
	<i>Manufacturing, testing and supply of vacuum vessels for HNB3 (Beam Line Vessel and Beam Source Vessel) and DNB</i> <b><i>Annexure 9: Hydrostatic pressure testing of cooling water penetrations</i></b>	<b>INDUS Ref No</b>
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## 1. Scope

This annexure specifies the requirements for Hydrostatic pressure testing of cooling water penetrations of DNB Vessel and HNB3 Vessel.

## 2. References

ANSI B 31.3

A18.3257.4 Section 1 - Subsection Z: technical appendices (APPENDIX A18) of RCC-MR 2007

## 3. Requirements

3.1 This pressure test is for the cooling water penetration provided on the vessel for supplying water to the internal components. i.e Neutraliser, Residual Ion Dump, Calorimeter, Exit scraper and Grounded Grid. To allow the pressure test, temporary 'caps' shall be procured and welded on both sides (internal and external) of the penetrations. These 'caps' shall also follow all the requirement of the technical specification.

### 3.2 Contractor's Responsibility

3.2.1 Contractor is responsible for confirming and controlling the Hydrostatic test job in order to ensure that the same is being carried out according to the prescribed procedure.

3.2.2 Contractor is responsible to communicate its readiness related to pressure testing and the invitation to witness the same.

#### 3.2.3 Documentation

Contractor shall submit a detailed pressure testing procedure (which fulfills the requirements of this specification) and applicable code requirements to purchaser for approval prior to pressure testing.


Contractor shall submit calibration certificate of Test gauge to purchaser prior to testing.

Contractor shall prepare Pressure test report after completion of testing.

### 3.3 Verification Prior to Pressure Testing

All Components upon completion of Fabrication and Assembly shall be checked / verified by Contractor and purchaser to ensure following:

- All Fabrication has been completed, except for operations that could not be performed prior to the test.
- All Applicable Examinations, inspections and tests including NDT Tests and required heat treatments (If applicable) are satisfactorily completed and accepted

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- All Inspection against Review, Witness and Hold point in Manufacturing Inspection Plan have been carried out and accepted.

### 3.4 Safety Precautions

Pressure Test shall be carried out in isolated place from work area / pit with appropriate safety precautions and equipment.

Before applying Test pressure, the test equipment shall be inspected to see that it is tight and that all low pressure filling lines and other appurtenances that should not be subjected to the test pressure have been disconnected or isolated by valves or other suitable means.

All the local safety norms shall be followed by Contractor and purchaser while performing / witnessing the pressure testing.

### 3.5 Pressure Testing General Requirements

#### 3.5.1 Component to be tested:

All cooling penetration of the DNB Vessel and HNB3 Vessel

#### 3.5.2 Type of pressure test

A series of cycles of pressure test as follows on completion of assembly:

Step 1: (At least) 30 Min. at  $P_{TEST}$

Step 2: 50 cycles between  $P_{TEST}$  (kept for 1 Min.) and  $P_{ATM}$

#### 3.5.3 Test Procedure

With reference to standard: BS 31.3 ANSI/ASME Code for Pressure Piping / equivalent. Reference standard shall be in agreement between purchaser and Contractor

#### 3.5.4 Pressure test media

Pressure test shall be with DM water.


#### 3.5.5 Test Temperature

The test temperature shall be room temperature.

#### 3.5.6 Test Pressure:

$P_{TEST} = 39\text{bar}$

*(The nominal pressure of the cooling penetration is 26bars. According to RCC-MR and ESPN, the pressure test value shall be 1.43 times the nominal pressure. However, rest of*

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*the cooling circuit (external to the vessel and not part of this contract) is designed as per ASME B31.3, it is decided to set the test pressure 1.5 times the nominal pressure to be compliant with ASME B 31.3)*

### 3.5.7 Test Gauge

#### 3.5.7.1 Location

Pressure gauge used in testing shall be connected directly to the test component. If the indicating gauge is not readily visible to the operator controlling the pressure applied from a safe location, an additional indicating gauge shall be provided where it will be visible to the operator and inspector throughout the duration of the test. It is recommended that a recording gauge be used in addition to the indicating gauge.

#### 3.5.7.2 Range

Dial indicating pressure gauges used in testing shall be graduated over a range of about two times the maximum intended test pressure, but in no case shall the range be less than 1.5 times nor more than four times the intended test pressure.

Digital reading pressure gauges having a wider range may be used provided the readings give the same or a greater degree of accuracy than obtained with dial pressure gauges.

#### 3.5.7.3 Calibration

All gauges shall be calibrated against a standard deadweight tester or a calibrated master gauge at least every 6 months or at any time there is a reason to believe that they are in error.


### 3.5.8 Pressurization and Preliminary check

Pressure shall be gradually increased until a gage pressure which is the lesser of one half of the test pressure is attained, at which time a preliminary check shall be made to ensure integrity of installation, sealing & opening etc. After satisfactory check pressure shall be gradually increased in steps until the test pressure is reached & subsequently held for prescribed duration.

### 3.5.9 Inspection and Testing

Visual Examination shall be made for leakage and permanent deformation of all joints and connections.

Any leakages that are present, except for that leakage that may occur at temporary test closures, shall be satisfactory repaired and retested.

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The inspector shall reserve the right to reject the Pressure test program if there are any visible signs of permanent distortion and deformation.

Remote monitoring provision shall be arranged by Contractor for the inspection.

The test is considered to be satisfactory if the pressure can be withstood with no leaking or residual deformation observed in a direct visual examination.

#### 3.5.10 Pressure Test record

Contractor shall record following data in pressure test report and submit to purchaser.

- Identification of Parts being tested.
- Calibration status of measuring instruments
- Test condition
- Test pressure
- Test duration
- Test Fluid and temperature
- Test Result
- Date of Pressure Test
- Detail of witnessing authority.
- Reference of the Procedure followed.