



## **CCGS Jackman**

### **Fuel Oil Tank Top Renewal & Modifications**

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## **Section 1 – General Information**

### **1.1 Introduction**

In early January 2014, a pin hole fracture was identified on the tank top of the port side fuel oil tank, located near the tank centerline bulkhead. Additional testing was carried out and determined that cracks were present within the welding of the watertight bulkhead (frame 13.5) to the tank top located within the engine room compartment in way of the identified tank damages. The damages were repaired by grinding out existing welds and re-welding in way of the bulkhead plating to fuel oil tank top.

Upon completion of the above repairs, additional damages were noted on the tank top plating of the starboard fuel oil tank. An inspection of the damages revealed surface pitting corrosion that had penetrated the 5mm aluminum plate of the starboard side fuel oil tank. The pitting corrosion was located between the tank fill and vent pipes and directly beneath the flanged piping connection penetrating the watertight bulkhead at frame 13.50. Plate thickness testing was conducted in the immediate area of the pitting corrosion which garnered results ranging from 1 – 2mm. Additional plate thickness testing was carried out on accessible areas of the starboard, port and centerline fuel oil tank with favourable results ranging from 4.8mm to 5.0mm. Repairs were completed in the spring of 2014 by cropping the tank top plating and fitting an insert plate.

Additional damages were again discovered during December 2014 consisting of cracks within the welding of the watertight bulkhead (frame 13.5) to the tank top located within the forward survivors compartment. The damages were repaired by grinding out existing welds and re-welding in way of the bulkhead plating to fuel oil tank top.

It is evident that stress fractures are occurring within the welds associated with the bulkhead and tank top plating and modifications to the existing structural arrangement are necessary to strengthen and distribute loads into adjoining hull structure. This specification and associated drawing describes the extent of fuel oil tank top plating renewal and modifications to the bulkhead located at frame 13.50. Pictures of the renewal area can be found in Appendix A.

### **1.2 Extent of Renewals / Modifications**

The extent of the renewals and modifications is detailed in section two below and is identified on the supplied MSI drawings. In general, a 2430mm x 610mm section of the fuel oil tank top plating extending from frame 13 within the engine room to frame 14 within the forward survivors compartment. The existing plate will be cropped out and replaced with 8.0mm plate.

Structural modifications are localized to the bulkhead at frame 13.5 (forward engine room bulkhead). The bulkhead plating will be extended within the fuel oil tanks and continuous to the existing hull bottom structure. The new swash bulkhead will be fitted with cut-outs to permit the free flow of fuel within each fuel tank.

### **1.3 Supplied Drawings and Information**

Attached for use are the MSI drawings covering this renewal and are as follows:

- 2665-01-00 Fuel Oil Tank Top Renewal / Modification

#### **1.4 Owner Supplied Materials**

The owner will not supply any materials or labour. All materials and labour will be contractor supplied.

#### **1.5 Contractor's Responsibility**

It is the contractor's responsibility to follow all applicable federal, provincial and local regulations. The contractor is to adhere to all DFO-Coast Guard / PWGS work requirements and must complete the work to the satisfaction of both the representative from Canadian Coast Guard Vessel Support and the attending TCMS Surveyor if necessary.

The contractor is also responsible to provide all materials, labour, lighting, ventilation, staging and lifting capacity to complete the required tasks. The contractor is also responsible for all temporary enclosures to facilitate the work, and finally, all clean up and disposal of debris generated due to the work.

The contractor is responsible for removal of all fuel within the port and starboard fuel oil tanks and tank cleaning to ensure suitability for hot work. Prior to any hot work the contractor is to ensure the tanks have been gas freed.

#### **1.6 Owner's Requirements**

It is the owner's intention that the successful contractor will be responsible to complete all aspects of this upgrade. The owner will provide the contractor with vessel access 24 hours per day for the purpose of completing the work scope.

### **Section 2 – Materials & Workmanship**

#### **2.1 Materials**

All aluminum plate shall be new 5086 – H32 or H116.plate. Extrusions and shapes shall be new 6061 T6.

#### **2.2 Welding**

This renewal requires that the Contractor be currently certified by the Canadian Welding Bureau (CWB) to standard CSA W47.2M, Division I, II or III – Certification of Companies for Fusion Welding of Aluminium. The Contractor shall provide the following:

1. Current letter of validation from the CWB indicating compliance with standard CSA W47.2M 1987, Division I, II or III.
2. Approved procedure data sheets for each type of joint and welding position that will be involved with this repair.
3. Current Welders Ticket for each individual welder that will be involved during the repairs.

The new tank top plate shall be welded to the existing plate and bulkheads using full penetration welds where possible. All other welds to be double continuous fillet welding.

The Contractor shall arrange a welding inspection from an organization currently certified to the latest CSA Standard W178.1. The completed repair work is to be 100% visually inspected by the welding inspector after welding is completed.

The contractor shall remove weld splatter and smooth weld seams and sharp edges and remove grease, smoke, and soot marks.

## **2.3 Inspection & Testing**

The work is to be completed to the satisfaction of a representative from Canadian Coast Guard, Vessel Support. The Contractor shall arrange a welding inspection from an organization currently certified to the latest CSA Standard W178.1. The completed repair work is to be 100% visually inspected and 100% Liquid Penetrant Inspection. The contractor shall be required to obtain 10 radiographs per tank divided between the renewal and modification area. Radiography shall meet the requirement of the ASTM Standard ER142, with acceptance criteria as per the CSA W59 Welding Standard. All costs associated with radiographs (x-rays) and liquid penetrant inspections of welded connections to be included in the Contractors bid.

All costs associated with inspections of welded connections to be included in the Contractors bid. Upon completion of tank top repair, the port and starboard fuel oil tanks shall be pressure tested to 3psi using compressed air and a monometer and held for duration of 30 minutes.

## **2.4 Documentation**

Three copies of the following documentation are to be supplied to the Canadian Coast Guard Project Officer responsible to the vessel prior to commencing the work scope:

- Material Certificates for Plate & Sections
- CWB Certificates for Welders
- CWB Certificates for Weld Supervisor
- CWB Weld Procedures
- CWB Weld Data Sheets
- LPI / X -Ray Testing Documentation

## **2.5 Protection of Area from Additional Damage and Disruption**

The contractor is to take all necessary precautions to protect the vessel and machinery from physical damage and contamination due to the generated smoke.

## **Section 3 – Details of Renewal / Modification**

### **3.1 Scope of Plating Renewal**

The contractor shall complete tank top plating renewals of the port and starboard side fuel oil tanks within the engine room / forward survivor compartments as follows:

1. The fuel oil tank top located within the engine room compartment is welded to the bulkhead at frame 13.50 which extends into the fuel oil tank by 2". The tank top is also welded to outboard void compartments and to the engine room floor at frame

- 13.50. From available vessel reference drawings, the tank top is noted not to be continuous as the existing tank top butts into the watertight bulkhead. The location of the crop and renewal is shown on the supplied MSI drawing which extends 300mm forward and aft of the water tight bulkhead at frame 13.50. The plate shall be cut at the existing weld seam on the engine room floor, the weld seam at the intersection of the bulkhead/tank top location and 25mm aft of frame 14 within the forward survivor space. The longitudinal cut shall be made at the existing welds seam at the intersection of the outboard void compartment/tank top. The new insert will be 8.0mm (5/16") and will incorporate the same flange and mounting details associated with the existing fuel fill, vent piping and tank sounding deck fitting. The contractor will take a template from the existing flange/fitting locations to determine the exact location on the new tank top plating.
2. The bulkhead at frame 13.5 is shown to extend into the fuel oil tank by 2". A new bulkhead plate, complete with cut-outs will be welded to the existing bulkhead extension and to all surrounding structure within the tank (bottom frames, longitudinal bulkheads and existing vertical support stiffeners within each fuel tank. A template shall be measured to obtain the shape of the new bulkhead, however, in general the new bulkhead plate will have dimensions of 1215mm x 525mm, neglecting the curvature of the vessel in this area.

### **3.2 Interference Items**

The following list of interferences has been identified which the contractor shall temporarily remove and store for re-installation upon completion of the work scope. All items are located adjacent the bulkhead at frame 13.5

1. Gyrocompass located port side of forward survivors compartment.
2. Port and starboard sea water strainers
3. Sea water supply to port and starboard engines
4. Piping and valves associated with sea water overboard discharge
5. Port and starboard fuel oil vents and fills.
6. Port and starboard sea water supply to strainers
7. Fuel oil return to port and starboard tanks.
8. Sea water supply piping to forward washroom
9. Pre-heat pump and associated piping/hoses
10. Port and starboard Racor fuel filters .
11. Port and starboard main sea suction piping.
12. Starboard side bench seat located within the forward survivors compartment.

## **Section 4 – Installation**

### **4.1 General**

The existing tank top shall be removed as indicated on the supplied MSI drawing. The removal of the tank top from the port and starboard fuel tanks will provide access for the installation of the swash bulkhead within each tank. The new bulkhead will be 6.0mm (1/4") plate and shall be welded to adjacent structure using double continuous fillet welds. Cut - outs will be provided in the bulkhead plate and fitted with a 50x6 flat bar around the perimeter of each cut out. Upon completion of the structural modifications, new 8.0mm (5/16") tank top plating shall be installed. All penetrations shall be made to the new tank top as per the existing arrangement. Due to space constraints within the tanks, a backing bar may be necessary to be welded along the perimeter and the new tank top plating to be welded using a full penetration weld from one side.

### **4.2 Arising Work**

If, during the completion of this work, it is evident that additional work items are required to complete the general scope of work, the contractor is to immediately notify the owner's representative or the Project Engineer.

The arising work will be defined and agreed to by the owners before such work is undertaken.

## **Appendix A**



**ENGINE ROOM PORT SIDE TANK TOP LOOKING FORWARD**



**ENGINE ROOM TANK TOP IWO W.T. DOOR - LOOKING FORWARD**





**ENGINE ROOM STBD SIDE TANK TOP - LOOKING FORWARD**



**ENGINE ROOM STBD SIDE TANK TOP & BHD - LOOKING FORWARD**





**ENGINE ROOM PORT SIDE TANK TOP & BHD - LOOKING FORWARD**



**FORWARD SURVIVOR COMPARTMENT - LOOKING AFT**



**STBD SIDE FORWARD SURVIVOR COMPARTMENT - LOOKING AFT**



**PORT SIDE FORWARD SURVIVOR COMPARTMENT - LOOKING AFT**