

- 2.15.5- The total dry thickness of coating system (including Zn layer) shall not be less than 100 microns. Unless applied paint manufacturer specification calls for higher thickness, total dry paint film thickness shall not be less than (100 Microns) .
- 2.15.6- The manufacturer during offering stage shall provide full detail of the following:-
- A- Specification of zinc wire ,sealer top coat and grits.
 - B- Procedures for surface preparation (cleaning,degreasing and grit blasting) and sequence of finishing works.
 - C- Quality control , inspection on coating and thickness .
 - D- Test results on proposed top coat (published sheet as issued by top coat manufacturer).
 - E- Stoving (baking) diagrams (to assure full curing).
- 2.15.7- Paint colour shall be subject to Purchaser's approval and shall be agreed upon the time of placing the order. The manufacturer during offering stage shall provide three alternatives of colour shade numbers.
- 2.15.8 - Dry paint film thickness shall be checked by magnetic micrometer (Elcometers) by adopting same procedure that was used for verification of Zn-layer thickness. Not less than 1% of painted cylinders shall be checked for their paint thickness .
- 2.15.9- The Company would accept to reconsider the manufacturer's alternative external protective coating system provided the quality of obtained coating is capable to meet the Company's requirement. The alternative coating shall be resistant to impacts, abrasion and corrosion. Full details (in a manner similar to what is required in paragraph 2.15.6) shall be provided by the manufacturer during offering stage .
Minimum dry film thickness of the paint shall not be less than 70 microns .

3- CYLINDER VALVE SPECIFICATION:-

3.1- Design and construction:-

3.1.1- General

- 3.1.1.1- Valve shall be constructed according to an approved type, tamper proof and non-repairable in accordance with the valve as shown in the sketch of attachment no.2 of this specification. Outlet threaded connection shall be in accordance with DIN-477 connection no.1 .
- 3.1.1.2- Gas tightness to atmosphere must be maintained at all spindle (piston) settings between the closed bore and full bore positions.
- 3.1.1.3- The torque required for full closing and re-opening of the valve shall not go appreciably higher even after long time of use .

- 3.1.1.4- All valves shall be manufactured and furnished with high degree of workmanship and uniformity. All components shall be free from any defect which might impair the safe use of valves .
- 3.1.1.5- Valve shall be capable (in case of fire) to stop the gas flow even without the nylon pad (that might be destroyed by fire).
- 3.1.1.6- Valve shall be capable to withstand a breaking torque not less than 2 kgm.
- 3.1.1.7- Valve shall remain tight after applying endurance test on minimum 6000 cycles (while valve is under hydrostatic pressure of 17 bars).
- 3.1.1.8- Valve shall be capable to withstand an internal pressure of 70 bars.
- 3.1.2- **Material of construction :-**
- 3.1.2.1- Valve body and handwheel shall be manufactured by hot die forging (hot pressed) process by using forging brass with relative forgability rating not less than 100%. The nominal chemical composition of forged brass used for manufacturing, shall be according to one of the following:-
- UNS copper alloy C 37700 .
 - DIN 17660 CuZn 40 Pb2-F37
- The mechanical properties shall not be less than the following:-
- Tensile strength - 36 kg/mm² .
 - Elongation (A5) - 25%
 - Modulus of elasticity - 10500 kg/mm²
 - Hardness (Brinell - HBN) - 80 - 100 .
- 3.1.2.2- Spindle (piston) and orbital locking pin shall be manufactured from wrought brass material with chemical composition and mechanical properties same as the material used for the construction of valve body and handwheel .
- 3.1.2.3- The seal rings (O-rings) shall be manufactured from synthetic rubber (such as nitrile rubber) which at least shall satisfy the following typical values of mechanical properties:-
- | | |
|--|--------------------------------|
| *Hardness (Shore A) | 70 (+5/-4) |
| *Compression set at room temp. for 24 hours | 10% max. |
| At 100 °C for 24 hours | 20% max. |
| *Temp. of utilization | -30 °C to + 100 °C |
| *Pressure of utilization | 80 kg/cm ² (max.) |
| *Tensile strength | 200 kg/cm ² (app .) |
| *Elongation at breakage | 350% (app.) |

- 3.1.2.4- The disc (pad) shall be manufactured from moulded polyamide resin (such as nylon 66) which at least shall satisfy the following typical values of mechanical properties:-
- | | | |
|-------------------------------|-------|---------------------------|
| *Hardness (HRM) | | 90° |
| *Tensile strength | | 860 kg/cm ² |
| *Elongation | | 40 - 80 % . |
| *Ultimate compression stress | | 115 kg/cm ² |
| *Ultimate bending stress | | 1100 kg/cm ² |
| *Izod resilience (with notch) | | 7-8 kg cm/cm ² |
- 3.1.2.5- The inlet of each valve shall be provided with a non-metallic ferrule that is firmly attached to valve inlet as shown in the sketch of valve of attachment 2 of this specification. Full details shall be provided during offering stage.
- 3.1.2.6- All of nonmetallic components shall be tested to assure their suitability for LPG service. (results of tests shall be attached with offers). Valve manufacturer shall be responsible to assure the conformity of used nonmetallic components .
Following shall be considered as a minimum requirement that should be met:-
- 3.1.2.6.1- No deterioration shall occur, nor volume or weight change in excess of 10%, on immersion of the nonmetallic components for 72 hours in liquid pentane or alternatively to a gaseous mixture of 50/50 Propane/Propylene at its vapour pressure at 20 ° C.
- 3.1.2.6.2- The nonmetallic components shall substantially maintain their suppleness, hardness and resilience on exposure to temperatures within the range -30 °C and +70 °C for periods of 72 hours.

3.2- Capacity and filling pressure :-

- Valve shall be suitable for differential filling pressure = 4-5 kg/cm² .
- Maximum boxed in-line pressure = 16 kg/cm² .
- Nominal filling rate (in 45 seconds) = 12.5 kgs. of LPG .
Test certificate to confirm suitability of valve capacity shall be provided.

- 3.3- **Marking:-**
- 3.3.1- Valve handwheel shall be stamped or embossed with the words "JOPETROL" in the middle, "Open" and "Closed" with suitable direction arrows as shown in the sketch of the valve of attachment no.2 of this specification.
 - 3.3.2- Purchase date of the cylinder shall be stamped on valve body at wrench zone (month and year is sufficient).
 - 3.3.3- Valve manufacturer symbol or name shall be forge stamped on valve body .
- 3.4- **Data required from manufacturers:-**
Manufacturers are requested to provide with their offer the following:-
- 3.4.1- Two sample valves .
 - 3.4.2- Detailed constructional drawings of offered valve that show the name and dimension of each part as well as material specifications .
 - 3.4.3- Valve type testing report and test certificate for nonmetallic components. Report and certificate shall clearly state the following:-
 - 3.4.3.1- Name of type testing authority (recognized expert testing authority is required).
 - 3.4.3.2- Type approval number .
 - 3.4.3.3- Results of the examinations and tests which were done for the sake of valve type approval, which; at least; shall include the following:-
 - A)- Gas tightness of valve at 20 kg/cm² pressure (both in the seating and relative to atmosphere) as following:-
 - In the delivered condition .
 - After drying for five days. (plus 70 °C drying temp.) .
 - In cold condition (minus 20 °C).
 - In the hot condition (plus 70 °C) .
 - B)- Gas tightness of the valve to atmosphere under endurance stressing.
 - C)- Gas tightness in the seating and relative to atmosphere on completion of endurance stressing.
 - D)- Checking the closing and opening torque required .
 - E)- Testing for mechanical strength .
 - F)- Testing of nonmetallic components to assure their suitability for LPG service. At least test results for the determination of the following shall be provided:-
 - Mechanical properties (under tension and compression conditions) .
 - Absorption of humidity .
 - Melting point .

- Ageing (test temp. not less than 70 °C) .
- Resistance to LPG .
- Resilience (for pads) .
- Hardness (shore A) .
- 3.4.3.4- Number of valves used for the sake of valve type approval (this shall not be less than 10 valves).
- 3.4.4- Slop tests and quality assurance work to assure product conformity. At least this shall include the following:-
 - Tightness test at 21 kg/cm² (open and closed positions) .
 - Hydrostatic testing at 30 kg/cm² (valve in the open position) .
 - Dimensional check .
 - Checks on raw materials .
 - Capacity test .
- 3.5- Test report and certification:-
Following test reports and certificates shall be provided:-
 - 3.5.1-Tightness test at 21 kg/cm² for every valve (this shall be done in closed and opened positions) .
 - 3.5.2- Hydrostatic test at 30 kg/cm² (valve in the open position). This test shall be done on 5% of purchased valves .
 - 3.5.3- Mill certificate and test report of raw materials. (including the nonmetallic components) .
 - 3.5.4-Capacity tests .
- 3.6- Responsibility of valves manufacturer :-
 - 3.6.1- The manufacturer of the valves shall be responsible to provide valves of proper quality and workmanship to fulfill safely the operating condition during the first five years of service .
 - 3.6.2- Valve manufacturer shall be responsible to replace promptly, free of charge the valves that might fail due to any of the following reasons :-
 - Leaks during first filling (whatsoever in nature) .
 - Leaks during service which might be related to bad quality or poor workmanship of valves and inner components .
 - Weakness of valve body or inner components .
 - 3.6.3- The Company reserves it's right to test purchased valves according to DIN-477 sheet 2 and the requirement of this specification .
- 3.7- Each valve shall be provided with a closure nut to fit and protect the outlet.
- 3.8- Valves with integral pressure relief devices are not acceptable.

- 3.9- When valves are fitted to the cylinders, the threads shall be coated with a suitable proof joining compound, which should fulfill the following requirements :-
- a- Should not be affected by LPG steam or water .
 - b- Leak proof at maximum storage temp. (60 °C).
 - c- Of non-corrosive type .
- Detailed specification (including manufacturer sheets) of sealing (leak proof) compound shall be provided during offering stage .
- 3.10- The approximate weight of the valve and closing nut are to be stated .
- 3.11- The inlet and outlet shall be threaded in accordance with DIN-477 (connection no. 1) .
- Inlet taper shank (3:25) Appx. 19.8 mm x 17.4 mm over thread X 14 threads per inch right hand taper male .
- Outlet approximately 21.8 mm over the thread x 14 threads per inch left hand parallel male .

4- **INSPECTION AND TESTING:-**

4.1- **General requirements:-**

- A- The manufacturer shall arrange for the supervision and inspection of the cylinders in all stages of manufacturing and testing by an authorized and commissioned inspector. Only DOT and/or NB authorized, accredited and commissioned inspectors shall be allowed to participate in the task of inspection and testing of subject cylinders.
- B- The nationality and place of residence of assigned inspector(s) shall not be the same as that of the manufacturer .
- C- The assigned inspector shall be nominated by an internationally recognized inspection authority /agency such as LLOYDS Register Of Shipping, TUV, Bureau Veritas; Det Norske Veritas ...etc. .
- D- It is the responsibility of the cylinders manufacturer to provide the Company with detailed offer to cover the task of 3rd party inspection. Three options; each covering the inspection activities of a different inspection authority/agency shall be provided for the Company selection. Scope of responsibilities and activities of nominated inspector and inspection authority shall be clearly stated.
The inspection authority shall be totally responsible for the mistakes and misjudgment done by its nominated inspector. The qualification of nominated inspector require the Company's prior approval. The nominated inspector shall not be authorized to approve the nonconformities , whatsoever they are in nature.
- E- Change in the Company's approved and accepted inspector(s) and/or inspection authority is strictly not acceptable.