

SUB-SECTION–E-05

LOW PRESSURE PIPING

LOW PRESSURE PIPING

PIPES, FITTINGS, BENDS, VALVES, COATING-WRAPPING, STRAINERS EXPANSION, JOINTS, TANKS, FASTENERS, LINING ETC.

	Tests/Check Items / Components	Material Test	DPT/MPI / RT	Ultrasonic Test	WPS/ WQS/PQR	Hydraulic / Water Fill Test	Pneumatic Test	Assembly Fit up	Dimensions	Functional/operational Test	Other Tests	All Tests as per relevant Std	REMARKS
1	Pipes & Pipe Fittings	Y ^a	Y ^b			Y ¹			Y			Y	
2	Diaphragm Valves	Y ^a				Y ⁵			Y		Y ⁶		
3A	Cast Butterfly Valves (Low Pressure)					Y		Y	Y	Y	Y ⁷		
	Body	Y ^a	Y ^b										
	Disc	Y ^a	Y ^b										
	Shaft	Y ^a	Y	Y ^c									
3B	Fabricated Butterfly Valves	REFER NOTE 14											
4	Gate/ Globe/Swing Check / Ball Valves	Y ^a	Y ^b	Y ^c		Y ⁵	Y	Y	Y	Y	Y ⁸		
5	Dual Plate Check Valves	Y ^a	Y ^b	Y ^c		Y	Y	Y	Y	Y	Y ⁴		
6	Rolled & Welded Pipes and Mitre Bends	Y ^a	Y ³		Y	Y ³			Y		Y ^{3&15}	Y	
7	Coating & Wrapping of Pipes	Y ²									Y ²		
8	Tanks & Vessels	Y ^a	Y ^b		Y	Y			Y		Y ¹⁶		
9	Strainers	Y ^a	Y ^b		Y #	Y					Y ¹¹		#For Fabricated Strainer
10	Rubber Expansion Joints	Y ^a				Y ¹²		Y	Y		Y ¹³		
11	Internal Lining of Pipes	Y ^a							Y		Y ⁹		
12	Site Welding		Y ¹⁰		Y	Y							
NOTES (MEANING OF SUPERSCRIPTS)													
a	One per heat/heat treatment batch/lot.												
b	On machined surfaces only for castings and on butt welds.												
c	For shaft/spindles > or = 40 mm												
1	100% Hydraulic test shall be carried out. Weld joints not subjected to hydraulic test due to some unavoidable reasons, shall be subjected to 100% RT/PAUT.												
2	Spark Test, Adhesion Test and Material Test for primer and enameled & Coal Tar Tapes as per AWWA-C-203-91/ IS-10221 & IS 15337 as applicable.												
3	Followings are the testing requirements for fabrication of pipes at site												
	TESTS					QUANTUM OF CHECKS							
	WPS, PQR, Welder Qualification Test					100% Welders and WPS shall be qualified as per ASME- section IX							
	DPT on root run					100% for pipes up to 1200 mm diameter							
	DPT after back gauging					100% for pipes above 1200 mm diameter							
	RT / UT by (TOFD/PAUT) Technique					5% (100% of T Joints)							

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	DPT on finished butt weld joints	10%
	Hydraulic Test	100%, 1.5 times the design pressure or 2 times the working-pressure whichever is higher.
4	Dry Cycle Test on Dual Plate Check valve spring for one lakh Cycles shall be carried out as a type test. If Dry Cycle test carried out earlier for same material & diameter, Test report shall be reviewed.	
5	Seat Leakage Test for Actuator Operated Valves, shall be done with by closing the valves with actuator.	
6	Tests on rubber parts shall be conducted per batch of rubber mix for tensile, Elongation, hardness, adhesion, spark test, bleed resistance test. In addition, type test for 50,000 cycles of each type of diaphragm shall also be conducted.	
7	Hydraulic Test of Body, Seat and disc-strength shall be carried out in accordance with governing design standard in presence of owner / owner's representatives. Actuator operated valves shall be checked for Seat Leakage by closing the valves with actuator. For Proof of Design Test refer respective chapters of engineering portion in the technical specification.	
8	Blue matching, wear travel for gates, valves, pneumatic seat leakage, and reduced pressure test for check valves shall be done as per relevant standard. Maximum allowable vacuum loss is 0.5 mm of Hg abs. for valves to be tested for vacuum operation for internal pressure 25 mm of Hg abs. for a period of 15 minutes. Fire safe test for ball valve shall be done wherever specified. In case of already carried out, the test report shall be submitted for review and acceptance by owner / owner's representatives. Valves shall be offered for hydro test in unpainted condition.	
9	Tensile, Elongation, Hardness, Specific Gravity, Lining Thickness, Humidity Check, Pipe temperature check, Adhesion Test and Holiday Detection Test etc as per applicable standard shall be done for all lining material and application.	
10	10% of welds (Root and finished welds) shall be subjected to DPT. (100% DPT for compressed air line and boiler & deaerator fill line.).	
11	Pressure drop across the strainer for each type and size as a special test shall be carried out. In case of already carried out, the test report shall be submitted for review and acceptance by owner / owner's representatives.	
12	During hydraulic and vacuum tests at 25mm Hg abs in 3 positions, the change in the circumference of arch should not be more than 1.5%. 24 hrs after the test permanent set in dimension should not exceed 0.5%.	
13	Tests on rubber for tensile, elongation, hardness, hydraulic stability check as per ASTM D 471, ozone resistance test as per ASTM D 1149/IS 3400 Part 20 aging test and adhesion strength of rubber to fabric, rubber to metal adhesion shall be carried out.	
14	In addition of all tests as indicated for Cast Butterfly valve being applicable for fabricated butterfly valves, following test shall be done for Fabricated Butterfly Valve: - UT as per ASTM A-435/IS 11630 & IS 4225 on plate material for body and disc shall be carried out for plate thickness 25mm and above. 100% RT and DPT as per ASTM, Section-VIII, Division-I, on butt joins of body and disc. 10% DPT on other welds shall be done. - Post weld heat treatment as per ASME, Section-VIII, Division-I on butt joints of body and disc. - Welders and WPS shall be qualified as per ASME- section IX	
15	Maximum number of segments in segmental flanges shall be four (04) only. All butt weld joints in the segmental flanges shall be examined by RT/UT. Segmental flanges exceeding 37.5 mm thickness shall be stress relieved as per norms of ASME Section VIII after welding.	
16	For pressure vessel welds RT shall be done as per design code requirements.	

All Valves shall be offered for inspection in unpainted condition.

No repair welding is permitted on Cast Iron / Alloy Cast Iron Castings.

SUB-SECTION–E-24

FIRE PROTECTION SYSTEM

CLAUSE NO.	QUALITY ASSURANCE	एनटीपीसी NTPC
1.00.00	FIRE DETECTION & PROTECTION SYSTEM	
1.01.00	HYDRANT SYSTEM: Shop Tests	
1.01.01	Hydrant Valve: (a.) All valves shall be hydro tested for body and seat. (b.) Capacity test / flow test shall be done as per relevant standard.	
1.01.02	Water Monitor, Hoses, Branch Pipes, Couplings and Nozzles: (a.) All tests including hydraulic test shall be done as per relevant Indian / International standard.	
1.01.03	For Pumps, Diesel Engine, refer the requirements are indicated separately.	
1.02.00	HIGH / MEDIUM VELOCITY WATER SPRAY & SPRINKLER SYSTEM: Shop Tests	
1.02.01	For Pipes, Fittings, Valves and specialties, requirements are indicated separately.	
1.02.02	Deluge Valves, Alarm Valves and Spray Sprinkler Nozzles (a.) All valves shall be hydro tested for body and seat. (b.) Performance test / functional test of 'Deluge Valves', 'Alarm Valves' and 'Spray Nozzles' shall be carried out.	
1.02.03	Detectors: All 'Detectors' shall be tested as per relevant Indian / International Standards. Detectors shall also meet the requirements of UL / FM / LPC/VDS etc.	
1.03.00	HORIZONTAL CENTRIFUGAL PUMP:	
1.03.01	SHOP TESTS (a.) UT on Pump Shaft ($\geq 50\text{mm}$ dia) and MPI / DPT on Pump Shaft and Impeller shall be carried out. (b.) All rotating components of the pumps shall be statically and dynamically balanced as per IS: 21940 Gr. 6.3 or better. (c.) Hydraulic test shall be conducted on pump casing with water at 1.5 times the shut off pressure or twice the rated pressure whichever is higher for a minimum duration of 30 minutes. (d.) Performance test and Standard Running test: (1.) All the pumps shall be tested in the manufacturer's works for capacity, efficiency, head and brake horsepower. Pump shall be given running test over the entire operating range covering the shut	
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	off head to the maximum flow. The duration of test shall be minimum one hour. A minimum of five readings approximately equidistant shall be taken for plotting the curves with one point at design flow. Testing of pump shall be in accordance with stipulations oh Hydraulic Institute Standard (HIS) and / or as per applicable Indian Standard or equivalent. Tolerance of parameters shall be as per HIS. (2.) The test shall be conducted at the rated speed preferably with the type tested contract drive motor being furnished. However, in case of any limitation test bed motor duly calibrated can also be used. (3.) Noise and vibration shall be measured. (4.) Pumps shall be subjected to strip down examination visually to check for mechanical damages after testing at shop in case abnormal noise level / vibration performance are observed during the shop test.		
1.04.00	COMPRESSION IGNITION DIESEL ENGINE		
1.04.01	Shop Tests:		
	(a.) All pressure parts shall be subjected to hydraulic pressure tests at 1.5 times the design pressure.		
	(b.) All Diesel engine shall be performance tests as per relevant IS / equivalent code.		
1.04.02	Performance Test :		
	Performance test of diesel engine shall be carried out as per BS-5514 to determine the rated power and specific fuel consumption and governor's function. Performance test of engine in shop shall be done with actual job accessories for minimum four hours (three hours for full load and one hour for over load at 110% of full load). All the engine parameters like RPM, inlet airs temp and pressure, water inlet and outlet temp. And pressure, lub. Oil pressure, fuel consumption, ambient condition shall be measured and recorded for every half an hour. No positive tolerance shall be allowed on the specific fuel consumption (contractor to specify in the offer.)		
1.05.00	STORAGE VESSELS: Shop Test		
1.05.01	Atmospheric Tank		
	(a.) All weld joints shall be DP Tested and complete tanks shall be water fill tested.		
	(b.) All atmospheric storage tanks fabricated and erected at site shall be subjected to all tests (Hydro, NDT, and Vacuum) according to design code as applicable.		
1.06.00	PIPING, VALVE AND SPECIALITIES		
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1.06.01	SHOP TESTS (a.) All pipes and fittings shall be tested as per applicable code. (b.) DPT of pipe welds (in case of rolled and welded pipes only) shall be carried out for root and finished welds. (c.) All strainers shall be subjected to hydraulic pressure test for leakage and Pressure drop v/s Flow for each type and size. (d.) All valves shall be hydraulically tested for body, seat and back seat (if applicable) as per relevant standard. Check valves shall also be tested for leak tightness test at 25% of the specified seat test pressure. (e.) Valves shall be offered for hydro test in unpainted condition. (f.) Functional checks of the valves for smooth opening and closing shall also be done. (g.) Anti-corrosive protection shall be tested as per applicable code.	
1.07.00	PORTABLE & MOBILE FIRE EXTINGUISHERS	
1.07.01	SHOP TEST (a.) All fire extinguishers shall be tested as per relevant standard. (b.) Performance / function test shall be carried out on sampling basis as per relevant code / standard.	
1.08.00	EOT Crane a) Chain pulley Blocks shall be tested as per IS: 3832. b) Electrical wire rope hoists shall be tested as per IS : 3938 c) Following NDT requirements shall be met: (i) 100% RT of Butt welds in tension and 10% RT of butt welds in compression. (ii) DP at random on all weldments. c) Deflection, load, overload & travel check on EOT crane assembly shall be carried out as per IS: 3177.	
1.09.00	SITE TESTS: (a.) Fire Extinguishers: A performance demonstration test at site of five (5) percent or one (1) number, whichever is higher, of each type and capacity of the extinguisher shall be carried out by the contractor. All consumables and	
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	replaceable items require for the contractor without any extra cost to employer would supply this test would be supplied by the Contractor without any extra cost to employer. (b.) Piping Protection: (1.) Thickness, Holiday by spark test, Adhesion test shall be carried out as per relevant standard. (2.) Complete piping shall be Hydro pressure tested, at 1.5 X DP or 2 X MWP whichever is higher, before protection. (c.) Welding of Pipes: (1.) ERW Black / rolled welded: 100% DPT on root of butt and finish weld of butt and fillet. RT on 10% randomly selected joints shall be carried out (for underground piping). (2.) GI Pipes Welding on GI Pipes in general shall not be done. Welding of GI Pipes, if permitted by design, (butt / socket / fillet weld) shall be done strictly as per approved drawing and procedure approved by NTPC Engineering. For all such welds 100% DP test and random 1% RT shall be done.
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SUB-SECTION–E-56

ELECTRICAL ACTUATOR

CLAUSE NO.	QUALITY ASSURANCE														
	ELECTRICAL ACTUATOR WITH INTEGRAL STARTER														
	Test/Attributes Characteristics ITEM/ COPONENT/ SUB SYSTEM ASSEMBLY/ TESTING	RPM ®	No Load Current ®	IR & HV Test®	Mounting Dimension®	All routine Test as per Standard & Specification®	Correct Phase Sequence®	Operation & Setting of limit Switch/Torque Switch®	Stall Torque/Current (A)	Hand Wheel operation/ Auto de clutch function (A)	Function of Aux. like Potentiometer, space heater, position indicator ®	EPT output ®	Local/ Remote (Open-Stop-Close) Operation®	Safety check (Single phasing, Phase correction, Tripping etc.) (A)	
	ELECTRICAL ACTUATOR with Integral Starter , Non-Intrusive Electrical Actuator (EN15714-2)														
	Motor	Y	Y	Y	Y	Y									
	Final Testing	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
	Note: 1) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the practices and procedure adopted along with relevant supporting documents. - SIL 2 certificate if applicable ® - Routine Test (A) - Acceptance Test Y - Test applicable														
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