutilated T3 - Precautionary operational markings missing T4 - Inspection data missing or incomplete T5 - Serviceability operating data missing or incomplete T6 - Warranty data missing <b>WRONG ITEM (Identify requested item as a separate copy in Item 9 above)</b> W1 - Incorrect item received W2 - Unacceptable substitute <b>OTHER DISCREPANCIES</b> Z1 - See remarks	1A - Disposition instructions requested (Reply on reverse) 1B - Material being retained (See remarks) 1C - Supporting supply documentation requested 1D - Material still required expedite shipment (Not applicable to FMS) 1E - Local purchase material to be returned at supplier's expense unless disposition instructions to the contrary are received within 15 days (Reply on reverse) (Not applicable to FMS) 1F - Replacement shipment requested (Not applicable to FMS) 1G - Reshipment not required. Item to be re-requisitioned 1H - No action required. Information only. 1Z - Other action requested (See remarks)	

13. FUNDING AND ACCOUNTING DATA	
14a. TYPED OR PRINTED NAME, TITLE, AND PHONE NUMBER OF PREPARING OFFICIAL	14b. SIGNATURE
15. DISTRIBUTION ADDRESSEES FOR COPIES	

**FIGURE 7-1. SF 364, Report of Discrepancy (Sheet 1 of 2)**

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16. FROM:		17. DISTRIBUTION ADDRESSEES FOR COPIES	
18. TO:		<p>Use window envelope to mail this document. Insert name and address, including ZIP Code, starting one typing space below the left dot. Each address line must NOT extend beyond right dot. Address must not exceed four single space typing lines.</p>	
19. IN ACCORDANCE WITH NOTICE OF DISCREPANCY ON FACE OF THIS FORM:			
Fold here a. MATERIAL	<input type="checkbox"/> HAS BEEN SHIPPED <input type="checkbox"/> WILL BE SHIPPED	DOCUMENT NUMBER	b. <input type="checkbox"/> NO RECORD OF SHIPMENT. RESUBMIT REPORT TO PROPER OFFICE UNDER APPROPRIATE REGULATION.
c. <input type="checkbox"/> AN ADJUSTMENT IN BILLING HAS BEEN/WILL BE PROCESSED AS A:	<input type="checkbox"/> CREDIT <input type="checkbox"/> DEBIT	d. <input type="checkbox"/> INVOICE/BILL ATTACHED	e. <input type="checkbox"/> PROOF OF DELIVERY (Parcel Post Shipments) OR EVIDENCE OF SHIPMENT ENCLOSED.
f. <input type="checkbox"/> AN ADJUSTMENT IN BILLING FOR THE REPORTED DISCREPANCY WILL NOT BE PROCESSED FOR THE FOLLOWING REASON WHICH IS CITED IN THE INDICATED REGULATION.			
(1) REASON FOR NOT PROCESSING		(2) PRESCRIBING REGULATION	
(a) DISCREPANCY WAS NOT REPORTED WITHIN THE TIME FRAMES ALLOWED AND/OR		(a) CHAPTER 5 OF THE GSA HANDBOOK, DISCREPANCIES OR DEFICIENCIES IN GSA OR DOD SHIPMENTS, MATERIAL, OR BILLINGS (FPMR 101-26.8)	
(b) DOLLAR VALUE DOES NOT MEET THE CRITERIA PRESCRIBED IN THE REGULATION OR AGREEMENT INDICATED IN 19f(2)		(b) CHAP. 2 AND/OR 7 OF DOD 4000.25-7-M, MILITARY STANDARD BILLING SYSTEM (MILSBILLS) AND/OR DD 1513, U.S. DOD OFFER AND ACCEPTANCE, AS APPLICABLE.	
20. THE FOLLOWING DISPOSITION IS TO BE MADE OF THE REFERENCED MATERIAL:			
a. <input type="checkbox"/> PROCESS FOR DISPOSAL IN ACCORDANCE WITH SERVICE/AGENCY DIRECTIVES	b. <input type="checkbox"/> REPRESENTATIVE WILL CALL FOR DISCUSSION CONCERNING DISPOSITION IN:	DAYS	
c. <input type="checkbox"/> RETAIN MATERIAL AT NO CHARGE.	d. <input type="checkbox"/> MATERIAL WILL BE PICKED UP IN:	DAYS	
e. <input type="checkbox"/> SHIP MATERIAL ( <i>Specify location</i> ):			
(1) <input type="checkbox"/> GBL APPROPRIATION CHARGEABLE:			
(2) <input type="checkbox"/> CHARGES COLLECT - VIA: <input type="checkbox"/> FREIGHT <input type="checkbox"/> EXPRESS <input type="checkbox"/> PARCEL POST			
(3) <input type="checkbox"/> PARCEL POST LABEL ATTACHED    (4) <input type="checkbox"/> FREIGHT PREPAID			
(\$ _____ postage advanced herewith. NOTE: Please enclose postage. Material cannot be returned Parcel Post collect.)			
f. <input type="checkbox"/> OTHER ( <i>Specify</i> )			
21. <input type="checkbox"/> IF MATERIAL IS STILL REQUIRED, SUBMIT NEW REQUISITION	22. <input type="checkbox"/> REPLACEMENT WITH SATISFACTORY MATERIAL WILL BE MADE ON OR BEFORE:	DATE	
23. REMARKS ( <i>Continue on separate sheet of paper if necessary</i> )			
24a. TYPED OR PRINTED NAME AND PHONE NUMBER OF PREPARING OFFICIAL	24b. SIGNATURE	24c. DATE	

STANDARD FORM 364 BACK (REV. 2-80)

**FIGURE 7-1. SF 364, Report of Discrepancy (Sheet 2 of 2)**

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PRODUCT QUALITY DEFICIENCY REPORT					<input type="checkbox"/> CATEGORY I		<input type="checkbox"/> CATEGORY II		
1a. FROM (Originator)					2a. TO (Screening point)				
1b. NAME, TELEPHONE NO. AND SIGNATURE			1c. DATE		2b. NAME, TELEPHONE NO. AND SIGNATURE			2c. DATE	
3. REPORT CONTROL NO.		4. DATE DEFICIENCY DISCOVERED		5. NATIONAL STOCK NO. (NSN)		6. NOMENCLATURE			
7a. MANUFACTURER/CITY/STATE			7b. MFRS. CODE		7c. SHIPPER/CITY/STATE			8. MFRS. PART NO.	
9. SERIAL/LOT/BATCH NO.		10a. CONTRACT NO.		10b. PURCHASE ORDER NO.		10c. REQUISITION NO.		10d. GBL NO.	
11. ITEM <input type="checkbox"/> NEW <input type="checkbox"/> REPAIRED/ OVERHAULED		12. DATE RECD., MFRD., REPAIRED, OR OVERHAULED		13. OPERATING TIME AT FAILURE		14. GOVERNMENT FURNISHED MATERIAL <input type="checkbox"/> YES <input type="checkbox"/> NO			
15. QUANTITY		a. RECEIVED		b. INSPECTED		c. DEFICIENT		d. IN STOCK	
16. DEFICIENT ITEM WORKS ON/WITH	a. END ITEM <i>(Aircraft, mower, etc.)</i>	(1) TYPE/MODEL/SERIES						(2) SERIAL NO.	
	b. NEXT HIGHER ASSEMBLY	(1) NATIONAL STOCK NO. (NSN)		(2) NOMENCLATURE		(3) PART NO.		(4) SERIAL NO.	
17. UNIT COST \$		18. ESTIMATED REPAIR COST \$		19a. ITEM UNDER WARRANTY? <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN		19b. EXPIRATION DATE			
20. WORK UNIT CODE/EIC <i>(Navy and Air Force Only.)</i>									
21. ACTION/DISPOSITION <input type="checkbox"/> HOLDING EXHIBIT FOR _____ DAYS <input type="checkbox"/> RELEASED FOR INVESTIGATION <input type="checkbox"/> RETURNED TO STOCK <input type="checkbox"/> DISPOSED OF <input type="checkbox"/> REPAIRED <input type="checkbox"/> OTHER <i>(Explain in Item 22)</i>									
22. DETAILS <i>(Describe, to best ability, what is wrong, how and why, circumstances prior to difficulty, description of difficulty, cause, action taken, including disposition, recommendations. Attach copies of supporting documents. Continue on separate sheet if necessary.)</i>									
23. LOCATION OF DEFICIENT MATERIAL									
24a. TO (Action Point)					25a. TO (Support Point) <i>(Use Items 26 and 27 if more than one)</i>				
24b. NAME, TELEPHONE NO. AND SIGNATURE			24c. DATE		25b. NAME, TELEPHONE NO. AND SIGNATURE			25c. DATE	
26a. TO (Support Point)					27a. TO (Support Point)				
26b. NAME, TELEPHONE NO. AND SIGNATURE			26c. DATE		27b. NAME, TELEPHONE NO. AND SIGNATURE			27c. DATE	

368-102  
NSN 7540-00-133-5541

**STANDARD FORM 368 (REV. 10-85) (EG)**  
GENERAL SERVICES ADMINISTRATION  
(FPMR 101-26.8)  
Designed using Perform Pro, WHS/DIOR, Mar 97

**FIGURE 7-2. SF 368, Product Quality Deficiency Report (Blank) (Sheet 1 of 2)**

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28. FINDINGS AND RECOMMENDATIONS OF INVESTIGATION. (Explain in detail. Continue on a separate sheet of paper, if necessary.)

29. ACTION TAKEN

30. RESULTS OF DEPOT SURVEILLANCE

## INSTRUCTIONS

1a. FROM (Originator) - Complete name of activity (no acronyms when sending deficiency report across component lines), activity address code (ACC), address including zip code of the activity originating the report.

1b. NAME, TELEPHONE NO., AND SIGNATURE - Provide name, telephone no., (include all available telephone numbers; FTS; Autovon, and commercial) and signature of an individual who can serve as a contact for questions regarding the report and/or to request exhibits or samples.

1c. DATE - Enter date report was signed and forwarded to the screening or action point.

2a. TO (Screening Point) - The originating point will complete name of the screening point activity (no acronyms when deficiency report will be sent across component lines), the activity address code (AAC), address including zip code of the screening point where the report needs to be sent by the originator's activity. For those activities that do not have screening points, leave blank.

2c. DATE - Enter the date the person finished processing the report at the screening point.

3. REPORT CONTROL NUMBER - Number assigned to report when a numbering system is used. Those activities which are reporting quality deficiencies across component lines and are to comply with the DLA Regulation 4155.24 should reference the report control number as prescribed in the regulation.

7a. MANUFACTURER/CITY/STATE - Name of the manufacturer, the maintenance contractor, or Government activity which last repaired or overhauled the deficient item. For motor vehicles or components thereof, enter name of manufacturer of the vehicle or component, as appropriate.

7b. MANUFACTURER'S CODE - Code of the manufacturer as listed in Cataloging Handbook H4.1 (Name to code), Federal Supply Code for Manufacturers (United States and Canada).

7c. SHIPPER/CITY/STATE - When the shipper of an item is different from the manufacturer, also include the shipper's or supplier's name.

9. SERIAL/LOT/BATCH NO. - Manufacturer's serial, lot, or batch number of deficient item as applicable.

10. CONTRACT, PURCHASE ORDER, REQUISITION; GOVERNMENT BILL OF LADING (GBL) NO. - Enter these numbers or any other available transportation document number in lieu of the GBL. Such numbers appear on the container, purchase document and/or the item. It is extremely helpful if these items are furnished when the material was supplied by GSA.

11. ITEM - Check the appropriate block; provide the dates manufactured and received in Block 12, if available.

13. OPERATING TIME AT FAILURE - Time item had been in operation since new, overhauled, or repaired when the deficiency was discovered, citing the appropriate performance element (miles, cycles, hours, etc.).

15c. QUANTITY DEFICIENT - Enter the quantity found deficient of those inspected.

15d. QUANTITY IN STOCK - Enter the quantity of material from the same manufacturer remaining in stock.

17. UNIT COST - Dollar value of the deficient item when known. Not applicable on reporting vehicles to GSA.

18. ESTIMATED REPAIR COST - Unit cost times number of units for replacement or estimated repair costs (including overhead) times number of units for correcting all the deficient items reported when it can readily be determined. Not applicable on reporting vehicles to GSA.

19. ITEM UNDER WARRANTY - Check if item is known to be covered by contractor warranty. If yes, provide expiration date.

21. ACTION/DISPOSITION - A check in the appropriate block to indicate the action taken or requested. When an exhibit or sample is being held, indicate the number of days in the space provided. (An exhibit or sample shall be held for a minimum of 30 calendar days from date the report is transmitted to the action point. Reporting activities are reminded that the packaging, packing and shipping containers are to be held along with the exhibits to facilitate investigation.) When none of the items indicate the actions or disposition taken or requested, check "Other" and identify the nature of the action taken or requested in item 22.

23. LOCATION OF DEFICIENT MATERIAL - Address and location of deficient material.

24a. TO (Action Point) - Name, in the clear address, including zip code of the action point to which the report is being submitted.

24c. DATE - Enter the date the report was forwarded to an action point or the date the findings and recommendations were completed.

28. FINDINGS AND RECOMMENDATIONS OF INVESTIGATION - Include the findings and recommendations for resolution of complaint.

29. ACTION TAKEN - State the action taken to resolve the complaint.

30. RESULTS OF DEPOT SURVEILLANCE - Show results of depot surveillance and planned action (i.e. replacement or repair by contractor, disposal, issue, etc.).

STANDARD FORM 368 BACK (REV. 10-85)

FIGURE 7-2. SF 368, Product Quality Deficiency Report (Blank) (Sheet 2 of 2)

b. Completing QDR's. Instructions are provided in [figure 7-2](#) to properly complete the Product QDR. Other equivalent forms (e.g., CASREP, email, etc.) may be used provided the same information required on the Product QDR is documented on that form. Additionally, when completing details (block 22), provide as many specific details about the failure as possible. If applicable, provide the part number of the failed component, the USN number, and the manufacturer's serial number. If more than one MHE has the same failure, provide the USN number and serial number for each unit affected. Also, ensure that a point of contact, including an accurate phone number, is documented on the QDR. In addition to being provided as [figure 7-2](#), blank Product QDR Forms are available through the supply system (NSN 7640-00-133-5541) and internet sites, including <http://web1.whs.osd.mil/forms/sf0368.pdf> and [www.supply.dla.mil/pdfs/sf368.pdf](http://www.supply.dla.mil/pdfs/sf368.pdf).

c. Screening Point. Upon receipt of any QDR, NAVICP-M (Code 058133) will serve as the screening point, forward the QDR to the MHE In-Service Engineering Agent (ISEA) and to the Defense Logistics Agency (DLA) contracting officer, and contact the QDR originator and other supporting Commands with the final resolution. NAVICP-M will actively manage all QDR's. When closure to the QDR has been established, NAVICP-M will report these results.

(1) ISEA Responsibility. The MHE ISEA will review the QDR and determine whether or not a safety hazard exists. If safety is a consideration, the MHE ISEA shall immediately issue a message to all concerned advising of precautions to be taken and the plan of action to process the QDR. If safety is not a factor, NAVICP-M will issue a message advising the nature of the QDR and plans to process the QDR.

(2) DLA Responsibility. The DLA contracting officer will review the QDR and determine whether or not the equipment is under manufacturer warranty. If under warranty, the contracting officer will be requested by NAVICP-M to contact the manufacturer within 24 hours and establish an agreement to investigate the QDR and initiate repair or modification actions as soon as possible. NAVICP-M will monitor the progress of this activity to assure timeliness and accuracy in response to the QDR. If not under warranty, the contracting officer will determine if a product latent defect exists and will pursue a solution to the QDR from that perspective. If no warranty or latent defect features apply, the contracting officer is to notify NAVICP-M of that decision as soon as possible.

d. Status of QDR's. Regardless of the QDR decision, NAVICP-M will make at least biweekly contact with the contracting officer to determine the status of the QDR review. If a warranty or latent defect applies, NAVICP-M will ensure the manufacturer generates a repair plan within a reasonable period of time, and will notify Fleet users as to the status of the QDR. All repairs under these circumstances are to be completed at the site of the submitting activity. If no warranty or latent defect feature can be applied, NAVICP-M will schedule a meeting with all activities concerned to develop a repair plan. Usually as a general rule, the user activity will be responsible for repair payment in these instances. If a Fleet-wide problem exists, NAVICP-M will attempt to acquire and provide funding, as available.

7-3.3. **WARRANTY DEFICIENCIES**. For reporting MHE deficiencies that are still under the manufacturer's warranty, the same Product QDR process as stated in [paragraph 7-3.2](#) applies.

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7-3.4. **LATENT DEFICIENCIES.** For reporting MHE deficiencies that are beyond the manufacturer's warranty, the same Product QDR process as stated in [paragraph 7-3.2](#) applies.

7-3.5. **MANUFACTURER'S TECHNICAL MANUAL DEFICIENCIES.** Whenever any errors, omissions or suggestions for improvement involve the appropriate manufacturer's technical manual, which is provided with each class of MHE, a Manufacturer's Technical Manual Deficiency/Evaluation Report (TMDER), [figure 7-3](#), shall be completed and submitted to the NAVICP-M. NAVICP-M will contact and inform the manufacturer of such deficiencies and will report all resolutions.

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<b>MANUFACTURER'S TECHNICAL MANUAL DEFICIENCY/EVALUATION REPORT</b>				
INSTRUCTIONS: USE THIS REPORT TO INDICATE DEFICIENCIES, USER REMARKS AND RECOMMENDATIONS RELATING TO PUBLICATIONS. CONTINUE ON 8-1/2 X 11" PAPER, IF ADDITIONAL SPACE IS NEEDED.				
1. TECHNICAL MANUAL STOCK NO.	2. INITIAL DATE, REVISION DATE OR CHANGE DATE.	3. TM TITLE.		
4. MANUFACTURER.		5. MODEL		
6. CONTRACT NO.	7. SERIAL NUMBERS	8. USN(S)		
9. CHAPTER/PARAGRAPH/APPENDIX		10. REPORT CONTROL NUMBER (FORMAT IS UIC CODE)-YY-XXXX		
11. RECOMMENDED CHANGES TO TECH MEMO AND REASONS FOR CHANGE				
A. PAGE NO.	B. PARAGRAPH	C. RECOMMENDED CHANGES AND REASONS		
12. ORIGINATOR AND WORK CENTER (Print)		13. DATE	14. DSN & COMM. NO.	15. TRANSMITTED TO
16. UIC, SHIP HULL NO. AND ADDRESS (Do Not Abbreviate)				

**FIGURE 7-3. Manufacturer's Technical Manual Deficiency/Evaluation Report (TMDER)**

[\*\*CLICK HERE TO REPRODUCE AND COMPLETE TMDER FOR SUBMISSION.\*\*](#)

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## CHAPTER 8

### PREVENTIVE MAINTENANCE

#### 8-1. GENERAL

The purpose of this chapter is to present the basic preventive maintenance practices which will assure the satisfactory performance of Materials Handling Equipment (MHE). For specific preventive maintenance, corrective maintenance, scheduled lubrication and inspection of safety devices, reference should also be made to the manufacturer's technical manual that is supplied with the equipment.

#### 8-2. RESPONSIBILITIES

Preventive maintenance and support funding is the direct responsibility of the MHE allowance holder of record and the indirect responsibility of personnel who operate MHE. For this reason, all personnel who operate MHE must satisfy the operator qualification requirements described in [chapter 4](#). Likewise, to comply with ASME B56.1, maintenance and inspection on all powered industrial MHE shall be performed in conformance with the following practices:

a. A scheduled planned maintenance, lubrication, and inspection system [e.g., Equipment Management and Control System (EMACS), Maintenance Material Management (3M) Manual, Maintenance Index Pages (MIPs) with their associated Maintenance Requirement Cards (MRC's), etc.] shall be followed. Consult the manufacturer's recommendations as well.

b. Only trained, knowledgeable or experienced personnel shall be authorized to maintain, repair, adjust, and inspect industrial MHE, and in accordance with manufacturer's specifications.

8-2.1. OPERATOR RESPONSIBILITIES. MHE operators shall perform pre-operational and post-operational visual inspections and functional tests prior to placing any MHE in service.

##### 8-2.1.1. Powered MHE Operators.

a. Initial Operator. The first operator shall conduct a daily pre-operational safety inspection of the MHE, by completing the "START" portion of the MHE Inspection Form, [figure 8-1](#). Only the applicable inspection criteria shall apply; procedures that do not apply may be obliterated for that particular MHE class. Procedures are documented on the back of the MHE Inspection Form to support each inspection criteria. If the MHE passes all required inspections and functional tests, the MHE Inspection Form shall be signed and dated by the operator and shall be attached to the MHE.

b. Subsequent Operators. When operational circumstances requires more than one operator to use the MHE during the course of a shift or evolution, the subsequent operators shall review the initial

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operator's completed "START" portion of the MHE Inspection Form, [figure 8-1](#). If the MHE is found acceptable, the original MHE Inspection Form shall remain with the MHE.

c. Last Operator. The last operator shall conduct a daily post-operational safety inspection of the MHE by completing the "FINISH" portion of the MHE Inspection Form, [figure 8-1](#). If no defects are noted, the MHE Inspection Form shall be maintained in accordance with local procedures.

d. Reporting Defects. All operators shall record all defects on the MHE Inspection Form, [figure 8-1](#), notify immediate supervisor of defects, and turn in the MHE for repairs in accordance with local procedures.

8-2.1.2. Non-Powered MHE Operators. Operators of non-powered MHE shall conduct inspections and functional tests in accordance with applicable MRC's (afloat) or manufacturer's technical manuals (ashore). Completion of the MHE Inspection Form is not required by the operator. If defects are found, notify immediate supervisor of defects and turn in the MHE for repairs in accordance with local procedures.

8-2.1.3. Local Procedural Requirements. As a minimum, all local procedures established shall stipulate the following:

a. A safety deficiency tag-out process, which includes procedures for tagging [e.g., "DO NOT OPERATE" tag (NAVSUP Form 1377/6), [figure 8-2](#), red tag, caution, etc.] unserviceable MHE in a conspicuous location and for removing equipment from service until repairs are made.

b. The MHE Inspection Form, [figure 8-1](#), is kept in the MHE history file only if defects are found and until repairs have been completed.

8-2.2. MAINTENANCE PROVIDER RESPONSIBILITIES. When MHE is scheduled for preventive maintenance servicing, it should be cleaned and lubricated prior to receiving an inspection by authorized personnel. Upon completion of the preliminary servicing, a thorough inspection of the equipment, including an operational test and service inspection, shall be conducted. Preliminary servicing and inspections should be accomplished in accordance with EMACS, the 3M System, the applicable manufacturer's technical manual, or local equivalent procedures, which authorizes minor adjustments to the equipment. If, however, the inspection indicates major adjustments or repairs, a work order using the EMACS program, 3M System, or local equivalent form shall outline the required maintenance for the equipment. One copy of the work order or local form will be retained in the equipment history file.

8-2.2.1. EMACS Program. Refer to [chapter 6](#) for supporting EMACS program information and requirements.

8-2.2.2. Manufacturer's Technical Manuals. The maintenance provider has the responsibility of maintaining the manufacturer's technical manuals. These technical manuals provide recommended maintenance procedures, time schedules, lubrication schedules, principles of operation, a troubleshooting guide, repair instructions, and numerous other useful maintenance data relative to the specific types of MHE. They also contain illustrated parts breakdown of components and assemblies, including parts lists.

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**MHE INSPECTION FORM (Dated 11/15/02)**

<b>DATE</b>	<b>REGISTRATION NO. (USN)</b>	<b>MHE CLASS (see table 4-1)</b>
-------------	-------------------------------	----------------------------------

**POWERED MHE TO BE CHECKED DAILY BY OPERATOR**

**NOTES**

1. USE THIS FORM WHEN INSPECTING MHE BEFORE AND AFTER OPERATION. CHECK (X) IN APPROPRIATE COLUMNS TO INDICATE SATISFACTORY OR UNSATISFACTORY CONDITIONS.
2. NOT APPLICABLE INSPECTION PROCEDURES MAY BE OBLITERATED FOR THAT PARTICULAR MHE CLASS.
3. IF DEFECTS ARE FOUND, REMOVE MHE FROM SERVICE, NOTIFY IMMEDIATE SUPERVISOR AND RETAIN FORM UNTIL REPAIRS ARE MADE.
4. IF NO DEFECTS ARE FOUND:
  - (A) INITIAL OPERATOR: SIGN AND DATE FORM. ATTACH TO MHE.
  - (B) LAST OPERATOR: MAINTAIN FORM IN ACCORDANCE WITH LOCAL PROCEDURES.
5. THIS FORM IS NOT AVAILABLE IN THE SUPPLY SYSTEM. REPRODUCTION OF THIS FORM FROM THIS MANUAL IS AUTHORIZED.

SHIFT HOUR-METER READING	
END	
START	
DIFF.	

		START		FINISH		
		SAT	UNSAT	SAT	UNSAT	
1	Tires and Rims					1
2	Engine Oil and Fluid Levels					2
3	Radiator Coolant Level					3
4	Battery					4
5	Fuel System					5
6	Unusual Engine Noises					6
7	Lights					7
8	Horn					8
9	Hoist					9
10	Tilt and Side Shift					10
11	Transmission/Clutch					11
12	Directional Controls					12
13	Brake System					13
14	Gauges/Meters					14
15	Fire Extinguisher (if applicable)					15
16	Operator Restraint System (e.g., Seat Belts)					16
17	Forks					17
18	Fork Positioning Locks and Stops					18
19	Fork Safety Chains					19
20	Overhead Guards					20
21	Ground Straps/Static Conductive Tires/Wheels					21
22	Structural Cracks/Broken Weldments					22
23	Mandatory Markings					23
AREA	INITIAL OPERATOR'S SIGNATURE	LAST OPERATOR'S SIGNATURE				

SEE REVERSE SIDE FOR INSPECTION CRITERIA PROCEDURES

**FIGURE 8-1. MHE Inspection Form**

## MHE Inspection Form - Inspection Criteria

1. **Tires and Rims.** Inspect tires for excessive wear and damage. Remove foreign material from tire treads. Reject tires for illegible or missing markings or labels. Reject pneumatic tires when the tire tread has worn down to the tread wear mark or if fabric is exposed through the sidewall. Inspect the rims for dents, bends, and cracks. Refer to [figure 8-3](#) for examples of solid rubber tire defects and the probable causes.
2. **Engine Oil and Fluid Levels.** Check engine oil, hydraulic, transmission and brake fluid levels. If low, add oil/fluid to raise the level to the full mark.
3. **Radiator Coolant Levels.** CAUTION: Do not check radiator coolant level when engine is hot. Check the radiator coolant level, if low, add coolant to the full mark.
4. **Battery.** CAUTION: Do not attempt to charge a battery when the battery charge indicator window is yellow. Verify the condition of the battery or batteries and inspect the battery cables for damage, cuts and abrasions. Verify that the cables are securely fastened to the connector lugs and are free of corrosion, verdigris, arcing, pitting, exposed conductor material, and loose connections. Verify that the vent hole on the side of a maintenance free battery is clean and unobstructed. Newer models have a green indicator, which indicates adequate charge. Dark or black indicator window indicates battery needs charging. Yellow window indicates TROUBLE; reject and call for service.
5. **Fuel System.** Visually inspect the entire fuel system assembly for any leaks or any abnormal odors. Where accessible, inspect the fuel tank or gas cylinder for leakage, denting, building, or evidence of rough usage.
6. **Unusual Engine Noises.** Start engine. Should any unusual noises be noted with the engine running, turn off MHE, reject and discontinue this check.
7. **Lights.** Check that the headlights, brake lights, and any other installed lights are working. All lights must operate properly for night work.
8. **Horn.** Depress the horn push button to verify that the horn is operating properly.
9. **Hoist.** Raise and lower hoist to verify the hoist assembly and controls operate smoothly. Inspect all hoses for cracked coverings, wear, bulges or leaks. Verify all fittings are free of cracks or leaks. Inspect for loose or binding chains.
10. **Tilt and Side Shift.** Tilt forward and backward to verify the tilt operates smoothly. Operate side shift to verify the carriage moves immediately and smoothly to the left and the right. Verify all hoses are serviceable and that these fittings are free of cracks or leaks. For any additional accessory controls installed on the MHE; verify proper operation with the manufacturer's recommendations.
11. **Transmission/Clutch.** Verify that the transmission/clutch operates smoothly with no unusual noises. Where applicable, test the neutral start switch on most fuel-powered MHE. Verify that the parking brake is set and that no one is in front of or behind the MHE. A periodic check can be made by attempting to stall the engine with the directional control lever in either the forward or reverse position. If the engine starts, the MHE shall be rejected.
12. **Directional Controls.** Shift directional controls into forward, neutral and reverse directions to verify the MHE operates properly and smoothly. [Figure 8-4](#) shows a typical example of the directional controls.
13. **Brake System Check.** With the parking brake engaged, attempt to drive MHE forward by applying a moderate amount of power to the MHE and verify that it does not move. Visually inspect that no fluid is leaking from the brake system. Check the service brakes to verify they stop the MHE smoothly and evenly without pulling or binding. Where applicable, check the dead-man brake or travel control disconnect device for proper operation.
14. **Gauges/Meters.** Where applicable, inspect the following:
  - a. **Warning Indicators.** With the engine running at normal operating temperature, check the oil pressure gauge ([figure 8-5](#)) for normal operating pressure. If any warning indicator lights signal a malfunction, the MHE shall be rejected until repaired.
  - b. **Coolant Temperature Gauge.** With the engine running at normal operating temperature, check that the gauge is indicating within the proper indicating range.
  - c. **Fuel Gauge.** Check the fuel gauge for proper reading. On types LP and CN MHE, the mechanical-type fuel gauge may be mounted directly on the gas tank. Dual-fueled MHE shall not be operated unless the gasoline fuel tank is at least 1/4 full.
  - d. **Voltmeter/Ammeter.** With the engine running, check the voltmeter/ammeter to verify that its in the green range when the engine is running at least 550 rpm.
  - e. **Hourmeter.** Verify that the hourmeter ([figure 8-6](#)) is registering while the engine is running.
  - f. **Weight Scales.** With forks elevated, and no load, verify that the weight scales read zero. Adjust accordingly.
15. **Fire Extinguisher.** When equipped, visually inspect the extinguisher cylinder for dents. Check that the gauge is registering in the green (if so equipped) and check that the wire seal has not been broken. Verify periodic checks are current. Check nozzle and hose for defects. Reject extinguisher if not serviceable. Replace rejected extinguishers.
16. **Operator Restraint System.** If MHE is equipped with an operator restraint system (e.g., seat belt) it shall be inspected to verify that they fully extend out, can be properly secured, and fully retract back. Additionally, they shall not exhibit any evidence of the following discrepancies: (a) nicks or cuts ([figure 8-7, view A](#)), (b) frayed webbing ([figure 8-7, view B](#)), (c) holes ([figure 8-7, view C](#)), and (d) broken or worn retractor ([figure 8-7, view D](#)).
17. **Forks.** Visually examine the forks for surface cracks, including under the heel of the forks. Verify that blade and shank are straight, properly installed, and fork tips are even. Verify that load ratings of forks match MHE load rating. Surface cracks appearing on the forks shall be cause for rejection until forks are repaired or replaced.
18. **Fork Positioning Locks/Stops.** Verify the fork positioning locks/stops secure each fork in position. Verify forks are securely engaged to the carriage.
19. **Fork Safety Chains.** Verify the presence and operation of fork safety chains (equipped on units with folding forks) and associated locking pins.
20. **Overhead Guards.** Inspect all welds and hardware. Verify that overhead guard and hardware is in place and all structural members are secured.
21. **Ground Straps or Static Conductive Tires/Wheels.** For EE type MHE, verify the presence of two ground straps and that they touch the floor/deck or two conductive tires/wheels. For EX type MHE, verify the presence of two conductive tires/wheels.
22. **Structural Cracks/Broken Weldments.** Inspect all external weldments for structural cracks or defects. Reject MHE until repaired or replaced.
23. **Mandatory Markings.** Verify the following is clearly and properly marked: (a) safe working load (SWL) and vehicle weight (VW) on both sides, and except for pallet trucks, in view of operator, (b) operator controls, (c) manufacturer's nameplate/label, (d) accredited laboratory (UL, FM) certification, and (e) for ammunition and explosives handling only, the weight test certification form ([figure 5-5](#)). Reject if any marking is missing, illegible, expired or incorrect. All other required markings that are rejected shall be recorded on the MHE Inspection Form, but is not a cause for removal from service.

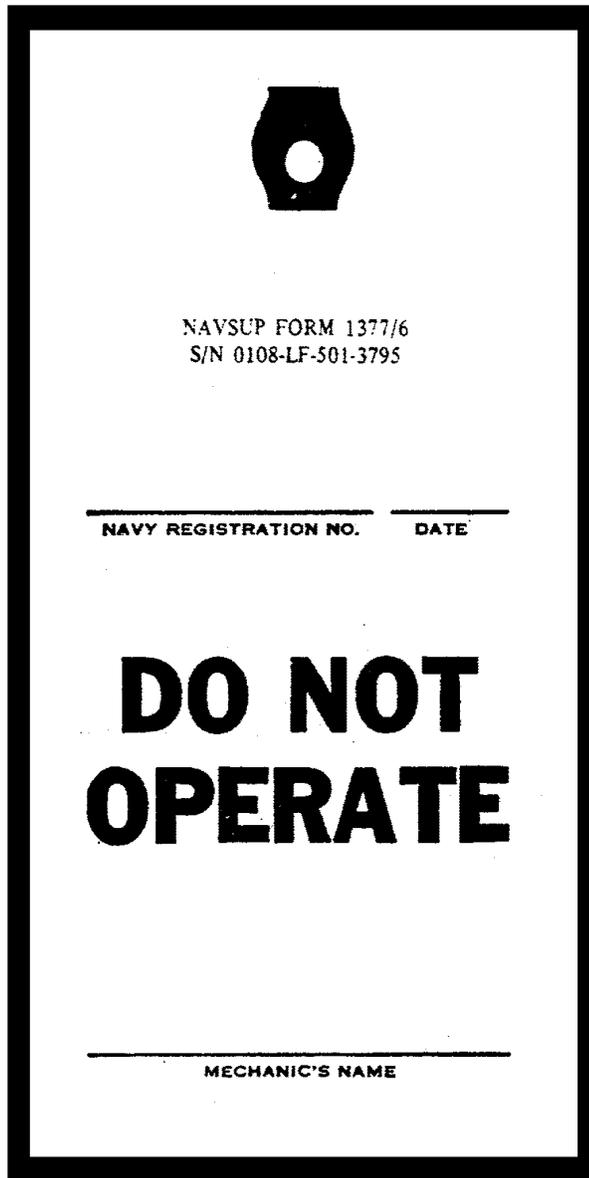


FIGURE 8-2. "DO NOT OPERATE" Tag



FIGURE 8-3. Solid Rubber Tire Defects

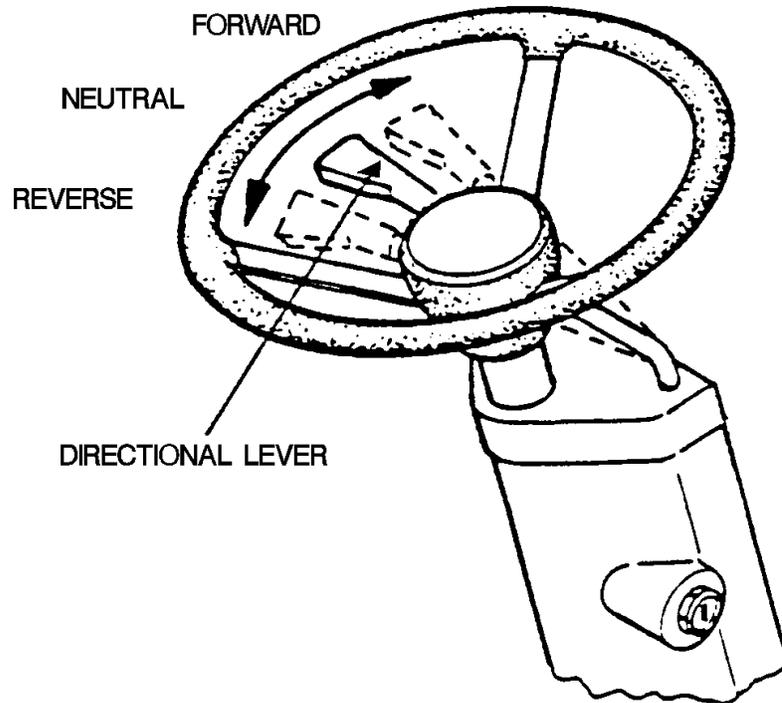


FIGURE 8-4. Directional Controls (Example)

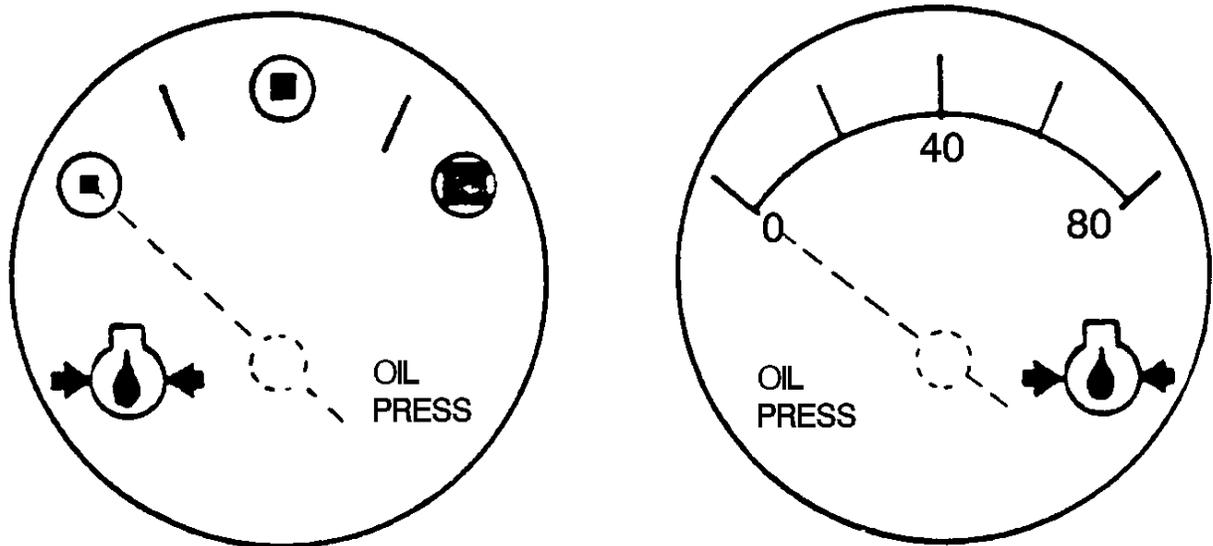
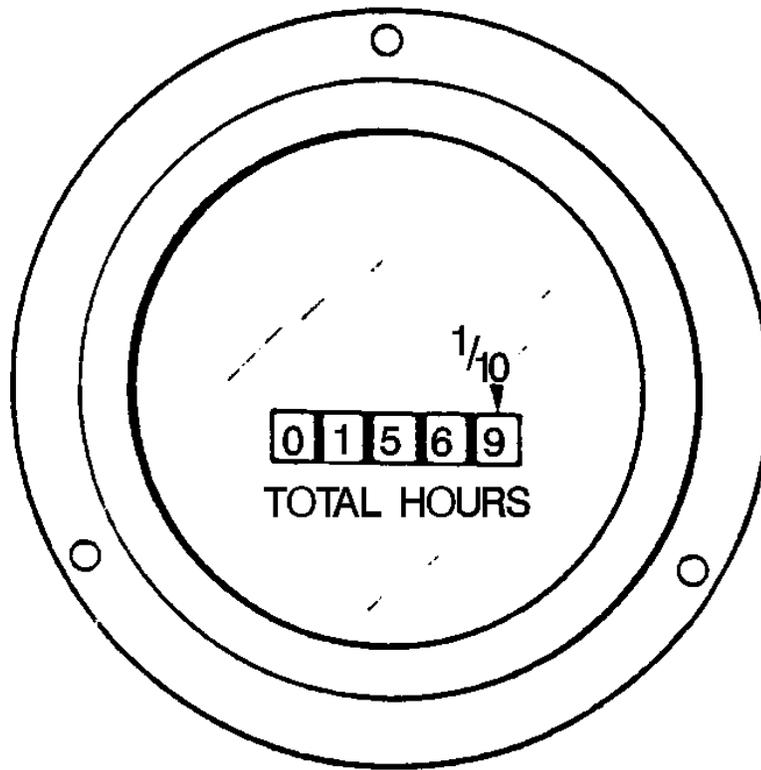


FIGURE 8-5. Oil Pressure Gauges (Example)



**FIGURE 8-6. Engine Hourmeter**

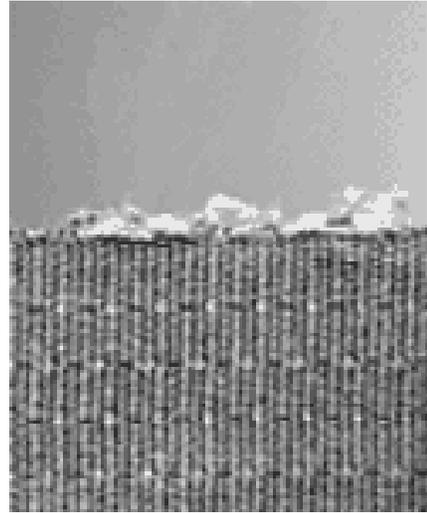
8-2.2.3. Capabilities. The maintenance provider has the responsibility to ensure adequate capabilities to service all types of MHE and to efficiently handle the anticipated workload. These capabilities should include adjustable lifts, lubrication and cleaning equipment, power tools, test equipment, and various types of hand tools necessary to repair and adjust the equipment. Only the correct tools should be used to make repairs.

### **8-3. EQUIPMENT HISTORY FILE**

Each piece of MHE requires an equipment history file. It is the responsibility of the maintenance provider to initiate and maintain an equipment history file (e.g., hard copy or electronic copy using EMACS). The information filed will provide a complete history of the service life of the equipment, including hours of operation and maintenance, the costs of maintenance and materials, inspections, repair data (including maintenance related work orders), and proposed/approved MHE modifications or alterations. In the event MHE is transferred to another activity, the equipment history file shall accompany the MHE. The history file shall be maintained throughout the MHE life cycle.



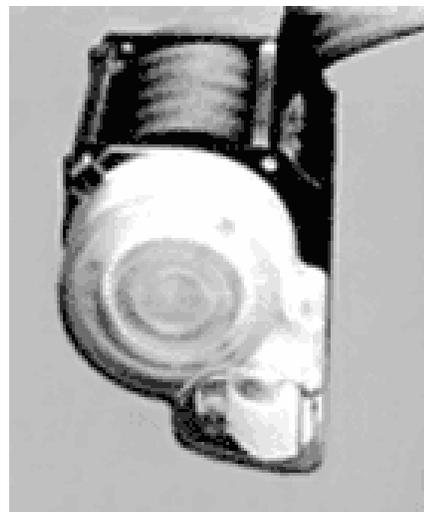
**Nicks or Cuts  
View A**



**Frayed Webbing  
View B**



**Holes  
View C**



**Broken or Worn Retractor  
View D**

**FIGURE 8-7. Operator Restraint System Discrepancies**

#### 8-4. NEW OR SLEP EQUIPMENT

**CAUTION:**

Mast and fork restraint devices must be removed prior to operating components to prevent damage to the MHE.

All new equipment from direct vendor delivery or a Service Life Extension Program (SLEP) unit from a SLEP facility must receive an initial receipt inspection and servicing in accordance with the MHE Initial Receipt Inspection Form, [figure 8-8](#). Prior to conducting these inspections, remove any restraint devices (e.g., stops, blocks, etc.), which would prevent the MHE from operating properly. Also, remove any covers, cardboard protectors, engine exhaust or breather vent covers, etc., which would restrict the MHE from operating throughout its entire range capability. After completion of these inspection procedures and the initiation of an individual equipment history file, the MHE should be placed in service in accordance with the manufacturer's instructions. MHE shall not be accepted or placed in service if any discrepancy is noted on this form. The receiving activity will initiate the appropriate product deficiency report as described in [chapter 7](#) to begin corrective action.

#### 8-5. PREVENTIVE MAINTENANCE SCHEDULING

Each activity, afloat or ashore, must establish a preventive maintenance program, based on manufacturer's technical manual recommendations, or applicable MIP and their associated MRC's appropriate for local operating conditions. This program should include:

- a. A planned program of periodic inspections and maintenance based on active MHE operation as measured by established maintenance cycles.
- b. A capable maintenance provider.
- c. An accurate reporting system (e.g., EMACS), since it is essential that repair requests and maintenance steps are recorded. This reporting system must be maintained for each piece of equipment and must be periodically reviewed for general equipment conditions and indications of repetitive malfunctions on the same component or assembly.
- d. A planned program for reporting technical deficiencies or changes to inspection and maintenance procedures documented in associated MIP's/MRC's. A Technical Feedback Report (TFBR) shall be completed by originators and submitted to Fleet Technical Support Center Pacific (FTSCPAC) in accordance with the instructions of OPNAVINST 4790.4 (series). All feedback reports will be thoroughly investigated and those who provided the comments will be advised of the outcome.

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SHIPBOARD UNIT <input type="checkbox"/>	SHOREBASED UNIT <input type="checkbox"/>	INSPECTION DATE
MAKE	MHE TYPE	BLADE LENGTH
MODEL	MOTOR TYPE	FUEL TYPE
YEAR	TIRE TYPE	HOUR METER READING
SERIAL NO.	CAPACITY	EQUIPMENT COST CODE

Item No.	Inspection Point	Accept	Reject	N/A
1	Manufacturer's data/identification plate			
2	Manufacturer's "STRUCTURALLY WEIGHT TESTED" marking (ammunition or shipboard handling)			
3	Accredited laboratory certification plate (e.g., UL, FM)			
4	Alphabetical designation (EE, DS, etc.)			
5	Operational controls correctly labeled/marked			
6	Battery identification plate or marking			
7	Fuel type marking (e.g., DIESEL FUEL ONLY)			
8	Warning decals and labels			
9	Safe working load marking (sides and mast) (e.g., SWL 6000 LBS)			
10	Vehicle weight marking (sides and mast) (e.g., VW 10,000 LBS)			
11	Registration number (e.g., 13-20000)			
12	SLEP data plate			
13	"LEAD AND CHROMATE FREE PAINT" marking			
14	"LIFT HERE" marking			
15	"TIEDOWN" marking			
16	Tire pressure marking (pneumatic only)			
17	Fuel cap (color coded)			
18	"SHIPBOARD USE APPROVED" marking			
19	Blue diagonal striping (type EX only)			
20	Instruction plates			
21	Grease fittings (on components) fully filled and accessible			
22	Correct fluid levels (brake, radiator, transmission, hydraulic, etc.)			
23	Paint is smooth and adheres well			
24	No evidence of loose, missing or broken hardware			
25	No evidence of bent, cracked or worn accessories			
26	No evidence of missing covers, panels, loose or poor fit			
27	Overhead guard and load backrest (cargo guard) not damaged			

**FIGURE 8-8. MHE Initial Receipt Inspection Form**

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<b>Item No.</b>	<b>Inspection Point</b>	<b>Accept</b>	<b>Reject</b>	<b>N/A</b>
28	Forks are straight within 1% of length			
29	Hydraulic cylinders: no weld cracks, leaks or other damage			
30	Neoprene hydraulic lines: free of paint, routed correctly and secured			
31	Towing devices, hitch pins, tow chains, etc. are attached			
32	Battery cables: secure, no cuts/abrasions, and protected by non-conductive covers			
33	Battery mounts and hold downs are secure			
34	Wiring harness is correct with no frayed, brittle or crimped connections (soldered only)			
35	Tires are correct type, size and thread (no delamination shall be accepted)			
36	Wheel lugs are torqued as specified			
37	Check mast rollers and locks			
38	Fork heel pins and locks function			
39	Lift chains and anchor pins are secure and functional			
40	Operator pedals are equipped with rubber pads or non-slip coating			
41	Operator restraint system/seat belt equipped and functional			
42	Dash gauges are correct and marked			
43	Key ignition switch (verify key numbers match contract numbers)			
44	Start MHE and note any unusual noises			
45	Weight gauge is legible and operable			
46	Steering wheel is smooth and little free play			
47	Verify all gauges function			
48	Verify hourmeter operates properly			
49	Verify horn operates			
50	Verify back-up alarm operates			
51	Verify all lights operate: brake, spot, battle/blackout, etc.			
52	No evidence of steering play or loose suspension			
53	Bring to full operating temperature (fuel power only) and check for leaks			
54	Check for arcing and operation of contactors, traction, steer and hydraulic pump motors (electric MHE only)			
55	Battery disconnect switch is operable			
56	Check accelerator and inching/declutching pedal operation			
57	Check seat brake operation			

**FIGURE 8-8. MHE Initial Receipt Inspection Form (Continued)**

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<b>Item No.</b>	<b>Inspection Point</b>	<b>Accept</b>	<b>Reject</b>	<b>N/A</b>
58	Parking brake functions			
59	Check emergency stop operation			
60	Check for smoothness when raising mast to full height			
61	Verify hose reel functions smoothly			
62	Check tilt and side shift (rotation some models) operation and smoothness			
63	Check acceleration (all forward and reverse gears)			
64	Check braking (at speed) if smooth and straight			
65	Check transmission (forward and reverse, crab in some models)			
66	Clutch adjustment, engagement and operation			
67	Check for exhaust leaks			
68	Verify the turning radius/tracking			

<b>INSPECTION ACTIVITY</b>	<b>INSPECTOR NAME</b>	<b>DATE (MMDDYY)</b>
	PRINT:	
	SIGNATURE:	

**FIGURE 8-8. MHE Initial Receipt Inspection Form (Continued)**

## 8-6. FORK MAINTENANCE INSPECTION PROCEDURES

As required by ASME B56.1, forks shall be inspected and documented in the MHE's history file at intervals of not more than 12 months or whenever any defect or permanent deformation is detected. To satisfy the requirement, all MHE forks shall be inspected in accordance with the Fork Maintenance Inspection Form, [figure 8-9](#). Procedures are documented on the back of the Fork Maintenance Inspection Form to support each inspection criteria. Such inspections and subsequent certification should be performed by a maintenance provider or local mechanic knowledgeable on MHE. Any fork defect shall be a cause for the MHE to be removed from service until the fork is repaired or replaced. Only the fork manufacturer or their designated representative shall be authorized to repair forks. Fork components are illustrated in [figure 8-10](#).

## 8-7. MAINTAINING SAFETY INTEGRITY OF MHE

Adherence to the recommendations, service notes, and maintenance procedures contained in the applicable manufacturer's technical manuals will maximize personnel safety and equipment efficiency during materials handling operations. All repairs to MHE must follow the safeguards in the manufacturer's technical manual safety section (green pages) to maintain the proper safety rating. The exact parts identified within those pages must be used when repairs are made to avoid comprising the unit's safety rating.

**8-7.1. MAINTENANCE PERSONNEL PRECAUTIONS.** To maintain the integrity of MHE, the following precautions shall be observed by maintenance personnel concerned with servicing and repairing industrial MHE:

- a. Only trained and authorized personnel shall perform repairs using manufacturer instructions. Replacement parts must meet the manufacturer specifications.
- b. When parts are replaced, an entry shall be recorded in the equipment history file and the respective maintenance data system (e.g., EMACS, 3M System, etc.) identifying the replaced part(s) by manufacturer's name, catalog and part number. The name of the person replacing the part(s), the date, and the activity shall be entered.
- c. All repairs shall be performed in approved areas as required by [29 CFR 1910.178](#).
- d. Safety devices, described in [paragraph 5-4](#), and components removed, such as covers, panels, etc., must be reinstalled upon completion of repairs to maintain the integrity of the safety rating.

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**FORK MAINTENANCE INSPECTION FORM (Dated 11/15/02)**

USN: _____ - _____					
Manufacturer': _____ Model: _____ Year: _____ Serial Number: _____					
Contract Number: _____					
<b>REQUIREMENT</b>					
Each fork shall be inspected and documented in the MHE history file at intervals of not less than 12 months or whenever any defect or permanent deformation is detected. Any defect shall be a cause for rejection. MHE shall be removed from service until the fork is repaired or replaced.					
DESCRIPTION	LEFT FORK		RIGHT FORK		Not Applicable
	SAT	UNSAT	SAT	UNSAT	
1. Manufacturer's SWL Markings					
2. Surface Cracks					
3. Straightness of Blade: (a) Upper Face of Blade (b) Front Face of Shank					
4. Fork Angle: (original specification = _____)					
5. Difference in Height of Fork Tips: (Length of blade = __ inches x 0.03 = __ inches)					
6. Fork Blades: Left Fork: original thickness = __ inches x 0.10 = __ inches current thickness = __ inches Right Fork: original thickness = __ inches x 0.10 = __ inches current thickness = __ inches					
7. Positioning Locks and Stops (where applicable)					
8. Fork Hooks (where applicable)					
9. Plated Fork (Type EX Only)					
Inspection results: Based on the above inspections, the overall condition of each fork is:					
Left Fork: SAT/UNSAT			Right Fork: SAT/UNSAT		
Inspector: _____		Date: _____		Next Due Date: _____	
Print Name/Rate: _____			Command: _____		

SEE REVERSE SIDE FOR INSPECTION CRITERIA PROCEDURES

**FIGURE 8-9. Fork Maintenance Inspection Form**

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## Fork Maintenance Inspection Form – Criteria

1. Manufacturer's SWL Markings. Verify the manufacturer's SWL marking is present, legible and clearly visible on each fork. The SWL of each fork shall be at least half of the manufacturer's SWL at the rated load as shown on the MHE data plate. Older forks may not have the manufacturer's SWL markings and there is no requirement to mark them.
2. Surface Cracks. The forks shall be thoroughly inspected for cracks and, if necessary, be subjected to a non-destructive crack detection process with special emphasis on the heel and welds attaching all mounting components to the fork.

### NOTE

A T-square, flashlight and a feeler gauge, is required to perform inspection steps 3, 4, and 5.

3. Straightness of Blade. The straightness of the upper face of the blade and the front face of the shank shall be checked. The deviation from the straightness shall not exceed 0.5 percent of the length of the blade and/or height of the shank, respectively. [Example: The length of the blade is 36 inches and the length of the shank is 18 inches. The maximum allowable deviation for the blade is 0.18 inches ( $36" \times 0.005 = 0.18$  inches), and for the shank is 0.09 inches ( $18" \times 0.005 = 0.09$  inches)]. Reset as required.
4. Fork Angle (upper face of the blade to load face of shank). Any fork that has a deviation of greater than 3 degrees from the original specification (normally 90 degrees).
5. Difference in Height of Fork Tips. The difference in height of one set of forks when mounted on the fork carrier shall be checked. The difference in tip height shall not exceed 3% of the length of the blade. [Example: A 42-inch fork would be allowed a maximum variation of 1.26 inches in height ( $42 \text{ inches} \times 0.03 = 1.26$  inches)]. Reset as required.
6. Fork Blades. The fork blades shall be thoroughly inspected for wear with emphasis on the high wear area of the heel. Additionally, the thickness of the fork blades shall be inspected to ensure that they have not been reduced below 10% of the original thickness. Because the fork shank is not subject to wear, it serves as a reference for the fork's original cross section (thickness). Use an appropriate measuring device such as a micrometer, vernier caliper, or fork wear caliper when determining fork wear limits. Examples are provided below:
  - (1) If using a micrometer or vernier caliper, take a minimum of three measurements along each fork at the beginning, the middle, and the end up to where the taper begins. If the fork is worn below 10% at any of these locations, then the fork must be replaced. [Example: The blade shank thickness measures 2.000 inches. The maximum allowable wear of the fork blades is 10% or 0.10, which is  $2.00 \times 0.10$  (10%) = 0.20 inches. Therefore, if the lowest of the three location readings is less than 1.80 inches ( $2.00 - 0.20$ ), then the fork has been worn beyond 10% of its original thickness and it must be replaced.]
  - (2) If using a fork wear caliper, [figure 8-11](#), the outer caliper's points are set by gauging the shank's thickness, [figure 8-11, view A](#). The caliper is then transferred to each blade at any point between the heel to a point where the taper begins (not the taper itself). If the inner measuring points clear any blade, [figure 8-11, view B](#), the thickness has been worn by 10% or more from its original thickness, and the fork must be replaced.
7. Positioning Locks and Stops (when originally provided). Verify that the positioning locks and stops are in good condition and operate properly. Stops shall prevent the forks from becoming disengaged from the carriage during fork adjustment. Replace parts as required.
8. Fork Hooks (when originally provided). The support face of the top hook and the retaining face of both hooks shall be inspected for wear, crushing and other deformations. The clearance between the forks and the fork carrier shall not exceed the manufacturer's tolerances.
9. Plated Hooks (Type EX Only). The plated forks on EX type MHE shall be inspected and maintained in accordance with manufacturer's instructions. These forks contain plating (cladding) material (usually bronze) which is applied to an average depth of 3/32 inches (0.090 inches). Reject forks if the plating (cladding) is completely worn exposing the metal fork. Forks can usually be re-plated.

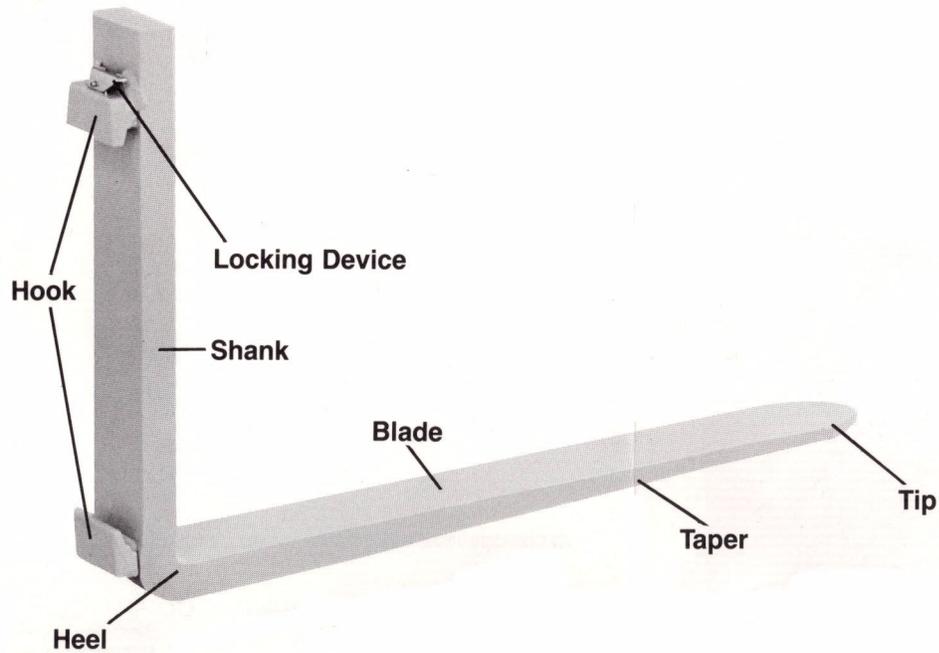


FIGURE 8-10. Fork Components

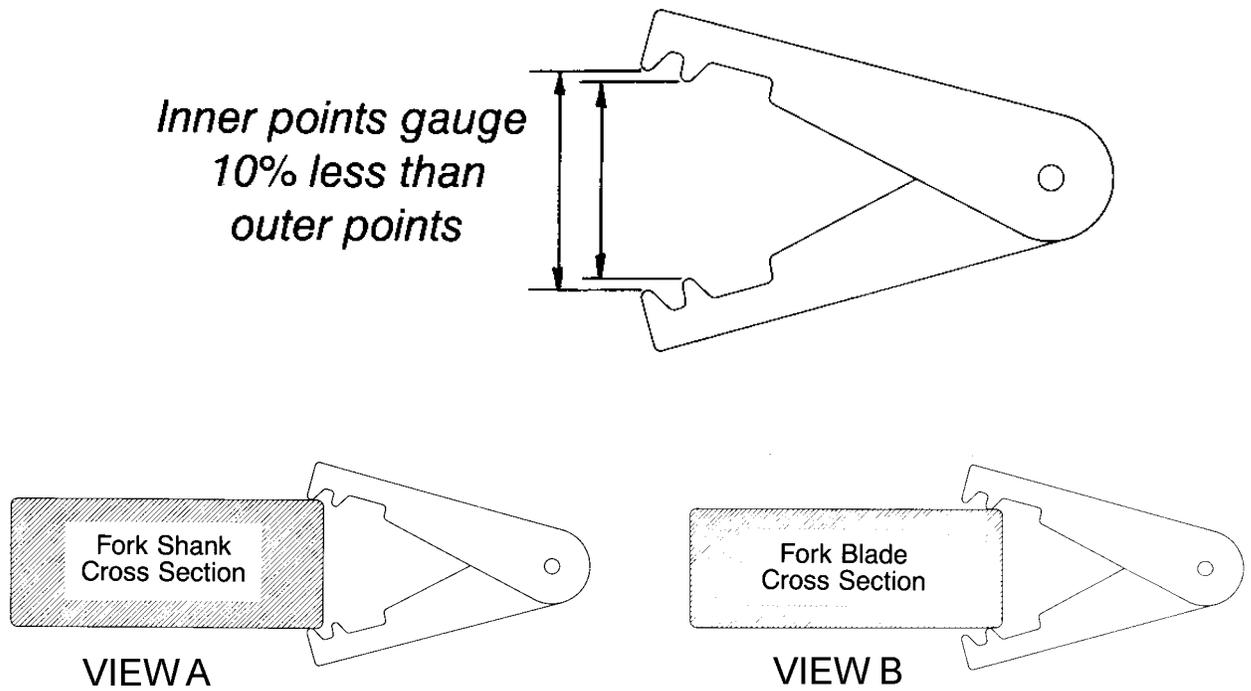


FIGURE 8-11. Fork Wear Caliper

8-7.2. OPERATIONAL WEIGHT TESTING (ALL FORKLIFT TRUCKS). Whenever forklift trucks have undergone repairs or modifications affecting any load-bearing component, the following operational weight test shall be performed and recorded in the equipment history file:

a. Ensure the forklift truck is on a level surface.

b. Position a rated load (100% of the forklift truck's SWL) on the forks with the center of mass at the load center. Ensure the load is centered laterally. If weights are used and stacked more than two high, the safety officer or supervisor shall determine whether the weights are stable prior to proceeding with these tests. If instability of weights has been determined, they must be secured with steel strapping or chains. Raise the loaded forks 6 inches off the deck/floor, tilt full back, and hold for 2 minutes.

**WARNING**

When the mast is fully raised, ensure the operator's hands are clear of the controls and the person marking and verifying the height is positioned to the side of the forklift truck. An observer must ensure that all personnel are clear of the mast prior to raising the rated load.

c. Shift lateral to full limits and then raise load to full mast extension. Repeat lateral shift operation and then return load to deck/floor.

**NOTE**

The following steps must be performed with the hydraulic system at normal operating temperatures. This may be accomplished by raising and lowering the mast five times.

d. With the mast vertical, forks centered, and the rated load on the forks, raise the forks to the maximum height. Mark a reference point on the mast or measure the carriage to a reference point on the fixed portion of the mast. If the forklift truck has a tilting mast (e.g., standard forklift truck), mark a reference point on the tilt cylinders or obtain an initial measurement on the mast angle.

e. After 2 minutes, measure the downward and tilt drift, as applicable, from the reference points.

**NOTE**

Perform steps f through h on forklift trucks that have tilting carriages (e.g., sideloader and reaching and tiering forklift trucks).

f. Lower the forks to just above the outriggers or to the lowest point allowed by the centering limit switch, if so equipped.

g. Tilt the carriage rearward to its limit. Release the tilt lever.

- h. After 2 minutes, tilt the fork carriage rearward again. Note any movement.
- i. Lower and remove the load.

The forklift truck shall be rejected if the mast drift vertically more than 1-3/4 inches. If equipped with a tilting mast, the forklift truck shall be rejected if it tilts more than one degree. If equipped with a tilting carriage, the forklift truck shall be rejected if any movement is noted when tilting the carriage rearward the second time. The forklift truck shall be rejected if it lifts, shifts or tilts the load too slowly or unevenly, the hoses and tubing have bulges or distortion, the frame and mast assembly have fractures or broken welds, or if the forklift truck leaks hydraulic fluid. When raising or lowering the mast, if the forklift truck does not operate freely and/or binds or catches on the overhead guard or any other component, it shall be rejected.

**8-7.3. OPERATIONAL WEIGHT TESTING (ALL POWERED PALLET TRUCKS).** Whenever powered pallet trucks have undergone repairs or modifications affecting any load-bearing component, the following operational weight test shall be performed and recorded in the equipment history file:

- a. Ensure the powered pallet truck is on a level surface.
- b. Position a rated load (100% of the pallet truck's SWL) on the forks with the center of mass at the rated load center. Raise the forks to maximum height.
- c. After 2 minutes, lower the forks and remove the test load.
- d. The pallet truck shall be rejected if leakage of hydraulic fluid is found, if the forks do not rise smoothly to full height, or if the forks do not lower smoothly in a controlled decent.

## **8-8. SERVICING**

All servicing to any MHE shall be conducted in accordance with the appropriate manufacturer's technical manuals or the 3M System using applicable MIP's and their associated MRC's.

## **8-9. REPAIR LIMITS AND LIFE EXPECTANCIES**

Despite following an established preventive maintenance program, MHE will be required for unscheduled repairs and will need to be eventually replaced when old equipment is retired due to economical considerations, age, wear, or severe accidental damage. [Tables 8-1](#) (ashore) and [8-2](#) (afloat) establish a uniform and economical program for the retirement of MHE. The estimated data provided in both tables should be applied by all holders of MHE to avoid undue expenditures in the repair of MHE that could be more economically replaced. When a piece of MHE requires repair that exceeds the one-time or accumulated repair limit, no further maintenance expenditure is authorized. Normally, such repairs will retire the MHE from use. However, retirement will not be effected if:

- a. The required repairs exceed the maximum cumulative limit, but will extend the life of the MHE for a period commensurate with the expenditure required.

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b. The unit is beyond the maximum utilization years of economical use as shown in [tables 8-1](#) (ashore) and [8-2](#) (afloat), but any one-time repair cost does not exceed 10 percent of the replacement cost and the maximum cumulative repair limit is not exceeded, except as noted above.

c. The unit load is inducted into the MHE SLEP for a complete overhaul to extend the life expectancy to that of a like-new unit.

All inspections and repairs performed on MHE will be included in the repair expenditure limits. Expenditures not to be included in the expenditure limits are operating costs such as expenditures for fuels, lubricants, battery charging, installation of markings, washing, antifreeze, replacement tires and replacement of batteries on electric-powered MHE. Upon reaching the maximum age of utilization, MHE may be considered, for planning purposes, eligible for retirement. However, when the equipment has remaining operational and economical life, based on past records which show it is reliable, it may be kept operational after making adjustments for past retirement experience and the general age and condition of the MHE inventory. Refer to [paragraph 2-5](#) for procedures to replace MHE units and the associated funding requirements.

### **8-10. MHE ASSIST CHECKLIST**

[Appendix C](#) provides a checklist for shipboard and shore base use, as appropriate, to assist the MHE representative and that ship/shore activity evaluate their MHE operations and to provide needed assistance and information.

**Table 8-1. General Guide for MHE Repair Limits and Life Expectancies (Ashore)**

Type of Equipment	Maximum Economical Utilization		Maximum Cumulative Repair Limit % of Replacement Cost*	Maximum Allowable "One-Time Repair Limits" % of Replacement Costs														
	Years	Hours		Hours of Use (in hundreds)														
				12	24	36	48	60	72	84	96	108	120	132	144	156	168	180
Fork Truck, Gas/Diesel/LPG (2,000 to 6,000 pounds)	8	9,600	100	50	45	40	35	25	20	15	10							
Fork Truck, Gas/Diesel (7,500 to 20,000 pounds)	10	12,000	100	50	45	40	35	30	25	20	15	10	10					
Fork Truck, Gas/Diesel (25,000 pounds and above)	10	12,000	100	50	45	40	35	30	25	20	15	10	10					
Tractor, Gas/Diesel	8	9,600	100	50	45	40	35	25	20	15	10							
Crane, Gas/Diesel	12	14,400	100	50	50	45	45	40	40	35	30	25	20	15	10			
Platform Truck, Gas/Diesel	8	9,600	100	50	45	40	35	25	20	15	10							
Truck, Straddle-Carry, Gas/Diesel	12	14,400	100	50	50	45	45	40	40	35	30	25	20	15	10			
Fork Truck, Electric	15	18,000	100	50	50	50	45	45	45	40	40	35	35	30	25	20	15	10
Tractor, Electric	15	18,000	100	50	50	50	45	45	45	40	40	35	35	30	25	20	15	10
Crane, Electric	15	18,000	100	50	50	50	45	45	45	40	40	35	35	30	25	20	15	10
Platform Truck, Electric	15	18,000	100	50	50	50	45	45	45	40	40	35	35	30	25	20	15	10
Pallet Truck, Electric	15	18,000	100	50	50	50	45	45	45	40	40	35	35	30	25	20	15	10

\*Under unusual circumstances or under the Service Life Extension Program (SLEP), the maximum cumulative repair limit may be extended provided the additional cost of repairs will extend the remaining life expectancy of the equipment.

- NOTE: 1. Cost of replacement batteries for electric powered MHE will not be considered part of the repair costs.  
 2. Data on this chart are intended as a guide for procurement and budget planning.

**Table 8-2. General Guide for MHE Repair Limits and Life Expectancies (Afloat)**

Type of Equipment	Maximum Economical Utilization		Maximum Cumulative Repair Limit % of Replacement Cost*	Maximum Allowable "One-Time Repair Limits" % of Replacement Costs												
	Years	Hours		Hours of Use (in hundreds)												
				12	24	36	48	60	72	84	96	108	120	132	144	156
Fork Truck, Electric, EE (4,000 to 6,000 pounds)	12	14,400	100	50	50	45	45	40	40	35	30	25	20	15	10	
Fork Truck, Electric, EX (4,000 to 6,000 pounds)	12	14,400	100	50	50	45	45	40	40	35	30	25	20	15	10	
Reach & Tier, Electric, EE (4,000 to 4,500 pounds)	12	14,400	100	50	50	45	45	40	40	35	30	25	20	15	10	
Pallet Truck, Electric, EE, Walkie (6,000 pounds)	12	14,400	100	50	50	45	45	40	40	35	30	25	20	15	10	
Fork Truck, Diesel, Solid Tires (6,000 pounds)	8	9,600	100	50	45	40	35	25	20	15	10					
Fork Truck, Diesel, Pneumatic Tires (6,000 pounds)	8	9,600	100	50	45	40	35	25	20	15	10					
Fork Truck, Diesel, Pneumatic Tires (15,000 to 20,000 pound)	9	10,800	100	50	45	40	35	30	25	20	15	10				
Fork Truck, Diesel, Rough Terrain (4,000 to 10,000 pounds)	8	9,600	100	50	45	40	35	25	20	15	10					

\*Under unusual circumstances or under the Service Life Extension Program (SLEP), the maximum cumulative repair limit may be extended provided the additional cost of repairs will extend the remaining life expectancy of the equipment.

- NOTE: 1. Cost of replacement batteries for electric powered MHE will not be considered part of the repair costs.  
 2. Data on this chart are intended as a guide for procurement and budget planning.

## CHAPTER 9

# MAINTENANCE AND CHARGING PROCEDURES FOR LEAD-ACID BATTERIES

### 9-1. GENERAL

This chapter provides recommended guidelines and procedures for the maintenance and charging of lead-acid (vented) batteries used in all electric-powered Materials Handling Equipment (MHE).

### 9-2. APPLICATION

The following requirements are provided to establish local battery maintenance and storage operating procedures.

### 9-3. DEFINITIONS

9-3.1. **BATTERY CELL.** A lead-acid battery cell contains a group of positive and negative plates immersed in an electrolyte solution of water and sulfuric acid. The electrolyte solution and plates are contained in an acid proof container called a jar. Each cell produces a nominal voltage of 2 volts. A car battery is a typical lead-acid battery. It is comprised of six cells producing 12 volts. Thus, an 18 cell lead-acid battery would produce 36 volts, etc.

9-3.2. **CHARGE.** The process of passing a direct current (DC) electric current through a battery producing a chemical reaction, returning the battery to its maximum useful state.

9-3.3. **CYCLE.** One cycle occurs when a battery is charged and then discharged during use. Battery life is measured and referred to in this document as a number of cycles. One complete cycle constitutes an 80% discharge of the battery and then recharging it back to full capacity. The average battery life cycle is 1200 to 1500 cycles (5-6 years). Proper maintenance and charging will prolong the battery's life cycle.

9-3.4. **DEPTH OF CYCLE.** The degree to which a battery is allowed to become discharged, as a result of usage, before being taken out of service and charged again. Thus, a battery discharged to a depth of 70 percent has 30 percent of its capacity remaining. Batteries should not be discharged to depths greater than 80 percent.

9-3.5. **ELECTROLYTE.** A mixture of distilled, demineralized water and sulphuric acid within a battery. The concentration of sulfuric acid in the electrolyte mixture is 37 to 43 percent by weight and, normally, has a specific gravity of 1.285 to 1.315 depending on battery type and manufacturer.

**9-3.6. EQUALIZING CHARGE.** The continuation of charging current beyond what is normally required to restore full charge, for the purpose of ensuring that the cells which require more charging time than other are fully charged. Equalizing charges are necessary because, in any one battery, there are usually slight differences in the uniformity of construction and content of the cells which cause some cells to require slightly more charging time than other cells. Failure to perform equalizing charges will result in some cells never receiving a complete charge, which over time, will lead to sulfation on the surface of the plates. An equalizing charge serves to mix the electrolyte in order to prevent stratification, which will also cause sulfation on the plates.

**9-3.7. FINISH RATE.** The maximum level of charge current which can be safely continued, after a battery is fully charged (about 80 percent), without causing excessive gassing or high temperature. Some battery manufacturers post the finish rate on the battery's nameplate.

**9-3.8. FRESHENING CHARGE.** A freshening charge is used to bring a battery to a fully charged condition before it is initially placed in service, or when it has been standing idle for a short period. It usually takes about 3 hours at the finish charge rate.

**9-3.9. GASSING.** The visual bubbling of the electrolyte, most noticeable during the latter stages of the charging process. During charging, the electrical current causes the water in the electrolyte to break down into hydrogen and oxygen gas. The hydrogen is produced at the negative plate while oxygen forms at the positive plate. The oxygen gas poses no danger, but the hydrogen gas, if allowed to concentrate, is highly explosive.

**9-3.10. HYDROMETER.** An instrument used to measure the specific gravity of liquids by suspending a calibrated float in the liquid and reading the scale at the fluid surface level.

**9-3.11. LEAD-ACID BATTERY.** A number of cells or containers filled with a mixture of sulfuric acid and water, called electrolyte. The electrolyte covers vertical plates made of two types of lead (lead peroxide and sponge lead). Chemical action between the acid and the lead creates electrical energy.

**9-3.12. OVERCHARGE.** The charging of a battery beyond its rated charge capacity. This is strongly discouraged for several reasons. First, it results in excessive hydrogen gas production which is highly explosive. Second, it results in low water levels in the battery cells which, if allowed to get low enough, will leave the cell plates exposed to air. Exposed cell plates will oxidize. Third, the internal cell temperature could reach levels that would cause damage to the battery.

**9-3.13. REFRACTOMETER.** An optical instrument used to measure liquids (as in specific gravity) by passing light through the sample fluid and focusing the light on the internal scale. NSN 6630-00-105-1418 is presently authorized.

**9-3.14. SPECIFIC GRAVITY.** The ratio of a substance's density (weight per unit volume) to the density of water. By definition, the specific gravity of pure water is exactly 1.

**9-3.15. STRATIFICATION.** The process of incomplete electrolyte mixing in a battery cell that causes different layers of electrolyte concentration. This is usually caused by insufficient gassing at the end of a charging cycle (undercharging).

9-3.16. **SULFATION.** A chemical oxidation appearing as a white or powdery residue covering the battery plates. It is caused by insufficient equalizing charge or by partially discharged battery cells, being left unattended for an extended period of time.

9-3.17. **VOLT.** A practical unit of electromotive force. A fully charged cell in a lead-acid battery produces a nominal 2 volts. MHE running speed and lifting speed are decreased by a battery's decrease from normal voltage.

#### 9-4. INSPECTION AND MAINTENANCE UPON RECEIPT OF BATTERIES

##### **WARNING**

Do not touch spilled liquids without appropriate personal protective equipment. Spilled liquid is likely to be electrolyte which contains sulfuric acid.

##### **CAUTION**

In sub-freezing temperatures, water should be added one hour before charging is completed or at beginning of equalizing charge to ensure proper mixing with the electrolyte.

- a. Inspect for physical damage to or corrosion of the battery tray. Corrosion is likely the result of electrolyte spillage. Report all visible damage to the supervisor.
- b. Inspect and test battery lifting lugs/eyes in accordance with [paragraph 9-5](#). Report any visible damage or test failures to the supervisor.
- c. Inspect for electrolyte spill. Dampness or wet spots on the sides and bottom of the battery tray are good indicators that electrolyte has been spilled. Spillage is usually the result of broken battery jars or the battery having been tipped over in transit. Note that spilled water will eventually evaporate. Sulfuric acid, on the other hand does not evaporate and gives the appearance of dampness. Report all spillage to the supervisor.
- d. Check electrolyte levels before initial use and immediately after equalizing charge and add distilled water, if needed. When adding distilled water, the electrolyte level should be between the low and high level indicators, as shown in [figure 9-1](#), or in accordance with Maintenance Requirement Cards (MRC's) or the battery maintenance publication. Electrolyte levels should never be below the top of the lead plate separators.

##### **NOTE**

High level is when electrolyte is 1/4 inch below vent well. Low level is when electrolyte is below separator protector (i.e., if the separator protector is exposed to air).

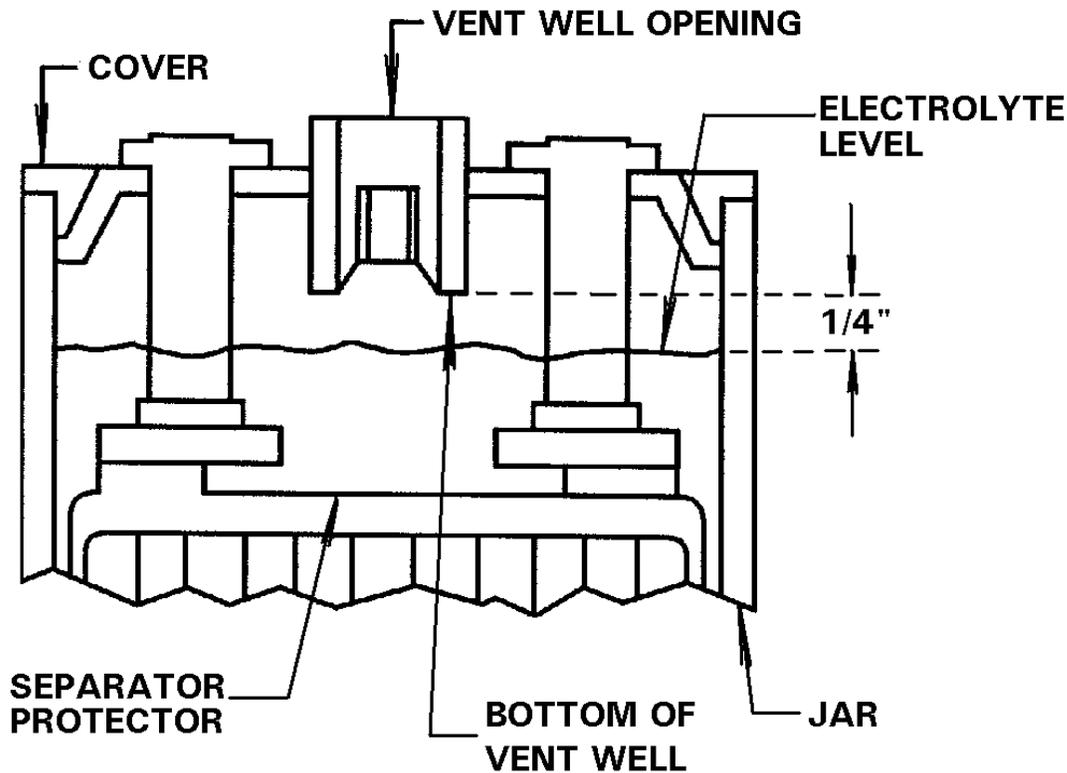


FIGURE 9-1. Electrolyte Level Indicators

e. Units ashore or afloat that are equipped with automatic charges, shall perform an equalizing charge in accordance with [paragraph 9-8](#).

f. Initiate battery record form, [figure 9-2](#) or a locally derived form. After receiving and equalizing each battery, record the specific gravity of each cell using a hydrometer. This will serve as a reference for comparison of later readings.

**NOTE**

Battery record form, [figure 9-2](#), supersedes NAVSUP Form 1377/2.

**9-5. INSPECTION AND TESTING OF BATTERY LIFTING LUGS (ELECTRIC MHE ONLY)**

9-5.1. **INSPECTION.** Prior to lifting the battery to move it to the testing location, visually inspect the lifting lugs/eyes for evidence of damage (bends, elongation, cracked or broken welds, etc.) and excessive corrosion. If discrepancies are noted, the battery shall be tagged and removed from service. Repairs shall be made before proceeding with the test.



9-5.2. TEST PROCEDURE. The test shall be conducted as follows:

a. Secure to the deck/floor. Do not use the lifting lugs/eyes to hold the battery down during this test. The battery assembly consists of tray, jars and cover. Use lumber between the cables and battery cover to prevent damage. Do not perform this test with battery mounted in MHE.

**WARNING**

For units ashore, locally procured battery lifting beams may be used to lift MHE batteries provided they are maintained, inspected, tested and certified in accordance with [NAVFAC P-307](#).

**WARNING**

For units afloat, the Mk 18 Mod 1 Handling Beam, [figure 9-3](#), is issued lift batteries. The battery cover shall be kept closed to prevent the beam from accidentally coming into contact with the battery connecting terminals, causing a short circuit. If battery cover is missing, plywood or other insulating material shall be cut to appropriate dimensions and placed over the battery terminals.

**CAUTION**

Ensure that only a vertical force is applied to the battery lifting lugs/eyes during the battery lifting test. This is accomplished using several approval battery lifting beams. Do not attach sling assemblies that would tend to squeeze or stretch the battery tray and lifting lugs/eyes when the load is applied.

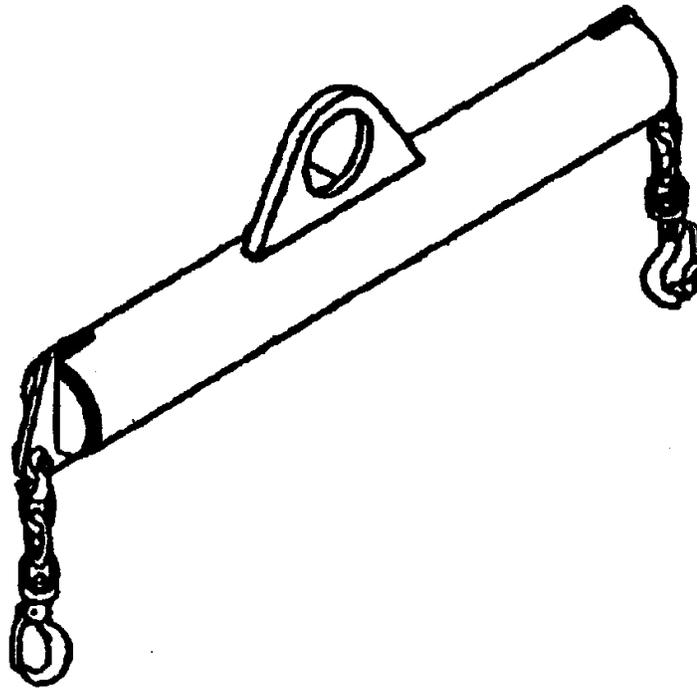
b. Assemble appropriate hoisting equipment (crane, dynamometer, battery lifting beam, and other necessary hardware capable of lifting 1-1/2 times the weight of the battery) with the dynamometer in series. Only approved battery lifting beams, such as locally procured beams ashore or the Mk 18 Mod 1 Handling Beam afloat, [figure 9-3](#), shall be attached directly to the battery lifting lugs/eyes.

c. Hoist the battery by its lifting lugs until the dynamometer registers 1-1/2 times the gross weight of the battery assembly.

d. Hold the force for two minutes.

e. Lower the battery and remove the lifting equipment.

9-5.3. TEST RESULTS. Examine the lifting lugs/eyes and points where attached to the battery. The battery shall be rejected if the battery lifting lugs/eyes exhibit elongation, permanent deformation, fractures or other evidence of failure. Any cracks or fractures in the welds that attach the lugs/eyes to the battery tray housing are also cause for rejection.



**FIGURE 9-3. Mk 18 Mod 1 Handling Beam**

**9-6. BATTERY INSTALLATION**

- a. Ensure the battery compartment is clean and free of any water, oil, dirt, and other foreign matter. If the battery compartment appears wet where there is no obvious source of moisture, then the dampness is probably sulfuric acid from spilled electrolyte. Sulfuric acid does not evaporate as does water and will need to be cleaned to avoid corrosion of the battery compartment. Neutralize and clean spilled electrolyte in accordance with [paragraph 9-12](#).
- b. Ensure the battery compartment has drainage holes located in the floor. Remove any foreign matter that may be clogging the holes.
- c. Visually inspect the battery lifting lugs/eyes for evidence of damage (bends, elongation, cracked or broken welds, etc.) and excessive corrosion. If any such discrepancies are noted, repairs shall be made before proceeding with this test.

**WARNING**

Only use authorized battery lifting equipment to hoist lead-acid batteries and to connect to the battery lifting lugs. Do not use sling assemblies that would tend to squeeze or stretch the battery tray and lifting lugs as the load is applied. The Mk 18 Mod 1 Handling Beam, [figure 9-3](#), is approved for lifting batteries afloat, while locally procured lifting beams are approved ashore.

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d. Attach a Mk 18 Mod 1 Handling Beam (afloat), [figure 9-3](#), or a locally procured beam (ashore) to the battery lift eyes/lugs. Position a conveyor, overhead hoist, or other hoisting machine directly above the battery. Lower hoisting machine and connect to battery lifting beam. An intermediate device installed between the hoisting device and the battery beam is permitted so long as the safe working load (SWL) is not exceeded. When an authorized/approved battery lifting device is not available and fleet commitments dictate that a battery must be removed or replaced, an alternate lifting device may be used to lift the battery. This alternate device may be used only after interim approval has been granted by the [Naval Surface Warfare Center \(NAVSURFWARCEN\)](#), [Indian Head Division Detachment Earle](#), [Naval PHST Center \(Code 71\)](#) and the following requirements are met:

(1) During lifting, the battery cover is kept closed. If this is not possible or if the cover is missing, all lead cell connectors must be covered with an insulating material, such as plywood or thick rubber.

(2) The lifting device applies a vertical force only on the battery lifting lugs/eyes. Slings which tend to stretch or squeeze the battery tray as vertical force is applied are not approved.

(3) The lifting device has two hooks which are electrically insulated from each other to prevent short circuits.

e. Hoist battery, remove it from storage area, and install into MHE.

f. Battery shall be properly positioned and secured in the MHE. Battery should be blocked, not wedged, to allow for 1/8-inch minimum clearance on all sides for easy removal from the battery compartment. Also some batteries tend to expand or contract during service, so wedging them into the battery compartment could result in damage.

g. During storage, a battery may lose some of its charge. Prior to using the battery, inspect the battery record. If the battery record, [figure 9-2](#), indicates that the battery has been out of service or has been in storage for over five days, perform an equalizing charge as described in [paragraph 9-8](#).

### **CAUTION**

When cleaning battery connections, verify the lead coating is not removed from terminals, exposing copper.

h. Ensure all connections on the battery are clean and free of debris.

i. Connect the battery to MHE. Ensure all the connections are tight. Due to vibration, handling and temperature change, all bolted connections will loosen during normal operation. All bolted connections should be inspected and tightened in accordance with the applicable MRC.

j. Once the battery installation is complete, coat all bolted connections and terminals with Grease, Aircraft and Instruments, MIL-PRF-23827. Battery Protector and Sealer, Part No. SA-9 (Permatex) is an approved alternate corrosion preventive compound.

## 9-7. BATTERY CHARGING, TESTING, AND MAINTENANCE

Battery charging shall be performed in accordance with the applicable manufacturer's technical instructions (ashore) or applicable MRC's (afloat) to maximize both the single charge operating time of the battery and the long-term capability of the battery to consistently attain the maximum charge. Local operating procedures are required ashore and afloat and shall be posted on or near the battery charger. Procedures for the testing and maintenance of batteries are provided later in this chapter.

### NOTE

The length of charging times and temperature requirements identified in this chapter are written to maintain the optimum life and serviceability of the battery. They do not consider fleet operational or high use operations beyond the prescribed limits. Be aware that continued operation beyond these specified limits will greatly reduce the service life of the battery.

9-7.1. LOCATION. At least one specific area shall be designated by the shore activity's Commanding Officer (CO)/Officer in Charge (OIC) or by the ship's CO/Master for the charging, testing and maintenance of lead-acid batteries in powered MHE. Battery charging, testing and maintenance shall only be done in those areas designated specifically for that purpose. Battery charging, testing and maintenance shall not be performed in magazines or other areas/spaces where ammunition and explosives are present. MHE shall be properly positioned on a level surface with brakes applied before batteries are charged or replaced.

9-7.1.1. Ashore. In addition to the requirements of [paragraph 9-7.1](#), the following shall apply ashore:

a. Battery charging, testing and maintenance shall comply with [OPNAVINST 5100.23 \(series\)](#) and [29 CFR 1910.132](#).

b. When charging stations are in proximity to ammunition and explosives operations, the provisions of [NAVSEA OP 5](#) shall be met and operating procedures posted accordingly.

9-7.1.2. Afloat. In addition to the requirements in [paragraph 9-7.1](#), units afloat shall refer to [NAVSEA OP 4](#) for other regulations concerning battery charging stations.

9-7.2. FIRE SAFETY REGULATIONS. Fire extinguishing equipment shall be installed and maintained in all battery charging areas in accordance with the local fire bill. Extinguishers installed on MHE can satisfy this requirement. The type of extinguisher required, location, training requirements for emergency use and other pertinent safety information afloat and ashore shall be contained in local procedures covering MHE operations. Table A-2-1 in the [National Fire Protection Association \(NFPA\) 10](#) contains guidance in selecting the type of extinguisher required for a specific fire hazard.

9-7.3. BATTERY CHARGING SAFETY PRECAUTIONS. The following precautions shall be taken prior to the charging of batteries:

**WARNING**

Severe burns can be caused by the sulfuric acid contained in batteries. In case of contact, thoroughly flush affected area with clean water. Obtain medical attention immediately.

- a. In the event that electrolyte should spill, cease all operations, notify personnel in the area, and begin emergency clean up/containment in accordance with local procedures.
- b. Fire protection apparatus shall be provided.
- c. Charging apparatus shall be protected from physical damage by MHE.
- d. Adequate ventilation must be provided for the dispersal of fumes from gassing batteries.
- e. An emergency shower/eyewash fountain shall be available, as required by [OPNAVINST 5100.23 \(series\)](#).
- f. Use safe and effective devices such as a tilter siphon or pump when handling electrolyte.
- g. Use of personal protective equipment shall be based on the industrial hygiene survey, as stated in [OPNAVINST 5100.23 \(series\)](#) (ashore) or [OPNAVINST 5100.19 \(series\)](#) (afloat), and the hazard assessment conducted by the activity or ship, as stated in [29 CFR 1910.132](#).
- h. If battery and battery charging unit are in separate locations, then two people are required to make the connections/disconnections. Visual or audio communication is required to ensure the safety of these individuals.
- i. Smoking or other extraneous sources of ignition shall be prohibited in battery charging areas.
- j. Personnel shall not wear loose jewelry made of conductive material, which may short circuit a battery.

**WARNING**

An explosion can result from the hydrogen gas produced from battery charging.

**WARNING**

Severe burns can be caused by the sulfuric acid contained in batteries. In case of contact, thoroughly flush affected area with clean water. Obtain medical attention immediately.

**WARNING**

When mixing electrolyte, acid shall be poured into water, not water into acid.

**CAUTION**

Lead-acid batteries shall only be charged by trained and authorized personnel.

9-7.4. **BATTERY CHARGING PROCEDURAL REQUIREMENTS.** The following are general regulations that shall be applied during the actual charging of batteries.

- a. If a battery is to be charged while still mounted in the MHE, ensure that it is electrically disconnected from the MHE.
- b. If a battery has just been removed from service, allow the battery to cool to an internal temperature of 90 °F or less before commencing charging.
- c. Open battery's compartment cover to increase ventilation. This will accelerate the pre-charge cooling process. It shall remain open throughout the charging process.
- d. Ensure the top of the battery is clean, dry and free of any materials that could cause ground shorts during charging.
- e. Ensure all battery vent plugs are present and firmly in place. Vent plugs shall only be removed to add water, and to take hydrometer/refractometer and temperature readings. Ensure vent caps are not clogged by washing them periodically with water and blowing through the bottom with low pressure air.
- f. Connect battery to charging apparatus and commence charging.

**CAUTION**

To avoid damaging the battery, never allow the electrolyte temperature to exceed 115 °F during charging. Reduce or stop current if electrolyte reaches this temperature.

**CAUTION**

Do not continuously exceed a battery beyond 80 percent discharge. Its service life will be greatly diminished.

g. Ensure that the battery receives the proper amount of current and voltage throughout the charging process. This will vary depending on the temperature of the electrolyte inside the battery and to what degree the battery has been discharged. It will also vary among batteries from different manufacturers. Automatic battery chargers will usually make the correct voltage/current adjustments on their own, but it is important that the battery is hooked up to an automatic charger compatible with that battery make and model. Where automatic equipment is not available, charging personnel will have to make these adjustments manually. Generally speaking, lead-acid batteries can be charged at any rate of current that does not cause excessive gassing or produce temperatures in excess of 115 °F. But as the battery approaches full charge, the current will need to be gradually reduced to the finish rate. Knowing when a battery is approaching full charge requires periodic readings of the electrolyte's specific gravity. If a battery is to deliver optimum performance and long life, it should be sized to deliver a full shift of work, while discharging to not more than 80 percent of the total rated capacity. Normally, the specific gravity for fully charged batteries range from 1.285 to 1.315 ( $\pm 0.005$ ). Refer to the specific battery manufacturer's battery instruction manual for actual specific gravities. The actual specific gravity (at 100% charge) and the voltage for a particular battery will be located on the battery plate or stamped into the top of the battery case. The voltage will also be located on the MHE identification plate.

h. When it is determined that the battery is fully charged, turn off and disconnect battery from charging equipment.

i. Perform equalizing charge, when necessary, in accordance with [paragraph 9-8](#).

j. Lead-acid batteries shall not be charged more than once in a 24-hour period.

#### NOTE

Consistent undercharge results in excess sulfation and gradual reduction of battery life. Overcharge will result in excess gassing, low water levels, and damage to battery.

### 9-8. EQUALIZING CHARGE

9-8.1. BACKGROUND. Each cell of a battery has slight differences in uniformity of construction and content. These slight differences causes some cells to require slightly more charging time than others do to reach a fully charged state. If this fact were simply ignored, certain cells in a given battery would always receive slightly less than a full 100 percent charge. Over time, these cells would gradually succumb to effects of chronic undercharging, which is sulfation, and drift back in capacity. To ensure that these battery cells are occasionally brought to a full state of charge, the battery is given additional charging time beyond what is normally required to fully charge the battery. This is called equalizing. Since it is not possible to apply charging current to individual cells, the other cells in the battery may be overcharged somewhat. This is acceptable as long as their temperatures do not exceed 115 °F. A decrease in electrolyte level due to increased gassing is the only concern. Therefore, electrolyte levels should be monitored carefully during and after equalizing charges. Consult the battery manufacturer's instructions for how much current to use during equalizing. Typically, an equalize cycle continues the charge for an additional 3 hours following a normal charge.

**NOTE**

The length of charging times and temperature requirements identified in this chapter are written to maintain the optimum life and serviceability of the battery. They do not consider fleet operational or high use operations beyond the prescribed limits. Be aware that continued operation beyond these specified limits will greatly reduce the service life of the battery.

9-8.1.1. **Shore Activity Chargers.** Shore activities employ commercial automatic chargers that incorporate the constant current-constant voltage-constant current (IEI curve) techniques for recharging electric batteries.

9-8.1.2. **Shipboard Chargers.** Electric battery chargers used aboard ship are qualified in accordance with DOD-C-24529. They employ a constant current to constant voltage curve with a tapering current. These type of battery chargers cannot perform the traditional equalizing charge with an extended constant current period beyond the normal finishing rate like shore activity chargers. Instead, they are capable of prolonged float at low current and at a non-adjustable voltage limit of 2.33 to 2.37 volts per cell.

9-8.2. **EQUALIZING FREQUENCY.** Equalizing charges need not be performed every single time a battery is recharged. The frequency depends on how often the battery is cycled and to what depth it is being discharged. Battery manufacturers' instructions are the best source of information as to how often a battery should be equalized. Generally speaking:

- a. Batteries that are cycled only once or twice a week to an average depth of 30 to 60 percent, need equalizing charges only once per month.
- b. Batteries that are cycled four to eight times per month to any depth require equalizing once per month.
- c. Batteries that are cycled three or more times per week to an average depth of 60 to 80 percent should be equalized weekly.
- d. Batteries that are cycled five or more times a week to an average depth of 60 percent or greater usually never require equalizing unless stored.

9-8.3. **DETERMINING DEPTH OF DISCHARGE.** Depth of discharge can be determined by measuring the specific gravity of the electrolyte. This is accomplished using a hydrometer. Specific gravity decreases as the battery becomes more discharged. The graph in [figure 9-4](#) provides the percentage of battery discharge based on electrolyte specific gravity. This graph can be used as a general guide, but charts provided by individual battery manufacturers should be used when available.

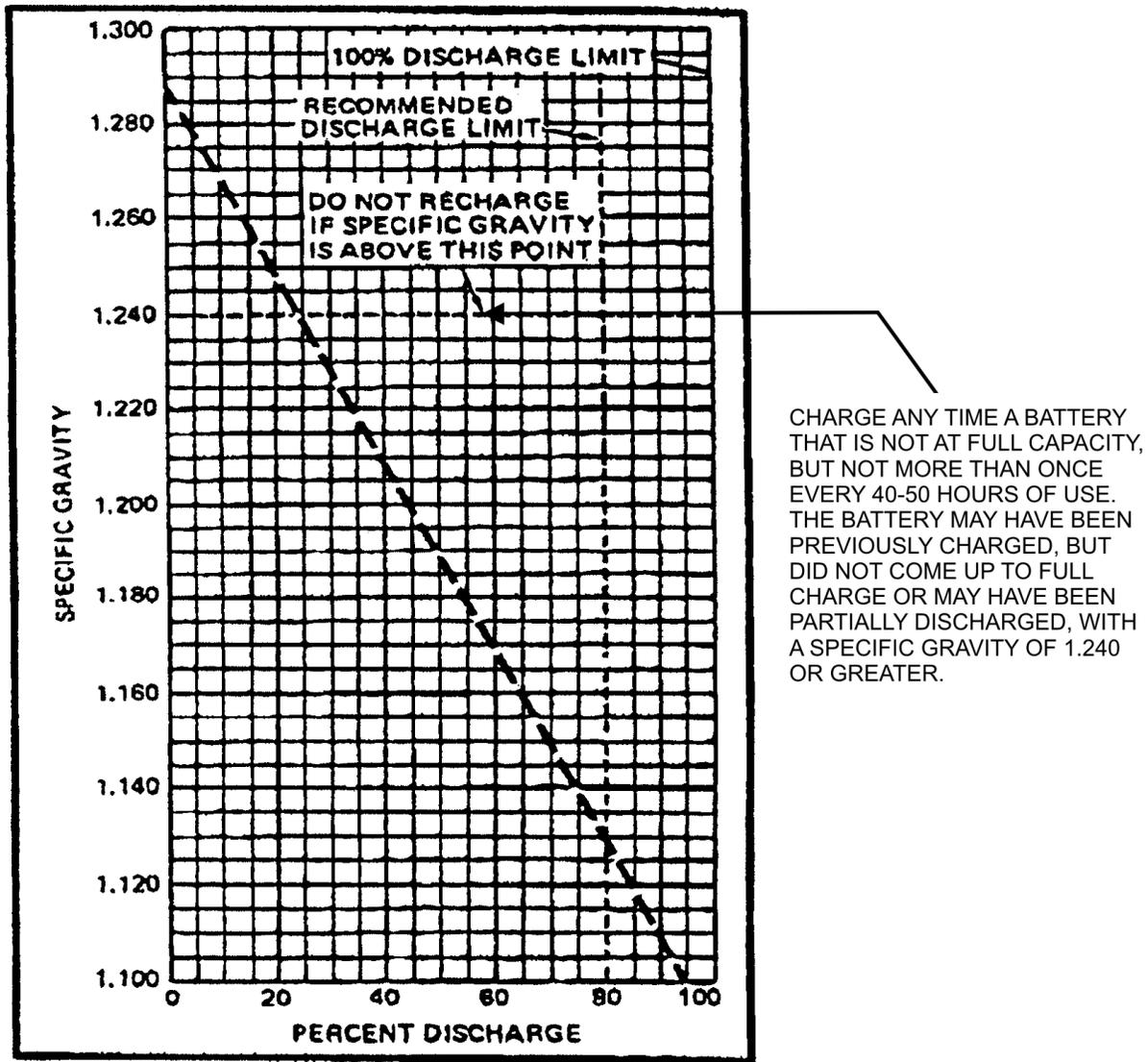


FIGURE 9-4. Battery Discharge

**9-9. DISCHARGING LEAD-ACID BATTERIES**

A battery may be discharged without harm at any rate of current it will deliver, but the discharge should not be continued beyond the point where the cells approach exhaustion (over 80 percent depth of discharge), or where the terminal voltage of the battery falls below an average of 1.70 volts/cell. Repeated discharging to depths beyond 80 percent can cause considerable damage to the battery's overall performance and directly affect its service life. Also, operating MHE when the battery output voltage has dropped off could damage the MHE. During discharge, there is normally a rise in battery temperature. How high it rises depends on the ambient temperature and the rate of discharge of the battery. Battery temperatures should not be allowed to exceed 115 °F.

**NOTE**

The length of charging times and temperature requirements identified in this chapter are written to maintain the optimum life and serviceability of the battery. They do not consider fleet operational or high use operations beyond the prescribed limits. Be aware that continued operation beyond these specified limits will greatly reduce the service life of the battery.

**NOTE**

The battery run time will vary from task to task. For example, it takes 2-1/2 times the power to raise the forks of a forklift truck than it does to drive the forklift truck on a flat surface.

**9-10. WATERING**

**WARNING**

Severe burns can be caused by the sulfuric acid contained in batteries. In case of contact, thoroughly flush affected area with clean water. Obtain medical attention immediately.

**CAUTION**

Use only distilled or de-mineralized water for filling lead-acid batteries.

**CAUTION**

Do not add distilled or de-mineralized water until visual inspection shows that top of separators/plates are visible.

**CAUTION**

Prior to battery charging if electrolyte is not visible above the battery plates add distilled water to a level just above the battery plates.

**CAUTION**

Do not overfill battery cells. Overfilling will likely cause electrolyte spillage, which will eventually lead to tray corrosion, ground paths, and loss of battery capacity.

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9-10.1. **REQUIREMENTS.** Only distilled or de-mineralized water shall be added to the battery. The need to add distilled or de-mineralized water may vary from weekly to quarterly depending on application, battery temperature, and battery design. Some of the most common causes for excessive fluid loss in a battery are:

- a. Automatic charges are not shutting off, resulting in excessing gassing.
- b. Charging rate exceeds the rate on the battery nameplate, resulting in excess gassing.
- c. One cell shorted out.

9-10.2. **WATER LEVELS.** Battery cell water levels shall be checked at the end of the charging cycle when the battery is gassing. Water shall only be added at this time. If maintenance personnel are not present at this time (as is likely when automatic chargers are used), and water is needed, the battery shall be connected to the charger and allowed to gas for one hour after adding the water. This facilitates “mixing” of the water and sulfuric acid in the battery cells. Do not let the battery temperature rise above 115 °F during this operation.

9-10.3. **ELECTROLYTE LEVEL.** Watering is only required when the electrolyte level drops to that of the separator plates. When adding water, the electrolyte level should be raised so that it is 1/4 inch below vent wells. See [figure 9-1](#). Do not overfill the battery cells. This could lead to spillage of electrolyte, resulting in corrosion of the battery tray and the MHE.

### 9-11. ACID REPLACEMENT AND SPECIFIC GRAVITY ADJUSTMENT

9-11.1. **BACKGROUND.** Under normal circumstances, a battery should never require the addition of acid to increase the specific gravity. Remember that sulfuric acid does not evaporate like water. However, when upsets, jar breakage or leaks, spillage, over flushing, or careless use of the hydrometer cause a significant loss of electrolyte, the lost acid should be replaced. The only way to tell that there is not enough sulfuric acid in a battery is when the battery seems to be fully charged (i.e. the electrolyte is gassing) but the specific gravity does not reach the level it should be reaching. In such case, the only way to get the specific gravity back up to where it should be is to add sulfuric acid.

#### **CAUTION**

Sulfuric acid should never be added to a cell without first ensuring that charging will not restore specific gravity to normal values.

#### **CAUTION**

Never make a specific gravity adjustment on a cell which does not gas freely on charge.

9-11.2. **ADDITION OF ACID.** The following procedures shall be followed when it is suspected that the addition of acid is required:

a. Perform an equalizing charge in accordance with [paragraph 9-8](#). The equalizing charge should be continued until the specific gravity, when read every hour, shows no further rise or when two successful readings show no increase.

**CAUTION**

Ensure all cells are gassing prior to starting any gravity adjustment.

b. At this time, if the specific gravity is not at the level it should be for a fully charged battery, then sulfuric acid needs to be added. Some batteries have this information printed on their nameplates. When taking readings, remember that specific gravity changes with temperature. Normal values are at 77 °F. For every 3 degrees above 77 °F, add 0.001 to the measured specific gravity. For each 3 degrees below 77 °F, subtract 0.001 from the measured specific gravity. See [table 9-1](#).

c. Place the battery back on charge at the finish rate to ensure all cells are gassing.

d. If electrolyte level is currently at the maximum level (1/4 inch below bottom of vent wells) draw off electrolyte so that it is just covering the separator plates. See [figure 9-1](#).

e. Slowly add new acid to the cell. If added too fast, the acid will not diffuse immediately and drop to the bottom of the cell, resulting in inaccurate specific gravity readings.

**WARNING**

Never use electrolyte with a specific gravity higher than 1.400.

**WARNING**

Severe burns can be caused by the sulfuric acid contained in batteries. In case of contact, thoroughly flush affected area with clean water. Obtain medical attention immediately.

f. Wait 20 minutes (on charger finish rate) to ensure that the added electrolyte has thoroughly mixed, then take a gravity reading.

g. If any one cell is still low, repeat the aforementioned process as many times as necessary to bring the specific gravity of that cell to normal.

h. If the specific gravity is too high, draw off a small amount of electrolyte from the cell as the battery is charging and replace it with distilled water. Repeat this procedure at 20-minute intervals until the desired reading is obtained.

i. Once the required gravity has been reached, keep the battery charging for an additional hour to ensure the electrolyte has completely mixed.

Table 9-1. Specific Gravity Temperature Correction Chart

Electrolyte Temperature (°F)	Point Correction	Electrolyte Temperature (°F)	Point Correction
140	+21	74	-1
137	+20	71	-2
134	+19	68	-3
131	+18	65	-4
128	+17	62	-5
125	+16	59	-6
122	+15	56	-7
119	+14	53	-8
116	+13	50	-9
113	+12	47	-10
110	+11	44	-11
107	+10	41	-12
104	+9	38	-13
101	+8	35	-14
98	+7	32	-15
95	+6	29	-16
92	+5	26	-17
89	+4	23	-18
86	+3	20	-19
83	+2	17	-20
80	+1	14	-21
77	no correction		

j. Record the voltage of the cells while still on charge at the finishing rate, and then stop the charge. After 20 minutes, record the specific gravity of all cells and the electrolyte temperature of at least two or three cells in several locations (e.g., middle and opposite ends of battery).

**9-12. CLEANING**

a. Check battery for cleanliness at regular intervals. Ensure dust, grease, corrosion and other foreign materials have not accumulated on the battery.

**CAUTION**

Only clean a battery with an approved neutralizer/cleaner or a mixture of bicarbonate of soda and water (one pound of bicarbonate to one gallon of water). Ensure cleaning mixture does not get into battery cells.

**CAUTION**

Prior to cleaning a battery, ensure all vent plugs are in place.

- b. Remove any spilled electrolyte from the battery covers, trays or battery compartment. Spilled electrolyte will not dry or evaporate and will corrode grounds and other metal parts.
- c. Under normal operating conditions, a battery should be completely cleaned and neutralized at least twice a year.
- d. Inspect the gas escape holes in all the vent caps to ensure they are not clogged with dirt or foreign substances.
- e. Coat all bolted battery connections and terminals with Grease, Aircraft and Instruments, MIL-PRF-23827. Battery Protector and Sealer, Part No. SA-9 (Permatex) is an approved alternate corrosion preventive compound.

**9-13. MAINTENANCE RECORDS**

Specific records shall be maintained for each battery in service using the battery record form, [figure 9-2](#). Once a battery is taken out of service, the cause shall be documented on the battery record form. Regularly scheduled maintenance shall be continued if the battery is to be placed back in service. If the battery is to be disposed of, no maintenance is required. A sample battery record form is provided in [figure 9-2](#). Commands may use a locally developed record form provided that the same data is being recorded. When a battery is being used in a new application, the depth of discharge should be checked for several weeks to determine whether it is within a safe range. This is accomplished by reading the specific gravity of a particular cell or cells at the beginning and end of the discharge. Daily discharge should not exceed 80 percent. If the specific gravity is below 80 percent, then a problem exists and the battery should be removed from that application.

**9-14. STORAGE/STOWAGE**

**CAUTION**

All batteries should be stored or stowed under cover and in a diked or contained area to prevent any electrolyte from accidentally entering the environment.

**CAUTION**

Batteries and acids should be stored or stowed away from sewer and storm drains and from sources of heat.

**CAUTION**

Leaking or cracked batteries and cells must be provided with adequate containment during storage and transportation.

- a. Batteries shall be stored or stowed in a clean, cool, dry and well ventilated location away from radiators or heating ducts. All efforts shall be made to keep batteries out of direct sunlight.
- b. All batteries should be fully charged and filled with the correct levels of electrolyte prior to being placed into storage. Batteries should be stored on an impenetrable surface. Storing on concrete will accelerate the discharge of the battery.
- c. Disconnect all battery leads.
- d. If the storage or stowage area temperature is 80 °F or higher, the specific gravity shall be checked monthly. If the temperature is 80 °F or less, the specific gravity shall be checked every 2 months.
- e. When racks are used for support of batteries, they shall be made of spark resistant materials. They may be coated or covered to achieve this objective.
- f. Batteries in storage or stowage should be charged to full capacity every 3 months.

**9-15. BATTERY REPLACEMENT**

The following provisions apply when ordering replacement batteries ashore and afloat.

**9-15.1. ASHORE.** Batteries shall be replaced and purchased directly from various vendor sources that meet the applicable MHE safety and use requirements. Ashore activities that purchase batteries for shipboard use must comply with the provisions in [paragraph 9-15.2](#).

**9-15.2. AFLOAT.** Batteries shall be replaced and purchased using the information documented in the applicable Allowance Parts List (APL) assigned for the specific MHE. In the event that no battery listing is provided on the APL, the battery shall be purchased using the part number documented in the MHE manufacturer's technical manual that refers to the original battery manufacturer. Standard procurement phrases such as "similar to," "like," or "equal to" shall not be used to obtain shipboard batteries. Replacement batteries must meet shipboard shock-hardened requirements. When doubts arise for a particular application, units afloat shall contact the Type Commander (TYCOM) MHE Manager for assistance and guidance. If no TYCOM MHE Manager is available or for application assistance, contact the MHE Program Manager at Commander, Naval Inventory Control Point Mechanicsburg (NAVICP-M), 5450 Carlisle Pike, Code 058133, P.O. Box 2020, Mechanicsburg, PA 17055-0788.

## CHAPTER 10

### REPAIR TIME STANDARDS

#### Section 1 - Introduction

##### 10-1. PURPOSE

This chapter contains general time standards for the repair, overhaul and maintenance of Materials Handling Equipment (MHE) to be used in the Equipment Management and Control System (EMACS) or other local cost control programs, when actual manufacturer repair time standards are not available, for establishing a measurement and comparison of the actual time consumed during maintenance operations. [Appendix E](#) identifies actual MHE manufacturer repair time standards, which may be used in place of or in conjunction with the repair time standards presented in this chapter. This information will assist in evaluating the effectiveness of supervision and the productivity of labor forces. As such, the repair time standards are a management tool and are not to be used by management to restrict personnel to specific time limitations in the performance of repair and maintenance functions.

##### 10-2. APPLICATION INSTRUCTIONS

10-2.1. ORGANIZATION. The MHE equipment cost codes for maintenance are presented in the remaining sections in this chapter. Identification of Equipment Cost Codes (ECC's), and a list of equipment classes and their capacities are provided at the beginning of each section.

10-2.2. REPAIR TIME STANDARDS. Each section contains repair time standards in hours for actual steps in a job to be performed (i.e., remove and repair clutch, transmission, or steering gear).

10-2.3. ABBREVIATIONS. The following abbreviations are used in these sections:

- a. CNG – Compressed Natural Gas.
- b. DBP – Draw Bar Pull.
- c. LPG – Liquefied Petroleum Gas.
- d. PRT – Pneumatic Rubber Tire.
- e. R & R – Remove and Replace.
- f. SRT – Solid Rubber Tire.

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10-2.4. **EXAMPLE.** The proper application of time standards is shown by the following example to remove and replace (R&R) a radiator from a 4,000-pound rated, gas powered, warehouse wheeled tractor:

Step 1: Refer to the Index of Equipment Cost Codes (ECC's) for Maintenance, [table 10-1](#), and locate the appropriate code for the equipment requiring repair (i.e., Code 1100).

Step 2: Refer to section 2 and select the repair code (i.e., 05 Cooling System).

Step 3: Refer to the time standards for that particular equipment code (i.e., 1100) and the repair action (i.e., Radiator – R&R) that lists a time standard of 1.3 hours.

Step 4: If using EMACS, create a work order and begin the repair process; otherwise use the local operating procedures.

### NOTE

Refer to the manufacturer's technical manual to become familiar with the procedures for each particular required repair action. It may be necessary, for example, that in order to replace a water pump on a particular unit, the radiator would also need to be removed. It is important that the individual who determines the repair action required is knowledgeable of all aspects concerning the repair of MHE.

10-2.5. **ELIMINATING DUPLICATION.** Planner estimators should be cautious before applying standards to any group of operations to avoid duplication of preparatory time.

### 10-3. PREPARING ESTIMATED STANDARDS

10-3.1. **GENERAL.** Because of the scope of this program, it is impossible to establish a standard for every type of operation that may be performed throughout the maintenance shops. When a standard has not been established, the planner estimator will be required to apply an estimated standard. To facilitate this procedure and to determine the standards more accurately, it is recommended that these procedures be followed:

- a. Identify the equipment cost code for the unit requiring repairs,
- b. Refer to the technical manual for complete repair procedures,
- c. Select the appropriate time standards making adjustments in hours, if needed.

10-3.2. **SUBMISSION OF PREPARED TIME STANDARDS.** All repair time standards prepared because of engineering design changes of the basic unit, assemblies, attachments, or for new or not covered equipment will be forwarded to the MHE Program Manager at Commander, Naval Inventory Control Point (NAVICP), Code 058133, 5450 Carlisle Pike, P.O. Box 2020, Mechanicsburg, PA 17055-0788.

**10-4. INDEX OF EQUIPMENT COST CODES AND PREVENTIVE MAINTENANCE INSPECTION STANDARDS**

Preventive maintenance is required on all equipment. For detailed procedures, refer to the manufacturer’s technical manual for guidance. [Table 10-1](#) identifies the various types of MHE, their associated maintenance cost codes, and a reference to the applicable section in the chapter to obtain the necessary repair codes and time standards.

**Table 10-1. Index of Equipment Cost Codes (ECC’s) for Maintenance**

Section	Code	Equipment
2	1100	Tractor, Wheeled, Warehouse, Gas, PRT (Up to and including 4000 pounds DBP)
	1105	Tractor, Wheeled, Warehouse, Propane, PRT (Up to and including 4000 pounds DBP)
	1110	Tractor, Wheeled, Warehouse, Gas, PRT (Over 4000 pounds DBP)
	1115	Tractor, Wheeled, Warehouse, LPG, PRT (Over 4000 pounds DBP)
3	1120	Tractor, Wheeled, Warehouse, Electric, SRT (2000 to 4000 pounds DBP)
4	1300	Truck, Lift, Fork, Gs, PRT (Up to and including 6000 pounds)
	1302	Truck, Lift, Fork , LPG/Gas, PRT (All Capacities)
	1305	Truck, Lift, Fork, Propane, PRT (Up to and including 6000 pounds)
	1306	Truck, Lift, Fork, CNG, PRT (All Capacities)
	1310	Truck, Lift, Fork, Gas, PRT (Over 6000 pounds)
	1315	Truck, Lift, Fork, Propane, PRT (Over 6000 pounds)
	1320	Truck, Lift, Fork, Gas, SRT (All Capacities)
	1322	Truck, Lift, Fork, LPG/Gas, SRT (All Capacities)
	1325	Truck, Lift, Fork, Propane, SRT (Up to and including 6000 pounds)
	1326	Truck, Lift, Fork, CNG, SRT (All Capacities)
5	1330	Truck, Lift, Fork, Diesel, PRT (Up to and including 6000 pounds)
	1331	Truck, Lift, Fork, Low Profile, Diesel, PRT (Up to and including 6000 pounds)
	1333	Truck, Lift, Fork, Low Profile, 463L, Diesel, PRT (Up to 6000 pounds)
	1340	Truck, Lift, Fork, Diesel, PRT (Over 6000 pounds)
	1343	Truck, Lift, Fork, Low Profile, 463L, Diesel, PRT (Over 6000 pounds)
	1350	Truck, Lift, Fork, Low Profile, Diesel SRT (All Capacities)
	1351	Truck, Lift, Fork, Low Profile, Diesel SRT (Up to and including 6000 pounds)
	1895	Sideloader, Front, Diesel, SRT (All Capacities)
6	1360	Truck, Lift, Fork, Electric, SRT (All Capacities)
7	1370	Truck, Lift, Fork, Electric Spark Enclosed, SRT (All Capacities)
	1371	Truck, Lift, Fork, Electric Spark Enclosed, SRT (All Capacities)
	1372	Truck, Lift, Fork, Electric Spark Enclosed, Shipboard, SRT (All Capacities)
	1375	Truck, Lift, Fork, Electric Spark Enclosed, PRT (All Capacities)
	1890	Truck, Sideloader, Front, Electric Spark Enclosed, SRT (All Capacities)
8	1380	Truck, Lift, Fork, Electric Explosion Proof, PRT (All Capacities)
9	1390	Truck, Lift, Fork, Tiering, Straddle and Reach Type, Electric
	1395	Truck, Lift, Fork, Tiering, Stockpicker, Electric
10	1400	Truck, Fixed Platform, Gas, PRT
11	1410	Truck, Fixed Platform, Electric, PRT

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**Table 10-1. Index of Equipment Cost Codes (ECC's) for Maintenance (Continued)**

<b>Section</b>	<b>Code</b>	<b>Equipment</b>
12	1420	Truck, Elevating Platform, Electric, SRT
13	1430	Truck, Elevating Platform, Gas, PRT
	1440	Truck, Elevating Platform, Gas, PRT
14	1500	Truck, Straddle-Carry, Gas or Diesel, PRT (Up to and including 60,000 pounds)
15	1600	Truck, Hand, Lift, Pallet, Electric, SRT (All Capacities)
	1610	Truck, Hand, Lift, Pallet, Electric, Spark Enclosed, SRT (All Capacities)
16	1820	Truck, Lift, Fork, Rough Terrain, Diesel, PRT (All Capacities)
	1823	Truck, Lift, Fork, Rough Terrain, 463L, Diesel, PRT (All Capacities)
17	1860	Truck, Sideloader, Diesel, PRT (Up to and including 10,000 pounds)
	1870	Truck, Sideloader, Diesel, PRT (Over 10,000 pounds)
18	1880	Truck, Sideloader, Electric (All Capacities)
19	1900	Truck, Hand, Lift, Pallet, Manual (All Capacities)
20	1433	463L K-Loader, Elevating Platform With Rollers, Gas or Diesel, PRT (All Capacities)
21	1903	463L Trailer With Rollers (All Capacities)

**NOTE**

No general repair time standards have been established for ECC #1433 in section 20 and for ECC #1903 in section 21.

**Section 2 – Equipment Cost Codes 1100-1115**

**TRACTOR, WHEELED, WAREHOUSE, GS/PROPANE/LPG,  
PRT, ALL MODELS**

**REPAIR CODES**

- 01 – Engine
- 02 – Clutch
- 03 – Fuel System
- 04 – Exhaust System
- 05 – Cooling System
- 06 – Electrical System
- 07 – Transmission
- 09 – Drive Shaft and Universal Joint
- 11 – Rear Axle and Differential
- 12 – Brakes
- 13 – Front Axle, Wheels, Controls, and Linkage
- 15 – Frame, Brackets, Springs, and Shock Absorbers
- 16 – Tires

**BASIC STANDARDS – EC Codes 1100-1115**

	Standard Time		Standard Time
A	Seat Assembly . . . . .	D	Floor Plates, Front - R & R . . . . .
B	Hood Assembly - R & R . . . . .	E	Floor Plates, Rear - R & R . . . . .
C	Side Panels . . . . .	F	Dash Panel and Frame - R & R . . . . .
	.2		.3
	.2		.4
	.3		.6

**TIME STANDARDS**

**Engine - Repair Code 01**

Operation	Description	Time
01-1	Bearings, Connecting Rod (1) . . . . .	.3
01-2	Bearings, Main, Adjust or Renew, All . . . . .	32.0
01-3	Bearings, Main, Oil Seat (Front) . . . . .	2.0
01-4	Bearings, Main, Oil Seal (Rear) . . . . .	1.5
01-5	Camshaft (Engine Out) - R & R . . . . .	1.7
01-6	Camshaft Bushing (1) - R & R . . . . .	.4
01-7	Carbon and Valve Job . . . . .	3.4
01-8	Crankshaft (Engine Out) - R & R . . . . .	3.5
01-9	Cylinder-Rebore (1) . . . . .	1.5
01-10	Cylinder Head Gasket - R & R . . . . .	1.5
10-11	Reface Cylinder Head . . . . .	1.0
01-12	Engine - R & R . . . . .	5.3
01-13	Engine Cylinder Block Overhaul (Engine In) and Tune-Up . . . . .	16.0
01-14	Engine Dynamometer Test . . . . .	2.2
01-15	Engine Overhaul, Complete Recondition and Tune-Up . . . . .	32.0
01-16	Engine Support Mountings (Front) - R & R . . . . .	1.0
01-17	Engine Support Mountings (Rear) - R & R . . . . .	.6
01-18	Engine Tune-Up - Minor . . . . .	.5
01-19	Engine Tune-Up - Major . . . . .	1.5
01-20	Flywheel - R & R . . . . .	3.0
01-21	Flywheel Reface . . . . .	1.0
01-22	Flywheel Ring Gear (Flywheel Out) - R & R . . . . .	.4
01-23	Engine-Ring Job and Tune-Up . . . . .	8.6
01-24	Oil Filter Cartridge - R & R . . . . .	.3
01-25	Oil Pan and/or Gasket - R & R . . . . .	1.1
01-26	Oil Pressure Gage - R & R . . . . .	.3
01-27	Oil Pump - R & R . . . . .	.4
01-28	Oil Pump Recondition - Removed . . . . .	.4
01-29	Pins, Fit (1) . . . . .	.2
01-30	Piston Assembly, Renew, Including Tune-Up . . . . .	4.2
01-31	Piston Assembly, Renew, Each Additional . . . . .	.9
01-32	Piston Renew (1) . . . . .	.5
01-33	Retime Valves . . . . .	2.6
01-34	Timing Case Cover and/or Gasket - R & R . . . . .	2.2
01-35	Timing Chain and Sprocket - R & R . . . . .	2.4
01-36	Valve (1-Each Additional .3) - R & R . . . . .	.7
01-37	Valve Guide (1) - R & R . . . . .	.2
01-38	Valve Insert (1) - R & R . . . . .	.3
01-39	Valve Side Cover Gasket - R & R . . . . .	.3
01-40	Valve Spring (1) - R & R . . . . .	.2
01-41	Valve Tappets, Adjust . . . . .	1.4

**Clutch - Repair Code 02**

Operation	Description	Time
02-1	Clutch Assembly - R & R . . . . .	.27
02-2	Clutch Driven Plate - Recondition - Removed . . . . .	.7
02-3	Clutch Cover Assembly - Recondition - Removed . . . . .	1.3
02-4	Clutch Housing (Includes Engine R & R) - R & R . . . . .	6.8
02-5	Clutch Pedal Adjust . . . . .	.5
02-6	Clutch Pedal Rebush - R & R . . . . .	1.5
02-7	Clutch Pedal Return Spring - R & R . . . . .	1.1
02-8	Clutch Release Bearing - R & R . . . . .	1.7
02-9	Clutch Release Fork - R & R . . . . .	1.7

**Fuel System - Repair Code 03**

Operation	Description	Time
03-1	Accelerator Spring - R & R . . . . .	1.1
03-2	Carburetor - Adjust . . . . .	.2
03-3	Air Filter - Clean . . . . .	.2
03-4	Carburetor - Adjust with Gages - R & R . . . . .	1.2
03-5	Carburetor Air Cleaner Service - R & R . . . . .	.2
03-6	Carburetor Linkage Recondition . . . . .	.5
03-7	Carburetor and/or Gasket - R & R . . . . .	.4
03-8	Carburetor Overhaul - R & R . . . . .	1.4
03-9	Carburetor Overhaul - Removed . . . . .	1.0
03-10	Flexible Fuel Line - R & R . . . . .	.5
03-11	Fuel Bowl Gasket - R & R . . . . .	.3
03-12	Fuel Filter - R & R . . . . .	.2
03-13	Fuel Gage - R & R . . . . .	.3
03-14	Fuel Line (Pump to Carburetor) R & R . . . . .	.3
03-15	Fuel Line Manufacture . . . . .	.5
03-16	Fuel Line (Tank to Pump) - R & R . . . . .	1.0
03-17	Fuel Pump and/or Gasket - R & R . . . . .	.5
03-18	Fuel Pump Overhaul (Pump Off) . . . . .	.6
03-19	Fuel Tank - R & R . . . . .	1.0
03-20	Governor - Adjust . . . . .	.2

**Exhaust System - Repair Code 04**

Operation	Description	Time
04-1	Exhaust Pipe - R & R . . . . .	.9
04-2	Gasket, Exhaust Pipe - R & R . . . . .	.4
04-3	Gasket, Manifold - R & R . . . . .	1.2
04-4	Manifold, Exhaust or Intake - R & R . . . . .	2.1
04-5	Manifold Heat Control Valve - R & R . . . . .	.5
04-6	Muffler - R & R . . . . .	1.2
04-7	Tail Pipe - R & R . . . . .	.7

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## TIME STANDARDS (Continued)

### Cooling System - Repair Code 05

Operation	Description	Time
05-1	Fan Belt - R & R	.3
05-2	Fan Blade - R & R	.5
05-03	Head Water Outlet Gasket - R & R	.4
05-4	Radiator - R & R	1.3
05-5	Radiator Drain Cock - R & R	.3
05-6	Radiator Hose, Lower - R & R	.3
05-7	Radiator Hose, Upper - R & R	.2
05-8	Temperature Gage - R & R	.4
05-9	Thermostat - R & R	.5
05-10	Water Pump - R & R	1.3
05-11	Water Pump Recondition (Pump Removed)	.8
05-12	Cooling System - Flush	1.0

### Electric System - Repair Code 06

Operation	Description	Time
06-1	Ammeter - R & R	.4
06-2	Battery - R & R	.3
06-3	Battery Cable (Each) - R & R	.3
06-4	Battery Holddown - R & R	.2
06-5	Condenser - R & R	.2
06-6	Distributor - R & R	.5
06-7	Distributor Cap - R & R	.3
06-8	Distributor Recondition (Distributor Removed)	.8
06-9	Generator - R & R	.5
06-10	Generator Recondition (Generator Removed)	1.0
06-11	Generator Armature - R & R	.8
06-12	Generator Bushes - R & R	.4
06-13	Generator Circuits Tested	.5
06-14	Headlight - R & R	.3
06-15	Headlight Assembly - R & R	.5
06-16	Horn - R & R	.3
06-17	Horn Button - R & R	.3
06-18	Ignition Coil - R & R	.3
06-19	Ignition Points - R & R	.4
06-20	Reset Ignition Timing	.2
06-21	Spark Plugs, One Set, Clean and Reset - R & R	.4
06-22	Spark Plug Wires, One set - R & R	.4
06-23	Starter - R & R	.9
06-24	Starter Solenoid - R & R	.7
06-25	Starter Armature - R & R	.8
06-26	Starter Brushes - R & R	.4
06-27	Starter Recondition (Removed), Renew Field Cores	.6
06-28	Starter Switch - R & R	.4
06-29	Switch - R & R	.4
06-30	Tail or Stoplight - R & R	.2
06-31	Tail or Stoplight Assembly - R & R	.5
06-32	Voltage Regulator - R & R	.3
06-33	Voltage Regulator Check and Adjust	.4
06-34	Voltage Regulator Recondition - Removed	1.0
06-35	Hour Meter - R & R	.3

### Transmission - Repair Code 07

Operation	Description	Time
07-1	Automatic Transmission - R & R	.3.5
07-2	Automatic Transmission Governor Assembly Condition - R & R	1.8
07-3	Automatic Transmission Housing Oil Seal	1.0
07-4	Automatic Transmission Oil Pump, Add Automatic Transmission - R & R for Front Pump	1.8
07-5	Automatic Transmission Regulator Valve Body - R & R	3.4
07-6	Fluid Coupling - R & R	3.5
07-7	Fluid Coupling Seal (Assembly Removed)	1.3
07-8	Shift Mechanism, Recondition	.8
07-9	Shift Mechanism, Recondition - R & R	.6
07-10	Torque Converter - R & R	4.5
07-11	Torque Converter Adapter or Adapter to Housing Seals - R & R	4.5
07-12	Torque Converter Adapter to Engine Seals - R & R	4.5
07-13	Transmission - R & R	1.8
07-14	Transmission Rear Seal - R & R	1.9
07-15	Transmission, Recondition (Transmission Removed)	2.8
07-16	Transmission Cover and Shift Assembly - Recondition	1.7

### Drive Shaft and Universal Joint - Repair Code 09

Operation	Description	Time
09-1	Universal Joint (1) - R & R	.6
09-2	Universal Joint (1) - Recondition	.6

### Drive Axle, Wheels, and Differential - Repair Code 11

Operation	Description	Time
11-1	Differential Assembly - R & R	2.5
11-2	Differential Pinion Oil Seal - R & R	2.0
11-3	Differential Assembly Adjust Ring Gear and Pinion	1.6
11-4	Differential Assembly Recondition (Differential Removed)	3.8
11-5	Drive Axle (2) - R & R	1.3
11-6	Drive Axle Bearings and Oil Seal (Each Axle) - R & R	1.0
11-7	Drive Axle Bearings and Cones (Each Axle) - R & R	1.7
11-8	Drive Wheel - R & R	.4

### Brakes - Repair Code 12

Operation	Description	Time
12-1	Brake Adjustment (Major), After Relining	.9
12-2	Brake Adjustment (Minor), Includes Bleeding	.6
12-3	Brake Drum Turning (One Removed)	.8
12-4	Brake Hub and Drum (1) - R & R	.4

**TIME STANDARDS (Continued)**

**Brakes - Repair Code 12 (Continued)**

Operation	Description	Time
12-5	Brake Line (1) Includes Fill Master Cylinder and Bleeding - R & R	.5
12-6	Brake Pedal Free Play Adjustment	.3
12-7	Brake Pedal Rebush - R & R	1.5
12-8	Brake Pedal Return Spring - R & R	.2
12-9	Brake Relining (2 Wheels) - R & R	1.7
12-10	Brake Shoes Reline (Per Wheel)	.6
12-11	Bleed Brake System, Includes Fill Master Cylinder	.6
12-12	Handbrake - R & R	.7
12-13	Handbrake - Adjustment	.3
12-14	Handbrake Drum	.7
12-15	Handbrake Drum - R & R	1.5
12-16	Handbrake Reline	.7
12-17	Master Cylinder - R & R	.6
12-18	Master Cylinder Hone and Rebuild (Cylinder Off)	.6
12-19	Wheel Cylinder (1) (Wheel Off) - R & R	.5
12-20	Wheel Cylinder Rebuild (Wheel Off)	.3

**Front Axle - Wheels - Controls and Linkage - Repair Code 13**

Operation	Description	Time
13-1	Drag Link (1), Clean and Lubricate - R & R	.6
13-2	Horn Wire in Steering Column - R & R	.4
13-3	Pitman Arm Assembly - R & R	.4
13-4	Power Steering Booster - R & R	2.0
13-5	Power Steering Booster Adjustment	1.0
13-6	Power Steering Booster Recondition (Removed)	2.1
13-7	Steering Arm - R & R	.7
13-8	Steering Assembly Alinement	.7
13-9	Steering Gear Assembly - R & R	1.5
13-10	Steering Gear Assembly Adjust	.7
13-11	Steering Gear Assembly Cross Shaft and Seal - R & R	.8

**Front Axle - Wheels - Controls and Linkage - Repair Code 13 (Continued)**

Operation	Description	Time
13-12	Steering Gear Assembly Recondition (Off)	1.6
13-13	Steering Knuckle (1) - R & R	.8
13-14	Steering Knuckle Ball Joints Adjust (1) - R & R	.3
13-15	Steering Knuckle Pins and Bushings (1 Wheel) - R & R	1.1
13-16	Steering Wheel - R & R	.3
13-17	Steering Wheel Hand - R & R	.3
13-18	Steering Wheel Bearings, Clean and Lubricate - R & R	.4
13-19	Tie Rod End (1), Clean and Lubricate - R & R	.5
13-20	Tie Rod End (1), Rod Off - R & R	.3
13-21	Tighten Steering Gear Mounting Bolts	.3
13-22	Tighten Suspension and Steering Linkage	1.0
13-23	Steering Axle - R & R	1.6
13-24	Steering Axle Recondition	2.5

**Frame, Brackets, Springs, and Shock Absorbers - Repair Code 15**

Operation	Description	Time
15-1	Coupler Assembly Latch - R & R	.2
15-2	Coupler Assembly Latch - R & R	.2
15-3	Springs (1) - R & R	1.1
15-4	Spring Center Bolt - R & R	1.2
15-5	Spring Shackle Assembly (1) - R & R	.4

**Tires - Repair Code 16**

Operation	Description	Time
16-1	Tire, Drive Wheel, Pneumatic (1), Includes Wheel Removal and Repair - R & R	.5
16-2	Tire, Steer Wheel, Pneumatic (1), Includes Wheel Removal and Repair - R & R	.4

**Section 3 – Equipment Cost Code 1120**

**TRACTOR, WHEELED, WAREHOUSE, ELECTRIC, SRT,  
2,000-POUND TO 4,000-POUND DRAW BAR PULL**

**REPAIR CODES**

- 11 – Rear Axle and Differential
- 12 – Brakes
- 13 – Front Axle, Wheels, Controls, and Linkage
- 16 – Tire - Solid
- 18 – Body, Fenders, Guards
- 37 – Battery
- 50 – Electric Motors
- 52 – Electric Controls

**TIME STANDARDS**

**Rear Axle and Differential - Repair Code 11**

Operation	Description	Time Model Up to 4000#
11-1	Differential - Overhaul (out-of unit)	2.1
11-2	Differential - R & R	1.5
11-3	Drive Axle - R & R	.2
11-4	Drive Wheels - R & R	.5
11-5	Drive Wheel Bearings - remove, repack and replace	.8
11-6	Drive Wheel Sprocket - R & R	1.5
11-7	Jackshaft - R & R	1.5
11-8	Jackshaft Bearings - R & R	1.5

**Brakes - Repair Code 12**

Operation	Description	Time Model Up to 4000#
12-1	Brakes - Adjustment - Major	1.0
12-2	Brakes - Adjustment - Minor	.5
12-3	Brake Band - reline	.2
12-4	Brake Pedal Return Spring - R & R	.2
12-5	Seat Brake - adjust	.2
12-6	Brake Shoes - R & R	1.5
12-7	Brake Shoes - reline (out-of-unit)	.4

**Front Axle - Wheels - Controls Linkage - Repair Code 13**

Operation	Description	Time Model Up to 4000#
13-1	Drag Link - R & R	.4
13-2	Front Suspension Spring - R & R - One Spring	.6
	Front Suspension Spring - R & R - Two Springs	1.2
13-3	Rear Suspension Spring - R & R - One Spring	.6
	Rear Suspension Spring - R & R - Two Springs	1.2
13-4	Steer Axle Assembly - Overhaul (out-of unit)	1.5
13-5	Steer Axle Assembly - R & R	.7
13-6	Steer Gear - Overhaul (out-of-unit)	.8
13-7	Steer Gear - R & R	1.1
13-8	Steer Wheels - R & R	.2
13-9	Steering - Inspect and Service	.3
13-10	Wheels - R & R	.2
13-11	Wheel Bearings - remove, repack, and replace	.6
13-12	Steering Turntable - Adjust	3.0
13-13	Steering Handle - R & R	.8
13-14	Steering Handle Return Spring - R & R	.2
13-15	Turntable Adjustment Ring - R & R	2.5

**Tire - Solid - Repair Code 16**

Operation	Description	Time Model Up to 4000#
16-1	Tires - Front - R & R (Solid)	1.0
16-2	Tires - Rear - R & R (Solid)	1.0

**Body - Fenders - Guards - Repair Code 18**

Operation	Description	Time Model Up to 4000#
18-1	Hitch - R & R	.2
18-2	Hitch Tongue - R & R	.1
18-3	Seat Spring - R & R	.4
18-4	Rear Wheel - R & R	.5

**Battery - Repair Code 37**

Operation	Description	Time Model Up to 4000#
37-1	Battery - R & R (Check all Grounds)	.3
37-2	Battery Plug - R & R	.5
37-3	Charging Plug - R & R	.5

**Electric Motors - Repair Code 50**

Operation	Description	Time Model Up to 4000#
50-1	Drive Motor - Clean and Inspect	.5
50-2	Drive Motor - R & R	1.0
50-3	Drive Motor - Overhaul	6.0
50-4	Drive Motor Wires - R & R	.3

**Electric Controls - Repair Code 52**

Operation	Description	Time Model Up to 4000#
52-1	Contacts - One Set - R & R	.2
	Add for each additional set replaced	(.1)
52-2	Contacts (All) - Clean & Service	.9
52-3	Control Pedal Return Spring - R & R	.1
52-4	Drive Controller - Repair	Est.
	Estimate time for repair or use actual time	Est.
52-5	Drive Motor Controller - Clean and Inspect	.5
52-6	Limit Switch - Adjust	.2

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## TIME STANDARDS (Continued)

### Electric Controls - Repair Code 52 (Continued)

Operation	Description	Time Model Up to 4000#
52-7	Limit Switch - R & R .....	.4
52-8	Horn - R & R .....	.3
52-9	Horn Button - R & R .....	.3
52-10	Horn Adjustment .....	.1
52-11	Hour-Meter - R & R .....	.3

### Electric Controls - Repair Code 52 (Continued)

Operation	Description	Time Model Up to 4000#
52-12	Battery Flush .....	.3
52-13	Battery Cable Lug Resolder .....	.5
52-14	Drive Motor, Overhaul .....	32.0
52-15	Drie Resistor - R & R .....	.1.0
52-16	Contacts, One Set (Clean) .....	.1

**Section 4 – Equipment Cost Codes 1300-1326**

**TRUCK, LIFT, FORK, GAS/LPG/PROPANE/CNG**

**REPAIR CODES**

- 01 – Engine
- 02 – Clutch
- 03 – Fuel System
- 04 – Exhaust System
- 05 – Cooling System
- 06 – Electrical System
- 07 – Transmission
- 09 – Drive Shaft and Universal
- 11 – Rear Axle and Differential
- 12 – Brakes
- 13 – Front Axle - Wheels - Controls
- 16 – Tires
- 18 – Hood - Fenders - Body
- 37 – Battery
- 63 – Hydraulic System
- 85 – Hoist - Winch Assemblies

**BASIC STANDARDS – EC Codes 1300-1326**

**Standard Time**

A	Lift Forks - R & R .....	.2
B	Safety Rack - R & R .....	.5
C	Mast -- R & R (Includes Operations A & B) .....	.0
D	Mast (Lay on floor without removing, including Operations A & B) .....	1.0
E	Floor Board - R &R .....	.2
F	Side Panels - R & R .....	.4
G	Floor Board and Side Panels - R & R .....	.5
H	Gas Tank Cover - R & R .....	.3
I	Gas Tank - R & R (Includes Operation H) .....	.6
J	Hydraulic Tank and Seat Frame - R & R (Includes Operations E & I) .....	2.0
K	Block Up Rear End .....	.1
L	Block Up Front End .....	.1

**TIME STANDARDS**

		Time			
		Models			
		SRT		PRT	
		Up to:			
Operation	Description	4000	6000	6000	15,000
01-1	Engine - Bore for Sleeves .....	9.7	13.2	13.2	13.2
01-2	Engine - Bore Oversize .....	6.6	7.6	7.6	7.8
01-3	Engine - Disassemble .....	2.5	2.7	2.6	2.9
01-4	Engine - Dynamometer Test .....	2.2	2.2	2.2	2.2
NOTE: In this standard, full attention is not required for the 3-1/4 hours run-in time. The standard includes .6 hour for attention and check of operating results.					
01-5	Engine - R & R .....	8.1	8.3	8.4	9.4
01-6	Engine - Reassemble .....	7.6	8.7	8.7	8.9
01-7	Engine - Replace Head or Gasket .....	1.1	1.2	1.3	1.5
01-8	Engine - Replace Valve Spring .....	.9	2.5	2.5	2.5
01-9	Valve Job Complete .....	7.5	8.0	9.0	12.0
01-10	Valve Side Cover Gasket .....	.6	.6	.8	1.4
01-11	Engine - Tappets - Adjust .....	1.2	2.8	2.8	2.8
01-12	Engine - Timing Gear Cover or Gasket - R & R .....	8.2	8.2	8.2	8.4
01-13	Engine - Tune-Up .....	.9	1.0	1.0	1.0
01-14	Engine Tune-Up Minor .....	1.5	1.5	1.5	2.0
01-15	Engine Tune-Up Major .....	2.0	2.0	2.0	2.5
01-16	Engine Mount Springs (Both Sides) - R & R .....	.5	.5	.7	.8
01-17	Engine Mount Springs (One Side) - R & R .....	.4	.4	.5	.5
01-18	Oil Gauge - R & R .....	.4	.4	.4	.4
01-19	Accessory Drive - R & R .....	....	2.3	....	....
01-20	Accessory Drive - Overhaul .....	....	1.5	....	....

**TIME STANDARDS (Continued)**

		Time			
		Models			
		SRT	PRT		
		Up to:			
Operation	Description	4000	6000	6000	15,000
02-1	Clutch - Adjust . . . . .	.2	.2	.2	.2
02-2	Clutch Facing - Reline . . . . .	.4	.4	.4	.4
02-3	Clutch Pedal Springs - R & R . . . . .	.1	.3	.3	.3
02-4	Flywheel - R & R . . . . .	4.9	4.8	4.9	4.9
02-5	Flywheel Ring Gear - Install . . . . .	.2	.1	.1	.2
02-6	Flywheel Reface . . . . .	1.0	1.0	1.0	2.0
02-7	Pressure Plate - Facing and Release Bearing - R & R	2.8	3.9	4.0	4.1
02-8	Pressure Plate - Overhaul . . . . .	.7	.7	.7	.8
03-1	Accelerator Spring - R & R . . . . .	.2	.1	.1	.1
03-2	Air Filter - Clean . . . . .	.1	.1	.1	.1
03-3	Carburetor - Overhaul . . . . .	.6	.6	.6	.6
03-4	Carburetor - R & R . . . . .	.4	.4	.4	.4
03-5	Choke Assembly - R & R . . . . .	.5	.5	.5	.6
03-6	Carburetor and Governor- Adjust . . . . .	.2	.2	.2	.2
03-7	Carburetor Return Spring - R & R . . . . .	.1	.1	.1	.1
03-8	Fuel Filter - Clean . . . . .	.1	.1	.1	.1
03-9	Fuel Gauge - R & R . . . . .	.4	.4	.4	.4
03-10	Fuel Pump - Overhaul . . . . .	. . . .	.4	.4	.4
03-11	Fuel Pump - R & R . . . . .	.1	.5	.5	.5
03-12	Fuel Tank - R & R . . . . .	.7	.7	.7	.7
04-1	Exhaust Pipe and Gasket - R & R . . . . .	.6	.8	.7	.8
04-2	Exhaust Pipe Gasket - R & R . . . . .	.3	.5	.5	.6
04-3	Heat Control Thermostat - R & R . . . . .	. . . .	.1	.1	.2
04-4	Intake and Exhaust Section Gasket - R & R . . . . .	.5	1.1	1.1	1.1
04-5	Manifold and/or Gasket - R & R . . . . .	1.3	1.7	1.8	1.8
04-6	Muffler - R & R . . . . .	.6	.7	.6	.7
04-7	Muffler, Exhaust Pipe and Gasket - R & R . . . . .	.8	1.0	1.0	1.0
05-1	Engine Drain cock - R & R . . . . .	.2	.2	.2	.2
05-2	Fan Belt - R & R . . . . .	.2	.1	.1	.2
05-3	Fan Belt - Adjust . . . . .	.1	.1	.7	.4
05-4	Fan Blade - R & R . . . . .	.3	.4	.4	.3
05-5	Head Water Outlet Gasket - R & R . . . . .	.3	.3	.3	.4
05-6	Radiator - R & R . . . . .	1.4	1.3	1.4	1.7
05-7	Radiator Drain Cock - R & R . . . . .	.1	.1	.1	.2
05-8	Radiator Hose - Lower - R & R . . . . .	.3	.3	.3	.3
05-9	Radiator Hose - Upper - R & R . . . . .	.2	.2	.2	.2
05-10	Water Pump - Overhaul . . . . .	.6	.6	.6	.7
05-11	Water Pump - R & R . . . . .	1.5	1.5	1.5	1.6

**TIME STANDARDS (Continued)**

		Time			
		Models			
		SRT	PRT		
		Up to:			
Operation	Description	4000	6000	6000	15,000
05-12	Cooling System - Flush . . . . .	1.0	1.0	1.0	1.0
05-13	Temperature Gauge - R & R . . . . .	.4	.4	.4	.4
06-1	Ammeter - R & R . . . . .	.4	.4	.4	.4
06-2	Coil - R & R . . . . .	.2	.2	.2	.2
06-3	Dash Panel - Rewire . . . . .	.9	.9	.9	1.1
06-4	Distributor - Overhaul . . . . .	.7	.6	.6	.7
06-5	Distributor - R & R . . . . .	.2	.2	.2	.2
06-6	Generator - Adjust . . . . .	.2	.2	.2	.2
06-7	Generator - R & R . . . . .	.4	.4	.3	.5
06-8	Generator Belt - R & R . . . . .	. . . .	. . . .	.8	.8
06-9	Horn - R & R or Adjust . . . . .	.3	.3	.3	.3
06-10	Horn Button - R & R . . . . .	.1	.1	.1	.1
06-11	Horn Wire to Button - R & R . . . . .	.2	.2	.2	.2
06-12	Ignition Switch - R & R . . . . .	.4	.4	.4	.4
06-13	Spark Plugs - R & R . . . . .	.2	.4	.4	.4
06-14	Spark Plug Wires - R & R . . . . .	.3	.4	.4	.4
06-15	Starter - R & R . . . . .	.6	.6	.6	.6
06-16	Starter - Overhaul . . . . .	1.3	1.3	1.3	1.3
06-17	Starter Cable - R & R . . . . .	.2	.2	.2	.3
06-18	Starter Switch - R & R . . . . .	.5	.5	.5	.5
06-19	Starter Switch to Battery Cable - R & R . . . . .	.2	.2	.2	.2
06-20	Voltage Regulator - Adjust . . . . .	.3	.3	.3	.3
06-21	Voltage Regulator - R & R . . . . .	.3	.3	.3	.3
06-22	Hour Meter - R & R . . . . .	.3	.3	.3	.3
06-23	Voltage Regulator - Overhaul . . . . .	1.0	1.0	1.0	1.0
06-24	Fuse Holder - R & R . . . . .	.5	.5	.5	.5
07-1	Ring and Pinion Gear Assembly - Overhaul . . . . .	1.0	1.0	1.0	1.0
07-2	Transmission - Overhaul . . . . .	5.1	5.1	3.4	4.8
07-3	Transmission Shifting Link - R & R . . . . .	.5	. . . .	. . . .	. . . .
07-4	Transmission Shifting Pall - R & R . . . . .	. . . .	1.0	. . . .	. . . .
07-5	Transmission - R & R . . . . .	4.4	4.3	3.8	4.1
07-6	Transmission - Replace Grease Seals and Inspect . . . . .	1.4	1.4	1.6	.16
07-7	Transmission Shifting Rail Seals - R & R . . . . .	. . . .	1.0	. . . .	. . . .
<b>Automatic Transmission</b>					
07-8	Automatic Transmission - R & R . . . . .	3.5	3.5	3.5	3.6
07-9	Automatic Transmission Oil Filter - R & R . . . . .	. . . .	0.8	. . . .	. . . .
07-10	Automatic Transmission Oil Pump - R & R (Add Automatic Transmission R & R for Front Pump)	1.8	1.8	1.8	1.8

**TIME STANDARDS (Continued)**

		Time			
		Models			
		SRT	PRT		
		Up to:			
Operation	Description	4000	6000	6000	15,000
07-11	Automatic Transmission Housing Oil Seal - R & R . . . . .	1.0	1.0	1.0	1.0
07-12	Automatic Transmission Governor Assembly - Recondition . . . . .	1.8	1.8	1.8	1.8
09-1	Universal Joint - R & R . . . . .	. . . .	. . . .	.6	.6
09-2	Sprocket Coupling Chain - R & R . . . . .	.5	. . . .	. . . .	. . . .
09-3	Universal Joint - Replace Bearings . . . . .	. . . .	. . . .	1.1	1.1
11-1	Differential Assembly - Overhaul . . . . .	. . . .	. . . .	2.9	3.2
11-2	Differential Assembly - R & R . . . . .	. . . .	. . . .	3.1	3.2
11-3	Differential "U" Bolt - R & R . . . . .	.5	. . . .	. . . .	. . . .
11-4	Differential and Transmission Assembly - Overhaul . . . . .	11.0	11.0	. . . .	. . . .
11-5	Rear Axle - R & R . . . . .	1.6	1.6	1.8	1.8
11-6	Wheels - Drive - R & R . . . . .	.7	.7	1.0	1.0
11-7	Wheels - Drive - Pack Bearings . . . . .	.4	.4	.4	.5
11-8	Differential Pinion Drive Seal . . . . .	3.5	2.0	2.0	2.0
12-1	Adjustment - Major . . . . .	.9	.9	1.0	1.2
12-2	Adjustment - Minor . . . . .	.4	.4	.4	.4
12-3	Brake Cylinder - Overhaul (out-of-unit) (Per Cylinder) . . . . .	.3	.3	.3	.4
12-4	Brake Cylinder - R & R . . . . .	1.4	1.4	1.4	1.5
12-5	Brake Line - Central - R & R . . . . .	.2	.2	.2	.2
12-6	Brake Lines - Bleed . . . . .	.6	.5	.3	.3
12-7	Brake Lines - L or R - R & R . . . . .	.7	.7	.3	.3
12-8	Brake Pedal - Adjust . . . . .	.2	.2	.2	.2
12-9	Brake Pedal Springs - R & R . . . . .	.1	.3	.3	.3
12-10	Brake Shoe - Bonded - Reline . . . . .	.3	.3	.3	.3
12-11	Brake Shoes - R & R . . . . .	1.5	1.4	1.5	1.6
12-12	Brake Shoes - Reline (Per Wheel) . . . . .	.3	.3	.3	.3
12-13	Hand Brake - Adjust . . . . .	.3	.3	.3	.3
12-14	Hand Brake Band - Reline . . . . .	.2	.2	.2	.3
12-15	Master Cylinder - Overhaul (out-of-unit) . . . . .	.4	.4	.4	.5
12-16	Master Cylinder - R & R . . . . .	.5	.5	.5	.5
12-17	Micro Brake Unit - R & R . . . . .	1.1	. . . .	. . . .	.8
13-1	Steel Wheels - Repack . . . . .	.6	.6	.6	.7
13-2	Steering - Inspect . . . . .	.3	.3	.3	.3
13-3	Steering Assembly - Overhaul . . . . .	2.0	2.2	2.2	2.7
13-4	Steering Assembly - R & R . . . . .	1.8	1.8	1.7	1.8
13-5	Steering Axle Drag Link - R & R . . . . .	.7	.7	.7	.7
13-6	Steering Axle Spring (One) - R & R . . . . .	2.1	2.1	. . . .	. . . .
13-7	Steering Gear - Overhaul . . . . .	1.1	1.1	1.1	1.1

**TIME STANDARDS (Continued)**

		Time			
		Models			
		SRT	PRT		
		Up to:			
Operation	Description	4000	6000	6000	15,000
13-8	Steering Gear . . . . .	1.1	1.2	1.2	1.2
13-9	Steering Wheel - R & R. . . . .	.3	.3	.3	.3
<b>Power Steering</b>					
13-10	Cylinder, Steering, Air Booster - R & R . . . . .	....	....	.8	1.0
13-11	Valve Assembly, Control - R & R . . . . .	....	....	.5	.5
13-12	Valve, Relief - R & R. . . . .	....	....	.3	.3
13-13	Pump, Hydraulic - R & R . . . . .	....	....	.5	.5
13-14	Flexible Oil Line - R & R . . . . .	....	....	.2	.2
13-15	Hose, Hydraulic, Gear Pump to Control Valve - R & R . . . . .	....	....	.3	.2
16-1	Drive Wheels - Retire - Solid - Pneumatic . . . . .	.8	.8	1.4	1.4
16-2	Front Wheels - Steering - Retire - Solid - Pneumatic . . . . .	.7	.7	.7	.7
18-1	Floor Board - R & R . . . . .	.2	.2	.2	.2
18-2	Gas Tank Cover - R & R . . . . .	.3	.3	....	....
18-3	Hydraulic Tank and Seat Frame - R & R. . . . .	2.0	2.0	2.0	2.0
18-4	Safety Rack - R & R . . . . .	.5	.5	.5	.5
18-5	Seat Spring - R & R. . . . .	....	.2	....	....
18-6	Side Panels - R & R. . . . .	....	.4	....	....
37-1	Battery - R & R . . . . .	.2	.2	.2	.2
37-2	Battery Ground Cable - R & R . . . . .	.2	.1	.2	.2
63-1	Hydraulic Oil Tank - R & R . . . . .	1.1	1.2	1.2	1.3
63-2	Hydraulic Pump and/or Gasket - R & R . . . . .	1.0	1.4	1.0	1.2
63-3	Lift Cylinder - Overhaul . . . . .	2.6	2.7	2.7	2.8
63-4	Lift Cylinder to Tank Line - R & R. . . . .	.6	.6	.6	.6
63-5	Mast and Lift Cylinder - Overhaul . . . . .	6.5	7.0	7.0	8.0
63-6	Pump to Valve Hydraulic Line - R & R. . . . .	.4	.4	.5	.7
63-7	Tank to Pump Hydraulic Line - R & R . . . . .	.8	.8	.8	.9
63-8	Tilt Cylinder - Overhaul (in unit) . . . . .	.8	.8	.9	.9
63-9	Tilt Cylinder - Overhaul (out-of-unit) . . . . .	.7	.7	.7	.7
63-10	Tilt Cylinder Crossover Line (Front) - R & R. . . . .	.5	.5	.5	.5
63-11	Tilt Cylinder Crossover Line (Rear) - R & R . . . . .	.5	.5	.5	.5
63-12	Tilt Cylinder Gland - Repack (in unit). . . . .	.5	.5	.5	.5
63-13	Valve - R & R . . . . .	.7	.7	.7	.8
63-14	Valve to Lift Cylinder Line - R & R . . . . .	.4	.4	.4	.4
63-15	Valve to Tank Hydraulic Line - R & R . . . . .	.5	.5	.5	.5

**TIME STANDARDS (Continued)**

		Time			
		Models			
		SRT	PRT		
		Up to:			
Operation	Description	4000	6000	6000	15,000
63-16	Valve to Tilt Cylinder (Front) Line - R & R .....	.5	.5	.5	.5
63-17	Valve to Tilt Cylinder (Rear) Line - R & R .....	.5	.5	.5	.5
63-18	Crankshaft Pulley and Coupler - R & R .....	2.5	....	....	....
85-1	Carrier Roller .....	1.5	2.4	1.5	4.0
85-2	Carrier Roller (Spacer Blocks) - R & R .....	1.3	....	....	....
85-3	Fork Lock Pin - R & R .....	.3	.1	.5	.1
85-4	Upright Support Bushings - R & R .....	2.5	2.5	....	....

**Section 5 – Equipment Cost Codes 1330-1351, 1895**

**TRUCK, LIFT, FORK, DIESEL OR  
SIDELOADER, FRONT DIESEL**

**REPAIR CODES**

- 01 – Engine
- 02 – Clutch
- 03 – Fuel System
- 04 – Exhaust System
- 05 – Cooling System
- 06 – Electrical System
- 07 – Transmission
- 09 – Drive Shaft and Universal
- 11 – Rear Axle and Differential
- 12 – Brakes
- 13 – Front Axle - Wheels - Controls
- 16 – Tires
- 18 – Hood - Fenders - Body
- 37 – Battery
- 63 – Hydraulic System

**BASIC STANDARDS – EC Codes 1330-1351, 1895**

	<b>Standard Time</b>
A Lift Forks - R & R . . . . .	.2
B Safety Rack - R & R . . . . .	.5
C Mast - R & R (includes Operations A & B) . . . . .	2.0
D Floor Board - R & R . . . . .	.2
E Side Panels - R & R . . . . .	.4
F Floor Board and Side Panels - R & R . . . . .	.5
G Fuel Tank Cover - R & R . . . . .	.3
H Fuel Tank - R & R (Includes Operation G) . . . . .	.6
I Block Up Rear End . . . . .	.1
J Block Up Front End . . . . .	.1

**TIME STANDARDS**

Operation	Description	Time	
		All Models	
		SRT	PRT
01-1	Compression Test (1 Cylinder) . . . . .	.4	.4
01-2	Engine - Bore for Sleeves . . . . .	13.2	13.2
01-3	Engine - Disassemble . . . . .	2.3	2.3
01-4	Engine - Dynamometer Test . . . . .	2.2	2.2
01-5	Engine - R & R . . . . .	7.7	7.7
01-6	Engine - Reassemble . . . . .	8.5	8.5
01-7	Engine - Replace Head or Gasket . . . . .	1.0	1.0
01-8	Engine - Rocker Arm Cover or Gasket - R & R . . . . .	.4	.4
01-9	Engine - Timing Gear Cover or Gasket - R & R . . . . .	8.2	8.2
01-10	Engine - Tune-Up . . . . .	.8	.8
01-11	Engine Mount Springs - R & R . . . . .	.4	.7
01-12	Oil Gage - R & R . . . . .	.3	.3
02-1	Clutch - Adjust . . . . .	.2	.2
02-2	Clutch Facing - Reline . . . . .	.3	.3
02-3	Clutch Pedal Springs - R & R . . . . .	.3	.3
02-4	Flywheel - R & R . . . . .	4.6	4.4
02-5	Flywheel Ring Gear - Install . . . . .	.1	.1
02-6	Pressure Plate - Facing and Release Bearing - R & R . . . . .	3.7	3.5
02-7	Pressure Plate - Overhaul . . . . .	.6	.6
03-1	Accelerator Spring - R & R . . . . .	.1	.1
03-2	Air Filter - Clean . . . . .	.1	.1
03-3	Filter, Fuel, Primary - Clean . . . . .	.2	.2
03-4	Filter, Fuel, Secondary - Clean . . . . .	.2	.2
03-5	Fuel Gage - R & R . . . . .	.3	.3
03-6	Fuel Tank - R & R . . . . .	.6	.6
03-7	Injector, Fuel - Remove, Test, and Replace . . . . .	.6	.6
03-8	System, Fuel - Clean Complete . . . . .	.5	.5

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TIME STANDARDS (Continued)

Operation	Description	Time	
		All Models	
		SRT	PRT
04-1	Exhaust Pipe and Gasket - R & R . . . . .	.7	.7
04-2	Heat Control Thermostat - R & R . . . . .	.1	.1
04-3	Exhaust Manifold and Gasket - R & R . . . . .	1.4	1.4
04-4	Muffler - R & R . . . . .	.6	.6
05-1	Engine Drain Cock - R & R . . . . .	.1	.1
05-2	Fan Belt - R & R . . . . .	.1	.1
05-3	Fan Blade - R & R . . . . .	.2	.2
05-4	Head Water Outlet Gasket - R & R . . . . .	.3	.3
05-5	Radiator - R & R . . . . .	1.2	1.3
05-6	Radiator Drain Cock - R & R . . . . .	.1	.1
05-7	Radiator Hose, Lower - R & R . . . . .	.2	.2
05-8	Radiator Hose, Upper - R & R . . . . .	.2	.2
05-9	Water Pump - Overhaul . . . . .	.5	.5
05-10	Water Pump - R & R . . . . .	1.4	.14
05-11	Cooling System - Flush . . . . .	1.0	1.0
05-12	Temperature Gage - R & R . . . . .	1.0	1.0
06-1	Dash Panel - Rewire . . . . .	.8	.8
06-2	Generator - Adjust . . . . .	.2	.2
06-3	Generator - R & R . . . . .	.3	.3
06-4	Horn - R & R or Adjust . . . . .	.2	.2
06-5	Horn Button - R & R . . . . .	.1	.1
06-6	Horn Wire to Button - R & R . . . . .	.2	.2
06-7	Hour Meter - R & R . . . . .	.3	.3
07-1	Ring and Pinion Gear Assembly - Overhaul . . . . .	1.0	1.0
07-2	Transmission - Overhaul . . . . .	4.7	4.7
07-3	Transmission - R & R . . . . .	3.5	3.0
07-4	Transmission - Replace Grease Seals and Inspect . . . . .	1.3	1.3
07-5	Automatic Transmission - R & R . . . . .	3.4	3.4
07-6	Automatic Transmission Oil Pump - R & R (Add Automatic Transmission R & R for Front Pump) . . . . .	1.8	1.8
07-7	Automatic Transmission Housing Oil Seal - R & R . . . . .	1.0	1.0
07-8	Automatic Transmission Regulator Valve Body - R & R . . . . .	3.4	3.4
07-9	Automatic Transmission Governor Assembly - Recondition . . . . .	1.8	1.8
09-1	Universal Joint - R & R . . . . .	....	.5
09-2	Universal Joint - Replace Bearings . . . . .	....	1.0
11-1	Differential Assembly - Overhaul . . . . .	....	2.3
11-2	Differential Assembly - R & R . . . . .	....	3.0
11-3	Real Axle - R & R . . . . .	1.5	1.8
11-4	Wheels, Drive - R & R . . . . .	.5	.8

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TIME STANDARDS (Continued)

Operation	Description	Time	
		All Models	
		SRT	PRT
12-1	Adjustment - Major . . . . .	.8	.8
12-2	Adjustment - Minor . . . . .	.3	.3
12-3	Brake Cylinder - Overhaul (out-of-unit) . . . . .	.3	.3
12-4	Brake Cylinder - R & R . . . . .	1.3	.13
12-5	Brake Line, Central - R & R . . . . .	.2	.2
12-6	Brake Lines - Bleed . . . . .	.5	.2
12-7	Brake Line, L or R - R & R . . . . .	.7	.3
12-8	Brake Pedal - Adjust . . . . .	.2	.2
12-9	Brake Shoes, Bonded - Rewline . . . . .	.2	.2
12-10	Brake Shoes - R & R . . . . .	1.4	1.4
12-11	Brake Shoes - Reline (Per Wheel) . . . . .	.3	.3
12-12	Hand Brake - Adjust . . . . .	.3	.3
12-13	Hand Brake Band - Reline . . . . .	.1	.1
12-14	Master Cylinder - Overhaul (out-of-unit) . . . . .	.3	.3
12-15	Master Cylinder - R & R . . . . .	.3	.3
13-1	Cylinder, Steering, Air Booster - R & R . . . . .	.1	.8
13-2	Hose, Hydraulic, Gear Pump to Control Valve - R & R . . . . .	....	.2
13-3	Line, Oil, Flexible - R & R . . . . .	....	.2
13-4	Pump, Hydraulic - R & R . . . . .	....	.5
13-5	Steer Wheels - Repack . . . . .	.5	.5
13-6	Steering - Inspect . . . . .	.3	.3
13-7	Steering Assembly - Overhaul . . . . .	1.9	1.9
13-8	Steering Assembly - R & R . . . . .	1.7	1.7
13-9	Steering Axle Drag Link - R & R . . . . .	.6	.6
13-10	Steering Axle Spring (One) - R & R . . . . .	2.1	2.1
13-11	Steering Gear - Overhaul . . . . .	.9	.9
13-12	Steering Gear - R & R . . . . .	.7	.7
13-13	Steering Wheel - R & R . . . . .	.2	.2
13-14	Valve, Relief - R & R . . . . .	....	.5
13-15	Valve Assembly, Control, R & R . . . . .	....	.6
16-1	Drive Wheels - Retire . . . . .	.8	1.4
16-2	Front Wheels - Retire . . . . .	.7	.7
18-1	Floor Board - R & R . . . . .	.2	.2
18-2	Fuel Tank Cover - R & R . . . . .	.3	....
18-3	Hydraulic Tank and Seat Frame - R & R . . . . .	2.0	2.0
18-4	Safety Rack - R & R . . . . .	.5	.5
18-5	Seat Spring - R & R . . . . .	.2	....
18-6	Side Panels - R & R . . . . .	.4	....
37-1	Battery - R & R . . . . .	.1	.1
37-2	Battery Ground Cable - R & R . . . . .	.1	.1

**TIME STANDARDS (Continued)**

Operation	Description	Time	
		All Models	
		SRT	PRT
63-1	Hydraulic Oil Tank - R & R . . . . .	1.0	1.0
63-2	Hydraulic Pump and Gasket - R & R . . . . .	.9	.9
63-3	Lift Cylinder - Overhaul . . . . .	2.6	2.6
63-4	Lift Cylinder to Tank Line - R & R . . . . .	.5	.5
63-5	Mast and Lift Cylinder - Overhaul . . . . .	7.0	7.0
63-6	Pump to Valve Hydraulic Line - R & R . . . . .	.4	.4
63-7	Tank to Pump Hydraulic Line - R & R . . . . .	.7	.7
63-8	Tilt Cylinder - Overhaul (in unit) . . . . .	.8	.8
63-9	Tilt Cylinder - Overhaul (out-of-unit) . . . . .	.5	.5
63-10	Tilt Cylinder Crossover Line (Front) - R & R . . . . .	.4	.4
63-11	Tilt Cylinder Crossover Line (Rear) - R & R . . . . .	.4	.4
63-12	Tilt Cylinder Gland - Repack (in unit) . . . . .	.6	.6
63-13	Valve - R & R . . . . .	.7	.7
63-14	Valve to Lift Cylinder Line - R & R . . . . .	.3	.3
63-15	Valve to Tank Hydraulic Line - R & R . . . . .	.5	.5
63-16	Valve to Tilt Cylinder (Front) Line - R & R . . . . .	.4	.4
63-17	Valve to Tilt Cylinder (Rear) Line - R & W . . . . .	.4	.4

**Section 6 – Equipment Cost Code 1360**

**TRUCK, LIFT, FORK, ELECTRIC, SRT (ALL CAPACITIES)**

**REPAIR CODES**

- 11 – Rear Axle
- 12 – Brakes
- 13 – Front Axle - Wheels - Controls and Linkage
- 16 – Tires
- 18 – Hood - Fenders - Body
- 37 – Battery
- 50 – Motors - Electric
- 52 – Controls - Electric
- 63 – Hydraulic System

**TIME STANDARDS**

**Rear Axle and Differential - Repair Code 11**

Operation	Description	Time
		All Models
11-1	Differential - Overhaul (out-of-unit) (two men)	2.5
11-2	Differential - R & R (two men)	6.0
11-3	Drive Axle - R & R	.6
11-4	Drive Wheels - R & R	.4
11-5	Drive Wheel Bearings - Remove, Repack and Replace	.6

**Brakes - Repair Code 12**

Operation	Description	Time
		All Models
12-1	Brake Pedal Spring - R & R	.3
12-2	Brake Shoes - Reline - Bonded	.2
12-3	Adjust Brakes - Minor	.5
12-4	Adjust Brakees - Major	1.8
12-5	Adjust Brake Pedal	.2
12-6	Brake Shoes - R & R	1.8
12-7	Brake Cylinder - R & R	1.7
12-8	Brake Cylinder - Overhaul	.5
12-9	Drive Motor Brake - Adjust	.3
12-10	Drive Motor Brake - Adjust	.7
12-11	Drive Motor Brake Shoes - Reline	.2
12-12	Drive Motor Brake Springs - R & R	.4
12-13	Lift Motor Brake - Adjust	.2
12-14	Lift Motor Brake - R & R	.5
12-15	Lift Motor Brake Shoes - Reline	.1
12-16	Lift Motor Brake Shoes - R & R	.4
12-17	Master Cylinder - R & R	1.0
12-18	Master Cylinder - Overhaul	.7
12-19	Hand Brake - Adjust	.6
12-20	Hand Brake - Reline	.6
12-21	Brake Lines - Bleed	.8
12-22	Brake Lines R & R	1.0

**Front Axle - Wheels - Controls and Linkage - Repair Code 13**

Operation	Description	Time
		All Models
13-1	Drag Link - Remove, Renew Ends, and Replace	1.0
13-2	Steer Axle Assembly - Overhaul (out-of-unit)	1.7
13-3	Steer Axle Assembly - R & R	1.0
13-4	Steer Gear Box - Overhaul (out-of-unit)	1.2
13-5	Steer Gear Box - R & R	.6
13-6	Steering - Inspect and Service	.3
13-7	Steering Wheel - R & R	.2
13-8	Tie Rod - Remove, Renew Ends, and Replace	1.0
13-9	Wheel Bearings - Remove, Repack and Replace	.9
13-10	Wheels - R & R	.5

**Tires - Repair Code 16**

Operation	Description	Time
		All Models
16-1	Tires - Drive Wheels - R & R	.8
16-2	Tires - Steer Wheels - R & R	1.0

**Hood - Finders - Body - Repair Code 18**

Operation	Description	Time
		All Models
18-1	Lift Chains - R & R	1.0
18-2	Lift Forks - R & R	.2
18-3	Mast - Remove, Rebuild, and Replace	.8.0
18-4	Step Pedal Return Spring - R & R	.2

**Battery - Repair Code 37**

Operation	Description	Time
		All Models
37-1	Battery - R & R	.2
37-2	Battery Plug - R & R	.5
37-3	Charging Plug	.5

**Motors - Electric - Repair Code 50**

Operation	Description	Time
		All Models
50-1	Drive Motor - Clean and Inspect	.5
50-2	Drive Motor - Overhaul	15.0
50-3	Drive Motor - R & R	1.6
50-4	Drive Motor Wires - R & R	.3
50-5	Lift Motor - Clean and Inspect	.5
50-6	Lift Motor - Overhaul	11.0
50-7	Lift Motor - R & R	1.6
50-8	Lift Motor Wires - R & R	.4
50-9	Tilt Motor - Clean and Inspect	.4
50-10	Tilt Motor - R & R	.7
50-11	Tilt Motor Wires - R & R	.4

**Controls - Electric - Repair Code 52**

Operation	Description	Time
		All Models
52-1	Contacts - One Set - R & R	.3
52-2	Drive and Hoist Contacts (Clean and Service)	2.0
52-3	Drive, Lift or Tilt Controller - Repair	2.5
52-4	Drive Motor Controllers - Clean and Inspect	.6
52-5	Lift Motor Controllers - Clean and Inspect	.5
52-6	Tilt Motor Controller - Clean and Inspect	.5
52-7	Hour Meter - R & R	.3
52-8	Horn - R & R	.3

**TIME STANDARDS (Continued)**

**Controls - Electric - Repair Code 52 (Continued)**

Operation	Description	Time All Models
52-9	Horn Button - R & R	.3
52-10	Battery - Flush	.3
52-11	Battery Cable and Lug Resolder	.5
52-12	Resistor - R & R	.5
52-13	Resistor - Overhaul	2.0
52-14	Directional Control Switch - R & R	.5
52-15	Directional Control Switch - Overhaul	1.0
52-16	Limit Switch (Brake) - R & R	1.5
52-17	Limit Switch (Brake) - Overhaul	.5

**Hydraulic System - Repair Code 63**

Operation	Description	Time All Models
63-1	Hydraulic Oil Tank - R & R	1.5
63-2	Hydraulic Pump and Gasket - R & R	2.0

**Hydraulic System - Repair Code 63 (Continued)**

Operation	Description	Time All Models
63-3	Hydraulic Pump - Overhaul	2.0
63-4	Lift Cylinder - Overhaul	2.4
63-5	Lift Cylinder to Tank Line - R & R	.7
63-6	Pump to Valve Hydraulic Line - R & R	.6
63-7	Tank to Pump Hydraulic Line - R & R	1.3
63-8	Tilt Cylinder - Overhaul (out-of-unit)	1.6
63-9	Tilt Cylinder - R & R	1.5
63-10	Tilt Cylinder Crossover Line (Front) - R & R	.8
63-11	Tilt Cylinder Crossover Line (Rear) - R & R	1.1
63-12	Valve - R & R	1.5
63-13	Valve to Life Cylinder Line - R & R	.7
63-14	Valve to Tank Hydraulic Line - R & R	.8
63-15	Valve to Tilt Cylinder (Front) Line - R & R	.8
63-16	Valve to Tilt Cylinder (Rear) Line - R & R	.8
63-17	Valve - Overhaul	2.0

**Section 7 – Equipment Cost Codes 1370-1375, 1890**

**TRUCK, LIFT, FORK, ELECTRIC, SPARK ENCLOSED, SRT  
(ALL CAPACITIES) OR TRUCK, SIDELoader,  
FRONT, ELECTRIC SPARK ENCLOSED, SRT**

**REPAIR CODES**

- 11 – Rear Axle and Differential
- 12 – Brakes
- 13 – Front Axle - Wheels - Springs - Controls and Linkage
- 16 – Tires
- 18 – Hood - Fenders - Body
- 37 – Battery
- 50 – Motors
- 52 – Controls
- 63 – Hydraulic System

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## TIME STANDARDS

### Rear Axle and Differential - Repair Code 11

Operation	Description	Time
		All Models
11-1	Differential - Overhaul (out-of-unit)	2.7
11-2	Differential - R & R	4.0
11-3	Drive Axle - R & R	.8
11-4	Drive Wheels - R & R	.9
11-5	Wheel Bearings - R & R Service	.8

### Brakes - Repair Code 12

Operation	Description	Time
		All Models
12-1	Adjustment - Major	1.1
12-2	Adjustment - Minor	.3
12-3	Brake Cylinder - Overhaul (out-of-unit) (Per Cylinder)	.3
12-4	Brake Cylinder - R & R	1.3
12-5	Brake Line - Central - R & R	.2
12-6	Brake Line - R & R	1.0
12-7	Brake Lines - Bleed	.8
12-8	Brake Pedal - Adjust	.2
12-9	Brake Shoes - R & R	1.2
12-10	Brake Shoes - Reline - Bonded	.2
12-11	Brake Shoes - Reline (Per Wheel)	.3
12-12	Drive Motor Brake Spring - R & R	.4
12-13	Drive Motor Brake - Adjust	.4
12-14	Drive Motor Brake - R & R	1.1
12-15	Master Cylinder - Overhaul (out-of-unit)	.4
12-16	Master Cylinder - R & R	.4
12-17	Hand Brake - Adjust	.6
12-18	Hand Brake - Reline	.6

### Front Axle - Wheels - Springs - Controls and Linkage - Repair Code 13

Operation	Description	Time
		All Models
13-1	Connecting Link - R & R	.6
13-2	Drag Link or Chain - R & R	.5
13-3	Reversing Return Spring - R & R	.5
13-4	Speed Return Spring - R & R	.5
13-5	Star Wheel Springs - R & R	.1
13-6	Steer Axle Assembly - Overhaul (out-of-unit)	1.7
13-7	Steer Axle Assembly - R & R	1.1
13-8	Steering - Inspect and Service	.3
13-9	Steering Gear - Overhaul (out-of-unit)	1.1
13-10	Steering Gear - R & R	.5
13-11	Steering Wheel - R & R	.2
13-12	Wheel Bearings - Remove, Repack, and Replace	.9
13-13	Wheels - R & R	.6

### Tires - Repair Code 16

Operation	Description	Time
		All Models
16-1	Tires - Drive Wheels - Solid - R & R	1.2
16-2	Tires - Steer Wheels - Solid - R & R	1.2

### Hood - Fenders - Body - Repair Code 18

Operation	Description	Time
		All Models
18-1	Lift Chains - R & R	1.1
18-2	Lift Forks - R & R	.2
18-3	Mast - Overhaul (out-of-unit)	3.8
18-4	Mast - R & R	2.2

### Battery - Repair Code 37

Operation	Description	Time
		All Models
37-1	Battery - R & R	.4
37-2	Battery Plug - R & R	.5
37-3	Charging Plug - R & R	.5

### Motors - Repair Code 50

Operation	Description	Time
		All Models
50-1	Drive Motor - Clean and Inspect	.6
50-2	Drive Motor - R & R	4.0
50-3	Drive Motor - Overhaul	16.0
50-4	Drive Motor Wires - R & R	.4
50-5	Tilt and Lift Motor - Clean and Inspect	.5
50-6	Tilt and Lift Motor - R & R	2.2
50-7	Tilt and Lift Motor - Overhaul	12.0
50-8	Tilt and Lift Motor Wires - R & R	.3

### Controls - Repair Code 52

Operation	Description	Time
		All Models
52-1	Contact Release Springs - R & R	.5
52-2	Contacts - One Set - R & R	.3
52-3	Drive and Hoist Contacts - Clean and ??????ce	2.5
52-4	Controller Contact Springs - R & R	.1
52-5	Controller Finger and Roller - R & R	4.0
52-6	Drive, Lift or Tilt Controller - Repair	2.0
52-7	Drive Motor Controller - Clean and Inspect	.6
52-8	Drive Motor Controller - R & R	.7
52-9	Reversing Drum Contacts - R & R	.5
52-10	Tilt and Lift Motor Controller - Clean and Inspect	.6

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## TIME STANDARDS (Continued)

### Controls - Repair Code 52 (Continued)

Operation	Description	Time All Models
52-11	Hour Meter - R & R .....	.3
52-12	Horn - R & R .....	.3
52-13	Horn Button - R & R .....	.3
52-14	Battery Flush .....	.3
52-15	Battery Cable Lug Resolder .....	.5
52-16	Resistor - R & R .....	1.5
52-17	Resistor - Overhaul .....	2.0
52-18	Directional Control Switch - R & R .....	.5
52-19	Directional Control Switch - Overhaul .....	1.0
52-20	Limit Switch (Brake) - R & R .....	1.5
52-21	Limit Switch - Overhaul .....	.5

### Hydraulic System - Repair Code 63

Operation	Description	Time All Models
63-1	Hydraulic Oil Tank - R & R .....	1.1
63-2	Hydraulic Pump and/or Gasket - R & R .....	1.0

### Hydraulic System - Repair Code 63 (Continued)

Operation	Description	Time All Models
63-3	Hydraulic Pump - Overhaul .....	2.0
63-4	Lift Cylinder - Overhaul .....	2.3
63-5	Lift Cylinder to Tank Line - R & R .....	.6
63-6	Mast and Lift Cylinder - Overhaul .....	6.6
63-7	Pump to Valve Hydraulic Line - R & R .....	.5
63-8	Tank to Pump Hydraulic Line - R & R .....	.8
63-9	Tilt Cylinder - Overhaul (in-unit) .....	1.1
63-10	Tilt Cylinder - Overhaul (out-of-unit) .....	.7
63-11	Tilt Cylinder - R & R .....	2.0
63-12	Tilt Cylinder Crossover Line (Front) - R & R .....	.4
63-13	Tilt Cylinder Crossover Line (Rear) - R & R .....	.5
63-14	Tilt Cylinder Gland - Repack (in-unit) .....	.4
63-15	Valve - R & R .....	.7
63-16	Valve to Lift Cylinder Line - R & R .....	.3
63-17	Valve to Tank Hydraulic Line - R & R .....	.5
63-18	Valve to Tilt Cylinder (Front) Line - R & R .....	.4
63-19	Valve to Tilt Cylinder (Rear) - R & R .....	.4
63-20	Valve - Overhaul .....	2.0

**Section 8 – Equipment Cost Code 1380**

**TRUCK, LIFT, FORK, ELECTRIC, EXPLOSION PROOF, PRT  
(ALL CAPACITIES)**

**REPAIR CODES**

- 11 – Rear Axle and Differential
- 12 – Brakes
- 13 – Front Axle - Wheels - Hubs - Springs - Controls and Linkage
- 16 – Tires
- 18 – Hood - Fenders - Body
- 37 – Battery
- 50 – Motors
- 52 – Controls

# NAVSUP PUBLICATION 538 FIRST REVISION

## TIME STANDARDS

### Rear Axle and Differential - Repair Code 11

Operation	Description	Time
		All Models
11-1	Differential - Overhaul (out-of-unit)	2.0
11-2	Differential - R & R	7.5
11-3	Drive Axle - R & R	.6
11-4	Drive Wheel Bearings - Remove, Repack and Replace	.5
11-5	Drive Wheels - R & R	.3

### Brakes - Repair Code 12

Operation	Description	Time
		All Models
12-1	Brake Pedal Spring - R & R	.2
12-2	Brake Shoes - Reline - Bonded	.2
12-3	Drive Motor Brake - Adjust	.4
12-4	Drive Motor Brake - R & R	1.0
12-5	Drive Motor Brake Shoes - Reline	.1
12-6	Drive Motor Brake Springs - R & R	.4
12-7	Lift Motor Brake - Adjust	.3
12-8	Lift Motor Brake - R & R	.9
12-9	Lift Motor Brake Shoes - Reline	.1
12-10	Lift Motor Brake Springs - R & R	.4

### Front Axle - Wheels - Hubs - Springs - Controls and Linkage - Repair Code 13

Operation	Description	Time
		All Models
13-1	Drag Link - R & R	1.0
13-2	Steer Axle Assembly - Overhaul (out-of-unit)	1.5
13-3	Steer Axle Assembly - R & R	1.0
13-4	Steer Gear Box - Overhaul (out-of-unit)	1.1
13-5	Steer Gear Box - R & R	.3
13-6	Steering - Inspect and Service	.3
13-7	Steering Wheel - R & R	.2
13-8	Tie Rod - R & R	1.0
13-9	Wheel Bearings - Remove, Repack and Replace	.9
13-10	Wheels - R & R	.5

### Tires - Repair Code 16

Operation	Description	Time
		All Models
16-1	Tires - Drive Wheels - R & R	.8
16-2	Tires - Steer Wheels - R & R	.8

### Hood - Fenders - Body - Repair Code 18

Operation	Description	Time
		All Models
18-1	Directional Control Box Cover - R & R	.1
18-2	Drive Motor Cover - R & R	.2
18-3	Junction Box Cover - R & R	.4
18-4	Lift Chains - R & R	1.0
18-5	Lift Forks - R & R	.2
18-6	Mast - Remove, Rebuild and Replace	8.0
18-7	Step Pedal Return Spring - R & R	.2
18-8	Tilt or Lift Control Box Cover - R & R	.1
18-9	Tilt or Lift Motor Cover - R & R	.1

### Battery - Repair Code 37

Operation	Description	Time
		All Models
37-1	Battery - R & R (Check all Grounds)	.3
37-2	Battery Plug - R & R	.4
37-3	Charging Plug - R & R	.4

### Motors - Repair Code 50

Operation	Description	Time
		All Models
50-1	Drive Motor - Clean and Inspect	.6
50-2	Drive Motor - R & R	2.1
50-3	Drive Motor Wires - R & R	.2
50-4	Lift Motor - Clean and Inspect	.7
50-5	Lift Motor - R & R	6.5
50-6	Lift Motor Wires - R & R	.3
50-7	Tilt Motor - Clean and Inspect	.5
50-8	Tilt Motor - R & R	2.0
50-9	Tilt Motor Wires - R & R	.3

### Controls - Repair Code 52

Operation	Description	Time
		All Models
52-1	Contacts - One Set - R & R	.2
	Add for each additional set replaced	(.1)
52-2	Drive, Lift or Tilt Controller - Repair	Est.
52-3	Drive Motor Controllers - Clean and Inspect	.8
52-4	Lift Motor Controllers - Clean and Inspect	.6
52-5	Tilt Motor Controller - Clean and Inspect	.3
52-6	Hour Meter - R & R	.3
52-7	Horn - R & R	.3
52-8	Horn Button - R & R	.3
52-9	Battery - Flash	.3
52-10	Battery Cable Lug Resolder	.5

**Section 9 – Equipment Cost Codes 1390 and 1395**

**TRUCK, LIFT, FORK, TIERING, STRADDLE AND REACH TYPE, ELECTRIC  
OR TRUCK, LIFT, FORK, TIERING, STOCKPICKER, ELECTRIC**

**REPAIR CODES**

- 11 – Rear Axle and Differential
- 12 – Brakes
- 13 – Front Axle, Wheels, Springs, Controls
- 16 – Tires
- 18 – Body, Fenders
- 37 – Battery
- 63 – Hydraulic System

**BASIC STANDARDS – EC Codes 1390 and 1395**

	Standard Time		Standard Time
A	Obtain Scaffold - Position - Remove . . . . .	C	Wheel Guards, R or L - R & R . . . . .
B	Jack Up Wheels . . . . .	D	Block Up Unit, Front or Rear . . . . .
	.2		.2
	.2		.2

**TIME STANDARDS**

**Rear Axle and Differential - Repair Code 11**

Operation	Description	Time All Models
11-1	Differential - Overhaul . . . . .	3.5
11-2	Differential - R & R . . . . .	2.2
11-3	Drive Wheel Sprockets - R & R (Per Sprocket) . . . . .	.8
11-4	Drive Wheels - R & R (Per Wheel) . . . . .	.9
11-5	Fork Tubes, Bearings, Sleeves and Springs - R & R (Per Side) . . . . .	3.3
11-6	Wheel Bearings and Oil Seals - Repack and Service (Per Wheel) . . . . .	1.0

**Brakes - Repair Code 12**

Operation	Description	Time All Models
12-1	Brake Lines - Bleed . . . . .	.2
12-2	Brake Master Cylinder - Overhaul . . . . .	.4
12-3	Brake Master Cylinder - R & R . . . . .	.5
12-4	Brake Pedal - Adjust . . . . .	.1
12-5	Brake Shoes - R & R (Both Front or Both Rear) . . . . .	.7
12-6	Brake Shoes, Bonded - Reline . . . . .	.2
12-7	Brake Wheel Cylinder - Overhaul (One) . . . . .	.3
12-8	Brake Wheel Cylinders - R & R (Both Front or Both Rear) . . . . .	.8
12-9	Brakes - Major Adjustment . . . . .	.7
12-10	Brakes - Minor Adjustment . . . . .	.5
12-11	Hoist Brake - Adjust . . . . .	.2
12-12	Hoist Brake Lining - R & R . . . . .	.2

**Front Axle, Wheels, Springs, Controls -  
Repair Code 13**

Operation	Description	Time All Models
13-1	Front Fork Tubes - Bearings, Sleeves, and Springs - R & R (Per Side) . . . . .	3.1
13-2	Front Wheels - R & R (Per Wheel) . . . . .	.6
13-3	Steer Gear - Adjust . . . . .	.2
13-4	Steer Gear and Wheel Assembly - Overhaul . . . . .	2.0
13-5	Steer Gear and Wheel Assembly - R & R . . . . .	1.7
13-6	Steering Arm - R & R (One) . . . . .	.4

**Front Axle, Wheels, Springs, Controls -  
Repair Code 13 (Continued)**

Operation	Description	Time All Models
13-7	Tie Rods - R & R (Front or Rear) . . . . .	.4
13-8	Wheel Bearings and Oil Seals - Repack and Service (Per Wheel) . . . . .	.7

**Tires - Repair Code 16**

Operation	Description	Time All Models
16-1	Tires, Drive Wheels - R & R . . . . .	.9
16-2	Tires, Steer Wheels - R & R . . . . .	1.0

**Body, Fenders - Repair Code 18**

Operation	Description	Time All Models
18-1	Drive Chain Guard - R & R . . . . .	.2
18-2	Fork Tube Guard - R & R (One) . . . . .	.2
18-3	Wheel Guards - R & R . . . . .	.2

**Battery - Repair Code 37**

Operation	Description	Time All Models
37-1	Battery - R & R . . . . .	.1
37-2	Battery Plug - R & R . . . . .	.4
37-3	Charging Plug - R & R . . . . .	.4

**Hydraulic System - Repair Code 63**

Operation	Description	Time All Models
63-1	Hydraulic Hoses - R & R . . . . .	1.5
63-2	Hydraulic Tubing - R & R . . . . .	.8
63-3	Vacuum Cylinder Valve - Overhaul . . . . .	.7
63-4	Vacuum Cylinder Valve - R & R . . . . .	1.0
63-5	Vacuum Power Cylinder - Overhaul . . . . .	.6
63-6	Vacuum Power Cylinder - R & R . . . . .	1.2
63-7	Vacuum Tank - R & R . . . . .	1.0

**Section 10 – Equipment Cost Code 1400**

**TRUCK, FIXED PLATFORM, GAS, PRT**

**REPAIR CODES**

- 01 – Engine
- 02 – Clutch
- 03 – Fuel System
- 04 – Exhaust System
- 05 – Cooling System
- 06 – Electrical System
- 07 – Transmission
- 09 – Drive Shaft and Universal
- 11 – Rear Axle and Differential
- 12 – Brakes
- 13 – Front Axle - Wheels - Controls
- 16 – Tires
- 18 – Hood - Body
- 37 – Battery

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## BASIC STANDARDS – EC Code 1400

	Standard Time		Standard Time		
A	Hood Assembly - R & R . . . . .	.2	C	Cab (Top) - R & R . . . . .	2.8
B	Block Up Rear or Front End . . . . .	.2			

## TIME STANDARDS

### Engine - Repair Code 01

Operation	Description	Time All Models
01-1	Engine - Bore for Sleeves . . . . .	13.5
01-2	Engine - Bore Oversize . . . . .	7.6
01-3	Engine - Disassemble . . . . .	2.4
01-4	Engine - Dynamometer Test . . . . .	2.2
01-5	Engine - Head and Gasket - R & R . . . . .	1.5
01-6	Engine - R & R . . . . .	5.4
01-7	Engine - Reassemble . . . . .	8.6
01-8	Engine - Tappets - Adjust . . . . .	3.7
01-9	Engine - Tune-Up . . . . .	1.0
01-10	Engine - Tune-Up - Minor . . . . .	2.0
01-11	Engine - Tune-Up - Major . . . . .	2.5
01-12	Engine - Valve Springs - R & R . . . . . (Include for Each Spring Renewed) . . . . .	2.8 (.1)
01-13	Timing Case Cover and/or Gasket - R & R . . . . .	4.5

### Clutch - Repair Code 02

Operation	Description	Time All Models
02-1	Clutch - Adjust . . . . .	.4
02-2	Clutch Facing - Reline . . . . .	.3
02-3	Clutch - Pressure Plate - Facings or Release Bearing - R & R . . . . .	.2 2.9
02-4	Clutch - Pressure Plate - Overhaul . . . . .	.7
02-5	Flywheel - R & R . . . . .	3.1
02-6	Ring Gear - R & R . . . . .	.1

### Fuel System - Repair Code 03

Operation	Description	Time All Models
03-1	Accelerator and/or Choke Linkage - R & R . . . . .	.5
03-2	Air Filter - R & R - Service . . . . .	.4
03-3	Carburetor - Governor - Adjust . . . . .	.4
03-4	Carburetor - Overhaul . . . . .	.6
03-5	Carburetor - R & R . . . . .	.6
03-6	Fuel Pump - Overhaul . . . . .	.6
03-7	Fuel Pump - R & R . . . . .	.6
03-8	Gas Filter - R & R - Service . . . . .	.4
03-9	Gas Tank - R & R . . . . .	.8

### Exhaust System - Repair Code 04

Operation	Description	Time All Models
04-1	Exhaust Pipe and Gasket - R & R . . . . .	.6
04-2	Intake and Exhaust Section Gasket - R & R . . . . .	1.4
04-3	Manifold and Gasket - R & R . . . . .	1.1
04-4	Muffler - R & R . . . . .	.4

### Cooling System - Repair Code 05

Operation	Description	Time All Models
05-1	Fan Belt - Adjust . . . . .	.1
05-2	Fan Belt - R & R . . . . .	.4
05-3	Fan Blade - R & R . . . . .	.6
05-4	Head Water Outlet Gasket - R & R . . . . .	1.3
05-5	Radiator - R & R . . . . .	.5
05-6	Radiator By-Pass Hose - R & R . . . . .	.1
05-7	Radiator Drain Cock - R & R . . . . .	.1
05-8	Radiator Hose, Upper or Lower - R & R . . . . .	.5
05-9	Thermostat - R & R . . . . .	.5
05-10	Water Pump - Overhaul . . . . .	.6
05-11	Water Pump - R & R . . . . .	1.1
05-12	Cooling System - Flush . . . . .	1.0

### Electrical System - Repair Code 06

Operation	Description	Time All Models
06-1	Coil - R & R . . . . .	.5
06-2	Distributor - Overhaul . . . . .	.6
06-3	Distributor - R & R . . . . .	.5
06-4	Generator - Adjust . . . . .	.5
06-5	Generator - R & R . . . . .	.6
06-6	Generator Recondition - Generator Removed . . . . .	2.0
06-7	Horn - R & R . . . . .	.5
06-8	Horn Button - R & R . . . . .	.3
06-9	Ignition Switch - R & R . . . . .	.6
06-10	Light Switch - R & R . . . . .	.6
06-11	Lights - R & R (One) . . . . .	.1
06-12	Spark Plug Wires - R & R . . . . .	.6
06-13	Spark Plug - R & R . . . . .	.5
06-14	Starter Cable - R & R . . . . .	.5

**TIME STANDARDS**

**Electrical System - Repair Code 06 (Continued)**

Operation	Description	Time
		All Models
06-15	Starter Motor - R & R	.6
06-16	Starter Recondition - Starter Removed	1.5
06-17	Starter Switch - R & R	.4
06-18	Starter Switch Cable - R & R	.4
06-19	Voltage Regulator - Adjust	.4
06-20	Voltage Regulator - R & R	.5
06-21	Voltage Regulator Recondition - Removed	1.0
06-22	Hour Meter - R & R	.3

**Transmission - Repair Code 07**

Operation	Description	Time
		All Models
07-1	Transmission - Overhaul	4.0
07-2	Transmission - R & R	2.6
07-3	Transmission - Service and Inspect (out-of-unit)	1.5
07-4	Transmission Rear Seal - R & R	1.9
07-5	Transmission Cover and Shift Assembly - Recondition	1.7
07-6	Automatic Transmission - R & R	3.4
07-7	Automatic Transmission Oil Pump - R & R (Add Automatic Transmission R & R for Front Pump)	1.8
07-8	Automatic Transmission Housing Oil Seal - R & R	1.0
07-9	Automatic Transmission Regulator Valve Body - R & R	3.4
07-10	Automatic Transmission Governor - Assembly - Recondition	1.8

**Drive Shaft and Universal - Repair Code 09**

Operation	Description	Time
		All Models
09-1	Universal Joint, Propeller Shaft - Overhaul	.3
09-2	Universal Joint, Propeller Shaft - R & R	.5

**Rear Axle and Differential - Repair Code 11**

Operation	Description	Time
		All Models
11-1	Differential - Overhaul	2.8
11-2	Differential - Ring and Pinion Gear (out-of-unit) R & R	1.1
11-3	Differential Assembly - R & R	2.1
11-4	Differential Seal - R & R	2.0
11-5	Drive Axle - Inspect, Service, Overhaul (out-of-unit)	.4
11-6	Drive Axle - R & R	1.6
11-7	Drive Wheels - Bearings and Grease Seals (Both Wheels)	.2
11-8	Drive Wheels - R & R (Both Wheels)	.7

**Brakes - Repair Code 12**

Operation	Description	Time
		All Models
12-1	Brakes - Major Adjustment	1.0
12-2	Brakes - Minor Adjustment	.5
12-3	Brake Cylinder - Overhaul	.3
12-4	Brake Cylinder - R & R	1.0
12-5	Brake Drum - R & R	1.6
12-6	Brake Line - R & R	.3
12-7	Brake Lines - Bleed	.2
12-8	Brake Pedal - Adjust	.1
12-9	Brake Shoes - R & R	1.2
12-10	Brake Shoes - Reline (Per Set)	.2
12-11	Brake Shoes, Bonded - Reline (Per Set)	.1
12-12	Hand Brake - Adjust	.2
12-13	Master Cylinder - Overhaul	.4
12-14	Master Cylinder - R & R	.5

**Front Axle - Wheels - Controls - Repair Code 13**

Operation	Description	Time
		All Models
13-1	Drive Axle Assembly - Overhaul	3.0
13-2	Steer Axle Assembly - Overhaul	2.5
13-3	Steer Axle Assembly - R & R	2.0
13-4	Steering Gear - R & R	1.9
13-5	Steer Wheels - R & R	.5
13-6	Steering - Inspect and Service	.5
13-7	Steering Wheel - R & R	.2
13-8	Tie Rod - R & R	.5
13-9	Wheel Bearings - Remove, Repack and Replace	.7

**Power Steering**

Operation	Description	Time
		All Models
13-10	Cylinder, Steering, Air Booster - R & R	.9
13-11	Valve Assembly, Control - R & R	.5
13-12	Valve, Relief - R & R	.4
13-13	Pump, Hydraulic - R & R	.5
13-14	Flexible Oil Line - R & R	.2
13-15	Hose, Hydraulic, Gear Pump to Control Valve - R & R	.2

**Tires - Repair Code 16**

Operation	Description	Time
		All Models
16-1	Tire, Drive, Wheel, Inner - R & R	1.1
16-2	Tire, Drive, Wheel, Outer - R & R	.8
16-3	Tire, Steer Wheel - R & R	.8

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TIME STANDARDS (Continued)

Hood - Body - Repair Code 18

Battery - Repair Code 37

Operation	Description	Time All Models
18-1	Engine Hood Assembly - R & R .....	.6
18-2	Hood Side Panel (R or L) - R & R .....	.1

Operation	Description	Time All Models
37-1	Battery - R & R .....	.3
37-2	Battery Plug - R & R .....	.4

**Section 11 – Equipment Cost Code 1410**

**TRUCK, FIXED PLATFORM, ELECTRIC, PRT**

**REPAIR CODES**

09 – Drive Shaft and Universal Joints

11 – Rear Axle and Differential

12 – Brakes

13 – Front Axle - Wheels - Controls

16 – Tires

37 – Battery

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## TIME STANDARDS

### Drive Shaft and Universal Joints - Repair Code 09

Operation	Description	Time All Models
09-1	Drive Shaft - R & R (Per Wheel) . . . . .	.3
09-2	Universal Joint - R & R (Per Wheel) . . . . .	.3

### Rear Axle and Differential - Repair Code 11

Operation	Description	Time All Models
11-1	Differential Assembly - Inspect and Service (out-of-unit) . . . . .	.5
11-2	Differential Assembly - Overhaul. . . . .	3.6
11-3	Differential Assembly - R & R. . . . .	3.1
11-4	Power Axle - R & R. . . . .	2.3
11-5	Wheels, Drive - R & R (Two Wheels) . . . . .	.4
11-6	Wheel Bearings - Repack, Service (Two Wheels) . . . . .	.6

### Brakes - Repair Code 12

Operation	Description	Time All Models
12-1	Brake Linkage - R & R. . . . .	.5
12-2	Brake Linkage - Tighten and Adjust. . . . .	.3
12-3	Brake Pedal - R & R. . . . .	.4
12-5	Brake Shoes - Reline (Per Set) . . . . .	.1
12-6	Brake Shoes, Bonded - Reline (Per Set) . . . . .	.2
12-7	Brakes - Adjust. . . . .	.2

### Front Axle - Wheels - Controls - Repair Code 13

Operation	Description	Time All Models
13-1	Axle Springs - R & R. . . . .	.8
13-2	Bell-Crank Bearings - R & R . . . . .	.4
13-3	Steer Knuckles and Yoke - R & R . . . . .	.6
13-4	Tie Rods - R & R (One) . . . . .	.4
13-5	Wheel Bearings - Repack, Service (Two Wheels) . . . . .	.6
13-6	Wheels, Steer - R & R (Two Wheels). . . . .	.4

### Tires - Repair Code 16

Operation	Description	Time All Models
16-1	Tires, Drive, Wheels - R & R. . . . .	1.0
16-2	Tires, Steer Wheels - R & R. . . . .	1.0

### Battery - Repair Code 37

Operation	Description	Time All Models
37-1	Battery - R & R. . . . .	.3
37-2	Battery Plug - R & R . . . . .	.4
37-3	Charging Plug - R & R. . . . .	.4

**Section 12 – Equipment Cost Code 1420**

**TRUCK, ELEVATING PLATFORM, ELECTRIC, SRT**

**REPAIR CODES**

- 11 – Rear Axle and Differential
- 12 – Brakes
- 13 – Front Axle - Wheels - Controls - Linkage Springs
- 16 – Tires
- 18 – Body - Guards and Hoods
- 37 – Battery
- 50 – Motor
- 52 – Controls
- 63 – Hydraulic System

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## TIME STANDARDS

### Rear Axle and Differential - Repair Code 11

Operation	Description	Time
		All Models
11-1	Differential - Overhaul (out-of-unit) . . . . .	3.4
11-2	Differential - R & R . . . . .	3.1
11-3	Drive Axles - R & R . . . . .	.5
11-4	Drive Axle Springs - R & R . . . . .	3.5
11-5	Drive Wheel Bearings - Remove, Repack and Replace . . . . .	.6
11-6	Drive Wheels - R & R . . . . .	.4
11-7	Drive Wheel Universal Forks - R & R . . . . .	.6

### Brakes - Repair Code 12

Operation	Description	Time
		All Models
12-1	Brake Pedal Spring - R & R . . . . .	.4
12-2	Brake Shoes - Reline - Bonded . . . . .	.2
12-3	Drive Motor Brake - Adjust . . . . .	.3
12-4	Drive Motor Brake Shoes - R & R . . . . .	.6
12-5	Drive Motor Brake Shoes - Reline (out-of-unit) . . . . .	.2
12-6	Drive Motor Brake Spring - R & R . . . . .	.3
12-7	Lift Motor Brake - Adjust . . . . .	.3
12-8	Lift Motor Brake Shoes - R & R . . . . .	.8
12-9	Lift Motor Brake Shoes - Reline (out-of-unit) . . . . .	.2
12-10	Lift Motor Brake Spring - R & R . . . . .	.3

### Front Axle - Wheels - Controls - Linkage Springs - Repair Code 13

Operation	Description	Time
		All Models
13-1	Drive Axle Assembly - Overhaul . . . . .	3.0
13-2	Steer Axle Assembly - Overhaul . . . . .	2.5
13-3	Steer Gear Box - Remove, Overhaul and Replace . . . . .	1.4
13-4	Steer Wheels - R & R . . . . .	.5
13-5	Steering - Inspect and Service . . . . .	.5
13-6	Steering Wheel or Arm - R & R . . . . .	.2
13-7	Tie Rod - R & R . . . . .	.5
13-8	Wheel Bearings - Remove, Repack and Replace . . . . .	.8

### Tires - Repair Code 16

Operation	Description	Time
		All Models
16-1	Tires - Drive Wheels - R & R . . . . .	.9
16-2	Tires - Steer Wheels - R & R . . . . .	1.0

### Body - Guards and Hoods - Repair Code 18

Operation	Description	Time
		All Models
18-1	Hoising Unit - Remove, Overhaul and Replace . . . . .	3.7
18-2	Lifting Platform - R & R . . . . .	.8
18-3	Step Pedal Return Spring - R & R . . . . .	.4

### Motor - Repair Code 50

Operation	Description	Time
		All Models
50-1	Drive Motor - Clean and Inspect . . . . .	.5
50-2	Drive Motor - R & R . . . . .	2.5
50-3	Lift Motor - Clean and Inspect . . . . .	.5
50-4	Lift Motor - R & R . . . . .	2.2
50-5	Pump Motor - Clean and Inspect . . . . .	.4
50-6	Pump Motor - R & R . . . . .	.8

### Controls - Repair Code 52

Operation	Description	Time
		All Models
52-1	Controller - Remove, Repair and Replace . . . . .	Est.
52-2	Controller Contact Spring - R & R . . . . .	.3
52-3	Controller Contacts - One Set - R & R . . . . .	.5
	Add for each additional set replaced . . . . .	(.1)
52-4	Controller Return Spring - R & R . . . . .	.5
52-5	Drive Motor Controller - Clean and Inspect . . . . .	.5
52-6	Lift Motor Controller - Clean and Inspect . . . . .	.5
52-7	Horn - R & R . . . . .	.3
52-8	Horn Button - R & R . . . . .	.3
52-9	Hour Meter - R & R . . . . .	.3
52-10	Battery Flush . . . . .	.3
52-11	Battery Cable Lug Resolder . . . . .	.5

### Hydraulic System - Repair Code 63

Operation	Description	Time
		All Models
63-1	Hydraulic Cylinder - Remove, Repair and Replace . . . . .	1.5
63-2	Hydraulic Line - R & R . . . . .	.5
63-3	Hydraulic Pump - Remove, Repair and Replace . . . . .	1.5
63-4	Hydraulic Tank - R & R . . . . .	1.7

**Section 13 – Equipment Cost Codes 1430 and 1440**

**TRUCK, ELEVATING PLATFORM, GAS, PRT**

**REPAIR CODES**

- 01 – Engine
- 02 – Clutch
- 03 – Fuel System
- 04 – Exhaust System
- 05 – Cooling System
- 06 – Electrical System
- 07 – Transmission
- 09 – Drive Shaft and Universal
- 11 – Rear Axle and Differential
- 12 – Brakes
- 13 – Front Axle - Wheels - Controls
- 16 – Tires
- 18 – Body
- 37 – Battery
- 63 – Hydraulic System

**BASIC STANDARDS – EC Codes 1430 and 1440**

	Time		Time
A Hood Assembly - R & R . . . . .	.2	C Hoisting Unit - R & R . . . . .	.7
B Block Up Rear or Front End . . . . .	.2		

**TIME STANDARDS**

**Engine - Repair Code 01**

Operation	Description	Time
01-1	Engine - Bore for Sleeves . . . . .	13.2
01-2	Engine - Bore Oversize . . . . .	7.2
01-3	Engine - Disassemble . . . . .	2.3
01-4	Engine - Dynamometer Test . . . . .	2.2
01-5	Engine - R & R . . . . .	7.8
01-6	Engine - Reassemble . . . . .	8.5
01-7	Engine - Tune-Up . . . . .	.8
01-8	Engine Head and Gasket - R & R . . . . .	1.1
01-9	Engine Mount Springs - R & R . . . . .	.4
01-10	Engine Tappets - Adjust . . . . .	2.8
01-11	Engine Timing Gear Cover and Gasket - R & R . . . . .	8.2
01-12	Engine Valve Spring - R & R . . . . .	2.5
01-13	Oil Gage - R & R . . . . .	.3

**Clutch - Repair Code 02**

Operation	Description	Time
02-1	Clutch - Adjust . . . . .	.4
02-2	Clutch Facing - Reline . . . . .	.3
02-3	Clutch Pedal Springs - R & R . . . . .	.3
02-4	Flywheel - R & R . . . . .	4.6
02-5	Flywheel Ring Gear - Install . . . . .	.1
02-6	Pressur Plate - Overhaul . . . . .	.6
02-7	Pressure Plate Facing and Release Bearing - R & R . . . . .	3.5

**Fuel System - Repair Code 03**

Operation	Description	Time
03-1	Accelerator Spring - R & R . . . . .	.1
03-2	Air Filter - Clean . . . . .	.1
03-3	Carburetor - Overhaul . . . . .	.5
03-4	Carburetor - R & R . . . . .	.3
03-5	Carburetor and Governor - Adjust . . . . .	.2
03-6	Carburetor Return Spring - R & R . . . . .	.1
03-7	Fuel Filter - Clean . . . . .	.1
03-8	Fuel Gage - R & R . . . . .	.3
03-9	Fuel Pump - Overhaul . . . . .	.3
03-10	Fuel Pump - R & R . . . . .	.4
03-11	Fuel Tank - R & R . . . . .	.6

**Exhaust System - Repair Code 04**

Operation	Description	Time
04-1	Exhaust Pipe and Gasket - R & R . . . . .	.7
04-2	Heat Control Thermostat . . . . .	.1
04-3	Intake and Exhaust Section Gasket - R & R . . . . .	1.0
04-4	Manifold and Gasket - R & R . . . . .	1.7
04-5	Muffler - R & R . . . . .	.6
04-6	Muffler, Exhaust Pipe and Gaskets - R & R . . . . .	.9

**Cooling System - Repair Code 05**

Operation	Description	Time
05-1	Engine Drain Cock - R & R . . . . .	.1
05-2	Fan Belt - R & R . . . . .	.1
05-3	Fan Blade - R & R . . . . .	.2
05-4	Heat Water Outlet Gasket - R & R . . . . .	.3
05-5	Radiator - R & R . . . . .	1.2
05-6	Radiator Drain Cock - R & R . . . . .	.1
05-7	Radiator Hose - R & R . . . . .	.2
05-8	Water Pump - Overhaul . . . . .	.5
05-9	Water Pump - R & R . . . . .	1.4
05-10	Temperature Gage - R & R . . . . .	.3
05-11	Cooling System - Flush . . . . .	1.0

**Electrical System - Repair Code 06**

Operation	Description	Time
06-1	Ammeter - R & R . . . . .	.3
06-2	Coil - R & R . . . . .	.2
06-3	Distributor - Overhaul . . . . .	.5
06-4	Distributor - R & R . . . . .	.2
06-5	Generator - Adjust . . . . .	.2
06-6	Generator - R & R . . . . .	.3
06-7	Horn - R & R or Adjust . . . . .	.2
06-8	Horn Button - R & R . . . . .	.3
06-9	Ignition Switch - R & R . . . . .	.3
06-10	Spark Plugs - R & R . . . . .	.3
06-11	Spark Plug Wires - R & R . . . . .	.3
06-12	Starter - R & R . . . . .	.4
06-13	Starter Cable - R & R . . . . .	.2
06-14	Starter Switch - R & R . . . . .	.5
06-15	Voltage Regulator - Adjust . . . . .	.3
06-16	Voltage Regulator - R & R . . . . .	.4
06-17	Hour Meter - R & R . . . . .	.3

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## TIME STANDARDS

### Transmission - Repair Code 07

Operation	Description	Time
7-1	Ring and Pinion Gear Assembly - Overhaul . . . . .	1.0
7-2	Transmission - Overhaul . . . . .	3.2
07-3	Transmission - R & R . . . . .	3.0
07-4	Transmission - Replace Grease Seals and Inspect . . . . .	1.3

### Automatic Transmission

Operation	Description	Time
07-5	Automatic Transmission - R & R . . . . .	3.4
07-6	Automatic Transmission Oil Pump R & R (Add Automatic Transmission R & R for Front Pump) . . . . .	1.8
07-7	Automatic Transmission Housing Oil Seal - R & R . . . . .	1.0
07-8	Automatic Transmission Regulator Valve Body - R & R . . . . .	3.4
07-9	Automatic Transmission Governor Assembly - Reconditoin . . . . .	1.8

### Drive Shaft and Universal - Repair Code 09

Operation	Description	Time
09-1	Universal Joint - R & R . . . . .	.5
09-2	Universal Joint - Replace Bearings . . . . .	1.0

### Rear Axle and Differential - Repair Code 11

Operation	Description	Time
11-1	Differential Assembly - Overhaul . . . . .	2.3
11-2	Differential Assembly - R & R . . . . .	3.0
11-3	Rear Axle - R & R . . . . .	1.8
11-4	Wheels, Drive - R & R . . . . .	.8

### Brakes - Repair Code 12

Operation	Description	Time
12-1	Brake Adjustment, Major . . . . .	.8
12-2	Brake Adjustment, Minor . . . . .	.3
12-3	Brake Cylinder - Overhaul (out-of-unit) . . . . .	.3
12-4	Brake Cylinder - R & R . . . . .	1.3
12-5	Brake Line, Central - R & R . . . . .	.2
12-6	Brake Line, L or R - R & R . . . . .	.3
12-7	Brake Lines - Bleed . . . . .	.2
12-8	Brake Pedal - Adjust . . . . .	.2
12-9	Brake Shoes - Adjust . . . . .	.2
12-10	Brake Shoes - R & R . . . . .	1.4
12-11	Brake Shoes - R & R . . . . .	.2
12-12	Hand Brake - Adjust . . . . .	.3
12-13	Hand Brake - Adjust . . . . .	.1
12-14	Master Cylinder - Overhaul (out-of-unit) . . . . .	.3
12-15	Master Cylinder - R & R . . . . .	.3

### Front Axle - Wheels - Controls - Repair Code 13

Operation	Description	Time
13-1	Steer Wheels - Repack . . . . .	.5
13-2	Steering - Inspect . . . . .	.3
13-3	Steering Assembly - Overhaul . . . . .	1.9
13-4	Steering Assembly - R & R . . . . .	1.7
13-5	Steering Axle Drag Link - R & R . . . . .	.6
13-6	Steering Gear - Overhaul . . . . .	.9
13-7	Steering Gear - R & R . . . . .	.7
13-8	Steering Wheel - R & R . . . . .	.3

### Power Steering

Operation	Description	Time
13-9	Cylinder, Steering, Air Booster - R & R . . . . .	.8
13-10	Valve, Relief - R & R . . . . .	.3
13-11	Valve Assembly, Control - R & R . . . . .	.5
13-12	Pump, Hydraulic - R & R . . . . .	.5
13-13	Flexible Oil Line - R & R . . . . .	.2
13-14	Hose, Hydraulic, Gear Pump to Control Valve - R & R . . . . .	.3

### Tires - Repair Code 16

Operation	Description	Time
16-1	Drive Wheels - Retire . . . . .	.9
16-2	Steer Wheels - Retire . . . . .	.8

### Body - Repair Code 18

Operation	Description	Time
18-1	Hoisting Unit - Remove, Overhaul, Replace . . . . .	.37
18-2	Lifting Platform - R & R . . . . .	.4

### Battery - Repair Code 37

Operation	Description	Time
37-1	Battery - R & R . . . . .	.1
37-2	Battery Ground Cable - R & R . . . . .	.1

### Hydraulic System - Repair Code 63

Operation	Description	Time
63-1	Hydraulic Cylinder - Remove, Repair, Replace . . . . .	1.5
63-2	Hydraulic Line - R & R . . . . .	.5
63-3	Hydraulic Pump - Remove, Repair, Replace . . . . .	1.5
63-4	Hydraulic Tank - R & R . . . . .	1.7

**Section 14 – Equipment Cost Code 1500**

**TRUCK, STRADDLE-CARRY, GAS OR DIESEL, PRT  
(UP TO AND INCLUDING 60,000 POUNDS)**

**REPAIR CODES**

- 01 – Engine
- 02 – Clutch
- 03 – Fuel System
- 04 – Exhaust System
- 05 – Cooling System
- 06 – Electrical System
- 07 – Transmission
- 09 – Drive Shaft and Universal
- 11 – Rear Axle and Differential
- 12 – Brakes
- 13 – Front Axle - Wheels- Springs - Controls and Linkage
- 16 – Tires
- 18 – Hood - Fenders - Body
- 37 – Battery
- 63 – Hydraulic System
- 85 – Hoist - Winch Assemblies

**BASIC STANDARDS – EC Code 1500**

	Time		Time
A Obtain Scaffold - Position - Remove . . . . .	.2	E Drive Chain Guard (R or L) - R & R . . . . .	.2
B Jack Up Wheels . . . . .	.2	F Fork Tube Guards - R & R - Front R or L . . . . .	.2
C Hood and Side Panels - R & R . . . . .	.1	Rear R or L . . . . .	.2
D Wheel Guards, Rear - R & R (R or L) . . . . .	.2	G Block Up Unit - Front and Rear . . . . .	.2

**TIME STANDARDS**

**Engine - Repair Code 01**

Operation	Description	Time All Models
01-1	Engine - Bore for Sleeves . . . . .	14.0
01-2	Engine - Bore for Oversize . . . . .	7.8
01-3	Engine - Disassemble . . . . .	2.7
01-4	Dynamometer Test . . . . .	2.2

NOTE: In this standard, full attention is not required for the 3-1/4 hours run-in time - the standard includes .6 hour for attention and check of operating results.

01-5	Engine - Head and/or Gasket - R & R . . . . .	1.4
01-6	Engine - R & R . . . . .	5.1
01-7	Engine - Reassemble . . . . .	9.0
01-8	Engine - Tappets - Adjust . . . . .	3.7
01-9	Engine - Tune-Up . . . . .	1.1
01-10	Engine - Tune-Up - Minor . . . . .	2.0
01-11	Engine - Tune-Up - Major . . . . .	2.5
01-12	Engine - Valve Springs - R & R . . . . .	2.8
	Include for each spring renewed . . . . .	(.1)

**Clutch - Repair Code 02**

Operation	Description	Time All Models
02-1	Clutch - Adjust . . . . .	.4
02-2	Clutch Facing - Reline . . . . .	.3
02-3	Clutch - Pressure Plate - Facings or Release Bearing - R & R . . . . .	3.0
02-4	Clutch - Pressure Plate - Overhaul . . . . .	.7
02-5	Flywheel - R & R . . . . .	3.3
02-6	Ring Gear - On Flywheel - R & R . . . . .	.1

**Fuel System - Repair Code 03**

Operation	Description	Time All Models
03-1	Accelerator and/or Choke Linkage - R & R . . . . .	.5
03-2	Air Filter - R & R - Service . . . . .	.4
03-3	Carburetor Governor - Adjust . . . . .	.4
03-4	Carburetor - Overhaul . . . . .	.6
03-5	Carburetor - R & R . . . . .	.6
03-6	Fuel Pump - Overhaul . . . . .	.6
03-7	Fuel Pump - R & R . . . . .	.6
03-8	Gas Filter - R & R - Service . . . . .	.4
03-9	Gas Tank - R & R . . . . .	.9

**Exhaust System - Repair Code 04**

Operation	Description	Time All Models
04-1	Exhaust Pipe and/or Gasket - R & R . . . . .	.7
04-2	Intake and Exhaust Section Gasket - R & R . . . . .	1.4
04-3	Manifold and/or Gasket - R & R . . . . .	1.2
04-4	Muffler - R & R . . . . .	.5

**Cooling System - Repair Code 05**

Operation	Description	Time All Models
05-1	Fan Belt - Adjustment . . . . .	.1
05-2	Fan Belt - R & R . . . . .	.4
05-3	Fan Blade - R & R . . . . .	.6
05-4	Head Water Outlet Gasket - R & R . . . . .	.6
05-5	Radiator - R & R . . . . .	1.6
05-6	Surge Tank - R & R . . . . .	.8
05-7	Radiator By-Pass Hose . . . . .	.5
05-8	Radiator Drain Cock - R & R . . . . .	.1
05-9	Radiator Hose, Lower - R & R . . . . .	.5
05-10	Radiator Hose, Upper - R & R . . . . .	.5
05-11	Thermostat - R & R . . . . .	.5
05-12	Water Pump - Overhaul . . . . .	.7
05-13	Water Pump - R & R . . . . .	.9
05-14	Cooling System - Flush . . . . .	1.0

**Electrical System - Repair Code 06**

Operation	Description	Time All Models
06-1	Ammeter - R & R . . . . .	.4
06-2	Coil - R & R . . . . .	.5
06-3	Dash Panel - Rewire . . . . .	2.6
06-4	Distributor - Overhaul . . . . .	.6
06-5	Distributor - R & R . . . . .	.5
06-6	Generator - Adjustment . . . . .	.5
06-7	Generator - Overhaul . . . . .	2.0
06-8	Generator - R & R . . . . .	.6
06-9	Horn - R & R . . . . .	.5
06-10	Horn Button - R & R . . . . .	.3
06-11	Ignition Switche - R & R . . . . .	.6
06-12	Light Switch - R & R . . . . .	.6
06-13	Lights (Tail, Head, Stop, Load, or Backup) - R & R . . . . .	.1
06-14	Spark Plug Wires - R & R . . . . .	.6

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## TIME STANDARDS

### Electrical System - Repair Code 06 (Continued)

Operation	Description	Time
		All Models
06-15	Spark Plugs - R & R	.5
06-16	Speedometer - R & R	.8
06-17	Starter Cable - R & R	.5
06-18	Hour Meter - R & R	.3
06-19	Starter Motor - R & R	.7
06-20	Starter Switch - R & R	.4
06-21	Starter Overhaul	1.5
06-22	Starter Switch Cable - R & R	.4
06-23	Voltage Regulator - Adjust	.4
06-24	Voltage Regulator - R & R	.5

### Transmission - Repair Code 07

Operation	Description	Time
		All Models
07-1	Transmission - Overhaul	4.9
07-2	Transmission - R & R	3.3
07-3	Transmission - Service and Inspect (out-of-unit)	1.6

### Automatic Transmission

Operation	Description	Time
		All Models
07-4	Automatic Transmissio - R & R	3.7
07-5	Automatic Transmission Oil Pump - R & R (Add Automatic Transmission R & R for Front Pump)	1.9
07-6	Automatic Transmission Housing Oil Seal - R & R	1.0
07-7	Automatic Transmission Regulator Valve Body - R & R	3.4
07-8	Automatic Transmission Governor Assembly - Recondition	1.8

### Drive Shaft and Universal - Repair Code 09

Operation	Description	Time
		All Models
09-1	Drive Axle, Jackshaft - Overhaul	1.0
09-2	Drive Axle, Jackshaft - R & R	.9
09-3	Drive Chain - Adjust (Both Sides)	.3
09-4	Drive Chain - R & R	1.6
09-5	Drive Sprocket and Housing Assembly- Overhaul	.7
09-6	Drive Sprocket and Housing Assembly - R & R (Per Side)	1.9
09-7	P.T.O. Universal Joint - Overhaul	.4
09-8	P.T.O. Universal Joint - R & R	.6
09-9	Propeller Shaft - Overhaul	1.0
09-10	Propeller Shaft - R & R	.6
09-11	Universal Joints, Propeller - Overhaul	.4
09-12	Universal Joints, Propeller Shaft - R & R	.4

### Rear Axle and Differential - Repair Code 11

Operation	Description	Time
		All Models
11-1	Differential - Overhaul	3.9
11-2	Differential Axle Seals - R & R	2.5
11-3	Differential - R & R	2.6
11-4	Drive Wheel Sprockets - R & R (Per Sprocket)	.9
11-5	Drive Chains and Sprockets - R & R	14.0
11-6	Drive Wheels - R & R (Per Wheel)	.9
11-7	Fork Tubes, Bearings, Sleeves, and Springs - R & R (Per Side)	3.4
11-8	Wheel Bearings and Oil Seals - Repack and Service (Per Wheel)	1.0

### Brakes - Repair Code 12

Operation	Description	Time
		All Models
12-1	Brake Lines - Bleed	.3
12-2	Brake, Master Cylinder - Overhaul (Per Cylinder)	.5
12-3	Brake, Master Cylinder - R & R	.5
12-4	Brake Pedal - Adjust	.1
12-5	Brake Shoes - R & R (Both Front or Both Rear Wheels)	.7
12-6	Brake Shoes - Reline - Bonded	.3
12-7	Hand Brake Bank - Reline	.7
12-8	Brake Shoes - Reline (Per Wheel Set)	.3
12-9	Brake, Wheel-Cylinder - Overhaul (Per Cylinder)	.4
12-10	Brake, Wheel Cylinder - R & R (Both Front or Both Rear Wheels)	.8
12-11	Brakes - Major Adjustment (Both Front or Rear Wheels)	.8
12-12	Brakes - Minor Adjustment (Both Front or Rear Wheels)	.6
12-13	Differential and Jackshaft Brakes - Adjust	.1
12-14	Differential and Jackshaft Brakes, Band Assemblies - R & R	.3
12-15	Hoist Brake - Adjust	.3
12-16	Hoist Brake Lining - R & R	.4
12-17	Hoist Brake Drive Sprocket - R & R	4.0
12-18	Hydraulic Hose Assemblies - R & R (Front or Rear Connector)	.2
12-19	Tubing Assemblies - R & R (a) Connector to Wheel (b) Bracket to "T" Front or Rear (c) Master Cylinder to "T" Right or Left	.2 .2 .2

**TIME STANDARDS (Continued)**

**Front Axle - Wheels - Springs - Controls and Linkage - Repair Code 13**

Operation	Description	Time All Models
13-1	Bearing Auxiliary Shaft - R & R	.4
13-2	Drag Links - R & R	
	(a) Front Drag Link	.6
	(b) Center Drag Link	.6
	(c) Rear Drag Link	.6
13-3	Front Fork Tubes, Bearings, Sleeves and Springs - R & R (Per Side)	3.2
13-4	Front Wheels - R & R (Per Wheel)	.6
13-5	Wheels - Align	3.0
13-6	Steer Gear - Adjustments:	
	(a) Worm Bearing	.7
	(b) Roller Shaft	1.0
	(c) Thrust Bearings - "On Cam"	1.0
	(d) Tapered Stud - Backlash	.8
13-7	Steer Gear and Wheel Assembly - Overhaul	2.0
13-8	Steer Gear and Wheel Assembly - R & R	2.1
13-9	Steering Arms - R & R	
	Right - Front or Rear	.4
	Left - Front or Rear	.4
13-10	Tie Rods - R & R - Front or Rear	.5
13-11	Wheel Bearings and Oil Seals - Repack and Service (Per Wheel)	.7

**Power Steering**

Operation	Description	Time All Models
13-12	Cylinder, Steering, Air Booster - R & R	.8
13-13	Valve, Relief - R & R	.3
13-14	Valve Assembly, Control - R & R	.5
13-15	Pump, Hydraulic - R & R	.5
13-16	Flexible Oil Line - R & R	.2
13-17	Hose, Hydraulic, Gear Pump to Control Valve - R & R	.2

**Tires - Repair Code 16**

Operation	Description	Time All Models
16-1	Tires, Drive Wheels, Pneumatic - R & R	1.1
16-2	Tires, Front Wheels, Pneumatic - R & R	1.1

**Hood - Fenders - Body - Repair Code 18**

Operation	Description	Time All Models
18-1	Drive Chain Guard - R & R	.2
18-2	Fork Tube Guards - Front or Rear, R or L - R & R	.2
18-3	Hood, Side Panels - R & R	.1

**Hood - Fenders - Body - Repair Code 18 (Continued)**

Operation	Description	Time All Models
18-4	Wheel Guards - R & R	.3
18-5	Windshield - R & R	1.0
18-6	Radio and Top - R & R	1.5

**Battery - Repair Code 37**

Operation	Description	Time All Models
37-1	Battery - R & R	.3
37-2	Battery Ground Cable - R & R	.3

**Hydraulic System - Repair Code 63**

Operation	Description	Time All Models
63-1	Hoses - R & R:	
	(a) Frame Coupling to "T"	.3
	(b) Pipe to Tank	.3
	(c) "T" to Vacuum Cylinder	.3
	(d) "T" to Valve	.3
	(e) Valve to Vacuum Cylinder	.3
63-2	Tubing - R & R:	
	(a) Tank to Frame Coupling	.4
	(b) Manifold to Check Valve	.4
63-3	Vacuum Cylinder Valve - Overhaul	.7
63-4	Vacuum Cylinder Valve - R & R	1.0
63-5	Vacuum Power Cylinder - Overhaul	.6
63-6	Vacuum Power Cylinder - R & R	1.4
63-7	Vacuum Tank - R & R	1.0

**Hoist - Winch Assemblies - Repair Code 85**

Operation	Description	Time All Models
85-1	Hoist Chain Sprockets - R & R	.9
85-2	Hoist Chains - Adjust	.3
85-3	Hoist Chains - R & R	.8
85-4	Hoist Drive Chains - Adjust	.4
85-5	Hoist Drive Chain - R & R	.6
85-6	Hoist Friction Wheel Assembly - Adjust	.4
85-7	Hoist Friction Wheel Assembly - Overhaul	2.7
85-8	Hoist Friction Wheel Assembly - R & R	1.5
85-9	Hoist Gear Cases - Adjust	.4
85-10	Hook or Shoes - R & R (One Side Only)	1.2
85-11	Hoist Shoes - Adjust	1.1
85-12	Hoist Shoe - Swing - Adjust	.6
85-13	Hook Swing Cylinder and Valve - Overhaul	.9
85-14	Hook Swing Cylinder and Valve - R & R	.6
85-15	Load Hook Limit Stops - Adjust	.2

**Section 15 – Equipment Cost Codes 1600 and 1610**

**TRUCK, HAND, LIFT, PALLET, ELECTRIC  
(ALL CAPACITIES)**

**REPAIR CODES**

- 11 – Rear Axle and Differential
- 12 – Brakes
- 13 – Front Axle - Wheels - Controls - Linkage Springs
- 16 – Tires
- 18 – Body - Guards and Hoods
- 37 – Battery
- 50 – Motors
- 52 – Controls
- 63 – Hydraulic

**TIME STANDARDS**

**Rear Axle and Differential - Repair Code 11**

Operation	Description	Time
		All Models
11-1	Drive Axle - R & R	1.1
11-2	Drive Chain - R & R	.6
11-3	Drive Mechanism Support - R & R	2.5
11-4	Drive Wheel - R & R	1.1
11-5	Drive Wheel Bearings - R & R	1.2
11-6	Drive Wheel Sprocket - R & R	1.1
11-7	Jackshaft - R & R	1.3
11-8	Jackshaft Bearings - R & R	1.4
11-9	Jackshaft Sprocket (large) - R & R	.8
11-10	Jackshaft Sprocket (small) - R & R	1.1

**Brakes - Repair Code 12**

Operation	Description	Time
		All Models
12-1	Brake - Adjust	.2
12-2	Brake Shoes - R & R	.7
12-3	Brake Shoes - Reline (out-of-unit)	.2
12-4	Brake Shoes - Reline - Bonded	.2
12-5	Brake Spring - R & R	.3

**Front Axle - Wheels - Controls -  
Linkage Springs - Repair Code 13**

Operation	Description	Time
		All Models
13-1	Steer Turntable - Adjust	.7
13-2	Steer Turntable Race - R & R	1.1
13-3	Steering - Inspect and Service	.3
13-4	Steering Handle - R & R	.8
13-5	Steering Handle Return Spring - R & R	.2
13-6	Steering Handle Support - R & R	.8
13-7	Turntable Adjustment Ring - R & R	.8

**Tires - Repair Code 16**

Operation	Description	Time
		All Models
16-1	Tire - R & R	1.2

**Body - Guards and Hoods - Repair Code 18**

Operation	Description	Time
		All Models
18-1	Booster Roller - R & R	.2
18-2	Fork Assembly - Remove, Overhaul and Replace	2.5

**Body - Guards and Hoods - Repair Code 18  
(Continued)**

Operation	Description	Time
		All Models
18-3	Frame Return Springs - R & R	.1
18-4	Lift Chain - R & R	.6
18-5	Lift Chain Sprocket - R & R	1.0
18-6	Lower Lifting Cam - R & R	1.0
18-7	Pull Rods - Adjust	.2
18-8	Pull Rods - R & R	.5
18-9	Rear Wheel - R & R	.6

**Battery - Repair Code 37**

Operation	Description	Time
		All Models
37-1	Battery - R & R (Check all Grounds)	.1
37-2	Battery Plug - R & R	.5
37-3	Charging Plug - R & R	.5

**Motors - Repair Code 50**

Operation	Description	Time
		All Models
50-1	Drive Motor - Clean and Inspect	.3
50-2	Drive Motor - R & R	1.2
50-3	Drive Motor - Overhaul	6.0
50-4	Drive Motor Chain - R & R	.3
50-5	Drive Motor Sprocket - R & R	.4
50-6	Pump Motor - R & R	1.0
50-7	Pump Motor - Overhaul	4.0

**Controls - Repair Code 52**

Operation	Description	Time
		All Models
52-1	Controller Contacts - One Set - R & R	.2
	Add for each additional set replaced	(.1)
52-2	Contacts (All) - Clean and Service	.9
52-3	Forward Push Button Switch - R & R	.3
52-4	Drive Motor Controller - Inspect and Clean	.2
52-5	Control Handle (Harness) - R & R	1.3
52-6	Pump Motor Controller - Inspect and Clean	.2
52-7	Reverse Push Button Switch - R & R	.3
52-8	Up-Down Push Button Switch - R & R	.3
52-9	Horn - R & R	.3
52-10	Horn Button - R & R	.3
52-11	Battery Flush	.3
52-12	Battery Cable Lug Resolder	.5

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## TIME STANDARDS (Continued)

### Hydraulic - Repair Code 63

Operation	Description	Time All Models
63-1	Hydraulic Cylinder - R & R .....	1.6
63-2	Hydraulic Cylinder - Overhaul .....	1.0
63-3	Hydraulic Lines - One - R & R .....	.3
63-4	Hydraulic Pump - R & R .....	1.0

### Hydraulic - Repair Code 63 (Continued)

Operation	Description	Time All Models
63-5	Hydraulic Tank - R & R .....	.7
63-6	Piston Rod Packing - R & R .....	.5
63-7	Release Valve - R & R .....	.6

**Section 16 – Equipment Cost Codes 1820 and 1823**

**TRUCK, LIFT, FORK, ROUGH TERRAIN (OR 463L), DIESEL, PRT  
(ALL CAPACITIES)**

**REPAIR CODES**

- 01 – Engine
- 02 – Clutch
- 03 – Fuel System
- 04 – Exhaust System
- 05 – Cooling System
- 06 – Electrical System
- 07 – Transmission
- 09 – Drive Shaft and Universal
- 11 – Rear Axle and Differential
- 12 – Brakes
- 13 – Front Axle - Wheels - Controls
- 16 – Tires
- 37 – Battery
- 63 – Hydraulic System

**BASIC STANDARDS – EC Codes 1820 and 1823**

	Time		Time
A	Lift Forks - R & R . . . . .	C	Seat - R & R . . . . .
B	Hood - R & R . . . . .	D	Block Up Front or Rear End. . . . .
	.2		.2
	.2		.1

**TIME STANDARDS**

**Engine - Repair Code 01**

Operation	Description	Time
01-1	Compression Test (One Cylinder) . . . . .	.4
01-2	Engine - Bore for Sleeves . . . . .	13.2
01-3	Engine - Disassemble . . . . .	2.3
01-4	Engine - Dynamometer Test . . . . .	2.2
01-5	Engine - R & R . . . . .	7.7
01-6	Engine - Reassemble . . . . .	8.5
01-7	Engine - Tune-Up . . . . .	.8
01-8	Engine Head or Gasket - R & R . . . . .	1.0
01-9	Engine Mount Springs - R & R . . . . .	.4
01-10	Engine Rocker Arm Cover or Gasket - R & R . . . . .	.4
01-11	Engine Timing Gear Cover or Gasket - R & R . . . . .	8.2
01-12	Oil Gage - R & R . . . . .	.3

**Engine Clutch - Repair Code 02**

Operation	Description	Time
02-1	Clutch - Adjust . . . . .	.2
02-2	Clutch Facing - Reline . . . . .	.3
02-3	Clutch Pedal Springs - R & R . . . . .	.3
02-4	Flywheel - R & R . . . . .	4.6
02-5	Flywheel Ring Gear - Install . . . . .	.1
02-6	Pressure Plate - Overhaul . . . . .	.6
02-7	Pressure Plate Facing and Release Bearing - R & R . . . . .	3.7

**Fuel System - Repair Code 03**

Operation	Description	Time
03-1	Accelerator Spring - R & R . . . . .	.1
03-2	Air Filter - Clean . . . . .	.1
03-3	Fuel Filter, Primary - Clean . . . . .	.2
03-4	Fuel Filter, Secondary - Clean . . . . .	.2
03-5	Fuel Gage - R & R . . . . .	.3
03-6	Fuel Tank - R & R . . . . .	.6
03-7	Injector, Fuel - Remove, Test, Replace . . . . .	.5
03-8	System, Fuel - Clean Complete . . . . .	1.0

**Exhaust System - Repair Code 04**

Operation	Description	Time
04-1	Exhaust Pipe and Gasket - R & R . . . . .	.7
04-2	Exhaust Manifold and Gasket - R & R . . . . .	1.4
04-3	Heat Control Thermostat - R & R . . . . .	.1
04-4	Muffler - R & R . . . . .	.6

**Cooling System - Repair Code 05**

Operation	Description	Time
05-1	Engine Drain Cock - R & R . . . . .	.1
05-2	Fan Belt - R & R . . . . .	.1
05-3	Fan Blade - R & R . . . . .	.2
05-4	Head Water Outlet Gasket - R & R . . . . .	.3
05-5	Radiator - R & R . . . . .	1.2
05-6	Radiator Drain Cock - R & R . . . . .	.1
05-7	Radiator Hose, Upper or Lower - R & R . . . . .	.2
05-8	Water Pump - Overhaul . . . . .	.5
05-9	Water Pump - R & R . . . . .	1.4
05-10	Temperature Gage - R & R . . . . .	.3

**Electrical System - Repair Code 06**

Operation	Description	Time
06-1	Generator - Adjust . . . . .	.2
06-2	Generator - R & R . . . . .	.3
06-3	Horn - R & R or Adjust . . . . .	.2
06-4	Horn Button - R & R . . . . .	.1
06-5	Hour Meter - R & R . . . . .	.3

**Transmission - Repair Code 07**

Operation	Description	Time
07-1	Ring and Pinion Gear Assembly - Overhaul . . . . .	1.0
07-2	Transmission - Overhaul . . . . .	4.7
07-3	Transmission - R & R . . . . .	3.0
07-4	Transmission - Replace Grease Seals and Inspect . . . . .	1.3

**Automatic Transmission**

Operation	Description	Time
07-5	Automatic Transmission - R & R . . . . .	3.4
07-6	Automatic Transmission Oil Pump - R & R (Add Automatic Transmission R & R for Front Pump) . . . . .	1.8
07-7	Automatic Transmission Housing Oil Seal - R & R . . . . .	1.0
07-8	Automatic Transmission Regulator Valve Body - R & R . . . . .	3.4
07-9	Automatic Transmission Governor Assembly - Recondition . . . . .	1.8

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## TIME STANDARDS

### Final Drive - Repair Code 09

Operation	Description	Time
09-1	Universal Joint - R & R . . . . .	.5
09-2	Universal Joint Bearings - R & R . . . . .	1.0

### Rear Axle and Differential - Repair Code 11

Operation	Description	Time
11-1	Differential Assembly - Overhaul . . . . .	2.3
11-2	Differential Assembly - R & R . . . . .	3.0
11-3	Rear Axle - R & R . . . . .	1.8
11-4	Wheels, Drive - R & R . . . . .	.8

### Brakes - Repair Code 12

Operation	Description	Time
12-1	Adjustment - Major . . . . .	.8
12-2	Adjustment - Minor . . . . .	.3
12-3	Brake Cylinder - Overhaul (out-of-unit) . . . . .	.3
12-4	Brake Cylinder - R & R . . . . .	1.3
12-5	Brake Line, Central - R & R . . . . .	.2
12-6	Brake Line, L or R - R & R . . . . .	.3
12-7	Brake Lines - Bleed . . . . .	.2
12-8	Brake Pedal - Adjust . . . . .	.2
12-9	Brake Shoes, Bonded - Reline . . . . .	.2
12-10	Brake Shoes - R & R . . . . .	1.2
12-11	Brake Shoes - Reline (per wheel) . . . . .	.2
12-12	Hand Brake - Adjust . . . . .	.3
12-13	Hand Brake Band - Reline . . . . .	.1
12-14	Master Cylinder - Overhaul (out-of-unit) . . . . .	.3
12-15	Master Cylinder - R & R . . . . .	.3

### Front Axle - Wheels - Controls - Repair Code 13

Operation	Description	Time
13-1	Steer Wheels - Repack . . . . .	.5
13-2	Steering - Inspect . . . . .	.3
13-3	Steering Assembly - Overhaul . . . . .	1.9
13-4	Steering Assembly - R & R . . . . .	1.7
13-5	Steering Axle Drag Link - R & R . . . . .	.6

### Front Axle - Wheels - Controls - Repair Code 13 (Continued)

Operation	Description	Time
13-6	Steering Axle Spring - R & R (One) . . . . .	.2.1
13-7	Steering Gear - Overhaul . . . . .	.8
13-8	Steering Gear - R & R . . . . .	.7
13-9	Steering Wheel - R & R . . . . .	.2

### Power Steering

Operation	Description	Time
13-10	Cylinder, Steering, Air Booster - R & R . . . . .	.8
13-11	Valve, Relief - R & R . . . . .	.3
13-12	Valve, Assembly, Control - R & R . . . . .	.5
13-13	Pump, Hydraulic - R & R . . . . .	.5
13-14	Flexible Oil Line - R & R . . . . .	.2
13-15	Hose, Hydraulic, Gear Pump to Control Valve - R & R . . . . .	.2

### Tires - Repair Code 16

Operation	Description	Time
16-1	Drive Wheels - Retire . . . . .	1.4
16-2	Steer Wheels - Retire . . . . .	.7

### Battery Repair - Code 37

Operation	Description	Time
37-1	Battery - R & R . . . . .	.1
37-2	Battery Round Cable - R & R . . . . .	.1

### Hydraulic System - Repair Code 63

Operation	Description	Time
63-1	Hydraulic Lines - R & R . . . . .	1.5
63-2	Hydraulic Oil Tank - R & R . . . . .	.9
63-3	Hydraulic Pump and Gasket - R & R . . . . .	.8
63-4	Lift Cylinder - Overhaul . . . . .	2.6
63-5	Tilt Cylinder - Overhaul . . . . .	.7
63-6	Valve - R & R . . . . .	.6

**Section 17 – Equipment Cost Codes 1860 and 1870**

**TRUCK, SIDE LOADER, DIESEL, PRT**

**REPAIR CODES**

- 01 – Engine
- 02 – Clutch
- 03 – Fuel System
- 04 – Exhaust System
- 05 – Cooling System
- 06 – Electrical System
- 07 – Transmission
- 09 – Drive Shaft and Universal
- 11 – Rear Axle and Differential
- 12 – Brakes
- 13 – Front Axle - Wheels - Controls
- 16 – Tires
- 18 – Hood and Body
- 37 – Battery
- 63 – Hydraulic System

**BASIC STANDARDS – EC Codes 1860 and 1870**

	Time		Time
A	Lift Forks - R & R . . . . .	D	Fuel Tank Cover - R & R . . . . .
B	Mast - R & R (Includes Operation A) . . . . .	E	Fuel Tank - R & R (Includes Operation D) . . . . .
C	Side Panels - R & R . . . . .	F	Block Up Front or Rear End. . . . .
	.2		.2
	1.5		.5
	.2		.2

**TIME STANDARDS**

**Engine - Repair Code 01**

Operation	Description	Time
01-1	Compression Test (One Cylinder) . . . . .	.4
01-2	Engine - Bore for Sleeves. . . . .	13.2
01-3	Engine - Disassemble . . . . .	2.3
01-4	Engine - Dynamometer Test . . . . .	2.2
01-5	Engine - R & R . . . . .	7.7
01-6	Engine - Reassemble. . . . .	8.5
01-7	Engine - Tune-Up . . . . .	.8
01-8	Engine Head or Gasket - R & R . . . . .	1.0
01-9	Engine Mount Springs - R & R . . . . .	.4
01-10	Engine Rocker Arm Cover or Gasket - R & R . . . . .	.4
01-11	Engine Timing Gear Cover or Gasket - R & R . . . . .	8.2
01-12	Oil Gage - R & R . . . . .	.3

**Clutch - Repair Code 02**

Operation	Description	Time
02-1	Clutch - Adjust . . . . .	.2
02-2	Clutch Facing - Reline . . . . .	.3
02-3	Clutch Pedal Springs - R & R . . . . .	.3
02-4	Flywheel - R & R . . . . .	4.6
02-5	Flywheel Ring Gear - Install. . . . .	.1
02-6	Pressure Plate - Overhaul . . . . .	.6
02-7	Pressure Plate Facing and Release Bearing - R & R . . . . .	3.7

**Fuel System - Repair Code 03**

Operation	Description	Time
03-1	Accelerator Spring - R & R . . . . .	.1
03-2	Air Filter - Clean. . . . .	.1
03-3	Fuel Filter, Primary - Clean . . . . .	.2
03-4	Fuel Filter, Secondary - Clean . . . . .	.2
03-5	Fuel Gage - R & R . . . . .	.3
03-6	Fuel Tank - R & R . . . . .	.6
03-7	Injector, Fuel - Remove - Test - Replace . . . . .	.5
03-8	System, Fuel - Clean Complete . . . . .	1.0

**Exhaust System - Repair Code 04**

Operation	Description	Time
04-1	Exhaust Pipe and Gasket - R & R . . . . .	.7
04-2	Exhaust Manifold and Gasket - R & R . . . . .	1.4
04-3	Heat Control Thermostat - R & R . . . . .	.1
04-4	Muffler - R & R . . . . .	.6

**Cooling System - Repair Code 05**

Operation	Description	Time
05-1	Engine Drain Cock - R & R . . . . .	.1
05-2	Fan Belt - R & R . . . . .	.1
05-3	Fan Blade - R & R . . . . .	.2
05-4	Head Water Outlet Gasket - R & R . . . . .	.3
05-5	Radiator - R & R . . . . .	1.2
05-6	Radiator Drain Cock - R & R . . . . .	.1
05-7	Radiator Hose, Upper or Lower - R & R . . . . .	.2
05-8	Water Pump - Overhaul . . . . .	.5
05-9	Water Pump - R & R . . . . .	1.4
05-10	Temperature Gage - R & R . . . . .	.3
05-11	Cooling System - Flush . . . . .	1.0

**Electrical System - Repair Code 06**

Operation	Description	Time
06-1	Generator - Adjust . . . . .	.2
06-2	Generator - R & R . . . . .	.3
06-3	Horn - R & R or Adjust . . . . .	.3
06-4	Horn Button - R & R . . . . .	.3
06-5	Hour Meter - R & R . . . . .	.3

**Transmission - Repair Code 07**

Operation	Description	Time
07-1	Ring and Pinion Gear Assembly - Overhaul . . . . .	1.0
07-2	Transmission - Overhaul. . . . .	4.7
07-3	Transmission - R & R . . . . .	3.0
07-4	Transmission - Replace Grease Seals and Inspect . . . . .	1.3

**Automatic Transmission**

Operation	Description	Time
07-5	Automatic Transmission - R & R . . . . .	3.4
07-6	Automatic Transmission Oil Pump - R & R . . . . . (Add Automatic Transmission R & R for Front Pump) . . . . .	1.8
07-7	Automatic Transmission Housing Oil Seal - R & R . . . . .	1.0
07-8	Automatic Transmission Regulator Valve Body - R & R . . . . .	3.4
07-9	Automatic Transmission Governor Assembly - Recondition. . . . .	1.8

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## TIME STANDARDS

### Drive Shaft and Universal - Repair Code 09

Operation	Description	Time
09-1	Universal Joint - R & R . . . . .	.5
09-2	Universal Joint Bearings - R & R . . . . .	1.0

### Rear Axle and Differential - Repair Code 11

Operation	Description	Time
11-1	Differential Assembly - Overhaul . . . . .	2.3
11-2	Differential Assembly - R & R . . . . .	3.0
11-3	Rear Axle - R & R . . . . .	1.8
11-4	Wheels, Drive - R & R . . . . .	.8

### Brakes - Repair Code 12

Operation	Description	Time
12-1	Adjustment - Major . . . . .	.8
12-2	Adjustment - Minor . . . . .	.3
12-3	Brake Cylinder - Overhaul (out-of-unit) . . . . .	.3
12-4	Brake Cylinder - R & R . . . . .	1.3
12-5	Brake Line, Central - R & R . . . . .	.2
12-6	Brake Line, L or R - R & R . . . . .	.3
12-7	Brake Lines - Bleed . . . . .	.2
12-8	Brake Pedal - Adjust . . . . .	.3
12-9	Brake Shoes, Bonded - Reline . . . . .	.2
12-10	Brake Shoes - R & R . . . . .	1.2
12-11	Brake Shoes - Reline (per wheel) . . . . .	.2
12-12	Hand Brake - Adjust . . . . .	.3
12-13	Hand Brake Band - Reline . . . . .	.1
12-14	Master Cylinder - Overhaul (out-of-unit) . . . . .	.3
12-15	Master Cylinder - R & R . . . . .	.3

### Front Axle - Wheels - Controls - Repair Code 13

Operation	Description	Time
13-1	Steer Wheels - Repack . . . . .	.5
13-2	Steering - Inspect . . . . .	.3
13-3	Steering Assembly - Overhaul . . . . .	1.9
13-4	Steering Assembly - R & R . . . . .	1.7
13-5	Steering Axle Drag Link - R & R . . . . .	.6
13-6	Steering Axle Spring - R & R (One) . . . . .	2.1
13-7	Steering Gear - Overhaul . . . . .	.8
13-8	Steering Gear - R & R . . . . .	.7
13-9	Steering Wheel - R & R . . . . .	.2

### Power Steering

Operation	Description	Time
13-10	Cylinder, Steering, Air Booster - R & R . . . . .	.8
13-11	Valve, Relief - R & R . . . . .	.3
13-12	Valve, Assembly, Control - R & R . . . . .	.5
13-13	Pump, Hydraulic - R & R . . . . .	.5
13-14	Flexible Oil Line - R & R . . . . .	.2
13-15	Hose, Hydraulic, Gear Pump to Control Valve - R & R . . . . .	.2

### Tires - Repair Code 16

Operation	Description	Time
16-1	Drive Wheels - Retire . . . . .	1.4
16-2	Steer Wheels - Retire . . . . .	.7

### Hood and Body - Repair Code 18

Operation	Description	Time
18-1	Floor Plates - R & R . . . . .	.2
18-2	Hood Side Panel - R & R . . . . .	.1
18-3	Lift Chains - R & R . . . . .	1.0
18-4	Lift Forks - R & R . . . . .	.2
18-5	Mast - Overhaul (out-of-unit) . . . . .	3.5
18-6	Mast - R & R . . . . .	2.0

### Battery Repair - Code 37

Operation	Description	Time
37-1	Battery - R & R . . . . .	.1
37-2	Battery Ground Cable - R & R . . . . .	.1

### Hydraulic System - Repair Code 63

Operation	Description	Time
63-1	Hydraulic Lines - R & R . . . . .	1.5
63-2	Hydraulic Oil Tank - R & R . . . . .	.9
63-3	Hydraulic Pump and Gasket - R & R . . . . .	.8
63-4	Lift Cylinder - Overhaul . . . . .	2.6
63-5	Tilt Cylinder - Overhaul . . . . .	.7
63-6	Valve - R & R . . . . .	.6

**Section 18 – Equipment Cost Code 1880**

**TRUCK, SIDELoader, ELECTRIC (ALL CAPACITIES)**

**REPAIR CODES**

- 11 – Rear Axle and Differential
- 12 – Brakes
- 13 – Front Axle - Wheels - Controls
- 16 – Tires
- 18 – Hood and Body
- 37 – Battery
- 50 – Motors
- 52 – Controls
- 63 – Hydraulic System

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## TIME STANDARDS

### Rear Axle and Differential - Repair Code 11

Operation	Description	Time
11-1	Differential - Overhaul (out-of-unit)	2.5
11-2	Differential - R & R	3.5
11-3	Drive Axle - R & R	1.2
11-4	Drive Wheels - R & R	.9
11-5	Wheel Bearings - R & R	.9

### Brakes - Repair Code 12

Operation	Description	Time
12-1	Brake Adjustment - Major	1.1
12-2	Brake Adjustment - Minor	.3
12-3	Brake Cylinder - Overhaul (out-of-unit)	.3
12-4	Brake Cylinder - R & R	1.0
12-5	Brake Line, Central - R & R	.2
12-6	Brake Line, L or R - R & R	1.0
12-7	Brake Lines - Bleed	.8
12-8	Brake Pedal - Adjust	.2
12-9	Brake Shoes - R & R	1.2
12-10	Brake Shoes, Bonded - Reline	.2
12-11	Brake Shoes - Reline (Per Wheel)	.2
12-12	Drive Motor Brake Spring - R & R	.4
12-13	Master Cylinder - Overhaul (out-of-unit)	.3
12-14	Master Cylinder - R & R	.3

### Front Axle - Wheels - Controls - Repair Code 13

Operation	Description	Time
13-1	Steer Wheels - Repack	.5
13-2	Steering - Inspect	.3
13-3	Steering Assembly - Overhaul	1.9
13-4	Steering Assembly - R & R	1.7
13-5	Steering Axle Drag Link - R & R	.6
13-6	Steering Gear - Overhaul	.8
13-7	Steering Gear - R & R	.7
13-8	Steering Wheel - R & R	.2

### Tires - Repair Code 16

Operation	Description	Time
16-1	Drive Wheels - Retire	1.4
16-2	Steer Wheels - Retire	.7

### Hood and Body - Repair Code 18

Operation	Description	Time
18-1	Floor Plates - R & R	.2
18-2	Lift Chains - R & R	1.0

### Hood and Body - Repair Code 18 (Continued)

Operation	Description	Time
18-3	Lift Forks - R & R	.2
18-4	Mast - Overhaul (out-of-unit)	3.5
18-5	Mast - R & R	2.0

### Battery Repair - Code 37

Operation	Description	Time
37-1	Battery - R & R	.3
37-2	Battery Plug - R & R	.4
37-3	Charging Plug - R & R	.4

### Motors - Repair Code 50

Operation	Description	Time
50-1	Drive Motor - Clean and Inspect	.5
50-2	Drive Motor - R & R	4.0
50-3	Drive Motor Wires - R & R	.3
50-4	Tilt and Lift Motor - Clean and Inspect	.4
50-5	Tilt and Lift Motor - R & R	2.0
50-6	Tilt and Lift Motor Wires - R & R	.2

### Controls - Repair Code 52

Operation	Description	Time
52-1	Contact Release Springs - R & R	.5
52-2	Contacts - R & R (One Set)	.2
52-3	Controller Contact Springs - R & R	.1
52-4	Drive, Lift or Tilt Controller - Repair	Est.
52-5	Drive Motor Controller - Clean and Inspect	.5
52-6	Drive Motor Controller - R & R	.6
52-7	Reversing Drum Contacts - R & R	.5
52-8	Tilt and Lift Motor Controller - Clean and Inspect	.5
52-9	Horn - R & R	.3
52-10	Horn Button - R & R	.3
52-11	Hour Meter - R & R	.3
52-12	Battery Flush	.3
52-13	Battery Cable Lug Resolder	.5

### Hydraulic System - Repair Code 63

Operation	Description	Time
63-1	Hydraulic Lines - R & R	1.5
63-2	Hydraulic Oil Tank - R & R	.9
63-3	Hydraulic Pump and Gasket - R & R	.8
63-4	Lift Cylinder - Overhaul	2.6
63-5	Tilt Cylinder - Overhaul	.7
63-6	Valve - R & R	.6

**Section 19 – Equipment Cost Code 1900**

**TRUCK, HAND, LIFT, PALLET, MANUAL  
(ALL CAPACITIES)**

**REPAIR CODES**

- 01 – Hydraulic Pump Assembly
- 02 – Brake Assembly
- 03 – Wheels (Steer and Load)

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## TIME STANDARDS

### Hydraulic Pump Assembly - Repair Code 01

Operation	Description	Time
01-1	Hydraulic Pump - R & R .....	3.0
01-2	Piston Rod - Repack .....	1.5

### Wheels (Steer and Load) - Repair Code 03

Operation	Description	Time
03-1	Steer Wheels - R & R .....	1.5
03-2	Load Wheels - R & R .....	1.5

### Hydraulic Pump Assembly - Repair Code 01

Operation	Description	Time
02-1	Brake Cable - R & R .....	2.0
02-2	Brake Cable - Adjust .....	1.0

**Section 20 – Equipment Cost Code 1433**

**463L K-LOADER, ELEVATING PLATFORM WITH ROLLERS,  
GAS OR DIESEL, PRT (ALL CAPACITIES)**

No general repair time standards have been established for this unit.

**Section 21 – Equipment Cost Code 1903**

**463L TRAILER WITH ROLLERS (ALL CAPACITIES)**

No general repair time standards have been established for this unit.

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## CHAPTER 11

### SHORT TERM (LIVE) STORAGE

#### 11-1. PURPOSE

Materials Handling Equipment (MHE) storage procedures were developed to minimize equipment degradation while in storage prior to issuance. The requirements for storage are divided into two separate categories based on anticipated storage duration. This chapter describes short term, commonly called “live storage,” for an anticipated MHE storage duration of less than 24 months (2 years). [Chapter 12](#) describes long term procedures, commonly called “dead storage,” for MHE storage of greater than 24 months (2 years).

#### 11-2. RECEIPT INSPECTION

Upon receipt at a storage site and before placing into storage, each MHE will be inspected and operationally tested, as described in [paragraph 8-4](#), to determine operability and condition, and to determine whether deficiencies exist that may be covered under the contract warranty. The receiving activity will complete the inspections and operations prior to signing any documents [i.e., government bill of lading (GBL), shipper’s GBL, etc.)], which may serve to release the shipping company of responsibility for damage incurred during transport. If the receiving activity fails to perform these receipt functions and shipping damage is subsequently identified, the receiving activity may be assigned the responsibility for those damages. Each MHE shall be completely inspected prior to storage. Report any equipment deficiencies or warranty defects on the Product Quality Deficiency Report (QDR) (Standard Form 368), [figure 6-2](#), to the MHE Program Manager at Commander, Naval Inventory Control Point (NAVICP-M), Code 058133, 5450 Carlisle Pike, P.O. Box 2020, Mechanicsburg, PA 17055-0788 and a copy to the Director, Naval Surface Warfare Center, Indian Head Division Detachment Earle, Naval PHST Center (Code 71), 201 Highway 34 South, Colts Neck, NJ 07722-5023.

#### 11-3. SYSTEM PRESERVATION

The following preservation procedures, where applicable, shall be applied to each MHE:

11-3.1. **BATTERIES.** Using the battery record form, [figure 9-2](#), record the battery specific gravity and open circuit voltage for baseline purposes. Refer to the procedures in [chapter 9](#) for safety precautions when performing these measurements. A commercially available equivalent form of battery record recording may be used if authorized by the appropriate Fleet and Industrial Supply Center (FISC) Regional MHE Manager. Perform these inspections in accordance with the battery manufacturer’s recommendations to ensure full coverage of the manufacturer’s warranty.

a. Batteries shall be maintained as close to 100% of capacity as economical. At no time shall the batteries be allowed to discharge below 1.240 specific gravity without charging. Charge batteries, as

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required, whenever the battery cell voltage falls below 25% of the initial reading. Batteries shall be maintained in a charged ready state either in the forklift truck or a separate battery room location.

b. Charge batteries if the specific gravity is below 25% of the manufacturer's full charge recommendation. Ensure a constant current, constant voltage, constant current charging method [current voltage current (IEI)] is used to prevent battery overcharging. High rate shall not exceed 16-18 amps per 100 amp hour of rated capacity, constant current.

### NOTE

Use caution when servicing forklift trucks with battery box covers using cover support rods (type E/EE/EX) and safety interlocks (type EX only). Damage to battery, battery cables, and switches may occur when the battery cover is lowered without properly positioning the supports/interlocks.

c. Add distilled water only as required for battery cell replacement.

### WARNING

Refer to the Material Safety Data Sheet (MSDS) for Grease, Aircraft and Instruments, MIL-PRF-23827. The precautions, procedures and special protection information concerning the grease shall be followed.

d. Apply Grease, Aircraft and Instruments, MIL-PRF-23827 (refer to [table 11-1](#)) or commercial equivalent to the battery terminals and connectors on forklift trucks equipped with quick connect type cables.

### WARNING

Refer to the Material Safety Data Sheets (MSDS) for Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®. The precautions, procedures and special protection information concerning the lubricant shall be followed.

e. For electrically powered MHE, disconnect the battery cable connectors. Spray Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36® (refer to [table 11-1](#)) to the battery connector contacts.

11-3.2. WIRING HARNESS. Spray the wiring harness connector plugs with Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®.

### WARNING

Refer to the Material Safety Data Sheet (MSDS) for Compound, Silicone, Soft Film, DC-6 or G-24. The precautions, procedures and special protection information concerning the compound shall be followed.

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11-3.3. **LIGHTS.** Preserve all light devices by removing the protective lenses. Coat sockets and bulb bases using Compound, Silicone, Soft Film, DC-6 or G-24 (refer to [table 11-1](#)).

11-3.4. **BRAKE SYSTEM.** Metal surfaces, such as adjusting wedges, pins, eccentrics, cam levers, linkages, anchors, retracting springs, and external surfaces of brake drums, shall be sprayed with Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®. Brake rotors shall be sprayed and wiped dry using a clean cloth.

11-3.5. **HYDRAULIC PISTONS.** Hydraulic pistons shall remain in the lowest or “relaxed” position. Spray the exposed piston surface initially with Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36® and, subsequently every 60 days or whenever MHE is operationally tested.

### **WARNING**

Refer to the Material Safety Data Sheet (MSDS) for CRC Industrial Duty Silicone. The precautions, procedures, and special protection information concerning the silicone shall be followed.

11-3.6. **ENGINES.** Engines shall be sprayed using Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®. Hoses and rubber/plastic components shall be sprayed using CRC Industrial Duty Silicone (refer to [table 11-1](#)).

11-3.7. **TRANSMISSIONS.** The transmission outer case shall be sprayed with Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®. All tie rod and linkages shall be preserved with Grease, Aircraft and Instruments, MIL-PRF-23827.

### **WARNING**

Refer to the Material Safety Data Sheet (MSDS) for Lubricating Oil, Engine, MIL-L-21260, Grade 30. The precautions, procedures and special protection information concerning the oil shall be followed.

11-3.8. **FUEL TANKS.** Fluid levels shall be maintained at the maximum full level to eliminate excess moisture from the system. In locations not able to comply with this recommendation due to safety or hazard analysis, the fuel tanks shall be filled to at least half capacity. The remainder of the tank shall be atomize sprayed using Lubricating Oil, Engine, MIL-L-21260, Grade 30 (refer to [table 11-1](#)) at a rate of 2 ounces per gallon for the remainder of the empty tank. A flexible nozzle of sufficient length shall be used to assure coverage to all interior surface of the tank. This procedure shall be repeated annually.

### **WARNING**

Refer to the Material Safety Data Sheet (MSDS) for Fuel Soluble Lubricity Improver Corrosion Inhibitor, MIL-I-25017. The precautions, procedures and special protection information concerning the corrosion inhibitor shall be followed.

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For engine driven forklift trucks, add Fuel Soluble Lubricity Improver Corrosion Inhibitor, MIL-I-25017, if not added at the factory.

11-3.9. **RADIATOR.** Check the antifreeze and, for engine driven forklift trucks only, the radiator corrosion protection. Top off using 50-50 or 60-40 mixture of antifreeze to water (ratio based on the manufacturer's recommendation).

**Table 11-1. Qualified Products List**

Manufacturer's Designation	National Stock Number (NSN)	Specification	Description	Manufacturer's Name, Address and Phone Number
CRC 3-36®	6850-00-050-0659	Commercial	Multi-Purpose Lubrication/Corrosion Inhibitor. Manufacturer's part number 03005, 16 oz. can or bulk equivalent	CRC Chemicals USA 885 Louis Drive Warminster, PA 18974-2820 (215) 674-4300
Aeroshell 17	9150-00-223-4004		Grease, Molybdenum Disulfide	Shell Oil Co.
LPS 814	8030-00-546-8637	MIL-C-81309	Corrosion Preventative Compound	Various
ALOX 22028CM-3	8030-00-546-8637	MIL-C-81309	Corrosion Preventative Compound	Various
DC-6 or G-24	6850-00-664-4959	MIL-C-21567	Compound, Silicone, Soft Film	Various
CRC Industrial Duty Silicone	6850-01-265-3115		Silicone Lubricant Manufacturer's Part Number 03030	CRC Chemicals USA 885 Louis Drive Warminster, PA 18974-2820 (215) 674-4300
Aeroshell 17	9150-00-223-4004	MIL-PRF-23287	Grease, Aircraft and Instruments	Various
		O-E-760	Alcohol, Denatured Ethyl	
		MIL-L-21260, Grade 30	Lubricating Oil, Engine	
	6850-01-113-2063	MIL-I-25017	Fuel Soluble Lubricity Improver Corrosion Inhibitor	

11-3.10. **GREASE FITTINGS.** All grease fittings and components lubricated by these fittings shall be charged/filled using the manufacturer recommended lubricant.

11-3.11. **UNPAINTED SURFACES.** Components, such as levers, latches, control linkage, locking pins, shafts, pedal linkages, couplers, and exposed hydraulic shafts, shall be coated with Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®.

**WARNING**

Refer to the Material Safety Data Sheet (MSDS) for Grease, Aircraft and Instruments, MIL-PRF-23827. The precautions, procedures and special protection information concerning the grease shall be followed.

11-3.12. **WINCHES AND CABLES.** Wire cables, if not galvanized, shall be completely unwound from the drum and all surfaces of the drums, sheaves, blocks, and linkages shall be coated with Grease, Aircraft and Instruments, MIL-PRF-23827.

**WARNING**

Refer to the Material Safety Data Sheet (MSDS) for CRC 3-36®, or LPS 814, or ALOX 22028CM-3. The precautions, procedures and special protection information concerning the lubricant shall be followed.

11-3.13. **MASTS AND BOOMS.** Exposed, unpainted metal surfaces on masts and booms shall be coated with CRC 3-36®, LPS 814, or ALOX 22028CM-3.

11-3.14. **DIFFERENTIALS, TRANSFER CASES, AND FINAL DRIVES.** Unpainted surfaces of drive shafts, propeller shafts, and universal joints shall be coated with CRC 3-36®, LPS 814, or ALOX 22028CM-3.

11-3.15. **OPERATOR COMPARTMENT.** Unpainted metal surfaces of handles and levers shall be coated with Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®.

11-3.16. **INSTRUMENT PANELS.** Instrument panels, unpainted gauges, instruction plates, data plates, unpainted toggle switches, and any unpainted surfaces on the instrument panel shall be sprayed with Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®.

11-3.17. **TIRES.** Pneumatic tires shall be inflated to 10 pounds above the recommended pressure for maximum load. Spray tire sidewall surface using CRC Industrial Duty Silicone. If tarps do not cover tires completely and the MHE is subjected to ultraviolet light from windows or open doors, protective polyethylene bags/covers shall be applied conforming to MIL-T-46755.

11-3.18. **FORKS.** Unpainted surfaces on the forks, fork locks, etc., shall be coated with Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®.

11-3.19. **LIFT CHAINS.** Spray lift chains initially with Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®, then again every quarter or as required after operational testing.

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11-3.20. **MAINTENANCE TOOLS.** Tools provided as part of the MHE contract shall be initially preserved by atomize spray application of Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®. Spray annually thereafter or as conditions require.

### 11-4. STORAGE

When MHE is to be placed in other than ready-to-ship or ready-to-operate condition for immediate issue on short notice (“live storage”), NAVICP-M will ensure that the appropriate corrosion prevention is performed at the factory. The following storage restrictions apply:

- a. Outside storage is prohibited.
- b. MHE shall be kept dry and in an enclosed area. Keeping the MHE in a low moisture (less than 50% humidity), temperature controlled environment will greatly reduce degradation.
- c. MHE shall be covered by tarps, whenever possible. Tarps shall be of cotton, linen or other material that is water permeable (material that does not trap water or allow equipment to sweat, i.e., used parachutes work well). Tarps will help eliminate dirt or dust buildup and ultraviolet light degradation to rubber and plastic components. Plastic sheets or waterproof tarps used to wrap equipment are prohibited. These materials can trap floor moisture and accelerate corrosion. Tarps may be applied loosely to the equipment.
- d. Maintenance Requirement Cards (MRC’s) shall be used in conjunction with this publication. The MRC calendar periodicity may be largely ignored, but the hourly maintenance requirement shall be strictly followed. When conflicting information between this publication and the MRC exists, contact NAVICP-M for clarification and resolution.

### 11-5. RECORDS

Each activity will maintain records documenting the identity (type, make, model, size, serial and registration numbers), location, and the condition of the MHE upon arrival, upon examination at each exercising period, and following removal from storage containing the dates and a description of maintenance performed along with the cost of servicing the MHE.

### 11-6. STORAGE DOCUMENTATION DATA

The following storage data shall be maintain, where applicable:

- a. The date the MHE is placed in storage.
- b. Uncorrected deficiencies.
- c. Battery readings.
- d. Logistics information for all maintenance, inspection, and preservation checks, including the dates and the names of the technicians performing the storage checks.

- e. A list of manufacturer recommended fluids and system applications.
- f. Date of de-preservation for equipment that is preserved for long term storage (level A or B) as described in [chapter 12](#).

### **11-7. LUBRICATION CARD**

A laminated 8-1/2 by 11-inch card containing the manufacturer recommended lubricants and fill locations may be included with each MHE placed into short term storage.

### **11-8. PERIODIC INSPECTION, EXERCISING AND MAINTENANCE**

Each MHE will be visually inspected at least every 30 days. If deterioration is evident, the equipment shall be preserved to the extent necessary to preclude further deterioration. Every 60 to 90 days, each MHE will be operated and exercised until normal operating temperature is reached or for a minimum period of 15 minutes, whichever occurs first. The equipment shall be maneuvered in all directions (includes crab positions, as applicable) and in all gear ratios. All operational capabilities of the MHE, such as lift, lower, reach, retract, side shift, rotate, etc. shall be tested. The storing activity will inspect and perform corrosion protection and fluid/filter maintenance, as required. Any additional maintenance and repairs requires authorization by NAVICP-M.

**11-8.1. MONTHLY INSPECTION.** The following are the monthly inspection requirements, where applicable:

- a. Visually inspect MHE for damage or evidence of corrosion.
- b. Apply Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36® to piston rods, chains, linkages, and all exposed, unpainted metal surfaces, as required by inspection.
- c. Charge and water batteries, and clean, as required.
- d. Inspect for any fluid leaks.

**11-8.2. BIMONTHLY INSPECTION.** The following are the bimonthly (once every 2 months) inspection requirements, where applicable:

- a. Visually inspect MHE for damage or evidence of corrosion.
- b. Apply Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36® to unpainted metal surfaces, as required, after operational testing (hydraulic pistons, chains, rollers, linkages, stack valves, etc.).
- c. Charge and water batteries, and clean, as required.
- d. Inspect for any fluid leaks.

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- e. Top off fluid levels, as required.
- f. Perform operational tests. Record abnormal operations or noises and report them to NAVICP-M.
- g. Inspect gages to ensure proper operation of the MHE.

### NOTE

When performing operational testing, care should be taken to avoid dirt and debris from embedding into the tires.

- h. Fill dehydrator/evaporators, as appropriate (engine driven forklift trucks only).
- i. Drain moisture from air actuated brake systems (engine driven forklift trucks only).
- j. Drain water from fuel filters (engine driven forklift trucks only).
- k. Inspect for tire damage and proper inflation pressure.
- l. Disconnect battery (if forklift truck is not equipped with a master disconnect switch).

11-8.3. QUARTERLY INSPECTION. The following are the quarterly inspection requirements, where applicable:

- a. Perform a battery equalizing charge in accordance with [paragraph 9-8](#). Record the specific gravity and temperature. Battery specific gravity levels below 25% of the original level (e.g., 1.300 original, followed by 1.275) shall be considered suspect. Notify NAVICP-M for warranty assistance.
- b. Perform all bimonthly operational, inspection, maintenance and preservation checks in accordance with [paragraph 11-8.2](#).
- c. Check and maintain fuel levels. Add fuel stabilizers, as required (engine driven forklift trucks only).
- d. Lubricate grease fittings, as required.
- e. Drain moisture from fuel filters (engine driven forklift trucks only).
- f. Clean battery, as required. Apply corrosion preventative to battery connectors.

11-8.4. SEMI-ANNUAL INSPECTION. The following are the semi-annual inspection requirements, where applicable:

- a. Inspect wiring harness for corrosion, abrasion, loose connections, or other defects. Clean and preserve, as required.

**WARNING**

Refer to the Material Safety Data Sheet (MSDS) for Alcohol, Denatured Ethyl, O-E-760. The precautions, procedures and special protection information concerning the cleaning solvent shall be followed.

- b. Inspect contactors (electrically powered forklift trucks only) for corrosion, and clean, as required, using Alcohol, Denatured Ethyl, O-E-760 or a commercial contact cleaner.
- c. Inspect fuse blocks, fuses, and connectors for corrosion. Clean and apply Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®, as required.
- d. Perform all bimonthly operational, inspection, maintenance and preservation checks in accordance with [paragraph 11-8.2](#).

11-8.5. ANNUAL INSPECTION. The following are the annual inspection requirements, where applicable:

- a. Inspect the ether cylinder (cold start). Change or fill, as required (diesel only).
- b. Sample coolant for corrosion and antifreeze protection. Change, as required (engine driven forklift trucks only).
- c. Sample lubricants and fluids. Change, as required.
- d. Top off fluids, as required, to maintain full levels.
- e. Check the condition of the air filter, belts, fuel lines, brake lines, and hydraulic lines. Repair and replace, as required.
- f. Clean MHE. MHE with tarps are exempt from cleaning, depending on its condition.

**NOTE**

Be extremely careful around controller and contractor panels to prevent water intrusion (electrically powered forklift trucks only).

- g. Perform corrosion control procedures upon completion of cleaning and drying the MHE.
- h. Bleed the brake system at the lowest point on the vehicle.
- i. Perform quarterly and semi-annual operational, inspection, maintenance, and preservation checks in accordance with [paragraphs 11-8.3](#) and [11-8.4](#), respectively.
- j. Perform fuel tank maintenance on MHE so equipped with less than full tanks.

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k. Spray electrical connector plugs with Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®.

l. Purge fuel from tank in gasoline-powered vehicles and refill to capacity with fresh replacement. Use fuel for powering non-tactile vehicles.

m. Add fuel conditioner, as required.

**11-8.6. BIENNIAL (24 MONTH) INSPECTION.** The following are the biennial inspection requirements, where applicable:

a. Purge fuel tank from petroleum fuel powered vehicles and refill to capacity with fresh replacement. Use purged fuel for powering non-tactile vehicle.

b. Add fuel conditioner, as required.

c. Perform annual operational, inspection, maintenance, and preservation checks in accordance with [paragraph 11-8.5](#).

### **11-9. SHIPMENT AND TRANSPORTATION OF MHE**

[Appendix D](#) provides general guidelines for the shipment and transportation of MHE from short term storage. These procedures will ensure that MHE will not be degraded or damaged during shipment.

## CHAPTER 12

### LONG TERM (DEAD) STORAGE

#### 12-1. PURPOSE

Materials Handling Equipment (MHE) storage procedures were developed to minimize equipment degradation while in storage prior to issuance. The requirements for storage are divided into two separate categories based on anticipated storage duration. This chapter describes long term procedures, commonly called “dead storage,” for an anticipated MHE storage duration of greater than 24 months (2 years). [Chapter 11](#) describes short term procedures, commonly called “live storage,” procedures for MHE storage of less than 24 months (2 years). Long term (dead) storage refers to MHE that requires complete preservation upon receipt and a thorough de-preservation of all major systems prior to issue. Two military levels of preservation, as described in MIL-STD-2073, are Level “A” and Level “B”. Level A requires protection to meet the most severe worldwide shipment, handling, and storage conditions. Level B requires protection to meet moderate worldwide shipment, handling, and storage conditions. For the purpose of this publication, level “A” shall be used.

#### 12-2. RECEIPT INSPECTION

MHE received at a storage site will be thoroughly inspected prior to being prepared for long term storage. MHE received in unpreserved condition shall be operationally tested to determine whether deficiencies exist that may be covered under the contract warranty. The receiving activity will complete the inspections and operations, documented in [paragraph 8-4](#), prior to signing any documents [i.e., government bill of lading (GBL), shipper’s GBL, etc.)], which may serve to release the shipping company of responsibility for damage incurred during transport. If the receiving activity fails to perform these receipt functions and shipping damage is subsequently identified, the receiving activity may be assigned the responsibility for those damages. Report any equipment deficiencies or warranty defects on the Product Quality Deficiency Report (QDR) (Standard Form 368), [figure 6-2](#), to the MHE Program Manager at Commander, Naval Inventory Control Point (NAVICP-M), Code 058133, 5450 Carlisle Pike, P.O. Box 2020, Mechanicsburg, PA 17055-0788 with a copy to the Director, Naval Surface Warfare Center, Indian Head Division Detachment Earle, Naval PHST Center (Code 71), 201 Highway 34 South, Colts Neck, NJ 07722-5023. Equipment that is preserved for long term (dead) storage shall be inspected with systems re-preserved as required to assure that the equipment will not degrade further during storage.

#### 12-3. SYSTEM PRESERVATION

The following preservation procedures, where applicable, shall be applied to each MHE:

12-3.1. **CLEANING.** MHE may be cleaned by any method or combination of processes that will not damage or degrade components or systems. The following are general cleaning requirements:

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- a. Exterior surfaces and interior surfaces of cabs and bodies shall be clean and free of dirt, dust, grease, and other contaminants.
- b. MHE shall be clean and dry prior to the application of preservation compounds.

### **WARNING**

Refer to the Material Safety Data Sheet (MSDS) for Cleaning Compound, P-C-437. The precautions, procedures and special protection information concerning the compound shall be followed.

### **NOTE**

Cleaning Compound, P-C-437, contains phosphates and shall not be used in countries or areas that prohibit its use.

- c. Tape openings and seal with barrier material to prevent moisture intrusion prior to washing.
- d. For power washing or steam cleaning, use Cleaning Compound, P-C-437. Do not spray directly into lights, wiring harnesses, wire loom connectors, bearings, axles shafts, engine components, exhaust systems, etc. Do not direct spray as to remove markings or paint from components.

**12-3.2. DRYING.** MHE may be dried using prepared compressed air. The air stream of prepared (filtered and dried air) shall be directed away from components. Wiping rags or wiping papers may be used provided they are linen, combed cotton or lint free, non-woven fabric as listed by General Services Administration (GSA).

**12-3.3. PAINTING.** Painted surfaces on which the paint film has been damaged shall be repainted after cleaning using compatible materials (e.g., same type, quality and color) as original or as required by specification.

### **WARNING**

Refer to the Material Safety Data Sheet (MSDS) for Antifreeze, A-A-52624. The precautions, procedures and special protection information concerning the antifreeze shall be followed.

**12-3.4. LIQUID COOLANT SYSTEM.** The coolant system shall be drained and filled with a pre-mixed solution of antifreeze and distilled water. Engines with thermostatically, controlled coolant systems shall be operated until temperature is reached that opens thermostats assuring system protection. Top off using 50-50 or 60-40 mix of antifreeze to water [ratio depends on original equipment manufacturer (OEM) recommendation and storage temperature]. Antifreeze, if not specified by the OEM shall be in accordance with specification, A-A-52624, heavy duty, concentrate type (refer to [table 12-1](#)). Attach a warning tag (A-A-1266, Type 2) with the notation, "Preserved Month/Year With Antifreeze Type."

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12-3.5. TRANSMISSIONS. The following preservation procedures shall be applied to transmission on each MHE.

**WARNING**

Refer to the Material Safety Data Sheet (MSDS) for Lubricating Oil, Combat/Tactical 15W-40 in accordance with MIL-PRF-2104, or Lubricating Oil, Gear, Multi-Purpose 85W-140 in accordance with MIL-L-2105. The precautions, procedures and special protection information concerning these oils shall be followed.

**Table 12-1. Qualified Products List**

<b>Manufacturer's Designation</b>	<b>National Stock Number (NSN)</b>	<b>Specification</b>	<b>Description</b>	<b>Manufacturer's Name, Address and Phone Number</b>
CRC 3-36®	6850-00-050-0659	Commercial	Multi-Purpose Lubrication/Corrosion Inhibitor. Manufacturer's part number 03005, 16 oz. can or bulk equivalent	CRC Chemicals USA 885 Louis Drive Warminster, PA 18974-2820 (215) 674-4300
Aeroshell 17	9150-00-223-4004		Grease, Molybdenum Disulfide	Shell Oil Co.
LPS 814	8030-00-546-8637	MIL-C-81309	Corrosion Preventative Compound	Various
ALOX 22028CM-3	8030-00-546-8637	MIL-C-81309	Corrosion Preventative Compound	Various
DC-6 or G-24	6850-00-664-4959	MIL-C-21567	Compound, Silicone, Soft Film	Various
CRC Industrial Duty Silicone	6850-01-265-3115		Silicone Lubricant Manufacturer's Part Number 03030	CRC Chemicals USA 885 Louis Drive Warminster, PA 18974-2820 (215) 674-4300
Aeroshell 17	9150-00-223-4004	MIL-PRF-23287	Grease, Aircraft and Instruments	Various
**		O-E-760	Alcohol, Denatured Ethyl	Various
Ashlandar Oil 30, Sunsolvent 2650A	9150-00-111-3199	MIL-L-21260, grade 30	Lubricating Oil, Engine	Various
**	6850-01-113-2063	MIL-I-25017	Fuel Soluble Lubricity Improver Corrosion Inhibitor	Various
**		A-A-52624	Antifreeze	Various

Table 12-1. Qualified Products List (Continued)

Manufacturer's Designation	National Stock Number (NSN)	Specification	Description	Manufacturer's Name, Address and Phone Number
**		A-A-51461	Antifreeze Tester	Various
**		MIL-B-131 Type 1 Class B	Bags, Waterproof	Various
**	6850-00-965-2330	P-C-437	Cleaning Compound	Various
**		NAS 847	Cap Plugs	Various
**		L-T-100 Type 2	Tape, Waterproof	Various
**		A-A-1266 Type 2	Tags, Warning, Red	Various
**		MIL-P-46002 Type 1	Preservative Oil, Light Viscosity	Various
**		MIL-PRF-2104	Lubricating Oil Combat/Tactical 15W-40	Various
**		MIL-L-2105	Lubricating Oil Multi-Purpose 85W-140	Various

\*\*Manufacturer's designator not available.

12-3.5.1. **Standard (Synchromesh) Drive.** Fill the transmission to its operating level with the OEM recommended oil grade conforming to Lubricating Oil, Combat/Tactical 15-40W in accordance with MIL-PRF-2104 or Lubricating Oil, Gear, Multi-Purpose 80-140W in accordance with MIL-L-2105 using the manufacturer's technical manual. Operate the transmission through all ranges to distribute corrosion resistant oil to all surfaces. Atomize spray transmission and dip stick fill tubes with Multi-Purpose Lubrication/Corrosion Inhibitor, CRC 3-36®. Seal all breather vents and tubes using Tape, Waterproof, L-T-100, Type 2. Attach a red warning tag, A-A-1266, Type 2, to the transmission operating lever indicating, "Transmission preserved with (insert applicable oil type) and month/year."

12-3.5.2. **Automatic Drive.** Fill the transmission to its operating level with a lubricant recommended by the OEM. Atomize spray transmission and dip stick fill tubes with Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®. Seal all breather vents and tubes using Tape, Waterproof, L-T-100, Type 2.

12-3.5.3. **Transmission Case.** The transmission outer case shall be sprayed with Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®. All tie rod and linkages shall be preserved with Grease, Aircraft and Instruments, MIL-PRF-23827 (refer to [table 12-1](#)).

12-3.6. **FLYWHEEL RING GEAR.** Atomize spray the flywheel ring gear with a film of Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®.

12-3.7. **DISC TYPE CLUTCH (DRY TYPE).** Clutch control mechanisms not enclosed shall be coated with Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36® after removing the cover plate. Spring-loaded type clutch mechanisms shall have the clutch pedal secured in a partially disengaged position to eliminate contact with the disc face and the pressure plate. Snap-over-center and toggle-in type clutches shall be completely disengaged.

12-3.8. **FUEL SYSTEMS.** A portable fuel preservation tank containing two compartments shall be positioned to provide gravity feed to the engine. One compartment shall contain Preservative Oil, Light Viscosity, MIL-P-46002, Type 1 (refer to [table 12-1](#)). The other compartment shall contain the designated fuel type (diesel or gas) used by the engine under preservation. The preservation tank shall contain a manual selector valve in line with the fuel source compartment allowing switching between the compartments. The fuel supply line from the engine shall be disconnected at a convenient point. Connect the fuel supply line from the portable tank to the engine. The engine shall be started and operated at a fast idle until running smoothly. Accelerate the engine (with no load) until half speed and switch to the preservation oil tank. When the preservative oil reaches the combustion chambers, evidenced by a loss of engine speed and smoking, shut the ignition to the “off” position.

12-3.9. **FUEL FILTERS.** Drain fuel filters, sediment bowls and water separators. Reconnect the fuel supply after draining.

12-3.10. **FUEL TANKS.** Drain fuel tanks completely of fuel.

**WARNING**

Refer to the Material Safety Data Sheet (MSDS) for Preservative, Oil, Light Viscosity, MIL-P-46002, Type 1. The precautions, procedures and special protection concerning the oil shall be followed.

a. Fuel tanks without baffles shall be atomize sprayed with Preservative Oil, Light Viscosity, MIL-P-46002, Type 1, using a flexible nozzle of sufficient length to assure coverage of all tank interior surfaces. Two ounces (2 oz.) of Preservative Oil, Light Viscosity, MIL-P-46002, Type 1, per gallon of interior space shall be used.

**WARNING**

Refer to the Material Safety Data Sheet (MSDS) for Lubricating Oil, Engine, MIL-L-21260, Grade 30. The precautions, procedures and special protection information concerning the oil shall be followed.

b. Fuel tanks with baffles shall be filled with oil conforming to Lubricating Oil, Engine, MIL-L-21260, Grade 30 (refer to [table 12-1](#)). The oil may remain in the tank, or can be drained into a recovery system and reused. The recovered mixture shall be discarded when contaminated with fuel greater than 10%. Attach a red warning tag, A-A-1266, Type 2, stating, “Fuel tank preserved with Lubricating Oil, Engine, MIL-L-21260, Grade 30.”

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12-3.11. **ENGINE CRANKCASE.** Fill the engine crankcase to the maximum safe operating level with oil conforming to Lubricating Oil, Engine, MIL-L-21260, Grade 30. Upon completion, affix a red warning tag, A-A-1266, Type 2, to the fill tube stating, "Crankcase filled to operating level with preservative Lubricating Oil, Engine, MIL-L-21260, Grade 30. Drain and refill prior to operating."

### **NOTE**

Allow engine cylinder temperature to cool to a maximum temperature of 100 degrees Fahrenheit (100 °F) prior to engine cylinder preservation.

### **NOTE**

The mating locations on engine parts and accessories removed shall be match-marked when necessary to facilitate re-assembly and shall be identified with a red warning tag, A-A-1266, Type 2, attached to the mating parts and locations, as required.

12-3.12. **ENGINE CYLINDER PRESERVATION.** The following procedures pertain to engine cylinder preservation:

a. Remove spark plugs, fuel injectors, glow plugs, etc. Remove only those items to allow access to engine cylinders.

b. Inject Preservative Oil, Light Viscosity, MIL-P-46002, Type 1, by atomize spray method into each engine cylinder using the amount listed below:

(1) 25 cubic inches (cu. in.) or less [409.75 cubic centimeters (cc)] - atomize spray with 1/2 ounce (0.5 oz.) of MIL-P-46002, Type 1.

(2) 25-50 cu. in. (409.75 to 819.5 cc) – atomize spray one ounce (1 oz.) per cylinder of MIL-P-46002, Type 1.

(3) 50-75 cu. in. (819.5 to 1229.25 cc) – atomize spray 1-1/2 ounces (1.5 oz.) per cylinder of MIL-P-46002, Type 1.

(4) 75 cu. in. (1229.25 cc) or larger – atomize spray two ounces (2 oz.) per cylinder of MIL-P-46002, Type 1.

### **CAUTION**

Precautions must be taken to assure hydrostatic lock-up does not occur causing severe engine damage. Spark plugs, fuel injectors, glow plugs, etc., must remain out during this procedure or engine damage may result.

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c. Slowly rotate the engine crank shaft manually (preferred method) or by using the starter motor for four revolutions to distribute the preservative oil. Lightly coat items previously removed with Preservative Oil, Light Viscosity, MIL-P-46002, Type 1 and re-assemble.

d. Tape engine breathers, vent tubes, etc., using Tape, Waterproof, L-T-100, Type 2.

e. Place a red warning tag, A-A-1266, Type 2, near the engine starter control stating, "Engine Preserved. Do Not Crank."

**12-3.13. ENGINE BLOCK.** Engine blocks shall be sprayed using Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®. Rubber or plastic engine hoses shall be sprayed using CRC Industrial Duty Silicone (refer to [table 12-1](#)).

**12-3.14. AIR INTAKE.** The air cleaner shall be removed and one ounce (1 oz.) of preservative oil conforming to Preservative Oil, Light Viscosity, MIL-P-46002, Type 1, shall be atomize sprayed into the air intake tube. The air intake shall be immediately sealed with Tape, Waterproof, L-T-100, Type 2.

**12-3.15. TURBOCHARGER/SUPERCHARGER.** Disconnect the tube between the intake manifold/charger and the air cleaner/charger. Atomize spray one ounce (1 oz.) of Preservative Oil, Light Viscosity, MIL-P-46002, Type 1, into the air intake toward the charger. Spray one ounce (1 oz.) of additional oil toward the charger from the outlet side.

**12-3.16. AIR CLEANER.**

a. Oil Bath Type. Oil bath type air cleaners shall be filled to its operating level with Lubricating Oil, Engine, MIL-L-21260, Grade 30. Metallic elements shall be dipped in Preservative Oil, Light Viscosity, MIL-P-46002, Type 1, whenever possible for complete coverage. Atomize spray all other surfaces of the air cleaner assembly using Preservative Oil, Light Viscosity, MIL-P-46002, Type 1.

b. Dry Type. Remove the dry element. Atomize spray the interior surfaces with Preservative Oil, Light Viscosity, MIL-P-46002, Type 1. Reinstall the element.

**12-3.17. AIR INTAKE SEALING.** After the air cleaner elements have been preserved and reinstalled, the air intake shall be sealed with Tape, Waterproof, L-T-100, Type 2.

**12-3.18. DRIVE BELTS.** Relieve all tension from the drive belts. Drive belts may remain in position provided the pulleys can be preserved.

**12-3.19. DRIVE PULLEYS.** Unpainted surfaces of the drive pulleys shall be sprayed with Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®.

**12-3.20. EXHAUST SYSTEM.** Atomize spray the exhaust system components with one ounce (1 oz.) of Preservative Oil, Light Viscosity, MIL-P-46002, Type 1 for each two feet (2 ft.) of pipe. The spray coat shall be applied to the outside and inside of the pipe. The system shall immediately be sealed with plastic plugs conforming to specification, NAS 847, or Tape, Waterproof, L-T-100, Type 2.

12-3.21. **BRAKE SYSTEM.** Metal surfaces, such as adjusting wedges, pins, eccentrics, cam levers, linkages, anchors, retracting springs, and surfaces of brake drums and brake rotors (both external and internal), shall have surfaces sprayed with Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®.

**CAUTION**

Mask friction-type brake linings from overspray. Damage to lining material will result.

12-3.22. **BRAKE AIR COMPRESSOR.** The brake air compressor shall be filled to operating level with 10W oil conforming to Lubricating Oil, Engine, MIL-L-21260, Grade 30. A red warning tag, A-A-1266, Type 2, indicating, "Preservation Performed. Drain Before Operating," shall be attached near the air compressor.

12-3.23. **AIR SUPPLY TANKS.** Atomize spray the interior and exterior surfaces of the air supply tanks using Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®.

12-3.24. **AIR LINE FILTERS.** Air line filters shall be drained and closed. Exhaust ports of emergency quick release and relay valves shall be sealed using Tape, Waterproof, L-T-100, Type 2.

12-3.25. **HYDRAULIC PISTONS.** Hydraulic pistons shall remain in the lowest or "relaxed" position. Spray the exposed piston surface initially with Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®. Wipe clean and apply Grease, Aircraft and Instruments, MIL-PRF-23827 to the exposed piston.

**WARNING**

Refer to the Materials Safety Data Sheet (MSDS) for CRC Industrial Duty Silicone. The precautions, procedures and special protection information concerning silicone shall be followed.

12-3.26. **HYDRAULIC HOSES AND FITTINGS.** Spray hoses and fitting components using CRC Industrial Duty Silicone.

12-3.27. **HYDRAULIC VALVES.** Hydraulic valves (spool, stack, etc.) shall be sprayed with Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®. A film of Grease, Aircraft and Instruments, MIL-PRF-23827 shall be applied over all actuating rods.

12-3.28. **GREASE FITTINGS.** All grease fittings and parts lubricated by these fittings shall be charged/filled to capacity with an OEM recommended lubricant.

12-3.29. **DIFFERENTIALS, TRANSFER CASES, AND FINAL DRIVES.** Unpainted surfaces of drive shafts, propeller shafts, and universal joints shall be coated with CRC 3-36®, LPS 814, or ALOX 22028CM-3.

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12-3.30. **UNPAINTED COMPONENTS.** Components, such as levers, latches, control linkage, locking pins, shafts, pedal linkages, couplers, and exposed hydraulic shafts, shall be coated with Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®.

12-3.31. **MASTS AND BOOMS.** Exposed, unpainted metal surfaces of masts and booms shall be coated with CRC 3-36®, LPS 814, or ALOX 22028CM-3.

12-3.32. **WINCHES AND CABLES.** Wire cable, if not galvanized, shall be completely unwound from the drum and all surfaces of the drums, sheaves, blocks, and linkages shall be coated with Grease, Aircraft and Instruments, MIL-PRF-23827.

12-3.33. **OPERATOR COMPARTMENT.** Unpainted metal surfaces of handles and levers shall be coated with Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®.

12-3.34. **INSTRUMENT PANELS.** Instrument panels, unpainted gauges, instruction plates, data plates, unpainted toggle switches, and any unpainted surfaces shall be sprayed with Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®.

12-3.35. **SEAT BELT COUPLERS.** Chrome or metal surfaces and spring-loaded interlock mechanisms shall be sprayed with Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®.

12-3.36. **WIRING HARNESS.** Spray wiring harness connector plugs with Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®.

12-3.37. **FUSE BLOCKS.** Spray a thin film of Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36® on all fuse lugs and conductor lugs that are unpainted.

12-3.38. **TIRES.** Pneumatic tires shall be inflated to the maximum pressure recommended for the tire. Spray tire sidewall surface using CRC Industrial Duty Silicone. Raise the vehicle until the tires are free to rotate and block MHE securely. If tarps do not cover the tires completely and the MHE is subject to ultraviolet light from windows or open doors, protective polyethylene bags or covers conforming to MIL-T-46755 shall be applied.

12-3.39. **FORKS.** Unpainted surfaces of the forks, fork locks, etc., shall be coated with CRC 3-36®, LPS 814, or ALOX 22028CM-3.

12-3.40. **LIFT CHAINS.** Spray lift chains with CRC 3-36®, LPS 814, or ALOX 22028CM-3.

### **WARNING**

Refer to the Material Safety Data Sheet (MSDS) for Compound, Silicone, Soft Film, DC-6 or G-24. The precautions, procedures and special protective information concerning the compound shall be followed.

12-3.41. **LIGHTS.** Preserve all light devices by removing protective lenses. Coat sockets and bulb bases using Compound, Silicone, Soft Film, DC-6 or G-24 (refer to [table 12-1](#)).

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12-3.42. **BATTERIES.** Batteries shall be removed and stored if unfilled with electrolyte. Batteries filled with electrolyte shall have the specific gravity and open circuit voltage recorded using the battery record form shown in [figure 9-2](#) for baseline purposes. Refer to the procedures in [chapter 9](#) for safety precautions when performing these measurements. A commercially available equivalent form of battery record recording may be used if authorized by the appropriate Fleet and Industrial Supply Command (FISC) Regional MHE Manager. Perform these inspections in accordance with the battery manufacturer's recommendations to ensure full coverage of the manufacturer's warranty.

a. Batteries shall be maintained as close to 100% of capacity as economical. At no time shall the batteries be allowed to discharge below 1.240 specific gravity without charging. Charge batteries, as required, whenever the battery cell voltage falls below 25% of the initial reading. Batteries shall be maintained in a charged ready state either in the forklift truck or a separate battery room location.

b. Charge batteries if the specific gravity is below 25% of the manufacturer's full charge recommendation. Ensure a constant current, constant voltage, constant current charging method [current voltage current (IEI)] is used to prevent battery overcharging. High rate shall not exceed 16-18 amps per 100 amp hour of rated capacity, constant current.

### NOTE

Use caution when servicing forklift trucks with battery box covers using cover support rods (type E/EE/EX) and safety interlocks (type EX only). Damage to battery, battery cables, and switches may occur when the battery cover is lowered without properly positioning the supports/interlocks.

c. Add distilled water only as required for battery cell replacement.

### WARNING

Refer to the Material Safety Data Sheet (MSDS) for Grease, Aircraft and Instruments, MIL-PRF-23827. The precautions, procedures and special protection information concerning the grease shall be followed.

d. Apply Grease, Aircraft and Instruments, MIL-PRF-23827 (refer to [table 12-1](#)) or a commercial equivalent to the battery terminals and connectors.

e. Battery cable connectors for electrically driven MHE shall be disconnected. Spray Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36® to the battery connector contacts.

f. Battery Compartment. Clean and preserve the battery compartment using Preservative Oil, Light Viscosity, MIL-P-46002, Type 1, or Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®.

g. Maintenance Tools. Maintenance tools supplied as part of the MHE contract shall be preserved by atomize spray application of Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®. The tools shall be sealed in a waterproof bag conforming to MIL-B-131, Type 1, Class B.

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h. Repair Parts. Apply Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36® to non-electric repair parts. Place these parts in a sealed bag conforming to MIL-B-131, Type 1, Class B (heavy duty waterproof).

i. Technical Manuals. Waterproof bags shall be used for storing instruction and operating manuals. Items to be preserved together and sealed in a waterproof bag shall have projections, sharp edges, or other features padded to protect the contents and bag with commercial bubble wrap or an equivalent non-permeable material. The waterproof bag shall be in accordance with MIL-B-131, Type 1, Class B (heavy duty waterproof).

### 12-4. STORAGE

Long term (dead) storage requires additional environmental controls to ensure MHE does not degrade during storage. These controls are identified as follows:

- a. Inside storage is required.
- b. MHE shall be kept clean and dry in an enclosed, rodent-free area. Keeping the MHE in a low moisture (less than 50% humidity), temperature controlled environment will greatly reduce degradation.
- c. Forklift trucks may be encased in “cocoon-type” storage bags, when available. However, as a minimum, MHE shall be covered by a tarp constructed of cotton, linen, or other material (used parachutes work well) that is water permeable (material that does not trap water or allow equipment to sweat). Tarps help eliminate dirt or dust buildup and ultraviolet light degradation to rubber and plastic components. Plastic sheets or waterproof tarps used to wrap MHE is prohibited. These materials can trap floor moisture and accelerate corrosion. Tarps may be applied loosely over the equipment.
- d. Maintenance Requirement Cards (MRCs) shall be used in conjunction with this publication for use in the preservation/de-preservation process. When conflicting data between this publication and the MRC exist, contact the NAVICP-M for clarification and resolution.

### 12-5. RECORDS

Each activity will maintain records documenting the identity (type, make, model, size, serial and registration numbers), location, condition, servicing, processing, and repairs performed for each piece of equipment. Each record will indicate the condition of the MHE upon arrival, upon being placed in storage, preservation performed, preservations used, condition of equipment at inspection intervals, and maintenance performed to allow for continued storage. De-preservation records shall identify the length of storage with dates, de-preservation hours, cost of material, and additional maintenance prior to issue, if any.

### 12-6. STORAGE DOCUMENTATION DATA

The following storage data shall be maintained, where applicable:

- a. The date the MHE is placed in storage.

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- b. Uncorrected deficiencies.
- c. Battery readings (does not apply to dry batteries without electrolyte).
- d. Logistics information for all maintenance, inspection, and preservation checks performed, including the dates and the names of the technicians performing the storage checks.
- e. A list of manufacturer recommended fluids and system applications.
- f. Date of preservation for MHE that is preserved for long term storage.
- g. Applicable MRC used during de-preservation.

### 12-7. LUBRICATION CARD

A laminated 8-1/2 by 11-inch card containing the manufacturer recommended lubricants and fill locations may be included with each MHE placed into long term storage.

### 12-8. PERIODIC INSPECTION AND EXERCISING

Each MHE, as a minimum, will be visually inspected annually. Due to storage conditions in some remote locations, inspection monitoring may be increased (reduced in time) as required. If deterioration is evident, the equipment shall be corrected and preserved to the extent necessary to preclude further deterioration. Batteries filled with electrolyte shall be on permanent float charge or charged a minimum of once every 30 days. Dry charged batteries shall be kept clean and dry. The storing activity will inspect and perform corrosion protection as required. Any additional maintenance and repairs requires authorization by NAVICP-M.

12-8.1. ANNUAL INSPECTION. The following are the annual inspection requirements, where applicable:

- a. Visually inspect MHE for damage or evidence of corrosion.
- b. Clean and apply corrosion preventive compounds removed during inspection. Particular attention should be made to the brake rotors and drums, hydraulic pistons, chains, cables, rubber parts, and any other components not covered with organic coatings (paint).
- c. Inspect for any fluid leaks.
- d. Test coolant system for corrosion/temperature protection.
- e. Visually inspect all fluid levels.
- f. Top off fluid levels, as required.
- g. Inspect all fluid, fuel, hydraulic, and air tanks for evidence of corrosion. Preserve as required.

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- h. Maintain inspection records and components that require representation.

12-8.2. BIENNIAL (24 MONTH) INSPECTION. The following are the biannual inspection requirements, where applicable:

- a. Perform annual operational, inspection, maintenance, and preservation checks in accordance with [paragraph 12-8.1](#).
- b. Lubricate grease fittings.
- c. Inspect wiring harness for corrosion, abrasion, loose connections, or other defects. Clean and preserve as required.

### WARNING

Refer to the Material Safety Data Sheet (MSDS) for Alcohol, Denatured Ethyl, O-E-760. The precautions, procedures and special protection information concerning the cleaning solvent shall be followed.

- d. Inspect contactors (electrically powered forklift trucks only) for corrosion. Clean, as required, using Alcohol, Denatured Ethyl, O-E-760 (refer to [table 12-1](#)) or a commercial contact cleaner equivalent.

### NOTE

Do not use emery or sand paper to clean contact tips of contactors.

- e. Inspect fuse blocks, fuses and connectors for corrosion. Clean and apply Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36® as required.
- f. Sample lubricants and fluids. Change as required.

### NOTE

MHE that uses DOT 5 Silicone Brake Fluid, MIL-B-46176, or other types of lubricating oil (MIL-L-2104 or MIL-L-2105) are exempt from the biannual brake bleeding requirement.

- g. Bleed brake system using a power or vacuum-type bleeder unit at the lowest point on the equipment. This is applicable to equipment that uses DOT 3 or DOT 4 (VV-B-680) brake fluid types.
- h. Perform engine cylinder preservation in accordance with [paragraph 12-3.12](#).
- i. Electrically powered forklift trucks shall have the motors rotated to distribute the lubricant.
- j. Spray electrical connector plugs with Multi-Purpose Lubrication/Corrosion Inhibitor CRC 3-36®.

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**APPENDIX A**  
**REFERENCE DOCUMENTS**

**A-1. GENERAL**

This appendix contains all the documents referenced in this publication, as well as publications which may provide further information regarding Materials Handling Equipment (MHE).

**A-2. NAVAL INVENTORY CONTROL POINT**

The publications and instructions in this paragraph are available from the Defense Distribution Depot Susquehanna Pennsylvania, Building 05, 5450 Carlisle Pike, Mechanicsburg, PA 17055-0789. Publications must be ordered in accordance with NAVSUP Publication 600, "Naval Logistics Library User Guide."

**A-2.1. DEPARTMENT OF DEFENSE (DOD) REGULATIONS.**

**A-2.1.1. Regulations.**

4145.19R-1 – Storage and Materials Handling

**A-2.1.2. Instructions.**

6055.1 – DOD Occupational Safety and Health Program

**A-2.2. SECRETARY OF THE NAVY (SECNAV) INSTRUCTIONS.**

4355.18 – Reporting of Supply Discrepancies

4440.31 – Management of Civil Engineering Support Equipment and Materials Handling Equipment

**A-2.3. OFFICE OF THE CHIEF OF NAVAL OPERATION (OPNAV) INSTRUCTIONS (OPNAVINST).**

4460.1 – Management of Materials Handling Equipment (MHE) in the Navy

4790.2 – Naval Aviation Maintenance Program (NAMP)

4790.4 – Ship's Maintenance Material Management (3-M) Manual

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5100.19 – Navy Occupational Safety and Health (NAVOSH) Program, Manual for Forces Afloat

5100.23 – Navy Occupational Safety and Health (NAVOSH) Program for Shore Activities

8020.14 – Department of the Navy Explosives Safety Policy Manual

### A-2.4. BUREAU OF MEDICINE AND SURGERY (BUMED).

#### A-2.4.1. NAVMED Publications.

P-117 – Manual of the Medical Department for the U.S. Navy

### A-2.5. NAVAL FACILITIES ENGINEERING COMMAND (NAVFACENGCOM) PUBLICATIONS.

P-307 – Management of Weight Handling Equipment; Maintenance and Certification

### A-2.6. NAVAL INVENTORY CONTROL POINT (NAVICP) INSTRUCTIONS (NAVICPINST).

10490.4 – Materials Handling Equipment (MHE); Administration and Control of

### A-2.7. NAVAL MATERIALS COMMAND (NAVMAT).

P-5100 – Safety Precautions for Shore Activities

### A-2.8. NAVAL SEA SYSTEMS COMMAND (NAVSEASYSKOM).

#### A-2.8.1. NAVSEA Instructions (NAVSEAINST).

8020.9 – Non-Nuclear Ordnance and Explosives Handling Qualification and Certification  
Program

8023.11 – Standard Operating Procedures (SOPs) for the Processing of Expendable Ordnance  
at Navy and Marine Corps Activities

#### A-2.8.2. NAVSEA Ordnance Pamphlets (OP).

4 – Ammunition and Explosives Safety Afloat

5 Volume 1 – Ammunition and Explosives Safety Ashore; Safety Regulations for Handling,  
Storing, Production, Renovation and Shipping

2173 – Approved Handling Equipment for Weapons and Explosives (2 volumes)

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### A-2.8.3. NAVSEA Technical Manuals.

SG420-AP-MMA-010 – Periodic Testing Arrangements for Ordnance Handling Equipment  
SW023-AH-WHM-010 – Handling Ammunition and Explosives With Industrial Materials Handling Equipment (MHE)

### A-2.9. NAVAL SUPPLY SYSTEMS COMMAND (NAVSUPSYSCOM).

#### A-2.9.1. NAVSUP Instructions (NAVSUPINST).

4440.179 – Report of Discrepancy (ROD) Manual; Exchange of Non-Excess Personal Property of the Navy

4610.33 – Reporting of Transportation Discrepancies in Shipment

10490.33 – Materials Handling Equipment (MHE); Administration and Control of (formerly SPCCINST's 10490.2 and 10490.3)

#### A-2.9.2. NAVSUP Publications (NAVSUP PUB).

117 – Naval War Reserve Material Requirements

284 – Storage and Materials Handling

572 – Joint Service Manual (JSM) for Storage and Materials Handling

573 – Storage and Handling of Hazardous Materials

600 – Naval Logistics Library User Guide

601 – Naval Supply System Command Fleet and Industrial Supply Center Operations Guide

723 – Navy Inventory Integrity Procedures

724 – Conventional Ordnance Management; Policies and Procedures

### A-2.10. NAVY MILITARY STANDARDS (MIL-STD).

2073 – Preservation, Military

## A-3. STANDARDIZATION DOCUMENT ORDER DESK

The following military specifications and other standardization documents are available from the Standardization Document Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

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### A-3.1. MILITARY SPECIFICATIONS.

A-A-1266 – Tag, Warning

A-A-52624 – Antifreeze

CRC 3-36® - Inhibitor, Multi-Purpose Lubrication/Corrosion

DC-6 – Silicone, Soft Film

DOD-C-24529 – Chargers, Battery, Lift Truck and Pallet Transporter Battery Service

G-24 – Silicone, Soft Film

L-T-100 – Tape, Waterproof

MIL-B-131 - Bag, Sealing

MIL-B-46176 – Fluid, Silicone Brake

MIL-I-25017 – Inhibitor, Fuel Soluble Lubricity Improver Corrosion

MIL-L-2105 – Lubrication Oil, Gear, Multi-Purpose, 75W, 80W-90, 85W-140

MIL-L-21260 – Lubrication Oil, Engine

MIL-P-46002 – Preservation Oil, Light Viscosity

MIL-PRF-2104 – Lubricating Oil, Combat/Tactical, 15-40W

MIL-PRF-23827 – Grease, Aircraft and Instrument, Gear and Actuator Screw  
(formerly MIL-G-23827)

MIL-T-46755 – Bags/Covers, Polyethylene, Protective

O-E-760 – Alcohol, Denatured Ethyl

P-C-437 – Compound Cleaning

VV-B-680 - Fluid, Brake

### A-3.2. FEDERAL STANDARDS (FED-STD).

595 – Colors Used in Government Procurement

**A-4. MARINE CORPS ORDERS (MCO)**

Requests for Marine Corps publications should be directed to CMC (HQSP-2), Washington, DC 20380, and should be submitted in accordance with the current edition of MCO P5600.31. Additionally, an index of Marine Corps publications is available at <http://www.usmc.mil/directiv.nsf/>.

3571.2 – Explosive Ordnance Disposal (EOD) Program

P8020.11 – Department of the Navy Explosives Safety Policy Manual

**A-5. NAVY ORDNANCE SAFETY AND SECURITY ACTIVITY (NOSSA)**

**A-5.1. MATERIALS HANDLING EQUIPMENT (MHE) TRAINING VIDEOS.**

The following Materials Handling Equipment (MHE) training videos can be obtained (borrowed) from Commander, Naval Ordnance Safety and Security Activity (NOSSA), Code N7123, Farragut Hall, Building D323, 23 Strauss Avenue, Indian Head, MD 20640-5555; Telephone (301) 744-1903 or DSN 354-1903.

Forklift Safety (Ammunition Pier Waterfront Safety) #3 (15 minutes)

Supervisor Awareness (Explosives Loading Supervisor) #23 (18 minutes)

Color of Danger #53 (16 minutes)

**A-6. SUPERINTENDENT OF DOCUMENTS**

The following publications are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 or visit their web site at <http://www.dot.gov/>.

CODE OF FEDERAL REGULATIONS (CFR).

29 CFR 1910 – Occupational Safety and Health Standards

**A-7. AMERICAN GAS ASSOCIATION (AGA)**

The following documents can be obtained from the American Gas Association Laboratories, 8501 East Pleasant Valley Road, Cleveland, OH 44131.

**A-7.1. AGA LABORATORIES.**

Requirement No. 1-85 – Natural Gas Vehicle (NGV) Conversion Kits

Requirement No. 2-90 – Natural Gas Vehicle (NGV) Fueling Appliances

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### A-7.2. AGA STANDARDS.

ANSI/AGA NGV1 – Compressed Natural Gas Vehicle (NGV) Fueling Connection Devices

ANSI/AGA NGV2 – Basic Requirements for Compressed Natural Gas Vehicle (NGV) Fuel Containers

### A-8. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

The following standards can be obtained from American National Standards Institute, 1430 Broadway, New York, NY 10018.

Z9.2 – Fundamentals Governing the Design and Operation of Local Exhaust Systems

Z9.3 – Safety Code for Design, Construction and Ventilation of Spray Finishing Operations

Z41 – Personnel Protection – Protective Footwear

Z87.1 – Practice for Occupational and Educational Eye and Face Protection

Z88.1 – Practices for Respiratory Protection

Z89.1 – Personnel Protection – Protective

Z358.1 – American National Standard for Emergency Eyewash and Shower Equipment

### A-9. AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

The following standards can be obtained from the American Society of Mechanical Engineers, United Engineering Center Building, 345 East 47<sup>th</sup> Street, New York, NY 10017.

B56.1 – Fork Lift and High Lift Trucks

B56.2 – Powered Industrial Trucks, Type Designations, Areas of Use, Maintenance and Operation

B56.3 – Electric-Battery-Powered Industrial Trucks, Standard for Safety (covers types E, EE and EX).

B56.4 – Internal Combustion Engine-Powered Industrial Trucks, Standard for Safety (covers types G, GS, D and DS)

B56.5 – Guided Internal Vehicles, Standard for Safety

B56.6 – Rough Terrain Forklift Trucks, Standard for Safety

B56.9 – Operator Controlled Industrial Tow Tractors, Standard for Safety

**A-10. COMPRESSED GAS ASSOCIATION (CGA)**

The following standards can be obtained from the Compressed Gas Association, Inc., 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102.

CGA C-6 – Standards for Visual Inspection of Steel Compressed Gas Cylinders

CGA C-6.1 – Standards for Visual Inspection of High Pressure Aluminum Compressed Gas Cylinders

CGA C-6.2 – Guidelines for Visual Inspection and Re-qualification of Fiber Reinforced High Pressure Cylinders

**A-11. NATIONAL FIRE PROTECTION AGENCY (NFPA)**

The following documents can be obtained from the National Fire Protection Agency, Batterymarch Park, Quincy, MA 02269.

10 – Portable Extinguishers

30 – Flammable and Combustible Liquids Code

33 – Spray Finishing

45 – Fire Protection for Laboratories Using Chemicals

52 – Compressed Natural Gas (CNG) Vehicular Fuel Systems

58 – Standard for the Storage and Handling of Liquefied Petroleum Gases

70 – National Electrical Code

80 – Fire Doors and Windows

91 – Standard for the Installation of Blower and Exhaust Systems for Dust, Stock, and Vapor Removal or Conveying

101 – Life Safety Code

325 – Fire Hazard Properties of Flammable Liquids, Gases and Volatile Solids

430 – Code for the Storage of Liquid and Solid Oxidizers

505 – Fire Safety Standard for Powered Industrial Trucks, Including Type Designations, Areas of Use, Maintenance and Operation

**A-12. NATIONAL PROPANE GAS ASSOCIATION (NPGA)**

The following bulletins can be obtained from the National Propane Gas Association, 1600 Eisenhower Lane, Suite 100, Lisle, IL 60532.

C602 – Safe Use of LP-Gas in Industrial Trucks

C611 – Recommended Safe Filling Procedures for Forklift Fuel Cylinders (Containers)

0055 – Refueling LP-Gas Powered Vehicles Safety

**A-13. UNDERWRITERS' LABORATORY (UL)**

The following standards are available from Underwriters' Laboratories, 333 Pfingsten Road, Northbrook, IL 60062.

558 – Industrial Trucks, Internal Combustion Engine Powered

583 – Electric-Battery Powered Industrial Trucks

**A-14. SERVICE LIFE EXTENSION PROGRAM (SLEP) TECHNICAL MEMORANDUM**

The following technical memorandum is available from Director, Naval Surface Warfare Center, Indian Head Division Detachment Earle, Naval PHST Center (Code 71), 201 Hwy 34 South, Colts Neck, NJ 07722-5023.

PHST-35-00 – MHE Service Life Extension Program (SLEP); Processing Guide