

**MANAGEMENT OF
MATERIALS HANDLING EQUIPMENT (MHE)
AND SHIPBOARD MOBILE SUPPORT EQUIPMENT (SMSE)**



DISTRIBUTION STATEMENT A

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**THIS PUBLICATION SUPERSEDES NAVSUP PUBLICATION 538 THIRD REVISION
DATED 15 AUGUST 2006**

PUBLISHED BY DIRECTION OF COMMANDER, NAVAL SUPPLY SYSTEMS COMMAND

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NAVSUP PUBLICATION 538 FOURTH REVISION

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LIST OF EFFECTIVE PAGES

The total number of pages in this manual is 386. They are all original revision four pages, with the new changes identified by change bars along the margin. The date of issue for all pages in this manual is 15 August 2008.

FOREWORD

1. This publication documents the management, maintenance, and safe use of industrial Materials Handling Equipment (MHE) and their approved attachments, and Shipboard Mobile Support Equipment (SMSE) 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 8341, P.O. Box 2020, Mechanicsburg, PA 17055-0788.
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SAFETY SUMMARY

This publication contains instructions and regulations necessary for the safe usage of Materials Handling Equipment (MHE) and Shipboard Mobile Support Equipment (SMSE) 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 5-10.)

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 5-13.)

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 5-16.)

WARNING

Type DS and DY 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 5-27.)

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 5-29.)

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 8-26.)

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 9-5.)

WARNING

For units afloat, the Mk 18 Mod 1 Handling Beam, figure 9-3, is approved to 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. (Page 9-5.)

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 9-8.)

WARNING

Do not use the Mk 18 Mod 1 Handling Beam with batteries without lift tabs or those that do not allow full contact with the lift hook throat. (Page 9-8.)

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, 9-11, 9-28, and 9-30.)

WARNING

An explosion can result from the hydrogen gas produced from battery charging. (Page 9-11.)

WARNING

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

WARNING

Verify the battery charger is in the OFF position before connecting or disconnecting batteries. (Page 9-19.)

WARNING

Fluctuating dial readings, readings that are full scale, smoke or violent gassing may indicate a shorted battery cell or incorrect connection. Turn the charger immediately to the OFF position and recheck the connections and settings. (Page 9-19.)

WARNING

Do not attempt to charge a battery with loose, damaged or corroded terminals. (Page 9-24.)

WARNING

Do not add acid to an aging cell in an attempt to increase its capacity. Decreased service life will result. (Page 9-29.)

WARNING

Never use electrolyte with a specific gravity higher than 1.400. (Page 9-30.)

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, 12-10.)

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 11-3, 12-10.)

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, 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, 12-6.)

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 11-4.)

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, 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-PRF-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

The use salt water to clean MHE/SMSE is strictly prohibited. (Page 5-2.)

CAUTION

Side loading the mobile cargo crane may cause structural damage to the boom, causing it to collapse. (Page 5-8.)

CAUTION

Mast and fork restraint devices must be removed prior to operating components to prevent damage to the MHE. (Page 8-15.)

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 9-5.)

CAUTION

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

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 9-12.)

CAUTION

Do not continuously exceed a battery beyond 80 percent discharge. Its service life will be greatly diminished. (Page 9-12.)

CAUTION

Automatic battery filler has an adjustable nozzle that allows a precise shut off capability for watering batteries and must be properly adjusted when received to avoid overfilling. (Page 9-13.)

CAUTION

Do not use these procedures for gel or absorbed glass mat type batteries. (Page 9-14.)

CAUTION

Do not disconnect the battery by pulling on the cable. (Page 9-15.)

CAUTION

Do not use the plastic coolant tester tube when sampling battery electrolyte, which may damage the instrument. (Page 9-18.)

CAUTION

Do not overfill cells with distilled water because levels will rise during charging spilling the electrolyte. For battery cells with low levels, use the battery filler syringe only and not the automatic (2 quart) battery filler for filling to prevent overfilling prior to charging. (Page 9-18.)

CAUTION

Operational requirements may dictate temperatures exceeding 90 °F during charging. Do not allow battery temperatures to exceed 115 °F during charging, which will reduce its service life. Allow as much “cooling off” time as operationally possible before and after battery charging. (Page 9-19.)

CAUTION

Ensure the battery vent/fill caps are in place before using acid neutralizing solution to prevent damage to the cells. (Page 9-22.)

CAUTION

Do not overfill battery cells with distilled water because the levels will rise during charging spilling the electrolyte. (Page 9-24.)

CAUTION

Do not place a battery on a charger when the cell temperature is 90 °F or greater. Allow the battery to cool. (Page 9-24.)

CAUTION

Do not short meter probes across the battery connector terminals to prevent damage to the meter. (Page 9-27.)

CAUTION

Use only distilled or de-mineralized water for filling lead-acid batteries. (Page 9-28.)

CAUTION

Do not add distilled or de-mineralized water until visual inspection shows that top of separators/plates are visible. (Page 9-28.)

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 9-28.)

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 9-28.)

CAUTION

Sulfuric acid should never be added to a cell without first ensuring that charging will not restore specific gravity to normal values. (Page 9-29.)

CAUTION

Never make a specific gravity adjustment on a cell which does not gas freely on charge. (Page 9-29.)

CAUTION

Ensure all cells are gassing prior to starting any gravity adjustment. (Page 9-30.)

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 9-31.)

CAUTION

Prior to cleaning a battery, ensure all vent plugs are in place. (Page 9-31.)

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 9-32.)

CAUTION

Batteries and acids should be stored or stowed away from sewer and storm drains and from sources of heat. (Page 9-32.)

CAUTION

Leaking or cracked batteries and cells must be provided with adequate containment during storage and transportation. ([Page 9-32.](#))

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 12-7.](#))

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) and, as appropriate, Shipboard Mobile Support Equipment (SMSE). Also, this publication identifies and describes the approved types of MHE (and their associated forklift truck attachments) and SMSE. 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 and SMSE without regard to employer. Refer to [paragraph 4-3.4a](#) for regulations involving contractor and non-Government personnel employed under a Navy command. The provisions of this publication apply to Navy-owned MHE and SMSE 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, Third Revision, dated 15 August 2006.

1-4. ORGANIZATION OF PUBLICATION

This publication is divided into 13 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](#) 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). [Chapter 12](#) describes long term procedures, commonly called “dead storage,” for MHE storage of greater than 24 months (2 years). Finally, [chapter 13](#) is solely dedicated for the life cycle management of SMSE by identifying and describing the approved types of SMSE, documenting training, qualification and operator licensing requirements, prescribing related safety precautions, and detailing the basic preventive maintenance practices and periodic requirements.

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 or SMSE. Applicable documents shall be maintained as a collection of current information pertaining to all aspects of MHE or SMSE operations 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. DECK SCRUBBER OPERATOR'S TRAINING COURSE

Appendix F provides the training course meeting the minimum requirements that U.S. Navy shipboard personnel must successfully meet prior to operating the deck scrubber (Model No. SRS1550-DN-A)

1-11. 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.

1-11.1. **A-4 CONDITION.** The condition of previously used material that is repaired, reconditioned, overhauled and remanufactured to function and look like new, and issue to all customers without limitations or restrictions. MHE that have major overhaul performed on all systems with corrosion control performed on all assemblies circuits and systems. An A-4 unit will be capable of performing its original intended service life.

1-11.2. **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.

1-11.3. **COMMANDING OFFICER/OFFICER-IN-CHARGE (CO/OIC).** For the purpose of this publication, the CO/OIC is defined as the title of the senior officer or responsible authority (e.g., resident director, senior contracting official) at activities ashore or the senior officer aboard ship who has the full responsibility for the operation and maintenance of the ship.

1-11.4. **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.

1-11.5. **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.

1-11.6. **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.

1-11.7. **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,

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surveillance, adjusting, and lubrication of equipment in order to minimize breakdown and keep the equipment in optimum operating condition.

1-11.8. **REPAIR.** As used in this publication, denotes the procedure or method used to return MHE to operational condition after failure.

1-11.9. **SERVICE LIFE EXTENSION PROGRAM (SLEP).** Managed by NAVSUP/NAVICP-M, the Navy's major, scheduled overhaul/remanufacture program that effectively extends the life of MHE and returns it back to its original service life (in like-new A-4 condition).

1-12. 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 8341, 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.

1-13. OBTAINING COPIES OF THIS PUBLICATION

1-13.1. **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 or using the Naval Logistics Library (NLL) website at www.nll.navsup.navy.mil (password required). Activities may reproduce additional hard copies of this publication for their own use.

1-13.2. **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 E4, 201 Highway 34, Colts Neck, NJ 07722-5023. Activities may replicate additional CD-ROM's of this publication for their own use.

1-14. DISTRIBUTION OF PUBLICATION

Correspondence involving distribution quantities, address changes, etc., should be forwarded to Commander, [Naval Inventory Control Point \(NAVICP\)](#), 5450 Carlisle Pike, Code 8341, P.O. Box 2020, Mechanicsburg, PA 17055-0788.

1-15. 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.

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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 4460.1A](#), 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) and Shipboard Mobile Support Equipment (SMSE). 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/SMSE. 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). The next revision to these instructions will also contain program responsibilities for SMSE, but are documented here in advance.

2-2.1. PROGRAM MANAGER. The MHE/SMSE program manager, NAVICP-M (Code 8341), 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 use 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 use of Navy MHE/SMSE.
- f. Administer public laws and regulations relating to the acquisition, use and disposal of MHE/SMSE.
- g. Review and approve life expectancy and repair limit criteria for MHE/SMSE.
- h. Oversee the review of MHE/SMSE specifications in connection with the Department of Defense (DOD) Standardization Program. Approve all new MHE/SMSE specifications and significant revisions to existing MHE/SMSE specifications for the Navy.

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- i. Approve standards for training of MHE/SMSE 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/SMSE 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/SMSE 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/SMSE management capabilities to all Navy users 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). For SMSE, plan for the scheduled 18- and 36-month servicing.
- q. Oversee the AEA function and fund, task and monitor the MHE/SMSE 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 MANAGER. The MHE/SMSE life cycle manager, NAVICP-M (Code 8341), will:

- a. Serve as AEA for the Navy's MHE/SMSE program.
- b. Perform all inventory control functions for MHE/SMSE assigned to Navy activities, afloat and ashore, to include Fleet Inventory Control Points (FICP's) and WRM.
- 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/SMSE assigned to ships, assist in determining Navy-wide MHE/SMSE requirements in support of existing programs, previously established allowances, approved allowance changes, new allowances and new programs.

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- 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 use of MHE/SMSE.
- f. Develop and defend MHE/SMSE 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/SMSE 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/SMSE 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/SMSE for the Navy in accordance with current regulations.
- p. Provide recommended revisions to MHE/SMSE cost accounting and cost reporting procedures for coordination with the Comptroller of the Navy (NAVCOMPT).

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q. As required, review submissions by activities of other commands (including Navy ships) for procurement of powered MHE, non-powered shipboard pallet trucks, SMSE 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), SMSE and 6140 (MHE batteries only) applicable to Navy programs.

s. Chair provisioning conferences and effect provisioning for Navy MHE/SMSE 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/SMSE 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/SMSE 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/SMSE and industrial storage batteries for electric powered MHE.

2-2.3. IN-SERVICE ENGINEERING AGENT (ISEA). 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/SMSE ISEA. The ISEA will:

a. Maintain the MHE/SMSE ILSP and other maintenance plans, procedures and standards to ensure MHE/SMSE 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/SMSE 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/SMSE 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/SMSE.
- 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/SMSE training programs for Navy 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/SMSE 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/SMSE 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/SMSE procurement contract, and provide recommendations for corrective action to manufacturers and Fleet users.

2-2.4. NAVAIR/NAVSEA/NAVFAC SYSTEMS COMMAND. 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/SMSE 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/SMSE requirements.

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

Table 2-1. FISC Regional Areas

FISC	Regional Areas
Jacksonville	Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Cuba, Bahamas and Central America
Norfolk	Connecticut, Delaware, Illinois, Indiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia, Wisconsin, Italy, Spain, United Kingdom, Greece, Iceland, Bahrain and Egypt
Pearl Harbor	Hawaii
Puget Sound	Alaska, Colorado, Idaho, Iowa, Kansas, Missouri, Montana, Nebraska, North Dakota, Oregon, South Dakota, Utah, Washington and Wyoming
San Diego	Arizona, California, Nevada
Yokosuka	Japan, Guam, Korea, Diego Garcia and Singapore

a. Assist in securing contracts and 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. Assist in securing contracts for maintenance and repair as required or requested by various regional MHE holders.

d. Secure leasing contracts for MHE users for commercially available equipment, as required.

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- 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/SMSE pool inventories to service shipboard requirements and maintain MHE pool inventories to service 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. Make available either a maintenance training or 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/SMSE.
- k. For base closures, if requested, the FISC Regional 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 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 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 717 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. The major claimant will:

a. Advise NAVICP-M and the respective FISC Regional Manager of any changes in mission or other functional, operational or unique conditions that may affect MHE requirements for the respective activities.

b. Recommend approval or disapproval of an activity's Allowance Change Request (ACR), as described in [paragraphs 2-3.2](#) and [2-3.3](#), prior to forwarding to NAVICP-M.

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

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

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

2-2.7. TYPE COMMANDER (TYCOM). The TYCOM'S will:

a. Designate a TYCOM MHE Manager who is familiar with Fleet MHE/SMSE matters to interface with the Fleet and NAVICP-M, and to accomplish the following:

(1) Provide representation with the NAVSUP MHE team that includes the NAVICP-M MHE Program Manager, FICP managers, MHE ISEA, TYCOM MHE Managers, and other personnel designated by the NAVICP-M MHE Program Manager.

(2) Establish policy, guidance, and oversight, as required, to ensure the Fleet is in compliance with the requirements of this publication.

b. Advise NAVICP-M and the respective FISC Regional Manager of any changes in mission that may effect requirements for the respective ships. For decommissioning of ships, which includes ships transferred to MSC, a 90-day prior notification is required.

c. Recommend approval or disapproval of a ship's ACR, as described in [paragraphs 2-3.2](#) and [2-3.3](#), prior to forwarding to NAVICP-M via the Hardware Systems Command (HSC) located at COMNAVSEASYS COM (SEA-05).

d. Budget and fund new mission or initial allowance requirements. As applicable, fund the ships for maintenance and repairs of MHE/SMSE.

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- e. Ensure respective activities are aware of the MHE SLEP process when considering replacements.
- f. Advise NAVICP-M and the appropriate FISC Regional Manager of major ship overhaul schedules to facilitate SLEP/replacement of MHE/SMSE on board, if warranted.
- g. Collect and submit user utilization, maintenance and repair data to the respective FISC Regional Manager on a quarterly basis, if users are not on-line with EMACS.
- h. Advise the appropriate FISC Regional Manager on any MHE/SMSE user equipment transfers (cross-decking).
- i. Maintain an up-to-date inventory for MHE/SMSE on all ships so that age, model, issue dates, etc., can be maintained in a readily available format. Use EMACS to establish databases and track ship reporting.
- j. Coordinate with FISC Regional Managers on recommendations for new allowances or unit replacement requirements, and to determine SLEP candidate induction dates. Submit annual requirements to NAVICP-M.
- k. Provide ships guidance on MHE/SMSE maintenance, repairs and periodic (18-month) servicing/testing.

2-2.8. NAVY USERS. All Navy MHE/SMSE users, ashore or afloat, will:

2-2.8.1. Ashore.

- a. Be responsible for ensuring the completion of preventive maintenance and organizational and intermediate levels of repair on all assigned MHE. Failure to perform and document required Planned 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 inventory using either EMACS or hard copy procedures. 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.
- c. Work with FISC Regional Managers to recommend new allowance or unit replacement requirements, and to determine SLEP candidate induction dates.
- d. Request guidance on MHE maintenance, repairs and periodic 18-month servicing/testing from the FISC Regional Manager.
- e. Execute equipment transfers, leases or disposals through regional direction.

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f. NAVICP-M will initiate an annual data call to determine projected funding 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.

g. Maintain an equipment history file as described in [paragraph 8-3](#).

2-2.8.2. Afloat.

a. Recommend appointing, in writing, a shipboard MHE/SMSE Manager that will interface with the TYCOM MHE/SMSE Manager for all MHE matters.

b. Be responsible for ensuring the completion of preventive maintenance and organizational and intermediate levels of repair on all assigned MHE/SMSE documented in [OPNAVINST 4790.4 \(series\)](#). Failure to perform and document required PMS efforts/repairs could result in financial assessments for replacement MHE/SMSE to those commands that would normally receive free issue. All users will be held financially responsible for cannibalized or missing components.

c. Request guidance on MHE/SMSE maintenance, repairs and periodic 18-month servicing/testing from the TYCOM MHE Manager.

d. Maintain an up-to-date MHE inventory using either EMACS or hard copy procedures. 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.

e. Maintain an equipment history file as described in [paragraph 8-3](#).

2-3. MHE ASSIGNMENT

2-3.1. GENERAL CRITERIA. As appropriate, MHE/SMSE will be assigned only to those units ashore and afloat which have approved inventory allowances. Equipment 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 or SMSE needed to carry out the stated mission will be assigned to units ashore and afloat, as appropriate. The equipment 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/SMSE and maintains the established authorized allowable quantities ashore and afloat. All requests for units 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 equipment will be required. For shipboard MHE/SMSE, 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 8341), P.O. Box 2020, Mechanicsburg, PA 17055-0788. The activity's Commanding Officer/

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Officer-in-Charge (CO/OIC) will certify that the equipment 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 8341) via the respective user's major claimant or TYCOM and the HSC at NAVSEA (SEA-05), 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/SMSE. 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.
- 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 AND SMSE.

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 equipment within the FISC region will be handled by the respective FISC Regional 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

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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 equipment 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 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 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.

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.

ALLOWANCE CHANGE REQUEST
NAVSUP 1220-2 (09-03) S/N: 0108-LF-128-5600

Instructions on Reverse

Please type or print

1. FROM:		2. Date:						
		3. Serial Number:						
		4. APL/AEL/RIC/Instruction Number Affected:						
		5. Status of Requested/Allowed Item						
TO:		<input type="checkbox"/> Item Addition or		<input type="checkbox"/> Item on Board or				
		<input type="checkbox"/> Item Deletion		<input type="checkbox"/> Item Not on Board				
6. National Stock Number (NSN) or FSCM & Part Number		7. Equipment/Component (E/C) or Item Nomenclature		8. Unit of Issue	9. Unit Price	10. Present Qty. Allowed	11. New Total Qty.	12. Extended Value of Change
13. Justification (Mandatory)								
14. Submitter Information: Name of Submitter: _____ DSN Phone Number: _____ Commercial Phone Number: _____ Email Address: _____ Submitter's Signature: _____				15. Approving Official Information: Name of Approving Official: _____ DSN Phone Number: _____ Commercial Phone Number: _____ Email Address: _____ Approving Official's Signature: _____				
16. First Endorsement: Name of Endorser: _____ Activity of Endorser: _____ DSN Phone Number: _____ Commercial Phone Number: _____ Email Address: _____ Endorser's Signature: _____				<input type="checkbox"/> Approval Recommended. Conditions, if applicable: _____ _____ <input type="checkbox"/> Disapproved. Reason for disapproval: _____ _____ _____				
17. Copy to:								

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: Current date.
- Block 3. SERIAL NUMBER: The Serial Number shall include the ship type/hull number of the ship or Unit Identification Code of the activity and a sequential number.
- Block 4. APL/AEL/RIC/INSTRUCTION NUMBER AFFECTED: Enter the affected Allowance Parts List (APL), Allowance Equipage List (AEL), Repairable Item Code (RIC), or Instruction Number in this block.
- Block 5. STATUS OF REQUESTED/ALLOWED ITEM: Place an "x" in the appropriate box(es) to show the status of the requested/allowed item(s).
- Block 6. NATIONAL STOCK NUMBER (NSN) OR 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 7. EQUIPMENT/COMPONENT (E/C) OR ITEM NOMENCLATURE: Enter nomenclature for each stock number or part number listed in Block 6. 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 4, 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 13 or separate page.)
- Block 8. 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 U/I Data. If the U/I is unknown, leave this blank.
- Block 9. UNIT PRICE: Enter the unit price for each item listed.
- Block 10. PRESENT QUANTITY ALLOWED: Enter present quantity allowed (authorized). Cite source and date of allowance document in Block 13.
- Block 11. NEW TOTAL QUANTITY: Enter the total of the present quantity allowed and the additional quantity requested.
- Block 12. EXTENDED VALUE OF CHANGE: New total quantity less present quantity allowed times Unit Price. (Not required for decreases.)
- Block 13. JUSTIFICATION: Indicate authority for present quantity allowed (Block 10) and reason for requesting change. Completion of this block is mandatory.
- Block 14. SUBMITTER INFORMATION: Provide submitter's name, DSN and Commercial Telephone Number, email address and signature.
- Block 15. APPROVING OFFICIAL INFORMATION: Provide approving official's name, DSN and Commercial Telephone Number, email address and signature. Sign in same manner as other official correspondence.
- Block 16. FIRST ENDORSEMENT: Provide endorser's name, activity, DSN and Commercial Telephone Number, email address and signature. Sign in same manner as other official correspondence. Identify approval or disapproval and provide comments as necessary. Type Commander's endorsement should include applicability to other ships and such other information which will assist in further consideration of the request.
- Block 17. COPY TO: Enter abbreviated titles and codes. Addresses are not necessary unless they are not available in the SNDL.

NAVSUP 1220-2 (09-03)
S/N 0108-LF-128-5600

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

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 Manager or direct vendor delivery.

2-4. NEW OR SLEP EQUIPMENT

Upon receipt of new MHE/SMSE 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 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/SMSE as described in [paragraph 8-4](#).

2-5. REPLACEMENT UNITS

Funding for replacement MHE/SMSE 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. Users will submit a written request to the FISC Regional 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 Manager, users will provide additional information as stated below, where applicable. Replacement SMSE units will be centrally managed and coordinated through NAVICP-M

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.

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

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

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DOD PROPERTY RECORD											Form Approved OMB No. 0704-0246 Expires Feb 28, 2006					
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 the Department of Defense, Executive Services and Communications Directorate (0704-0246). 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.																
PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE ABOVE ORGANIZATION. RETURN COMPLETED FORM TO THE CONTRACT ADMINISTRATION OFFICE																
1.	a. ACTIVE	b. INITIAL	c. IDLE	d. CHANGE	2. JULIAN DATE			3. I.D./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 - 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?													42. Must item be repaired/rebuilt/overhauled to perform all functions?			
31. Has item been rebuilt/overhauled? If so, when? Date													\$			
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.			
40. Is item severable without damage to components? If not, give their replacement cost.													\$			
41. Is item in operable condition?													51. Indicate date item will be available for redistribution.			
													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, JUN 2003

PREVIOUS EDITION IS OBSOLETE.

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.	
SECTION V - NUMERICALLY CONTROLLED MACHINE DATA							
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	
		(1) RS-273		(2) RS-274		(1) WORD ADD	
		(3) RS-326		(3) FIXED SEQ		(2) TAB SEQ	
				(4) CL DATA		(1) RS-244aa	
						(2) RS-358	
						(1) INCH	
						(2) METRIC	
						(3) BINARY	
						(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		(1) SEQUENTIAL 2	
				NO		(2) RANDOM	
77. ROTABLE TABLE DATA		a. INDEXING	b. NO. OF STOPS	c. POSITIONING, NC	d. NO. OF POSITIONS	e. CONTOURING, NC	f. FEED RANGE: RPM
		(1) MANUAL		(1) YES		(1) YES	
		(2) NC		(2) NO		(2) NO	
78. NO. OF READERS		79. READER TYPE		80. READER SPEED		81. INTERPOLATION	
		a. MECH	b. PHOTO			a. PARABOLIC	b. LINEAR
		c. OTHER (List)				c. CIRCULAR	d. NONE
						a. YES	b. NO
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		88. MIN. PROGRAMMABLE INCREMENT				89. MOTOR DRIVE	
a. ANALOG	b. NONE					a. STEPPING	b. DC
c. DIGITAL						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), JUN 2003

FIGURE 2-1. 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 Manager may loan units, if available, from the respective OPN MHE/SMSE pool at cost or can recommend commercial lease (for MHE only), 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 equipment 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 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 MANAGER LEASING GUIDELINES. The following leasing guidelines apply to each FISC Regional Manager:

a. The regional manager will maintain a small MHE/SMSE pool to assist customers and/or 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/SMSE separate from any of the FISC's own equipment 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 or SMSE while in their custody and may include a FISC administrative surcharge. No pro-rated equipment 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 equipment allowances 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. MODIFICATIONS OR ALTERATIONS

MHE or SMSE may only be modified or altered using the means outlined in this paragraph. Equipment shall not be modified or altered in any other way without obtaining written approval from the Program Manager at NAVICP-M (Code 8341). A copy of the proposed modification or alteration shall be forwarded to the [Naval PHST Center](#) (Code E4). Ships desiring to modify or alter an item to increase its use 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/SMSE 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/SMSE is not authorized, except for under the following conditions:

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

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

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

All MHE and SMSE is identified by a unique 7-digit USN registration number assigned by NAVICP-M and is not to be duplicated throughout the Navy inventory. For MHE units, the USN registration number is painted on each side of the mast and the body of the equipment where applicable. For SMSE units, the USN registration number is painted on each side of the equipment. The number usually starts with 11, 12, 13, 14, 15, 16, 18, 19 or 01 depending on the type of equipment. When equipment 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, tow tractor, deck scrubber, 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/SMSE 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 or SMSE.
- 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 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/SMSE Program Office is responsible for replacement budgeting of equipment for OPN funded activities. The Program Manager initiates the acquisition process for the procurement of equipment 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. For SMSE, periodic maintenance (18- and 36-month) requirements are essentially funded by NAVICP-M.

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/SMSE 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 equipment allowances will be submitted to NAVICP-M, via the 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 requested initial requirements.

b. Repair, Overhaul and Preventive Maintenance. Budgeting and funding requests for repair, overhaul, and preventive maintenance of MHE should be submitted to the user's major claimant in accordance with established local procedures. For SMSE, the 18- and 36-month periodic maintenance requirements are essentially programmed through NAVICP-M. All other funding requirements shall be budgeted through the major claimant. Included with submissions should be funding for acquisition of the onboard repair parts required to maintain MHE/SMSE 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/SMSE

All requests for the disposition of excess and disposal of MHE/SMSE, afloat or ashore, will be submitted to the local FISC Regional Manager on a "Report of Excess Personal Property" (Standard Form 120), [figure 2-2](#), or using the EMACS Program. Units afloat shall coordinate such efforts with their respective TYCOM. The FISC Regional 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 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		REPORT OF EXCESS PERSONAL PROPERTY		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 (Name and Address of Agency to which report is made) THRU				6. APPROPR. OR FUND TO BE REIMBURSED (If any)			
7. FROM (Name and Address of Reporting Agency)				8. REPORT APPROVED BY (Name and Title)			
9. FOR FURTHER INFORMATION CONTACT (Title, Address and Telephone No.)				10. AGENCY APPROVAL (If applicable)			
11. SEND PURCHASE ORDERS OR DISPOSAL INSTRUCTIONS TO (Title, Address and Telephone No.)				12. GSA CONTROL NO.			
13. FSC GROUP NO.	14. LOCATION OF PROPERTY (If location is to be abandoned, give date)			15. REIM.REQD YES NO <input type="checkbox"/> <input type="checkbox"/>		16. AGENCY CONTROL NO.	
						17. SURPLUS RELEASE DATE //	
EXCESS PROPERTY LIST						ACQUISITION COST	FAIR VALUE
ITEM NO. (a)	DESCRIPTION (b)	COND (c)	UNIT (d)	NUMBER OF UNITS (e)	PER UNIT (f)	TOTAL (g)	% (h)

STANDARD FORM 120 REV.
 APRIL 1957 EDITION
 (CDC Adobe Acrobat 4.0 Electronic Version, 1/2001)

(Use Standard Form 120A for Continuation Sheets)
 NSN 7540-00-634-4074

PREVIOUS EDITION USABLE

FIGURE 2-2. 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 (MHE only).
- 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/SMSE approved for disposal will have the USN registration number removed prior to turn in to preclude re-instatement in the Navy's inventory. No cannibalization of equipment shall be performed prior to turn-in to the FISC Regional Manager. Users will be responsible for funding any missing parts. The respective FISC Regional 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.

3-1.3. NON-DESIGNATIONS. The following MHE do not have an assigned NFPA or Naval designation.

3-1.3.1. Mobile Cargo Cranes. Mobile, diesel-powered cargo cranes used ashore and afloat having safeguards to exhaust, fuel and electrical systems.

3-1.3.2. Aerial Work Platforms. Boom-lift platforms and scissor-lift platforms are shipboard or shore based aerial work platforms containing safeguards to personnel safety.

3-1.3.3. Diesel Conveyor Belt Vehicles. Portable, diesel-powered conveyor belt vehicles used ashore with safeguards to exhaust, fuel and electrical systems.

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. Shipboard forklift trucks are procured by NAVICP-M using Commercial Item Descriptions (CID's) or Purchase Descriptions (PD's) that contain additional/unique safety requirements such as all-wheel braking, additional stability tests, and shipboard shock qualifications. Shipboard forklift trucks are procured by NAVICP-M using Commercial Item Descriptions (CID's) or Purchase Descriptions (PD's), which are identified in [paragraph A-2.6.2](#). Table 3-1 identifies the minimum requirements necessary to qualify forklift trucks as shipboard approved.

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. Also, diesel-powered DY forklifts are equipped with static grounding straps or electrically conductive wheels and tires to discharge any build-up of static electricity.

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](#) through [3-4](#) provide examples of standard forklift trucks.

Table 3-1. Minimum Requirements for MHE Shipboard Approval

* All-Wheel Brakes
* Hi-Shock, Grade A (only mission critical equipment shall be shock tested)
* Electromagnetic Interference (EMI)
* Safety Rating (e.g., UL or FM)
* Saline Atmosphere
* Rated Capacity to Full Lift Height, unless otherwise specified
* Increased Stability (that exceeds ASME B56.1 requirements)
* Free Lift Height
* Slope Ascension
* Under-Clearance
* Reliability
* Weight Scales
* Lowering Speed of Forks
* Parking Brakes, Service Brakes and Deadman Controls
* Maintainability
* Sling and Tie-Down Provisions
* Power/Fuel Consumption
* Rain
* Speed Control (3 rd gear locked out)
* User Test
* Technical Manual Review
* Non-Directional, Lug-Type Tread Tires
* Blackout Lighting
* Horn/Hourmeter
* Markings and Identification Plates
* Color (FED-STD-595, No. 13538, Yellow Color)
The details of each item listed above can be found in the appropriate A-A Specification, Purchase description (PD) or Critical Item Development Specification (CIDS) listed in NAVSUP Publication 538.



FIGURE 3-1. Type EX Forklift Truck



FIGURE 3-2. Low Profile Shipboard Diesel Forklift Truck



FIGURE 3-3. Standard Profile Shipboard Diesel Forklift Truck



FIGURE 3-4. 20K 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 3-5](#) illustrates a reaching and tiering forklift truck.



FIGURE 3-5. 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 3-6](#) illustrates a sideloader.



FIGURE 3-6. 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 or rigid frame-type vehicles with pneumatic tires. Rough terrains may be either vertical masts, as shown in [figure 3-7](#), variable reach linkage-type, as shown in [figure 3-8](#), or variable reach boom-type, as shown in [figure 3-9](#).

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 3-10](#) 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 3-7. Rough Terrain Forklift Truck (Vertical Mast)



FIGURE 3-8. Rough Terrain Forklift Truck (Boom-Type)



FIGURE 3-9. Rough Terrain Forklift Truck (Variable Reach Boom-Type)



FIGURE 3-10. Front/Sideload (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 E4) or [Naval Inventory Control Point Mechanicsburg \(NAVICP-M\)](#) (Code 8341). [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. FORK EXTENSIONS. Fork extensions mount directly on the forks and provide additional lengths to the forks to permit the handling of oversized/wider loads with greater load centers. However, the SWL of the forklift is reduced with the use of these fork extensions. Refer to [table 5-1](#) for specific SWL's at non-standard load centers. The [Mk 12 Mod 0 Fork Extensions](#) are approved on forks that are 2 inches thick by 6 inches wide and are less than 40 inches in length. [Figure 3-11](#) illustrates the [Mk 12 Mod 0 Fork Extensions](#) installed on the forks. Activities may locally procure fork extensions to accommodate other fork sizes intended to handle non-ordnance provided they comply with ASME B56.1 requirements.

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 3-12](#) 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 3-13](#) 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 3-14](#) illustrates a typical electric-powered ride-type pallet truck.

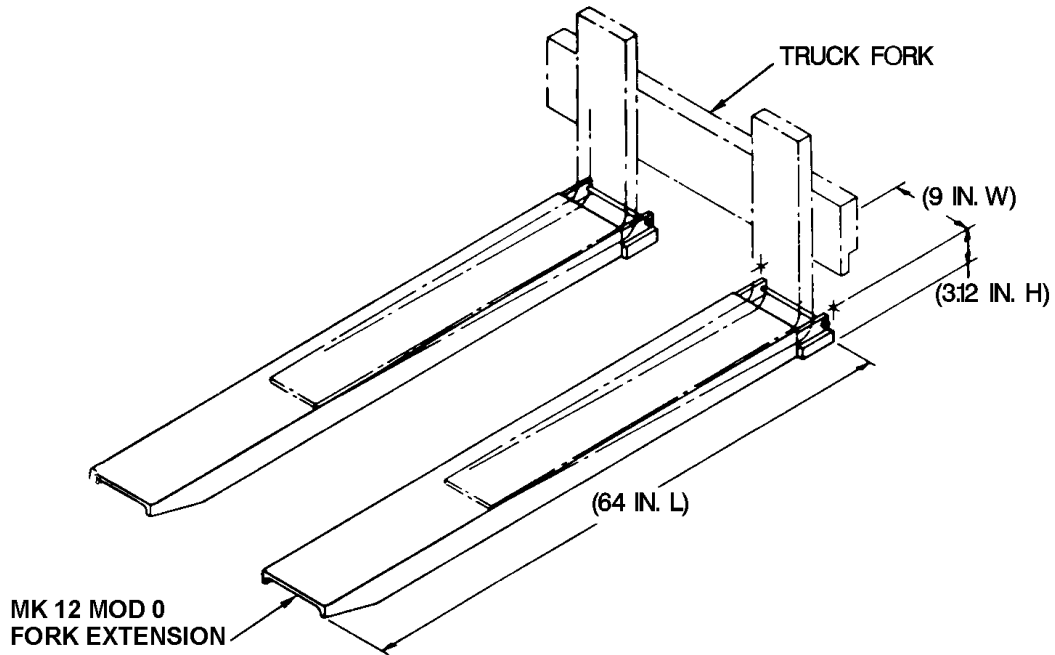


FIGURE 3-11. Mk 12 Mod 0 Fork Extensions

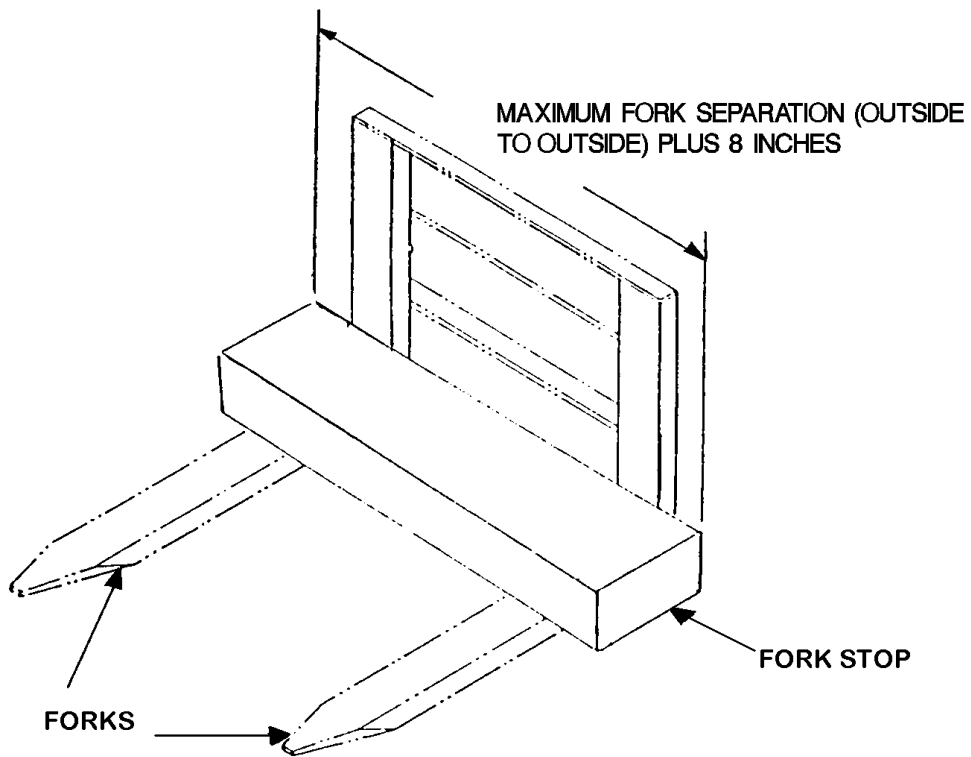


FIGURE 3-12. Fork Stop



FIGURE 3-13. Straddle Carrier



FIGURE 3-14. 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 3-15](#) illustrates a typical electric-powered walkie-type pallet truck.



FIGURE 3-15. 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 3-16](#) 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 3-17](#) and [3-18](#) illustrate a rider-type and walkie-type platform truck, respectively.



FIGURE 3-16. Manual Pallet Truck



FIGURE 3-17. Rider-Type Platform Truck



FIGURE 3-18. Walkie-Type Platform Truck

3-7. TOW TRACTORS

Tow tractors are used for towing trailer loads. They are self-propelled vehicles with front wheel steering and rear wheel drive having one- to four-wheel braking systems. A minimum two-wheel braking system is required for handling ammunition and explosives. 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 3-19](#) provides an example of a gas-powered tow tractor.

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 3-20](#) and [3-21](#) provide typical examples of common ISO container lift trucks.



FIGURE 3-19. Tow Tractor



FIGURE 3-20. ISO Container Handler Lift Truck



FIGURE 3-21. ISO Container Reach Stacker Lift Truck

3-9. MOBILE CARGO CRANES

Cargo cranes are mobile, diesel-powered supported by a welded steel frame, with front and rear wheel steering used afloat or ashore. They are equipped with outriggers on all corners and are of the telescoping type. The diesel engine is mounted below the deck at the rear of the crane and provides motorized power through a three speed automatic transmission. The superstructure is capable of rotating 360 degrees and a planetary swing drive with multi-wet disc brakes. The telescoping boom is 13 to 30 feet long, full power, chain and cable synchronized assembly, and is trapezoidal in design. A low profile boom head allows lifting of maximum loads with just two parts of line. A low profile style anti-two block system minimizes the head room required to work in congested areas. They are intended to hoist or lower general supplies. Additionally, the Grove mobile cargo crane (Model No. YB4410) has also been approved for handling the Rolling Airframe Missile (RAM), NATO Sea Sparrow Missile or palletized loads of Close-In Weapon System (CIWS) into the ship's sponson. Refer to [NAVSEA OP 4](#) (afloat) or [NAVSEA OP 5](#) (ashore) for regulations and safety precautions involving the handling of ammunition and explosives with these cranes. [Figure 3-22](#) provides an example of a Grove mobile cargo crane (Model No. YB4410 and YB4411).



FIGURE 3-22. Grove Crane (YB4410 & YB4411)

3-10. AERIAL WORK PLATFORMS

The two types of aerial work platforms that provide reach capability to elevate personnel and offer a platform to perform scheduled maintenance operations are the boom-lift platform and the scissor-lift platform.

3-10.1. BOOM-LIFT PLATFORM. The boom-lift platform is a telescopic boom lift used for applications requiring reach capability. The platform's turntable may be rotated 360 degrees in either direction. The boom can be raised or lowered from vertical to below horizontal positions, and can be extended while the work platform remains horizontal and stable. From the working platform, the operator can maneuver the truck forward and backward, and can steer it in any direction even while the boom is extended. [Figure 3-23](#) and [3-24](#) show examples of an articulating boom-lift truck and a telescopic boom-lift truck, respectively.



FIGURE 3-23. Articulating Boom-Lift Truck



FIGURE 3-24. Telescopic Boom-Lift Truck

3-10.2. SCISSOR-LIFT PLATFORM. The scissor-lift platform consists of a maintenance platform that is used where less reach and height are required. It is designed to provide a larger platform working area and generally accommodates heavier loads than the boom-lift platform. The scissor-lift may be maneuvered in a manner similar to the boom-lift truck, but the work platform can only be raised vertically. [Figure 3-25](#) illustrates a typical scissor-lift platform.



FIGURE 3-25. Scissor-Lift (Raised Position)

3-11. DIESEL CONVEYOR BELT VEHICLES

The diesel conveyor belt vehicle is used by shore activities for general supply loading and unloading of ships. By means of hydraulic cylinders, the conveyor belt can be height-adjusted at the front and rear. This allows compensation of the height difference between the loading bay door or the aircraft and the loading platform of the transportation vehicle. The conveyor system is equipped with cargo guide (side) railings and a series of rollers running the entire length of loading table extension (45 feet, 7 inches long x 28 inches wide) that can accommodate loads up to 330 pounds or a distributed load of 33.5 pounds per square foot at a conveyor belt speed of 0 m/sec to 0.6 m/sec. An adjustable loading table (5 feet, 2 inches in length) is attached to the forward end of the conveyor belt system for initial load placement onto the vehicle. The hydraulic system drives the conveying belt by means of a hydraulic motor and additionally provides driver support regarding the steering and braking systems. [Figure 3-26](#) provides an example of a Mulag (Model No. MDF12) diesel conveyor belt vehicle.



FIGURE 3-26. Diesel Conveyor Belt Vehicle

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 lift codes, safe working loads (SWL's), type designations (e.g., EE, DS, etc.), 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.** Every three years, all MHE operators shall comply with the medical surveillance/certification requirements listed in Program 710 (Forklift Operator) of the latest edition of NEHC-TM OM 6260, published by the Navy Environmental Health Center. All medical examinations shall be performed by a licensed medical examiner. Each MHE operator must hold a current Medical Examiner's Certificate ([OPNAV Form 8020/2](#)). This certificate shall either be on file or in the operator's possession, and it shall be documented on their license as noted in [paragraph 4-4.1c](#).

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4-3.2. **AGE.** The Fair Labor Standard Act (FLSA), the Occupational Safety and Health Administration (OSHA), and the Office of Personnel Management (OPM) require civilians to be 18 years of age or older to operate MHE. The minimum induction age requirement applies to military personnel to operate MHE.

4-3.3. **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, the following apply:

a. Except for mobile cargo cranes, aerial work platforms or diesel conveyor belt vehicles, a comprehensive MHE operator training course is contained in appendix B.

b. For mobile cargo cranes, the operator qualification and licensing requirements described in NSTM S9086-T4-STM-010/CH-589 (afloat) or NAVFAC P-307 (ashore) shall be followed.

c. For aerial work platform or diesel conveyor belt vehicle initial operator training, a locally derived qualification program, using the safety and operational manuals provided by the original manufacturer and complying to the requirements established by ANSI/SIA A92.5 or ANSI/SIA A92.6 (as appropriate), shall be used as the training course that U.S. Navy personnel must successfully complete prior to be qualified and certified. For units afloat, this qualification program must be approved by the MHE TYCOM Manager prior to implementation. Supervisors may signify completion of the applicable sections either by written or oral examination, or by observation of normal work performance. The examination or checkout need not cover every item, however, a sufficient number of areas should be covered to demonstrate the examinee's knowledge and ability to safely use and operate the equipment. A copy of the training certificate shall be documented in the operator's personal file.

4-3.4. **ADMINISTRATIVE OPERATOR TRAINING CONTROLS.** The following administrative operator training control requirements must be followed:

a. The Commanding Officer (CO) or Officer-in-Charge (OIC) shall ensure that the applicable training requirements are employed to train MHE operators, regardless of personnel employer. Contractor and non-Government personnel employed by or performing work at Naval facilities must either be:

(1) Trained, licensed and possess a valid medical examiner's certificate under the regulations of this publication, or

(2) Trained, licensed and possess a valid medical examiner's certificate by their employer or by an outside agency. A letter from their employer or outside agency is required prior to any MHE handling operations stating that the operator has been trained on the specific type(s) of MHE, is certified (licensed) as an MHE operator, and possesses a valid medical surveillance/examiner's certificate that complies with OSHA standards. The location of the medical record shall also be indicated in this letter. The operator must have a valid MHE operator's license in their possession at all times. Under circumstances when the operator has been involved in any accident using government owned MHE, the

company shall be responsible for any damages or loss of property incurred, subsequent refresher training, and any medical surveillance/examinations and license renewals.

b. The CO/OIC shall verify that positive administrative controls are in place that will keep MHE operators informed of changes to this publication and other related documentation that could affect the safety of MHE operations.

4-3.5. 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 operate different MHE classes and lift codes, SWL's, type designations (e.g., EE, DS, etc.) or different working conditions are encountered.
- f. A condition in the workplace changes in a manner that could affect safe operation of the MHE.

4-3.6. 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. For mobile cargo cranes, the qualification and licensing requirements described in NSTM S9086-T4-STM-010/CH-589 (afloat) or NAVFAC P-307 (ashore) shall be followed. For aerial work platforms and diesel conveyor belt vehicles ashore, the training and licensing requirements documented in NAVFAC P-300, which requires Form OF 346, "U.S. Government Motor Vehicle Operator's Identification Card", shall apply.

NOTE

The U.S. Navy has assigned “AWP” in [table 4-1](#) to document on the “MHE Operator’s License”, [figure 4-1](#), for operators who have successfully completed training on shipboard aerial work platforms.

4-4.1. **MHE OPERATOR’S LICENSE.** The “MHE Operator’s License,” [figure 4-1](#), 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. All restrictions imposed (e.g., corrective lenses required, daytime operations only, requires hearing aids, etc.).
- b. “YES” marked in the “General Supply Authorized” field. The “Explosives Authorized” field shall be left blank.
- c. The Medical Certificate, [OPNAV Form 8020/2](#), is either “ON FILE” or “ON PERSON.”
- d. The month and year appears on the “DATE ISSUED” and “DATE EXPIRES” fields.
- e. 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.

NOTE

The U.S. Navy has assigned “AWP” in [table 4-1](#) to document on the “MHE Operator’s License”, [figure 4-1](#), for operators who have successfully completed training on shipboard aerial work platforms.

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.

NOTE

A field on the MHE Operator's License, [figure 4-1](#), is provided entitled, "Other Local Requirements", which may be used to annotate additional licensing requirements beyond the scope of this publication, but may be required by local directives/instructions such as annotating a person's valid state driver's license number.

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](#), or in each operator's training certificate, 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. **REVOCAION.** The license or training certificate 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 a workspace trainer (WST)/instructor. Training shall be accomplished by accessing the following Continuous Navy Learning

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(CNL) courses under the [Navy Knowledge Online \(NKO\) website](#): the required CNL Instructional Delivery Continuum Apprentice (CNL-IDC-AP-1) course and the optional Journeyman (CNL-IDC-JIT-000R and CNL-IDC-JIT-0010) courses. The CO/OIC may accept other equivalent training provided it's documented in the instructor's training record.

b. Possession of the appropriate MHE operator's 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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MHE OPERATOR'S LICENSE				Physical Restrictions (<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		LICENSED TO OPERATE	
General Supply Authorized				YES	<input type="checkbox"/>	Class/ Lift Code
Explosives Authorized				YES	<input type="checkbox"/>	SWL
Issuing Authority's Signature						Type Designations
Operator's Signature						
Medical Certificate:						
On File		<input type="checkbox"/>	On Person		<input type="checkbox"/>	

FIGURE 4-1. 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 or Internal Combustion, Sit Down Rider Tractor (Solid and Pneumatic Tires)
7	1	Rough Terrain Forklift Truck (Pneumatic Tires)
AWP		Shipboard Aerial Work Platforms

NOTE

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

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 [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:

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

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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.

CAUTION

The use salt water to clean MHE/SMSE is strictly prohibited.

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, aqueous film forming foam (AFFF), or other water sources.

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

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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.

l. All mobile cargo crane operational and staging procedures referenced in Naval Ships' Technical Manual (NSTM) S9086-T4-STM-010/CH-589 (afloat) or NAVFAC P-307 (ashore) shall be strictly adhered to.

m. All mobile cargo crane operations shall cease under local policy instructions and the immediate supervisor notified when adverse conditions resulting from the climate (rain, snow, ice, lightning, electrical storms, etc.), wind speed limitations, inadequate support, congestion or obstructions, improper rigging or handling, equipment failure or any other situation which the operator feels could result in loss of control or otherwise render the operator or operation unsafe. At sea, lifts shall only be conducted when the ship is in sea stage 4 or less condition.

n. Always lock out equipment power when removing or installing wire rope assemblies.

o. Use supports and clamps to prevent uncontrolled movement of wire rope, parts and equipment.

p. When replacing fixed length cable assemblies (e.g., pendants) having permanently attached end fittings, use only pre-assembled lengths of wire rope. Do not build lengths from individual components.

q. Replace an entire wire rope assembly. Do not attempt to rework damaged wire rope or wire rope ends.

r. On systems equipped with two or more wire rope assemblies or chains operating as a matched set, they shall be replaced as an entire set.

s. Leaf chains are manufactured from specially heat-treated steels. If heating a chain is absolutely necessary for removal, the entire chain shall be discarded.

t. Do not paint or coat wire rope or chains with any substance except approved lubricants.

u. Do not operate the starter on any diesel engine vehicle for more than 8 seconds at a time. Wait at least one minute before operating the starter again to avoid the risk of thermal damage as well as danger due to overheating, fire or explosion.

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.

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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.

i. For mobile cargo cranes, always lock out the equipment power when removing or installing wire rope assemblies.

j. For mobile cargo crane operations, to determine the required crew at each crane location, refer to NSTM S9086-T4-STM-010/CH-589 (afloat) or NAVFAC P-307 (ashore). Operation of the crane is prohibited without the presence of a qualified signalman. No load shall be moved without an approved signal from the signalman, except in the event that the crane operator detects an unsafe condition or receives an emergency stop signal from any source.

k. For mobile cargo crane operations, no loads shall be lowered, lifted or suspended directly above the tagline handlers or any other personnel. Personnel are prohibited from riding the hoist block, hook, load, or ascend or descend the crane when it is rotating.

l. If the mobile cargo crane operator is required to go aloft in order to perform inspections, a safety harness with safety lines shall be worn as specified in the ship's procedure for man-aloft.

m. Ensure all personnel in the elevated work platform are wearing fall protection devices and other related safety equipment as required at all times.

n. Personnel are only permitted to stand underneath the lifted diesel conveyor belt vehicle if the conveyor belt supports are in their upright and locked position and the rear cylinder is in its bottom position or locked.

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. Fork lengths shall be at least 2/3 of the load for proper engagement. For example, a minimum fork length of 32 inches is required to engage a 48-inch 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 [table 5-1](#) 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.
- 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. Shipping containers equipped with new interlocking features are authorized to be secured together in accordance with the appropriate fleet issue unit load (FIUL) drawing, as shown in [figure 5-1](#), without the need for additional steel strapping (banding) and seals.
- 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.

Table 5-1. Examples of Non-Standard Load Centers

TYPICAL NON-STANDARD LOAD CENTERS		
Truck Safe Working Load (Pounds)	Load Center (inches)	Maximum Weight (pounds)
4,000	24 (rated)	4,000
	30	3,200
	36	2,667
	42	2,286
	48	2,000
4,500	24 (rated)	4,500
	30	3,600
	36	3,000
	42	2,571
	48	2,250
6,000	24 (rated)	6,000
	30	4,800
	36*	4,000
	42*	3,429
	48*	3,000
8,000	24 (rated)	8,000
	30	6,400
	36*	5,333
	42*	4,571
	48*	4,000
10,000	24 (rated)	10,000
	30	8,000
	36	6,667
	42	5,714
	48	5,000
15,000	24 (rated)	15,000
	30	12,000
	36	10,000
	42	8,571
	48	7,500
20,000	24 (rated)	20,000
	30	16,000
	36	13,333
	42	11,429
	48	10,000

*Install the Mk 12 Mod 0 Fork Extensions to achieve the 36-inch, 42-inch and 48-inch non-standard load center.

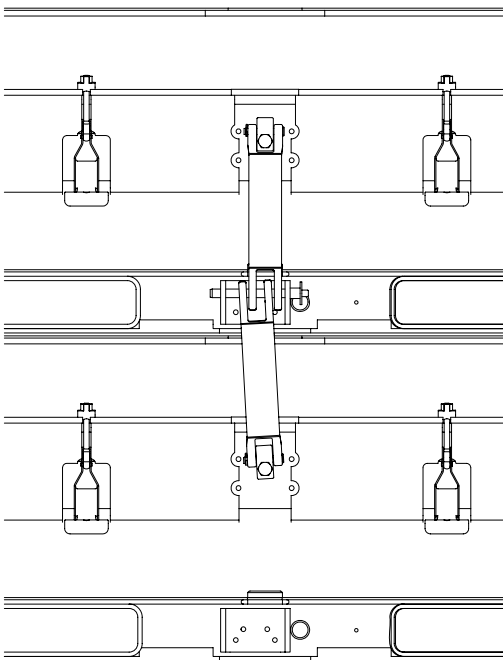


FIGURE 5-1. Close-Up of Container Interlocking Feature

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.

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(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.

n. The use of removable boom extensions on mobile cargo cranes is prohibited.

o. When positioning the boom on the mobile cargo crane, the hook shall be plumbed directly over the estimated center of gravity (cg) of the load before attaching the rigging gear. Loads shall be hoisted just high enough to clear any obstructions.

p. Do not use hooks which are not safety hooks or are not moused, except when using a tripping line rigged for lowering or hoisting boats only.

q. Do not use the limit switch or stop as an operating control to limit the travel of the load block, boom or crane.

CAUTION

Side loading the mobile cargo crane may cause structural damage to the boom, causing it to collapse.

r. Never side load the mobile cargo crane. Examples of side loading include:

(1) Rotating or traveling the crane with the load swaying from side-to-side ([figure 5-2](#)).

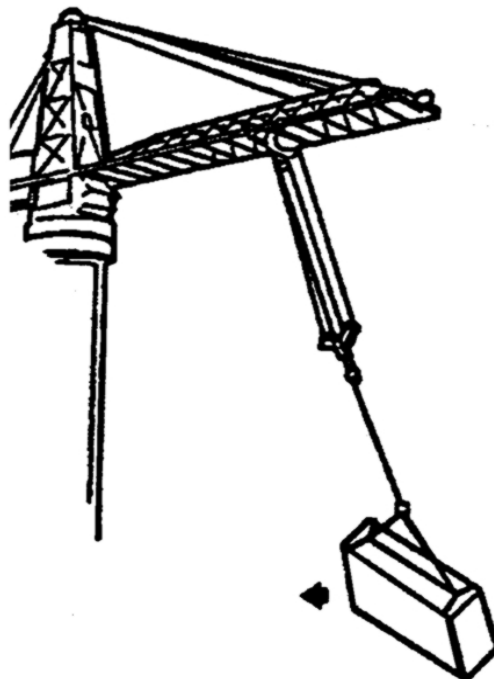


FIGURE 5-2. Never Side Load the Crane

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(2) Hoisting or topping a load that is at rest where the hook has not been plumbed directly under the upper block.

(3) Attempting to rotate or travel the crane with the hook attached to a load at rest (dragging the load).

s. No passengers may ride on or in the diesel conveyor belt vehicle nor stand within the swiveling range of the vehicle. No persons are permitted to stand on the conveyor belt when the unit does not include a guardrail.

t. Do not remain in the driver's area on diesel conveyor belt vehicles during loading and unloading operations as packages may fall from the conveyor belt.

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.

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- 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 5-3](#).

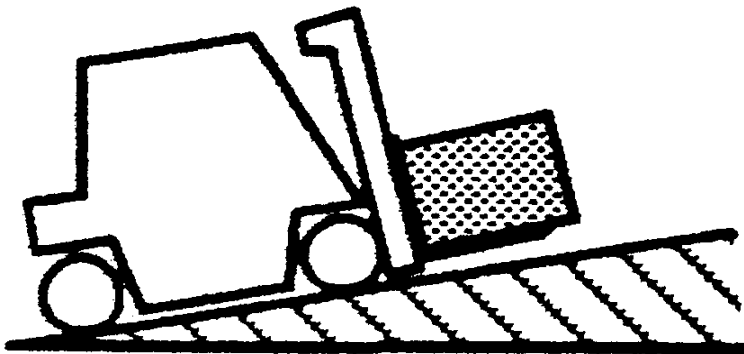


FIGURE 5-3. Traveling Up or Down Steep Grades with Loaded Forklift Truck

(2) When operating an unloaded forklift truck on a grade in excess of 5% (3 degrees), keep the counterweight up grade as shown in [figure 5-4](#).

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.

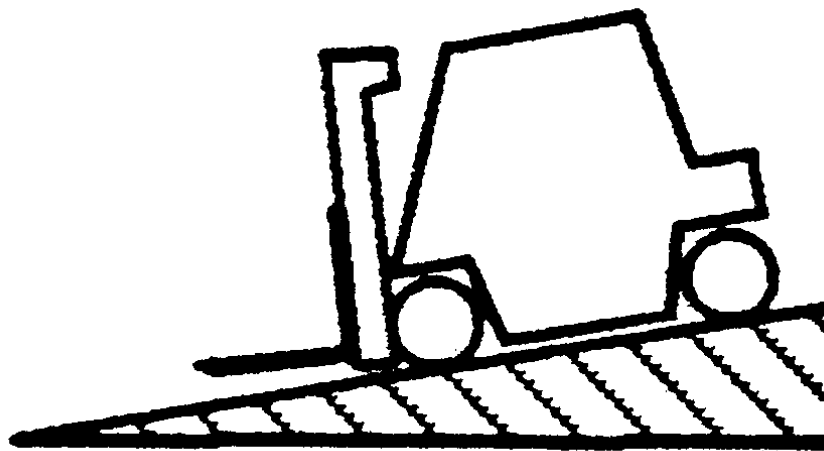


FIGURE 5-4. Operating Unloaded Forklift Truck on Steep Grades

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.

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- 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 tow tractor, never exceed its rated towing capacity. The maximum number of trailers permitted in a trailer train shall be documented in local Standard Operating Procedures (SOP's).
- cc. All tow tractor operators must comply with the following regulations:
 - (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 fork lengths are at least $\frac{2}{3}$ of the load being lifted for proper engagement. For example, a minimum fork length of 32 inches is required to engage a 48-inch load.
 - (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.

gg. For mobile cargo cranes, always use supports and clamps to prevent uncontrolled movement of wire rope, parts and equipment.

hh. Traveling the mobile cargo crane with a load on the hook is prohibited.

ii. The mobile cargo crane operator will follow the direction signals of the signalman and maneuver the load into position as directed. The operator must maintain direct visual contact with the signalman at all times and shall immediately secure the operation if contact is lost.

jj. Always use sufficient taglines to prevent possible load swing on cranes.

kk. To avoid the risk of tipping or overturning, do not attempt to drive when the diesel conveyor belt vehicle is lifted up (shunting allowed).

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.

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. If removed to meet operational commitments, the overhead guards shall be stenciled with the USN registration number assigned to the MHE. The user is responsible for maintaining and storing them. Contact the TYCOM MHE manager to determine whether ashore storage is available.

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. If removed to meet operational commitments, the load backrest extensions shall be stenciled with the USN registration number assigned to the MHE. The user is responsible for maintaining and storing them. Contact the TYCOM MHE manager to determine whether ashore storage is available.

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. **LIMIT SAFETY SWITCHES.** Limit safety switches have been installed by the manufacturer on mobile cargo cranes to limit the movement of the boom and the hoist. These switches may not be disabled and they shall be properly maintained in accordance with the manufacturer's instructions.

5-4.9. **EMERGENCY STOP SWITCHES.** The aerial work platforms and the diesel conveyor belt vehicle have been equipped by the manufacturer with emergency stop switches located at the upper and lower operating positions to completely disable the equipment. These switches may not be disabled and they shall be properly maintained in accordance with the manufacturer's instructions.

5-4.10. **SAFETY GUARDRAILS.** ANSI/SIA A92.5 and ANSI /SIA A92.6 require the use of safety guardrails on any boom-support aerial work platform or any self-propelled aerial work platform, respectively, for personnel safety protection. For this reason, the manufacturer has equipped safety guardrails on the aerial work platforms. They may be removed in support of maintenance operations, but must be properly installed on the same aerial work platform upon completion of all maintenance tasks.

5-4.11. **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 E4) 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.

5-5.4.2. DOT Cylinders. DOT-approved 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 using 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).

The date of requalification shall be stamped into the protective collar. 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, except for the following MHE or their components:

- a. Existing green rough terrain forklift trucks shall be painted yellow during the next scheduled painting interval, except for the expeditionary force units, war reserve materiel (WRM) assets, constructions battalion (CB) assets, and cargo handling battalion (CHB) assets.
- b. Aerial work platforms (boom-lift and scissor-lift) shall be painted orange and yellow in accordance with FED-STD-595, Color No. 12300 or 12246 and FED-STD-595, Color No. 13591 or 13655, respectively

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 5-5](#) shows a typical example of the required markings and location for a shorebase electric forklift truck. [Figure 5-6](#) 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.

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

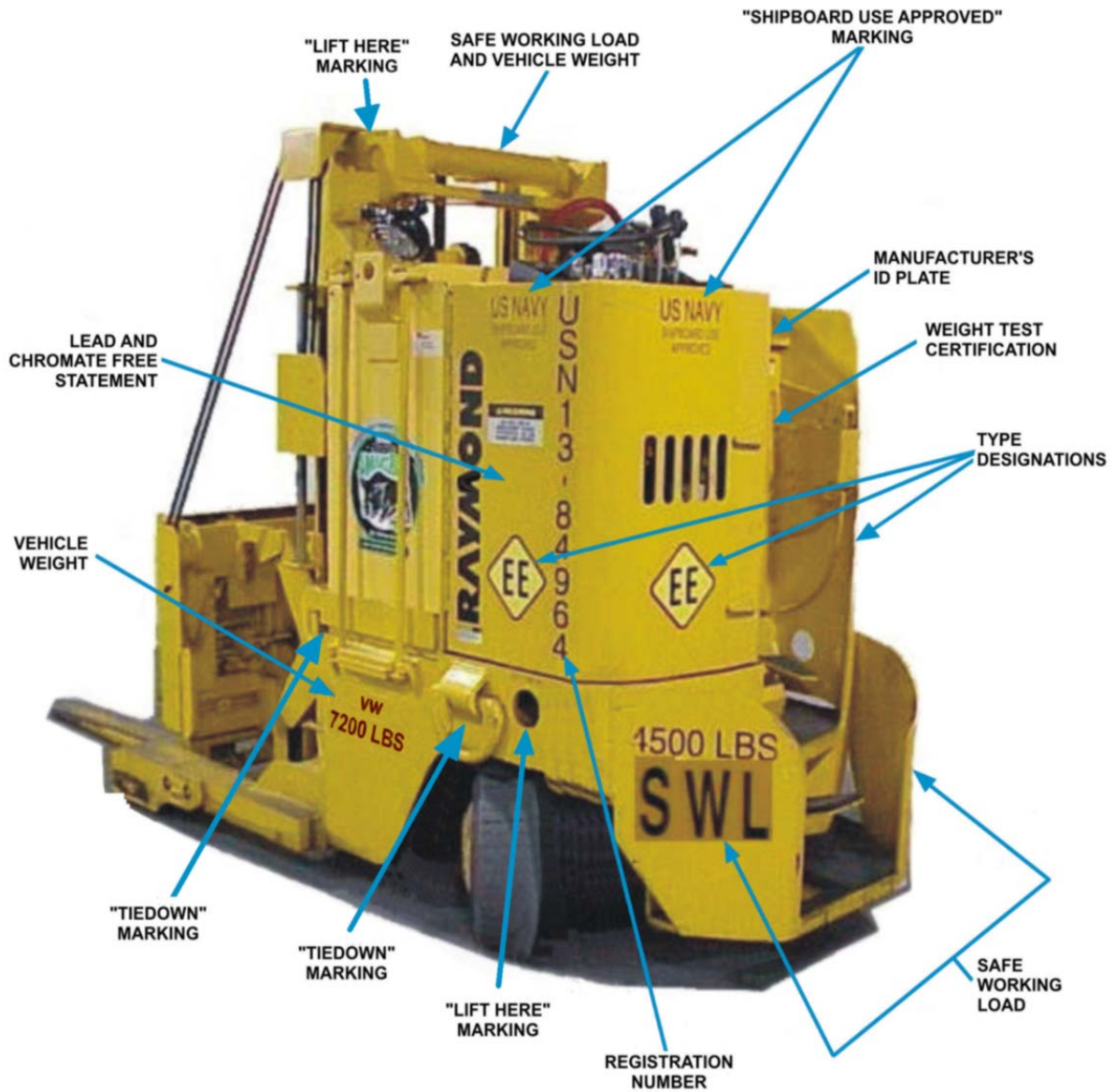


FIGURE 5-6. Shipboard Electric Reach and Tier Truck Markings (Example)

c. Weight Test Certification. For MHE assigned to handle ammunition and explosives, a periodic weight test certification form, [figure 5-7](#), 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](#).

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

FIGURE 5-7. 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 5-8](#). If the MHE certification plate or label is missing or illegible, then a replacement certification plate or label, [figure 5-9](#), 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 E4) for further instructions. Prior to installing or affixing the replacement certification plate or label, ensure that the necessary supporting documentation regarding certification authenticity (i.e., letter from original manufacturer, information from the technical manual, or letter from the [Naval PHST Center](#)) is included in the equipment history file. 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. The type designators shall consist of black borders and lettering on a yellow background. Examples of type designation shapes and dimensional requirements are shown in [figure 5-10](#).

NOTE

In-service MHE that is not in compliance with the alphabetical designation marking requirements must be re-marked during the next overhaul or the next scheduled 18-month periodicity.

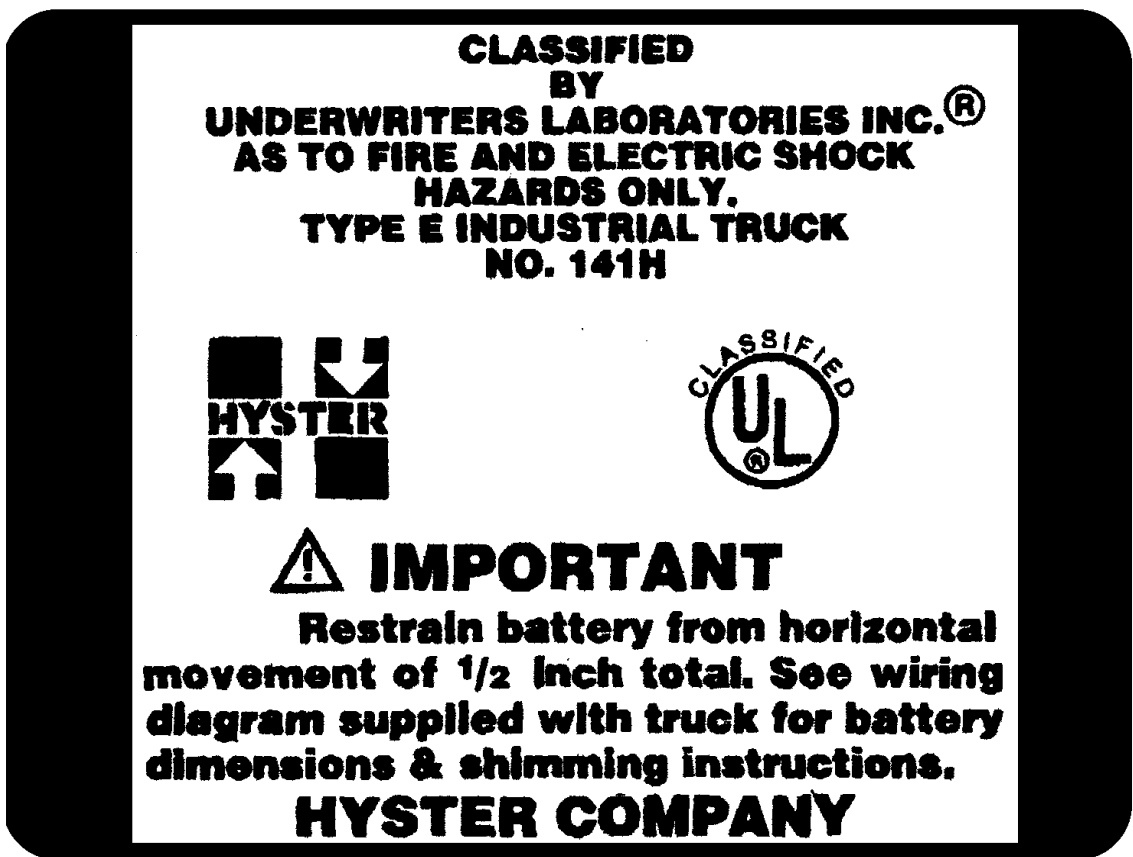
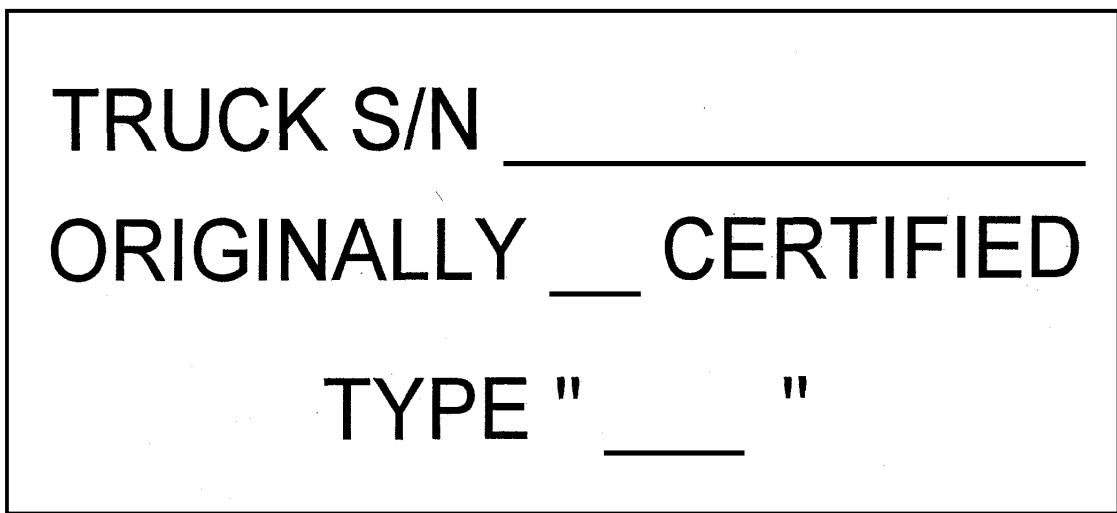


FIGURE 5-8. Typical Example of Accredited Laboratory Certification Plate



RECOMMENDED SIZE: 4" X 1 3/4"

FIGURE 5-9. Replacement Certification Plate

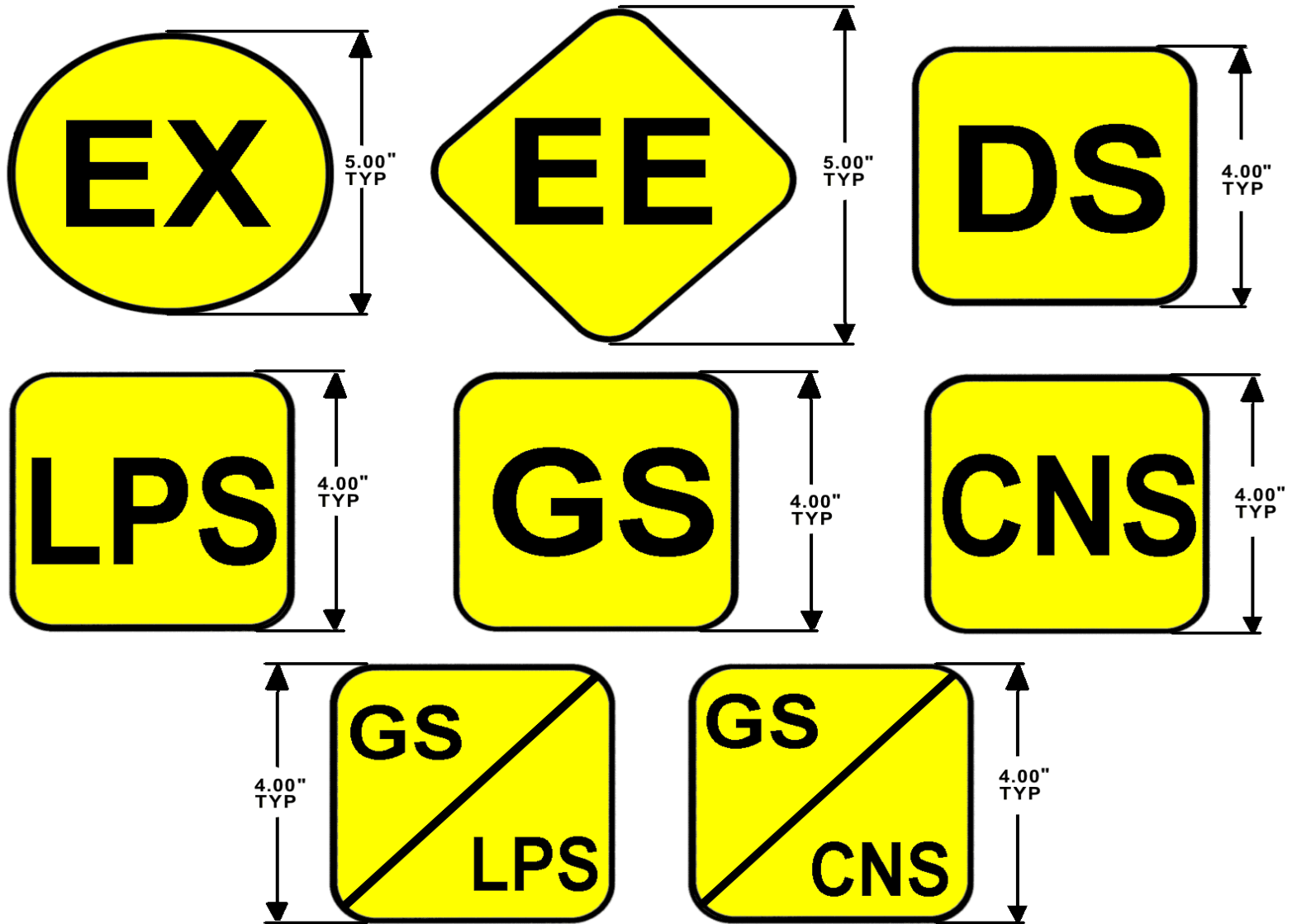


FIGURE 5-10. Examples of Type Designation Shapes and Dimensions

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- 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).
- 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. Activities may affix additional warning decals or labels, such as a hazardous noise level label, onto MHE that are visible to the operator without being considered a modification or alternation. [Figure 5-11](#) 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 directly in front and in clear view of the operator, normally on the mast crossbar in minimum 1-inch high characters. (Example: SWL 6,000 LBS. VW 10,000 LBS.)

NOTE

The SWL marking requirement is not applicable to tow tractors.

- k. Drawbar Pull Rating and Coupler Height. For tow tractors ([figure 3-19](#)), the maximum drawbar pull (DBP) rating (in pounds) shall be marked on both sides and the rear of the vehicle. Additionally, the coupler height shall be marked on the rear of the tractor.
- 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 in size to fit characters or, if feasible, on the mast (size to fit). (Example: 13-20000). The serial number markings annotated on the MHE must match with the serial numbers recorded on the manufacturer's identification plate or label as shown in [paragraph 5-7.a](#). If discrepancies or questions arise, contact NAVICP-M (Code 8341) for clarification.
- 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

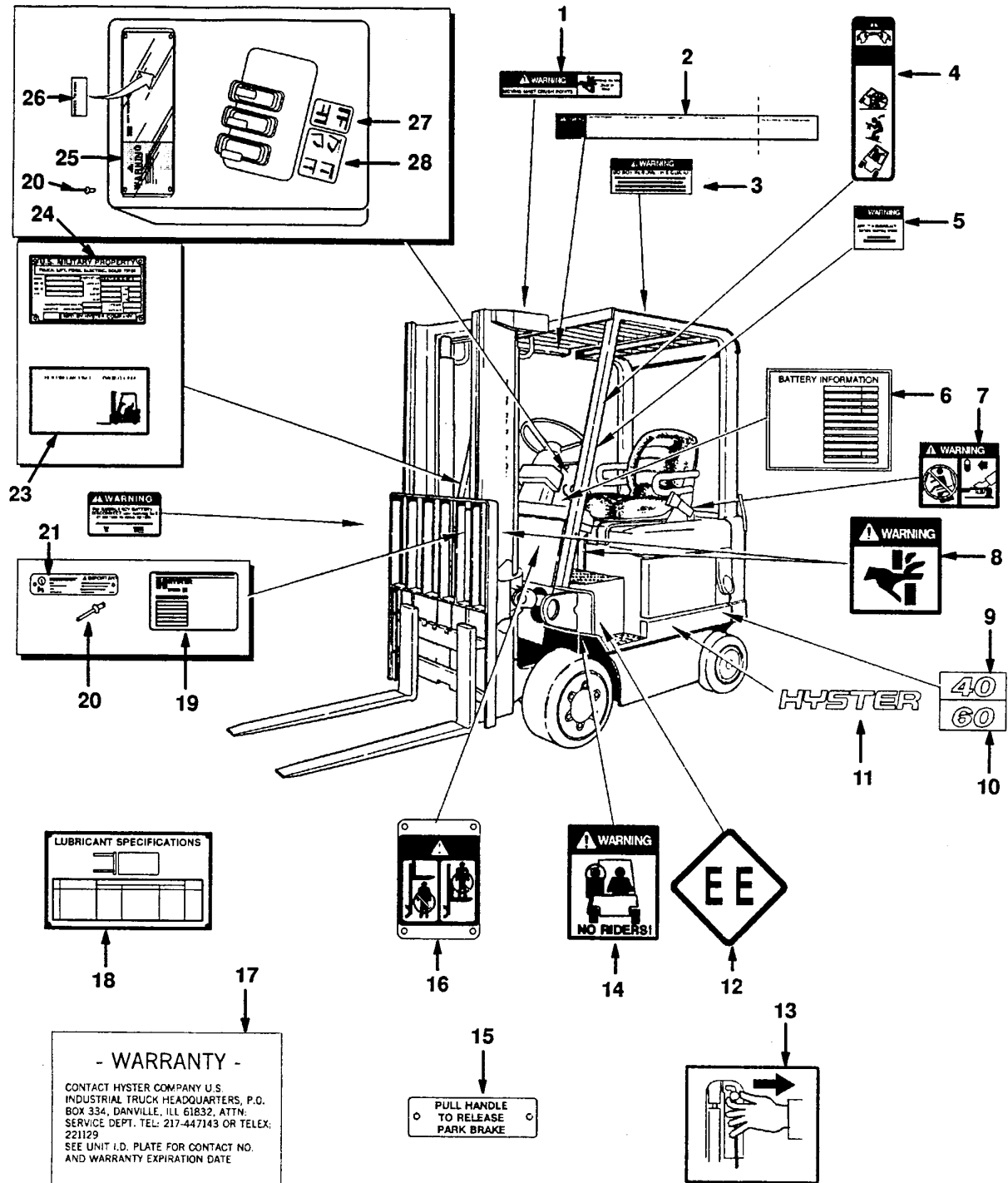


FIGURE 5-11. Warning Decals and Labels (Example) (Sheet 1 of 2)

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INDEX NUMBER	DESCRIPTION	INDEX NUMBER	DESCRIPTION
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 5-11. Warning Decals and Labels (Example) (Sheet 2 of 2)

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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)

q. Tire Pressure. For pneumatic tires only, the pressure markings for each tire shall be minimum 3/4-inch characters 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 or JP-8 fuel may be substituted for diesel fuel. [Examples: DIESEL (Green, FED-STD-595 #14090) or GAS (Red, FED-STD-595 #11105)]

s. Shipboard Marking. For shipboard use only, each unit shall be identified with the words, "SHIPBOARD USE APPROVED" in minimum 3/4-inch high letters.

t. Striping. Type EX MHE shall have a 6-inch wide blue diagonal stripe painted at 45 degree angles along both sides and on the rear, as shown in [figure 5-12](#). This stripe shall be in accordance with FED-STD-595, Color No. 15092, or a NAVICP-M approved equivalent.



FIGURE 5-12. Type EX (Blue Stripe)

u. Hydraulic Controls and Instruments. All hydraulic controls and instruments shall be clearly marked and visible when in the operator's position. All markings shall be in accordance with the original manufacturer's specifications. Emblems shall be applied away from edges to prevent their removal.

v. Platform Reach and Height. According to ANSI/SIA A92.5, aerial work platforms must have the maximum reach and height markings in a clearly visible, accessible area and in a durable manner.

w. Load, Voltage and Insulation Tests. Each aerial work platform must contain the annual certification and date of the load test, the voltage and date of insulation test, and whether the unit is insulated or non-insulated. This information shall be permanently affixed, clearly understandable and readily visible to the operator.

x. Lubrication/Fluid Tag. Each aerial work platform shall be equipped with a lubricant/fluid list installed in a visible location to indicate which lubricant/fluid has been used in each component or system. The lubricants/fluids shall be listed by their commercial designation and their military equivalent, if applicable.

y. Cold Start Instructions. Aerial work platforms shall be equipped with a cold start instruction plate. It shall instruct the operator as to the steps required to use the vehicles's cold start system.

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

Table 5-2 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 and DY 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 5-2. Approved MHE Afloat

Material	Operational Area		
	Below Deck	Closed Lighter	Top Side
General Supply	EE, EX, HS	DS, DY, EE, EX, HS	DS, DY, EE, EX, H, HS, Cargo Crane, Aerial Work Platforms

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 5-3](#) 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 5-3](#), 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 5-3](#), 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 5-3. 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, Aerial Work Platforms, Diesel Conveyor Belt Vehicle

5-10. TEMPORARY PARKING.

The following definition and conditions apply for temporary parking of MHE ashore or afloat.

5-10.1. DEFINITION. For the purposes of this manual, temporary parking is defined as whenever the operator leaves the MHE unattended. Examples include the operator is out of sight of the MHE, is more than 25 feet away from the MHE, takes a break during daily handling operations, or ends the shift/workday (but the same handling operation is scheduled in that area for the next shift/day).

5-10.2. CONDITIONS. As defined in [paragraph 5-10.1](#), the following conditions are required for MHE that is temporarily parked:

- a. The forks/booms shall be lowered to the floor/deck.
- b. All controls shall be placed in the neutral position.
- c. The parking brake shall be set.
- d. The ignition switch shall be turned off.
- e. If parked on an incline, the wheels shall be chocked.

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

5-11.1. DEFINITION. For the purposes of this manual, storage is defined as an area/building reserved or kept for future use or safekeeping of MHE. Examples include maintenance facilities/recharging stations, FISCs, or warehouses.

5-11.2. **CONDITIONS.** As defined in [paragraph 5-11.1](#), the following conditions are required for MHE that is stored:

- a. The MHE shall meet the same requirements of [paragraph 5-10.2](#).
- b. The MHE is positioned such that it does not block normal or emergency exits/access.
- c. The battery cable connector on electrically-powered MHE shall be disconnected.
- d. 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.
- e. Keys shall be removed and stored in a controlled, limited access area in accordance with local procedures.
- f. Refer to [NAVSEA SW023-AH-WHM-010](#) for additional 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 5-10.2](#).
- b. MHE shall be stowed in the fore and aft directions, whenever possible.
- c. The battery must be disconnected on electrically-powered MHE.
- d. Keys shall be removed and stored in a controlled, limited access area in accordance with local operating procedures.
- e. 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.

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 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 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 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 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 Managers).
TYCOM(TY)	Type Commanders (for MHE in their regions only).
Inquire Only (Inq)	FISC Regional 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
<i>checked all fluid levels</i>			brakes, ck front & rear	MM	1.0	battery clean only		
Total Standard Hours:		1.0	<i>changed oil and filter</i>		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 *(MM)* Released By *A usg (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 MANAGERS. All FISC Regional 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 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 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 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 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 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 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 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 Manager.

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MATERIAL INSPECTION AND RECEIVING REPORT						Form Approved OMB No. 0704-0248					
<p>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;">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.</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. <i>(Indicate number of shipping containers - type of container - container number.)</i>	DESCRIPTION	17. QUANTITY SHIP/REC'D*	18. UNIT	19. UNIT PRICE	20. AMOUNT					
21. CONTRACT QUALITY ASSURANCE 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: _____				22. RECEIVER'S USE 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.			
23. CONTRACTOR USE ONLY <div style="height: 100px;"> </div>											

DD FORM 250, AUG 2000

PREVIOUS EDITION IS OBSOLETE.

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

nv_fisc
prtwksht:ulme2005

User Worksheets

Page: 1
01/11/30 09:36

UIC: 0067a	Previous Meter Reading	Current Meter Reading	* Monthly Downtime *				Repair Cost Not Reported	Date Last In Shop	Remarks
USN/ Reg Key | EJON			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 | jkl774	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

UIC: USN/ Reg Key	EJON	Previous Meter Reading	Current Meter Reading	User Worksheet * Monthly Downtime *				Repair Cost Not Reported	Date Last In Shop	Remarks
				EOS Hrs	PM Hrs	UM Hrs	EDP Hrs			

Count: _____
 Total records selected: _____

Report Complete -- EMACS 7.7

EOS = Equivalent Out of Service
 PM = Preventive Maintenance
 UM = Unscheduled Maintenance
 EDP = Equipment Down for Parts

PM + UM + EDP = EOS

Measured against 40-hr work weeks
 that equipment is in-use or on-call

FIGURE 6-4. Blank EMACS Quarterly Report

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 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 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 Manager for resolution. Any problems that cannot be resolved at the regional level will be forwarded to NAVICP-M for final resolution.

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

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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 Program Manager at Naval Inventory Control Point Mechanicsburg (NAVICP-M) (Code 8341) with a copy to the Naval Surface Warfare Center (NAVWARCEN), Indian Head Division Detachment Earle, [Naval Packaging, Handling, Storage and Transportation \(PHST\) Center \(Code E4\)](#) 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 Manager or other shore activities shall be forwarded directly to NAVICP-M (Code 8341) with a copy to the Naval PHST Center (Code E4). 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 8341). Any defect reported as a casualty report (CASREP) should also be forwarded with the QDR to NAVICP-M (Code 8341).

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 the [internet](#).

c. Screening Point. Upon receipt of any QDR, NAVICP-M (Code 8341) will serve as the screening point, forward the QDR to the 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 ISEA will review the QDR and determine whether or not a safety hazard exists. If safety is a consideration, the 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.

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**. A Manufacturer's Technical Manual Deficiency/Evaluation Report (TMDER), [figure 7-3](#), shall be used whenever any errors, omissions or suggestions for improvement involve the appropriate manufacturer's technical manual, which is provided with each class of MHE. The following steps shall be followed to review, process, and finalize any manufacturer's TMDER's:

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a. The originator shall complete the manufacturer's TMDER, [figure 7-3](#), and submit it to NAVICP-M (Code 8341), along with a copy to the MHE ISEA and, for units afloat, to the TYCOM MHE Manager for initial review.

b. If changes are warranted, the MHE ISEA will mark-up the appropriate pages from the manual, and submit it to the manufacturer for review and acceptance along with a copy to the TMDER originator and the TYCOM MHE Manager (if necessary).

c. A change package will be prepared by the MHE ISEA containing the affected pages and the cover page of that particular manufacturer's technical manual. The cover page and the affected pages will be annotated, under the original technical manual stock number (e.g., 0532-LP-000-3700) in the upper right corner with the revision number and the date of revision (e.g., Change 1 – 25 March 2008). The original NSN of the technical manual will be retained.

d. The MHE ISEA will distribute this change package to the appropriate TYCOM's, the TYCOM MHE Manager, and NAVICP-M (Code 8341). The TYCOM's will be responsible for distributing this change package to those ships that have this technical manual.

e. NAVICP-M (Code 8341) will forward this change package to the Defense Automated Printing Service (DAPS), who will scan this change package and incorporate the affected pages (include title page) into the current technical manual.

f. Customers who subsequently order the print on demand for this manual through the Navy Logistics Library (NLL) will receive the latest manual under the original NSN, including any revisions/changes that have been made to date.

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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).

REPORT OF DISCREPANCY (ROD)				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/Shipments, 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)	QUANTITY (a)	UNIT PRICE (b)	TOTAL COST (c)	CODE (d)	AC- ² TION CODE
12. REMARKS (Continue on separate sheet of paper if necessary)									

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

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:	
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.	
19. IN ACCORDANCE WITH NOTICE OF DISCREPANCY ON FACE OF THIS FORM:	
a. MATERIAL <input type="checkbox"/> HAS BEEN SHIPPED <input type="checkbox"/> WILL BE SHIPPED	DOCUMENT NUMBER
c. <input type="checkbox"/> AN ADJUSTMENT IN BILLING HAS BEEN/WILL BE PROCESSED AS A: <input type="checkbox"/> CREDIT <input type="checkbox"/> DEBIT	b. <input type="checkbox"/> NO RECORD OF SHIPMENT. RESUBMIT REPORT TO PROPER OFFICE UNDER APPROPRIATE REGULATION. 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:
c. <input type="checkbox"/> RETAIN MATERIAL AT NO CHARGE.	d. <input type="checkbox"/> MATERIAL WILL BE PICKED UP IN:
e. <input type="checkbox"/> SHIP MATERIAL (Specify location):	
(1) <input type="checkbox"/> GBL APPROPRIATION CHARGEABLE:	(a) _____ DAYS
(2) <input type="checkbox"/> CHARGES COLLECT - VIA: <input type="checkbox"/> FREIGHT <input type="checkbox"/> EXPRESS <input type="checkbox"/> PARCEL POST	(b) _____ DAYS
(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 (Specify)	
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:
23. REMARKS (Continue on separate sheet of paper if necessary)	
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 (Original Office Mailing Address)			2a. TO (PQDR Screening Point)		
1b. ORIGINATOR NAME, PHONE NUMBER & E-MAIL ADDRESS MMO NAME, PHONE NUMBER & E-MAIL ADDRESS		1c. DATE SUBMITTED	2b. NAME, TELEPHONE NUMBER & E-MAIL ADDRESS		2c. DATE
3. REPORT CONTROL NUMBER		4. DATE DEFICIENCY WAS DISCOVERED	5. DEFECTIVE ITEM NATIONAL STOCK NUMBER (NSN)	6. DEFECTIVE ITEM NOMENCLATURE	
7a. MANUFACTURER OR REPAIR DEPOT / CITY / STATE			7b. MANUFACTURER'S CAGE CODE	7c. SHIPPER / CITY / STATE	8. DEFECTIVE ITEM PART NUMBER
9. SERIAL, LOT, OR BATCH NUMBER Serial #: Unknown <input type="checkbox"/> Lot #: N/A <input type="checkbox"/> Batch #:		10a. CONTRACT NUMBER	10b. PURCHASE ORDER NUMBER	10c. REQUISITION / DOCUMENT NUMBER	10d. GBL NUMBER
11. ITEM <input type="checkbox"/> Original Equipment <input type="checkbox"/> New Replacement <input type="checkbox"/> Repaired <input type="checkbox"/> Overhauled		12. DATE RECEIVED, MANUFACTURED, REPAIRED, OR OVERHAULED Date Received: Date Repaired: Date Manufactured: Date Overhauled:	13. OPERATING TIME AT FAILURE <input type="checkbox"/> Initial Hours: Cycles: Days: Miles: Rounds:	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 <input type="checkbox"/>	(1) END ITEM NSN TYPE / MODEL / SERIES			(2) END ITEM SERIAL NUMBER
	b. NEXT HIGHER ASSEMBLY (NHA) <input type="checkbox"/>	(1) NHA NSN	(2) NHA NOMENCLATURE	(3) NHA PART NUMBER	(4) NHA SERIAL NUMBER
17. DEFECTIVE ITEM UNIT COST \$		18. ESTIMATED REPAIR COST \$	19a. ITEM UNDER WARRANTY <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN	19b. WARRANTY EXPIRATION DATE	
20. END ITEM TAM					
21a. ACTION REQUESTED (Select only one value) <input type="checkbox"/> REPLACEMENT <input type="checkbox"/> REPAIR <input type="checkbox"/> CREDIT <input type="checkbox"/> OTHER (Explain in Block 22)					
21b. CURRENT DISPOSITION OF DEFECTIVE ITEM (the Exhibit) (Select only one value) <input type="checkbox"/> HOLDING EXHIBIT FOR 30 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 (Explain in Block 22)					
22. DESCRIPTION OF THE DEFECT (Describe in detail what is wrong, circumstances prior to the difficulty, probable cause, any action taken, recommendations. Attach copy of supporting documents. Continue on separate sheet if necessary.)					
23. LOCATION OF DEFICIENT MATERIAL (e.g. Base, Camp, Station)					

368-102
NSN 7540-00-133-5541

STANDARD FORM 368 (REV. 6/2007)
GENERAL SERVICES ADMINISTRATION
(FPMR 101 – 26.8)

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

INSTRUCTIONS

1a. FROM (Originating Office Mailing Address) – Complete name of activity (no acronyms when sending deficiency report across component lines), activity address code (ACC) mailing address including zip code of the activity originating the report.

1b. ORIGINATOR NAME, PHONE NUMBER & E-MAIL ADDRESS – Provide name, telephone number (including all available telephone numbers; FTS; Autovon, and commercial) and email address of an individual who can serve as a contact for questions regarding the report and/or to request exhibits or samples.

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

2a. TO (PQDR Screening Point) – The originating point will complete name of the screening point activity (no acronyms when deficiency report will be 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.

2b. NAME, TELEPHONE NUMBER AND E-MAIL ADDRESS – Nothing follows.

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 OR REPAIR DEPOT / 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 CAGE CODE – Code of the manufacturer as listed in Cataloging Handbook H4.1 (Name to code), Federal Supply Code for manufacturer (United States and Canada).

7c. SHIPPING / 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 NUMBER – Manufacturer's serial, lot, or batch number of deficient items as applicable.

10a. CONTRACT NUMBER – Enter contract number.

10b. PURCHASE ORDER NUMBER – Enter purchase order number.

10c. REQUISITION / DOCUMENT NUMBER – Enter requisition and/or number.

10d. GBL NUMBER – Nothing follows.

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

12. DATE RECEIVED, MANUFACTURED, REPAIRED, OR OVERHAULED – Nothing follows.

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.).

15a. QUANTITY RECEIVED – Enter the total number of items or parts received.

15b. QUANTITY INSPECTED – Enter the total number of items inspected.

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. DEFECTIVE ITEM 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.

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

19b. WARRANTY EXPIRATION DATE – Provide the date the warranty is set to expire.

20. END ITEM TAM – Nothing follows.

21a. ACTION REQUESTED (Select only one value) – A check in the appropriate block to indicate the action taken or requested. 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 taken or requested, check "OTHER" and identify the nature of the action taken or requested in item 22.

21b. CURRENT DISPOSITION OF DEFECTIVE ITEM (the Exhibit) (Select only one value) – 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. ACO will instruct disposition of the item. When none of the items indicate the actions taken or requested, check "OTHER" and identify the nature of the action taken or requested in item 22.

22. DESCRIPTION OF THE DEFECT (describe in detail what is wrong, circumstances prior to the difficulty, probable cause, any action taken, recommendations. Attach copies of supporting documents. Continue on separate sheet if necessary.) – Nothing follows.

23. LOCATION OF DEFICIENT MATERIAL (e.g. Base, Camp, Station) – Nothing follows.

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

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MANUFACTURER'S TECHNICAL MANUAL DEFICIENCY/EVALUATION REPORT				
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.

NOTE

Refer to the appropriate MRC or technical manual for additional specific operating inspection procedures not addressed in the MHE Inspection Form, [figure 8-1](#).

a. Initial Operator. The first operator shall conduct a daily pre-operational safety inspection of the MHE, using the inspection criteria provided, by completing the "START" portion of the MHE Inspection Form, [figure 8-1](#), except:

(1) For aerial work platforms, refer to [figure 8-2](#).

(2) For diesel conveyor belt vehicles, refer to [figure 8-3](#).

(3) For mobile cargo cranes afloat, refer to table 589-3.2a, "Guidelines for Crane Daily Checklist", documented in NSTM S9086-T4-STM-010/CH-589 (includes Walk Around, Machinery House, Operator Cab and Operational Testing Inspection Criteria)

(4) For mobile cargo cranes ashore, refer to NAVFAC P-307. Only the applicable inspection criteria shall apply; procedures that do not apply may be obliterated for that particular MHE. If the MHE passes all required inspections and functional tests, the applicable 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 operator's completed "START" portion of the applicable MHE Inspection Form. 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 respective MHE Inspection Form. 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 appropriate MHE Inspection Form, notify immediate supervisor of defects, and tag-out the unserviceable MHE for repairs in accordance with local procedures described in [paragraph 8-2.1.3](#).

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 8-6](#), red tag, caution, etc.] unserviceable MHE in a conspicuous location and for removing equipment from service until repairs are made.

b. The appropriate MHE Inspection Form, described in [paragraph 8-2.1.1a](#), shall be retained in the MHE history file only if defects are found and when repairs/tests 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

DATE	REGISTRATION NO. (USN)	MHE CLASS (see table 4-1)
-------------	-------------------------------	----------------------------------

POWERED MHE TO BE CHECKED DAILY BY OPERATOR

NOTES

1. USE THIS FORM WHEN INSPECTING MHE BEFORE AND AFTER OPERATION.
MARK 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, Fluid Levels and Belts					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 Guard and Load Backrest					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 8-7](#) for examples of solid rubber tire defects and the probable causes.
2. Engine Oil, Fluid Levels and Belts. Check engine oil, hydraulic, transmission and brake fluid levels. If low, add oil/fluid to raise the level to the full mark. Inspect engine belts for cracks, wear, damage, nicks or cuts, and proper tension.
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, bulging, corrosion, pitting, gouges not exposed to fire, or evidence of rough usage. Valves are protected from physical damage.
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 and Lowering Control. Raise and lower the lifting assembly to verify the lifting assembly 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 (i.e., dry/not lubricated, frozen or rusted) chains. Inspect hose and cable reel guards, as applicable, for breaks, bends or chafing.
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 8-8](#) shows a typical example of the directional controls. Ensure steering operation functions smoothly.
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 8-9](#)) 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 8-10](#)) 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 and Load Backrest. Inspect all welds and hardware. Verify that overhead guard, load backrest 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, (e) for tow tractors, the drawbar pull rating (DBP) on both sides and rear, and coupler height on rear, and (f) for ammunition and explosives handling only, the weight test certification form ([figure 5-7](#)). 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.

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SHIP/ShORE ACTIVITY NAME:

OPERATOR NAME:

DATE:

DATE CURRENT LOAD TEST EXPIRES:

	Description	Criteria	START		FINISH		
			SAT	UNSAT	SAT	UNSAT	
1	Structure	Inspect the platform's structural components for obvious physical damage, such as cracking, bending and deformation of members or welds. Inspect for cracking or flaking paint. Verify platform is clean and clear of unnecessary equipment and articles.					1
2	Hardware	Inspect for missing or loose bolts, nuts, brackets or supports.					2
3	Hydraulic System	Inspect hydraulic lines for loose connections, or damaged fittings or hoses.					3
4	Tires	Inspect the condition of the tires. Ensure proper inflation and verify tread is not damaged or cut.					4
5	Leaks	Inspect the entire area for hydraulic line, reservoir, fuel tank, engine and gearbox leaks.					5
6	Hydraulic Tank	Inspect the level of hydraulic fluid in the tank. Level should be midway between 3/4 and full with the boom in the fully lowered and retracted position.					6
7	Diesel Fuel	Add diesel fuel if the level is half or less full.					7
8	Engine Oil	Check engine oil. Add oil if necessary.					8
9	Gages & Indicators	Inspect for broken, missing, inoperable or non-calibrated gages, indicators and warning lights.					9
10	Start-Up	At ground control console, position selector switch to "Ground". Turn ignition switch and start engine. Test all functions and verify proper operation.					10
11	Unusual Noises	After starting engine, note any unusual noises, fluid leaks, loss of power or poor response to controls. Verify proper operation and correct readings of all gages and indicators. Verify battery is charging.					11
12	Stop Circuit	After initial warm-up (5 minutes), turn off engine at the ground control console.					12
13	Aerial Control	Reposition the Aerial/Ground selector switch to "Aerial". Place ignition switch to ON position and start engine from aerial platform. Operate the following controls: Boom Up/Down, Rotation CW/CCW, Platform Rotation, Boom Out/In, Drive FWD/Reverse, Throttle High/Low and Platform Tilt.					13
14	Boom Operation	Raise and lower boom, and check for freedom of movement. Extend and retract boom, and check freedom of travel. Swing boom to left and right, and check for freedom of movement.					14
15	Steering	Rotate steering wheel left and right. Move aerial platform forward and aft a few feet. Ensure movements are smooth and properly operational.					15
16	Basket	Rotate basket left and right, and verify freedom of movement.					16
17	Emergency Stop Switches	Shutdown the engine using each of the emergency stop switch. Verify entire system shuts down. Start emergency motor driven hydraulic pump and operate at					17
18	Emergency System Checkout	After shutting engine off using one of the emergency stop switches, start emergency motor driven hydraulic pump and operate at least one function to verify emergency hydraulic pump is working.					18

FIGURE 8-2. Aerial Work Platforms (MHE Inspection Form/Criteria)

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SHIP/Shore Activity Name:

Operator Name:

Date:

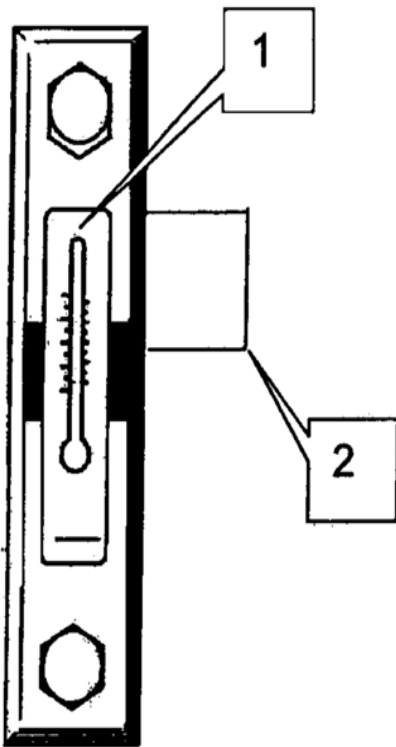
Date Current Load Test Expires:

USN Registration Number:

Location:

	Description	Criteria	START		FINISH		
			SAT	UNSAT	SAT	UNSAT	
1	Engine Area: (a) Fluid Levels (b) Exhaust System (c) Belts	Inspect fluid levels for the engine oil, brakes, radiator coolant, hydraulics, battery (when not sealed) and power steering. Add fluids as necessary. Refer to figure 8-4 for hydraulic fluid (oil and temperature) check. Inspect entire exhaust system for leaks. Inspect for dry, frayed or loose belts.					1
2	Tires & Rims	Ensure tires are free of cuts, gouges or embedded objects and tires are the same size and type. Inspect that pneumatic tires are properly inflated. Verify rims are not loose or missing hardware.					2
3	Hydraulic System	Verify hydraulic line connections are secure and there are no leaks.					3
4	Lighting & Travel Direction Indicator	Verify lighting and travel direction indicator functions properly and is clean.					4
5	Horn	Test the horn.					5
6	Start-Up	Start engine and make note of any unusual noises or vibrations. Test all functions and verify proper operation.					6
7	Battery	Check battery charge at regular intervals.					7
8	Controls & Indicator Instruments	Test all controls and indicator instruments (figure 8-5) for proper operation and function.					8
9	Electrical System (after 500 operating hours)	Inspect entire electrical system for cleanliness. Ensure leads and cables are in good condition. Check fastening for no mechanical damages or discoloration of the insulation. Check bolted and plug connections for secure seating. Verify switching cabinet does not have mechanical damage and closes tightly. Inspect actuating lever for proper function and no damages, dirt or corrosion.					9
10	Emergency Stop Switches	With engine running, shut down the system using each of the emergency stop switches. Verify the entire system shuts down.					10

FIGURE 8-3. Diesel Conveyor Belt Vehicle (MHE Inspection Form/Criteria)



- 1 Hydraulic oil temperature
(Max. 70 °C; 158 °F)
- 2 Optimum hydraulic oil level (one stage
of the front cylinder on the conveying
belt must be extended)

FIGURE 8-4. Indicator for Hydraulic Oil Level and Hydraulic Oil Temperature

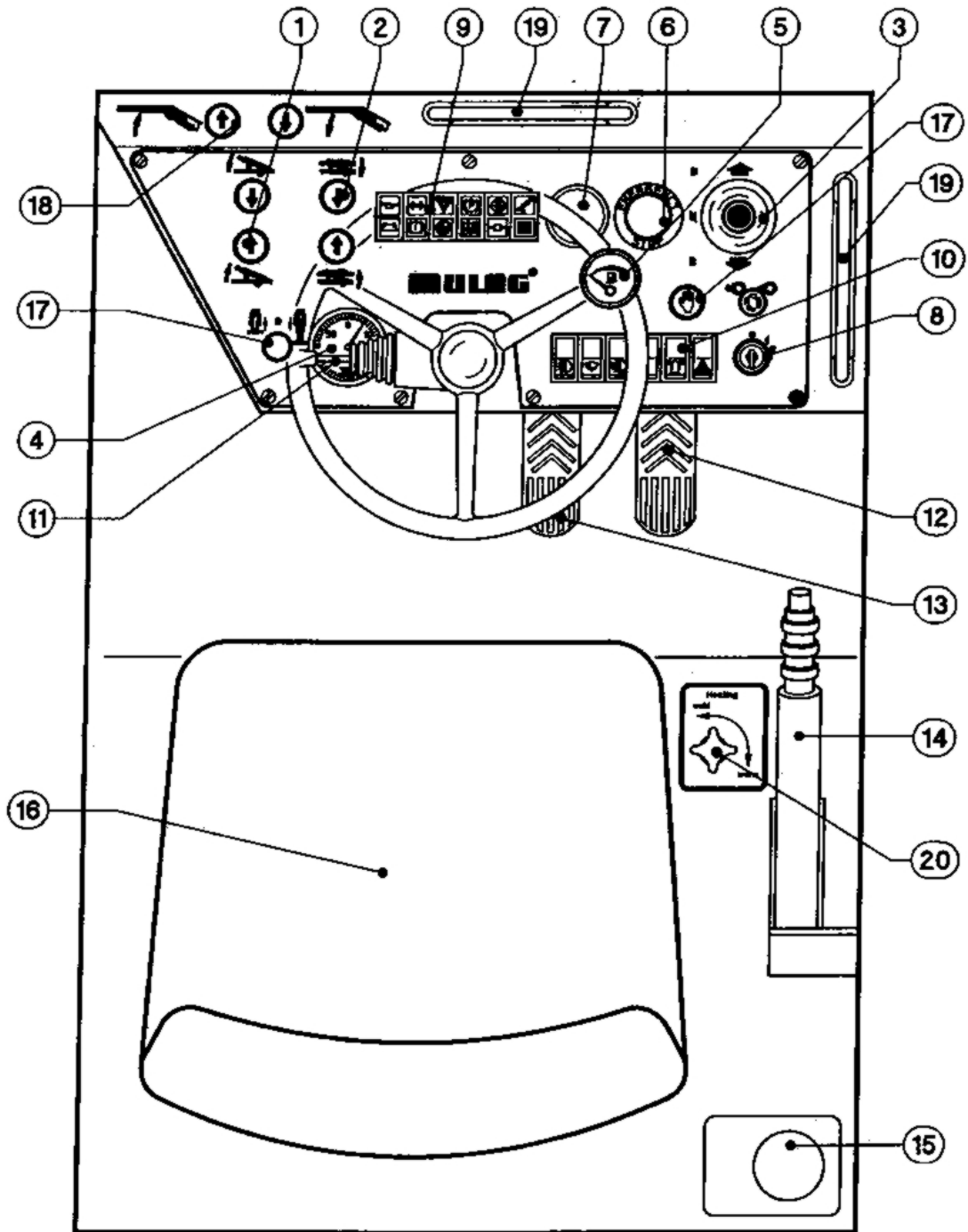


FIGURE 8-5. Control and Indicator Instruments (1 of 2)

- Description of Individual Functions

1. Conveyor belt front - "raise - lower"
2. Conveyor belt rear - "raise - lower"
3. Directional travel selector - "forward -- 0 - backwards"
4. Hourly operating meter
5. Fuel gauge
6. Emergency off switch
7. Engine oil - temperature indicator
8. Ignition switch
Vehicle "on - drive-off"
9. Indicator lamps
10. Pushbutton toggle switch panel
11. Stalk lever control switch for direction indicators and horn
12. Gas pedal
13. Brake pedal
14. Parking brake
15. Brake fluid tank
16. Driver's seat
17. Support cylinder - "draw in - extend"
18. Align loading table - "Lift - lower"
19. Demister/deicer nozzle
20. Heater - control

FIGURE 8-5. Control and Indicator Instruments (2 of 2)

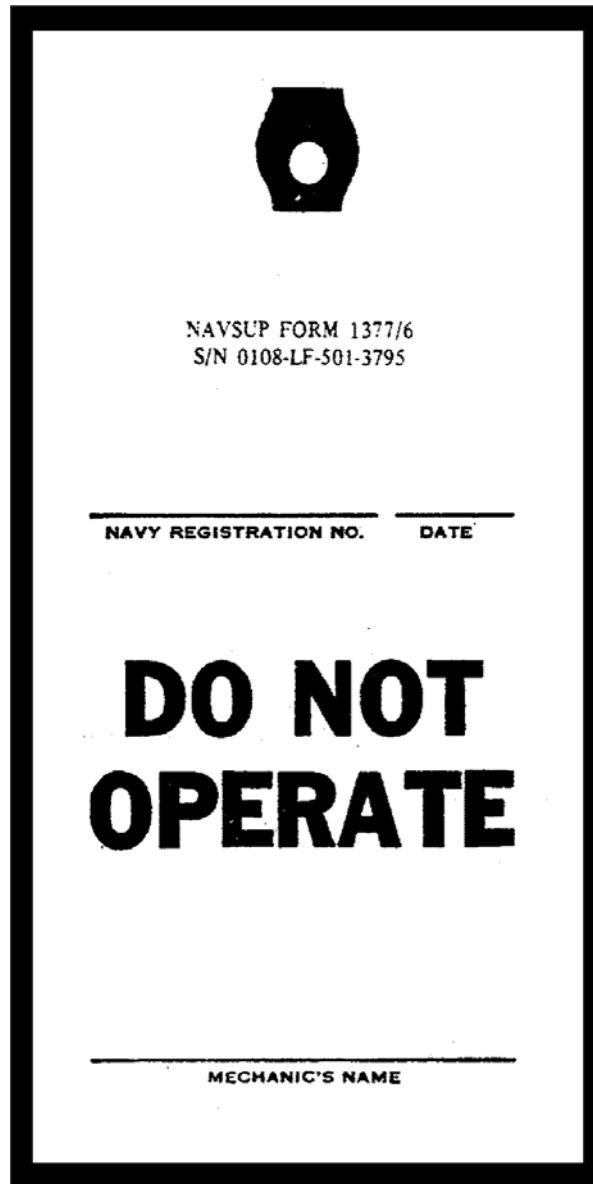


FIGURE 8-6. "DO NOT OPERATE" Tag



FIGURE 8-7. Solid Rubber Tire Defects

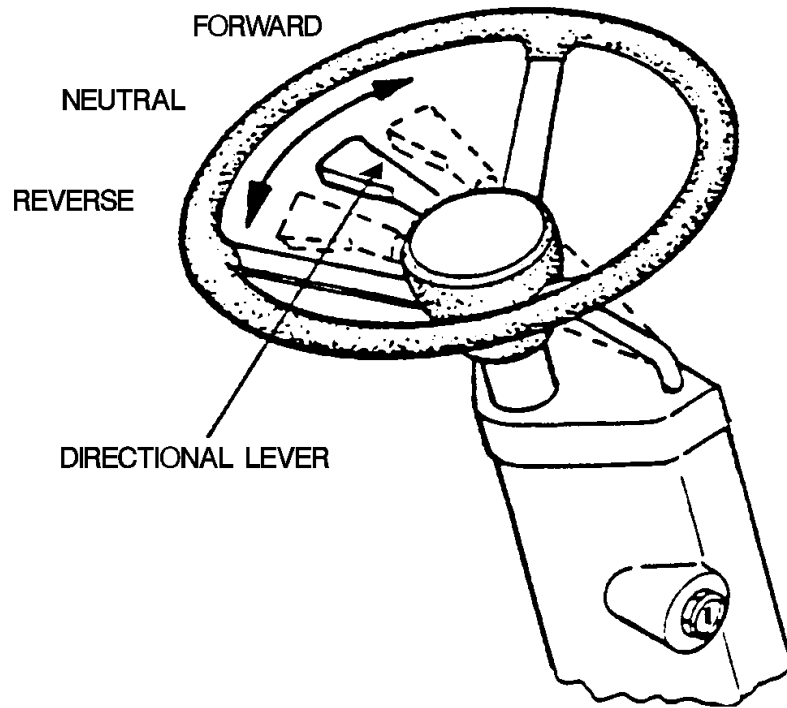


FIGURE 8-8. Directional Controls (Example)

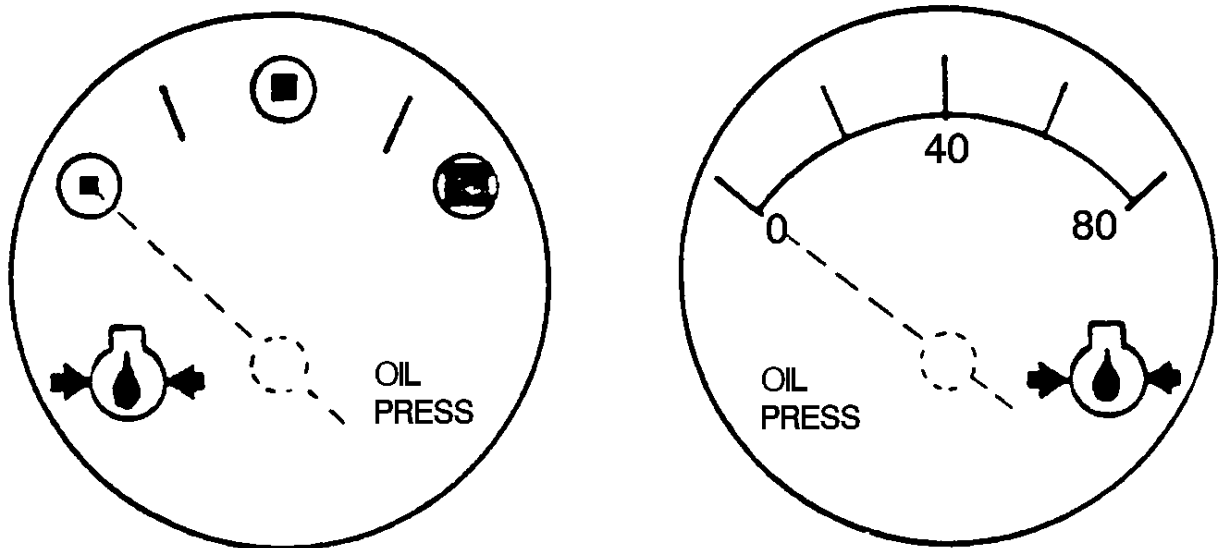


FIGURE 8-9. Oil Pressure Gauges (Example)

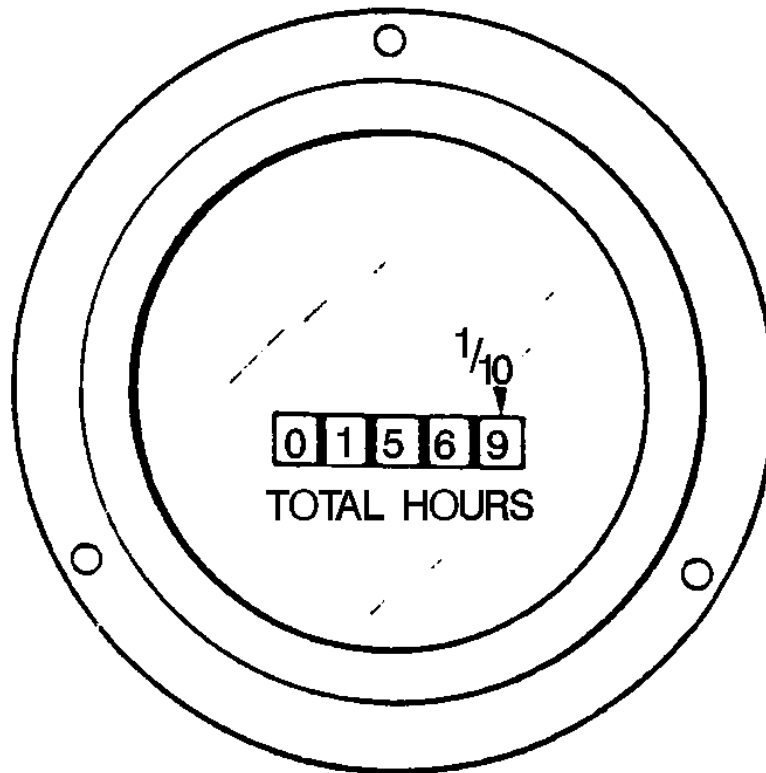


FIGURE 8-10. Engine Hourmeter

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

Every piece of MHE used ashore and afloat requires an equipment history file. It is the responsibility of the maintenance provider to initiate and maintain an equipment history file. For units originally delivered to the Fleet Industrial Supply Center (FISC), the Regional Manager will initiate all equipment history files. The information recorded will provide a complete history of the equipment and its service life. 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.

8-3.1. **MANDATORY DOCUMENTATION.** A typical history file shall include the following:

- a. Maintenance actions (repairs or preventive), cost, materials/parts and inspection data.

NOTE

Although this data can reside on an electronic database, hard copy reports/forms are required in the equipment history file.

- b. All shipping and receiving (e.g., DD-1149 Form) and commercial acceptance (e.g., DD-250 Form) documentation.
- c. Weight test certification documentation.
- d. Annual fork inspection certification documentation.
- e. Any proposed or approved MHE modifications or alterations.

8-3.2. OPTIONAL DOCUMENTATION. A typical equipment history file should include the following, as applicable:

- a. Periodic hours of operation reports, if available.
- b. Any pertinent correspondence (e.g., letters or messages).
- c. A copy of the MHE ISEA endorsement that the safety rating has been maintained when the accredited laboratory certification identification, such as Underwriters' Laboratory (UL) or Factory Mutual (FM), is missing or illegible on the MHE.

8-3.3. SLEP DOCUMENTATION. If a piece of equipment has gone through the Service Life Extension Program (SLEP), the old equipment history file will be archived by the applicable FICP, who will initiate a new history file containing the following information:

- a. SLEP estimates and parts replaced.
- b. SLEP engine test results.
- c. SLEP MHE Final Inspection Form.

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.

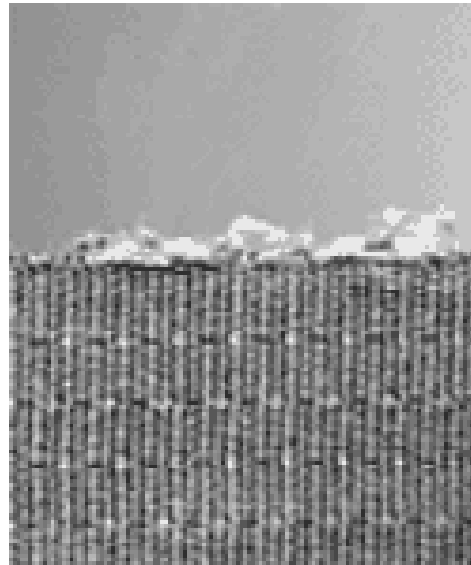
All new equipment from direct vendor delivery or a Service Life Extension Program (SLEP) unit from a SLEP facility must receive an initial receipt inspection and servicing in accordance with the MHE Initial Receipt Inspection Form, [figure 8-12](#). Prior to conducting these inspections, remove any restraint 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

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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.



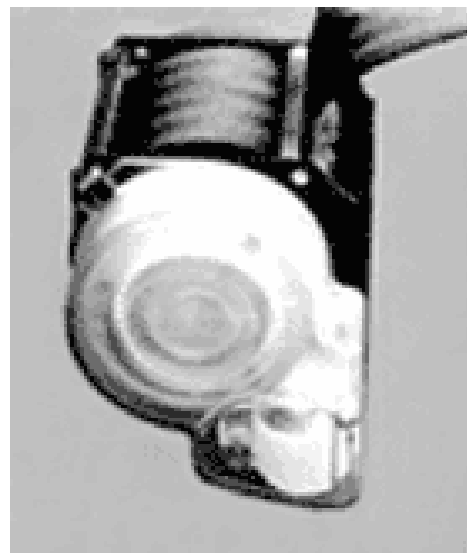
**Nicks or Cuts
View A**



**Frayed Webbing
View B**



**Holes
View C**



**Broken or Worn Retractor
View D**

FIGURE 8-11. Operator Restraint System Discrepancies

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. For units afloat, maintain MHE in accordance with Planned Maintenance System (PMS) and Type Commander (TYCOM) programs.

c. An accurate reporting system [e.g., EMACS or hard copy procedures for ashore activities; for units afloat, the applicable maintenance data system as directed by [OPNAVINST 4790.4 \(series\)](#)], since it is essential that repair requests and maintenance procedures 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. Periodic and unscheduled maintenance should be documented in the equipment history file.

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 Commanding Officer, Naval Logistics Center (NAVSEALOGCEN) Detachment San Diego, Code 05316, 4755 Railroad Way, San Diego, CA 92136-5503 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.

MRC's identify the minimum (scheduled) periodicity for which that particular task must be accomplished to maintain the MHE at a fully operational condition. However, MRC procedures can be accomplished more frequently than prescribed due to harsh weather, unusual operating conditions, outside storage, corrective maintenance, and because of test requirements. For example, if operational requirements dictate that a forklift truck (normally stowed within the ship) must be stowed outside on the weather deck, the maintenance procedures would be performed sooner on an as needed basis. In this example, a TFBR would not be required unless outside stowage requirements becomes part of local operating procedures, thus increasing scheduled maintenance. Typically, electric MHE contain extremely delicate electronic components that when used or stored outdoors will cause failures due to moisture.

There are two major areas that require lubrication more frequently than scheduled to ensure that the MHE is fully operational at all times. Lubrication on dry, bare metal components serve as the only barrier of protection against harsh environments.

8-5.1. LUBRICATING LIFT CHAINS. The minimum PMS periodicity requirement to lubricate the lift chains is semi-annually. However, during inspection, if the operator detects that the lift chains are dry, the unit should be lubricated sooner than its scheduled periodicity. They should never become rusted or frozen.

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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 8-12. MHE Initial Receipt Inspection Form

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Item No.	Inspection Point	Accept	Reject	N/A
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 brake operation			

FIGURE 8-12. MHE Initial Receipt Inspection Form (Continued)

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Item No.	Inspection Point	Accept	Reject	N/A
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)			
66	Clutch adjustment, engagement and operation			
67	Check for exhaust leaks			
68	Check applicable steering modes (2 wheel, 4 wheel, crab)			
69	Verify the turning radius/tracking			

INSPECTION ACTIVITY	INSPECTOR NAME	DATE (MMDDYY)
	PRINT:	
	SIGNATURE:	

FIGURE 8-12. MHE Initial Receipt Inspection Form (Continued)

8-5.2. LUBRICATING OTHER COMPONENTS. Depending on the operating environments, other MHE components, such as cylinder rods, operating controls and load rollers need to be kept clean and may need lubrication at periodicities sooner than scheduled. Cylinder rods should be wiped down after each use, especially when units are operated or stored in the weather, and kept clean and lubricated in order to prevent the salt spray from causing the hard-chrome and nitro-steel (which appear dark in color) from pitting that could lead to leaking. This type of prevention will reduce maintenance costs and keep the deck/floor clean.

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 8-13](#). 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 8-14](#).

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.

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

USN: _____ - _____					
Manufacturer': _____ Model: _____ Year: _____ Serial Number: _____					
Contract Number: _____					
REQUIREMENT					
Each fork shall be inspected and documented in the MHE history file at intervals of not more 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 and Shank: (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/Latches 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: _____			Inspection Activity: _____		

SEE REVERSE SIDE FOR INSPECTION CRITERIA PROCEDURES

FIGURE 8-13. Fork Maintenance Inspection Form

[CLICK HERE TO REPRODUCE AND ANNOTATE THIS FORM](#)

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 and Shank. 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 by the fork manufacturer or their designated representative.
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 ($42 \text{ inches} \times 0.03 = 1.26 \text{ inches}$)]. 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. For non-folding forks, the shank is not subject to wear so it may serve as a reference for the fork’s original cross-section (thickness). For folding forks, the shank is always thicker than the blade. Therefore, do not use the shank thickness for calculating the required fork blade thickness measurement. Refer to the actual fork manufacturer’s markings, which normally is stamped on the side of the shank. 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 2.00×0.10 (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 8-15](#), the outer caliper’s points are set by gauging the shank’s thickness, [figure 8-15, 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 8-15, view B](#), the thickness has been worn by 10% or more from its original thickness, and the fork must be replaced. Refer to [table 8-1](#) for suggested sources of supply.
7. Positioning Locks/Latches and Stops (when originally provided). Verify that the positioning locks/Latches 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.

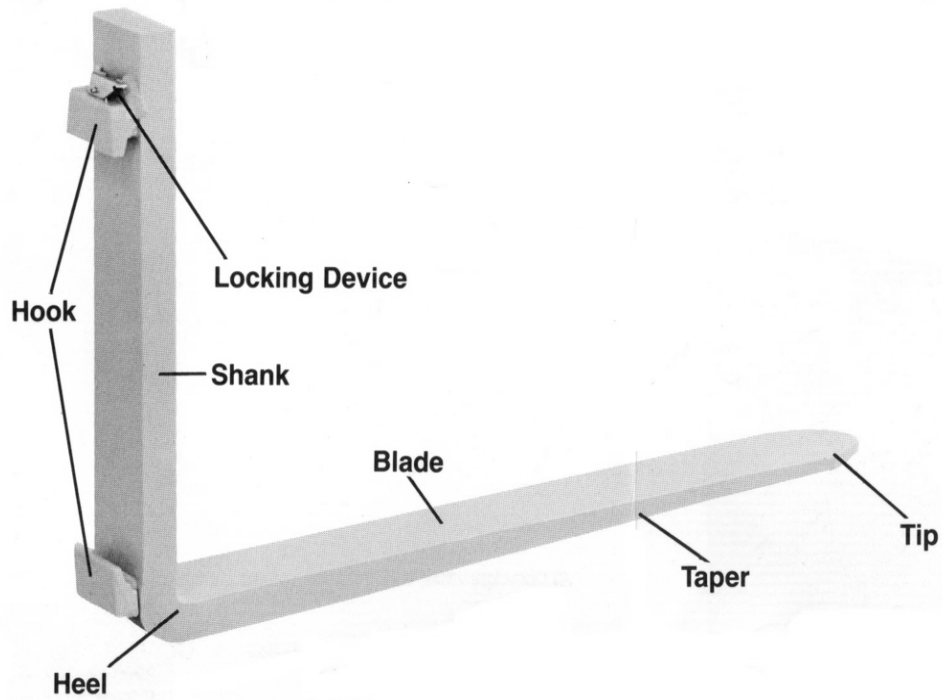


FIGURE 8-14. Fork Components

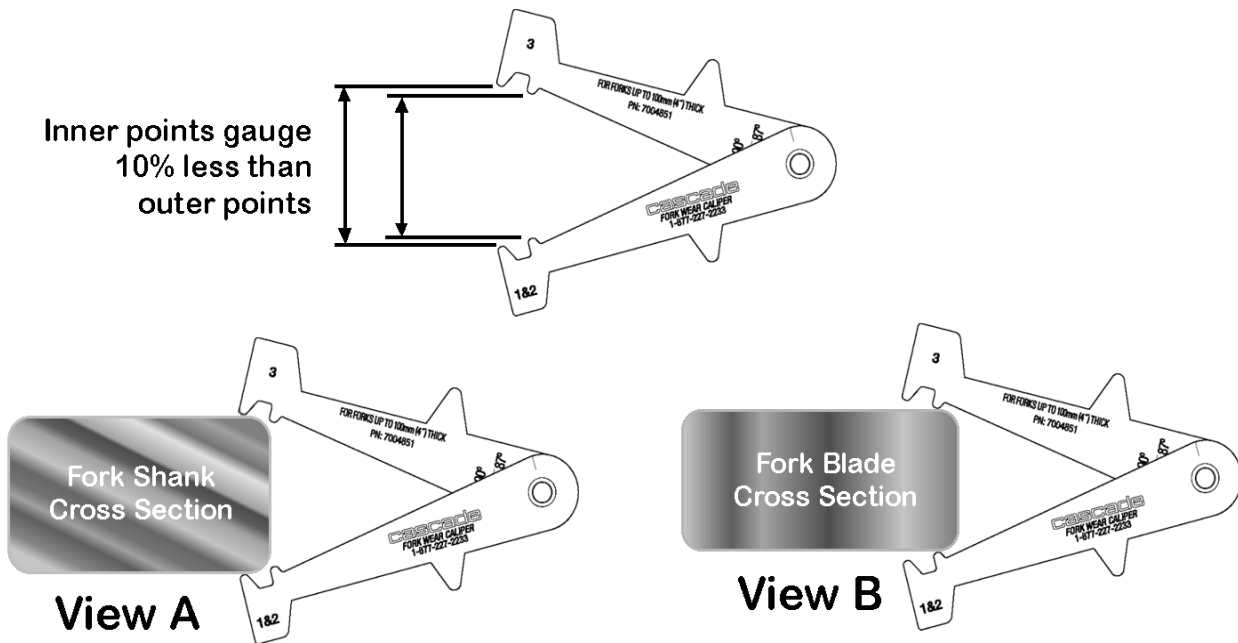


FIGURE 8-15. Fork Wear Caliper

Table 8-1. Fork Wear Caliper (Suggested Source of Supply)

Vendor	Product	Order No.	Phone No.	Internet
Iron Works, Inc.	Forks Inspection Kit	IWIFORKCAL	800-221-6572	IWISlaes@IWI-Ironworks.com

(When ordering from the vendor, please specify that you are with the "U.S. Navy".)

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. For ashore activities, when parts are replaced, an entry shall be recorded in the equipment history file and the respective maintenance data system (e.g., EMACS, hard copy procedures, or other maintenance data management systems) 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's name shall also be recorded.

c. For units afloat, when parts are replaced, an entry shall be recorded in the equipment history file as directed by [OPNAVINST 4790.4 \(series\)](#) 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's name shall also be recorded.

d. All repairs shall be performed in approved areas as required by [29 CFR 1910.178](#).

e. 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.

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.

8-7.4. OPERATIONAL WEIGHT TEST (ALL MOBILE CARGO CRANES). Whenever mobile cargo cranes have undergone repairs or modifications affecting any load-bearing component, an operational weight test (110% of the cargo crane's SWL) shall be performed in accordance with NSTM 9086-T4-STM-010/CH-589 (afloat) or NAVFAC P-307 (ashore) and recorded in the equipment history file. The mobile cargo crane shall be rejected under the provisions of the applicable governing document.

8-7.5. AERIAL WORK PLATFORM PERIODIC INSPECTIONS AND TESTS. As required by NAVFAC P-300, a condition inspection, a load test, and (when applicable) an electrical insulation test shall be performed on all aerial work platforms (boom-lift and scissor-lift) annually. Certification of these inspections and tests shall be the responsibility of the designated (in writing) activity certifying official who will certify the equipment safe and reliable for use. A copy of the certification shall be posted on the equipment, in full view of the operator, with the original certification form being filed in the equipment history file. A locally developed condition inspection, load test, and certification form shall be used. Refer to NAVFAC-300 for the specific load testing, electrical insulation testing and certification requirements for this equipment.

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. For a listing of applicable MIP's associated with each piece of MHE, refer to EMACS (ashore) or the Configuration Data Management Database - Open Architecture (CDMD-OA) (afloat).

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 8-2 (ashore) and 8-3 (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-

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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.
- b. The unit is beyond the maximum utilization years of economical use as shown in [tables 8-2](#) (ashore) and [8-3](#) (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 8-2. 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 8-3. 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. LEAD ACID BATTERY TYPES

9-2.1. **SERVICEABLE.** Has easily removable cell caps to allow the addition of distilled water. These are referred to as “Flooded or Wet” cell batteries. The electrolyte remains a liquid within the battery cell. Requires periodic replenishment of distilled water.

9-2.2. **MAINTENANCE FREE.** Do not have removable cell caps. There are two types of maintenance free batteries, absorbed glass mat (AGM) and gel.

a. AGM. Normally sealed, containing a pressure relief valve. Sometimes referred to as “Valve Regulated Lead Acid” (VRLA). Electrolyte is contained in the glass mat close to the cell plates. Does not sulfate as easily as the flooded type. Longest service life is achieved when recharged before battery drops below 50% of discharge rate.

b. Gel. Acid is “gelled” by the addition of silica gel, preventing electrolyte spill even when battery cell case is cracked. Requires special charging considerations (i.e., stand alone charger, battery indicative device (BID) which allows the charger to recognize requirements for alternate charge algorithm) as the recharge voltage per cell is much lower than either flooded or AGM types. May sustain permanent damage if incorrect charger is used.

9-3. APPLICATION

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

9-4. DEFINITIONS

9-4.1. **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.

9-4.2. BATTERY INDICATING DEVICE (BID). A solid state device attached to the battery allowing the programmable battery charger to select the correct charge algorithm for each battery type.

9-4.3. 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.

9-4.4. 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 percent 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.

9-4.5. 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.

9-4.6. 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.

9-4.7. 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.

9-4.8. 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.

9-4.9. 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.

9-4.10. 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.

9-4.11. 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.

9-4.12. **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.

9-4.13. **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.

9-4.14. **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.

9-4.15. **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.

9-4.16. **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).

9-4.17. **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.

9-4.18. **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.

9-5. BATTERY RECEIPT INSPECTION AND MAINTENANCE

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 9-6](#). 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 1/8 to 1/4 inches below the vent well.
 Low level is when electrolyte is below separator protector (i.e., if the separator protector is exposed to air).

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

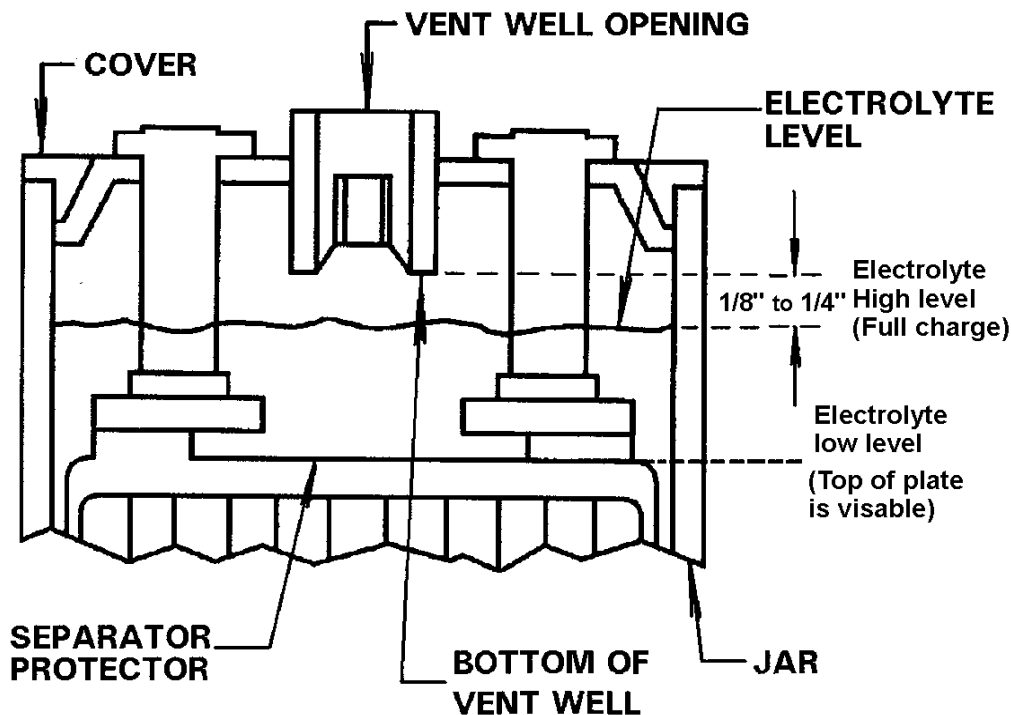


FIGURE 9-1. Electrolyte Level Indicators

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.

9-6. INSPECTION AND TESTING OF BATTERY LIFTING LUGS (ELECTRIC MHE ONLY)

9-6.1. **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 lifting lugs/eyes shall be tagged and removed from service. Any repairs to or replacement of existing battery lifting lugs/eyes shall be subjected to the test procedures shown in [paragraph 9-6.2](#).

9-6.2. **TEST PROCEDURES.** 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 approved to 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.

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.

Battery Record Form

TRUCK NUMBER:						BATTERY NUMBER:			
START OF CHARGE						END OF CHARGE			
(Start Time: _____)						(End Time: _____)			
Charger Number	Date	Specific Gravity	Temp	Hour Meter Reading	Operator's Initials	Date	Specific Gravity	Temp	Operator's Initial

FIGURE 9-2. Battery Record Form

- 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.

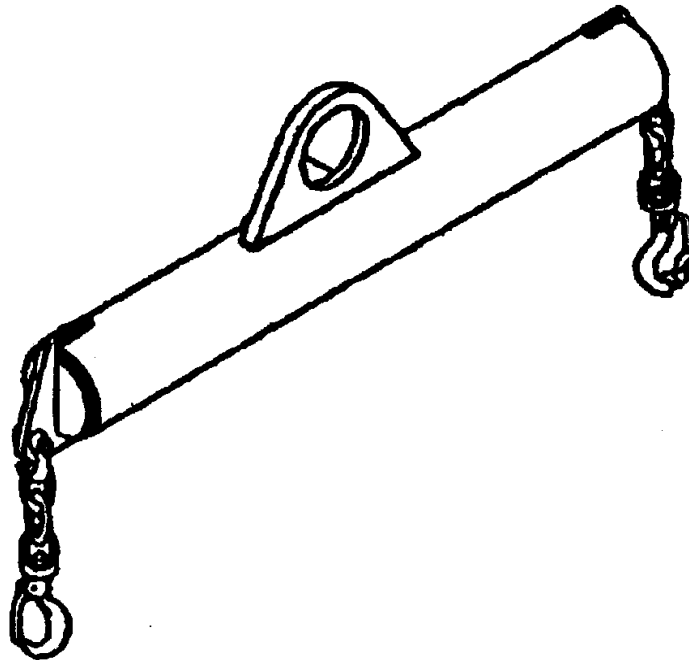


FIGURE 9-3. Mk 18 Mod 1 Handling Beam

9-6.3. 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.

9-7. 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 9-15](#).
- b. Ensure the battery compartment has drainage holes located in the floor. Remove any foreign matter that may be clogging the holes.

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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.

WARNING

Do not use the [Mk 18 Mod 1 Handling Beam](#) with batteries without lift tabs or those that do not allow full contact with the lift hook throat.

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 \(Code E4\)](#) 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 9-9](#) or an extended charge as described in [paragraph 9-10](#) depending on the type of charger.

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.

9-8. 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.

9-8.1. LOCATION. At least one specific area shall be designated in writing 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.

9-8.1.1. Ashore. In addition to the requirements of [paragraph 9-8.1](#), the following shall apply ashore:

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

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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.

9-8.1.2. Afloat. In addition to the requirements in [paragraph 9-8.1](#), units afloat shall refer to [NAVSEA OP 4](#) for other regulations concerning battery charging stations.

9-8.2. 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.

9-8.3. BATTERY CHARGING SAFETY PRECAUTIONS. The following precautions shall be observed 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 \(series\)](#), and must be accessible at all times.

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. Observe all “NO SMOKING” regulations. Smoking or other extraneous sources of ignition shall be prohibited in battery charging areas.

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- j. Personnel shall remove all jewelry (rings, watches, etc.) prior to servicing batteries.
- k. Do not attempt to charge a battery with loose, damaged or corroded terminals, which may result in causing excess heat, arcing or an explosion.
- l. Verify the battery is in the OFF position before connecting or disconnecting batteries.
- m. Battery lockers shall only be used for battery charging and battery stowage, and must be readily accessible by personnel.

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.

9-8.4. BATTERY CHARGING PROCEDURAL REQUIREMENTS. In addition to observing the safety precautions outlined in [paragraph 9-8.3](#), the following general procedural requirements shall be applied during the actual charging of batteries:

- a. If a battery is to be charged while still installed in the MHE, ensure that it is electrically disconnected from the MHE.
- b. Charge batteries immediately after discharging (providing cell temperature is less than stated below).
- c. 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 operations.

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d. Open battery's compartment cover to increase ventilation. This will accelerate the pre-charge cooling process. It shall remain open throughout the charging process.

e. Ensure the top of the battery is clean, dry and free of any materials that could cause ground shorts during charging.

f. 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.

g. Connect battery to charging apparatus and commence charging in accordance with [paragraph 9-8.6](#).

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.

h. 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 (± 0.005). Refer to the specific battery manufacturer's battery instruction manual for actual specific gravities. The actual specific gravity (at 100 percent 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.

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

j. Depending on the type of battery charger, when necessary, perform either an equalizing charge in accordance with [paragraph 9-9](#) or an extended charge (for most ships) in accordance with [paragraph 9-10](#).

- k. 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.

9-8.5. BATTERY MAINTAINER – HELPFUL TIPS. The following are helpful informational tips for personnel responsible for maintaining batteries:

- a. If possible, keep battery temperatures below 77 °F to achieve the longest battery life. Batteries operating at 100 °F will only last half as long as a battery operating at 77 °F.
- b. Serviceable batteries normally will be within 8 to 10 points from its original specific gravity reading. For example, when new, a battery's specific gravity will be 1.290. It will gradually be reduced to a specific gravity of 1.282 after repeated cycling. This is normal and indicates that a battery has been cycled, but is otherwise fully functional.
- c. Never add acid to a battery cell. This does not take into account the loss of electrolyte due to accident or overflow spillage.
- d. Use only distilled water when filling batteries.
- e. Never allow a battery to remain discharged for long periods.
- f. Unless a low level is detected, do not add distilled water to a battery prior to placing on charge.
- g. When adding distilled water to a fully charged battery, fill the cells to within 1/8 to 1/4 inches from the bottom of the vent well tube as shown in [figure 9-1](#).

CAUTION

Automatic battery filler has an adjustable nozzle that allows a precise shut off capability for watering batteries and must be properly adjusted when received to avoid overfilling.

- h. Batteries discharged greater than 80 percent capacity will require recharge times in excess of 8 hours. Continued battery discharging greater than 80 percent of the battery's capacity will result in a reduce life and cell damage.
- i. Battery cells with specific gravities of 1.240 and below should be placed on either an equalizing charge ([paragraph 9-9](#)) or an extended charge ([paragraph 9-10](#)) depending on the type of charger for the recommended time to maintain full readiness capability.

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j. Battery cells with specific gravities greater than 1.240 but less than full charge should be placed on either an equalizing charge ([paragraph 9-9](#)) or an extended charge ([paragraph 9-10](#)) depending on the type of charger once every week.

k. One complete battery cycle is a discharge to 80 percent with a subsequent recharge to full capacity. A discharge to 40 percent capacity with subsequent recharge is considered half a battery cycle. The average forklift truck battery life is 1,500 cycles.

l. Causes for low specific gravity readings are:

- (1) The battery is old or nearing the end of its life cycle.
- (2) The battery was left in a discharged state for too long.
- (3) Electrolyte was lost due to spillage.
- (4) A weak or bad cell is developing.
- (5) The battery was over-watered prior to testing.
- (6) The battery did not receive a complete charge.
- (7) The battery charger is not functioning correctly.

m. Causes for excessive water use are:

- (1) The battery was left on charge or extended charge too long.
- (2) The battery temperature is too high at the beginning or at the end of charge.
- (3) The battery is nearing the end of usable life.

9-8.6. BATTERY CHARGING PROCEDURES. After observing the safety precautions addressed in [paragraph 9-8.3](#) and the procedural requirements identified in [paragraph 9-8.4](#), this paragraph describes the actual charging procedures that shall be undertaken whenever a lead-acid battery's specific gravity falls below 1.240. [Table 9-1](#) lists the required tools, materials and test equipment in support of safely charging these batteries. It also contains the applicable Standard PMS Item Name (SPIN) and National Stock Number (NSN).

CAUTION

Do not use these procedures for gel or absorbed glass mat type batteries.

- a. Set the parking brake and remove the ignition key.
- b. If equipped, turn the master battery disconnect switch to the OFF position.

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- c. Attach a “DO NOT OPERATE” tag ([figure 8-6](#)) on the MHE.
- d. Disconnect the battery power cables at the connectors.
- e. Loosen and remove the retaining bolts of the battery cover and raise cover.

CAUTION

Do not disconnect the battery by pulling on the cable.

f. Grasp the receptacle and disconnect the battery connector. Visually ensure the contacts are clean, bright (no carbon, grease, dirt, etc.) and flat. If contacts are dirty or pitted, proceed with [paragraph g](#). If contacts are acceptable, proceed with [paragraph h](#).

g. With a crocus (abrasive) cloth and using light pressure, polish the contact surfaces. Using a clean rag lightly moistened with a cleaning solvent and remove any residue from the contact surfaces.

NOTE

Do not substitute sandpaper or steel wool for crocus cloth.

- h. Open the battery box cover and remove the battery fill/vent caps.

NOTE

Battery cover will remain open or slightly open during charging to prevent the pooling of explosive hydrogen gases.

i. Inspect battery cables for loose, damaged or corroded terminal posts, damage to the cable insulation, and clogging or debris of the battery vent/top. Clean or repair terminals and insulation, as required. Clean the vent/fill caps, as required, by submerging in water. Then using low-pressure air, blow out any debris from the underside of the cap.

NOTE

When taking the specific gravity and temperature readings of the cells, a hydrometer or a refractometer are two acceptable pieces of test equipment. Follow [paragraph j](#) procedures when using a hydrometer or follow [paragraph k](#) when using a refractometer. Then continue with [paragraph l](#).

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Table 9-1. List of Battery Charging Tools, Materials and Test Equipment

Tools	SPIN	NSN
Battery Filler, Gravity	00116	6140-00-752-2184
Battery, Filler, Syringe	02794	6140-00-808-7325
Wrench Set, Socket, 1/2" Sq Drive, 7/16" to 1-1/4", 20 PC	01269	5120-00-081-2307
Flashlight, Type 3, Style 1, Explosive Proof	02271	6230-00-229-3035
Materials	SPIN	NSN
Measure, Liquid	00880	7240-00-138-7984
Rag, Wiping	01102	7920-00-205-1711
Sodium Bicarbonate, Technical, O-S-576 (see note 1)	01297	6810-00-264-6618
Distilled-Deionized Water	01701	6810-00-682-6867
Dry Cleaning Solvent, PD-680, Type III (see note 2)	02283	6850-01-377-1808
Gloves, Disposable	02826	8415-01-447-8212
Cloth, Abrasive, P-C-458 (crocus cloth)	03685	5350-00-221-0872
Marker Assortment, Tube Type	09550	7520-01-207-4169
Test Equipment	SPIN	NSN
Multimeter, Digital, 4-1/2 Digits, SCAT 4212	00904	6625-01-443-9922
Miscellaneous Items	SPIN	NSN
Apron, Toxicological Agents Protective, Small	00067	8415-00-281-7815
Hydrometer Tester, Battery Electrolyte Solution, S.G. 1.130 to 1.310	01373	6630-00-171-5157
Refractometer Tester, Battery Electrolyte Solution, S.G. 1.130 to 1.310 (alternate)	03593	6630-00-105-1418
Goggles, Industrial, Not Vented	03707	4240-01-169-9070
Low Pressure Air	09449	Work Center Provided

NOTES:

1. For proper disposal, refer to Hazardous Material User's Guide (HMUG) Group 3, Disposal Method 3.
2. For proper disposal, refer to Hazardous Material User's Guide (HMUG) Group 15, Disposal Method 1.

j. When using a hydrometer, take the specific gravity and temperature readings of the end cells and of a middle cell (figure 9-4). Omit any battery cells that have low distilled water levels (refer to paragraph l).

NOTE

Testing just the positive and negative end cells (where the cable originates) and a middle cell can be used as an indicator of the overall condition of the battery.

NOTE

Ensure electrolyte tester is clean to prevent erroneous readings.

- (1) Draw electrolyte into hydrometer until the float is suspended freely and is free of air bubbles (figure 9-4).
- (2) Read the scale on the hydrometer stem, where the upper portion of the electrolyte makes contact. Void the electrolyte into the same cell. Annotate the readings for reference. Continue for both end cells and for a middle cell.

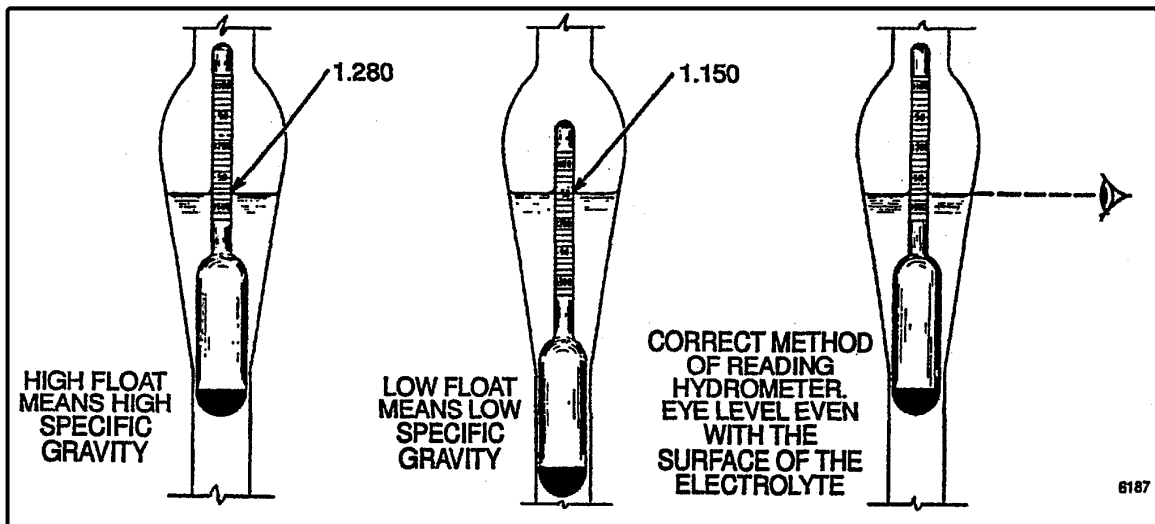


FIGURE 9-4. Reading the Hydrometer

NOTE

The actual specific gravity (at 100 percent charge) and 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 identification plate of the MHE [voltage may be determined by counting the number of battery cells (fill caps) and multiplying that number by 2]. Depending on the battery manufacturer, the specific gravity of a fully charged battery varies between 1.285 to 1.315.

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(3) Verify the temperature indicated on the thermometer. Readings below 1.240 corrected to 77 °F (refer to [table 9-1](#)) shall be charged as follows:

NOTE

As a general rule for electrolyte temperature correction, for every 10 degrees above 77 °F, add three points to the specific gravity (e.g., 1.240 at 87 °F is actually 1.243). Conversely, for every 10 degrees below 77 °F, subtract 3 points from the specific gravity. This method applies to the temperature of the electrolyte and not ambient air temperature.

k. When using a refractometer, take the specific gravity and temperature readings of the end cells and of a middle cell. Omit any battery cells that have low distilled water levels (refer to [paragraph l](#)).

CAUTION

Do not use the plastic coolant tester tube when sampling battery electrolyte, which may damage the instrument.

(1) Remove the dipstick located on the tester, dip it into the battery cell while under test, and place a few drops on the measuring prism. Close the sample cover pointing the tester toward a light source and read the battery scale.

(2) Swing back the plastic sample cover located at the slanted end of the instrument to expose the measuring prism and wipe both clean using a clean, soft cloth.

(3) Repeat [paragraph \(1\)](#) and [\(2\)](#) above for each cell under test.

(4) Clean and dry measuring prism and sample cover using distilled water and a soft, clean cloth between each use and before returning to storage.

CAUTION

Do not overfill cells with distilled water because levels will rise during charging spilling the electrolyte. For battery cells with low levels, use the battery filler syringe only and not the automatic (2 quart) battery filler for filling to prevent overfilling prior to charging.

l. Check all cells for low water levels. Add only enough distilled water to just cover the cell plates/protector (see [figure 9-1](#)). Do not overfill.

m. Replace battery fill/vent caps.

NOTE

The temperatures and charging times prescribed in these maintenance procedures are provided to maintain the battery's optimum life and serviceability. They do not take into consideration fleet operational or high use requirements that may demand operations outside of this range, which will reduce the battery's service life.

WARNING

Verify the battery charger is in the OFF position before connecting or disconnecting batteries.

CAUTION

Operational requirements may dictate temperatures exceeding 90 °F during charging. Do not allow battery temperatures to exceed 115 °F during charging, which will reduce its service life. Allow as much "cooling off" time as operationally possible before and after battery charging.

- n. Verify that all charger indicators are not illuminated and connect the battery charger to the battery.
- o. Select the correct amperage on the charger for the battery under charge and select the correct voltage (if so equipped, Type IV charger).

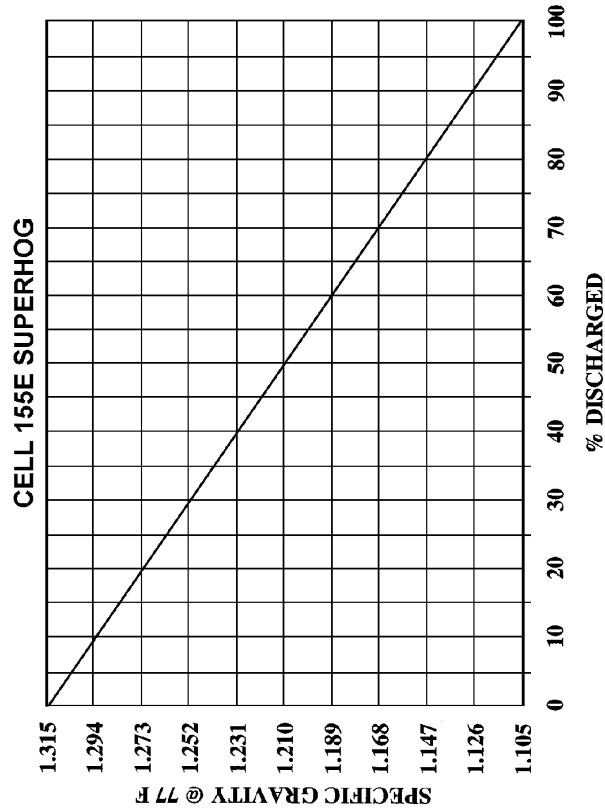
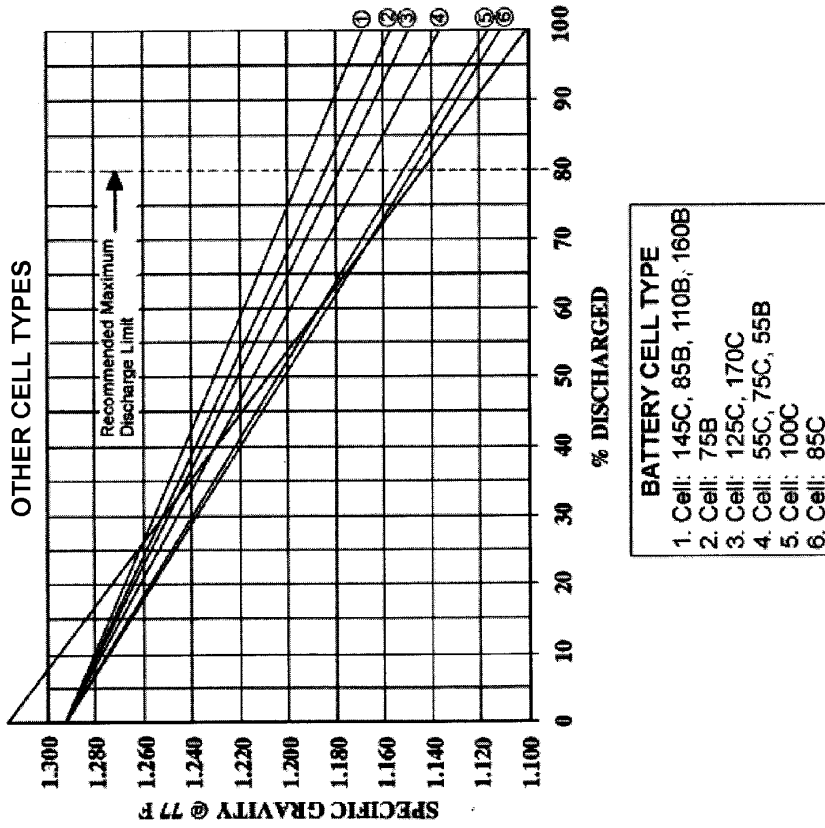
NOTE

Batteries used in the Raymond Corp. reach and tier forklift trucks are all 24 volts and use the 210 amp charger setting, if equipped with adjustable settings.

WARNING

Fluctuating dial readings, readings that are full scale, smoke or violent gassing may indicate a shorted battery cell or incorrect connection. Turn the charger immediately to the OFF position and recheck the connections and settings.

SPECIFIC GRAVITY VS. PERCENT DISCHARGED



Recharge Times	
Battery Discharge (%)	Charge Time (hours)
25	3
50	6
over 50	8

NOTE: This chart applies only to shipboard chargers manufactured under DOD-C-24529 (e.g., Christie, Good-All, Sierra, Trilectron)

FIGURE 9-5. Battery Discharge Charts

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p. Turn the charger to the ON position and monitor the voltage and amperage gauges, which should indicate a steady value.

NOTE

Shipboard battery chargers are calibrated to take a battery that has been discharged 80 percent and bring to a full charge in 8 hours. Batteries may be left on charge longer than 8 hours without battery damage, due to the charger design to reduce hydrogen gas generation in poorly vented spaces. The battery will not become excessively overcharged, but electrolyte levels must be monitored. Allow a maximum cool-down time between charging and use, especially in hot environments.

q. Use the initial battery's specific gravity reading and compare it to the applicable specific gravity charts in [figure 9-5](#) for that particular cell type to determine the approximate amount of battery discharge. (Example: If the initial battery reading is 1.210 and using [figure 9-5](#) for a battery with a specific gravity of 1.315, then the 1.210 specific gravity intersects the discharge line at approximately 50 percent discharge state. Since the battery is not discharged to 80 percent, it would not require the full 8-hour charge.)

NOTE

When determining the charge time for a battery, refer to [figure 9-5](#) and estimate the recharge time by rounding up to the nearest 1/2 to 1 hour.

r. When operational requirements permit, take the specific gravity readings and temperature for all cells prior to shutting off the charger to ensure a full charge. Inspect the cell for low electrolyte levels. If the battery is fully charged, add distilled water to 1/8 to 1/4 inch from the bottom of the vent wall opening ([figure 9-1](#)). If the readings are not up to full charge, continue charging based on the specific gravity using [figure 9-5](#). (Example: If the battery's specific gravity is 1.260 and using [figure 9-5](#) for batteries with a specific gravity of 1.315, then the battery is still approximately 25 percent discharged.) When placing it back on charge, ensure the electrolyte levels for all cells are above the battery separator/plates.

NOTE

Batteries or cells that do not rise above the specific gravity of 1.260, even with continued charging, should have the end of life cycle testing performed in accordance with [paragraph 9-11](#).

NOTE

Do not add distilled water to a battery cell that is not at full charge, unless a low level is indicated, as the cell is not finished charging and the acid will continue to be expelled from the positive plate.

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s. Batteries that are fully charged, but have low electrolyte levels, shall have distilled water added to the maximum level (1/8 to 1/4 inch below the bottom of the fill tube as shown in [figure 9-1](#)) and allowed to charge for an additional 1 hour to allow the distilled water to mix prior to shutting down the charger. Ensure to inspect a middle battery cell for acceptable temperature readings (less than 115 °F) before continuing further charging.

t. Secure the battery fill/vent caps.

NOTE

Do not return a battery for use with an internal temperature of more than 90 °F. Allow for it to cool down, unless operational or mission need dictate its continued use.

CAUTION

Ensure the battery vent/fill caps are in place before using acid neutralizing solution to prevent damage to the cells.

u. Wipe any moisture or electrolyte residue from the top of the battery using a clean rag dampened with neutralizing solution, followed by drying it with a clean rag. To make acid neutralization solution, add 1 pound of bicarbonate soda to 1 gallon of distilled water then mix thoroughly.

v. Close the battery cover and secure hold-down bolts.

w. Connect the battery connector cables to the forklift truck and return it to readiness condition.

9-9. EQUALIZING CHARGE

An equalizing charge can be accomplished by all shore activities and only a few of the newly constructed (CVN or amphibious) ships. Ships that do not have this capability shall perform an extended charge in accordance with [paragraph 9-10](#).

9-9.1. 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.

9-9.1.1. 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. These fully, automated charging systems are capable of performing equalizing charges prescribed in this paragraph.

9-9.1.2. 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 as described in [paragraph 9-10](#).

9-9.2. 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.

9-9.3. 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. Depending on the type of battery cells, the graphs shown in [figure 9-5](#) provide the percentage of battery discharge based on electrolyte specific gravity. These graphs can be used as a general guide, but charts provided by individual battery manufacturers should be used when available.

9-10. EXTENDED CHARGE

For ships that do not have the capability to perform an equalizing charge described in [paragraph 9-9](#), the following extended charge procedures are required to increase the cell capacity of lead-acid forklift truck batteries. An extended charge may be performed anytime a battery (or all battery cells) is not a full capacity, but not more than once a week. The battery may have been previously charged but did not come up to full charge, or may have been partially discharged with a specific gravity of 1.240 or greater.

CAUTION

Do not overfill battery cells with distilled water because the levels will rise during charging spilling the electrolyte.

a. Remove the vent/fill caps. Inspect the cells for low levels (cell separator or plates exposed). Fill the low level cells with enough distilled water to cover the cell plates or separator ([figure 9-1](#)).

NOTE

Pilot cells, which are cells that the battery maintainer monitors each time the battery is charged due to higher temperatures or because of lower specific gravity readings, may be marked for future reference by a paint dot or grease pencil.

b. Take the specific gravity and temperature readings for the two end cells and a middle cell (marked pilot cells may be used). Record these readings on the battery record form ([figure 9-2](#)).

c. Using the specific gravity charts for the applicable cell type identified in [figure 9-5](#), determine the approximate battery recharge time.

WARNING

Do not attempt to charge a battery with loose, damaged or corroded terminals.

CAUTION

Do not place a battery on a charger when the cell temperature is 90 °F or greater. Allow the battery to cool.

d. Replace the vent/fill caps. Select the proper current and voltage required for the battery. Turn the charger to the ON position.

NOTE

Damaged or battery cells at the end of their life may not be capable of reaching 100 percent charge or the required specific gravity. Refer to the end of life cycle testing requirements ([paragraph 9-11](#)) to schedule for repairing or replacing batteries.

e. At the conclusion of the specified recharge time, take the specific gravity readings for the three marked cells (pilot or ends and middle cells). If the specific gravity has increased, but is still not at 100 percent charge, continue charging the battery for an additional 3 hours or until the specific gravity no longer increases any further. If the temperature reaches 115 °F, then the battery should be allowed to cool prior to continuing.

NOTE

The battery record form, [figure 9-2](#), may be used for tracking the battery's longevity and system performance (charger, battery condition and maintenance). Locally derived forms or electronic tracking methods may be used, provided they meet the minimum requirements of the battery record form, [figure 9-2](#).

f. When the specific gravity readings no longer increase while being charged, take a final specific gravity and temperature reading, record them in the battery record form, [figure 9-2](#), or equivalent for future reference. [Figure 9-6](#) identifies the correct battery cell sequence for recording purposes.

NOTE

Numbering sequence for battery cells in series starting at the positive battery terminal.

NOTE

If used semi-annually for new batteries or quarterly for in-service batteries, the battery record form, [figure 9-2](#), will assist the battery maintainer and mechanic prevent equipment downtime and will assist in maintaining full operational equipment capability.

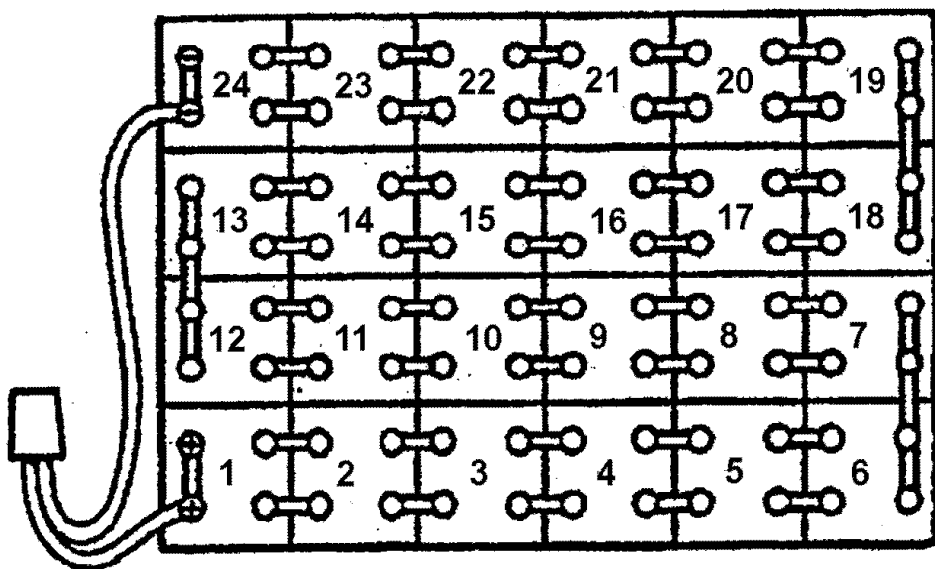


FIGURE 9-6. Battery Cell Sequence (48 Volt Battery Shown)

- g. Fill the cell with distilled water to within 1/8 to 1/4 inch of the vent well opening, [figure 9-1](#), and replace the fill/vent caps.
- h. Allow the distilled water to mix on the charger for 1/2 to 1 hour depending on the agitation of gassing. Excessive gassing for an extended period of time can lead to fluid loss.
- i. Turn the charger to the OFF position and allow the battery to remain idle for 8 hours (when possible) prior to returning it back to service.

9-11. END OF LIFE CYCLE TEST

The following test procedures are required for all lead-acid batteries having a specific gravity of less than 1.260 (or with no further increase in specific gravity following an equalizing charge or extended charge) to confirm that they have reached the end of their life cycle and should be scheduled for replacement.

- a. Perform the battery charging procedures documented in [paragraph 9-8](#), followed by either an equalizing charge described in [paragraph 9-9](#) or an extended charge as prescribed in [paragraph 9-10](#) depending on the type of charger.

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b. Allow the battery to rest, open circuit (but do not connect the battery coupler to the forklift truck even with all power off) for a minimum of 8 hours.

CAUTION

Do not short meter probes across the battery connector terminals to prevent damage to the meter.

c. Using a multimeter, measure the voltage at the battery connectors. Based on 2.08 volts in each cell, batteries that do not meet the below minimum volts (80 percent) should be scheduled for testing and possible replacement.

(1) For 12 cell battery (24 volts) – 24.96 volts (minimum)

(2) For 18 cell battery (36 volts) – 37.44 volts (minimum)

d. Battery cells that contain foreign particles or substances, are cloudy or brown in color have sustained damage and should be scheduled for replacement during the next scheduled availability.

NOTE

Battery cells can be replaced restoring them to their original capacity. However, allowing a damaged cell to remain can cause damage to the adjoining cells and render an otherwise repairable battery unserviceable. Contact the FISC Regional Manager or TYCOM representative to evaluate the economics of repairing or replacing the battery.

9-12. 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.

9-13. 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.

9-13.1. 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 excess gassing.
- b. Charging rate exceeds the rate on the battery nameplate, resulting in excess gassing.
- c. One cell shorted out.

9-13.2. 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.

9-13.3. 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 1/8 to 1/4 inches below the 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.

9-14. ACID REPLACEMENT AND SPECIFIC GRAVITY ADJUSTMENT

9-14.1. 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 may be replaced. The only way to tell that there is not enough sulfuric acid in a battery is when the battery is 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 increase the specific gravity to an acceptable level is to add sulfuric acid.

WARNING

Do not add acid to an aging cell in an attempt to increase its capacity. Decreased service life will result.

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.

9-14.2. 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 9-9](#). 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 9-2](#).

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 (1/8 to 1/4 inches below bottom of the 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.

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).

Table 9-2. 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		

9-15. 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.

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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.

9-16. 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.

9-17. 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.

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- 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.

9-18. BATTERY REPLACEMENT

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

9-18.1. **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 9-18.2](#).

9-18.2. **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 8341, P.O. Box 2020, Mechanicsburg, PA 17055-0788. ■

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CHAPTER 10

REPAIR TIME STANDARDS

Section 1 - Introduction

10-1. PURPOSE

NOTE

At the present time, an Equipment Cost Code (ECC) has not been established for the diesel conveyor belt vehicles. Therefore, the information contained in this chapter is not applicable.

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.

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 8341, 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	1200	Crane Truck, Diesel/Gas, PRT (Up to 30,000 pounds)
	1205	Crane Truck, LPG, PRT (Up to 30,000 pounds)
	1210	Crane Truck, Gas SRT, SRT (Up to 30,000 pounds)
5	1220	Crane Truck, Electric, SRT (Up to 30,000 pounds)
6	1230	Crane Truck, Electric, Spark Enclosed, SRT (Up to 30,000 pounds)
7	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)
8	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)
9	1360	Truck, Lift, Fork, Electric, SRT (All Capacities)

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

Section	Code	Equipment
10	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)
11	1380	Truck, Lift, Fork, Electric Explosion Proof, PRT (All Capacities)
12	1390	Truck, Lift, Fork, Tiering, Straddle and Reach Type, Electric
	1395	Truck, Lift, Fork, Tiering, Stockpicker, Electric
13	1396	Aerial Work Platform, Shipboard, Diesel (All Capacities)
14	1400	Truck, Fixed Platform, Gas, PRT
15	1410	Truck, Fixed Platform, Electric, PRT
16	1420	Truck, Aerial Platform, Electric, SRT
17	1430	Truck, Aerial Platform, Gas, PRT
	1440	Truck, Aerial Platform, Gas, PRT
18	1500	Truck, Straddle-Carry, Gas or Diesel, PRT (Up to and including 60,000 pounds)
19	1600	Truck, Hand, Lift, Pallet, Electric, SRT (All Capacities)
	1610	Truck, Hand, Lift, Pallet, Electric, Spark Enclosed, SRT (All Capacities)
20	1820	Truck, Lift, Fork, Rough Terrain, Diesel, PRT (All Capacities)
	1823	Truck, Lift, Fork, Rough Terrain, 463L, Diesel, PRT (All Capacities)
21	1860	Truck, Sideloader, Diesel, PRT (Up to and including 10,000 pounds)
	1870	Truck, Sideloader, Diesel, PRT (Over 10,000 pounds)
22	1880	Truck, Sideloader, Electric (All Capacities)
23	1900	Truck, Hand, Lift, Pallet, Manual (All Capacities)
24	1433	463L K-Loader, Aerial Platform With Rollers, Gas or Diesel, PRT (All Capacities)
25	1903	463L Trailer With Rollers (All Capacities)

NOTE

No general repair time standards have been established for ECC #1396 in section 13, 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 . . . . .	.2	D	Floor Plates, Front - R & R . . . . .	.3
B	Hood Assembly - R & R . . . . .	.2	E	Floor Plates, Rear - R & R . . . . .	.4
C	Side Panels . . . . .	.3	F	Dash Panel and Frame - R & R . . . . .	.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 . . . . .	.68
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

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

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 1200-1210

**CRANE TRUCK, GAS/DIESEL/LP, PRT/SRT
(UP TO 30,000 POUNDS)**

REPAIR CODES

- 01 – Engine
- 02 – Clutch
- 03 – Fuel
- 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
- 16 – Tires
- 18 – Hood - Fenders and Body
- 37 – Battery
- 62 – Cable System
- 85 – Hoist and Winch Assemblies

BASIC STANDARDS – EC Codes 1200-1210

	Standard Time		Standard Time
A	Seat and Hood Cover	C-1	Block up Crane for Rear End
B	Side Plates, R or L - R & R	D	Support Boom Structure
C	Block up Crane - Regular		

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	2.5
01-4	Engine - Dynamometer Test	2.2
01-5	Engine - Head and/or gasket - R & R	1.3
01-6	Engine - R & R	4.2
01-7	Engine - Reassemble	8.6
01-8	Engine - Tappets - Adjust	2.6
01-9	Engine - Tune-up	1.2
01-10	Engine - Valve Springs - R & R	2.3
01-11	Oil Gauge - R & R . . . . .	.3

Clutch - Repair Code 02

Operation	Description	Time
02-1	Clutch - Adjust . . . . .	.4
02-2	Clutch - Facing - Reline . . . . .	.3
02-3	Clutch - Pressure Plate - Facing and/or Release Bearing - R & R	1.9
02-4	Clutch - Pressure Plate - Overhaul . . . . .	.7
02-5	Flywheel - R & R	2.0
02-6	Ring Gear on Flywheel - R & R . . . . .	.2

Fuel System - Repair Code 03

Operation	Description	Time
03-1	Air Filter - Clean - R & R . . . . .	.3
03-2	Carburetor - Governor - Adjust . . . . .	.3
03-3	Carburetor - Overhaul . . . . .	.6
03-4	Carburetor - R & R . . . . .	.5
03-5	Fuel Gauge - R & R . . . . .	.2
03-6	Fuel Pump - Overhaul . . . . .	.6
03-7	Fuel Pump - R & R . . . . .	.5
03-8	Gas Filter - Clean - R & R . . . . .	.3
03-9	Gas Tank - R & R . . . . .	.5

Exhaust System - Repair Code 04

Operation	Description	Time
04-1	Exhaust Pipe and/or Gasket - R & R . . . . .	.6
04-2	Heat Control Thermostat - R & R	1.0
04-3	Intake and Exhaust Section Gasket - R & R	1.3
04-4	Manifold and/or Gasket - R & R	1.2
04-5	Muffler - R & R . . . . .	.4

Cooling System - Repair Code 05

Operation	Description	Time
05-1	Fan - Pump to Generator Belt - R & R . . . . .	.4
05-2	Fan Belt - Adjust . . . . .	.5
05-3	Fan Belt - R & R . . . . .	.6
05-4	Fan Blade - R & R . . . . .	.7
05-5	Fan Blade Bearings - R & R	2.0
05-6	Head Water Outlet Gasket - R & R . . . . .	.6
05-7	Radiator - R & R	1.3
05-8	Radiator Hose - Lower - R & R . . . . .	.5
05-9	Radiator Hose - Upper - R & R . . . . .	.5
05-10	Radiator Hoses - Upper and Lower - R & R . . . . .	.7
05-11	Radiator or Engine Drain Cock - R & R . . . . .	.1
05-12	Temperature Gauge - R & R . . . . .	.3
05-13	Water Pump - Overhaul . . . . .	.7
05-14	Water Pump - R & R . . . . .	.8
05-15	Cooling System - Flush	1.0

Electric System - Repair Code 06

Operation	Description	Time
06-1	Ammeter - R & R . . . . .	.3
06-2	Coil - R & R . . . . .	.4
06-3	Dash Panel - Rewire	1.4
06-4	Distributor - Overhaul . . . . .	.6
06-5	Distributor - R & R . . . . .	.4
06-6	Generator - Adjust . . . . .	.4
06-7	Generator - R & R . . . . .	.5
06-8	Horn - R & R . . . . .	.2
06-9	Horn Button - R & R . . . . .	.2
06-10	Horn Wire to Button - R & R . . . . .	.2
06-11	Ignition Switch - R & R . . . . .	.3
06-12	Lights (Head, Rear, or Stop) R & R . . . . .	.2
06-13	Light Switch - R & R . . . . .	.3
06-14	Spark Plugs - R & R . . . . .	.3
06-15	Spark Plug Wires - R & R . . . . .	.5
06-16	Starter Cable - R & R . . . . .	.4
06-17	Starter Motor - R & R . . . . .	.6
06-18	Starter Switch - R & R . . . . .	.3
06-19	Starter Switch Cable to Battery - R & R . . . . .	.2
06-20	Voltage Regulator - Adjust - Service3
06-21	Voltage Regulator - R & R4
06-22	Hour Meter - R & R3

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TIME STANDARDS (Continued)

Transmission System - Repair Code 07

Operation	Description	Time
07-1	Transmission - Overhaul	3.5
07-2	Transmission - R & R	1.7
07-3	Transmission - Service and Inspect (out-of unit)	1.6

Automatic Transmission

Operation	Description	Time
07-4	Automatic Transmission - R & R	3.7
07-5	Automatic Transmission Oil Pump R & R add Automatic Transmission R & R for Front pump	1.8
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 Joint - Repair Code 09

Operation	Description	Time
09-1	Universal Joint - Propeller Shaft - Overhaul	.2
09-2	Universal Joint - Propeller Shaft - R & R	.5

Rear Axle and Differential - Repair Code 11

Operation	Description	Time
11-1	Differential - Overhaul	2.9
11-2	Differential - Ring and Pinion Gear (out-of unit) R & R	1.0
11-3	Differential Assembly - R & R	2.2
11-4	Drive Axle - Inspect - Service - Overhaul (out-of-unit) (Both Axles)	1.6
11-5	Drive Axle - R & R (Both Sides)	3.6
11-6	Drive Wheels - Bearings and Grease Seals (Both Wheels)	.8
11-7	Drive Wheels - R & R (Both Wheels)	2.7
11-8	Internal Final Drive Gear - R & R (Per Wheel)	2.4

Brakes - Repair Code 12

Operation	Description	Time
12-1	Brakes - Major Adjustment	1.0
12-2	Brakes - Minor Adjustment	.5
12-3	Brake Cylinder - Overhaul (Per Cylinder)	.4
12-4	Brake Cylinder - R & R	1.0
12-5	Brake Drum - R & R	1.8
12-6	Brake Line - Center - R & R	.3
12-7	Brake Line - (R or L) R & R	.3
12-8	Brake Lines - Bleed	.3
12-9	Brake Pedal - Adjustment	.1
12-10	Brake Shoes - R & R	1.4
12-11	Brake Shoes - Reline (Per Set (Two))	.3
12-12	Brake Shoes - Reline - Bonded (Per Set)	.1

Brakes - Repair Code 12 (Continued)

Operation	Description	Time
12-13	Hand Brake - Adjustment	.2
12-14	Master Cylinder - Overhaul (Per Cylinder)	.4
12-15	Master Cylinder - R & R	.4

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

Operation	Description	Time
13-1	Steer Axle Box Assembly - R & R	1.0
13-2	Steer Column and Case - Overhaul	.7
13-3	Steer Column and Case - R & R	.7
13-4	Steer Shaft - R & R	.3
13-5	Steer Shaft Universal Joints - R & R	.2
13-6	Steer Wheel - Bearings and Seals - Check and Service (Both Wheels)	.6
13-7	Steer Wheels - R & R - Pneumatic or Solid (Both Wheels)	.8
13-8	Steer Worn and Gear Assembly - R & R	1.5
13-9	Vertical Spindle - R & R	1.8

Power Steering

Operation	Description	Time
13-10	Cylinder, Steering, Air Booster - R & R	.8
13-11	Valve Assembly, Control - R & R	.5
13-12	Valve, Relief - R & R	.3
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	Tire - Drive Wheels - Pneumatic - Dual Type (Inner) (Per Tire)	1.2
16-2	Tire - Drive Wheels - Pneumatic - Dual Type (Outer) (Per Tire)	.9
16-3	Tire - Drive Wheels - Retire - Solid (Both Wheels)	1.3
16-4	Tire - Steer Wheels - Pneumatic - Single Type (Per Tire)	.8
16-5	Tire - Steer Wheels - Solid (Both Wheels)	1.3

Hood - Fenders and Body - Repair Code 18

Operation	Description	Time
18-1	Dash Panel Cover - R & R	.6
18-2	Fenders (R or L) - R & R (Per Fender)	.3
18-3	Radiator Support (R or L) - R & R (Both Sides)	.8
18-4	Seat and Hood Cover Assembly - R & R	.4
18-5	Side Plates (R or L) - R & R	.1

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TIME STANDARDS (Continued)

Brakes - Repair Code 37

Operation	Description	Time
37-1	Battery - R & R . . . . .	.3
37-2	Battery Ground Cable - R & R . . . . .	.3

Cable System - Repair Code 62

Operation	Description	Time
62-1	Boom Extension - Extend or Reduce . . . . .	.7
62-2	Boom Hinge Pins - R & R (Both Pins) . . . . .	.6
62-3	Boom Hoist and Hook Cable - R & R	2.4
62-4	Boom Limit Control - Adjust . . . . .	.1
62-5	Boom Structure - R & R	1.0
62-6	Boom Topping Cable - R & R	2.4
62-7	Load Block - Overhaul . . . . .	.6
62-8	Load Block R & R . . . . .	.7
62-9	Mast Assembly - R & R	3.8
62-10	Sheaves - Rebush . . . . .	.5
62-11	Sheave and/or Sheave Pins - R & R . . . . .	.5
62-12	Topping Yoke Cover - R & R . . . . .	.1
62-13	Yoke - Sheave Topping - R & R	1.0

Hoist and Winch Assemblies - Repair Code 85

Operation	Description	Time
85-1	Boom Hoist Unit Drive - Overhaul	3.0
85-2	Boom Hoist Unit Drive - R & R	5.9
85-3	Boom Topping Unit Drive - Overhaul	3.0
85-4	Boom Topping Unit Drive - R & R	8.2
85-5	Brake - Topping - Adjust . . . . .	.2
85-6	Clutch - Topping Unit - Adjust . . . . .	.2
85-7	Control Levers and Linkage - R & R	1.2
85-8	Final Drive Gear - R & R	5.0
85-9	Hoist Unit Brake - Adjust . . . . .	.2
85-10	Hoist Unit Clutch - Adjust . . . . .	.2
85-11	Main Drive Belts - Adjust . . . . .	.2
85-12	Main Drive Belts - R & R . . . . .	.7
85-13	Slewing Drive Roller Chain - Adjust . . . . .	.2
85-14	Slewing Drive Roller Chain - R & R . . . . .	.4
85-15	Slewing Transmission - Overhaul	2.0
85-16	Slewing Transmission - R & R	1.9
85-17	Slewing Transmission - Brake - Adjust . . . . .	.2
85-18	Slewing Transmission Clutch - Adjust . . . . .	.2
85-19	Winch Drive Pulleys - R & R . . . . .	.8
85-20	Winch Drive Universal Joints - Overhaul . . . . .	.2
85-21	Winch Drive Universal Joints - R & R . . . . .	.3
85-22	Worn Gear - Cone - Spacers - Sprockets - R & R	3.5

Section 5 – Equipment Cost Code 1220

**CRANE TRUCK, ELECTRIC, SRT
(UP TO 30,000 POUNDS)**

REPAIR CODES

- 09 – Drive Shaft and Universal Joints
- 11 – Rear Axle and Differential
- 12 – Brakes
- 13 – Front Axle, Wheels, Controls, and Linkage
- 16 – Tire - Solid
- 37 – Battery
- 50 – Motors - Electric
- 52 – Controls - Electric
- 62 – Boom Structure
- 85 – Hoist and Winch Assemblies

BASIC STANDARDS – EC Code 1220

	Standard Time		Standard Time
A	Block up Front or Rear	B	Support Boom Structure
	.1		.3

TIME STANDARDS

**Drive Shaft and Universal Joints -
Repair Code 09**

Operation	Description	Time
09-1	Drive Shafts - R & R (per Wheel) . . . . .	.2
09-2	Universal Joints - Wheel - R & R (per Wheel). . . . .	.2

Rear Axle and Differential - Repair Code 1

Operation	Description	Time
11-1	Differential Assembly - Inspect and Service (out-of-unit) . . . . .	.5
11-2	Differential Assembly - Overhaul.	3.8
11-3	Differential Assembly - R & R.	3.6
11-4	Drive Yoke - R & R . . . . .	.4
11-5	Oldham Coupling - R & R . . . . .	.7
11-6	Power Axle - R & R	2.4
11-7	Torque Yoke - R & R . . . . .	.4
11-8	Wheels - Drive - R & R (Two Wheels) . . . . .	.4
11-9	Wheel Bearings - Repack - Service (Two Wheels) . . . . .	.6

Brakes - Repair Code 12

Operation	Description	Time
12-1	Brake Linkage - R & R. . . . .	.5
12-2	Brake Linkage - Tighten and Adjust. . . . .	.3
12-3	Brake Pedal - R & R. . . . .	.4
12-4	Brake Pedal Spring - R & R . . . . .	.1
12-5	Drive Motor Brake Spring - R & R . . . . .	.4
12-6	Travel Brakes - Adjust . . . . .	.2
12-7	Travel Brakes - Timing. . . . .	.2
12-8	Travel Brake Shoes - R & R . . . . .	.5
12-9	Travel Brake Shoes - Reline (Per Set) . . . . .	.1
12-10	Travel Brake Shoes - Reline - Bonded (Per Set) . . . . .	.2

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

Operation	Description	Time
13-1	Axle Springs - R & R (Both Sides of Power or Powerless Axle) . . . . .	.8
13-2	Ball Joints - Tighten and Service (Per Joint) . . . . .	.1
13-3	Steer - Bell Crank Bearings - R & R . . . . .	.4
13-4	Steer Gear Case and Post - Overhaul	1.5
13-5	Steer Gear Case and Post - R & R . . . . .	.9
13-6	Steer Knuckles and Yoke - R & R . . . . .	.6
13-7	Steering Levers - R & R Bearings (Per Lever). . . . .	.4

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

Operation	Description	Time
13-8	Tie Rods - R & R (Per Rod). . . . .	.4
13-9	Wheel Bearings - Repack - Service (Two Wheels) . . . . .	.6
13-10	Wheels - Steer - R & R (Two Wheels). . . . .	.4

Power Steering

Operation	Description	Time
13-11	Cylinder, Steering, Air Booster - R & R . . . . .	.8
13-12	Valve Assembly, Control - R & R . . . . .	.5
13-13	Valve, Relief - R & R . . . . .	.3
13-14	Pump, Hydraulic - R & R. . . . .	.5
13-15	Flexible Oil Line - R & R. . . . .	.2
13-16	Hose, Hydraulic, Gear Pump to Control Valve - R & R . . . . .	.2

Tires - Repair Code 16

Operation	Description	Time
16-1	Tire - Drive Wheels - Solid (Two Wheels). . . . .	.8
16-2	Tire - Steer Wheels - Solid (Two Wheels) . . . . .	.8

Battery - R & R Repair - Code 37

Operation	Description	Time
37-1	Battery - R & R. . . . .	.3
37-2	Battery Plug - R & R . . . . .	.5
37-3	Charging Plug - R & R. . . . .	.5

Motors - Electric - Repair Code 50

Operation	Description	Time
50-1	Boom Hoist Motor - Clean and Service . . . . .	.2
50-2	Boom Hoist Motor - R & R (Two Man Operation)	3.1
50-3	Boom Hoist Motor Wires - R & R . . . . .	.9
50-4	Hoist Unit Motor - Clean and Service . . . . .	.2
50-5	Hoist Unit Motor - R & R (Two Man Operation).	3.0
50-6	Hoist Unit Motor Wires - R & R . . . . .	.9
50-7	Slew Assembly (Motor and Gear Reduction) - R & R.	1.6
50-8	Slew Motor - Clean and Service. . . . .	.3
50-9	Slew Motor Wires - R & R. . . . .	.9
50-10	Travel Motor - Clean3
50-11	Travel Motor - R & R.	1.2
50-12	Travel Motor Wires - R & R.4

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TIME STANDARDS (Continued)

Control - Electric - Repair Code 52

Operation	Description	Time
52-1	Boom Hoist Contactors - R & R . . . . .	.3
52-2	Boom Hoist Control Switch - Clean and Inspect . . . . .	.2
52-3	Boom Hoist Control Switch - R & R . . . . .	.3
52-4	Boom Hoist - Limit Switch - R & R . . . . .	.3
52-5	Boom Hoist Limit Switch Contacts - R & R . . . . .	.3
52-6	Contactor Springs - R & R . . . . .	.2
52-7	Contactor Tips - R & R . . . . .	.2
52-8	Electrical Interlock - R & R . . . . .	.2
52-9	Electrical Interlock Tips - R & R . . . . .	.3
52-10	Hoist Unit Contactors - R & R . . . . .	.3
52-11	Hoist Unit Control Switch - Clean and Inspect . . . . .	.2
52-12	Hoist Unit Control Switch - R & R . . . . .	.3
52-13	Hoist Unit Limit Switch - R & R . . . . .	.2
52-14	Limit Switch Contacts - R & R . . . . .	.3
52-15	Pedal Contact Switch (Segment Contacts) - R & R . . . . .	.2
52-16	Slew Unit Contactor - R & R . . . . .	.3
52-17	Slew Unit Control Switch - Clean and Inspect . . . . .	.2
52-18	Slew Unit Control Switch - R & R . . . . .	.3
52-19	Slew Unit Limit Switch - R & R . . . . .	.3
52-20	Slew Unit Limit Switch Contacts - R & R . . . . .	.3
52-21	Slew Unit Resistor - R & R . . . . .	.8
52-22	Travel Controller (Contact Segments) - R & R . . . . .	.3
52-23	Travel Unit Controller - R & R . . . . .	.3
52-24	Travel Unit Controller - Clean and Inspect . . . . .	.5
52-25	Travel Unit Resistor - R & R . . . . .	.4
52-26	Hour-Meter - R & R . . . . .	.3
52-27	Horn - R & R . . . . .	.3
52-28	Horn Button - R & R . . . . .	.3
52-29	Battery Flush . . . . .	.3
52-30	Battery Cable Lug Resolder . . . . .	.5

Boom Structure - Repair Code 62

Operation	Description	Time
62-1	Block and Hook Assembly - Overhaul . . . . .	.6
62-2	Block and Hook Assembly - R & R . . . . .	.7
62-3	Boom - Hinge Pin - R & R . . . . .	.5
62-4	Boom Hinge Pin Bushings - R & R (Both Bushings) . . . . .	.7
	One Bushing	(.5)
62-5	Boom Structure - R & R	1.0
62-6	Boom Topping Block - R & R . . . . .	.9
62-7	Boom Topping Cable - R & R (Two Man Operation)	3.8
62-8	Boom - Topping Sheave Block - R & R . . . . .	.9
62-9	Boom Topping Striker - R & R . . . . .	.2
62-10	Cable Retainer Pins - R & R (Per Pin) . . . . .	.4
62-11	Hoist Cable - R & R (Two Man Operation)	4.3
62-12	Hoist Cable Sheaves - R & R . . . . .	.7
62-13	Hoist Striker - R & R . . . . .	.6
62-14	Topping Support Strap - R & R . . . . .	.9
62-15	Wire Reel - R & R . . . . .	.6

Hoist and Winch Assemblies - Repair Code 13

Operation	Description	Time
85-1	Boom Hoist Gear Assembly - Overhaul	3.5
85-2	Boom Hoist Gear Assembly - R & R (Two Man Operation)	5.2
85-3	Boom Hoist Magnetic Brake - R & R	1.0
85-4	Boom Hoist Mercury Brake - R & R . . . . .	.5
85-5	Hoist Unit Gear Assembly - Overhaul	3.5
85-6	Hoist Unit Gear Assembly - R & R (Two Man Operation)	4.6
85-7	Hoist Unit Magnetic Brake - R & R . . . . .	.4
85-8	Slew Gear Assembly - Overhaul	2.6
85-9	Slew Gear Assembly - R & R	1.6
85-10	Slew Unit Magnetic Brake - R & R	1.0

Section 6 – Equipment Cost Code 1230

**CRANE TRUCK, ELECTRIC, SPARK ENCLOSED, SRT
(UP TO 30,000 POUNDS)**

REPAIR CODES

- 09 – Drive Shaft and Universal Joints
- 11 – Rear Axle and Differential
- 12 – Brakes
- 13 – Front Axle - Wheels - Controls
- 16 – Tires
- 37 – Battery
- 50 – Motors - Electric
- 52 – Controls - Electric
- 62 – Boom Structure
- 85 – Hoist and Winch Assemblies

BASIC STANDARDS – EC Code 1230

	Standard Time		Standard Time
A	Block Up Crane - Regular	C	Support Beam Structure
B	Block Up Crane for Rear End.		

TIME STANDARDS

**Drive Shaft and Universal Joints -
Repair Code 09**

Operation	Description	Time
09-1	Drive Shafts - R & R (Per Wheel) . . . . .	.2
09-2	Universal Joints - R & R (Per Wheel) . . . . .	.2

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

Operation	Description	Time
11-1	Differential Assembly - Inspect and Service (out-of-unit) . . . . .	.5
11-2	Differential Assembly - Overhaul.	3.5
11-3	Differential Assembly - R & R.	3.0
11-4	Drive Yoke - R & R . . . . .	.4
11-5	Power Axle - R & R	2.3
11-6	Torque Yoke - R & R . . . . .	.4
11-7	Wheels, Drive - R & R (Two Wheels) . . . . .	.4
11-8	Wheel Bearings - Repack, Service (Two Wheels) . . . . .	.6

Brakes - Repair Code 12

Operation	Description	Time
12-1	Brake Linkage - R & R. . . . .	.5
12-2	Brake Linkage - Tighten and Adjust. . . . .	.3
12-3	Brake Pedal - R & R. . . . .	.4
12-4	Drive Motor Brake Spring - R & R . . . . .	.4
12-5	Travel Brakes - Adjust . . . . .	.2
12-6	Travel Brake Shoes - R & R . . . . .	.5
12-7	Travel Brake Shoes - Reline (Per Set) . . . . .	.1
12-8	Travel Brake Shoes, Bonded - Reline (Per Set) . . . . .	.2

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

Operation	Description	Time
13-1	Axle Springs - R & R . . . . .	.8
13-2	Ball Joints - Tighten and Service (Per Joint) . . . . .	.1
13-3	Steer Bell Crank Bearings - R & R. . . . .	.4
13-4	Steer Gear Case and Post - Overhaul	1.5
13-5	Steer Gear Case and Post - R & R . . . . .	.8
13-6	Steer Knuckles Yoke - R & R. . . . .	.6
13-7	Tie Rods - R & R (Per Rod) . . . . .	.4
13-8	Wheel Bearings - Repack - Service (Two Wheels) . . . . .	.6
13-9	Wheels, Steer - R & R (Two Wheels) . . . . .	.4

Tires - Repair Code 16

Operation	Description	Time
16-1	Tire, Drive Wheels, Solid - R & R (Two Wheels) . . . . .	.8
16-2	Tire, Steer Wheels, Solid - R & R (Two Wheels). . . . .	.8

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 - Electric - Repair Code 50

Operation	Description	Time
50-1	Boom Hoist Motor - Clean and Service . . . . .	.2
50-2	Boom Hoist Motor - R & R (Two Man Operation)	3.0
50-3	Boom Hoist Motor Wires - R & R . . . . .	.9
50-4	Hoist Unit Motor - Clean and Service . . . . .	.2
50-5	Hoist Unit Motor - R & R (Two Man Operation).	2.8
50-6	Hoist Unit Motor Wires - R & R . . . . .	.9
50-7	Slew Assembly - R & R	1.6
50-8	Slew Motor - Clean and Service. . . . .	.2
50-9	Slew Motor Wires - R & R. . . . .	.9
50-10	Travel Motor - Clean . . . . .	.2
50-11	Travel Motor - R & R.	1.5

Controls - Electric - Repair Code 52

Operation	Description	Time
52-1	Boom Hoist Contactors - R & R. . . . .	.3
52-2	Boom Hoist Control Switch - Clean and Inspect . . . . .	.2
52-3	Boom Hoist Control Switch - R & R . . . . .	.3
52-4	Boom Hoist Limit Switch - R & R. . . . .	.3
52-5	Contactors Springs - R & R. . . . .	.3
52-6	Contactors Springs - R & R. . . . .	.2
52-7	Contactors Tips - R & R. . . . .	.2
52-8	Hoist Unit Contactors - R & R . . . . .	.3
52-9	Hoist Unit Control Switch - Clean and Inspect . . . . .	.2
52-10	Hoist Unit Control Switch - R & R . . . . .	.3
52-11	Hoist Unit Limit Switch - R & R. . . . .	.3
52-12	Hoist Unit Limit Switch Contacts - R & R. . . . .	.3
52-13	Pedal Contact Switch - R & R . . . . .	.2
52-14	Slew Unit Contactor - R & R3
52-15	Slew Unit Control Switch - Clean and Inspect.2

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TIME STANDARDS (Continued)

Controls - Electric - Repair Code 52 (Continued)

Operation	Description	Time
52-16	Slew Unit Control Switch - R & R	.3
52-17	Slew Unit Limit Switch - R & R	.3
52-18	Slew Unit Limit Switch Contacts - R & R	.3
52-19	Slew Unit Resistor - R & R	.8
52-20	Travel Controller Contact Segments - R & R	.3
52-21	Travel Unit Contactor - R & R	.3
52-22	Travel Unit Controller - Clean and Inspect	.5
52-23	Travel Unit Resistor - R & R	.3
52-24	Hour-Meter - R & R	.3
52-25	Horn - R & R	.3
52-26	Horn Button - R & R	.3
52-27	Battery Flush	.3
52-28	Battery Cable	.3

Boom Structure - Repair Code 62

Operation	Description	Time
62-1	Block and Hook Assembly - Overhaul	.6
62-2	Block and Hook Assembly - R & R	.7
62-3	Boom Hinge Pin - R & R	.5
62-4	Boom Hinge Pin Bushings - R & R	.7
62-5	Boom Structure - R & R	1.0
62-6	Boom Topping Block - R & R	.9
62-7	Boom Topping Cable - R & R (Two Man Operation)	3.8

Boom Structure - Repair Code 62 (Continued)

Operation	Description	Time
62-8	Boom Topping Sheaving Block - R & R	.9
62-9	Boom Topping Striker - R & R	.2
62-10	Cable Retainer Pins - R & R (Per Pin)	.4
62-11	Hoist Cable - R & R (Two Man Operation)	4.3
62-12	Hoist Cable Sheaves - R & R	.7
62-13	Hoist Striker - R & R	.6
62-14	Wire Reel - R & R	.6

**Hoist and Winch Assemblies -
Repair Code 85**

Operation	Description	Time
85-1	Boom Hoist Gear Assembly - Overhaul	3.5
85-2	Boom Hoist Gear Assembly - R & R (Two Man Operation)	5.0
85-3	Boom Hoist Brake - R & R	1.0
85-4	Hoist Unit Gear Assembly - Overhaul	3.5
85-5	Hoist Unit Gear Assembly - R & R (Two Man Operation)	4.6
85-6	Hoist Unit Brake - R & R	.4
85-7	Slew Gear Assembly - Overhaul	2.5
85-8	Slew Gear Assembly - R & R	1.6
85-9	Slew Unit Brake - R & R	1.0

Section 7 – 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

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BASIC STANDARDS – EC Codes 1300-1326

Standard Time

A	Lift Forks - R & R2
B	Safety Rack - R & R5
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	. . . .	. . . .
Automatic Transmission					
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	Steerl 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
Power Steering					
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 8 – 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

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BASIC STANDARDS – EC Codes 1330-1351, 1895

		Standard Time
A	Lift Forks - R & R2
B	Safety Rack - R & R5
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 Replace6	.6
03-8	System, Fuel - Clean Complete5	.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 & R5	.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 - Adjsut . . . . .	.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 9 – 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 Inspect5
52-7	Hour Meter - R & R3
52-8	Horn - R & R3

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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 10 – 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

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 11 – 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

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 12 – 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 13 – Equipment Cost Code 1396

**AERIAL WORK PLATFORM, SHIPBOARD, DIESEL
(ALL CAPACITIES)**

No general repair time standards have been established for this unit.

Section 14 – 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

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 . . . . .	.29
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 15 – 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 16 – Equipment Cost Code 1420

TRUCK, AERIAL 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

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 17 – Equipment Cost Codes 1430 and 1440

TRUCK, AERIAL 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

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	3.7
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 18 – 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	.2	E	.2
B	.2	F	.2
C	.1		.2
D	.2	G	.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 & R6
06-13	Lights (Tail, Head, Stop, Load, or Backup) - R & R1
06-14	Spark Plug Wires - R & R6

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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

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 19 – 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

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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 & R3
52-11	Battery Flush3
52-12	Battery Cable Lug Resolder5

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TIME STANDARDS (Continued)

Hydraulic - Repair Code 63

Hydraulic - Repair Code 63 (Continued)

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

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 20 – 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 & R5
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 21 – 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 22 – 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 23 – 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 24 – Equipment Cost Code 1433

**463L K-LOADER, AERIAL PLATFORM WITH ROLLERS,
GAS OR DIESEL, PRT (ALL CAPACITIES)**

No general repair time standards have been established for this unit.

Section 25 – Equipment Cost Code 1903

463L TRAILER WITH ROLLERS (ALL CAPACITIES)

No general repair time standards have been established for this unit.

CHAPTER 11

SHORT TERM (LIVE) STORAGE

11-1. PURPOSE

NOTE

At the present time, short term (live) storage requirements are not planned for mobile cargo cranes, aerial work platforms or diesel conveyor belt vehicles. Therefore the information contained in this chapter is not applicable.

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 8341, 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 \(Code E4\)](#), 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

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recording may be used if authorized by the appropriate Fleet and Industrial Supply Center (FISC) Regional 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 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.

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

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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.

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) or NATO Code	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	

Table 11-1. Qualified Products List (Continued)

Manufacturer's Designation	National Stock Number (NSN) or NATO Code	Specification	Description	Manufacturer's Name, Address and Phone Number
		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®.

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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.

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.

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- 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.
- 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 9-9](#). 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](#).

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- 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 contactor 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.
- 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

NOTE

At the present time, short term (dead) storage requirements are not planned for mobile cargo cranes, aerial work platforms or diesel conveyor belt vehicles. Therefore the information contained in this chapter is not applicable.

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 8341, 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 \(Code E4\)](#), 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:

- 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

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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.”

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-PRF-2105. The precautions, procedures and special protection information concerning these oils shall be followed.

Table 12-1. Qualified Products List

Manufacturer's Designation	National Stock Number (NSN) or NATO Code	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

Table 12-1. Qualified Products List (Continued)

Manufacturer's Designation	National Stock Number (NSN) or NATO Code	Specification	Description	Manufacturer's Name, Address and Phone Number
**		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
**		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
**	O-228	MIL-PRF-2105	Lubricating Oil Multi-Purpose 85W-140	Various

**Manufacturer's designator not available.

12-3.5.1. **Standard (Syncromesh) 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 85W-140 in accordance with MIL-PRF-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/

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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."

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.

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(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.

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.

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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.

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- 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.
- 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](#)).

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 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.

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- 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.
- 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

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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.
- 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.

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- 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.
- h. Maintain inspection records and components that require representation.

12-8.2. BIENNIAL (24 MONTH) INSPECTION. The following are the biennial 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.

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NOTE

MHE that uses DOT 5 Silicone Brake Fluid, MIL-B-46176, or other types of lubricating oil (MIL-L-2104 or MIL-PRF-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®.

CHAPTER 13

SHIPBOARD MOBILE SUPPORT EQUIPMENT (SMSE)

13-1. GENERAL

This chapter is solely dedicated for the support of Shipboard Mobile Support Equipment (SMSE) under program and life cycle management of the Naval Inventory Control Point Mechanicsburg (NAVICP-M). It identifies and describes the approved types of SMSE commonly used by the Navy. Training, qualification and licensing requirements for SMSE operators is provided along with compliance to safety precautions relating to general, personnel, operational, movement and fueling regulations is documented. Detailed procedures for reporting product deficiencies on new or existing SMSE are addressed. Finally, the basic preventive maintenance practices and servicing requirements that will assure the satisfactory performance of SMSE are included. The administrative controls and overall program responsibilities supporting SMSE are documented in [chapter 2](#).

13-2. TYPES OF SHIPBOARD MOBILE SUPPORT EQUIPMENT (SMSE)

The following three approved shipboard types of SMSE are described and illustrated:

13-2.1. DECK SCRUBBER. The Deck Scrubber is designed to spray a cleaning solution onto the flight and hangar decks, scrub the deck and recover the residual solution and debris for disposal into 55 gallon drums. It consists of two opposite rotational cylinder brushes, debris hopper housing, a solution and recovery tank, a vacuum recovery system, and a rear squeegee mounted on a drive operated 3-cylinder diesel engine power drive train. As the scrubber moves forward, a solution dispenser sprays solution ahead of the scrubbing brushes. The brushes scrub in opposite directions creating water-lift into the debris hopper. The vacuum system draws water from the hopper and from ahead of the rear squeegee and discharges it into the recovery tank. The rear squeegee leaves the deck free from residual solution. [Figure 13-1](#) illustrates the Deck Scrubber (Model No. SRS1550-DN-A).



FIGURE 13-1. Deck Scrubber

13-2.2. POWER/PRESSURE WASHER. The Power/Pressure Washer is a specialty, cleaning unit designed for handling hazardous materials (HAZMAT). It is a 3-cylinder, diesel/JP5 powered engine with solid rubber tires, a 100 gallon stainless steel fresh water tank and a 130 gallon stainless steel recovery tank. Also, it is equipped with a high pressure pump containing a relief and safety discharge valve, dual 50-foot hose reels (each with a high pressure spray nozzle at the end of each wand with a trigger gun handle). Oversized clean out doors and flex drain hoses are provided along with lighted controls, a 14-foot vacuum hose with a 15-inch vacuum tool on the wand. Lighted controls and instrumented gages identify the hourmeter, oil pressure, water pressure, water temperature, fuel and solution. The unit contains a 9-inch vacuum impeller and a 12-volt, 3000 British Thermal Unit (BTU) burner (using diesel/JP5 fuel) with a sow-water burner shutdown system. [Figure 13-2](#) depicts the Power/Pressure Washer (Model No. QRE 3000 series).



FIGURE 13-2. Power Pressure Washer

13-2.3. FUEL TRANSFER CART. The Fuel Transfer Cart is used to transfer low flash point fuel to aircraft and fuel cells. It contains a hydraulic pump that retrieves fuel from aircraft or fuel cells and transfers it to either a motor vehicle, to another fuel cell, or to a storage tank. [Figure 13-3](#) provides an example of a Fuel Transfer Cart.

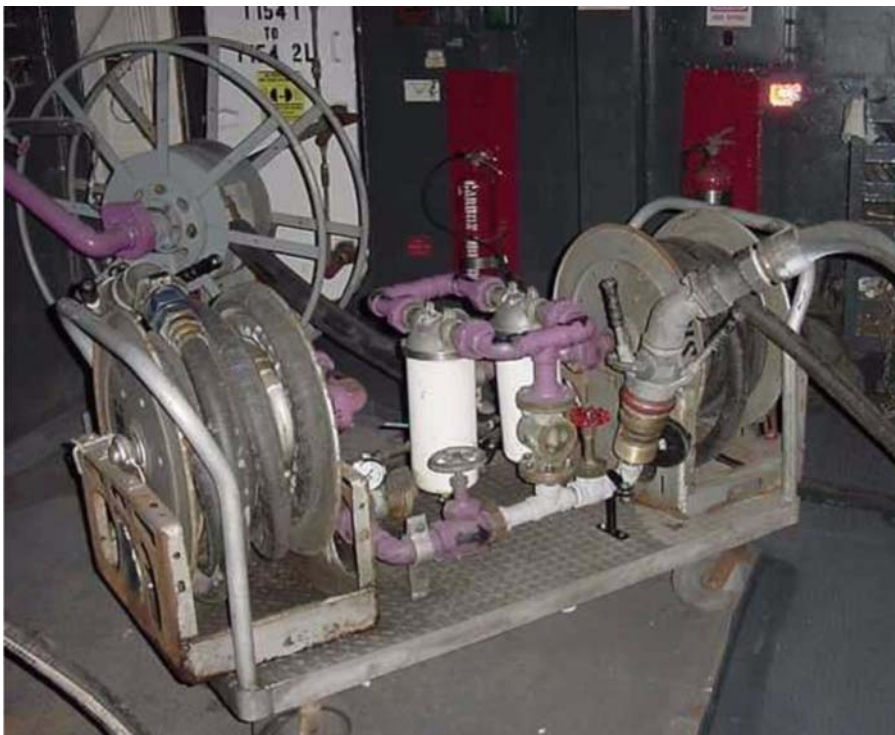


FIGURE 13-3. Fuel Transfer Cart

13-3. LICENSING

13-3.1. QUALIFICATIONS. Chapter 17 of [COMNAVAIRFORINST 4790.2 \(series\)](#) establishes the policy, responsibilities and requirements for Support Equipment (SE) training and licensing of personnel to operate a Deck Scrubber. Personnel who comply with the requirements prescribed in this instruction satisfy the qualification requirements of this publication to obtain a license to operate the Deck Scrubber. The Power/Pressure Washer and the Fuel Transfer Cart are non-powered, trailerable equipment. Therefore, personnel are not required to be licensed to operate them. However, these operators must initially complete a locally derived Personnel Qualification Standard (PQS) to ensure they are proficient in the safe use of this equipment.

13-3.1.1. Initial Operator Training. As required by [COMNAVAIRFORINST 4790.2 \(series\)](#), Maintenance Officers (MO's) are required to establish a formal instructional course, and implement and manage the SE Training and Licensing Program. This instruction provides an operator training outline to assist MO's implement this program. To further assist MO's, appendix F provides an example of a Deck Scrubber training and qualification course that may be used for local implementation. Each Power/Pressure Washer or Fuel Transfer Cart operator must complete a locally derived PQS. The following requirements must be followed:

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a. The ship's Commanding Officer (CO) shall ensure that either appendix F or the regulations documented in COMNAVAIRFORINST 4790.2 (series) is employed to train and license Deck Scrubber operators. Additionally, the CO shall ensure that local PQS requirements are employed to train and qualify Power/Pressure Washer or Fuel Transfer Cart operators.

b. The CO shall verify that positive administrative controls are in place that will keep SMSE operators informed of changes to this publication or the instruction that could affect the safety of SMSE operators.

13-3.1.2. **Certification.** Each student who satisfactorily completes the required initial operator training described in [paragraph 13-3.1.1](#) shall be issued a training certificate. For Deck Scrubber operators, the Operator Training Certificate shown at the end of appendix F or the SE License Certification, [figure 13-4](#), documented in COMNAVAIRFORINST 4790.2 (series) shall be completed and retained in each student's personal file. For PQS certification of the Pressure/Power Washer or the Fuel Transfer Cart, a locally completed training certificate shall be retained in each student's personal file.

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SE LICENSE CERTIFICATION

Last Name	First	MI	Rate/Rank	SSN	Activity	T/M/S Aircraft
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State Driver's License				U.S. Government Motor Vehicle Operator's License	
State	License No.	Expiration Date	Auto Extend <input type="checkbox"/> Yes <input type="checkbox"/> No	License No.	Expiration Date

PHASE I SECTION

Training Activity		
Support Equipment	Course Number	Date Completed
Self Propelled Vehicle <input type="checkbox"/> Yes <input type="checkbox"/> No	Flight Line Training Date	Weight Handling Equipment Physical
SE DIVISION OFFICER		DATE:

PHASE II SECTION

- NEW (Parts A, B, C, D, and E required)
- RENEWAL (Parts C, D and E required)
- PROFICIENCY (Parts C and E required)

PART A. REQUIRED READING	Trainee Signature	Date Read
A. COMNAVAIRFORINST 4790.2, Volume V, Chapter 17		
B. NAVAIR 00-80T-96, Chapter ____, Page __		
C. NAVAIR 00-80T-105 "Aircraft Emergency Procedures", Chapter ____, Page __		
D.		
E.		

PART B. ON THE JOB TRAINING	Instructor's Signature	Date	Instructor's Signature	Date	Instructor's Signature	Date
1. Discuss ramp/flight line/hangar deck procedures.						
2. Discuss safety precautions.						
3. Discuss emergency procedures (Fuel spill, A/C or SE fire, etc.).						
4. Discuss personnel requirements and positioning.						
5. Discuss hand signals and other communication devices.						
6. Perform and document pre-operational inspection.						
7. Perform proper driving/towing procedures.						
8. Properly position and hookup SE.						
9. Perform maintenance/servicing tasks with the SE.						
10. Perform normal shutdown/disconnect procedures.						
11. Perform postoperational inspection.						

FIGURE 13-4. SE License Certification (Sample)

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PART C. PRACTICAL EXAMINATION	SAT/ UNSAT	Examiner's Signature/Date:
1. Discuss ramp/flight line hangar deck procedures.		Remarks:
2. Discuss safety precautions		
3. Discuss emergency procedures (fuel spill, A/C or SE, fire, etc.).		
4. Discuss personnel requirements and positioning.		
5. Discuss hand signals and other communication devices.		
6. Perform and document preoperational inspection.		
7. Perform proper driving/towing procedures.		
8. Properly position and hookup SE.		
9. Perform maintenance/servicing tasks with the SE.		
10. Perform normal shutdown/disconnect procedures.		
11. Perform postoperational inspection.		

PART D. QUALITY ASSURANCE WRITTEN EXAMINATION			
QAR Examiner	Signature	Exam Score: _____ (Min. Passing Score 85%)	Date

PART E. CERTIFICATION					
Work Center Supervisor	Signature	Recommended	Yes	No	
Division Officer	Signature	Recommended	Yes	No	
Support Equipment Officer (IMA only)	Signature	Recommended	Yes	No	
AMO (OMA only)	Signature	Recommended	Yes	No	
MO	Signature	Recommended	Yes	No	

FIGURE 13-4. SE License Certification (Sample) (Continued)

13-3.1.3. License. The support equipment operator licensing program documented in chapter 17 of COMNAVAIRFORINST 4790.2 (series) shall apply for all personnel who operate the Deck Scrubber. In summary, a USN Aviation Support Equipment (SE) Operator's License (OPNAV Form 4790/102), [figure 13-5](#), is required of all personnel who operate the Deck Scrubber, regardless of rate or rating, and is valid for 3 years. A valid U.S. Government Motor Vehicle Operator's Identification Card (OF-346) for motor vehicles or a valid state operator's license is a prerequisite for issuing an SE operator's license for self-propelled equipment.

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OPNAVINST 4790.2E

USN AVIATION SUPPORT EQUIPMENT OPERATOR'S LICENSE				
1. NAME OF OPERATOR	2. RATE	3. DATE EXPIRES		
4. U.S. GOVERNMENT/STATE MOTOR VEHICLE OPERATOR'S LICENSE				
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 2px;">CARD NO.</td> <td style="width: 50%; padding: 2px;">ACTIVITY/STATE</td> </tr> </table>			CARD NO.	ACTIVITY/STATE
CARD NO.	ACTIVITY/STATE			
LICENSEE IS QUALIFIED TO OPERATE AVIATION SUPPORT EQUIPMENT SPECIFIED ON THIS CARD SUBJECT TO STATED RESTRICTIONS.				
5. NAME AND LOCATION OF ISSUING ACTIVITY				
NOT TRANSFERABLE Card must be carried at all times when operating aviation support equipment.	6. SIGNATURE OF LICENSEE (Not Valid Unless Signed)			
	7. ISSUED BY (Signature and Title)			
OPNAV 4790/102 (REV. 1/92)		S/N 0107-LF-012-9600		
8A. TYPE EQUIPMENT(S) FOR WHICH QUALIFIED	B. EXPIRATION DATE	C. CERTIFIED BY (Initials)		

FIGURE 13-5. USN Aviation Support Equipment Operator's License (OPNAV 4790/102) (Front)

13-3.2. **ISSUANCE.** The CO/OIC shall designate in writing the responsible party authorized to issue Deck Scrubber licenses, or PQS or training certificates (for Power/Pressure Washer or Fuel Transfer Cart operators).

13-3.3. **RENEWAL.** The CO/OIC will ensure that a process is documented to renew the license only. This renewal process shall include documentation attesting to the demonstration of the operator's proficiency.

13-3.4. **REVOCAION.** The license, or PQS or training certificate may be revoked under the provisions of COMNAVAIRFORINST 4790.2 (series), in writing, by the CO/OIC. The reason for the revocation of and the process required to reissue the license shall be documented.

13-4. OPERATIONAL SAFETY REQUIREMENTS

General, personnel and operational safety precautions associated with the use of SMSE is provided. Careless or improper operation of SMSE may result in personnel injury or damage to equipment even if the approved SMSE is used. Therefore, it is imperative that all safety precautions and operator requirements pertaining to the safe operation of SMSE detailing in the following paragraphs are applied and strictly enforced.

13-4.1. **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). Shipboard personnel shall comply with all applicable OSH program regulations documented in [OPNAVINST 5100.19 \(series\)](#). Specifically, this shall include compliance with work safety and health standards, proper use of personal protective equipment (PPE) and clothing, and proper reporting to DOD management of unsafe conditions, hazardous exposure, or occupational injury or illness.

13-4.2. **GENERAL SAFETY PRECAUTIONS.** It is necessary for the protection of personnel and the safe integrity of the equipment that all safety features show no evidence of damage or deterioration that could cause a hazard to safe equipment operation. Further, each type of SMSE 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 deck and working areas must be free of oil or gasoline spots that could cause accidents due to skidding or slipping. All equipment safety devices must be properly installed and maintained. For the Deck Scrubber, only qualified and licensed operators may operate the equipment and shall perform the pre-operational and post-operational visual inspections, and functional tests. Lastly, incorrect disposal of HAZMAT is a federal offense. Ensure HAZMAT is disposed of properly in accordance with local disposal procedures.

13-4.2.1. **Personnel Safety.** The following applicable personnel safety precautions shall be observed:

a. Avoid prolonged contact with, or the inhalation of, cleaning solvents. Avoid use near heat or open flames. Always have adequate ventilation when using cleaning solvents.

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- b. Do not use flammable or combustible cleaning agents when scrubbing.
- c. Corrosion inhibitors can cause damage to the eyes or skin. If contact is made, immediately wash the skin with water. For the eyes, immediately flush the eyes with water for several minutes. In either event, always seek prompt medical attention.
- d. A raised scrub head could fall. Always block the scrub head up.
- e. Always lock the scrub head up in the raised position when working under the scrub head. Hydraulics alone may “leak down” crushing anything beneath it.
- f. The fan suction is very strong. Never run the vacuum fan with the vacuum line removed from the fan or the recovery tank. Keep hands away from the vacuum fan intake.
- g. Keep feet and hands away from under the scrub head and when pulling the lever to unlock and lower the debris trough.
- h. Keep hands and face from coming in contact with the atomizer spray, as the working pressure will cause the fuel oil to penetrate the skin.
- i. All operators shall be familiar with the potential safety hazards associated with the HAZMAT being used with SMSE. As a minimum, the operator must understand the Material Safety Data Sheet (MSDS) and is aware of local HAZMAT regulations involving fire fighting, emergency response and containment/clean-up procedures.
- j. Do not check the radiator coolant level when the engine is hot.

13-4.2.2. **Operational Safety.** The following applicable operational safety precautions shall be observed:

- a. Do not operate the starter motor for more than 10 seconds at a time or after the engine has started. Allow the starter to cool between starting attempts. The starter motor may be damaged if it is operated incorrectly.
- b. Ensure the scrub head lock has been engaged before leaving the machine.
- c. Always engage the parking brake before leaving the machine.
- d. Lower the debris trough carefully. Do not allow it to drop.
- e. Always stop the engine and engage the parking before operating the vacuum wand. The machine may creep or roll if the brake is not set.
- f. Do not overfill the hydraulic fluid reservoir or operate the machine with a low level of hydraulic fluid in the reservoir. Either condition may cause damage to the machine’s hydraulic system.

g. The air pressure nozzle must not exceed 30 pounds psig or 205 (kPa). Always maintain a reasonable distance between the nozzle and the filter.

h. If the engine oil pressure is not present or is lower than the specified value, shut the engine down immediately.

13-4.2.3. Safety Precautions During Movements. When moving SMSE, always operate the equipment with care when driving or moving on wet surfaces.

13-4.2.4. Safety Devices. Several kinds of safety devices have been equipped on the Deck Scrubber by the manufacturer 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.

13-4.2.4.1. Emergency Fuel Shutoff Switch. An emergency fuel shutoff switch located on the instrument panel of the Deck Scrubber shuts down the engine by stopping the fuel flow. This switch may not be disabled and it shall be properly maintained in accordance with the manufacturer's instructions.

13-4.2.4.2. Static Discharge Device. The Deck Scrubber is equipped with an electrical conductive ground strap which allows any static charge to be safely discharged to the deck. The strap shall always be installed on the unit and must always contact the deck.

13-4.2.4.3. Scrub Head Lock Lever. A scrub head lock lever is equipped on the Deck Scrubber located on the floor near the operator's left foot which prevents the scrub head from lowering during maintenance operations. To prevent injuries to maintenance personnel, this lever must be engaged prior to any scheduled tasks.

13-4.2.5. Safety During Fueling. The safety precautions during fueling described in [paragraph 5-5](#) also apply for the Deck Scrubber or the Power/Pressure Washer.

13-5. COLOR

All Navy-owned SMSE shall be painted as follows:

a. Deck Scrubber. All Deck Scrubbers shall be primed with light gray epoxy conforming to MIL-P-53022 and shall have a white topcoat finish in accordance with MIL-C-85285, Color No. 37875 or MIL-PRF-85285, Color No. 17925.

b. Pressure/Power Washer. All Pressure/Power Washers shall be primed with light gray epoxy conforming to MIL-P-53022 and shall have a white topcoat finish in accordance with MIL-C-85285, Color No. 37875 or MIL-PRF-85285, Color No. 17925.

c. Fuel Transfer Cart. Fuel Transfer Cart components (i.e., piping) may be painted gloss purple in accordance with FED-STD-595, Color No. 17142 or 17155 to designate it as jet fuel within the equipment.

13-6. MARKINGS

There is no specific safety markings associated with SMSE. However, when SMSE is scheduled for a complete paint overhaul, all markings originally provided by the manufacturer must be replaced on the equipment.

13-7. PRODUCT DEFICIENCY REPORTING

The specific requirements in [chapter 7](#) for MHE also apply to SMSE units relating to reporting product deficiencies.

13-8. PREVENTIVE MAINTENANCE

The following requirements provide the basic preventive maintenance practices and periodic servicing requirements that will assure the satisfactory performance of SMSE. For specific preventive maintenance, corrective maintenance, scheduled lubrication and inspection of specific safety devices, reference should also be made to the manufacturer's technical manual that is supplied with the equipment or using the applicable Maintenance Index Page (MIP) and their associated Maintenance Requirements Cards (MRC's). Consult the latest shipboard (electronic version) of the Force Revision for the most current available MIP and their associated MRCs.

13-8.1. **RESPONSIBILITIES.** Preventive maintenance and support funding is the direct responsibility of the SMSE holder of record and the indirect responsibility of personnel who operate SMSE. For this reason, all personnel who operate SMSE must satisfy the operator qualification requirements described in [paragraph 13-3.1](#). Likewise, maintenance and inspection on all SMSE 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, MIP's with their associated 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 SMSE in accordance with the manufacturer's specifications or the MIP/MRC's.

13-8.1.1. **Operator Responsibilities.** SMSE operators shall perform pre-operational and post-operational visual inspections and functional tests in accordance with the applicable MIP prior to placing the equipment in service and upon completion of the daily operation. All operators shall record all defects, notify the immediate supervisor of defects, and tag-out the unserviceable SMSE for repairs in accordance with local procedures. As a minimum, all local procedures established shall stipulate the following:

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- a. A safety deficiency tag-out process, which includes procedures for tagging [e.g., “DO NOT OPERATE” tag (NAVSUP Form 1377/6), figure 8-6, red tag, caution, etc.] unserviceable SMSE in a conspicuous location and for removing equipment from service until repairs are made.
- b. All defects found and repairs/servicing accomplished shall be documented in the equipment history file.

13-8.1.2. Maintenance Provider Responsibilities. When SMSE is scheduled for preventive maintenance servicing every 18 and 36 months, it should be cleaned 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 (MIP/MRC's), 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 EMACS program, 3M System, or local equivalent form shall be outline the required maintenance for the equipment. One copy of the work order or local form will be retained in the equipment history file.

13-8.1.2.1. EMACS Program. The specific requirements in chapter 6 for MHE also apply to SMSE supporting EMACS program information and requirements.

13-8.1.2.2. Manufacturer's Technical Manual. The maintenance provider has the responsibility of maintaining the manufacturer's technical manuals. These technical manuals provide recommended maintenance procedures, time schedules, lubrication schedules, basic principles of operation, a troubleshooting guide, repair instructions, and numerous other useful maintenance data relative to the specific types of SMSE. They also contain illustrated parts breakdown of components and assemblies, including parts lists.

13-8.1.2.3. Capabilities. The maintenance provider has the responsibility to ensure adequate capabilities to service the types of SMSE 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.

13-8.2. EQUIPMENT HISTORY FILE. Every piece of SMSE requires an equipment history file. It is the responsibility of the maintenance provider to initiate and maintain an equipment history file. For units originally delivered to the Fleet Industrial Supply Center (FISC), the Regional Manager will initiate all equipment history files. The information recorded will provide a complete history of the equipment and its service life. In the event SMSE is transferred to another ship, the equipment history file shall accompany the SMSE. The history file shall be maintained throughout the SMSE life cycle.

13-8.2.1. Mandatory Documentation. A typical history file shall include the following:

- a. Maintenance actions (repairs or preventive), cost, materials/parts and inspection data.

NOTE

Although this data can reside on an electronic database, hard copy reports/forms are required in the equipment history file.

- b. All shipping and receiving (e.g., DD-1149 Form) and commercial acceptance (e.g., DD-250 Form) documentation.
- c. Any proposed or approved SMSE modifications or alterations.

13-8.2.2. Optional Documentation. A typical equipment history file should include the following, as applicable:

- a. Periodic hours of operation reports, if available.
- b. Any pertinent correspondence (e.g., letters or messages).
- c. A copy of the SMSE In-Service Engineering Agent (ISEA) endorsement for any authorized modification or alteration.

13-8.3. **PREVENTIVE MAINTENANCE SCHEDULING**. Each ship 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 SMSE operation as measured by established maintenance cycles.

- b. A capable maintenance provider. Units afloat shall maintain SMSE in accordance with Planned Maintenance System (PMS) and Type Commander (TYCOM) programs.

- c. An accurate reporting system [e.g., EMACS, hard copy procedures or the applicable maintenance data system for units afloat as directed by [OPNAVINST 4790.4 \(series\)](#)], since it is essential that repair requests and maintenance procedures 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. Periodic and unscheduled maintenance should be documented in the equipment history file.

- d. A planned program for reporting technical deficiencies or changes to inspection and maintenance procedures documented in the associated MIP's/MRC's. A Technical Feedback Report (TFBR) shall be completed by originators and submitted to Commanding Officer, Naval Sea Logistics Center (NAVSEALOGCEN) Detachment San Diego, Code 05316, 4755 Railroad Way, San Diego, CA 92136-5503 in accordance with the instructions of [OPNAVINST 4790.4 \(series\)](#). All feedback reports will be thoroughly investigated and those who provide the comments will be advised of the outcome.

MRC's identify the minimum (scheduled) periodicity for which that particular task must be accomplished to maintain the MHE at a fully operational condition. However, MRC procedures can be

accomplished more frequently than prescribed due to harsh weather, unusual operating, corrective maintenance, and because of test requirements.

13-8.4. MAINTAINING SAFETY INTEGRITY OF SMSE. Adherence to the recommendations, service notes, and maintenance procedures in the applicable manufacturer's technical manuals will maximize personnel safety and equipment efficiency during normal operations. All repairs to SMSE must follow the safeguards in the manufacturer's technical manual safety sections. The exact parts identified within these manuals must be used when repairs are made. Likewise, the following precautions shall be observed by maintenance personnel concerned with servicing and repairing SMSE:

- 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., hard copy procedures or other maintenance data management systems) 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's name shall also be recorded.
- c. All repairs shall be performed in approved areas.
- d. Safety devices, described in [paragraph 13-4.2.4](#), and components removed must be reinstalled upon completion of repairs to maintain the unit's integrity and to provide the intended safety safeguards/protection.

13-8.5. SERVICING. All servicing to any SMSE shall be conducted in accordance with the appropriate manufacturer's technical manuals or the 3M System using the applicable MIP's and their associated MRC's.

13-9. REPAIR TIME STANDARDS.

General time standards for the repair, overhaul and maintenance of SMSE is provided to be used in local cost control program when actual manufacturer repair time standards are not available. These time standards are used for establishing a measurement and comparison of the actual time consumed during maintenance operations. 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.

13-9.1. PREPARING ESTIMATED STANDARDS. The following are general procedures for establishing estimated standards and instructions for submitting these prepared time standards.

13-9.1.1. 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 (ECC) 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.

13-9.1.2. 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 SMSE Program Manager at Commander, Naval Inventory Control Point (NAVICP), Code 8341, 5450 Carlisle Pike, P. O. Box 2020, Mechanicsburg, PA 17055-0788.

13-9.2. 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 13-1](#) identifies the types of SMSE, their associated ECC’s and a reference to the applicable section in this chapter to obtain the necessary repair codes and time standards.

Table 13-1. Index of Equipment Cost Codes (ECC’s) for Maintenance

Section	Code	Equipment
1	5400	Pressure Washer, Diesel
2	5500	Fuel Transfer Cart
3	5700	Flight Deck Scrubber, Diesel

NOTE

At the current, no general repair time standards have been established for these three types of SMSE.

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 OPERATIONS (OPNAV).

A-2.3.1. Instructions.

4460.1 – Management of Materials Handling Equipment (MHE) in the Navy

4790.4 – Ship's Maintenance Material Management (3-M) Manual

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Afloat 5100.19 – Navy Occupational Safety and Health (NAVOSH) Program, Manual for Forces

5100.23 – Navy Occupational Safety and Health (NAVOSH) Program for Shore Activities

8020.14 – Department of the Navy Explosives Safety Policy Manual

A-2.3.2. Publications.

P-45-110-96 – Hazardous Material User’s Guide (Shipboard)

A-2.4. COMMANDER NAVAL AIR FORCE (COMNAVAIRFOR).

A-2.4.1. COMNAVAIRFOR Instructions (COMNAVAIRFORINST).

4790.2 – Naval Aviation Maintenance Program (NAMP) (formerly OPNAVINST 4790.2)

A-2.5. NAVAL FACILITIES ENGINEERING COMMAND (NAVFACENGCOM) PUBLICATIONS.

P-300 – Management of Civil Engineering Support Equipment

P-307 – Management of Weight Handling Equipment; Maintenance and Certification

A-2.6. NAVAL INVENTORY CONTROL POINT (NAVICP) INSTRUCTIONS (NAVICPINST).

A-2.6.1. Instructions.

10490.4 – Materials Handling Equipment (MHE); Administration and Control of

A-2.6.2. Specifications [Commercial Item Descriptions (CID’s) and Shipboard Purchase Descriptions (PD’s)].

CID-A-A-59405, Type 1 - 4K Forklift, Electric (EE) (ECC 1372)

CID-A-A-59405, Type 2 - 6K Forklift, Electric (EE) (ECC 1372)

CID-A-A-59405, Type 3 - 4K Forklift, Electric (EX) (ECC 1380)

CID-A-A-59492, Type I - 6K Forklift, Diesel, RT (ECC 1820)

CID-A-A-59492, Type II - 10K Forklift, Diesel, RT 24’ LC (ECC 1820)

CID-A-A-59492, Type III - 10K Forklift, Diesel, RT 48’ LC (ECC 1820)

CID-A-A-59493, Type 2 - 4K Forklift, Reach & Tier (ECC 1390)

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CID-A-A-59498, Type 4 - 4.5K Forklift, Reach & Tier (ECC 1390)

CID-A-A-59498, Type 2 - 6K Forklift, Diesel, Low-Profile (ECC 1351)

CID-A-A-59498, Type 4 - 15K Forklift, Diesel (ECC 1340)

CID-A-A-59498, Type 5 - 20K Forklift, Diesel (ECC 1340)

PD-500 - 4K Forklift, Diesel, RT (ECC 1820)

PD-1610 - 6K Pallet, Electric, Walkie (ECC 1610)

PD-1900 - 6K Pallet, Manual, Hydraulic (ECC 1900)

PD-9901 - 6K Forklift, Diesel (ECC 1350)

PD-73008 - SRS 1550 Flight Deck Scrubber (ECC 5700)

PD-80106 - 45 Foot Manlift, Articulating Boom (ECC 1396)

PD-80806 - 66 Foot Manlift, Telescopic Boom (ECC 1396)

Power-Boss QRE-3001A - Pressure Washer (ECFC 5400)

A-2.7. NAVAL ORDNANCE SAFETY AND SECURITY ACTIVITY (NOSSA) INSTRUCTIONS (NOSSAINST).

8023.11 – Standard Operating Procedures (SOPs): Development, Implementation and Maintenance for Ammunition and Explosives

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

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2173 – Approved Handling Equipment for Weapons and Explosives (2 volumes)

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).

717 – 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.

A-3.1. MILITARY SPECIFICATIONS.

A-A-1266 – Tag, Warning

A-A-52624 – Antifreeze, Multi-Engine Type

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-C-85285 – Coating, Polyurethane, High Solids

MIL-DTL-5624 – Turbine Fuel, Aviation, Grades, JP-5

MIL-DTL-83133 – Turbine Fuel, Aviation, Kerosene Type, JP-8

MIL-I-25017 – Inhibitor, Fuel Soluble Lubricity Improver Corrosion

MIL-L-21260 – Lubrication Oil, Engine

MIL-P-46002 – Preservation Oil, Light Viscosity

MIL-PRF-2104 – Lubricating Oil, Combat/Tactical, 15-40W

MIL-PRF-2105 – Lubrication Oil, Gear, Multi-Purpose, 75W, 80W-90, 85W-140

MIL-PRF-17672 – Hydraulic Fluid, Petroleum, Inhibited

MIL-PRF-23827 – Grease, Aircraft and Instrument, Gear and Actuator Screw
(formerly MIL-G-23827)

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MIL-T-46755 – Bags/Covers, Polyethylene, Protective

O-E-760 – Alcohol, Denatured Ethyl

P-C-437 – Compound Cleaning

PD-680 – Solvent, Dry 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

P11262.2 - Inspection, Testing and Certification of Tactical Ground Load Lifting Equipment

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) 744-6067 or DSN 354-6067.

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

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.

A92.5 – Aerial Work Boom Platforms

A92.6 – Self-Propelled Aerial Work Platforms

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 47th 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

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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 E4), 201 Hwy 34 South, Colts Neck, NJ 07722-5023.

PHST-35-00 – MHE Service Life Extension Program (SLEP); Processing Guide

APPENDIX B

MATERIALS HANDLING EQUIPMENT OPERATOR TRAINING COURSE

B-1. PURPOSE

This training course establishes the minimum requirements that U.S. Navy personnel must successfully meet prior to being issued a powered industrial materials handling equipment (MHE) license to handle general supply materials (general cargo or stores) and hazardous materials (HAZMAT) other than ammunition and explosives. Refer to [NAVSEA SW023-AH-WHM-010](#) for powered MHE operator licensing requirements when handling ammunition and explosives.

B-2. SCOPE

This course identifies the various types of MHE approved afloat and ashore, defines the operational areas in which the MHE can be operated, addresses operational safety precautions, and concludes with a test that assesses the students knowledge of safety requirements and operational proficiency. Upon satisfactorily completing this course and the medical qualification requirements found in [paragraph 4-3.1](#), students may be issued a license under the provisions of [paragraph 4-4](#) for handling general supply materials. For the handling of HAZMAT, MHE operators will be required to satisfactorily complete any local training requirements as described in [paragraph 4-3.6](#).

B-3. COURSE VARIATIONS

Commanders, Commanding Officers or Officers-in-Charge (CO/OIC), at their discretion and under their documented approval, may authorize variations as needed to adopt this course to train and license MHE operators.

B-4. CONTENT AND DURATION

For scheduling purposes, this course is approximately 40 hours in length. Given a class size of 2 to 10 students with different experience levels, it takes 8 hours of classroom time to cover the various types of MHE, transportation and storage requirements, operating and reporting requirements, mandatory inspection requirements, bulk storage, operation in confined areas, and the handling of various size loads. The classroom time occurs on the first day and is enforced throughout the week during the practical exercises. Past experience indicates that 24 hours are required for practical exercises covering flatbed, trailer, railcar, ramp, dock and magazine handling operations. These hours are broken down as follows: 8 hours of basic operating and lifting techniques, 4 hours of handling bulk items, 4 hours of maneuvering in confined areas, and 8 hours of handling different size loads. The final 8 hours is a proficiency test consisting of a written test and an operational skills demonstration.

B-4.1. MODIFICATIONS. It is not possible for this course to cover every training scenario for all types of MHE in use, the operational environments encountered, and the abilities of the individual students. For these reasons, satisfactory completion of the classroom material is mandatory and instructors are permitted to modify the practical exercises to accommodate the MHE used and the operational environments encountered at each activity. For example, to issue a license to an individual to operate a 6,000-pound DS Rough Terrain Forklift Truck, the instructor would eliminate operational areas that it would not be used in (a railcar, trailer, etc.) and have the practical exercises performed in appropriate rough terrain (steep ramps) conditions.

B-5. TRANSFER OF COMMAND

If this same MHE operator is subsequently transferred to another activity that has only 4,000-pound EE Reaching/Tiering and 6,000-pound DS Front/Sideloader Forklift Trucks, then, at the discretion of the CO/OIC of the gaining activity, this operator's license may be upgraded based solely on a proficiency demonstration. The individual may be required to complete the gaining activity's licensing course.

NOTE

An employer does not need to retrain an employee in the operation of powered MHE if the employer certifies that the operator has been evaluated and has proven to be competent to operate MHE safely. Where their performance warrants further training, or when new classes/types of MHE or different areas of operation (working conditions) are encountered, operators would need additional training in those areas.

LESSON NO. 1

Introduction

Day 1 - Classroom 1.0 Hour

1. Good morning. My name is _____. Welcome to the course on “Handling General Supplies and Hazardous Materials (other than ammunition and explosives) with Industrial Materials Handling Equipment (MHE).”
2. COURSE REQUIREMENTS.
 - a. Lecturers and demonstrations are given at the start of each day. Tardiness will not be tolerated.
 - b. This course shall not be canceled due to inclement weather.
 - c. Students must attend the classroom, practical demonstrations, and a proficiency test to pass this course.
 - d. Students may be dropped from this course at the discretion of the instructor.
 - e. If disruptive, students shall be dismissed from class.
3. TELEPHONE NUMBERS.
 - a. Emergency _____
 - b. Safety _____
 - c. Others _____
4. COURSE CONTENT AND HOURS.
 - a. The course shall consist of 8 hours of classroom material, 24 hours of practical exercises and concludes with 8 hours of proficiency tests.
 - (1) Classroom material will consist of identifying the approved types of MHE and forklift attachments, discussing the licensing requirements, reviewing all safety precautions and regulations, reviewing the regulations for using MHE in various hazardous locations, reviewing pre- and post-operational inspection and functional test requirements, identifying human failures that cause accidents, procedures on what to do in the event of an accident or incident, and completing accident reports.
 - (2) Practical exercises will consist of performing the required pre-operational and post-operational inspections and functional tests, stow and break out various types of loads, operating MHE through designated obstacle courses, loading and unloading a boxcar, and bulk storage.

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(3) The proficiency test is given in two parts consisting of a written portion and an operational skills demonstration. Students must score 75 percent or better on each part to pass.

b. Course starts at _____ and ends at _____.

c. Lunch will be from _____ to _____.

5. REGULATIONS.

a. Uniform requirements: Military students must wear the uniform of the day; civilian students must wear proper attire.

b. Smoking regulations: Smoking is allowed only in designated areas.

c. Privately-owned vehicles: Shall be accordance with local law.

d. Housekeeping: Students are responsible for keeping the classroom and workroom clean.

6. TRANSPORTATION (Explain to the class any special requirements)

a. Mornings

b. To and from lunch

c. Evenings

7. **PERSONAL PROTECTIVE EQUIPMENT.** The following personal protective equipment (PPE) is “mandatory” for this course (students must furnish):

a. Hard hat

b. Safety shoes

8. **INTRODUCTION TO NAVSUP PUBLICATION 538.** A complete overview of [chapters 3, 4, 5,](#) and [8](#) of this publication will be provided by the instructor.

9. **HAZMAT TRAINING.** For the handling of HAZMAT, potential operators may be required to be trained and certified under local instructions/regulations, if applicable. The instructor should mention any known local training and certification requirements to the students.

10. INSTRUCTIONAL AIDS.

a. VHS/CD/DVD playback capability

b. Chalkboard

- c. Overhead projector
 - d. Various handouts
11. FORMS.
- a. Medical Examiner's Certificate ([OPNAV Form 8020/2](#))
 - b. MHE Operator's License ([figure 4-1](#))
 - c. MHE Inspection Form ([figure 8-1](#))
12. RECOMMENDED VIDEOS.
- Lesson 2 - Forklift Safety (15 min.)
- Lesson 4 - Supervisor Awareness (14 min.)
- Lesson 6 - Color of Danger (16 min.)

LESSON NO. 2

Types of Industrial Materials Handling Equipment

Day 1 - Classroom 1.0 Hour

1. OBJECTIVE. Students shall be introduced to the various types of approved MHE and forklift attachments. Students shall be instructed on the differences between operating MHE versus an automobile (e.g., top heavy, loaded and unloaded driving conditions, rear steering, tighter turning radius, etc.).
2. LESSON OUTLINE. Review [chapter 3](#) in detail.
3. TEACHING PROCEDURES. Instructor lectures.
4. INSTRUCTIONAL AIDS (CLASSROOM).
 - a. Chalkboard
 - b. Overhead projector
 - c. Handouts
 - d. VHS/CD/DVD playback capability
 - e. Movie (Forklift Safety)
5. EQUIPMENT AND MATERIALS. As required.

LESSON NO. 3

Operational Safety Regulations

Day 1 - Classroom 2.0 Hours

1. OBJECTIVE. Students shall be knowledgeable on all MHE safety precautions, regulations for using MHE in specific locations, and securing MHE.
2. LESSON OUTLINE. Review [chapter 5](#) entirely.
3. TEACHING PROCEDURES. Instructor lectures on MHE safety precautions and MHE usage in hazardous locations.
4. INSTRUCTIONAL AIDS.
 - a. Classroom
 - b. Chalkboard
 - c. Overhead projector
5. EQUIPMENT AND MATERIALS. As required

LESSON NO. 4

MHE Inspection

Day 1 - Classroom 0.5 Hour, Worksite 1.0 Hour

1. OBJECTIVE. Students shall be instructed on the required procedures to perform daily pre-operational and post-operational tests and inspections on MHE using MHE Inspection Form (figure 8-1), and to perform annual inspection of forks using Fork Maintenance Inspection Form (figure 8-13).
2. LESSON OUTLINE. Review chapter 8 (paragraphs 8-1 through 8-6) in detail. Make mention of paragraphs 8-7 through 8-9.
3. TEACHING PROCEDURES. Instructor lectures, has students inspect actual MHE and completes MHE Inspection Form (figure 8-1) and Fork Maintenance Inspection Form (figure 8-13). All MHE controls and their functions shall be explained and demonstrated by the instructor.
4. INSTRUCTION AIDS.
 - a. VHS/CD/DVD playback capability
 - b. Movie (Supervisor Awareness)
 - c. Applicable manufacturer's technical manual (for operating controls identification)
5. EQUIPMENT AND MATERIALS.
 - a. MHE Inspection Form (figure 8-1)
 - b. Fork Maintenance Inspection Form (figure 8-13)
 - c. Applicable MHE

LESSON NO. 5

Basic Operation Of Forklift Trucks

Day 2 - Worksite 8.0 Hours

1. **OBJECTIVE.** Students are required to learn the proper procedures for lifting a load, skills in handling and maneuvering the forklift truck over designated obstacle courses, and spotter requirements.
2. **SAFETY PRECAUTIONS TO BE OBSERVED.** Instructor shall review selected areas from [chapter 5](#) (primarily [paragraphs 5-3](#) and [5-4](#)) and [paragraph 8-2.1](#).
3. **LESSON OUTLINE.**
 - a. Pre-operational inspection on the forklift truck using MHE Inspection Form ([figure 8-1](#)) and inspection procedures ([page 8-5](#)).
 - b. Lifting a pallet (nominal 48 x 40 x 36 inches weighing at least 500 pounds).
 - (1) Approach the pallet squarely, aligning forks between the top and the bottom decking and equal distance from the center stringer.
 - (2) Enter forks squarely, penetrating not less than three-quarters of the pallet, with or without stops, and shall not extend through the pallet.
 - (3) Lift the pallet approximately two inches and tilt back.
 - (4) Raise the pallet approximately 6 inches above the ground/deck.
 - (5) Look over both shoulders, sound horn and back straight away.
 - (6) Stop and lower pallet approximately 4 inches above the ground/deck.
 - (7) Move the pallet to the desired location.
 - c. Setting the pallet down.
 - (1) Position the pallet at the proper storage/stowage location.
 - (2) Level the pallet.
 - (3) Lower the pallet to the ground/deck.
 - (4) Look back over both shoulders, sound horn and back straight away from the pallet until the forks clear the pallet.

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d. Using the above instructions, lift the same pallet and drive the following pre-designated obstacle courses in both forward and reverse directions as demonstrated by the instructor. These obstacle courses will simulate entering a boxcar from a loading dock, loading onto a flatbed truck, and double stacking unit loads.

(1) A 40-foot long by 52-inch wide straight aisle. (Refer to [figure B-1](#)).

(2) A 32-½ foot diameter (16 feet, 3-inch radius) circle passing obstacles alternately on the left and the right. (Refer to [figure B-2](#)).

(3) Continue driving the prescribed obstacle courses, observing all the safety regulations, until all students have experienced operating the forklift truck and have undertaken the spotter's responsibilities.

e. Upon completion of step d, perform a post-operational inspection using MHE Inspection Form ([figure 8-1](#)) and the inspection procedures ([page 8-5](#)).

4. TEACHING PROCEDURES. Instructors shall demonstrate:

a. The proper method of lifting and setting down the pallet.

b. How to operate the loaded forklift truck in both forward and reverse directions using the pre-designated obstacle courses.

c. The proper positioning and signaling for a spotter ([paragraph 5-3.4.ee](#)).

5. EQUIPMENT AND MATERIALS.

a. Worksite

b. 4,000/6,000-pound Forklift Truck

c. Palletized loads, as required

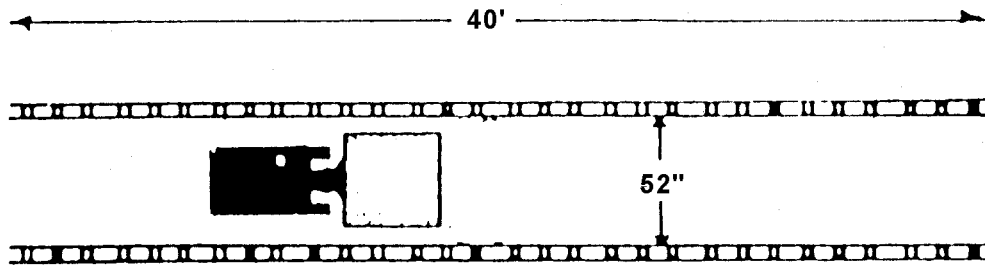


FIGURE B-1. Straight Aisle Course

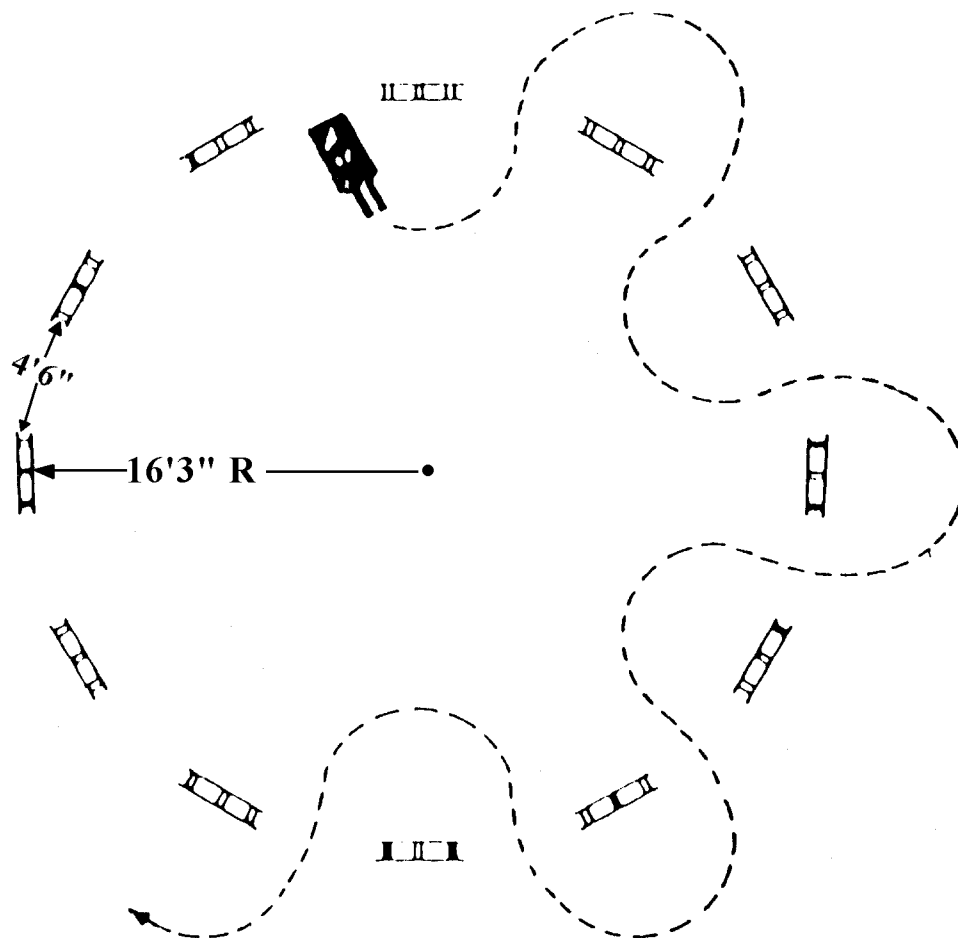


FIGURE B-2. Weaving Obstacle Course

LESSON NO. 6

Storage/Stowage

Day 3 - Classroom 0.5 Hours, Worksite 3.5 Hours

1. OBJECTIVE. Students will be instructed to safely operate MHE, properly store/stow pallet loads and spotter requirements.

2. SAFETY PRECAUTIONS TO BE OBSERVED. Instructor shall review selected areas from [chapter 5](#) (primarily [paragraphs 5-3](#) and [5-4](#)) and [paragraph 8-2.1](#).

3. LESSON OUTLINE.

a. Pre-operational inspection on the forklift truck using MHE Inspection Form ([figure 8-1](#)) and inspection procedures ([page 8-5](#)).

b. Each student will move six pallet loads (nominal 48 x 40 x 36 inches weighing at least 500 pounds), one pallet at a time, using the following procedures: [pallet loads will be arranged three high by two wide]

(1) Using a forklift and fork stops, if required, approach within 6 inches of the stack of pallets.

(2) Stop forklift truck and raise forks to proper height of highest tiered pallet.

(3) Enter pallet fully and stop.

(4) With foot on the brake, raise the pallet approximately 2 inches and tilt back.

(5) Look over both shoulders, sound horn and back straight away until you've cleared the stack or any other obstructions.

(6) Stop forklift truck and, with foot on the brake, lower the pallet approximately 4 inches above the ground/deck.

(7) Move the pallet to the staging area to begin block stow and stop. The first pallet must be square on the ground/deck. All other pallet must be aligned tight to the first pallet.

(8) With foot on the brake, raise the pallet 6 inches above the stow location.

(9) Level the pallet and drive forward to the proper location where the pallet is to be set down and stop.

(10) With foot on the brake, set the pallet down.

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(11) Look over both shoulders, sound horn and back straight away clearing the pallet and any other obstructions. Drive the empty forklift truck to transport remaining pallet loads.

(12) Lift next pallet load repeating the same steps. Continue these procedures until all six pallet loads have been moved and stacked three high by two wide.

(13) Continue driving the prescribed driving requirements, observing all the safety regulations, until all students have experienced operating the forklift truck and have undertaken the spotter's responsibilities ([paragraph 5-3.4.ee](#)).

c. Upon completion of step b, perform a post-operational inspection using MHE Inspection Form ([figure 8-1](#)) and the inspection procedures ([page 8-5](#)).

4. TEACHING PROCEDURES. Instructor shall demonstrate each step in the lesson outline.

5. INSTRUCTIONAL AIDS.

a. VHS/CD/DVD playback capability

b. Movie (Color of Danger)

6. EQUIPMENT AND MATERIALS.

a. Worksite

b. 4,000/6,000-pound Forklift Truck

c. Palletized loads, as required

LESSON NO. 7

Operating MHE In Confined Areas

Day 3 - Classroom 1.0 Hour, Worksite 3.0 Hours

1. OBJECTIVE. Students shall be instructed to safely operate MHE in confined areas, such as small magazines, elevators, motor vehicles and railcars.

2. SAFETY PRECAUTIONS TO BE OBSERVED. Instructor shall review selected areas from [chapter 5](#).

3. LESSON OUTLINE.

a. Inspect the following items on the boxcar:

(1) Wheels are chocked before any loading or unloading operation, except for pier wharf or MILVAN/ISO Container operations.

(2) Doors on loading dock are fully opened.

(3) Floor is in good condition with nails and dunnage removed.

b. Using local procedures, ensure the correct bridgeplate is used. Inspect the bridgeplate for the following:

(1) Enough strength to support the load and the forklift truck.

(2) No broken welds or other deformations.

(3) Properly positioned and secured.

(4) Correct bridgeplate (inboard or outboard).

c. Pre-operational inspection on the forklift truck using MHE Inspection Form ([figure 8-1](#)) and the inspection procedures ([page 8-5](#)).

d. Students will move eight pallet loads (nominal 48 x 40 x 36 inches weighing at least 500 pounds), one load at a time, into the boxcar using the following procedures:

(1) Ensure the fork carriage is centered.

(2) With foot on the brake, lift the pallet load and tilt back.

(3) Approach the corner of the boxcar parallel to and within 2 inches of the side.

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- (4) With foot on the brake, level the unit load.
- (5) Drive squarely up to and touch the end of the boxcar.
- (6) With foot on the brake, move the pallet load to the left or right until touching the side of the boxcar.
- (7) With foot on the brake, lower the pallet load to the floor. Pallet load should be flush against the side/end of the boxcar.
- (8) Look back over both shoulders, sound horn and back straight away until forks are clear of the pallet.
- (9) Repeat steps d(1) through d(8) for the opposite corner of the boxcar.
- (10) Repeat steps d(1) through d(8) for the opposite end of the boxcar.
- (11) For stacking pallet loads, two tier high, repeat steps d(1) through d(4).
- (12) Stop forklift truck within 6 inches of the previously positioned pallet load.
- (13) Raise pallet load approximately 6 inches above the previously positioned pallet load.
- (14) Repeat steps d(6) and d(7).
- (15) Repeat these procedures until all eight pallet loads have been positioned in the boxcar. Continue with this training exercise, observing all the safety regulations, until all students have experienced operating the forklift truck.

e. Upon completion of step d, perform a post-operational inspection using MHE Inspection Form ([figure 8-1](#)) and the inspection procedures ([page 8-5](#)). Lastly, secure the MHE ([paragraph 5-11](#) or [5-12](#)).

4. TEACHING PROCEDURES.

- a. Instructor shall demonstrate each step in the lesson outline.

5. EQUIPMENT AND MATERIALS.

- a. 4,000/6,000-pound Forklift Truck
- b. Two DODX railcars or, if not available, two dimensionally simulated railcars.
- c. Eight palletized loads.
- d. Two bridgeplates.
- e. Loading dock.

LESSON NO. 8

Handling Long Loads

Day 4 - Classroom 1.0 Hour, Worksite 3.0 Hours

1. OBJECTIVE. Students shall be instructed in the handling of long, unstable palletized loads with MHE and spotter requirements. These palletized loads shall extend beyond the carriage width (minimum 2 feet on each side).

2. SAFETY PRECAUTIONS TO BE OBSERVED. Instructor shall review selected areas from [chapter 5](#).

3. LESSON OUTLINE.

a. Pre-operational inspection on the forklift truck using MHE Inspection Form ([figure 8-1](#)) and the inspection procedures ([page 8-5](#)).

b. Verify that the trailer wheels are chocked to prevent vehicle movement.

c. Verify that the trailer loading area is free of nails and dunnage.

d. Position six palletized loads (e.g., steel beams, pipes, lumber, etc.) onto a flatbed trailer (three loads wide and two loads high).

(1) Align forklift truck with load; ensure forks are properly spaced to fit into fork pockets.

(2) If required, ensure fork stops are properly installed to prevent forks from protruding through the load.

(3) Insert forks through fork pockets, lift load approximately 2 inches, and tilt back.

(4) Look over both shoulders and back away from the stack until clear.

(5) Lower the load approximately 4 inches from the ground/deck. Move the load to the desired location on the flatbed trailer.

(6) With foot on the brake, level forks and raise the load high enough to clear the bed of the trailer.

(7) Following the spotter's directions, drive forward and lower the load in the desired position on the flatbed trailer.

(8) Look back over both shoulders, sound horn and back forklift truck straight away until forks clear the load and the flatbed trailer. Lower forks approximately 4 inches above the ground/deck.

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(9) Repeating steps d(1) through d(8) to position the second load on the opposite side of the trailer.

(10) Repeating steps d(1) through d(8), position the third load on top of the first load, fourth load on top of second load, etc.

(11) Repeat the above steps to stack the loads on both sides of the trailer, ensuring that they are flush against the blocking and aligned properly fore and aft on the flatbed trailer.

(12) Continue with this training exercise, observing all the safety regulations, until all students have experienced operating the forklift truck.

e. Upon completion of step d, perform a post-operational inspection using MHE Inspection Form ([figure 8-1](#)) and the inspection procedures ([page 8-5](#)).

4. TEACHING PROCEDURES.

a. Instructor shall demonstrate each step in the Lesson Outline.

5. INSTRUCTIONAL AIDS

a. Classroom - Chalkboard

b. Worksite - Area, as required

6. EQUIPMENT AND MATERIALS (Worksite)

a. 4,000/6,000-pound Forklift Truck

b. Six long, unstable palletized loads (e.g., steel beams, pipes, lumber, etc.).

c. One flatbed trailer or raised platform.

LESSON NO. 9

Operating Electric Pallet Trucks

Day 4 - Worksite 4.0 Hours

1. **OBJECTIVE.** Students shall learn the proper procedures for inspecting, operating and skills in maneuvering an electric pallet truck over pre-designated obstacle courses.
2. **SAFETY PRECAUTIONS TO BE OBSERVED.** Instructor shall review selected areas from [chapter 5](#).
3. **LESSON OUTLINE.**
 - a. Perform a pre-operational inspection on the electric pallet truck using MHE Inspection Form ([figure 8-1](#)) and the inspection procedures ([page 8-5](#)).
 - b. Lifting and lowering a pallet (nominal 48 x 40 x 36 inches weighing at least 500 pounds).
 - (1) Approach the pallet squarely, aligning forks between the top and bottom decking and an equal distance from the center stringer.
 - (2) Enter forks squarely into the pallet, penetrating not less than three-quarters through the pallet. Prior to lifting the pallet, verify that the pallet's base is not resting on the pallet truck's wheels.
 - (3) With brakes on, lift the pallet approximately 2 inches above the ground/deck.
 - (4) Lower pallet to the ground/deck.
 - (5) Look back over both shoulders and, if equipped, sound horn and back straight away from the pallet until the forks are clear of the pallet.
 - c. Designated obstacle courses. Using the above instructions, lift the same pallet and drive the following designated obstacle courses in the forward and reverse directions as demonstrated by the instructor.
 - (1) A 40-foot long by 52-inch wide straight aisle. (Refer to [figure B-1](#)).
 - (2) A 32-½ foot diameter (16 feet, 3-inch radius) circle passing obstacles alternately on the left and the right. (Refer to [figure B-2](#)) An alternate obstacle course for ships, such as cruisers, frigates and destroyers, that have limited deck space is shown in [figure B-3](#).
 - (3) Continue driving the prescribed obstacle courses, observing all the safety regulations, until all students have experienced operating the forklift truck and have undertaken the spotter's responsibilities.

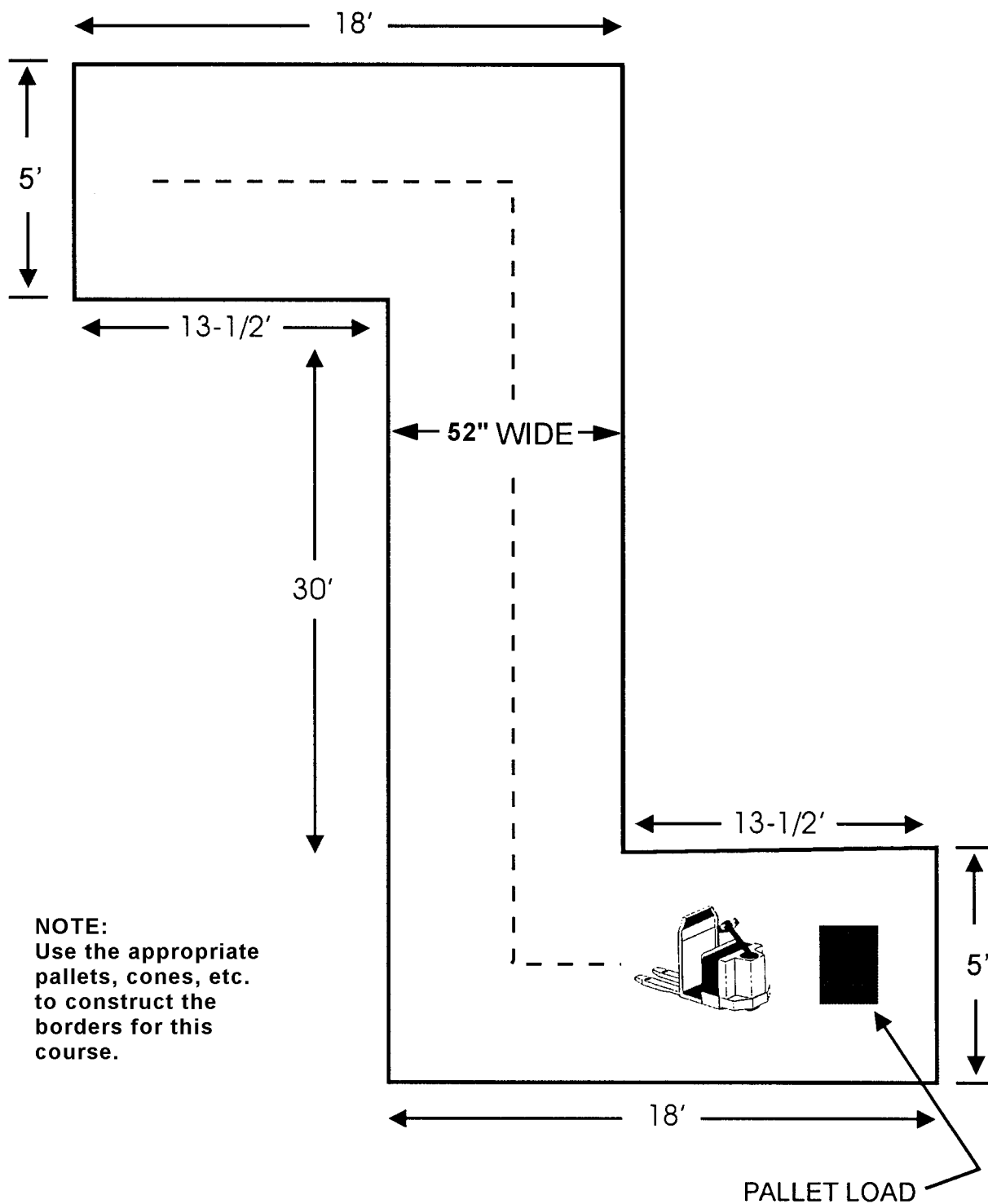


FIGURE B-3. Alternate Shipboard Obstacle Course

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d. Upon completion of step c, perform a post-operational inspection, using MHE Inspection Form (figure 8-1) and the inspection procedures (page 8-5).

4. TEACHING PROCEDURES.

a. Instructor shall demonstrate each step in the Lesson Outline.

5. EQUIPMENT AND MATERIALS.

a. MHE Inspection Form (figure 8-1).

b. Type E/EE Electric Pallet Truck.

c. Pallet loads.

d. Pallets, cones, etc. (as appropriate to simulate obstacle course borders).

LESSON NO. 10

Proficiency Test

Day 5 - Jobsite 8.0 Hours

1. **OBJECTIVE.** Students shall satisfactorily pass a written test and, while observing all safety precautions and regulations, satisfactorily complete an operational skills demonstration consisting of inspecting, operating, and securing MHE.

2. **LESSON OUTLINE.** This proficiency test shall be conducted in two sections: written and operational skills demonstration. The instructor shall prepare a local written test or request one from the Director, [Naval PHST Center](#) (Code E4), Naval Surface Warfare Center, Indian Head Division Detachment Earle, 201 Highway 34 South, Colts Neck, NJ 07722-5023. This test shall minimally consist of 25 multiple choice questions based on the operational safety regulations in [chapter 5](#). The retention of the graded written test is at the discretion of the instructor's CO/OIC in accordance with local procedures. The operational skills demonstration shall consist of six parts given in a continuous sequence as follows:
 - a. Part 1 - Students shall perform a pre-operational MHE inspection using MHE Inspection Form ([figure 8-1](#)) and the inspection procedures ([page 8-5](#)). The students shall verbally address each inspection criteria to the instructor. The instructor shall deduct one point for each inspection criteria not reported or performed.

 - b. Part 2 - Students shall break out one pallet (nominal 48 x 40 x 36 inches weighing at least 500 pounds) from a stack of four pallets (two high by two wide) or two pallets (side-by-side) for electric pallet trucks only. The instructor shall deduct one point for each of the following applicable infractions:
 - (1) Failure to fasten seat belt, if equipped. See [paragraph 5-3.2.g.](#) for shipboard exceptions.
 - (2) Improper use of fork stop ([figure 3-12](#)), if required.
 - (3) Bumping a pallet.
 - (4) Improper penetration of forks.
 - (5) Forks protruding through pallet.
 - (6) Lifting pallet with tilt control.
 - (7) Failure to look back over both shoulders before traveling in reverse direction.
 - (8) Failure to sound horn before traveling in reverse direction.
 - (9) Failure to have full tilt on load before traveling in any direction.

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- (10) Dragging pallet to be lifted across the top of the remaining pallet.
- (11) Failure to lower pallet approximately 4 inches above the ground/deck before traveling.
- (12) Foot not on brake when lifting and tilting.

c. Part 3 - Students shall drive with a pallet (nominal 48 x 40 x 36 inches weighing at least 500 pounds) in the forward and reverse directions through a straight aisle course (40 foot long x 52 inch wide) with 12 pallets, cones, etc., equally spaced along each side. Refer to [figure B-1](#) for straight aisle course illustration. If the student hits two or more pallets, cones, etc., then the student shall not continue the test.

d. Part 4 -

(1) Students shall drive one pallet (nominal 48 x 40 x 36 inches weighing at least 500 pounds) through a 32-1/2 foot diameter obstacle course. The circle's perimeter is formed by placing 12 pallets, cones, etc., at an equal distance spaced 4 feet 6 inches apart from each other. Refer to [figure B-1](#) for the obstacle course illustration. Students will be required to weave in and out between the pallets, cones, etc., in the forward and reverse directions. If the student hits two or more pallets, cones, etc., the student shall not continue this test.

(2) Alternate (Electric Pallet Trucks Only). Aboard ships with limited deck space, such as cruisers, frigates, destroyers, etc., the alternate obstacle course shall be configured in accordance with [figure B-1](#). Students shall lift one pallet (nominal 40 x 40 x 36 inches weighing at least 500 pounds), travel with the load in the reverse direction to the final destination, and then drive in the forward direction back to the original location. The course's borders shall be configured using the appropriate pallets, cones, etc. If the student hits two or more pallets, cones, etc., the student shall not continue the test.

e. Part 5 - Students shall restow one pallet (nominal 48 x 40 x 36 inches weighing at least 500 pounds) onto a stack of four pallets (two high by two wide) or two pallets (side-by-side) for electric pallet trucks only. The instructor shall deduct one point for each of the following applicable infractions:

- (1) Failure to restow pallet from opposite side.
- (2) Failure to level pallet within 6 inches of stow.
- (3) Failure to land pallet squarely.
- (4) Lowering pallet with tilt.
- (5) Bumping pallet into position.
- (6) Failure to look before backing.
- (7) Dragging pallet.

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(8) Failure to lower forks.

(9) Improper use of spacer.

f. Part 6 - Students shall return the pallet to the original starting position and secure MHE. The instructor shall deduct one point for each of the following applicable infractions:

(1) Failure park MHE in the designated area.

(2) Failure to lower forks to the ground/deck.

(3) Failure to set the parking brake.

(4) Failure to neutralize controls.

(5) Failure to disconnect battery connector cable (electric only) after dismounting MHE.

(6) Failure to remove key.

(7) Each item verbally not reported or performed by the student to the instructor during the post-operational inspection of the MHE, using MHE Inspection Form ([figure 8-1](#)) and the inspection procedures ([page 8-5](#)).

3. **INSTRUCTIONAL PROCEDURES.** Instructor shall read the instructions to the students, emphasizing that the students must have the ability to understand and follow written and verbal instructions.

4. **INSTRUCTION AIDS.**

a. Operational skill test raw score sheet.

b. MHE operator training certificate.

c. MHE operator written test.

5. **EQUIPMENT AND MATERIALS.**

a. Forklift truck or electric pallet truck, 4000/6000-pound capacity.

b. Four pallets (nominal 48 x 40 x 36 inches weighing at least 500 pounds).

c. MHE Inspection Form ([figure 8-1](#)).

d. Pallets, cones, etc. (as appropriate to simulate the obstacle course borders).

OPERATIONAL SKILL TEST RAW SCORE SHEET

PART ONE: Pre-Operational Inspection		Deductions
Color, Markings	Type	
	Restrictions	
	Test Date	
	Capacity	
Battery		
Static Tires or Straps		
External Conditions	Weldments	
	Loose or Missing Bolts	
	Lift Chains	
	Hoses - Leaks	
	Cylinders Leaks	
	Fork Stops	
	Forks	
	Fork Pins	
Battery Connector Cable		
Hydraulic Cylinders	Hoist	
	Tilt	
	Sideshift	
Brakes	Parking Brake	
	Foot Brake	
	Seat Brake	
Seat Belt		
Warning Device (Horn)		
TOTAL DEDUCTIONS PART ONE		

PART TWO: Breakout Pallet	Deductions
Seat belt not fastened	
Improper use of spacer	
Bumping pallet	
Improper penetration of forks	
Forks protruding through pallet	
Lifting pallet with tilt control	

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PART TWO: Breakout Pallet		Deductions
Failure to look before backing		
Failure to sound horn before backing		
Failure to have full tilt on pallet		
Dragging pallet		
Failure to lower pallet approximately 4 inches before traveling		
Foot not on brake when lifting and fitting		
TOTAL DEDUCTIONS PART TWO		

PART THREE: Driving Through Straight Aisle		Deductions
Forward	Pylons Hit	
	Stops/Slows	
Reverse	Pylons Hit	
	Stops/Slows	
TOTAL DEDUCTIONS PART THREE		

PART FOUR: Obstacle Course		Deductions
Forward	Pylons or Pallet Hit	
	Stops/Slows	
Reverse	Pylons or Pallet Hit	
	Stops/Slows	
TOTAL DEDUCTIONS PART FOUR		

PART FIVE: Restow Pallet		Deductions
Failure to restow pallet from opposite side		
Failure to level pallet within 6 inches of stow		
Failure to land pallet squarely		
Lowering pallet with tilt		
Bumping pallet into position		
Failure to look before backing		
Dragging pallet		
Failure to lower forks		
Improper use of spacer		
TOTAL DEDUCTIONS PART FIVE		

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PART SIX: Secure MHE		Deductions
Failure to park in designated area		
Failure to lower forks to the ground/deck		
Failure to set parking brake		
Failure to neutralize controls		
Failure to disconnect battery connector cable (electric drive only) after dismounting MHE		
Failure to remove key		
Post-Operational Inspection		Deductions
Color, Markings	Type	
	Restrictions	
	Test Date	
	Capacity	
Battery		
Static Tires or Straps		
External Conditions	Weldments	
	Loose or Missing Bolts	
	Lift Chains	
	Hoses - Leaks	
	Cylinders Leaks	
	Fork Stops	
	Forks	
	Fork Pins	
Battery Connector Cable		
Hydraulic Cylinders	Hoist	
	Tilt	
	Sideshift	
Brakes	Parking Brake	
	Foot Brake	
	Seat Brake	
Seat Belt		
Warning Device (Horn)		
TOTAL DEDUCTIONS PART SIX		

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The total number of deductions from the six parts must be 25 or less to pass the operational skill test.

PART 1	PART 2	PART 3	PART 4	PART 5	PART 6	TOTAL

This form is provided as an example and its use is at the instructors' discretion. The retention of this information is at the discretion of the instructors CO/OIC in accordance with local procedures.

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MHE OPERATOR TRAINING CERTIFICATE

The student named below successfully completed the written and operational skill demonstration tests and I recommend that the command issue the appropriate MHE license in accordance with NAVSUP Publication 538.

Student Name (*last, first, middle initial*)

Rank/Grade

Parent Command

The student named above successfully demonstrates proficiency on the following MHE on dates indicated and I recommend that the command issue/upgrade the appropriate MHE license in accordance with NAVSUP Publication 538.

MHE: Class/Lift Code and SWL	Instructor Name (<i>last, first middle initial</i>) Instructor Signature/Date Parent Command	Evaluator Name (<i>last, first, middle initial</i>) Evaluator Signature/Date Parent Command Evaluator's Description of Workplace

This certificate is an example of the documentation that must be maintained by the parent command issuing/upgrading the MHE license. The information must be documented and maintained, however the format is optional.

APPENDIX C

**MATERIALS HANDLING EQUIPMENT
ASSIST CHECKLIST**

C-1. GENERAL

This appendix provides a checklist for shipboard and shore based use, as appropriate, to assist the ships crew or personnel ashore in evaluating their MHE operations and to provide needed assistance and information.

Ship/Shore Activity Name _____

Date of Visit _____

C-2. MHE ADMINISTRATION

a. Determine who owns/reports on the MHE.

Dept	_____	POC	_____	Phone	_____
Dept	_____	POC	_____	Phone	_____
Dept	_____	POC	_____	Phone	_____

b. Advise the ship/shore activity of their NAVICP-M, TYCOM, Fleet Issue Control Point (FICP) and MHE In-Service Engineering Agency (ISEA) and Hardware Systems Command (HSC) representatives.

NAVICP-M:	Code 8341	POC	_____	DSN	_____
				Comm	_____
		POC	_____	DSN	_____
				Comm	_____
TYCOM:	_____	POC	_____	DSN	_____
				Comm	_____
FICP:	_____	POC	_____	DSN	_____
				Comm	_____

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ISEA:	PHST Center	POC _____	DSN _____
			Comm _____
HSC (Afloat):	NAVSEA	POC _____	DSN _____
			Comm _____

c. The following documents should be on board. (Check if available)

- (1) NAVSUPINST 10490.33 (series) _____
- (2) NAVICPINST 10490.4 (series) _____
- (3) [NAVSEA SW023-AH-WHM-010](#) _____
- (4) Technical Manuals for each type of MHE on board _____
- (5) Allowance Parts List (APL) for each type of truck on board _____
(Note: Not all MHE have APL's; check EMACS to verify)
- (6) Product Quality Deficiency Report SF 368, [figure 7-2](#) (blanks) _____
- (7) MHE Inspection Form, [figure 8-1](#) (Daily Checklist Form) (blanks) _____
- (8) 3-M Data Maintenance Index Pages and Maintenance Requirement Cards for all MHE on board. _____
- (9) Technical Feedback Report (TFBR) Form _____

If any of this data is unavailable, the ship should be directed to work through their TYCOM representative and local FICP coordinator. Shore activities should be directed to work through their FISC Regional Manager and NAVCIP-M to obtain this data. Any item with a stock number can be ordered through normal MILSTRIP process.

C-3. MHE MANAGEMENT

C-3.1. ALLOWANCE VERIFICATION.

a. Verify that MHE aboard conforms to the reported ships inventory from the EMACS data base which can be obtained from the local FISC. All MHE should have a USN painted on the truck. List any discrepancies.

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b. Verify/ascertain from ships force that all MHE aboard meets the ships operating conditions. For example turning radius, charging stations, underclearance, overhead clearance, proper safety rating and weight certification for ordnance handling ([NAVSEA SW023-AH-WHM-010](#)), cold storage application, etc. Make any recommendations for changes/additions/deletions.

c. Verify that each piece of MHE has all the proper markings. Note any discrepancies. Reproduce this page as needed. Refer to [paragraph 5-7](#) for specific MHE marking requirements and sizes.

- (1) USN registration number (i.e. 13-12345) _____
 - (2) Safety Rating (i.e. EE) painted on truck and indicated on plate _____
 - (3) Manufacturers Identification Plate _____
 - (4) Shipping data plate _____
 - (5) Wheel loading plate _____
 - (6) Vehicle Weight _____
 - (7) Safe Working Load (i.e. SWL 6000 pounds) _____
 - (8) Slinging and tiedown positions marked _____
 - (9) Safety Warning “NO RIDERS” _____
 - (10) Fuel Type (i.e. Diesel Fuel Only) _____
 - (11) Structural Testing Certification (i.e., painted on truck w/manufacturer’s name and test date) or Periodic Weight Test Certification Form _____
 - (12) Paint Markings (i.e., Lead/Chromate Free) on new and SLEP MHE. _____
 - (13) Brake Markings on new and SLEP MHE “Non-Asbestos Brake Liner Used; Replacement Shall Be Non-Asbestos”. _____
 - (14) Verify that trucks have no unauthorized modifications. If any are found, check Equipment History File for authorization from NAVICP-M. List any discrepancies.
-
-

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(15) Check trucks for proper corrosion control/paint. All exposed surfaces should be painted or adequately protected. Note any deficiencies.

(16) Verify that trucks have daily operators log and that any major deficiencies are being reported.

(17) **(Shipboard Only)** Shipboard Marking “SHIPBOARD USE APPROVED”

(18) **(Shore Activity Only)** Verify that trucks have seat belts/safety harness (stock selector only). List any discrepancies/plan of action to install seat belts.

C-3.2. QUALITY DEFICIENCIES REPORTS (QDR'S).

a. What action does the ship/shore activity take if they have problems with a new piece of MHE? (Are ships working with TYCOM/FICP Rep's or are shore activities working with NAVICP-M/FISC Reps?)

b. Do they understand the QDR process _____? If not explain. All shipboard QDR's go to the TYCOM first.

c. The ship/shore activity should maintain a file on QDR's and if not resolved they should send out a tracer. Review tracking system and provide any recommendations.

C-3.3. REPLACEMENTS.

a. What procedures does the ship/shore activity use to obtain a replacement forklift and/or transfer/dispose of an existing piece of MHE? Does the ship/shore activity work through their TYCOM (ships only) and Regional FISC (**shore activity only**)? Are trucks returned in good condition?

b. What procedures does the ship/shore activity use to request an increase to their current MHE allowance or advise if an alternative piece of MHE is required? Is the ship working through their TYCOM/ FICP MHE Representatives?

c. (**Shore Activity Only**) Is the shore activity aware of the MHE Service Life Extension Program (SLEP) through their Regional FISC and how to obtain replacement/SLEP MHE?

d. (**Shore Activity Only**) Does the shore activity lease any MHE and are they aware of the services offered through their Regional FISC representative?

C-3.4. REPORTING/TRACKING.

a. Is the ship/shore activity using EMACS to track their MHE? If not, have them contact TYCOM or Regional FISC representative to get access and training. Verify they have completed their last annual report and that they are submitting quarterly reports.

b. Does each piece of MHE have a equipment history file containing all pertinent information? If not, provide assistance in establishing some type of record keeping system.

C-4. MHE REPAIR AND MAINTENANCE

C-4.1. PREVENTIVE MAINTENANCE (PM).

a. Verify that PM is being performed and what procedure or guidance is used to schedule preventive maintenance? Are they using the Technical Manual and the MIP to schedule the work?

b. Who does the PM work and are they qualified? Do they follow the Technical Manual and/or the MRC's for performing PM? Any deficiencies with the MIP/MRC's should be reported to the MHE ISEA by a TFBR with a copy to the TYCOM (**shipboard only**). Any technical manual deficiencies should be reported to NAVICP-M with a copy to the TYCOM (**shipboard only**).

c. How are PM actions recorded and are they included in the EMACS report and Equipment History File?

d. Who verifies that PM has been accomplished and checks on quality of service?

e. (**Shore Activity Only**) Is the shore activity aware of the Regional FISC program for maintaining their MHE? This program is not available in all regions. Verify with Regional FISC to see what is currently available.

C-4.2. REPAIRS.

a. Verify how unscheduled maintenance is performed. Are personnel qualified to perform the repairs? What level repairs are performed?

b. Do they ever use other repair sources (i.e., PWC, SIMA, contractors) and which ones? Are they aware of the Regional MHE Manager's ability to coordinate all maintenance actions for them?

c. Verify that procedures are in place to check all repairs to ensure the integrity of the Safety Ratings. Ensure all covers, gaskets, shields etc. are reinstalled on the trucks after repairs. Also only qualified repair parts should be used. Note any deficiencies. Advise on corrective action plans to take.

d. Verify that all maintenance actions are properly recorded in the Equipment History File and in EMACS. If EMACS is not used, how are actions being recorded? Note any deficiencies.

e. Do they have proper tools and area to perform required maintenance operations? Make any recommendations.

f. Is there a quality control program in place to verify all repairs? Who inspects repairs after completion?

C-4.3. PARTS SUPPORT.

a. Do they have adequate parts/COSAL support to perform PM operations? If no, list deficiencies and check to see a request to change the APL has been made.

b. What procedures are in place to order repair parts? For ships, what about when in port or deployed? Do they know they can go to Regional FISC/TYCOM for assistance or call 1-800 numbers in some instances?

c. How do they order replacement batteries for electric forklifts? Are they shipboard qualified?

C-4.4. MAINTENANCE TRAINING.

a. Do they feel they are adequately trained to perform PM, repairs and maintenance? If not, what type of training do they feel they need?

b. Are the technical manuals and MRC's adequate guides in performing PM and other maintenance and repairs? Any recommendations?

c. Are any procedures in place when maintenance personnel rotate out to brief replacements?

C-5. MHE OPERATIONS

C-5.1. OPERATOR TRAINING AND LICENSING.

a. What type of training do the MHE operators receive? Are the operators trained in the proper use of MHE for ordnance handling, and hazardous material? If not, training needs to be obtained.

b. Are licenses issued to each operator and by whom?

c. What controls are in place to prevent unauthorized use of MHE? Are they effective? Make any recommendations.

C-5.2. STORAGE/STOWAGE.

a. How is MHE stored/stowed? Are electric trucks protected from the elements and used for interior operations? Are all other trucks protected from the elements when not in use for long periods of time?

b. **(Shipboard Only)** Are tiedowns used when MHE is not being used for long periods of time?

C-5.3. BATTERY CHARGING.

a. Verify that adequate chargers/charging stations are available for all electric MHE. Note any discrepancies.

b. Are electric batteries of sufficient amp capacity for required operations?

C-5.4. MHE INSPECTION FORM (DAILY INSPECTIONS).

a. Who reviews the MHE Inspection Form? Are these forms maintained for each piece of MHE? List any discrepancies.

b. Who reviews the MHE Inspection Form and are maintenance actions being corrected in a timely manner?

C-5.5. ACCIDENTS.

a. How are accidents reported and what corrective measures are taken?

Any comments/recommendations to help improve MHE operations:

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Assist Team Member _____

Mailing Address _____

Phone Comm. _____

DSN _____

Email Address _____

After completing form, provide a copy to the ship/shore activity (and to ship's TYCOM).
Send original to:

Commander
Naval Inventory Control Point (NAVICP)
Code 8341 (T. Lewis)
5450 Carlisle Pike
P.O. Box 2020
Mechanicsburg, PA 17055-0788

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APPENDIX D

SHIPMENT AND TRANSPORTATION OF MHE

D-1. GENERAL

This appendix provides shipment and transportation guidelines for Materials Handling Equipment (MHE) intended to be transported on enclosed vans and trailers, or on flatbed trailers from short term storage and long term storage. Additionally, general truckload requirements are provided to properly and safely block and brace MHE for transportation. These procedures are presented to ensure MHE will not be degraded or damaged during shipment. If provided, refer to manufacturer recommendations supporting any shipment and transportation requirements associated with MHE. The truckload requirements presented in this chapter apply to all classes of MHE provided they can physically be capable of being transported by the offering motor vehicle.

D-2. SHORT TERM STORAGE REQUIREMENTS

MHE intended to be shipped from short-term storage, described in [chapter 11](#), requires an inspection, operational test, and maintenance procedures prior to shipment.

D-2.1. INSPECTION, TEST AND MAINTENANCE. The following requirements will be performed on each unit:

- a. Conduct an initial receipt inspection on each unit in accordance with [paragraph 8-4](#).
- b. Operate the unit for a minimum of 30 minutes.
- c. Perform the periodic inspection, exercising and maintenance with the requirements specified in [paragraph 11-8](#) and with the Maintenance Requirement Card (MRC), as required, based on the total storage time interval.
- d. Accompany the appropriate technical manual and equipment history file with each piece of MHE.

D-2.2. SHIPMENT REQUIREMENTS. The following procedures document the general shipment requirements prior to loading MHE onto a motor vehicle:

- a. Whenever practical, enclosed-type motor vehicles shall be used to transport MHE. Flatbed trailers containing waterproof tarpaulins may be used for the transportation of MHE. When tarpaulins are used, they shall be properly secured to prevent abrasion damage to the painted MHE surfaces.
- b. Forks shall be secured in carriage detents with the latches closed.

c. Folding-type forks shall be secured for shipment in accordance with figures D-1, D-2, and D-3.

d. Forks that are non-folding or that are detachable shall be secured to the carriage using steel strapping or web straps. Free ends of the web straps shall be properly secured to prevent abrasion damage to the painted MHE surfaces.

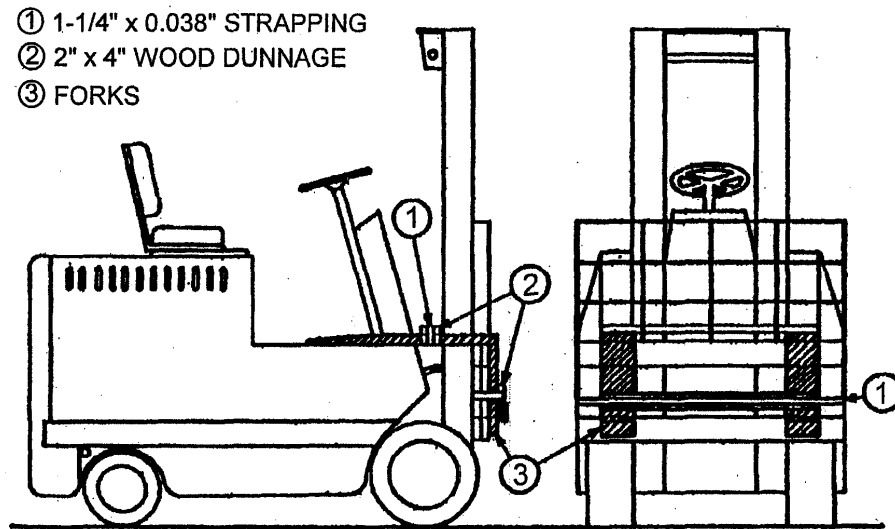


FIGURE D-1. Typical Application of Metal Strapping Securing Forks to Truck

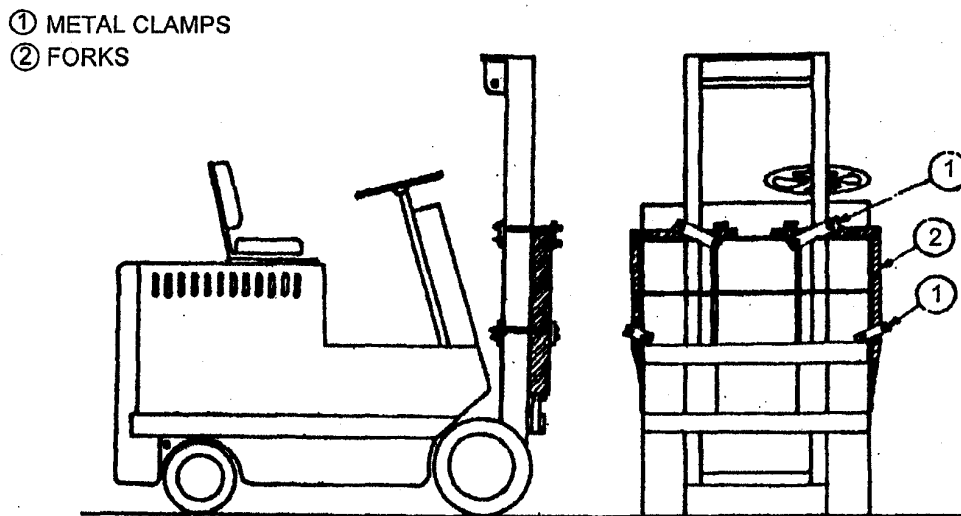


FIGURE D-2. Typical Application of Metal Clamps Securing Forks to Truck

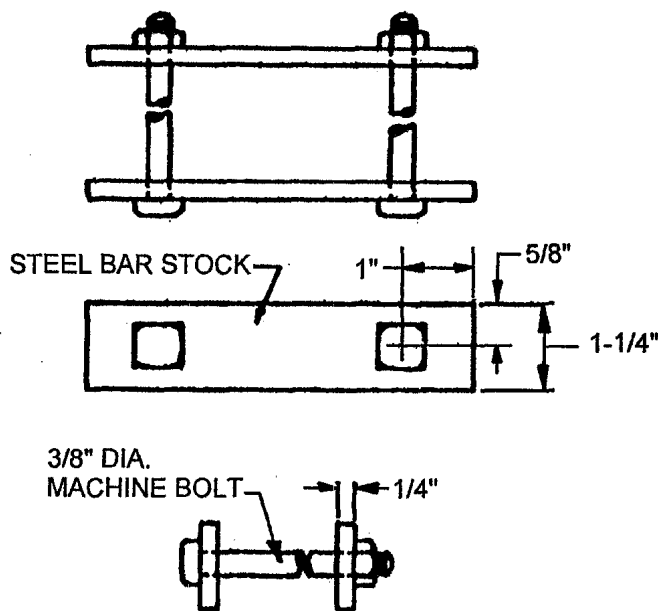


FIGURE D-3. Clamping Device Used for Securing Forks on MHE

D-2.3. **TRANSPORTATION REQUIREMENTS.** Upon completion of the requirements specified in [paragraphs D-2.1](#) and [D-2.2](#), MHE shall be properly blocked and braced onto a motor vehicle with the truckload requirements described in [paragraph D-4](#).

D-3. LONG TERM STORAGE

MHE intended to be shipped from long-term storage, described in [chapter 12](#), requires an inspection, operational test, and maintenance procedures prior to shipment.

D-3.1. **INSPECTION, TEST AND MAINTENANCE.** The following requirements will be performed on each unit:

- a. De-preserve engines, transmissions, fuel systems, hydraulic systems, brake systems, etc. If applicable, clean battery contactors on electric MHE. Clean armatures, as required.
- b. Drain and refill all fluids with manufacturer recommended fluids.
- c. Conduct an initial receipt inspection on each unit in accordance with [paragraph 8-4](#).
- d. Operate the unit for a minimum of 30 minutes.
- e. Perform the periodic inspection, exercising and maintenance requirements specified in [paragraph 12-8](#) and with the Maintenance Requirement Card (MRC), as required, based on the total storage time interval.

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f. Accompany the appropriate technical manual, parts, test equipment as supplied, and the equipment history file with each piece of MHE.

D-3.2. SHIPMENT REQUIREMENTS. The shipment requirements specific in [paragraph D-2.2](#) for short term storage also apply for long term storage.

D-3.3. TRANSPORTATION REQUIREMENTS. Upon completion of the requirements specified in [paragraphs D-3.1](#) and [D-3.2](#), MHE shall be properly blocked and braced onto a motor vehicle with the truckload requirements described in [paragraph D-4](#).

D-4. TRUCKLOAD REQUIREMENTS

All MHE being offered for transportation on a motor vehicle shall be properly blocked and braced in accordance with [NAVSEASYS COM Drawing 6214257](#). This drawing illustrates full and less than full truckload requirements for reaching and tiering, and for sit-down type forklift trucks. However, these requirements apply to all other MHE classes that are physically capable of being transported on enclosed vans and trailers or on flatbed trailers.

APPENDIX E

MANUFACTURER REPAIR TIME STANDARDS

E-1. GENERAL

This appendix identifies actual repair time standards provided by the respective industrial Materials Handling Equipment (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 Equipment Management and Control System (EMACS) or other local cost control programs. The actual manufacturer repair time standards are presented as follows:

- [Hyster Times Guide](#)
- [Kalmar Allis-Chalmers \(AC\) Labor Standard Guide](#)
- [Liftking Industries Inc. Repair Time Schedule](#)

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APPENDIX F

DECK SCRUBBER OPERATOR'S TRAINING COURSE

F-1. PURPOSE

[COMNAVAIRFORINST 4790.2 \(series\)](#) establishes the policy, responsibilities and requirements for Support Equipment (SE) training and licensing of personnel to operate a Deck Scrubber. This instruction directs Maintenance Officers (MO's) to establish a formal course of instruction on each item defined as SE. For this reason, the program manager for Shipboard Mobile Support Equipment (SMSE) at Naval Inventory Control Point Mechanicsburg (NAVICP-M), Code 8341, has established this course meeting the minimum requirements that U.S. Navy shipboard personnel must successfully complete prior to being issued a license to operate the Deck Scrubber (Model No. SRS1550-DN-A).

F-2. COURSE VARIATIONS

The Commanding Officer/Officer-In-Charge (CO/OIC), at their discretion and under their documented approval, may authorize variations as needed to adopt this course to train, certify and license Deck Scrubber operators.

F-3. SAFETY AND HAZARD AWARENESS

Any time an operator or instructor has apprehension concerning personal safety, they should signal for a "Training Time-Out (TTO)" to clarify the situation or procedure, and receive or provide additional instruction as appropriate. TTO signals, other than verbal, shall be appropriate to this training environment. Instructors are responsible for maintaining situational awareness and shall be constantly alert to signs of student behavior that may impair safe completion of the training exercise, and shall immediately stop the training, identify the problem or situation, and make a determination to continue or discontinue training. The safety precautions contained in this course are applicable to the instructor and the operators (students). They are basic and general in nature. Personnel who operate or maintain equipment in support of this course must be thoroughly familiar with all aspects of personnel safety and strictly adhere to the every general and specific safety precautions contained in the operating and emergency procedures along with all governing directives. All personnel must have a comprehensive knowledge of emergency procedures, which prescribe courses of action to be followed in the event of equipment failure or human error as stated in the local shipboard mishap reporting. Strict adherence to approved and verified operating, emergency and maintenance procedures is mandatory. As a minimum, each individual is responsible for knowing, understanding and observing all safety precautions applicable to the command, course, their work and their work area. In addition, all personnel are responsible for observing the following safety precautions:

- a. Reporting for work rested and emotionally prepared for the work tasks at hand.

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- b. Using good judgment in all their functions, commensurate with the work at hand.
- c. Reporting any unsafe conditions, or any equipment or material uncertainties, which may be considered to be unsafe, and any unusual or developing hazards.
- d. Warning others believed to be in danger of known hazards or by failure to observe safety precautions.
- e. Reporting any accident, injury or evidence of impaired health occurring in the course of their work or during any non-training environment.
- f. Wearing or using the protective clothing and/or equipment of the type required, approved and supplied for the safe performance of their work.
- g. Wearing appropriate hearing protective devices when in the vicinity of a designated noise hazard area or noise hazard operation.
- h. Hazard materials (HAZMAT) are used during this course. Students must be made aware of the nature of the HAZMAT being used, symptoms of exposure, safety precautions to be observed when handling these materials, and the proper disposal requirements. This is accomplished by ensuring each student has read the appropriate Material Safety Data Sheet (MSDS) for each HAZMAT used and signing a statement of understanding. The following HAZMAT is discussed in the lesson plans and used during the training of operators:

- (1) Jet Fuel JP5 (MIL-DTL-5624)
- (2) Jet Fuel JP8 (MIL-DTL-83133)
- (3) Lubricating Oil, 15W-40 (MIL-PRF-2104)
- (4) Hydraulic Fluid (MIL-PRF-17672)
- (5) Antifreeze (A-A-52624)
- (6) Dry Cleaning Solvent (PD-680, Type III)
- (7) Solvent-Detergent Cleaning Compound (NSN: 6850-01-376-1201; 5-gallon container)

LESSON NO. 1

INTRODUCTION

1. INSTRUCTOR PREPARATION.

Prior to instructing students, the instructor shall:

- a. Review the assigned training materials
- b. Discuss the following reference documentation:
 - (1) NAVSUP PUB 538 – Management of Materials Handling Equipment (MHE).
 - (2) Naval Air Training and Operating Procedures Standardization (NATOPS) NAVAIR 00-80T-96 - Support Equipment Basic Handling and Safety Manual.
 - (3) NAVAIR Aviation Support Equipment Rework Facility (NAVAIRSEFAC) 0532-LP-104-9048 – Flight Deck Scrubber: Diesel Powered (Model SRS 1550-DN-A) Operational and Maintenance Manual with Parts List.
 - (4) Obtain OPNAV Form 4790/102 Support Equipment (SE) Operator’s License.
 - (5) Produce copies of Deck Scrubber Maintenance Index Page (MIP) 5882/013 and the associated Maintenance Requirement Cards (MRC’s).
 - (6) Acquire the appropriate Material Safety Data Sheets (MSDS) for the applicable HAZMAT associated with the Deck Scrubber.

2. PURPOSE OF THE DECK SCRUBBER.

The instructor will explain the purpose of the Deck Scrubber. In summary, the scrubber is intended to achieve and maintain a high degree of flight deck and hangar deck cleanliness. It is designed to remove the residual solution leaving the deck surface free from grease, oil, diesel fuel and debris. The unit contributes to a reduction of aircraft engine Foreign Object Damage (FOD) incidences and provides better traction, therefore improving personnel safety during flight operations.

LESSON NO. 2

DESCRIPTION AND OPERATION

1. FAMILIARIZATION OF THE DECK SCRUBBER.

The instructor will introduce to the students the Deck Scrubber (Model No. SRS1550-DN-A) as outlined in [chapter 13](#) of this manual. This introduction shall include providing a description and illustration ([paragraph 13-2.1](#)), the operator license qualification requirements ([paragraph 13-3](#)), all operational safety requirements ([paragraph 13-4](#)), color ([paragraph 13-5](#)) and marking requirements ([paragraph 13-6](#)), initial product reporting deficiencies ([paragraph 13-7](#)), and all preventive maintenance practices ([paragraph 13-8](#)) relating to operator responsibilities, maintaining an equipment history file, preventive maintenance scheduling, maintaining the integrity of the unit and servicing requirements.

2. OPERATION DESCRIPTION OF THE DECK SCRUBBER.

The instructor will explain that the functional operation of the Deck Scrubber is to spray a cleaning solution onto the flight and hangar decks, then scrub the surface, and recover the residual solution and debris into a recovery tank for subsequent discharge in accordance with local procedures. As the scrubber moves forward, a solution dispenser sprays solution ahead of the scrubbing brushes. The brushes scrub in opposite directions creating a water-lift into the debris hopper. The vacuum system draws water from the hopper and from the area forward of the rear squeegee, and then charges it into the recovery tank. Rear squeegees leave the deck free from any residual solution.

3. FUNCTIONAL CHARACTERISTICS.

The instructor will discuss the following functional characteristics of the Deck Scrubber.

- a. Engine Type – Detroit Diesel: 3 cylinder, 4 stroke; 61 horsepower at 2350 RPM; Engine Oil (15W/40; MIL-PRF-2104).
- b. Fuel System – JP5 Jet Fuel (MIL-DTL-5624) or JP8 Jet Fuel (MIL-DTL-83133); 15.3-Gallon Capacity.
- c. Cooling System – Antifreeze (A-A-52624) [50% Water and 50% Ethylene Glycol]; 13.4-Quart Capacity.
- d. Hydraulic System – Type MIL-PRF-17672; 18.3-Gallon Capacity.
- e. Electrical System – One 12-Volt Direct Current (VDC) nominal battery; 42-amp alternator.
- f. Braking System –
 - (1) Service Brakes - Hydraulic dual caliper disc brakes; 4 total (2 on each front wheel).
 - (2) Parking Brakes – Mechanical caliper disc brakes; 4 total (1 on each wheel).

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- g. Tires – 8 x 16.5-inch; 6-ply foam filled (each tire).
- h. General Machine Dimensions/Capacities:
 - (1) Length – 102 inches
 - (2) Width – 62 inches
 - (3) Height – 70.8 inches
 - (4) Track – 46.7 inches (front); 45.3 inches (rear)
 - (5) Wheel Base – 90 inches
 - (6) Fresh Water Tank – 510 gallons
 - (7) Scrub Brush Path (each) – 50 inches (width), 11 inches (diameter)
 - (8) Rear Squeegee Path – 56.5 inches
 - (9) Debris Hopper Capacity – 2.6 cubic feet

4. OPERATING CONTROLS AND INDICATORS.

The instructor will discuss and demonstrate on the Deck Scrubber the operating controls and indicators.

- a. Brake Pedal – operates the hydraulic disc brakes on the two front wheels. Always use the brake speed for normal stopping and controlling machine speed on down grades.
- b. Directional Control Pedal – controls the hydraulic propelling drive. Used to select the direction of swivel and propelling speed of the machine.

CAUTION

Always engage the parking brake levers before leaving the machine unattended.

- c. Parking Brake Levers – controls the brake cables that are connected to the mechanical disc brakes on the wheels. Forward lever controls the front wheels and the aft lever controls the rear wheels.
- d. Tank Drain Lamp – indicates when the recovery tank is nearly full.
- e. Fuses – are a one-time circuit protection device designed to stop the flow of current in the event of circuit overload. There are 7 fuses:

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- (1) Fuse 1 – protects the main ignition
 - (2) Fuse 2 – protects the squeegee
 - (3) Fuse 3 – protects the horn
 - (4) Fuse 4 – protects the lights
 - (5) Fuse 5 – protects the Solution Recovery System (SRS) gauge
 - (6) Fuse 6 – protects the pressure washer
 - (7) Fuse 7 – protects the SRS panel
- f. Engine Hourmeter – records the number of hours the machine has been operated.

CAUTION

If the engine oil pressure gauge registers pressure below 40 psig, stop the engine immediately. Failure to stop the engine could result in severe engine damage.

- g. Engine Oil Pressure Gauge – registers the engine oil pressure. Normal engine pressure ranges from 40 psig at idle to 55 psig at full engine throttle.

CAUTION

Engine coolant temperature above 210°F indicates the engine is overheating.

- h. Engine Coolant Temperature Gauges – registers the engine coolant temperature. Normal engine coolant temperatures range up to 210°F.
- i. Ammeter – registers the charging current which is being passed to the battery from the alternator.
- j. Squeegee Switch – in conjunction with a hydraulic flow sensing device and scrubbing control levers, it controls the position of the rear squeegee.
- k. Diesel Pre-Heat Lamp – indicates when the diesel pre-heater is operating.
- l. Operating Lamps Switch – controls the headlights, taillights and brush spot lamp.
- m. Solution Meter Switch – located on the SRS panel. A three position switch that controls the amount of cleaning solution metered to the front scrub deck.

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- n. Ignition Switch – controls the machine engine and accessories.

CAUTION

Do not engage the starter motor for more than 10 seconds at a time or after the engine has started, as the starter may be damaged.

- o. Start Switch – engages the engine starter motor.
- p. Fuel Level Gauge – indicates how much fuel remains in the fuel tank.
- q. Panel Lamp – illuminates the panel gauge whenever the operating lamps are on.
- r. Scrub Brush Control Lever – operates the hydraulic control valve which controls the scrub brush motors.
- s. Scrub Head Position Control Lever – operates the hydraulic control valve which controls the scrub head lift cylinder.
- t. Throttle Control Knob – operates a cable which controls the engine speed.
- u. Solution Control Lever – operates a cable which controls the solution control valve.
- v. Emergency Fuel Shutoff Switch – stops the machine engine. To reset the emergency fuel shutoff switch, flip the ignition switch down to the OFF position.
- w. Steering Wheel – operates a hydraulic steering control valve mounted at the end of the steering column.

CAUTION

Never use your foot to lock or unlock the scrub head lock lever. To lock or unlock the scrub head, the scrub head must be in the raised position.

- x. Scrub Head Lock Lever – controls the scrub head lock mechanism.
- y. Pivot Lock Pin – used to lock the pivot joint located between the front and rear machine sections to prevent the machine from pivoting and creating a pinch area.
- z. High Pressure Washer (Front) – used for routine deck maintenance in areas where the unit cannot reach and for cleaning away debris from the unit.
- aa. Accessories/Attachments (Rear) – a vacuum hose and wand consisting of two 25-foot hoses, two vacuum wands and one squeegee wand allowing one or two users to collect spills not accessible with the Deck Scrubber.

LESSON NO. 3

OPERATIONAL SAFETY REQUIREMENTS AND PREOPERATIONAL INSPECTIONS

1. INSTRUCTOR PREPARATION.

Prior to starting this lesson, the instructor will stress the importance to the students on understanding all safety precautions and performing the preoperational inspections, the required supporting documentation and the knowledge of all safety precautions. Licensed operators must conduct mandatory prior to use inspections and functional tests to ensure the equipment is fully operational and safe to use to prevent injury to personnel or damage to the equipment. The inspection procedures contain the minimum inspection requirements. No steps may be deleted. Additional steps may be added to meet local requirements.

2. OPERATIONAL SAFETY REQUIREMENTS.

The instructor will review with the students, in its entirety, all the operational safety requirements described in [paragraph 13-4](#). Likewise, the instructor will review with the students the appropriate MSDS sheets associated with the Deck Scrubber.

3. PRIOR TO USE INSPECTION PROCEDURES.

The instructor will distribute copies of the MIP 5882/013 and the associated MRC's to the students. Each student will be required to conduct the mandatory inspections and functional tests on the Deck Scrubber. The instructor will discuss with the students the local procedural requirements for the safety deficiency tag-out process described in [paragraph 13-8.1.1](#) when unsatisfactory visual inspections or functional tests are noted, and the maintenance provider responsibilities described in [paragraph 13-8.1.2](#) when the Deck Scrubber is to be scheduled for preventive maintenance servicing. Lastly, the instructor will review the mandatory and optional documentation requirements for maintaining the equipment history file detailed in [paragraph 13-8.2](#).

LESSON NO. 4

BASIC OPERATIONAL TRAINING

1. INSTRUCTOR PREPARATION.

The instructor will take the students to the Deck Scrubber (prescribed training area) and will first conduct the prior to use inspection procedures and functional tests in accordance with MIP 5882/013. Next, the instructor will identify the unit's basic operational principles to the students. Lastly, the instructor will operate the Deck Scrubber and show the students all operations and functions while scrubbing the prescribed deck area.

2. OPERATOR USE TRAINING.

The instructor will then have each student perform the prior to use inspection requirements and then operate the Deck Scrubber in the prescribed training area. During this entire evolution, the instructor shall note the proficiency of each student.

DECK SCRUBBER OPERATOR TRAINING CERTIFICATE

The student named below successfully completed the classroom and operational skill demonstration tests of the Deck Scrubber (Model No. SRS1500-DN-A).and I recommend that the ship's Certifying Official issue the appropriate license in accordance with NAVSUP Publication 538.

STUDENT NAME (last, first, middle initial)

RANK

SHIP NAME

INSTRUCTOR NAME (last, first, middle initial)

(print):

(date):

(signature):

This training certificate is an example of the documentation that must be maintained by the ship issuing the USN Aviation Support Equipment (SE) Operator's License (OPNAV Form 4790/102), figure 13-5. This training certificate must be documented and maintained in the operator's personal folder.

REPAIR JOBS • RELATED PARTS

Q2

REPAIR JOBS • RELATED PARTS

HYSTER TIMES GUIDE



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REPAIR JOBS • RELATED PARTS

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REPAIR JOBS • RELATED PARTS

Q2 TIMES GUIDE

THIS BOOKLET SUMMARIZES SERVICE TIMES FOR MANY COMMON REPAIRS TO HYSTER LIFT TRUCKS. IT WAS COMPILED ON THE BASIS OF RECOMMENDATIONS FROM A CROSS-SECTION OF HYSTER DEALERS.

THE TIMES SHOWN ARE MEANT TO BE GUIDELINES. ACTUAL CONDITION OF THE UNIT UNDERGOING REPAIR SHOULD BE CONSIDERED WHEN MAKING ESTIMATES.

NOTE CAREFULLY THE DETAILED DESCRIPTION GIVEN FOR EACH JOB LISTED. THIS DEFINES THE SCOPE OF WORK TO BE DONE IN THE TIME SHOWN. IF YOU PLAN TO DO MORE OR LESS THAN WHAT IS COVERED BY THESE DESCRIPTIONS, ADJUST THE TIME ESTIMATES ACCORDINGLY.

THE BOOKLET IS DIVIDED INTO FIVE SECTIONS: **INTERNAL COMBUSTION, ELECTRIC, MODIFICATIONS, PERIODIC MAINTENANCE, AND UPRIGHT / CARRIAGE.** THUMB TABS ARE PROVIDED IN THE TABLES OF CONTENTS FOR QUICK ACCESS TO ANY OF THE FIVE SECTIONS.

A COMPLETE INDEX OF THE JOB CODING SYSTEM IMMEDIATELY FOLLOWS THE TABLE OF CONTENTS.

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POWER UNIT

- ** AA INSTALL REBUILT ENGINE
- ** AB RESEAL ENGINE, FRONT ONLY
- ** AC RESEAL ENGINE, COMPLETE
- ** AD REPLACE HEAD GASKET
- ** AE MAJOR TUNE-UP
- ** AF MINOR TUNE-UP
- ** AG SPIN-ON OIL FILTER CONVERSION
- ** AH REPLACE DISTRIBUTOR
- AI ADJUST GOVERNOR
- AJ ADJUST TIMING
- AK INSTALL NEW ENGINE (AA)
- ** AL REPLACE MOTOR MOUNTS
- ** AM REPLACE FLYWHEEL RING GEAR
- ** AN REPLACE EXHAUST MUFFLER
- AP REPLACE EXHAUST GASKET (AN)
- AR REPLACE TAIL PIPE (AN)
- AS REPLACE GOVERNOR/PUMP GASKET (AB)
- AT RESURFACE CYLINDER HEAD
- ** AV OVERHAUL INTAKE/EXHAUST VALVES

POWER UNIT COOLING SYSTEM

- ** BA OVERHAUL COOLING SYSTEM
- BB REPLACE THERMOSTAT (BA)
- ** BC REPLACE WATER PUMP
- ** BD REPLACE COOLANT HOSES & BELT-THERMOSTAT
- BE REPLACE ANTI-FREEZE
- BF CLEAN & REPAIR RADIATOR
- BG RECORE RADIATOR
- ** BH REPLACE RADIATOR
- BI REPLACE RADIATOR CAP (BA)
- BJ REPLACE FAN BELTS (BA)
- ** BK REBUILD FAN DRIVE
- BL REPAIR COOLANT RECOVERY (BA)

CLUTCH

- ** CA CLUTCH OVERHAUL
- CB SEAL CLUTCH HOUSING (CA)
- ** CC SEAL CLUTCH BOOSTER
- ** CD CLUTCH LINKAGE CONVERSION
- CE REPLACE CLUTCH RELEASE SLEEVE & BEARING (CA)
- CF ADJUST CLUTCH
- CG REPLACE CLUTCH BOOSTER (CC)
- CH REPAIR CLUTCH LINKAGE
- CJ REPLACE CLUTCH LINKAGE
- CK REPLACE CLUTCH RETURN SPRINGS (CA)
- CL REPLACE JET PUMP (EB)

TRANSMISSION - DRIVE LINE

- ** DA OVERHAUL TRANSMISSION
- ** DB OVERHAUL DRIVE AXLE/ FINAL DRIVE

TRANSMISSION (continued)

- ** DC REPLACE/REPAIR DIFFERENTIAL
- DD REBUILD CLUTCH PACK (DA)
- DF RESEAL PINION SHAFT (DA)
- DG REPLACE RING GEAR & PINION (DC)
- ** DH REPLACE TORQUE CONVERTOR
- ** DI REPLACE TRANSMISSION PUMP
- DJ RESEAL TRANSMISSION PUMP (DI)
- ** DK REPAIR TRANSMISSION LINKAGE
- DL REPLACE MONOTROL PEDAL (MK)
- DM REPLACE MONOTROL PEDAL PAD (MK) RESEAL TRANSMISSION PAN (DA)
- ** DN REPLACE DRIVE AXLE HUB
- DP REPLACE TRANSMISSION FLUID & FILTER (DA)
- DR ADJUST INCHING PEDAL
- ** DS RESEAL/REPAIR TRANSMISSION CONTROL VALVE
- ** DT REPAIR SPEED REDUCER
- ** DU REPLACE DRIVE LINE U-JOINT
- DV REPLACE DRIVE AXLE WHEEL SEAL (DB)
- DW RESEAL DRIVE AXLE HOUSING (DB)
- DX REPLACE DRIVE AXLE SHAFT (DB)
- DZ REPLACE WHEEL BEARING - DRIVE AXLE (DB)

HYDRAULIC SYSTEM

- ** EA RESEAL HYDRAULIC CONTROL VALVE
- ** EB REPLACE ASSORTED HYDRAULIC COMPONENTS
- ** EC REPLACE HYDRAULIC OIL & FILTER
- ** ED REPLACE HYDRAULIC PUMP DRIVE CHAIN AND COMPONENTS
- ** EE REPAIR HYDRAULIC CONTROL LINKAGE
- EF REPLACE HYDRAULIC VALVE LINKAGE SPRING (EA)
- EG REPLACE HYDRAULIC FILTER ELEMENT (EC)
- ** EH REPLACE HYDRAULIC PUMP
- EI RESEAL MAIN HYDRAULIC PUMP (EH)
- EJ RESEAL AUXILIARY CONTROL VALVE (EA)
- EK CLEAN HYDRAULIC TANK
- ** EL REPAIR DRIVE SHAFT MAIN HYD PUMP
- EM RESEAL HOSE REEL
- EN RESEAL JUNCTION BLOCK
- EP REPLACE HEADER HOSES
- ER REPLACE/ADJUST TWO-SPEED VALVE (EB)
- ES REPAIR TILT LOCK VALVE (EB)
- ** ET REPLACE HYDRAULIC CHARGE PUMP - OIL CLUTCH

TILT CYLINDER

- ** FA PACK & SEAL TILT CYLINDER
- ** FB REPLACE TILT CYLINDER
- FC REPLACE TILT CYLINDER ANCHOR PIN (FB)
- FD REPLACE TILT CYLINDER ROD END/PIN
- FE REPLACE TILT CYLINDER ROD
- FF REPAIR TILT LOCK VALVE
- FG REPLACE TILT LOCK VALVE (EB)

** INDICATES PARTS FOR THIS JOB ARE COVERED BY A PULL LIST

• INDICATES PARTS FOR THIS JOB ARE COVERED BY THE PULL LIST INDICATED IN PARENTHESES.

STEERING

- ** GA REBUILD STEERING AXLE
- ** GB REPAIR STEERING GEAR/COLUMN
- ** GC REPAIR/REPLACE STEERING HAND PUMP
- ** GD PACK & SEAL STEERING CYLINDER
- GE REPLACE STEERING DRAG LINK
- * GF REPAIR STEERING DRAG LINK (GA)
- * GG REPLACE BALL STUD (GA)
- ** GH REPLACE STEERING CYLINDER
- ** GI REPLACE STEERING TIE ROD ENDS
- ** GJ REPLACE STEERING PUMP
- * GK REPLACE STEERING PUMP BELT (BA)(GJ)
- GL ADJUST STEERING PRESSURE
- * GM REPLACE STEERING FLOW DIVIDER (EB)
- * GP REPLACE STEERING COLUMN (GB)
- * GR REPLACE STEERING WHEEL (GB)
- ** GS REPLACE SPINDLE
- ** GU REPLACE KING PIN & BEARINGS
- ** GV REPLACE CENTER ARM & BEARINGS
- * GW REPLACE WHEEL BEARING-STEER AXLE (GS)

BRAKES

- ** HA BRAKE JOB
- ** HB REPLACE PARK BRAKE CABLES
- ** HC RESEAL/REPAIR PARK BRAKE
- * HD REPLACE BRAKE SPRINGS AND ATTACH HDW (HA)
- * HE REPLACE BRAKE ADJUSTER & LINKAGE (HA)
- * HG REPLACE PARK BRAKE SHOES (HC)
- * HH REPLACE BRAKE PEDAL PAD (HA)
- ** HJ REPLACE/REBUILD BRAKE MASTER CYLINDER
- HK RESEAL PARK BRAKE CYLINDER
- HL REPLACE PARK BRAKE CYLINDER
- * HM REPLACE PARK BRAKE HANDLE (HB)
- ** HN REPLACE BRAKE DRUM (ONE SIDE)
- HP BLEED AND ADJUST BRAKES

ELECTRICAL - I.C.

- ** IA REPLACE ASSORTED ELECTRICAL COMPONENTS
- JB REPLACE WIRE HARNESS
- * IC REPLACE BATTERY CABLE (IH)
- * ID REPLACE IGNITION SWITCH (IA)
- IE REPLACE DASH PANEL
- ** IF REPLACE STARTER
- * IG REPLACE BATTERY HOLD-DOWN (IH)
- ** IH REPLACE BATTERY
- * II REPLACE HORN (IA)
- * IJ REPLACE HORN BUTTON/RING (IA)
- * IK REPLACE HOURMETER (IA)
- * IL REPLACE DASH PANEL LIGHTS (IA)
- * IM REPLACE DASH PANEL GAUGES (IA)
- * IN REPLACE DISTRIBUTOR (AH)
- ** IP REPLACE ALTERNATOR
- * IR REPLACE GENERATOR (IA)

ELECTRICAL - I.C. (continued)

- * IS REPLACE VOLTAGE REGULATOR (IA) (IP)
- * IT REPLACE COIL (IA)
- * IU REPLACE SENDING UNITS (IA)
- * IV REPLACE SPARK PLUG WIRES (AE)
- IW REPLACE FUSES
- * IX REPLACE STARTER DRIVE (IF)

APPEARANCE

- ** JA PAINT & DECAL
- JB STEAM CLEAN
- JC REPAIR/REPLACE DRIVING LIGHTS
- JD REPAIR/REPLACE WARNING LIGHTS
- JE REPAIR/REPLACE BACK-UP ALARM
- JF INSTALL/REPLACE FIRE EXTINGUISHER

FRAME

- ** KA REPLACE ASSORTED FRAME PARTS
- * KB REPLACE HOOD LATCH (KA)
- * KC REPLACE SEAT RAILS (KA)
- * KD ADJUST HOOD LINKAGE (KA)
- * KE REPLACE FRAME HANGER BUSHINGS (KA)
- * KF REPLACE SEAT CUSHION (KA)

UPRIGHT & CARRIAGE

- ** LA PACK & SEAL HOIST CYLINDER
- ** LB REPLACE UPRIGHT ROLLER & WEAR PLATES
- * LC SHIM & ADJUST CARRIAGE (LM)
- ** LD RESEAL SIDESHIFT CRG CYL
- ** LE REPLACE UPRIGHT MOUNTING BUSHINGS
- ** LF REPAIR/REPLACE CHAIN SHEAVE
- ** LG REPLACE LOAD CHAIN/ANCHOR
- LH ADJUST HOIST CHAIN/ANCHOR
- * LJ REPLACE UPRIGHT WEAR STRIPS (LB)
- * LK REPLACE STUB SHAFTS (LC)
- LL REPLACE UPRIGHT LATCHES/SHAFTS
- ** LM REPLACE CARRIAGE ROLLERS
- LN REPLACE UPRIGHT HANGER BRACKET
- LP REPLACE HOIST CYL. BLEEDER HOSE
- ** LR REPAIR KE HOIST MECHANISM

FUEL SYSTEM

- ** MA REPLACE/REBUILD CARBURETOR
- ** MB ASSORTED FUEL SYSTEM COMPONENTS
- * MC REPLACE CHOKE/KILL CABLE (MB)
- ** MD REPLACE/REPAIR LPG LOCK OFF
- * ME REPLACE LPG HOSE (MW)
- * MF REPLACE/REPAIR GOVERNOR (MA)
- ** MG REPLACE FUEL PUMP
- * MH REPLACE FUEL FILTER (MB)
- ** MK REPLACE THROTTLE PEDAL
- ML REPAIR FUEL INJECTOR
- ** MM REPLACE FUEL INJECTOR
- MN REPAIR INJECTOR PUMP

FUEL SYSTEM (continued)

- ** MP REPLACE INJECTOR PUMP
- MR REPLACE FUEL SUPPLY LINE SEALS DIESEL (MM)
- ** MT REPLACE/REBUILD LPG VAPORIZER
- ** MU REPLACE/REPAIR THROTTLE CABLE
- MV REPAIR/ADJUST THROTTLE LINKAGE
- ** MW REPLACE LPG TANK

TIRES

- NA REPLACE DRIVE TIRE
- NB REPLACE STEER TIRE

PERIODIC MAINTENANCE

- ** PB SCHEDULE "B" PM SERVICE
- ** PC SCHEDULE "C" PM SERVICE
- ** PD SCHEDULE "D" PM SERVICE

ELECTRICAL E.T.

- ** RA REPLACE ASSORTED ELECTRIC COMPONENTS
- RB REPLACE FUSE (RA)
- RC REPLACE KEY SWITCH (RA)
- RD REPLACE HOURMETER (RA)
- RE REPLACE HORN (RA)
- RF REPLACE HORN SWITCH/KIT (RA)
- RG REPLACE POTENTIOMETER (RA)
- RH ADJUST POTENTIOMETER
- RR REPLACE RESISTOR (RA)
- RS REPLACE SWITCH (RA)
- RT TROUBLESHOOT/REPAIR ELECTRICAL SYSTEM
- RW REPAIR/REPLACE WIRING/CONNECTORS

CONTROL PANEL

- ** SA REPLACE STATIC PANEL COMPONENTS
- SB REPLACE CONTROL CARD (SA)
- SC TUNE/ADJUST CONTROL CARD
- SD REPLACE SCR (SA)
- SE REPLACE RECTIFIER (SA)
- SF REPLACE CAPACITOR (SA)
- SG REPLACE SNUBBER (SA)
- SH REPLACE THERMAL PROTECTOR (SA)
- SI REPLACE TERMINAL BLOCK (SA)
- SJ REPLACE TRANSFORMER (SA)

CONTACTOR PANEL

- ** TA REPLACE CONTACTOR PANEL COMPONENTS
- TB TROUBLESHOOT/REPAIR SCR CONTROLS
- ** TC REPLACE CONTACTOR TIPS
- TD REPLACE COIL (TA)
- TE REPLACE CONTACTOR (TA)
- TF REPLACE CONTROL SWITCH (TA)

TRACTION MOTOR

- ** UA REPAIR TRACTION MOTOR
- UB REPLACE TRACTION MOTOR BRUSHES (UA)
- UC REBUILD TRACTION MOTOR
- UD REPLACE TRACTION MOTOR (UA)

HOIST PUMP MOTOR

- ** UE REPAIR HOIST PUMP MOTOR
- UF REPLACE HOIST PUMP MOTOR BRUSHES (UE)
- UG REBUILD HOIST PUMP MOTOR
- UH REPLACE HOIST PUMP MOTOR (UE)

STEER PUMP MOTOR

- ** UI REPAIR STEER PUMP MOTOR
- UJ REPLACE STEER PUMP MOTOR BRUSHES (UI)
- UK REBUILD STEER PUMP MOTOR
- UL REPLACE STEER PUMP MOTOR (UI)

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INTERNAL COMBUSTION LIFT TRUCKS

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POWER UNIT

JOB DESCRIPTION	JOB CODE
INSTALL NEW OR REBUILT ENGINE - GASOLINE OR LPG	AA
INSTALL REBUILT ENGINE - DIESEL	AA
RESEAL ENGINE - FRONT ONLY	AB
RESEAL ENGINE - COMPLETE	AC
REPLACE HEAD GASKET	AD
MAJOR TUNE-UP	AE
MINOR TUNE-UP	AF
REPLACE DISTRIBUTOR	AH
REPLACE MOTOR MOUNTS	AL
REPLACE RING GEAR (FLYWHEEL)	AM
REPLACE MUFFLER - STANDARD EXHAUST	AN
REPLACE MUFFLER - OVERHEAD EXHAUST	AN
REPLACE GOVERNOR	AS
VALVE JOB	AV

AA - INSTALL NEW OR REBUILT ENGINE - GASOLINE OR LPG

INCLUDES ALL TIME REQUIRED TO INSTALL ENGINE AND RELATED PARTS. THIS INCLUDES REPLACEMENT OF FUEL PUMP (OR REBUILD VAPORIZER), WATER PUMP, THERMOSTAT, BELTS, HOSES, RADIATOR CAP, MOTOR MOUNT PADS, ENGINE OIL, ENGINE OIL FILTER, FUEL FILTER, ANTI-FREEZE, BATTERY CABLES, SPARK PLUGS, IGNITION WIRES, DISTRIBUTOR CAP, ROTOR AND POINTS AND CONDENSER IF APPLICABLE. REPLACE CONVERTER SEAL AND FLYWHEEL SEAL WHERE APPLICABLE. REMOVE RADIATOR AND CLEAN. INSPECT THE FOLLOWING AND ADVISE CUSTOMER IF REPAIR IS ADVISABLE: GAUGES AND INDICATOR LIGHTS, FLYWHEEL RING GEAR, CLUTCH PARTS, CONVERTER PUMP, CARBURETOR, STARTER, ALTERNATOR, VOLTAGE REGULATOR, BELT PULLEYS. RETORQUE CYLINDER HEAD BOLTS AND CHECK VALVE ADJUSTMENTS ON OVERHEAD VALVE ENGINES AFTER ENGINE REACHES OPERATING TEMPERATURE.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
20	22	20	26	22	26	20	26	24	24	24	26	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
20	22	20	26	20	20	26	26	22	26	24	24	24
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
24	NA	NA	NA	20	20	20						

AA - INSTALL REBUILT ENGINE - DIESEL

INCLUDES LABOR TO INSTALL ENGINE AND RELATED PARTS. THIS INCLUDES REPLACEMENT OF LIFT PUMP, THERMOSTAT, BELTS HOSES, RADIATOR CAP, MOTOR MOUNT PADS, ENGINE OIL ENGINE OIL FILTER, FUEL FILTERS, ANTI-FREEZE AND BATTERY CABLES. REPLACE CONVERTER SEAL AND FLYWHEEL SEAL WHERE APPLICABLE. REBUILD OR REPLACE INJECTORS AND REBUILD INJECTOR PUMP. INSPECT THE FOLLOWING AND ADVISE CUSTOMER IF REPAIR OR REPLACEMENT IS ADVISABLE: GAUGES AND INDICATOR LIGHTS, FLYWHEEL RING GEAR, CLUTCH PARTS, CONVERTER PUMP, STARTER, ALTERNATOR, BATTERY AND BELT PULLEYS. RETORQUE CYLINDER HEAD BOLTS AND CHECK VALVE ADJUSTMENTS AFTER ENGINE REACHES OPERATING TEMPERATURE.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
20	22	20	26	24	26	20	26	24	24	24	26	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
20	22	20	26	24	22	26	26	24	26	26	26	25
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
24	26	26	27	NA	20	20						

AB - RESEAL ENGINE - FRONT ONLY

INCLUDES ALL TIME REQUIRED TO REPLACE GASKETS AND SEALS ON FRONT OF ENGINE AND INSPECT MOTOR MOUNTS AND FRAME MOUNTING BUSHINGS. INCLUDES PAN GASKET REPLACEMENT ON SOME ENGINES.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
9	10	9	9	10	9	9	14	15	13	14	15	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
11	10	9	14	14	9	9	14	9	14	9	9	12
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
13	14	13	13	9	9	9						

AC - RESEAL ENGINE - COMPLETE

INCLUDES ALL TIME TO REMOVE ENGINE, DISASSEMBLE SUFFICIENTLY TO REPLACE ALL GASKETS AND SEALS, INSPECT CYLINDER WALLS AND ROD BEARINGS FOR WEAR, CHECK HEAD AND BLOCK FOR FLATNESS, REASSEMBLY AND REPLACEMENT OF ALL GASKETS AND SEALS RELATED TO ENGINE REINSTALLATION. RUN ENGINE TO OPERATING TEMPERATURE, CHECK FOR LEAKS, RETORQUE HEAD AND READJUST VALVES ON OVERHEAD VALVE ENGINES. CHANGE ENGINE OIL AND OIL FILTER.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
22	24	22	28	24	28	22	26	26	26	26	28	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
22	24	22	23	23	22	28	25	22	26	26	26	26
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
26	28	29	30	22	22	22						

AD - REPLACE HEAD GASKET

INCLUDES ALL TIME TO REMOVE HEAD, CHECK HEAD AND BLOCK FOR FLATNESS, RETAP BOLT HOLES IN BLOCK, CLEAN OR REPLACE HEAD BOLTS, REPLACE GASKET, HEAD AND RELATED PARTS, RUN ENGINE TO OBTAIN OPERATING TEMPERATURE, RETORQUE HEAD, READJUST VALVES ON OVERHEAD VALVE ENGINES AND CHANGE ENGINE OIL AND FILTER.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
3.5	5	3.5	5	5	5	3.5	5*	3.5	6.5	6.5	5*	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
3.5	5	5	5	5	3.5	5	5*	5	5*	5*	5*	6.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
6.5	9	9	9	3.5	5	3.5						

* EACH SIDE

AE - MAJOR TUNE-UP

REPLACE POINTS, PLUGS, CONDENSER, ROTOR, DISTRIBUTOR CAP AND IGNITION WIRES. CHECK COMPRESSION, CLEAN OR REPLACE FUEL FILTER, CHANGE AIR FILTER ELEMENT, SET TIMING, ADJUST CARBURETOR AND GOVERNOR. ADD TIME FOR VALVE ADJUSTMENT.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
2	2	2	2	2	2	2	2.5	2.5	2	2	2.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
2	2	2.5	2	2	2.5	2	2.5	2.5	2.5	2.5	2.5	2
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
2	NA	NA	NA	2	2	2.5						

AF - MINOR TUNE-UP

REPLACE POINTS, PLUGS, CONDENSOR, ROTOR AND AIR FILTER ELEMENT. CLEAN FUEL FILTER, SET TIMING AND ADJUST CARBURETOR.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1	1	1	1	1	1	1	1	1	1	1	1.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1	1	1	1	1	1	1	1	1	1	2	1	1
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1	NA	NA	NA	1	1	1						

AH - REPLACE DISTRIBUTOR

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1	1	1	1	1	1	1	1	1	1	1	1	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1	1	1	1	1	1	1	1	1	1	1	1	1
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1	NA	NA	NA	1	1	1						

AL - REPLACE MOTOR MOUNTS

DOES NOT PROVIDE FOR REMOVAL OF BROKEN STUDS OR REPLACEMENT OF BRACKETS.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
+ 4	4	4	5	4	5	4	5	5	4.5	4	5.5	
& 6	5	6	6	5	6	6	6	6	5	5	6	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
+ 4	4	4	4	4	5	5	5	5	5	5	3	4.5
& 6	5	6	6	5	6	6	6	6	6	6	4	5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
+ 4.5	NA	NA	NA	4	4	5						
& 5	6	6	6	6	6	6						

+ GAS/LPG
& DIESEL

AM - REPLACE RING GEAR (FLYWHEEL)

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
13	14	12	20	14	20	12	16	12	15	15	16	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
13	14	14	14	14	10	11	15	11	16	14	14	15
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
15	16	16	16	7	9	9						

(ADD 2 HRS IF REPLACING REAR CRANKSHAFT SEAL)

AN - REPLACE MUFFLER - STANDARD TYPE

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
4	4	2	2	4	2	2	4	2.5	3.5	3.5	3.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
12	3.5	4	4	4	2.5	3.5	4	2.5	4	2.5	2.5	3.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
3.5	3	3	3	2	2.5	2.5						

AN - REPLACE MUFFLER - OVERHEAD EXHAUST

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	NA	NA	3	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
3	2.5	2.5	2.5	2	2.5	2.5						

AS - REPLACE GOVERNOR

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
2.5	2	2.5	1.5	1.5	1.5	8	1.5	9	2.5	2.5	2	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
2.5	2	2	2	1.5	8	1.5	1.5	9	1.5	2	2	2.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
2.5	4	4	4	9	2	2.5						

AV - VALVE JOB

INCLUDES ALL LABOR TO INSTALL ALL PULL LIST PARTS AS REQUIRED FOR EACH MODEL. REMOVE HEAD, CLEAN CARBON FROM HEAD AND BLOCK AND CHECK FOR FLATNESS. REPLACE OR GRIND VALVES, GRIND SEATS, REPLACE WORN GUIDES OR REAM TO OVERSIZE. REPLACE VALVE SPRINGS AND SEALS. INSPECT AND/OR REPLACE VALVE ROTATORS. FREE-UP HEAT RISER VALVE IF USED. CHECK RADIATOR FOR LEAKS AND CLEAN. REASSEMBLE, CHANGE OIL AND FILTER, HEAT ENGINE TO OPERATING TEMPERATURE, RETORQUE HEAD AND READJUST VALVES PERFORM MAJOR TUNE-UP.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
8	8	8	6	8	7	10	11	10	11.5	11.5	14.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
8	8	8	8	8	10	8	11	8	12	12*	12*	12
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
12	17.5	17.5	15.5	8	8	8						

* PLUS 2 IF AIR BRAKES

COOLING SYSTEM

JOB DESCRIPTION	JOB CODE
OVERHAUL COOLING SYSTEM	BA
REPLACE COOLANT THERMOSTAT	BB
REPLACE WATER PUMPS	BC
REPLACE COOLANT HOSES - UPPER AND LOWER	BD
REPLACE RADIATOR	BH
REPLACE FAN BELTS	BJ
REBUILD FAN DRIVE	BK

BA - OVERHAUL COOLING SYSTEM

INCLUDES LABOR TO REMOVE, CLEAN AND REPAIR OR REPLACE RADIATOR, REBUILD OR REPLACE WATER PUMP, AND REPLACE THERMOSTAT, BELTS AND HOSES.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
5	5	5	7	5	7	5	6	5.5	6	6	12	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
9	5	5	7	4	4	6	6	6	12	5	5	6
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
6	7.5	7.5	8	4	4	4						

BB - REPLACE COOLANT THERMOSTAT

DOES NOT PROVIDE FOR REMOVAL OF BROKEN STUDS OR REPLACEMENT OF BRACKETS.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1	1	1	1	1	1	1	1	1	1	1	1	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1	1	1	1	1	1	1	1	1	1	1	1	1
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1	1	1	1	1	1	1						

BC - REPLACE WATER PUMP

INCLUDES LABOR TO REPLACE PUMP, HOSES, BELTS AND ANTI-FREEZE

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
2	3	2	3	3	3	3	4	2.5	4	4	4	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
3	3	3	3	3	2	3	4	4	4	3	3	3.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
3.5	4.5	4.5	4.5	2	3	2						

BD - REPLACE COOLANT HOSES - UPPER AND LOWER

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
2	1.5	1	1.5	1.5	1.5	1	1.5	1.5	1.5	1.5	1.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
2	1.5	1.5	1.5	1.5	1	1	1.5	1	1	1.5	1.5	1.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1.5	1.5	1.5	1.5	1	1	1						

BH - REPLACE RADIATOR

INCLUDES LABOR TO REMOVE AND REPLACE RADIATOR, HOSES, BELTS AND ANTI-FREEZE. DOES NOT INCLUDE RADIATOR CLEAN AND REPAIR.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
3	3	3	4	3	4	3	4	3	3.5	3.5	4.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
3	3	2	2	2	2	3	4	3	4	3	3	3.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
3.5	4.5	4.5	4.5	3	2	2						

BJ - REPLACE FAN BELTS

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1	1.5	1	1.5	1.5	1.5	1	1.5	1.5	1.5	1.5	1.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1	1.5	1	1	1.5	1	1.5	1	1.5	1.5	2	2	1.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1.5	2.5	2.5	2.5	1.5	1.5	1.5						

BK - REBUILD FAN DRIVE

REFERS TO UNITS THAT DO NOT HAVE THE FAN BLADE MOUNTED TO THE WATER PUMP. INCLUDES ALL LABOR TO REBUILD FEAR BOX DRIVE OR BELT AND SHAFT DRIVES.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
NA	3	NA	5	3	5	NA	3.5	NA	3	3	3.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
3	3	NA	1	NA	NA	5	3	1	3.5	NA	NA	3
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
3	3	3	NA	NA	NA	NA						

CLUTCH

JOB DESCRIPTION	JOB CODE
CLUTCH OVERHAUL	CA
RESEAL CLUTCH HOUSING	CB
RESEAL HYDRAULIC CLUTCH BOOSTER	CC
CONVERT TO MECHANICAL LINKAGE	CD
ADJUST CLUTCH.....	CF
REPLACE JET PUMP	CL

CA - CLUTCH OVERHAUL

INCLUDES ALL LABOR TO REPLACE DRIVEN PLATE, COVER ASSEMBLY, THROW-OUT BEARING, PILOT BEARING, CROSS SHAFT BUSHINGS AND SEALS, YOKE AND FLYWHEEL SEAL.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
5	NA	6	20	NA	20	6	NA	7	NA	NA	16	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
5	NA	18	20	NA	4.5	6	10	6	10	10	10	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	NA	NA	14	5	6	6						

CB - RESEAL CLUTCH HOUSING

INCLUDES ALL GASKETS, CROSS SHAFT SEALS AND FLYWHEEL SEAL.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
NA	NA	4	15	NA	15	4	NA	5	NA	NA	13.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
NA	NA	15	15	NA	4	5	10	5	10	9	9	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	NA	NA	12.5	NA	5	5						

CC - RESEAL HYDRUALIC CLUTCH BOOSTER

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
NA	NA	3	NA	NA	NA	3	NA	3	NA	NA	NA	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
NA	NA	3	NA	NA	3	NA	NA	3	NA	3	NA	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	NA	NA	NA	NA	NA	3						

CD - CONVERT TO MECHANICAL LINKAGE

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
NA	NA	8	NA	NA	NA	8	NA	8	NA	NA	NA	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
NA	NA	8	NA	NA	8	NA	8	8	8	8	NA	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	NA	NA	NA	NA	NA	8						

CF - ADJUST CLUTCH

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1	1	1	1	1	1	1	1	1	NA	NA	1	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1	1	1	1	1	1	1	1	1	1	1	1	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	NA	NA	1	1	1	1						

CL - REPLACE JET PUMP

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
NA	NA	NA	NA	NA	NA	NA	3	NA	3	1.5	1.5	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	NA	NA	3	NA	NA	NA						

TRANSMISSION

JOB DESCRIPTION	JOB CODE
STANDARD TRANSMISSION OVERHAUL	DA
POWERSHIFT TRANSMISSION OVERHAUL	DA
OVERHAUL DRIVE AXLE	DB
REPAIR DIFFERENTIAL	DC
REBUILD FORWARD/REVERSE CLUTCH PACK	DD
REPLACE DIFFERENTIAL	DE
REPLACE CONVERTER	DH
REPLACE TRANSMISSION PUMP	DI
RESEAL TRANSMISSION PAN - POWERSHIFT	DN
REPLACE TRANSMISSION FLUID AND FILTER	DP
ADJUST INCHING PEDAL	DR
REBUILD TRANSMISSION CONTROL VALVE	DS
REBUILD SPEED REDUCER	DT
REBUILD SPEED REDUCER AND DIFFERENTIAL	DT
REPLACE UNIVERSAL JOINTS	DU
REPLACE DRIVE AXLE WHEEL SEALS - (ONE SIDE)	DV
RESEAL AXLE TUBES	DW
REPLACE AXLE SHAFT - (ONE SIDE)	DX

DA - STANDARD TRANSMISSION OVERHAUL

INCLUDES LABOR TO REMOVE, DISASSEMBLE, INSPECT, REPLACE ALL NECESSARY GEARS, SHAFTS, BEARINGS AND SEALS. INCLUDES PINION SHAFT SEAL REPLACEMENT AND RING GEAR AND PINION ADJUSTMENTS ON UNITS WITH PINION GEAR LOCATED IN THE TRANSMISSION CASE. INSTALL TRANSMISSION AND ADJUST SHIFT LINKAGE.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
25	NA	25	32	NA	32	30	NA	22	NA	NA	31	
16	NA	16	18	NA	18	18	NA	8	NA	NA	18	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
25	NA	30	30	NA	9	32	29	10	29	20	20	NA
16	NA	16	16	NA	6	18	18	7	18	12	12	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	NA	NA	27	9	9	9						
NA	NA	NA	18	6	6	6						

* BENCH JOB. (ADD 2 HRS. IF REPLACING REAR CRANKSHAFT SEAL)

DA - POWERSHIFT TRANSMISSION OVERHAUL

INCLUDES LABOR TO REMOVE, DISASSEMBLE, INSPECT, REPLACE ALL NECESSARY GEARS, SHAFTS, BEARINGS, FRICTION DISCS AND SEPARATOR PLATES. REPLACE ALL SEALS AND GASKETS. RESEAL CONTROL VALVE AND INSTALL NEW SPRINGS. INCLUDES PINION SHAFT SEAL REPLACEMENT AND RING GEAR AND PINION ADJUSTMENTS ON UNITS WITH PINION GEAR LOCATED IN TRANSMISSION CASE. INSTALL TRANSMISSION, ADJUST CONTROL VALVE PRESSURES, ADJUST INCHING AND SHIFT LINKAGES.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
25	25	30	30	25	30	30	30	30	27	27	33	
20	16	20	16	16	16	20	20	16	16	16	20	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
35	25	25	25	25	30	25	30	30	30	46	46	27
20	16	12	12	16	20	12	20	16	20	30	30	16
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
27	49	49	47	NA	NA	NA						
16	34	34	32	NA	NA	NA						

* BENCH JOB. (ADD 2 HRS. IF REPLACING REAR CRANKSHAFT SEAL)

DB - OVERHAUL DRIVE AXLE

INCLUDES LABOR TO REMOVE WHEELS, HUBS, SPINDLES, GEARS, BEARINGS AND SEALS, INSPECT AND REPLACE AS NECESSARY. REMOVE RING GEAR, PINION AND DIFFERENTIAL, INSPECT, REPLACE PARTS AS NECESSARY, MAKE ALL ADJUSTMENTS. INCLUDES TIME TO REPLACE AXLE TUBE BUSHINGS AND SEALS.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
33	30	40	29	30	31	40	33	34	30	30	35	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
29	30	29	29	30	32	34	34	31	34	32	32	30
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
30	35	35	35	27	28	28						

DC - REPAIR DIFFERENTIAL

INCLUDES ALL LABOR TO REMOVE DIFFERENTIAL CASE FROM TRANSMISSION OR DIFFERENTIAL HOUSING, DISASSEMBLE, INSPECT PINION AND SIDE GEARS, THRUST WASHERS AND CROSS SHAFTS AND REPLACE NECESSARY PARTS. REASSEMBLE AND MAKE ADJUSTMENTS TO RING GEAR AND PINION IF APPLICABLE AND INSTALL.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
25	30	35	40	30	40	24	32	30	30	30	32	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
25	30	30	30	30	16	30	32	30	32	26	26	30
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
30	33	33	33	30	16	18						

DD- REBUILD FORWARD/REVERSE/ CLUTCH PACK

INCLUDES LABOR TO REMOVE TRANSMISSION TOP COVER, CLUTCH PACK ASSEMBLY, DISASSEMBLE, REPLACE SEALS AND WORN PARTS, REASSEMBLE, CHECK AND ADJUST PRESSURES AND INCHING LINKAGE.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
NA	NA	9	NA	NA	NA	9	NA	NA	NA	NA	NA	
NA	NA	4	NA	NA	NA	4	NA	NA				
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	NA	NA	NA	NA	NA	NA						
NA	NA	NA	NA	NA	NA	NA						

* BENCH JOB

DE - REPLACE DIFFERENTIAL

INCLUDES ALL LABOR TO REPLACE DIFFERENTIAL WITH NEW OR REBUILT PART AND ADJUST RING GEAR AND PINION IF APPLICABLE.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
31	27	33	35	28	35	34	30	23	29	29	30	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
20	27	31	32	28	14	23	30	20	30	20	20	29
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
29	28	28	28	18	15	15						

DH - REPLACE CONVERTER

INCLUDES ALL LABOR TO GAIN ACCESS TO CONVERTER AND REPLACE TRANSMISSION PUMP ON UNITS THAT USED THE CONVERTER HUB TO DRIVE THE PUMP.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
13	14	12	20	14	20	12	16	12	16	16	17	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
13	14	18	18	14	12	14	16	13	17	18	18	16
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
18	18	18	18	NA	NA	NA						

(ADD 2 HRS. IF REPLACING REAR CRANKSHAFT SEAL)

DI - REPLACE TRANSMISSION PUMP

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
13	12	13	3	12	3	13	14	12	14	14	15	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
13	12	NA	NA	13	12	3	14	13	14	3	3	14
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
14	4	4	4	NA	NA	NA						

DN - RESEAL TRANSMISSION PAN - POWERSHIFT

CHANGE FLUID AND FILTER

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
NA	NA	2	2	NA	2	2	NA	NA	NA	NA	NA	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
NA	NA	NA	NA	NA	NA	1.5	NA	NA	NA	3	3	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	NA	NA	3	NA	NA	NA						

DP - REPLACE TRANSMISSION FLUID AND FILTER

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1.5	1.5	1.5	2	1.5	2	1.5	1.5	1.5	1.5	1.5	1.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	1.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1.5	2	2	2	NA	NA	NA						

DR - ADJUST INCHING PEDAL

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1.5	2	1.5	NA	2	NA	1.5	2	1.5	1.5	1.5	2	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1.5	2	NA	NA	2	1.5	NA	2	1.5	2	1.5	1.5	1.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1.5	2	2	2	NA	NA	NA						

DS - REBUILD TRANSMISSION CONTROL VALVE

INCLUDES LABOR TO REMOVE, DISASSEMBLE, INSPECT, REPLACE WORN OR DAMAGED PARTS, REPLACE SPRINGS, INSTALL AND ADJUST PRESSURES AND INCHING CONTROLS

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
5	4	5	6	4	6	6	6	6	4.5	4.5	6	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
6	4	6	6	4	6	6	6	6	6	6	6	4.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
4.5	6	6	6	NA	NA	NA						

DT - REBUILD SPEED REDUCER

INCLUDES LABOR TO REMOVE, DISASSEMBLE, INSPECT, REPLACE NEEDED PARTS, ADJUST BEARINGS AND FORK AND INSTALL.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
NA	NA	NA	NA	NA	NA	NA	NA	12	NA	NA	NA	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
NA	NA	NA	NA	NA	20	NA	NA	12	NA	20	20	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	NA	NA	18	15	10	10						

DT - REBUILD SPEED REDUCER AND DIFFERENTIAL

REMOVE SPEED REDUCER AND DIFFERENTIAL ASSEMBLY AS A UNIT, DISASSEMBLE, INSPECT, REPLACE NEEDED PARTS AND INSTALL. INCLUDES RING GEAR CARRIER, BEARINGS ADJUSTMENT AND RING GEAR AND PINION ADJUSTMENTS.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
NA	NA	NA	NA	NA	NA	NA	NA	15	NA	NA	NA	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
NA	NA	NA	NA	NA	20	12	24	15	24	15	15	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	NA	NA	22	15	12	12						

DU - REPLACE UNIVERSAL JOINTS

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
NA	NA	NA	NA	NA	NA	NA	2	1.5	NA	NA	2	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
NA	NA	NA	NA	NA	1	1.5	2	1	2	1.5	1.5	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	2	2	2	1	1	1.5						

DV - REPLACE DRIVE AXLE WHEEL SEALS (ONE SIDE)

INCLUDES REPLACING OIL SOAKED BRAKE SHOES

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
3	3	3	3	3	3	5	4	5	3	3	4	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
3	3	3	3	3	3	3	4	3	4	5	5	3
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
3	4.5	4.5	4.5	5	3	3						

DW - RESEAL AXLE TUBES

INCLUDES LABOR TO REPLACE BUSHINGS, SEALS, SIDE PLATES AND MAKE ADJUSTMENTS.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
16	16	16	16	16	16	18	17	NA	16	16	17	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
16	16	NA	NA	NA	NA	NA	17	NA	18	NA	NA	16
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
16	NA	NA	NA	NA	NA	NA						

DX - REPLACE AXLE SHAFT (ONE SIDE)

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1	1	3.5	3.5	1	3.5	3.5	1	1.5	1	1	1	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1	1	1	1	1	1	1	1	1	1	1.5	1.5	1
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1	1.5	1.5	1.5	1	1	1						

HYDRAULIC SYSTEM

JOB DESCRIPTION	JOB CODE
RESEAL HYDRAULIC CONTROL VALVE.....	EA
REPLACE HYDRAULIC OIL AND FILTER	EC
REBUILD HYDRAULIC CONTROL VALVE..... LINKAGE (2-SPOOL)	EE
REPLACE HYDRAULIC OIL FILTER.....	EG
REPLACE MAIN HYDRAULIC PUMP	EH
CLEAN HYDRAULIC TANK	EK
REPAIR DRIVE SHAFT - MAIN HYDRAULIC PUMP...	EL
RESEAL HOSE REEL	EM
RESEAL JUNCTION BLOCK.....	EN
REPLACE HEADER HOSES.....	EP
REPLACE TWO-SPEED HOIST VALVE	ER
REBUILD TILT CONTROL VALVE OR ANTI-CAVITATION SPOOL	ES

EA - RESEAL HYDRAULIC CONTROL VALVE

INCLUDES LABOR TO REMOVE, DISASSEMBLE, INSPECT, REPLACE SEALS, INSTALL AND ADJUST RELIEF PRESSURE

	S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
+	2.5	4	2.5	5	4	5	2.5	4	1.5	4	4	5	
#	3	4	3	5	4	5	3	5	2.5	4	4	5	
&	4	5	4	5	5	5	4	5	2.5	5	5	6.5	
	H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
+	2.5	4	5.5	5	4	2	5	4	1.5	4	2.5	2.5	4
#	3	4	5.5	5.5	4	4	5	4	4	4	3	3	4
&	4	5	6.5	6	5	4.5	5	5	4.5	5	3.5	3.5	5
	H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
+	4	4.5	4.5	4.5	1.5	1.5	1.5						
#	4	4.5	4.5	4.5	NA	2.5	2.5						
&	5	6.5	6.5	6.5	NA	2.5	2.5						

+ 2-W
3-W
& 4-W

EC - REPLACE HYDRAULIC OIL AND FILTER

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	2.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
2.5	3	3	3	2.5	2.5	2.5						

EE - REBUILD HYDRAULIC CONTROL VALVE LINKAGE (2-SPOOL)

INCLUDES LABOR TO DISASSEMBLE, INSPECT, REPLACE WORN PARTS, ASSEMBLE AND ADJUST.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
3	2	2	2	2	2	2	2	2	2	2	3	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
3	2	2	2	2	2	2	2	2	2	2	2	2
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
2	3	3	3	2	2	2						

EG - REPLACE HYDRAULIC OIL FILTER

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1.5	1.5	1.5	1.5	1.5	1.5	1.5						

EH - REPLACE MAIN HYDRAULIC PUMP

INCLUDES LABOR TO REPLACE PUMP AND ADJUST PRESSURES

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
3	3	3*	2.5	3	2.5	3*	3.5	4	3	3	4	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
3	3	2	2	2	3*	2.5	3.5	3	3.5	3	3	3
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
3	4.5	4.5	4.5	2	2	2						

* PLUS 2 HOURS FOR DIESEL

EK - CLEAN HYDRAULIC TANK

INCLUDES REPLACE FILTER

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
3	3	3	3	3	3	3	3	3	3	3	3	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
3	3	3	3	3	3	3	3	3	3.5	3.5	3.5	3
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
3	4	4	4	3	3	3						

EL - REPAIR DRIVE SHAFT - MAIN HYDRAULIC PUMP

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
NA	NA	NA	NA	NA	NA	NA	NA	4	4	4	4	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	NA	NA	4	NA	4	4						

EM - RESEAL HOSE REEL

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	NA	NA	NA	2
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
2	NA	NA	NA	NA	1.5	1.5						

EN - RESEAL JUNCTION BLOCK

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1.5	1.5	1.5	1.5	1.5	1.5	1.1	1.5	1.5	NA	NA	NA	1.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1.5	NA	NA	NA	NA	1.5	1.5						

EP - REPLACE HEADER HOSE

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
2	2	2	2	2	2	2	2	2	2	2	2	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
2	2	2	2	2	2	2	2	2	NA	NA	NA	2
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
2	3	3	3	NA	2	2						

ER - REPLACE TWO-SPEED HOIST VALVE

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
NA	NA	NA	NA	NA	NA	3	NA	3	NA	NA	NA	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
NA	NA	NA	NA	NA	3	3	NA	3	NA	3	3	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	NA	NA	1.5	NA	NA	NA						

ES - REBUILD TILT CONTROL VALVE OR ANTI-CAVITATION SPOOL

INCLUDES LABOR TO REMOVE, DISASSEMBLE, INSPECT, REPLACE WORN PARTS AND SEALS, ASSEMBLE AND INSTALL

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
4	5	4	8	5	8	4	5	4	5	5	5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
4	5	5	5	5	4	8	5	4	5	2	2	5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
5	5	5	5	2	1	1						

TILT CYLINDERS

JOB DESCRIPTION

JOB CODE

REPACK TILT CYLINDER (ONE) FA

REPLACE TILT CYLINDERS (ONE) FB

FA - REPACK CYLINDER (ONE)

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
2	2	2	2	2	2	2	2	2	2	2	2.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
2	2	2	2	2	2	2	2	2	2.5	2.5	2.5	2
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
2	3	3	3	NA	2	2						

FB - REPLACE TILT CYLINDER (ONE)

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
2	1.5	1.5	1	1.5	1	1.5	1.5	1.5	1.5	1.5	2	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
2	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2.5	2.5	1.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1.5	2	2	2	NA	1.5	1.5						

STEERING SYSTEM

JOB DESCRIPTION	JOB CODE
REBUILD STEERING AXLE.....	GA
REBUILD STEERING GEAR ASSEMBLY	GB
RESEAL STEERING HAND PUMP	GC
REPACK STEERING CYLINDER.....	GD
REPLACE STEERING DRAG LINK	GE
REPAIR STEERING DRAG LINK	GF
REPLACE BALL STUD	GG
REPLACE STEERING CYLINDER	GH
REPLACE STEERING TIE ROD - (EACH)	GI
REPLACE STEERING PUMP	GJ
ADJUST STEERING PRESSURE	GL
REPLACE STEERING FLOW DIVIDER	GM
REPLACE STEERING GEAR OR HAND PUMP	GN
REPLACE STEERING WHEEL	GR
REPLACE STEER AXLE SPINDLE (ONE SIDE)	GS
REPLACE KING PINS OR SPINDLE BEARINGS ONLY	GU
REPLACE CENTER ARM AND BEARINGS	GV
REPLACE STEERING SPINDLE HUB AND BEARINGS AND SEALS (BOTH SIDES)	GW

GA - REBUILD STEERING AXLE

INCLUDES LABOR TO REMOVE AXLE, DISASSEMBLE, REPLACE KING PINS AND BEARINGS, CENTER ARM PIN AND BEARINGS, SEALS, TIE ROD ENDS, BALL SEATS AND SPRINGS, FRAME MOUNT BUSHINGS OR MOUNTS, REPACK WHEEL BEARINGS AND MAKE ALL ADJUSTMENTS. DOES NOT INCLUDE STEER CYLINDER REPACK. INCLUDES TRUNNION REMOVAL, BEARING INSPECTION OR REPLACEMENT, LUBE, REASSEMBLE AND ADJUSTMENTS ON THREE-WHEEL UNITS. SEE GU FOR KING PINS AND BEARINGS ONLY.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
10	9	8	11	9	11	8	10	11	8	8	10	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
10	9	8	8	8	8	10	10	8	10	12	8	8
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
8	12	12	12	8	9	10						

GB - REBUILD STEERING GEAR

INCLUDES LABOR TO REMOVE ASSEMBLY, DISASSEMBLE, INSPECT, REPLACE ALL WORN PARTS, INSTALL ANE MAKE ALL ADJUSTMENTS.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
3	4	3	NA	4	NA	5	5	NA	NA	NA	NA	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
3	4	NA	NA	NA	5	NA	5	5	5	5	NA	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	NA	NA	NA	5	NA	NA						

GC - RESEAL STEERING HAND PUMP

INCLUDES LABOR TO REMOVE, DISASSEMBLE, INSPECT, REPLACE SEALS, REASSEMBLE AND INSTALL.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
NA	3	NA	3	3	3	NA	3.5	3	3.5	3.5	3.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
NA	3	3	3	3	3.5	3	3.5	3.5	3.5	NA	3	3.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
3.5	4	4	4	3	3	3						

GD - REPACK STEERING CYLINDER

INCLUDES LABOR TO REMOVE (IF NECESSARY), DISASSEMBLE, INSPECT, REPLACE ALL SEALS, REASSEMBLE, INSTALL AND MAKE ALL ADJUSTMENTS.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
NA	4	NA	4	4	4	4	4	4	4	4	4.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
NA	4	4	4	4	4	4	4	4	4	4	4	4
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
4	5	5	5	4	4	4						

GE - REPLACE STEERING DRAG LINK

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
2	NA	2	NA	NA	NA	2	NA	NA	NA	NA	NA	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
2	NA	NA	NA	NA	2	NA	NA	2	NA	2	NA	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	NA	NA	NA	2	NA	NA						

GF - REPAIR STEERING DRAG LINK

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
3	NA	3	NA	NA	NA	3	NA	NA	NA	NA	NA	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
3	NA	NA	NA	NA	3	NA	NA	3	NA	3	NA	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	NA	NA	NA	3	NA	NA						

GG- REPLACE BALL STUD

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
6	NA	5	NA	NA	NA	5	NA	NA	NA	NA	NA	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
6	NA	5	5	NA	5	NA	NA	5	NA	6	NA	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	NA	NA	NA	6	NA	NA						

GH - REPLACE STEERING CYLINDER

INCLUDES LABOR TO REPLACE WITH NEW OR REBUILT CYLINDER AND MAKE ADJUSTMENTS.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
NA	3	NA	3	3	3	3	3	3	3	3	4	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
NA	3	3	3	3	3	3	3.5	4	4	3	3	3
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
3	4	4	4	3	3	3						

GI - REPLACE TIE ROD END OR CONNECTING LINK (EACH)

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1	1	1	1	1	1	1	1	1	1	1	1	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1	1	1	1	1	1	1	1	1	1	1*	1	1
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1	1.5	1.5	1.5	1	1	1						

* 8 HOURS INNER RODS

GJ - REPLACE STEERING PUMP

INCLUDES LABOR TO INSTALL PUMP AND SET PRESSURE

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
2	2	2	2	2	2	2	2.5	2	NA	NA	3.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
2	2	2	2	2	2	2	2.5	2	3	4	4	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	4	4	4	2	2	2						

GL - ADJUST STEERING PRESSURE

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1.5	1.5	1.5	1.5	1.5	1.5	1.5						

GM - REPLACE STEERING FLOW DIVIDER

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1.5	2	2	3.5	2	3.5	NA	1.5	NA	2	2	2	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1.5	2	2	2	2	NA	2	1.5	NA	NA	2	2	2
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
2	3	3	3	1.5	2	1.5						

GN - REPLACE STEERING GEAR OR HAND PUMP

LABOR TO INSTALL NEW OR REBUILT ASSEMBLY

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
2	3	2	3	3	3	3	3	3	3.5	3.5	3.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
2	3	3	3	3	4	3	3	3	3	3	3	3.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
3.5	3.5	3.5	3.5	3	3	3						

GR - REPLACE STEERING WHEEL

INCLUDES HORN KIT

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1	1	1	1	1	1	1	1	1	1	1	1	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1	1	1	1	1	1	1	1	1	1	1	1	1
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1	1	1	1	1	1	1						

GS - REPLACE STEEL AXLE SPINDLE (ONE SIDE)

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
3	3	3	3	3	3	3	3	3	3	3	3.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
3	3	3	3	3	3	3	3	3	3.5	3.5	3.5	3
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
3	4.5	4.5	4.5	3	3	3.5						

GU - REPLACE KING PINS AND BEARINGS OR SPINDLE BEARINGS ONLY

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
6	4	6	4	4	4	4	6	8	4	4	4.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
4	4	4	6	4	4	8	6	5	6	6	6	4
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
4	5	5	5	4	4	6						

GV - REPLACE CENTER ARM AND BEARINGS

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
7	NA	6	NA	NA	NA	6	NA	NA	NA	NA	NA	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
7	NA	6	6	NA	6	NA	NA	6	NA	8	NA	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	NA	NA	NA	7	NA	NA						

GW - REPLACE STEERING SPINDLE HUB BEARINGS AND SEALS (BOTH SIDES)

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
2	2	2	2	2	2	2	2	2.5	2	2	2	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
2	2	2	2	2	2	2	2	2.5	2.5	2.5	2.5	2
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
2	3	3	3	2	2	2						

BRAKE SYSTEM

JOB DESCRIPTION	JOB CODE
OVERHAUL BRAKE SYSTEM	HA
REPLACE PARK BRAKE HANDLE AND CABLES	HB
RESEAL PARK BRAKE HUB	HC
REPLACE BRAKE PEDAL PAD	HH
REPLACE MASTER CYLINDER	HJ
REBUILD MASTER CYLINDER	HJ
RESEAL PARK BRAKE CYLINDER	HK
REPLACE PARK BRAKE CYLINDER	HL
REPLACE PARK BRAKE HANDLE	HM
BLEED AND ADJUST BRAKES	HP

HA - OVERHAUL BRAKE SYSTEM

INCLUDES LABOR TO INSTALL NEW SHOES AND LINING, WHEEL CYLINDERS AND MASTER CYLINDER. INSPECT AND REPLACE AS NEEDED-ADJUSTORS, BACKING PLATES, PARK BRAKE CABLES OR LINKAGE AND PARK BRAKE SHOE LINING IF USED. INSPECT AND REPACK WHEEL AND FITTINGS, BLEED SYSTEM. ADJUST BRAKES, PEDAL LINKAGE, CABLES AND INCHING CONTROL. ADD COST OF TURNING DRUMS IF NEEDED.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
7	8	7	8	8	8	12	10	12	8	8	10	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
7	8	8	8	8	8	7	10	8	10	12	12	8
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
8	13	13	13	12	8	8						

HB - REPLACE PARK BRAKE HANDLE AND CBALES

INCLUDES LABOR TO REPLACE AND MAKE ALL ADJUSTMENTS.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
5	4	4	4	4	4	4	6	6	5	5	6	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
5	4	5	5	4	6	4	6	6	6	3	3	5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
5	NA	NA	6	2	6	4						

HC - RESEAL PARK BRAKE DRUM HUB

INCLUDES LABOR TO REPLACE SEALS, CLEAN OR REPLACE SHOE AND MAKE ADJUSTMENTS.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
NA	3	2.5	NA	3	NA	3	3.5	NA	NA	NA	NA	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
NA	3	NA	NA	NA	2.5	NA	3.5	NA	3.5	2.5	2.5	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	NA	NA	NA	NA	NA	2.5						

HH - REPLACE BRAKE PEDAL PAD

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
.5	.5	.5	.5	.5	.5	.5						

HJ - REPLACE MASTER CYLINDER

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1.5	1.5	1.5	1.5	1.5	2	2	2	2	2	2.5	2.5	2
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
2	3*	3*	3*	1.5	2	2						

*TREADLE VALVE

HJ - REBUILD MASTER CYLINDER

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
2	2	2	2	2	2	2	2.5	2.5	3	3	3	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
2	2	2	2	2	2.5	2.5	2.5	2.5	2.5	3	3	3
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
3	4*	4*	4*	2	2.5	2.5						

*TREADLE VALVE

HK - RESEAL PARK BRAKE CYLINDER

INCLUDES LABOR TO REMOVE, DISASSEMBLE, INSPECT, REPLACE SEALS, REASSEMBLE, INSTALL AND ADJUST.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
2	NA	2	NA	NA	NA	2	NA	NA	NA	NA	NA	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	5*	5*	NA	NA	NA	NA						

*AIR BRAKE CHAMBER (BOTH)

HL - REPLACE PARK BRAKE CYLINDER

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1.5	NA	2	NA	NA	NA	1.5	NA	NA	NA	NA	NA	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	NA	4*	4*	NA	NA	NA						

*AIR BRAKE CHAMBER (BOTH)

HM - REPLACE PARK BRAKE HANDLE

CLEAN AND LUBE CABLES, MAKE ADJUSTMENTS

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
2	2	2	2	2	2	2	2	2	2	2	2	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
2	2	2	2	2	2	2	2	2	2	2	2	2
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
2	1.5*	1.5*	2	2	2	2						

*AIR BRAKE VALVE IN DASH

HP - BLEED AND ADJUST BRAKES

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
2	2	2	2	2	2	2	2	2	2	2	2	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
2	2	2	2	2	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
2	1.5	1.5	1.5	2.5	2.5	2.5						

ELECTRICAL

JOB DESCRIPTION	JOB CODE
REPLACE TEMPERATURE GAUGE.....	IA
REPLACE OIL PRESSURE GAUGE.....	IA
REPLACE AMMETER GAUGE	IA
REPLACE WIRING HARNESS AND INSTRUMENTS	IB
REPLACE POSITIVE AND NEGATIVE BATTERY CABLES - FOR GAS AND LPG ENGINES	IC
REPLACE POSITIVE AND NEGATIVE BATTERY CABLES - FOR DIESEL ENGINES	IC
REPLACE IGNITION SWITCH	ID
REPLACE DASH PANEL	IE
REPLACE STARTER	IF
REPLACE BATTERY HOLD DOWN-GAS/LPG/DIESEL .	IG
REPLACE BATTERY - GAS/LPG/DIESEL.....	IH
REPLACE HORN	II
REPLACE HORN BUTTON	IJ
REPLACE HOURMETER	IK
REPLACE ALTERNATOR AND VOLTAGE REGULATOR.	IP
REPLACE VOLTAGE REGULATOR.....	IS
REPLACE IGNITION COIL.....	IT
REPLACE TEMPERATURE SENDING UNIT.....	IU
REPLACE OIL PRESSURE SENDING UNIT.....	IU
REPLACE SPARK PLUG WIRES	IV
REPLACE STARTER DRIVE	IX

IA - REPLACE TEMPERATURE GAUGE

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
.5	.5	.5	.5	.5	.5	.5	.5	.5	1	1	1	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	1
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1	1	1	1	.5	.5	.5						

IA - REPLACE PRESSURE GAUGE

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
.5	.5	.5	.5	.5	.5	.5	.5	.5	1	1	1	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	1
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1	1	1	1	.5	.5	.5						

IA - REPLACE AMMETER GAUGE

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
.5	.5	.5	.5	.5	.5	.5	.5	.5	1	1	1	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	1
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1	1	1	1	.5	.5	.5						

IB - REPLACE WIRE HARNESS AND INSTRUMENTS

INCLUDES LABOR TO REPLACE ALL WIRING, GAUGES, LAMPS, IGNITION SWITCH, HOUR METER, HORN AND HORN DELAY. TIME DOES NOT INCLUDE MAKING HARNESSES.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
8	8	8	8	8	8	8	8	8	8	8	9	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
7	8	8	8	8	8	8	8	10	9	10	10	8
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
8	11	11	11	8	10	10						

IC - REPLACE POSITIVE AND NEGATIVE BATTERY CABLES FOR GAS/LPG ENGINES

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1	1	1	1	1	1	1	1	1	1	1	1	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1	1	1	1	1	1	1	1	1	1	1	1	1
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1	NA	NA	NA	1	1	1						

IC - REPLACE POSITIVE AND NEGATIVE BATTERY CABLES FOR DIESEL ENGINES

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1	1	1	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1	1	1	1	1.5	1.5	1.5						

ID - REPLACE IGNITION SWITCH

CHECK FOR BAD WIRES. REPLACE WIRE END, IF NEEDED.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1	1	1	1	1	1	1	1	1	1	1	1	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1	1	1	1	1	1	1	1	1	1	1	1	1
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1	1	1	1	1	1	1						

IE - REPLACE DASH PANEL

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
4	4	4	4	4	4	4	4	4	3.5	3.5	4	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
4	4	4	4	4	4	4	4	4	4	4	4	3.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
3.5	4	4	4	4	4	4						

IF - REPLACE STARTER

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1.5	1.5	1.5	1	1.5	1.5	1.5	2	1	1.5	1.5	2	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1.5	1.5	1	1	1	1	1	2	1	2	1.5	1.5	1.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1.5	2	2	2	1	1	1						

IG - REPLACE BATTERY HOLD DOWN - GAS/LPG/DIESEL

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1	1	1	1	1	1	1	1	1	1	1	1	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1	1	1	1	1	1	1	1	1	1	1	1	1
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1	1	1	1	1	1	1						

IH - REPLACE BATTERY - GAS/LPG/DIESEL

CLEAN CABLES AND SPRAY WITH PROTECTANT. CHECK CHARGING SYSTEM.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1	1	1	1	1	1	1	1	1	1	1	1	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1	1	1	1	1	1	1	1	1	1	1	1	1
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1	1	1	1	1	1	1						

II - REPLACE HORN

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1	1	1	1	1	1	1	1	1	1	1	1	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1	1	1	1	1	1	1	1	1	1	1	1	1
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1	1	1	1	1	1	1						

IJ - REPLACE HORN BUTTON

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
.5	.5	.5	.5	.5	.5	.5						

IK - REPLACE HOURMETER

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
.5	.5	.5	.5	.5	.5	.5	.5	.5	1	1	1	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	1
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1	1	1	1	.5	.5	.5						

IP - REPLACE ALTERNATOR AND VOLTAGE REGULATOR

INCLUDES LABOR TO CHECK VOLTAGE AND AMPERE OUTPUT.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1	1	1	1	1	1	1	1	1	1.5	1.5	1.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1	1	1	1	1	1	1	1	1	1	1	1	1.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1.5	1.5	1.5	1.5	1	1	1						

IS - REPLACE VOLTAGE REGULATOR

CHECK CHARGING SYSTEM

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
.5	.5	.5	.5	.5	.5	.5	.5	.5	2	2	*	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
.5	.5	.5	.5	.5	.5	.5	.5	.5	*	.5	.5	2
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
2	*	*	2	.5	.5	.5						

* .5 HR WITH PRESTOLITE EXTERNAL REG. 2 HRS. WITH DELCO INTERVAL REG.

IT - REPLACE IGNITION COIL

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
.5	NA	NA	NA	.5	.5	.5						

IU - REPLACE TEMPERATURE SENDING UNIT

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
.5	.5	.5	.5	.5	.5	.5						

IU - REPLACE OIL PRESSURE SENDING UNIT

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
.5	.5	.5	.5	.5	.5	.5						

IV - REPLACE SPARK PLUG WIRES

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
.5	NA	NA	NA	.5	.5	.5						

IX - REPLACE STARTER DRIVE

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
3	3	3	2	3	3	3	3.5	2.5	3	3	3.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
3	3	2.5	2.5	2.5	2.5	2.5	3.5	2.5	3.5	3	3	3
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
3	3.5	3.5	3.5	2.5	2.5	2.5						

APPEARANCE

JOB DESCRIPTION

JOB CODE

PAINT AND DECAL JA

STEAM CLEAN JB

JA- PAINT AND DECAL

INCLUDES LABOR TO SAND, PAINT AND INSTALL DECALS. ADD STEAM CLEANING IF NEEDED.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
12	12	12	12	12	12	12	13	12	13	13	16	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
12	12	12	12	12	12	12	13	14	15	16	16	13
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
13	18	18	18	14	12	12						

JB - STEAM CLEAN

DEPENDS ON CONDITION OF TRUCK. MINIMUM TIME AS LISTED.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	1.5	1.5	2	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	4	4	1.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1.5	3	3	3	4	2	2						

FRAME

JOB DESCRIPTION

JOB CODE

REPLACE FRAME MOUNTING BUSHINGS KE

KE - REPLACE FRAME MOUNTING BUSHINGS

INCLUDES TIME TO REMOVE AND REPLACE UPRIGHT.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
NA	NA	7	NA	NA	NA	12	NA	NA	NA	NA	NA	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
NA	NA	7	7	NA	NA	NA	NA	NA	NA	NA	NA	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	NA	NA	NA	NA	NA	NA						

FUEL SYSTEM

JOB DESCRIPTION	JOB CODE
REPLACE CARBURETOR - GAS	MA
REBUILD CARBURETOR - GAS	MA
REPLACE CARBURETOR - LPG	MA
REBUILD CARBURETOR - LPG	MA
REPLACE CHOKE CABLE.....	MC
REPLACE KILL CABLE	MC
REPLACE FILTER - LPG	MD
REBUILD FILTER - LPG	MD
REPLACE HOSE - LPG.....	ME
REPLACE LIFT PUMP - DIESEL	MG
REPLACE FUEL PUMP - GAS	MG
REPLACE TANK BRACKET - LPG	MJ
REPLACE MONOTROL PEDAL	MK
REPLACE THROTTLE PEDAL - STD XMSN	MK
REPLACE THROTTLE PEDAL - FWD/REV LEVER PS XMSN	MK
REPLACE INJECTOR PUMP - DIESEL	MP
REPLACE VAPORIZER - LPG	MT
REBUILD VAPORIZER - LPG	MT
REPLACE THROTTLE CABLE - STD XMSN	MU
REPLACE THROTTLE CABLE - FWD/REV LVR PS	MU

MA - REPLACE CARBURETOR - GAS

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1	1	1	1	1	1	1	1	1	1.5	1.5	1.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1	1	1	1	1	1	1	1	1	1	1	1	1.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1.5	NA	NA	NA	1	1	1						

MA - REBUILD CARBURETOR - GAS

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
3	NA	NA	NA	2.5	2.5	2.5						

MA - REPLACE CARBURETOR - LPG

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1	1	1	1	1	1	1	1	1	1.5	1.5	1.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1	1	1	1	1	1	1	1	1	1	1	1	1.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1.5	NA	NA	NA	1	1	1						

MA - REBUILD CARBURETOR - LPG

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
2	2	2	2	2	2	2	2	2	2	2	2.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
2	2	2	2	2	2	2	2	2	2	2	2	2
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
2	NA	NA	NA	2	2	2						

MC - REPLACE CHOKE CABLE

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1	1	1	1	1	1	1	1	1	1	1	1	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1	1	1	1	1	1	1	1	1	1	1	1	1
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1	NA	NA	NA	1	1	1						

MC - REPLACE KILL CABLE

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1	1	1	1	1	1	1	1	1	1	1	1	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1	1	1	1	1	1	1	1	1	1	1	1	1
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1	1	1	1	1	1	1						

MD - REPLACE FILTER - LPG

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1	1	1	1	1	1	1	1	1	1	1	1	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1	1	1	1	1	1	1	1	1	1	1	1	1
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1	NA	NA	NA	1	1	1						

MD - REBUILD FILTER - LPG

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.51	1.5	1.5	1.5	1.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.51	1.5	1.5	1.5	1.5	1.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1.5	NA	NA	NA	1.5	1.5	1.5						

ME - REPLACE LPG HOSE

TANK TO FILTER

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
.5	NA	NA	NA	.5	.5	.5						

MG - REPLACE LIFT PUMP - DIESEL

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
NA	1	1	1	1	1	1	1	1	1	1	1	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
NA	1	1	1	1	1	1	1	1	1	1	1	1
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1	1	1	1	1	1	1						

MG - REPLACE FUEL PUMP - GAS

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1	1	1	1	1	1	1	1.5	1				
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1	1	1	1	1	1	1	1.5	1	1.5	1	1	1.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1.5	NA	NA	NA	1	1	1						

MJ - REPLACE TANK BRACKET - LPG

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
2	2	1	1	1	1	1	1	1	1	1	1	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
2	2	1	1	1	1	1	1	1	1.5	1.5	1.5	1
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1	NA	NA	NA	1	1	1						

MK - REPLACE MONOTROL PEDAL*

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1.5	1.5	1.5	1.5	1.5	NA	1.5	1.5	1.5	1.5	1.5	1.5	1.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1.5	1.5	1.5	1.5	NA	NA	NA						

* .5 TO REPLACE PAD ONLY

MK - REPLACE THROTTLE PEDAL - STANDARD TRANSMISSION

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1.5	1	1.5	1	NA	1	1.5	1	1.5	NA	NA	1	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1.5	1.5	1	1	NA	1.5	1.5	1	1.5	1.5	1.5	1.5	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	NA	NA	1.5	1	1	1						

MK - REPLACE THROTTLE PEDAL - FWD/REV LEVER - POWERSHIFT TRANSMISSION

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1	1	1	1	1	1	1	1	1	1	1	1	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1	1	1	1	1	1	1	1	1	1	1	1	1
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1	1.5	1.5	1.5	NA	NA	NA						

MP - REPLACE INJECTOR PUMP - DIESEL

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
NA	NA	3	3	3	3	3	3	3	3	3	3	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
NA	NA	3	3	3	3	3	3	3	3	3	3	3
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
3	3	3	3	3	3	3						

MT - REPLACE VAPORIZER - LPG

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1.5	NA	NA	NA	1.5	1.5	1.5						

MT - REBUILD VAPORIZER - LPG

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
2	2	2	2	2	2	2	2	2	2	2	2	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
2	2	2	2	2	2	2	2	2	2	2	2	2
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
2	NA	NA	NA	2	2	2						

MU - REPLACE THROTTLE CABLE - STANDARD TRANSMISSION


S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1	NA	1	1	NA	1	1	NA	1	NA	NA	1.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1	NA	1	1	NA	1	1	1	1	1	1	1	NA
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
NA	NA	NA	1.5	1	1	1						

MU - REPLACE THROTTLE CABLE - FWD/REV LEVER POWERSHIFT TRANSMISSION

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL	
1	1	1	1	1	1	1	1	1	1.5	1.5	1.5	
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM
1	1	1	1	1	1	1	1	1	1	1	1	1.5
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A						
1.5	1.5	1.5	1.5	NA	NA	NA						

ELECTRIC LIFT TRUCKS

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TRANSMISSION and DRIVE AXLE

JOB DESCRIPTION	JOB CODE
OVERHAUL TRANSMISSION	DA
OVERHAUL FINAL DRIVE WHEEL HUB	DB
OVERHAUL DIFFERENTIAL.....	DC

DA - OVERHAUL TRANSMISSION

INCLUDES LABOR TO REMOVE UPRIGHT AND DRIVE TRAIN FROM UNIT, PULL AXLES, SEPARATE TRANSMISSION FROM DIFFERENTIAL HOUSING, DISASSEMBLE, INSPECT, REPLACE WORN PARTS, REASSEMBLE AND ADJUST AND INSTALL BACK IN UNIT. INCLUDES RING GEAR AND PINION ADJUSTMENTS.

A20 30XL													
22													
E20- 30AS	E20- 30BS	E25- 35XL	E30- 60AC	E30- 60AS	E30- 60BC	E30- 60BS	E40- 60XL	E60- 100AS	E60- 120BS	E70- 120XL	E30- 50ER	E30- 50FR	E45 65XM
22	22	22	22	22	22	22	22	22	22	22	22	22	22
J25- 35AS	J25- 35B	J40- 60AS	J40- 60XL	J30- 40XMT	J40 60XM								
22	22	22	22	23	22								

DB - OVERHAUL FINAL DRIVE WHEEL HUB

INCLUDES LABOR TO REMOVE HUB, DISASSEMBLE, INSPECT, REPLACE WORN PARTS, REPACK BEARINGS, REPLACE SEALS, INSTALL AND ADJUST BEARINGS. INCLUDES LABOR TO REMOVE AXLE AND BEARING, INSPECT AND REPLACE IF NECESSARY ON UNITS USING OUTBOARD FINAL DRIVE GEAR REDUCTION.

A20 30XL													
22													
E20- 30AS	E20- 30BS	E25- 35XL	E30- 60AC	E30- 60AS	E30- 60BC	E30- 60BS	E40- 60XL	E60- 100AS	E60- 120BS	E70- 120XL	E30- 50ER	E30- 50FR	E45 65XM
22	22	22	22	22	22	22	22	22	22	22	NA	NA	NA
J25- 35AS	J25- 35B	J40- 60AS	J40- 60XL	J30- 40XMT	J40 60XM								
22	22	22	22	NA	NA								

DC - OVERHAUL DIFFERENTIAL

INCLUDES LABOR TO REMOVE UPRIGHT AND DRIVE TRAIN, PULL AXLES, SEPARATE TRANSMISSION FROM DIFFERENTIAL HOUSING, REMOVE RING GEAR AND DIFFERENTIAL, DISASSEMBLE, INSPECT AND REPLACE PARTS AS NECESSARY, REASSEMBLE, ADJUST DIFFERENTIAL CARRIER BEARINGS AND RING GEAR BACKLASH AND INSTALL BACK IN UNIT.

A20 30XL													
22													
E20- 30AS	E20- 30BS	E25- 35XL	E30- 60AC	E30- 60AS	E30- 60BC	E30- 60BS	E40- 60XL	E60- 100AS	E60- 120BS	E70- 120XL	E30- 50ER	E30- 50FR	E45 65XM
22	22	22	22	22	22	22	22	22	22	22	NA	NA	24
J25- 35AS	J25- 35B	J40- 60AS	J40- 60XL	J30- 40XMT	J40 60XM								
22	22	22	22	6*	24								

*EACH SIDE

HYDRAULIC SYSTEM

JOB DESCRIPTION

JOB CODE

REPAIR HYDRAULIC CONTROL VALVE	EA
REPLACE HYDRAULIC OIL AND FILTER	EC
REPLACE MAIN HYDRAULIC PUMP	EH

TILT CYLINDERS

JOB DESCRIPTION

JOB CODE

REPACK TILT CYLINDER (ONE) FA

REPLACE TILT CYLINDER (ONE) FB

FA - REPACK TILT CYLINDER (ONE)

INCLUDES LABOR TO REPLACE PISTON AND ROD PACKING AND SEALS IN ONE CYLINDER WITHOUT REMOVING CYLINDER

A20 30XL													
2													
E20- 30AS	E20- 30BS	E25- 35XL	E30- 60AC	E30- 60AS	E30- 60BC	E30- 60BS	E40- 60XL	E60- 100AS	E60- 120BS	E70- 120XL	E30- 50ER	E30- 50FR	E45 65XM
2	2	2	2	2	2	2	2	2	2	2	2	2	2
J25- 35AS	J25- 35B	J40- 60AS	J40- 60XL	J30- 40XMT	J40 60XM								
2	2	2	2	2	2								

FB - REPLACE TILT CYLINDER (ONE)

A20 30XL													
1.5													
E20- 30AS	E20- 30BS	E25- 35XL	E30- 60AC	E30- 60AS	E30- 60BC	E30- 60BS	E40- 60XL	E60- 100AS	E60- 120BS	E70- 120XL	E30- 50ER	E30- 50FR	E45 65XM
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
J25- 35AS	J25- 35B	J40- 60AS	J40- 60XL	J30- 40XMT	J40 60XM								
1.5	1.5	1.5	1.5	1.5	1.5								

STEERING

JOB DESCRIPTION	JOB CODE
REBUILD STEERING AXLE.....	GA
REPLACE STEERING HAND PUMP	GC
REPACK STEERING CYLINDER	GD
REPLACE STEERING CYLINDER.....	GH
REPLACE STEERING PUMP	GJ

GA - REBUILD STEERING AXLE

INCLUDES LABOR TO REPLACE KING PINS AND BEARINGS, INSPECT ROD ENDS AND REPLACE AS NECESSARY, REPACK WHEEL BEARINGS AND ADJUST (POWER STEERING ONLY). DOES NOT INCLUDE AXLE REMOVAL OR REPACKING STEER CYLINDER.

A20 30XL													
4													
E20- 30AS	E20- 30BS	E25- 35XL	E30- 60AC	E30- 60AS	E30- 60BC	E30- 60BS	E40- 60XL	E60- 100AS	E60- 120BS	E70- 120XL	E30- 50ER	E30- 50FR	E45 65XM
4	4	5	5	5	5	5	5	5	5	5	6	6	6
J25- 35AS	J25- 35B	J40- 60AS	J40- 60XL	J30- 40XMT	J40 60XM								
NA	5	5	5	6	6								

* ADD 3 HOURS IF NECESSARY TO REMOVE AXLE.

GC - REPLACE STEERING HAND PUMP

A20 30XL													
2.5													
E20- 30AS	E20- 30BS	E25- 35XL	E30- 60AC	E30- 60AS	E30- 60BC	E30- 60BS	E40- 60XL	E60- 100AS	E60- 120BS	E70- 120XL	E30- 50ER	E30- 50FR	E45 65XM
2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	NA	NA	3
J25- 35AS	J25- 35B	J40- 60AS	J40- 60XL	J30- 40XMT	J40 60XM								
2.5	2.5	2.5	3	3	3								

GD - REPACK STEERING CYLINDER IN TRUCK

A20 30XL													
NA													
E20- 30AS	E20- 30BS	E25- 35XL	E30- 60AC	E30- 60AS	E30- 60BC	E30- 60BS	E40- 60XL	E60- 100AS	E60- 120BS	E70- 120XL	E30- 50ER	E30- 50FR	E45 65XM
6	6	6	6	6	6	6	6	6	6	6	NA	NA	6
J25- 35AS	J25- 35B	J40- 60AS	J40- 60XL	J30- 40XMT	J40 60XM								
NA	5	6	6	6	6								

INCLUDES CYLINDER REMOVAL

A20 30XL													
4													
E20- 30AS	E20- 30BS	E25- 35XL	E30- 60AC	E30- 60AS	E30- 60BC	E30- 60BS	E40- 60XL	E60- 100AS	E60- 120BS	E70- 120XL	E30- 50ER	E30- 50FR	E45 65XM
8	8	8	8	8	8	8	8	8	8	8	NA	NA	8
J25- 35AS	J25- 35B	J40- 60AS	J40- 60XL	J30- 40XMT	J40 60XM								
4	4	8	8	8	8								

GH - REPLACE STEERING CYLINDER

A20 30XL													
4													
E20- 30AS	E20- 30BS	E25- 35XL	E30- 60AC	E30- 60AS	E30- 60BC	E30- 60BS	E40- 60XL	E60- 100AS	E60- 120BS	E70- 120XL	E30- 50ER	E30- 50FR	E45 65XM
4	4	4	4	4	4	4	4	4	4	4	NA	NA	4
J25- 35AS	J25- 35B	J40- 60AS	J40- 60XL	J30- 40XMT	J40 60XM								
2	3	4	4	4	4								

GJ - REPLACE STEERING PUMP

A20 30XL													
3													
E20- 30AS	E20- 30BS	E25- 35XL	E30- 60AC	E30- 60AS	E30- 60BC	E30- 60BS	E40- 60XL	E60- 100AS	E60- 120BS	E70- 120XL	E30- 50ER	E30- 50FR	E45 65XM
3	3	3	3	3	3	3	3	3	3	3	3	3	3
J25- 35AS	J25- 35B	J40- 60AS	J40- 60XL	J30- 40XMT	J40 60XM								
3	3	3	3	3	3								

BRAKE SYSTEM

JOB DESCRIPTION

JOB CODE

OVERHAUL BRAKE SYSTEM HA

ADJUST PARKING BRAKE HB

HA - OVERHAUL BRAKE SYSTEM

INCLUDES LABOR TO INSTALL NEW SHOES AND LINING, WHEEL CYLINDERS AND MASTER CYLINDER. INSPECT AND REPLACE AS NEEDED - ADJUSTERS, BACKING PLATE, PARK BRAKE CABLES OR LINKAGE AND PARK BRAKE SHOES AND LINING. TIGHTEN BACKING PLATE MOUNTING HARDWARE. INSPECT AND REPACK WHEEL BEARINGS, REPLACE SEALS, INSPECT LINES AND FITTINGS AND BLEED SYSTEM. ADJUST BRAKES, PEDAL LINKAGE AND PARK BRAKE CABLES OR LINKAGE. ADD COST OF TURNING DRUMS IF NEEDED.

A20 30XL													
8													
E20- 30AS	E20- 30BS	E25- 35XL	E30- 60AC	E30- 60AS	E30- 60BC	E30- 60BS	E40- 60XL	E60- 100AS	E60- 120BS	E70- 120XL	E30- 50ER	E30- 50FR	E45 65XM
8	8	8	8	8	8	8	8	8	8	8	7	7	8
J25- 35AS	J25- 35B	J40- 60AS	J40- 60XL	J30- 40XMT	J40 60XM								
8	8	8	8	8	8								

HB - ADJUST PARKING BRAKE

INCLUDES LABOR TO ADJUST CABLES AND LINKAGE FOR HAND AND/OR ACTUATED PARK BRAKE.

A20 30XL													
2.5													
E20- 30AS	E20- 30BS	E25- 35XL	E30- 60AC	E30- 60AS	E30- 60BC	E30- 60BS	E40- 60XL	E60- 100AS	E60- 120BS	E70- 120XL	E30- 50ER	E30- 50FR	E45 65XM
3	3	3	3	3	3	3	3	3	3	3	1.5	1.5	1.5
J25- 35AS	J25- 35B	J40- 60AS	J40- 60XL	J30- 40XMT	J40 60XM								
3	3	3	3	1.5	1.5								

CONTROL PANEL

JOB DESCRIPTION

JOB CODE

REPLACE ALL CONTACT TIPS TC

TC - REPLACE ALL CONTACT TIPS

A20 30XL													
2													
E20- 30AS	E20- 30BS	E25- 35XL	E30- 60AC	E30- 60AS	E30- 60BC	E30- 60BS	E40- 60XL	E60- 100AS	E60- 120BS	E70- 120XL	E30- 50ER	E30- 50FR	E45 65XM
2	2	2	2	2	2	2	2	2	2	2	2.5	2.5	2.5
J25- 35AS	J25- 35B	J40- 60AS	J40- 60XL	J30- 40XMT	J40 60XM								
2	2	2	2	2.5	2.5								

MOTORS

JOB DESCRIPTION	JOB CODE
REBUILD TRACTION MOTOR	UA
REPLACE TRACTION MOTOR BRUSHES	UB
REBUILD HOIST PUMP MOTOR.....	UE
REPLACE HOIST PUMP MOTOR BRUSHES	UG
REBUILD POWER STEERING MOTOR	UI
REPLACE POWER STEERING MOTOR BRUSHES	UJ

UA - REBUILD TRACTION MOTOR

INCLUDES LABOR TO REMOVE, REBUILD, INSTALL AND ADJUST CONTROLS.

A20 30XL													
6													
E20- 30AS	E20- 30BS	E25- 35XL	E30- 60AC	E30- 60AS	E30- 60BC	E30- 60BS	E40- 60XL	E60- 100AS	E60- 120BS	E70- 120XL	E30- 50ER	E30- 50FR	E45 65XM
6	6	7	7	6	7	6	7	6	6	7	8	8	14
J25- 35AS	J25- 35B	J40- 60AS	J40- 60XL	J30- 40XMT	J40 60XM								
6	7	6	7	6*	14								

*EACH SIDE

UB - REPLACE TRACTION MOTOR BRUSHES

INCLUDES LABOR TO REPLACE AND SEAT BRUSHES AND ADJUST CONTROLS.

A20 30XL													
3													
E20- 30AS	E20- 30BS	E25- 35XL	E30- 60AC	E30- 60AS	E30- 60BC	E30- 60BS	E40- 60XL	E60- 100AS	E60- 120BS	E70- 120XL	E30- 50ER	E30- 50FR	E45 65XM
3	3	3	3	3	3	3	3	3	3	3	3	3	3
J25- 35AS	J25- 35B	J40- 60AS	J40- 60XL	J30- 40XMT	J40 60XM								
3	3	3	3	2*	3								

*EACH SIDE

UE - REBUILD HOIST PUMP MOTOR

INCLUDES LABOR TO REMOVE, REBUILD AND INSTALL.

A20 30XL													
3.5													
E20- 30AS	E20- 30BS	E25- 35XL	E30- 60AC	E30- 60AS	E30- 60BC	E30- 60BS	E40- 60XL	E60- 100AS	E60- 120BS	E70- 120XL	E30- 50ER	E30- 50FR	E45 65XM
3	3	3.5	3.5	3	3.5	3	3.5	3	3	3.5	4	4	4
J25- 35AS	J25- 35B	J40- 60AS	J40- 60XL	J30- 40XMT	J40 60XM								
4	4	4	4	4	4								

UF - REPLACE HOIST PUMP MOTOR BRUSHES

INCLUDES LABOR TO REPLACE AND SEAT BRUSHES.

A20 30XL													
2													
E20- 30AS	E20- 30BS	E25- 35XL	E30- 60AC	E30- 60AS	E30- 60BC	E30- 60BS	E40- 60XL	E60- 100AS	E60- 120BS	E70- 120XL	E30- 50ER	E30- 50FR	E45 65XM
1.5	1.5	2	2	1.5	2	1.5	2	1.5	1.5	2	2	2	2
J25- 35AS	J25- 35B	J40- 60AS	J40- 60XL	J30- 40XMT	J40 60XM								
2	2	2	2	2	2								

UI - REBUILD POWER STEERING MOTOR

INCLUDES LABOR TO REMOVE, REBUILD AND INSTALL.

A20 30XL													
3													
E20- 30AS	E20- 30BS	E25- 35XL	E30- 60AC	E30- 60AS	E30- 60BC	E30- 60BS	E40- 60XL	E60- 100AS	E60- 120BS	E70- 120XL	E30- 50ER	E30- 50FR	E45 65XM
3	3	3	3	3	3	3	3	3	3	3	4	4	5
J25- 35AS	J25- 35B	J40- 60AS	J40- 60XL	J30- 40XMT	J40 60XM								
3	3	3	3	4	5								

UJ - REPLACE POWER STEERING MOTOR BRUSHES

INCLUDES LABOR TO REPLACE AND SEAT BRUSHES.

A20 30XL													
2													
E20- 30AS	E20- 30BS	E25- 35XL	E30- 60AC	E30- 60AS	E30- 60BC	E30- 60BS	E40- 60XL	E60- 100AS	E60- 120BS	E70- 120XL	E30- 50ER	E30- 50FR	E45 65XM
2	2	2	2	2	2	2	2	2	2	2	2	2	2.5
J25- 35AS	J25- 35B	J40- 60AS	J40- 60XL	J30- 40XMT	J40 60XM								
2	2	2	2	2.5	2.5								

MODIFICATIONS

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CONVERT TO LPG

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
6	6	6	6	6	6	6	6	6	6	6	8		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
6	6	6	6	6	6	6	6	8	8	8	8	6	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
6	NA	NA	NA	6	6	6							

EXCHANGE AND RESHIM CARRIAGES BETWEEN UNITS

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
3	3	3	3	3	3	3	3	3	5	5	6		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
3	3	3	3	3	3	3	3	4	4	5	5	5	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
5	6.5	6.5	6.5	NA	3	3							
A20-30XL													
3													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
3	3	3	3	3	3	3	3	3	3	3	5	4.5	4.5
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
3	3	3	3	4.5	4.5								

EXCHANGE AND RESHIM CARRIAGE WITH NON-INSTALLED CARRIAGE

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
3	3	3	3	3	3	3	3	3	4.5	4.5	5		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
3	3	3	3	3	3	3	3	3	4	4	4	4.5	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
4.5	6	6.5	6.5	NA	3	3							
A20-30XL													
3													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
3	3	3	3	3	3	3	3	3	3	3	4.5	4.5	4.5
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
3	3	3	3	4.5	4.5								

REMOVE STANDARD LOAD ARM CARRIAGE AND INSTALL AND SHIM INTEGRAL SIDE-SHIFT CARRIAGE

DOES NOT INCLUDE VALVE AND HEADER HOIST ARRANGEMENT.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
4	4	4	4	4	4	4	4	4	6	6	7		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
4	4	4	4	4	4	4	4	4	4	4	4	6	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
6	7	7	7	NA	4	4							
A20-30XL													
4													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
4	4	4	4	4	4	4	4	4	4	4	6	6	6
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
4	4	4	4	6	6								

EXCHANGE LOAD ARMS

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
1	1	1	1	1	1	1	1	1	1	1	2		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
1	1	1	1	1	1	1	1	2	2	2	2	1	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
1	2	2	2	NA	1	1							
A20-30XL													
1													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
1	1	1	1	1	1	1	1	1	1	1	1	1	1
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
1	1	1	1	1	1	1							

EXCHANGE UPRIGHTS BETWEEN TWO TRUCKS

DOES NOT INCLUDE HEADER HOSE ARRANGEMENT.

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
7	7	7	8	8	8	8	8	10	5.5	5.5	7		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
7	7	8	8	8	7	8	8	8	8	8	8	5.5	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
5.5	8	8	8	NA	8	8							
A20-30XL													
7													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
7	7	7	7	7	7	7	7	7	7	7	5	5	5
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
7	7	7	7	5	5								

EXCHANGE UPRIGHT WITH NON-INSTALLED UPRIGHT

DOES NOT INCLUDE HEADER HOSE ARRANGEMENT

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
6	6	6	6	6	6	6	6	6	5	5	7		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
6	6	6	6	6	6	6	6	6	6	6	6	5	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
5	7	7	7	NA	6	6							
A20-30XL													
6													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
6	6	6	6	6	6	6	6	6	6	6	5	5	5
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
6	6	6	6	5	5								

INSTALL UPRIGHT ON BASIC TRUCK

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
4	4	4	4	4	4	3	4	4	3.5	3.5	4		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
4	4	3	3	3	3.5	3.5	4	4	4	4	4	3.5	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
3.5	5	5	5	NA	4	4							
A20-30XL													
4													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
4	4	4	4	4	4	4	4	4	4	4	3.5	3.5	3.5
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
4	4	4	4	3.5	3.5								

INSTALL BACK TILT LIMITERS

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
2	2	2	2	2	2	2	2	2	2	2	2		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
2	2	2	2	2	2	2	2	2	2	2	2	2	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
2	2	2	2	NA	2	2							
A20-30XL													
2													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
2	2	2	2	2	2	2	2	2	2	2	2	2	2
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
2	2	2	2	2	2								

INSTALL COTTON OR CARTON CLAMP

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
3.5	4	3.5	3.5	4	3.5	3.5	4	3.5	4	4	4		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
3.5	4	3.5	4	4	3.5	4	4	NA	4	NA	NA	4	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
4	NA	NA	NA	NA	NA	NA							
A20-30XL													
4													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
4	4	4	4	4	4	4	4	4	4	4	4	4	4
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
4	4	4	4	4	4								

INSTALL REVOLVING PAPER ROLL CLAMP

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
5	5	5	5	5	5	5	5	5	4	4	4		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
5	5	5	5	5	5	5	5	5	5	NA	NA	4	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
4	NA	NA	NA	NA	5	5							
A20-30XL													
5													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
5	5	5	5	5	5	5	5	5	5	5	4	4	4
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
5	5	5	5	4	4								

INSTALL PUSH/PULL ATTACHMENT

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
5	5	5	5	5	5	5	5	5	4	4	4		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
5	5	5	5	5	5	5	5	NA	5	NA	NA	5	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
5	NA	NA	NA	NA	NA	NA							
A20-30XL													
5													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
5	5	5	5	5	5	5	5	5	5	5	4	4	4
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
5	5	5	5	4	4								

INSTALL FORGING CLAMP

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
NA	6	NA	NA	6	NA	NA	6	6	6	6	6		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
NA	6	NA	6	6	6	6	6	6	6	6	6	6	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
6	6.5	6.5	6.5	NA	NA	NA							
A20-30XL													
6													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
6	6	6	6	6	6	6	6	6	6	6	NA	NA	NA
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
6	6	6	6	NA	NA								

INSTALL FORK POSITIONER

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
5	5	5	5	5	5	5	5	5	5	5	6		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
5	5	5	5	5	5	5	6	7	7	7	7	5	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
5	7	7	7	NA	5	5							
A20-30XL													
6													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
5	5	5	5	5	5	5	5	5	5	5.5	5	5	5
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
5	5	5	5	5	5								

INSTALL CATALYTIC EXHAUST SYSTEM

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
9	9	9	9	9	9	9	9	9	9	9	9		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
9	9	9	9	9	9	9	9	9	9	9	9	9	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
9	NA	NA	NA	9	9	9							

INSTALL OVERHEAD AIR CLEANER

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
10	10	10	10	10	10	10	10	10	7.5	7.5	8.5		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
10	10	12	12	12	10	10	10	8	10	NA	NA	7.5	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
7.5	NA	NA	NA	10	10	10							

INSTALL AIR STARTER

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
6	6	6	6	6	6	6	6	6	NA	NA	NA		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
6	6	6	6	6	6	6	6	6	6	6	6	NA	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
NA	6	6	6	6	6	6							

INSTALL DIRECT READING GAUGES

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
4	4	4	4	4	4	4	4	4	4	4	4		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
4	4	4	4	4	4	4	4	4	4	4	4	4	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
4	4	4	4	4	4	4							

INSTALL HEADLIGHTS (2)

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
4	4	4	4	4	4	4	4	4	3.5	3.5	4		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
4	4	4	4	4	4	4	4	4	4	4	4	3.5	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
3.5	4	4	4	4	4	4							
A20-30XL													
4													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
4	4	4	4	4	4	4	4	4	4	4	4	4	4
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
4	4	4	4	4	4								

INSTALL COLUMN-MOUNTED FORWARD/REVERSE CONTROL

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
8	8	8	8	8	8	8	8	NA	8	8	8		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
8	8	8	8	NA	NA	8	8	NA	9	10	NA	8	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
8	NA	NA	NA	NA	NA	NA							
A20-30XL													
8													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
8	8	8	8	8	8	8	8	8	8	8	NA	NA	8
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
8	8	8	8	8	8								

CONVERT FROM SINGLE TO DUAL DRIVE TIRES

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
NA	7	25	25	7	28	28	25	NA	25	NA	NA	7	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
7	NA	NA	NA	NA	NA	NA							

CONVERT FROM DUAL DRIVE TO SINGLE DRIVE TIRES

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
NA	20	25	25	25	28	28	25	NA	25	NA	NA	11	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
11	NA	NA	NA	NA	NA	NA							

SWAP DRIVE TIRES (DUALS)

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
NA	2	2	2	2	2	2	2	2	2	2	2	2	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
2	2	2	2	2	NA	NA							

SWAP DRIVE TIRES (SINGLES)

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
2	2	2	2	2	2	2	2	2	2	2	2		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
2	2	1	1	1	1	1	2	NA	2	NA	NA	2	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
2	NA	NA	NA	NA	1	1							
A20-30XL													
2													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
2	2	2	2	2	2	2	2	2	2	2	NA	NA	2
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
2	2	2	2	2	2								

INSTALL WEIGHT INDICATOR

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
8	8	8	8	8	8	8	8	8	8	8	8		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
8	8	8	8	8	8	8	8	8	8	8	8	8	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
8	9	9	9	8	8	8							
A20-30XL													
8													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
8	8	8	8	8	8	8	8	8	8	8	8	8	8
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
8	8	8	8	8	8								

PERIODIC MAINTENANCE

INTERNAL COMBUSTION AND ELECTRIC TRUCKS

JOB DESCRIPTION

JOB CODE

PM BASIC (250 HR / 6 WKS) SERVICE PB

PM BASIC + (1000 HR / 6 MOS) SERVICE PC

PM COMPREHENSIVE (2000 HR /1 YR) SERVICE ..PD

PB - BASIC (250 HR / 6 WKS) SERVICE*

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	1.5	1.5	2.5		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	1.5	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
1.5	3.5	3.5	3.5	2	1.5	2							
A20-30XL													
1.5													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
1.5	1.5	1.5	1.5	1.5	1.5								

PC - BASIC + (1000 HR / 6 MOS) SERVICE*

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	3	3.5		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	3	3	3	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
3	5	5	5	3	3	3							
A20-30XL													
2													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
2	2	2	2	2	2	2	2	2	2	2.5	2.5	2.5	2.5
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
2	2	2	2	2.5	2.5								

PD - COMPREHENSIVE (2000 HR / 1 YR) SERVICE*

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
8	8	8	8	8	8	8	8	8	8	8	10		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
8	8	8	8	8	8	8	8	10	10	10	10	8	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
8	10	10	11	10	10	10							
A20-30XL													
8													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
8	8	8	8	8	8	8	8	8	8	8	8	8	8
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
8	8	8	8	8	8								

* SEE MAINTENANCE FORM NUMBER 852524

UPRIGHT and CARRIAGE

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REPACK HOIST CYLINDER . . . LA

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LA - REPACK HOIST CYLINDER

INCLUDES LABOR TO REMOVE, DISASSEMBLE, INSPECT, REPLACE PACKING AND SEALS, REASSEMBLE AND INSTALL.

STANDARD AND IFL UPRIGHTS - SINGLE-STAGE CYLINDER

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
4	4	4	4	4	4	4	5	5	NA	NA	6		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
4	4	4	4	4	4	7	6	8	7	10	10	NA	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
NA	NA	NA	10	5	4	4							
A20-30XL													
4													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
4	4	4	4	4	4	4	4	5	5	6	NA	NA	NA
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
4	4	4	4	NA	NA								

FREE-LIFT AND TREE-STAGE UPRIGHTS - TWO-STAGE CYLINDER

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
6	6	6	6	6.5	7	7	8	8	NA	NA	NA		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
6	6	6	6	NA	7	7	8	NA	7	NA	NA	NA	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
NA	NA	NA	NA	NA	6	6							
A20-30XL													
6													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
6	6	6	6	6	6	6	6	8	8	8	NA	NA	NA
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
6	6	6	6	NA	NA								

VISTA UPRIGHTS

VISTA FREE-LIFT (ONE)

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
NA	4	NA	6	5	6	NA	7	NA	NA	NA	NA		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
NA	4	NA	6	4	NA	NA	7	NA	7	NA	NA	NA	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
NA	NA	NA	NA	NA	NA	NA							
A20-30XL													
4													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
NA	NA	4	6	6	5	5	5	NA	6	6	NA	NA	NA
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
NA	4	6	5	NA	NA								

VISTA TWO-STAGE (ONE)

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
NA	4.5	NA	NA	7	NA	NA	7	NA	5	5	6		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
NA	5	NA	4	4	NA	NA	7.5	NA	8	NA	NA	5	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
5	11	12	NA	NA	NA	NA							
A20-30XL													
4													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
NA	5	4	6	6	5	6	5	NA	6	7	5	5	5
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
NA	5	5	4	5	5								

VISTA THREE STAGE FREE-LIFT CYLINDER (ONE)

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
NA	4.5	NA	NA	5	NA	NA	6.5	NA	7.5	7.5	7.5		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
NA	4.5	NA	5	5	NA	6	7	NA	8	NA	NA	7.5	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
7.5	NA	NA	NA	NA	NA	NA							
A20-30XL													
4													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
NA	NA	4	NA	NA	5	6	5	6	6	8	7.5	7.5	7.5
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
NA	4	6	6	7.5	7.5								

VISTA THREE STAGE MAIN CYLINDER (ONE)

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
NA	4	NA	NA	4.5	NA	NA	6	NA	6	6	6		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
NA	4	NA	5	5	NA	6	6	NA	6.5	NA	NA	6	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
6	NA	NA	NA	NA	NA	NA							
A20-30XL													
4													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
NA	5	4	5	NA	4	5	4	NA	6	5	6	6	6
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
NA	5	5	4	6	6								

VISTA FOUR-STAGE FREE-LIFT CYLINDER (ONE)

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
NA	5	NA	5	5	8	NA	7	NA	NA	8	9		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
NA	5	NA	6	5	NA	7	7	NA	7	NA	NA	NA	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
NA	NA	NA	NA	NA	NA	NA							
A20-30XL													
4													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
NA	NA	4	4	NA	6	6	5	NA	NA	6	NA	8	8
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
NA	4	6	5	NA	NA								

VISTA FOUR-STAGE MAIN CYLINDER (ONE)

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
NA	5	NA	5	5	NA	NA	7	NA	NA	6	7		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
NA	5	NA	5	5	NA	6	6	NA	6	NA	NA	NA	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
NA	NA	NA	NA	NA	NA	NA							
A20-30XL													
4													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
NA	5	5	5	5	5	5	5	NA	8	7	NA	6	6
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
5	5	5	5	NA	NA								

REPLACE ALL UPRIGHT ROLLERS and WEAR PLATES . . . LB

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LB - REPLACE ALL UPRIGHT ROLLERS AND WEAR PLATES

INCLUDES LABOR TO REMOVE AND REPLACE UPRIGHT WHEN REQUIRED

STANDARD AND FREE-LIFT

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
6	6	6	6	6	6	6	7	6	NA	NA	NA		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
6	6	6	6	6	6	6	8	8	12	14	14	NA	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
NA	NA	NA	13	NA	6	6							
A20-30XL													
6													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
6	6	7	6	6	6	6	8	6	7	9			
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
6	6	6	6	NA	NA								

THREE-STAGE

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
12	12	12	12	12	13	13	13	15	NA	NA	NA		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
12	12	12	12	12	13	12	14	NA	15	NA	NA	NA	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
NA	NA	NA	NA	NA	NA	13							
A20-30XL													
12													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
12	12	12	12	12	12	12	14	13	13	14	NA	NA	NA
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
12	12	12	14	NA	NA								

FOUR-STAGE

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
NA	16	14	14	16	NA	20	17	NA	NA	NA	NA		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
NA	16	NA	NA	NA	NA	NA	16	NA	18.5	NA	NA	NA	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
NA	NA	NA	NA	NA	14	NA							
A20-30XL													
16													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
16	16	16	16	16	16	16	17	16	16	18	NA	NA	NA
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
16	16	16	16	NA	NA								

VISTA TWO-STAGE AND VISTA FREE-LIFT

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
NA	6	NA	6	6	6	NA	8	NA	8	8	9		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
NA	7	NA	6	6	NA	6	8	NA	8	NA	NA	8	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
8	13	13	NA	NA	NA	NA							
A20-30XL													
7													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
NA	8	7	NA	NA	8	8	8	NA	8	8	10	10	8
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
NA	7	7	7	9	9								

VISTA THREE-STAGE

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
NA	14	NA	12	14	13	NA	14	NA	14	14	16		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
NA	14	NA	13	14	NA	14	14	NA	16	NA	NA	14	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
14	NA	NA	NA	NA	NA	NA							
A20-30XL													
13													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
NA	NA	14	NA	NA	13	13	14	NA	15	15	14	14	14
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
NA	14	14	14	13	13								

VISTA FOUR-STAGE

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
NA	NA	NA	NA	17	NA	NA	NA	NA	NA	18	NA		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
NA	NA	NA	NA	NA	NA	NA							
A20-30XL													
NA													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
NA	NA	NA	NA	NA	NA	NA	18	NA	NA	NA	18	18	18
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
NA	NA	NA	NA	NA	NA								

REPLACE UPRIGHT MOUNTING BUSHINGS . . . LE

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ALL MODELS U-12

REPLACE ALL HOIST CHAINS . . . LG

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LG - REPLACE ALL HOIST CHAINS

STANDARD - IFL UPRIGHTS

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
2	2	2	2	2	2	2	2.5	2.5	NA	NA	NA		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
2	2	2	2	2	2	2	2.5	2.5	3	3	3	NA	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
NA	NA	NA	3	NA	2	2.5							
A20-30XL													
2													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
2	2	2	2	2	2	2	2	2	2	2	NA	NA	NA
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
2	2	2	2	NA	NA								

FREE-LIFT

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
3	3	3	3	3	3	3	3	3	NA	NA	NA		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
3	3	3	3	3	3	3	3	NA	3	NA	NA	NA	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
NA	NA	NA	NA	NA	NA	NA							
A20-30XL													
3													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
3	3	3	3	3	3	3	3	3	3	3	NA	NA	NA
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
3	3	3	3	NA	NA								

THREE-STAGE

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
3.5	4	3.5	3.5	4	3.5	3.5	4	3.5	NA	NA	NA		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
3.5	4	3.5	3.5	3.5	3.5	3.5	4	NA	4	NA	NA	NA	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
NA	NA	NA	NA	NA	3.5	3.5							
A20-30XL													
4													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
3.5	3.5	4	3.5	3.5	3.5	3.5	4	3.5	3.5	4	NA	NA	NA
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
3.5	3.5	3.5	3.5	NA	NA								

FOUR-STAGE

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
NA	4	4	4	4	NA	NA	4	NA	NA	NA	NA		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
NA	4	NA	NA	NA	NA	NA	4	NA	4	NA	NA	NA	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
NA	NA	NA	NA	NA	NA	NA							
A20-30XL													
4													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
4	4	4	4	4	4	4	4	4	4	4	NA	NA	NA
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
4	4	4	4	NA	NA								

VISTA FREE-LIFT

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
NA	2	2.5	2	2.5	3	3.5	3	3.5	2.5	3	3.5		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
NA	2	2	2	3	3.5	3	3	3.5	3.5	NA	NA	2.5	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
3	3.5	3.5	NA	NA	NA	NA							
A20-30XL													
3													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
3	3	3	3	3	3	3	3	3	3	3.5	3	3	3
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
3	3	3	3	3	3								

VISTA TWO-STAGE

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
NA	3	NA	3	3	3	NA	3	NA	4	4	4		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
NA	3	3	3	3	NA	3	3	NA	3.5	NA	NA	3	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
3	4	4	NA	NA	NA	NA							
A20-30XL													
2													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
2.5	3	3	3	3	3	3	3	3	3	3	4	4	4
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
3	3	3	3	4	4								

VISTA THREE-STAGE

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
NA	5	NA	5	5	5	NA	5	NA	6	6	6		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
NA	5	NA	5	5	NA	5	5	NA	6	NA	NA	5	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
5	NA	NA	NA	NA	NA	NA							
A20-30XL													
5													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
5	5	5	5	5	5	5	5	5	5	5	6	6	6
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
5	5	5	5	6	6								

VISTA FOUR-STAGE

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
NA	NA	NA	NA	6.5	NA	NA	NA	NA	NA	8	8		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
NA	NA	NA	NA	NA	NA	NA							
A20-30XL													
NA													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
NA	NA	NA	NA	NA	NA	NA	7	NA	NA	NA	NA	8	8
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
	NA	NA	NA	NA	NA								

**REPLACE
ALL
CARRIAGE ROLLERS . . . LM**

DESCRIPTION

PAGE

ALL MODELS U-18

KARRY KRANE HOIST REPAIRS

JOB DESCRIPTION	JOB CODE
MAJOR ADJUSTMENT	LR
REBUILD	LR
REPLACE CLUTCH	LR

LR - MAJOR ADJUSTMENT

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
NA	NA	NA	NA	6	NA	NA							
A20-30XL													
NA													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
NA	NA	NA	NA	NA	NA								

LR - REBUILD

INCLUDES LABOR TO REMOVE WORM DRIVE AND CLUTCH ASSEMBLY, DISASSEMBLE, REPLACE WORN PARTS, ASSEMBLE, INSTALL AND ADJUST.



S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
NA	NA	NA	NA	18	NA	NA							
A20-30XL													
NA													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
NA	NA	NA	NA	NA	NA								

LR - REPLACE CLUTCH

INCLUDES ALL LABOR TO REPLACE CLUTCH, BANDS, SEALS AND ADJUST

S20-30A	S25-35XL	S30-50C	S30-60ES	S40-60XL	S60-100E	S60-100B	S70-120XL	S125-150A	S25-40XM	S45-65XM	S135-155XL		
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
H20-30E	H25-35XL	H30-60F/H	H40-60H/J	H40-60XL	H60-90C	H60-110E	H70-110XL	H110-150F	H135-155XL	H150-250E	H150-275H	H25-40XM	
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
H45-65XM	H165-280XL	H300-360XL	H300-350B	KE	P40-50A	P60-80A							
NA	NA	NA	NA	10	NA	NA							
A20-30XL													
NA													
E20-30AS	E20-30BS	E25-35XL	E30-60AC	E30-60AS	E30-60BC	E30-60BS	E40-60XL	E60-100AS	E60-120BS	E70-120XL	E30-50ER	E30-50FR	E45-65XM
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
J25-35AS	J25-35B	J40-60AS	J40-60XL	J30-40XMT	J40-60XM								
NA	NA	NA	NA	NA	NA								

 **HYSTER COMPANY**
P.O. BOX 847
DANVILLE, ILLINOIS 61834-0847 USA

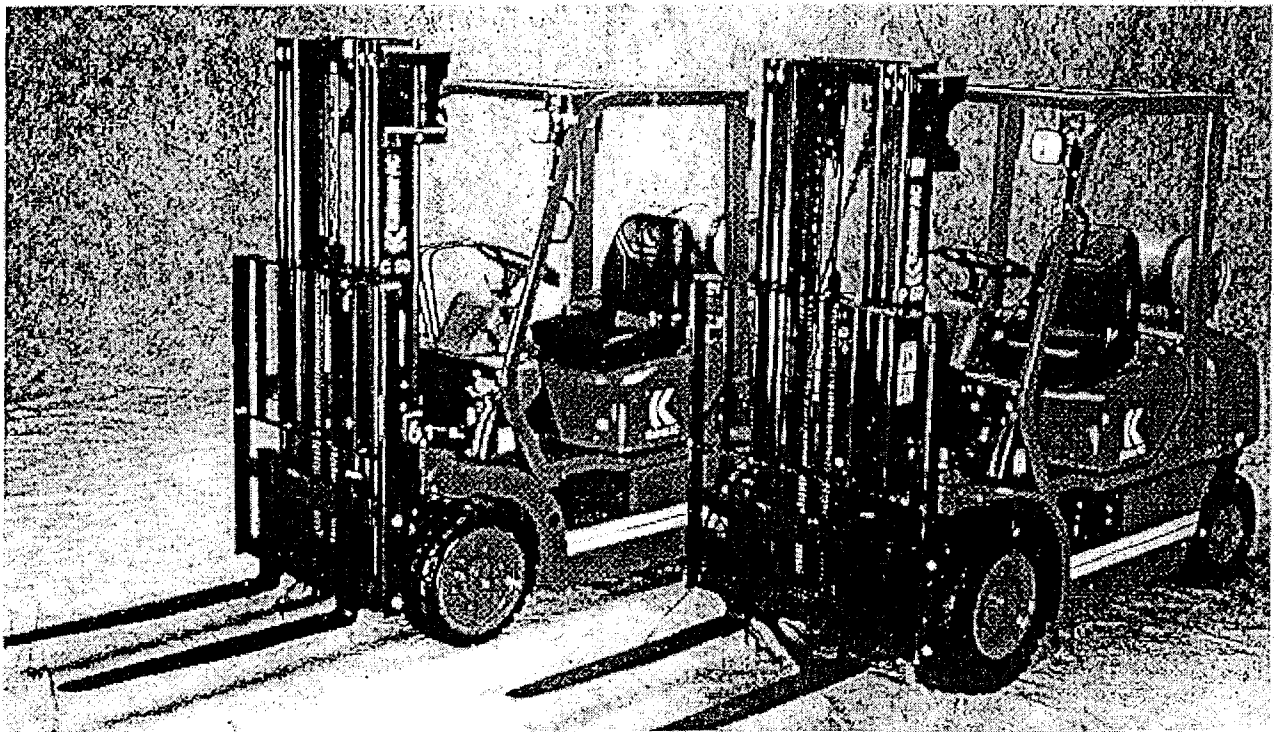
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LABOR STANDARD GUIDE (FLAT RATE MANUAL)



Manual No. FLR 1999
Issued June 1999
Revised March 2001



TO: Warranty Administrators
Parts Managers
Service Managers

Date: June, 1999

Subject: Warranty Labor Standard Guide (Flat Rate Guide) and updates for policy and procedures manual.

Enclosed in this packet is the new manual to be used for all warranty repairs on Kalmar AC trucks. Please discard the manuals you are currently using and replace with the manual. Also included is new pages for your policy and procedures manual, please insert in proper section.

All warranty reimbursement will be based on this manual. There may be circumstances when it will take more time to complete a repair due to unforeseen problems, when this happens please give a detailed explanation and the extra time will be considered and paid if justified.

When it is felt that a time is unfair please fill out the review sheet and a new study will be done and a revision done if deemed necessary by Kalmar AC.

When a suitable problem code cannot be found use the miscellaneous code and a new code will be assigned if necessary, in this case submit for actual repair time and the time will be reviewed for a standard and paid if not excessive.

NOTICE:

All warranty repairs over \$1000.00 must have prior approval before work is done.



FLAT RATE REVIEW SHEET

Dealer Code. _____

Dealer Name. _____

Dealer Contact. _____

Truck Model. _____ Serial Number. _____

Problem Code. _____ Current Hours Allowed _____

Hours Recommended. _____

Detail repair and times (including special tools if needed).

Dealer signature _____

Mail to: Kalmar AC, Inc.
 144181 Lochridge Blvd., Bldg 2
 Covington, Georgia 30014
 Attn: Warranty Department



MANDATORY RETURN LIST

When warranty repairs are done on a Kalmar AC lift truck, the following parts must be returned, prepaid to: use orange label or send to

**Kalmar AC, Inc.
144181 Lochridge Blvd., Bldg 2
Covington, Georgia 30014
Attn: Warranty Department**

The parts listed below must be returned within 30 days of completion of repair, with a copy of the warranty claim attached.

Any item with a dealer net cost of more then \$50.00

All electronic parts if not rebuild able
Fuel system parts if not rebuild able
Engines if not rebuild able
Transmissions if not rebuild able
Steer axle if not rebuild able
Drive axles if not rebuild able
Transaxles if not rebuild able
Pumps if not rebuild able
Control valves or parts if not rebuild able
Cylinders or parts if not rebuild able
Brake parts if not rebuild able

NOTICE: All parts are to be rebuilt if more economical than replacing.

- The only exception to the above is when a part can be rebuilt or repaired. If it is more economical to rebuild than replace, Kalmar AC will reimburse the cost of rebuilding, or installing a rebuilt component. A copy of the vendor repair bill must be sent in with the warranty claim.

Any claim where the part is not returned within the 30 day limit will be rejected and not reopened.

All parts must have a copy of the claim attached.

All parts that are not to be return must be held until the claim is paid or the part is requested back.

Issued June 1999
Revised March 2001



Warranty Returns

The following procedures are to be used in determining if a failed part needs to be returned to Kalmar AC.

- Any part that is used on a warranty repair and is listed on the Mandatory Return List, must be returned to Kalmar AC within 30 days from the date the repair is completed. If the part is not returned within the claim will be rejected and will not be reopened.

- Any failed part that is used and is not on the Mandatory Return List must be held until the claim is paid, or the part is requested back. On any claim where the part is not available for return, the claim will be rejected and will not be reopened.

- The only exception to the above is when a part can be rebuilt or repaired. If it is more economical to rebuild than replace, Kalmar AC will reimburse the cost of rebuilding, or installing a rebuilt component. A copy of the vendor repair bill must be sent in with the warranty claim.

- Only Kalmar AC parts are allowed to be used on warranty repairs.

- However If you use a none Kalmar part you MUST reorder new stock from Kalmar AC within 5 days or the claim will be denied a copy of the parts order must accompany the claim.



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WF40/WA30/WF45B/WA30B

TRANSMISSION

PROB.		
CODE	OPERATION DESCRIPTION	TIME
A1.001	REMOVE AND REPLACE	1.0
A1.002	REPLACE AXLE SEAL (ADD 0.5 WA)	1.0
A1.004	REBUILD/RECONDITION	4.5
A1.005	REPLACE CONTROL HANDLE HEAD	1.5
A1.006	REPLACE CONTROL HANDLE STEM	2.0
A1.007	REPLACE HAND GUARD	1.0
A1.008	REPLACE HANDLE SPRING	1.0
A1.009	REPLACE BRAKE SPRING	1.5
A1.011	ADJUST BRAKE	0.5
A1.012	REPLACE DRIVE TIRE (ADD 0.5 WA)	0.5
A1.013	REPLACE BRAKE SHOE	1.0

ELECTRICAL

PROB.		
CODE	OPERATION DESCRIPTION	TIME
A2.001	REPLACE HORN	0.3
A2.002	REPLACE BDI	0.5
A2.003	REPLACE HOURMETER	0.5
A2.004	REPLACE HANDRAIL WIRING HARNESS	1.0
A2.005	REPLACE KEY SWITCH	0.5
A2.006	REPLACE BRAKE SWITCH	0.5
A2.007	REPLACE EMERGENCY DISCONNECT SWITCH	0.5
A2.009	REPLACE HORN SWITCH	0.8
A2.010	REPLACE FORWARD/REVERSE SWITCH	0.5
A2.013	REPLACE LINE CONTACTOR	0.5
A2.014	REPLACE POTENTIOMETER	0.5
A2.015	REPLACE DRIVE MOTOR	1.5
A2.021	REPLACE LIFT PUMP CONTACTOR	0.5
A2.028	REPLACE TRANSISTOR CONTROLLER	0.8
A2.036	REPLACE BATTERY CONNECTOR	0.5
A2.037	REPLACE ONE POWER CABLE	1.0
A2.038	REPAIR OPEN WIRE	0.5
A2.039	REPLACE LIFT PUMP MOTOR	1.5
A2.042	RESEAL LIFT PUMP MOTOR	1.5
A2.045	REPLACE TIME DELAY	0.5
A2.050	REPLACE CIRCUIT BREAKER	0.5
A2.057	REPLACE LOWERING SOLENOID COIL	0.5
A2.059	REPLACE HANDLE HEAD HARNESS	1.0
A2.063	REPLACE HANDLE HARNESS	2.0

CONTINUED

WF40/WA30/WF45B/WA30B

ELECTRICAL CONTINUED

PROB.		
CODE	OPERATION DESCRIPTION	TIME
A2.064	REPLACE LIFT SWITCH	0.5
A2.065	REPLACE LOWER SWITCH	0.5
A2.066	REPLACE REVERSER SWITCH	1.0
A2.068	REPLACE ONE DRIVE MOTOR CABLE	2.0
A2.069	REPLACE LIFT LIMIT SWITCH	0.5
A2.073	REPLACE DRIVE MOTOR BRUSHES	1.0
A2.074	REPLACE PUMP MOTOR BRUSHES	1.5
A2.077	REPLACE BATTERY	0.5
A2.078	REPLACE BATTERY CHARGER	1.0
A2.080	REPLACE THERMOSTAT	0.5
A2.081	REPLACE HEATER	1.0

HYDRAULIC

PROB.		
CODE	OPERATION DESCRIPTION	TIME
A3.001	REPLACE RESERVOIR	1.5
A3.011	REPLACE ANY HYDRAULIC HOSE	0.5
A3.013	REPLACE LIFT PUMP	2.0
A3.017	REPLACE LIFT PUMP CHECK VALVE	0.5
A3.018	REPLACE LIFT CYLINDER	1.0
A3.019	RESEAL LIFT CYLINDER (R&R INCLUDED)	2.0
A3.021	REPLACE LIFT PUMP/MOTOR ASSY	1.0
A3.022	REPLACE LOWERING VALVE	0.5

FRAME

PROB.		
CODE	OPERATION DESCRIPTION	TIME
A4.009	REPLACE PIVOT BEARING	2.5
A4.013	REPLACE LOAD WHEEL	0.5
A4.017	REPLACE STABILIZING SUPPORT	0.5
A4.018	REPLACE PULL ROD	1.0
A4.019	REPLACE WHEEL FORK	1.0
A4.020	REPLACE LIFT FRAME	4.5
A4.021	REPLACE LOWER LINK/LIFT FRAME	1.5
A4.023	REPLACE STABILIZER CASTER	0.8
A4.024	REPLACE CASTER WHEEL	0.5
A4.026	REPLACE RIDER PLATFORM CUSHION BUMPER	0.8
A4.029	REMOVE AND REPLACE RIDER PLATFORM	0.5
A4.030	REPLACE RIDER PLATFORM CASTER	0.5
A4.031	REPLACE RIDER PLATFORM CASTER WHEEL	0.5

WF50/65/80(B)/WA65/80(B)

TRANSMISSION

PROB. CODE	OPERATION DESCRIPTION	TIME
B1.001	REMOVE AND REPLACE	1.5
B1.002	REPLACE AXLE SEAL	1.0
B1.003	REPLACE DRIVE AXLE	2.5
B1.004	REBUILD/RECONDITION	4.5
B1.006	REPLACE CONTROL HANDLE HEAD	1.5
B1.007	REPLACE CONTROL HANDLE STEM	1.0
B1.008	REPLACE HAND GUARD	0.7
B1.009	REPLACE HANDLE SPRING	0.7
B1.010	REPLACE BRAKE SPRING	1.0
B1.011	ADJUST BRAKE	0.3
B1.012	REPLACE DRIVE TIRE	0.5
B1.013	REPLACE BRAKE SHOE	1.0
B1.014	REPLACE HANDLE BUMPER	0.3

ELECTRICAL

PROB. CODE	OPERATION DESCRIPTION	TIME
B2.001	REPLACE HORN	0.3
B2.002	REPLACE BDI	0.5
B2.003	REPLACE HOURMETER	0.5
B2.004	REPLACE HANDRAIL WIRING HARNESS	1.0
B2.005	REPLACE KEY SWITCH	0.5
B2.006	REPLACE INTERLOCK BRAKE SWITCH	1.0
B2.007	REPLACE EMERGENCY DISCONNECT SWITCH	0.5
B2.008	REPLACE HANDRAIL HORN SWITCH	0.8
B2.009	REPLACE HORN SWITCH	0.8
B2.010	REPLACE FORWARD/REVERSE SWITCH	0.5
B2.013	REPLACE LINE CONTACTOR	0.5
B2.014	REPLACE POTENTIOMETER	0.5
B2.015	REPLACE DRIVE MOTOR	2.0
B2.018	REPLACE FORWARD/REVERSE CONTACTOR	1.0
B2.021	REPLACE LIFT PUMP CONTACTOR	0.5
B2.028	REPLACE TRANSISTOR CONTROLLER	0.8
B2.036	REPLACE BATTERY CONNECTOR	0.6
B2.037	REPLACE ONE POWER CABLE	1.0
B2.038	REPAIR ONE OPEN WIRE	0.5
B2.039	REPLACE LIFT PUMP MOTOR	1.5
B2.042	RESEAL LIFT PUMP MOTOR	1.8
B2.043	REPLACE HIGH SPEED HANDRAIL SWITCH	0.8

CONTINUED

WF50/65/80(B)/WA65/80(B)

ELECTRICAL CONTINUED

PROB.	OPERATION DESCRIPTION	TIME
B2.044	REPLACE HANDRAIL HORN SWITCH	0.8
B2.045	REPLACE TIME DELAY	0.3
B2.050	REPLACE CIRCUIT BREAKER	0.3
B2.053	REPLACE 1A SPEED CONTACTOR	1.0
B2.055	REPLACE FORWARD SPEED CONTACTOR	1.0
B2.057	REPLACE LOWERING SOLENOID COIL	0.3
B2.058	REPLACE REVERSER RELAY	0.5
B2.059	REPLACE HANDLE HEAD HARNESS	1.0
B2.063	REPLACE HANDLE HARNESS	1.5
B2.064	REPLACE LIFT SWITCH	0.5
B2.065	REPLACE LOWER SWITCH	0.5
B2.066	REPLACE REVERSER SWITCH	1.0
B2.067	REPLACE LIFT SWITCH (HANDRAIL)	0.5
B2.068	REPLACE LOWER SWITCH (HANDRAIL)	0.5
B2.069	REPLACE LIFT LIMIT SWITCH	0.5
B2.073	REPLACE DRIVE MOTOR BRUSHES	1.5
B2.074	REPLACE PUMP MOTOR BRUSHES	1.5
B2.080	REPLACE COLD STORAGE THERMOSTAT	0.3
B2.081	REPLACE COLD STORAGE HEATER	1.0

HYDRAULIC

PROB.	OPERATION DESCRIPTION	TIME
B3.001	REPLACE RESERVOIR	1.5
B3.011	REPLACE ANY HYDRAULIC HOSE	0.7
B3.013	REPLACE LIFT PUMP	2.0
B3.017	REPLACE LIFT PUMP CHECK VALVE	0.5
B3.018	REPLACE LIFT CYLINDER	2.0
B3.019	RESEAL LIFT CYLINDER	2.5
B3.021	REPLACE LIFT PUMP / MOTOR ASSY	1.5
B3.022	REPLACE LOWERING VALVE	0.5

WF50/65/80(B)/WA65/80(B)

FRAME

PROB.		
CODE	OPERATION DESCRIPTION	TIME
B4.009	REPLACE PIVOT BEARING	3.5
B4.013	REPLACE LOAD WHEEL	0.5
B4.018	REPLACE PULL ROD	2.5
B4.019	REPLACE WHEEL FORK	1.0
B4.020	REPLACE LIFT FRAME	4.0
B4.021	REPLACE LOWER LINK/LIFT FRAME	2.0
B4.022	REPLACE CARRIER FRAME	4.0
B4.023	REPLACE STABILIZER CASTER	0.6
B4.024	REPLACE CASTER WHEEL	0.5
B4.025	REPLACE STABILIZER CASTER SPRING	0.7
B4.026	REPLACE PLATFORM CUSHION BUMPER	0.5

OP30

TRANSMISSION

PROB.		
CODE	OPERATION DESCRIPTION	TIME
C1.001	REMOVE AND REPLACE	3.0
C1.002	REPLACE AXLE SEAL	1.0
C1.003	REPLACE DRIVE AXLE	4.5
C1.004	REBUILD/RECONDITION	6.5
C1.005	REPLACE BRAKE SEPERATORS / DISCS	4.5
C1.008	REPLACE SLAVE CYLINDER	0.8
C1.009	REBUILD SLAVE CYLINDER	1.0
C1.010	REPLACE BRAKE HYDRAULIC HOSE	1.0
C1.012	REPLACE DRIVE TIRE	0.6

ELECTRICAL

PROB.		
CODE	OPERATION DESCRIPTION	TIME
C2.001	REPLACE HORN	0.5
C2.002	REPLACE BDI	0.8
C2.003	REPLACE HOURMETER	0.8
C2.004	REPLACE ACCESSORY WIRING HARNESS	2.0
C2.005	REPLACE KEY SWITCH	1.0
C2.006	REPLACE BRAKE INTERLOCK SWITCH	0.5
C2.007	REPLACE START SWITCH	1.0
C2.009	REPLACE HORN SWITCH	1.0
C2.010	REPLACE MASTER CONTROL SWITCH	2.0
C2.011	REPLACE EMERGENCY DISCONNECT BUTTON	1.0
C2.012	REPLACE EMERGENCY DISCONNECT INTERLOCK	0.5
C2.013	REPLACE EMERGENCY DISCONNECT CONTACTOR	1.0
C2.014	REPLACE POTENTIOMETER	1.0
C2.015	REPLACE DRIVE MOTOR	2.5
C2.018	REPLACE FORWARD / REVERSE CONTACTOR	0.7
C2.020	REPLACE 1A CONTACTOR	0.7
C2.021	REPLACE LIFT PUMP CONTACTOR	0.7
C2.022	REPLACE STEERING CONTACTOR	0.7
C2.023	REPLACE FORWARD CONTACTOR COIL	1.0
C2.024	REPLACE REVERSE CONTACTOR COIL	1.0
C2.025	REPLACE 1A CONTACTOR COIL	1.0
C2.026	REPLACE LIFT PUMP CONTACTOR COIL	1.0
C2.027	REPLACE STEER PUMP CONTACTOR COIL	1.0
C2.028	REPLACE EV100 LX CARD	1.5
C2.029	REPLACE NUMBER 1 SCR	1.0
C2.030	REPLACE NUMBER 2 SCR	0.8

CONTINUED

OP30

ELECTRICAL CONTINUED

PROB.		
CODE	OPERATION DESCRIPTION	TIME
C2.031	REPLACE NUMBER 5 SCR	0.8
C2.032	REPLACE NUMBER 3 SCR	0.6
C2.033	REPLACE NUMBER 4 SCR	0.6
C2.034	REPLACE CAPACITOR	1.1
C2.035	REPLACE REACTOR	1.1
C2.036	REPLACE BATTERY CONNECTOR	0.5
C2.037	REPLACE ONE POWER CABLE	0.7
C2.038	REPAIR ONE OPEN WIRE	1.0
C2.039	REPLACE LIFT PUMP MOTOR	1.5
C2.043	REPLACE LIFT PUMP VALVE COIL	0.5
C2.046	REPLACE BRAKE VALVE COIL	0.5
C2.058	REPLACE MAST CABLE	2.5
C2.059	REPLACE 24" LIMIT SWITCH	1.0
C2.060	REPLACE 150" LIMIT SWITCH	1.0
C2.061	REPLACE 226" LIMIT SWITCH	1.0
C2.062	REPLACE TURN ANGLE LIMIT SWITCH	0.5
C2.063	REPLACE CHAIN TENSION SWITCH	0.5
C2.064	REPLACE GATE SWITCH	1.0
C2.065	REPLACE LIFT / LOWER SWITCH	1.5
C2.074	REPLACE DRIVE MOTOR BRUSHES	1.0
C2.075	REPLACE PUMP MOTOR BRUSHES	1.0
C2.076	REPLACE STEER MOTOR BRUSHES	1.0
C2.077	REPLACE STEER PUMP MOTOR	2.0
C2.079	REPLACE STORBE LIGHT	0.5
C2.080	REPLACE WORK LIGHT	0.5
C2.081	REPLACE DOME LIGHT	0.5
C2.082	REPLACE FAN	0.7

HYDRAULIC

PROB.		
CODE	OPERATION DESCRIPTION	TIME
C3.001	REPLACE RESERVOIR	2.0
C3.002	REPLACE LIFT PUMP SOLENOID VALVE	1.0
C3.006	REPLACE FREE LIFT CYLINDER	3.5
C3.007	RESEAL FREE LIFT CYLINDER	1.0
C3.008	REPLACE STAGING CYLINDER	3.5
C3.009	RESEAL STAGING CYLINDER	1.2
C3.011	REPLACE ANY HYDRAULIC HOSE	1.3
C3.012	REPLACE VELOCITY FUSE	0.8

CONTINUED

OP30

HYDRAULIC CONTINUED

PROB.		
CODE	OPERATION DESCRIPTION	TIME
C3.013	REPLACE LIFT PUMP	2.0
C3.014	REPLACE LOWERING VALVE	1.0
C3.015	REPLACE TORQUE GNERATOR	2.2
C3.017	REPLACE BRAKE VALVE	0.8
C3.022	REPLACE STEER PUMP	2.0

FRAME

PROB.		
CODE	OPERATION DESCRIPTION	TIME
C4.003	REPLACE CONTROL HANDLE	2.0
C4.004	REPLACE CONTROL HANDLE SUPPORT	1.5
C4.007	REPLACE TRANSIMSSION ECCENTRIC BEARING (ONE)	1.0
C4.008	EACH ADDITIONAL BEARING	0.3
C4.009	REPLACE PIVOT BEARING	1.5
C4.010	ADJUST STEER CABLE	0.5
C4.011	ADJUST STEER CHAIN	0.5
C4.012	REPLACE STEER CABLE	2.5
C4.013	REPLACE LOAD WHEEL	0.8
C4.014	REPLACE STEER CHAIN (TORQUE GENERATOR TO SHAFT)	1.0
C4.015	REPLACE STEER CHAIN (SHAFT TO CABLE)	1.0
C4.016	REPLACE STEER CHAIN (TORQUE GENERATOR TO TRANS- MISSION)	1.2

MAST

PROB.		
CODE	OPERATION DESCRIPTION	TIME
C5.001	SHIM CARRIAGE	3.5
C5.002	SHIM INNER COLUMN	4.5
C5.003	SHIM INTERMEDIATE COLUMN	5.0
C5.004	REPLACE CARRIAGE ROLLER	3.5
C5.005	REPLACE INNER COLUMN ROLLER	4.5
C5.006	REPLACE INTERMEDIATE COLUMN ROLLER	5.0
C5.007	INSTALL MAST AND PLATFORM	2.5
C5.008	REPLACE CARRIAGE ROLLER	3.5
C5.009	REPLACE INNER COLUMN ROLLER	4.5
C5.010	REPLACE INTERMEDIATE COLUMN ROLLER	5.0

NR30/40

TRANSMISSION

PROB.		
CODE	OPERATION DESCRIPTION	TIME
D1.001	REMOVE AND REPLACE	2.5
D1.002	REPLACE AXLE SEAL	1.6
D1.003	REPLACE DRIVE AXLE	5.5
D1.004	REBUILD/RECONDITION	10.0
D1.005	REPLACE SUPPORT YOKE BEARING	3.0
D1.011	ADJUST BRAKE	0.8
D1.012	REPLACE DRIVE TIRE	0.6
D1.013	REPLACE BRAKE SHOES	1.2
D1.014	REPLACE SUPPORT YOKE	3.0
D1.016	REPLACE BRAKE PEDAL	1.0
D1.017	REPLACE BRAKE CABLE	1.5

ELECTRICAL

PROB.		
CODE	OPERATION DESCRIPTION	TIME
D2.001	REPLACE HORN	0.5
D2.002	REPLACE BDI	0.5
D2.003	REPLACE HOURMETER	0.5
D2.004	REPLACE ACCESSORY WIRING HARNESS	1.0
D2.005	REPLACE KEY SWITCH	0.5
D2.006	REPLACE BRAKE SWITCH	0.5
D2.007	REPLACE LIFT VALVE SWITCH	1.5
D2.008	REPLACE AUXILIARY VALVE SWITCH	1.5
D2.009	REPLACE HORN SWITCH	1.0
D2.010	REPLACE MASTER CONTROL SWITCH	1.2
D2.014	REPLACE POTENTIOMETER	1.0
D2.015	REPLACE DRIVE MOTOR	2.5
D2.016	REPLACE DRIVE MOTOR ARMATURE	3.5
D2.017	REPLACE DRIVE MOTOR FIELDS	3.5
D2.018	REPLACE FORWARD / REVERSE CONTACTOR	0.7
D2.020	REPLACE 1A CONTACTOR	0.7
D2.021	REPLACE LIFT PUMP CONTACTOR	0.7
D2.022	REPLACE AUXILIARY PUMP CONTACTOR	0.7
D2.023	REPLACE FORWARD CONTACTOR COIL	1.0
D2.024	REPLACE REVERSE CONTACTOR COIL	1.0
D2.025	REPLACE 1A CONTACTOR COIL	1.0
D2.027	REPLACE STEER PUMP CONTACTOR COIL	1.0
D2.028	REPLACE EV100 LX CARD	1.5
D2.029	REPLACE NUMBER 1 SCR	1.0

CONTINUED

NR30/40

ELECTRICAL CONTINUED

PROB.		
CODE	OPERATION DESCRIPTION	TIME
D2.030	REPLACE NUMBER 2 SCR	0.8
D2.031	REPLACE NUMBER 5 SCR	0.8
D2.032	REPLACE NUMBER 3 SCR	0.6
D2.033	REPLACE NUMBER 4 SCR	0.6
D2.034	REPLACE CAPACITOR	1.1
D2.035	REPLACE REACTOR	1.1
D2.036	REPLACE BATTERY CONNECTOR	0.6
D2.037	REPLACE ONE POWER CABLE	1.0
D2.038	REPAIR ONE OPEN WIRE	1.0
D2.039	REPLACE LIFT PUMP MOTOR	1.5
D2.040	REPLACE LIFT PUMP MOTOR ARMATURE	1.8
D2.041	REPLACE LIFT PUMP MOTOR FIELDS	1.8
D2.042	REPLACE SPEED LIMIT SWITCH	1.0
D2.043	REPLACE MAST ELECTRICAL CABLE	3.5
D2.044	REPLACE CHASSIS WIRING HARNESS	3.5
D2.045	REPLACE ONE HYDRAULIC SOLENOID COIL	0.5
D2.046	REPLACE REACH WIRING HARNESS	1.5
D2.047	REPLACE STEER PUMP MOTOR	1.5
D2.048	REPLACE STEER MOTOR ARMATURE	2.0
D2.049	REPLACE STEER MOTOR FIELD COIL	2.0
D2.050	REPLACE AUXILIARY VALVE COIL	1.0
D2.051	REPLACE SELECTOR SWITCH	1.5
D2.052	REPLACE AUXILIARY SWITCH	1.5
D2.053	REPLACE INDICATOR LIGHTS	0.5
D2.070	REPLACE FORWARD / REVERSE CONTACTOR TIPS	1.0
D2.071	REPLACE 1A CONTACTOR TIPS	0.5
D2.072	REPLACE PUMP MOTOR CONTACTOR TIPS	0.5
D2.073	REPLACE AUXILIARY PUMP MOTOR CONTACTOR TIPS	0.5
D2.074	REPLACE DRIVE MOTOR BRUSHES	2.0
D2.075	REPLACE PUMP MOTOR BRUSHES	2.0
D2.076	REPLACE AUXILIARY MOTOR BRUSHES	1.0

HYDRAULIC

PROB.		
CODE	OPERATION DESCRIPTION	TIME
D3.001	REPLACE RESERVOIR	1.5
D3.002	REPLACE LIFT VALVE	1.5
D3.003	RESEAL LIFT VALVE	2.0
D3.004	REPLACE TILT CYLINDER	1.0

CONTINUED

NR30/40

HYDRAULIC CONTINUED

PROB.		
CODE	OPERATION DESCRIPTION	TIME
D3.005	RESEAL TILT CYLINDER	2.0
D3.006	REPLACE FREE LIFT CYLINDER	3.0
D3.007	RESEAL FREE LIFT CYLINDER	1.0
D3.008	REPLACE STAGING CYLINDER	3.5
D3.009	RESEAL STAGING CYLINDER	1.2
D3.011	REPLACE ANY HYDRAULIC HOSE	1.3
D3.012	REPLACE VELOCITY FUSE	0.8
D3.013	REPLACE LIFT PUMP	3.0
D3.014	RESEAL LIFT PUMP	3.5
D3.015	REPLACE AUXILIARY PUMP	1.5
D3.016	RESEAL AUXILIARY PUMP	2.0
D3.017	REPLACE TORQUE GENERATOR	1.5
D3.018	RESEAL TORQUE GENERATOR	2.0
D3.019	REPLACE HYDRAULIC SOLENOID VALVE	1.0
D3.020	REPLACE REACH CYLINDER	1.5
D3.021	RESEAL REACH CYLINDER	2.0
D3.022	REPLACE SIDE SHIFT CYLINDER	1.5
D3.023	RESEAL SIDE SHIFT CYLINDER	2.0
D3.024	REPLACE AUXILIARY VALVE	1.5

FRAME

PROB.		
CODE	OPERATION DESCRIPTION	TIME
D4.003	REPLACE CONTROL HANDLE	1.0
D4.006	REPLACE CASTER WHEEL	1.5
D4.007	REPLACE UPPER / LOWER SHAFT SPROCKET	2.5
D4.008	REPLACE TRANSMISSION SPROCKET	2.0
D4.013	REPLACE LOAD WHEEL	1.2
D4.027	REPLACE UPPER STEER CHAIN	1.5
D4.028	REPLACE LOWER STEER CHAIN	1.5

NR30/40

MAST

PROB.		
CODE	OPERATION DESCRIPTION	TIME
D5.001	SHIM CARRIAGE	2.5
D5.002	SHIM INNER COLUMN	4.0
D5.003	SHIM INTERMEDIATE COLUMN	4.5
D5.004	REPLACE CARRIAGE ROLLER	2.5
D5.005	REPLACE INNER COLUMN ROLLER	4.0
D5.006	REPLACE INTERMEDIATE COLUMN ROLLER	4.5
D5.007	INSTALL MAST	2.5

REACH

PROB.		
CODE	OPERATION DESCRIPTION	TIME
D5.008	REPLACE CENTER PIVOT BEARING	3.0
D5.010	REPLACE FRONT FRAME	3.0
D5.011	REPLACE REAR FRAME	5.0
D5.012	REPLACE ARM ROLLER	2.0
D5.013	RECONDITION SINGLE REACH	6.0
D5.014	INSTALL SIDE SHIFT	3.0
D5.015	RECONDITION DEEP REACH	8.0

NR45

TRANSMISSION

PROB. CODE	OPERATION DESCRIPTION	TIME
E1.001	REMOVE AND REPLACE	2.5
E1.002	REPLACE AXLE SEAL	1.6
E1.003	REPLACE DRIVE AXLE	5.5
E1.004	REBUILD/RECONDITION	10.0
E1.005	REPLACE SUPPORT YOKE BEARING	3.0
E1.006	REPLACE MASTER CYLINDER	1.2
E1.007	REBUILD MASTER CYLINDER	1.7
E1.008	REPLACE SLAVE CYLINDER	1.5
E1.009	REBUILD SLAVE CYLINDER	2.0
E1.010	REPLACE BRAKE HYDRAULIC HOSE	1.2
E1.011	ADJUST BRAKE	0.5
E1.012	REPLACE DRIVE TIRE	0.6
E1.013	REPLACE BRAKE SHOES	1.2
E1.014	REPLACE SUPPORT YOKE	3.0
E1.016	REPLACE BRAKE PEDAL	1.0

ELECTRICAL

PROB. CODE	OPERATION DESCRIPTION	TIME
E2.001	REPLACE HORN	0.5
E2.002	REPLACE BDI	0.5
E2.003	REPLACE HOURMETER	0.5
E2.004	REPLACE ACCESSORY WIRING HARNESS	1.0
E2.005	REPLACE KEY SWITCH	0.5
E2.006	REPLACE BRAKE SWITCH	0.5
E2.007	REPLACE LIFT VALVE SWITCH	1.5
E2.008	REPLACE AUXILIARY VALVE SWITCH	1.5
E2.009	REPLACE HORN SWITCH	1.0
E2.010	REPLACE MASTER CONTROL SWITCH	1.2
E2.011	REPLACE Z-LIFT SWITCH	1.0
E2.014	REPLACE POTENTIOMETER	1.0
E2.015	REPLACE DRIVE MOTOR	2.5
E2.016	REPLACE DRIVE MOTOR ARMATURE	3.5
E2.017	REPLACE DRIVE MOTOR FIELDS	3.5
E2.018	REPLACE FORWARD / REVERSE CONTACTOR	0.7
E2.020	REPLACE 1A CONTACTOR	0.7
E2.021	REPLACE LIFT PUMP CONTACTOR	0.7
E2.022	REPLACE AUXILIARY PUMP CONTACTOR	0.7
E2.023	REPLACE FORWARD CONTACTOR COIL	1.0

CONTINUED

NR45

ELECTRICAL CONTINUED		
PROB.		
CODE	OPERATION DESCRIPTION	TIME
E2.024	REPLACE REVERSE CONTACTOR COIL	1.0
E2.025	REPLACE 1A CONTACTOR COIL	1.0
E2.026	REPLACE LIFT PUMP CONTACTOR COIL	1.0
E2.027	REPLACE STEER PUMP CONTACTOR COIL	1.0
E2.028	REPLACE EV100 LX CARD	1.5
E2.029	REPLACE NUMBER 1 SCR	1.0
E2.030	REPLACE NUMBER 2 SCR	0.8
E2.031	REPLACE NUMBER 5 SCR	0.8
E2.032	REPLACE NUMBER 3 SCR	0.6
E2.033	REPLACE NUMBER 4 SCR	0.6
E2.034	REPLACE CAPACITOR	1.1
E2.035	REPLACE REACTOR	1.1
E2.036	REPLACE BATTERY CONNECTOR	0.6
E2.037	REPLACE ONE POWER CABLE	1.0
E2.038	REPAIR ONE OPEN WIRE	1.0
E2.039	REPLACE LIFT PUMP MOTOR	1.5
E2.040	REPLACE LIFT PUMP MOTOR ARMATURE	1.8
E2.041	REPLACE LIFT PUMP MOTOR FIELDS	1.8
E2.042	REPLACE SPEED LIMIT SWITCH	1.0
E2.043	REPLACE MAST ELECTRICAL CABLE	3.5
E2.044	REPLACE CHASSIS WIRING HARNESS	3.5
E2.045	REPLACE ONE HYDRAULIC SOLENOID COIL	0.5
E2.046	REPLACE REACH WIRING HARNESS	1.5
E2.047	REPLACE STEER PUMP MOTOR	1.5
E2.048	REPLACE STEER MOTOR ARMATURE	2.0
E2.049	REPLACE STEER MOTOR FIELD COIL	2.0
E2.050	REPLACE AUXILIARY VALVE COIL	1.0
E2.051	REPLACE SELECTOR SWITCH	1.5
E2.052	REPLACE AUXILIARY SWITCH	1.5
E2.053	REPLACE INDICATOR LIGHTS	0.5
E2.070	REPLACE FORWARD / REVERSE CONTACTOR TIPS	1.0
E2.071	REPLACE 1A CONTACTOR TIPS	0.5
E2.072	REPLACE PUMP MOTOR CONTACTOR TIPS	0.5
E2.073	REPLACE AUXILIARY PUMP MOTOR CONTACTOR TIPS	0.5
E2.074	REPLACE DRIVE MOTOR BRUSHES	2.0
E2.075	REPLACE PUMP MOTOR BRUSHES	2.0
E2.076	REPLACE AUXILIARY MOTOR BRUSHES	1.0

NR45

HYDRAULIC

PROB.		
CODE	OPERATION DESCRIPTION	TIME
E3.001	REPLACE RESERVOIR	1.5
E3.002	REPLACE LIFT VALVE	1.5
E3.003	RESEAL LIFT VALVE	2.0
E3.004	REPLACE TILT CYLINDER	1.0
E3.005	RESEAL TILT CYLINDER	2.0
E3.006	REPLACE FREE LIFT CYLINDER	3.0
E3.007	RESEAL FREE LIFT CYLINDER	1.0
E3.008	REPLACE STAGING CYLINDER	3.5
E3.009	RESEAL STAGING CYLINDER	1.2
E3.011	REPLACE ANY HYDRAULIC HOSE	1.3
E3.012	REPLACE VELOCITY FUSE	0.8
E3.013	REPLACE LIFT PUMP	3.0
E3.014	RESEAL LIFT PUMP	3.5
E3.015	REPLACE AUXILIARY PUMP	1.5
E3.016	RESEAL AUXILIARY PUMP	2.0
E3.017	REPLACE STEER CYLINDER	3.0
E3.018	RESEAL STEER CYLINDER	3.5
E3.019	REPLACE HYDRAULIC SOLENOID VALVE	1.0
E3.020	REPLACE REACH CYLINDER	1.5
E3.021	RESEAL REACH CYLINDER	2.0
E3.022	REPLACE SIDE SHIFT CYLINDER	1.5
E3.023	RESEAL SIDE SHIFT CYLINDER	2.0
E3.024	REPLACE AUXILIARY VALVE	1.5

FRAME

PROB.		
CODE	OPERATION DESCRIPTION	TIME
E4.001	REPLACE ARTICULATING FRAME	6.5
E4.002	ADJUST ARTICULATING STOPS	0.5
E4.003	REPLACE CONTROL HANDLE	1.0
E4.004	REPLACE IDLER WHEEL	1.0
E4.013	REPLACE LOAD WHEEL	1.2
E4.014	RECONDITION STEER AXLE	7.5

NR45

MAST

PROB.		
CODE	OPERATION DESCRIPTION	TIME
E5.001	SHIM CARRIAGE	2.5
E5.002	SHIM INNER COLUMN	4.0
E5.003	SHIM INTERMEDIATE COLUMN	4.5
E5.004	REPLACE CARRIAGE ROLLER	2.5
E5.005	REPLACE INNER COLUMN ROLLER	4.0
E5.006	REPLACE INTERMEDIATE COLUMN ROLLER	4.5
E5.007	INSTALL MAST	2.5

REACH

PROB.		
CODE	OPERATION DESCRIPTION	TIME
E5.008	REPLACE CENTER PIVOT BEARING	3.0
E5.010	REPLACE FRONT FRAME	3.0
E5.011	REPLACE REAR FRAME	5.0
E5.012	REPLACE ARM ROLLER	2.0
E5.013	RECONDITION SINGLE REACH	6.0
E5.014	INSTALL SIDE SHIFT	3.0
E5.015	RECONDITION DEEP REACH	8.0

WB60-80(B)

TRANSMISSION

PROB.		
CODE	OPERATION DESCRIPTION	TIME
F1.001	REMOVE AND REPLACE	1.5
F1.002	REPLACE AXLE SEAL	1.0
F1.003	REPLACE DRIVE AXLE	2.5
F1.004	REBUILD/RECONDITION	4.5
F1.006	REPLACE CONTROL HANDLE HEAD	1.0
F1.007	REPLACE CONTROL HANDLE STEM	1.0
F1.008	REPLACE HAND GUARD	0.7
F1.010	REPLACE BRAKE SPRING	1.0
F1.011	ADJUST BRAKE	0.3
F1.012	REPLACE DRIVE TIRE	0.5
F1.013	REPLACE BRAKE SHOE	1.0

ELECTRICAL

PROB.		
CODE	OPERATION DESCRIPTION	TIME
F2.001	REPLACE HORN	0.3
F2.002	REPLACE BDI	0.5
F2.003	REPLACE HOURMETER	0.5
F2.004	REPLACE BACKREST WIRING HARNESS	1.0
F2.005	REPLACE KEY SWITCH	0.5
F2.006	REPLACE BRAKE SWITCH	0.5
F2.007	REPLACE EMERGENCY DISCONNECT SWITCH	0.3
F2.009	REPLACE HORN SWITCH	0.8
F2.010	REPLACE FORWARD/REVERSE SWITCH	0.5
F2.013	REPLACE LINE CONTACTOR	0.5
F2.014	REPLACE POTENTIOMETER	0.5
F2.015	REPLACE DRIVE MOTOR	2.0
F2.021	REPLACE LIFT PUMP CONTACTOR	0.5
F2.028	REPLACE TRANSISTOR CONTROLLER	0.8
F2.036	REPLACE BATTERY CONNECTOR	0.6
F2.037	REPLACE ONE POWER CABLE	1.0
F2.038	REPAIR ONE OPEN WIRE	0.5
F2.039	REPLACE LIFT PUMP MOTOR	1.5
F2.042	RESEAL LIFT PUMP MOTOR	1.8
F2.045	REPLACE TIME DELAY	0.3
F2.050	REPLACE CIRCUIT BREAKER	0.3
F2.058	REPLACE HIGH SPEED RELAY	0.5
F2.059	REPLACE HANDLE HEAD HARNESS	1.0
F2.063	REPLACE HANDLE HARNESS	1.5

CONTINUED

WB60-80(B)

ELECTRICAL CONTINUED

PROB.		
CODE	OPERATION DESCRIPTION	TIME
F2.064	REPLACE LIFT SWITCH	0.5
F2.065	REPLACE LOWER SWITCH	0.5
F2.068	REPLACE BACKREST LIFT/LOWER SWITCH	0.5
F2.069	REPLACE LIFT LIMIT SWITCH	0.5
F2.073	REPLACE DRIVE MOTOR BRUSHES	1.5
F2.074	REPLACE PUMP MOTOR BRUSHES	1.5
F2.080	REPLACE COLD STORAGE THERMOSTAT	0.3
F2.081	REPLACE COLD STORAGE HEATER	1.0
F2.082	REPLACE PLATFORM SWITCH	0.7
F2.083	REPLACE K-TRAK TOGGLE SWITCH	0.3
F2.084	REPLACE K-TRAK LIMIT SWITCH	0.3
F2.085	REPLACE K-TRAK SOLENOID COIL	0.3
F2.086	REPLACE K-TRAK PUMP CONTACTOR	0.3

HYDRAULIC

PROB.		
CODE	OPERATION DESCRIPTION	TIME
F3.001	REPLACE RESERVOIR	1.5
F3.011	REPLACE ANY HYDRAULIC HOSE	0.7
F3.013	REPLACE LIFT PUMP	2.0
F3.017	REPLACE LIFT PUMP CHECK VALVE	0.5
F3.018	REPLACE LIFT CYLINDER	2.0
F3.019	RESEAL LIFT CYLINDER	2.5
F3.021	REPLACE LIFT PUMP / MOTOR ASSY	1.5
F3.022	REPLACE LOWERING VALVE	0.3
F3.025	REPLACE K-TRAK CYLINDER	1.0
F3.026	RESEAL K-TRAK CYLINDER	1.5
F3.027	REPLACE K-TRAK PUMP	1.5
F3.028	REPLACE K-TRAK SOLENOID VALVE	0.8

WB60-80(B)

FRAME

PROB.		
CODE	OPERATION DESCRIPTION	TIME
F4.009	REPLACE PIVOT BEARING	3.5
F4.013	REPLACE LOAD WHEEL	0.5
F4.018	REPLACE PULL ROD	2.5
F4.019	REPLACE WHEEL FORK	1.0
F4.020	REPLACE LIFT FRAME	4.0
F4.021	REPLACE LOWER LINK/LIFT FRAME	2.0
F4.022	REPLACE CARRIER FRAME	4.0
F4.023	REPLACE STABILIZER CASTER	0.6
F4.024	REPLACE CASTER WHEEL	0.5
F4.025	REPLACE STABILIZER CASTER SPRING	0.7
F4.026	REPLACE PLATFORM CUSHION BUMPER	0.5

WC20/30/40

TRANSMISSION

PROB.		
CODE	OPERATION DESCRIPTION	TIME
G1.001	REMOVE AND REPLACE	1.5
G1.002	REPLACE AXLE SEAL	1.0
G1.003	REPLACE DRIVE AXLE	2.5
G1.004	REBUILD/RECONDITION	4.5
G1.006	REPLACE CONTROL HANDLE HEAD	1.5
G1.007	REPLACE CONTROL HANDLE STEM	1.0
G1.008	REPLACE HAND GUARD	0.7
G1.009	REPLACE HANDLE SPRING	0.7
G1.010	REPLACE BRAKE SPRING	1.0
G1.011	ADJUST BRAKE	0.3
G1.012	REPLACE DRIVE TIRE	0.5
G1.013	REPLACE BRAKE SHOE	1.0
G1.014	REPLACE HANDLE BUMPER	0.3

ELECTRICAL

PROB.		
CODE	OPERATION DESCRIPTION	TIME
G2.001	REPLACE HORN	0.3
G2.002	REPLACE BDI	0.5
G2.003	REPLACE HOURMETER	0.5
G2.005	REPLACE KEY SWITCH	0.5
G2.006	REPLACE BRAKE SWITCH	0.5
G2.007	REPLACE EMERGENCY DISCONNECT SWITCH	0.5
G2.010	REPLACE DIRECTIONAL CONTROL SWITCH	0.5
G2.013	REPLACE LINE CONTACTOR	0.5
G2.014	REPLACE POTENTIOMETER	0.5
G2.015	REPLACE DRIVE MOTOR	2.0
G2.021	REPLACE LIFT PUMP CONTACTOR	0.5
G2.023	REPLACE CONTROL VALVE SWITCH	0.5
G2.028	REPLACE TRANSISTOR CONTROLLER	0.8
G2.036	REPLACE BATTERY CONNECTOR	0.6
G2.037	REPLACE ONE POWER CABLE	1.0
G2.038	REPAIR ONE OPEN WIRE	0.5
G2.039	REPLACE LIFT PUMP MOTOR	1.5
G2.044	REPLACE HYDRAULIC CONTROL HANDLE SWITCH	0.8
G2.045	REPLACE HYDRAULIC SOLENOID COIL	0.5
G2.050	REPLACE CIRCUIT BREAKER	0.5
G2.057	REPLACE LOWERING SOLENOID COIL	0.3
G2.059	REPLACE HANDLE HEAD HARNESS	1.0

CONTINUED

WC20/30/40

ELECTRICAL CONTINUED

PROB.		
CODE	OPERATION DESCRIPTION	TIME
G2.063	REPLACE HANDLE HARNESS	1.5
G2.064	REPLACE LIFT SWITCH	0.5
G2.065	REPLACE LOWER SWITCH	0.5
G2.066	REPLACE REVERSER SWITCH	1.0
G2.073	REPLACE DRIVE MOTOR BRUSHES	1.5
G2.074	REPLACE PUMP MOTOR BRUSHES	1.0
G2.080	REPLACE COLD STORAGE THERMOSTAT	0.3
G2.081	REPLACE COLD STORAGE HEATER	1.0

HYDRAULIC

PROB.		
CODE	OPERATION DESCRIPTION	TIME
G3.001	REPLACE RESERVOIR	2.0
G3.002	REPLACE CONTROL VALVE	2.5
G3.004	REPLACE TWO STAGE LIFT CYLINDER	2.5
G3.005	RESEAL TWO STAGE LIFT CYLINDER	1.2
G3.006	REPLACE FREE LIFT CYLINDER	2.5
G3.007	RESEAL FREE LIFT CYLINDER	1.2
G3.008	REPLACE STAGING CYLINDER	3.5
G3.009	RESEAL STAGING CYLINDER	1.2
G3.010	REPLACE HYDRAULIC FILTER	0.5
G3.011	REPLACE ANY HYDRAULIC HOSE	1.0
G3.012	REPLACE VELOCITY FUSE	1.0
G3.013	REPLACE LIFT PUMP	2.0
G3.014	REPLACE HYDRAULIC SOLENOID VALVE	0.5
G3.015	REPLACE COMPENSATOR CYLINDER	1.5
G3.016	RESEAL COMPENSATOR CYLINDER	2.0
G3.017	REPLACE LIFT PUMP CHECK VALVE	0.5
G3.018	REPLACE HYDRAULIC SOLENOID VALVE	0.5
G3.021	REPLACE LIFT PUMP/MOTOR ASSY	1.5
G3.024	REPLACE TILT CYLINDER	1.0
G3.025	RESEAL TILT CYLINDER	1.5
G3.026	REPLACE SIDE SHIFT CYLINDER	1.0
G3.027	RESEAL SIDE SHIFT CYLINDER	1.5

WC20/30/40

FRAME

PROB.		
CODE	OPERATION DESCRIPTION	TIME
G4.009	REPLACE TRANSMISSION PIVOT BEARING	1.5
G4.013	REPLACE LOAD WHEEL	0.5
G4.023	REPLACE STABILIZER CASTER	0.6
G4.024	REPLACE CASTER WHEEL	0.5
G4.025	REPLACE STABILIZER CASTER SPRING	0.7
G4.026	REPLACE PLATFORM CUSHION BUMPER	0.5

MAST

PROB.		
CODE	OPERATION DESCRIPTION	TIME
G5.001	SHIM CARRIAGE	2.0
G5.002	SHIM INNER COLUMN	3.0
G5.003	SHIM INTERMEDIATE COLUMN	3.0
G5.004	REPLACE CARRIAGE ROLLER	2.5
G5.005	REPLACE INNER COLUMN ROLLER	3.5
G5.006	REPLACE INTERMEDIATE COLUMN ROLLER	3.5
G5.014	INSTALL SIDESHIFTER	3.0

WT750(B)

TRANSMISSION

PROB.		
CODE	OPERATION DESCRIPTION	TIME
H1.001	REMOVE AND REPLACE	1.5
H1.002	REPLACE AXLE SEAL	1.0
H1.003	REPLACE DRIVE AXLE	2.5
H1.004	REBUILD/RECONDITION	4.5
H1.006	REPLACE CONTROL HANDLE HEAD	1.5
H1.007	REPLACE CONTROL HANDLE STEM	1.5
H1.008	REPLACE HAND GUARD	1.0
H1.010	REPLACE BRAKE SPRING	1.0
H1.011	ADJUST BRAKE	0.3
H1.012	REPLACE DRIVE TIRE	0.5
H1.013	REPLACE BRAKE SHOE	1.0

ELECTRICAL

PROB.		
CODE	OPERATION DESCRIPTION	TIME
H2.001	REPLACE HORN	0.3
H2.002	REPLACE BDI	0.5
H2.003	REPLACE HOURMETER	0.5
H2.005	REPLACE KEY SWITCH	0.5
H2.006	REPLACE BRAKE SWITCH	0.3
H2.007	REPLACE EMERGENCY DISCONNECT SWITCH	0.5
H2.009	REPLACE HORN SWITCH	0.8
H2.010	REPLACE FORWARD/REVERSE SWITCH	0.5
H2.013	REPLACE LINE CONTACTOR	0.5
H2.014	REPLACE POTENTIOMETER	0.5
H2.015	REPLACE DRIVE MOTOR	1.5
H2.028	REPLACE TRANSISTOR CONTROLLER	0.8
H2.036	REPLACE BATTERY CONNECTOR	0.6
H2.037	REPLACE ONE POWER CABLE	1.0
H2.038	REPAIR ONE OPEN WIRE	0.5
H2.045	REPLACE TIME DELAY	0.5
H2.050	REPLACE CIRCUIT BREAKER	0.5
H2.053	REPLACE 1A FORWARD CONTACTOR	1.0
H2.055	REPLACE FORWARD SPEED CONTACTOR	0.8
H2.058	REPLACE HIGH SPEED RELAY	0.5
H2.059	REPLACE HANDLE HEAD HARNESS	1.0
H2.062	REPLACE PLATFORM SWITCH	0.7
H2.063	REPLACE HANDLE HARNESS	1.5

CONTINUED

WT750(B)

ELECTRICAL CONTINUED

PROB.		
CODE	OPERATION DESCRIPTION	TIME
H2.073	REPLACE DRIVE MOTOR BRUSHES	1.5
H2.080	REPLACE COLD STORAGE THERMOSTAT	0.3
H2.081	REPLACE COLD STORAGE HEATER	1.0

FRAME

PROB.		
CODE	OPERATION DESCRIPTION	TIME
H4.009	REPLACE TRANSMISSION PIVOT BEARING	3.5
H4.013	REPLACE LOAD WHEEL	0.5
H4.026	REPLACE PLATFORM CUSHION BUMPER	0.5

WS22/30/40

TRANSMISSION

PROB.		
CODE	OPERATION DESCRIPTION	TIME
J1.001	REMOVE AND REPLACE	1.5
J1.002	REPLACE AXLE SEAL	1.0
J1.003	REPLACE DRIVE AXLE	2.5
J1.004	REBUILD/RECONDITION	4.5
J1.006	REPLACE CONTROL HANDLE HEAD	1.5
J1.007	REPLACE CONTROL HANDLE STEM	1.0
J1.008	REPLACE HAND GUARD	0.7
J1.009	REPLACE HANDLE SPRING	0.7
J1.010	REPLACE BRAKE SPRING	0.5
J1.011	ADJUST BRAKE	0.3
J1.012	REPLACE DRIVE TIRE	0.5
J1.013	REPLACE BRAKE SHOE	1.0
J1.014	REPLACE HANDLE BUMPER	0.3

ELECTRICAL

PROB.		
CODE	OPERATION DESCRIPTION	TIME
J2.001	REPLACE HORN	0.3
J2.002	REPLACE BDI	0.5
J2.003	REPLACE HOURMETER	0.5
J2.005	REPLACE KEY SWITCH	0.5
J2.006	REPLACE BRAKE SWITCH	1.0
J2.007	REPLACE EMERGENCY DISCONNECT SWITCH	0.5
J2.010	REPLACE DIRECTIONAL CONTROL SWITCH	0.5
J2.013	REPLACE LINE CONTACTOR	0.5
J2.014	REPLACE POTENTIOMETER	0.5
J2.015	REPLACE DRIVE MOTOR	2.0
J2.021	REPLACE LIFT PUMP CONTACTOR	0.5
J2.023	REPLACE CONTROL VALVE SWITCH	0.5
J2.028	REPLACE TRANSISTOR CONTROLLER	0.8
J2.036	REPLACE BATTERY CONNECTOR	0.6
J2.037	REPLACE ONE POWER CABLE	1.0
J2.038	REPAIR ONE OPEN WIRE	0.5
J2.039	REPLACE LIFT PUMP MOTOR	2.0
J2.044	REPLACE HYDRAULIC CONTROL HANDLE SWITCH	0.5
J2.045	REPLACE HYDRAULIC SOLENOID COIL	0.5
J2.050	REPLACE CIRCUIT BREAKER	0.5
J2.057	REPLACE LOWERING SOLENOID COIL	0.5
J2.059	REPLACE HANDLE HEAD HARNESS	1.0

CONTINUED

WS22/30/40

ELECTRICAL CONTINUED

PROB.	OPERATION DESCRIPTION	TIME
J2.063	REPLACE HANDLE HARNESS	1.5
J2.064	REPLACE LIFT SWITCH	0.5
J2.065	REPLACE LOWER SWITCH	0.5
J2.066	REPLACE REVERSER SWITCH	1.0
J2.073	REPLACE DRIVE MOTOR BRUSHES	1.0
J2.074	REPLACE PUMP MOTOR BRUSHES	1.0
J2.080	REPLACE COLD STORAGE THERMOSTAT	0.3
J2.081	REPLACE COLD STORAGE HEATER	1.0

HYDRAULIC

PROB.	OPERATION DESCRIPTION	TIME
J3.001	REPLACE RESERVOIR	2.0
J3.002	REPLACE CONTROL VALVE	2.5
J3.004	REPLACE TWO STAGE LIFT CYLINDER	2.5
J3.005	RESEAL TWO STAGE LIFT CYLINDER	1.2
J3.006	REPLACE FREE LIFT CYLINDER	2.5
J3.007	RESEAL FREE LIFT CYLINDER	1.2
J3.008	REPLACE STAGING CYLINDER	3.5
J3.009	RESEAL STAGING CYLINDER	1.2
J3.010	REPLACE HYDRAULIC FILTER	0.5
J3.011	REPLACE ANY HYDRAULIC HOSE	1.3
J3.012	REPLACE VELOCITY FUSE	1.0
J3.013	REPLACE LIFT PUMP	2.0
J3.014	REPLACE HYDRAULIC SOLENOID VALVE	0.5
J3.015	REPLACE COMPENSATOR CYLINDER	1.5
J3.016	RESEAL COMPENSATOR CYLINDER	2.0
J3.017	REPLACE LIFT PUMP CHECK VALVE	0.5
J3.018	REPLACE HYDRAULIC SOLENOID VALVE	0.5
J3.021	REPLACE LIFT PUMP MOTOR ASSY	1.5
J3.024	REPLACE TILT CYLINDER	0.5
J3.025	RESEAL TILT CYLINDER	1.0
J3.026	REPLACE SIDE SHIFT CYLINDER	0.5
J3.027	RESEAL SIDE SHIFT CYLINDER	1.0

WS22/30/40

FRAME

PROB.		
CODE	OPERATION DESCRIPTION	TIME
J4.009	REPLACE TRANSMISSION PIVOT BEARING	1.5
J4.013	REPLACE LOAD WHEEL	0.5
J4.023	REPLACE STABILIZER CASTER	0.6
J4.024	REPLACE CASTER WHEEL	0.5
J4.025	REPLACE STABILIZER CASTER SPRING	0.7
J4.026	REPLACE PLATFORM CUSHION BUMPER	0.5

MAST

PROB.		
CODE	OPERATION DESCRIPTION	TIME
J5.001	SHIM CARRIAGE	2.0
J5.002	SHIM INNER COLUMN	3.0
J5.003	SHIM INTERMEDIATE COLUMN	3.0
J5.004	REPLACE CARRIAGE ROLLER	2.5
J5.005	REPLACE INNER COLUMN ROLLER	3.5
J5.006	REPLACE INTERMEDIATE COLUMN ROLLER	3.5
J5.014	INSTALL SIDESHIFTER	3.0

WR30

TRANSMISSION

PROB. CODE	OPERATION DESCRIPTION	TIME
K1.001	REMOVE AND REPLACE	1.5
K1.002	REPLACE AXLE SEAL	1.0
K1.003	REPLACE DRIVE AXLE	2.5
K1.004	REBUILD/RECONDITION	4.5
K1.006	REPLACE CONTROL HANDLE HEAD	1.5
K1.007	REPLACE CONTROL HANDLE STEM	1.0
K1.008	REPLACE HAND GUARD	0.7
K1.009	REPLACE HANDLE SPRING	0.7
K1.010	REPLACE BRAKE SPRING	0.5
K1.011	ADJUST BRAKE	0.3
K1.012	REPLACE DRIVE TIRE	0.5
K1.013	REPLACE BRAKE SHOE	1.0
K1.014	REPLACE HANDLE BUMPER	0.3

ELECTRICAL

PROB. CODE	OPERATION DESCRIPTION	TIME
K2.001	REPLACE HORN	0.3
K2.002	REPLACE BDI	0.5
K2.003	REPLACE HOURMETER	0.5
K2.005	REPLACE KEY SWITCH	0.5
K2.006	REPLACE BRAKE SWITCH	0.5
K2.007	REPLACE EMERGENCY DISCONNECT SWITCH	0.5
K2.010	REPLACE DIRECTIONAL CONTROL SWITCH	0.5
K2.013	REPLACE LINE CONTACTOR	0.5
K2.014	REPLACE POTENTIOMETER	0.5
K2.015	REPLACE DRIVE MOTOR	2.0
K2.021	REPLACE LIFT PUMP CONTACTOR	0.5
K2.023	REPLACE CONTROL VALVE SWITCH	0.5
K2.028	REPLACE TRANSISTOR CONTROLLER	0.8
K2.036	REPLACE BATTERY CONNECTOR	0.6
K2.037	REPLACE ONE POWER CABLE	1.0
K2.038	REPAIR ONE OPEN WIRE	0.5
K2.039	REPLACE LIFT PUMP MOTOR	2.0
K2.044	REPLACE HYDRAULIC CONTROL HANDLE SWITCH	0.5
K2.045	REPLACE HYDRAULIC SOLENOID COIL	0.5
K2.050	REPLACE CIRCUIT BREAKER	0.5
K2.057	REPLACE LOWERING SOLENOID COIL	0.5
K2.059	REPLACE HANDLE HEAD HARNESS	1.0

CONTINUED

WR30

ELECTRICAL CONTINUED

PROB. CODE	OPERATION DESCRIPTION	TIME
K2.063	REPLACE HANDLE HARNESS	1.5
K2.064	REPLACE LIFT SWITCH	0.5
K2.065	REPLACE LOWER SWITCH	0.5
K2.066	REPLACE REVERSER SWITCH	1.0
K2.073	REPLACE DRIVE MOTOR BRUSHES	1.0
K2.074	REPLACE PUMP MOTOR BRUSHES	1.0
K2.080	REPLACE COLD STORAGE THERMOSTAT	0.3
K2.081	REPLACE COLD STORAGE HEATER	1.0

HYDRAULIC

PROB. CODE	OPERATION DESCRIPTION	TIME
K3.001	REPLACE RESERVOIR	2.0
K3.002	REPLACE CONTROL VALVE	2.5
K3.004	REPLACE TWO STAGE LIFT CYLINDER	2.5
K3.005	RESEAL TWO STAGE LIFT CYLINDER	1.2
K3.006	REPLACE FREE LIFT CYLINDER	2.5
K3.007	RESEAL FREE LIFT CYLINDER	1.2
K3.008	REPLACE STAGING CYLINDER	3.5
K3.009	RESEAL STAGING CYLINDER	1.2
K3.010	REPLACE HYDRAULIC FILTER	0.5
K3.011	REPLACE ANY HYDRAULIC HOSE	1.3
K3.012	REPLACE VELOCITY FUSE	1.0
K3.013	REPLACE LIFT PUMP	2.0
K3.014	REPLACE HYDRAULIC SOLENOID VALVE	0.5
K3.015	REPLACE COMPENSATOR CYLINDER	1.5
K3.016	RESEAL COMPENSATOR CYLINDER	2.0
K3.017	REPLACE LIFT PUMP CHECK VALVE	0.5
K3.018	REPLACE HYDRAULIC SOLENOID VALVE	0.5
K3.021	REPLACE LIFT PUMP MOTOR ASSY	1.5
K3.022	REPLACE REACH CYLINDER	1.0
K3.023	RESEAL REACH CYLINDER	1.5
K3.024	REPLACE TILT CYLINDER	1.0
K3.025	RESEAL TILT CYLINDER	1.5
K3.026	REPLACE SIDE SHIFT CYLINDER	1.0
K3.027	RESEAL SIDE SHIFT CYLINDER	1.5

WR30

FRAME

PROB.		
CODE	OPERATION DESCRIPTION	TIME
K4.009	REPLACE TRANSMISSION PIVOT BEARING	1.5
K4.013	REPLACE LOAD WHEEL	0.5
K4.023	REPLACE STABILIZER CASTER	0.6
K4.024	REPLACE CASTER WHEEL	0.5
K4.025	REPLACE STABILIZER CASTER SPRING	0.7
K4.026	REPLACE PLATFORM CUSHION BUMPER	0.5

MAST

PROB.		
CODE	OPERATION DESCRIPTION	TIME
K5.001	SHIM CARRIAGE	2.0
K5.002	SHIM INNER COLUMN	3.0
K5.003	SHIM INTERMEDIATE COLUMN	3.0
K5.004	REPLACE CARRIAGE ROLLER	2.5
K5.005	REPLACE INNER COLUMN ROLLER	3.5
K5.006	REPLACE INTERMEDIATE COLUMN ROLLER	3.5

REACH

PROB.		
CODE	OPERATION DESCRIPTION	TIME
K5.008	REPLACE CENTER PIVOT BEARING	3.0
K5.009	REMOVE AND INSTALL REACH ASSY	2.0
K5.010	REPLACE FRONT FRAME	3.0
K5.011	REPLACE REAR FRAME	3.0
K5.012	REPLACE ARM ROLLER	2.0
K5.013	RECONDITION SINGLE REACH	4.5
K5.014	INSTALL SIDE SHIFT	3.0
K5.015	RECONDITION DEEP REACH	8.0

NR35B

TRANSMISSION

PROB.		
CODE	OPERATION DESCRIPTION	TIME
L1.001	REMOVE AND REPLACE	2.0
L1.002	REPLACE AXLE SEAL	3.0
L1.003	REPLACE DRIVE AXLE	3.0
L1.004	REBUILD/RECONDITION	8.0
L1.005	REPLACE STEER BEARING	2.2
L1.010	REPLACE DRIVE MOTOR BRAKE DISC	1.5
L1.011	ADJUST BRAKES	0.5
L1.012	REPLACE DRIVE TIRE	0.5
L1.016	REPLACE BRAKE PEDAL	2.0

ELECTRICAL

PROB.		
CODE	OPERATION DESCRIPTION	TIME
L2.001	REPLACE HORN	0.3
L2.002	REPLACE EMERGENCY DISCONNECT	0.8
L2.003	ADJUST BRAKE SWITCH	0.7
L2.004	REPLACE ACCESSORY WIRING HARNESS	1.0
L2.005	REPLACE KEY SWITCH	1.0
L2.006	REPLACE BRAKE SWITCH	0.7
L2.007	REPLACE LIFT POTENTIOMETER	1.0
L2.008	REPLACE REACH/TILT/SIDESHIFT POTENTIOMETER	1.0
L2.009	REPLACE HORN BUTTON	1.0
L2.010	REPLACE DIRECTION/SPEED POTENTIOMETER	1.0
L2.011	REPLACE BRAKE TRANSDUCER	0.1
L2.014	ADJUST BRAKE TRANSDUCER	0.7
L2.015	REPLACE DRIVE MOTOR	1.5
L2.018	REPLACE K11/K13 CONTACTOR	1.5
L2.020	REPLACE STEER TACHOMETER	1.5
L2.021	REPLACE MAIN CONTACTOR	1.0
L2.024	REPLACE DRIVE MOTOR FAN	0.7
L2.025	REPLACE LIFT PUMP BY PASS CONTACTOR	0.7
L2.027	REPLACE ELECTRONIC FAN	0.7
L2.028	REPLACE A5 MAIN LOGIC CARD	1.0
L2.029	REPLACE A1 DRIVE TRANSISTOR REGULATOR	1.0
L2.030	REPLACE A2 LIFT TRANSISTOR REGULATOR	1.0
L2.031	REPLACE A6 DASH DISPLAY	0.5
L2.032	REPLACE A7 PRESET HEIGHT CARD	1.0
L2.033	REPLACE A8 HEIGHT INDICATOR CARD	0.5
L2.034	REPLACE A22 PRESET HEIGHT KEY PAD	1.5

CONTINUED

NR35B

ELECTRICAL CONTINUED

PROB.	OPERATION DESCRIPTION	TIME
L2.035	REPLACE MAST UPPER POSITION SWITCH	0.5
L2.036	REPLACE BATTERY CONNECTOR	0.6
L2.037	REPLACE ONE POWER CABLE	1.0
L2.038	REPAIR ONE OPEN WIRE	0.5
L2.039	REPLACE LIFT PUMP MOTOR	3.5
L2.042	REPLACE SPEED LIMIT SWITCH	0.7
L2.043	REPLACE MAST ELECTRICAL CABLE	2.0
L2.044	REPLACE CHASSIS WIRING HARNESS	3.5
L2.045	REPLACE HYDRAULIC SOLENOID COIL	0.5
L2.046	REPLACE REACH WIRING HARNESS	1.0
L2.047	REPLACE STEER MOTOR	0.7
L2.048	REPLACE STEER SENSOR	1.0
L2.049	ADJUST STEER SENSOR	0.5
L2.050	REPLACE A/B VALVE COIL	0.5
L2.051	REPLACE PULSE SENSOR	0.8
L2.052	REPLACE DRIVE MOTOR SPEED SENSOR	0.3
L2.053	REPLACE DRIVE MOTOR DIRECTION SENSOR	0.3
L2.054	REPLACE DRIVE MOTOR BRAKE COIL	1.0
L2.055	REPLACE RIGHT FOOT SWITCH	0.7
L2.070	REPLACE K11/K13 CONTACTOR TIPS	1.5
L2.071	REPLACE FAN/LIGHT SWITCH	1.0
L2.072	REPLACE LIFT BYPASS CONTACTOR TIPS	1.5
L2.073	REPLACE MAIN CONTACTOR TIPS	1.5
L2.074	REPLACE DRIVE MOTOR BRUSHES	1.5
L2.075	REPLACE PUMP MOTOR BRUSHES	1.5
L2.076	REPLACE STEER MOTOR BRUSHES	0.5

HYDRAULIC

PROB.	OPERATION DESCRIPTION	TIME
L3.001	REPLACE RESERVOIR	2.0
L3.002	REPLACE LIFT VALVE	2.0
L3.003	RESEAL LIFT VALVE	1.0
L3.004	REPLACE TILT CYLINDER	0.5
L3.005	RESEAL TILT CLINDER	1.0
L3.006	REPLACE FREE LIFT CYINDER	2.5
L3.007	RESEAL FREE LIFT CYLINDER	1.2
L3.008	REPLACE STAGING CYLINDER	3.5
L3.009	RESEAL STAGING CYLINDER	1.2

CONTINUED

NR35B

HYDRAULIC CONTINUED

PROB.		
CODE	OPERATION DESCRIPTION	TIME
L3.011	REPLACE ANY HYDRAULIC HOSE	1.3
L3.012	REPLACE VELOCITY FUSE	0.8
L3.013	REPLACE LIFT PUMP	3.5
L3.015	REPLACE LOWERING PROPORTIONAL VALVE	1.0
L3.016	RESEAL LOWERING PROPORTIONAL VALVE	0.5
L3.017	REPLACE A/B VALVE	0.8
L3.018	RESEAL A/B VALVE	0.8
L3.019	REPLACE HYDRAULIC SOLENOID VALVE	0.7
L3.020	REPLACE REACH CYLINDER	1.0
L3.021	RESEAL REACH CYLINDER	1.5
L3.022	REPLACE SIDE SHIFT CYLINDER	0.5
L3.023	RESEAL SIDE SHIFT CYLINDER	1.0

FRAME

PROB.		
CODE	OPERATION DESCRIPTION	TIME
L4.001	REPLACE CASTER PIVOT	2.0
L4.002	ADJUST ARTICULATING STOPS	0.5
L4.003	REPLACE CASTER BRACKET	2.0
L4.004	REPLACE CASTER WHEEL	0.5
L4.013	REPLACE TWO LOAD WHEELS	0.5

MAST

PROB.		
CODE	OPERATION DESCRIPTION	TIME
L5.001	SHIM CARRIAGE	2.5
L5.002	SHIM INNER COLUMN	4.0
L5.003	SHIM INTERMEDIATE COLUMN	4.5
L5.004	REPLACE CARRIAGE ROLLER	2.5
L5.005	REPLACE INNER COLUMN ROLLER	4.0
L5.006	REPLACE INTERMEDIATE COLUMN ROLLER	4.5
L5.007	INSTALL MAST	1.0
L5.017	REPLACE HEIGHT INDICATOR CABLE	0.5

NR35B

REACH

PROB.		
CODE	OPERATION DESCRIPTION	TIME
L5.008	REPLACE CENTER PIVOT BEARING	3.0
L5.009	REMOVE AND INSTALL REACH ASSEMBLY	1.5
L5.010	REPLACE FRONT FRAME	3.0
L5.011	REPLACE REAR FRAME	3.0
L5.012	REPLACE ARM ROLLER	2.0
L5.013	RECONDITION SINGLE REACH	4.5
L5.014	INSTALL SIDE SHIFT	3.0

NR45B

TRANSMISSION

PROB.		
CODE	OPERATION DESCRIPTION	TIME
M1.001	REMOVE AND REPLACE	2.0
M1.002	REPLACE AXLE SEAL	3.0
M1.003	REPLACE DRIVE AXLE	3.0
M1.004	REBUILD/RECONDITION	8.0
M1.005	REPLACE STEER BEARING	2.2
M1.010	REPLACE DRIVE MOTOR BRAKE DISC	1.5
M1.011	ADJUST BRAKES	0.5
M1.012	REPLACE DRIVE TIRE	0.5
M1.013	REPLACE CASTER BRAKE SHOES	2.0
M1.014	ADJUST CASTER BRAKE	0.5
M1.016	REPLACE BRAKE PEDAL	2.0

ELECTRICAL

PROB.		
CODE	OPERATION DESCRIPTION	TIME
M2.001	REPLACE HORN	0.3
M2.002	REPLACE EMERGENCY DISCONNECT	0.8
M2.003	ADJUST BRAKE SWITCH	0.7
M2.004	REPLACE ACCESSORY WIRING HARNESS	1.0
M2.005	REPLACE KEY SWITCH	1.0
M2.006	REPLACE BRAKE SWITCH	0.7
M2.007	REPLACE LIFT POTENTIOMETER	1.0
M2.008	REPLACE REACH/TILT/SIDESHIFT POTENTIOMETER	1.0
M2.009	REPLACE HORN BUTTON	1.0
M2.010	REPLACE DIRECTION/SPEED POTENTIOMETER	1.0
M2.011	REPLACE BRAKE TRANSDUCER	0.7
M2.014	ADJUST BRAKE TRANSDUCER	0.7
M2.015	REPLACE DRIVE MOTOR	1.5
M2.018	REPLACE K11/K13 CONTACTOR	1.5
M2.020	REPLACE STEER TACHOMETER	1.5
M2.021	REPLACE MAIN CONTACTOR	1.0
M2.024	REPLACE DRIVE MOTOR FAN	0.7
M2.025	REPLACE LIFT PUMP BY PASS CONTACTOR	1.0
M2.027	REPLACE ELECTRONIC FAN	1.0
M2.028	REPLACE A5 MAIN LOGIC CARD	1.0
M2.029	REPLACE A1 DRIVE TRANSISTOR REGULATOR	1.0
M2.030	REPLACE A2 LIFT TRANSISTOR REGULATOR	1.0
M2.031	REPLACE A6 DASH DISPLAY	0.5
M2.032	REPLACE A7 PRESET HEIGHT CARD	1.0

CONTINUED

NR45B

ELECTRICAL CONTINUED

PROB. CODE	OPERATION DESCRIPTION	TIME
M2.033	REPLACE A8 HEIGHT INDICATOR CARD	0.5
M2.034	REPLACE A22 PRESET HEIGHT KEY PAD	1.5
M2.035	REPLACE MAST UPPER POSITION SWITCH	0.7
M2.036	REPLACE BATTERY CONNECTOR	0.6
M2.037	REPLACE ONE POWER CABLE	1.0
M2.038	REPAIR ONE OPEN WIRE	0.5
M2.039	REPLACE LIFT PUMP MOTOR	3.5
M2.042	REPLACE SPEED LIMIT SWITCH	0.5
M2.043	REPLACE MAST ELECTRICAL CABLE	2.0
M2.044	REPLACE CHASSIS WIRING HARNESS	3.5
M2.045	REPLACE HYDRAULIC SOLENOID COIL	0.5
M2.046	REPLACE REACH WIRING HARNESS	1.0
M2.047	REPLACE STEER MOTOR	0.7
M2.048	REPLACE STEER SENSOR	1.0
M2.049	ADJUST STEER SENSOR	0.5
M2.050	REPLACE A/B VALVE COIL	0.5
M2.051	REPLACE PULSE SENSOR	0.8
M2.052	REPLACE DRIVE MOTOR SPEED SENSOR	0.3
M2.053	REPLACE DRIVE MOTOR DIRECTION SENSOR	0.3
M2.054	REPLACE DRIVE MOTOR BRAKE COIL	1.0
M2.055	REPLACE RIGHT FOOT SWITCH	0.7
M2.070	REPLACE K11/K13 CONTACTOR TIPS	1.5
M2.071	REPLACE FAN/LIGHT SWITCH	1.0
M2.072	REPLACE LIFT BYPASS CONTACTOR TIPS	1.5
M2.073	REPLACE MAIN CONTACTOR TIPS	1.5
M2.074	REPLACE DRIVE MOTOR BRUSHES	1.5
M2.075	REPLACE PUMP MOTOR BRUSHES	2.0
M2.076	REPLACE STEER MOTOR BRUSHES	0.5

HYDRAULIC

PROB. CODE	OPERATION DESCRIPTION	TIME
M3.001	REPLACE RESERVOIR	2.0
M3.002	REPLACE LIFT VALVE	2.0
M3.003	RESEAL LIFT VALVE	1.0
M3.004	REPLACE TILT CYLINDER	0.5
M3.005	RESEAL TILT CLINDER	1.0
M3.006	REPLACE FREE LIFT CYINDER	2.5
M3.007	RESEAL FREE LIFT CYLINDER	1.2

CONTINUED

NR45B

HYDRAULIC CONTINUED		
PROB.		
CODE	OPERATION DESCRIPTION	TIME
M3.008	REPLACE STAGING CYLINDER	3.5
M3.009	RESEAL STAGING CYLINDER	1.2
M3.011	REPLACE ANY HYDRAULIC HOSE	1.3
M3.012	REPLACE VELOCITY FUSE	0.8
M3.013	REPLACE LIFT PUMP	3.5
M3.015	REPLACE LOWERING PROPORTIONAL VALVE	1.0
M3.016	RESEAL LOWERING PROPORTIONAL VALVE	0.5
M3.017	REPLACE A/B VALVE	0.8
M3.018	RESEAL A/B VALVE	0.8
M3.019	REPLACE HYDRAULIC SOLENOID VALVE	0.7
M3.020	REPLACE REACH CYLINDER	1.0
M3.021	RESEAL REACH CYLINDER	1.5
M3.022	REPLACE SIDE SHIFT CYLINDER	0.5
M3.023	RESEAL SIDE SHIFT CYLINDER	1.0

FRAME

PROB.		
CODE	OPERATION DESCRIPTION	TIME
M4.001	REPLACE CASTER PIVOT	2.0
M4.002	ADJUST ARTICULATING STOPS	0.8
M4.003	REPLACE CASTER BRACKET	2.0
M4.004	REPLACE CASTER WHEEL	0.5
M4.013	REPLACE TWO LOAD WHEELS	0.5

NR45B

MAST

PROB.		
CODE	OPERATION DESCRIPTION	TIME
M5.001	SHIM CARRIAGE	2.5
M5.002	SHIM INNER COLUMN	4.0
M5.003	SHIM INTERMEDIATE COLUMN	4.5
M5.004	REPLACE CARRIAGE ROLLER	2.5
M5.005	REPLACE INNER COLUMN ROLLER	4.0
M5.006	REPLACE INTERMEDIATE COLUMN ROLLER	4.5
M5.007	INSTALL MAST	1.0
M5.017	REPLACE HEIGHT INDICATOR CABLE	0.5

REACH

PROB.		
CODE	OPERATION DESCRIPTION	TIME
M5.008	REPLACE CENTER PIVOT BEARING	3.0
M5.009	REMOVE AND INSTALL REACH ASSEMBLY	1.5
M5.010	REPLACE FRONT FRAME	3.0
M5.011	REPLACE REAR FRAME	3.0
M5.012	REPLACE ARM ROLLER	2.0
M5.013	RECONDITION SINGLE REACH	6.0
M5.014	INSTALL SIDE SHIFT	3.0

ND30B

TRANSMISSION

PROB. CODE	OPERATION DESCRIPTION	TIME
N1.001	REMOVE AND REPLACE	2.0
N1.002	REPLACE AXLE SEAL	3.0
N1.003	REPLACE DRIVE AXLE	3.0
N1.004	REBUILD/RECONDITION	8.0
N1.005	REPLACE STEER BEARING	2.2
N1.010	REPLACE DRIVE MOTOR BRAKE DISC	1.5
N1.011	ADJUST BRAKES	0.5
N1.012	REPLACE DRIVE TIRE	0.5
N1.013	REPLACE CASTER BRAKE SHOES	2.0
N1.014	ADJUST CASTER BRAKE	0.5
N1.016	REPLACE BRAKE PEDAL	2.0

ELECTRICAL

PROB. CODE	OPERATION DESCRIPTION	TIME
N2.001	REPLACE HORN	0.3
N2.002	REPLACE EMERGENCY DISCONNECT	0.8
N2.003	ADJUST BRAKE SWITCH	0.7
N2.004	REPLACE ACCESSORY WIRING HARNESS	1.0
N2.005	REPLACE KEY SWITCH	1.0
N2.006	REPLACE BRAKE SWITCH	0.7
N2.007	REPLACE LIFT POTENTIOMETER	1.0
N2.008	REPLACE REACH/TILT/SIDESHIFT POTENTIOMETER	1.0
N2.009	REPLACE HORN BUTTON	1.0
N2.010	REPLACE DIRECTION/SPEED POTENTIOMETER	1.0
N2.011	REPLACE BRAKE TRANSDUCER	0.7
N2.014	ADJUST BRAKE TRANSDUCER	0.7
N2.015	REPLACE DRIVE MOTOR	1.5
N2.018	REPLACE K11/K13 CONTACTOR	1.5
N2.020	REPLACE STEER TACHOMETER	1.5
N2.021	REPLACE MAIN CONTACTOR	1.0
N2.024	REPLACE DRIVE MOTOR FAN	0.7
N2.025	REPLACE LIFT PUMP BY PASS CONTACTOR	1.0
N2.027	REPLACE ELECTRONIC FAN	1.0
N2.028	REPLACE A5 MAIN LOGIC CARD	1.0
N2.029	REPLACE A1 DRIVE TRANSISTOR REGULATOR	1.0
N2.030	REPLACE A2 LIFT TRANSISTOR REGULATOR	1.0
N2.031	REPLACE A6 DASH DISPLAY	0.5
N2.032	REPLACE A7 PRESET HEIGHT CARD	1.0

CONTINUED

ND30B

ELECTRICAL CONTINUED

PROB.		
CODE	OPERATION DESCRIPTION	TIME
N2.033	REPLACE A8 HEIGHT INDICATOR CARD	0.5
N2.034	REPLACE A22 PRESET HEIGHT KEY PAD	1.5
N2.035	REPLACE MAST UPPER POSITION SWITCH	0.7
N2.036	REPLACE BATTERY CONNECTOR	0.6
N2.037	REPLACE ONE POWER CABLE	1.0
N2.038	REPAIR OPEN WIRE	0.5
N2.039	REPLACE LIFT PUMP MOTOR	3.5
N2.042	REPLACE SPEED LIMIT SWITCH	0.7
N2.043	REPLACE MAST ELECTRICAL CABLE	2.0
N2.044	REPLACE CHASSIS WIRING HARNESS	3.5
N2.045	REPLACE HYDRAULIC SOLENOID COIL	0.5
N2.046	REPLACE REACH WIRING HARNESS	1.0
N2.047	REPLACE STEER MOTOR	0.7
N2.048	REPLACE STEER SENSOR	1.0
N2.049	ADJUST STEER SENSOR	0.5
N2.050	REPLACE A/B VALVE COIL	0.5
N2.051	REPLACE PULSE SENSOR	0.8
N2.052	REPLACE DRIVE MOTOR SPEED SENSOR	0.3
N2.053	REPLACE DRIVE MOTOR DIRECTION SENSOR	0.3
N2.054	REPLACE DRIVE MOTOR BRAKE COIL	1.0
N2.055	REPLACE RIGHT FOOT SWITCH	0.7
N2.070	REPLACE K11/K13 CONTACTOR TIPS	1.5
N2.071	REPLACE FAN/LIGHT SWITCH	1.0
N2.072	REPLACE LIFT BYPASS CONTACTOR TIPS	1.5
N2.073	REPLACE MAIN CONTACTOR TIPS	1.5
N2.074	REPLACE DRIVE MOTOR BRUSHES	1.5
N2.075	REPLACE PUMP MOTOR BRUSHES	1.5
N2.076	REPLACE STEER MOTOR BRUSHES	0.5

HYDRAULIC

PROB.		
CODE	OPERATION DESCRIPTION	TIME
N3.001	REPLACE RESERVOIR	2.0
N3.002	REPLACE LIFT VALVE	2.0
N3.003	RESEAL LIFT VALVE	1.0
N3.004	REPLACE TILT CYLINDER	0.5
N3.005	RESEAL TILT CYLINDER	1.0
N3.006	REPLACE FREE LIFT CYLINDER	2.5
N3.007	RESEAL FREE LIFT CYLINDER	1.2

CONTINUED

ND30B

HYDRAULIC CONTINUED

PROB.		
CODE	OPERATION DESCRIPTION	TIME
N3.008	REPLACE STAGING CYLINDER	3.5
N3.009	RESEAL STAGING CYLINDER	1.2
N3.011	REPLACE ANY HYDRAULIC HOSE	1.3
N3.012	REPLACE VELOCITY FUSE	0.8
N3.013	REPLACE LIFT PUMP	3.5
N3.015	REPLACE LOWERING PROPORTIONAL VALVE	1.0
N3.016	RESEAL LOWERING PROPORTIONAL VALVE	1.5
N3.017	REPLACE A/B VALVE	0.8
N3.018	RESEAL A/B VALVE	0.8
N3.019	REPLACE HYDRAULIC SOLENOID VALVE (EACH)	0.7
N3.020	REPLACE REACH CYLINDER	1.0
N3.021	RESEAL REACH CYLINDER	1.5
N3.022	REPLACE SIDE SHIFT CYLINDER	0.5
N3.023	RESEAL SIDE SHIFT CYLINDER	1.0

FRAME

PROB.		
CODE	OPERATION DESCRIPTION	TIME
N4.001	REPLACE CASTER PIVOT	2.0
N4.002	ADJUST ARTICULATING STOPS	0.8
N4.003	REPLACE CASTER BRACKET	2.0
N4.004	REPLACE CASTER WHEEL	0.5
N4.013	REPLACE TWO LOAD WHEELS	0.5

MAST

PROB.		
CODE	OPERATION DESCRIPTION	TIME
N5.001	SHIM CARRIAGE	2.5
N5.002	SHIM INNER COLUMN	4.0
N5.003	SHIM INTERMEDIATE COLUMN	4.5
N5.004	REPLACE CARRIAGE ROLLER	2.5
N5.005	REPLACE INNER COLUMN ROLLER	4.0
N5.006	REPLACE INTERMEDIATE COLUMN ROLLER	4.5
N5.007	INSTALL MAST	1.0
N5.017	REPLACE HEIGHT INDICATOR CABLE	0.5

ND30B

REACH

PROB.		
CODE	OPERATION DESCRIPTION	TIME
N5.009	REMOVE AND INSTALL REACH ASSEMBLY	1.5
N5.010	REPLACE FRONT FRAME	3.0
N5.011	REPLACE REAR FRAME	3.0
N5.012	REPLACE ARM ROLLER	2.0
N5.014	INSTALL SIDE SHIFT	3.0
N5.015	RECONDITION DEEP REACH	8.0
N5.016	REPLACE REAR ARM CENTER BEARING	3.0
N5.017	REPLACE FRONT ARM CENTER BEARING	3.0

NS40B

TRANSMISSION

PROB.		
CODE	OPERATION DESCRIPTION	TIME
P1.001	REMOVE AND REPLACE	2.0
P1.002	REPLACE AXLE SEAL	3.0
P1.003	REPLACE DRIVE AXLE	3.0
P1.004	REBUILD/RECONDITION	8.0
P1.005	REPLACE STEER BEARING	2.2
P1.010	REPLACE DRIVE MOTOR BRAKE DISC	1.5
P1.011	ADJUST BRAKES	0.5
P1.012	REPLACE DRIVE TIRE	0.5
P1.016	REPLACE BRAKE PEDAL	2.0

ELECTRICAL

PROB.		
CODE	OPERATION DESCRIPTION	TIME
P2.001	REPLACE HORN	0.3
P2.002	REPLACE EMERGENCY DISCONNECT	0.8
P2.003	ADJUST BRAKE SWITCH	0.7
P2.004	REPLACE ACCESSORY WIRING HARNESS	1.0
P2.005	REPLACE KEY SWITCH	1.0
P2.006	REPLACE BRAKE SWITCH	0.7
P2.007	REPLACE LIFT POTENTIOMETER	1.0
P2.008	REPLACE REACH/TILT/SIDESHIFT POTENTIOMETER	1.0
P2.009	REPLACE HORN BUTTON	1.0
P2.010	REPLACE DIRECTION/SPEED POTENTIOMETER	1.0
P2.011	REPLACE BRAKE TRANSDUCER	0.7
P2.014	ADJUST BRAKE TRANSDUCER	0.7
P2.015	REPLACE DRIVE MOTOR	1.5
P2.018	REPLACE K11/K13 CONTACTOR	1.5
P2.020	REPLACE STEER TACHOMETER	1.5
P2.021	REPLACE MAIN CONTACTOR	1.0
P2.024	REPLACE DRIVE MOTOR FAN	0.7
P2.025	REPLACE LIFT PUMP BY PASS CONTACTOR	1.0
P2.027	REPLACE ELECTRONIC FAN	1.0
P2.028	REPLACE A5 MAIN LOGIC CARD	1.0
P2.029	REPLACE A1 DRIVE TRANSISTOR REGULATOR	1.0
P2.030	REPLACE A2 LIFT TRANSISTOR REGULATOR	1.0
P2.031	REPLACE A6 DASH DISPLAY	0.5
P2.032	REPLACE A7 PRESET HEIGHT CARD	1.0
P2.033	REPLACE A8 HEIGHT INDICATOR CARD	0.5
P2.034	REPLACE A22 PRESET HEIGHT KEY PAD	1.5

CONTINUED

NS40B

ELECTRICAL CONTINUED

PROB.		
CODE	OPERATION DESCRIPTION	TIME
P2.035	REPLACE MAST UPPER POSITION SWITCH	0.7
P2.036	REPLACE BATTERY CONNECTOR	0.6
P2.037	REPLACE ONE POWER CABLE	1.0
P2.038	REPAIR ONE OPEN WIRE	0.5
P2.039	REPLACE LIFT PUMP MOTOR	3.5
P2.042	REPLACE SPEED LIMIT SWITCH	0.5
P2.043	REPLACE MAST ELECTRICAL CABLE	2.0
P2.044	REPLACE CHASSIS WIRING HARNESS	3.5
P2.045	REPLACE HYDRAULIC SOLENOID COIL	0.5
P2.046	REPLACE REACH WIRING HARNESS	1.0
P2.047	REPLACE STEER MOTOR	0.7
P2.048	REPLACE STEER SENSOR	1.0
P2.049	ADJUST STEER SENSOR	0.5
P2.050	REPLACE A/B VALVE COIL	0.5
P2.051	REPLACE PULSE SENSOR	1.0
P2.052	REPLACE DRIVE MOTOR SPEED SENSOR	0.3
P2.053	REPLACE DRIVE MOTOR DIRECTION SENSOR	0.3
P2.054	REPLACE DRIVE MOTOR BRAKE COIL	1.0
P2.055	REPLACE RIGHT FOOT SWITCH	0.7
P2.070	REPLACE K11/K13 CONTACTOR TIPS	1.5
P2.071	REPLACE FAN/LIGHT SWITCH	1.0
P2.072	REPLACE LIFT BYPASS CONTACTOR TIPS	1.5
P2.073	REPLACE MAIN CONTACTOR TIPS	1.5
P2.074	REPLACE DRIVE MOTOR BRUSHES	1.5
P2.075	REPLACE PUMP MOTOR BRUSHES	1.5
P2.076	REPLACE STEER MOTOR BRUSHES	0.5

HYDRAULIC

PROB.		
CODE	OPERATION DESCRIPTION	TIME
P3.001	REPLACE RESERVOIR	2.0
P3.002	REPLACE LIFT VALVE	2.0
P3.003	RESEAL LIFT VALVE	1.0
P3.004	REPLACE TILT CYLINDER	0.5
P3.005	RESEAL TILT CLINDER	1.0
P3.006	REPLACE FREE LIFT CYINDER	2.5
P3.007	RESEAL FREE LIFT CYLINDER	1.2
P3.008	REPLACE STAGING CYLINDER	3.5
P3.009	RESEAL STAGING CYLINDER	1.2

CONTINUED

NS40B

HYDRAULIC CONTINUED

PROB.		
CODE	OPERATION DESCRIPTION	TIME
P3.011	REPLACE ANY HYDRAULIC HOSE	1.3
P3.012	REPLACE VELOCITY FUSE	0.8
P3.013	REPLACE LIFT PUMP	3.5
P3.015	REPLACE LOWERING PROPORTIONAL VALVE	1.0
P3.016	RESEAL LOWERING PROPORTIONAL VALVE	1.5
P3.017	REPLACE A/B VALVE	0.8
P3.018	RESEAL A/B VALVE	0.8
P3.019	REPLACE HYDRAULIC SOLENOID VALVE	0.7
P3.020	REPLACE REACH CYLINDER	1.0
P3.021	RESEAL REACH CYLINDER	1.5
P3.022	REPLACE SIDE SHIFT CYLINDER	0.5
P3.023	RESEAL SIDE SHIFT CYLINDER	1.0

FRAME

PROB.		
CODE	OPERATION DESCRIPTION	TIME
P4.001	REPLACE CASTER PIVOT	2.0
P4.002	ADJUST ARTICULATING STOPS	0.8
P4.003	REPLACE CASTER BRACKET	2.0
P4.004	REPLACE CASTER WHEEL	0.5
P4.013	REPLACE TWO LOAD WHEELS	0.5

MAST

PROB.		
CODE	OPERATION DESCRIPTION	TIME
P5.001	SHIM CARRIAGE	2.5
P5.002	SHIM INNER COLUMN	4.0
P5.003	SHIM INTERMEDIATE COLUMN	4.5
P5.004	REPLACE CARRIAGE ROLLER	2.5
P5.005	REPLACE INNER COLUMN ROLLER	4.0
P5.006	REPLACE INTERMEDIATE COLUMN ROLLER	4.5
P5.007	INSTALL MAST	1.0
P5.017	REPLACE HEIGHT INDICATOR CABLE	0.5

NS50B

TRANSMISSION

PROB.		
CODE	OPERATION DESCRIPTION	TIME
Q1.001	REMOVE AND REPLACE	2.0
Q1.002	REPLACE AXLE SEAL	3.0
Q1.003	REPLACE DRIVE AXLE	3.0
Q1.004	REBUILD/RECONDITION	8.0
Q1.005	REPLACE STEER BEARING	2.2
Q1.010	REPLACE DRIVE MOTOR BRAKE DISC	1.5
Q1.011	ADJUST BRAKES	0.5
Q1.012	REPLACE DRIVE TIRE	0.5
Q1.013	REPLACE CASTER BRAKE	2.0
Q1.014	ADJUST CASTER BRAKE	0.5
Q1.016	REPLACE BRAKE PEDAL	2.0

ELECTRICAL

PROB.		
CODE	OPERATION DESCRIPTION	TIME
Q2.001	REPLACE HORN	0.3
Q2.002	REPLACE EMERGENCY DISCONNECT	0.8
Q2.003	ADJUST BRAKE SWITCH	0.7
Q2.004	REPLACE ACCESSORY WIRING HARNESS	1.0
Q2.005	REPLACE KEY SWITCH	1.0
Q2.006	REPLACE BRAKE SWITCH	0.7
Q2.007	REPLACE LIFT POTENTIOMETER	1.0
Q2.008	REPLACE REACH/TILT/SIDESHIFT POTENTIOMETER	1.0
Q2.009	REPLACE HORN BUTTON	1.0
Q2.010	REPLACE DIRECTION/SPEED POTENTIOMETER	1.0
Q2.011	REPLACE BRAKE TRANSDUCER	0.7
Q2.014	ADJUST BRAKE TRANSDUCER	0.7
Q2.015	REPLACE DRIVE MOTOR	1.5
Q2.018	REPLACE K11/K13 CONTACTOR	1.5
Q2.020	REPLACE STEER TACHOMETER	1.5
Q2.021	REPLACE MAIN CONTACTOR	1.0
Q2.024	REPLACE DRIVE MOTOR FAN	0.7
Q2.025	REPLACE LIFT PUMP BY PASS CONTACTOR	1.0
Q2.027	REPLACE ELECTRONIC FAN	1.0
Q2.028	REPLACE A5 MAIN LOGIC CARD	1.0
Q2.029	REPLACE A1 DRIVE TRANSISTOR REGULATOR	1.0
Q2.030	REPLACE A2 LIFT TRANSISTOR REGULATOR	1.0
Q2.031	REPLACE A6 DASH DISPLAY	0.5
Q2.032	REPLACE A7 PRESET HEIGHT CARD	1.0

CONTINUED

NS50B

ELECTRICAL CONTINUED

PROB.		
CODE	OPERATION DESCRIPTION	TIME
Q2.033	REPLACE A8 HEIGHT INDICATOR CARD	0.5
Q2.034	REPLACE A22 PRESET HEIGHT KEY PAD	1.5
Q2.035	REPLACE MAST UPPER POSITION SWITCH	0.7
Q2.036	REPLACE BATTERY CONNECTOR	0.6
Q2.037	REPLACE ONE POWER CABLE	1.0
Q2.038	REPAIR ONE OPEN WIRE	0.5
Q2.039	REPLACE LIFT PUMP MOTOR	3.5
Q2.042	REPLACE SPEED LIMIT SWITCH	0.5
Q2.043	REPLACE MAST ELECTRICAL CABLE	2.0
Q2.044	REPLACE CHASSIS WIRING HARNESS	3.5
Q2.045	REPLACE HYDRAULIC SOLENOID COIL	0.5
Q2.046	REPLACE REACH WIRING HARNESS	1.0
Q2.047	REPLACE STEER MOTOR	0.7
Q2.048	REPLACE STEER SENSOR	1.0
Q2.049	ADJUST STEER SENSOR	0.5
Q2.050	REPLACE A/B VALVE COIL	0.5
Q2.051	REPLACE PULSE SENSOR	0.8
Q2.052	REPLACE DRIVE MOTOR SPEED SENSOR	0.3
Q2.053	REPLACE DRIVE MOTOR DIRECTION SENSOR	0.3
Q2.054	REPLACE DRIVE MOTOR BRAKE COIL	1.0
Q2.055	REPLACE RIGHT FOOT SWITCH	0.7
Q2.070	REPLACE K11/K13 CONTACTOR TIPS	1.5
Q2.071	REPLACE FAN/LIGHT SWITCH	1.0
Q2.072	REPLACE LIFT BYPASS CONTACTOR TIPS	1.5
Q2.073	REPLACE MAIN CONTACTOR TIPS	1.5
Q2.074	REPLACE DRIVE MOTOR BRUSHES	1.5
Q2.075	REPLACE PUMP MOTOR BRUSHES	1.5
Q2.076	REPLACE STEER MOTOR BRUSHES	0.5

HYDRAULIC

PROB.		
CODE	OPERATION DESCRIPTION	TIME
Q3.001	REPLACE RESERVOIR	2.0
Q3.002	REPLACE LIFT VALVE	2.0
Q3.003	RESEAL LIFT VALVE	1.0
Q3.004	REPLACE TILT CYLINDER	0.5
Q3.005	RESEAL TILT CYLINDER	1.0
Q3.006	REPLACE FREE LIFT CYLINDER	2.5
Q3.007	RESEAL FREE LIFT CYLINDER	1.2

CONTINUED

NS50B

HYDRAULIC CONTINUED

PROB.		
CODE	OPERATION DESCRIPTION	TIME
Q3.008	REPLACE STAGING CYLINDER	3.5
Q3.009	RESEAL STAGING CYLINDER	1.2
Q3.011	REPLACE ANY HYDRAULIC HOSE	1.3
Q3.012	REPLACE VELOCITY FUSE	0.8
Q3.013	REPLACE LIFT PUMP	3.5
Q3.015	REPLACE LOWERING PROPORTIONAL VALVE	1.0
Q3.016	RESEAL LOWERING PROPORTIONAL VALVE	0.5
Q3.017	REPLACE A/B VALVE	0.8
Q3.018	RESEAL A/B VALVE	0.8
Q3.019	REPLACE HYDRAULIC SOLENOID VALVE	0.7
Q3.020	REPLACE REACH CYLINDER	1.0
Q3.021	RESEAL REACH CYLINDER	1.5
Q3.022	REPLACE SIDE SHIFT CYLINDER	0.5
Q3.023	RESEAL SIDE SHIFT CYLINDER	1.0

FRAME

PROB.		
CODE	OPERATION DESCRIPTION	TIME
Q4.001	REPLACE CASTER PIVOT	2.0
Q4.002	ADJUST ARTICULATING STOPS	0.8
Q4.003	REPLACE CASTER BRACKET	2.0
Q4.004	REPLACE CASTER WHEEL	0.5
Q4.013	REPLACE TWO LOAD WHEELS	0.5

MAST

PROB.		
CODE	OPERATION DESCRIPTION	TIME
Q5.001	SHIM CARRIAGE	2.5
Q5.002	SHIM INNER COLUMN	4.0
Q5.003	SHIM INTERMEDIATE COLUMN	4.5
Q5.004	REPLACE CARRIAGE ROLLER	2.5
Q5.005	REPLACE INNER COLUMN ROLLER	4.0
Q5.006	REPLACE INTERMEDIATE COLUMN ROLLER	4.5
Q5.007	INSTALL MAST	1.0
Q5.017	REPLACE HEIGHT INDICATOR CABLE	0.5

ACNR30/40 ACNM30/35 NM30/35B

BATTERY AND CONNECTIONS

PROB.		ACNR	ACNM/ NM
CODE	OPERATION DESCRIPTION	TIME	TIME
100	BATTERY, REMOVE CLEAN, TEST AND INSTALL	1.0	1.0
100	BATTERY, CLEAN, TEST-VOLTAGE & SPECIFIC GRAVITY	0.5	0.5
100	CABLE, BATTERY REPAIR, REMOVE AND INSTALL	0.7	0.7
100	CONNECTORS, BATTERY, REPAIR OR REMOVE AND INSTALL	1.0	1.0
100	BATTERY REMOVE AND INSTALL	0.5	0.5

BRAKE SYSTEM

PROB.		ACNR	ACNM/ NM
CODE	OPERATION DESCRIPTION	TIME	TIME
105	BRAKE DISC, REMOVE AND INSTALL	1.0	1.0
105	BRAKE PAD, REMOVE AND INSTALL	0.4	0.4
105	BRAKE CALIPER, REPLACE UPPER	0.5	0.5
105	BRAKE CALIPER, REPLACE LOWER	1.0	1.0
105	BRAKE CAM BOLT, REPLACE	0.1	0.1
105	BRAKE CAM, REPLACE	0.2	0.2
105	BRAKE PEDAL SPRING, REPLACE	0.2	0.2
105	BRAKE LINKAGE, REMOVE AND INSTALL	1.0	1.0

DRIVE AXLE

PROB.		ACNR	ACNM/ NM
CODE	OPERATION DESCRIPTION	TIME	TIME
110	DRIVE UNIT AY, REMOVE AND INSTALL	3.0	3.0
110	UPPER LINK, AND/OR UNDER LINK, REPLACE	NA	0.3
110	UPPER LINK BUSHING, REPLACE	NA	0.2
110	UPPER SPRING AND/OR LINK PIN, REPLACE	NA	0.4
110	UNDER SPRING AND/OR LINK PIN, REPLACE	NA	0.4
110	UPPER AND/OR UNDER SPRING BOLT, REPLACE	0.2	0.2
110	GEAR CASE ASSEMBLY, REMOVE AND REPLACE ANY GEAR OR SHAFT AND REPLACE	1.2	1.2
110	LOWER GEAR CASE, R&R RING AND PINION GEAR	2.5	2.5
110	DRIVE WHEEL, DRIVE SHAFT OR OIL SEAL, REPLACE	0.2	0.2
110	DRIVE WHEEL BEARING, REPLACE	0.4	0.4
110	CASTER WHEEL ARM, REPLACE	NA	0.7
110	CASTER WHEEL ARM BUSHING AND/OR PIN, REPLACE	NA	0.3
110	SWING AXLE, REPLACW	NA	0.8
110	SWING AXLE PIN AND BUSHING, REPLACE	NA	0.9
110	CASTER WHEEL BEARING, REPLACE	0.3	0.7
110	CASTER, REPLACE	0.7	NA
110	CASTER, REPAIR OR REPLACE ANY ONE ITEM	1.0	NA

ACNR30/40 ACNM30/35 NM30/35B

ELECTRICAL SYSTEM (INCLUDING INSTRUMENT PANEL)

PROB.		ACNR	ACNM/ NM
CODE	OPERATION DESCRIPTION	TIME	TIME
115	BRAKE SWITCH, REPLACE	0.3	0.3
115	WIRING HARNESS, REMOVE AND REPLACE ALL	5.0	5.0
115	WIRING HARNESS, REMOVE AND REPLACE ONE	2.0	2.0
115	HORN, REPLACE	0.3	0.3
115	HORN BUTTON AND CABLE, REPLACE	0.5	0.5
115	REMOTE LIFT SWITCH, REPLACE	0.3	0.3
115	POWER CYLINDER, REPLACE	0.7	0.7
115	INSTRUMENT PANEL, REPLACE	1.3	1.3
115	KEY SWITCH	0.3	0.3
115	LCD DISPLAY	0.8	0.8
115	FUSE HOLDER	0.2	0.2
115	HORN SWITCH, REPLACE	0.3	0.3
115	FUSE, REPLACE	0.2	0.2
115	ROTARY SWITCH, REPLACE	0.3	0.3

FRAME

PROB.		ACNR	ACNM/ NM
CODE	OPERATION DESCRIPTION	TIME	TIME
120	BATTERY CARRIER ROLLER, REPLACE ONE	0.3	0.3
120	COVERS, REMOVE AND REPAIR AND REPLACE	0.5	0.5
120	OVERHEAD GUARD, REPLACE	0.5	0.5

HYDRAULIC SYSTEM

PROB.		ACNR	ACNM/ NM
CODE	OPERATION DESCRIPTION	TIME	TIME
125	HYDRAULIC TANK, REPLACE	1.8	1.8
125	HYDRAULIC TANK CLEAN	1.0	1.0
125	HYDRAULIC HOSE, TUBE OR LINE, REPLACE ONE	0.5	0.5
125	HYDRAULIC PUMP REPLACE & SET PRESSURE	3.0	3.0
125	HYDRAULIC PUMP R&R AND REBUILD	4.5	4.5
125	CONTROL VALVE, REPLACE	0.8	0.8
125	CONTROL VALVE R&R AND CLEAN	2.8	2.8
125	SEAL, CONTROL VALVE PLUNGER	1.0	1.0
125	FITTING, REPLACE (OIL LEAK)	0.5	0.5
125	FILTER, REPLACE AND FLUSH TANK	1.3	1.3
125	FILTER, REPLACE	0.8	0.8
125	HYDRAULIC, BOARD REPLACE	0.7	0.7
125	SOLENOID VALVE, REPLACE	0.3	0.3
125	HYDRAULIC LINKAGE, REPLACE	0.5	0.5

ACNR30/40 ACNM30/35 NM30/35B

LIFT CYLINDER

PROB.		ACNR	ACNM/ NM
CODE	OPERATION DESCRIPTION	TIME	TIME
135	PRIMARY CYL. REPACK INCLUDES R&R	1.5	1.5
135	PRIMARY CYL. REMOVE AND CLEAN	2.5	2.5
135	PRIMARY CYL. ASSMBLE AND INSTALL	1.0	1.0
135	R&R FITTING	1.0	1.0
135	SECONDARY CYL. REPACK INCLUDES R&R	1.5	1.5
135	SECONDARY CYL. REMOVE AND CLEAN	2.5	2.5
135	SECONDARY CYL. ASSEMBLE AND INSTALL	2.5	2.5
135	FITTING R&R	1.0	1.0

MAST, CARRIAGE, AND FORKS

PROB.		ACNR	ACNM/ NM
CODE	OPERATION DESCRIPTION	TIME	TIME
140	MAST AND CARRIAGE R&R	1.5	1.5
140	MAST AND CARRIAGE INSTALL	1.0	1.0
140	SHIM AND ADJUST CHANNELS (ALL)	3.0	3.0
140	INNER CHANNEL R&R	1.4	1.4
140	CARRIAGE R&R	NA	1.5
140	BEARING, CARRIAGE R&R ONE ADD 0.2 FOR SECOND	1.5	1.5
140	CHAIN MAST R&R ONE	0.5	.05
140	CROSSHEAD REPLACE	0.8	0.8
140	CROSSHEAD ROLLER, BUSHING OR BEARING REPLACE	0.8	0.8
140	FORK LOCK REPLACE	0.2	0.2
140	FORK REPLACE	0.5	0.5
140	CARRIAGE, ADJUST	1.5	1.5
140	REACH ASSEMBLE, REPLACE	1.5	NA
140	REACH, DISSAMBLE AND ASSEMBLE	4.5	NA

STEERING SYSTEM

PROB.		ACNR	ACNM/ NM
CODE	OPERATION DESCRIPTION	TIME	TIME
145	STEERING WHEEL, REPLACE	0.2	0.2
145	STEERING GEAR, REPLACE	0.7	0.7
145	STEERING SHAFT, REPLACE	3.0	3.0
145	STEER MOTOR, REPLACE	0.4	0.4
145	EPS UNIT, REPLACE	0.8	0.8
145	STEERING GERA BOX POTENTIOMETER, REPLACE	0.3	0.3
145	TEST EPS SYSTEM	1.0	1.0

ACNR30/40 ACNM30/35 NM30/35B

REACH ASSEMBLY

PROB.		ACNR	ACNM/ NM
CODE	OPERATION DESCRIPTION	TIME	TIME
150	REACH R&R	1.5	NA
150	REACH, REBUILD	4.5	NA
150	REACH CYLINDER, REPLACE	0.5	0.5
150	REACH CYLINDER, REBUILD INCLUDER R&R	1.5	1.5
150	FITTING, REPLACE	0.2	0.2
150	TILT CYLINDER, REPLACE	0.4	0.4
150	TILT CYLINDER, REBUILD INCLUDES R&R	1.5	1.5
150	HOSE, REPLACE ONE	0.5	0.5
150	SPACERS ADD OR REMOVE TO ADJUST TILT DEGREE	0.5	0.5
150	REACH PINS, REPLACE	0.2	0.2

ACCELERATOR

PROB.		ACNR	ACNM/ NM
CODE	OPERATION DESCRIPTION	TIME	TIME
700	ACCERERATOR, REPLACE	0.5	0.5
700	MICROSWITCH, REPLACE	0.2	0.2
700	REPAIR ACCELERATOR	0.8	0.8
700	ALLELERATOR PC BOARD, REPLACE	0.3	0.3

CONTACTORS

PROB.		ACNR	ACNM/ NM
CODE	OPERATION DESCRIPTION	TIME	TIME
710	CONTACTOR TIPS, REPLACE	0.3	0.3
710	CONTACTOR, REPLACE	0.8	0.8
710	CONTACTOR COIL, REPLACE	0.6	0.6

DRIVE MOTOR

PROB.		ACNR	ACNM/ NM
CODE	OPERATION DESCRIPTION	TIME	TIME
715	DRIVE MOTOR, REPLACE	0.8	0.8
715	BRUSHES, REPLACE	0.5	0.5
715	REBUILD MOTOR	1.5	1.5
715	BRUSH HOLDER, REPLACE	0.3	0.3

ACNR30/40 ACNM30/35 NM30/35B

PRIMARY ELECTRICAL CONTROLS

PROB.		ACNR	ACNM/ NM
CODE	OPERATION DESCRIPTION	TIME	TIME
725	SYSTEM CHECK OUT	1.5	1.5
725	STARTING CURRENT ADJUST	0.5	0.5
725	CURRENT LIMIT ADJUST	0.5	0.5
725	MPU BOARD, REPLACE AND SET	0.5	0.5
725	FET UNIT , REPLACE	0.5	0.5
725	CAPACITORS, REPLACE	0.2	0.2
725	BATTERY SENSOR, REPLACE	0.2	0.2
725	DIODE, REPLACE	0.2	0.2

PUMP MOTOR

PROB.		ACNR	ACNM/ NM
CODE	OPERATION DESCRIPTION	TIME	TIME
740	PUMP MOTOR, REPLACE	1.0	1.0
740	BRUSHES, REPLACE	0.8	0.8
740	REBUILD MOTOR	1.5	1.5

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

01. ENGINE

PROB.	OPERATION DESCRIPTION	C/P	C/P	C/P	P	ET	E	E
		30-35	40-60	80-100	150-155	30-35	30-35	40-60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
01.1000	ENGINE ASSEMBLY R&R - GASOLINE	7.0	7.0	7.2	7.2	0.0	0.0	0.0
01.1010	ENGINE ASSEMBLY R&R - DIESEL	0.0	6.5	6.9	6.9	0.0	0.0	0.0
01.1110	LONG BLOCK R&R - GASOLINE	10.0	10.0	10.2	10.2	0.0	0.0	0.0
01.1110	LONG BLOCK R&R - DIESEL	0.0	9.3	9.7	9.7	0.0	0.0	0.0
01.1200	SHORT BLOCK R&R - GASOLINE	13.5	13.5	13.9	13.9	0.0	0.0	0.0
01.1210	SHORT BLOCK R&R - DIESEL	0.0	13.3	13.7	13.7	0.0	0.0	0.0
01.1300	BARE BLOCK R&R - GASOLINE	20.0	20.0	20.2	20.2	0.0	0.0	0.0
01.1310	BARE BLOCK R&R - DIESEL	0.0	17.8	18.2	18.2	0.0	0.0	0.0
01.2000	FREEZE PLUG/COOLANT LEAK R&R	1.0	1.0	1.0	1.0	0.0	0.0	0.0
01.2010	FREEZE PLUG/COOLANT LEAK R&R ALL	2.0	2.0	2.0	2.0	0.0	0.0	0.0
01.2020	FREEZE PLUG/COOLANT LEAK INCL. ENGINE R&R	7.0	7.0	7.2	7.2	0.0	0.0	0.0
01.2100	PISTON/RING SET R&R (FIRST SET)	10.0	10.0	10.5	10.5	0.0	0.0	0.0
01.2110	PISTON/RING SET R&R (ALL)	10.7	10.7	12.5	12.5	0.0	0.0	0.0
01.2200	CONNECTING ROD R&R (FIRST ONE)	10.0	10.0	10.5	10.5	0.0	0.0	0.0
01.2210	CONNECTING ROD R&R (ALL)	12.1	12.1	14.0	14.0	0.0	0.0	0.0
01.2300	CRANKSHAFT OR BEARING R&R	12.0	12.0	12.9	12.9	0.0	0.0	0.0
01.2400	CRANKSHAFT SEAL REAR MAIN R&R	10.0	10.0	10.5	10.5	0.0	0.0	0.0
01.2500	OIL PUMP/DISTRIBUTOR DRIVE R&R	0.7	0.7	0.7	0.7	0.0	0.0	0.0
01.2600	FRONT PULLEY R&R (CRANK)	20.	2.0	2.5	2.5	0.0	0.0	0.0
01.2700	FLYWHEEL/FLYWHEEL RING GEAR R&R	6.7	6.7	6.9	6.9	0.0	0.0	0.0
01.2800	CYLINDER HEAD/GASKET R&R	4.3	4.3	5.2	5.2	0.0	0.0	0.0
01.2850	CAMSHAFT R&R	5.7	5.7	6.4	6.4	0.0	0.0	0.0
01.2860	CAMSHAFT INCL. BEARINGS R&R	6.7	6.7	6.7	6.7	0.0	0.0	0.0
01.2900	CAM GEAR R&R	5.1	5.1	5.6	5.6	0.0	0.0	0.0
01.3000	FLWHELL BEARING R&R	0.2	0.2	0.2	0.2	0.0	0.0	0.0
01.3010	FLYWHEEL BEARING INCL. ENGINE R&R	6.2	6.2	6.4	6.4	0.0	0.0	0.0
01.3100	FLYWHEEL HOUSING R&R	0.7	0.7	0.7	0.7	0.0	0.0	0.0
01.3110	FLWHEEL HOUSING INCL. ENGINE R&R	6.7	6.7	6.9	6.9	0.0	0.0	0.0
01.3150	FLEX PLATE R&R	6.4	6.4	6.6	6.6	0.0	0.0	0.0
01.3200	INPUT GUIDE R&R	6.4	6.4	7.0	7.0	0.0	0.0	0.0
01.3300	VALVE GUID R&R (FIRST)	0.5	0.5	0.5	0.5	0.0	0.0	0.0
01.3310	VALVE GUIDE R&R (ALL)	1.0	1.0	1.4	1.4	0.0	0.0	0.0
01.3350	VALVE SEAT R&R (FIRST)	0.5	0.5	0.5	0.5	0.0	0.0	0.0
01.3400	VALVE COVER/GASKET R&R	0.8	0.8	0.8	0.8	0.0	0.0	0.0
01.3410	ROCKER SHAFT/ARM R&R	1.8	1.8	1.8	1.8	0.0	0.0	0.0
01.3420	VALVE R&R (FIRST)	0.5	0.5	0.5	0.5	0.0	0.0	0.0
01.3430	VALVE R&R (ALL)	1.1	1.1	1.5	1.5	0.0	0.0	0.0
01.3440	VALVE SPRING/SEAL R&R (FIRST)	0.9	0.9	1.0	1.0	0.0	0.0	0.0
01.3450	VALVE SPRING/SEAL R&R (ALL)	1.5	1.5	2.0	2.0	0.0	0.0	0.0
01.3460	VALVE LIFTER R&R ALL	5.4	5.4	6.1	6.1	0.0	0.0	0.0
01.3500	BROKEN MOUNT BOLTS IN ENGINE BLOCK R&R	7.0	7.0	7.9	7.9	0.0	0.0	0.0
01.3520	ENGINE MOUNT R&R (EACH)	1.0	1.0	1.0	1.0	0.0	0.0	0.0

CONTINUED

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

01. ENGINE CONTINUED

PROB.	OPERATION DESCRIPTION	C/P	C/P	C/P	P	ET	E	E
		30-35	40-60	80-100	150-155	30-35	30-35	40-60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
01.3530	ENGINE MOUNT R&R RUBBER	0.7	0.7	0.7	0.7	0.0	0.0	0.0
01.3600	FRONT COVER/GASKET OIL LEAK	3.5	3.5	4.5	4.5	0.0	0.0	0.0
01.3610	FRONT COVER SEAL R&R	6.0	2.1	2.6	2.6	0.0	0.0	0.0
01.3620	PUMP DRIVE CHAIN/SPROCKET/BEARING R&R	5.0	5.0	0.0	0.0	0.0	0.0	0.0
01.3630	TIMING CHAIN/CRANK AND CAM GEAR R&R	6.0	6.0	7.0	7.0	0.0	0.0	0.0
01.3800	OIL PAN/GASKET R&R	3.0	3.2	6.8	6.8	0.0	0.0	0.0
01.3810	DRAIN PLUG/GASKET	0.5	0.5	0.5	0.5	0.0	0.0	0.0
01.3820	OIL PUMP R&R	4.0	4.2	8.0	8.0	0.0	0.0	0.0
01.3830	OIL FILTER HOUSING GASKET R&R	06.	0.6	0.6	0.6	0.0	0.0	0.0
01.3850	PCV VALVE R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
01.3860	PCV VALVE HOSE R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
01.3870	AIR FILTER ASSEMBLY R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
01.3880	AIR FILTER ELEMENT R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
01.3890	AIR FILTER HOSE R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
01.3900	GOVERNOR ASSEMBLY R&R	1.0	1.0	1.0	1.0	0.0	0.0	0.0
01.3910	GOVERNOR - CAM BAND KIT R&R	1.2	1.2	1.2	1.2	0.0	0.0	0.0
01.3920	GOVERNOR - LEVER/SPRING R&R	0.0	0.5	0.5	0.5	0.0	0.0	0.0
01.3930	GOVERNOR - LINKAGE FAILURE/MISC.	0.7	0.7	0.7	0.7	0.0	0.0	0.0
01.3990	ENGINE MISCELLANEOUS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
01.7000	ENGINE ASSEMBLY OVERHAUL - GASOLINE	21.8	21.8	22.6	22.6	0.0	0.0	0.0
01.7010	ENGINE ASSEMBLY OVERHAUL - DIESEL	0.0	22.4	23.2	23.2	0.0	0.0	0.0
01.7100	TORQUE CYLINDER HEAD BOLTS	0.6	0.6	0.8	0.8	0.0	0.0	0.0
01.7200	CYLINDER HEAD OVERHAUL	6.2	6.2	7.4	7.4	0.0	0.0	0.0
01.7300	VALVE ADJUSTMENT	1.2	1.2	1.6	1.6	0.0	0.0	0.0

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

02. ENGINE ELECTRICAL

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
02.3990	ENGINE ELECTRICAL MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
02.6000	GLOW PLUG R&R	0.0	0.8	0.8	0.8	0.0	0.0	0.0
02.6010	SOLENOID SHUT OFF VALVE R&R	1.0	1.0	1.0	1.0	0.0	0.0	0.0
02.6020	HEATER RIBBON R&R	0.0	0.0	0.9	0.9	0.0	0.0	0.0
02.6100	TEMPERATURE SENDING UNIT R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
02.6010	OIL PRESSURE SENDING UNIT R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
02.6120	STARTER R&R	1.0	1.0	1.0	1.0	0.0	0.0	0.0
02.6130	STARTER REBUILD INCL. R&R	1.8	1.8	1.8	1.8	0.0	0.0	0.0
02.6140	ALTERNATOR R&R	1.0	1.0	1.0	1.0	0.0	0.0	0.0
02.6160	VOLTAGE REGULATOR R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
02.6200	DISTRIBUTOR ASSEMBLY R&R	0.8	0.8	0.8	0.8	0.0	0.0	0.0
02.6210	SPARK PLUG WIRES	0.5	0.5	0.5	0.5	0.0	0.0	0.0
02.6220	SPARK PLUGS R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
02.6230	IGNITION COIL R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
02.6240	IGNITOR/ELECTRONIC R&R	1.0	1.0	1.0	1.0	0.0	0.0	0.0
02.6250	RESISTOR R&R	0.5	0.5	0.0	0.0	0.0	0.0	0.0
02.6260	QUICK GLOW SYSTEM R&R	0.0	1.0	0.0	0.0	0.0	0.0	0.0
02.6270	TEMPERATURE SENSOR (QUICK GLOW) R&R	0.0	0.0	0.0	0.0	0.0	0.0	0.0
02.8000	STARTER FOR 6D95L NEW STYLE (ONLY)	0.0	0.0	1.5	0.0	0.0	0.0	0.0

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

03. EXHAUST SYSTEM

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
03.1000	MANIFOLD AND/OR GASKET R&R	2.0	2.0	2.2	2.2	0.0	0.0	0.0
03.1100	MUFLER R&R	1.5	1.5	1.7	1.7	0.0	0.0	0.0
03.2000	EXHAUST PIPE R&R	1.0	1.0	1.0	1.0	0.0	0.0	0.0
03.3000	LOOSE CONNECTION/TIGHTEN BOLTS	0.5	0.5	0.5	0.5	0.0	0.0	0.0
03.3990	EXHAUST MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

04. COOLING SYSTEM

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
04.1000	RADIATOR R&R	3.0	3.0	3.0	3.0	0.0	0.0	0.0
04.1010	RADIATOR LEAK R&R	3.0	3.0	3.0	3.0	0.0	0.0	0.0
04.1020	RADIATOR SHROUD R&R	1.0	1.0	1.0	1.0	0.0	0.0	0.0
04.1030	RADIATOR CAP R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
04.1040	RADIATOR DRAIN PETCOCK R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
04.1050	RADIATOR HOSES - UPPER R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
04.1060	RADIATOR HOSES - LOWER R&R	0.6	0.6	0.6	0.6	0.0	0.0	0.0
04.1070	RADIATOR RECORE	3.0	2.0	2.0	2.0	0.0	0.0	0.0
04.1100	WATER PUMP R&R	2.0	2.0	2.0	2.0	0.0	0.0	0.0
04.2000	FAN BLADE/PULLEY R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
04.2010	THERMOSTAT R&R	1.0	1.0	1.0	1.0	0.0	0.0	0.0
04.2030	FAN BELT R&R	0.5	0.5	1.0	1.0	0.0	0.0	0.0
04.3000	HOSE CLAMP R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
04.3300	T/M COOLER LINE R&R (ONE)	0.6	0.6	0.6	0.6	0.0	0.0	0.0
04.3350	T/M COOLER HOSE R&R (ONE)	0.5	0.5	0.5	0.5	0.0	0.0	0.0
04.3990	COOLING MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

05. FUEL SYSTEM - GASOLINE/DIESEL

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
05.1000	CARBURETOR R&R	1.0	1.0	1.0	1.0	0.0	0.0	0.0
05.1100	INJECTION PUMP R&R	0.0	2.1	2.5	2.5	0.0	0.0	0.0
05.1110	SHUT OFF SOLENOID R&R	0.0	1.0	1.0	1.0	0.0	0.0	0.0
05.1120	DSL FEED PUMP R&R (INTERNAL TYPE)	0.0	2.6	2.6	2.6	0.0	0.0	0.0
05.1130	DSL FEED PUMP R&R (EXTERNAL TYPE)	0.0	1.0	1.0	1.0	0.0	0.0	0.0
05.1210	INJECTOR NOZZLE R&R (EACH)	0.0	0.5	0.5	0.5	0.0	0.0	0.0
05.1300	GAS FUEL PUMP/GASKET R&R	0.5	0.5	0.7	0.7	0.0	0.0	0.0
05.1500	INTAKE MANIFOLD R&R	1.4	1.4	1.6	1.6	0.0	0.0	0.0
05.3000	FUEL TANK COVER GASKET R&R	0.7	0.7	0.7	0.7	0.0	0.0	0.0
05.3100	FUEL PICK UP TUBE R&R	0.9	0.9	0.9	0.9	0.0	0.0	0.0
05.3150	FUEL PETCOCK R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
05.3200	DASHPOT R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
05.3250	FUEL SHUT OFF VALVE R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
05.3260	RETURN SPRING R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
05.3300	FUEL FILTER R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
05.3350	FUEL LINE/HOSE R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
05.3400	ENGINE SHUT DOWN CABLE R&R	0.0	0.5	0.5	0.5	0.0	0.0	0.0
05.3450	CHOKE CABLE R&R	0.6	0.6	0.6	0.6	0.0	0.0	0.0
05.3500	INTAKE MANIFOLD GASKET R&R	1.2	1.2	1.2	1.2	0.0	0.0	0.0
05.3510	INTAKE MANIFOLD HOSE R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
05.3520	INTAKE STUD/BOLT R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
05.3990	FUEL MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
05.7000	CARBURETOR REPAIR/REBUILD INCL. R&R	1.5	1.5	1.5	1.5	0.0	0.0	0.0
05.7100	CARBURETOR LINKAGE ADJUSTMENT	0.5	0.5	0.5	0.5	0.0	0.0	0.0

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

06. FUEL SYSTEM - LPG

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
06.1000	CARBURETOR R&R	1.0	1.0	1.0	1.0	0.0	0.0	0.0
06.1010	CARBURETOR REBUILD INCL. R&R	1.5	1.5	1.5	1.5	0.0	0.0	0.0
06.1100	REGULATOR R&R	0.8	0.8	0.8	0.8	0.0	0.0	0.0
06.1200	LOCKOFF R&R	0.8	0.8	0.8	0.8	0.0	0.0	0.0
06.1300	AV1 DIAPHRAM R&R	0.6	0.6	0.6	0.6	0.0	0.0	0.0
06.2000	RELIEF VALVE R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
06.3000	FUEL HOSE/LINE R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
06.3050	HOSE COOLANT R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
06.3100	TANK BRACKET R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
06.3200	REGULATOR/LOCKOFF BRACKET R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
06.3250	SPRING R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
06.3990	FUEL MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
06.7000	REGULATOR REBUILD INCL. R&R	1.2	1.2	1.2	1.2	0.0	0.0	0.0
06.7100	LOCKOFF REBUILD INCL. R&R	1.1	1.1	1.1	1.1	0.0	0.0	0.0
06.7200	FUEL LEAK REPAIR	0.5	0.5	0.5	0.5	0.0	0.0	0.0

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

10. CLUTCH

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
10.1000	PRESSURE PLATE/DISC R&R	2.0	2.0	2.0	0.0	0.0	0.0	0.0
10.2000	THROWGHT BEARING/SLEEVE R&R	2.0	2.0	2.0	0.0	0.0	0.0	0.0
10.2100	CLUTCH HOUSING COVER PLATE R&R	0.5	0.5	0.5	0.0	0.0	0.0	0.0
10.2200	CLUTCH MASTER CYLINDER R&R	1.2	1.2	1.2	0.0	0.0	0.0	0.0
10.2250	CLUTCH RELEASE CYLINDER R&R	1.2	1.2	1.2	0.0	0.0	0.0	0.0
10.2300	CLUTCH ROD/CLEVIS	0.5	0.5	0.5	0.0	0.0	0.0	0.0
10.3000	CLUTCH PEDAL/BUSHING/SHAFT R&R	1.5	1.5	1.5	0.0	0.0	0.0	0.0
10.3100	CLUTCH PEDAL RETURN SPRING R&R	0.5	0.5	0.5	0.0	0.0	0.0	0.0
10.3990	CLUTCH MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

13. TORQUE CONVERTOR

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
13.1000	CONVERTOR ASSMEBLY R&R	8.0	8.0	8.5	5.0	0.0	0.0	0.0
13.1100	CONVERTOR CASE R&R	9.5	9.5	10.0	6.5	0.0	0.0	0.0
13.1300	GEAR PUMP R&R	9.5	9.5	10.0	6.5	0.0	0.0	0.0
13.2000	OIL LEAK/RESEAL TC	9.0	9.0	9.5	6.0	0.0	0.0	0.0
13.3000	FLEX PLATE R&R	6.4	6.4	6.6	5.0	0.0	0.0	0.0
13.3990	CONVERTOR MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13.7000	CONVERTOR ASSEMBLY OVERHAUL	9.5	9.5	10.0	5.5	0.0	0.0	0.0
13.7010	CONVERTOR RESEAL (WITH ENGINE OUT)	2.0	2.0	2.0	2.0	0.0	0.0	0.0

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

14. TRANSMISSION MANUAL SHIFT

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
14.1000	TRANSMISSION ASSEMBLY R&R	11.0	11.0	11.5	0.0	0.0	0.0	0.0
14.1100	TRANSMISSION CASE R&R	22.5	22.5	25.0	0.0	0.0	0.0	0.0
14.2000	SHIFT FORK/SHAFT R&R	1.5	1.5	1.7	0.0	0.0	0.0	0.0
14.2100	SHIFT LEVER ASSEMBLY R&R	0.7	0.7	0.7	0.0	0.0	0.0	0.0
14.3000	OIL LEAK/GASKET/SEAL	1.0	1.0	1.0	0.0	0.0	0.0	0.0
14.3100	LINKAGE MISC. R&R	1.0	1.0	1.0	0.0	0.0	0.0	0.0
14.3990	TRANSMISSION MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14.7000	TRANSMISSION ASSEMBLY OVERHAUL	22.0	22.0	22.5	0.0	0.0	0.0	0.0

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

15. TRANSMISSION TORQUFLOW

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
15.1000	TRANSMISSION ASSEMBLY R&R	11.0	11.0	11.5	8.5	0.0	0.0	0.0
15.1100	CLUTCH PACK ASSEMBLY RESEAL/REPLACE	20.5	20.5	20.5		0.0	0.0	0.0
15.2000	CONTROL VALVE ASSEMBLY R&R	1.1	1.1	1.1		0.0	0.0	0.0
15.2050	CONTROL VALVE GASKET R&R	1.0	1.0	1.0		0.0	0.0	0.0
15.2100	CONTROL VALVE SPOOL SEAL R&R (ONE)	1.6	1.6	1.6		0.0	0.0	0.0
15.2150	INCHING LINKAGE/PIN R&R	0.5	0.5	0.5		0.0	0.0	0.0
15.2200	NETURAL SWITCH R&R	0.5	0.5	0.5		0.0	0.0	0.0
15.2210	FILTER R&R (INTERNAL)	1.0	1.0	1.0		0.0	0.0	0.0
15.3000	PINION SEAL R&R	23.5	23.5	23.5		0.0	0.0	0.0
15.3100	SEAL RINGS/RETAINER R&R	7.5	7.5	8.0	8.0	0.0	0.0	0.0
15.3110	RETAINER/O-RING INTERNAL LEAKAGE R&R	7.5	7.5	7.5	7.5	0.0	0.0	0.0
15.3200	SIDE COVER GASKET R&R	1.2	1.2	1.2	0.0	0.0	0.0	0.0
15.3400	OIL LEAK EXTERNAL O-RING/PLUG/GASKET R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
15.3990	TRANSMISSION MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15.7000	TRANSMISSION ASSEMBLY OVER HAUL	24.5	24.5	24.5	0.0	0.0	0.0	0.0
15.7010	TRANSMISSION ASSEMBLY OVERHAUL - 2 SPEED	0.0	25.5	25.5	25.5	0.0	0.0	0.0
15.7020	TRANSMISSION CASE R&R	24.5	24.5	24.5	24.5	0.0	0.0	0.0
15.7100	CONTROL VALVE OVER HAUL	2.0	2.0	2.0	2.5	0.0	0.0	0.0

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

16. TRANSFER CASE

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
16.1300	RING/PINION R&R	0.0	0.0	0.0	0.0	9.3	10.8	10.8
16.1400	TRANSFER CASE R&R	0.0	0.0	0.0	0.0	10.3	11.3	11.3
16.1450	TRANSFER GEARS R&R (ALL)	0.0	0.0	0.0	0.0	6.0	10.0	10.0

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

17. DRIVE MOTOR

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
17.1000	MOTOR R&R	0.0	0.0	0.0	0.0	3.0	4.0	4.2
17.2000	BRUSHES R&R	0.0	0.0	0.0	0.0	1.0	1.2	1.2
17.3000	BEARING R&R	0.0	0.0	0.0	0.0	4.0	5.2	5.4
17.3100	SEAL R&R	0.0	0.0	0.0	0.0	3.5	4.5	4.7
17.3990	MOTOR MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17.7000	MOTOR OVERHAUL INCL. R&R	0.0	0.0	0.0	0.0	5.0	6.0	6.2

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

18. HYDRAULIC MOTOR

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
18.1100	MOTOR R&R	0.0	0.0	0.0	0.0	1.3	1.5	1.5
18.2100	BRUSHES R&R	0.0	0.0	0.0	0.0	1.1	1.2	1.2
18.3100	BEARING R&R	0.0	0.0	0.0	0.0	3.3	3.5	3.5
18.3990	MOTOR MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18.7100	MOTOR OVERHAUL INC. R&R	0.0	0.0	0.0	0.0	3.3	3.5	3.5

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

19. POWER STEER MOTOR

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
19.1200	MOTOR R&R	0.0	0.0	0.0	0.0	1.0	1.1	1.1
19.2200	BRUSHES R&R	0.0	0.0	0.0	0.0	1.6	1.1	1.1
19.3200	BEARING R&R	0.0	0.0	0.0	0.0	2.0	2.5	2.5
19.3990	MOTOR MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19.7200	MOTOR OVERHAUL INCL. R&R	0.0	0.0	0.0	0.0	2.0	2.5	2.5

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

21. DRIVE AXLE

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
21.1000	RING/PINION GEAR R&R	22.0	22.0	22.5	22.5	11.5	12.5	12.5
21.1100	DIFFERENTIAL CASE GASKET R&R	5.5	5.5	5.8	5.8	2.0	5.5	5.5
21.1200	DIFFERENTIAL HOUSING R&R	7.0	7.0	7.3	7.3	9.2	7.0	7.0
21.2000	HUB ASSEMBLY R&R	1.8	1.8	1.9	1.9	3.1	1.8	1.8
21.2100	AXLE R&R	1.0	1.0	1.0	1.0	0.0	1.0	1.0
21.3000	WHEEL BEARING R&R	1.2	1.2	1.3	1.3	5.0	1.2	1.2
21.3100	HUB BOLT R&R	2.0	2.0	2.1	2.1	2.0	2.0	2.0
21.3200	OIL SEAL R&R (ONE SIDE)	1.5	1.5	1.5	1.5	0.0	1.5	1.5
21.3300	OIL SEAL R&R	0.0	0.0	0.0	0.0	3.1	0.0	0.0
21.3990	DIFFERENTIAL MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

24. STEER AXLE

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
24.1000	AXLE ASSEMBLY R&R	2.0	2.0	2.0	2.0	2.5	2.0	2.0
24.2000	LINK R&R	1.0	1.0	1.0	1.0	1.0	1.0	1.0
24.2050	LINK BUSHING CYLINDER ROD SIDE R&R	1.5	1.5	1.5	1.5	0.0	1.5	1.5
24.2051	LINK BUSHING KNUCKLE SIED R&R	1.0	1.0	1.0	1.0	1.0	1.0	0.0
24.2100	KING PIN R&R	1.5	1.5	1.3	1.3	0.0	1.5	1.5
24.2200	BELLCRANK/BEARINGS R&R	1.9	1.9	1.9	1.9	0.0	0.0	0.0
24.2300	HUB R&R	1.9	1.9	1.9	1.9	0.0	1.9	1.9
24.2400	BALL STUD R&R	1.3	1.3	1.3	1.3	0.0	0.0	0.0
24.3000	STEER AXLE SUPPORT BEARINGS	1.8	1.8	1.8	1.8	2.5	1.8	1.8
24.3100	HUB BEARING R&R	1.0	1.0	1.0	1.0	1.0	1.0	1.0
24.3200	HUB BOLT R&R (ONE)	0.9	0.9	0.9	0.9	0.9	0.9	0.9
24.3210	HUB BOLT R&R (ALL)	1.4	1.4	1.4	1.4	1.4	1.4	1.4
24.3300	GREASE SEAL R&R	0.8	0.8	0.8	0.8	0.8	0.8	0.8
24.3400	AXLE SWING LIMIT PLATE	0.0	0.8	0.8	0.8	0.0	0.8	0.8
24.3500	STOPPER BOLT REPAIR/REPLACE/ADJUST	0.5	0.5	0.5	0.5	0.5	0.5	0.5
24.3990	AXLE MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24.7000	SHIM STEER AXLE ASSEMBLY	1.5	1.5	1.5	1.5	0.0	1.5	1.5
24.7100	ADJUST ROD END ALIGNMENT	0.6	0.6	0.6	0.6	0.0	0.6	0.6

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

27. DRIVE TIRE/WHEEL

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
27.1000	RIM R&R	1.0	1.0	1.0	1.0	1.0	1.0	1.0
27.1100	TIRE COUSHION R&R	1.0	1.0	1.0	0.0	1.0	1.0	1.0
27.1110	TIRE PNEUMATIC R&R	1.0	1.0	1.0	1.0	1.0	0.0	0.0
27.1120	TIRE R&R DUAL (INNER)	1.2	1.2	1.2	1.2	0.0	0.0	0.0
27.3990	DRIVE TIRE/WHEEL MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

28. STEER TIRE/WHEEL

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
28.1000	RIM R&R	1.0	1.0	1.0	1.0	1.0	1.0	1.0
28.1100	TIRE CUSHION R&R	1.0	1.0	1.0	0.0	1.0	1.0	1.0
28.1110	TIRE PNEUMATIC	1.0	1.0	1.0	1.0	1.0	0.0	0.0
28.3990	STEER TIRE/WHEEL MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

30. BRAKE SERVICE/PARKING

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
30.1000	DRUM/DISC R&R (ONE)	1.5	1.5	1.5	1.5	1.3	1.5	1.5
30.1010	DRUM/DISC R&R (BOTH SIDES)	2.5	2.5	2.5	2.5	2.3	2.5	2.5
30.1100	BRAKE BACKING PLATE ASSEMBLY R&R (ONE)	2.0	2.0	2.0	2.0	0.0	2.0	2.0
30.1110	BRAKE BACKING PLATE ASSEMBLY R&R (BOTH)	3.0	3.0	3.0	3.0	0.0	4.0	4.0
30.1200	BRAKE SHOES R&R	1.5	1.5	1.5	1.5	0.0	1.5	1.5
30.1300	WHEEL CYLINDER R&R	2.0	2.0	2.1	2.1	0.0	2.0	2.0
30.1500	CALIPER ASSEMBLY R&R	0.0	0.0	1.0	1.0	1.5	0.0	0.0
30.2000	BRAKE COMPONENT SPRING/ADJUSTER R&R	1.2	1.2	1.2	1.2	1.2	1.2	1.2
30.2100	MASTER CYLINDER R&R	1.0	1.0	1.2	1.2	1.2	1.0	1.0
30.2110	MASTER CYLINDER POWER BRAKES R&R	0.0	0.0	1.7	1.7	0.0	0.0	0.0
30.2200	ACCUMULATOR R&R	0.0	0.0	1.1	1.1	0.0	0.0	0.0
30.2500	BRAKE PADS R&R	0.0	0.0	1.3	1.3	1.3	0.0	0.0
30.2600	ROTOR R&R	0.0	0.0	1.5	1.5	1.5	0.0	0.0
30.3000	BACKING PLATE BOLTS R&R	1.5	1.5	1.5	1.5	0.0	1.5	1.5
30.3050	PARKING BRAKE HANDLE R&R	0.7	0.7	0.7	0.7	0.7	0.7	0.7
30.3100	PARKING BRAKE CABLE LOWER R&R	2.0	2.0	2.0	2.0	1.5	2.0	2.0
30.3110	PARKING BRAKE CABLE UPPER R&R	1.0	1.0	1.0	1.0	1.0	1.0	1.0
30.3200	BRAKE PIPE R&R (ONE)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
30.3300	BRAKE RESERVOIR R&R	0.6	0.6	0.0	0.0	0.0	0.6	0.6
30.3400	ACCUMULATOR PRESSURE SWITCH R&R	0.0	0.0	0.5	0.5	0.0	0.0	0.0
30.3450	ACCUMULATOR CHECK VALVE R&R	0.0	0.0	0.7	0.7	0.0	0.0	0.0
30.3990	BRAKE MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30.7000	BLEED BRAKES	0.5	0.5	0.5	0.5	0.5	0.5	0.5
30.7100	MASTER CYLINDER OVERHAUL INCL. R&R	1.5	1.5	1.5	1.5	1.5	1.5	1.5

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

33. STEERING WHEEL ASSEMBLY

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
33.1000	HYDROSTATIC UNIT R&R	1.8	1.8	1.8	1.8	1.8	1.8	1.8
33.2000	GEAR BOX VALVE R&R	2.8	2.8	3.1	0.0	0.0	0.0	0.0
33.3990	STEERING MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33.7000	HYDROSTATIC UNIT REBUILB INCL. R&R	2.5	2.5	3.2	3.2	3.2	2.5	2.5

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

34. STEERING COLUMN ASSEMBLY

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
34.3300	FLOW CONTROL VALVE R&R	0.0	0.0	1.0	1.0	0.0	0.0	0.0
34.3350	COLUMN/UNIVERSAL JOINT R&R	1.0	1.0	1.0	1.0	1.0	1.0	1.0
34.3400	COLUMN BUSHINGS R&R	1.0	1.0	1.0	1.0	1.0	1.0	1.0
34.3450	COLUMN SEAL R&R	1.0	1.0	1.0	1.0	1.0	1.0	1.0
34.3990	COLUMN MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

35. STEER COLUMN LINKAGE

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
35.1000	SHIFT SHAFT R&R	0.6	0.6	0.6	0.6	0.0	0.0	0.0
35.1500	SHIFT CABLE ADJUSTMENT	1.5	1.5	1.5	0.0	0.0	0.0	0.0
30.1501	SHIFT CABLE R&R	1.0	1.0	1.0	0.0	0.0	0.0	0.0
30.2000	SHIFT SHAFT BUSHING R&R	0.8	0.8	0.8	0.0	0.0	0.0	0.0
30.3990	LINKAGE MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

36. PEDALS

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
36.2100	ACCELERATOR/BRAKE/INCHING PEDAL R&R	0.9	0.9	0.9	0.9	0.9	0.9	0.9
36.3000	ROD END R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
36.3100	CLEVIS PIN R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
36.3200	RETURN SPRING R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
36.3990	PEDAL MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

37. ACCELERATOR PEDAL

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
37.2200	ACCELERATOR CABLE R&R	1.0	1.0	1.0	1.0	0.0	0.0	0.0
37.3990	ACCELERATOR MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

40. OVERHEAD GUARD

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
40.1000	OVERHEAD GUARD ASSEMBLY R&R	1.0	2.0	1.0	2.5	2.0	2.0	2.0
40.1050	BOLTS R&R (ONE)	0.2	0.2	0.2	0.2	0.2	0.2	0.2
40.1100	STAY R&R	1.0	1.0	0.5	0.5	1.0	1.0	1.0
40.3990	GUARD MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

41. FRAME CHASSIS

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
41.1200	COUNTER WEIGHT R&R	0.8	0.8	0.8	0.7	0.8	0.8	0.8
41.3000	FUEL/HYDRAULIC DRAIN PLUG R&R	0.6	0.6	0.6	0.6	0.6	0.6	0.6
41.3100	FUEL/HYDRAULIC COVER PLATE	1.0	1.0	1.0	1.0	1.0	1.0	1.0
41.3200	FUEL CAP LEAKING	0.5	0.5	0.5	0.5	0.0	0.0	0.0
41.3300	FUEL/HYDRAULIC TANK LEAK (WELDING)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
41.3990	FRAME MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41.5001	PAINT POOR FINISH	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

47. SCR DRIVE CONTROL

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
47.1000	MAIN CONTROLLER ASSEMBLY R&R	0.0	0.0	0.0	0.0	2.0	2.0	2.2
47.1200	SCR TEST	0.0	0.0	0.0	0.0	1.0	1.0	1.0
47.1300	DIODE R&R	0.0	0.0	0.0	0.0	1.0	1.0	1.0
47.1400	CONDENSOR R&R	0.0	0.0	0.0	0.0	1.0	1.0	1.0
47.1500	REACTOR R&R	0.0	0.0	0.0	0.0	1.0	1.0	1.0
47.2000	#1 REC. R&R	0.0	0.0	0.0	0.0	1.5	1.0	1.0
47.2010	#2 REC. R&R	0.0	0.0	0.0	0.0	1.2	0.7	0.7
47.2020	#3 REC. R&R	0.0	0.0	0.0	0.0	1.2	0.7	0.7
47.2030	#4 REC. R&R	0.0	0.0	0.0	0.0	1.2	0.7	0.7
47.2040	#5 REC.R&R	0.0	0.0	0.0	0.0	1.2	0.7	0.7
47.2050	SHUNT R&	0.0	0.0	0.0	0.0	1.0	1.0	1.0
47.2100	#22 SNUBBER R&R	0.0	0.0	0.0	0.0	1.2	0.7	0.7
47.2110	#23 SNUBBER R&R	0.0	0.0	0.0	0.0	1.2	0.7	0.7
47.2120	#24 SNUBBER R&R	0.0	0.0	0.0	0.0	1.2	0.7	0.7
47.2030	#25 SNUBBER R&R	0.0	0.0	0.0	0.0	1.2	0.7	0.7
47.2200	THERMAL PROTECTOR R&R	0.0	0.0	0.0	0.0	1.5	1.0	1.0
47.2210	MAIN FUSE R&R	0.0	0.0	0.0	0.0	0.5	0.5	0.5
47.2300	SENSOR R&R	0.0	0.0	0.0	0.0	1.2	0.7	0.7
47.2400	CAPACITOR R&R	0.0	0.0	0.0	0.0	1.2	0.7	0.7
47.2500	MAIN CARD R&R	0.0	0.0	0.0	0.0	1.5	1.0	1.0
47.3000	TMM1 CARD R&R	0.0	0.0	0.0	0.0	1.0	0.8	0.8
47.3050	TMM2 CARD R&R	0.0	0.0	0.0	0.0	1.0	0.8	0.8
47.3100	DRIVER/TIME DELAY R&R	0.0	0.0	0.0	0.0	1.0	1.0	1.0
47.3990	SCR MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
47.7000	LOOSE CONNECTIONS	0.0	0.0	0.0	0.0	0.5	0.5	0.5

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

48. CONTACTOR PANEL

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
48.1000	CONTACTOR PANEL R&R	0.0	0.0	0.0	0.0	1.5	1.5	1.5
48.1050	MAIN WIRING HARNESS R&R	0.0	0.0	0.0	0.0	1.7	1.7	1.7
48.2000	FOR/REV CONTACTOR R&R	0.0	0.0	0.0	0.0	0.8	0.8	0.8
48.2010	FOR/REV CONTACTOR TIPS R&R	0.0	0.0	0.0	0.0	0.5	0.5	0.5
48.2020	FOR/REV CONTACTOR COIL R&R	0.0	0.0	0.0	0.0	0.6	0.6	0.6
48.2050	1A CONTACTOR TIPS R&R	0.0	0.0	0.0	0.0	0.5	0.5	0.5
48.2100	1A CONTACTOR R&R	0.0	0.0	0.0	0.0	0.8	0.8	0.8
48.2120	1A CONTACTOR COIL R&R	0.0	0.0	0.0	0.0	0.6	0.6	0.6
48.2200	HYDRAULIC PUMP CONTACTOR R&R	0.0	0.0	0.0	0.0	0.8	0.8	0.8
48.2210	HYD. PUMP CONTACTOR TIPS R&R	0.0	0.0	0.0	0.0	0.5	0.5	0.5
48.2220	HYD. PUMP CONTACTOR COIL R&R	0.0	0.0	0.0	0.0	0.6	0.6	0.6
48.2230	REGEN CONTACTOR COIL R&R	0.0	0.0	0.0	0.0	0.0	0.8	0.8
48.2240	REGEN CONTACTOR TIPS R&R	0.0	0.0	0.0	0.0	0.0	0.5	0.5
48.2250	REGEN CONTACTOR R&R	0.0	0.0	0.0	0.0	0.8	0.8	0.8
48.2290	POWER STEERING FUSE R&R	0.0	0.0	0.0	0.0	0.5	0.5	0.5
48.2300	POWER STEERING PUMP CONTACTOR R&R	0.0	0.0	0.0	0.0	0.8	0.8	0.8
48.2310	P/S STEERING CONTACTOR TIPS R&R	0.0	0.0	0.0	0.0	0.5	0.5	0.5
48.2320	P/S STEERING PUMP CONTACTOR COIL R&R	0.0	0.0	0.0	0.0	0.6	0.6	0.6
48.3000	POTENTIOMETER R&R	0.0	0.0	0.0	0.0	0.8	0.8	0.8
48.3050	SEAT/BRAKE SWITCH R&R	0.0	0.0	0.0	0.0	0.5	0.5	0.5
48.3100	ACCELERATOR R&R	0.0	0.0	0.0	0.0	1.0	1.0	1.0
48.3200	VOLTMETER R&R	0.0	0.0	0.0	0.0	0.5	0.5	0.5
48.3300	DIRECTIONAL SWITCH R&R	0.0	0.0	0.0	0.0	0.5	0.5	0.5
48.3310	MICROSWITCH R&R	0.0	0.0	0.0	0.0	0.7	0.7	0.7
48.3320	WIRING HARNESS R&R	0.0	0.0	0.0	0.0	0.5	0.5	0.5
48.3330	WIRING HARNESS REPAIR	0.0	0.0	0.0	0.0	1.0	1.0	1.0
48.3990	PANEL MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48.4000	BATTERY INDICATOR GUAGE R&R	0.0	0.0	0.0	0.0	0.5	0.5	0.5
48.4100	BATTERY INNDICATOR CONTROLLER R&R	0.0	0.0	0.0	0.0	0.6	0.6	0.6
48.7000	LOOSE WIRE/CONNETCTIONS	0.0	0.0	0.0	0.0	0.5	0.5	0.5

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

50. OUTER PANEL

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
50.1000	BONNET R&R	1.0	1.0	1.0	1.0	0.0	0.0	0.0
50.1100	BATTERY COVER R&R	0.0	0.0	0.0	0.0	1.0	1.0	1.0
50.2000	HOOD DAMPER R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
50.2040	HOOD HINGE R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
50.2050	HOOD LATCH R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
50.2100	SEAT ASSEMBLY R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
50.2200	SEAT BACK R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
50.2300	SEAT RAIL R&R	0.5	0.5	0.5	0.5	0.6	0.6	0.6
50.2400	DASH PANEL R&R	1.5	1.5	1.5	1.5	1.2	1.5	1.5
50.2450	DASH ASSEMBLY R&R	2.5	2.5	2.5	2.5	2.5	2.5	2.5
50.2500	RADIATOR COVER R&R	0.5	0.5	0.5	0.5	0.0	0.0	0.0
50.3990	OUTER PANEL MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

55. ELECTRICAL SYSTEM

PROB.	OPERATION DESCRIPTION	C/P	C/P	C/P	P	ET	E	E
		30-35	40-60	80-100	150-155	30-35	30-35	40-60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
55.1050	WIRE HARNESS DASH R&R	1.5	1.5	1.5	1.5	1.5	1.5	1.5
55.1100	WIRE HARNESS CHASSIS R&R	1.0	1.0	1.0	1.0	1.0	1.0	1.0
55.1110	WIRE HARNESS BOTH R&R	2.5	2.5	2.5	2.5	2.5	2.5	2.5
55.1111	WIRE HARNESS DISCONNECTED - RECONNECT	0.5	0.5	0.5	0.5	0.5	0.5	0.5
55.1120	REPLACE ONE POWER CABLE	0.0	0.0	0.0	0.0	0.8	0.8	0.8
55.1150	DASH PANEL CIRCUIT BOARD R&R	1.2	1.2	1.2	1.2	1.2	1.2	1.2
55.1200	BATTERY R&R	0.7	0.7	0.7	0.7	0.7	0.7	0.7
55.2000	FUSE BLOCK R&R	0.8	0.8	0.8	0.8	0.8	0.8	0.8
55.2010	DASH CIRCUIT BOARD R&R	1.0	1.0	1.0	1.0	1.0	1.0	1.0
55.2030	BATTERY CONNECTOR R&R	0.0	0.0	0.0	0.0	0.5	0.5	0.5
55.2050	IGNITION SWITCH R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
55.2100	LIGHT SWITCH R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
55.2150	TURN SIGNAL SWITCH R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
55.2160	CONTROL VALVE SWITCH R&R	0.0	0.0	0.0	0.0	1.0	1.0	1.0
55.2160	CONTROL VALVE SWITCH ADJUST	0.0	0.0	0.0	0.0	0.5	0.5	0.5
55.2200	FLASHER R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
55.2250	HEAD LAMP ASSEMBLY R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
55.2300	TAIL BLINKER LAMP ASSEMBLY R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
55.2350	BRAKE SWITCH R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
55.2400	BACKUP LIGHT SWITCH R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
55.2450	NETURAL SWITCH R&R	0.8	0.8	0.8	0.8	0.0	0.0	0.0
55.250	HORN ASSEMBLY R&R	0.8	0.8	0.8	0.8	0.8	0.8	0.8
55.2550	FUEL TANK SENDOR R&R	1.0	1.0	1.0	1.0	0.0	0.0	0.0
55.2600	DASH HEATER SIGNAL R&R	0.0	0.5	0.5	0.5	0.0	0.0	0.0
55.2650	SAFETY DISCONNECT R&R (GS/LPS)	0.5	0.5	0.5	0.5	0.0	0.0	0.0
55.2700	HOUR METER/FUEL/WATER TEMPERATURE GUAGE R&R	1.0	1.0	1.0	1.0	0.7	0.7	0.7
55.2750	TEMPERATURE SENDOR TO GLOW BOX R&r	0.0	1.0	0.0	1.0	0.0	0.0	0.0
55.2850	TRANSMISSION TEMPERATURE SENDER R&R	0.8	0.8	0.8	0.8	0.0	0.0	0.0
55.3060	PARKING BRAKE SWITCH R&R	0.0	0.0	0.0	0.0	0.7	0.7	0.7
55.3100	HORN BUTTON/SPRING/CONTACT R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
55.3990	ELECTRICAL MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55.5100	LOW FUEL WARNING FLOAT SWITCH	0.0	1.0	0.0	1.0	0.0	0.0	0.0
55.5200	LOW FUEL WARNING LIGHT R&R	0.0	0.5	0.0	1.0	0.0	0.0	0.0
55.7000	REPAIR WIRING HARNESS	0.8	0.8	0.8	0.8	0.8	0.8	0.8

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

60. HYDRAULIC PUMP

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
60.1000	PUMP ASSEMBLY R+&R	1.5	1.5	2.0	2.0	1.5	1.5	1.5
61.3990	PUMP MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60.7000	PUMP RESEAL INCL. R&R	2.5	2.5	3.0	3.5	2.5	2.5	2.5
60.7400	GASKET/O-RING/OIL LEAK R&R	1.0	1.0	1.0	1.0	0.0	0.0	0.0

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

61. HYDRAULIC CONTROL VALVE

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
61.1100	CONTROL VALVE ASSEMBLY R&R	1.5	1.5	2.0	2.0	1.5	1.5	1.5
61.1200	FLOW DIVIDER/FLOW CONTROL R&R	2.0	2.0	1.0	1.0	1.0	2.0	2.0
61.1250	CONTROL VALVE LEVER R&R	0.6	0.6	0.6	0.6	0.6	0.6	0.6
61.1300	CONTROL VALVE CONTAMINATION	2.5	2.5	2.5	2.5	2.5	2.5	2.5
61.2000	CONTROL VALVE SECTION R&R	2.0	2.0	2.1	2.1	2.0	2.0	2.0
61.2100	RELIEF VALVE ASSEMBLY R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
61.3300	CONTROL VALE CLEVIS PIN R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
61.3990	CONTROL VALVE MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
61.7100	CONTROL VALVE SECTION RESEAL INCL. R&R	2.0	2.0	2.0	2.0	2.0	2.0	2.0
61.7200	CONTROL VALE SPOOL RESEAL	1.0	1.0	1.0	1.0	1.0	1.0	1.0
61.7300	SET/CHECK HYDRAULIC PRESSURE	0.6	0.6	0.6	0.6	0.6	0.6	0.6
61.7400	FITTING/O-RING/OIL LEAK R&R	0.8	0.8	0.8	0.8	0.8	0.8	0.8

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

62. POWER STEERING PUMP

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
62.1000	P/S PUMP ASSEMBLY R&R	0.0	0.0	0.0	0.0	1.5	1.5	1.5
62.3990	P/S PUMP MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
62.7000	P/S PUMP RESEAL INCL. R&R	0.0	0.0	0.0	0.0	2.5	2.5	2.5

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

64. TILT CYLINDER

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
64.1000	CYLINDER ASSEMBLY R&R (ONE)	0.8	0.8	0.8	0.8	0.8	0.8	0.8
64.1010	CYLINDER ASSEMBLY R&R (BOTH)	1.2	1.2	1.2	1.2	1.2	1.2	1.2
64.2000	CYLINDER ROD R&R	1.6	1.6	1.6	1.6	1.6	1.6	1.6
64.2100	CYLINDER GLAND HEAD R&R	1.0	1.0	1.0	1.0	1.0	1.0	1.0
64.2200	CYLINDER TUBE R&R	1.4	1.4	1.4	1.4	1.4	1.4	1.4
64.3000	SPACER R&R	0.7	0.7	0.7	0.7	0.7	0.7	0.7
64.3100	ROD END R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
64.3200	ROD END BUSHING R&R	0.7	0.7	0.7	0.7	0.7	0.7	0.7
64.3250	FITTING/O-RING/OIL LEAK	0.5	0.5	0.5	0.5	0.5	0.5	0.5
64.3990	CYLINDER MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
64.7000	CYLINDER ASSEMBLY RESEAL INCL. R&R (ONE)	1.3	1.3	1.3	1.3	1.3	1.3	1.3
64.7100	CYLINDER ASSEMBLY RESEAL INCL. R&R (BOTH)	2.3	2.3	2.3	2.3	2.3	2.3	2.3

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

65.POWER STEERING CYLINDER

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
65.1000	CYLINDER ASSEMBLE R&R	1.5	1.5	1.5	1.5	1.5	2.0	2.0
65.2000	CYLINDER ROD R&R	1.7	1.7	1.7	1.7	1.7	1.7	1.7
65.2100	CYLINDER GLAND HEAD R&R	1.7	1.7	1.7	1.7	1.7	1.7	1.7
65.3000	FITTING/O-RING R&R	0.8	0.8	0.8	0.8	0.8	0.8	0.8
65.3990	CYLINDER MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65.7000	CYLINDER RESEAL INCL. R&R	1.9	1.9	1.9	1.9	1.9	1.9	1.9
65.7100	BROKEN OR LOOSE BOLTS REPAIR	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

66. HYDRAULIC SYSTEM

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
66.2000	STRAINER R&R	0.9	0.9	0.9	0.9	0.9	0.9	0.9
66.2100	RETURN FILTER R&R	0.8	0.8	0.8	0.8	0.8	0.8	0.8
66.3000	MAIN HYDRAULIC PIPING R&R	1.0	1.0	1.0	1.0	1.0	1.0	1.0
66.3050	STEERING HOSE R&R	0.9	0.9	0.9	0.9	0.9	0.9	0.9
66.3060	LOOSE HOSE/LEAKING FITTING OR CLAMPS	0.5	0.5	0.5	0.5	0.5	0.5	0.5
66.3100	TILT PIPING R&R	0.8	0.8	0.8	0.8	0.8	0.8	0.8
66.3150	TILT HOSE R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
66.3200	POWER STEERING HOSE R&R	0.8	0.8	0.8	0.8	0.8	0.8	0.8
66.3210	POWER STEERING HOSE LEAK	0.5	0.5	0.5	0.5	0.5	0.5	0.5
66.3260	HYDRAULIC HOSE R&R	0.8	0.8	0.8	0.8	0.8	0.8	0.8
66.3400	FITTING/O-RING LEAK R&R	0.8	0.8	0.8	0.8	0.8	0.8	0.8
66.3450	RETURN HOSE (MAST)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
66.3500	SUCTION HOSE R&R	1.2	1.2	1.2	1.2	1.2	1.2	1.2
66.3550	BREATHER R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
66.3600	DRAIN PLUG R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
66.3990	HYDRAULIC MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
66.6000	CONTAMINATION	1.0	1.0	1.0	1.0	1.0	1.0	1.0
66.7500	PRESSURE TESTING	0.5	0.5	0.5	0.5	0.5	0.5	0.5

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

72. MAST

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
72.1000	MAST ASSEMBLY R&R	1.5	1.5	1.5	1.5	1.5	1.5	1.5
72.1010	FRONT LIFT CYLINDER R&R	1.1	1.1	1.3	1.3	1.1	1.1	1.1
72.1020	REAR CYLINDER R&R	1.5	1.6	2.1	2.1	1.5	1.6	1.5
72.1050	RAIL R&R (2 STAGE)	2.8	2.8	2.9	2.9	2.9	2.8	2.8
72.1100	RAIL R&R (3 STAGE)	3.7	3.7	3.9	3.9	3.9	3.7	3.7
72.2000	HOSE WHEEL R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
72.2100	CHAIN WHEEL R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
72.2200	CHAIN R&R (ONE)	0.6	0.6	0.6	0.6	0.6	0.6	0.6
72.2250	CHAIN R&R (BOTH)	1.1	1.1	1.1	1.1	1.1	1.1	1.1
72.2300	CARRIAGE R&R	1.0	1.0	1.0	1.0	1.0	1.0	1.0
72.2400	CARRIAGE ROLLERS R&R	1.5	1.5	1.5	1.5	1.5	1.5	1.5
72.2500	CARRIAGE SIDE ROLLERS R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
72.2600	CROSS HEAD R&R	1.0	1.0	1.0	1.0	1.0	1.0	1.0
72.3000	WEAR STRIP R&R	2.0	2.0	2.5	2.5	2.5	2.0	2.0
72.3010	DOWN SAFETY VALVE R&R	1.0	1.0	1.0	1.0	1.0	1.0	1.0
72.3050	HOIST CYLINDER FITTING/O-RING IL LEAK	0.8	0.8	0.8	0.8	0.8	0.8	0.8
72.3100	PIPE ASSEMBLY R&R	0.8	0.8	0.8	0.8	0.8	0.8	0.8
72.3400	CUSHION RETURN R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
72.3500	BACKREST R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
72.3750	RETURN HOSE R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
72.3850	TRUNION CAP R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
72.3900	TRUNION BUSHING R&R	1.8	1.8	1.8	1.8	1.8	1.8	1.8
72.3990	MAST MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
72.7010	FREELIFT CYLINDER RESEAL INCL. R&R (ONE)	2.0	2.0	2.2	2.2	2.0	2.0	2.0
72.7040	FREELIFT CYLINDER RESEAL INCL. R&R (BOTH)	3.5	3.5	3.5	3.5	3.5	3.5	3.5
72.7050	REAR CYLINDER RESEAL	2.5	2.5	2.7	2.7	2.5	2.5	2.5
72.7100	SIDE ROLLER ADJUST	0.5	0.5	0.5	0.5	0.5	0.5	0.5
72.7150	CYLINDER GLAND HEAD RESEAL	1.3	1.3	1.3	1.3	1.3	1.3	1.3

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

93. FORKS

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
93.3600	FORKS R&R (BOTH)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
93.3700	FORK PIN R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
93.3990	FORK MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ELECTRIC/GAS/LPG/DIESEL SIT DOWN TRUCKS

94. ATTACHMENTS

PROB.		C/P 30- 35	C/P 40- 60	C/P 80- 100	P 150 155	ET 30- 35	E 30- 35	E 40- 60
CODE	OPERATION DESCRIPTION	TIME	TIME	TIME	TIME	TIME	TIME	TIME
94.3990	FORK MISC.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
94.4000	SIDESHIFTE HOSE R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5
94.4010	INTERNAL HOSE TAKE UP GUIDE ROLLERS R&R	0.5	0.5	0.5	0.5	0.5	0.5	0.5



Kalmar AC, Inc.
14481 Lochridge Blvd., Bldg 2
Covington, Georgia 30014

REPAIR TIME SCHEDULE
Internal Combustion

This repair labor guide pertains to Liftking straight mast Forklift trucks.
The number of labor hours assigned to each job is a multiplying factor for your warranty labor rate. The number of hours shown is the average length of time taken by Liftking servicemen. Many of these times have been verified and/or influenced by many dealer servicemen. If your time to complete a task varies significantly from the specified time, report the variance separately and describe the circumstances which may have caused the variance
The time allowed to complete a job includes normal troubleshooting and testing procedures. Tasks which are incidental to a service job should be considered to be included in the main job even if the incidental task is not specifically listed.

DESCRIPTION	M Series	P Series	K Series	TMF
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Mast and Carriage All times are divided into tenths of an hour Example 0.1 = 6 minutes

Forks Without Fork Positioners R & R	0.4	0.4	1.0	0.3
Forks With Fork Positioners R & R	1.0	1.0	1.5	N/A
Carriage Assembly R & R Without Fork Positioners	0.3	0.3	0.7	0.3
Carriage Assembly R & R With Fork Positioners	0.6	0.6	1.4	N/A
Carriage Bearings (4) R & R	0.5	0.5	1.5	0.5
Carriage Thrust Bearings (2) R & R	0.5	0.5	1.3	0.4
Fork Positioning Chain R & R	0.5	0.5	0.5	N/A
Fork Positioning Sprocket	0.5	0.5	0.5	N/A
Mast Assembly 2 Stage R & R	1.0	1.0	2.0	1.0
Mast Assembly 3 Stage R & R	1.0	1.0	2.0	N/A
Mast Chain R & R each	0.5	0.5	0.7	0.5
Mast Chain Roller R & R each	1.0	1.0	1.0	0.5
Chain Bolt R & R each	0.5	0.5	0.7	0.5
Chain Adjustment	0.5	0.5	0.5	0.5
Mast Bearings (4) 2 Stage R & R	2.0	2.0	2.5	2.0
Mast Bearings (8) 3 Stage R & R	4.0	4.0	4.0	N/A
Hose Reel R & R	1.0	1.0	1.0	N/A
Lift Cylinder 2 Stage Single Cylinder R & R	1.0	1.0	1.0	0.5
Lift Cylinder 2 Stage Clearview R & R each	0.5	0.5	0.5	N/A
Lift Cylinder 3 Stage Single Cylinder R & R	0.5	0.5	0.5	N/A
Lift Cylinder 3 Stage Clearview R & R each	1.5	1.5	3.0	N/A
Free Lift Cylinder R & R	1.0	1.0	2.0	N/A
Tilt Cylinder R & R each	1.0	1.0	1.5	0.5
Side Shift Cylinder R & R	0.5	0.5	0.5	0.5
Fork Positioning Cylinder R & R each	0.5	0.5	0.5	N/A

Note all engine Warranty repair must be completed by an authorized dealer of the EngineOEM
Engine

Engine Assembly R & R Perkins	8.0	6.5	6.5	6.0
Engine Assembly R & R Cummins	8.0	6.5	6.5	N/A
Engine Mounting Rubber change (both sides)	1.5	1.5	1.5	1.5

Air Induction and Exhaust System

Air Cleaner Assembly R & R	0.5	0.5	0.5	0.5
Air Intake Pipe with Elbows	0.3	0.3	0.3	0.3
Tailpipe on Engine Cover R & R	0.3	0.3	0.3	0.3
Muffler Assembly R & R	0.3	0.3	0.3	0.3

DESCRIPTION	M Series	P Series	K Series	TMF
Fuel System				
All times are divided into tenths of an hour Example 0.1 = 6 minutes				
Fuel Tank Assembly R & R	1.5	1.5	1.5	1.5
Fuel Tank Cap and Strainer R & R	0.2	0.2	0.2	0.2
Fuel Hose Tank to Water Separator R & R	0.3	0.3	0.3	0.3
Fuel Hose Water Separator to Fuel Feed Pump	0.3	0.3	0.3	0.3
Fuel Feed Pump R & R	0.4	0.4	0.4	0.4
Water Separator Assembly R & R	0.3	0.3	0.3	0.3
Fuel Filter Assembly	0.4	0.4	0.4	0.4
Accelerator Cable Assembly R & R	0.5	0.5	0.5	0.5
Accelerator Pedal Assembly R & R	0.5	0.5	0.5	0.5
Engine Shut-off Solenoid	0.3	0.3	0.3	0.3
Cooling System				
Radiator Assembly R & R including: Engine Hood R & R, Refilling with coolant, and Shroud R & R	2.0	2.0	2.0	2.0
Radiator pressure test	0.5	0.5	0.5	0.5
Pressure Cap change	0.1	0.1	0.1	0.1
Radiator Lower (outlet) Hose change	0.5	0.5	0.5	0.5
Radiator Upper (inlet) Hose change	0.3	0.3	0.3	0.3
Bypass Hose change	0.4	0.4	0.4	0.4
Thermostat change. Including refilling with coolant	0.5	0.5	0.5	0.5
Fan R & R or change	0.5	0.5	0.5	0.5
Fan Belt change	0.3	0.3	0.3	0.3
Radiator Shroud change	0.3	0.3	0.3	0.3
Heater Hose change Including refilling with coolant	1.0	1.0	1.0	1.0
Transmission Cooler R & R Including oil refill	0.8	0.8	0.8	0.8
Electrical System				
Positive Battery Cable R & R	0.2	0.2	0.2	0.2
Negative Battery Cable R & R	0.2	0.2	0.2	0.2
Battery dismounting/mounting R & R	0.3	0.3	0.3	0.3
Starter Motor R & R	0.5	0.5	0.5	0.5
Alternator R & R	0.5	0.5	0.5	0.5
Key/Switch (Ignition Switch) change	1.0	1.0	1.0	1.0
Brake Stop Light Switch change	0.2	0.2	0.2	0.2
Headlamp Switch change	0.2	0.2	0.2	0.2
Battery Disconnect Switch change	0.2	0.2	0.2	0.2
Headlamp Assembly Lens/Bulb change (each side)	0.2	0.2	0.2	0.2
Rear Working Lamp Assembly Lens/Bulb change	0.2	0.2	0.2	0.2
Front Turn Signal or Combination Lamp Assembly Lens/Bulb change (each side)	0.2	0.2	0.2	0.2
Rear Turn Signal Lamp Assembly Lens/Bulb change (each side)	0.2	0.2	0.2	0.2
Tail/Stop or Rear Combination Lamp Assembly Lens/Bulb change (each side)	0.2	0.2	0.2	0.2
Wire Harness change - on chassis	1.0	1.0	1.0	1.0

DESCRIPTION	M Series	P Series	K Series	TMF
Torque Converter/Transmission				
All times are divided into tenths of an hour Example 0.1 = 6 minutes				
Transmission Assy R & R	5.0	4.0	4.0	N/A
Torque Converter R & R	5.5	4.5	4.5	N/A
Drive Plate R & R	5.5	4.5	4.5	N/A
Flywheel R & R	6.0	5.0	5.0	N/A
Complete rebuild 2WD	11.25	N/A	12.5	N/A
Complete rebuild 4WD	13.25	14.0	N/A	N/A
Drain and Refill Transmission including filter change	0.75	1.0	1.0	N/A
Charge Pump and Seals R & R	4.25	N/A	N/A	N/A
Dipstick and tube R & R	0.5	0.2	0.2	N/A
Pressure regulated valve and charging pump R & R	N/A	1.5	1.5	N/A
Converter relief valve R & R plus pressure test	1.0	N/A	N/A	N/A
Control Valve Assembly R & R	N/A	1.5	1.5	N/A
F & R solenoid and reseal	1.0	N/A	N/A	N/A
Pressure Maintenance Valve Assy. R & R	1.0	N/A	N/A	N/A
Pressure Maintenance Valve clean	0.5	N/A	N/A	N/A
Hose Transmission to cooler R & R	1.0	1.0	1.0	N/A
Hose Cooler to Transmission	1.0	1.0	1.0	N/A
Transmission Rubber Mounts R & R	1.0	1.0	1.0	N/A
Transmission Oil Pressure Test	1.0	1.0	1.0	N/A
Rear oil seal R & R	1.0	1.0	1.0	N/A
Gear lever assy and gasket R & R	1.5	N/A	N/A	N/A
4WD Solenoid R & R	.75	N/A	N/A	N/A
4WD Hyd Clutch Rebuild	3.5	N/A	N/A	N/A
4WD selector seal	5	N/A	N/A	N/A
Stall Test RPM Measurement	.5	.5	.5	N/A
Wheels and Tires				
Front Wheel Assembly R & R (each)	0.5	0.5	1.0	0.5
Front Tire change (each side), including Front Wheel Assembly R & R	1.0	1.0	1.5	1.0
Rear Wheel Assembly R & R (each)	0.5	0.5	0.5	0.5
Rear Tire change (each side), including Rear Wheel Assembly R & R	1.0	1.0	1.0	1.0
Wheel Studs R & R (1 pc.)	0.3	0.3	0.3	0.3
Wheel Nut retightening (all wheels)	0.4	0.4	0.4	0.3
Front Drive Axle and Drive Line (Non Steering)				
Front Drive Axle R & R	4.0	N/A	6.0	N/A
Front Drive Shaft Assembly R & R	0.5	N/A	0.5	N/A
Drive Shaft Universal Joint R & R each	0.3	N/A	0.3	N/A
Front Drive Axle Overhaul including R & R	12.5	N/A	16.5	N/A
Drain and Refill	0.5	N/A	0.5	N/A
Pinion oil seal R & R	1.0	N/A	1.0	N/A
Planetary Gear Assembly R & R (each side), including: Wheel Assembly	1.5	N/A	2.5	N/A
Axle Shaft R & R (each side)	1.8	N/A	2.0	N/A
Wheel Hub R & R (each side) including Bearings, Seals	3.0	N/A	3.5	N/A
Differential Assy. R & R	7.0	N/A	8.0	N/A

DESCRIPTION	M Series	P Series	K Series	TMF
Hydraulic System)				
All times are divided into tenths of an hour Example 0.1 = 6 minutes				
Hydraulic Pump (main) Assembly R & R	1.0	1.0	1.0	1.0
Control Valve Assembly R & R – 3 Block Control Valve	1.6	1.6	1.6	N/A
Control Valve Assembly R & R – 4 Block Control Valve	1.7	1.7	1.7	1.7
Control Valve Assembly R & R – 5 Block Control Valve	1.8	1.8	1.8	N/A
Control Valve Assembly overhaul – 3 Block Control Valve, excl. R & R	1.0	1.0	1.0	N/A
Control Valve Assembly overhaul – 4 Block Control Valve, excl. R & R	1.1	1.1	1.1	1.1
Control Valve Assembly overhaul – 5 Block Control Valve, excl. R & R	1.2	1.2	1.2	N/A
Main Relief Valve Assembly R & R incl. Oil Pressure adjustment	0.8	0.8	0.8	0.8
Hydraulic Tank Filler Cap change	0.3	0.3	0.3	0.3
Hydraulic Tank Suction Strainer cleaning or change, including: Hydraulic Tank Cover R & R or change	1.0	1.0	1.0	1.0
Hydraulic Oil change, including: Oil Screen cleaning or change and Return Filter Element change	1.5	1.5	1.5	1.5
Suction Hose change – between tank and pump	0.3	0.3	0.3	0.3
Return Hose change – between control valve, filter and tank (2 pc)	0.5	0.5	0.5	0.5
Hose Reel R & R	1.0	1.0	1.0	N/A
Hydraulic Manifold R & R	N/A	N/A	N/A	2.0
Hydraulic Motors R & R	N/A	N/A	N/A	2.5
Hydraulic Cylinders				
Lift Cylinder Overhaul	2.5	3.0	3.0	2.5
Free Lift Cylinder Overhaul	3.0	N/A	N/A	N/A
Tilt Cylinder Overhaul	1.5	1.5	2.0	1.5
Sideshift Cylinder Overhaul	1.0	1.0	1.0	1.0
Fork Positioning Cylinder Overhaul	1.0	1.0	1.0	N/A
Oscillation Cylinder Overhaul	1.0	1.0	1.0	1.0
Extension Cylinder R & R	N/A	N/A	N/A	1.0
Extension Cylinder Overhaul	N/A	N/A	N/A	1.0
Outrigger Cylinder R & R	N/A	N/A	N/A	1.0
Outrigger Cylinder Overhaul	N/A	N/A	N/A	1.0

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