

## "CCGS Earl Grey" Specification for Installation of New Bow Thruster

For  
Dept. of Fisheries and Oceans/Canadian Coast Guard  
Dartmouth, Nova Scotia



*Prepared By:*  
**Lengkeek Vessel Engineering Inc.**  
*Report Number: J14010-R06, rev. 0*  
*Date: 21 Jan 2015*

<i>Prepared By: D. O'Rourke</i>
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<i>Checked By: D. Careless</i>
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<i>LVE Form 67, rev0</i>
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## 1. SPECIFICATION DETAILS

### Scope of Work

- .1 This specification covers work to be completed onboard the CCGS “Earl Grey” to remove the existing Omnithruster unit, drive motor and associated components presently located within the Bow Thruster Compartment and for the installation of a new Wartsila tunnel thruster unit and equipment within the same compartment.

### General Instructions

- .1 This specification shall be read in conjunction with the latest revision of the removal drawings J14010-S01 and J14010-M02 and installation drawing J14010-S02 indicating the extent of the work and location of components.
- .2 Where ever the words “approved by”, “equivalent” or similar phrases are used in this specification, they shall be understood to mean the material, process, or item referred to.
- .3 Approval from the DFO/CCG is required if the Contractor wishes to deviate from any of the specified methods or recommended materials.

## 2. REFERENCES

- .1 CSA W47.1-03, Certification of Companies for Fusion Welding of Steel
- .2 CSA W59-03, Welded Steel Construction (Metal Arc Welding)
- .3 CSA 17, Canada Shipping Act - Tackle Regulations
- .4 CSA 28, Canada Shipping Act - Hull Construction Regulations
- .5 CSA 33, Canada Shipping Act – Marine Machinery Regulations
- .6 CSA 29, Canada Shipping Act - Hull Inspection Regulations
- .7 CSA 57, Canada Shipping Act – Safe Working Practices Regulations
- .8 MOSHR, Canada Labour Code – Marine Occupational Safety and Health Regulations
- .9 TP 127E, Transport Canada Marine Safety – Ship Electrical Standards
- .10 IEEE STD 45 – 1998 Recommended Practice for Shipboard Electrical Installations
- .11 Note: In case of conflict between any of the standards, then the most stringent requirements will prevail.

### 3. GENERAL NOTES

#### On-site Project Officer:

- .1 All work to be completed to the satisfaction of the On-site Project Officer who, unless otherwise advised, will be the Chief Engineer of the ship, or his designated representative.
- .2 Upon completion of each item of the specification, the Chief Engineer shall be notified so that he may inspect the work prior to the complete closing up of any work.
- .3 Failure to give notification does not absolve the Contractor of the responsibility of providing the Chief Engineer with the opportunity to inspect any item.
- .4 Inspection of any item by the Chief Engineer does not substitute for any required inspection by Transport Canada Marine Safety (TCMS), Public Works and Government Services Canada (PWGSC) or Health Canada (HC).

#### Safety

- .1 There is a safety annex attached to this specification entitled “FLEET SAFETY MANUAL REQUIREMENTS”. In addition to the detailed requirements within the specification, this annex contains excerpts from the document DFO 5737, “FLEET SAFETY MANUAL” that are applicable to contracted refit and dry-docking situations.
- .2 All contracted work shall be conducted in compliance with the requirements of the Canada Labour Code, Part 2.
- .3 Potential Contractors shall include with their bids the name of their Safety Manager or Supervisor who will ensure that these requirements for workplace safety are met
- .4 NOTE: Under the Canada Labour Code, Part 2, the Coast Guard has an obligation to exercise due diligence to ensure the safety of Contractors’ workers as well as the ship’s crew.

#### Sub-Contractors

- .1 All conditions, stipulations etc. listed in the General Notes apply to any Sub-Contractors employed by the Main Contractor to carry out work on any Specification item.

### **Chemist's Certificates**

- .1 The Contractor shall supply the Chief Engineer with Marine Chemist's Certificates in accordance with TCMS TP 3177E before any cleaning, painting or hot work is commenced in confined spaces or machinery compartments.
- .2 Certificates shall clearly state the type of work permitted and shall be renewed as required by the regulations.
- .3 The Contractor and his sub-Contractors are advised that any work carried out in confined spaces as defined by the Canada Labour Code (CLC) and relevant provincial legislation must fully comply with all provisions therein.

### **Duration of Scheduled Work**

- .1 The Contractor shall provide sufficient personnel, material, and equipment resources to complete the specified work, within the period of the contract.
- .2 Extra effort required due to the Contractor's failure to maintain his production schedule will not be paid for by CCG.

### **Protection**

- .1 The Contractor shall provide adequate temporary protection for any equipment or areas affected by his work.
- .2 The Contractor shall take proper precautions to maintain in a proper state of preservation any machinery, equipment, fittings, stores or items of outfit which might become damaged by exposure, movement of materials, paint, sand, grit or shot blasting, airborne particles from sand, grit or shot blasting, welding, grinding, burning, gouging and painting.
- .3 Any damage shall be the responsibility of the Contractor.

### **Welding (General)**

- .1 The Contractor shall be currently certified by the Canadian Welding Bureau in accordance with Standard W47.1-03 "Certification of Companies for Fusion Welding of Steel Structures," Division 1, 2.1 or 2.2.
- .2 All personnel performing welding shall be approved by the Canadian Welding Bureau.
- .3 Welding materials to CSA W59-03.

### **Auxiliary Services**

- .1 Contractor shall include in the quotation the costs of any and all transportation, rigging, staging, slinging, crantage, removals, and installations of parts and equipment such as may be required to carry out the work.

### **Service Conditions**

- .1 All materials supplied and work carried out by the Contractor shall be adequate to meet service conditions of outside air temperature of minus (-) 40<sup>0</sup> C to plus (+) 35<sup>0</sup> C; for exterior installations.
- .2 All materials supplied and work carried out by the Contractor shall be adequate to meet service conditions of wind velocity of 50 knots; for exterior installations.
- .3 All materials supplied and work carried out by the Contractor shall be adequate to meet service conditions of water temperature of minus (-) 2<sup>0</sup> C to plus (+) 30<sup>0</sup> C; for exterior installations.
- .4 All materials supplied and work carried out by the Contractor shall be adequate to meet service conditions of shock loading of 2.5g horizontal, 1.5g vertical; for all installations.

### **Hot Work & Fire Watches**

- .1 Any item of work involving the use of heat in its execution requires that the Contractor advises the Chief Engineer prior to starting such heating and upon its completion.
- .2 The Contractor shall provide sufficient suitable fire extinguishers and a fire watch during any heating and until the work has cooled.
- .3 Ship's extinguishers are not to be used except in an emergency.

### **Relocations**

- .1 Any piping, manholes, parts and/or equipment requiring removal to carry out specified work and/or to gain access shall be refitted upon completion with new jointing, anti-seize compound, clamps and brackets as applicable (Contractor supply).

### **Temporary Lighting & Ventilation**

- .1 Temporary lighting and/or temporary ventilation required by the Contractor to carry out any item of this specification shall be supplied, installed and maintained in safe working condition by the Contractor and removed on completion of the related work.

## Vessel Cleanup

- .1 The principal work areas, as defined by this specification, shall be cleaned to "as new condition" on completion of the contracted work.
- .2 The Contractor shall ensure that all spaces, compartments and areas of the ship outside of the principal areas of work are "as clean as found" when work is completed.

## Materials & Tools

- .1 All materials, unless otherwise specified, to be supplied by the Contractor.
- .2 Contractor to supply all necessary tools to perform specified work.
- .3 Ship's tools and equipment will not be available for Contractor's use except for specialty tools that will be issued by and returned to the Chief Engineer in good condition.

## Fire Safety Systems

- .1 Whenever any work is being carried out involving a ship's firefighting or fire detecting system, it shall be done in such a way as to leave the vessel and any persons aboard with adequate protection against fire at all times. This may be so accomplished by the removal or disarming of only a Portion of the system at a time, by replacement with spares while work is in progress or by other reasonable means acceptable to the Chief Engineer.

## Smoking

- .1 The Public Service Smoking Policy forbids smoking in Government ships in all areas inside the ship where Contractor personnel will be working.
- .2 Contractor shall inform workers of the smoking policy and ensure that it is complied with in all cases.

## Access

- .1 The following areas are out of bounds to Contractor's personnel except to perform work as required by the specification: all cabins, offices, Wheelhouse, Control Room, public washrooms, cafeteria, dining room and lounge areas.
- .2 Contractors to ensure that no workers bring meals onboard the ship.

## DFO/CCG Facilities

- .1 The refit period will be at the Fisheries and Oceans / Coast Guard facilities.

- .2 If the Contractor does not have access to washroom facilities off the ship, a designated washroom on board will be open during regular working hours for Contractor's use. If the cleanliness of the washroom is adversely affected by this usage, Coast Guard reserves the right to stop Contractor use of the facility.
- .3 Contractors are advised that normal working hours for ship's personnel during alongside refit periods are from 0800 hours to 2000 hours, seven (7) days a week, excluding statutory holidays. Permission to work outside of these hours on the ship must be obtained by the Contractor from the Chief Engineer in advance.
- .4 Contractor machinery located on the ship or the dock can only be run from 0700 hours to 1900 hours, Monday to Saturday. Contractor to ensure that any equipment used meets the current noise abatement regulations.

### **Dockside Cleanup**

- .1 The Contractor is responsible for the complete cleanup of adjacent dock areas used by his personnel and/or equipment during and after completion of the contracted work. This shall include, but not be limited to the following:
  - 1) Removal of all dirt, grit and debris;
  - 2) Removal of all staging, containers and equipment
  - 3) Immediate cleanup and legal disposal of any leaked oils, solvents or other hazardous materials.

## 4. STRUCTURE

### Relevant Documents

#### .1 Drawings

Drawing No:

J14010-M02 Rev.0 Existing Bow Thruster Removal  
J14010-M03 Rev.0 Bow Thruster Header Tank Diagram  
J14010-S01 Rev.0 Bow Thruster Shipping Route Structural Strip-Out  
J14010-S02 Rev.0 Bow Thruster Structural Installation

#### .2 References

CSA 28 Canada Shipping Act - Hull Construction Regulations  
CSA 33 Canada Shipping Act - Marine Machinery Regulations  
CSA 29 Canada Shipping Act - Hull Inspection Regulations  
CSA 57 Canada Shipping Act - Safe Working Practices Regulations  
MOSHR Canada Labour Code - Marine Occupational Safety and Health Regulations  
IACS No. 47 Shipbuilding and Repair Quality Standard (1996)  
Part B – Repair Quality Standard for Existing Ships

### Material Requirements

#### Equipment/Material Required

All new steel plates and shapes shall be minimum Lloyds Grade 'A' or equivalent unless noted. The steel necessary to plate over any openings in the shell shall have the same steel grade as the surrounding plating.

The Contractor shall supply all material required, including any material required to complete the work which is not explicitly identified in this specification. See also applicable structural guidance drawings for material requirements.

All new steel work shall be sandblasted and shop primed with a primer compatible with the vessel's existing paint system. On completion of all welding, all damaged paintwork shall be wire brushed to remove loose material.

All work shall be consistent with Transport Canada Marine Safety standards and all applicable standards as listed in the References section of this Technical Statement of Requirement. Work shall be consistent with good shipbuilding practice where standards are not applicable. The work shall be conducted to the satisfaction of the designated approval authority.

## **Structural Strip-out**

### Side Shell Plating and Related Structure

A panel of side shell plating on the stbd side within the Bow Thruster Compartment shall be removed to form a shipping opening to aid in the removal of the existing Omnithruster and to facilitate installation of the new bow thruster unit. The area of plating shall be immediately aft of frame 43, and shall extend for approx. 2200mm aft, and will be approx. 1450mm in depth, as outlined on the guidance drawing.

The existing side shell structure attached to the panel of plating shall need to be cut and removed along with the plating, including a section of the web frame at frame 42, and the ordinary flat bar frames within the area of side shell plating to be temporarily removed.

Likewise, the existing longitudinal stringers attached to the plating will need to be cut free also, to provide a clear access area for removal and installation.

At the port side, a section of shell plating and side structure at the location of the Omnithruster discharge outlet between Fr.42-43 shall be cut out in order to allow the removal of the existing outlet. However, additional plating and structure shall need to be removed in order to suit the installation of the new thruster tunnel plating. The exact size and location of the new thruster tunnel shall be determined before removing the additional plating and structure in order not to remove any more of the existing structure than is necessary. See Dwg J14010-S01-R0 for guidance with respect to structural strip-out.

The seats for the existing thruster motor, gearbox, cooling pump, motor control cabinet, and hydraulic power unit are to be removed in their entirety.

## **Mechanical Strip-out**

All sections comprising the main Omnithruster unit are to be removed. See Dwg. J14010-M02-R0 for further guidance. These include, but are not limited to the following:

- Sea water inlet from sea chest to suction bowl
- Suction bowl
- Shaft bearings, stuffing box, drive shaft and impeller
- Discharge bowl

- Steering vane actuators
- Steering valve assembly
- All sections of the discharge nozzles (P&S)

Additional components/equipment for the Omnitruster unit to be removed includes, but not limited to the following:

- Thruster gearbox
- Thruster drive motor
- Sea water pump for gearbox oil cooler
- Hydraulic power unit
- Motor control cabinet

### **Piping Strip-Out**

Piping to be removed includes, but shall not be limited to:

- Sea water cooling piping between the sea water inlet, pump, and gearbox oil cooler
- Piping associated with the thruster gearbox
- Piping and hoses connecting the hydraulic power unit to the thruster vane actuators

### **Electrical Strip-Out**

As some power cables for the existing motor and thruster components may prove suitable for reuse with the new thruster and components, the extent of electrical strip-out is to be determined onsite. If existing electrical cables are not suitable for the new thruster installation, new cables of suitable capacity and type are to be installed for all components.

### **Miscellaneous Strip-Out**

Existing hydraulic hoses for the Omnitruster directional vane control are to be removed. Electrical wiring for the existing S.W. Cooling Pump motor is to be removed. Any ventilation within the Bow Thruster Compartment is to be temporarily removed if required to aid the removal of the existing thruster and installation of the new tunnel thruster. Lighting, brackets or other miscellaneous items deemed necessary for temporary removal to aid the new tunnel thruster installation are to be removed. Existing electrical cables, piping or other items located within the Bow Thruster Compartment that are not related to the existing or new thruster units are to be verified prior to any temporary removal or cut back.

### **New Steel Work**

#### Existing Omnitruster Discharges through Side Shell

The openings in the side shell for the thruster discharges are to be sealed with insert plates. Related structure in this area where it has been interrupted by the discharge piping

is to be modified in way of the new insert plates as required. See Dwg. J14010-S01-Rev 0 for guidance.

### Existing Omnithruster Sea Water Inlet

The Ø890mm opening in the top plate of the sea chest is to be sealed with a new circular insert plate. The existing cut out in the centerline bulkhead at the underside of the tank top is to be sealed with an insert plate, and the cut outs in the two transverse floors at this location shall be plated in with similar insert plates.

These insert plates shall be of the same thickness as the floors and tank top in which they are to be fitted. See Dwg. J14010-S02 Rev. 0 for guidance.

### Components Seats

New structural seats/supports will be fabricated and installed to support the new drive motor, hydraulic pump, starter cabinet, motor control cabinet and oil header tank. Refer to Dwg. J14010-S02-R0 for further details on machinery seats.

A new insert plate shall be fitted in way of an existing opening in the centreline keel plate which was required as part of the original Omnithruster installation, and shall follow the line of the existing opening.

### New Thruster Tunnel

Two new sections of thruster tunnel (approx. Ø1.35) are to be installed. Each section will be welded to one end of the main thruster unit and shall extend to the new opening in the ships side shell (P&S). Ice grids will be fitted Existing structure at side shell to be cut back to suit new tunnel installation and welded to new tunnel after fit up.

The existing keel plate at centreline shall be cut back to suit the new thruster tunnel. The plating shall be trimmed clear of any thruster machinery. The existing flange on the top of the keel plate shall be cut back from the thruster tunnel, and shall be sniped back with a 25mm nose, as outlined on the guidance drawing.

The existing transverse sideshell stiffenng at the frames intersecting the new tunnel thruster installation (frames 41  $\frac{3}{4}$ , 42, and 42  $\frac{1}{4}$ ) shall be trimmed to suit the new tunnel plating and welded to the tunnel plating, as outlined on the guidance drawing, J14010-S02.

The existing plate floors at these locations shall also be trimmed and welded to the underside of the new thruster tunnel plating. The floors shall be scalloped out in way of the tunnel thruster rings, as outlined on the guidance drawing.

## 5. THRUSTER INSTALLATION

### Thruster Unit

A new electrically driven Wartsila CT125 600kW CPP transverse tunnel thruster is to be installed in the fwd end of the Bow Thruster Compartment at Fr.42. The thruster unit is to be orientated with the motor connection flange facing aft. To be welded on both sides of the thruster are (2) new sections of steel tunnel with sides shell fairing. Existing CL girder, side shell stiffeners, brackets and floors i.w.o. the new thruster unit are to be modified to suit the installation See Dwg. J14010-S02-Rev 0. for guidance.

### Drive Motor

A new 600kW (600V) drive motor is to be installed aft of the thruster unit and connected via Wartsila supplied coupling. This motor is to be secured to a new structural seat using appropriate stainless steel hardware. See Dwg. J14010-S02-Rev 0. for guidance. If existing electrical cables for the Omnithruister motor are deemed suitable, they are to be reused with the new motor.

### Hydraulic Pump

A new hydraulic power pump for pitch control will be installed on the port side of the drive motor on top of the existing sea chest. See Dwg. J14010-S02-Rev 0 for guidance. If exiting electrical cables for the Omnithruister hydraulic power pack are deemed suitable, they are to be reused. Hydraulic piping and hoses as deemed necessary by Wartsila are to be installed between the pump and the thruster unit.

### Header Tank

A new 35L header tank for maintaining oil pressure in the propeller gearbox is to be installed. The tank is to be located at the Focsle Deck level in the general area of the supply hatch Fr.43-44. A new seat/support will be fabricated to support the tank and suit its location. A ¾" pipe (w/ball valves) connecting the header tank at the Focsle deck level to the thruster unit below is to be installed and if suitable, run down to the Bow Thruster Compartment beside the ladder located below the stores supply hatch. The pipe is to penetrate the Bow Thruster Room deck head and connect with the thruster unit. See Dwg. J14010-M03-Rev 0 for guidance.

### Motor Control Cabinet

A new motor cabinet will be installed in the same general location as the existing motor control cabinet within the Bow thruster compartment on the stbd side. Suitable angle bars are to be fitted around the perimeter of the new cabinet at bottom. These angle bars are to work in conjunction with the stand portion of the cabinet. If existing electrical cables

connecting power sources to the existing control cabinet are deemed suitable, they are to be reused. See Dwg. J14010-S02-Rev 0 for guidance.

### **Hydraulic Pump Starter Cabinet**

A pump starter cabinet is to be installed near the deck head in the vicinity of the hydraulic pump. The cabinet is to be secured to vertical angle bars which have been fitted to the overhead structure. See Dwg. J14010-S02-Rev 0 for guidance.

**APPENDIX A:  
OMNITHRUSTER AND STRUCTURAL REMOVAL DRAWINGS**

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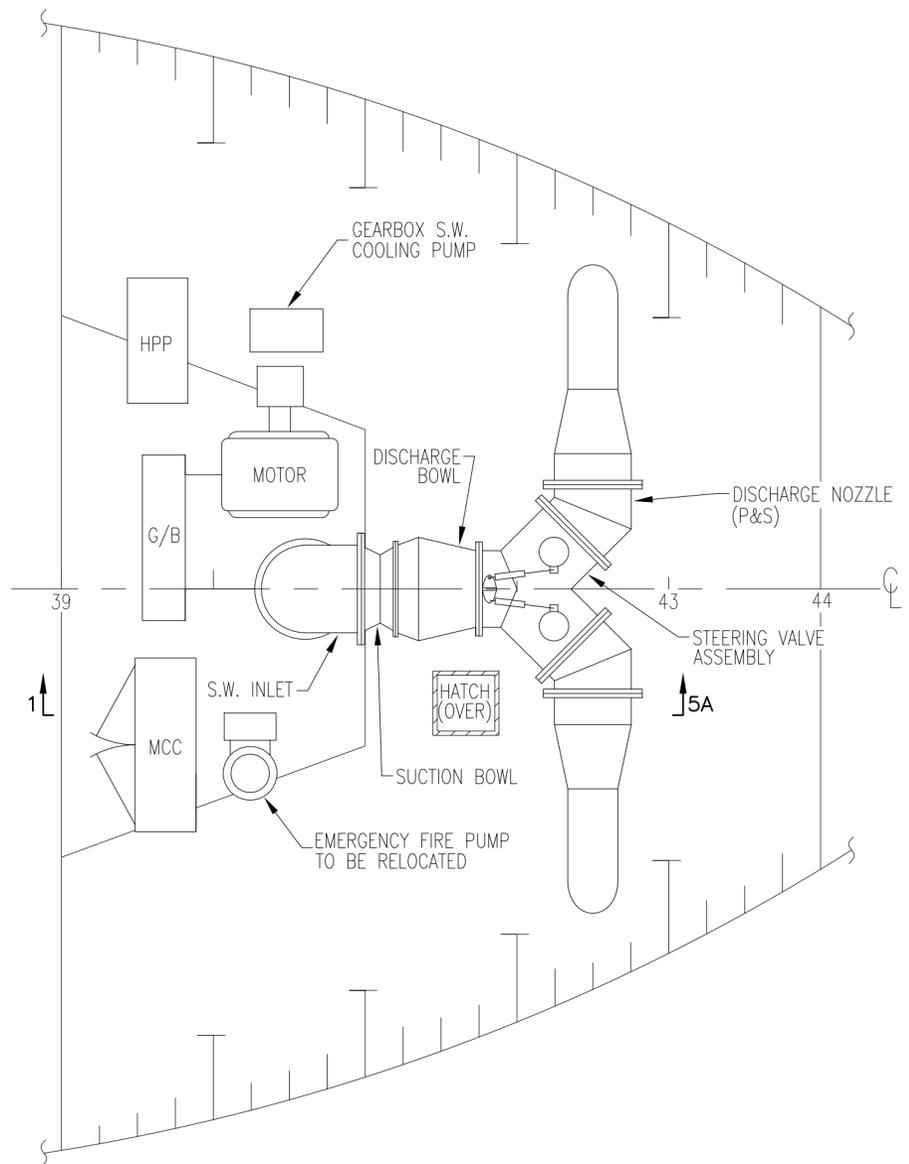
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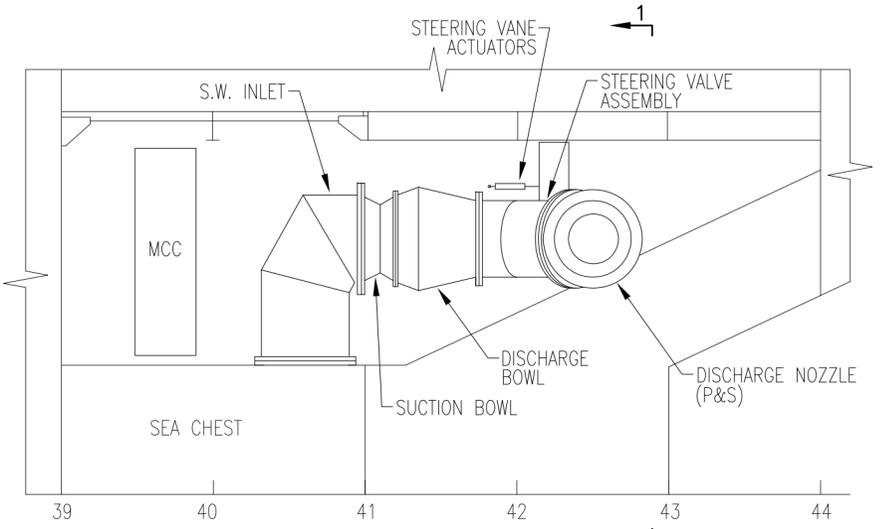
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No.	Dwg No.	DESCRIPTION

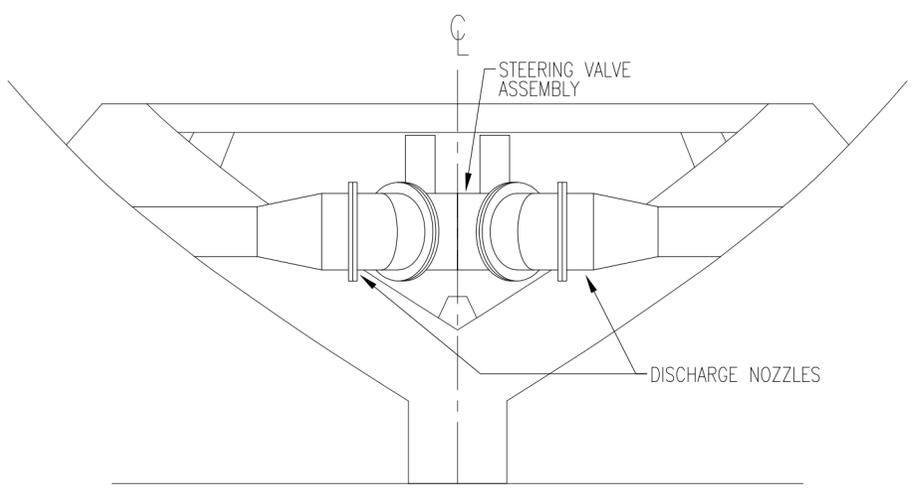


THRUSTER AND RELATED MACHINERY ITEMS SHOWN ARE TO BE REMOVED UNLESS NOTED OTHERWISE

PLAN 1-5B  
BOW THRUSTER ROOM



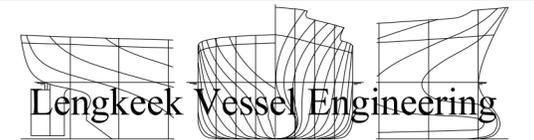
ELEVATION 1-5A  
STBD SIDE - LOOKING TO PORT



SECTION 1-3A  
LOOKING AFT

Rev	Date	By	Remarks

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Client:	CCG-DFO		
Title:	CCGS "EARL GREY" EXISTING BOW THRUSTER REMOVAL		

Drawn By:	D.O'R.	Date:	21/01/15
Checked By:	D.C.	Scale:	1:50
	Approval/Rev	Rev:	0
Client	DWG NO: <b>J14010-M02</b>		
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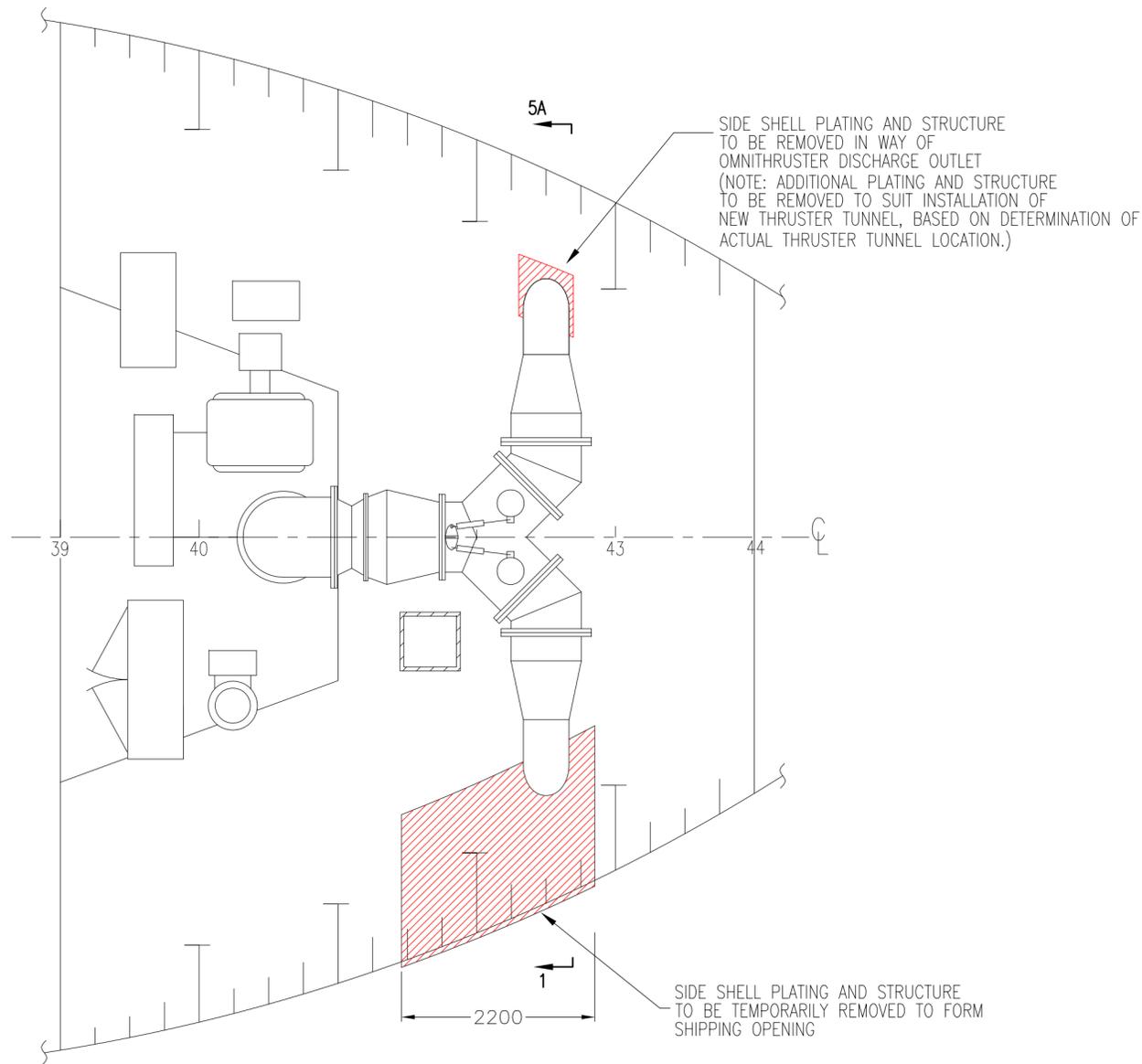
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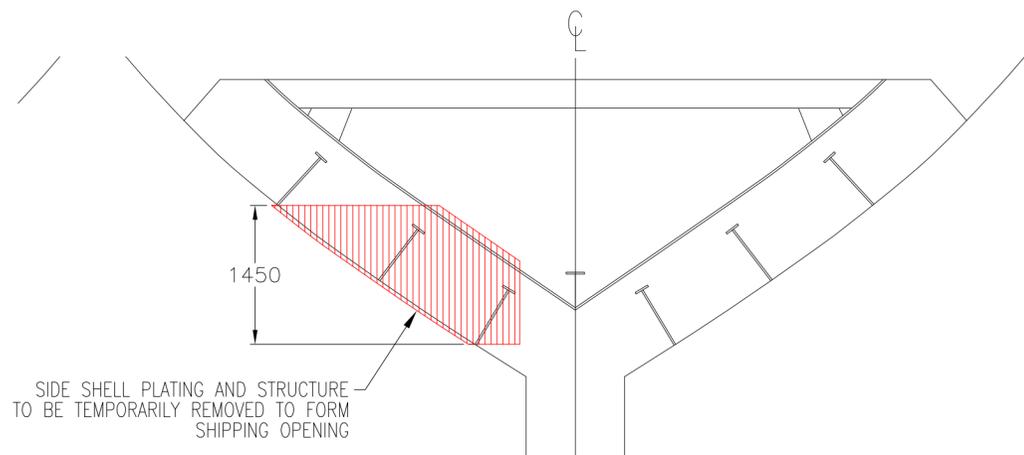
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REFERENCE PLANS:

No.	Dwg No.	DESCRIPTION



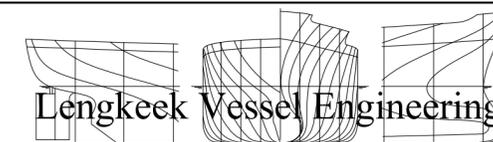
PLAN 1-5B  
AT BOW THRUSTER COMPARTMENT



SECTION 1-5A  
APPROX. FRAME 42.5 - LOOKING AFT

Rev	Date	By	Remarks

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Client: **CCG-DFO**

Title: **CCGS "EARL GREY"  
BOW THRUSTER SHIPPING ROUTE  
STRUCTURAL STRIP-OUT**

Drawn By: D.O'R. Date: 21/01/15  
Checked By: D.C. Scale: 1:50 Rev: 0

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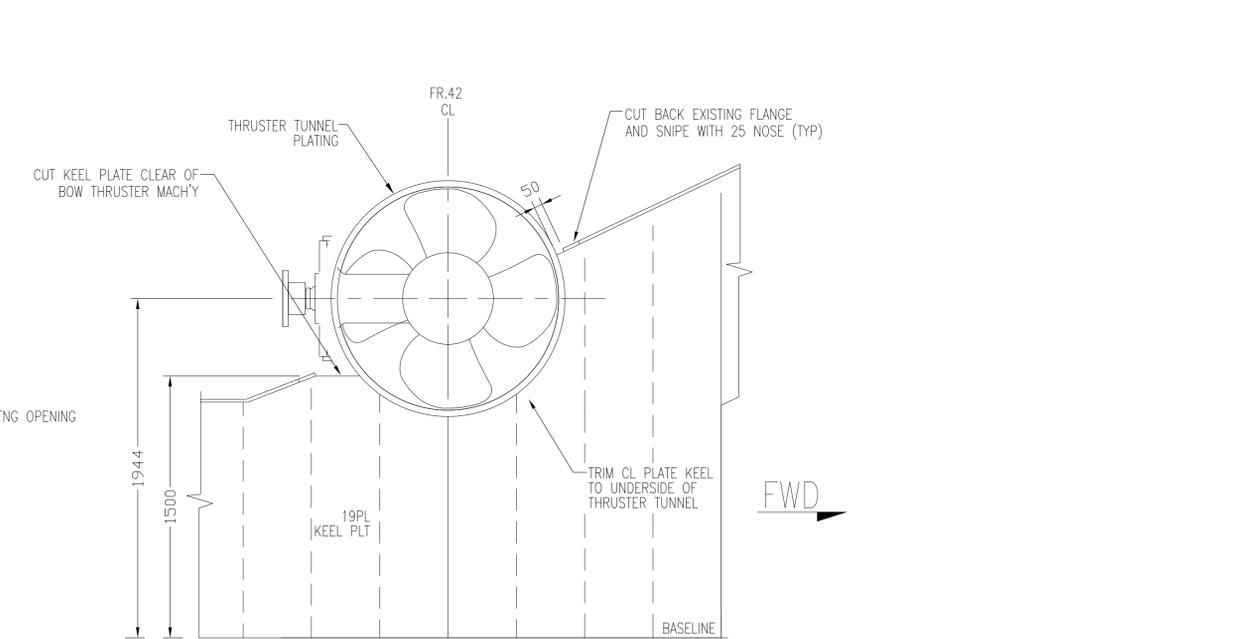
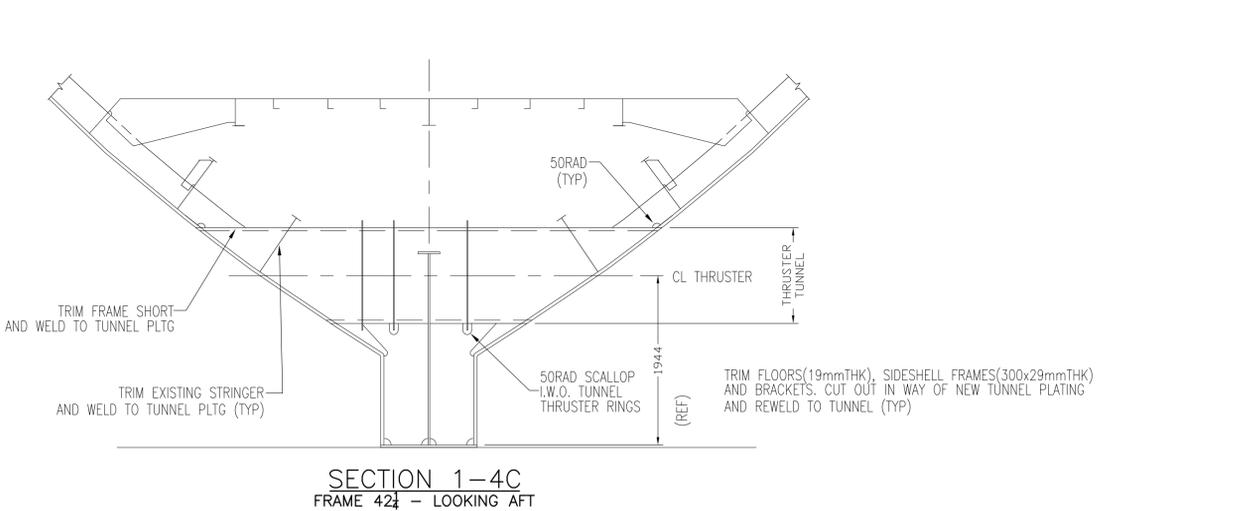
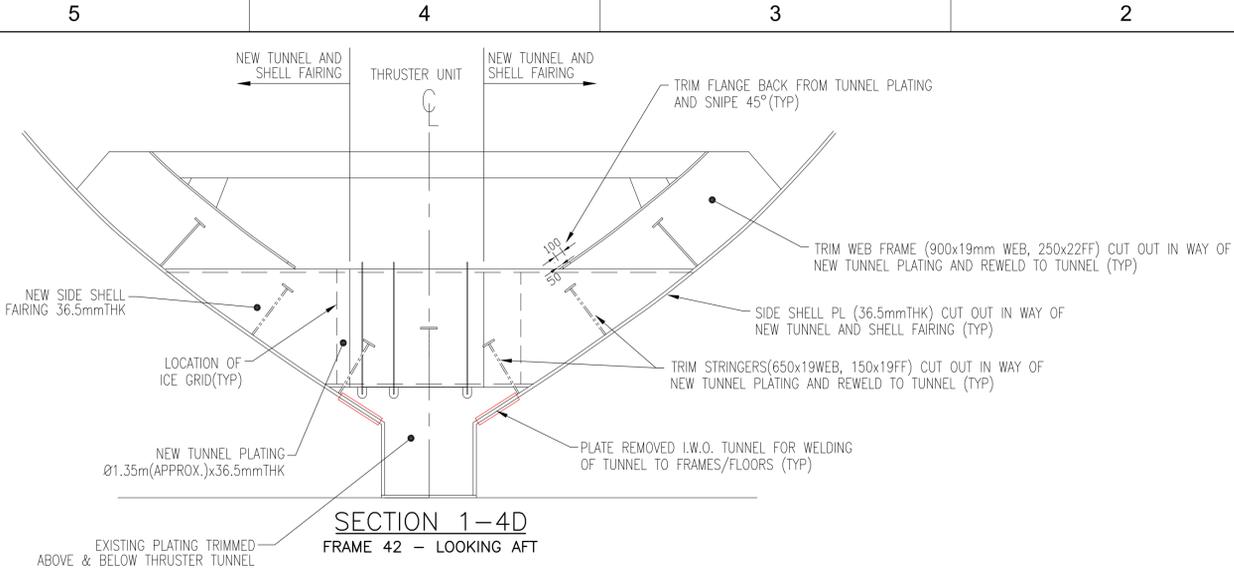
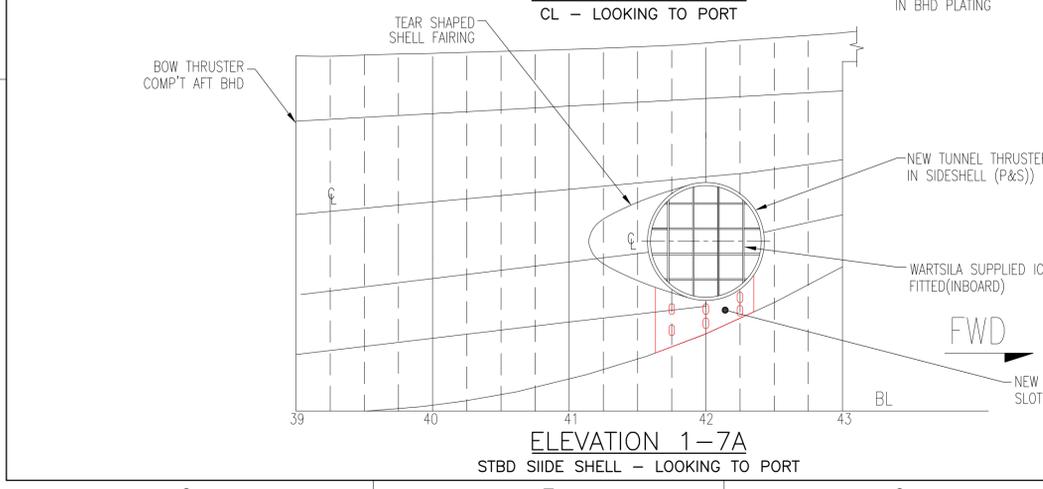
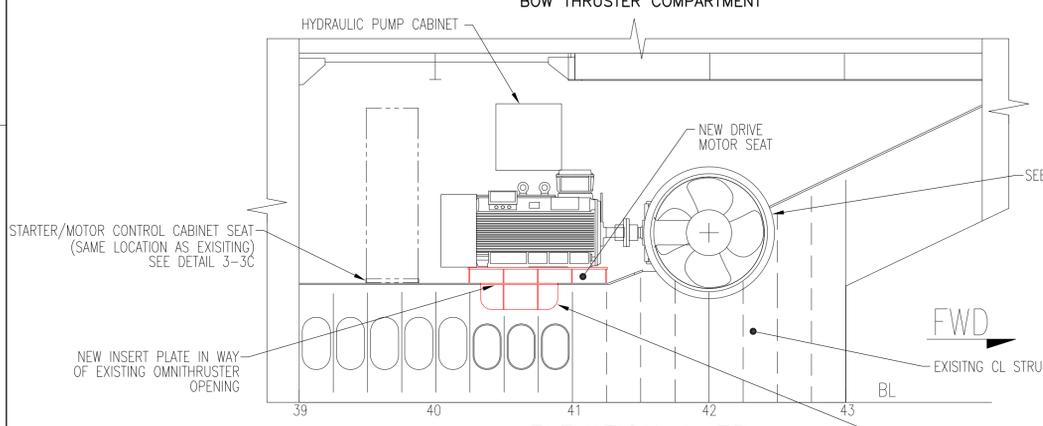
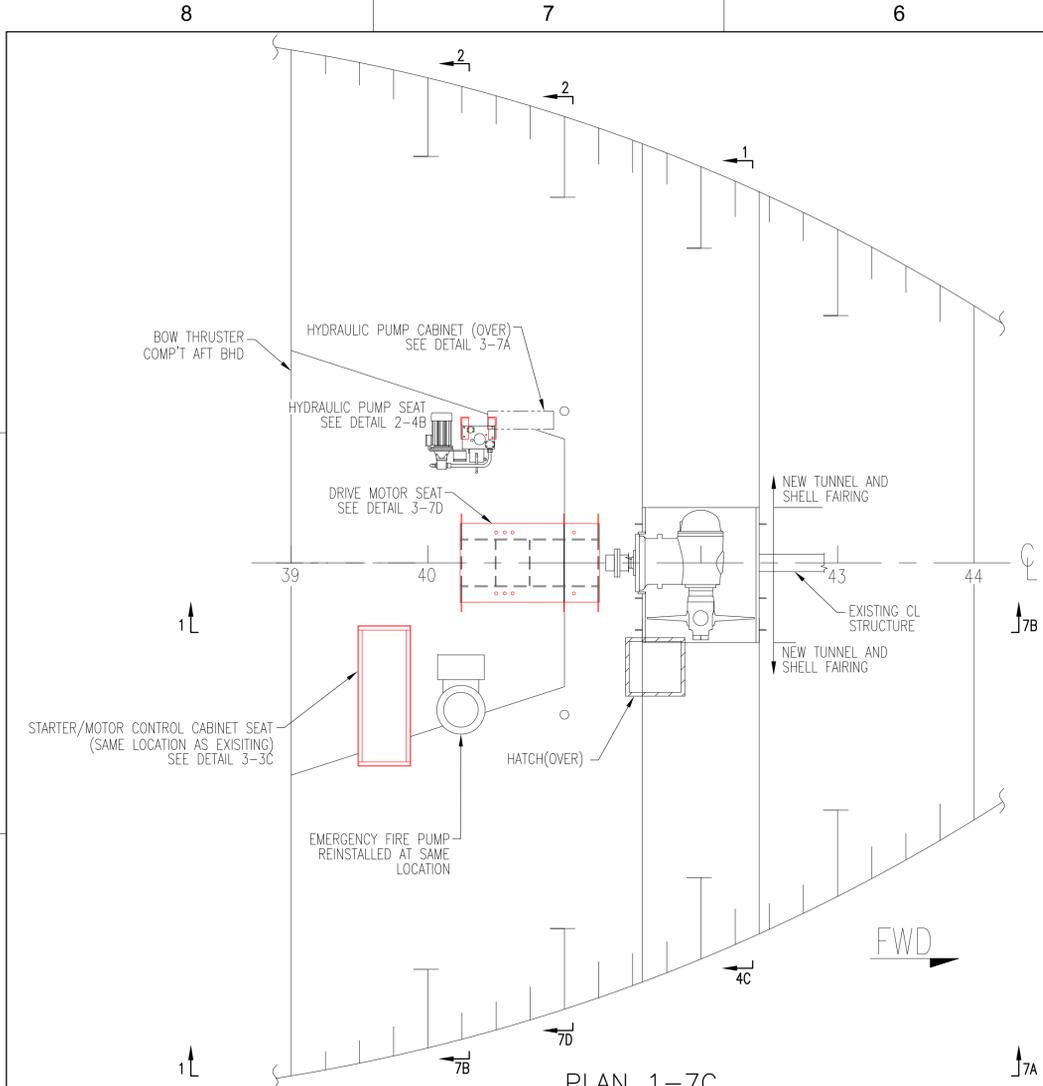
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**APPENDIX B:  
NEW BOW THRUSTER STRUCTURAL INSTALLATION**



**REFERENCE PLANS:**

No.	Dwg No.	DESCRIPTION

**NOTE A**  
EXACT SPACING OF ANGLE BARS AND HOLE LOCATIONS FOR SECURING BOLTS IS TO BE DETERMINED ONSITE. DIMENSIONS GIVEN ARE FOR GUIDANCE PURPOSES ONLY.

**NOTE B**  
SIZE AND SPACING OF ANGLE BARS TO BE ADJUSTED TO SUIT STAND SECTION OF THE CABINET. CABINET TO BE SECURED TO SEAT WHEN MOUNTING DETAILS ARE KNOWN. LAYOUT AND DIMENSIONS ARE FOR GUIDANCE PURPOSES ONLY.

**NOTE C**  
BRACKETS AT FRAME 41 TO BE MODIFIED TO SUIT WEB FRAME FLANGE

**NOTE D**  
HYDRAULIC PUMP SEAT BASED ON DIMENSIONS FROM TYPICAL INSTALLATION MANUAL AND MAY VARY FROM ACTUAL PUMP SUPPLIED.

Rev	Date	By	Remarks

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Client: **CCG-DFO**

Title: **CCGS "EARL GREY" BOW THRUSTER STRUCTURAL INSTALLATION**

Drawn By: D.O'R./D.C. Date: 21/01/15  
 Checked By: D.C. Scale: 1:40 UNO Rev: 0

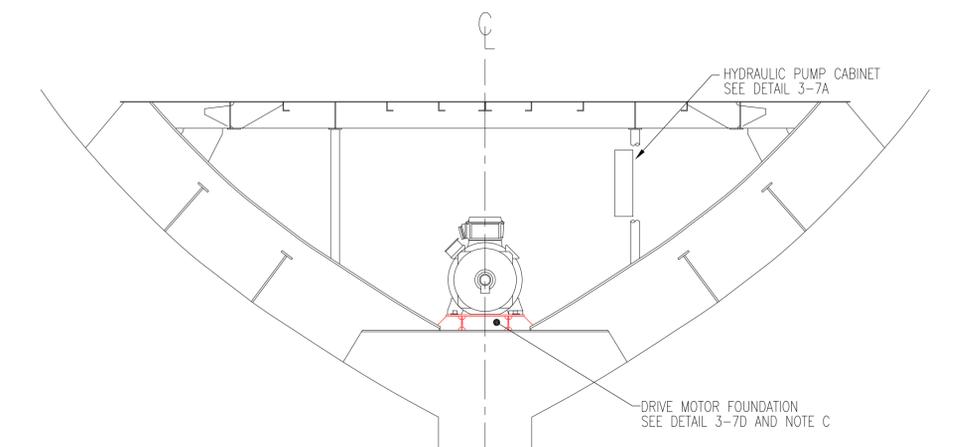
Approval/Rev DWG NO:  
**J14010-S02**

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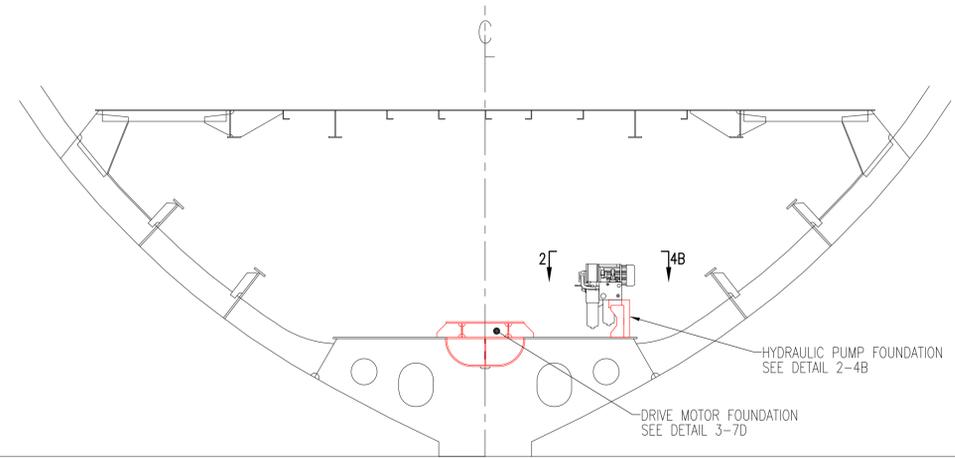
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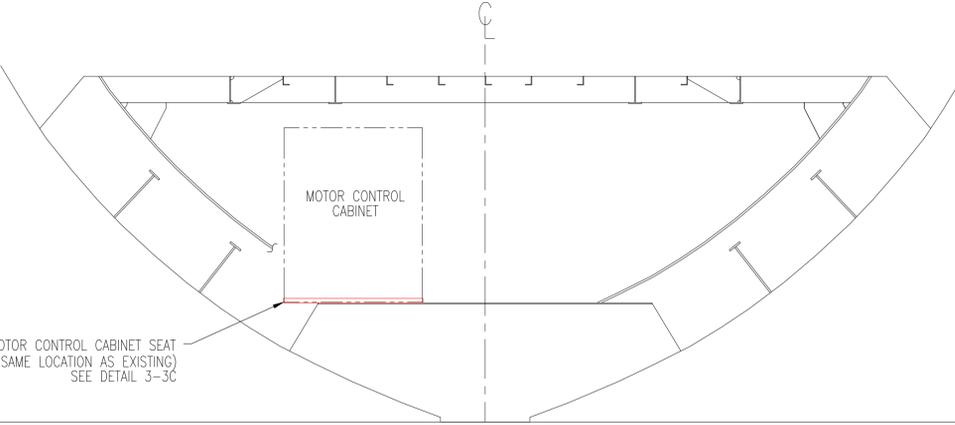
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No.	Dwg No.	DESCRIPTION



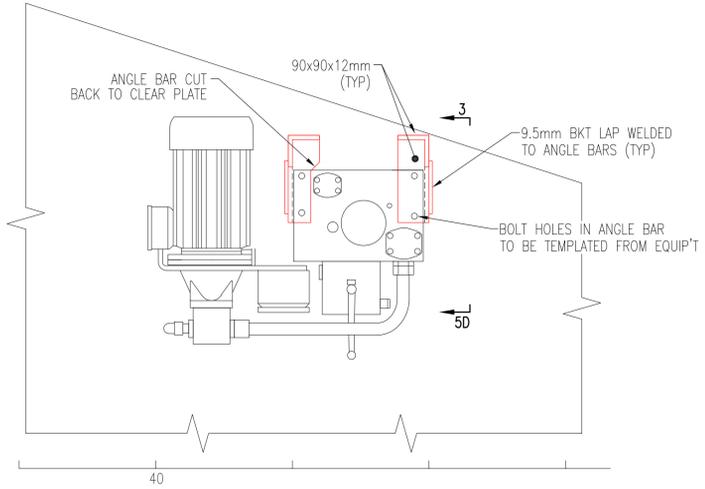
**SECTION 2-7D**  
FRAME 41 - LOOKING AFT



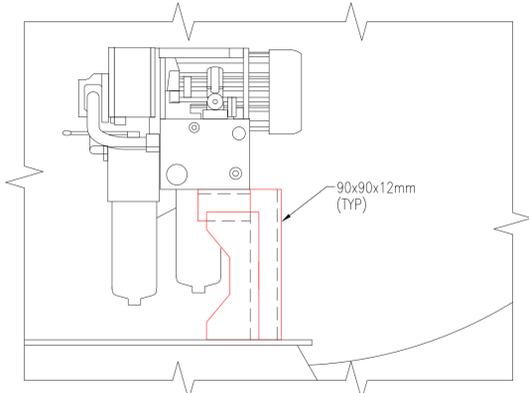
**SECTION 2-7B**  
FRAME 40.5 - LOOKING AFT



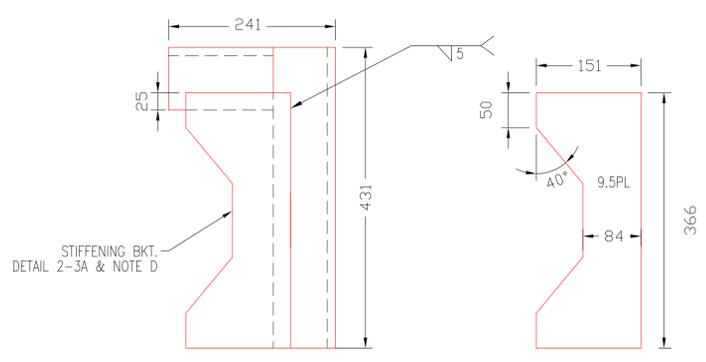
**SECTION 2-7A**  
FRAME 40 - LOOKING AFT



**DETAIL 2-4B**  
HYDRAULIC PUMP SEAT - PLAN VIEW AT TANK TOP  
SCALE 1:10



**SECTION 2-2B**  
HYDRAULIC PUMP SEAT - SECTION AT FR. 40.5  
LOOKING AFT  
SCALE 1:10

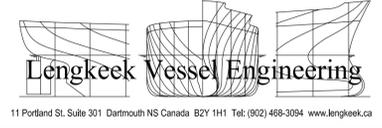


**DETAIL 2-4A**  
HYDRAULIC PUMP SEAT  
SCALE 1:5

**DETAIL 2-3A**  
STIFFENING BRACKETS  
SCALE 1:5

Rev	Date	By	Remarks

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Client: **CCG-DFO**  
Title: **CCGS "EARL GREY" BOW THRUSTER STRUCTURAL INSTALLATION**

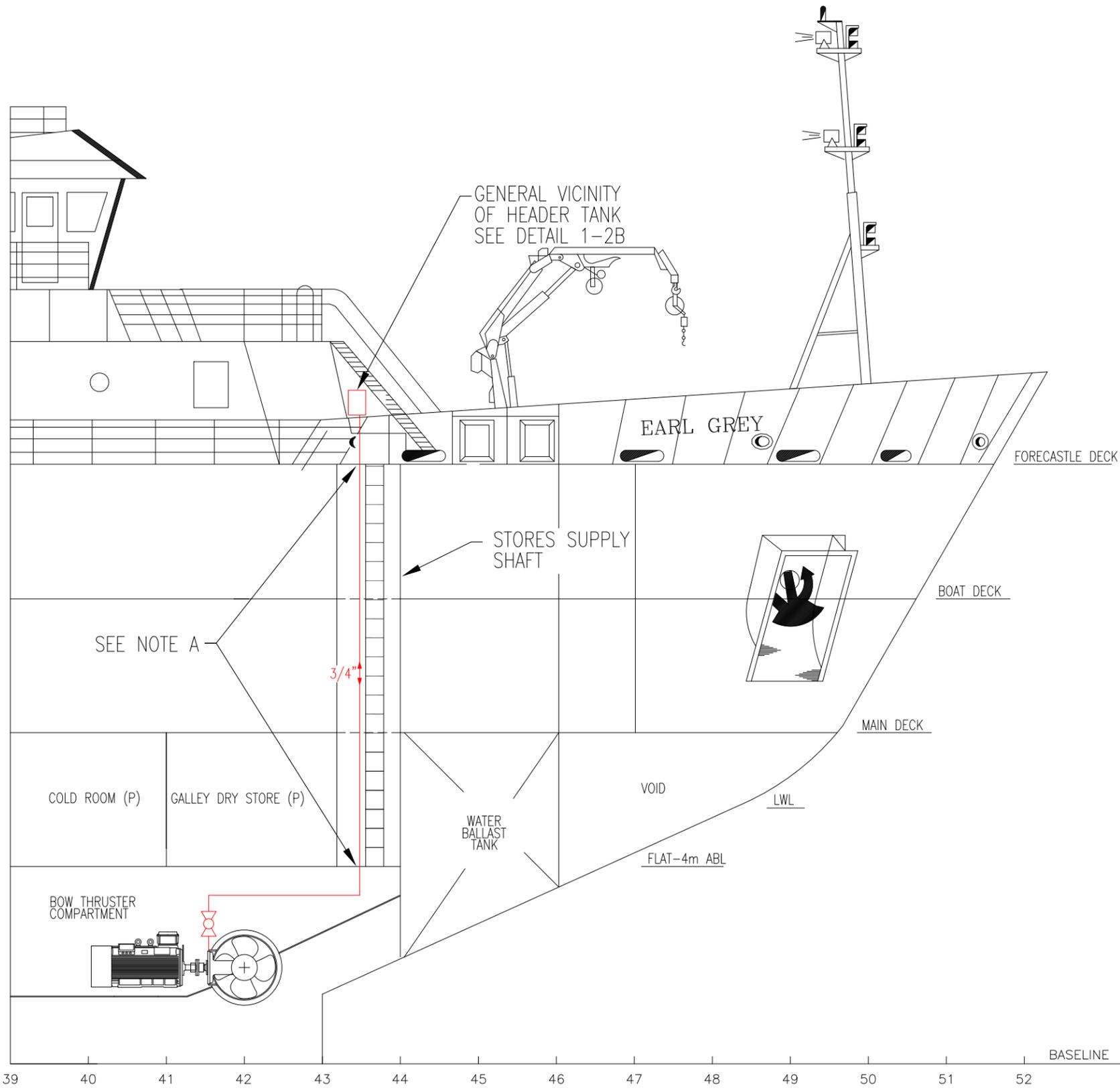
Drawn By: D.O'R./D.C.	Date: 12/01/15
Checked By: D.C.	Scale: 1:40 UNO Rev: 0
Approval/Rev	DWG NO:
Client	<b>J14010-S02</b>
Class	
Flag	Sht No: 2 of 3

8 7 6 5 4 3 2 1 A1 SHT METRIC



**APPENDIX C:  
NEW BOW THRUSTER HEADER TANK DIAGRAM**

8 7 6 5 4 3 2 1



**ELEVATION 1-4A**  
LOOKING TO PORT

39 40 41 42 43 44 45 46 47 48 49 50 51 52

REVISIONS			
REV	DATE	BY	REMARKS

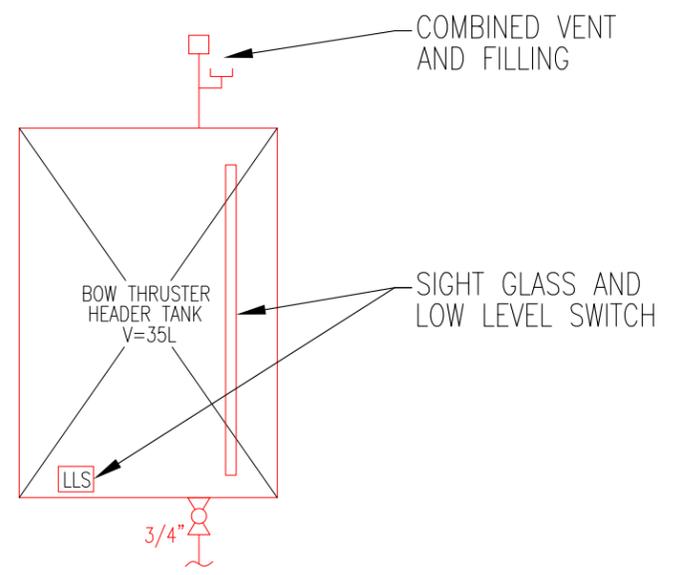
**MATERIAL SPECIFICATION**

PIPE: ALL. STEEL ASTM A-106 SCH.40 SMLS  
 FITTINGS: SOCKETWELD ASTM A-105 #3000  
 FLANGES: SOCKETWELD OR SLIP-ON ASTM A-105  
 GASKETS: NITRILE  
 VALVES: BALL VALVE. S.S. SOCKETWELD

**\*\*DIAGRAM IS FOR GUIDANCE PURPOSES ONLY. TO BE REVISED TO SUIT FURTHER SPECIFICATIONS FROM WARTSILA.**

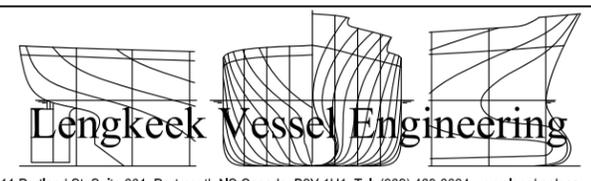
**NOTE A**

DECK AND BHD PENETRATIONS TO BE OF APPROVED TYPE.



**DETAIL 1-2B**  
BOW THRUSTER HEADER TANK

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Client:	CCG-DFO		
Title:	CCGS "EARL GREY" BOW THRUSTER HEADER TANK DIAGRAM		
Approval/Rev	Drawn By: D.O'R.	Scale: NTS	Rev: 0
Client	Checked By:	Dwg No:	Sht No: 1 of 1
Class	Date: 21/01/15	J14010-M03	
Flag			

8 7 6 5 4 3 2 1