

Module : Use Of Hydro Test

Faculty : Course co-ordinators (KVR,BDP,SGC)

Demonstrator : Workmen from Shops

Duration : Maximum 8 Hours

Participants : Max. 06 / Module (Workmen from shops)

TOPICS

Time

- | | |
|--------------------------|---------|
| • Introduction on SRMs | 30 Min |
| • Pre-test | 30 Min |
| • Information on Equipt. | 2.0 Hrs |
| • Demonstration | 1.0 Hr |
| • Practical | 1.0 Hr |
| • Skill test | 2.0 Hrs |
| • Post-test & Feedback | 1 Hr |

Tests

Destructive Tests

Tensile, Impact, Bend, etc

Non-destructive Tests

Radiography,

Ultrasonic,

Dye-penetration,

Magnetic Particle

and leak testing like

Hydrotest, Air Test, Helium Test etc..

Hydrotest-----why?

To ensure the integrity of the vessel and system operation under pressure.

Recommended For pressure vessel operating under pressure

Ensures the strength of weld joints & materials

Ensures nozzle-flange joint

Test The strength of The pressure vessel at 1.5 times the designed pressure

Ensures safe & reliable performance during the operational life

Requirements Of Materials , Tools & Equipments

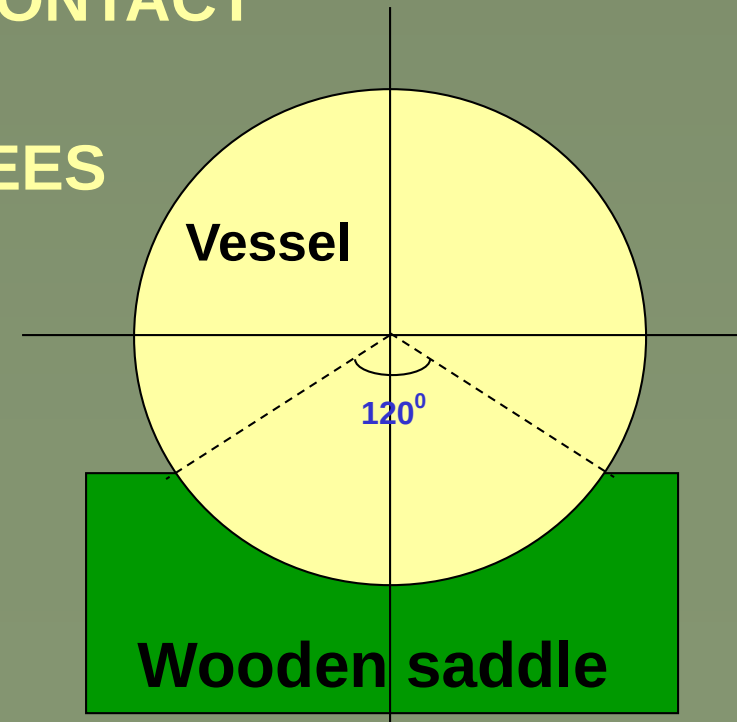
TEST MEDIUM

- WATER WITH 'X' PPM AS FREELY AVAILABLE
- (PARTS PER MILLION---CHLORINE IMPURITIES)
- 'X' ---- 25 PPM OR LESS FOR SS VESSEL
- 'X' ---- 80 PPM OR LESS FOR CS VESSEL
- CHLORINE PARTICLES AFFECT THE ANTICORROSIVE PROPERTIES OF VESSEL

REQUIREMENTS OF MATERIALS , TOOLS & EQUIPMENTS-(CONTD.)

WOODEN SADDLES (SOFT WOOD)

- TO SUPPORT THE VESSEL & AVOID ANY DEFORMATION OR DENT AT CONTACT SURFACES
- CONTACT ANGLE---120 DEGREES



REQUIREMENTS OF MATERIALS , TOOLS & EQUIPMENTS-(CONTD.)

THERMOCOL SHEETS

- 20--30 MM THICKNESS
- USED AS A SOFT PACKING BETWEEN VESSEL & SADDLE

REQUIREMENTS OF MATERIALS , TOOLS & EQUIPMENTS-(CONTD.)

COVER FLANGES

- NOZZLES WHICH HAVE ORIGINAL BLIND FLANGES TO BE BLANKED BY THOSE FLANGES
- OTHER NOZZLES TO BE BLANKED AS PER SPECIFIED DRAWING

REQUIREMENTS OF MATERIALS , TOOLS & EQUIPMENTS-(CONTD.)

HIGH TENSILE FASTNERS

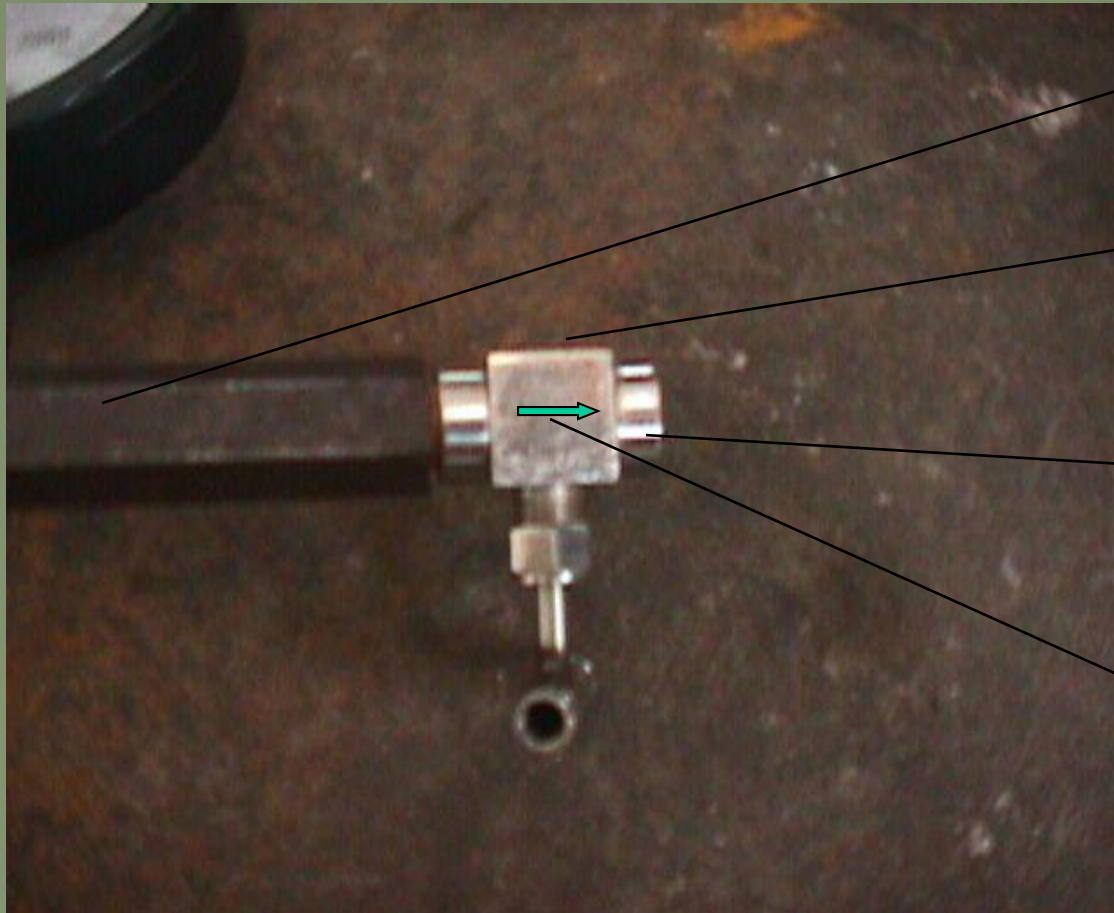
- TO BE USED AS SPECIFIED IN THE DRAWING

REQUIREMENTS OF MATERIALS , TOOLS & EQUIPMENTS-(CONTD.)

PIPE FITTING

- HIGH PRESSURE (5000 TO 10000 PSI)
- REQUIRED SIZES (BSP,NPT) TO BE USED FOR INLET & OUTLET EQUIPMENT, VALVES, GAUGES CONNECTIONS

PUMP ACCESSORIES



• **SQUARE BAR**

• **SHUT OFF
VALVE**

• **COUPLER**

• **FLOW
DIRECTION**

REQUIREMENTS OF MATERIALS , TOOLS & EQUIPMENTS-(CONTD.)

GASKETS

- TO BE USED JOB GASKET UNLESS OTHERWISE SPECIFIED

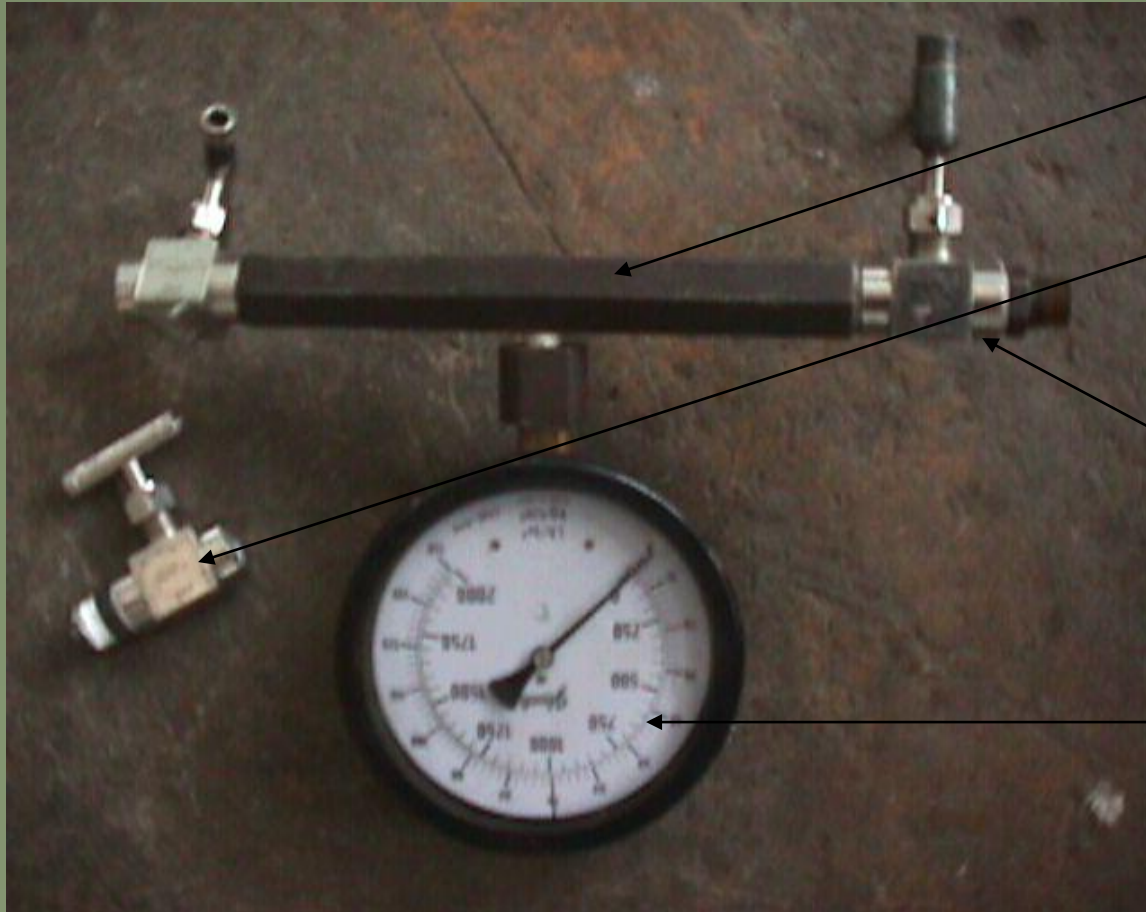
REQUIREMENTS OF MATERIALS , TOOLS & EQUIPMENTS-(CONTD.)

PRESSURE GAUGES

- USE MINIMUM TWO CALIBRATED PRESSURE GAUGES
- RANGE--- MIN. 1.5 TIMES THE TEST PRESSURE
MAX. 4 TIMES THE TEST PRESSURE
- EXAMPLE: FOR TEST PRESSURE OF 60 KG/CM²
RANGE SHOULD BE 0-100 KG/CM²
(OR) 0-240 KG/CM²



PUMP ACCESSORIES



- SQUARE BAR

- SHUT OFF VALVE

- COUPLER

- PRESSURE GAUGE

REQUIREMENTS OF MATERIALS , TOOLS & EQUIPMENTS-(CONTD.)

WATERPUMP & HOSE ASSEMBLIES

- SUBMERSIBLE OR ANY OTHER PUMP IS USED FOR FILLING THE VESSEL
- CONNECTED THROUGH FLEXIBLE HOSE PIPES TO TANK & VESSEL

REQUIREMENTS OF MATERIALS , TOOLS & EQUIPMENTS-(CONTD.)

HYDROTEST PUMP

- REQUIRED FOR PRESSURIZING THE VESSEL TO THE TEST PRESSURE
- COMPRISES OF
 - A HIGH PRESSURE PUMP
 - B NON-RETURN VALVE
 - C RELIEF VALVES
 - D ATTACHMENTS LIKE HOSES, COUPLERS

PUMP ACCESSORIES



- **PRESSURE
GAUGE**

- **SUBMISSILE
PUMP**

- **OUTLET
HOSE**

REQUIREMENTS OF MATERIALS , TOOLS & EQUIPMENTS-(CONTD.)

TORQUE WRENCH, GUN & STUD TENSIONER

- ALL THE OPENINGS MUST BE CLOSED WITH BLIND FLANGES
- TIGHTENING TO BE ENSURED AT DESIRED TORQUE BY TORQUING WRENCH, TORQUING GUN OR STUD TENSIONER

TYPES OF HYDROTEST PUMP

- **HIGH DISCHARGE LOW PRESSURE**

PRESSURE RANGE : UP TO 100 KG/SQ.CM(g)

QTY. : 02

- **LOW DISCHARGE HIGH PRESSURE**

PRESSURE RANGE : UP TO 400 KG/SQ.CM(g)

QTY. : 06

HYDROTEST PUMP DETAILS

(HIGH PRESSURE, LOW DISCHARGE)



- INLET HOSE
- TANK
- TROLLEY
- OUTLET HOSE



SEQUENCE OF OPERATIONS

SADDLE ARRANGEMENT

- REQUIRED NO. OF SADDLES AS MENTIONED ON DRG. TO BE PLACED AT THE DISTANCES
- PUT THERMOCOL SHEETS ON SADDLES BEFORE KEEPING THE VESSEL

SEQUENCE OF OPERATIONS (CONTD.)

ORIENTATION

- LONGSEAM, CIRCSEAM REMAIN EXPOSED FOR VISUAL INSPECTION & NOT COVERED UNDER SADDLE
- INLET NOZZLE FOR WATER IS AT THE TOP & DRAIN OUT AT THE BOTTOM OF VESSEL

SEQUENCE OF OPERATIONS

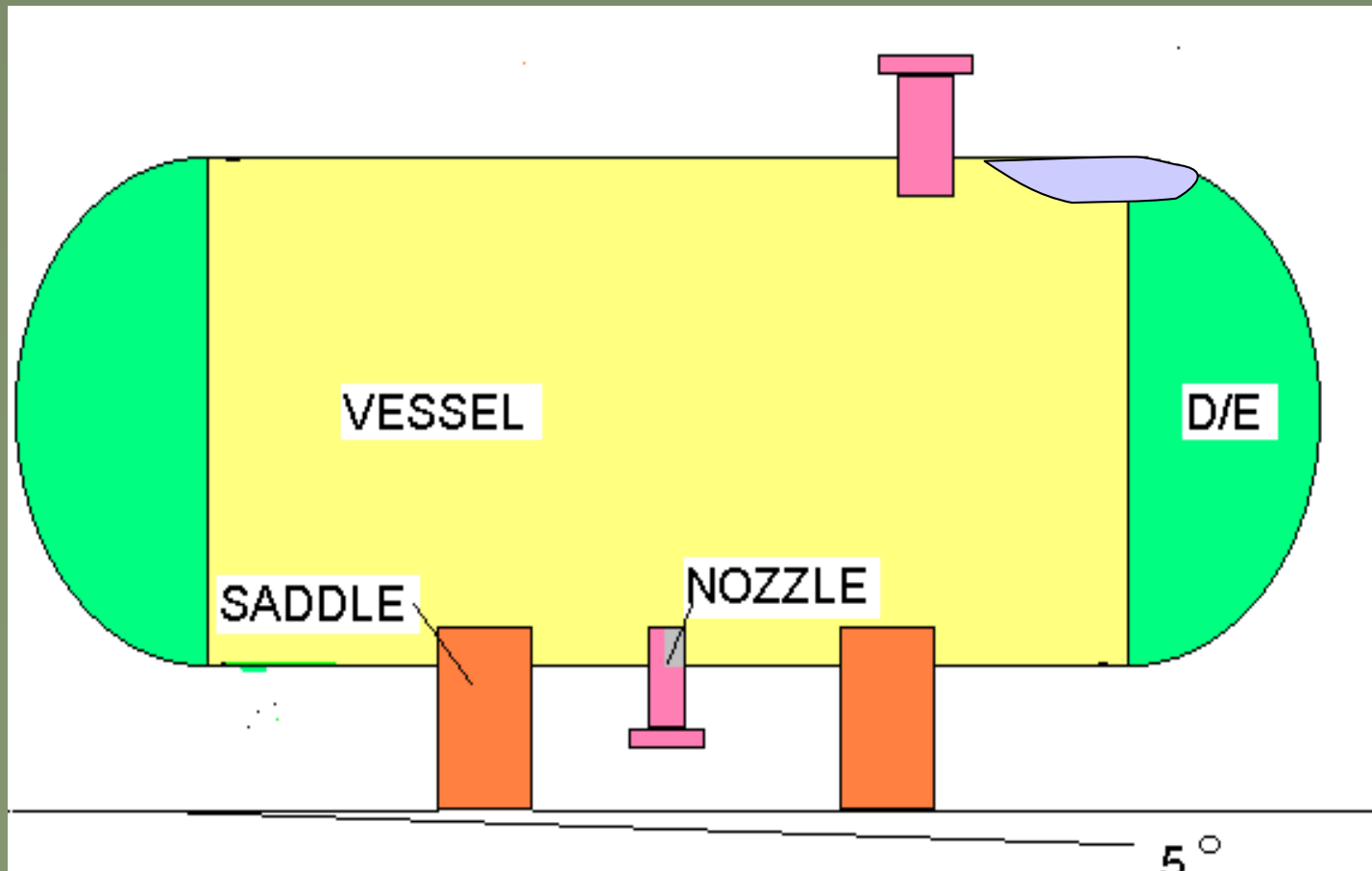
(CONTD.)

AIR LOCK REMOVAL

- **ADEQUATE ARRANGEMENT TO BE MADE FOR VENTING THE AIR, TRAPPED INSIDE THE VESSEL**
- **FOUR DIFFERENT CASES TO BE STUDIED**

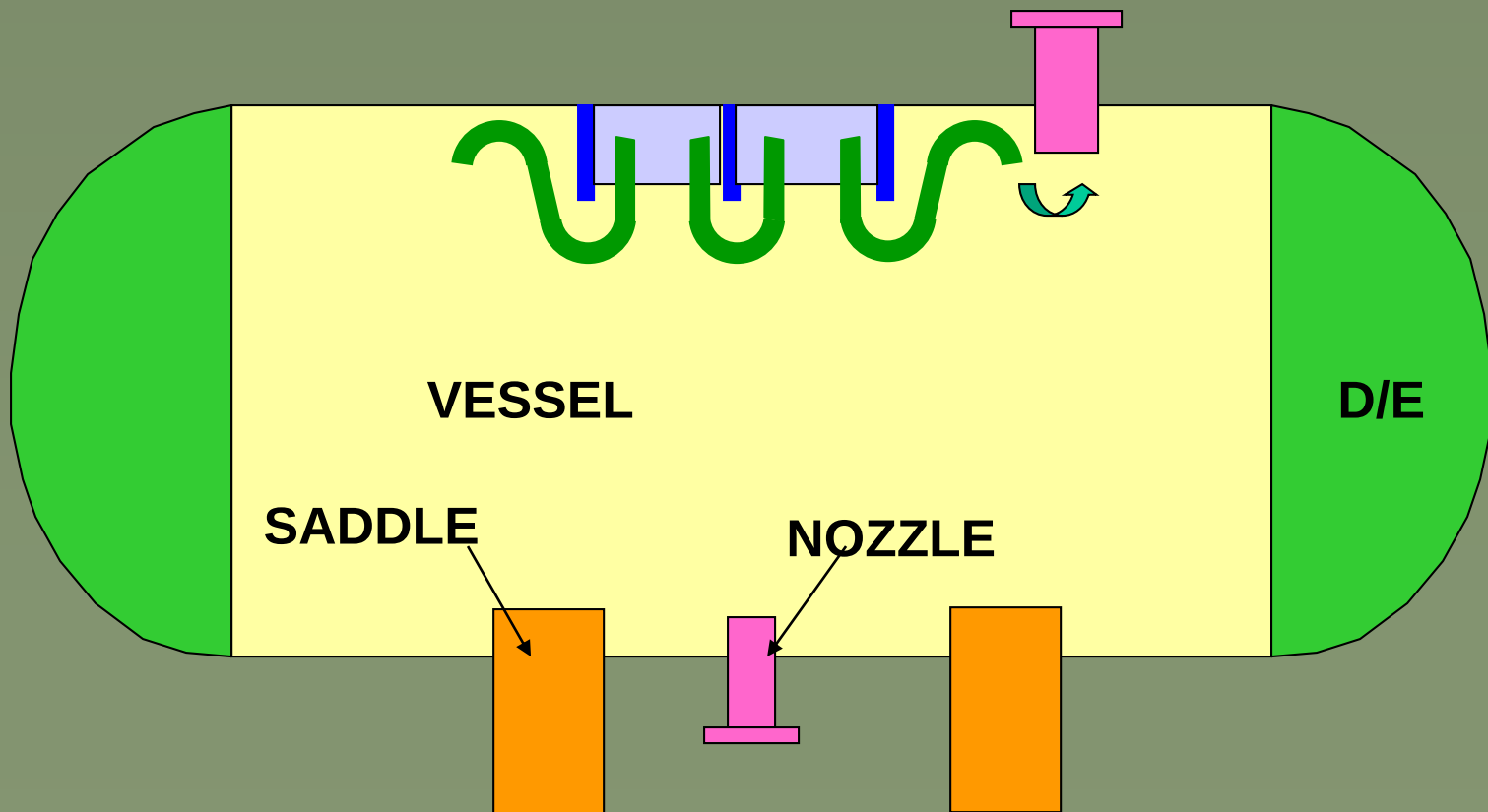
AIR LOCK REMOVAL

1 VESSEL IN HORIZONTAL, INCLINED AT 5 DEG.



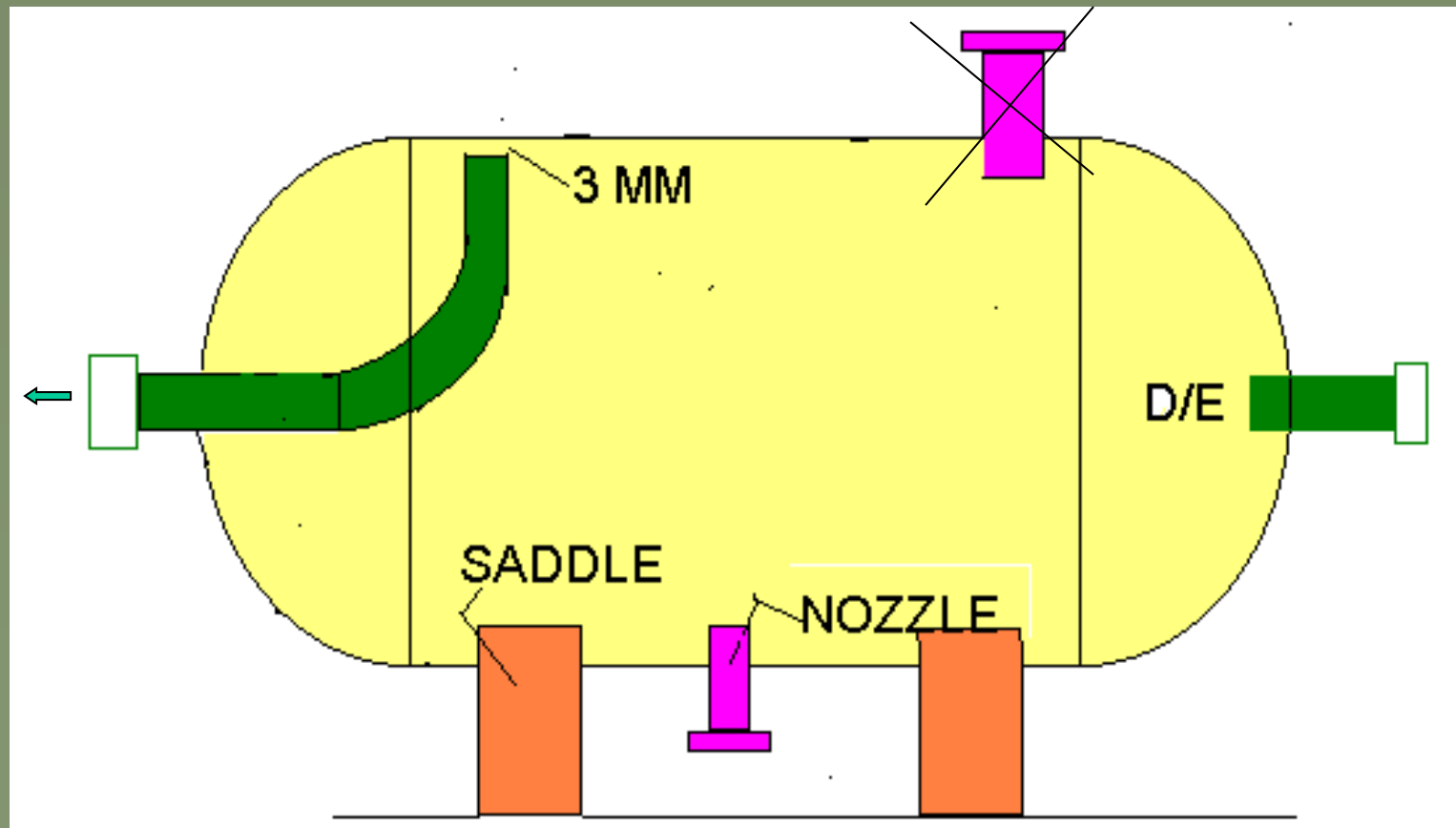
AIR LOCK REMOVAL

2. WHEN INTERNALS LIKE TSRs PROVIDED INSIDE THE VESSEL

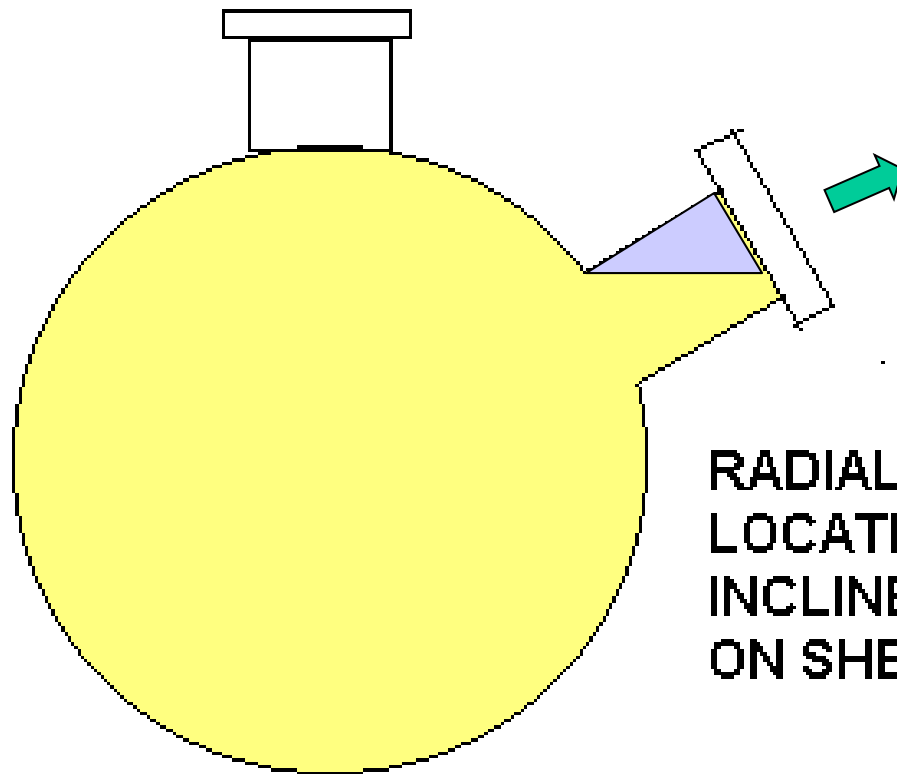


AIR LOCK REMOVAL

3 FOR HORIZONTAL NOZZLE INSIDE THE D/E

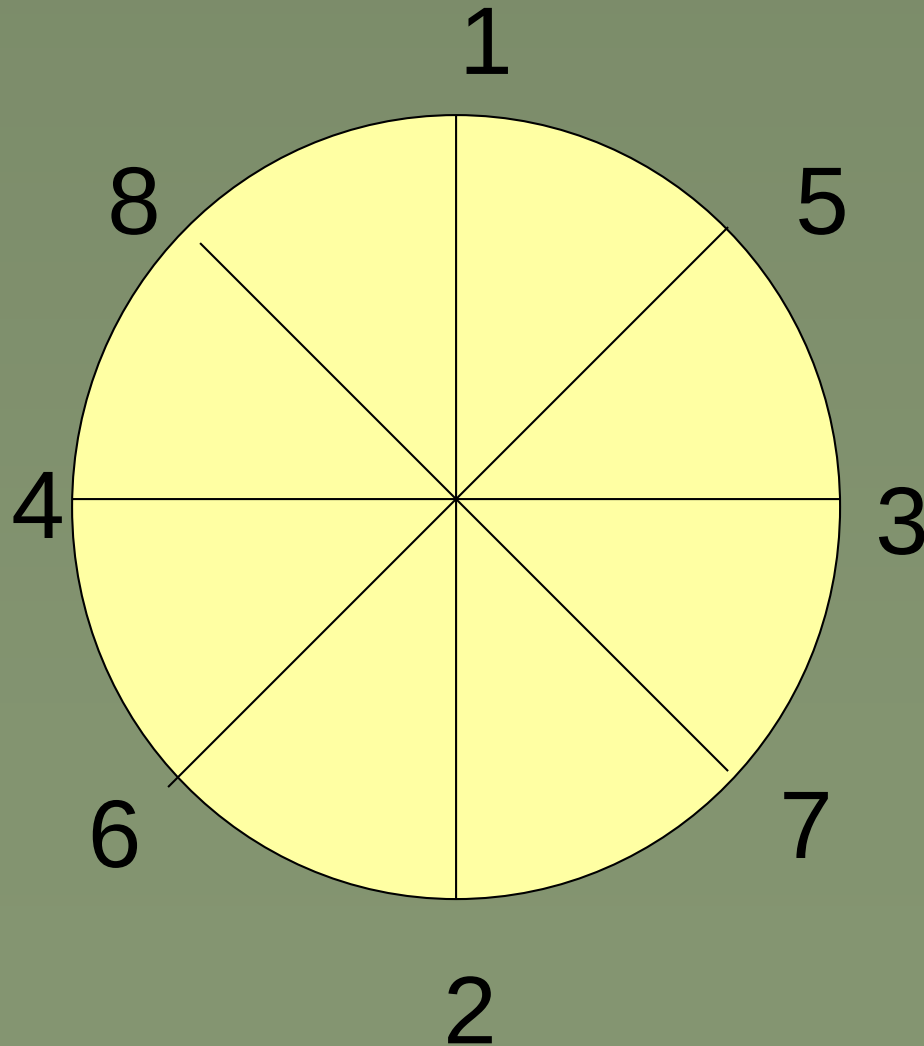


AIR LOCK REMOVAL



**RADIAL NOZZLES
LOCATED AT
INCLINED POSITION
ON SHELL**

TIGHTENING SEQUENCE



PRESSURE VALVE SETTING



- VALVE
SETTING FOR
REQUIRED
PRESSURE

GUIDELINES FOR HYDROTEST

- Pump shaft should rotate clock wise looking from shaft side
- Ensure bypass line is open.
- Ensure that **bypass line should not connect to the pump suction line.**

(If discharge line is shut off, bypass water is diverted to the pump suction & as a result there is a rapid rise in temperature , which causes damage to piston plunger packing)

- **Connect pump outlet to vessel inlet through standard hose pipe, with proper valve connections, square bar, couplers, etc.**
- **Ensure the pressure regulator valve, foot valve, should be in unloading position.**
- **Ensure the pressure gauge calibration validity**
- **Ensure water tank or suction line should be free from any foreign material**

OPERATING PROCEDURES

- Start hydrotest pump
- Ensure 100% removal of entrapped air
(monitor the tank into which the outlet hose pipe is dipped. As soon as bubbles stop showing up, close outlet valve)
- **Monitor pressure gauge** provided at outlet.

- **OPERATING PROCEDURES**
(Contd.)

- As soon as pressure reaches 50% of the test pressure , wait for 10 minutes
- Increase pressure by 10% in stages till the test pressure is achieved
- Observe pressure drop
(by marking line on pressure gauges)

- Hold the hydrotest pressure for specific time as mentioned in drawing
- Carry out thorough visual inspection of all joints & connections
(If **any leakage** is noticed, mark the point. The vessel is to be depressurized and then necessary repairs are to be carried out. **Again the test procedure is to be repeated**)

DOs & DON'Ts

- **Ensure pressure gauge readability**
- **Working, design & test pressure to be displayed near the vessel**
- **Ensure all gasket surfaces are free from dent & scratches before blanking**
- **Do not apply paint, oil, grease on weld joints**
- **Do not weld on job blind flange**