	<p>HEALTH, SAFETY, ENVIRONMENT AND QUALITY MANAGEMENT SYSTEM</p> <p><b>62.0 SAFE BALLAST OPERATIONS</b></p> <p>ON THE JOB TRAINING</p>	<p>OJT : 062  Page : 1 of 3  Date : 07-Nov-25  Rev : 10.1  Appr : DPA</p>
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DATE : \_\_\_\_\_

### **Details of training: Safe Ballast Operations**

Following precautions are to be observed to avoid damage to ballast lines, valves, pumps and expansion joints.

#### **Water Slug (Hammer) Effect**

- Vacuum is often left in the ballast lines if eductor was used to strip the ballast tanks. Vacuum in the empty ballast lines also occurs due to the thermal variation of the ambient temperature.
- When water enters a pipeline under vacuum, it takes the form of a large mass that moves much like a bullet through the bore of a rifle. The momentum imparted to the water slug that travels through the pipe is proportional to the intensity of vacuum in the pipeline and the head from which the water was released.
- The impact of this quickly moving mass of water against valves or pumps is severely damaging, with the most damages reported either in the foremost tanks or in the pumproom, wherein the water slug has achieved the greatest momentum.
- To avoid damages to ballast lines/valves in the tanks or pumproom or even to ballast pumps, it is essential to ensure that no vacuum remains in a ballast pipeline before starting ballasting or de- ballasting operations.

#### **Removal of negative pressure from the ballast line**

- Confirm the pressure in the ballast line is Positive by the suction gauge on Water Ballast Pump. If pressure in the ballast line is negative, make the pressure positive by crack opening (less than 10% open) the ballast tank suction valve.


#### **Filling the water in ballast line**

- Prior to start of ballasting, the relevant lines should be filled up with sea water to prevent the acceleration of the water flow in the ballast suction line. After removing the negative pressure from the line as above, crack open the Water Ballast Pump sea-chest valve (less than 10% open) to fill the seawater into the line until ballast pump suction gauge indicates slight positive pressure and is stable.
- When the above processes are complete the ballast suction line is filled up with sea water and it is confirmed is at a positive pressure, the “Water Hammer” possibility is quite low, it is the time to proceed Line-up for ballasting on a full scale and start ballasting tanks by gravity before taking ballast using pump.

#### **Standard Precautions**

When ballasting tanks in loaded condition, standard precaution is to:

- Open furthestmost tank for peak, or 1 wing first.
- Then, line up and open all valves till the sea-chest working backwards from the forward-most valves.
- Finally, crack the sea-chest valve (less than 10%) open to ensure the line fills up slowly.
- Once water is flowing from the forward-most tank, start with other tanks as required, and the forward tanks can be closed.
- When shutting, shut sea-chest first when at full load.

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The general rule is to work from low-pressure to high-pressure and open the high-pressure valve last.

For de-ballasting, standard precautions are:

- Open sea-chest first.
- Line up and open all valves, until the main ballast tank valve is working backwards.
- Finally, slowly crack the ballast tank valve open, to ensure a gradual change in pressure occurs.

### Pressure surge

- A pressure surge is generated in a pipeline system when there is an abrupt change in the rate of flow of liquid in the line. In the event of a pressure surge, a high pressure phase propagates through the pipeline at a velocity faster than the speed of sound causing damage to structural parts of the pipeline i.e. pipe/gasket rupture, displacement of expansion joint.
- To avoid pressure surges, valves at the downstream end of a pipeline system should not, as a general rule, be closed against the flow of liquid.
- Care should be observed during switching over the tanks during ballasting by pump, the valve of the intended tank should be opened prior to closing the valve of the tank.
- Upon completion of the ballast operation, tank valve should be closed after stopping the pump.
- Check the timings of the valves closure which should be within the range of the parameters provided by the manufacturer. In very general terms, total closure times should be of the order of 30 seconds, and preferably more.

### Glass reinforced plastic (GRP) ballast lines

- The glass reinforced plastic (GRP) does not corrode, but care is needed for pipe support and clamp to ensure that the pipe is secure and does not move along its axis. This may cause coupling joints to fail.
- Spare GRP pipe section, joining couplings and gaskets should be carried on board along with the repair kit.
- Familiarize with the pump characteristic, valves and pipe line system on board

Above has been read and understood.

CNO:

2NO:

3NO:

X2NO/X3NO

JNO

D/C

2EO

3EO

4EO

JEO

E/C

Verified by: Master / CEO

Feedback :