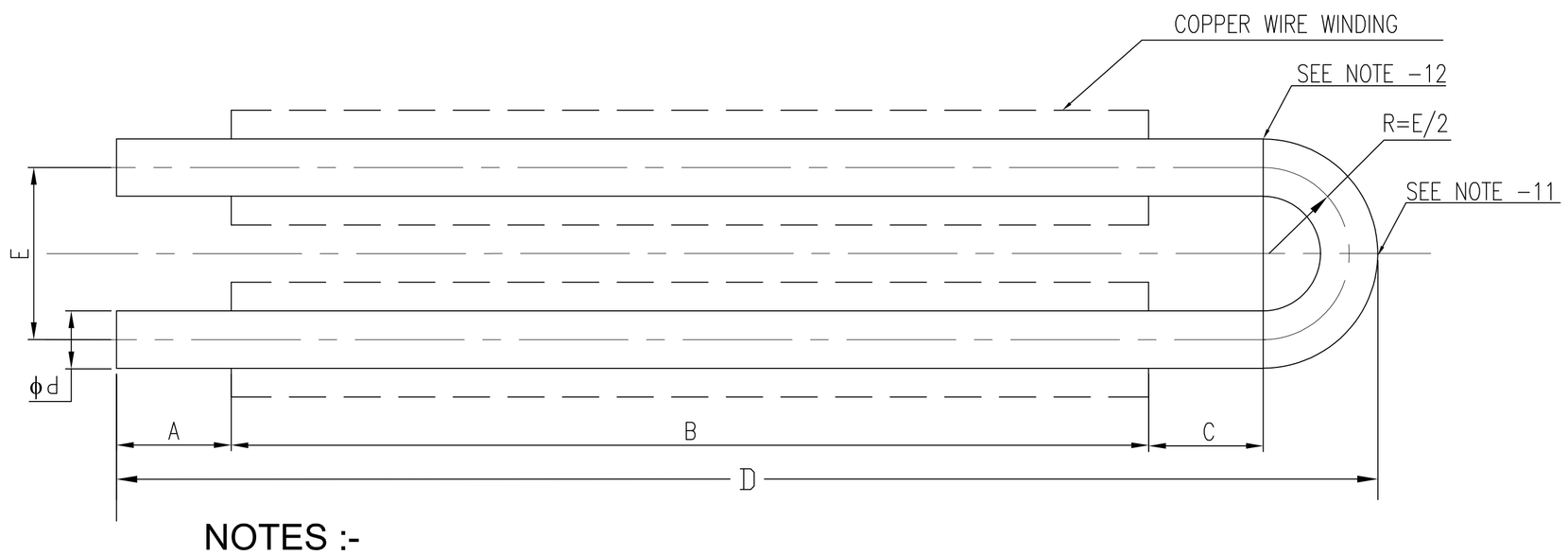
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO.2-16505-40219

ITEM NO.	TUBE O/D ϕd	A	B	C	D	E	DEV LENGTH	WINDING FORMULA	HYD. TEST PR. AFTER WINDING AND BENDING	TUBE WEIGHT IN KG	COPPER CONTENT IN KG	NICKEL CONTENT IN KG
001	12.7(1/2")	30	438	25	522	45.6	1058	22/1/2"/19/1.515"/30.8/52.6/.05 NO.150	20 Kg/cm² g	1.139	1.104	0.035
002	9.5(3/8")	25	445	25	517	33.4	1043	24/3/8"/19/1.3"/37.6/67.9/.05 NO.157	20 Kg/cm² g	0.783	0.758	0.025
003	9.5(3/8")	25	245.5	25	317	33.4	643.5	24/3/8"/19/1.3"/37.6/67.9/.05 NO.157	20 Kg/cm² g	0.449	0.433	0.016
004	12.7(1/2")	41	638	25	733	45.6	1480	22/1/2"/19/1.515"/30.8/52.6/.05 NO.150	20 Kg/cm² g	1.639	1.59	0.049
005	12.7(1/2")	30	588	25	672	45.6	1358	22/1/2"/19/1.515"/30.8/52.6/.05 NO.150	20 Kg/cm² g	1.509	1.464	0.045
006	12.7(1/2")	30	338	25	422	45.6	858	22/1/2"/19/1.515"/30.8/52.6/.05 NO.150	20 Kg/cm² g	0.894	0.865	0.029
007	12.7(1/2")	30	388	25	472	45.6	958	22/1/2"/19/1.515"/30.8/67.9/.05 NO.157	20 Kg/cm² g	1.209	1.177	0.032
008	12.7(1/2")	30	238	25	322	45.6	658	22/1/2"/19/1.515"/30.8/52.6/.05 NO.157	20 Kg/cm² g	0.647	0.625	0.022
009	12.7(1/2")	30	388	25	472	45.6	958	22/1/2"/19/1.515"/30.8/52.6/.05 NO.157	20 Kg/cm² g	1.016	0.984	0.032
010	12.7(1/2")	30	488	25	572	45.6	1158	22/1/2"/19/1.515"/30.8/52.6/.05 NO.157	20 Kg/cm² g	1.263	1.224	0.039
011	12.7(1/2")	30	718	25	802	45.6	1618	22/1/2"/19/1.515"/30.8/52.6/.05 NO.157	20 Kg/cm² g	1.829	1.775	0.054
012	12.7(1/2")	30	568	25	652	45.6	1317	22/1/2"/19/1.515"/30.8/52.6/.05 NO.157	20 Kg/cm² g	1.460	1.416	0.044
013	12.7(1/2")	30	773	25	857	45.6	1727	22/1/2"/19/1.515"/30.8/52.6/.05 NO.157	20 Kg/cm² g	1.965	1.907	0.058
014	9.5(3/8")	25	295	25	367	33.4	742.5	24/3/8"/19/1.3"/37.6/67.9/.05 NO.157	20 Kg/cm² g	0.532	0.514	0.018
015	12.7(1/2")	30	618	25	702	45.6	1418	22/1/2"/19/1.515"/30.8/52.6/.05 NO.157	20 Kg/cm² g	1.583	1.536	0.047
016	9.5(3/8")	25	195	25	267	33.4	542.5	24/3/8"/19/1.3"/37.6/67.9/.05 NO.157	20 Kg/cm² g	0.364	0.351	0.013
017	12.7(1/2")	30	413	25	497	45.6	1008	22/1/2"/19/1.515"/30.8/52.6/.05 NO.157	20 Kg/cm² g	1.078	1.044	0.034
018	12.7(1/2")	30	288	25	372	45.6	758	22/1/2"/19/1.515"/30.8/52.6/.05 NO.157	20 Kg/cm² g	0.770	0.745	0.025
019	12.7(1/2")	30	418	25	502	45.6	1017	22/1/2"/19/1.515"/30.8/52.6/.05 NO.157	20 Kg/cm² g	1.090	1.056	0.034
020	12.7(1/2")	30	368	25	452	45.6	917	22/1/2"/19/1.515"/30.8/52.6/.05 NO.157	20 Kg/cm² g	0.967	0.936	0.031
021	12.7(1/2")	30	638	25	722	45.6	1458	22/1/2"/19/1.515"/30.8/52.6/.05 NO.157	20 Kg/cm² g	1.632	1.583	0.049
022	12.7(1/2")	30	308	25	392	45.6	797	22/1/2"/19/1.515"/30.8/52.6/.05 NO.157	20 Kg/cm² g	0.819	0.793	0.027
023	12.7(1/2")	30	538	25	622	45.6	1257	22/1/2"/19/1.515"/30.8/52.6/.05 NO.157	20 Kg/cm² g	1.386	1.344	0.042
024	9.5(3/8")	25	315	25	387	33.4	782	24/3/8"/19/1.3"/37.6/67.9/.05 NO.157	20 Kg/cm² g	0.565	0.547	0.019
025	12.7(1/2")	30	613	25	697	45.6	1407	22/1/2"/19/1.515"/30.8/52.6/.05 NO.157	20 Kg/cm² g	1.570	1.524	0.047



NOTES :-

1. TUBE MATERIAL :-
   90 / 10 CUPRO NICKEL TO AA12130 IN BRIGHT ANNEALED CONDITION.
2. **CONDTION OF BASE TUBE :-**
   FULL LENGTH SHALL BE BRIGHT ANNEALED CONDITION SUITABLE FOR EXPANSION AT BOTH ENDS.
3. **FIN MATERIAL :-**
   (a) COPPER WIRE AS PER IS-191 (ETP GRADE) HAVING CONDUCTIVITY 97% IACS (MIN.).
   (b) SOLDER TO IS:193 GRADE Sn60.
4. **TESTING :-** FOLLOWING TESTS ARE TO BE CONDUCTED ON TUBES AS PER AA12130
   (a) BASE TUBE :-
   (i) MECHANICAL AND CHEMICAL.
   (ii) HYDROSTATIC AND EDDY CURRENT TEST BEFORE WINDING AS PER AA12130.
   (iii) MERCUROUS NITRATE AND MICROSCOPIC EXAMINATION.
   (b) WIRE :-
   (i) COPPER WIRE CONDUCTIVITY & PURITY TEST.
   (C) HYD. TEST :-
   (i) FINAL HYDROSTATIC TEST AS PER CHART.
5. **TEST CERTIFICATES :-**
   6 COPIES OF EACH FOR ABOVE TESTS.
6. **GENERAL :-**
   WINDING & ENDS ARE TO BE FIRMLY SECURED WITH THE TUBE TO GIVE EFFECTIVE HEAT TRANSFER AND WITHSTAND TRANSPORT AND OPERATIONAL HAZARDS.
7. **INSPECTION :-**
   (i) FOR DETAIL QUALITY REQUIREMENTS, REFER BHEL STANDARD QAP CDE-09-2703.
   (ii) TUBES ARE TO BE INSPECTED BY CUSTOMER OR THEIR AUTHORISED REPRESENTATIVE AND SUPPLIER SHOULD PROVIDE ALL FACILITIES FOR INSPECTION AT THEIR WORKS.
8. **CONDITION OF DELIVERY :-**
   (i) INSIDE OF TUBE IS TO BE FREE FROM CARBONEOUS MATERIAL, DUST, OIL ETC.
   (ii) THE TUBES SUPPLIED SHALL BE ROUND, SMOOTH, STRAIGHT CLEAN & FREE FROM HARMFUL DEFECTS (e.g. WRINKLES, SCRATCHES, TOOL MARKS, DENTS, ETC.)
   (iii) THE ENDS OF TUBE TO BE SQUARE, DEBURRED AND CAPPED BEFORE DISPATCH.
9. **GUARANTEE :-**
   TUBES SHALL BE GUARANTEED AGAINST DEFECTS IN MATERIAL, TREATMENT AND WORKMANSHIP FOR A PERIOD OF30 MONTHS AFTER DESPATCH OR 12 MONTHS AFTER ACTUAL USE IN OUR EQUIPMENT WHICH EVER IS EARLIER.
10. **PACKING & MARKING :-**
   (i) THE TUBES SHALL BE SUITABLY PACKED TO AVOID MOVEMENTS AND RUBBING.
   (ii) THE CONSIGNMENT SHOULD BE ENDORSED WITH TUBES FOR OIL COOLER AND P.O. NO.

11. - MINIMUM THICKNESS AT BEND ≥ 0.915 mm (FOR BOTH 12.7 & 9.5 O/D TUBES).
    - BEND PORTION TO BE D.P. TESTED AS PER APPENDIX - 8 OF ASME SEC-VIII DIV.1.
    - HARDNESS OF TUBE TO BE LIMITED TO 110 HV (INCLUDING BEND PORTION ALSO).
    - MAJOR OUTSIDE DIAMETER AT BEND ≤ 13.3 FOR 12.7 mm O/D TUBES.
      ≤ 10.0 FOR 9.5 mm O/D TUBES.

12. DISTANCE BETWEEN TUBE LEGS (OUTSIDE) AT TANGENT PORTION ≤ 58.5 FOR 12.7 mm O/D TUBES.
    ≤ 43.0 FOR 9.5 mm O/D TUBES.

DETAIL OF WINDING FORMULA

WIRE GAUGE	TUBE O.D.	TUBE GAUGE	DIA OVER LOOPS	LOOPS PER INCH	COILS PER FT RUN	MANDREL WIDTH (INCH)	MANDREL NO.

REV.	DATE		
15	25.11.20	ALTERED	विजय कुमार कुशवाहा
		CHECKED	अरुण कुमार सिंह
		APPD.	ललित अरनामी

ZONE NOTE 3 (a) & 4(b) MODIFIED.

REV.	DATE		
14	27.10.2020	ALTERED	विजय कुमार कुशवाहा
		CHECKED	अरुण कुमार सिंह
		APPD.	सुजीत के विश्वास

ZONE ITEM NO. 24,25 ADDED.

REV.	DATE		
13	19.12.19	ALTERED	विजय कुमार कुशवाहा
		CHECKED	अरुण कुमार सिंह
		APPD.	सुजीत के विश्वास

ZONE ITEM NO. 22,23 ADDED.

REV.	DATE		
12	11.04.18	ALTERED	विजय कुमार कुशवाहा
		CHECKED	अरुण कुमार सिंह
		APPD.	सुजीत के विश्वास

ZONE ITEM NO. 21 ADDED.

REV.	DATE		
11	05.04.17	ALTERED	विजय कुमार कुशवाहा
		CHECKED	अरुण कुमार सिंह
		APPD.	सुजीत के विश्वास

ZONE ITEM NO. 20 ADDED.

REV.	DATE		
10	07.03.17	ALTERED	विजय कुमार कुशवाहा
		CHECKED	अरुण कुमार सिंह
		APPD.	सुजीत के विश्वास

ZONE ITEM NO.19 ADDED.

ADDITIONAL INFORMATION

STATUS OF DRAWING

DISTRIBUTION OF PRINTS

OC - 1 HCM - 4

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: PLUG IN TYPE OIL COOLER

BHARAT HEAVY ELECTRICALS LTD. BHOPAL

	NAME	SIGN	DATE
DRN	PAWAR	-sd/-	23.12.09
CKD	SKB/MKS	-sd/-	23.12.09
APPD	RAJEEV	-sd/-	23.12.09

NO. OF VAR.

DEPT. CDE	UNTOL. DIMS. GR.	SCALE	WEIGHT(K.G.)	REF.TO ASSY.DRG.	ITEM NO.	NO.OF ITEM
CODE 411	--					

TITLE TUBE FOR PLUG IN TYPE OIL COOLER (WITH 19-SWG TK BASE TUBE)

DRAWING NO. 2-16505-40219 REV. 15

SHT. NO. 01 NO. OF SHT. 01

A2 SIZE

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REF. DRG. NO.

SIGN. & DATE

INVENTORY NO.