



SHIP SAFETY BULLETIN

Bulletin No.: 04/2001
Date: 2001-04-26
Y - M - D

Subject:

**INTERIM
SMALL PASSENGER VESSEL
COMPLIANCE PROGRAM**

This Bulletin replaces Bulletin No. 11/99.

Purpose

The Interim Small Passenger Vessel Compliance Program came into effect in June of 1999 with an initial expiration date of Dec 31st, 2000; it is hereby extended to Dec 31st, 2002. Some of the requirements specified in this extension are a step closer to full regulatory compliance than those of the previous program. Please refer to the following elements for details:

- a) background and scope;
- b) applicable safety requirements (Table A);
- c) applicable inspection regimes (Table B); and
- d) non-compliance procedures.

Background

There have been two changes to the Canada Shipping Act that have precipitated the use of this interim program to allow vessel owners and operators the possibility of gradual compliance with the regulations.

a) Change in the definition of the term "passenger": on October 31st 1998, a new definition of the term "passenger" in the Canada Shipping Act became law. Many vessels operating as Charter Vessels are now classified as Passenger Vessels under the new definition.

Keywords:

- 1. Inspection
- 2. SVMIP
- 3. Small Vessels

Questions concerning this Bulletin should be addressed to:

AMSRA
Terrance Hounsell
(613) 991-3145

Transport Canada
Marine Safety
Tower C, Place de Ville
11th Floor, 330 Sparks Street
Ottawa, Ontario K1A 0N8

Recognising that meeting the safety requirements associated with passenger vessels can have a cost impact, Marine Safety has developed the Interim Small Passenger Vessel Compliance Program. This program employs a stepped approach whereby vessel owners or operators may achieve full compliance with the regulations based on a schedule agreed to with Marine Safety.

Marine Safety's policy on how to determine if a vessel is carrying passengers may be found in Appendix A. To take advantage of the Interim Small Passenger Vessel Compliance Program, or to determine if your vessel is a passenger vessel, owners or operators should contact the nearest Marine Safety Office.

b) Change in the inspection threshold: Section 406 of the Canada Shipping Act (CSA) has been amended to raise the mandatory annual inspection threshold from 5 tons gross tonnage to 15 tons gross tonnage for vessels that carry no more than 12 passengers. This provision came into force on 31 October 1999.

For vessel falling within the new threshold Marine Safety will focus its small vessel inspection efforts on owners and operators that have an history of non-compliance. To this end, Marine Safety has developed a comprehensive Small Vessel Monitoring and Inspection Program (SVMIP) that systematically addresses these owners and operators. The SVMIP builds on the First Inspection, which is mandatory for all vessels, and carries on through the subsequent use of random and targeted inspections. This allows Marine Safety greater flexibility in delivering small vessel inspection services to the marine community.

General

Any questions regarding the Interim Small Passenger Vessel Compliance Program should be addressed to the nearest Marine Safety office. No action should be taken to modify a vessel before consulting a Marine Safety office.

In applying this program limitations on the voyage, the season of operation or other operational limitations will be considered. Vessels will be treated on a case by case basis.

Scope

The Interim Small Passenger Vessel Compliance Program applies to all small passenger vessels that:

- a) are engaged on domestic voyages;
- b) have a capacity of 60 tons or less gross tonnage; and

- c) carry up to and including 49 passengers; or plan to convert to the carriage of passengers before the expiration of the Interim Small Passenger Vessel Compliance Program.

Application

The Interim Small Passenger Vessel Compliance Program consists of two distinct parts:

- a) Safety Requirements: The Interim Small Passenger Vessel Compliance Program was initially set forth in Ship Safety Bulletin 11/99 and contained interim requirements attached as Appendix B to that bulletin. This Ship Safety Bulletin brings those safety requirements a step closer to full compliance. For example the electrical and mechanical requirements previously found in Appendix B have been upgraded and are now attached as Appendix C and D respectively. These requirements were developed by the Small Vessel Working Group of the Canadian Marine Advisory Council (CMAC) and are approved for use in the revised version of TP 1332.

Small Passenger Vessels must comply with the following safety requirements as applicable:

- (1) Guidelines in Appendix B;
- (2) TP 1332: Construction Standards for Small Vessels;
- (3) TP 11717: Standards for the Construction and Inspection of Small Passenger Vessels;
- (4) Small Vessel Regulations; and
- (5) Consolidated Regulations of the Canada Shipping Act.

The applicable requirements for Small Passenger Vessels based on gross tonnage and number of passengers carried is summarised in Table A, Small Passenger Vessel Safety Requirement Matrix, attached.

- b) Inspection Regime: Vessels covered by the Interim Small Passenger Vessel Compliance Program will be inspected under one of the following two inspection regimes as follows:
 - (1) Vessels of 15 gross tons or less, and 12 passengers or less: a new inspection regime has been put into place in lieu of mandatory annual inspection, it is called the Small Vessel Monitoring and Inspection Program (SVMIP). The SVMIP defines how and when the inspections will be performed, and how the level of compliance being achieved will be recorded and monitored. The SVMIP is described on the Transport Canada web site. Supporting procedures, checklists and new certificates are being developed to support this program and will be placed on the web site when finalised.

Vessels subject to the SVMIP program are required to:

- (i) have a First Inspection whereby they will receive a “Notice of Survey”;
- (ii) have an “Annual Seaworthiness Information Report” to be completed annually by the owner;
- (iii) be subject to Random Inspection and Compliance Monitoring, by a Marine Safety Inspector whereby a “Letter of Compliance” will be issued; and
- (iv) new vessels must be approved by Marine Safety and are subject to inspection during construction.

(2) Vessels greater than 15 GTs or carrying more than 12 passengers; are subject to mandatory annual inspection.

Vessels subject to mandatory annual inspection are required to:

- (i) have a First Inspection whereby they will receive an SIC 16;
- (ii) have a mandatory annual inspection whereby the SIC 16 will be reissued. A Ship Inspection Certificate 16 (SIC 16) can only be granted by Marine Safety based on a satisfactory inspection by a Marine Safety Inspector; and
- (iii) new vessels must be built to plans approved by Marine Safety and are subject to inspection during construction.

The applicable inspection regime for Small Passenger Vessels based on gross tonnage and number of passengers carried is summarised in Table B, Small Passenger Vessel Inspection Regime Matrix, attached.

Non-Compliance Procedures:

The responsibility for requesting an inspection rests with the owner or operator under the terms of the Canada Shipping Act.

When any inspection is requested, Marine Safety will conduct an inspection to determine the degree of compliance with the regulations and standards. Vessels that do not fully comply with the requirements have two options:

- (1) if an equivalent level of safety can be achieved by other means or exemption is appropriate, the owner or operator must make an application to the Board of Steamship Inspection through the Regional Director, Marine Safety, in which the owner or operator will agree to a schedule for completion of all outstanding items. An

Inspection Certificate may be issued provided the exemption or equivalency being approved by the Board of Steamship Inspections is noted on the certificate;

- (2) if full compliance can be achieved by phasing-in the requirements, the owner or operator may request that Marine Safety consider a schedule that achieves this. The owner or operator must agree to a schedule for completion of all outstanding items as determined by the inspection, within the phase-in period. The vessel may continue to operate provided it complies with the Interim Small Passenger Vessel Compliance Program in which case Marine Safety will issue a Notice of Survey. All Interim Notices of Survey must expire not later than December 31st, 2002.

TABLE A: SMALL PASSENGER VESSEL *SAFETY REQUIREMENT* MATRIX
(BOXED AREA SHOWS SCOPE OF INTERIM SPV COMPLIANCE PROGRAM)

SMALL PASSENGER VESSELS	≤ 12 Passengers	13 to 49 Passengers	50 to 100 Passengers	> 100 Passengers
Gross Tonnage ≤ 15	CSA. Interim Guidelines in Appendix B until TP1332 is revised. Small Vessel Regs	CSA. Interim Guidelines in Appendix B until TP11717 is revised.	CSA and TP 11717	Consolidated Regulations of the Canada Shipping Act (CSA)
Gross Tonnage > 15 to 60	CSA. Interim Guidelines in Appendix B until TP11717 is revised.	CSA. Interim Guidelines in Appendix B until TP11717 is revised.	CSA and TP 11717	Consolidated Regulations of the Canada Shipping Act (CSA)
Gross Tonnage > 60 to 150	CSA and TP 11717	CSA and TP 11717	CSA and TP 11717	Consolidated Regulations of the Canada Shipping Act
	Consolidated	Consolidated	Consolidated	Consolidated

Gross Tonnage > 150	Regulations of the Canada Shipping Act	Regulations of the Canada Shipping Act	Regulations of the Canada Shipping Act	Regulations of the Canada Shipping Act
------------------------	--	--	--	--

- CSA means the Consolidated Regulations of the Canada Shipping Act.

TABLE B: SMALL PASSENGER VESSEL *INSPECTION REGIME* MATRIX

(BOXED AREA SHOWS SCOPE OF INTERIM SPV COMPLIANCE PROGRAM)

SMALL PASSENGER VESSELS	≤ 12 Passengers	13 to 49 Passengers	50 to 100 Passengers	> 100 Passengers
Gross Tonnage ≤ 15	SVMIP. Mandatory First Inspection and Annual Notice of Seaworthiness	Mandatory First and Periodic Inspections with SIC 16	Mandatory First and Periodic Inspections with SIC 16	Mandatory First and Periodic Inspections with SIC 16
Gross Tonnage > 15 to 60	Mandatory First and Periodic Inspections with SIC 16	Mandatory First and Periodic Inspections with SIC 16	Mandatory First and Periodic Inspections with SIC 16	Mandatory First and Periodic Inspections with SIC 16
Gross Tonnage > 60 to 150	Mandatory First and Periodic Inspections with SIC 16	Mandatory First and Periodic Inspections with SIC 16	Mandatory First and Periodic Inspections with SIC 16	Mandatory First and Periodic Inspections with SIC 16
Gross Tonnage	Mandatory First and	Mandatory First and	Mandatory First and	Mandatory First and

> 150	Periodic Inspections with SIC 16	Periodic Inspections with SIC 16	Periodic Inspections with SIC 16	Periodic Inspections with SIC 16
-----------------	---	---	---	---

- SVMIP means the Small Vessel Monitoring and Inspection Program
- SIC 16 means the Ship Inspection Certificate No. 16.

APPENDIX A

REVISION 1, January 12th, 1999

Marine Safety's Policy on How To Determine If A Ship Is Carrying A Passenger

The definition of "passenger" in Bill C-15 is became effective on October 31, 1998. The new definition of "passenger" eliminates the references to "charterer." The purpose of this amendment was to enhance passenger safety by eliminating the uncertainties that permitted some charterers and charter ships to circumvent passenger ship regulations. This change was also designed to ensure that all passenger ship operators operate on a level playing field throughout Canada.

In determining if a person(s) on board a non-Safety Convention ship is a passenger, four factors must be considered. These are reflected in the full definition of passenger found below.

Definitions.

1. *Who is the owner or operator of the ship?*
2. *Is the person the master, a member of the crew employed or engaged in any capacity on board the ship on the business of that ship?*
3. *Is the person carried on the ship without remuneration or any object of profit?*
4. *Is the ship used exclusively for pleasure?*

1. Owner or Operator?

The owner or operator is not considered a passenger. To be the owner, only the actual owner (unregistered ship) or the registered owner (registered ship) is allowed (see definition in annex). To be considered the operator of the ship, requires a fuller explanation since this term is not defined. Transport Canada, Marine Safety considers the operator to be "one who controls the operation of the ship in terms of such things as navigation, management, upkeep, maintenance, manning, on board processes and routines, budgets, schedules, fuel supplies and ship's stores." For example, the following would be considered an operator, under the circumstances given:

- *A charterer who has complete possession and control of the ship including the right to appoint its master and crew (i.e. a bare boat charter).*
- *A person on board who direct the ship's movement and its operations.*
- *Agency or representative of the owner who controls the overall operation of the ship.*

Noting the above, a person who charters a vessel for a period of time and who does not participate in the actual operation or management of the ship will not be regarded as an “operator.” Another way to look at it would be that the master and crew would not take orders or look for direction from this charterer or consult with them for problem-solving on ship matters. Further guidance in determining whether someone is an owner / operator or passenger may be found in a charter or rental agreement.

2. Master, crew member or a person employed/engaged?

Master and crew member are the persons required on board to run the ship. “A person who is employed or engaged in any capacity on board the ship on the business of that ship” are not passengers. These individuals could be, for example, the owner’s representative, superintendent or agent, service engineer and workers on board to repair or test equipment or certain parts of the ship.

3. Remuneration or any object of profit?

It must be determined whether a person has paid in some manner to be on board a ship. Some examples are unacceptable practices to claim a person has not paid to be on board a ship include the following:

- *Owner charters vessel to another individual or organization who, in turn, charges individuals participating in the voyage.*
- *An operation which suggests that an up front payment is not for the voyage but rather for a meal or drinks consumed during the voyage.*
- *A person pays for an activity such as, a package tour, that includes a voyage on board the ship.*
- *An operation where a person is expected to perform a financial transaction on board i.e., a casino, restaurant or other similar service.*
- *An operation where a participant purchases a ticket. The minute that someone buys a ticket, they are a passenger.*

4. Pleasure only?

The ship must be used exclusively for pleasure to determine if the persons on board are guests. If a ship is chartered by an employer to transport workers to or from a work site, the employees are considered passengers because the ship is not being used exclusively for pleasure and the employees are not part of the crew complement of that particular ship.

5. Other Examples

- *Guests at a wedding reception or similar event who are non-paying participants. For example, a ship has been chartered for a wedding reception by the father of the bride. The following question should then be asked: is the father of the bride an operator or the owner of the ship? This is not usually the case and therefore the persons on board would be considered passengers.*
- *Company employees taking a cruise as guests of their employer, the company or an officer of the company having chartered the ship and the employees not contributing to the cost of the charter. Again, is the company operating the ship? If not, the persons would be considered passengers.*
- *Group charters where it is clear that each person in the group is a party to the charter and are operating (i.e. crewing) the ship. The persons on board this ship would be considered operators and if they were to invite additional persons on board for a cruise without charge and only for pleasure then these persons would be considered guests.*

Compliance Program and Safety Requirements

The ships that are being affected by the new definition of “passenger” will have to comply with all applicable passenger ship regulations and standards. Such ships will also be subject for inspection by Marine Safety ship inspectors, where appropriate. If genuine difficulties arise for an owner or operator to meet these requirements, Marine Safety will consider each case on an individual basis as required.

Regional Directors are responsible for implementing the necessary monitoring and compliance program.

The following extracts from the CSA are provided for information purposes:

- *"passenger" or «passager»*

"passenger" means a person carried on a ship by the owner or operator, other than

(a) a person carried on a Safety Convention ship who is

(i) the master, a member of the crew or a person employed or engaged in any capacity on board the ship on the business of that ship, or

(ii) under one year of age,

(b) *a person carried on a ship that is not a Safety Convention ship who is*

(i) *the master, a member of the crew or a person employed or engaged in any capacity on board the ship on the business of that ship, or*

(ii) *a guest on board the ship, if the ship is used exclusively for pleasure and the guest is carried on it without remuneration or any object of profit,*

(c) *a person carried on a ship in pursuance of the obligation on the master to carry shipwrecked, distressed or other persons or by reason of any circumstances that neither the master nor the owner could have prevented, or*

(d) *special purpose personnel;*

- ***"passenger ship" or «navire à passagers»***

"passenger ship" means a ship carrying passengers;

- ***"pleasure craft" or «embarcation de plaisance»***

"pleasure craft" means a vessel used by an individual for pleasure and not for a commercial purpose;

APPENDIX B
INTERIM GUIDELINES

1. VOYAGE LIMITATIONS

Class 1: Inland and Limited Home Trade 3 voyages within 15 miles of a port of refuge and not more than 10 miles off shore.

Class 2: Inland waters, Minor waters 1, Limited Home Trade 3 not more than 5 miles from home port between May and September and in fair weather only, which is defined as fine, clear settled weather, with a sea state such as to cause only moderate rolling and/or pitching.

Class 3: Within sheltered waters (HT. IV, Inland or Minor Waters 2) as defined on the certificate.

2. INSPECTION CRITERIA

(a) First Inspection

A First Inspection will be conducted by a Marine Safety Inspector to ascertain the degree of compliance with the appropriate regulations/standards pertaining to the condition of the hull, machinery and equipment.

(b) Hull Inspection

The First Inspection will include a thorough examination of the internal hull to the extent practicable. The external hull will also be inspected, however, an out of water inspection may be deferred, taking into consideration the vessel's age, material of construction, condition, area of operation and any other relevant facts.

(c) Machinery & Electrical Inspection

A general safety inspection of machinery and electrical equipment will be conducted. The Safety Requirements for Electrical and Machinery are Appendix C and D respectively.

(d) Intact Stability

The vessel should be inclined and trim and stability data submitted in accordance with the Hull Construction Regulations (CSA 28) and the Stability, Subdivision and Load Line Standards TP 7301.

If stability data is unavailable an Inspector may if satisfied, postpone this requirement for vessels not subject to damaged stability requirements and/or carrying not more than 49 passengers, subject to the following four conditions:

1. A period of roll test, in accordance with STAB 2, appendix B of TP 7301 or preferably an inclining test, if appropriate, should be conducted to assess an estimated GM and approximate GZ at 5°.
2. A simulated passenger heeling test, based on 4 passengers per sq. metre, on one side should, be conducted to assess the worst combination of trim and stability. This test should be conducted incrementally.
3. A demonstration of the sea-keeping characteristics of the vessel shall be carried out in calm water to the satisfaction of the Marine Safety Inspector .

The demonstration shall simulate the loaded passenger condition. During the demonstration the vessel shall be brought up to full speed incrementally and the rudder operated hard over to hard over with steady state condition being attained in each phase. During this manoeuvre the deck edge shall not be submerged.

If the vessel does not meet the foregoing criteria, the passenger load and/or the speed shall be incrementally reduced until the criteria is met.

If compliance is dependent upon speed restriction, a notice shall be posted in the wheel-house, the tachometer suitably marked, and the certificate endorsed accordingly.

In the event compliance is achieved by a reduced passenger load, then the certificate shall be limited to the equivalent number of passengers on the basis of 63.5 kg per person for un-berthed passengers and 74.8 kg per person for berthed passengers.

4. Successful past passenger operations under similar conditions and number of passengers may be considered.

General:

If the Inspector is satisfied with the above conditions he may accept the vessel's stability for this program. With respect to sailing passenger vessels the acceptance of stability characteristics will be at the discretion of the Regional Director, Marine Safety. The stability characteristics of sailing vessels over 12.0 m in length or carrying more than 12 passengers are to be in accordance with the Sail Training Vessel Standards (Draft).

(e) Structural Fire Protection

Where a vessel does not substantially comply with TP 11717 or TP 2237 by reason of interior layout and/or materials of construction, an equivalent degree of protection may be considered.

(f) Means of Escape, Guard-rails, etc.

All compartments shall have two means of escape unless it can be demonstrated that this is unnecessary or impractical.

Guard rails or bulwarks or combination thereof to be a minimum of 1 metre above the standing deck with intermediate rails 254 mm apart in way of passenger areas. It is strongly recommended that netting also be fitted to give extra protection to small children. On sailing vessels where guard rails may interfere with the operation of the boom they may be lowered or temporarily removed.

Scuppers and/or freeing ports to be fitted to prevent water accumulation on deck.

(g) Lifesaving Equipment

Class 1 and Class 2 vessels

- Inflatable life rafts with B emergency pack and/or suitable boat for 100% of the complement.
- For vessels operating on Inland waters, inflatable life rafts with C emergency packs, inflatable platforms and/or suitable boat for 100% Of the complement.
- Approved lifejacket of appropriate size for each person onboard.
- Two (2) approved lifebuoys, one fitted with 15m heaving line and one with buoyant light.
- Signalling Appliances, 6 type A or B rockets and 6 type C or D hand flares.

Class 3 vessels

- Inflatable life rafts, inflatable platforms, and/or suitable boat for 100% of the complement. "Suitable boat" must meet float free requirements described herein.
- [Vessels built before 1996 that are less than 20m in length may use buoyant apparatus.](#) Buoyant apparatus may be used between May and September where the water temperature exceeds 10 degrees Celsius.
- Approved lifejacket or approved wearable [Small Vessel Lifejacket](#) of appropriate size for each person onboard.
- Six (6) type B distress signals.

Provision for Life rafts to Float Free:

[Every vessel that is under 25m in length shall carry its inflatable life rafts in a manner that allows the raft to float free when the vessel is submerged. Either of the following methods is acceptable:](#)

- (a) placed in sufficiently deep chocks, without lashings, so as to float free if the ship sinks; or
- (b) raft secured by a lashing fitted with a hydrostatic release unit.

Alternate Rescue Platform (ARP):

When a vessel is required by the Small Vessel Regulations (CSA76) to carry a life raft an ARP may provided in the form of a "Designated Partner" (DP) if the following requirements are met:

1. DPs must be of a similar size and must be capable of carrying the complements of both vessels. when required to do so in an emergency situation, and still retain adequate freeboard.
2. DPs must be in constant radio contact with their designated partner.
3. DPs must maintain a ten minute response time when operating during good visibility. When visibility is reduced the response time must be reduced accordingly.

(h) Navigation Appliances, Charts and Anchors

The following navigation equipment is to comply fully with the Collision Regulations.

- Required navigation lights
- Radar Reflector
- Anchor Light
- Compass
- Means of depth sounding
- Whistle or Horn
- Suitable Anchor and cable to be supplied
- Charts for the area of operation

(i) Fire Detection and Extinguishing Equipment

- Machinery spaces adjacent to the Accommodation Space to be made gas tight, and protected by two independent charges of smothering gas (CO2) permanently piped into and manually operable from outside of the space. Where spaces cannot be made gas tight Dry Chemical or other suitable fire extinguishing medium may be used.
- A fire detection system to be installed where considered necessary.
- Fire hoses whereby an adequate jet of water can be directed to any part of the vessel. A minimum of 1 Comb. Fog Nozzle and Shut-off.
- Suitable extinguishers to be provided for each space.

hand pumps may be considered in accordance with the “General” provisions below.

3. GENERAL

- One power bilge pump and one power fire pump to be fitted, however, separate hand pumps for fire and bilge may be considered where due to size and configuration of the vessel it would not be practical to fit power pumps.
- Pumps for oil and bilge systems may not be used as fire pumps. However, when two bilge pumps are fitted and they are capable of operating simultaneously and independently one may be used as a fire pump.
- Emergency steering arrangements to be provided where practical.
- Adequate guards to be fitted on all exposed moving parts.
- All fuel tanks to be fitted with shut-off valves capable of being operated from outside the engine space. Tanks to be vented to atmosphere. Vents to be fitted with suitable flame screens. Tanks to be efficiently grounded.
- Exhaust piping to be fully insulated (unless wet exhaust). Wet exhaust to have non-return valve at ship side connection to prevent back flooding of the engine.
- Engine space to be adequately vented with means of closure in the event of fire.
- Arrangements for emergency engine stopping to be provided.

4. SPECIAL PRECAUTIONS FOR VESSELS FITTED WITH GASOLINE ENGINES

- All electrically operated components installed in a gasoline fuel system shall be ignition protected.
- Adequate ventilation, including a bilge extraction fan interlocked with the ignition system suitable for use in an explosive environment, must be operated for 5 minutes before the engine is started.
- No passengers to be on board and no smoking allowed during refuelling.

5. LIQUEFIED PETROLEUM GAS

- Consideration may be given to liquefied petroleum gas (LPG/propane) fuelled propulsion systems.
- Consideration may be given to the use of LPG for cooking appliances.
- Barbecues if fitted to be on the open deck clear of overhanging decks and/or combustible materials. A 10lb DC extinguisher shall be readily available.

6. COMMUNICATION EQUIPMENT

- Dual watch VHF or 2 VHF's one of which may be portable. An independent emergency power supply for the fixed radio.
- Valid Radio Inspection Certificate.
- EPIRB Class 1 for vessels over 20 m operating in HT. III area.
- For vessels over 20 meters, a radio emergency battery is to be located above deck and the battery space vented.

NOTE:
TWO TABLES SUMMARIZING THE
CERTIFICATION REQUIREMENTS HAVE BEEN DELETED.

7. CERTIFICATION OF PERSONNEL

Owners and operators of vessels under this program must consult with the local Marine Safety Office with respect to the certification of crew. An examiner of Masters and Mates/Engineers will decide on the qualifications necessary in order that the Master/mate and if necessary engineer will be suitably qualified. The examiner will decide on the qualifications required in order to meet the certification requirements in order to operate the vessel in question.

DEMONSTRATION OF MAN OVERBOARD RESCUE

At the request of the Marine Safety Inspector the operator shall demonstrate the retrieval of a man overboard. The Marine Safety Inspector shall jettison an appropriate inanimate object for the purpose of this safety demonstration. The Marine Safety Inspector is to be satisfied with demonstration.

8. PASSENGER COMPLEMENT

Passenger complement is to be established on the basis of 610 mm (24") for each passenger on firm secured seating. Seat clearance front to back 300 mm (12") and aisles to be not less than 755 mm (32") in width. This applies to Class I and Class II vessels. Class III vessels must have suitable seating for each person on board.

9. OPERATIONAL SAFETY

The Marine Safety Inspector is to be satisfied with Boat and Fire Drills.

10. REGISTRATION

The Certificate of Registry of the vessels over 15 GRT should properly reflect registration as a "passenger ship" or be amended appropriately without re-measurement of tonnage.

Construction Standards for Small Vessels

Electrical Systems

ISSUE NUMBER: 1

DATED: March 2001 ~~1st April 1999~~
Interim Small Passenger Vessel Compliance Program

NUMBER OF PAGES: 18

THIS ISSUE SUPERSEDES:

Issue number: 0
Dated: 0

Number of pages:

Section 8: Electrical Systems

Application: Both pleasure craft and commercial vessels

DC Electrical Systems

Definitions

1. An electrical component means electrical equipment such as, but not limited to, conductors, resistors, motors, generators, alternators, distributors, resistors, appliances, and electrical control devices.
 2. Ignition Protection is defined as the design and construction of a device such that under design operating conditions it will not ignite a flammable hydrocarbon mixture surrounding the device when an ignition source causes an internal explosion, or it is incapable of releasing sufficient electrical or thermal energy to ignite a hydrocarbon mixture, or the source of ignition is hermetically sealed.
- **Engine negative terminal** means the connection on the engine where there negative side of the battery is connected.
 - **Grounded conductor** means a current carrying conductor in which is connected to one side of the power source that is intentionally maintained at ground potential.
 - **Grounding conductor** (green or green with yellow stripe) means a non-current carrying conductor employed to connect the metallic non-current carrying parts of electrical equipment to the DC system or engine negative terminal.

- **Ground** means the potential of the earth's surface in which the boats ground is established by a connection with earth including the conductive part of the wetted hull's surface.
- **Overcurrent device** means a device which is designed to interrupt the circuit when the current exceeds a predetermined value. A circuit breaker or fuses are such devices.
- **Panelboard** means an enclosure or assembly which contains devices such as circuit breakers, fuses, switches and instruments designed to distribute or protect the distribution of power in the boat.
- **Polarizing** means that the grounded wire (white / negative) and the ungrounded conductor are connected in the same relation to terminals or leads on devices in the circuit.
- **Switchboard** means an enclosure so constructed to control and distribute electrical power to panelboards and other electrical equipment within the vessel. Included in the enclosure are electrical devices such as circuit breakers, fuses, switches, indicating devices, meters and instruments.
- **A trip free circuit breaker** means a resettable circuit breaker designed so that it is impossible to override the current interrupting mechanism.
- **Water tight** means an enclosure constructed so that a stream of water from a hose not less than 13 millimetres in diameter under a head of 11 metres from a distance of 3 metres can be played on the enclosure from any direction for a period of 15 minutes without leakage;
- **Weatherproof** means that an enclosure is so constructed or protected in which exposure to the weather will not interfere with successful operation

Application

3. This part applies to all craft that have gasoline or diesel engines for propulsion or electrical generating power, and/or LPG or CNG equipment on board.

General

4. Switches and controls shall be marked to indicate their usage, unless the purpose of the switch is obvious and operation of the switch could not, under normal operating conditions cause a hazardous condition.
- Single pole breakers should be installed in the positive conductor.
 - Switches should be rated for the voltage of the and the current rating of the connected load of the circuit.
 - Electrical equipment such as engines pumps, fans controllers etc. shall be marked or identified with the following:

- (i) Manufacturer
 - (ii) Product ID, serial number, type, model
 - (iii) Voltage, amperage, wattage
 - (iv) Polarity
 - (v) Ignition protected if applicable
- Circuit Breakers shall meet the following requirements:
 - (i) have the same DC voltage rating as the system voltage;
 - (ii) be of a trip-free manual reset type;
 - (iii) have an interrupting capacity to meet the system requirements.
 - (iv) the requirements of UL 1500 Ignition-Protect if located in the space
- Fuses
 - (i) shall be the same nominal voltage the system voltage
 - (ii) shall have an interrupting capacity to meet system requirements
 - (iii) where applicable meet the requirements for ignition protection UL 1500.
- Integral overcurrent protect devices without manual reset are permitted to be used provided the rest of the circuit is protected by trip free breaker or fuses.
- All permanently installed electrical equipment and appliances shall be securely mounted to the ships structure.
- With the exception of engine mounted equipment all DC appliances and fixed electrical equipment shall be designed so that all current carrying parts are insulated from exposed electrically conductive parts
- The following devices need not comply with the article above if one conductor is connected to the exposed electrically conductive parts. The connected conductor shall be the negative conductor and the polarity of both the negative and positive connections are identified. The devices shall be mounted only on non-conductive surface and shall not be bonded.
 - (i) Communication and audio equipment
 - (ii) Electronic equipment
 - (iii) Instruments and instrument clusters
 - (iv) Cigarette lighters
 - (v) liquid level gauge transmitters
 - (vi) navigation lights operating at 12 volts or less.
- Exposed electrically conductive non-current parts of equipment which may normally be in contact with bilge or seawater shall be connect to DC grounding system with the exception boats not

equipped with a dc grounding system, double insulated devices and isolated metal parts in non-conductive material.

- Grounded liquid level gauge transmitters mounted on metallic fuel tanks or tank plates shall have the transmitter negative return conductor connected directly to the engine negative terminal or its bus. This conductor shall serve as the tank bonding or static ground conductor, where this conductor is employed as the bonding conductor it shall be not less than at least 8 AWG. and no other device shall be connected to the conductor.
- An alternate system of navigation lights shall be provided where the vessels exceeds 15 meters in accordance with Rule 46 of the Collision Regulations
- Boats that have multiple inboard engines including an auxiliary generator with crossover (paralleled) cranking motors circuits shall provide a cable large enough to carry the cranking motor current connected to each engine This cable shall be independent and in addition to any other electrical connections to the engines including the above section. Boats that are excepted from this are outboard motors and installations that use an ungrounded DC electrical system.
- Where a paralleling switch is used the switch shall be size to carry the current of the largest cranking motor, this switch may be of a maintained type or a solenoid type.
- The negative terminal of the battery and the negative side of the DC distribution system shall be connected to the engine negative terminal or its bus.
- Where an accessory negative bus is used the following conditions shall be met;
 - (i) all the connections of the accessories to the bus shall be branch circuits from the same panel board,
 - (ii) the negative bus, the negative return conductors, terminals and connections shall have an ampacity equal to the panelboard feeder.
 - (iii) the negative return conductors from the panelboard feeding the branch circuits using the accessory bus shall be the same size as the positive feeder to the panelboard.

FOR COMMERCIAL VESSELS

- A system of emergency lighting shall be provided in order to allow the passengers and crew to exit from any area of the boat, The lighting units are to be of a self contained type, rechargeable from the boats electrical distribution system and fitted with a charge indicator. As an alternative to an

emergency hard wired lighting system rechargeable or non-rechargeable portable hand lanterns of not less than the 6 volt battery type may be provided. For those boats with non-rechargeable lanterns a spare battery shall be carried and batteries shall be replaced with new batteries annually.

- Emergency lighting should be sufficient to allow passengers to see in order to exit from any area of the vessel. The emergency lighting should also provide enough lighting to illuminate the area where passengers are instructed to muster. Lighting units should be self contained, rechargeable and preferably connected for recharge to the low voltage circuit of the vessel. Emergency lights should have a charge indicator.

Ignition Protection

5. Every electrical component shall be ignition protected unless the component is isolated from the fuel source such as engines, stoves, valves, connections or other fittings on vent lines, fill lines, distribution lines or fuel tanks.

Exceptions:

- a) boats using diesel fuel as the only fuel source;
- b) electrical devices in accommodation spaces and/or open compartments having at least 70 cm² (15 in²) of open area per m³ (ft³) of net compartment volume exposed to the atmosphere outside of the craft.

- Electrical devices in compartments containing LPG or CNG appliances cylinders fittings valves or regulators shall be ignition protected (refer to above exceptions)
6. Isolation of an electrical component from a fuel source may be provided by:
 - (a) a bulkhead which meets the requirements of paragraph 7 and which is located between the electrical component and the fuel source;
 - (b) the installation of the electrical component with provision of a means to prevent fuel and fuel vapours from becoming exposed to the electrical component; or
 - (c) a space which is open to the atmosphere and which provides at least 600 mm (2 ft - 0 in) between the fuel source and the electrical component.
 7. A bulkhead as detailed in paragraph 6 (a) shall:
 - (a) extend both vertically and horizontally at least the distance of the open space between the fuel source and the ignition source;
 - (b) resist a water level which is 300 mm (1 ft - 0 in) high or one third the maximum height of the bulkhead, whichever is less, without seepage of more than 7.5 ml of fresh water per hour; and
 - (c) have no opening located higher than 300 mm (1 ft - 0 in) or one third the maximum height of the bulkhead, whichever is less, unless:
 - i) the opening is used for the passage of conductors, piping, ventilation ducts, mechanical equipment, or doors, hatches and access panels, and
 - ii) the maximum annular space around each item or door, hatch or access panel is not larger than 6 mm ($\frac{1}{4}$ in).

Grounding

8. Where a boat has more than one gasoline engine, grounded cranking motor circuits shall be connected to each other by a common conductor circuit which can carry the starting current of each of the grounded cranking motor circuits.
 - The engine block may be used as the common return for accessories mounted on the engine except on metallic vessels, where the engine is not isolated from the hull.
 - On metallic hull, the hull, the grounding conductor shall not be used as the return conductor.
 - If one side of the DC system is grounded it shall be negative of polarity.

Batteries

9. Batteries shall be installed in a dry, ventilated location above bilge water level, accessible for inspection and maintenance
 - Batteries shall not be tapped for voltages other than the total voltage of the cells comprising the battery.
10. Batteries as installed in the craft shall be capable of inclinations of up to 45° without leakage of electrolyte. Means shall be provided for containment of any spilled electrolyte.
11.
 - Batteries shall be protected against mechanical damage by either location or an enclosure and electrically protected by a non-conductive cover to protect metal objects coming in direct contact with the ungrounded terminals of the battery.
12. Every battery as installed shall not move more than 25 mm (1 in) when a pulling force of twice the battery weight is applied through the centre of gravity in each of the following five directions for one minute:
 - (a) vertically;
 - (b) horizontally, fore and aft; and
 - (c) horizontally port and starboard.
13. Fuel tank, fuel filter, or fuel line fittings should not be installed over a source of ignition. Personal water craft are exempt from this requirement
14. Every metallic fuel line and fuel system component located within 300 mm (12 in) above the level of the top of an installed battery shall be shielded with dielectric material.
16. Means for adequate ventilation shall be provided to prevent the accumulation of hydrogen from the battery during charging or discharging cycles. Vented batteries shall not be installed in accommodation spaces.

17. The positive terminal of a battery shall be identified on the terminal or on the battery case near the terminal, with one of the following symbols:
 - (a) “POS”;
 - (b) “P”; or
 - (c) “+”.
18. No battery terminal connector shall depend upon spring tension for its connection to the terminal.

Battery Disconnect Switch

19. A battery disconnect switch shall be installed in the positive conductor from each battery or group of batteries, with a cold cranking average rating greater than 800 amperes.

Exception: Conductors supplying:

- (a) Electronic equipment with continuously powered memory;
- (b) Safety equipment such as bilge pumps, alarms, CO detectors and bilge blowers;
- (c) Battery charging equipment.

(Exemptions: Boats less than 8.0 m (26 ft) are exempted.)

20. Battery switches shall be placed in a readily accessible location as close as practicable to the battery(s).
21. Battery disconnect switches shall be capable of carrying the maximum current of the distribution system including the intermittent load of the starter motor circuit.
22. Remote controlled battery disconnect switches, if used, shall also permit safe manual operation at the switch.

Conductors – General - Systems less than 50 V

23. This subsection does not apply to communications systems, electronic navigation equipment, resistance conductors which control circuit amperage, high voltage ignition systems, conductors and terminations, pigtails of less than 200 mm (8 in) of exposed length, and cranking motor conductors.

24.

- Conductors and flexible cords shall have a minimum nominal voltage rating of 50 volts, have stranded copper conductors, with an insulation rated for a minimum temperature of 60° C and may be of single or multi-conductor construction.
- Every permanently installed cable/conductor shall be:
 - (i) listed for marine use by an independent testing laboratory which provides listing, labeling and follow-up service; or

- (ii) conform to the latest requirements of UL 1426 Standard for Safety for Electrical Cables for Boats the CSA Canadian Electrical Code Part 1; or
- (iii) be constructed in accordance with either
 - (a) CSA C22.2 No. 245 Marine Shipboard Cable / UL 1309
 - (b) IEC 60350 Low-Voltage Shipboard Cables (general construction and general test requirements)
 - (c) the most recent edition of IEEE STD 45
- (iv) be flame retardant impervious to water absorption and of an oil resistant type when installed in engine room spaces.

- Conductors and flexible cords shall have the following surface markings:

Type/Style
Voltage rating
Wire Size
Temperature Rating

- Where flexible cords or power cables are used for portable equipment they shall be of a type SO, ST, SJOW or SJTW as listed in the CSA Canadian Electrical Code Part 1 or be of a similar cable which has been constructed to a recognized national standard.

25. Except for intermittent surges, no conductor shall carry a current greater than that specified in Table 8-1 for the conductors gauge and temperature rating.

26.

In circuits where voltage drop must be kept to a minimum the following values are permitted:

- | | | |
|-------|-------------------------------|------|
| (i) | Panelboard main feeders | 3 % |
| (ii) | navigation light circuits | 3 % |
| (iii) | electronic equipment circuits | 3 % |
| (iv) | bilge blower and pump | 3 % |
| (v) | all remaining circuits | 10 % |

for calculation of voltage drops for either 3% or 10 % refer to **Table 8.2**

27.

- Conductors shall be not less than 16 AWG (1 mm²) other than those conductors contained in manufacturers equipment and communication circuits of less than 1 ampere.

Colour Coding

28. The colour coding shown in Table 8-4 identifies colours for DC conductors used for general wiring purposes on boats.
29. Colour coding of wiring shall be in accordance with table 8-4 and identified in a wiring diagram of the system indicating the method of identification. The wiring diagram shall be provided with the boat.
- if colored tape is employed it shall be not less than 5 mm (3/16 in) wide and shall make at least 2 complete turns around the conductor in a visible location adjacent to the terminal.

Table 8-1: Allowable amperage of conductors

Conductor Size		Temperature rating of conductor insulation						
(Circular Mils)	(AWG)	60°C	75°C	80°C	90°C	105°C	125°C	200°C
1620	18 ..	10	10	15	20	20	25	25
2580	16 ..	15	15	20	25	25	30	35
4110	14 ..	20	20	25	30	35	40	45
6530	12 ..	25	25	35	40	45	50	55
10400	10 ..	40	40	50	55	60	70	70
16500	8 ..	55	65	70	70	80	90	100
26300	6 ..	80	95	100	100	120	125	135
41700	4 ..	105	125	130	135	160	170	180
52600	3 ..	120	145	150	155	180	195	210
66400	2 ..	140	170	175	180	210	225	240
83700	1 ..	165	195	210	210	245	265	280
106000	0 ..	195	230	245	245	285	305	325
133000	00 ..	225	265	285	285	330	355	370
168000	000 ..	260	310	330	330	385	410	430
212000	0000 ..	300	360	385	385	445	475	510

Correction Factors

Note 1.	60°C	75°C	80°C	90°C	105°C	125°C	200°C
Temperature rating of conductor	0.58	0.75	0.78	0.82	0.85	0.89	1.00

Note 2.

Number of current carrying conductors:	Correction Factor
3	0.70
4 to 6	0.60
7 to 24	0.50
25 and above	0.40

Table 8-2: Conductor Sizes for 3% Drop in Voltage

Length of Conductor from Source of Current to Device and Back to Source - Feet																			
Metres (Feet)	3 (10)	45 (15)	6 (20)	8 (25)	9 (30)	12 (40)	15 (50)	18 (60)	20 (70)	25 (80)	27 (90)	30 (100)	33 (110)	36 (120)	40 (130)	43 (140)	45 (150)	48 (160)	52 (170)
Total Current On Circuit in Amps.	12 Volts - 3% Drop Wire Sizes (gage) - Based on Minimum CM area																		
5	18	16	14	12	12	10	10	10	8	8	8	6	6	6	6	6	6	6	6
10	14	12	10	10	10	8	6	6	6	6	4	4	4	4	2	2	2	2	2
15	12	10	10	8	8	6	6	6	4	4	2	2	2	2	2	1	1	1	1
20	10	10	8	6	6	6	4	4	2	2	2	2	1	1	1	0	0	0	2/0
25	10	8	6	6	6	4	4	2	2	2	1	1	0	0	0	2/0	2/0	2/0	3/0
30	10	8	6	6	4	4	2	2	1	1	0	0	0	2/0	2/0	3/0	3/0	3/0	3/0
40	8	6	6	4	4	2	2	1	0	0	2/0	2/0	3/0	3/0	3/0	4/0	4/0	4/0	4/0
50	6	6	4	4	2	2	1	0	2/0	2/0	3/0	3/0	4/0	4/0	4/0				
60	6	4	4	2	2	1	0	2/0	3/0	3/0	4/0	4/0	4/0						
70	6	4	2	2	1	0	2/0	3/0	3/0	4/0	4/0								
80	6	4	2	2	1	0	3/0	3/0	4/0	4/0									
90	4	2	2	1	0	2/0	3/0	4/0	4/0										
100	4	2	2	1	0	2/0	3/0	4/0											
	24 Volts – 3% Drop Wire Sizes (gage) - Based on Minimum CM area																		
5	18	18	18	16	16	14	12	12	12	10	10	10	10	10	8	8	8	8	8
10	18	16	14	12	12	10	10	10	8	8	8	6	6	6	6	6	6	6	6
15	16	14	12	12	10	10	8	8	6	6	6	6	6	4	4	4	4	4	2
20	14	12	10	10	10	8	6	6	6	6	4	4	4	4	2	2	2	2	2
25	12	12	10	10	8	6	6	6	4	4	4	4	2	2	2	2	2	2	1
30	12	10	10	8	8	6	6	4	4	4	2	2	2	2	2	1	1	1	1
40	10	10	8	6	6	6	4	4	2	2	2	2	1	1	1	0	0	0	2/0
50	10	8	6	6	6	4	4	2	2	2	1	1	0	0	0	2/0	2/0	2/0	3/0
60	10	8	6	6	4	4	2	2	1	1	0	0	0	2/0	2/0	3/0	3/0	3/0	3/0
70	8	6	6	4	4	2	2	1	1	0	0	2/0	2/0	3/0	3/0	3/0	3/0	4/0	4/0
80	8	6	6	4	4	2	2	1	0	0	2/0	2/0	3/0	3/0	3/0	4/0	4/0	4/0	4/0
90	8	6	4	4	2	2	1	0	0	2/0	2/0	3/0	3/0	4/0	4/0	4/0	4/0	4/0	
100	6	6	4	4	2	2	1	0	2/0	2/0	3/0	3/0	4/0	4/0	4/0				
	32 Volts – 3% Drop Wire Sizes (gage) - Based on Minimum CM area																		
5	18	18	18	18	16	16	14	14	12	12	12	12	10	10	10	10	10	10	8
10	18	16	16	14	14	12	12	10	10	10	8	8	8	8	8	6	6	6	6
15	16	14	14	12	12	10	10	8	8	8	6	6	6	6	6	6	6	4	4
20	16	14	12	12	10	10	8	8	6	6	6	6	6	4	4	4	4	4	2
25	14	12	12	10	10	8	8	6	6	6	6	4	4	4	4	2	2	2	2
30	14	12	10	10	8	8	6	6	6	4	4	4	4	2	2	2	1	1	1
40	12	10	10	8	8	6	6	4	4	4	2	2	2	2	2	1	1	1	1
50	12	10	8	8	6	6	4	4	2	2	2	2	2	1	1	0	0	0	0
60	10	8	8	6	6	4	4	2	2	2	2	1	1	0	0	0	2/0	2/0	2/0
70	10	8	6	6	6	4	2	2	2	1	1	0	0	0	2/0	2/0	2/0	3/0	3/0

80	10	8	6	6	4	4	2	2	1	1	0	0	0	2/0	2/0	3/0	3/0	3/0	3/0
90	8	6	6	6	4	2	2	2	1	0	0	2/0	2/0	2/0	3/0	3/0	3/0	4/0	4/0
100	8	6	6	4	4	2	2	1	0	0	2/0	2/0	2/0	3/0	3/0	3/0	4/0	4/0	4/0

Table 8-3: Conductor Sizes for 10% Drop in Voltage

Length of Conductor from Source of Current to Device and Back to Source - Feet																			
Metres (Feet)	3 (10)	45 (15)	6 (20)	8 (25)	9 (30)	12 (40)	15 (50)	18 (60)	20 (70)	25 (80)	27 (90)	30 (100)	33 (110)	36 (120)	40 (130)	43 (140)	45 (150)	48 (160)	52 (170)
Total Current On Circuit in Amps.	12 Volts - 10% Drop Wire Sizes (gage) - Based on Minimum CM area																		
5	18	18	18	18	18	16	16	14	14	14	12	12	12	12	12	10	10	10	10
10	18	18	16	16	14	14	12	12	10	10	10	10	8	8	8	8	8	8	6
15	18	16	14	14	12	12	10	10	8	8	8	8	8	6	6	6	6	6	6
20	16	14	14	12	12	10	10	8	8	8	6	6	6	6	6	6	4	4	4
25	16	14	12	12	10	10	8	8	6	6	6	6	6	4	4	4	4	4	2
30	14	12	12	10	10	8	8	6	6	6	6	4	4	4	4	2	2	2	2
40	14	12	10	10	8	8	6	6	6	4	4	4	2	2	2	2	2	2	2
50	12	10	10	8	8	6	6	4	4	4	2	2	2	2	2	1	1	1	1
60	12	10	8	8	6	6	4	4	2	2	2	2	2	1	1	1	0	0	0
70	10	8	8	6	6	6	4	2	2	2	2	1	1	1	0	0	0	2/0	2/0
80	10	8	8	6	6	4	4	2	2	2	1	1	0	0	0	2/0	2/0	2/0	2/0
90	10	8	6	6	6	4	2	2	2	1	1	0	0	0	2/0	2/0	2/0	3/0	3/0
100	10	8	6	6	4	4	2	2	1	1	0	0	0	2/0	2/0	2/0	3/0	3/0	3/0
	24 Volts - 10% Drop Wire Sizes (gage) - Based on Minimum CM area																		
5	18	18	18	18	18	18	18	18	16	16	16	16	14	14	14	14	14	14	12
10	18	18	18	18	18	16	16	14	14	14	12	12	12	12	12	10	10	10	10
15	18	18	18	16	16	14	14	12	12	12	10	10	10	10	10	8	8	8	8
20	18	18	16	16	14	14	12	12	10	10	10	10	8	8	8	8	8	8	6
25	18	16	16	14	14	12	12	10	10	10	8	8	8	8	8	6	6	6	6
30	18	16	14	14	12	12	10	10	8	8	8	8	8	6	6	6	6	6	6
40	16	14	14	12	12	10	10	8	8	8	6	6	6	6	6	6	4	4	4
50	16	14	12	12	10	10	8	8	6	6	6	6	6	4	4	4	4	4	2
60	14	12	12	10	10	8	8	6	6	6	6	4	4	4	4	2	2	2	2
70	14	12	10	10	8	8	6	6	6	6	4	4	4	2	2	2	2	2	2
80	14	12	10	10	8	8	6	6	6	4	4	4	2	2	2	2	2	2	2
90	12	10	10	8	8	6	6	6	4	4	4	2	2	2	2	2	2	1	1
100	12	10	10	8	8	6	6	4	4	4	2	2	2	2	2	1	1	1	1
	32 Volts - 10% Drop Wire Sizes (gage) - Based on Minimum CM area																		
5	18	18	18	18	18	18	18	18	18	18	16	16	16	16	14	14	14	14	14
10	18	18	18	18	18	16	16	14	14	14	14	14	12	12	12	12	12	12	12
15	18	18	18	18	18	16	14	14	14	12	12	12	12	10	10	10	10	10	10
20	18	18	18	16	16	14	14	12	12	12	10	10	10	10	10	8	8	8	8
25	18	18	16	16	14	14	12	12	10	10	10	10	8	8	8	8	8	8	8
30	18	18	16	14	14	12	12	10	10	10	10	8	8	8	8	8	6	6	6
40	18	16	14	14	12	12	10	10	8	8	8	8	6	6	6	6	6	6	6

50	16	14	14	12	12	10	10	8	8	8	6	6	6	6	6	6	6	4	4
60	16	14	12	12	10	10	8	8	8	6	6	6	6	6	6	4	4	4	4
70	14	14	12	10	10	8	8	8	6	6	6	6	6	4	4	4	4	2	2
80	14	12	12	10	10	8	8	6	6	6	6	4	4	4	4	2	2	2	2
90	14	12	10	10	10	8	6	6	6	6	4	4	4	4	2	2	2	2	2
100	14	12	10	10	8	8	6	6	6	4	4	4	4	2	2	2	2	2	2

Table 8-4: General Wiring Colour Code

Colour		Use
Green, or green w/yellow stripe(s)		DC Grounding Conductors
Black, or Yellow		DC Negative Conductors
Red		DC Positive Conductors
Engine and Accessory Wiring Colour Code		
Colour Item		Use
Yellow w/red strip (YR)	Starting circuit	Starting switch to solenoid
Brown/yellow stripe (BY) or Yellow (Y) - see note	Bilge blowers	Fuse or switch to blowers
Dark Gray (Gy)	Navigation lights	Fuse or switch to lights
	Tachometer	Tachometer sender to gauge
Brown (Br)	Generator armature	Generator armature to regulator
	Alternator charge light	Generator
		Terminal/alternator
		Auxiliary terminal to light to regulator
	Pumps	Fuse or switch to pumps
Orange (O)	Accessory feed	Ammeter to alternator or generator output and accessory fuses or switches. Distribution panel to accessory switch.
	Purple (Pu)	Ignition Ignition switch to coil and electrical instruments.
	Instrument feed	Distribution panel to electric instruments.
Dark blue	Cabin and instrument lights	Fuse or switch to lights
Light blue (Lt Bl)	Oil pressure	Oil pressure sender to gauge
Tan	Water temperature	Water temperature sender to gauge
Pink (Pk)	Fuel gauge	Fuel gauge sender to gauge
Green/stripe (G/x) Except G/Y	Tilt down and/or trim in	Tilt and/or trim circuits
Blue/stripe (Bl/x)	Tilt up and/or trim out	Tilt and/or trim circuits

Note: If yellow is used for DC negative, blower must be brown with yellow stripe.

Pleasure Craft Only - Conductors in Circuits of 50 Volts or More

32. This subsection does not apply to communication systems, electronic navigation equipment, resistance conductors which control circuit amperage, conductors in secondary circuits of ignition systems, and pigtails of less than 200 mm (8 in) of exposed length.

33. Every permanently installed conductor in a circuit which has a nominal voltage of 50 volts or more shall be:
- (a) covered with insulation classified as moisture resistant and flame retardant in the latest edition of the Canadian Electrical code Part I or a recognized testing laboratory with list of approval lab;
 - (b) a conductor which conforms to the most recent edition of IEEE Standard 45;
 - (c) a conductor listed for marine use by an independent testing laboratory which provides listing, labeling, and follow-up service;
 - (d) a conductor which conforms to the mechanical water absorption and flame retardant standards of UL Standard 83; or
 - (e) of an oil resistant type when installed in engine spaces and bilge water areas.
- 34.
35. Where the nominal circuit voltage of each of three or more current carrying conductors in a duct, bundle or cable is 50 volts or more, the amperages of each of those conductors shall not exceed that listed in Table 8-1 multiplied by the correction factor in note 2 of Table 8-1 for the applicable number of conductors.

Secondary Circuits of Ignition Systems

36. Every conductor in a secondary circuit of an ignition system shall conform to SAE Standard J557.
37. The connection of every ignition conductor to a sparking plug, coil or distributor shall have a tight fitting cap, boot or nipple.

Conductors – Support and Protection

38. This subsection does not apply to communication systems, electronic navigation equipment, or high voltage secondary conductors and termination in ignition systems.

Except for the first 1000 mm (3 ft - 3 in) of a conductor leading from a battery terminal, every conductor or group of conductors shall be supported by clamps or straps at intervals not greater than 500 mm unless the conductor or group of conductors is enclosed in a rigid duct or conduit. The material for the nonmetallic straps or clamps shall be resistant to oil, gasoline water and will not break under flexing at a temperature range of -34°C to 121 °C. Non-metallic cable clamps or straps used where exposed to sunlight shall not be sensitive to ultra-violet radiation.

- Where metal clamps are lined with an insulating material the material shall be resistant to oil gasoline and water and be compatible with the insulation or sheath
40. Clamps, straps, ducts or conduits shall be designed to prevent chafing or damage to the conductor insulation.
41. Provision shall be made to avoid stress being placed on any conductor that connects two components that can move in relation to each other.
42. Every conductor or group of conductors which passes through a bulkhead, structural member, junction box, or other rigid surface shall be protected from abrasion.

43. Every conductor shall be protected from damage due to exposure to heat sources capable of damaging the insulation.
44. Current carrying conductors shall be routed as high as practical above the bilge water level and other areas where water may accumulate. If conductors must be routed in the bilge or other areas where water may accumulate, the wiring and connections shall be watertight.
45. AC and DC conductors or multiconductors shall be separately sheathed in conduit, cable trunking, bundled or otherwise kept separate from each other.
46. Each conductor that is part of the electrical system, except for conductors integral with engines as supplied by their manufacturers, shall be clearly differentiated between AC and DC and identified as to its function in the system.
47. DC equipotential bonding conductors shall be identified by green or green with yellow stripe insulation, which colours shall not be used for current carrying conductors, or may be uninsulated.

Conductors – Termination

48. This subsection does not apply to communications systems and electronic navigation equipment.
49. Every connection to a screw terminal or stud which is outside a junction box or enclosure shall be connected by a closed-ring connector, eyelet connector, captive spade connector, mechanical locking connector or spring locking connector.
50. Every stripped connector that is connected to a compression screw terminal which is outside a junction box or enclosure shall be mechanically secured to avoid stress on the connection.
51. Every single friction connection, spring type connector, and multi-connector plug which is outside a junction box or enclosure shall be capable of withstanding a force of 27 N for one minute, applied along the axial direction of the conductor.
52. Subject to paragraph 43, a soldered connection that is outside a junction box or enclosure shall not be the sole means of connection between two or more conductors, or between a conductor and connector.
53. Notwithstanding paragraph 42, a conductor may be soldered to a connector which joins the conductor to a battery terminal or stud, provided that the length of the soldered joint is at least 1.5 times the diameter of the stranded portion of the battery conductor.
54. .
55. Every ungrounded terminal or stud which is continuously energized:
 - (a) shall comply with paragraphs 36 and 37 of this Section; or
 - (b) shall have a boot, nipple, cap, cover, or shield which prevents accidental short-circuiting at the terminals or studs.

56. Every termination which is composed of an ungrounded current carrying conductor, terminal fitting, and connector shall be protected from accidental short-circuiting with:
 - (a) another termination from another circuit which is composed of an ungrounded current carrying conductor, terminal fitting, and connector; or
 - (b) any metal which is grounded.
57. No conductor shall be joined to another conductor by a wire nut, or wire screw.
58. Blade type friction connectors may be used if:
 - (a) the voltage drop from terminal to terminal does not exceed 50 millivolts for a 20 amp current flow; and
 - (b) The connection does not separate if subjected to a 27 N tensile force along the axial direction of the connector for one minute.
59. All connections shall be in locations protected from the weather or in weathertight enclosures. Connections exposed to immersion shall be in watertight enclosures.
60. Metals used for terminal studs, nuts and washers shall be corrosion resistant and galvanically compatible with the conductor and terminal. Aluminum and unplated steel shall not be used for studs, nuts or washers in electrical circuits.

Receptacles

61. Receptacles and matching plugs used on DC systems shall not be interchangeable with those used on AC systems on the craft.
62. Receptacles installed in locations subject to rain, spray or splash shall be protected by a cover with an effective weatherproof seal.
63. Receptacles installed in areas subject to flooding or immersion shall be protected by an effective cover with a watertight seal, including connecting plugs.

Overcurrent Protection – General

64. This section does not apply to resistance conductors which control circuit amperage, conductors in secondary circuits of ignition systems, pigtails of less than 200 mm (8 in.) of exposed length, and power supply conductors in cranking motor circuits.
65. Every ungrounded, current carrying conductor shall be protected by a manually reset, tripfree circuit breaker or fuse which shall be:
 - (a) at the source of power for each conductor; or
 - (b) at the point where a conductor size is reduced to a smaller gauge; or
 - (c) at the origin of the circuit, if the circuit breaker or fuse has a current rating which prevents overloading of the smallest conductor in the circuit.
 - (d) overcurrent protection for each ungrounded conductor of a branch circuit shall be at the point of connection to panelboard/switchboard .

(a)

66. Except as provided in paragraph 67 the current rating of each circuit breaker or fuse shall not exceed the current rating of the smallest conductor in the circuit.
67. If the value specified in paragraph 66 does not correspond to a standard circuit breaker or fuse rating, then the next larger rated circuit breaker or fuse may be used, provided it does not exceed 150% of the allowed current capacity of the conductor.
68. The voltage rating of each circuit breaker or fuse shall not be less than the nominal voltage of the circuit which it protects.

Overcurrent Protection – Special

69. Every ungrounded supply conductor from a storage battery shall have a manually reset, tripfree circuit breaker or fuse, unless the supply conductor is in the main power feed circuit from the battery to an engine cranking motor.
70. The circuit breaker or fuse as specified in paragraph 69 shall be within 1800 mm (6 ft) of the battery as measured along the conductor, unless the circuit has a switch which disconnects the battery.

Panel Boards

71. The front side of panel boards (i.e. switch and breaker operating face) shall be readily accessible, and the rear side (i.e. terminal and connection side) shall be accessible.
 72. Panel boards shall be designed, constructed and installed so that there are no exposed live parts accessible to the operator in the normal operating position.
 73. Panel boards shall be weatherproof or protected from weather and splash.
 74. Craft equipped with both DC and AC electrical systems shall have their distribution from either separate panel boards or a common one with a partition or other positive means provided to clearly separate the AC and DC sections from each other. Wiring diagrams to identify circuits, components and conductors shall be included.
- The switchboard or panelboard shall be provided with permanent markings of the nominal voltage and type (DC) and if associated with an AC system shall have a barrier separating the two systems which shall suitably identified.

The Following Requirements Apply to Commercial Vessels Only:

Cables and Connectors

75. All cables shall have stranded copper conductors, a protective covering of either watertight metallic sheath or impervious nonmetallic sheath, compatible with the insulation and be rated for at least 75°C service.

76. Every conductor in a circuit which has a nominal voltage of 50 volts or more shall:
- (a) be in accordance with *Transport Canada Marine Electrical Standards TP127, Section 12*;
 - (b) not be used for fixed wiring if they are portable cords or portable cables;
 - (c) be a conductor which conforms to the most recent edition of IEEE Standard 45; and
 - (d) be a conductor listed for marine use by an independent testing laboratory which provides listing, labeling, and follow-up service.
- All connections shall be made in locations which are protected from the elements or if required shall be in weatherproof or watertight enclosures where applicable.
 - Mechanical and electrical joints shall be designed and installed to avoid damage to the conductors.
 - Metals used for terminals, studs nuts and washers shall be corrosion resistant and galvanic compatible with the conductor and terminal lug. Aluminum and un-plated steel shall not be used for studs nuts and washers.
 - Terminal connectors shall be the ring or captive spade types and the same nominal size of the stud.
 - Set screw connectors may be used provided the set screw does not bear directly on the conductor strands
 - Twist-on wire nuts or wire screws shall not be used.
 - Solder shall not be the sole means of connection in a circuit. If soldered the connection shall be located or supported to minimize flexing of the conductor . Where battery lugs are soldered the contact length shall be not less than 1.5 times the diameter of the cable
 - Connectors of the crimp-on type shall only be attached by tools design for the connector being used.
 - There shall not be more than four conductors connected to any one stud terminal.
 - Ring and captive spade terminal shall be the same nominal size as the stud.
 - Where a conductor terminates at a switchboard, fixture or in a junction box a length of the conductor shall remain to provide strain relief at the terminal and allow for any future repairs.
 - Shanks of terminals shall be protected against accidental shorting except those employed for grounding lugs..

- Harness type wiring using multi-wire plugs and receptacles shall have cable clamps, molded connectors, insulation grips or extended terminals to limit flexing at the connection point; the connectors where exposed to weather shall be weatherproof or watertight; each terminal shall be protected from accidental short-circuiting and the capacity shall meet or exceed the ampacity and temperature rating of the connecting conductors.
- The DC distribution system shall be of a two wire type with the supply and return in the same cable. The engine block may be used as the common return for accessories mounted on the engine except on metallic vessels, where the engine is not isolated from the hull.
- On metallic hull, the hull, a bonding conductor or the grounding conductor shall not be used as the return conductor.
- If one side of the DC system is grounded it shall be negative of polarity.
- Where a boat has more than one engine with a grounded cranking motor including an auxiliary engine, the engines shall be connected by a common conductor that can carry the cranking motor current of each engine. Multiple outboard engines shall be connected at the battery negative
- Boats that have multiple inboard engines including an auxiliary generator with crossover (paralleled) cranking motors circuits shall provide a cable large enough to carry the cranking motor current connected to each engine. This cable shall be independent and in addition to any other electrical connections to the engines including the above section. Boats that are excepted from this are outboard motors and installations that use an ungrounded DC electrical system.

Electrical Systems of 50 Volts or Over

77. Permanently installed, electrical systems of 50 volts or over shall conform to *Transport Canada Marine Electrical Standards, TP 127 or ABYC*.
78. All connections should be made in terminal or junction boxes providing mechanical and environmental protection.

Equipment Grounding

79. In steel and aluminum vessels, non-conducting exposed metal parts of electrical equipment that requires grounding shall be effectively grounded to the hull.
80. On wood, fibre-reinforced plastic and composite vessels, a continuous ground conductor shall be installed to facilitate the grounding of non-conducting exposed metal parts of electrical, electronic and communication equipment that requires grounding. The ground conductor shall terminate at a point on the main engine or at a

copper plate of area not less than 0.2 m² fixed to the keel below the light waterline so as to be fully immersed under all conditions of heel.

81. Every grounding conductor shall be of copper or other corrosion-resistant material and shall be securely installed and protected, where necessary, against damage and electrolytic corrosion.
82. Every ground connection to the vessel's structure, or on wood, fibre-reinforced plastic and composite vessels, to the continuous ground conductor, shall be made in an accessible position and shall be secured by a screw or connector of brass or other corrosion-resistant material used solely for that purpose.

Shore Power

83. Shore power shall be in accordance with the requirements of TP127.

Construction Standards for Small Vessels

Machinery Systems

ISSUE NUMBER: 1

DATED: March 2001 1ST April 1999 Small Commercial Vessel Compliance Program

NUMBER OF PAGES: 6

THIS ISSUE SUPERSEDES:

Issue number: 0

Dated: 0

Number of pages: 0

Section 9: Machinery Systems

Application: Commercial Vessels Only

General

Where persons may come in contact with moving machinery parts, guards should be fitted where practical

Where assistance is not immediately available spares and tools for emergency repairs should be carried onboard. The spares to be carried are dependent upon the particulars of the vessel and its operation. However, the minimum spares that should be carried include a change of plugs and fuses and a spare propeller for both inboard-outboard and outboard engines

Engine Starting

1. The machinery may have either mechanical, hand or electric starting.
2. Charging facilities for the batteries should be automatic. Where there are two motors and an auxiliary battery, it is recommended that the two starter motor batteries be capable of being connected in parallel to provide additional starting power.

Gasoline Engines

3. In enclosed machinery spaces where gasoline is present there should be power ventilation which, prior to starting the engine, should be operated for an adequate length of time to clear the space(s) of vapors, with the minimum time of ventilation being 4 minutes. A clear permanent instruction placard covering this operation should be mounted at the ignition switch on the control console.

Operating Station Controls

4. The following shall be provided at the vessel's operating station, where applicable:
 - (a) Engine oil pressure and engine coolant temperature indicators for inboard engine
 - (b) Fuel capacity gauges unless other adequate means to determine the amount of fuel is provided
 - (c) Battery charging gauges
 - (d) Controls for navigation light, steering equipment, etc.
 - (e) Control and instructions for the blowers
 - (f) High bilge indicator
 - (g) Fire detection panel and alarms
 - (h) Engine shut-off device

Shafting and Propellers

5. The propulsion machinery manufacturer's recommendations, or other recognized authority criteria, should be taken into account when determining the material and dimensions of shafting and propellers.

Pressure Vessels

6. Where there are pressure vessels they should be fitted with a drain valve, pressure gauge and safety valve and should conform to recognized rules, except:
 - (a) one having a working pressure that does not exceed 103 kpa (15 lb/in²);
 - (b) one having an internal diameter that does not exceed 150 mm (6 in);
 - (c) one where the volume above the normal working level of a liquid does not exceed 45 l (12 gallons U.S.); or
 - (d) one where the volume does not exceed 150 l (40 gallons U.S.) and the maximum working pressure does not exceed 700 kpa (100 lb/in²).

Bilge Pumping Arrangements

7. There should be a means of pumping or bailing each watertight compartment when the vessel is in its operating condition. The means provided should be effective when the vessel is upright and when it is heeling up to an angle of 10°.
8. Vessels over 6 m (20 ft) should have bilge pumps of at least 0.91 l/ (900 US gallons per hour) minimum capacity.

Where a Piping System is Fitted

9. The piping arrangement should ensure that no back siphoning can occur and suitable strainers should be provided on the suction line from each compartment.
10. The piping may be of metal, rigid plastic or non-collapsible and non-oil degradable rubber hose with flanged, screwed or robust double-clamped connections, where possible.
11. The piping should normally be not less than 25 mm (1 in) in diameter, except that for small compartments 18 mm (³/₄ in) diameter may be acceptable where the pump out time is adequate.
12. On vessels over 6 m (20 ft) that have bilges that are not readily observed, audible bilge alarms or visual indicators should be provided at the operating station to indicate:
 - (a) a high bilge level in a normally unattended machinery space or other space having an underwater through-hull connection, and
 - (b) when an automatic bilge pump is operating.
13. Where overnight sleeping accommodation is provided, the high bilge level alarms should be audible (84dbA) to persons sleeping.
14. Where there are automatic bilge pumping arrangements they should be fitted with an overriding manual switch which is readily accessible.

Steering Systems

15. 15. Vessels should be fitted with a safe and efficient means of steering that is operable from the control position and capable of maneuvering the vessel under normal operating conditions. The steering systems should be protected from obstructions, excessive heat and mechanical wear.
16. When a steering gear is fitted with remote control, arrangements should be made, if practicable, for emergency steering. For inboard/outboard and outboard engines an installed, semi-permanently mounted, auxiliary motor will be accepted as emergency steering when it is fully functional and installed by being locked in place or requires tools for removal.

All vessels operating in remote areas or where help is not readily available require a means of emergency steering.

Emergency steering is not required for:

- a) vessels with multiple screw propulsion with independent control of each screw, when it has been demonstrated that the vessel can be effectively steered at low speed in this fashion;
- b) vessels with no rudder fitted, where steering action is obtained by a change of directional setting of the propulsion units, when it has been demonstrated that the vessel can be effectively steered at low speed in this fashion;
- c) vessels fitted with a rudder and a hand tiller as the main steering arrangement;
- d) vessels fitted with independently controlled adjustable trim tabs, when it has been demonstrated that the vessel can be effectively steered at low speed in this fashion; and
- e) vessels fitted with a bow thruster, when it has been demonstrated that the vessel can be effectively steered at low speed using the thruster only.

Exhaust Systems

Application

17. This subsection applies to all exhaust systems on both pleasure craft and commercial vessels equipped with inboard or stern drive engines or permanently installed auxiliary engines.

General Requirements

18. All exhaust systems shall be gastight to the hull interior.
19. All fittings, joints, clamps and supports of an exhaust system shall be accessible for inspection and repair. All hose connections shall be double clamped.
20. Exhaust system piping and components shall be independently supported to minimize failure from vibration, shock, expansion or contraction.
21. All supports, hangers, brackets or other fittings in contact with uncooled exhaust carriers shall be non-combustible and constructed so that the temperatures transmitted to the supporting materials will not cause combustion. Exhaust system piping should be kept at a safe distance from combustible material preventing the surface temperature of such materials from exceeding 93°C.

- 22. Protective guards, jacketing or covers shall be provided wherever persons or gear might come into contact with the exhaust system where the temperature exceeds 93°C. Engine maintenance or repair may make the temporary removal of this protection necessary.
- 23. Each exhaust system shall be designed and installed to prevent cooling water, rain water or raw water from entering the engine through the exhaust system under all normal operating and non-operating conditions.
- 24. No additional discharges other than cooling water shall share the exhaust gas passage.

Materials

- 25. Materials used in a marine engine exhaust system shall be resistant to saltwater corrosion, resistant to exhaust products and galvanically compatible. Non-metallic exhaust system component should meet the requirements of UL 1129 or SAE J2006.
- 26. Threaded pipe and fittings for the engine exhaust(s) shall be at least schedule 80 pipe or equivalent.
- 27. Non-metallic exhaust system components shall retain watertight integrity for 2 minutes after a total loss of cooling water with the engine operating at full power.