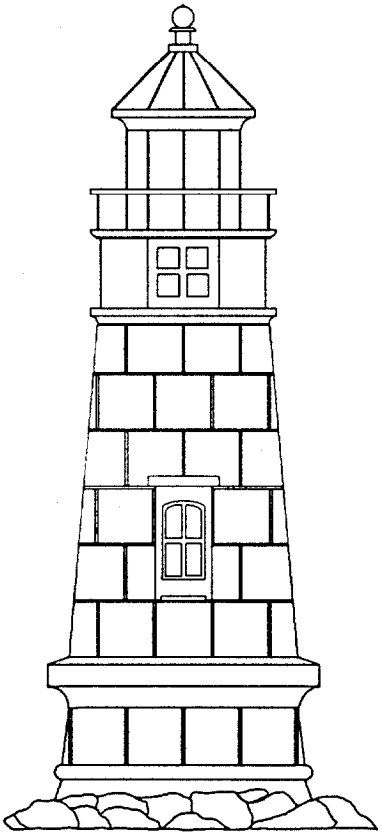
U.S. Department
of Transportation

**United States
Coast Guard**

Lighthouse Maintenance Management Manual



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U.S. Department of Transportation

United States Coast Guard

Commandant (G-ECV)
United States Coast Guard

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COMMANDANT INSTRUCTION M16500.6A

Subj: LIGHTHOUSE MAINTENANCE MANAGEMENT MANUAL

1. PURPOSE. This manual provides information, principles, policies, and requirements for district commanders, group commanders, and aids to navigation teams to maintain lighthouses, which are part of the Short Range Aids to Navigation Program.

2. ACTION. Area and district commanders and commanders of maintenance and logistics commands, shall ensure compliance with the provisions of this instruction.

3. DIRECTIVES AFFECTED. COMDTINST M16500.6 is cancelled.

4. DISCUSSION. This directive constitutes a reprint of the Lighthouse Maintenance Management Manual, revised to reflect the new organizational relationships and responsibilities associated with the establishment of the maintenance and logistics commands and the civil engineering units.

5. REPORTS AND FORMS. The reports required by this manual instruction are listed in Chapter 2, paragraph H. Forms may be ordered from Coast Guard Supply Center Baltimore in accordance with the Catalog of Forms, COMDTINST M5213.6 (series).

P. A. BUNCH
Chief, Office of Engineering,
Logistics and Development

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CHAPTER 1 GENERAL

A. Purpose. The purpose of this manual is to support high quality lighthouse maintenance. Actions directed herein should:

1. Clarify the unattended lighthouse maintenance problem at the maintainer's level.

2. Clarify responsibility, organizational relationships, and lines of communication for maintaining unattended lighthouses.

3. Provide policy for the lighthouse preventive maintenance system.

4. Provide policy and guidance to those who maintain lighthouses and the commands that support them.

5. Simultaneously provide ideas for maintaining large navigational buoys (LNB's).

B. Background. There is persistent concern about the deteriorated conditions of automated and unattended lighthouses. Inspections conducted by Coast Guard Area staffs and those of the Secretary and the General Accounting Office have frequently cited inadequate maintenance of aids, infrequent inspections, lack of maintenance management, and ineffectually organized maintenance forces. In addition there have been Congressional inquiries alleging inadequate maintenance of automated lighthouses. Comments from the public and direct observations by senior Coast Guard officials confirm the deteriorated appearances and conditions of many lighthouses. Neglected structural preservation is too often accompanied by inadequately maintained signal, power, and remote control/monitor equipment.

C. Discussion. Though unattended lighthouse deterioration has many causes, all of them certainly cannot be addressed here. Of primary concern in this manual is the fact that maintenance of unattended lighthouses is unique. It not only differs from ship and staffed facilities where resident personnel are in daily contact with their equipment, but it is considerably more complex than most routine 12 volt system aid to navigation maintenance. Thus primary servicing units often cannot handle it alone. Frequently, higher level maintenance forces with greater capability are needed. Maintenance tasks at lighthouses vary in complexity and are typically performed by several different organizational elements, e.g. ANT's, ESM's, groups, bases, district(oan), MLC(tst), CEU's and commercial contractors.

If various responsibilities are not clearly established and carefully coordinated, as has frequently been the case, there are uncertainties regarding the boundaries of an individual unit's responsibility and gaps in the total servicing effort. The main purpose of this manual is to more fully define the lighthouse maintenance situation and to specify maintenance management procedures that will help overcome the problems. To help appreciate the unique nature of lighthouse maintenance, the following definitions are important.

D. Overall Policy. Each district commander and MLC shall promulgate specific instructions that supplement and apply the requirements and general maintenance principles of this manual. They should be tailored to the specific organization and capabilities of maintenance forces at each level within the region.

E. Lighthouse Maintenance Elements. Lighthouses are Coast Guard shore facilities which are part of the Short Range Aids to Navigation System of the United States. The term "lighthouse" means important aids to navigation that are equipped with most of the following: 120V AC power, sound signals, 1000W lights, emergency 12 volt signals, battery chargers, signal controllers, power system controllers, electronic monitoring systems and radiobeacons. Included are significant structures or buildings that house this equipment. Also included is the 12 volt solar power lighthouse systems being introduced into the Coast Guard. Many were formerly staffed. Large navigational buoys can be considered effectively to be "floating lighthouses". While some lighthouses have less complex hardware (i.e. 12 volt systems), this manual deals with maintaining the more complex systems described above. Lighthouses, although a small percentage of shore facilities, are among the most difficult to maintain because most are unattended and/or remote and are exposed to the hostile marine environment. Managing lighthouse maintenance involves all of the elements discussed below.

1. Preventive Maintenance. Preventive Maintenance (PM) consists of routine and scheduled inspections, tests, adjustments, cleaning, lubrication, and preservation to maintain equipment performance at design standards and to keep buildings from deteriorating. These may be quarterly, semi-annual or annual actions. Typical examples of preventive maintenance are given under the definition of organizational level maintenance, though not all PM is necessarily carried out by that level.

2. Corrective Maintenance. Corrective maintenance (CM) consists of unscheduled action to repair and restore equipment to its normal operation as quickly as possible following an operational failure or following a fault or deficiency discovered by inspection. Depending on the nature of the problem, corrective maintenance can be accomplished by any of the three maintenance levels described below.

3. Primary Servicing Unit. This is the unit which is assigned primary organizational level maintenance responsibility in the Aid Assignment List for one or more lighthouses. Common primary servicing units are ANT's, WLB's, WLM's, and WLI's. For purposes of this manual, primary servicing units do most routine maintenance (PM) but can also carry out CM in cases where it is within their capability. It should be understood that lighthouses will also require higher level maintenance which is beyond the primary servicing unit's capability.

4. Servicing/Maintenance Manager (Group Commander). This is the command having "ownership" of the lighthouse. It usually has operational control over the primary servicing unit. Unless specifically stated otherwise by the district commander, this is the commander of the group where the lighthouse is located. Responsibilities are to: support primary servicing units fully; ensure that group or higher level maintenance forces are called in as needed for work that is beyond the capability of lighthouse primary servicing units; maintain a master Shore Station Maintenance Request (SSMR) file in support of this function; ensure primary servicing units are properly equipped and staffed with qualified personnel; and inspect lighthouses for proper maintenance.

5. MLC Engineering Staff. The highest level of staff supervision over all levels of lighthouse maintenance, repair, and alteration. Electronics Engineering support is provided at the Maintenance and Logistics Command level by MLC(tst). Facility Engineering support is provided by Civil Engineering Units (CEU). Main responsibilities are to: be actively aware of the general condition of lighthouses through SSMR, Casualty Reports (CASREP)s, inspections, and other means; initiate and supervise higher level maintenance, repairs, or alteration beyond the servicing/maintenance manager's capability; and inspect lighthouses for proper maintenance by all levels.

6. Three Levels of Maintenance. Lighthouse maintenance is inherently stratified, as is maintenance on other facilities and vessels. Simple tasks are performed at the lowest unit level and more complex tasks are performed at one of the higher levels having more capability. However, in view of the lack of resident personnel it is especially important to understand the three level system for effective maintenance of unattended lighthouses.

   a. Organizational Level Maintenance (Usually Done by Primary Servicing Unit). This lowest level of maintenance is the least complex and is generally defined for ships and shore facilities as that which is the responsibility of and performed by the resident personnel of the operational unit on their own equipment. For unattended lighthouses and LNB's it consists primarily, though not exclusively, of scheduled PM, most of which should be carried out during routine quarterly visits by the primary servicing unit. This includes inspection of all equipment at the aid, servicing, lubricating, minor repair, parts replacement, general housekeeping, painting, system operational testing (i.e. operate all equipment, test automatic devices, test safety devices, adjusting voltage and frequency as necessary) and minor calibration (for example: on ACMS, transmission tone, sensitivity and audio; on sound signals, voltage and current adjustments). Organizational maintenance is usually handled exclusively by the primary servicing unit for the aid such that there is no significant demand on other commands or facilities. However, due to the inherent limitations of this lowest level unit, more complex maintenance must be accomplished by higher level forces. Hence, it is incumbent upon organizational level maintainers to effectively communicate the condition of their lights (via SSMR and PMS feedback) up the maintenance chain to the group and CEU levels (See Chapter 2-E and 2-H). Without good documentation for a remote site there is no quick and easy way to ascertain material condition to plan future maintenance, especially higher level work by personnel who do not routinely visit the light.

      (1) Staffing Guidelines. On automated lighthouses, this lowest level maintenance must be carried out by a special team, which is usually attached to the group.

It is imperative that this team be constituted and administered according to Chapter 2-D. In most cases it will be the primary servicing unit, possibly supplemented with other group technicians, depending on the complexity of the equipment at the light and the nature of the primary servicing unit.

(2) Facilities Needed. Meters, tech manuals, PMS cards, various tools, transportation, and cleaning/painting equipment.

(3) Funding Guidelines. All preventive maintenance and some corrective maintenance performed by this lowest level is funded by the routine Allotment Fund Code, AFC-30 (operations and maintenance).

b. Intermediate Level Maintenance (Usually done by Group). This is maintenance of a less routine nature, usually performed in support of lowest level units who perform organizational type maintenance. Generally it is the more difficult or extensive maintenance or repair performed on equipment or property while it is still in place or in operation in the field. Examples are: replacement of major components (engine, fog signal, controller), repair work involving lengthy troubleshooting on system or components, engine decarbonizing, calibration of radiobeacons, concrete repair, minor structural repair, welding repair, replacement of doors or windows, major painting, technical advice, and specification preparation and contract administration for most of the above.

(1) Staffing Guidelines. Intermediate level maintainers most commonly consist of group engineering staff and MLC(tst) and CEUs; they may also be personnel who are with contractors, buoy tenders and in some cases CG industrial facilities. There is a gray area between the organizational and intermediate levels of maintenance that varies with the capabilities of the primary servicing unit (i.e. equipment available, experience and training of technicians, workload, etc). Because group commanders are considered to be the servicing/maintenance managers of lighthouses, they should take the lead in planning this maintenance.

If they have insufficient resources to carry it out themselves, they are still in the best position within the CG organization to initiate comprehensive requests for higher level assistance. To effectively do so they must have first hand knowledge of lighthouse condition through inspections and making sure that SSMR's and PMS feedback cards are filled out. (See Sections 2-B and 2-D).

(2) Funding Guidelines. Unit AFC-30 will cover some of this work, but frequently Engineering Support funding will be needed (Shore Unit program and A/N equipment: AFC-43 from the CEU; and electronic equipment: AFC-42 from MLC(tst)). Local guidance should be consulted to determine any imitations on expending money and/or work hours.

c. Depot Level Maintenance. This maintenance is significantly beyond group resources and generally exceeds AFC-30 funding criteria. It is performed by designated major shore commands having the capability to do major overhaul or repair of structures, equipment, assemblies, sub-assemblies, or parts. Within the Coast Guard, depot level maintenance for lighthouse equipment is accomplished by bases, support centers, depots, the Yard, the Supply Center, and EECEN. Outside the Coast Guard it can be performed by equipment manufacturers or other facilities approved by the MLC(tst) or CEU's. Depot maintenance facilities maintain large inventories of replacement parts and equipment using extensive facilities and a wide variety of highly skilled technicians and specialists. Depot level maintenance schemes for lighthouse gear are generally established beforehand at a high engineering administrative level in the Coast Guard. Various instructions explain the procedures for operational maintainers to have work accomplished (see enclosure (1)). However, initiating requests for lighthouse depot level maintenance services is a direct responsibility of the group commander, with assistance from MLC(tst) or CEU's who are responsible for overseeing administration and proper completion of the work. All depot level maintenance to the structure will be accomplished using AFC-43 funds. A typical example of depot level maintenance is the centralized repair of XB designated printed circuit boards by SUPCEN, Baltimore.

Another is the overhaul of a lighthouse diesel engine by a base or industrial division of a support center. For LNB's, dockside availabilities would fall in this category.

d. Specific maintenance tasks carried out an any particular lighthouse may not fall exactly into the breakdown presented above: this is only intended to illustrate the three level concept for complex aids in general. For local situations MLC(tst), CEUs and groups must jointly plan their lighthouse maintenance scheme, and it should be in written form through Standard Operating Procedures (SOP) and maintenance allocation charts (MAC) (see Section 2-A).

7. Aid Assignment Lists. Due to the large number of aids to navigation in a district, it is necessary to specify which units must service each one of them. The district commander assigns this responsibility in the Aid to Navigation Annex to the District SOP, Annex K, the Aids to Navigation Assignment List or individual Operation Orders. These documents designate the primary and secondary servicing units which are to carry out organizational level maintenance and emergency repairs. The majority of aids covered in the Aid Assignment List are powered with 12 volt systems, for which the primary servicing unit can normally accomplish all on-site maintenance without higher level assistance.

8. Maintenance Allocation Charts. Maintenance allocation charts are intended to cover more than primary servicing unit (or organizational level) maintenance, and therefore they supplement aid assignment lists. The need for maintenance allocation charts stems from the fact that lighthouses are significantly more complex than most aids (e.g. buoys), and thus more attention should be devoted to spelling out the tri-level maintenance responsibility for their subsystems and structures.

9. Secondary Servicing Unit. This is a unit which is not assigned primary organizational level maintenance responsibility in the Aid Assignment List but services on an emergency basis. Secondary servicing units may also provide transportation or other available services for AtoN personnel or cargo as a resource of opportunity. Included are WPB's, WYTM's, WYTL's, WLIC's, stations, or the group itself.

CHAPTER 2: LIGHTHOUSE MAINTENANCE POLICES AND REQUIREMENTS

A. Maintenance Responsibility.

1. General. Maintenance management responsibilities for each lighthouse shall be specifically assigned to group commanders. Where possible they shall delegate execution of this responsibility only to units having billets possessing the necessary qualification codes.

2. Maintenance Allocation Charts (MAC). To cover higher level maintenance not normally addressed in aid assignment lists, each group, in conjunction with district (oan), CEU's and MLC(tst) shall develop and promulgate Maintenance Allocation Charts (MAC) defining, assigning, and authorizing organizational, intermediate, and depot maintenance level responsibilities for each lighthouse, staffed and unattended. This maintenance allocation assignment shall be spelled out in the SOP, Annex K and Annex Q, as applicable. Since lighthouse maintenance involves structure, grounds, electronic, electrical and mechanical equipment and other elements, maintenance responsibilities for these major sub-systems shall be separately identified.

B. General Maintenance Policies for Lighthouses.

1. Perform preventive and corrective maintenance actions at lowest maintenance level allowable under published district doctrine.

2. Accomplish repairs on site whenever feasible.

3. Work that is beyond the capability of the organizational maintenance activity should be referred to the next higher level of maintenance activity or the servicing/maintenance manager (i.e. group commander).

4. Lighthouse preventive and corrective maintenance shall be supervised at the level performed and analyzed (for completeness) at the next higher level, in accordance with Section 2-C-2.

5. Preventive and, in particular, corrective maintenance shall also be analyzed by districts for adequacy of personnel and equipment performance. The inspection requirements of Sections 2-C-2 and 2-C-3 apply.

6. Deficiencies in standard equipment design, quality or performance shall be reported to Commandant (G-ECV) via CEUs. Equipment shall not be modified at any maintenance level except when authorized and directed by AtoN Operation Request (CG-3213), field changes, or alteration orders.

C. Inspections.

1. Continuous. Routine inspections are generally carried out by primary servicing units during all scheduled and emergency service visits. These inspections are an integral part of unattended lighthouse maintenance. Deficiencies which cannot be repaired during these visits shall be reported to the group commander, who will arrange for remedial action by an appropriate higher level maintenance force. Provisions should be made to insure that every time an aid station is visited, for whatever reason, a multi-disciplinary team (see 2-D) of technicians is in attendance. Too much time, money, and energy is being wasted with the wrong person going to remote sites to correct root problems that are not always apparent from superficial symptoms.

2. Annual. Group commanders shall personally, whenever practical, conduct annual inspections of a sampling of unattended lighthouses. Group engineers and aid to navigation officers shall personally, whenever practical, conduct inspections of all other unattended lighthouses. MLC(tst) and CEUs shall furnish technical or inspection assistance upon request. In general inspections shall cover the condition of the structure, general cleanliness, and condition of all the installed equipment. Particular attention should be paid to routine structural preservation and maintenance. Also inspections shall verify that the requirements in this manual are being met. At least one member of the inspection staff shall have attended ANC-LT or be equally competent in evaluating the condition of installed signal, power, and control/monitor equipment. An important purpose of these inspections is to insure that the lighthouse primary servicing unit performance is appraised.

3. Biennial. Lighthouses shall be included in the biennial inspection schedule of MLC(tst) and CEUs. Besides inspecting for all items covered in annual inspections this inspection shall include a comprehensive structural and preservation evaluation. To ensure an effective system inspection, at least one member of the inspection

staff shall have attended ANC-LT or be equally competent in evaluating the condition of installed signal, power and control/monitor equipment.

D. Personnel. Group and district commanders should ensure that lighthouse maintainers are properly equipped and trained.

1. Skills. Maintenance of lighthouses is performed by military personnel having ET, EM, DC, BM and MK rates or their civilian equivalents. Training provided in ANC-LT as applicable, is necessary along with obtaining the appropriate qualification codes. See the Enlisted Qualifications Manual COMDTINST M1414.8.

2. Maintenance Teams. The variety of systems on unattended lighthouses results in concurrent maintenance visits by personnel with different skills (rates). In this situation the senior petty officer or appropriate civilian equivalent shall serve as the team leader. Some situations will require that he/she receive additional system maintenance training. This person must become sufficiently cross-trained in the various ratings to be able to supervise with confidence supported by the assignment of direct responsibility. In the ideal case team leader training should include ANC-LT; as a bare minimum, at least one team member should have this training. It is highly recommended that local commands assign team leaders to specific lighthouses to foster "pride of ownership."

E. Shore Station Maintenance Program (SSMP). Lighthouse maintenance and improvement falls under the provisions of the Civil Engineering Shore Station Maintenance Program (SSMP). Guidance and reference material to aid district commanders in execution of the SSMP is contained in the Civil Engineering Manual, COMDTINST M11000.11A. The Shore Station Maintenance Record (SSMR), Form CG-4094, serves to identify, quantify, specify, request and approve work which is beyond the capability of servicing units and which must be accomplished by higher maintenance levels.

F. Structural.

1. Lighthouse structural condition shall be maintained in a manner that will preserve the structure for its role as a support and shelter for signals and their related equipment. The structure itself generally serves as a day-mark and shall be maintained in an effective condition as advertised. Structures shall also be free

of safety hazards and present a proud appearance to the public. Registered historical structures shall be specially maintained to preserve their historical characteristics and appearance. Otherwise, every effort shall be made to reduce required maintenance by eliminating unnecessary structures or appurtenances and by using maintenance-free materials. Primary servicing units sometimes cannot handle structural maintenance and repair by themselves. In these cases, they should fully document the problem (via SSMR's; see 2-E) so that higher level maintenance forces can correct it. Some typical examples of structural maintenance tasks that may fall into this category are:

Element	Work
Brick/Stone structure	replacing missing bricks/ stones, repointing
Wooden structures	build, repair, remove paint
Steel towers	renew joints, replace weaker members, preservation coating
Foundations	repair cracks
Access openings	repair or replace doors and windows, install vandal proofing features
Ladders and railings	install, repair and replace

2. In contrast to routine structural work, neglected lighthouses require larger, more comprehensive efforts to improve their condition. To carry out this major refurbishment, many districts have effectively used buoy tenders. Commercial sources may also be convenient. The successful award of contracts often requires additional planning. For example, obtaining reasonable bids from commercial contracting services can be facilitated by grouping related work at several locations in one bid package. This allows the single contractor mobilization costs to be spread over as many lighthouses as possible. But it requires appropriate coordination and work consolidation efforts by all levels. Other innovative contracting techniques have been used not only to perform structural work but to identify it in the first place. For example, hiring an architect-engineer firm to assess the condition of a neglected lighthouse. These techniques could include historical preservation work.

G. Specific Guidance.

1. Emergency Repairs. Emergency repairs are corrective maintenance actions necessary to be completed in a short time period (usually a few days maximum) to restore operational capabilities or the advertised lighthouse signal characteristic. When the necessary work is complex enough so that the primary servicing unit cannot handle it, there should be straightforward and explicit Procedures to call in higher level maintenance crews on short notice. For example, CEUs shall employ continuing work orders with bases or open-ended service contracts with commercial contractors where necessary to meet these maintenance requirements. CASREPS (Casualty Reports), Situation Reports (SITREPS), and Casualty Corrected (CASCOR) messages shall be used to report and request assistance on emergency lighthouse repairs. Districts shall provide specially tailored instructions based on NWP-7 in Annex Y of the district SOP on reporting outages at lighthouses. Maintenance allocation charts (MAC's) can be of great value in presenting emergency repair plans and associated communications.

2. Repair Parts.

a. General Responsibility. An activity's maintenance effectiveness is closely linked to the spare parts support the activity is receiving. Repair parts and common hardware on hand must be those needed to correct failures experienced most frequently. As these items are exhausted they must be promptly replaced in anticipation of future needs. The responsibility for this lies at the district level and below. Commandant (G-ECV) furnishes spare parts only upon initial issue of standard equipment.

b. Material on Hand.

(1) This supply source is most important to lighthouse maintainers - unit stocks of expendable supplies and the authorized stocks of repair parts. Their immediate availability reduces downtime.

(2) Allowance Lists. District commanders shall ensure that allowance lists are established for equipment, spare parts, tools, and test instruments of maintenance units servicing

lighthouses. Most electronic equipment already has an Electronic Repair Parts Allowance List (ERPAL), prepared by Supply Center, Baltimore. For the remainder of electronic equipment as well as for all other non-electronic, electrical and mechanical equipment these lists must be prepared by MLC(tst) and CEU's. This can be done by using the information given in the A/N Manual-Technical M16500.3A Data Sheets on each piece of standard equipment, HQ furnished spare parts kits, technical manuals, and parts consumption histories. It is understood that the quantity and variety of parts stocked and their distribution may vary according to unique circumstances, such as unusual remoteness, and will account for other factors, such as the capabilities and facilities of the responsible maintenance forces. Changes in demand for parts should be accounted for with periodic updates to allowance lists.

c. Replenishment

(1) Replacement parts are available from the Supply Fund, APA stock systems or commercial sources. Refer to COMDTINST M16500.3A for general guidance and to equipment technical manuals for specifics on procuring replacement parts for standard G-ECV equipment.

d. Other Sources of Supply

(1) Direct exchange. Direct exchange of certain designated supplies is authorized to simplify and speed up delivery of replacement repair parts. Direct exchange is usually limited to repairable items (such as XB designated circuit cards and Lister engines) which lend themselves to repair or rebuild and which higher maintenance level activities wish to control. These activities will prepare a list of items available on direct exchange basis and make distribution to all users.

(2) Cannibalization. CEUs shall be consulted for authority to cannibalize uneconomically repairable equipment. Often a damaged engine, for example, can be a gold mine of serviceable,

hard-to-get parts. Cannibalization should be authorized only in special circumstances as defined in district SOP.

(3) Fabrication. This source of repair parts is not necessarily confined to the depot level. Maintenance personnel at lower level activities may have to fabricate certain parts from stock materials (e.g. tubing, cable, wiring, sheet metal, etc.). However, care should be taken to ensure that standardization of equipment design and configuration is maintained.

e. Common Abuses.

(1) A build up in stocks of parts and supplies in excess of the organization needs creates supply, storage and management problems. Moreover, other units which do need the items are denied access.

(2) Obtaining parts or assemblies not authorized for issue to a lower maintenance level can result in an unduly heavy workload on maintenance people. The price is neglect of the maintenance which should be done and possible damage to equipment due to use of improper tools or installation procedures.

3. Equipment Status Display. On-site equipment status displays are required for all category I through III lighthouses (see COMDTINST M16500.8). They shall be prepared by CEUs and used by maintenance personnel for rapid identification of equipment status upon arrival. They also ensure equipment is left in the proper mode for automatic operation prior to departure. Equipment status displays shall contain the following:

a. A listing of all installed signal, power, and control/monitor equipment with space for marking the operational status of each equipment.

b. Space for listing deferred preventive or corrective maintenance and unusual equipment conditions such as bypassed or inoperative protective devices.

c. A list of all equipment mode selections or settings necessary to be made prior to site departure for fully automatic operation.

d. Space for identifying personnel and the date of the last maintenance visit.

4. Technical Manual Library. Each lighthouse shall have a library consisting of one technical manual for all installed equipment. Refer to COMDTINST M16500.3 for the availability/ordering of technical manuals for Commandant (G-ECV) standard equipment. A suitable cabinet shall be provided by the CEU's for the security and protection of the technical manuals at each individual lighthouse site. A list of required manuals shall be prepared by CEU's who shall provide technical manuals for all non-standard equipment installed at each individual lighthouse where non-standard equipment exists. Any unit assigned responsibility by the Maintenance Allocation Chart (MAC) shall also have a technical manual library. It shall contain technical manuals for all equipment assigned. Only a single manual copy is required for identical equipment installed in more than one lighthouse. Revisions to technical manuals for all standard equipment will be issued by Commandant (G-ECV) or(G-TES) to districts for further distribution. MLC(tst) and CEUs shall maintain up to date copies of all standard equipment technical manuals and recommend changes and improvements to Commandant (G-ECV) when necessary. Other related publications are listed in enclosure (1).

5. Equipment Maintenance Log Book. An equipment maintenance log book shall be maintained on site for Category I through III automated lighthouses. The purpose of the log book is to provide maintenance personnel with consolidated and/or additional information from what is written on the equipment status display. The maintenance team leader shall review previous log book entries before starting maintenance tasks. Entries shall include deferred preventive and corrective maintenance tasks, field changes, equipment installation and deinstallation, equipment repair, readings taken during PM, and other helpful information for maintenance personnel making the next visit. Entries shall cover all installed power, signal, and control/monitor equipment along with structural items. An entry is required for each lighthouse visit. Entries shall be entered in ball point pen, signed and dated by the maintenance team leader.

6. Drawings for Maintenance. All lighthouses having Commandant (G-ECV) standard equipment in standard volume configurations either built into existing lighthouses or

in standard shelter configurations shall be furnished a set of troubleshooting drawings. These drawings from Commandant (G-ECV) are the 130100, 130400 and 130700 series standard drawings. Drawings shall be nominal 12" X 18" size individually laminated in plastic. Drawings used for this purpose shall be made by CEU's from the cited Commandant (G-ECV) drawing series which is furnished in 35mm aperture cards and revised by CEUs to accurately reflect the "as built" conditions. The drawing set shall be posted at the location shown on the standard layout drawing. An identical set of drawings shall be provided to the primary servicing unit.
All non-standard lighthouses and their primary servicing units shall be provided a set of maintenance drawings developed by CEU's. As a minimum each set shall contain interconnect and troubleshooting drawings. Newly prepared "as built" drawing sets shall be patterned after the Commandant (G-ECV) drawings for purposes of format and content. Drawings shall be reproduced and reduced to 12" X 18" and individually laminated in plastic whenever possible. The drawing set retained on the lighthouse shall be kept in a location convenient for maintenance personnel.

7. Training Teams. Most districts have traveling aids to navigation training teams composed of enlisted personnel having considerable experience and a current knowledge of maintenance and hardware. The training teams are a supplement to formal classroom aids to navigation training. The team personnel function as counselors and are required to visit all units at least semi-annually; these visits are scheduled to coincide with normal unit operations so the team participates in the unit's regularly scheduled work. Training teams are required, in part, to:

   - Assist units in developing and conducting an aids to navigation training program.

   - Provide instructions in the use of ATONIS.

   - Consult with unit commanding officer or officer-in-charge on the current status of the unit's library of manufacturer's instructions and Coast Guard aids to navigation directives and publications.

   - Discuss unit aids to navigation material allowance, making recommendations for change as required.

- Report on discrepancies or areas needing improvement only to the unit commanding officer or officer-in-charge. General reports of trends or overall developments noted in the field will be submitted to the district commander.

H. Lighthouse Preventive Maintenance System (PMS).

1. General. This section requires a preventive maintenance manual for each lighthouse. This includes the PMS to be issued by Commandant (G-ECV) on standard LAMP hardware, and a separate PMS for non-standard hardware which shall be prepared by each CEU.

2. Background.

   a. Automation of lighthouses started over two decades ago. With automation, equipment and structural maintenance has become more difficult due to the reduced amount of time servicing crews spend at a site. Overall there has not been adequate guidance on the maintenance of the equipment or structure for most unattended lighthouses.

   b. Some standard LAMP lighthouses have operated well for extended periods while others have failed earlier. There has been no formal feedback system to help headquarters equipment managers understand why this variation occurs. For instance, failures could be caused by equipment deficiencies, variations in servicing practices, or unique geographical conditions. Not knowing the details and circumstances of many equipment failures has limited the ability of equipment managers to improve their hardware.

3. Scope and Purpose.

   a. PMS is a uniform system for conducting preventive maintenance on each individual item of installed equipment on any lighthouse. It is intended primarily to provide essential information in a useful manner to personnel performing preventive maintenance and their command.

   b. The system is based on separate procedure (PM action) cards for all lighthouse systems and equipment. Separate cards are also used for each maintenance interval. Personnel performing PM can use the cards

to identify tools, parts, materials, and test equipment they will need at the site. When performing PM, maintainers are to follow the sequential Procedures written on the cards. Personnel scheduling PM visits can use the frequency interval on each card to organize an overall schedule for each lighthouse. In order for the system to work and to achieve the best operational system, maintenance personnel must perform the PMS at prescribed intervals. Administrative control of maintenance can be achieved by being able to identify card numbers of tasks which were not completed.

c. If certain cards are incorrect, or a task is missing, this must be reported. The PMS should continuously be improved with comments from field maintenance personnel who the system is intended to serve.

4. Administration of PMS.

a. Due to many different configurations and pieces of gear on lighthouses, one standardized PMS covering all sites could not be provided by Commandant. Instead two systems are needed. The first one, developed by Commandant (G-ECV), covers standard headquarters-furnished LAMP gear used throughout the Coast Guard. The other PMS will cover non-standard equipment.

(1) LAMP Standard Lighthouses. A PMS for equipment used in the standard LAMP lighthouses has been promulgated by Commandant (G-ECV), Lighthouse Preventive Maintenance Manual COMDTINST M16500.10. PMS cards will be developed for all equipment as it becomes G-ECV standard. The equipment listed in enclosure (1) is the standard G-ECV lighthouse equipment. The PMS cards developed by G-ECV have their own numbering system that identify the chapter of The Aids to Navigation COMDTINST M16500.3A where the equipment data sheet can be found. Each Group with assistance from MLC(tst) and the CEU, will have to supplement the standard G-ECV PMS manual for any non-standard hardware on their lighthouses.

(2) Non-standard Lighthouses. These PMS cards shall be prepared and assembled by each district into a unique manual for each lighthouse. The cards shall be standard throughout that district for a particular piece of equipment.

Example: a district has several lighthouses which have Onan engines. The engines may differ in horsepower, but the manufacturer maintenance schedule does not. In preparing PMS cards, this district shall standardize maintenance tasks among servicing units who maintain this engine.

5. Required Reports.

a. The reporting requirement is deliberately minimized. In order to monitor the system, it is necessary to receive feedback from the personnel responsible for carrying out the PM tasks prescribed. This is accomplished through the use of the Lighthouse PMS Feedback Report, which shall be submitted quarterly. Feedback is required mainly to help engineering and program manager staffs better support primary servicing units.

b. The Lighthouse PMS Feedback Report is a form in triplicate containing a white, red and hard card copy. Upon completion of all the tasks prescribed by the system, the Team Leader shall fill in and sign the Feedback Report and submit it to the unit commanding officer or officer-in-charge. The CO/OIC shall verify and sign the report in block 6 of the form, retain the hard card copy as a part of the lighthouse record and forward the red and white copies to the group or next higher level in the chain of command. Upon receipt of the red and white copies of the Feedback Report, the group will review all reports for completeness and accuracy. The red copy is a flag copy that enables the group to recognize immediately a deferred maintenance item and flag it for follow up at the next reporting period. Deferrals shall be completed by the next reporting period. The white copy shall be used to compile a semi-annual letter report to the district, with copies to the CEU and MLC(tst) by end of the last week in January and July, listing all deferred or unaccomplished PMS maintenance items for the lighthouses under their command. In addition, comments shall be furnished to clarify the reasons for failure to accomplish the various PMS items of maintenance listed, together with recommendations for improvement of the system. These comments should include, but are not limited to the following:

(1) Tasks described on the individual PMS Cards that do not reflect actual conditions which are in need of PM.

(2) Improper or inadequate technical explanations and procedures.

(3) Inadequate or incomplete tool lists, material lists, and safety precautions.

(4) Cards missing or not updated as a result of equipment changes and alterations.

(5) Recommendations for changes or corrections to improve the system.

6. Action.

a. In establishing a preventive maintenance system for non-standard equipment, cooperation between MLC (tst), CEUs, district personnel, group commanders, and their primary maintenance units is essential. The maintenance personnel are in touch with the equipment and are more familiar with its operation. Therefore, they play an important role in preparing PM cards on non-standard equipment. MLC(tst) and CEUs on the other hand have a larger perspective of lighthouses in their districts; therefore, they should provide a standard maintenance policy. They are to ensure the various maintenance units are not writing inconsistent PM instructions for the same type equipment. District instructions and SOP will provide some of the needed policy guidance, but MLC (tst) and CEUs should supplement, as necessary, certain areas that may not be adequately covered for maintenance personnel to properly prepare cards.

b. Implementation of the non-standard PMS can be accomplished in four steps:

(1) Gathering the information - This can be done by using the manufacturers' instruction books (operator's and parts manuals) and Coast Guard publications.

(2) Preparing rough drafts of PMS cards - Rough drafts of the PMS cards should be completed by maintenance personnel. All rough drafts then should be forwarded to the next higher level of command for review. All cards should end up in CEU's for final review so the next phase can be accomplished, the selection of consistent maintenance tasks for each card. The PMS cards should have as a minimum the following information:

PMS card number
System
Sub-system of component
PMS interval
Personnel required
Summary of work
Safety precautions
Tools, test equipment, materials needed to complete task
Troubleshooting references
Procedures

The PMS cards published by Commandant G-ECV may be helpful guides in preparing the rough drafts.

(3) MLC(tst) and CEU review. MLC(tst) and CEUs shall screen rough draft PMS cards, ensuring a uniform standard for the entire district on each PM task. MLC(tst) and CEUs shall then finalize and distribute the PMS cards to group engineers. Each group can then select the required cards for their particular lighthouses and assemble a unique PMS manual for each site.

(4) Implement. Servicing units shall use the preventive maintenance system upon receipt, whether it be for the standard or non-standard equipment. Districts are encouraged to direct field maintenance personnel to complete the Feedback Report for non-standard lighthouse equipment also.

c. District (oan), MLC(tst) and CEUs may compile the intermediate level command reports (See 2.H.5.b) and provide a letter report annually by 1 October to Commandant (G-ECV). This letter report will include any problems which may be occurring in the field with the PMS cards. Suggestions may also be included in the report on ways to improve the system. Commandant (G-ECV) will review the reports and make changes to the system, cards, or if warranted, to the actual equipment itself. The PMS with feedback report is a vehicle for field personnel to relate their problems with LAMP equipment to the equipment managers at Headquarters via the chain of command. It also helps unit commanders manage personnel resources. MLC(tst) and CEUs shall maintain on file a copy of the PMS manual for each lighthouse in the district. Submitting copies of PMS Manuals to Commandant (G-ECV) is encouraged so that uniformity may be established where possible.

Miscellaneous Information For Lighthouse Maintenance Management

1. Related Publications. The following is a list of publications which contain information and requirements relating to maintenance of lighthouses.

a.	COMDTINST M16500.3A	Aids to Navigation Manual - Technical
b.	COMDTINST M16500.8	Automation Technical Guidelines
c.	COMDTINST M10550.25	Electronics Manual
d.	COMDTINST M11000.11A	Civil Engineering Manual
e.	COMDTINST M1414.8	Enlisted Qualifications Manual
f.	COMDTINST M16500.5	Lighthouse Systems Theory Handbook
g.	COMDTINST M16500.7	Aids to Navigation Manual-Administrative

2. Electronic Equipment.

a. Maintenance Philosophy and Hints. COMDTINST M10550.25, Chapters 11, 12, 24 and 25 detail the basic maintenance philosophy, calibration, alignment, adjustment and maintenance hints for Aids to Navigation electronic equipment.

b. Test Equipment. COMDTINST M10500.25, Chapter 27 details electronic test equipment for use in the Coast Guard. Refer to individual technical data sheets for special requirements.

c. Logistics. COMDTINST M10550.25, Chapter 5 details logistics support procedures, including the establishment and maintenance of a support unit Electronic Repair Parts Allowance List (ERPAL).

d. Field Changes. COMDTINST M10550.25, Chapter 8 describes the electronics field change system.

e. Electronics Equipment Information System (EEIS), (old Electronic Installation Change and Maintenance (EICAM) System). COMDTINST M10500.25, Chapter 6 establishes the policies and procedures for the EEIS. Particular attention should be paid to the requirements of this chapter and the responsibilities of the local support unit to report all installations, deinstallations, field changes, and equipment failures.

f. Electronics Engineering Information Bulletin (EEIB). The EEIB is an informal monthly publication which provides current information of interest to electronics personnel. The bulletin covers topics related to the management, control, operation, support and maintenance of electronic equipment, including lighthouse electronics.

3. Non-electronics Field Changes. Enclosure (2) describes the system of formally altering standard lighthouse and LNB equipment.

4. Personnel Training & Qualifications.

ANC-LT Automated Aids to Navigation Lighthouse Technician Course, teaches theory of operation, trouble shooting, and preventive maintenance of standard lighthouses.

ANC-FD Videograph B Fog Detector, teaches installation, operation, alignment, trouble shooting, and preventive maintenance of fog detectors.

ANC-RBN Radiobeacon, teaches operation, trouble shooting, and preventive maintenance of radiobeacons.

ANC-AC Minor Aids to Navigation with Alternating Current, teaches operation, trouble shooting and preventive maintenance of aids to navigation with 120 volt alternating current equipment.

ANC-M Lister Diesel Engine Overhaul, teaches operation, trouble shooting, and preventive maintenance on the Lister Diesel / Lima Generators on lighthouses.

ANC-ANT Officer in Charge of Aids to Navigation Teams, is to for petty officer newly assigned as officer in charge of an aids to navigation team.

5. G-ECV Standard Lighthouse Automation and Modernization Equipment. The following standard equipment is provided by Commandant (G-ECV) and is covered by the standard equipment Preventive Maintenance System.

250 mm and 300 mm lantern
190 mm (Amerace 2130) Rotating Beacon
DCB-24 and DCB-224, 24 Inch Rotating Beacon
24" Range Beacon
14" range Beacon
APRB 251 DC HW
High Current Lampchanger
High Current Flasher
ACMS Remote Unit
ACMS Transfer Unit
EF Johnson Link Radio
LE ACMS Remote
Range Light Controller

5. (cont'd)
Audio Visual Controller, GCF-RWL-2098
NAVAID Sensor Module, GCF-RWL-2076
NAVAID Sensor Module Panel, GCF-RWL-2241
AC Flash Controller, GCF-RWL-2106
Engine-generator, Lister models SR & ST
Environmental Control Unit
Fuel Oil Daytank
Battery Charger, 12 volt
Nickel-Cadmium storage battery, 24 volt
Nickel-Cadmium storage battery, 12 volt
Battery Charger, 24 volt
FA-232 and FA-232/02 sound signal
CG-1000/ELG-300/ELU 300 sound signal
Videograph B Fog Detector
Solar Charge Controller
PV Combiner Box
Solar Distribution Box
Local Terminal Box
Solar Aid Controller
Multi Array Controller

LIGHTHOUSE / LARGE NAVIGATIONAL BUOY EQUIPMENT FIELD CHANGE

1. A lighthouse or large navigational buoy (LNB) field change is a modification to a specific type of lighthouse or LNB nonelectronic designated equipment or system authorized by Commandant (G-ECV). Table 1-A lists the specific equipment subject to this field change procedure. Exceptions are specified by equipment serial number, location or use in the field change bulletin (Description paragraph).

a. Modification. Lighthouse or LNB equipment field change bulletins are issued to modify equipment to meet a change in operational requirements, remove hazards, correct design deficiencies, improve reliability and maintainability, and correct technical documentation. Technical manuals and operating and maintenance instructions are treated as an inherent part of the equipment for field change purposes.

b. Emergency Modification. Operational requirements may necessitate emergency field modifications of equipment. Emergency field changes are authorized by the district commander and will be reported immediately to Commandant (G-ECV) by message via chain of command. In urgent situations, such as safety hazards, a field change will be authorized by an ALDIST. The field change will be confirmed by a field change bulletin.

2. Type Designations. These designators are used in a field change to indicate the extent to which parts are furnished and may indicate technical manual correction. The types are defined as follows.

a. Type 1 Field Change. A Type 1 field change furnishes documentation, parts and special tools required to complete a field change. Documentation, parts and tools are assembled and supplied as a field change parts kit. This type change involves alteration to equipment and will require changes to the technical documentation.

b. Type 2 Field Change. A Type 2 field change furnishes documentation only. Required parts or special tool are procured by the installing unit from an appropriate supply source. The installing unit provides the funds for the parts or tools. This type change requires alteration to the equipment and will also require changes to the technical documentation.

2. c. Type 3 Field Change. A Type 3 field change furnishes technical documentation and some of the parts or special tools which are required. The remainder of the required parts or special tools are procured from a specified source by the installing unit. This type field change requires alteration to the equipment and will require corresponding changes to the technical documentation.

d. Type 4 Field Change. A Type 4 field change implements changes to technical documentation only and requires no alteration to the equipment.

3. Field Change Package. A field change package consists of the field change bulletin and a field change parts kit, if applicable. A field change parts kit will not be required for Type 2 and Type 4 field changes.

a. Field change Bulletin. The field change bulletin is the authority for the installation of the field change. The field change bulletin is organized into the following sections: PURPOSE, DESCRIPTION, IDENTIFICATION OF ACCOMPLISHMENT, MATERIALS REQUIRED, PROCEDURE and ROUTINE INSTRUCTIONS. The necessary documentation for implementing a field change is contained as part of the field change bulletin; this includes correction to technical documentation, parts lists and installation procedures. These items are included in the field change bulletin to clearly described the field change to equipment managers and support personnel involved in coordination installation and support of field changes. The field change bulletin is distributed to all activities with a known interest in the equipment referenced in the field change bulletin.

b. Field Change Parts Kit. A field change parts kit consists of the parts, special tools, related parts lists and installation procedures that are furnished for a field change. If deemed necessary, a copy of the field change bulletin may also be in the kit. Parts kits are only included in Type 1 and 3 field changes. Procurement information for parts not included in a Type 3 field change is included in the field change bulletin under the MATERIALS REQUIRED section. The parts kits are distributed by Commandant (G-ECV) or requisitioned by the unit from the supply source indicated in the field change bulletin.

3. c. If a minor mistake, such as a wrong stock number or circuit symbol, has been made in the field change bulletin, an errata sheet will be issued to correct these errors. The errata sheet receives the same distribution as the related field change bulletin.

4. Supply Source. General service field change parts kits fabricated by the Coast Guard are stocked at the Supply Center, Baltimore, Maryland. Procure in accordance with MILSTRIP procedures if not distributed by Commandant (G-ECV). The field change bulletins provides the stock number for both the kit and the bulletin. Additional field change bulletins are stocked by the Supply Center, Baltimore, MD, and may be obtained using standard MILSTRIP procedures. Commercial field change parts kits are procured as stipulated in the field change bulletin.

5. Reporting and Recording Procedures.

a. Completion Report Form. Report installation of a field change by inserting the necessary information on the completion report form, CG-5294. The completion report form should then be forwarded to the appropriate Group Office, District, CEU, MLC(tst) and Commandant; distribution of the completion report form is indicated on the form. The completion report form is included in the field change bulletin or parts kit as appropriate.

b. Field Change Accomplished Plate. A field change accomplished plate will be affixed, in a visible location, to all equipment. Record completion of a field change on the field change accomplished plate. These plates are available from NPFC, Philadelphia, PA under NSN I 0265-00-085-0000.

6. Responsibility. It is the responsibility of the individual field unit to assure that all applicable field changes have been installed in equipment for which they have maintenance responsibility. Each equipment that has an applicable field change should be physically checked, using the identification paragraph of the field change bulletin and the "Field Change Accomplished" plate, to ensure that the field change has actually been installed.

7. Lighthouse / LNB Equipment. A listing of approved Lighthouse/LNB equipment with approved field changes, if any, is listed in Table 1-A.

TABLE 1-A

LIGHTHOUSE/LNB EQUIPMENT AND FIELD CHANGES
(NONELECTRONIC DESIGNATED EQUIPMENT)

Model	FC	TYPE	DESCRIPTION	DATE
Daytank Assembly	1	3	fuel gauge	08/15/83
Distribution Panel, 12 volts				
Distribution Panel, 24 volts				
Engine/Generator	1	4	standard engines	06/15/84
	2	3	safety ground	05/09/85
	3	3	starter mod	03/29/91
Environmental Control Unit				
Fire Suppression System Halon 1301 (18 and 36 lbs)	1	4	maintenance	01/13/84
Lampchanger,				
CG-2P1000				
Lampchanger, CG-4P120				
Lampchanger, CG-6PHW				
Rotating Optic, 10"				
Rotating Optic, 24"				
Rotating Optic, 2-24"				
Range Beacon, 24"				
Range Beacon, 14"				

TABLE 1-A

LIGHTHOUSE/LNB EQUIPMENT AND FIELD CHANGES
(NON-ELECTRONIC DESIGNATED EQUIPMENT)

Model	FC	TYPE	DESCRIPTION	DATE
Rotating Optic, 190 mm High Wattage				
Solar Charge Controller (SSC)				
Photovoltaic Combiner Box (PVCB)				
Solar Distribution Box (SDB)				
Local Terminal Box (LTB)				
Multi Array Controller (MAC)				