एनटीपीसी
NTPC
A Maharatna Company

HAND BOOK
Of AIR COOLED CONDENSER
(ACC)

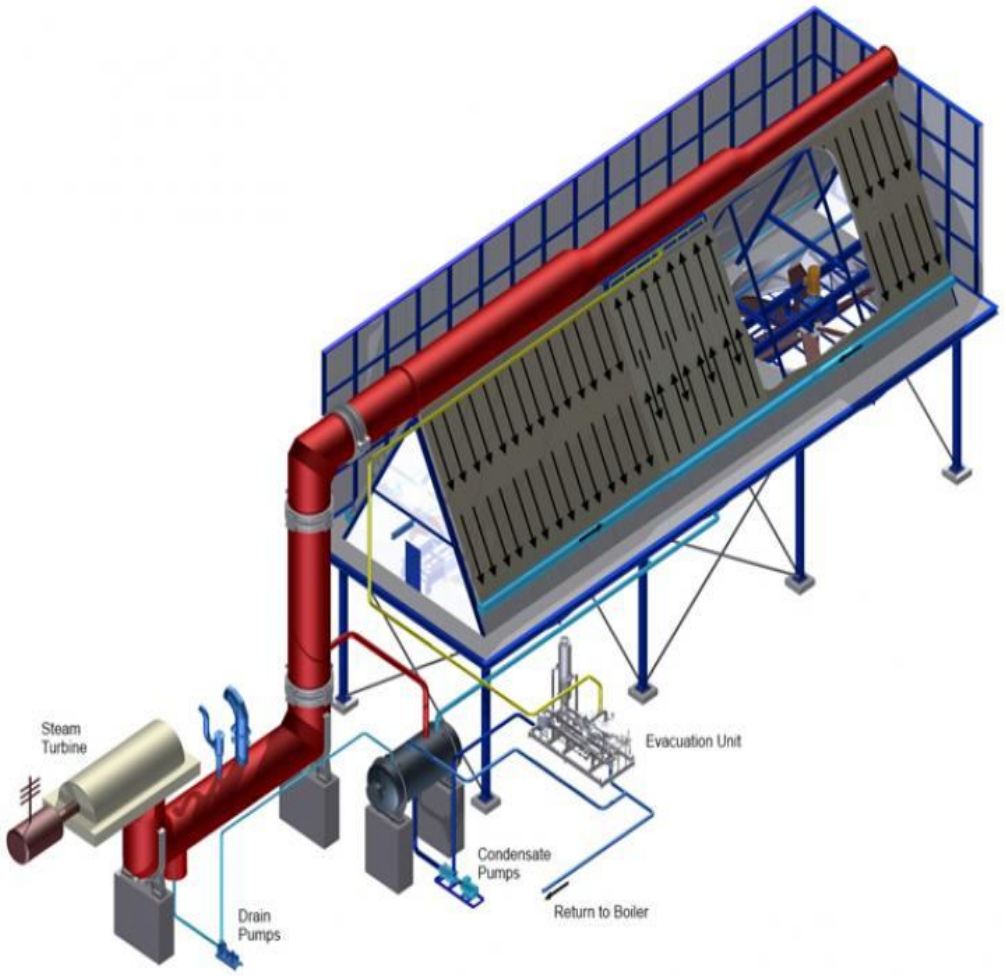
Prepared by:-

S. Chakraborty
A.P. Samal
Yogesh Kumar

Introduction

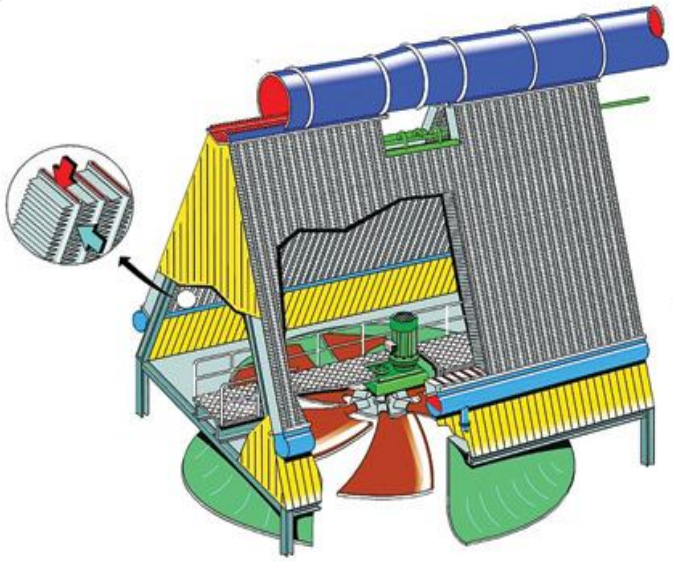
North Karanpura STPP (3x660 MW) is equipped with Direct Air Cooled type Condensers (ACC), A-frame configuration with single row, flat finned tubes and mechanical ventilation. Turbine exhaust steam passes through the steam headers and tube bundles. The Cooling air by axial flow fans passes over the outer surface of the finned tubes.

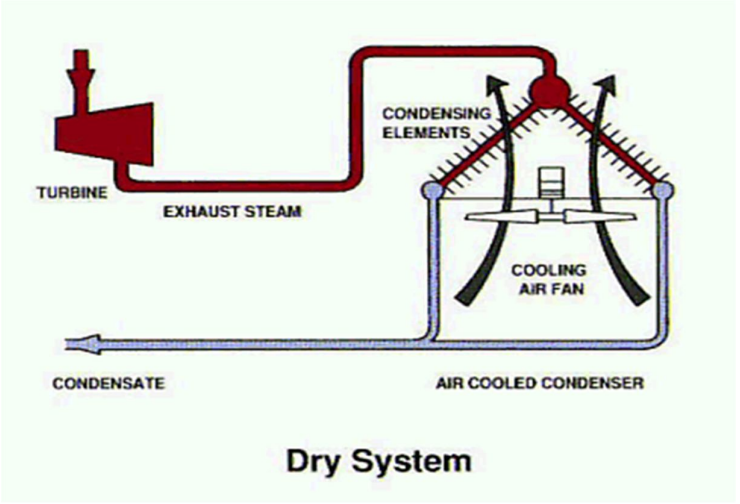
The ACC consists of a numbers of "A" frame type streets of finned tube elements. Each street contains several modules each composed of bundles of finned tubes. In a street there is a combination of Condensing or "K" type and Dephlegmator or "D" type tube bundles. The top of D-Bundles is connected to vacuum system for removal of non-condensable.



Design Parameters

Sl No	Parameter	Unit	Condenser Design	TMCR Guarantee
1	**Ambient Temperature**	^{0}C	38	38
2	**Condenser Pressure**	mmHg(a)	106.6	196
3	**Unit Heat Rate**	Kcal/Kwh	--------	2236.9
4	**Heat Load to ACC**	MW	799.24	791.07
5	**LMTD**	^{0}C	6.734	10.79
6	**Heat Tx Area Required**	m^2	3513530	
7	**Heat Tx Area Provided**	m^2	3708980	
8	**Fans at 100% Speed**	No.	90	10
9	**Fans at 50% Speed**	No.	0	80
10	**Wind Speed**	m/s	5	5
11	**Steam flow rate**	TPH	1275.3	1276.7
12	**Steam Enthalpy**	KJ/Kg	2460.54	2498.25
13	**Max Design Pressure**	Bar(g)	0.5	
14	**Minimum Design Pressure**		Full Vacuum	

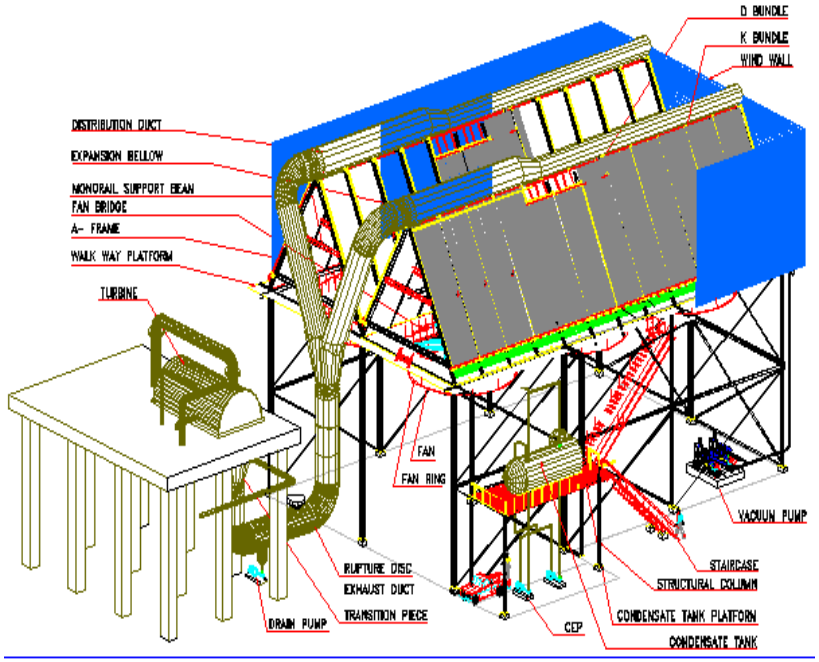




Dry System

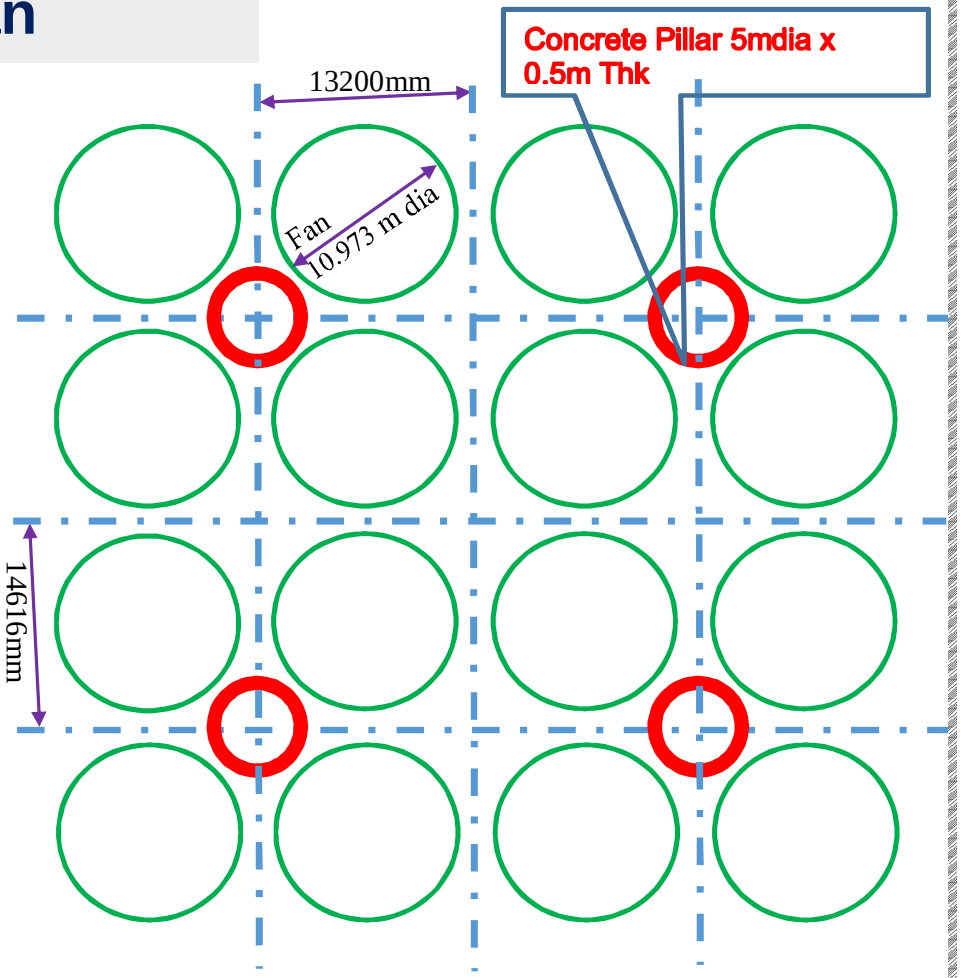
Constructional Details

S No	Description	Unit	Value
1	Number of Streets per Unit	No.	10
2	Number of Fan Modules per street	No.	9
3	Number of Tube bundle per street/side	No.	63
4	Number of “K” Bundles per street/side	No.	55
5	Number of “D” Bundles per street/side	No.	8
6	Number of tubes per Tube Bundle/side	No.	36
7	Width of Tube bundle (Along street)	mm	2088
8	Length of Street	m	131.54
9	Width of street	m	13.2
10	Length of “K” Bundle	mm	11652
11	Height of ACC Bundle	mm	11452
12	A-frame included angle	Deg	57.00
13	Material of Tube Sheet	SA-516 Gr 70	
14	Material of Fin	A3003 (Aluminium)	
15	Material of Tube (C.S. with aluminium cladding)	DC01+C290 (EN10139)	

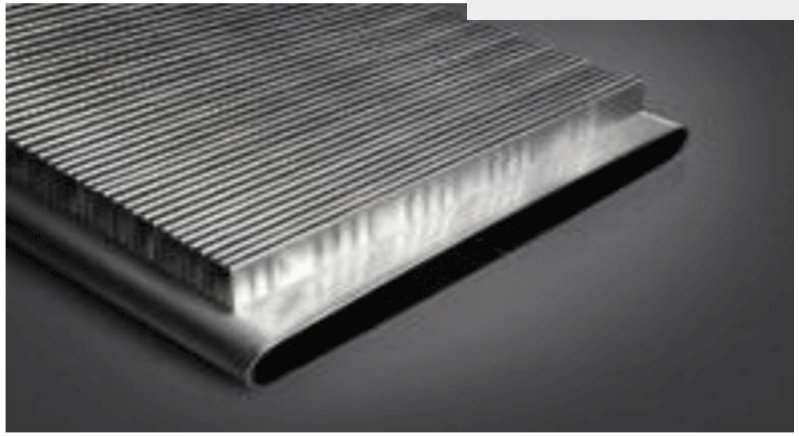


Plot Plan

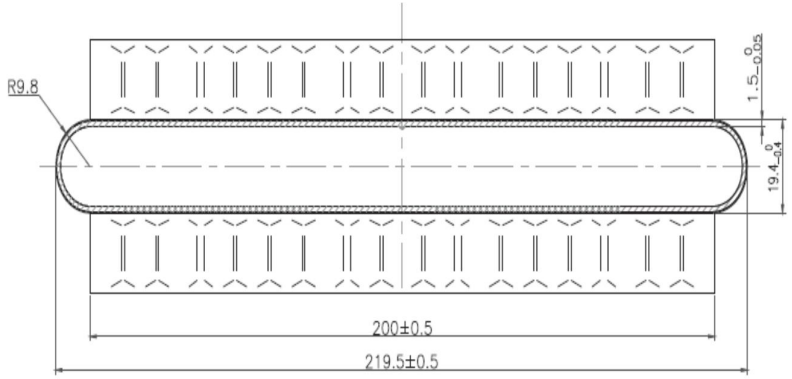
S No	Description	Unit	Value
1	Plot area (for One Unit)	m x m	149.5 x 134.8
2	Number of RCC columns	No.	25
3	Height of RCC column	m	55
4	Diameter of RCC column	m	5
5	Thickness of RCC column	m	0.5
6	Pitching	m	29.2 / 26.4
7	Fan Deck level	m	63
8	Height of structural steel truss	m	8
9	Main Exhaust Steam Duct diameter	mm	9200
10	Steam Riser duct diameter (for street)	mm	3020



Finned Tube Details



S No	Description	Unit	Value
1	Tube width	mm	19.4
2	Tube depth	mm	219.5
3	Tube thickness	mm	1.5
4	Fin Channel Height	mm	19.2
5	Fin Depth	mm	200
6	Fin thickness	mm	0.25
7	Tube pitch	mm	58
8	Fin pitch	mm	4.6
9	No of fin on each side of “D” tube	No.	2490
10	No of fin on each side of “K” tube	No.	2533



ACC Cleaning System

S No	Description	Unit	Value
1	Components	Movable ladder, Spray nozzles, Manifolds, Valves	
2	Type (Semi-Automatic)	Movable ladder: Manual Spray nozzle: Automatic	
3	Cleaning water flow	TPH	11
4	Cleaning Pump suction pressure	Bar(g)	>= 2.0
5	Cleaning pump discharge pressure	Bar (g)	80-100
6	Cleaning Time (One side of street)	Hours	13~17
7	Cleaning Time (One ACC)	Hours	260~340

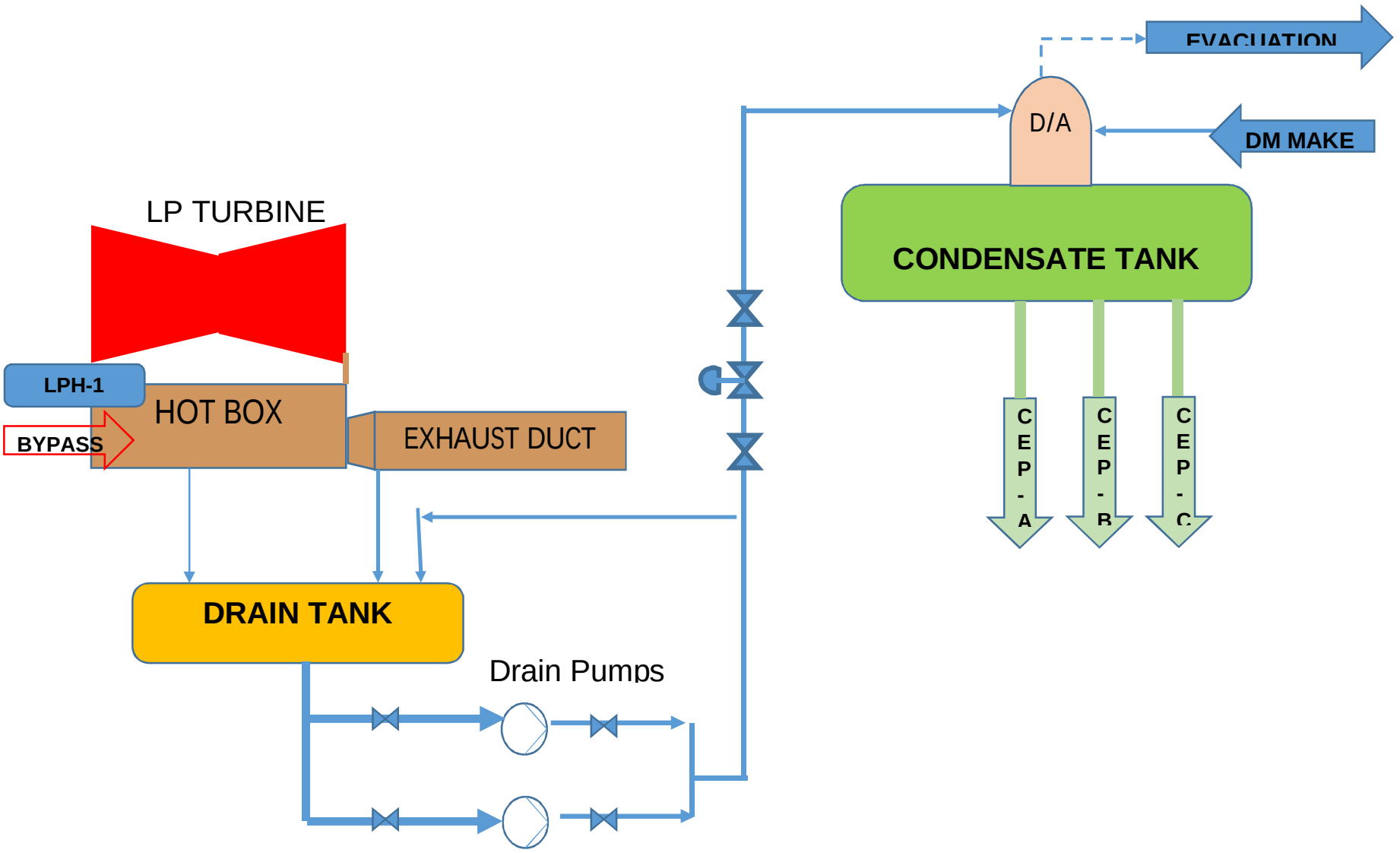
Drain Tank:

S No	Description	Unit	Value
1	Vessel Type		Cylindrical shell
2	Head Type		2:1 Ellipsoidal heads
3	Material		SA-285 Gr C
4	Shell Inside Diameter	mm	2600
5	Shell Length	mm	9000
6	Design pressure	Bar(g)	0.5
7	Design Temperature	Deg C	120
8	Volume at Normal operating Level	m^3	40

Condensate Tank with Deaerator:

S No	Description	Unit	Value
1	Vessel Type		Cylindrical shell
2	Head Type		2:1 Ellipsoidal heads
3	Material		SA-285 Gr C
4	Shell Inside Diameter	mm	3300
5	Shell Length	mm	15000
6	Design pressure	Bar(g)	0.5
7	Design Temperature	Deg C	120
8	Volume at Normal operating Level	m^3	93

ACC Drain Scheme



ACC Fan & Gear-Box

Fan Data

S No	Description	Unit	Value
1	Type of fan		36DLM6
2	Manufacturer		HOWDEN
3	Fan Blade material		FRP
4	Number of Fans per unit	No.	90
5	Fan Diameter	mm	10973
6	Number of Fan blades	No.	6
7	Cooling air flow per fan	m^3/s	871.5
8	Fan static pressure	Pa	127.7
9	Fan static pressure recovery	Pa	13
10	Duty point of fan static pressure	Pa	114.7
11	Tip speed (Fan Blade)	m/s	53.4
12	Rotational Speed	Rpm	93
13	Fan shaft power (Required)	kW	161.7
14	Fan Motor selected power	kW	200

Gear Box Data

S No	Description	Details
1	Type of Gearbox	Helical
2	Make	HANSEN
3	Type of oil used	ISO VG 220
4	Material (Housing)	ASTM A48
5	Material (Gears & Pinion Shaft)	EN 10084 (18 Cr NiMo7-6)
6	Material (Low speed Shaft)	DIN17200 (42CrMo4)
7	Material (Lateran)	ASTM A48