

# ELECTRICAL SPECIFICATIONS

*for the*  
CONSTRUCTION  
*of a*  
SINGLE SCREW TANKER  
DESIGN T2-SE-A1  
TURBO-ELECTRIC PROPULSION

## GENERAL

All electrical equipment is to conform to requirements of the Bureau of Marine Inspection and Navigation, American Bureau of Shipping, and the 1940 marine rules of the A.I.E.E.

All propulsion equipment, generators, motors, control and switchboards will be designed with particular attention to the requirements of marine service, special care being taken to provide ruggedness, reliability and simplicity. All windings will be specially insulated and treated to render them oil and moisture resistant.

## TURBINE-ELECTRIC PROPULSION EQUIPMENT

1—2300 volt, 3 phase, 2 pole propulsion turbo-generator rated as follows: 5400 K.W., 100% P.F., 62 cycle, 3720 R.P.M., continuous.

1—2300 volt, 3 phase, synchronous propulsion motor rated as follows: 6600 H.P., 62 cycle, 93 R.P.M. continuous.

1—Propulsion Control Unit.

1—Set Spare Parts.

## PROPULSION GENERATOR

The generator will have a closed re-circulating ventilating system with air coolers. Fans located in generator rotor will provide the necessary ventilating air. The generator rating includes 330 K.W. capacity in addition to that required for supplying the propulsion motor at normal and maximum rating. Generator fields will be excited from a separate source. Generator to have Class B insulation.

## PROPULSION MOTOR

Propulsion motor will be of the synchronous, totally enclosed, air cooled type. The motor will be fitted with two marine type sleeve, pedestal bearings and flanged shaft for connection to the propeller shaft. The bearing arrangement and length of shaft will be sufficient to allow for shifting the stator far enough to uncover the rotor for repair and maintenance.

The motor will be complete with totally enclosing sheet steel end bells and with air coolers and motor driven ventilating fan.

The motor fields will be excited from a separate source. The motor shall have Class B insulation throughout except that Class A insulation may be used for the 120 volt D.C. field windings. The motor shall be designed on a basis of 80 degree C. temperature rise which shall be measured on the stator by imbedded detectors and on the rotor by rise of resistance method when continuously developing 6600 SHP at 93 R.P.M. If Class A insulation is used for the D.C. field windings the temperature rise in these coils shall not exceed 60 degrees C. The poles to be provided with windings to provide for induction motor operation during maneuvering.

## PROPULSION CONTROL

The propulsion control unit will consist of a control cubicle built of steel angle framework with protective screens and access doors at the ends and with steel front panel. The panel will carry all

necessary electrical instruments for the propulsion units.

The cubicle will contain the necessary cam operated air break reversing switches for the main circuit between the propulsion motor and generator, the necessary cam operated air-break switches for controlling the field circuits, and all necessary potential and current transformers, shunts, rheostats and resistors, bus work and supports and control wiring.

#### AUXILIARY TURBINE GENERATOR SETS

2—525 K.W. geared Turbine Generating Sets are to be installed. Each set to consist of:

1—400 K.W., .8 P.F., 450 volt generator, 3 phase, 60 cycle.

1—75 K.W., 120 volt D.C. exciter for propulsion.

1—50 K.W., 120 volt D.C. generator for excitation of 1, or both, 400 K.W. auxiliary generators, plus normal ship requirements, 2 Navy signalling searchlights and degaussing. Size of D.C. generators subject to change to suit requirements of electrical manufacturer.

Generators to have class A insulation and to be fitted with approved type drip covers. Generators and exciters to have 25% overload capacity for 2 hours without excessive heating.

Turbines to operate with same steam conditions as specified for propulsion turbines.

## PORT SERVICE TURBINE GENERATOR SET

1—50 K.W., direct connected or geared, as approved, turbine generating set is to be installed, to consist of:

- 1—50 K.W., .8 P.F., 450 volt generator, 3 phase, 60 cycle.
- 1—125 volt D.C. direct connected exciter.

Generator to be suitable for parallel operation with auxiliary turbine generating sets for transfer of load only.

Generators to have class A insulation and to be fitted with approved drip covers. Generator and exciter to have 25% overload capacity for 2 hours.

Turbine to be suitable for conditions of 75 lbs. gauge pressure, steam containing 10% moisture, exhausting against atmosphere.

## POWER TRANSFORMERS

Three 200 KVA, 2300/450 volt, single phase transformers for power to cargo and stripper pump motors to be installed.

Three 15 KVA, 450/230 volt, single phase transformers for power to galley.

## LIGHTING TRANSFORMERS

Three 15 KVA 440/120 volt, single phase transformers are to be installed for supplying power for lighting, telegraphs, alarms and other 115 volt A.C. load.

## AUXILIARY GENERATOR AND DISTRIBUTION SWITCHBOARD

The switchboard is to be of the dead front type as required for the control and protection of the two 500 KVA turbo-generators and exciters, power and lighting transformers, and for power and lighting distribution circuits. All necessary switchgear is to be provided. Suitable switchboard lighting is to be provided.

For each A.C. generator, the switching and control equipment is to include a three pole air circuit breaker with inverse time limit overload protection in three phases and a reverse power relay, a three pole generator disconnecting switch, an ammeter switch, a voltmeter and voltmeter switch, wattmeter, a field ammeter and voltmeter (D.C.), mounting for field rheostats for generator and exciter, a field switch with discharge clips and resistor, pilot lights and ground lights, current and potential transformers, and all other necessary accessories. For use with both main generators, a frequency meter and selector switch, a synchroscope and switches are to be provided. Switchboard meters are to have black dials with white markings and pointers.

Switchboard is to be fitted with a 440 volt, 3 phase, 60 cycle, constant frequency bus and a separate 440 volt, 3 phase, variable frequency bus where required. Engine room auxiliary motors will normally be supplied from the constant frequency bus from the auxiliary generators. Main cargo and stripper pumps will normally be supplied through the power transformers and variable

frequency bus from the main 2300 volt propulsion generator. Proper arrangement of switching will permit operation of main cargo and stripper pump motors from the constant frequency bus.

Two steering gear feeders are to be provided and equipped with circuit breakers set to open instantaneously at not less than 700 to 800% normal rating of motor. An audible alarm is to be installed at main engine control station to indicate opening of the steering gear feeder circuit breaker. Indicating lights on this switchboard to indicate which circuit is in service. Switches in the steering gear room will be installed and so arranged that either feeder will supply power to either motor. Shore connections are to be provided for 440 volt 3 phase and 120 volt 3 phase source of adequate capacity for lighting circuits and essential engine room auxiliaries when vessel is in port. Shore connection breakers shall be mechanically interlocked so that the two voltages can not be connected to the switchboard at the same time.

A non-conductive guard rail is to be installed in front of the switchboard. The back of this board will be enclosed with galvanized easily removed expanded metal panels, or as approved, to prevent anyone being thrown upon the live parts of the board.

## **MOTORS AND CONTROL.**

Table gives list of motor applications with horsepower, speed, type of enclosure, temperature rise, etc. All motors and control to be designed

for 440 volt, 3 phase, 60 cycle, except for sizes less than  $\frac{1}{2}$  HP, which may be 115 volt, single phase. Control for items Nos. 1, 2 and 3 will be mounted in cubicle structure to line up with propulsion control and switchboard. All other controls are to be mounted in separate, ventilated enclosures for individual mounting near motor. Controls for items Nos. 1 and 5 are magnetic compensator type starters, all others are magnetic across the line type.

All motors will be squirrel cage type except for items Nos. 5, 10 and 13, which will be 2-speed type. No wound rotor motor to be used.



## MOTORS AND CONTROL

Item	Equipment	Ques. H.P.	Speed	Exc. H or V	Temp. Rise	Class. Level	Control
1.	Caron Pumps	2	1800/1200	DPSC	40 C	"A"	U.V.P.
2.	Stripping Motors	2	1800/1200	DPSC	48 C	"A"	U.V.P.
3.	Pen & Butterworth	2	5000	DPSC	46 C	"A"	U.V.P.
4.	Steering Gear	2	248	TEFC	55 C	"A"	U.V.R.
5.	Main Circulating Pumps	1	243	DPSC	40 C	"A"	U.V.R. (TD)
6.	Main Condensate Pumps	2	1800	TEFC	45 C	"A"	U.V.R.
7.	Aux. Circulating Pumps	1	1200	TEFC	45 C	"A"	U.V.R. (TD)
8.	Aux. Condensate Pumps	1	1800	TEFC	45 C	"A"	U.V.R.
9.	Fig Oil Transfer Pumps	2	1200/600	TEFC	45 C	"A"	U.V.P.
10.	Fig Oil Service Pumps	2	750/3.75	TEFC	45 C	"A"	U.V.P.
11.	Lube Oil Service Pumps	2	1200	TEFC	45 C	"A"	U.V.R.
12.	Lube Oil Separator	1	2400	TEFC	45 C	"A"	U.V.P.
13.	Forced Draft Fan	1	1800/1200	TEFC	55 C	"B"	U.V.R. (TD)
14.	Engine Room Vent. Fan	4	1800	TE	55 C	"A"	U.V.P.
16.	Refrigerator Compressor	1	1800	TEFC	45 C	"A"	U.V.P.
17.	Refrigerator Cond. Com. Pump	1	1800	TEFC	45 C	"A"	U.V.P.
18.	Ship's Service Air Comp.	1	1800	TEFC	45 C	"A"	U.V.P.
19.	Combustion Contr. Air Comp.	1	1800	TEFC	45 C	"A"	U.V.P.

## MOTORS AND CONTROL—(Continued)

Item	Equipment	Quan.	H.P.	Speed	Exc. H or V	Temp. Rise	Quas. Prot.	Control
20.	Exp. Feed Pump	1	1	1800	TR	45 C	"A"	U.V.P.
21.	Fresh Wash Water Pump	2	2	1800	TEFC	45 C	"A"	U.V.B.
22.	Eng. Room Salt Water Service	1	7½	3450	TEFC	45 C	"A"	U.V.P.
23.	Sanitary Pump	1	7½	3450	TEFC	45 C	"A"	U.V.B.(TD)
24.	Engine Room Bilge	2	10	1800	TEFC	45 C	"A"	U.V.P.
25.	Drinking Water	2	1	1800	TEFC	45 C	"A"	U.V.B.
*26.	Main Motor Cooling Fan	1	15	1800	TEFC	45 C	"A"	U.V.B.(TD)
*27.	Turbine Turning Gear	1	1	1800	TEFC	45 C	"A"	U.V.P.
28.	Lighting Transformers	3	15 KVA	450/120 volts				
29.	Main Shaft Turning	1	2	1200	TEFC	55 C	"A"	U.V.P.
30.	Lath	1	2	1200	TEFC	45 C	"A"	U.V.P.
31.	Drill Press	1	1	1800	TEFC	45 C	"A"	U.V.P.
32.	Shaper	1	1	1800	TEFC	45 C	"A"	U.V.P.
*33.	Grinder	1	1	1800	TEFC	45 C	"A"	U.V.P.
34.	Access. Drain Receiver Pump	1	2	1800	TEFC	45 C	"A"	U.V.B.

U.V.P.—Undervoltage Protection; U.V.B.—Undervoltage Release; U.V.B.(TD)—Undervoltage Release Time Delay.

All motors to be ball bearing. With the exception of Item #4, all motors are continuous rated. Item #4 is 1-hour continuous running light.

\*26. Part of Prop. Motor Equipment as specified by Electrical Manufacturer.

\*27. Part of Prop. Generator Equipment as specified by Electrical Manufacturer.

\*33. Furnished with Grinder.

## WIRING

All wiring, except in living quarters, to be marine type, leaded and basket weave, bronze armoured cable. In living quarters, the cable to be marine type, basket weave, bronze armoured, without lead. Cables under fore and aft gangway to be run in brass conduit and expansion to be provided for.

## LIGHTS AND FIXTURES

The distribution of lights will be such as to give adequate illumination. Number and location of lights to be as per approved drawings.

All fixtures to be watertight except in officers' quarters. Desk lights to be fitted in captain's, chief engineer's, chief mate's, and first assistant engineer's rooms. A chart table light is to be provided. Berth lights are to be fitted over all berths in officers' and crew's quarters. A mirror light is to be fitted over each mirror in rooms, bathrooms, and washrooms. The engine room is to be lighted with floodlights to cut down the number of small units. The pump room is to be lighted with adequate Standard Oil Company of New Jersey standard type lighting units. No wiring or lights installed inside pump room.

Receptacles are to be provided in suitable locations for portable lights. Six vapor proof hand portables, each fitted with 50 ft. of cable to be furnished.

## **RUNNING LIGHTS**

There is to be furnished and installed a complete set of brass, watertight, electric navigating lights, to consist of port, starboard, mast head, range, stern lights, two anchor lights, fitted with necessary screens, jackstays, halyards, brackets, etc. These lights to be of the latest watertight type and to be fitted with 50 watt, double filament lamps. There is also to be furnished a complete set of oil navigating lights. The electric navigating lights are to be connected to an approved tell-tale panel located in the pilot house. There will also be furnished two ruby out-of-command lanterns of the combination oil and electric type.

## **FLOODLIGHTS**

Two 200-watt floodlights are to be mounted on the foremast and two on the aft mast. There will also be furnished six (6) Crouse-Hinds 500 watt floodlights, two (2) are to be mounted on the forward end of the upper bridge deck; two (2) at the after end, and two (2) at the forward end of the poop. A suitable light is to be arranged at the forecandle head for use when operating the windlass.

## **LOADING LIGHT**

A loading light, of approved type, will be mounted on top of the wheel house. Operating key for signal light to be installed in wheel house.

## **ELECTRIC FANS**

Electric fans of the bracket, oscillating type, 12", with speed control switch, will be furnished and installed in all officers' and crew's quarters, including mess rooms, hospital, etc.

## **SEARCHLIGHT**

An 18" 1000 watt Westinghouse, or equal, incandescent searchlight will be mounted on the wheel house with manual control from below.

## **TELEPHONES**

There is to be furnished and installed a seven station, selective ringing, common talking, sound powered telephone system. Phones will be located in wheel house, captain's office, chief engineer's office, engine room operating station, steering gear room, bow and after steering station. Phones to be Hose-McCann, or equal approved. Plug in phone connection is to be provided at after Docking Telegraph.

## **GENERAL ALARM**

A general alarm system, consisting of a switch in the wheel house and eight inch gongs distributed throughout the ship, as required by Government regulations, will be provided.

## **TELEGRAPHS**

An electrical telegraph system will be installed between the wheel house and the engine room and will consist of one double face, single engine, return signal pedestal type transmitter in the wheel

house connected to a return single face type receiver in the engine room. The engine room unit to be equipped with a special constant ringing, relay panel for operating ten inch bell on telegraph. Current failure alarm to be installed.

An electrical docking telegraph system will be installed between the wheel house and the Poop Deck Aft and will consist of two twelve inch dial, pedestal, return signal type transmitters, one located in the wheel house and one on the after bulkhead of Poop Deck House. The telegraphs to be of the latest Henschel, or equal, alternating current type.

Electric telegraph transmitter located at operating platform with indicator fitted with 12" polished brass dial (no reply) located in boiler room.

### WHISTLE AND PULLS

One Tyfon type 300 D.V.E., or other approved steam whistle, to be hand and automatically electrically operated. To take steam from auxiliary steam lines at 150# pressure, drain and other connections led inside outer stack, provided with separator below whistles. Electrical control gear to be Leslie.

One automatic control panel for whistle valves.

Three "At will" switches, one at each side of navigating bridge and one on poop deck house.

The above whistle, besides being electrically operated to be mechanically operated through emergency pulls from each side of the bridge and in the wheel house, top of wheel house, and top of poop deck house.

## **PLANT MILLS SYSTEM**

A Plant Mills engine direction indicator system to be furnished and installed.

## **SHAFT REVOLUTION INDICATOR**

An electric shaft revolution indicator of approved make will be furnished and installed, to consist of a transmitter in the engine room, an indicator on the main engine control board, and an indicator in the wheel house.

The engine room indicator and transmitter to be equipped with a counter.

## **FATHOMETER**

A fathometer of the Submarine Signal Company's make will be furnished and installed.

## **GYRO EQUIPMENT**

There will be furnished and installed a gyro-compass complete with the following items :

One master gyro-compass

One compass control panel with accessories

One motor generator set

Three steering repeaters:

1 in wheel house

1 at radio direction finder

1 at wheel house top

One course recorder

## **RUDDER ANGLE INDICATOR**

A Sperry rudder angle indicator system is to be furnished and installed with indicator in wheel house and after steering station and transmitter in steering engine room.

**RADIO DIRECTION FINDER**

A radio direction finder, R.C.A. Model AR-8703-B or equal, to be furnished and installed.

**RADIO**

R.C.A., or approved equal, radio transmitting and receiving equipment complete as listed will be furnished and installed.

Model AR-8600	Auto Alarm
Model ET-8010A	200 watt Main and Emergency Transmitter, crystal controlled with eight frequencies
Model ET-8019A	200 watt High Frequency Transmitter
Model AR-8503	Low and Intermediate Frequency Main Receiver
Model AR-8505	High Frequency Receiver
	Type B Crystal Emergency Receiver
	Main Antenna

**MULTI-COUPLER SYSTEM**

A multi-coupler reception system is to be furnished and installed with an outlet in each officer's and crew's stateroom for plugging in radio sets.

**SALINITY INDICATOR**

A Control Instrument Co., or equal, salinity indicator will be furnished and installed and connected to the necessary feed or condensate circuits as required.



## LUBRICATING OIL ALARM SYSTEM

Approved type of oil level gauge and high oil level alarm to be fitted to sump tank and approved low level alarm to be fitted to gravity tank.

## SIGNALLING ARRANGEMENTS

Installation of metal bases to be constructed in the wings of the bridge or housetop, P & S, for 24" and 12" signalling searchlights, with the necessary wiring connections, so that 24" signalling searchlights may be installed when required. Searchlights, rheostats, etc., to be supplied by owner. For reference, see General Electric Co. Dwg. No. W-5935410-24"—Searchlight, and for searchlight base, M. C. Dwg. No. S66-0-1.

All around blinker lights, port and starboard, to be installed as directed, equipped with keying facilities inside of pilot house, and on bridge, port and starboard, each position key to operate both lights.

One flag bag, destroyer type, to be supplied and installed on pilot house top.

## DEGAUSSING

Approximately 35 KW, 120 volts D.C. is included in constant voltage exciter connected to each 400 KW A.C. auxiliary generator to provide power for degaussing. All other main equipment, such as switchboard, rheostats, cable, etc., to be provided by the Navy. Hangers, straps, conduit for main cable, if required, and switches on generator distribution switchboard to be provided and installed by the Contractor. Main belt cable

and leads to switchboard furnished by Owner are also to be installed by Contractor.

The complete installation to be made as directed and under supervision of Owner. Contractor is not responsible for operation of system.

### **VOICE TUBES**

Voice tubes shall be installed for communication between Cargo Pump Control Station on Upper Deck and Main Propulsion Control Station and also shall be fitted between locations as required by the U. S. Bureau of Marine Inspection and Navigation.

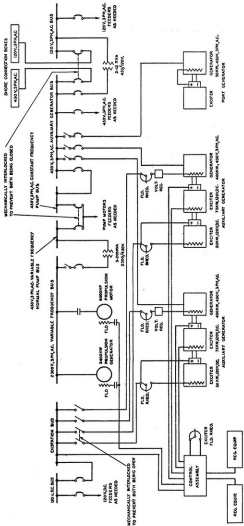
### **ELECTRICAL SPARES**

A complete set of electrical spare parts for generators, motors and control will be furnished as per latest rules of the American Bureau of Shipping, and the American Institute of Electrical Engineers:

The following items are also to be furnished:

- 1 electric soldering iron,  $\frac{5}{8}$ " tip
- 1 pr. side cutting pliers
- 1 pr. curved pliers
- 1 screw driver
- 1 portable ammeter
- 1 portable voltmeter
- 1 megger

A reasonable quantity of rubber and friction tape, solder, cable straps, etc.



DESIGN NO. TP-22-A1  
TANKER

U.S. MARITIME COMMISSION  
WASHINGTON, DC

TABLE NO. 101

ELECTRICAL DISTRIBUTION  
SYSTEM

SCALE	3/4" = 1'-0"
DRAWN BY	CHAS. BELL, JR.
CHECKED BY	CHAS. BELL, JR.
DESIGNED BY	CHAS. BELL, JR.
APPROVED BY	COMMISSIONER
M.C. NO. TP-22-A1-560-01	