Laboratory	**Quality Assurance Laboratories, Ship Building Centre, Naval Base (P.O), Dhruv Bldg. No. 15, Godavari Gate, Scindia Road, Visakhapatnam, Andhra Pradesh**		
Accreditation Standard	**ISO/IEC 17025: 2005**		
Discipline	**Chemical Testing**	**Issue Date**	**18.09.2014**
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S.No.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
I.	**METALS AND ALLOYS**			
1.	**Carbon, Low alloy steel**	Carbon	ASTM E 415 - 2008	0.05 % to 1.1 %
		Silicon		0.07 % to 1.15 %
		Manganese		0.10 % to 2.0 %
		Phosphorus		0.003 % to 0.065 %
		Sulfur		0.002 % to 0.055 %
		Chromium		0.03 % to 3.5 %
		Molybdenum		0.01 % to 0.6 %
		Nickel		0.01 % to 5.0 %
		Aluminium		0.01 % to 0.6 %
		Cobalt		0.008 % to 0.18 %
		Copper		0.04 % to 0.5 %
		Vanadium		0.001 % to 0.7 %
		Tin		0.005 % to 0.02 %
		Titanium		0.004 % to 0.4 %
2.	**Stainless steel**	Carbon	ASTM E 1086 - 2008	0.005 % to 0.25 %
		Silicon		0.01 % to 1.5 %
		Manganese		0.01 % to 2.0 %
		Phosphorus		0.005 % to 0.15 %
		Sulfur		0.001 % to 0.060 %
		Chromium		9.0 % to 27.0 %
		Molybdenum		0.05 % to 3.0 %
		Nickel		0.1 % to 35.0 %

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	Stainless steel	Cobalt	ASTM E 1086 - 2008	0.001 % to 1.0 %
		Copper		0.01 % to 0.70 %
		Niobium		0.001 % to 0.6 %
		Titanium		0.001 % to 0.8 %
		Vanadium		0.001 % to 0.3 %
		Tungsten		0.001 % to 0.3 %
		Tin		0.001 % to 0.1 %
		Arsenic		0.001 % to 0.1 %
		Nitrogen		0.001 % to 0.2 %
3.	**Nickel base alloy**	Carbon	QA-LAB/WI/CHEM-TPR-02 Issue no.4 ; Issue date: 04/11/13 (OES)	0.03 % to 0.18 %
		Silicon		0.05 % to 1.50 %
		Phosphorus		0.003 % to 0.06 %
		Sulfur		0.001 % to 0.02 %
		Chromium		0.03 % to 23.0 %
		Molybdenum		0.02 % to 28.0 %
		Iron		2.0 % to 9.0 %
		Copper		0.05 % to 34.0 %
		Aluminium		0.01 % to 0.4 %
		Cobalt		0.1 % to 3.0 %
		Niobium		0.01 % to 4.5 %
		Titanium		0.04 % to 0.5 %
		Manganese		0.02 % to 2.0 %

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4.	**Copper and Copper alloys**	Tin	QA LAB/WI/CHEM-TPR-02 Issue no.4 ; Issue date: 04/11/13 (OES)	0.002 % to 12.0 %
		Lead		0.003 % to 10.0 %
		Zinc		0.003 % to 42.0 %
		Phosphorus		0.002 % to 1.0 %
		Manganese		0.001 % to 8.0 %
		Iron		0.003 % to 4.5 %
		Nickel		0.002 % to 35.0 %
		Silicon		0.004 % to 6.0 %
		Arsenic		0.001 % to 0.3 %
		Bismuth		0.004 % to 0.2 %
		Aluminium		0.005 % to 15.0 %
		Sulfur		0.001 % to 0.12 %
		Titanium		0.003 % to 0.25 %
5.	**Titanium & Titanium alloys**	Aluminium	QA-LAB/WI/CHEM-TPR-02 Issue no.4 ; Issue date: 04/11/13 (OES)	0.02 % to 6.5 %
		Chromium		0.010 % to 0.020 %
		Iron		0.12 % to 0.20 %
		Manganese		0.0015 % to 0.005 %
		Molybdenum		0.001 % to 0.005 %
		Nitrogen		0.003 % to 0.10 %
		Oxygen		0.05 % to 0.20 %
		Silicon		0.001 % to 0.03 %
		Tin		0.004 % to 0.012 %
		Vanadium		0.002 % to 4.5 %

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	Titanium & Titanium alloys	Zirconium Carbon	QA-LAB/WI/CHEM-TPR-02 Issue no.4 ; Issue date: 04/11/13 (OES)	0.001 % to 0.005 % 0.003 % to 0.015 %
6.	**Carbon, Low alloy, Stainless Steel**	Carbon Sulfur	ASTM E 1019 - 2011	0.03 % to 6 % 0.005 % to 0.4 %
II.	**PAINTS AND SURFACE COATING**			
1.	**Paints for marine applications**	Colour	IS 5 : 2007	Qualitative
		Surface Dry	IS 101 (Part 3/ Sec 1) : 2001	Qualitative
		Hard Dry	IS 101 (Part 3/ Sec 1) : 2001	Qualitative
		Gel Time	NCD 1416 Appx. C-1992	30 minutes to 8 hrs
		Pot life	NCD 1457 (Part-1) Appx. A-1997, NCD 1435 Appx. A-1992, IS 14209 (Annex B) : 1994 (RA 2004)	30 minutes to 8 hrs
		Viscosity by Flow Cups	ASTM D 1200 - 2010	10 s to 200 s
		Viscosity by stormer type viscometer	ASTM D 562 - 2010	150 cP to 4000 cP
		Viscosity by cone & plate viscometer	ASTM D 4287 - 2010	1 P to 100 P

S.No.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
	Paints for marine applications	Mass per Ten litre	IS 101 (Part 1/Sec 7) : 1987 (RA 2004)	0.1 kg/10L to 20 kg/10L
		Flash Point	ASTM D 3828 - 2012	30 ^{o}C to 200 ^{o}C
		Grind in Microns	ASTM D 1210 - 2010	10 μm to 100 μm
		Sag resistance/Index	ASTM D 4400 - 2012	50 μm to 675 μm
		Gloss (20°, 60°, 85°)	ASTM D 523 - 2008	1 GU to 2000 GU
		Flexibility test/ Bend Test	IS 101 (Part 5/Sec 2) : 1998 (RA 2004)	Qualitative (Mandrel dia: 2, 3, 4, 5, 6, 8, 10, 12, 13, 16, 19, 20, 25 & 32 mm)
		Scratch Hardness	IS 101 (Part 5/Sec 2) : 1998 (RA 2004)	Qualitative
		Gumming Test	NCD 1457 Part I Appx. D - 1997	0.1 mg/ml to 1 mg/ml
		Pigment content	IS 101 (Part 8/Sec 2) : 2007	10 % to 60 %
		Binder content	IS 101 (Part 8/Sec 2) : 2007	5 % to 60 %
		Volatile matter	IS 101 (Part 2/Sec 2) : 2007	5 % to 60 %
		Mass solids (Non Volatile matter)	IS 101 (Part 2/Sec 2) : 2001	5 % to 80 %

S.No.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
	Paints for marine applications	Opacity/Spreading capacity	IS 101 (Part 4/Sec 1) : 2004 (Checkers board method)	1 m^2/L to 100 m^2/L
		Volume Solids	IS 101 (Part 8/Sec 6): 2004	10 % to 80 %
		Dry film Thickness	IS 101 (Part 3/Sec 2): 2004	10 μm to 1500 μm
		Adhesion	ASTM D 4541 - 2009	Qualitative (1 MPa to 18 MPa)
		Impact test	IS 101 (Part 5/Sec 3) : 1919 (RA 2004) Method-B	Qualitative (10 cm to 100 cm 1 kg & 2 kg load)
		Fire retardance	IS 1874 Annex D-2004	Qualitative (200 ^oC to 600 ^oC)
		Resistance to salt spray	IS 101 (Part 6/Sec 1) : 1988 (RA 2005)	Qualitative
		Resistance to condensation	IS 101 (Part 6/Sec 1) : 1988 (RA 2005)	Qualitative
		Resistance to sulfuric acid	NCD 1457 (Part II/Appx. B) 1997	Qualitative
		Resistance to distilled water	NCD 1457 (Part I/Appx. E) 1997	1 mS/cm to 200 mS/cm
		Resistance to liquids	IS 101 (Part 7/Sec 2) : 2005 NCD 1457 (Part 1/Appx. C) 1997	Qualitative

S.No.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
	Paints for marine applications	Resistance to sea water or fresh water	NCD 1457 (Part I/Appx. B) 1997	Qualitative
		Resistance to Intemitant immersion in sea water & fresh water	NCD 1416 (Appx. E) 1992	Qualitative
		Resistance to Sea water under cathodic protection condition	NCD 1416 (Appx. F) 1992 NCD 1417 (Appx. B) 1991	Qualitative
III.	**WATER**			
1.	**DM Water/Boiler Water**	pH	IS 3025 (Part 11) : 1983 (RA 2002)	1 to 14
		Conductivity	IS 3025 (Part 14) : 1984 (RA 2002)	0.01 µs/cm to 400 µs/cm
		Salinity	2520 B, APHA 22nd Edition, 2012	0.1 mg/L to 200 mg/L
		Total dissolved solids	IS 3025 (Part 14): 1984(RA 2002)	0.1 mg/L to 200 mg/L
		Total residue	GOST 27026 : 1986	0.2 mg/L to 10 mg/L
		Nitrate as NO_3	USEPA 300.0 - 1993 (By Ion Chromatography)	0.001 mg/L to 1 mg/L
		Chloride as Cl^-		0.001 mg/L to 50 mg/L
		Flouride as F^-		0.001 mg/L to 1 mg/L
		Nitrite as NO_2		0.001 mg/L to 1 mg/L

S.No.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
	DM Water/Boiler Water	Bromide as Br^-	USEPA 300.0 - 1993 (By Ion Chromatography)	0.001 mg/L to 1 mg/L
		Phosphate as PO_4		0.001 mg/L to 3 mg/L
		Sulphate as SO_4		0.001 mg/L to 20 mg/L
		Sodium as Na^+	ASTM D 6919 - 09 (By Ion Chromatography)	1 mg/L to 100 mg/L
		Lithium as Li^+		1 mg/L to 100 mg/L
		Calcium as Ca^+		1 mg/L to 100 mg/L
		Ammonium as NH_4^+		1 mg/L to 500 mg/L
		Potassium as K^+		1 mg/L to 100 mg/L
		Magnesium as Mg^{2+}		1 mg/L to 100 mg/L
		Iron as Fe	IS 3025 (Part 53) : 2003	0.01 mg/L to 1.0 mg/L
		Aluminium as Al	IS 3025 (Part 55) : 2003	0.02 mg/L to 1.0 mg/L
		Copper as Cu	IS 3025 (Part 42): 1992 (RA 2003)	0.02 mg/L to 1.0 mg/L
		Lead as Pb	IS 3025 (Part 47): 1994 (RA 2003)	0.004 mg/L to 1.0 mg/L
		Zinc as Zn	IS 3025 (Part 49): 1994 (RA 2003)	0.02 mg/L to 1.0 mg/L
		Hydrazine	ASTM D 1385 - 2013	1.0 mg/L to 500 mg/L
		$KMnO_4$ deoxidizing substances	GOST 6709 : 1972	Qualitative (Pass /Fail)

S.No.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
	DM Water/ Boiler Water	Dissolved oxygen	IS 3025 (Part 38) : 1989 (RA 2003)	2.0 mg/L to 15 mg/L
		Turbidity	IS 3025 (Part 10) : 1984 (RA 2002)	0.01 NTU to 1000 NTU
		Alkalinity as $CaCO_3$	IS 3025 (Part 23) : 1986 (RA 2003)	2.0 mg/L to 500 mg/L
		Density	IS 3025 (Part 12) : 1984 (RA 2002)	0.996 g/cc to 1.190 g/cc
		Silica	ASTM D 859 - 2010	0.02 mg/L to 3 mg/L
		Oil content	ASTM D 7066 - 2011	0.1 mg/L to 200 mg/L
IV.	**OILS & LUBRICANTS**			
1.	**Lube oil, Hydraulic oil and fuel oil**	Specific Gravity	ASTM D 1298 - 2012 IS 1448 (Part 32) : 1992 (RA 2003)	0.65 to 1.01
		Kinematic Viscosity	ASTM D 445 - 2012	0.6 mm^2/s to 1000 mm^2/s
		Breakdown voltage	IS 6792 : 1992 (RA 2007)	(0 to 90) kV
		Boiling point	ASTM D 1120 - 2011	100 ^oC to 420 ^oC

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	Lube oil, Hydraulic oil and fuel oil	Flash Point	ASTM D 93 - 13	50 ^{o}C to 360 ^{o}C
		Particle counts/100 ml (R-Method)	ASTM D 6786 - 2008 GOST 17216	NAS class 00 to 14 per (1 µm to 100 µm)
		Water Content	IS 1448 (Part 40): 1987 (RA 2006) QA-LAB/WI/OIL-TPR-10 Issue No: 4 ; Issue Date: 4/11/13	0.1 % to 2.5 %
		Water & Sediment Content	IS 1448 (Part 41): 1992 (RA 2003) ASTM D 1796 - 2009	0.1 % to 50 %
		Salt water contamination	QA-LAB/WI/OIL-TPR-07 Issue No: 4 ; Issue Date: 4/11/13	Qualitative (Pass/ Fail)
		Wear Particle Analysis	QA-LAB/WI/OIL-TPR-08 Issue No: 4 ; Issue Date: 4/11/13	Qualitative (Presence/Absence)
		Viscosity Index	IS 1448 (Part 56) : 1980 (RA 2003)	40 to 200
		Ash Content	IS 1448 (Part 4) : 2008	0.01 % to 5 %
		Mass fraction of mechanical impurities	GOST 25821-83	0.0001 % to 0.05 %

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