CONFIDENTIAL

SERIAL NO. 67

NAVSHIPS (451)

DETAIL AND SPECIAL SPECIFICATIONS FOR BUILDING MOTOR TORPEDO BOATS

PT565-624

DETAIL SPECIFICATIONS FOR BUILDING MOTOR TORPEDO BOATS PT 565-624 (80-Foot)

FOR THE UNITED STATES NAVY

BUREAU OF SHIPS
NAVY DEPARTMENT
31 March 1944

NOTE: The Detail Specifications are based on Specifications for Motor Torpedo Boats PT 103 to 138 design No. 80-N-3 (dated 2 January 1942) and addenda thereto (dated 22 February 1943), as prepared by Electric Boat Company, Elco Naval Division, Bayonne, N. J., with the minimum modifications made by the Bureau of Ships to make the hull specifications applicable to PT 565-624 Class.

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I

CONFIDENTIAL INFORMATION

These specifications and all general specifications, detail specifications, plans, and other data or information relative to these vessels shall be regarded as strictly confidential, and the contractor shall exercise every possible precaution to prevent such confidential information being divulged to unauthorized persons, and especially to those not citizens of the United States.

For ready reference purposes, excerpt from the Espionage Act of June 15, 1917 (50 U. S. C. 31-32), is quoted below:

* * * Whoever, lawfully or unlawfully,, having possession of, access to, control over, or being entrusted with any document, writing, code book, signal book, sketch, photograph, photographic negative, blueprint, plan, map, model, instrument, appliance, or note related to national defense, wilfully communicates or transmits or attempts to communicate or transmit the same to any person not entitled to receive it, or wilfully retains the same and fails to deliver it on demand to the officer or employee of the United States entitled to receive it; or whoever, being entrusted with or having lawful possession or control of any document, writing, code book, signal book, sketch, photograph, photographic negative, blueprint, plan, map, model, note, or information relating to the national defense, through gross negligence permits the same to be removed from its proper place of custody or delivered to anyone in violation of his trust, or to be lost, stolen, abstracted, or destroyed, shall be punished by a fine of not more than $10,000 or by imprisonment for not more than 2 years, or both. * * *

The contractors are reminded that the foregoing applies to the loss of confidential specifications, plans, and other confidential data furnished them by the Bureau.

Further, it is particularly emphasized that no information concerning the general or detailed characteristics of the machinery or appurtenances for these vessels will be divulged to any person or persons not citizens of the United States for the purpose of obtaining any plans or technical information concerning such machinery from any foreign source.

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DETAIL SPECIFICATIONS FOR BUILDING MOTOR TORPEDO BOATS

SECTION A-1. GENERAL.

A-1-a. Principal dimensions.-The following data are for information only.

	Feet	*Inches*	*Gallons*
Length overall	80	3	
Length des. L. W. L	73	4	
Beam, over planking, max	20	7	
Beam, extreme	20	10 3/4	
Depth, molded, top of deck at side to under side of keel amidships	8	9 1/2	
Draft, normal, under 28" propellers	5	0 3/4	
Potable water, approx.			200
Fuel (gasoline)			3, 000

It is the intent of these specifications to describe the hull construction, fittings, systems, machinery installation, and equipment, all of which are to follow best commercial practice except as otherwise stated, as specially applied to high-speed vessels of this character.

Where the specifications and plans differ, the specifications shall apply.

In the case of details which it is not possible fully to specify, or of inadvertent omissions from the plans and specifications or inadvertent inclusions therein, it is to be understood that the intent of the plans and specifications is to be carried out in all respects and also that the supplying and installation of all fittings and outfits are to be in accordance with what is considered to be the best practice for boats of this type.

The builder shall supply only such items of equipment and outfit as are specifically listed in these

specifications. Spare parts will 30 be acquired under separate contract.

These specifications contemplate the installation and/or stowage for Government furnished material as listed in these specifications, and the builder is to be reimbursed for any additional costs incurred if required to install Government material other than, or in addition to, that specified herein.

SECTION A-2.
SUMMARY OF WORK PERTAINING TO HULL TO BE DONE BY THE CONTRACTOR.

The contractor shall supply all necessary materials except as otherwise specified. The contractor shall build, launch, and fit out the vessel. The vessel shall be made complete in all respects by the contractor, with all compartments and spaces with their contents, as described by the contract plans or the specifications. The vessels shall be fitted complete with the necessary equipment for steering, towing, warping, stowage, and with such other arrangements as may be necessary for the proper handling, operating and controlling of the vessel and its equipment.

The contractor shall install, the systems complete for the following: gasoline, fire extinguishing, fresh water, lubricating oil, plumbing, pumping and drainage, salt water, ventilation, and such other systems as are necessary. The contractor shall also furnish the above items, except those specifically mentioned as being supplied by the Government.

The contractor shall provide the necessary foundations and connections to systems required for the installation of auxiliary machinery, main propelling machinery, ordnance, searchlights, miscellaneous equipment furnished by the Bureau of Ships or other Bureaus of the Navy Department, as specified in the detail and special specifications, but subject to section A-1 hereof.

The contractor shall perform such work and furnish such materials as may be necessary for the installation of systems, appliances, apparatus, fittings, instruments and utensils, and articles of equipage under other Bureaus, the installation of which is required by these specifications and which is under the cognaince of the Bureau of Ships. The contractor shall install all ordnance equipment, outfit, appurtenances, and instruments, subject to section A-1.

All machinery, tools, appliances, and supplies of all kinds required in building the vessel shall be supplied by the contractor.

The contractor shall also provide and install all fittings and appliances required for the trials which may be necessary to enable the representatives of the Government to determine whether the requirements provided for in the contract have been made, except that for such of these instruments and apparatus as are furnished by the Government the contractor shall be responsible for care, installation and removal only.

The contractor shall install the Government-furnished sectioned whip type radio antenna, with necessary bracing, protective guards, and stowage for all sections when unshipped. See Special (Machinery) Specifications, section S67.

SECTION A-3.
WORK PERTAINING TO OTHER BUREAUS.

The necessary foundations and attachments, where applicable, shall be provided for all ordnance equipment, outfit and material furnished by the Bureau of Ordnance.

Stowage shall be provided for portable outfit and equipment, furnished by the Government and the contractor, as listed herein.

All work necessary for the proper installation of outfit, equipment, and materials furnished by other Bureaus, as listed herein shall be done by the contractor.

All work under the cognizance of the Bureau of Ships in connection with installation of all systems, appliances, apparatus, fittings, or outfit, pertaining to all Bureaus, shall be done in the most satisfactory manner, and care shall be taken as to location and method of fitting, with a view to preserving structural strength and watertightness in all members.

SECTION A-4.
UNCOMPLETED WORK.

The vessel when delivered to the Government shall be complete in every respect, but in the case of such items of work as remain uncompleted, the Supervisor of Shipbuilding shall prepare a list, together with a list of all items of work which are found to be unsatisfactory, and submit such lists to the contractor. If desired by him, the completion of the work involved under the items in these lists will be treated as a reduced cost change under the contract, and in this case estimates should be submitted. Otherwise, the completion of such items of work will be undertaken at a Navy Yard at the delivery, and the cost thereof will be deducted from the contractor's account in final settlement.

SECTION A-5.
ORDNANCE AND ORDNANCE OUTFIT.

The battery will be as follows:

Four torpedo launching racks-Mk. 1.

One 20 mm. A. A. gun on mount Mk. 14 on forward 40 mm. foundation.
Four .50 cal. A. A. machine guns in two mounts, Mk. 17 Mod. 1.
One 40 mm. Army type single A. A. gun aft.
One FM smoke screen generator, Mk. 6.

Ordnance and ordnance outfit will be furnished by the Government and installed by the contractor.

The contractor shall provide all foundations and structural work in connection with the installation of the torpedo racks, the .50 caliber A. A. machine guns, the smoke screen generator, after 40 mm. -A. A. guns, Mark 1 side launching racks. Foundations

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shall also be provided by the contractor for the possible future installation of one army type 40 mm. single gun forward.

The torpedo director shall be located on the starboard side of the bridge at approximately height of eye.

Nonskid treads shall be added to firing steps in both machine gun turrets.

In all cases, the required space shall be maintained about the guns, when in place for their efficient service at any point in the designated arc of fire. Where fittings necessarily interfere with the efficient service of guns, such fittings shall be made portable.

The contractor shall supply and fit such lashings, padeyes, lashing bolts, and shackles as may be required for properly securing the guns, and torpedoes.

The contractor shall provide stowage for all parts of ordnance outfit and equipment that are not permanently installed.

The contractor will be required to cut the cam-stop blanks for Government-furnished cam-stops for 20 mm. A. A. gun.

Pipe railstops for 40 mm. army type A. A. gun, to protect bridge, torpedo, radar, and other hull interferences, shall be furnished by the contractor.

The contractor shall furnish and install suitable depression stops for .50 cal. A. A. machine guns to give approved clearance of structure, personnel on bridge, etc.

Test-loading and releasing of dummy torpedo from each rack (4 racks per boat) shall be performed after installation.

SECTION A-7.
MISCELLANEOUS ARTICLES.

The following articles will be supplied by the Government and shall be installed or shall have stowage provided by the contractor as directed by the Supervisor of Shipbuilding.

4 Torpedo launching racks, Mark 1.
2 Mk. 17, Mod. 1 mounts for twin .50 cal. machine guns.
1 Mk. 14 22 mm. A. A. mount.
1 40 mm. Army type A. A. gun (stern) with tools and equipment.
1 .50 cal. machine gun spare (packed in box).
2 .50 cal. machine gun Instruction Manuals.
2 sets .50 cal. machine gun sights.
1 box spare parts for .50 cal. machine gun mounts and cradles.
8 ammunition boxes .50 cal., 250 rounds each.
8 ammunition boxes .50 cal., 250 rounds each, spares.
1 Oerlikon 20 mm. A. A. machine gun, 1 box of spare parts and tools, and 1 instruction manual, and 12 magazines.
1 Oerlikon spare barrel.
1 Smoke screen generator Mk. 6 for mounting on stern.
2 Pioneer compasses.
1 Rubber life raft.
1 9-foot Dinghy.

The following articles shall be supplied by the contractor, and shall be installed or shall have stowage provided by the contractor as directed by the Supervisor of Shipbuilding. Articles supplied by the contractor shall be of first quality for the intended purposes, using best commercial articles obtainable where they are satisfactory for the service, and of special Elco manufacture where necessary. In all cases unnecessary weight to be eliminated, and stowage arrangement also to be as light as strength requirements will permit.

CREW'S QUARTERS

4 Transom berth cushions, pantasote covered.
1 Mess seat cushion, pantasote covered.
2 Mess seat cushion backs, pantasote covered. 1 Door curtain, lavatory.
1 Table, mess.

OFFICERS' STATEROOM

1 "Root"-type berth.
1 Transom and cushion.
2 Thin mattresses.
1 Chair, with cushion.

PETTY OFFICERS' STATEROOM

1 "Root"-type berth.
1 Transom and cushion.
2 Thin mattresses.

CHART ROOM

1 Seat cushion, pantasote covered.
1 Back cushion, pantasote covered.

OFFICER'S MESS

1 Seat cushion, pantasote covered.
1 Seat cushion, back.

CREW'S DAY ROOM

2 Crews lockers (portable).
2 "Root"-type settees.
2 Mattresses.

ENGINE ROOM

1 Observer's seat cushion.

MISCELLANEOUS

1 M. S. A. explosimeter Model 2.
1 Regular steel shipping cradle per boat, complete with chocks and boat-locating arms. In addition, there shall be supplied one out of every four cradles equipped with rubber-tired wheels and steering linkage.
2 75-pound Danforth anchors, with 5/8" shackle and 3/4" pin.
2 50 Fathoms 4 1/2" sisal anchor rope complete with thimble and shackle. Rig one for service.

**** *Page 5, line 38, DELETE"1 M.S.A. explosimeter Model 2." - to read - "Instrument, Electric*

*measuring combustible - gas - indicating portable - Type A of BuShips AD Interim Spec 18 I 19 (BuShips ltr. 11-4-44, PT565-624/S87(516f) ****

**** Officers' Mess The officers' mess furniture will be removed. (BuShips ltr. to Elco dated 30 June '44 PT565-0624/S38-2/S38-1) ****

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1 6 fathoms 3/8" galvanized chain with 1/2" shackle and 5/8" pin.
2 Life rings, 24" kapok with chocks and life line.
1 Sea anchor and oil can.
6 Hand Lux 7 1/2 pound fire extinguishers.
14 Life preservers, kapok, jacket type.
2 Cowl vents.
3 Cowl vent covers, canvas, color adapted to camouflage.
1 Oerlikon gun cover, canvas.
1 M. G. turret spray shield cover, aft, canvas.
2 M. G. turret covers, canvas.
4 Dock lines, 10 fathoms, 7/8" diameter.
**** 1 1/8" Per Sales O. N3417-7-21-44 ****
2 Heaving lines, 10 fathoms, 3/8" diameter.
4 Fenders, 7" by 24" with becket and lanyard.
2 Coir deck mats.
1 Bow flagstaff and halyard.
1 Stern flagstaff and halyard.
2 Boat hooks 10 ft., ash.
2 Life lines, wire rope, complete with necessary fittings and stanchions for forward deck to suit.
2 Life lines, wire rope, complete with necessary fittings between Mk. I racks.
2 Trouble lights, with cords and bulbs.
1 Gasoline fuel rod, wing tank.
1 Gasoline fuel rod, center tank.
2 Fuel cap wrenches.
2 Water tank cap wrenches.
5 Padlocks with keys (Corbin 9026 No. 2881).
12 Stools, folding canvas.
1 Rubber mat for bridge.

HELMSMAN'S PLATFORM

16 Crew's locker keys.
2 Key locker keys.
2 Keys, captain's room.

2 Keys, spare room.
2 Captain's wardrobe keys.
2 Keys, officer's spare wardrobe.
1 Bridle, towing; stock 10T with pennant.
1 Torque wrench No. 66.
12 12" hose clamps.
2 jars aluminum alloy thread lubricant.
1 1 13/16" socket wrench for propeller shaft flange nuts.
1 Allen set screw wrench for inlet scoop control.
1 Socket wrench for scoop.
1 Life line, wire rope, complete with necessary fittings, for after deck, loose on board.
2 Binnacles for 2 Government-furnished compasses.
1 Wrench for rudder bearings.
4 Ice trays for refrigerator.
1 Strainer and plug for galley sink.
1 Garbage receptacle.
1 Emergency tiller bar.
1 24 volt D. C., 115 Volt A. C. electric stove, 3-burner, portable oven type.

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The set cooking utensils included with stove consisting of the following:

1 Portable oven.
1 Oven baffle.
2 Covered oven pans.
1 Open oven pan.
1 Aluminum coffee pot.
2 6-qt. pots with strainers and steamer.
1 Aluminum frying pan.
1 Frying. pan pot holder.
1 Pot holder 6-qt. cooker.
1 Pot holder, percolator.

For other Government-furnished articles see Special Specifications for Machinery, dated 15 April 1944.

15 SECTION A-8.
CARE OF HULL DURING CONSTRUCTION.

These boats are to be constructed in the Elco Naval Division Plant on Newark Bay, at Bayonne, N. J.

Care shall be taken to preserve the structure, deck coverings, fitting, equipage, outfit, furniture, paint work, auxiliaries, appliances and apparatus in a satisfactory condition during the entire period of construction and fitting out. Special measures shall be taken where necessary or directed by the Supervisor of Shipbuilding to prevent the usual wear and tear and damage incident to construction, and to prevent corrosion, especially to unpainted and polished parts of machinery and fittings, and to prevent corrosion and freezing between moving parts. All defects, damages, and deteriorations of the vessel, its parts, fittings, outfit, etc., that develop during the construction and fitting out, or incident to the construction and fitting out, shall be corrected by and at the expense of the contractor.

Just before the delivery of the vessel to the Government all tanks, piping, fixtures, valves, pumps, and all other systems or parts of systems through which it is intended that any part of the potable water supply of the vessel shall flow, or in which it is intended that such water shall be stored, shall be thoroughly flushed with an approved nonpoisonous, noncorrosive, and antiseptic solution in such manner as approved by the Supervisor of Shipbuilding.

SECTION A-9.
INSPECTION.

By accepting a contract to which these specifications are applicable, the contractor recognizes and acknowledges his obligation to cooperate with the Government in the efforts of the latter to

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administer the inspection service efficiently and economically, and he undertakes to protect the interest of the Government, other contractors, and himself, by avoiding actions or omissions which add unnecessarily to the burden on the inspection service. The Government undertakes to complete, with reasonable rapidity, the inspection of all work.

The work of construction shall be at all times open to the inspection of the Supervisor of Shipbuilding and his assistants, and every facility afforded such inspectors for the prosecution of their work. The same facilities for inspection shall be afforded to the Naval Inspector of Ordnance and his assistants, insofar as work under the cognizance of that Bureau is concerned.

The inspectors may reject any unfit workmanship or material, or forbid the use thereof.

The contractor shall furnish such samples of materials and information as to the quality thereof and the manner of using the same as may be required, and any assistance necessary in testing or handling materials for the purpose of inspection or test shall be furnished by, and at the expense of the contractor.

The contractor shall supply such blueprints as the Supervisor of Shipbuilding may require for the execution of the work and for the files of Supervisor of Shipbuilding's office.

The contractor shall furnish the Government inspector with copies of all material orders at the time such orders are placed so that such material may be inspected at place of manufacture if the Government so elects.

SECTION B-1.
PLANS AND SPECIFICATIONS.

B-1-a. Contract plans.-The following plans accompany and form a part of these specifications. The intent of these plans is to show the essential general features and arrangements but not the exact details.

CONTRACT PLANS

Title	BuShips No. PT565-S0-101H-
Type sections	-408111
Steering gear assembly in boat	-408112
Cabin arrangement	-408113
Bilge drainage system	-408114
Inboard profile, hull construction	-408115
Profile and table of offsets	-408116
Deck arrangement	-408117

B-1-b. Working plans.-In addition to the contract plans, the ship contractor shall prepare detail working plans for the construction of these vessels.

All plans prepared by the contractor shall be approved by the Supervisor of Shipbuilding.

Any material ordered on work executed by the contractor before final approval of the plan of the work involved, shall be entirely at the contractor's risk.

These plans shall be prepared in general accordance with the 10 requirements of the General Specifications for Building Vessels of the U. S. Navy, appendix 16, chapter 1.

B-1-c. Finished plans.-The contractor shall furnish for use on each of the vessels two blueprints of each of the following finished plans:

Cabin arrangement.

Deck arrangement.
Diagrams of systems:
  Ventilation.
  Fire extinguishing.
  Potable water.
  Steering gear.
  Engine room piping.
Docking, general dimensions and data.
Inboard arrangement.
Outboard profile.
Shaft arrangement.
Wiring diagram.

B-1-d. Plans for squadrons.-The contractor shall furnish for each group of 12 vessels, one reproducible copy of the plans as listed below, applicable to those vessels:

Bilge drainage system.
Bottom blocking.
Lubricating oil system assembly.
Miscellaneous pipe lines.
Underwater exhaust master assembly.
Cabin arrangement.
Lux system arrangement and detail of.
Docking plan.
80-foot motor torpedo boat on cradle.
Inboard profile hull construction.
Towing bitt forward.
Fuel tank installation and construction of tank compartment.
Sections through gun'l, chine & keel.
Type sections.
Deck framing.
Construction of cabin trunk.
Oerlikon ammunition racks and general stowage in rudder compartment.

Ignition circuit wiring diagram.
Torpedo firing circuit wiring diagram. Instrument panel thermal wiring diagram. Gemmer gear outline.
Heat exchanger assembly.
Heat exchanger details.
Heat exchanger tube plate details.
Cooler oil control valve.
Steering shaft gimbal bearing.
Rudder bearings (lower).
Rudder bearings (upper).
Steering shaft bulkhead bearing.
Steering gear chain adjuster.
Steering gear assembly in boat.
Sherwood oil pump assembly (V-drive).
Machinery plan of engine room.
Propeller shaft location.
Exhaust pipe and muffler connection.
Exhaust pipe assembly.
Fore and aft push rod assembly (throttle system).
Mooring bitt.
Bottom blocking.
Bridge control rod assembly (throttle system).
Instrument panel assembly.
Fuel tank fill and sound and suction tube.
Fuel system flow control.
Salt water scoop control assembly.
Fresh water system assembly.
Storage battery power and charging circuit wiring diagram.
General lighting circuit wiring diagram.
Battle lighting circuit wiring diagram.
Power distribution circuit wiring diagram.
Electrical circuit schematic.
Electrical fixtures diagrammatic location.
Audible and visible signal circuit wiring diagram.
Underwater exhaust master assembly.
Outboard profile.
Strut main center.
Strut main wing.
Strut forward center.
Strut forward wing.
Stern tube details.
V-drive assembly.
V-drive shaft and gears.

B-1-e. Plans for Bureau of Ships.-One set of reproducible plans as listed above shall be furnished to the

Bureau not later than two months after delivery of the first vessel. When alterations to the above plans are approved, the Bureau shall be furnished with reproducible copy of such altered plans. The contractor shall furnish one blueprint of each plan and each alteration after approval, to the Supervisor of Shipbuilding for forwarding to the Bureau.

B-1-f. Instruction books.-No general information book or damage control book will be required for these vessels. Two instruction books for each hull auxiliary furnished by the contractor shall be provided for use on each vessel constructed.

B-1-g. Photographs.-The contractor shall furnish to the Bureau of Ships photographic negatives of the vessel taken after the vessel is completed or nearly completed. Photographs are, however, required for only one vessel of the class. A broadside view, a bow view about 45° off the centerline, a stern view about 135° off the centerline shall be taken of the vessel lying in stream against a clear background. One photograph of the broadside of the vessel proceeding at full speed against a clear background shall be taken. Photographs showing details of deck and interior arrangements shall be furnished as required by the Supervisor of Shipbuilding.

SECTION C-1.
WORKMANSHIP.

All workmanship throughout shall be thorough. Any portion of the work, whether partially or wholly completed, if found defective, shall be removed and satisfactorily replaced. Any defects or weakness of structure which may develop before, during, or after trial shall be made good by the contractor.

Particular care shall be taken to insure tightness of all parts of the hull and all parts of systems that are required by the plans or specifications to be watertight, oiltight, or airtight.

Sharp and ragged edges of exposed work in way of access holes, hatches, etc., where liable to injure personnel or equipment, shall be removed. Care shall be taken in all structural work to secure a good shift of butts between the different members.

The workmanship throughout shall be of the best standard for a boat of this type, particular care being taken to insure fair lines and smooth surfaces. During construction and as late as possible before such parts are closed in from proper access, all hull bolts are to be drawn up tight.

All wood plugs are to be set in white lead, shall be put in so that grain will follow same direction as grain of the member in which the plugs are located and shall be cut off flush.

Where practical, all fastening holes shall be bored slightly smaller than the fastenings, but care shall be taken so that driving in of fastenings does not split the members.

SECTION C-3.
ACCESS TO COMPARTMENTS.

Arrangements for access and for cleaning out and painting shall be provided to all compartments and to all parts of the vessel wherever practical. Flooring throughout shall be fitted with suitable hatches, and all gratings in bilges and peaks are to be removable. Care shall be taken in locating pipes and other parts to avoid blocking of access.

SECTION C-5.
OVERWEIGHT.

During the progress of the work, great care shall be taken in the design of all parts to keep weights down to the minimum requisite for adequate strength and rigidity in order that the designed draft of the vessel under designed conditions of load may not be exceeded in the completed ship.

SECTION C-6.
MATERIALS.

In general, unless otherwise specified, all materials entering into the construction of these vessels shall conform to the best commercial practice for marine work, as especially applied to highspeed vessels of this type, and as approved by the Navy Department for similar recently built boats.

All material shall be satisfactory to the Supervisor of Shipbuilding. In consideration of the size of vessels and type of construction, it shall be within the province of the Supervisor of Shipbuilding to approve the use of materials other than as specified herein, where such materials may be found more suitable, or where considered equally suitable and more available.

Wherever the use of critical materials is required herein or on the plans, the contractor shall make every effort possible to substitute less critical materials. These substitutions shall be approved by the Supervisor of Shipbuilding. All materials entering into the construction of the vessel, its auxiliaries, fittings, and systems and their appurtenances, and miscellaneous articles of outfit and equipment under the cognizance of the Bureau of Ships shall, except where otherwise specified, be in accordance with the best commercial marine practice for a vessel of this character and shall be satisfactory to the Supervisor of Shipbuilding.

SECTION C-7.
PICKLING AND CLEANING.

All aluminum which is to be painted shall be cleaned in suitable pickling solution, washed with clear water, dried and painted with zinc chromate primer before receiving regular painting.

All stainless corrosion-resisting steel which is to be painted shall be sand blasted or otherwise suitably cleaned before painting.

SECTION C-8.
GALVANIZING.

In genera], galvanizing shall be done by the hot process and the zinc shall be at least 98 percent pure. Where steel is required to be galvanized, an approved zinc spray may be applied in lieu of hot dipping. The work shall be of the highest quality and shall meet the approval of the Supervisor of Shipbuilding. For structural work, the increase in weight due to galvanizing shall not exceed one-sixth pound nor less than one-eighth pound per square foot of surface covered.

In general, fabricated articles i shall be galvanized in as completely assembled condition as s practicable. Where it is not practicable to galvanize the complete article after assembly, the seams, joints, rivets, and other parts not galvanized shall be cleaned and heavily coated with red lead after assembly.

All steel or iron fittings secured to wood; all steel or iron fittings, which owing to the nature of their use cannot be effectively protected by painting; all clips, hangers, and other small iron or steel fittings, which it may not be practicable thoroughly to paint or which may become clogged with paint, and in general all outside iron or steel fittings except as may be specifically excepted by the Supervisor of Shipbuilding shall be galvanized. Fittings of corrosion resisting steel need not be galvanized.

Galvanizing destroyed by welding may be made good by thoroughly cleaning the material and painting with a heavy coat of red lead.

SECTION C-9.
PAINTING AND VARNISHING.

Vessels shall be painted and varnished throughout, with a sufficient number of coats to preserve the surface and to obtain a satisfactory finish. All fastening holes, etc., shall be carefully puttied, where not plugged. Sanding before and between coats as required for obtaining suitable finish for the service intended.

Topsides shall be primed with Navy formula 5-11 special haze gray, Navy Dept. Spec. 52C45. Fastening holes shall be cemented with smoothing cement, Navy formula 62, Navy Dept. Spec. 52C25. One coat haze gray, Navy formula 5-H shall next be applied. Third (finish) coat shall be in accordance with latest camouflage instructions.

Bottom shall be primed with copper bottom enamel, fastening holes cemented with surfacing putty and finished with two coats copper bottom enamel.

Entire interior shall be painted with one coat of primer, glazed as required, and two coats of fire retardant white paint, Navy Dept. Spec. 52P22. An extra coat of enamel shall be applied to surfaces adjacent to passageways, areas of traffic, and confined spaces as directed by the Supervisor, where personnel traffic would render the fire retardant paint difficult to maintain.

Superstructure shall be primed and finished with three coats formula 511 special haze gray, final coat in accordance with latest camouflage instructions. Decks shall be primed, fastening holes filled with Navy formula 62 smoothing cement Navy Dept. Spec. 52C25 and finished with two coats nonskid deck paint, in accordance with latest camouflage instructions.

Metal work, interior and exterior, shall be pickled where practical, coated with zinc chromate, and painted as necessary, color 25 according to location.

Designating numbers and insignia shall be painted as required.

No red paint shall appear topsides.

The above specifications are maximum requirements and it shall be in the province of the Supervisor of Shipbuilding to authorize modifications where such modifications tend to expedite construction while still obtaining satisfactory results.

SECTION D-1.
TESTING.

D-1-a. General.-All portions of the vessel and all work therein, whether appertaining to the structure, fittings, systems, auxiliaries, or installations, required to be furnished or done by the contractors, shall be thoroughly tested as hereinafter specified or as considered by the Supervisor of Shipbuilding necessary to demonstrate satisfactory workmanship, adequate strength, rigidity, watertightness, oiltightness, airtightness, gastightness, and suitability for the purpose intended, and the provision and maintenance of proper clearances for all moving parts and for all lines of sight and lines of fire, and to demonstrate that all requirements have been satisfactorily fulfilled.

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All canvas and rigging shall be tried in place.

All stowage arrangements shall be tested by trying the various articles in place.

In case types of fittings, auxiliaries, systems, etc., are installed to which tests outlined below are not directly applicable, similar tests covering as nearly as practicable the same scope shall be made, together with such additional tests as are appropriate thereto. The details of these tests shall be as approved by the Supervisor of Shipbuilding.

D-1-b. Exterior tests for watertightness.-Upon launching, careful inspection shall be made for leakage of hull, and if such leaks as may appear do not cease within the space of a few days, they shall be corrected as necessary, in a workmanlike manner, including hauling out of the vessel if required.

Decks and superstructures shall be tested by directing against their entire surfaces a stream of water from a hose, at usual city pressure. Special attention shall be given to ports, windows, hatches and fittings passing through decks. Where leaks occur they shall be properly repaired until shown to be tight upon retesting.

SECTION D-2
COMPARTMENT TESTING.

Watertight bulkheads shall be carefully inspected for tightness when installed and during construction.

Fuel tanks shall be tested when made by applying 3 pounds per square inch air pressure, which shall be maintained for a reasonable length of time.

The same type of test as described in the above paragraph except that 2 pounds per square inch pressure instead of 3 pounds per square inch shall be repeated immediately before the tanks are installed in the vessel. This test shall be made with the tanks installed in jigs simulating the boat structure.

**** Under Section D-2, Page 15, Line 29, delete:*
"2 pounds per square inch pressure" and insert:
".3 pounds per square inch pressure"
Ref: Elco ltr. SWR/gl of 70 July 1945
SupShip, NY 1st end. PT565-624/S1-5
*(57720-Sb3)8/21 of 6 August 1945. *****

After the tanks are installed and the gasoline piping installed, the piping system, blanked off from the

tanks, shall be tested by applying a pressure of 3 pounds of air to the system, which shall be maintained not less than 12 hours without drop after compensating for temperature changes, as satisfactory to the Supervisor of Shipbuilding.

After the tanks have been installed in the vessel, they shall be subjected to a similar test at pressures as follows:

Wing tanks-2 pounds per square inch.
Center tank-1.2 pounds per square inch.

If during any of the above tests any leaks shall occur, they shall be remedied until shown to be satisfactory upon retesting.

SECTION D-3.
TESTS OF SYSTEMS.

All piping and other systems including carbon dioxide, fresh water, drainage, ventilation, etc., shall be tested to insure that they are in condition to operate properly.

SECTION E-1.
STEM.

Stem and knee shall be of spruce, sided 5 3/4 inches, molded as per plan and faired into lines of boat. Scarphs shall be plain bevel type, bronze bolted. Stem shall be covered with 1/16 inch brass plate veed over planking, brazed at apex, and fastened with monel wood screws. Stem plate shall continue full length of keel (see section H-1).

SECTION E-2.
FASTENINGS.

All fastenings securing fittings and hardware to hull below water line to be of monel.

SECTION F-1.
TRANSVERSE FRAMING.

Transom shall be of mahogany, 1 1/8 inches thick, planked double-diagonal, with mahogany fashion pieces and spruce stiffeners, and fitted with 1/16 by 3 by 3 inch brass angle capping, on sides and bottom. Transom planks shall be copper riveted together and to fashion pieces and fastened to vertical stiffeners with wood screws. Stiffeners shall be placed to catch bottom girder system, and shall be well bolted

thereto. Transom knee of galvanized steel or bronze, welded type with webs to straddle stern post and keel, extending forward to reinforce keel in way of center rudder post.

Frames shall be mahogany throughout. (except laminated bottom frames). Topsides frames shall be sawn in one-piece with 1/2-inch oak facing strip inboard, total molding 5 inches. Siding in forepeak and crew's lavatory shall be 1 1/4 inches, 1 inch in crew's quarters, and elsewhere 7/8 inch, except in way of heavy deck weights and other special locations, where siding shall be increased to 1 inch. Bottom frames shall be sawn type in forepeak sided 1 1/4-inches, and from forward tank compartment bulkhead aft, sided 7/8 inch, except in way of propellers and struts, and in special locations in engine room, where siding shall be 1 inch. Sawn frames shall be molded 5 inches in forepeak, and rudder compartment,

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and 6 inches in engine room and tank compartment, including 1/2- inch oak facing strip on top. Bottom frames throughout crew's lavatory, crew's quarters, and officers' quarters shall be sided 1 inch, laminated of oak, spruce, and mahogany to a total molding of 5 1/2 inches in crew's quarters, and 6 inches in officer's quarters. Sawn frames shall be as per plan, varying between 9- and 16-inch centers, to suit load requirements, with steam-bent intermediate bottom frames 7/8 by 1 3/8 inches from bow to forward bulkhead of tank compartment, also in special locations elsewhere as per plan. Frames shall be fitted with double 5/16-inch plywood gussets at deck, chine and keel. Special stiffening and increased gusseting shall be fitted in way of heavy deckloads and in special locations as per plan. All plywood gussets and brackets shall be glued in addition to fastenings (see Deckbeams).

Diagonal bracing of mahogany, 7/8 by 3 inches, shall be fitted on every frame to deck beam, except in way of bulkheads and special stiffening. All faying surfaces shall be glued.

SECTION G-1.
PLANKING.

Planking shall be mahogany in two layers, laid diagonally in opposite directions; total thickness of topsides 3/4 inch, inner 5/16 inch and outer 7/16 inch; and of bottom 15/16 inch, inner 7/16 inch and outer 1/2 inch. Planking shall be interlaid with aeroplane fabric and marine glue. Topside planking shall be fastened with bronze screws and copper nails; underwater portion aft to have monel screws and copper nails.

For special inner (third) course of planking, see Section 11-3.

SECTION H-1.
KEEL.

Keel of spruce, shall be sided 5 3/4 inches, molded as per plan, minimum 4 1/8 inches. Keel shall be bevelled to receive planking full width, not rabbetted. Keel scarphs shall be plain bevel type, ratio 6: 1,

with mahogany back-blocking, bronze bolted, and copper riveted. Cheek pieces of mahogany 1 1/8 inches thick shall be fitted both sides of keel in way of center line shaft log. Similar cheek pieces 1 3/8 inches thick shall be fitted in way of center main strut. Cheek pieces shall be glued and fastened with wood screws. Keel plate full-length shall be of brass 3/32 by 6 inches veed over planking, and fastened with monel wood screws.

SECTION H-3.
LONGITUDINAL FRAMING.

Chine log shall be of spruce aft and oak forward (approximately 1/4 length), and shall be sided 2 1/2 inches and molded 4 1/2 inches, bevelled on two sides to receive planking, which shall land full width butting at intersection. Chine log shall not be rabbetted. Chine shall be through-bolted on alternate frames (on about 24-inch centers) to an angle bracket bolted through chine corner gussets as per plan. Chine guard, inner, shall be of spruce 1 1/4 by 4 1/2 inches; outer, oak 3/4 by 3 1/2 inches. Gunwale clamp shall be of spruce 1 3/4 by 5 inches about 3/4 length aft, forward oak, tapering to stem.

Main shelf shall be mahogany 7/8 by 1 1/2 inches, tapering at ends. Subshelf shall be intercostal, of oak or mahogany 1 3/4 by 2 1/2 inches full length. Guard shall be spruce, sided 3 1/4 inches, with 3 inch face, molded as per plan. Guard capping, oak 3/4 by 3 inches, edges rounded.

Plank battens shall be spruce 7/8 by 1 1/2 inches throughout. The topside battens shall Am diagonally, spaced about 14-inch centers, and bottom battens shall run fore and aft on 6 inch centers. All battens shall be slightly rounded on inboard corners to avoid sharp corners in frames where notched to receive battens. Solid mahogany planking 1/2 inch thick in way of fuel tank compartment, and extending approximately 1 ft. beyond the bulkhead at each end shall be substituted for bottom battens. Bottom battens shall be checked into this inner planking extending one frame bay into tank compartment each end, and riveted to outer planking.

Solid bottom fill planks of 7/8 inch mahogany shall be fitted from transom to one frame bay forward of after bulkhead of engine room, and between chines, the regular plank battens being checked into this solid fill to a point one frame bay abaft the bulkhead. Three planks each side in way of wing shafts, shall extend forward the full length of engine room to tank compartment third skin, reducing in thickness from 7/8 to 1/2 inch just forward of shaft log. Special joggled butt-block shall be fitted over this step down in thickness. Additional backing blocks in way of struts, rudders, etc., as required, shall be fitted.

Side ceiling battens shall be spruce, 7/8 by 4 inches, in way of topsides full length of ship intercostal between bulkheads except where replaced in tank compartment by solid panels of plywood. Lower course in engine room shall be of mahogany.

Engine bearers and girders shall be constructed with 1/2 inch birch plywood webs and mahogany booms

top and bottom, except in engine room, where the girders shall be constructed of 3 webs

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of 1/4 inch birch plywood with inside booms of mahogany, sided as per plan.

Girders shall be deep molded as per plan, and shall be metal bracketed to every frame. Girders shall aline continuously fore and aft, and shall be intercostal between bulkheads with strongly bracketed through connections. Special intercostal girder seating to skin in tank compartment, the inboard girder being bracketed top to bottom.

Girders shall be alined along upper chord with floor bearers, and special bracing fitted to topsides framing with diagonal struts forward on alternate frames. All connections through metal brackets, through fastened, and plywood gussets as required. All wood to wood members shall be glued.

SECTION H-7.
GUARDS.

(See also longitudinal framing, Section II-3.)

Supplementing main guard, a guard clamp, about 3/4 length from stern, shall be of oak 1 1/8 by 3 3/4 inches shouldered below clamp and bolted through planking and gunwale clamp. Main guard shall be through bolted on every main frame, except at bulkheads, to an angle bracket bolted through gunwale gussets, as per plan.

Guard across transom shall be built up of two courses of spruce shaped to bevel of transom to place guard cap plumb. Inner course shall be molded 3 1/4 inches below deck plywood, outer course shall be sided 2 7/8 inches and molded 3 1/4 inches, being set with top flush with upper side of deck plywood. Guard cap shall be of oak 1 1/8 by 3 1/4 inches, to give a total projection aft of transom of 6 inches, to protect exhaust mufflers. A brass strap shall be bent around each outboard corner of guard cap, and fastened with wood screws.

SECTION I-1.
DECK.

***** Line 33: "of plywood having 5/16" fir core with cross banding each side of 1/20 birch, and faced on each side with 1/12 mahogany." (Per BuShips ltr. 10 June 1944 PT565-62/S11-6 (516f) (Hull Change I-1-(1) Elco S.O. N3385 *****

Decking shall be single layer of mahogany plywood, approximately 9/16 inch thick, installed in general accordance with plan, BuShips No. PT486-S1106-411193, subject to development of satisfactory material. Covering board and plank sheer shall be of mahogany. Beams shall be of mahogany, sawn type,

molded 6 inches and sided 1 1/8 inches throughout except at hatchways, etc., where beams are 1 3/8 inches. Short beams reduced molding except in way of torpedo tubes. Intermediate bent-beams shall be of mahogany 7/8 by 3 inches in crew's quarters, and elsewhere as required. Intercostal bridging in three courses under forward

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deck with mahogany stretcher below the beams; the wing courses shall pick up the deck coaming with ample lap-by, resuming at after end of engine hatch and continuing to transom.

Special reinforcing of both deck and topsides in way of torpedo rack deck pads, and 40 mm. gun foundations shall be fitted with stanchions and deep web frames as required. Diagonal metal strapping shall be fitted under deck plank to tie forward mooring bitt to bulkhead next aft of same, and to ship's side. Similar strapping shall be fitted to distribute torpedo tube and the fueling-at-sea bitts reactions as per plan.

Continuous full-length coaming 1 3/4 inches to 1 1/2 by 6 inches and deck shelf 1 1/8 by 9 inches mahogany, shall be through bolted to subshelf below deck beams.

Engine main hatch shall be raised about 7 inches above deck, with transverse beams of deep section at every frame, strongly bolted to main deck, and removable for unshipping engines. Hatchway header shall be mahogany 1 1/8 by 6 1/4 inches bracketed to each beam. The engine room access hatch shall have hinged cover set at approximately 45 degrees on forward side with means for clamping shut, and for holding fully open. The main housing of this hatch shall form an air intake scoop with water traps, light stops, hinged shutter, and drains. The athwartships dimensions of the air intake scoop shall be at least 6 inches wider each side than the hatch cover, or approximately 50 inches over-all.

A welded steel bracket with flanged web and wide flanges shall be bolted in each corner of main engine hatch coaming, also at each after corner and forward port corner of trunk coaming over tank compartment, with backing angle clips on heavy deck beams catching bolts through coaming.

SECTION 1-3.
DECK COVERINGS

Gun working circles, bridge floor, areas in way of towing and mooring bitts, as required by the Supervisor of Shipbuilding, shall be covered with "Dektred" or equal.

SECTION 1-4.
FLATS AND FLOORS.

Floor bearers of spruce constitute a part of the framing system, and shall be sided to match the bottom

frames, and connected thereto with 5/16 inch plywood gussets, glued and fastened with wood screws. Horizontal bearers and keel posts to be 4 inches molded, with 3 inch diagonal braces on alternate frames in crew's quarters as per plan. Flooring, except in tank compartment and

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chart house, shall be balsa-core aluminum covered panels having all edges sealed against moisture. Spacers of mahogany shall be fitted to permit easy and complete access to bilges.

Flooring of chart house shall be of 5/8 inch fir plywood, with mahogany bearers, well fastened to longitudinal bulkhead and with headers as required.

Flooring of tank compartment (day room) shall be of fir or birch plywood, and shall be completely removable for access to or unshipping of fuel tanks. There shall be one main section of flooring mid-length of the compartment, built up in box-panel form which shall include hatch to center tank, and shall have ledges across forward and after sides to support separately removable panels placed in the four corners of the room, also the raised portable steps over fuel tank connections (see Section W-1-k). The entire floor shall be carried on longitudinal sides by heavy cleat on side panels of day room, with parting strips, and designed to function as spreader for inboard supporting panels or chocks, for the wing fuel tanks. All joints shall be closely fitted, and properly landed, to obviate as far as practicable, circulation of gasoline fumes from the tank compartment.

SECTION J-1.
BULKHEADS.

Bulkheads shall be located as per plan, framed with mahogany, and faced on both sides with all-birch plywood,1/4 or 5/16 inch thick, Solid fill of western red cedar at bottom to a point above chine. Both faces glued and screwed to framing, fills, and stiffeners. Side framing shall be molded 6 inches to give solid backing to ceiling battens. All openings shall have rounded corners and plywood doublers. Plywood transverse joints shall occur on solid fill or on inside stiffeners, and shall be closely screw fastened. Bulkheads bracketed to gunwale and chine with welded galvanized steel knees, through-bolted on both legs. There shall be no vertical butt joints of plywood on bulkheads.

SECTION K-1.
SPLINTER PROTECTION.

Portable armor shall be fitted around helmsman's station, of contractor furnished 1/4-inch protective plating, Navy Dept. Spec. R47S33, fitted with raised platforms forward and aft of transverse panel, for helmsman and/or searchlight operator, and fitted with rubber bumpers on two corners on starboard side, satisfactory to the Supervisor of Shipbuilding.

SECTION M-1.
STRUTS.

Struts similar to those furnished by the contractor on Motor Torpedo Boats PT486-544 shall be provided.

SECTION M-2.
SHAFT LOGS.

Shaft logs similar to those furnished by the contractor on Motor Torpedo Boats PT486-544 shall be provided.

SECTION M-3.
RUDDERS.

Rudders similar to those furnished by the contractor on Motor Torpedo Boats PT486-544. Rudders shall be tinned with 50 percent tin and 50 percent lead.

SECTION N-1.
FOUNDATIONS AND SPECIAL FRAMING.

Torpedo rack deck pads, 40 mm. gun foundation on forward deck, 40 mm. gun foundation on after deck, built-up of spruce, mahogany, and plywood with under-deck blocking as required.

SECTION O-1.
DECK HOUSES.

Superstructure shall be of simple form, all straight sided and plumb, except the raked and angled forward end of radio house and bridge shelter.

The trunk above crew's dayroom shall be built with framed-up plywood side and ends, and top only being removable, to permit unshipping fuel tanks. Any tank may be unshipped independent of the other two.

Top shall be molded plastic or fabricated plywood, covered with aeroplane fabric, doped on, and is provided with means of securely bolting to sides and making watertight transverse joints.

It is unnecessary to dismantle turrets in removing either engine or tank hatches.

The radio and chart house shall be constructed in general the same as the after trunk, but shall have

permanently fixed top.

Machine gun turret cylinders shall be 48 inches 0. D. and be located as per plan and constructed of molded plastic plywood, with special connections to after trunk and chart house. Top shall be designed to carry government furnished scarf ring gun mount for twin .50 cal. machine guns. Scuppers to deck at low point of base. Firing steps for depressed fire shall be fitted.

House tops shall have heat insulation of Onazote or equal to within about 8 inches of house sides.

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SECTION O-4.
BRIDGES.

Bridge arrangement shall be in accordance with Motor Torpedo Boat PT486 type arrangement. Aperture for sighting radar scope to be provided to starboard of the throttle location, as approved. Throttles to be located to starboard of the steering wheel.

SECTION O-5.
WINDSHIELD.

A wind deflecting airfoil shall be installed over and slightly forward of the steering station.

SECTION R-1.
DOORS.

Watertight doors shall be fabricated of aluminum and plywood, with rubber gaskets and specially designed hinges and quick-operating dogs, located as per plan.

SECTION R-3.
HATCHES.

Deck hatches shall be cast aluminum throughout of raised gasketed type with special and improved hardware.

Four lifting eyebolts shall be installed in main engine hatch.

SECTION R-7.
AIRPORTS AND WINDOWS.

All ports shall be of special type with improved drain pans and scuppers, except in crew's dayroom and chart house sides which shall be fitted with hinged metal ports with integral black-out shutters and equipped with wire mesh insect screens satisfactory to the Supervisor of Shipbuilding. Eliminate windows from forward side of chart house.

SECTION R-10.
SCREENS.

Portable insect screens shall be provided to protect all living spaces.

Black-out shutters shall be provided throughout boat, including screens for fixed and hinged windows and ventilators. Screens shall be of solid plywood type, sliding in runners for windows, and under engine room vents, to be combined with spray shields, fitted with drains to deck. Special metal shutter shall be fitted on chart house door. Boots shall be fitted at muffler operating rods at transom. Areas reflecting light near shielded openings shall be painted flat black.

***** Magnetic compasses to be installed in accordance with NY NYK Dwg. No. Sk.-468 (Hull Chg, A-1-(2) 4 June '44 - BuShips ltr. PT-565-624/S24(516f) *****
***** Delete "Airfoil type wind deflector complete with all appurtenances from the vessel." (BuShips ltr. PT565-624/S18(516f) Hull Chg. A-1-(4) 27 July 1944. *****

SECTION U-5.
BOAT AND LIFE-RAFT STOWAGE.

The life raft shall be mounted in a chock on forward deck, and fitted with canvas retaining chocks and cotton lashings.

Suitable stowage shall be provided for the rubber life raft and the 9-foot dinghy.

SECTION U-8.
STEERING SYSTEM.

The contractor shall provide a steering system similar to that installed on Motor Torpedo Boats PT486-544.

SECTION U-11.
DRAINAGE SYSTEM.

Bilge system comprised of proper piping, with suction strainers in bilge with directional valves, and hand

pumps. Automatic bilge bailers shall be fitted to drain each compartment under way, and shall be provided with accessible shut-off cocks. Brass limber chains with return springs shall be fitted in tank compartment and engine room.

SECTION U-16.
PLUMBING.

Water tank, plastic lined, located below chart house, shall be constructed of welded aluminum, capacity 200 gallons. Hand hole easily accessible in face of tank, shall be provided for cleaning and inspection. Tank cradle of wood, braced to bulkhead, keel and girders, shaped to tank bottom, and lined with 1/2-inch felt in canvas bag. Corrosion-resisting steel strap shall be fitted around upper part of tank, bolted to bulkhead.

Piping and fittings shall be of aluminum to all fixtures. Proper filling pipe leading to bridge, with removable strainer at fill. Gage glass with stop cocks easily visible from passageway below.

Suitable fixtures of high quality yacht type shall be fitted in officers' and crew's quarters. Seacocks shall be fitted on all water closet intake and waste pipes.

Supply from tanks to wash basins shall be by means of hand pumps.

Drain pipes to sea, of copper tubing, shall be fitted.

Electric refrigerator for storage of food shall have a minimum capacity not less than 8 cubic feet (see see. W-1).

SECTION U-20.
VENTILATION AND HEATING.

Forced ventilation provided throughout the boat by electric blowers and duct system leading to all compartments except engine room and lazarette. Galley also shall have a small blower discharging to deck. Ducts to be of plywood construction covered with aero-fabric doped on. Lead-ins of metal as required. Outlets and exhaust shutters of aluminum.

Natural ventilation through cowl ventilators, the engine room access hatch blind scoop over engine room, as well as through special low-down vents over living quarters (see sec. W-1). Cowls are to be provided with means of swiveling and securing in any position, and to have black-out light and water traps as installed on Motor Torpedo Boats PT486-545.

Drop windows in crew's dayroom and in chart house also provide natural ventilation.

Two screw-down ventilators, mushroom type over lazarette, and two over tank compartments port and starboard. Heating units shall be provided with a capacity of 80,000 20 B. t. u. per hour and shall be equal to or better than the Stewart-Warner Model 906 combustion heater.

One exhaust blower of suitable capacity so arranged as to exhaust heated air at the radar equipment with minimum heated airflow across this equipment is to be provided in the chart room.

SECTION U-23.
FIRE EXTINGUISHING SYSTEM.

The fire extinguishing equipment shall be a remote manually controlled carbon dioxide system, completely installed for protection of engine room and fuel tank compartment. It shall consist of proper capacity of gunfire type cylinders, with watertight pull boxes on the bridge and at a point convenient to engine hatch, for separate flooding of engine room and tank compartments. Tanks shall be located in compartment below chart house, and supply lines run to engine room and fuel tank compartments with proper nozzles. Pressure-operated switch shall be provided to shut off blowers of ventilation system. Controls shall be located at bridge and engine room hatch on deck.

Six 7 1/2-pound size carbon dioxide portable gunfire type hand fire extinguishers shall be supplied and installed in approved locations.

An approved portable gas detection device shall be supplied and stowage provided for same. **** *Deleted per BUSHIPS Ltr. P.T.565-674/S87(516f)11-4-44(See Pages)* ****

SECTION W-1.
COMPARTMENTS.

W-1-a. Forepeak.-The forepeak is accessible through removable watertight hatch in the collision bulkhead, and on port side of center line is fitted with a slatted rack of hardwood for chain and anchor rope with fore and aft partitioning as per plan. Starboard side shall have removable solid flooring for miscellaneous small gear. A brass rope deck pipe of ample size with removable cover and keeper chain will be located on port side above rope locker, and a bitter end eye plate for anchor line to be bolted low on the bulkhead. A drain flange with threaded cap to be placed on each side of sampson post and accessible from the after side of bulkhead. Side ceiling battens of hardwood in way of chain and locker rope.

W-1-b. Crew's lavatory.-In addition to the specified plumbing fixtures, this compartment shall be fitted with medicine cabinet on after bulkhead, and a frameless mirror on the forward bulkhead, also, with three

grab rails, located on forward and after bulkhead, and on the after end of fore and aft partition. A canvas-lined oil skin drip tray of cedar shall be built above outboard girder at the after end as shown on plan, and a row of coat hooks mounted on bulkhead above. The diagonal deck beam braces shall have stowage battens on inboard side with ample access space left below deck beams.

A special ventilator of welded steel or aluminum with 6 by 6 inch throat shutter, operable from below decks, and water trap, shall be placed above drip tray close to after bulkhead. Fit one fixed deck light above wash basins. Toilet fixtures shall include paper holder and soap dish, the grab rails being so placed as to function as towel bars. Access to compartment through doorway with curtain.

W-1-c. Forward passageway to starboard of crew's lavatory.-To be fitted with a bench above girder and shelves for miscellaneous boat and commissary stores. Also, chocks and lashings for two 75-pound Danforth anchors one below and one on topside as required.

A ladder at the after end on fore and aft partition leads to the deck, and the compartment is reached from the crew's quarters through a watertight door fabricated of plywood and mahogany with handles for operation from either side of bulkhead.

Fit one fixed deck light matching that in crew's lavatory.

W-1-d. Crew's quarters.-Accommodations shall be provided for 8 men in 4 transom berths, and 4 canvas- and roller-type berths fitted with canvas bottoms, over. Lower berths shall follow inboard edge of outboard girder, and shall parallel floor with

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transverse bearers and portable plywood tops with finger holes. Crew's lockers in two units shall be placed on forward and after bulkheads as shown, to be framed up of western red cedar, the door frames only being of mahogany. Shelves and top as per plan, each compartment to have individual door, to have latch, lock, and name plate. Door frames to be relieved top and bottom for ventilation. A seat of slatted construction and open below, with cushion and back, and arm on inboard side shall be placed across after bulkhead as shown on plan. Folding table with mahogany top, two drop leaves and one drawer below fixed center portion, shall be mounted on tubular stanchions detachably bolted to inboard girder. Table top shall have rounded edges and low rails on all sides. Stowage battens similar to those in crew's lavatory shall be screwed to inboard side of diagonal beam braces with ample access space below deck beams. A bulletin board, 16 inches by 24 inches, shall be placed above transverse seat, constructed of cork board covered with green baize with mahogany frame. After bulkheads shall be fitted with watertight door fabricated of aluminum and plywood, rubber gasketed all around, and locked with dogs. Two special ventilators shall be fitted in deck of the same type as in crew's lavatory, at after end inboard of life lines (see Deck Plan). Fixed deck lights shall be located outboard of life line as per plan.

W-1-e. Galley.-Galley shall be located to starboard from center line between watertight bulkheads and

entered forward through door as described above, and provided with a similar door in the after bulkhead. Arrangement of countersink drain board, and dresser space shall be as per plan, these being constructed of aluminum, with suitable inboard ledges and made tight to flashing of aluminum 10 inches high on forward bulkhead and starboard side 1 inch ledge around inboard edges. The entire area of after bulkhead between outboard flashing and inboard partial bulkhead from top of stove bench to deck shall be covered with aluminum over 1/16-inch sheet asbestos. Similar treatment shall be given inboard side of partial bulkhead. Sink with over-all dimensions 14 by 20 by 6 inches, of commercial porcelain enamel type, with strainer and drain plug, waste pipe leading directly to sea close to chine shall be provided. Waste pipe shall be of 1 1/2-inch seamless copper tubing with outboard clam shell.

Refrigerator shall be lined with aluminum welded to make seamless tank, with 1 1/2-inch cork board insulation covered with tar paper and reinforced as necessary with spruce framing. Front shall be of mahogany with two doors each with spring catch. Interior capacity shall be not less than 8 cubic feet total volume. The after end shall be provided with evaporator unit with four ice

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trays and removable drip pan. Main food compartment shall have one 1/2-inch drain tube leading to bilge. Shelves shall be of light gage corrosion-resisting steel well vented and easily removable. Compressor shall be located below sink with door to enclose, and easily accessible for lubrication or other maintenance.

The outboard girder shall project 1 foot above galley floor and be covered with a removable foot board protected with linoleum and aluminum angle strip. Cupboards of western red cedar with door frames of mahogany, and two shelves each with ledges, shall be built below sink board and counter. Cupboard space outboard above refrigerator shall be fitted with partitions and doors, also racks and cutlery drawers to stow specified galley equipment. A bin with hinged cover shall be fitted on bulkhead between above cupboards and stove space, located well clear of dresser top. An additional cupboard shall be placed on forward bulkhead extending from crew's quarters door to inboard cupboard, this shall be of bin construction with compartments about 16 inches wide, each pair of which shall have a common lid. Grab rail shall be strongly affixed to after face of this bin. A similar grab rail shall be placed on inboard side of partial bulkhead beside stove. Galley soap dish shall be mounted above sink and through bolted to bulkhead. Garbage receptacle of rectangular section, metal guides, and jump type retaining strip shall be fitted below counter cupboard and shall be easily removable. Overhead ventilator of trunk type opening below the shelf in chart house with side outlet ventilator on deck house shall be provided. Fit two fixed deck lights to aline with those in crew's quarters. Electric stove and installation on shelf abaft ice box, with lockers below and outboard. Portable oven supplied with stove, shall be stowed on shelf conveniently above stove and securely retained. Stove shall be 24-volt D. C. and 115-volt A. C. (nominal), 3-element, 3-heat type, with latch for anchoring oven in place, and provided with rough water utensil keepers. Stove shall be direct connected to main distributing panel in engine room through circuit breaker switch. (See Special Machinery Specifications.)

W-1-f. Petty officers' stateroom.-This room shall be provided with one transom berth and one boat-type berth and two mattresses. Outboard side shall have close-spaced ceiling battens with pigeonhole recess. Two suitable lockers of plywood with doors fitted with latch and lock, also top shelf hanger bar and four wardrobe hooks shall be provided. Desk of table type 20 by 27 inches with lift top, mounted without leg, on bulkheads, open below. Book rack with adjustable clamp end shall be placed above on longitudinal bulkhead with light fixture recessed below. Fit ventilator and deck lights similar to those in galley.

W-1-g. Officers' stateroom.-This stateroom shall be arranged as per plan, all details similar to chief petty officers' stateroom. The desk shall be 30 inches wide; the bureau shall be of increased size. One suitable bureau and hanging locker in lieu of CPO lockers shall be furnished. In both staterooms the fore and aft bulkhead shall be of plywood with doors opening inward, with knobs and locks operable from either side.

W-1-h. Officers' lavatory.-The lavatory shall be located between officers' staterooms on port side with door opening outward into either, the forward one of which shall be of watertight construction similar to the galley bulkhead door. In addition to the specified plumbing fixtures, this compartment shall be fitted with deep medicine cabinet with mirror door and two shelves inside, and service shelf above wash basin. Linen shelves outboard and above water closet with deep ledges. Toilet fittings shall include paper holder, two wood towel bars, spring-type tumbler holder, toothbrush holder, and paper towel rack. One coat hook shall be mounted on after door, and a grab rail shall be mounted beside water closet on forward bulkhead. Natural ventilation shall be through special ventilator located above water closet located in deck, same type as described for crew's lavatory. Fit one fixed deck light above center of the gangway.

W-1-i. Officers' messroom.-This space shall be fitted with mess table with mahogany plywood top, open below. A small cabinet with two doors and a shelf shall be mounted on forward bulkhead about 18 inches clear of table top. Fit seat at after end, of slatted construction, with cushion, upholstered back, and arm on inboard end; fit fore and aft shelf recessed between frames with deep inboard ledge on inboard side. Fit one fixed deck light in center of compartment. Open archway in bulkhead abaft mess-room shall be fitted.

W-1-j. Ammunition stowage.-To starboard of fore and aft passageway, the entire area will be utilized for stowage of ammunition, small arms, pyrotechnic equipment, etc., to suit military requirements.

Stowage for .50 cal. ammunition shall be provided in crew's dayroom under settee on port side, and in locker on starboard side of bridge, with outboard door, forward of the machine-gun turret. Stowage shall be provided for four boxes of ammunition.

Small arms stowage shall be provided for all items on ordnance allowance list.

Stowage shall be provided for 20-mm. ammunition in 2 watertight deck boxes, fitted with hinged gasketed covers and necessary clamps and padlock staples, mounted on forward deck and adapted to receive 3 ammunition drums each; also below-deck stowage for

6 drums of ammunition shall be fitted with felt bearer strips and hinged covers. Stowage shall be provided for 12 boxes 40 mm. Mk 1 ammunition in the lazarette. Sixty-four rounds, clipped, shall be stowed on deck adjacent to gun.

W-1-k. Crew's dayroom.-Located above fuel tank compartment between watertight bulkheads, with nonwatertight door to forward quarters, and sound-insulating door and hatch in after bulkhead to engine room. This door shall be fitted with double fixed window and provided with gasket seal, and clamp dog from either side, but no lock. A roll-up canvas berth, with portable head-rail, shall be installed each side of cabin, with water repellent covered cushion over canvas for seating purposes. Day room shall be available as temporary infirmary as well as crew's quarters, and shall have crew lockers, medicine cupboard, and shelves worked into after end, according to plan. The floor of the day room shall be removable, as described in section 1-4. Portable steps shall be provided at forward and aft ends to accommodate center tank fuel filling and suction fittings, as well as to provide an access cover over the fuel valves and piping on forward side of after bulkhead. Access to the after machine gun turret shall be through a door cut in the part of turret wall rounding out from the port aft corner of the day room. A stretcher handling door shall be cut in starboard aft bulkhead of the cabin trunk just above the transverse deck coaming, and shall open outward. Access doors to the tank manholes shall be cut in the side panels of the day room between the floor and the deck. In effect, all furnishings above the day room floor shall be easily removable, so that flooring and tank side panels may be removed for inspection or service of the tanks. Above the deck line, the day room shall have 3 windows each side, and one in the forward bulkhead for bridge communication. All windows shall have black-out panels (section. R-7). A fore and aft cabin top stiffener each side of the center line shall be shaped to form an overhead handrail. In the starboard forward corner, a hatch of at least 22 inches square shall be cut, with a hinge back top, to provide an exit from the day room, using a steel ladder with tubular rungs mounted on the house side. The entire center section of the cabin roof shall be mechanically removable, to facilitate the extrication of the fuel tanks.

The sides and top of day room trunk shall be constructed as described in section O-1, and shall include the after port .50 cal. machine gun turret, with main and depressed firing floors, limiting stops, exit door, and adequate drainage, as per plan.

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W-1-l. Radio and chart house.-Shall be located forward of the bridge and reached therefrom by a door with fixed window and clamping dog handle bolted on inside. The deck level shall extend inside the chart house on the sides and forward, to form a continuous working table surrounding the floor space. To star board aft there shall be a .50 cal. ammunition locker, opening on deck, but having racks for sub-machine guns on its interior sides. The forward table space shall be reserved for navigation, and navigational equipment, also bookshelf, chart space, and transverse drawers which extend forward to the front of the house itself, having a tray top just under the forward house windows which shall be of fixed type. The port side shall be reserved for all radio and detecting equipment, including a chair against the after bulkhead for the operator. The floor space just forward of the entrance door shall be cut out and hinged as hatch cover, so that the ladder on the bulkhead may extend below the floor and provide a descent to the main floor level below, between the officer's mess and the officer's lavatory partition. The remaining space under the chart room floor, being of low headroom, shall contain the 200-gallon water tank on the forward bulkhead, and the two carbon dioxide tanks for the fire extinguishing system on the after bulkhead. A removable section of flooring between these tanks shall afford access to the bilge. An open arch to starboard shall provide entry to the main passage fore and aft in the boat.

The flooring in the chart house shall be mechanically portable, also a section of the chart house roof, approximately 30 by 54 inches for removal of the potable water tank described above. The flooring shall be fitted for a mat of sponge rubber with ribbed tread.

W-1-m. Engine room.-Engine room, aside from mechanical equipment specified under Machinery Installation and Electrical System, shall have regular aluminum covered flooring in removable sections. Platforms of plywood or metal to suit requirements of safety and access shall be placed over couplings, V-drives, batteries, stuffing boxes, and other moving parts, and shall be coated with nonskid paint where practicable. Tool box and shelf shall be located on port side abreast vee drive. A wooden seat shall be securely mounted on forward end of starboard engine, to permit operator to handle all 3 reverse gears, scoop controls, observe instruments, etc. A broad platform shall be fitted over center engine, above which a hinged wood and metal ladder shall give access to the engine room hatchway above. Grab rails shall be placed on deck beams and coamings, also head bumpers on critical areas, to suit arrangement.

W-1-n. Lazarette.-The after peak shall be accessible through a hinged deck hatch with metal ladder to floor, and through a watertight door in after bulkhead of engine room. Lazarette -flooring shall be of slatted type giving full access to all parts of bilges. Stowage shelves of fir plywood, with deep ledges shall be substantially fitted for engine spares and boat stores. (For ammunition stowage in lazarette see section W-1-j.)

Emergency tiller shall be of steel tubing, demountably fitted to cast socket on center line tiller, and stowed conveniently in lazarette. Tiller socket shall be protected by antifouling box forward of rudder shelf. Means shall be provided for easy operation of emergency hand tillers.

Workbench shall be constructed and installed on forward side of transom in lazarette.

SECTION X-1.
JOINER WORK.

Joiner bulkheads and partitions shall be of plywood, mahogany or birch, properly stiffened, and framed at doors, or other apertures. To constitute structural reinforcement wherever possible, in which case, edges shall have special rabbetted stanchion at edges, with brackets to deck, bulkheads, or girders as required. Interior trim of mahogany limited to surfaces subject to much handling.

SECTION Y-1.
GRAB RODS AND RAILS.

Grab rails as per plan shall be of wood or brass pipe in bronze stanchions. Special grabs shall be fitted at ladders, companionways, hatches, and elsewhere throughout ship as required for safe passage on deck or below.

Machine gun limiting stops of brass or steel tubing shall be fitted as required to prevent accidental firing into ship or occupants of bridge (see section A-5).

SECTION Y-3.
WARPING, MOORING, AND TOWING FITTINGS.

Welded steel towing pad and eye, hot dipped, galvanized, shall be fastened to the stem with inside blocking and brackets as required, complete with bridle and release mechanism and pendant for high speed towing.

The hawse pipe shall be of cast bronze and combined with bow light, and with eye fin for life lines and antenna mast stay to be fitted at stem head, with flanges to guard, and good deck pad, through bolted to breast hook.

One bow towing bitt, two forward fueling-at-sea bitts, two after towing bitts and 4 warping cleats shall be provided. A rope deck pipe of brass shall be located above chain locker. (See forepeaksection W-1.)

SECTION Y-4.
LIFE RAILS AND STANCHIONS.

Life lines shall be as installed on Motor Torpedo Boat PT486 class, including removable stanchions and galvanized wire rope forward, and all necessary pins, lashings, turnbuckles, and chain plates; and fixed tubular stanchions well braced across stern with galvanized wire rope with turnbuckles, eyebolts, etc., as required.

SECTION Y-9.
RUBBING AND CHAFING PLATES.

Chafing, and cradle location plates, of aluminum or corrosion resisting steel shall be fitted at designated locations, in way of 20 chocks, and elsewhere as required. Kick plates of aluminum shall be fitted at doorways, behind ladders, etc., as required.

SECTION Y-11.
LABELING.

Suitable center line marking plates shall be installed together with all necessary labeling and stenciling as required by the Supervisor of Shipbuilding.

SECTION Y-12.
CANVAS OUTFIT.

A canvas cover shall be provided for 20-mm. machine gun. Two canvas covers shall be provided for .50 cal. machine gun mounts to completely enclose guns, mounts, and limiting stops. After turret to have separate spray shield to height of limiting stop.

All covers shall be fitted with proper lashings.

All canvas covers and life preservers to receive approved treatment for fire retardance.

Next Part

Version 1.01, 10 Apr 06

PT Boats Inc. Archives and Library

PT Boats, Inc. is an organization established by veterans of WW II PT service to preserve the story Patrol Torpedo Boats and the men who manned and supported the "Mosquito Fleet."

Headquarters is in a suburb of Memphis Tennessee where the majority of the organization's photographic collection numbering many thousands are kept. Additionally, manuals, charts, periodicals of the era, some logs and diaries, film and factory blueprints are housed here. Other holdings include memorabilia ranging from a Japanese bugle, to propaganda leaflets and Shellback certificates.

Over one hundred books either mentioning or exclusively about PTs have been collected along with other naval references.

The collection focuses on WW II PT boats in the United States Navy; however, limited information has been accumulated about foreign coastal and patrol craft including a small amount about the Korean and Vietnam-era patrol craft.

Archives are open by appointment for research. Some searches can be done by staff if questions are specific. Copying service is available for 50 cents a page. Large copying orders will have postage added.

A modeler's kit listing blueprints and line drawings for sale may be obtained free of charge. 8x10 photo reprints are $13.00 each. Although a merchandise catalog isn't available, an order blank listing souvenirs caps, shirts, videos, books, jewelry, etc. is. Memberships are $25 annually.

PT Boats, Inc. restored two PT boats to WW II configuration. PTs 796 and 617 may be seen at the organization's museum which is part of Battleship Cove in Fall River, Massachusetts. Both PTs are National Historic Landmarks.

PT Boats, Inc.
P0 Box 38070
Germantown, TN 38183
(901) 755-8440
Fax: (901) 521-0522
Email: ptboats@ptboats.org
http://www.ptboats.org

Directions:
Nearest interstate I-40. Exit 16 south to State Highway 177/Germantown Road, 5.7 miles to right turn onto Wolf River Parkway, immediate first left on Brierbrook, immediate first right on Cordova Cove. Address: 1384 Cordova Cove, Suite 2, Germantown (suburb of Memphis), TN 38138. Please ask for map/ directions. **Archives open by appointment only.** Squadron, boat, tender and base documents, diaries, factory blueprints, manual, charts, memorabilia, books. Most of the collection is not catalogued. Several

thousand photos filed by boat, squadron, tender and base number. Membership and souvenirs available.

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Version 1.02, 25 May 2006

SPECIAL SPECIFICATIONS
FOR
MACHINERY
FOR
MOTOR TORPEDO BOATS
PT 565-624
(80-Foot)

FOR THE
UNITED STATES NAVY

BUREAU OF SHIPS
NAVY DEPARTMENT
15 April 1944

SPECIAL SPECIFICATIONS
FOR PROPELLING MACHINERY AND
ELECTRIC PLANT
FOR
MOTOR TORPEDO BOATS
PT 565-624

SECTION A1.
GENERAL REQUIREMENTS.

General description:	*Emergency*	*Continuous*
Brake horsepower total (3 shafts)	4, 500	
R. P. M. of propeller shaft	2, 500	
Brake horsepower total (3 shafts)		2, 850

R. P. M. of propeller shaft 2, 000

The arrangement of the machinery installation for the 80-foot and 78-foot hulls shall be as follows:

Alternate (a)-80-foot hull with main propelling engines having V drives on outboard shafts, center engine direct drive.
Alternate (b)-80-foot hull with main propelling engines arranged three abreast, direct driven.
Alternate (c)-78-foot hulls with main propelling engines arranged with two forward, one aft in engine room, direct driven.

One specific set of contract plans applies to each installation as specified in section S1 herein. Hereinafter any statement applying particularly to one hull will be followed by reference to the proper alternate. Where no reference is made to an alternate, it shall be understood that the statement applies to all three alternate designs.

It is further the intent of these specifications to obtain vessels that are essentially duplicates of previous vessels built by the ship- builder except as otherwise specified herein.

The general arrangement of machinery shall be as indicated on the contract plans, except for such modifications as may be agreed upon between the shipbuilder and the Bureau from time to time, in the form of developments or changes under the contract. It is intended that the machinery arrangement shall provide the best military protection for all vital equipment.

The main propulsion plant shall consist of three Packard gasoline marine engines arranged in general as follows:

Alternate (a).-One engine on centerline of boat at forward end of engine room driving through a clutch and reverse gear directly to the propeller. Two engines port and starboard at after end of engine room driving forward through a clutch and reverse gear to a V-drive and, thence, aft to the propellers. The propeller thrust bearing shall be included in the reverse gear housing on center engine and in the V-drive housing for the outboard engines.

Alternate (b).-Three engines shall be arranged at the forward end of the engine room in an abreast position, each driving forward through a clutch and reverse gear directly to its respective propeller shaft. The propeller thrust bearing shall be included in the reverse gear housing.

Alternate (c).-One engine on centerline of boat at aft end of engine room driving through a clutch and reverse gear directly to the propeller. Two engines port and starboard at forward end of engine room driving through clutch and reverse gear directly to the propellers. The propeller thrust bearing shall be included in the reverse gear housings.

The main engines shall be electrically started, with manual stop, start, and reverse controls from the engine room; and with remote controls from the pilot house for the throttles only. All main engines shall drive right-hand propellers turning clockwise in the ahead direction, when viewed from aft of the boat looking forward. The exhaust from the main and auxiliary engines shall be led outboard through water-jacketed pipes with water spray in such a way that will not permit back flow of water into the engines. In addition to the main machinery there shall be installed an electric plant, a heat generating plant, necessary pumps, and such other machinery, tools, instruments, and apparatus as specified or described herein, together with such others as may be necessary to complete the machinery installation in accordance with specifications and plans.

List of machinery and equipment to be supplied by the Government (Bureau of Ships) for installation by the shipbuilder.

The items of Government furnished machinery and equipment which will be delivered to the works of the shipbuilder for each vessel are as follows:

(a) Three Packard gasoline marine engines complete with reverse gears, clutches and attached auxiliaries, see section S41-3.
(b) Duplex fuel filters see section S55-1.
(c) Three lubricating oil coarse mesh strainers, see section S45-1.
(d) Three fresh water coolers, see section S48-1.
(e) Three lubricating oil coolers, see section S45-1.
(f) Three fresh water thermostats, see section S48-1.
(g) Three lubricating oil thermostats, see section S45-1.
(h) Three sets of shafting, see section S43-1.
(i) Three sets of shaft couplings, see section S43-1.
(j) Three propellers see section S44-1.
(k) Hand wobble fuel pumps see section S55-1.
(l) Three lubricating oil fine mesh strainers, see section S45-1.
(m) Two V-drives for propeller shafts (alternate (a)), see section S41-3.
(n) Ship's service, 40-ampere generators, furnished attached to main propulsion engines; complete with controls and regulators, see section S61-1.

(o) Two auxiliary engine driven, 5 1/2 kw. generators, complete with controls, see section S61-1 and item (d).

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(p) Two engine instrument panels, one local and one remote, see section S41-3 and S62-1.
(q) Main distribution panel, see section S62-1.
(r) Two auxiliary generator control panels, see section S61-1.
(s) Engine connection boxes, see section S62-3.
(t) Portable signaling equipment, see section S64-1.
(u) Flashlights, see section S64-1.
(v) Sound-powered telephones, see section S65-1.
(w) Signaling searchlight, see section S66-1.
(x) Radio equipment, see section S67.
(y) Radar equipment, see section S67-5.
(z) I. F. F. equipment, see section S67-6.
(aa) Fire control equipment, see section S71-1.
(bb) Remote indicating magnetic compass, see section S24-7.
(cc) All spare parts for the above listed material.

The shipbuilder shall install, at his expense, these items provided by the Government, in accordance with plans approved by the Bureau of Ships. He shall supply and install at his expense all installation piping, valves, fittings, electric cables and wiring, devices, and appurtenances necessary to make a complete and satisfactory working installation. The shipbuilder shall be responsible for care of all Government furnished machinery and equipment from the date of arrival at the shipyard until delivery of the vessel to the Government. Unsatisfactory operation of the Government furnished machine after installation shall be the responsibility of the shipbuilder and/or machinery contractor. The shipbuilder shall be responsible for proof that the unsatisfactory operation is not due to defective installation and/or deterioration or handling during storage.

General features.-It is the intent of these specifications to secure a machinery installation suitable for the purpose intended and comparable to machinery installation in previous boats furnished by contractor except as otherwise specified herein. It is the further intent of these specifications to achieve simplicity, accessibility for inspection, removal and assembly, economy of weight, space and cost, with a minimum of required maintenance insofar as practicable for the machinery installation. The design, construction, and workmanship, and installation of all machinery and machinery appurtenances shall be such that a minimum practicable noise level will result under all operating conditions. Any part of this equipment pertaining thereto, whether fully described in the specifications or omitted, or imperfectly described, but necessary for the proper completion of the installation, shall be furnished by the shipbuilder the same as if they had been specifically covered.

It is evident that it is not practicable to enumerate in the specifications all details or fittings or

appurtenances of the equipment, nor is it necessary to do so, it being understood that they

shall be supplied by the shipbuilder without extra compensation notwithstanding such omissions.

The contract specifications are not to be departed from except by approval of the Navy Department. If such departure should be made without approval, the Navy Department shall be at liberty at any time before or after completion of the work, to cause the part affected to be removed, remade, or replaced, and this work, together with all parts injured by the corrections shall be made good by, and at the expense of, the shipbuilder.

Defects in design, materials, or workmanship which may develop during the construction and tests of the equipment shall be made good by and at the expense of the shipbuilder excepting Government furnished equipment. Any dispute relative to the intent of specifications or concerning any omissions or imperfections shall be referred to the Navy Department, whose decision shall be final. The machinery and electrical contractor will, immediately upon being advised of the builders of the vessels in which the machinery and/or equipment is to be installed, contact the shipbuilders and assure himself and the Bureau that the machinery and/or equipment which he proposes to furnish is suitable for the purpose intended. He shall maintain this contact throughout the building period and endeavor by every means in his power to anticipate and eliminate any points of conflict as regards installation.

Any question of responsibility or procedure which cannot be amicably adjusted between the shipbuilder and the machinery and electrical contractor shall immediately be referred to the Bureau of Ships whose decision, so far as regards matters under this contract, will be final.

Critical materials.-Prior to ordering materials, the contractor shall consult the Supervisor of Shipbuilding with reference to all possible substitutions for critical materials in accordance with the Bureau's current instructions.

The use of critical materials shall be kept to a minimum with all substitutions being made on a not-to-delay-ship basis.

Special specifications.-Numbers and titles of sections of the General Specifications for Machinery are used as headings, throughout the Special Specifications for convenience in finding subjects. When the title is accompanied by an issue date the section applies as including Navy Requirements.

Inspection.-Inspection of all materials under these specifications shall be made by naval inspectors or supervisors of shipbuilding. In order to expedite the construction as much as possible, the Inspector or Supervisor may, subject to approval of the Bureau, substitute other requirements which tend to accelerate construction. The construction of the equipment and appurtenances shall be open to inspection at all times to a naval inspector.

Every facility shall be afforded the Inspector for the prosecution of his work, including handling of material as may be necessary.

Finished articles to be incorporated in the work may be inspected at the works of the manufacturer at the request of the shipbuilder.

SECTION S1.
PLANS AND MATERIALS.

The following is a complete list of applicable plans accompanying and forming a part of these specifications:

Title	BuShips No. PT565- S0101M-
Mechanical:	
Alternate (a) for 80-ft. hull.	
Arrangement of machinery	-64158
Diagrammatic arrangement of piping	-64159
Alternate (b) for 80-ft. hull:	
Arrangement of machinery	-64160
Diagrammatic arrangement of piping	-64159
Alternate (c) for 78-ft. hull:	BuShips No. PT625-S0101 M-
Arrangement of machinery	-64161
Diagrammatic arrangement of piping	-64162
Electrical:	BuShips No. PT565-S0101E-
Alternates (a) and (b) for 80-ft. hull:	
Power system:	
Deck arrangement	-62163
Elementary diagram	-62165
List of feeders and mains	-62166
Main distribution panel	-62167
Main engine instrument panel	-62168

Bridge engine instrument panel	-62169
Main engine starting and ignition control panel	-62170
Lighting system-Deck arrangement and diagram	-62161
Alternate (c) for 78 ft. hull:	BuShips No. PT625- S0101E
Power system:	
Deck arrangement	-62164
	BuShips No. PT565- S0101E-
Elementary diagram	-62165
List of feeders and mains	-62166
Main distribution panel	-62167
Main engine instrument panel	-62168
Bridge engine instrument panel	-62169
Main engine starting and ignition control panel	-62170
	BuShips No. PT625- S0101E-
Lighting system-Deck arrangement and diagram	-62162

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The following electrical standard plans shall be used in these vessels:

ELECTRICAL STANDARDS

Title	BuShips No.
DIAGRAMS	
Call bell system, voice tube and sound powered telephone, circuit E, type plan	9-S-4664-L
Light machine gun crew cease firing signal system, circuit 5U	9-S-5517-L
Officer's call bell system, type plan	9-S-4219-L
FIXTURES-REGULAR	
Bulkhead fixture, types H-S, HR-S, and H-S-Sw, and HHR-S	9-S-5490- L
Ceiling fixture, type	9-S-4665-L
Deck fixture, types G-S, GR-S and G-S-Sw	9-S-5491-L

Portable light, type DD, W. T	9-S-5392-L
FIXTURES-SPECIAL	
Chartboard light, type C	9-S-5613-L
Hand lantern, type J-1S	9-S-5311-L
FIXTURES-APPLIANCES PERTAINING TO	
Incandescent lamps used on naval vessels	9-S-4222-L
Lamp sockets:	
Type E, candelabra screw	9-S-2036-L
Type N, candelabra bayonet	9-S-4634-L
LIGHTS-RUNNING, ANCHOR AND SIGNAL	
Masthead light and anchor, Class III (modified)	9-S-5497-L
Side light, port and stbd., Class III (modified)	9-S-5498-L
Bow light, class III (modified)	9-S-5497-L
Details and mounting arrangements for running lights	9-S-5523-L
LIGHTS-RUNNING, ANCHOR AND SIGNAL-CONTROL FOR	
Bridge control panel, motor torpedo boats	9000-S640173165
GLASSWARE FOR FIXTURES AND LIGHTS	
Globes:	
Type IV-1 and IV-II (red)	9-S-5123-L
Lenses for running and signal lights	9-S-4072-L

Title	BuShips No.
INTERIOR COMMUNICATION	
Bell, type B4, W. T	9-S-5105-L
Cabinet, S. P. telephone handset for nonshockproof mounting bracket	9-S-5134-L
Jack box:	
Type T-1S	9-S-5406-L
Type T-1F	9-S-5600-L
Push buttons:	
Type P-S, R-S, S-S, and T-S; single W. T	9-S-4581-L
3-gang, type A-F	9-S-5602-L

WIRING APPLIANCES

Branch boxes:	
Type E-L	9-S-5607-L
Connection boxes:	
5-wire, type V-125S, W. T	9-S-5174-L
10-wire, type V-125S, W. T	9-S-5161-L
Combination circuit breaker and junction box	9-S-5605-L
Convenience outlet-single, type C-S1	9-S-5546-L
Emergency ignition switch box-type E-S, 9 gang-type E1-S	9-S-5604-L
Engine connection box	9-S-5618-L
Junction box for boats	9-S-5606-L
Feeder junction box, type N-S	9-S-4293-L
Multiple switch box, 10 A., 125 V., type B-F, 3 circuit	9-S-5612-L
Multiple switch box, 10 A., 125 V., type A-F, 2 circuit_	9-S-5622-L
Plugs:	
10-ampere types C, C-1, D, D-1, E, and F, D. P	9-S-4440-L
25-ampere, type B-1	9-S-4859-L
Receptacles:	
Single, 10-ampere, 125-volt, type G-IF	9000-S620273002
Single, 25-ampere, D. P., type B-1S, 125-volt, W. T	9-S-4860-L
Double, 10-ampere, D. P., type P-1F, 125-volt	9-S-5611-L
Switch, door-operated, single circuit	9-S-5589-L
Switch, snap, 10-ampere, DPST, types CC-S, DD-S and EE	9-S-4718-L
Switch, snap, 10-ampere, 125-volt, type CC-F	9-S-5609-L
Switch, snap, 10-ampere, 125-volt, type CC-L	9-S-5608-L
Switch, N. W. T., type SB-S	9-S-4772-L
Switch, engine starting, W. T., type US-1	9-S-5478-L
Voltage regulator box	9-S-5620-L
Auxiliary generator control panel	9-S-5615-L

WIRING ACCESSORIES

Bushing for electrical conductors, type IV-S	9-S-4268-L
Cable straps:	
For N. W. T. bulkheads	9-S-4442-L

Title	BuShips No.
WIRING ACCESSORIES-continued	
Lugs:	
Solder type	9-S-4435-L
Clamp type	9-S-4795-L
Copper tube	9-S-3808-L
Terminal tubes for electric cables:	
Types LX (drawn) and LXI (machined) for RI cable	9-S-5621-L
Types LI (machined) and LII (drawn)	9-S-5235-L
90-degree elbow; types LV (drawn) and LVI (I. P. S. fitters)	9-S-5343-L
45-degree elbow; types LIII (drawn) and LIV (I. P. S. fitters)	9-S-5342-L
Wire terminals	9-S-1841-L
MISCELLANEOUS	
Methods of supporting cables, fixtures and appliances for steel and aluminum decks and bulkheads	9-S-3980-L
Storage batteries:	
Type 6V-SBMD-175 AH	9-S-4906-L
Symbols for electrical installation	9-S-3744-L
NOTE.-List of fixtures and appliances called for under section S1-1 shall show alteration numbers of plan issued to apply on the vessel, and shall be submitted on plan, BuShips No. 9-S-4905-L.	

SECTION S1-1.
PLAN REQUIREMENTS.

Working plans.-Working plans for the installation of machinery and equipment as covered by these specifications shall be prepared by the shipbuilder. The shipbuilder shall submit to the Supervisor of Shipbuilding or the Bureau, if necessary, for approval plans which shall be in sufficient detail to permit the Supervisor of Shipbuilding, or the Bureau, if necessary, to obtain a definite conception of the shipbuilder's intention, and shall show particularly overall dimensions, weights, material of construction, fittings, pressures and temperatures in addition to any other pertinent data concerning the equipment. Plans shall conform to Bureau Standards as specified under "Finished Plans" herein.

The following shall be submitted for approval:

I. Mechanical:

Machinery arrangement: plan, elevation and sections.
Shafting arrangement.
Lubricating oil piping diagram.
Fuel piping diagram.
Engine room sea-water piping diagram.
Engine room fresh-water piping diagram.

II. Electrical-Power system:

(1) Schematic diagram (single line) showing connections of generators, switchboard, panels, and connected apparatus.
(2) List of electrical data for motor-driven auxiliaries and controllers.
(3) Working wiring deck plans and list of feeders and mains.
(4) Outline of vessel showing exact locations of all searchlights, running, anchor, and signal lights, and including elementary wiring diagram of running, anchor, and signal lights.
(5) Power analysis plan; abbreviated form.
(6) List of lighting fixtures and appliances including plan numbers, alterations, and quantities.
(7) Ship's service switchboards-Plans shall indicate the vessels to which they apply and shall include a complete wiring diagram (with identification of each appurtenance by piece number); front view, with identification of parts and over-all dimensions, list of principal parts, ratings, type designations, and manufacturer's names; rear, end, and typical section views showing foundation drilling, construction of framework, and the location of bus work.
(8) Manufacturer's plans of motors.
(9) Manufacturer's plans of controllers.
(10) Manufacturer's plans of ship's service generators and motor-generators.

NOTE.-Plans and instruction books for items (8), (9), and (10) as may be required by applicable specifications for such equipment.

Interior Communication System:

Elementary and isometric wiring diagrams of I. C. and F. C. systems (separate plans shall be submitted for each circuit).

Deck arrangement of I. C. and F. C. systems (this plan shall be submitted after the various circuit isometric wiring diagrams have been approved).

Details of I. C. apparatus as hereinafter required.

These diagrams shall list all equipment giving capacities, approximate weights, R. P. M., pressures, etc.

In addition to the above plans, such other working plans as may be required to represent the complete design shall be furnished by the shipbuilder. Two copies of all working plans shall be forwarded to the Bureau by the Supervisor immediately after approval.

Finished plans.-A complete set of finished plans shall be furnished within 3 months after completion of the vessels. These plans shall cover each and every part of the equipment described above which is subject to replacement or renewal during the life

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of the ship. Except for electrical items which are covered separately herein, these plans shall consist of ink tracings or photographic tracings on tracing cloth of manufacturer's shop plans, and shall be in sufficient detail to permit the manufacture (for replacement only) of the equipment. Assembly plans shall show all major parts of the equipment in elevation, cross section, plan view, and shall include installation plans, and arrangement of all piping on the equipment. Weights, pressures, capacities, speeds, etc., and limiting operating values of the equipment shall be shown on the assembly plan.

The plans shall be on a Navy standard size sheet of 27 inches wide by 40 inches long with a blank space of 1 1/2 inches wide by 4 inches long on the horizontal in lower right hand corner of each sheet. If special size sheets are required to show one item complete for such assembly plan, etc., these may be increased in length from 40 inches up to 80 inches. Any number of parts may be shown on a 27 by 40 inch sheet, provided they are spaced so that each part can be readily identified. Mechanical and electrical equipment plans shall be furnished on a separate sheet group so that no mechanical equipment part will be shown on an electrical equipment part sheet, or vice versa. List of material on assembly plan shall show the part number and the corresponding plan number upon which the part is detailed. A complete master list shall be furnished, showing all part and plan numbers of plans for identification. The master list shall have a blank column on right-hand side for adding BuShips number.

The Navy contract number, plan description, and vessel identification number shall be shown on each sheet.

Two blueprint copies representative of the type of finished plans that are to be furnished shall be submitted to the Bureau of Ships, Navy Department, Washington, D. C., for approval prior to delivery of complete set of finished plans.

On standard commercial fittings such as valves, gages, etc., no plan will be required if catalog literature showing details of construction is available. All such catalog literature must be bound together in a suitable, indexed folder, and the model or type of material furnished must be indicated in each case.

Two bound copies of the catalog shall be furnished to the Bureau of Ships. The finished plans for the electrical installation shall conform to the requirements stated above, except that the information shown shall include the following:

1. *For motors*.-The plan of each motor shall contain complete identification data and follow the plan, BuShips No. 10-T-2124-L.

2. *For motor controllers*.-The plan of each motor controller shall contain complete identification data and shall in general follow the standard motor

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controller plan, BuShips No. 10-T-1996-L Alt. 1, modified to suit a direct current controller.

3. List of lighting fixtures, lighting and power system wiring appliances including quantities and weights. (This list shall show BuShips plan number, catalog number, manufacturer, and other data as necessary to facilitate additional purchases and to permit determination of the type of equipment used and the materials of which it is constructed.)

4. Reproduction of plans required under working plans herein.

5. Record of electrical installation in bound book form.

One set of prints of principal plans shall be supplied each vessel by the shipbuilder. This list shall be compiled by the Supervisor of Shipbuilding. In order to assure proper data for training, maintenance and operation, all plans, instruction books and descriptive pamphlets specified for delivery to each boat shall be delivered prior to the completion date. (Working plans shall be substituted for finished plans, if latter are not available at time of delivery of the vessels.)

Instruction books.-Instruction books for principal items of shipbuilder furnished equipment shall be supplied as follows:

Two copies to each vessel.
Four copies to the cognizant Supervisor of Shipbuilding.
Twenty copies to the Bureau of Ships.
Twenty copies to the cognizant Motor Torpedo Boat Commissioning Detail.
Twenty-five copies to the Motor Torpedo Squadrons Training Center, Melville, R. I.

Instruction books for engineering piping systems.-The shipbuilder shall furnish instruction books for the operation of the engineering piping systems and related equipment. Instruction books shall be prepared in a form that may be readily understood by personnel of limited experience and shall contain complete but only sufficiently detailed instructions to serve this purpose. The book shall contain information pertaining to the following systems:

(1) Fuel system.
(2) Lubricating oil system.
(3) Sea water cooling system.
(4) Fresh water cooling system.
(5) Fire and bilge system.
(6) Engine exhaust system.

(1) A complete diagrammatic representation of the system illustrating by notes or by numbered or lettered symbols each component part. Directions of flow shall be given on the diagram. A table of symbols with the corresponding names and functions of component parts shall be provided. Use shall be made of colors and other devices as practicable to simplify the study and understanding of the system by showing clearly the

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normal or usual methods of operation, connections to other systems, etc.

(2) Tabulations of the principal parts, the designed functions and the designed limitations of the systems.

(3) Detailed directions for operation of the system with reference to the diagrams and illustrations, including instructions for alternative methods of operation to be used in event of failure or damage to parts of the system.

Instruction books for engineering piping systems and related equipment shall be prepared in accordance with all applicable requirements of section S1-1 of the General Specifications for Machinery, dated 1 March 1941, and shall be submitted for approval in preliminary form. A master instruction book will not be required. Copies of instruction books shall be delivered as follows:

Two (2) for each ship.
Four (4) for each cognizant Supervisor of Shipbuilding.
One (1) per 5 vessels to the Bureau of Ships.
Twenty-five (25) for Commanding Officer of Motor Torpedo Squadrons Training Center, Melville, R. I.
Four (4) for cognizant Motor Torpedo Boat Commissioning Detail.

SECTION S1-2.
MATERIALS, WORKMANSHIP, AND INSTALLATION.

Materials used in the construction of machinery equipment and fittings shall be of a quality in accordance with applicable specifications listed herein.

Where the manufacturer's certified tests are accepted in lieu of Navy chemical and physical tests, the manufacturer shall assume full responsibility for the service requirements of the material certified. Should the material fail in service, the manufacturer shall replace it at his own cost with a satisfactory material.

All workmanship shall be thorough and substantial in manner, with the best Marine standards and policies adhered to.

Operation and maintenance efficiency shall be the guiding objective in the installation. Any of the items herein not in accordance with the highest of standards indicated shall be removed or changed at the discretion of the Supervisor.

SECTION S1-3.
BOLTS, STUDS, SCREWS, NUTS, ETC.

Threaded parts shall be in accordance with the standards of the Inter-Departmental Screw Thread Committee.

SECTION S1-4.
WELDING AND BRAZING.

This section of the General Specifications for Machinery issue in effect of date of contract shall serve as a guide insofar as acceptable welding and brazing procedure is concerned. It is not intended that Navy requirements be strictly adhered to; inspection shall be relaxed to permit acceptable practice.

SECTION S8.
TRIAL REQUIREMENTS.

When each boat has been completed in every essential respect as required by the contract, and when the boat builder shall have made sufficient tests to be reasonably sure of satisfactory operation without excessive heating and without additional adjustment, the boat shall be subjected to a material inspection and acceptance trial, under the supervision of the Board of Inspection and Survey or a subboard appointed by it.

Trials shall be of three types and shall be run under the following conditions and as noted below. Trials to be conducted with full military load displacement on a trial course specified by the Bureau of Ships except as otherwise noted herein. During these trials, the performance of the engines shall be observed and records made of the boat speed, and all engine instrument readings as well as records of any vibration, erratic running, noise, and any sign of distress or overheating of any parts; also the general performance of the complete machinery installation. A record shall be made of the total displacement, weights aboard, draft forward and draft aft at the beginning and end of each test. Two copies of these test records shall be forwarded to the Bureau of Ships, Navy Department, Washington, D. C.

-Class Type Trials shall be conducted on the first vessel to be delivered under the contract and shall consist of the following:

The vessel shall be weighed on a certified set of scales upon completion. The weight figure thus obtained together with a complete itemized analysis thereof shall be included in the trial report of the vessel.

The boat shall be docked just prior to the trials, bottom cleaned and painted and propellers checked. Just prior to getting underway each day a check shall be made to insure the presence on board of full military load and its displacement determined. Where actual military equipment is not available, it shall be compensated for by additional added weights. The trials of the first boat shall consist of the following tests:

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(a) Propeller test.-This test shall be conducted in accordance with instructions issued by the Bureau of Ships for the type boat of each boatbuilder for the purpose of selecting the proper propeller for service conditions. Such a test shall be repeated as conditions of loading or design changes require.

(b) Standardization.-These tests shall be run over a measured mile, three runs being made in alternate directions at each speed. These tests shall be run on one, two or three engines from the lowest speed practical up to that corresponding to 2,500 r. p. m. on each engine. Sufficient tests shall be run to obtain smooth curves of shaft r. p. m. and engine manifold pressure vs. boat speed.

(c) Full speed test.-This test shall be run for one hour with all propelling units operating at a maximum of 2,400 r. p. m. The boat speed, engine manifold pressure, fuel and lubricating oil consumption shall be recorded.

(d) Cruising speed tests.-Each of these tests shall be run for two hours. The boat speed, fuel and lubricating oil consumption shall be recorded for each of the following two-hour tests:

(1) Maximum cruising at 2,000 r. p. m. 20
(2) Slow cruising at 1,200 r. p. m.
(3) Minimum cruising at 800 r. p. m.

(e) Auxiliaries tests.- During tests *(c)* and *(d)* the satisfactory operation of all auxiliary engineering equipment shall be demonstrated. The number of electric generators in operation together with their loads and the combined load shall be recorded.

(f) Silent running tests.-These tests shall be conducted on a calm night operating one, two and three engines at a boat speed from 10 to 20 knots and the audible range of engine noise recorded for each condition.

(g) Reverse gear and clutch tests.-The satisfactory operation of clutches and reverse gears shall be demonstrated during maneuvering tests of the boat.

(h) Acceleration test.-With each engine idling at 600 r. p. m., the throttles shall be thrown wide open and the time required for the engines to reach 2,500 r. p. m. recorded. This test shall be run over a course having markers at 100-yard intervals and a record made of the time to pass each marker as well as the engine r. p. m. at that point.

(i) Retirement maneuver tests.-With engines idling at 600 r. p.m., the throttles shall be opened up wide and simultaneously the helm put hard over changing course 180°. The boat shall be steadied on the reverse course and allowed to accelerate. The time to complete the 180° turn and the time to accelerate the engines to 2,500 r. p. m. shall be recorded. One test shall be made turning to the right and another test made turning to the left.

(j) Reverse course full speed tests.-With the boat making full speed, the helm shall be put over as fast as possible and the boat steadied on a new course 180° from the initial course and allowed to accelerate. The time to complete the 180° turn and the time to accelerate the engines to 2,500 r. p. m. shall be recorded. One test shall be made turning to the right and another test made turning to the left.

(k) Turning tests.-With the boat proceeding at each of 3 speeds corresponding to 600 r. p. m., 2,000 r. p. m., and 2,500 r. p. m., the helm shall be put over as rapidly as possible and the boat permitted to swing though a full circle. The time at each 90° and the diameter of the circle shall be recorded. At each speed one test shall be made turning to the right and another turning to the left.

(l) Additional trials.-Any additional trials and inspections, which may be required by the Board of Inspection and Survey (or a subboard appointed by it) to demonstrate suitability of the boat and equipment, shall be conducted by the boat builder.

(m) Post trial examination.-After the above trials have been completed, the boat will be returned to the works of the boat builder when the machinery will be inspected by the machinery contractor's representative for post trial examination as required by the Bureau of Ships or as directed by the Board of Inspection and Survey. The boat builder shall provide dockage space without charge and shop services and handling facilities, if required during the post-trial examination period.

(n) Other trials.-All other tests or trials required by the Bureau of Ordnance or other Bureaus shall be conducted after delivery of the boat. Where such tests or trials involve boat builder responsibility, they will be conducted in the presence of his representative and the boat builder shall make good at his own expense all defects and deficiencies for which he may be responsible.

First boat of each squadron trials.-Shall be run on a Government measured trial course approved by the Supervisor of Shipbuilding, at full military load displacement and shall consist of (b) (for 3 engines only), *(c), (e), (g), (k), (l)*.

Subsequent boats' trials.-Trials of subsequent boats shall be run on a course approved by the Supervisor of Shipbuilding, at 100,000 pounds displacement and shall consist of *(c), (e), (g), (l)* above.

SECTION S16-1.
FLOOR PLATES, GRATINGS, LADDERS, ETC.

All access trunks and escape hatches in machinery space shall be in accordance with the Detail (Hull) Specifications and contract plans. Floor of machinery space shall be water and oil resistant plywood similar to BuShips Specification 39P15 (INT), 1 October,

1942, or other approved material. There shall be provided suitable ladders for access to the engine room.

SECTION S19-1.
PAINTING AND PRESERVATION.

Painting shall be in accordance with appendix 6, dated June 1943.

All piping shall be thoroughly cleaned before assembly, and protected against dirt and foreign material during construction. After installation and before using, each piping system shall be adequately flushed with the type of fluid to be used in the system, and then fresh fluid used for operation. After flushing, all strainers shall be opened and cleaned.

SECTION S24-7.
REMOTE INDICATING MAGNETIC COMPASS EQUIPMENT.

Remote indicating magnetic compass equipment will be furnished by the Bureau of Ships and shall be installed by the shipbuilder in accordance with approved detail plans. The Government-furnished equipment will consist of the following Flux Gate Induction Compass Equipment:

1 Master indicator.
1 Transmitter.
1 Secondary indicator.
1 Inverter.
1 Amplifier.
1 Caging unit.
1 Spare parts kit.

All wiring, foundations, mountings, and accessories necessary for the satisfactory installation of the equipment in the vessel shall be provided and installed by the shipbuilder.

A 24-volt, 2-wire, direct-current supply will be required from the main distribution panel located in the engine room.

SECTION S28-1.
DESIGNATING AND MARKING, MACHINERY INSTALLATION.

Principal piping shall be marked in a suitable manner for ready identification as approved by the Supervisor of Shipbuilding.

SECTION S28-2.
DESIGNATING AND MARKING, ELECTRICAL INSTALLATION (dated 15 December 1943).

Power, lighting, I. C. and F. C. cables shall be marked in accordance with contract plans.

SECTION S29-1.
WEIGHTS, MACHINERY.

The weight of all on-board machinery items to be furnished by the Government shall not exceed 14,700 pounds for alternate *(a)* engine installation, 14,325 pounds for alternate *(b)* engine installation, or 14,425 pounds for alternate *(c)* engine installation. The weights of the individual items shall be approximately as follows:

Items common to all installations-

Item	Weight (dry pounds)
(a) 3 Packard gasoline marine engines including supercharger, generator, starter, fuel pump, L. 0. pressure pump, L. 0. scavenging pump, F. W. pump, S. W. pump, clutch and reversing gear (see section S41-3)	8,850
(b) 3 duplex fuel filters (see section S55-1)	100
(c) 3 lubricating oil coarse-mesh strainers (see section 545-1)	150
(d) and *(e)* 3 heat exchangers for lubricating oil and fresh-water cooling (see sections S45-1 and S48-1)	600
(f) 3 fresh-water thermostats (see section S48-1)	75
(g) 3 lubricating oil thermostats (see section S45-1)	100
(j) 3 propellers (see section S44-1)	225
(m) 3 lubricating oil fine-mesh strainers (see section S45-1)	100
(o) 3 battery-charging generators attached to the main engines (see section S61-1)	Incl. in item (a)
(p) 2 auxiliary gasoline-driven 5 1/2 KW generators complete (see section S61-1)	500
(q) 2 engine instrument panels, one local and one remote, also one starting-ignition panel (see sections S41-3 and 562-1)	175
(r) Main distribution panel (see section S62-1)	110
(s) 2 auxiliary generator control panels (see section 562-1)	110
(t) 3 engine connection boxes (see section S62-3)	15
(u) Portable signaling equipment (see section S64-1)	55

(v) Flashlights (see section S64-1)	15
(w) Sound powered telephone equipment (see section 565-1)	60
(x) 1 8-inch signaling searchlight (see section S66-1)	15
(y) Radio equipment (see section S67)	350
(z) Radar equipment (see section S67-5)	600
(aa) I. F. F. equipment (see section S67-6)	420
(bb) Special 400-cycle inverter (see section S71-1)	10
(cc) Remote-indicating magnetic-compass equipment (see section S24-7)	40
(dd) Spare parts and tools for items (a) to (cc)	650
Total	13,325

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Item		Weight (dry pounds)
	ITEMS FOR INSTALLATION (a) ONLY	
(h) and (i)	3 sets of shafting and couplings (see section S43-1)	750
(k)	1 hand wobble fuel pump (see section S55-1)	25
(n)	2 V-drives for propeller shafts (see section S41-3)	600
	Total	1,375
	ITEMS FOR INSTALLATION (b) ONLY	
(h) and (i)	3 sets of shafting and couplings (see section S43-1)	975
(k)	1 hand wobble fuel pump	25
	Total	1,000
	ITEMS FOR INSTALLATION (C) ONLY	
(h) and (i)	3 sets of shafting and couplings (see section 843-1)	1,050
(k)	2 hand wobble fuel pumps	50
	Total	1, 100

The various contractors shall submit a list of estimated weights showing the dry and wet unit weights (with separate weights for fresh water, sea water and lubricating oil) for each of the individual items listed above. These weights shall be itemized for each unit with its attached equipment, and for each unattached accessory. The list shall also include the net and gross weights of spare parts and tools per set, divided into onboard and ashore totals.

Upon completion of the first or one of the first of each item or unit listed above the contractor shall determine and submit immediately the actual weights thereof. These actual weights are to be itemized for

the unit and its attached equipment and for each unattached accessory, but need not include contained liquids.

The above estimated and actual weights are to be submitted to the Bureau of Ships, Navy Department, Washington, D. C.

SECTION S31-1.
SPARE PARTS.

All spare parts for shipbuilder furnished equipment will be provided under separate contract by outfitter activity. All spare parts are to be delivered concurrently with each squadron. The

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shipbuilder shall provide stowage for all spare parts to be carried onboard the vessel.

A parts list shall be furnished by the shipbuilder for all shipbuilder furnished equipment.

SECTION S38-1.
HEATERS, GASOLINE.

See Detail (Hull) Specifications.

SECTION S38-3.
BRACKET FANS.

Three ventilating bracket fans similar to the General Electric Marine type 95 by 512 (24-volt) or equal shall be installed; one in the chart house and two in the engine room as directed by the Supervisor of Shipbuilding.

These bracket fans shall meet the requirements of Navy Department Specification 17F6.

SECTION S39-1.
HEAT INSULATION AND LAGGING FOR PIPING AND MACHINERY.

Adequate heat insulation shall be provided to reduce radiation in particular from main engine exhaust system. The engine exhaust manifold shall be water jacketed as approved by the Bureau of Ships.

SECTION S41-3.
MAIN PROPULSION AND AUXILIARY GASOLINE ENGINES.

General-main and ship's service gasoline engines.

A. The gasoline engine propulsion and auxiliary equipment to be furnished by the Government and installed by the boat builder will consist in general of two types of equipment as follows:

1. *Alternate (a)*-Equipment furnished per vessel (2 with V-drive, 1 without V-drive).

(a) Three propulsion gasoline engines, each with a reverse gear. The two outboard engines shall be installed in the boat with the reverse gear forward and connected through V drives, to the propeller shaft. The center engine shall be installed with the reverse gear aft and direct connected to the propeller shaft. Each engine will turn its propeller clockwise in the ahead direction when viewed from aft of the vessel looking forward toward the propeller. (All three engines, with reverse gear, rotate clockwise in the ahead direction when viewed from the reverse gear end.

(b) Two V drives (1.034:1 approx. reduction ratio and 10° angle) complete with built-in thrust bearing and driving their own attached

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lube oil pump. The universal between the main engine and the V drive as well as the necessary lube oil pressure gages shall be supplied by the boatbuilder. Space will be provided on engines' instrument panel for gages.

(c) Two 5 1/2 KW gasoline generator sets.

2. *Alternates (b) and (c)*-Equipment furnished per vessel (3-direct drive).

(a) Three propulsion gasoline engines, each with a reverse gear, direct connected to its propeller shaft. All engines shall be installed with the reverse gear aft. Each engine with reverse gear will turn its propeller clockwise in the ahead direction when viewed from aft of the vessel looking forward toward the propeller. (All engines rotate in the same direction.)

(b) Two 5 1/2 KW gasoline generator sets.

Main propelling engines.

A. Three main propelling gasoline engines will be furnished for each vessel in accordance with the following:

(1) The engines will be equipped for marine service and will be twelve-cylinder, V-type, spark ignition, four-stroke cycle, fresh-water cooled. The engines will be furnished complete with the following equipment:

(a) Attached reverse gears with propeller shaft thrust bearing built into the reverse gear housing.

(b) Attached gasoline lubricating oil and fresh and salt water pumps required for the operation of the engines. Fresh water expansion tanks and lube oil sump tank shall be furnished by the boatbuilder.

(c) Fuel and lubricating oil filters and strainers.

(d) Hand-operated gasoline wobble pumps and primer pumps.

(e) Engine circulating fresh water coolers and water thermostats and lube oil coolers and lube oil thermostats.

(f) Two instrument boards for each boat, one suitable for bridge mounting and one mounted in the engine room. The necessary instruments will be included. The boatbuilder shall furnish the necessary cable and tubing for mounting in the boat.

(g) One wet type muffler for each engine shall be furnished by the boat builder. Mufflers shall be designed so that they will not create a back pressure exceeding two pounds per square inch at the exhaust manifold. Exhaust system shall be as indicated on contract plans.

(h) Set of spare parts.

(i) Set of special and standard tools.

(j) Engines will be arranged for electric starting, complete with starting motors battery charging generators for 24-volt system. Sufficient trays of Navy type 6V-SBMD-175AH starting batteries or commercial batteries of suitable capacity shall be provided by the shipbuilder; two sets of batteries for each boat.

(k) Bridge control for operating engine room signals and the engine throttle including the connecting tubing, cables and wiring between the engines and bridge shall be furnished and installed by the shipbuilder. Throttle controls shall be of the mechanical type.

(l) Propeller shaft coupling companion flange for 2 1/4-inch shaft will be furnished with the engines.

(m) The shipbuilder shall furnish and install all material such as piping, valves, fittings, etc. (except special valves and fittings furnished with the engines) necessary for connection between units and to vessel.

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(2) Dimensions, rating and weight.

(a) The overall dimensions of each propulsion engine will be approximately as follows:

Length (overall from timing gear end of engine to face of reverse gear flange), 103 5/16 inches.
Height (above crankshaft centerline), 29 7/8 inches.
Depth (below crankshaft centerline), 18 23/32 inches.
Width (overall), 46 inches.

(b) Each engine will be suitable for operation in accordance with the following ratings:

Emergency duty, 1,500 h. p. at 2,500 R. P. M., 15 minutes in one 10-hour period.
Maximum duty, 1,350 h. p. at 2,400 R. P. M., 1 hour in 25-hour period.
Maximum cruising, 950 h. p. at 2,000 R. P. M., normal operation.
Slow cruising, 250 h. p. at 1,200 R. P. M., normal operation.
Minimum cruising, 125 h. p. at 600 R. P. M., normal operation.

(c) The total weight of each engine, complete with reverse gear will be approximately 2,950 pounds.

Auxiliary generator sets.

A. Two auxiliary gasoline generator sets per vessel will be furnished in accordance with the following:

(a) Each gasoline engine generator set will consist of a gasoline engine prime mover, a 5.5 kw. 28 1/2 volt D. C. generator mechanically connected to the engine through the necessary gearing, an automatic voltage regulator, starting control equipment, reverse current cut-out equipment and such other accessories as necessary to make the equipment a self-contained generating unit capable of functioning without dependence on any other ship auxiliary when connected to the water, exhaust and fuel supply lines and when connected to receive power for ignition and starting from the ship's battery The generators will be furnished complete with the following accessories:

(b) Electric starting system including starting push button. Starting will be accomplished by means of starting windings in the generator and the ship's batteries.

(c) A wet type muffler.

(d) Salt water cooling system.

(e) Set of spare parts.

(f) Set of special tools.

(g) Weight of the complete unit will not exceed 250 pounds.

(h) The boat builder shall furnish and install all material such as piping valves, fittings, etc. (except special valves and fittings furnished with the generator sets), necessary for connecting the generator sets to the vessel.

Co-ordination-shipbuilder and machinery contractor.

D. Close coordination between the shipbuilder and machinery contractor will be necessary to assure that the machinery will fit into the vessel and there will be no delay in installing the machinery. The bulkheads and machinery foundations should not be located in the vessel until certified machinery installation plans are received from the machinery contractor. Lubricating-oil and fresh water pumps shall be removable without moving engines.

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SECTION S43-1.
SHAFTING, MAIN PROPULSION.

Service and spare shafts will be furnished by the Government. These shafts will be 2 1/4 inches diameter, heat treated, precision straightened, K monel bars which conform to Navy Department Specification 46N5. The Government will furnish one set, consisting of 3 shafts, per vessel for installation as service shafts and one set, consisting of 3 shafts, for every 2 vessels for onboard spare shafts. Service and spare shafts will be machined by the Government and shall be installed by the shipbuilder. The Government will furnish shaft accessory parts such as propeller hex nuts and locking jam nuts, coupling nuts and locking devices.

The propeller shaft-engine coupling will be furnished by the Government.

The propeller and engine coupling ends of the shafts will be taper splined. A taper of 1 inch per foot will be used on shaft tapers. A plan showing the taper spline details will be furnished by the Bureau of Ships at a later date.

The propeller hub will not exceed 8 1/2 inches in length.

Within two weeks from the date of award of contract, the ship-builder shall notify the Bureau of the exact lengths of shafting that the Government will be required to furnish.

The stern tube gland shall be of a floating type, rigidly restrained from rotation, but free to float so that it will not influence shaft alignment. The struts and stern tubes shall be manganese-bronze or aluminum-manganese-bronze castings.

SECTION S43-2.
BEARINGS, PROPULSION SHAFTING.

Stern tube and strut bearings shall be of the "Cutless Rubber, Full Molded, Water Lubricated Type." These bearings shall be furnished and installed by the shipbuilder.

The shipbuilder shall supply Bureau approved "Cutless Rubber," bearing pullers to the amount of one for each three vessels delivered.

SECTION S44-1.
PROPELLERS.

There shall be 3 aluminum-manganese-bronze right hand turning propellers per vessel. The diameter of the propellers shall not exceed 30 inches. Hub length will not exceed 8 1/2 inches.

The Government will furnish one set, consisting of 3 propellers per vessel for installation as service

propellers, and one set, consisting of 3 propellers, per vessel for stowage aboard as spare propellers.

Propellers for test purposes and replacements for propellers damaged on trials will be furnished by the Government from stock spares upon request of the Supervisor of Shipbuilding to the Bureau of Ships.

The Government will supply one propeller puller for each vessel.

SECTION S45-1.
LUBRICATING SYSTEMS.

The arrangement of lubricating oil system for the main engines shall be as approved. The reverse gear and clutch unit is lubricated from the engine oiling system. Each V-drive used in alternate (a) shall have independent lubricating oil system including lubricating oil tank. The lubricating oil tank of adequate size shall be furnished by the shipbuilder.

The lubricating system of each engine shall be independent of every other engine so that contamination of one will not affect any other. There will be no lubricating oil transfer system.

The main engines shall have individual lubricating oil sump tanks of about 30 gallons capacity each. The tanks shall be furnished by the shipbuilder and shall be baffled, have an anti-foaming internal oil return spout, a handhole for clean out and level indicating gages. The outlet shall be supplied with a flap valve, normally screwed and wired open, for convenience in changing engines. The tank shall be located with the normal oil level slightly above the engine oil pump so that it will maintain its prime, but not have sufficient head to flood the engine. There is to be a coarse strainer furnished by the Government located between the tank and the oil pressure pump. Scavenge oil shall be cooled in the heat exchanger furnished by the Government, shall pass through a fine wire wound type strainer, furnished by the Government, between the discharge side of the oil pump and the heat exchanger and then to the oil sump tank. The tank shall be vented to the engine crankcase to keep fumes out of the engine room. There shall be installed by the shipbuilder in the oil" out" line between the lubricating oil cooler and the oil sump tank a bypass thermostat, capable of regulating oil "in" temperature between 130 degrees and 150 degrees F. One bypass thermostat will be furnished by the Government for each main engine. The lubricating oil coolers will be furnished by the Government.

SECTION S47.
PUMPS.

There will be no detached motor-driven pumps.

SECTION S48-1.
GENERAL PIPING SYSTEMS.

This section of the General Specifications for Machinery, issue in effect on date of contract, shall serve as a guide insofar as the component parts and arrangement of the systems are concerned.

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***** PT565-624 - Seat. 548-1 page 58, line 16 DELETE, "All systems under pressure shall be tested to twice the maximum working pressure of the system", (BuShips ltr, 19 Apr, 1945, Section S48-1 General Piping Systems - Modification to. *****

***** Line 34: "One electrically driven air horn, equal to or better than Defiance Alloyed Products Co. Defiance, Ohio, Model 100 with 1/8 horsepower motor and Type H18 projector, shall be provided and installed with controls as shown on applicable contract plans for use as a navigation horn, The projector shall be located on top of the chart roam and the motor compressor unit shall be located in the chart room," (Machy. Change No, 2, Sales Order No. N3434) *****

Piping systems necessary for the safe and efficient operation of the vessel shall be installed and shall include the following:

Lubricating oil service system, see section S45-1.
Fuel service system, see section S55-1.
Sea water cooling system.
Fresh water cooling system.

There shall be installed by the shipbuilder between the engine fresh water outlets and the heat exchanger a bypass thermostat, capable of regulating water outlet temperature between 150 degrees and 170 degrees F. at all speeds. One bypass thermostat will be furnished by the Government for each main engine. The heat exchangers required for cooling the fresh water used in the engine cooling system will be furnished by the Government. Arrangement plans for each piping system shall be submitted for approval before installation of the system is undertaken.

All systems under pressure shall be tested to twice the maximum working pressure of the system. The materials of piping, valves, and fittings for circulating water, lubricating oil and fuel oil shall be in accordance with best commercial standards suitable for the service intended or as approved. Fittings and piping of a type resistant to aromatic fuel shall be supplied throughout. Synthetic rubber tubing (Hycar or equal) is acceptable to the Bureau. Aluminum piping shall be kept to an absolute minimum and only Bureau approved fittings shall be used. All piping shall have sufficient supports to prevent vibration. Sufficient take-down joints shall be provided to permit removal and/or replacement of any section. All water, lubricating oil and fuel connections to the engine shall be made with appropriate flexible connections. The bilge drainage will be accomplished by a hand pump as described in the Detail (Hull) Specifications.

SECTION S48-4.
WHISTLES AND SIRENS, APPLICATION AND INSTALLATION.

One horn, type H5a, 24-volt, watertight; in accordance with BuShips Specification 17S11 (INT), or approved commercial i equivalent shall be provided and installed with controls as shown on applicable contract plans for use as a navigation horn. The horn shall be located on top of the chart room.

SECTION S51.
BOILERS.

See section S38-1.

SECTION S55-1.
FUEL STORAGE AND BURNING SYSTEM.

The fuel system shall follow the scheme as shown on contract plan, PT565-S0101M-64159 ****64242**** for the alternates *(a)* and *(b)* and contract plan, PT625-S0101M-64162 ****64243**** for alternate *(c)*.

Arrangement plan of the fuel system shall be submitted for approval before installation.

Fuel storage tanks of a total capacity of approximately 3,000 gallons shall be furnished and installed by the shipbuilder as indicated on the contract plans. The fuel storage tanks shall be of a self-sealing type satisfactory to the Bureau.

Fuel from the tanks shall be drawn from each tank through the top and thence to a manifold as shown on the contract plan PT565-S0101M-6459 ****64242**** for the alternate *(a)* and *(b)* and contract plan PT625-S0101M-64162 ****64343**** for alternate *(c)*.

Wobble pumps, furnished by the Government, shall be installed in the fuel system as shown on contract plan PT565-S0101M-64159 ****64242**** for alternates (a) and (5) and contract plan PT625-S0101M-64102 ****64243**** for alternate (c).

**** *Per BuShips Ltr. 9-11-44 P.T.565-624/S1-5(L51)* ****

Each fuel tank shall be fitted with deck filling connections.

Arrangement shall be made for use of portable pump, furnished by the Government, through the filling pipe for pumping water from the bottom of the tanks.

Level indicating gages will be supplied by the boatbuilder. Space will be provided on engine instrument panel for gages.

The fuel to gasoline space heater, section S38-1, shall be drawn from the fuel storage tanks.

SECTION S56-2.
FEED WATER SYSTEMS AND TANKS.

Provision shall be made for replenishing water as needed in fresh water cooling of the main engines. One fresh water expansion tank of about 5 gallons capacity shall be furnished by the shipbuilder for each main engine.

SECTION S58-1.
DISTILLING PLANT.

No distilling plant is to be installed.

SECTION S59-2.
REFRIGERATION PLANT.

For refrigerator, see Detail (Hull) Specifications.

SECTION S60-1.
GENERAL REQUIREMENTS FOR ELECTRICAL MACHINERY.

The electrical installation shall be in accordance with the contract plans and these specifications. The electrical tests after installation shall be in accordance with the American Bureau of Shipping Requirements on shipboard, A. I. E. E. Publication No. 45, July 1940, section 45, except that generator load tests are not required. In addition, such tests as may be required by the Supervisor of Shipbuilding, to demonstrate compliance with the characteristics as specified herein, shall be conducted.

A grounding system shall be installed in accordance with Revised Notes on Grounding Radio and electrical equipment in wood hull vessels of the U. S. Navy dated 30 October 1942. (This circular will be furnished by the Bureau upon request.)

No changes or alterations shall be made in Government-furnished equipment without the specific approval of the Bureau in writing for each change or alteration.

SECTION S61-1.
DIRECT CURRENT GENERATORS, SHIP'S SERVICE.

A battery charging direct current generator will be furnished by the Government with each main propulsion engine and shall be suitably installed by the shipbuilder. Each direct current generator will be mounted on a main propulsion engine and will have the following characteristics:

40 amperes.
28.5 volt, D. C.
2-wire.
Shunt wound.
Continuous duty.
Self excited.

Each direct current generator will be equipped with a carbon pile voltage regulator mounted in a nonwatertight (splashproof) box, together with a current regulator, relays and radio noise filters as shown on plan, BuShips No. 9-S-5620L. *****PT S4103-S1929 & PT S4103-S19130 Per BuShips Ltr 9-11-44 P. T. 565-674/S1-5 (451) ***** The voltage age regulators shall be mounted in the engine room in a protected location and where there is a minimum of vibration and shall not be mounted on the engine or any part of the engine support framework. Voltage regulator mountings shall be such as to dampen vibration to a minimum. The machinery contractors installation plans for this equipment require that vibration absorbing mountings be provided.

A direct current ammeter will be furnished for each generator, mounted on the main distribution panel. Ammeters shall indicate the current output of each attached generator.

The three engine attached generators will be required to operate in parallel with each other but not with the auxiliary generators.

Two auxiliary generators will be furnished by the Government and shall be properly installed by the shipbuilder in strict accordance with the manufacturer's recommendations supplying this unit. These generators will have the following characteristics:

5.5 K. W.
28.5 volt D. C.
2-wire.
Shunt wound.
Continuous duty.
Self-excited.
Semi-enclosed.
Gasoline engine driven, gear connected.
Electrical starting.

A carbon pile voltage regulator, reverse current relay, starting relay, ignition coil, thermal instruments, radio noise-filters, switches and other associated equipment mounted in a control panel, in accordance with plan, BuShips No. 9-S-5615-L will be furnished for each auxiliary generator set. This Government furnished equipment necessary for the control and operation of the auxiliary generator set shall be installed by the shipbuilder in accordance with plan, BuShips No. 9-S-5615-L and applicable contract plans.

A direct-current ammeter will be furnished for each 5.5 kilowatt generator which shall be mounted on the main distribution panel. Each ammeter shall indicate the current output of its respective generator.

These generators will be required to operate in parallel with each other but not with the main propulsion engine attached generators.

For tests, see section S60-1.

SECTION S61-3.
MOTOR GENERATORS AND THEIR SHIPBOARD APPLICATION.

The following motor generator set will be furnished by the Government and shall be installed by the shipbuilder.

DC/DC motor generators for radio. See section S67.

The motor voltage for the above motor generator set will be 24-volt, 2-wire, direct current.

SECTION S62-1.
PANELS, ELECTRIC POWER DISTRIBUTION.

A main distribution panel will be furnished by the Government and shall be installed by the shipbuilder, together with such equipment as may be required for the proper operation and control of the vessel's electric plant.

Description of this panel in the following paragraphs indicate the general type and arrangement of the panel to be supplied.

The main distribution panel will be of the enclosed watertight type of construction. The shipbuilder may also mount, together with this panel, the engine instrument panel so as to give appearance of a one unit switchboard. The general design and arrangement of these panels is shown on plan, BuShips No. PT565-S0101E-62167.

This panel will be arranged for the distribution of 24-volt power and lighting and the charging of the ship's service batteries. This panel will have a 24-volt, 2-wire direct current main power bus fed from the three engine generators, the two auxiliary generators and the two ship's service batteries through circuit breakers and switches.

The main distribution panel will contain the following appurtenances together with such other appurtenances as may be required:

(a) Ammeters, 0-50-ampere, direct current, 2 1/2 inch flush type, Weston model 506 or equivalent; one for each main engine attached generator.

(b) Ammeters, 0-200-ampere, direct current, 2 1/2 inch flush type, Weston model 506 or equivalent; one for each auxiliary generator.

(c) Ammeter, 0-500-ampere, direct current, 2 1/2 inch flush type. Weston model 506 or equivalent; one for reading the bus load.

(d) Voltmeter, 0-50-volt, direct current, 2 1/2 inch flush type, Weston model 506 or equivalent; for reading the bus voltage.

(e) Switch, 24-volt direct current, single pole, single throw, 125-ampere Square D Company number 9320-991 or equivalent; one for connecting each ship's service battery to the main power bus.

(f) Circuit breakers, 24-volt direct current, single pole, 180 ampere, General Electric Co. type MCM 980 or equivalent; one for connecting each auxiliary generator to the main power bus. Each breaker will be mechanically interlocked through an operating handle with a circuit breaker, 24-volt direct current, single pole, 35 ampere, Square D Company number 9300-35b or equal, for connecting the respective voltage regulator equalizer lead to the equalizer bus.

(g) Circuit breakers, 24-volt direct current, single pole, 50 ampere, Square D Company number 9300-50B or equivalent; two will be mechanically interlocked, through

an operating handle, for each engine generator. One pole of each interlocked set will be for connecting the generator to the main power bus and the other pole will be for connecting the respective voltage regulator equalizer lead to the equalizer bus.

(h) Circuit breaker, 24-volt direct current, single pole, 100 ampere, Square D Company number 9300-100B or equivalent. Two for connecting distribution feeders to the main power bus.

(i) Circuit breaker, 24-volt direct current, single pole, 70 ampere, Square D Company number 9300-70B or equivalent; one connected to the main power bus as a spare.

(j) Circuit breaker, 24-volt direct current, single pole, 50-ampere, Square D Company number 9300-50B or equivalent; two for connecting distribution feeders to the main power bus.

(k) Circuit breaker, 24-volt direct current, single pole, 35 ampere, Square D Company number 9300-35D or equivalent; one for connecting a distribution feeder to the main power bus.

(l) Circuit breaker, 24-volt direct current, single pole, 15 ampere, Square D Company number 9300-15B or equivalent; nine for connecting distribution feeders to the main power bus and one for a spare.

(m) Engine starting solenoids furnished by the Government with the main propulsion engines; one for starting each engine.

(n) Shunts, suitable for use with the above ammeters, to be mounted as a part of the buswork where possible.

All necessary supporting and connecting material required to make a complete installation shall be furnished by the shipbuilder.

The shipbuilder will be notified as to the manufacturer of the panel and shall furnish the panel manufacturer with the following ship design information:

(a) Number of feeders, cable size, and type.

(b) Name plate data for feeder circuits including feeder designation, load on feeder in amperes, and circuit breaker element ratings.

This data shall be forwarded to the panel manufacturer in sufficient time to prevent delay in completion of the panel.

Main engine instrument panel.-A main engine instrument panel will be furnished by the Government and installed by the shipbuilder.

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This panel may be located in the engine room below the main distribution panel in such a manner that the general appearances of the two units will be as one switchboard.

This panel will contain all necessary engine indicating instruments, and gages, as required for the control and operation of the main propulsion engines.

For detail requirements, see section S41-3.

All necessary supporting and connecting material required to making a complete installation shall be furnished by the shipbuilder.

Bridge engine instrument panel.-A bridge engine instrument panel will be furnished by the Government and installed by the shipbuilder.

This panel shall be installed in a convenient location at the steering station on the bridge.

This panel will be arranged for indicating the engine speed and manifold pressure of each of the three main propulsion engines. The general design and arrangement of this panel will be in accordance with the front view shown on plan, BuShips No. PT565-SO101E-62169.

The panel will be of watertight construction and will have flush' mounted instruments.

All necessary supporting and connecting material required to make a complete installation shall be furnished by the shipbuilder.

Main engine starting and ignition control panel.-This panel will be furnished by the Government and

shall be installed by the shipbuilder in a convenient location to the control operators station in the engine room. This panel will be arranged for the ignition control and operation of the main engine starting system and will contain all necessary switches and pushbuttons for starting and controlling the main engine electrical system. This panel will contain the pushbutton for signalling the bridge.

The panel will be of the watertight type of construction and will be in accordance with plan, BuShips No. PT565-S0101E-62170. All necessary and connecting material required to make a complete and satisfactory installation shall be furnished by the shipbuilder.

Nameplates.-All panel-mounted apparatus shall be marked by means of suitable nameplates of laminated phenolic material, either type NDP engraved or type GCP printed (N. D. Specification 17P5) black with white core.

Panel support.-All shapes, angles and other members forming the supporting framework as well as all metal panels and enclosures will be of steel.

Insulating material-Edges, holes and machined surface of phenolic pieces will be given one coat of clear varnish, grade PR, N. D. Specification 17116.

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Bus bars.-Bus bars will be of copper and will be in accordance with section S62-1, paragraph S62-1-aa of the General Specifications for Machinery.

Circuit breakers and switches.-Circuit breakers and switches shall be so mounted that the panel wiring will not be disturbed when the front of the panel is opened or removed.

Painting.-Painting of panels shall be in accordance with Appendix 6 of the General Specifications for Building Vessels of the United States Navy.

Tests.-The electrical tests, after installation, except where specified otherwise herein, shall be in accordance with the American Bureau of Shipping requirements. In addition such tests as may be required by the local Supervisor of Shipbuilding to demonstrate compliance with the characteristics as specified herein, shall be conducted.

Spare parts.-Spare parts for the panels shall be furnished by the Government in accordance with the following list:

Circuit breakers.-One spare for each size and type.

Switches.-One spare for each size and type.

Tools, special.-One complete set, if necessary for proper maintenance.

These spare parts shall be stowed aboard ship in a suitable spare parts box. The spare parts box shall be in accordance with BuShips Specification 42B9(INT). See also section S62-3 and S63-3.

Cable calculations.-Computation of power and lighting cable sizes shall be in accordance with the applicable requirements of section S62-2 of the General Specifications; the drop in voltage in any part of the electrical installation shall not exceed 5 percent.

Painting.-Painting shall be in accordance with the requirements of Appendix 6 of the General Specifications for Building Vessels of the United States Navy.

SECTION S62-2.
ELECTRIC CABLES, ELECTRIC POWER DISTRIBUTION.

Cable classification.-All electrical cable installed on these vessels shall be in accordance with BuShips Specification 15C1 (INT).

All power lighting, interior communication and fire control cables shall be Navy type RI, RIA, or RIB. For cable size above 23000 CM and for multiconductor cable the shipbuilder shall use either Navy type "HFA" or Navy types TRF, TRXF, FJF, FJXF and MHFF cable. Portable or flexible cable shall be Navy oil resistant type COP. Battery jumpers shall be Navy fabric jacket flexible types FJF or FJXF.

Location and installation.-Cable shall be installed and supported in accordance with the applicable requirements of plan, BuShips No. 9-S-3980-L, modified as necessary for wood hull vessels. Cable runs shall be as direct and accessible as practicable.

Terminal tubes and their packing arrangements shall be in accordance with plan, BuShips No. 9-S-5621-L. Terminal tubes and stuffing tubes shall be so installed as to maintain the watertight integrity of watertight decks, bulkheads, and wiring appliances.

Flexible metallic loom (copper covered) similar to the Breeze or Tite-flex types: for radio shielding purposes, shall be used for enclosing generator and engine electrical instrument leads from the main engines to the voltage regulators. Flexible metallic loom (copper covered) similar to the Breeze or Tite-flex types or aluminum conduit may be used to protect wireways exposed to mechanical damage. The installation of rigid and flexible conduit shall be restricted to those locations where it is required for mechanical protection and shall be the minimum consistent with good practice.

Exposed terminals, clips and lugs shall be adequately protected by means of cotton friction tape and

insulating varnish.

Insulating varnish shall conform to N.D. Spec. 52V13d, Grade CA.

SECTION S62-3.
ELECTRIC WIRING EQUIPMENT, ELECTRIC POWER DISTRIBUTION.

Installation requirements.-Electrical fittings and panels shall be of watertight steel construction unless otherwise specified herein. All fittings, panels, and appliances shall be in accordance with Bureau standard plans specified under "List of Electrical Standards" herein. Pull boxes for use with conduit shall be of sheet steel construction.

Three engine connection boxes, one for each main propulsion engine, will be furnished by the Government and installed by the shipbuilder. Each box will be of watertight construction, suitable for connecting the ignition leads, the tachometer leads, and the thermal instrument leads of one main propulsion engine to its respective voltage regulator connection box. These engine connection boxes will be in accordance with plan, BuShips No. 9-S-5618-L.

The contractor shall install a permanent shore power and lighting system.

Connections shall be provided for lights in the engine room, galley and crew's quarters and for the electric range and coffee maker.

The contractor shall also provide a suitable 24-volt shore power system in these vessels. The shore power requirements shall be based on 150 amperes at 24 volts direct current.

Designation and marking.-All boxes and enclosures of electrical fittings shall be marked by means of suitable nameplates of laminated phenolic material, either type NDP engraved or type GCP printed (N. D. Spec. 17PS), black with white letters.

Additional nameplates may be installed in other locations if considered necessary by the Supervisor of Shipbuilding. Lettering shall be at least 1/4 inch high in capital letters.

***** Line 15: "Battery boxes shall be constructed either entirely of wood or of aluminum with wood liners." (BuShips ltr. 9-11-44`- PT565-624/ S1-5(451) *****

***** Line 34: "Non-renewable midget or cartridge type fuses shall be installed in accordance with BuShips Spec. 17F2(INT)," (BuShips ltr, 9-11-44-PT565-624/S1-5(451) *****

***** After Line 34: "All I.C. and F.C. circuits requiring an external source of power shall be separately fuesed". (BuShips ltr. 1-30-45 PT565-624/S1-5(451) *****

Painting.-Painting shall be in accordance with the requirements of appendix 6 of the General Specifications for Building Vessels of the United States Navy.

Spare parts.-See section S31-1 herein.

SECTION S62-4.
STORAGE BATTERIES, ELECTRIC POWER DISTRIBUTION.

The shipbuilder shall furnish and install two 24-volt batteries consisting of four Navy standard type 6V-SBMD-175 AH trays each in strict accordance with BuShips Specification 17B4(INT) Batteries, Storage, Portable, and plan, BuShips No. 9-S-4906-L, or commercial batteries of suitable capacity.

Battery boxes.-Boxes for the above batteries shall be furnished and installed by the shipbuilder. Each battery box shall be arranged to accommodate four Navy standard 6V-SBMD-175AH trays. Battery boxes shall be of wood construction. The interior of battery boxes shall be painted with a suitable acid resisting paint. Means shall be provided to secure batteries in place and prevent their dislodgement due to shock.

These boxes shall be so arranged that the individual trays may be readily removed for repairs or replacement.

Charging facilities.-The two ship's service batteries shall be charged in place, from the main power bus on the main distribution panel. Disconnect switches will be provided on this panel for disconnecting each battery from the main power bus.

SECTION S62-5.
ELECTRICAL PROTECTIVE DEVICES, ELECTRIC POWER DISTRIBUTION.

The electrical protection system for protection of power and lighting circuits shall be in accordance with the applicable American Bureau of Shipping requirements.

All feeders emanating from the main distribution panel shall be protected by means of enclosed type circuit breakers, connected in the positive side of the feeder. All power and lighting branch circuits shall be fused.

The enclosed type circuit breakers shall be of the Navy approved type and shall have trip free action.

Tests.-The tests for all electrical protective devices after installation shall be in accordance with the applicable Bureau of Ships Specifications. In addition, such tests as may be required by the local Supervisor of Shipbuilding to demonstrate compliance with the characteristics as specified herein, shall be conducted.

SECTION S62-8.
POWER SYSTEM, ELECTRICAL DISTRIBUTION.

Classification as to installation.-The ship's service installation shall be 24-volt, 2-wire direct current.

General design requirements.-A deck arrangement and an elementary diagram of the power distribution system and the

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approximate location of electric auxiliaries is shown on applicable contract plans.

The shipbuilder shall develop for approval, the required deck arrangements of power wiring showing location of electric auxiliaries and its local wiring on the basis of contract plans.

The shipbuilder shall provide and install feeders and wiring for any electric auxiliaries or interior communication system whether or not shown on contract plans, which may be required to be installed in the vessel and which will suit the final approved capacity of the auxiliaries. Approval of wire sizes and switch sizes on the basis of expected ratings of auxiliaries will not relieve the shipbuilder from installing wiring and switching to suit the final capacities of auxiliaries that may be required by the Bureau concerned.

Outlet for portable bilge and fuel pump.-The shipbuilder shall provide an outlet in a suitable location on deck in accordance with plan, BuShips No. 9-S-4860-L, Alt. 7, 25 ampere D. P., W. T. type B-1S for small boats. The shipbuilder shall also provide a receptacle plug in accordance with plan, BuShips No. 9-S-4859-L, Alt. 6 type B-1.

SECTION S63-3.
SHIPBOARD APPLICATIONS OF DIRECT CURRENT MOTORS.

Direct current motors shall be satisfactory for the service application. The local Supervisor of Shipbuilding shall authorize such tests as he deems necessary to demonstrate the suitability of the service application proposed. The local Supervisor of Shipbuilding may also authorize such tests as he deems necessary to demonstrate to his satisfaction that the motors proposed will function satisfactorily under all

service applications.

All motors shall have suitable filters mounted on the motor frame and properly connected and installed to minimize or eliminate radio noises.

Spare parts.-See section S31-1 herein.

SECTION S64-1.
LIGHTING SYSTEM DISTRIBUTION.

Classes of circuits.-One lighting system, designated as "ship's service" shall be installed.

Ship's service lighting system.-Applicable contract plans show the general arrangement of the lighting system. These contract plans are for the guidance and information of the shipbuilder and are subject to additions, modifications and developments as may be required to suit structural and other arrangements as finally approved for this vessel.

The shipbuilder shall develop for approval the required working wiring deck plans, on the basis of contract plans.

Cable designations shall be in accordance with contract plans. Feeders shall be 24-volt direct current, fed from power bus established on the main distribution panel.

Special lighting distribution.-The portable signalling outfit for these vessels will be furnished by the Government in accordance with Master Machinery Allowance List. The shipbuilder shall provide suitable stowage for this equipment.

Two portable lights, commercial watertight type or type DD, W. T. plan, BuShips No. 9-S-5392-L and adapters shall be furnished and installed. These adapters, similar to Perko Cat. 670 or equal, shall be provided for adapting the medium screw base of socket, plan, BuShips No. 9-S-4836-L, for bayonet candelabra, double contact base lamp, 24-28 volt, 15 c. p., similar to Navy type TS-102 (Mazda No. 1692). These portable lights shall each be equipped with 25 feet of portable cord, DCOP-3, and receptacle plug to fit the receptacles provided on the lighting system of vessel.

Outlets for portable equipment shall be installed in location and number as shown on contract plans.

Flashlights in accordance with BuShips Specification 17F7, in number as required by the Master Allowance List, shall be provided (furnished by the Government).

Four hand lanterns, type J-1S, with mounting brackets, in accordance with plan, BuShips No. 9-S-5311-L shall be installed as shown on contract plans.

Arrangement of running, signal and anchor lights shall conform to type plan, BuShips No. 9000-S6405-73103.

The following running, signal and anchor lights shall be installed:

Side light-Stbd.
Side light-Port.
Stern.
Masthead and anchor light.

These running, anchor and signal lights shall be controlled from a bridge control panel located on the bridge as shown on contract plans.

This bridge control panel in accordance with plan, BuShips No. 9000-S6401-73165 shall be designed to incorporate the following.

1 Switch for side lights (P & S).
1 Switch for masthead and anchor light.
1 Switch for stern light.
1 Switch for compass light.
1 Switch for searchlight.
1 P. B. for navigation horn, circuit "S." (sec. S65-4) and cease firing signal for forward guns circuit "5U" (sec. S71-1).
**** "W." Per BuShips Ltr. 9-11-44 PT 565-674/S1-5(415) ****
1 P. B. for bridge to crew's quarters horn, circuit "A" (sec. S65-4).
1 P. B. for bridge to engine rm. horn and signal light, circuit "E" (sec. S65-4).
1 P. B. for bridge to bell at depth charge racks, circuit "VE" (sec. S71-1).

1 P. B. for bridge to horn for aft. 20 mm. gun cease firing signal,. circuit "5U" (sec. S71-1).
3 Switches for emergency ignition.
1 Buzzer for signal from engine room to bridge, circuit "E" (sec. S65-4).

Lighting system control.-Lighting system control shall be in accordance with contract plans.

Detail distribution requirements.-The lighting fixtures shall be so installed as to give the most illumination over mess tables,. desks and in the proximity of mirrors.

A door switch shall be installed in accordance with plan, BuShips No. 9-S-5589-L as shown on contract plan.

SECTION S64-2.
LIGHTING SYSTEM, FIXTURES.

Lamps.-Lamps for use in white general lighting fixtures, red signal lighting fixture and portable lights shall be bayonet candelabra double contact base, 24-28 volt., 15 c. p., similar to Navy Type TS-102 (Mazda No. 1692).

Lamps for use in 110 volt shore power system shall be medium screw base, 50 watt, 115 volt, similar to Navy Type TR-5.

Regular fixtures.-Lighting fixtures shall be in accordance with BuShips standard plan specified under list of "Electrical Standards" herein.

SECTION S65.
INTERIOR COMMUNICATION.

All shipbuilders furnished equipment for I. C. and F. C. circuits shall conform with Bureau plan, insofar as applicable, as specified under list of electrical standards herein. No interior communication equipment listed in these specifications shall be used by the shipbuilder for any purpose during the construction of the vessel prior to 3 months before the delivery date of the vessel except for necessary tests to determine the reliability of the equipment. The main runs of interior communication and fire control system cables shall, in general, follow the cable runs of the lighting and power installation.

SECTION S65-1.
TELEPHONE SYSTEMS-SHIPBOARD APPLICATION.

The following string type telephone circuit shall be installed:

Station	Location	Blast helmet	Calls
1	Bridge	X	2
2	Engine room	--	1
3	20-mm. gun forward	X	--
4	20-mm. gun aft	X	1
5	Radar control station	--	--
6-7	Between torpedo launching racks (P & S)	X(2)	--
8-9	Each-50-caliber gun turret	X(2)	--

One jackbox and one telephone shall be installed at each station.

The Government (Bureau of Ships) will supply the telephones 14 (amplified type) and blast helmets (2 large, 5 medium.) The Government (Bureau of Ships) will also supply one spare telephone for each vessel.

SECTION S65-3.
VOICE TUBES.

One voice tube shall be installed from bridge (cockpit) to Radar control station. No calls.

SECTION S65-4.
ELECTRICAL SIGNAL AND INDICATING SYSTEMS.

Circuit A-Officer's Call Bell System.-Install pushbutton at bridge and type H5a horn (BuShips Specification 17S11 (INT)), in crew's quarters. (See sec. S64-1.)

Circuit E-Sound Powered Telephone Call Bell System.- Install as indicated in section S65-1 with pushbuttons at bridge and in engine room, type 115a horn in parallel with red lighting fixture in engine room, and buzzer in bridge. (See sec. S64-1.)

***** H3 Horn BuShips Spec 751/1 (Int) Except wound for 24 volt- (BuShips Ltr. 9-11-44 PT565-671/S15 (415) Mach. Chg. No 2 Sales O.N 3434 *****

Circuit K-Engine Revolution Indicator System.-Install transmitter at each engine with indicator in

engine room and on bridge. Equipment will be furnished with engines.

Circuit W-Whistle Operating System.-Install pushbutton bridge to operate navigation horn. (See secs. S48-4 and S64-1.)

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SECTION S65-5.
MECHANICAL TELEGRAPH, SIGNAL, AND INDICATING SYSTEMS.

Provide and install mechanical rudder angle indicator on bridge.

Provide and install a mechanical engine order telegraph (without reply) system between the bridge and the engine room. A combined transmitter shall be installed on the bridge with an indicator for each engine. The system shall provide for the following orders "Ahead," "Neutral," and "Back." The equipment shall be of the "Teleflex type" or of a type approved by the Bureau.

SECTION S66-1.
SEARCHLIGHTS, SHIPBOARD APPLICATION, Dated 1 November 1933.

One 8-inch incandescent searchlight will be furnished by the Government and shall be installed and connected by the contractor for signalling use. The power for the 8-inch searchlight shall be supplied from the ships' service normal 24-volt supply.

All necessary supporting and connecting material required to make a complete and satisfactory installation shall be furnished by the shipbuilder.

Applicable paragraphs of section S66-1.

S66-1-h-2(a).-(Except that "8-inch" shall be substituted for "12 inch".)

S66-1-i. Tests.
S66-1-j. Spare parts, tools and storage.-

SECTION S67.
RADIO INSTALLATION.

Radio communication equipment will be furnished by the government and shall be installed and connected for operation by the shipbuilder in accordance with plans approved by the Bureau. The

equipment will consist of radio transmitters, receivers, whip antennas and antenna insulators. All cable and wire shall be furnished by the shipbuilder and installed in accordance with plans approved by the Bureau. Power feeders, outlets, and fittings shall be installed as required.

The Bureau of Ships will furnish standard type plans for the radio installation. The shipbuilder shall make detailed plans based on type plans. Copies of these plans should be forwarded to the Bureau for final approval. The installation shall be made in accordance with the approved detail plans.

A naval radio engineer will be available, if considered necessary, for consultation in regard to the preparation of detailed plans and also for making adjustment to and tuning the equipment after installation has been completed by the shipbuilder.

***** Line 24: "Power for the Model 'BK' I.F.F. equipment may be supplied through a circuit breaker on the main generator and distribution switchboard or from a feeder distribution box at the radar motor-generator set." (BuShips ltr. 9-11-44, PT5b5-624/S1-5(451) ******

****** Page 73, line 40 to page 74, line 8 This system shall provide means for electrical firing of torpedo launching racks. from a control panel remote from the racks. Circuit shall be energized from ships 24 volt supply. Wiring is shown on Bureau of Ships Plan 37104-607107. (BuShips ltr. 9-11-44, PT565-624/S1-5 (451). Hull Chg. A-5-(1) S.O. N3458 ******

SECTION S67-5.
SEARCH RADAR INSTALLATION (Circuit 2R-ER).

Search radar equipments will be supplied by the Government (Bureau of Ships). The main RF units comprising the *classified* components such as the transmitter, receiver and indicator will be installed by the boatbuilder. The installation shall be accomplished only by shipbuilder's employees especially trained and authorized to install the classified components of Radar Equipment under direct supervision of the Supervisor of Shipbuilding.

The shipbuilder shall allocate space required for equipment, furnish and install equipment foundations, cables, and other incidental wiring materials as required to provide a complete and satisfactory installation including any special features the Bureau of Ships may elect to furnish in accordance with radar type allowance and pertinent equipment data as contained in the Radar Installation Plan effective at time of issue of these specifications.

The services of a naval radio engineer will be made available for consultation if desired.

SECTION S67-6.
I. F. F. EQUIPMENT.

I. F. F. equipment will be supplied by the Government (Bureau of Ships).

The general requirements for search radar equipment also apply to I. F. F. equipment.

SECTION S69-3.
PORTABLE ELECTRICAL INSTRUMENTS.

Portable electrical instruments shall be supplied in accordance with the following list:

1 testing set, storage battery (for small batteries) type B Navy Department Specification 18T18.

1 voltmeter, D. C. double scale, 0-30, 0-300 grade NSS-D, Navy Department Specification 17112.

Suitable provision shall be made for the satisfactory stowage of the equipment aboard ship.

SECTION S71-1.
ELECTRICAL FIRE CONTROL, SIGNAL, AND INDICATING SYSTEMS.

Circuit 6PA-Torpedo firing system.-This system shall provide means for firing torpedoes from a contact maker for each tube

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***** Page 74, line 20 to 30: Delete, Circuit GA Torpedo Course Data Transmission Circuit. (BuShips ltr. 9-11-44, PT565-624/S1-5(451) Hull Change A-5-(1) S.O. N3438) *****

***** After Line 30: "Circuit 9PA rocket firing system - This circuit shall provide means for electrical firing of the rockets from the bridge. Power to the system shall be 24 volts from ship's power (Bridge control panel). (BuShips ltr 1-30-45, PT565-624/S1-5(451) *****

located at the bridge. Contact makers shall be type M-XV-S, plan, BuShips No. 9-S-4835-L. Circuit shall be energized from a source having a voltage up to 20 volts or a 6-volt, 100 AH storage battery. A snap switch, type TT-S, plan BuShips No. 9-S-4720-L, shall be provided at the contact makers for deenergizing the circuit from the source of supply. This circuit shall not be provided for torpedo tubes which are fired by air under control of a hydraulic system or for torpedo launching racks.

Circuit VE-Depth charge release signal system.-This system shall consist of an audible signal 24-volt direct current, similar to type B-4 bell (BuShips Specification 17S11 (INT)) at the depth charge racks

energized by a pushbutton located in the bridge. Supply shall be 24 volts direct current. (See sec. S64-1.)

Circuit 5U-Light projectile machine gun cease firing signal.- This system shall consist of a 24-volt direct current horn similar to Type H5a horn (BuShips Spec. 17S11 (INT)) at the aft 20-mm. gun energized from the bridge. Supply shall be 24-volt direct current. Navigation horn will serve as an audible signal for forward 20-mm. and 50-caliber machine guns. (See sec. S64-1.)

Circuit GA- Torpedo course data transmission system. This system shall provide means for setting the vessel on a torpedo collision course. Inputs shall be provided from the lux gate compass and radar to a Course Control Unit in the chart house. Inputs shall be provided from the course control unit to a "Right-Left" helm indicator mounted in the dashboard on the bridge and to a Director Sight Coupling Unit on the bridge. Above instruments will be Government (Bureau of Ordnance) furnished. Supply will be 24 volt alternating current, 400 cycles from the fluxgate compass inverter or from a special inverter furnished by the Government.

SECTION S91-1.
SHOP EQUIPMENT.

There shall be supplied and installed by the shipbuilder:

1 workbench 18" wide x 3' long, with drawer under.
1 vise, combination, type IV, 4 1/2", Federal Specs. GGG-V-436.

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