Contract for the Centralized Procurement and Preassembly of Piping Systems for ITER

SUMMARY

Purpose

The purpose of this Contract is the Centralized Procurement and Preassembly of Piping Systems for ITER. The major ITER piping systems is the Cooling Water System (CWS) but other systems like Vacuum distribution as well as the Cryolines warm distributions are considered in this contract due to the similarity of the procurements.

Background

The ITER Cooling Water System (CWS) consists of the Tokamak Cooling Water System (TCWS), the Component Cooling Water System (CCWS), the Chilled Water System (CHWS), and the Heat Rejection System (HRS)

The TCWS is designed to reject all the heat generated in the plasma and transmitted to the in-vessel components to the intermediate closed loop Component Cooling Water System (CCWS-1) and then to the environment via the open Heat Rejection System (HRS). In particular, during the D-T Plasma phase, the heat transmitted and generated in the in-vessel component (IVCs) will be transferred, through the Primary Heat Transfer Systems (PHTSs) to the intermediated closed Component Cooling Water System (CCWS-1) and then, via the open loop Heat Rejection System (HRS), to the environment.

The HRS also absorbs heats through the CCWS-2 from other non-nuclear systems like the Chilled Water System (CHWS), the Cryogenic System, the Steady State Electrical Power Network (SSEPN) and other auxiliary systems. The CCWS-2 is further divided in CCWS-2A, 2B, 2C, and 2D to provide separated chemical control and prevent galvanic corrosion among the different material (SS, Cu, Al) of the clients' components.

CHWS is divided in CHWS-H1 for SIC systems and CHWS-H2 for non-sic components. The HRS rejects all the heat from ITER components (nuclear and non-nuclear) to the environment.

The total heat load to be removed at reference plasma operation by the CWS is about 1200 MW with the following single design requirements (excluding contemporary operations but including margin):

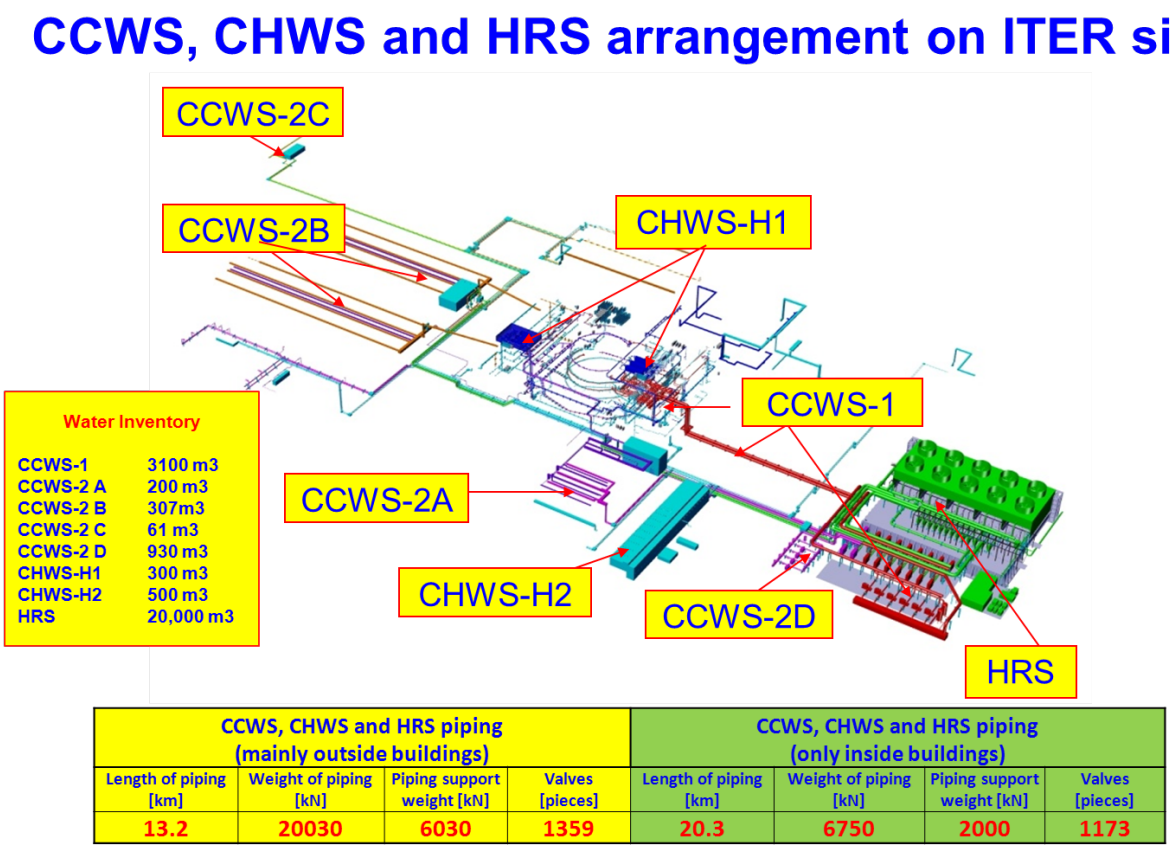
- TCWS is designed for about 1100 MW – 6100 kg/s;
- CCWS-1 is designed for about 982 MW – 5800 kg/s;
- CCWS-2 is designed for about 164 MW – 4300 kg/s with the:
    - CCWS-2A is designed for about 40 MW – 900 kg/s;
    - CCWS-2B is designed for about 28 MW – 1100 kg/s;
    - CCWS-2C is designed for about 6 MW – 160 kg/s;
    - CCWS-2D is designed for about 90 MW – 2150 kg/s;
- CHWS-H1 is designed for about 2.2 MW – 90 kg/s;
- CHWS-H2 is designed for about 27.5 MW – 1100 kg/s;

- HRS is designed for about 500 MW – 10500 kg/s.

The CCWS, CHWS and HRS systems are arranged as reported in the Fig. 1. The piping distribution is divided in two groups:

1. the piping distributed mainly in trenches or buried outside the buildings;
2. the piping distributed inside the buildings with the final connection to the clients' stubs.

The overall piping length and weight is reported in the table in the Fig. 1 for each group.



CCWS, CHWS and HRS piping (mainly outside buildings)				CCWS, CHWS and HRS piping (only inside buildings)			
Length of piping [km]	Weight of piping [kN]	Piping support weight [kN]	Valves [pieces]	Length of piping [km]	Weight of piping [kN]	Piping support weight [kN]	Valves [pieces]
13.2	20030	6030	1359	20.3	6750	2000	1173

Figure 1 - CCWS, CHWS and HRS arrangement on ITER site

The TCWS systems are arranged as reported in the Fig. 2. The TCWS piping length and weight is reported in the table in the Fig. 3.

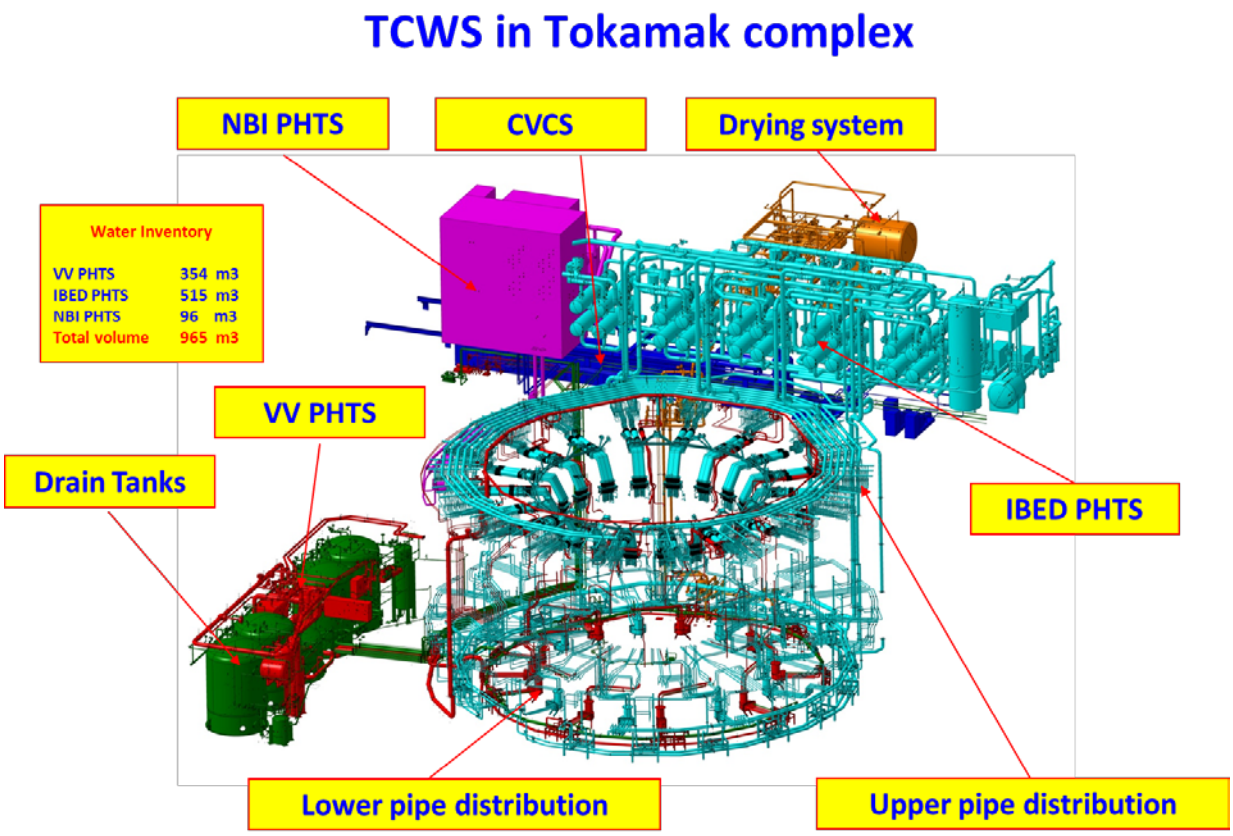


Figure 2- TCWS arrangement in Tokamak Complex

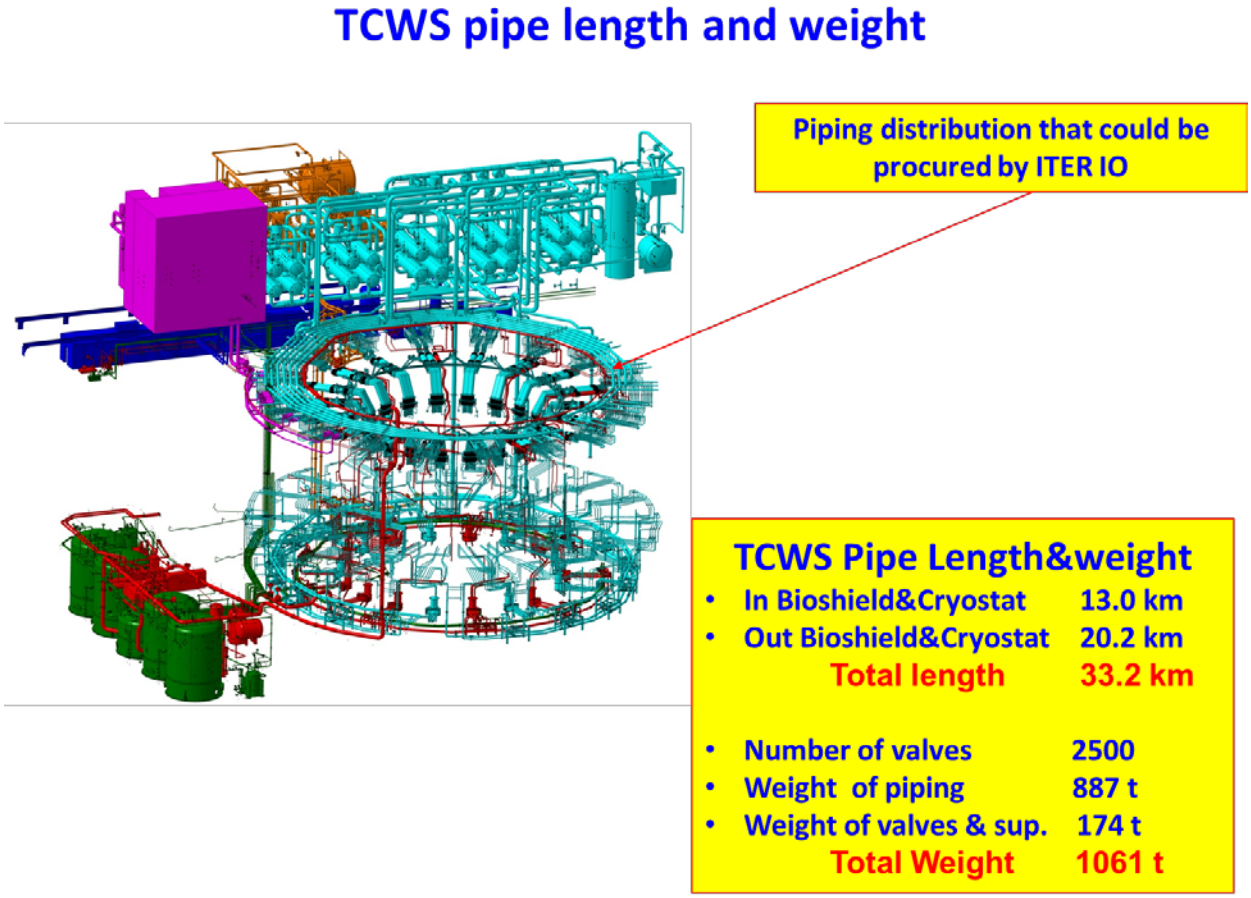


Figure 3- TCWS piping length and weight

The TCWS is mainly arranged in modules to be pre-installed, tested and certified as pressure equipment according to the ESP-ESPN French regulations. Some examples of TWS modules are shown in Figs. 4 and 5.

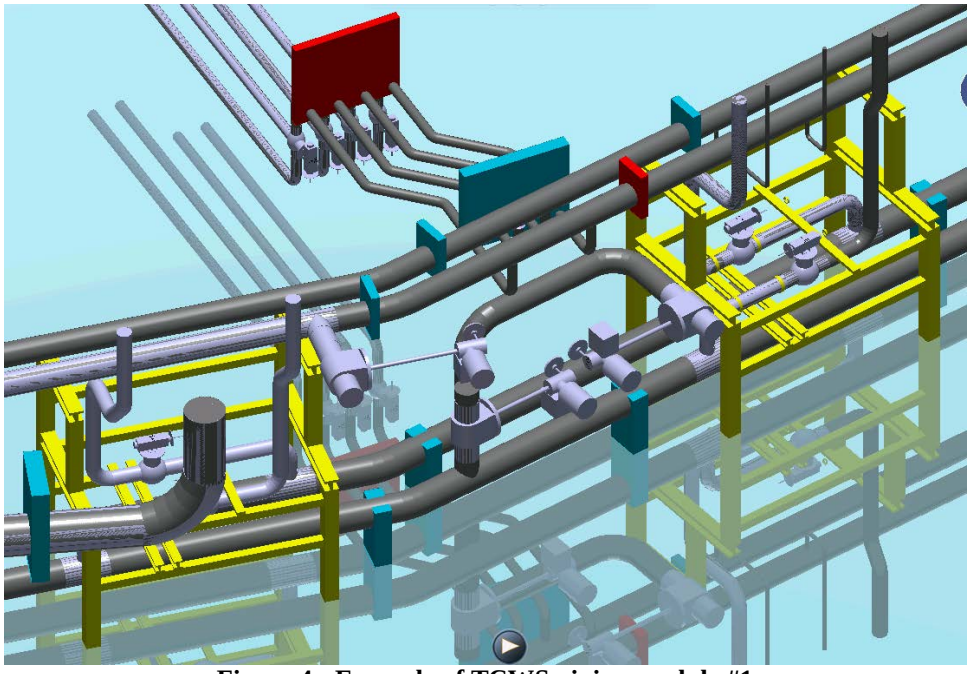


Figure 4 - Example of TCWS piping module #1

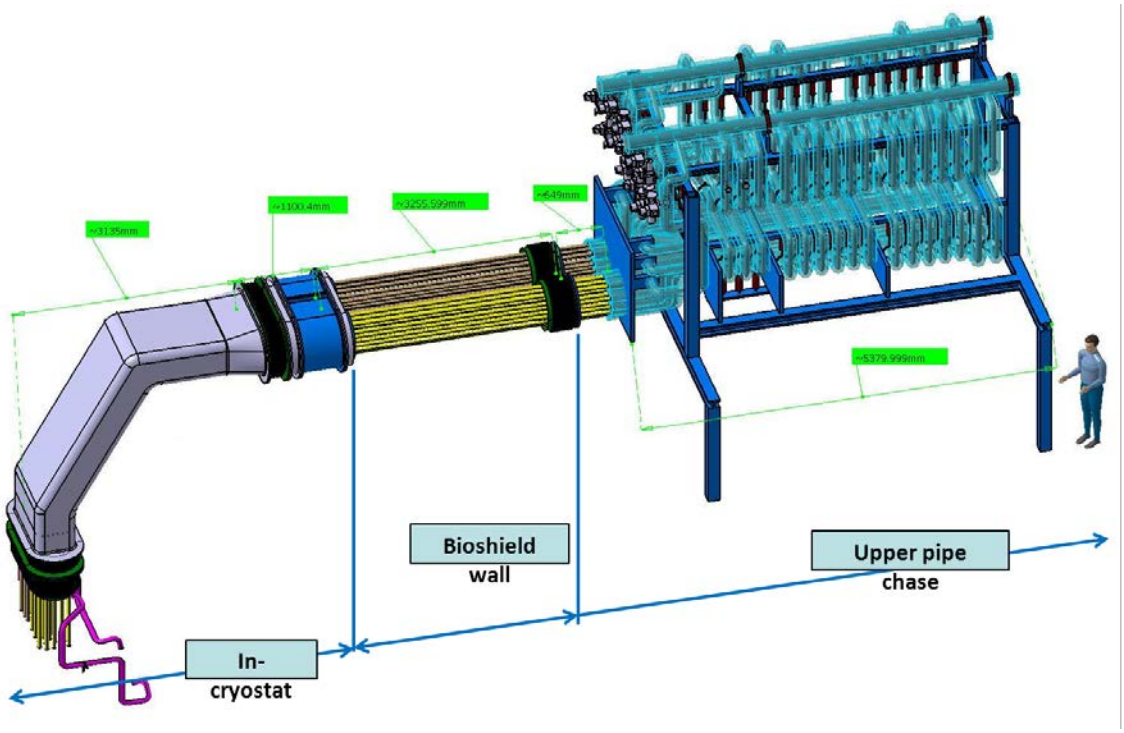


Figure 5 - Example of TCWS piping module #2

The Tenderer, awarded and having signed the Contract shall be denominated as the Contractor.

Scope of work

The contractor shall execute the following activities, in compliance with the French Quality Order of 7 February 2012, in compliance with the applicable ESP-ESPN classification and conformity requirements, and under the direct supervision of the selected NB or ANB, where applicable:

1. propose solutions to optimize the piping design introducing modularity and prefabrication, using spools, skids and support structures, as driven by the IO assembly requirements;
2. apply best value for money criteria to evaluate subtier suppliers and manufacturers of piping materials and components and to submit a list to IO for approval;
3. procure the piping, fitting and valves according to the IO Technical Specifications and selected codes & standards (ASME), based on quantity estimates provided by IO. ;
4. execute the prefabrication or pre-assembly of the piping in skids or spools with supporting structures as proposed by the Contractors and accepted by IO following the IO assembly schedule
5. execute piping examination and testing, NDE inspections and hydrotestings according to the selected codes & standards (ASME);
6. provide packaging, temporary storage and shipping of piping materials and preassembled spools from workshops to ITER site at Cadarache;
7. provide the necessary certification of conformity.

Estimated Duration and Timetable

The duration of the Contract will be approximately 5 years from the date of the signature.

The ITER Organization explicitly reserves the right to decide whether or not to extend the Contract for other piping systems.

The tentative timetable of the applicable Call for Tender procedure is as follows:

- Call for Pre-qualification July 2013
- Call for Tender Sept 2013
- Tender submission Oct 2013
- Contract placement Dec 2013

Experience

The potential tenderers shall have proven experience in the following areas:

- Design of large and complex cooling systems for Nuclear Power Stations according to ASME codes & standards and in compliance with the French regulations (QO 1984, ESP/ESPN for Pressure Equipments);

- Supply of piping systems and piping supports for nuclear island and/or for auxiliary circuits according to ASME codes & standards and in compliance with the French regulations (QO 1984, ESP/ESPN for Pressure Equipments). Pre-fabrication and fabrication of piping systems, modules, spools, skids, and supporting structures in qualified workshops in compliance with the French regulation (QO 1984, ESP-ESPN for Pressure Equipments) and under the control of NB and ANB

Particular interest shall be paid to the Tenderers that have or plan to have workshop nearby or in close proximity (< 50 km) to IO site at Cadarache.

Candidature

Participation is open to all legal persons participating either individually or in a grouping (consortium) which is established in an ITER Member State. A legal person cannot participate individually or as a consortium partner in more than one application or tender. A consortium may be a permanent, legally-established grouping or a grouping, which has been constituted informally for a specific tender procedure. All members of a consortium (i.e. the leader and all other members) are jointly and severally liable to the ITER Organization.

The consortium groupings shall be presented at the pre-qualification stage. The tenderer's composition cannot be modified without the approval of the ITER Organization after the pre-qualification.

Legal entities belonging to the same legal grouping are allowed to participate separately if they are able to demonstrate independent technical and financial capacities. Candidates (individual or consortium) must comply with the selection criteria. The IO reserves the right to disregard duplicated reference projects and may exclude such legal entities from the pre-qualification procedure.

Annex -1

Tab I - Draft estimation of TCWS piping

Steel- Grade	SIZE	Quantity	Weight	Total Weight	Remarks
	mm.	Unit	kg/unit	kg	
Piping inside Bioshield &Cryostat					
ASME SA312 GR.TP304L Cobalt controlled	DN25	142.3	2.52	359	Cobalt < 0.05%
ASME SA312 GR.TP304L Cobalt controlled	DN40	6843.5	4.08	27921	Cobalt < 0.05%
ASME SA312 GR.TP304L Cobalt controlled	DN50	1639.7	5.47	8969	Cobalt < 0.05%
ASME SA312 GR.TP304L Cobalt controlled	DN65	1930.5	8.69	16776	Cobalt < 0.05%
ASME SA312 GR.TP304L Cobalt controlled	DN90 (guard)	1450	13.57	19677	Cobalt < 0.05%
ASME SA312 GR.TP304L Cobalt controlled	DN100	276.5	16.18	4473	Cobalt < 0.05%
ASME SA312 GR.TP304L Cobalt controlled	DN150 (guard)	504	28.44	14335	Cobalt < 0.05%
ASME SA312 GR.TP304L Cobalt controlled	DN200 (guard)	227.6	42.82	9744	Cobalt < 0.05%
	Subtotal	13014.1	m	**102254**	kg
ASME SA312 GR.TP304L Cobalt controlled	TEE DN40	26	0.48	12	Cobalt < 0.05%
ASME SA312 GR.TP304L Cobalt controlled	TEE DN100 (pipe)	28	3.985	112	Cobalt < 0.05%
ASME SA312 GR.TP304L Cobalt controlled	TEE DN150 (guard)	28	10.1	283	Cobalt < 0.05%
ASME SA312 GR.TP304L Cobalt controlled	REDUCER DN40-DN25	62	0.48	30	Cobalt < 0.05%
ASME SA312 GR.TP304L Cobalt controlled	REDUCER DN100-DN65	56	3.985	223	Cobalt < 0.05%
ASME SA312 GR.TP304L Cobalt controlled	REDUCER DN150-DN90	56	10.1	566	Cobalt < 0.05%
ASME SA312 GR.TP304L Cobalt controlled	ELBOW DN25	59	0.195	12	Cobalt < 0.05%
ASME SA312 GR.TP304L Cobalt controlled	ELBOW DN40	13	0.48	6	Cobalt < 0.05%
ASME SA312 GR.TP304L Cobalt controlled	ELBOW DN65	270	1.475	398	Cobalt < 0.05%
ASME SA312 GR.TP304L Cobalt controlled	ELBOW DN150 (pipe)	20	10.1	202	Cobalt < 0.05%
ASME SA312 GR.TP304L Cobalt controlled	ELBOW DN200 (guard)	20	20.3	406	Cobalt < 0.05%
	Subtotal	638	unit	**2249**	kg
			Total	**104503**	kg
Piping outside Bioshield &Cryostat					
ASME SA312 GR.TP304L	DN20	106	1.7	180	
ASME SA312 GR.TP304L	DN25	279	2.52	704	
ASME SA312 GR.TP304L	DN40	4878	4.08	19904	
ASME SA312 GR.TP304L	DN50	1578	5.47	8632	
ASME SA312 GR.TP304L	DN65	5508	8.69	47864	
ASME SA312 GR.TP304L	DN80	964	11.36	10952	
ASME SA312 GR.TP304L	DN100	1015	16.18	16415	
ASME SA312 GR.TP304L	DN150	984	28.44	27991	
ASME SA312 GR.TP304L	DN200	1136	42.82	48644	
ASME SA312 GR.TP304L	DN250	763	60.7	46313	
ASME SA312 GR.TP304L	DN300	735	75.9	55768	
ASME SA312 GR.TP304L	DN350	375	93.7	35150	

ASME SA312 GR.TP304L	DN400	159	123.5	19650	
ASME SA312 GR.TP304L	DN450	323	156.2	50379	
ASME SA312 GR.TP304L	DN500	1191	183	217956	
ASME SA312 GR.TP304L	DN600	113	254.5	28828	
ASME SA312 GR.TP304L	DN650	41	280	11488	
	Subtotal	20149	m	**646818**	kg
ASME SA312 GR.TP304L	Fittings DN20	103	0.11	11	
ASME SA312 GR.TP304L	Fittings DN25	107	0.195	21	
ASME SA312 GR.TP304L	Fittings DN40	5908	0.48	2836	
ASME SA312 GR.TP304L	Fittings DN50	1399	0.76	1063	
ASME SA312 GR.TP304L	Fittings DN65	3140	1.475	4632	
ASME SA312 GR.TP304L	Fittings DN80	352	2.02	711	
ASME SA312 GR.TP304L	Fittings DN100	396	3.985	1578	
ASME SA312 GR.TP304L	Fittings DN150	636	10.1	6424	
ASME SA312 GR.TP304L	Fittings DN200	308	20.3	6252	
ASME SA312 GR.TP304L	Fittings DN250	273	36	9828	
ASME SA312 GR.TP304L	Fittings DN300	178	53	9434	
ASME SA312 GR.TP304L	Fittings DN350	130	68	8840	
ASME SA312 GR.TP304L	Fittings DN400	59	89.2	5263	
ASME SA312 GR.TP304L	Fittings DN450	99	113	11187	
ASME SA312 GR.TP304L	Fittings DN500	414	140	57960	
ASME SA312 GR.TP304L	Fittings DN600	24	202	4848	
ASME SA312 GR.TP304L	Fittings DN650	18	241.4	4345	
	Subtotal	13544	unit	**135233**	kg
			Total	**782051**	**kg**
			Grand Total	**886554**	**kg**

Annex -2

Tab II - Draft estimation of CCWS, CHWS piping inside building

Building	System	Pipe Size	Weight, kg/m	Length, m	Total Weight (Stainless Steel), Kg	Total Weight (Carbon Steel), Kg
Building 13	CCWS-2A	DN450	105.16	180	18928.8	
		DN100	16.07	30	482.1	
Building 15	CCWS-2A	DN500	117.15	0	0	
		DN400	93.27	25	2331.75	
		DN300	73.88	165	12190.2	
		DN250	60.31	23	1387.13	
		DN200	42.55	240	10212	
		DN150	28.26	20	565.2	
		DN100	16.07	280	4499.6	
	CCWS-2D	DN500	117.15	40		4686
		DN400	93.27	60		5596.2
		DN250	60.31	150		9046.5
B15 Annex	CCWS-2A	DN650	152.87	51	7796.37	
		DN500	117.15	41	4803.15	
		DN450	105.16	103	10831.48	
		DN100	16.07	40	642.8	
Building 21	CHWS-H1	DN150	28.26	560		15825.6
	CHWS-H2	DN350	81.33	300		24399
Building 23	CHWS-H2	DN150	28.26	0		0
Building 24	CHWS-H2	DN350	81.33	60		4879.8
		DN150	28.26	50		1413
Building 32	CCWS-2A	DN100	16.07	560	8999.2	
	CCWS-2B	DN750	176.84	60	10610.4	
		DN600	141.12	20	2822.4	
		DN500	117.15	60	7029	
		DN450	105.16	60	6309.6	
		DN350	81.33	10	813.3	
		DN300	73.88	550	40634	
		DN200	42.55	550	23402.5	
		DN80	11.29	70	790.3	
		DN50	5.44	40	217.6	
		DN25	3.38	10	33.8	
Building 33	CCWS-2A	DN100	16.07	640	10284.8	
	CCWS-2B	DN500	117.15	100	11715	
		DN300	73.88	560	41372.8	

		DN200	42.55	560	23828	
Building 34	CCWS-2B	DN250	60.31	80	4824.8	
	CHWS-H2	DN150	28.26	140		3956.4
Building 37	CCWS-2B	DN150	28.26	180	5086.8	
	CCWS-2C	DN200	42.55	180	7659	
	CHWS-H2	DN200	42.55	70		2978.5
Building 38	CCWS-2C	DN300	73.88	30	2216.4	
		DN200	42.55	150	6382.5	
		DN100	16.07	10	160.7	
		DN50	5.44	10	54.4	
Buildings 51-52-53	CCWS-2D	DN600	141.12	100		14112
		DN500	117.15	75		8786.25
		DN400	93.27	160		14923.2
		DN300	73.88	70		5171.6
		DN150	28.26	60		1695.6
		DN100	16.07	85		1365.95
		DN50	5.44	130		707.2
	CHWS-H2	DN300	73.88	205		15145.4
Building 61	CHWS-H2	DN800	188.82	0		0
		DN300	73.88	0		0
		DN250	60.31	160		9649.6
		DN100	16.07	10		160.7
Building 71	CHWs-H2	DN100	16.07	20		321.4
Building 11	CCWS-1	DN200	42.55	140	5957	
		DN150	28.26	20	565.2	
		DN100	16.07	20	321.4	
		DN65	8.63	350	3020.5	
		DN40	4.05	20	81	
		DN40	4.05	200	810	
	CCWS-2A	DN400	93.27	0	0	
		DN200	42.55	500	21275	
		DN150	28.26	35	989.1	
		DN100	16.07	600	9642	
		DN50	5.44	200	1088	
		DN50	5.44	200	1088	
	CCWS-2B	DN100	16.07	700	11249	
		DN50	5.44	200	1088	
	CHWS-H1	DN200	42.55	300	12765	
		DN150	28.26	10	282.6	
		DN50	5.44	260	1414.4	

		DN25	3.38	20	67.6	
		DN40	4.05	100	405	
	CHWS-H2	DN400	93.27	15	1399.05	
		DN350	81.33	15	1219.95	
		DN300	73.88	20	1477.6	
		DN250	60.31	15	904.65	
		DN200	42.55	100	4255	
		DN150	28.26	900	25434	
		DN100	16.07	800	12856	
		DN80	11.29	70	790.3	
		DN65	8.63	20	172.6	
		DN50	5.44	600	3264	
		DN25	3.38	100	338	
		DN40	4.05	500	2025	
Building 14	CCWS-1	DN1600	474.09	0	0	
		DN1400	414.17	0	0	
		DN800	188.82	0	0	
		DN500	117.15	150	17572.5	
		DN300	73.88	15	1108.2	
		DN250	60.31	15	904.65	
		DN200	42.55	140	5957	
		DN150	28.26	30	847.8	
		DN100	16.07	50	803.5	
		DN80	11.29	250	2822.5	
	CHWS-H1	DN200	42.55	0	0	
		DN150	28.26	0	0	
		DN80	11.29	10	112.9	
		DN50	5.44	300	1632	
		DN25	3.38	150	507	
		DN40	4.05	100	405	
	CHWS-H2	DN500	117.15	0	0	
		DN400	93.27	100	9327	
		DN250	60.31	50	3015.5	
		DN150	28.26	60	1695.6	
		DN100	16.07	300	4821	
		DN80	11.29	50	564.5	
		DN50	5.44	400	2176	
		DN40	4.05	30	121.5	
		DN25	3.38	300	1014	

		DN40	4.05	300	1215	
Building 74	CCWS-2A	DN200	42.55	150	6382.5	
		DN100	16.07	120	1928.4	
		DN50	5.44	100	544	
	CCWS-2B	DN300	73.88	10	738.8	
		DN200	42.55	180	7659	
		DN150	28.26	200	5652	
		DN100	16.07	50	803.5	
		DN50	5.44	100	544	
	CHWS-H2	DN300	73.88	80	5910.4	
		DN250	60.31	100	6031	
		DN150	28.26	600	16956	
		DN100	16.07	140	2249.8	
		DN80	11.29	30	338.7	
		DN40	4.05	30	121.5	
		DN40	4.05	400	1620	
Totals:				**20313**	**530265.58**	**144819.9**

Annex - 3

Tab III - Draft estimation of valves for TCWS

TYPE	SIZE DN	Pressure Class ASME	Actuator	End connection	No of units	Code/ Standard	Material
Ball Construction	10	600	Hand	BW	2	ASME B16.34	A182 Gr. F316L
Ball	15	600	Cylinder/Piston	BW	10		
Lift Check Valves	15	600		BW	12		
Ball	20	600	Cylinder/Piston	BW	71		
Ball	20	600	Hand	BW	304		
Globe	20	600	Single-acting Diaphragm Actuator	BW	1		
Lift Check Valves	20	600		BW	39		
Ball	25	600	Cylinder/Piston	BW	75		
Ball	25	600	Hand	BW	70		
Needle	25	600	Single-acting Diaphragm Actuator	BW	2		
Lift Check Valves	25	600		BW	28		
Ball	40	600	Cylinder/Piston	BW	55		
Globe	40	600	Hand	BW	579		
Lift Check Valves	40	600		BW	12		
Ball	50	600	Cylinder/Piston	BW	130		
Ball	50	600	Hand	BW	199		
Globe	50	600	Single-acting Diaphragm Actuator	BW	5		
Lift Check Valves	50	600		BW	61		
Ball	65	600	Cylinder/Piston	BW	110		
Ball	65	600	Hand	BW	6		
Globe	65	600	Single-acting Diaphragm Actuator	BW	2		
Lift Check Valves	65	600		BW	15		
Ball	80	600	Cylinder/Piston	BW	70		
Ball	80	600	Hand	BW	4		
Globe	80	600	Single-acting Diaphragm Actuator	BW	5		
Lift Check Valves	80	600		BW	32		
Ball	100	600	Cylinder/Piston	BW	71		
Ball	100	600	Hand	BW	3		
Globe	100	600	Single-acting Diaphragm Actuator	BW	2		

Lift Check Valves	100	600		BW	10		
Ball	150	600	Cylinder/Piston	BW	116		
Ball	150	600	Hand	BW	5		
Globe	150	600	Pressure Balanced diaphragm	BW	1		
Globe	150	600	Single-acting Diaphragm Actuator	BW	4		
Lift Check Valves	150	600		BW	8		
Default_Open	200	600	Cylinder/Piston	BW	38		
Ball	200	600	Hand	BW	2		
Default_Open	200	600	Rotary Motor	BW	6		
Butterfly Flanged	200	600	Single-acting Diaphragm Actuator	BW	4		
Swing Check Valves	200	600		BW	4		
Default_Closed	250	600	Hand	BW	3		
Default_Closed	250	600	Rotary Motor	BW	53		
Ball	250	600		BW	1		
Butterfly Flanged	300	600	Cylinder/Piston	BW	4		
Butterfly Flanged	350	600	Cylinder/Piston	BW	3		
Ball	350	600	Hand	BW	1		
Ball	350	600	Rotary Motor	BW	2		
Globe	350	600	Single-acting Diaphragm Actuator	BW	3		
Swing Check Valves	350	600		BW	9		
Ball	400	600	Rotary Motor	BW	3		
Globe	400	600	Single-acting Diaphragm Actuator	BW	1		
Swing Check Valves	400	600		BW	1		
Butterfly Flanged	450	600	Cylinder/Piston	BW	8		
Gate	450	600	Hand	BW	1		
Gate	450	600	Rotary Motor	BW	2		
Globe	450	600	Single-acting Diaphragm Actuator	BW	1		
Swing Check Valves	450	600		BW	1		
Automatic Recirculation Valve	450	600		BW	1		
Butterfly Flanged	500	600	Cylinder/Piston	BW	20		
Butterfly Flanged	500	600	Hand	BW	11		
Butterfly Flanged	500	600	Single-acting Diaphragm Actuator	BW	8		
Pressure relief valve	20-80	600		BW	89		
Ball	20-200	600	Hand	BW	95		
			TOTAL		2494		

STANDARD MATERIALS

PART	MATERIAL				
Body [1][2]	A 105	A 182 Gr. F11	A 182 Gr. F22	A 182 Gr. F91	A 182 Gr. F316
Cover [2]					
Disc [2]	A 105 or A 216 Gr. WCB	A 182 Gr. F11 or A 217 Gr. WC6	A 182 Gr. F22 or A 217 Gr. WC9	A 182 Gr. F91	A 182 Gr. F316 or A 351 Gr. CF8M
Gasket	Soft carbon steel - silver plated or Graphite/SS 316				
Gasket retainer	A 182 Gr. F6a Cl.4				
Spacer ring	Gr. 4140 option Ni or Cad plated or SS				
Cover plate	Carbon steel				
Cover stud	Gr. B7				
Cover nut	Gr. 2H				

Annex - 4

Tab IV - Draft estimation of valves for HRS, CCWS, CHWS piping inside building

CCWS, CHWS and HRS VALVES INSIDE BUILDINGS							
Type	**Size DN**	**Pressure Class ASME**	**Actuator**	**End connection**	**No of units**	**Code/ Standard**	**Material**
HRS							
GATE VALVE	50	900		SW	5	ASME B16.34	CS A 53 GR. B
GLOBE VALVE	20	900		SW	7		
CCWS-1							
GLOBE VALVE	150	150	Pneumatic	BW	1		SS A 358 GR. 304L CL1
GLOBE VALVE	100	150	Pneumatic	BW	1		
GLOBE VALVE	80	150	Pneumatic	BW	3		
GLOBE VALVE	50	900	Pneumatic	BW	3		
GLOBE VALVE	25	900	Pneumatic	BW	2		
GATE VALVE	150	150	Pneumatic	BW	2		
GATE VALVE	100	150	Pneumatic	BW	1		
GATE VALVE	80	150	Pneumatic	BW	3		
GATE VALVE	50	900	Pneumatic	SW	2		
GATE VALVE	50	900	Manual	SW	1		
CCWS-2A							
BUTTERFLY	300	150	PNEUMATIC	FLG	1		SS A 312 TP 304L A 358 GR. 304L CL1
BUTTERFLY	300	150	PNEUMATIC	BW	1		
BUTTERFLY	250	150	MOTOR-OPERATED	FLG	2		
GATE VALVE	250	150	MOTOR-OPERATED	FLG	2		
GLOBE	200	150	MOTOR-OPERATED	FLG	2		
GLOBE	200	150	PNEUMATIC	FLG	1		
GATE VALVE	200	150	MOTOR-OPERATED	FLG	2		
GATE VALVE	200	150	PNEUMATIC	BW	1		
BUTTERFLY	150	150	MOTOR-OPERATED	FLG	1		
GLOBE	150	150	PNEUMATIC	FLG	1		
GATE VALVE	150	150	MOTOR-OPERATED	FLG	1		
GATE VALVE	150	150	PNEUMATIC	BW	1		
GLOBE	100	150	PNEUMATIC	FLG	1		
GATE VALVE	100	150	PNEUMATIC	BW	1		
GLOBE	80	150	MOTOR-OPERATED	FLG	1		
GLOBE	80	150	PNEUMATIC	FLG	4		

GATE VALVE	80	150	PNEUMATIC	BW	3		
GLOBE	50	900	MOTOR-OPERATED	FLG	2		
GLOBE	50	900	PNEUMATIC	FLG	1		
GATE VALVE	50	900	MOTOR-OPERATED	SW	3		
GATE VALVE	50	900	PNEUMATIC	SW	1		
GLOBE	40	900	MOTOR-OPERATED	BW	9		
GLOBE	40	900	MOTOR-OPERATED	FLG	9		
GLOBE	40	900	PNEUMATIC	FLG	1		
GATE VALVE	40	900	MOTOR-OPERATED	SW	17		
GATE VALVE	40	900	PNEUMATIC	SW	1		
GATE VALVE	20	900	MANUAL	SW	148		
CCWS-2B							
BUTTERFLY	250	150	MOTOR-OPERATED	FLG	8		SS A 312 TP 304L
GLOBE VALVE	250	150	MOTOR-OPERATED	FLG	1		
GLOBE VALVE	200	150	MOTOR-OPERATED	FLG	2		
GLOBE VALVE	200	150	PNEUMATIC	FLG	1		
GATE VALVE	200	150	MOTOR-OPERATED	FLG	2		
GATE VALVE	200	150	PNEUMATIC	BW	1		
GLOBE VALVE	150	150	PNEUMATIC	FLG	2		
GATE VALVE	150	150	PNEUMATIC	BW	2		
GLOBE VALVE	80	150	PNEUMATIC	BW	2		
GATE VALVE	80	150	PNEUMATIC	BW	2		
GLOBE VALVE	50	900	PNEUMATIC	BW	1		
GATE VALVE	20	900	MANUAL	SW	49		
CCWS-2C							
GLOBE VALVE	200	150	MOTOR-OPERATED	FLG	1		SS A 312 TP 304L
GLOBE VALVE	150	150	MOTOR-OPERATED	FLG	2		
GLOBE VALVE	80	150	MOTOR-OPERATED	FLG	1		
GLOBE VALVE	25	900	MOTOR-OPERATED	FLG	3		
GATE VALVE	20	900	MANUAL	SW	1		
CCWS-2D							
BUTTERFLY	300	150	MANUAL	FLG	6		CS A 53 GR. B
BUTTERFLY	250	150	MANUAL	FLG	4		
GATE VALVE	100	150	MOTOR-OPERATED	FLG	1		
GLOBE VALVE	100	150	MOTOR-	FLG	1		

			OPERATED				
GLOBE VALVE	100	150	MANUAL	FLG	1		
GATE VALVE	80	150	MANUAL	FLG	3		
GLOBE VALVE	80	150	MANUAL	FLG	4		
GATE VALVE	40	900	MANUAL	SW	3		
GLOBE VALVE	40	900	MANUAL	SW	3		
GATE VALVE	20	900	MANUAL	SW	31		
CHWS-H1							
GLOBE VALVE	100	150	MOTOR-OPERATED	BW	1		SS A 312 TP 304L
GATE VALVE	100	150	PNEUMATIC	BW	1		
GATE VALVE	100	150	MOTOR-OPERATED	BW	1		
GLOBE VALVE	80	150	PNEUMATIC	BW	3		
GLOBE VALVE	80	150	MOTOR-OPERATED	BW	2		
GATE VALVE	80	150	PNEUMATIC	BW	2		
GATE VALVE	80	150	MOTOR-OPERATED	BW	2		
GLOBE VALVE	50	900	PNEUMATIC	BW	2		
GATE VALVE	50	900	PNEUMATIC	SW	2		
GLOBE VALVE	40	900	PNEUMATIC	BW	2		
GATE VALVE	40	900	PNEUMATIC	SW	3		
GLOBE VALVE	25	900	PNEUMATIC	BW	9		
GATE VALVE	25	900	PNEUMATIC	SW	8		
GATE VALVE	20	900	MANUAL	SW	79		
CHWS-H2							
GLOBE VALVE	200	150	PNEUMATIC	FLG	1		SS A 312 TP 304L
GLOBE VALVE	150	150	PNEUMATIC	FLG	2		
GLOBE VALVE	150	150	PNEUMATIC	BW	1		
GATE VALVE	150	150	PNEUMATIC	BW	3		
GLOBE VALVE	100	150	PNEUMATIC	FLG	2		
GLOBE VALVE	100	150	PNEUMATIC	BW	1		
GATE VALVE	100	150	PNEUMATIC	BW	3		
GLOBE VALVE	80	150	PNEUMATIC	FLG	2		
GLOBE VALVE	80	150	PNEUMATIC	BW	3		
GATE VALVE	80	150	PNEUMATIC	BW	5		
GLOBE VALVE	80	150	MANUAL	BW	16		
GATE VALVE	80	150	MANUAL	BW	15		
GLOBE VALVE	50	900	PNEUMATIC	BW	12		
GLOBE VALVE	50	900	MOTOR-OPERATED	BW	3		
GATE VALVE	50	900	PNEUMATIC	SW	11		
GLOBE VALVE	50	900	MANUAL	SW	38		
GATE VALVE	50	900	MANUAL	SW	38		

GATE VALVE	50	900	MOTOR-OPERATED	SW	3		
GLOBE VALVE	40	900	PNEUMATIC	BW	20		
GATE VALVE	40	900	PNEUMATIC	SW	23		
GLOBE VALVE	40	900	MANUAL	SW	39		
GATE VALVE	40	900	MANUAL	SW	38		
GLOBE VALVE	25	900	PNEUMATIC	BW	18		
GLOBE VALVE	25	900	MOTOR-OPERATED	BW	1		
GATE VALVE	25	900	PNEUMATIC	SW	18		
GLOBE VALVE	25	900	MANUAL	SW	27		
GATE VALVE	25	900	MANUAL	SW	27		
GATE VALVE	25	900	MOTOR-OPERATED	SW	1		
GATE VALVE	20	900	MANUAL	SW	268		
GLOBE VALVE	20	900	MANUAL	SW	1		
TOTAL					1144		

STANDARD MATERIALS

BODY AND BONNET

Body Construction	:	Cast	Material	:	ASTM SA 351 CF 8M
End Connection	:	Butt Welded to ASME B16.25			
Bolts Material	:	ASTM SA 193 Gr. B8	Nuts Material	:	ASTM SA 194 Gr. 8
Construction Features	:	Full Bore Type	Body Lining	:	Not Required
Bonnet Type	:	Bolted, Outside Screw and Yoke	Material	:	ASTM SA 351 CF 8M
Bonnet Gasket	:	Spiral Wound SS 304 with Graphite Filler			
Stem Packing	:	Required	Material	:	Graphoil
Gland Type	:	Bolted	Material	:	ASTM SA 351 CF 8M
Handwheel	:	Required (Standard)	Material	:	Carbon Steel

TRIM

Stem (Rising/Non-Rising)	:	Rising	Material	:	ASTM SA 564 Gr. 630 H1075 (17-4PH)
Wedge/Disc	:	Flexible Wedge	Material	:	ASTM SA 351 CF 3M Cobalt free Nickel based
Body Seat Ring	:	Renewable Seat Ring with Hard Facing	Material	:	ASTM SA 351 CF 3M Cobalt free Nickel based
Back Seat Bush	:	Renewable	Material	:	SS 316
Gland Bush	:	Renewable	Material	:	SS 316
Back Seating	:	Integral with Stem as a Shoulder			

Note

CS = Carbon Steel

SS = Stainless steel