

	Scope of work	Tutuka Power Station
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1. EXECUTIVE SUMMARY

Tutuka Power Station has experienced a great vacuum load loss on Units 1, 2 and 3 due to poor performance of the cooling towers and condensers as well as other factors such as suspected CW duct blockages, CW leaks, passing isolation valves and poor CW chemistry (due to factors such as poor availability of the CCW clarifiers). It is becoming more and more difficult to repair cooling towers, clarifiers and condensers on unit outages due to a lack of tight isolations as a result of many system valves that are passing. Leaks and blockages on the CW ducts cannot be attended to during a unit outage. A Half Station Shutdown (HSSD) is required to eliminate these problems.

These problems need urgent attention since they affect electricity generation efficiency and the units' output. The water usage is also high due to many leaks on the CW system. In addition to these CW concerns, the HSSD will be used as an opportunity to attend to valves on common steam manifolds and various awaiting unit defects. Tutuka Power Station will use the HSSD opportunity to reduce the current vacuum load losses experienced on the units 1, 2 and 3 although the AU defects will not form part of this documents.

2. OBJECTIVE

2.1 ABBREVIATIONS

Table 1: List of Abbreviations

Abbreviation & Acronyms	Description
AU	Awaiting Unit
BS	British Standard
ACV	Auto close valve
CT	Cooling Tower
CM	Corrective maintenance
CW	Cooling Water
ECSA	Engineering Council of South Africa
HPWJ	High Pressure Water Jetting
HSSD	Half Station Shut Down
MCW	Main Cooling Water
PS	Power Station
P&ID	Process and Flow Diagram
QCP	Quality Control Plan
SHE	Safety, Health & Environment
SOW	Scope of Work

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2.2 TECHNICAL CRITERIA

A successful HSSD will result in Units 1-3 returning with, repaired leaks and with proper CW and steam isolations for maintenance during unit outages, potentially reduced vacuum load losses as there will be an opportunity to attend to AU defects. The successful valve SOW during the HSSD will result in the following targets

- Zero forced shut down for rework after the outage.
- Zero multiple unit trip that resulted from loss of vacuum on the condenser due to cooling water pumps failing to supply sufficient cooling water.
- Improve Tutuka PS water targets.
- Reduced Dirty Water Dam ingress as CW leaks will be repaired.

2.3 SCOPE VARIATIONS

Variations from this scope will be addressed following the normal Eskom procedure.

2.4 FINANCIAL PERFORMANCE

The magnitude of the SOW is new to the Power station. A proper estimate will be conducted using this document. That will also include recourses and spares availability.

2.5 TIME MANAGEMENT/DURATION

The estimated duration to complete the SOW considering the HSSD critical path is 40 days. Depending on the actual status of the plant which will be established during internal inspection more or less time might be required. Also refer to the NEC.

2.6 ROLES AND RESPONSIBILITIES

- Contractor will design, manufacture, transport and install as per the works in section 3 of this document.
- Eskom to approve and monitor the works.

2.7 PROCESS FOR MONITORING

- Tender Returnable Documents
- Approved QCP
- NEC Document
- SOW/Technical Specification

2.8 RELATED/ APPLICABLE GUIDELINES AND STANDARDS

- i. 240-56030499 Condenser Healthcare Guideline
- ii. 240-630094243 Standard for Large Bore Resilient Seal Butterfly Valves for use as Cooling Water Isolation Valves

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iii.	240-63154109	Standard for Large Bore Metal seated valves for use as Cooling Water Isolation Valves
iv.	GGR 0992	Eskom Plant Safety Regulations
v.	EN 1092-1	Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, PN designated Part 1: Steel flanges
vi.	240-123801640	Specification for Low Pressure Pipelines Standard
vii.	240-55864767	Chemistry and Microbiology Standard for Condenser Cooling Water
viii.	240-56030508	Cooling Water System Health Care Guideline
ix.	OHS	Occupational Health And Safety Act of 1993
x.	240-105658000	Supplier Quality Management: Specification
xi.	240-101712128	Standard for the internal Corrosion Protection of Water Systems, Chemical Tanks and Vessel and Associated Piping with Linings
xii.	240-106365693	Standard for the external corrosion protection of Plant, Equipment and Associated Piping with coatings
xiii.	15ENG AUX-920	West HSSD Water Management
xiv.	15ENG AUX-919	WEST HSSD Return to Service
xv.	Valve Drawings	Tutuka drawings cannot be issued but can be viewed at Tutuka Power Station. The drawings which are available are listed below.

Table 2: Applicable Eskom drawing list

ESKOM DRAWING NO	TITLE
2	STATION LAYOUT
253	UNITS 1-3 OUTSIDE TURBINE HOUSE DUCT LINERS GENERAL ARRANGEMENT
0.61/40	WEST CW SYSTEM INSIDE TURBINE HOUSE CW DUCTS GENERAL ARRANGEMENTS
0.61/41	WEST CW SYSTEM INSIDE TURBINE HOUSE CONDENSER BRANCH DETAILS
0.61/41	WEST CW SYSTEM OUTSIDE TURBINE HOUSE ENCASEMENT AND VALVE PITS GA
0.61/45 0.61/5198	WEST CW SYSTEM OUTSIDE TURBINE HOUSE CW DUCTS GENERAL ARRANGEMENTS
0.61/5326 0.61/47	WEST CW PUMP HOUSE PUMP DISCHARGE DUCT ARRANGEMENTS
0.61/51	WEST CW SYSTEM VALVE PITS SPECIAL GA
0.61/5615	CONDENSER ISOLATION VALVE (T1 & T2 VALVES)

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0.61/5613	CW PUMPS AUTO CLOSING VALVE
0.61/5614	CW PUMPS BACKUP VALVE
0.61/5764	COOLING TOWERS ISOLATION VALVE
0.61/5614	CW PUMP BACKUP VALVE

2.9 GENERAL CONSIDERATIONS

ACTIVITIES	SPECIFICATIONS
PRE-REQUISITES / PRE-CONDITIONS	
See <i>Section 4.1</i> and <i>4.2</i> of this document	
SAFETY	
The OHS Act and all applicable Eskom and Tutuka safety requirements will apply, including adherence to life-saving rules.	
ENVIRONMENT	
Eskom and Tutuka environmental policies will apply. Where clarity is needed, the Tutuka Environmental Department will offer guidance.	
QUALITY	
Quality will be in line with Eskom's Quality Management System.	
General Requirements	
The importance of correct equipment spares and procedures should be included in structured toolbox talk sessions with all contractors.	
Spares It should be kept in mind that a significant lead time can apply to some spares, therefore all the spares required will be ordered in time. Spares ordered and used will be reported by always quoting the ESKOM stock number (if applicable) as well as the Group and item number from the spares manuals.	
Documentation Full-service reports must be compiled and submitted to the Tutuka documentation centre for safe keeping and approval 30 days after unit is synchronised on load.	
Equipment Lifting equipment: An up-to-date test certificate must be provided for all lifting equipment that will be used during the SOW.	

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Measuring equipment: An up to date calibration certificate must be available for all measuring equipment that will be used. Special tools must be serviced before the outage and must be in good working condition. A list if all special tools must be compiled before the outage and submitted to Engineering. The special tools must be readily available for inspection by QC and Engineering.	
Use of SAP PM to record history and costs SAP PM will be used to record history of work done and the related costs to at least the second level of headings as listed in this document.	
EXISTING DEFECTS	
All "awaiting unit" defects will be attended to as far as possible with available resources. The AU defects don't form part of this SOW however they will be attended to during HSSD outage.	Outage Department must coordinate the AU defects

3. SCOPE INTERFACE

- i. The *Contractor* shall take note that there are other scopes that will be running in parallel and adjacent with this SOW. The other possible scopes are as follows:
 - a. MCW Duct repairs (Cleaning, patch welding, surface preparation and coating).
 - b. Condenser chemical cleaning and/or HPWJ.
 - c. Cooling tower cleaning and Internal repairs.
 - d. Employer maintenance team will be addressing AU defects (this does not form part of this document)
- ii. The *Employer* shall create an access management system into the duct. The *Contractor* to adhere to all the requirements as stipulated by the *Employer*.
- iii. It is in the best interest of the *Contractor* to understand how the other mentioned scopes interfaces with theirs so that it does not affect their program and prevent reworks, see the attached appendixes with marked drawings.

3.1 QUALITY RELATED ASPECTS

3.1.1 DATA PACKAGES

- i. The *Contractor* must ensure that all documents adhere to requirements and standards.
- ii. Data Packs to be provided by the *Contractor* to the *Employer* for Final sign off.
- iii. The *Contractor* to submit a hard copy, 1 soft copy in PDF format using a USB and 1 native updatable copy for all data packs to the Employer.
- iv. *Contractor's* scope of work includes but is not limited to providing the following documentation as part of the data packages:
 - Copies of all inspections, test reports and photographs (with date and time).

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- Non-conformance reports.
- *Contractor* to Compile defect list as indicated by Tutuka Power Station and resolve/correct any issues.
- Cleanliness clearance certificate.
- Generic reports on all findings and corrective measures used/recommended.
- Completed and signed off approved QCP's.
- Copies of all approved procedures and method statements.
- Product data sheets and certificates.
- Copy of all Technical notifications (also signed by Employer system engineer)

3.1.2 QUALITY CONTROL PLANS

- i. The *Contractor* shall exercise strict and adequate quality control during all phases of the work.
- ii. Any defects will be reported to the outage manager and the system engineer. A technical notification with a proposed method to address the defect will be submitted to the *Employer* for approval.
- iii. The *Contractor* shall compile a detailed Quality Control Plans (QCPs) to be submitted for acceptance to the Employer System Engineer before the work can be executed.
- iv. The QCP shall indicate relevant intervention point (e.g. hold, witness, surveillance points, etc.) to be agreed upon by the *Employer*.
- v. The QCPs must meet the technical requirements and include relevant inspections and tests to be done. The reference documentation and acceptance criteria should be included on the QCP.
- vi. The *Contractor* shall prepare suitable quality control plans (QCP's) and Inspection and Test Plans (ITPs) for all work carried out.
- vii. The *Employer*, the Inspection Authority, the Employer QC Representative, and the Contractor shall review these QCPs/ITPs jointly and the actual scope of quality control and inspection required for the Contract agreed upon.
- viii. The QCPs/ITPs shall be subject to the *Employer's* approval and shall indicate all inspection and test points, the methods and procedures to be used and the acceptance criteria to be applied.
- ix. The *Contractor* is required to notify the *Employer* at least 24 hours in advance of witness and hold intervention points.
- x. Recovery plan must be provided by the *Contractor* in the event of any repair work/re-work.
- xi. Review of *Contractor's* Documentation by the *Employer* will be permitted.
- xii. Surveillance Inspection by the *Employer* can be done at any time during execution of the Works. The Employer will have full authority to inspect the Works at any time regardless if the *Employer's* Works on site or at the *Contractor's* premises/Workshops Or *Sub-Contractors* premises. This comprises of monitoring or making observations to verify whether material/items or services conform to specified requirements. Surveillance activities may include audit inspections, witness of testing, review of quality documentation & records, personnel qualifications etc.
- xiii. Any scope deviation during the execution shall be approved in writing from the *Employer*.

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3.1.3 COMMISSIONING, TEST, VERIFY PERFORMANCE AND HAND-OVER

- i. Safety clearance certificates to be completed prior to commencing with commissioning activities.
- ii. Perform commissioning with Employers Engineering, Maintenance, commissioning and operating for acceptance. Complete final inspection with relevant engineering, operating, commissioning and maintenance personnel from Tutuka PS.
- iii. *Contractor* or his relevant *sub-contractor* to be present for the stroke checking of valves (as per this Works) after installation and to correct any leaks/defects.
- iv. All equipment, instrumentation etc. to be tested and verified during commissioning.
- v. *Contractor* to Compile defect list as indicated by Tutuka PS and resolve/correct any issues.
- vi. Hand-over to Tutuka PS and Final Sign off of all Data Packs and QCPs.

4. SCOPE OF WORK

4.1 GENERAL REQUIREMENTS

- The *Contractor* shall also test all the valves for opening, closing and sealing in the presence of the *Employer* (This must be a hold point for engineering in the QCP).
- This SOW includes cleaning and corrosion protection repairs of the duct sections adjacent to the valve being installed/repared. Cleaning and corrosion protection repairs is applicable to the valve internals (e.g. discs, body), externals of the valves, at least 1m upstream and 1m downstream of the valve being installed. In addition, the cleaning and corrosion protection include the entire duct section between the ACV, backup isolating valve and Centre-well as marked in yellow on Figure 6: Valve *Contractor* SOW around ACV and Back up valves.
- All gaskets, studs and nuts, rolled pipe sections (for known defective pipes), to be available on site before the outage starts. The *Contractor* shall determine the details of the gaskets, studs and nuts, rolled pipe sections during the compulsory site clarification meeting.
- The *Contractor* shall make provision to have pre-rolled material available on short notice should an insert be required to repair the main CW ducts (3m, 2m, 1.6m and 0.8m diameter duct) around the valves. The material is SABS 1431 Gr 300WA or equivalent, shall be 12mm & 8 mm thick and provision to be made for 650mm wide and length to cater for the specified diameters.
- The *Contractor* shall make provision to have material available on short notice should an insert be required to repair the 3m diameter duct in the main valve pit. The material is SABS 1431 Gr 300WA or equivalent, 12mm thick and provision to be made for a diameter of 3m.
- This work will be executed during HSSD outage; thus the *Contractor* shall attend daily outage meetings to give progress feedback on the scope execution, or equivalently a progress feedback meeting including (but not limited to) the system engineer, the project manager and relevant outage co-ordinator at minimum for progress feedback.
- If a valve must be replaced, the *Contractor* shall remove the existing valves and install the new valves but is *not allowed to separate the assembly of the actuator, gearbox and valve* during

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removal and installation of the valves as this will result in the valve not sealing during operation. *This scope will be running in parallel with that of duct inspections and repair thus the gearboxes of the existing valves may not be removed under any circumstance as this may result in injury. The actuator, gearbox and the valve are to be removed as one assembly and installed as one assembly.*

- All welding work performed pertaining to the scope shall comply with document 240-106628253 "Standard for welding requirements in plant" and as per ISO 3834 part 4.
- All internal and external corrosion protection work to be executed shall comply with documents 240-101712128 and 240-106365693 respectively and coating specifications in document 240-63094243 and 240-56030508.
- The *Contractor* shall recommend a corrosion protection repair method and provide method statement for the repairs to be done. The method statement provided shall include the surface preparation, proposed corrosion protection products to be used, tools & equipment required and all testing/inspection to be carried out during corrosion protection application. This method statement shall be submitted to Eskom (System Engineer and Corrosion Section) for approval before commencement of work.
- Abrasive blasting can only be done in duct sections where it is cleared safe to abrasive blast as other personnel/contractors might be working in the same duct and proven not to cause new defects of the existing coating. Abrasive blasting shall be conducted to the degree of cleanliness as specified by the coating manufacturer. In the absence of such a cleanliness specification the cleanliness shall be to Grade Sa 3 (ISO 8501).
- The *Contractor* is responsible to move the old valves to the laydown area as indicated by *Employer*.
- The *Contractor* shall also conduct remedial work that needs to be executed on the flange faces, this work is subject to approval by the system engineer before execution.
- The *Contractor* is also responsible for cutting, welding, cleaning and corrosion protection work required should there be any corroded section of ducting close to the valve to be cut out and re-installation (At least 1m up/down stream of the valve), or in the duct section between the ACVs and the Backup isolating valves.
- All scaffolding requirements to be made and/or arranged timeously, *Employer* will provide the scaffold on the PS scaffolding contract. NB! Scaffolding must be handled in such a way that it will not damage the existing coating. Rubber gasket must be placed between duct and scaffolding to prevent coating damage. *Contractors will be responsible to repair damaged coating during the execution*
- The *Contractor* is responsible for transporting the new and old valves to and from stores or identified areas where valve might be temporally stored.
- All Lifting equipment (Mobile cranes, lever hoists, hydraulic jacks, chain blocks, nylon slings, forklifts, etc.) shall be provided by the *Contractor* for the sole purpose of executing this work.
- Before the ACVs and hydraulic cylinders are dis-assembled the *contractor* shall perform a full functional test of the ACV/Power pack combination (Hold point for engineering/maintenance in

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the QCP) to identify any defects and the *Contractor* shall provide a scope and quotation for repairs as required. However, the *Contractor* shall quote for oil replacement regardless of the condition of the power pack.

- The *Contractor* is to be available for commissioning and valve stroking activities.
- The drawings of the valves shall be made available to the successful *Contractor*, the details of the valve are to be inspected during the compulsory site clarification meeting. Basic information of each type of valve is given in section 4.4.
- The *Contractor* will allow for replacement of 10% of the existing valve flange bolting and expansion joints bolting. Details of bolting to be confirmed by *Contractor* during compulsory site meeting prior to submission of tender. All removed bolts to remain with the *Employer* after the works.
- The *Contractor* is responsible for inspecting and recording any defects found on the new valves prior to installation. *Contractor* will supply all gaskets, bolts and nuts to execute the work. The *Contractor* is also responsible for the Removal of the old expansion joints, and installation of new expansion joints for each of the valves on the back up, ACV , Condenser CW and Cooling Tower Isolation valves. The gasket material should be reinforced rubber insertion gaskets 3mm thick.
- Each nut will be fitted with a washer before the nut is installed. A bolt and nut assembly will be fitted with 2 washers.
- *Contractor* will be available during leak test of the line to repair any leaks or defects after all permits are cleared and valve installation is complete.
- Under no circumstances will the valve body be lifted on the actuator gearbox neck. Valves will only be lifted by means of the lug fixing points as provided on the valve body and *Contractor* to supply the eye bolts that will be screwed into the valve body at locations provided.
- The CCW cooling tower make-up sluice gate are mounted on concrete. After removal of the sluice gate structural inspection shall be conducted before installing the new sluice gate.
- Rigging, lifting and working equipment/tools shall be provided by the *Contractor*, only specified spares and scaffolding will be provided by the *Employer*,

4.2 DETAIL SCOPE OF WORK

This scope includes inspection, repair/removal and installation of the Main Cooling Water (MCW) and Secondary Cooling Water (SCW) system valves, Auxiliary steam range valves, Demin Circulating Water (DCW) valves, Boiler Auxiliary cooling system valves, Fuel oil system isolation valves and Heat exchanger plates cleaning.

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The SOW is as follows:

1. Remove and Replace the 12 x Condenser inlet and outlet isolating valves (T1's & T2's) on all 3 units (U1-3).
2. Remove and Replace 6 x BFPT condenser CW isolating valves on all 3 units.
3. Remove, Inspect, repair/replace if necessary, the following SCW isolation/control valves on all 3 units:
 - a. 12 x CW inlet to Water Air Ejector.
 - b. 12 x SCW inlet & outlet Culverts A & B valves.
 - c. 6 x CW outlet A & B from Generator Loop Cooling system.
 - d. 12 x CW inlet & outlet A & B from Turbine Loop Cooling system.
 - e. 9 x SCW pump excess return valve.
 - f. 24 x Boiler auxiliary heat exchanger isolation valves.
 - g. 12 x SCW pump inlet & outlet isolation valves.
4. Remove and Replace 6 x MCW pump discharge duct valves (2m in diameter), Auto Closing valves (6 off).
5. Remove and replace 6 x MCW Pump discharge duct valve (2m in diameter), backup isolating valves (6 off).
6. Inspect, repair/replace if necessary 9 x Cooling tower inlet/outlet valve (9 off, 3m in diameter valves). If valves body, disc is still sound, repairs are to be done in-situ by replacing the sealing rubber, ring segments, bolts and valve expansion joint. It is estimated that 4 of the valves must be replaced and 5 must be repaired in-situ. It is also estimated that all (9-off) the expansion joints to be replaced due to corrosion and leaks witnessed around the CW valve expansion joints.
7. Remove and replace 13x 200mm air vent valve along the CW ducting.
8. Remove and replace 13x 200mm air vent valve along the CW ducting.
9. Remove and replace 6 x 25mm air vent valve along the CW ducting.
10. Remove and replace 12x 200mm drain valves along the CW ducting.
11. Remove and replace 2 x Sluice gate valve for CCW clarifier make-up water into the cooling towers (2 off).
12. Inspect, repair/replace if necessary 2 x main CW 10% tap-off valves (2off).
13. Inspect and refurbish/overhaul the Aux Steam Range manifold isolating valves (3 off)
14. Inspect and refurbish/overhaul the Aux steam Range Section Valves (1 off), between U4 and U5
15. Install new section valve between U5 and U6 if spare is available.
16. Inspect and refurbish/overhaul Aux steam supply to Deaerator Storage Tank (DST) main valves (3 off)
17. Inspect and refurbish/overhaul Aux steam supply to Deaerator Storage Tank (DST) bypass valves (3 off)
18. Inspect and refurbish/overhaul Aux steam supply to Deaerator Storage Tank (DST) hand isolating valves (3 off)
19. Inspect and refurbish/overhaul Aux steam supply to Deaerator (DA) main valves (3 off)

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20. Inspect and refurbish/overhaul Aux steam supply to Deaerator (DA) bypass valves (3 off)
21. Inspect and refurbish/overhaul Aux steam supply to Deaerator (DA) hand isolating valves (3 off)
22. Inspect, refurbish/replace Fuel Oil Interconnection valves between the units (3 off)
23. Replace Fuel oil plant Pump pressure relief valves (3 off)
24. Replace Fuel oil plant LP system non return valves (6 off)
25. Inspect and repair defective piping on fuel oil plant booster pump discharge pipe (3 off, 200NB)
26. Inspect and repair defective piping on fuel oil plant HP pump discharge piping (3 off, 80NB)

4.3 PREPARATORY WORK BEFORE THE HSSD

Table 3: Preparation work before the HSSD

No	Description	Time
1.	<i>Contractor</i> to establish site	35 days before HSSD
2.	<i>Contractor</i> with assistance from the Employer create access control for entrance into the area where work will be executed.	30 days before HSSD
3.	<i>Contractor</i> to provide a detailed method statement detailing all work to be done in order to install the valves, the method statement is subject to approval by Employer engineering before the work can be executed. Method statement to include both for the T1's and T2's condenser, MCW discharge valves and the cooling tower inlet/outlet valves (1 600mm, 2 000mm and 3 000mm valves)	30 days before HSSD
4.	<i>Contractor</i> to Submit QCPs for approval to Employer engineering	28 days before HSSD
5.	<i>Contractor</i> to lubricate all valve bolts. <i>Contractor</i> will loosen every bolt, on a loosen bolt the <i>Contractor</i> will lubricate bolt and replace, then proceed to next bolt on the valve flange. This to be done for each of the valve flange bolts on valves that will be removed. Any bolts / nuts that remain after installation (of the 10% extra bolting allowance) to be provided to Project manager on completion of the project. The <i>Contractor</i> shall keep record of bolts to be replaced and make provision for the replacement of these bolts	25 days before HSSD
6.	<i>Contractor</i> to Pre-cut all gaskets,	5 days
7.	<i>Contractor</i> to establish where and how many power supply equipment/allowances must be catered for as power supply 220V and 380V is for the <i>Contractor's</i> scope	20 days before HSSD
8.	The <i>Contractor</i> to supply rigging equipment for the installation of the valves. Safety files for all rigging to be signed off by Tutuka Rigger / quality 10 days before - inclusive of load test certs.	10 days before HSSD
9.	Remove all gratings and grating support beams that are required to be removed (as per submitted method statement) and install barricades. NB! <i>Contractor</i> must put in scaffolding requirements as and when required at least 48 hrs in advanced through the SOW execution.	8 days before HSSD
10.	All main CW duct drain connections shall be function tested prior to the start of the outage by both the <i>Employer</i> and <i>Contractor</i> . The purpose of the test is to verify that the valves are functional, drain lines not blocked and that the drainage from the valve pit is functional.	8 days before HSSD

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11.	<i>Contactor</i> to strategically place critical spares in the vicinity of the work areas (includes all the valves).	6 days before HSSD
12.	<i>Contactor</i> to arrange Mobile lights and all required tools, PPE	8 days before HSSD
13.	Prior to draining the CW system, the <i>Contactor</i> , Engineering, maintenance and operating shall inspect CW system and mark and document all visible leaks for repairs.	5 days before HSSD
14.	<i>Employer</i> to isolate the CCW Clarifier make-ups to the cooling towers are (i.e., close the inlet valves to the CCW clarifiers).	24 hours before HSSD
15.	<i>Employer</i> to ensure that the centre well is lowered to -1.5m level before switching off the units. This will minimise the water to be drained from the system and subsequently reduce the draining time.	12 hours before HSSD

4.4 VALVE SPECIFICATIONS

Table 4: Valve specification

Description	Drawing number	Size [mm]	Pressure [kPa]	Flange PCD [mm]	Number of bolts	Bolts hole ϕ [mm]	Face to face [mm]	Valves Require for the HSSD
1.6m Condenser Isolation valve (T1 & T2)	0.61/5615	1600	300	1820	40	45	390	12
BFPT condenser isolating valves	21.61/55389	700	375	840	24	27	190	6
Generator loop isolating valves	21.61/55389	500	375	950	20	24	150	6
Turbine loop isolating valves	21.61/55389	800	375	950	24	30	250	12
2m CW pump Auto Closing Valve	0.61/5613	2000	300	2230	48	52	400	6
2m Backup valves	0.61/5614	2000	300	2230	48	52	400	6
3m Cooling tower Isolation valve	0.61/5764	3000	260	3290	68	62	700	6
CCW make-up water Cooling tower sluice gate inlet valve (Operation: Manual/ bevel geared headstock with rising spindles and spindle)	N/A	Gate size: 600m m Chann el size: 2600m m wide x 800m	Max head 1000mm, max flow 3750 m ³ /h	N/A	N/A	N/A	N/A	

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		m deep						
1m butterfly valve CCW clarifier		1000	1000	1160	28	36	320	1
750mm butterfly valve CCW clarifier		750	1000	840	24	33	270	2
800mm butterfly valve CCW clarifier		800	950	950	24	33	270	2
Main CW Drain valves								12
Air vent valves								
10% tap-off								

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4.5 SCOPE OF WORK RESPONSIBILITY MATRIX

Table 5: Valve SOW responsibility Matrix

No	Scope of Work Activity	Responsible Person
1.	RP to apply for PTW	Contractor
2.	Isolation and locking of MCW System	Employer
3.	Draining of MCW system (Normal draining). Assist with draining on sections that cannot be drained through gravity using a mobile pump and unblocking of drains will be conducted by the Duct contractor	Employer
4.	Scaffolding erection (on request)	Employer
5.	Supply of Rigging, Transportation and lifting requirements	Contractor
6.	Removal of existing valves	Contractor
7.	Replacement of new valves	Contractor
8.	Supply of new Expansion joints, new valves and in-situ refurbishment spares.	Employer
9.	Supply of all gaskets, studs, bolts, and nuts, rolled pipe sections	Contractor
10.	Removal and installation of power cylinders and ACV counterweight (to be installed as one assembly with the valve)	Employer
11.	Provide mobile cranes for removal (and installation) of valves as per the SOW	Contractor
12.	A day shift and night shift RP should be provided for permits application	Contractor
13.	Dimensional check must be carried out on each valve in order to verify the correctness of all spares parts	Contractor
14.	All required spares must be available before the outage starts	Employer
15.	The <i>Employer</i> shall demonstrate that each 1 of the Auto closing valve and power pack combination are fully functional after refurbishment and valve installation (Maintenance to refurbish the power pack system during the HSSD)	Employer
16.	The <i>Contractor</i> to witness stroking of the electrically operated valves that will be conducted by the <i>Employer</i>	Contractor and Employer
17.	Cleaning, cutting, welding and corrosion protection of previously corroded duct sections around the valve before installation of the new valves	Contractor
18.	The Contractor shall make provision to have material available on short notice should an insert be required to repair the 3m, 2m, 1.6m and 0.8m diameter duct around the valves. The material is SABS 1431 Gr 300WA or equivalent shall be 12mm/8mm thick and provision to be made for 0.65m wide and length to cater for CW duct in the event that the ducts are corroded below the expansion joints.	Contractor
19.	Hydraulic power pack and system to be inspected and overhauled	Employer
20.	Stroke checking of valves	Employer and Contractor
21.	Commissioning of valves will include verifying that the mechanical limits on gearboxes are still sealed and not been tampered with, and torque settings on the actuators	Contractor and Employer
22.	ACV 3B positioner installation and calibration	Employer

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5. VALVE LIST

Table 6: Turbine System valve list

No	COMPONENT FLOC (KKS CODE)	COMPONENT DESCRIPTION	ACTIVITY TYPE (INSPECTION / TEST / REFURBISH / REPLACE)	WORK SPECIFICATIONS	Size and Quantity
1.	VC11S011, VC12S011, VC14S011, VC15S011. <i>(For Units 1 – 3.)</i>	T1s and T2s (1600 mm in diameter)	In-situ Inspection	Inspect condenser inlet and outlet isolating valves (T1 & T2)	Φ1600mm (±2, estimated; may be more based on inspection)
			Refurbishment	If defective and cannot repair in-situ, remove valves from ducts so that contractor can do repairs. Refit after repairs are complete.	
			Refurbishment	Transport and refurbish valves	
			Test	Synchronise opening and closing limits.	
2.	VD01S001, VD01S002, VD01S003, VD01S004; <i>(For Units 1–3)</i>	Boiler Auxiliary Heat Exchanger Valves – Demin side	Replace	Remove and replace boiler auxiliary heat exchanger isolating valves.	Φ200 mm (8 per Unit)
3.	VF50S002, VF50S003, VF50S004, VF50S005. <i>(For Units 1- 3)</i>	Boiler Auxiliary Heat Exchanger Valves – CW side	Replace	Remove and replace boiler auxiliary heat exchanger isolating valves.	Φ200 mm (8 per Unit)

4.	VG01S001, VG01S002, VG01S034, VD01S035 <i>(For Units 1–3)</i>	Turbine loop valves	Replace	Remove, Inspect, refurbishment/replace and install	Φ800 mm (4 per Unit)
5.	VG13S066 VG13S067 <i>(For Units 1–3)</i>	Gen Loop Outlet Valves	Replace	Remove, Inspect, refurbishment/replace and install	Φ500 mm (2 per Unit)
6.	VG19S150 VG19S148 <i>(For Units 1–3)</i>	Access Return Bypass Valves	Replace	Remove, Inspect, refurbishment/replace and install	Φ150 mm (2 per Unit)
7.	VG13S065 <i>(For Units 1–3)</i>	Access Return Valve	Replace	Remove, Inspect, refurbishment/replace and install	Φ400 mm (1 per Unit)
8.	VG11S212 VG12S213 VG11S036 VG12S037 <i>(For Units 1–3)</i>	Water Air Ejector Inlet Valves	Replace	Remove, Inspect, refurbishment/replace and install	Φ500 mm (4 per Unit)

9.	VG11S032 VG12S033 <i>(For Units 1–3)</i>	BFPT Inlet and Outlet valves	Replace	Remove, Inspect, refurbishment/replace and install	Φ700 mm (4 per Unit)
10.	VF50 / VD01	Heat Exchanger Cleaning	Clean	Clean boiler auxiliary heat exchangers.	28 per unit
11.	VG01, VG06	Twin and Duplex Strainers	Inspection	Open, inspect and repair duplex twin strainers	2 per unit

All Turbine valve specifications will be supplied in the valve contract works information

Table 7: Main CW System valve list

No	Component AKZ Code	Component / System	Activity Type (Inspection/ Test/ Refurbish / Replace)	Size and Type	Quantity
1.	00VC50S011 00VC50S012 00VC50S013 00VC50S002	Cooling tower Isolation valves	Replace full valve and expansion joint	Φ3m butterfly valve	4
2.	00VC50S001 00VC50S021 00VC50S022 00VC50S023	Cooling tower Isolation valves	Repair valve in situ and replace expansion joint	Φ3m butterfly valve	5
3.		MCW pump discharge valves, Backup valves	Replace full valve and expansion joint	Φ2m butterfly valve	6
4.		MCW pump discharge valves, Auto Closing valves	Replace full valve and expansion joint	Φ2m butterfly valve	6
5.	10VC50S001 10VC50S005 10VC50S022 10VC50S023 10VC50S032 10VC50S033 10VC50S044 10VC50S053 10VC50S082 10VC50S092 10VC50S103	Main CW Air vent valves and Auto-closing valve air-vent valves	Remove, Inspect, Repair/refurbish and Install	ΦVOSA 200 mm vent valve	18
6.	10VC50S008 10VC50S027	10% Take-off air-vent valves	Remove, Inspect, Repair/refurbish and Install	Φ100mm VOSA air-vent valve	2
7.	01VC51S033 01VC52S033 02VC51S033 02VC52S033 03VC51S033 03VC52S033	Backup valve vent valves	Remove, Inspect, Repair/refurbish and Install	Φ25 mm VOSA air-vent valves	6
8.	10VC20S001 10VC20S002	East/West Cut-off valves (interconnecting valves)	Replace	Φ200mm butterfly valve	4

9.	10VC50G001KC01 10VC50G002KC01 10VC50G003KC01	Direct Raw water Isolation make-up valves	Remove, inspect Repair/refurbish or replace	Φ500 mm butterfly valve	2
10.	10VC50G001KC01 10VC50G002KC01 10VC50G003KC01	Direct Raw water make-up control valves	Remove, inspect Repair or replace	Φ450 mm butterfly valve	2
11.	10VB10S106	Raw water Inlet valve	Replace	Φ 1000mm butterfly valve	1
12.	10VB10S108 10VB30S052 10VB30S053 10VB20S103 10VB30S108	- Inlet valve from splitter box - CCW Clarifier 2 Inlet valve from splitter box - CW 10% take off valve inlet	Inspect repair/replace	Φ800mm butterfly valve	5
13.	10VB10S107 10VB20S102 10VB30S103	- CCW clarifier 1 inlet valve - CCW Clarifier 2 valve3 - CCW Clarifier 3 10% inlet valve	Inspect repair/replace	Φ750mm butterfly valve	3
Total number of valves					64

6. WORK TO BE PERFORMED BY THE *EMPLOYER*

- Take CW system out of operation to allow the repairs and replacement of valves in the main CW system.
- Treat cooling water for Legionella and provide test results to *Contractor*.
- Make provision for lay down area adjacent to the CW duct and CW valve pits to allow access to the CW ducts.
- Provide source of water and electricity supplies.
- Please note that **NO** compressed air is available on site for use by the *Contractor*.
- All Scaffolding will be provided by the Power Station. Requirements to be arranged 3 days in advance with the *Employer*.
- Drain the pond however the *contractor* to assist in case the gravity draining is not possible.
- The *Employer* maintenance team must refurbish all the Main CW pumps (i.e., cleaning of water boxes, replacement of neck rings, defective bearings, power pack, etc.)
- The *Employer* Maintenance Team Must also install the positioner indication on CW Auto Closing Valve 3B (AU defect)
- The *Employer* maintenance team must acid clean the DCW heat exchangers, Duplex strainers, and Cooling tower sprayers

7. TENDER RETURNABLES

7.1 GATE KEEPERS

The *Contractor* shall provide a verifiable reference list of previous projects performed since 2010, involving the removal and reinstallation of butterfly valves with a diameter of larger than 1000mm in diameter. The reference list shall contain as a minimum 2 projects of the similar nature as the HSSD, the date of the project, client name, number of valves involved in the project and valve sizes.

7.2 TENDER RETURNABLES FOR TECHNICAL EVALUATION

The following will be used to score the tender returnables to evaluate if the *contractor* is cable to satisfy this Technical specification

1. Preliminary method statement for repairs, removal and reinstallation of the 1600mm, 2000mm and 3000mm Main CW valves (i.e. Condenser, CW pump discharge and CT valves respectively) including all the preparatory work as stipulated on the SOW under section 4.2. The preliminary method statement shall contain the following details as a minimum:

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- a. Valve Sealing verification technique,
 - b. Duct Expansion joint removal and installation or Condenser valve bellow compression
 - c. Stroke checks and commissioning.
 - d. Corrosion Protection.
 - e. Valve Seal test at the end of outage
2. Typical QCP for the installation of butterfly valves larger than 1000mm
 3. Site project organogram including names and positions
 4. Corrosion protection

The Contractor or Sub-Contractor provides demonstrable evidence of previously completed corrosion protection projects in power station cooling water systems/water treatment plant/similar industries during the last 5 years where valves, piping and water-boxes were coated for corrosion.

5. Exclusion or qualification to the Scope of work section 4 of this document.
6. Lead time to roll plate duct material for welding repairs

8. TENDER EVALUATION FORM

8.1 GATEKEEPERS

Section	Criteria	Yes / No
1	The Contractor shall provide a verifiable reference list of previous projects performed since 2010, involving the removal and reinstallation of butterfly valves with a diameter of larger than 1000mm in diameter. The reference list shall contain as a minimum 2 projects of the similar nature as the HSSD, the date of the project, client name, number of valves involved in the project and valve sizes.	

Contractors who do not comply with the gate keepers will not be considered for further technical evaluation.

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8.2 TECHNICAL EVALUATION

Minimum score of 70% required			Score			
No.	Criteria	Weight [%]	0	2	4	5
1.	Preliminary method statement for repairs, removal and re-installation of the 1600mm, 2000mm and 3000mm Main CW valves including all the preparatory work as stipulated on the SOW under section 4.2.	35	Deficient or non-responsive	High level, or method statement only describe either CW valves or no reference to flexile seal but not both.	Submitted with Acceptable risks	Fully compliant and no technical risks as per the SOW
2.	Typical QCP for the repairs/Installation of butterfly valve larger than 1000mm.	10	Deficient or non-responsive	Non-compliant or unacceptable technical risk (40%≤QCP activities vs SOW≤59%)	Compliant with defined acceptance criteria (60%≤QCP activities vs SOW≤79%)	Compliant QCP activities are in-line with the SOW details (80%≤QCP activities vs SOW≤100%)
3.	Exclusions or qualifications to the detailed Scope of Work section 4	45	Deficient or non-responsive	Unacceptable risks or omissions in accordance with the requirements of section 4 of the SOW	Submitted with Acceptable risks	Fully compliant and no technical risks as per the SOW
4.	Demonstrable evidence of previously completed corrosion protection projects. Section 7.2 subsection 4	10	Deficient or non-responsive	Unacceptable risks or omissions in accordance with the requirements of 7.2 point no 4	Contractor has only done 2 or less projects in accordance to section 7.2 point no 4	Contractor has done more than 2 projects in accordance to section 7.2 point no 4

Note: A minimum total of 70 % is required in this section for further consideration. The tenderer is to ensure that all the evaluation criteria are submitted as stated with the tender application.

9. AUTHORISATION

This document has been seen and accepted by:

10. REVISIONS

Date	Rev.	Compiler	Remarks
March 2021	1	NM	First draft

11. DEVELOPMENT TEAM

12. ACKNOWLEDGEMENTS

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APPENDIX A: CONDENSER VALVES (T1'S AND T2'S) AND TURBINE COOLING WATER CIRCUIT

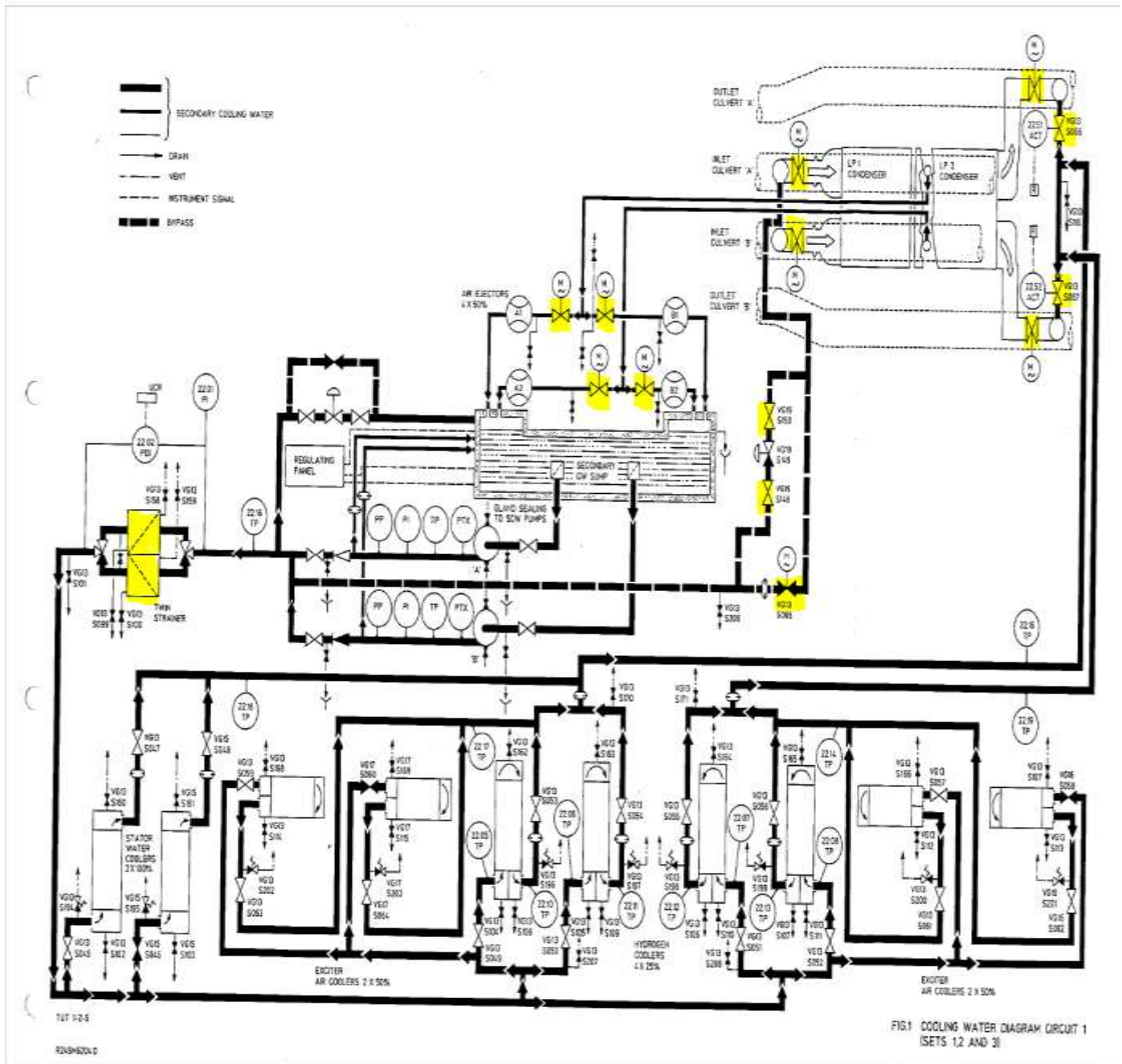
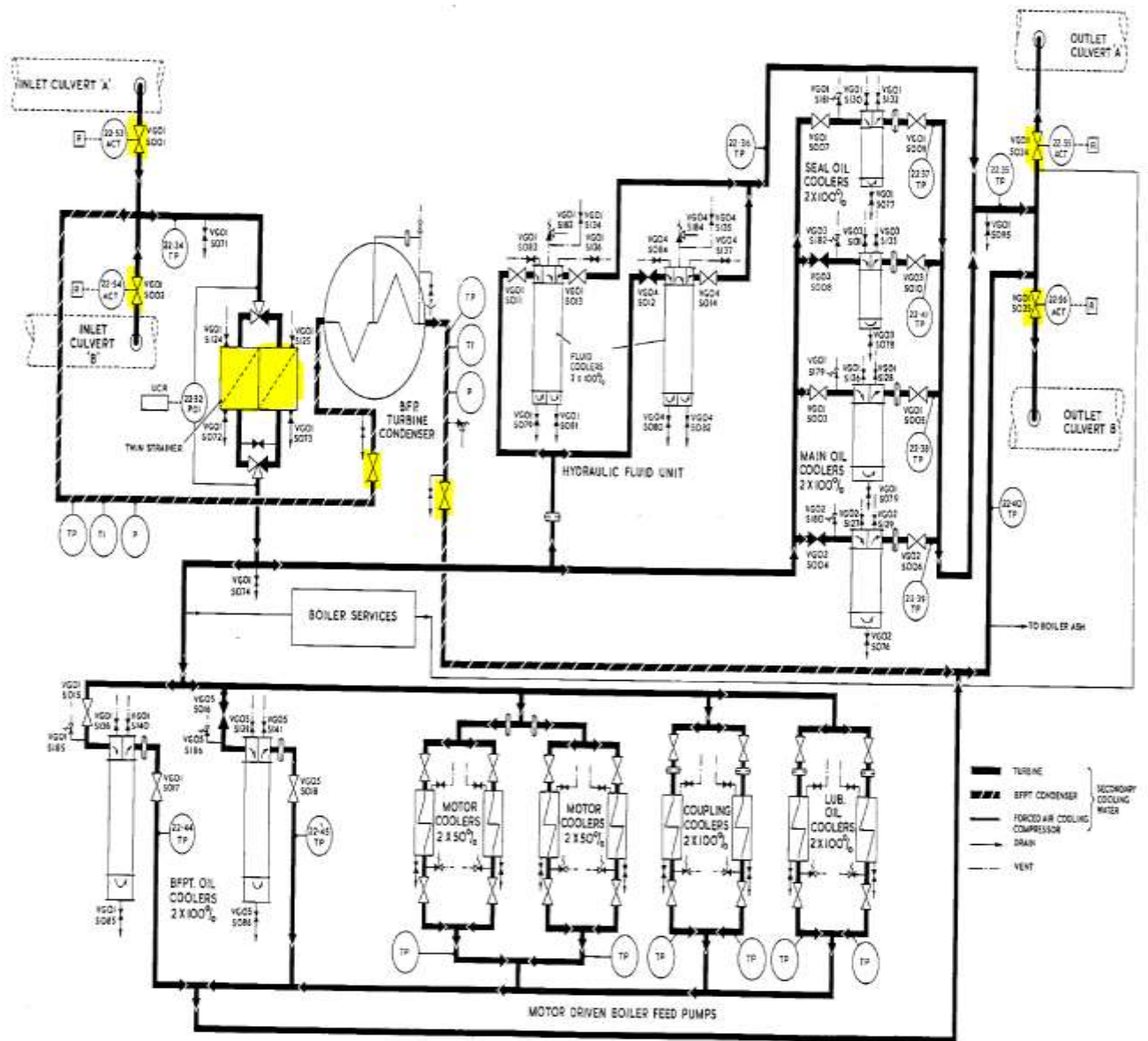


Figure 1: Cooling Water Circuit 1

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TUT 1-3-5
2016/03/23 E

FIG.2 COOLING WATER DIAGRAM CIRCUIT 2
(SETS 1, 2 AND 3)

Figure 2: Cooling Water Circuit 2

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APPENDIX B: OUTSIDE PLANT CW SYSTEM

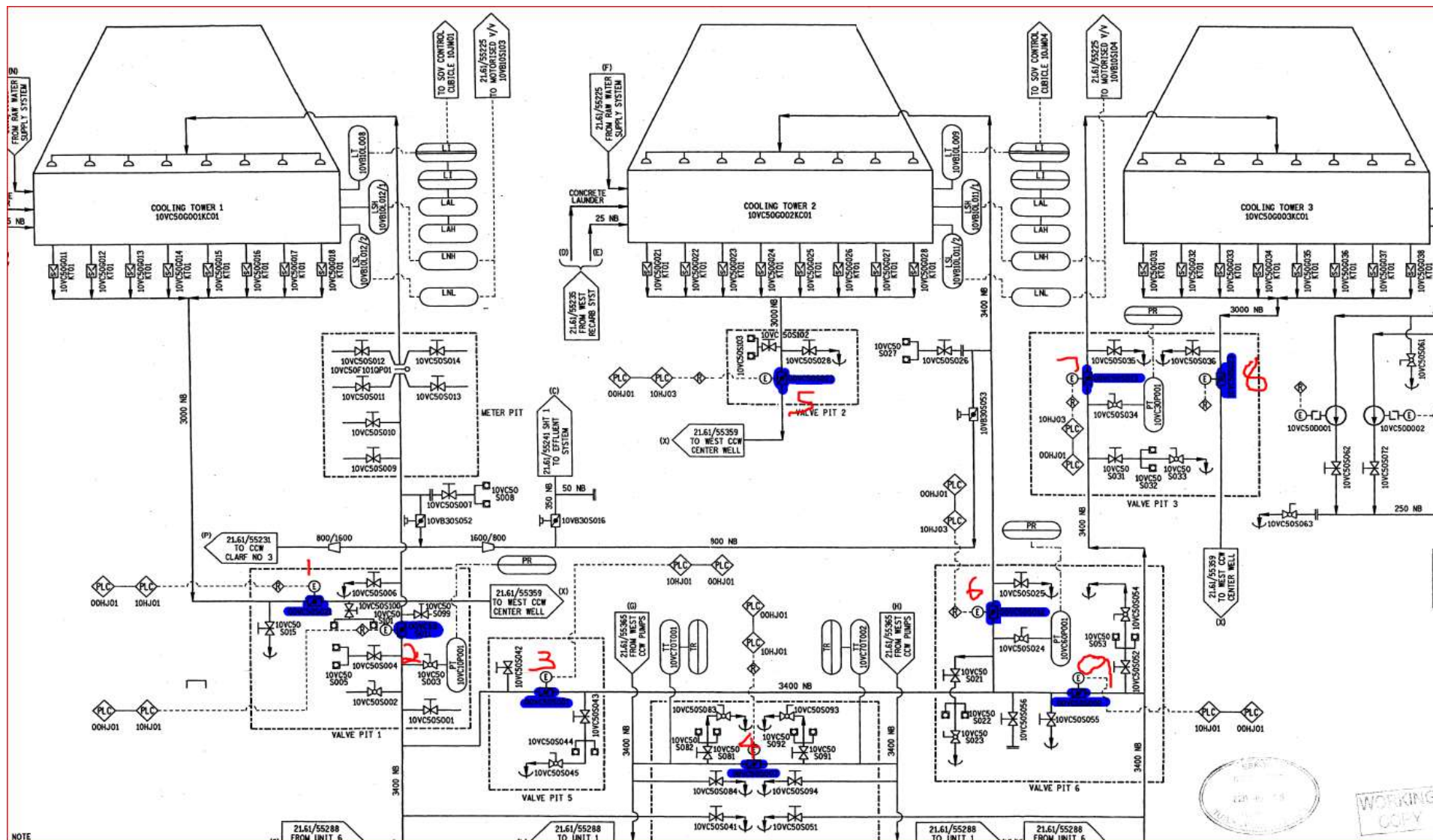


Figure 3: Main CW Cooling tower 3m valves layout

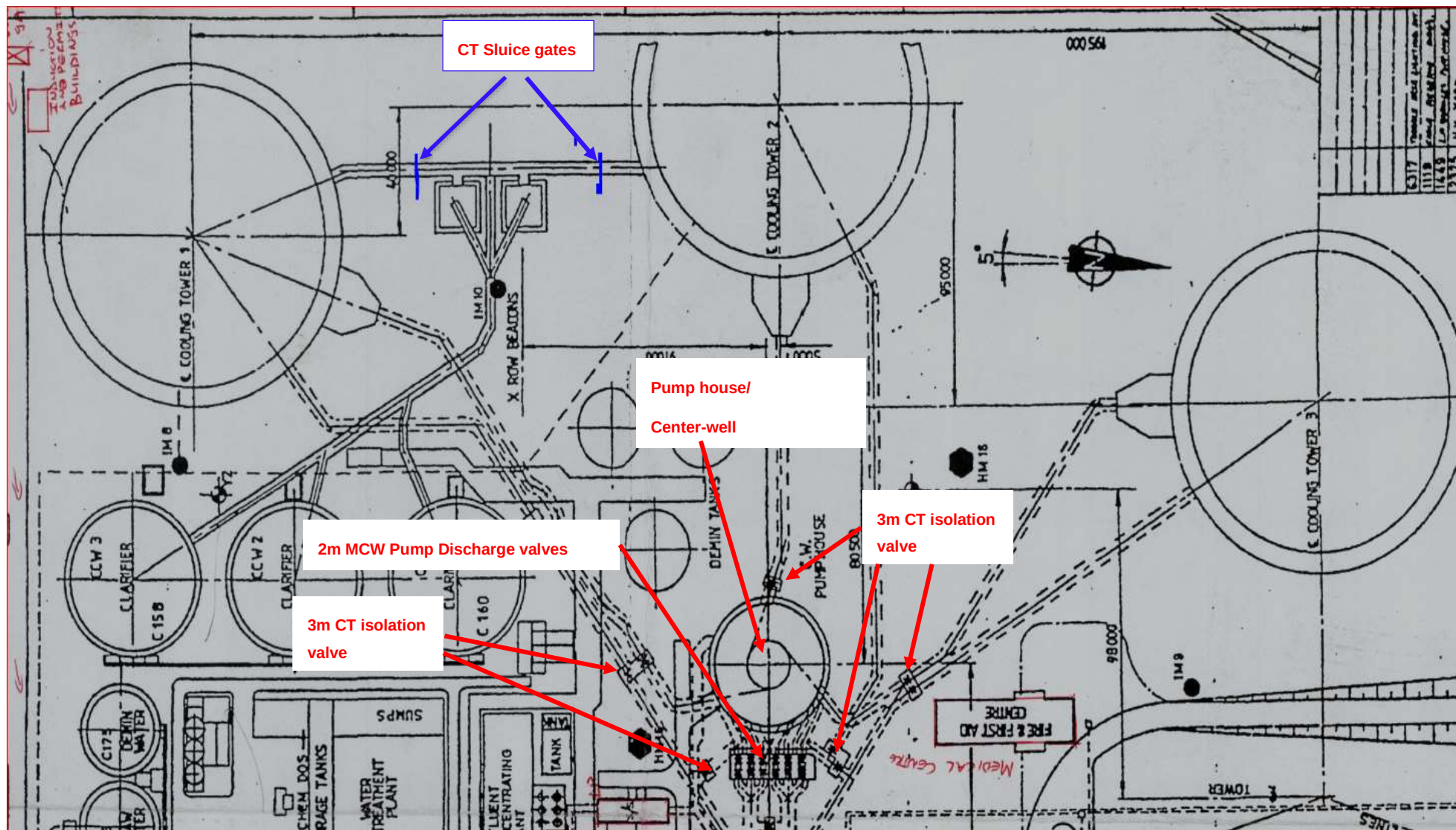


Figure 4 : Main CW Pump house, 2m and 3m valves location

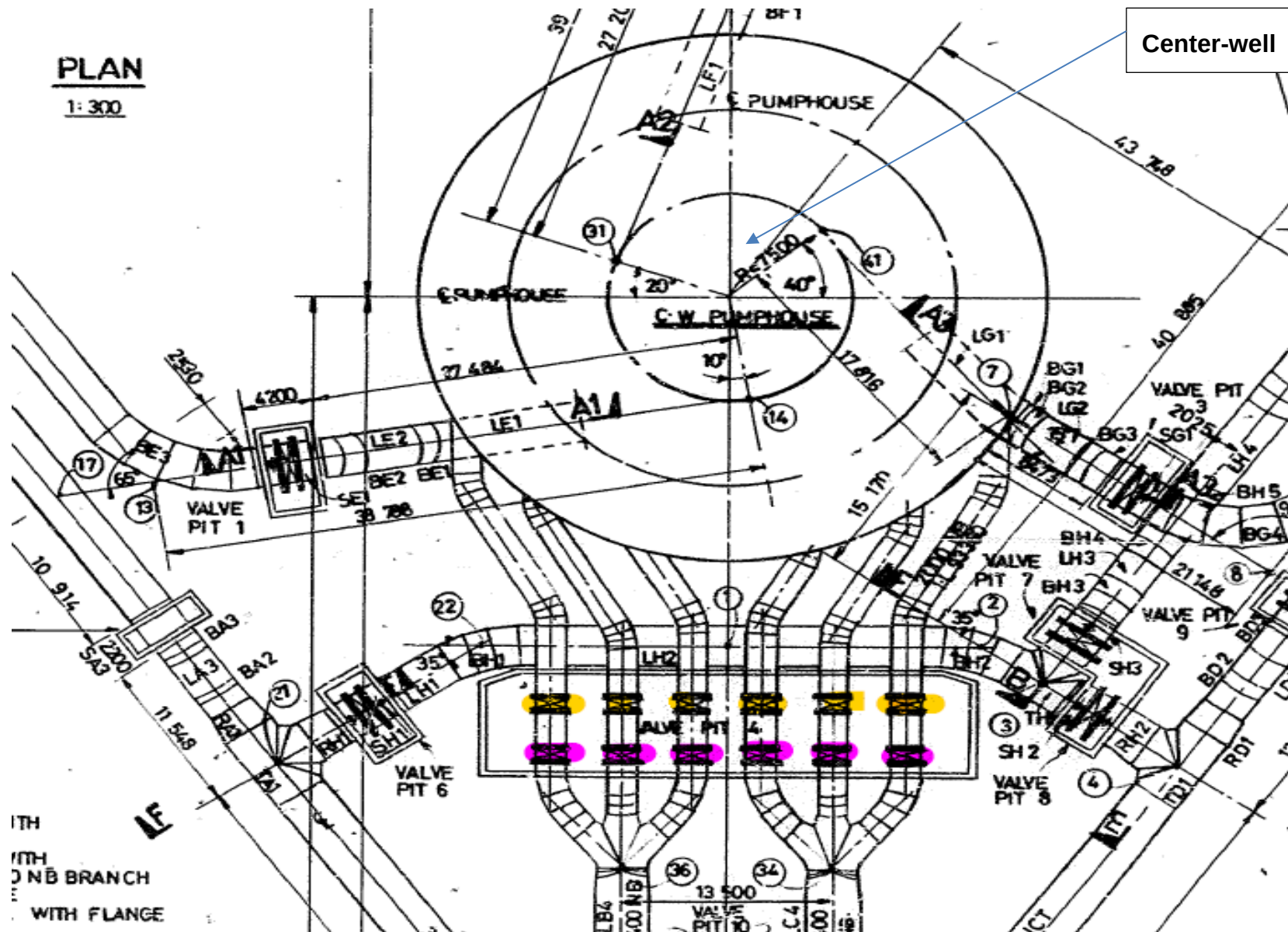


Figure 5: CW pump discharge valves (Yellow= ACV and Pink= Backup valve)

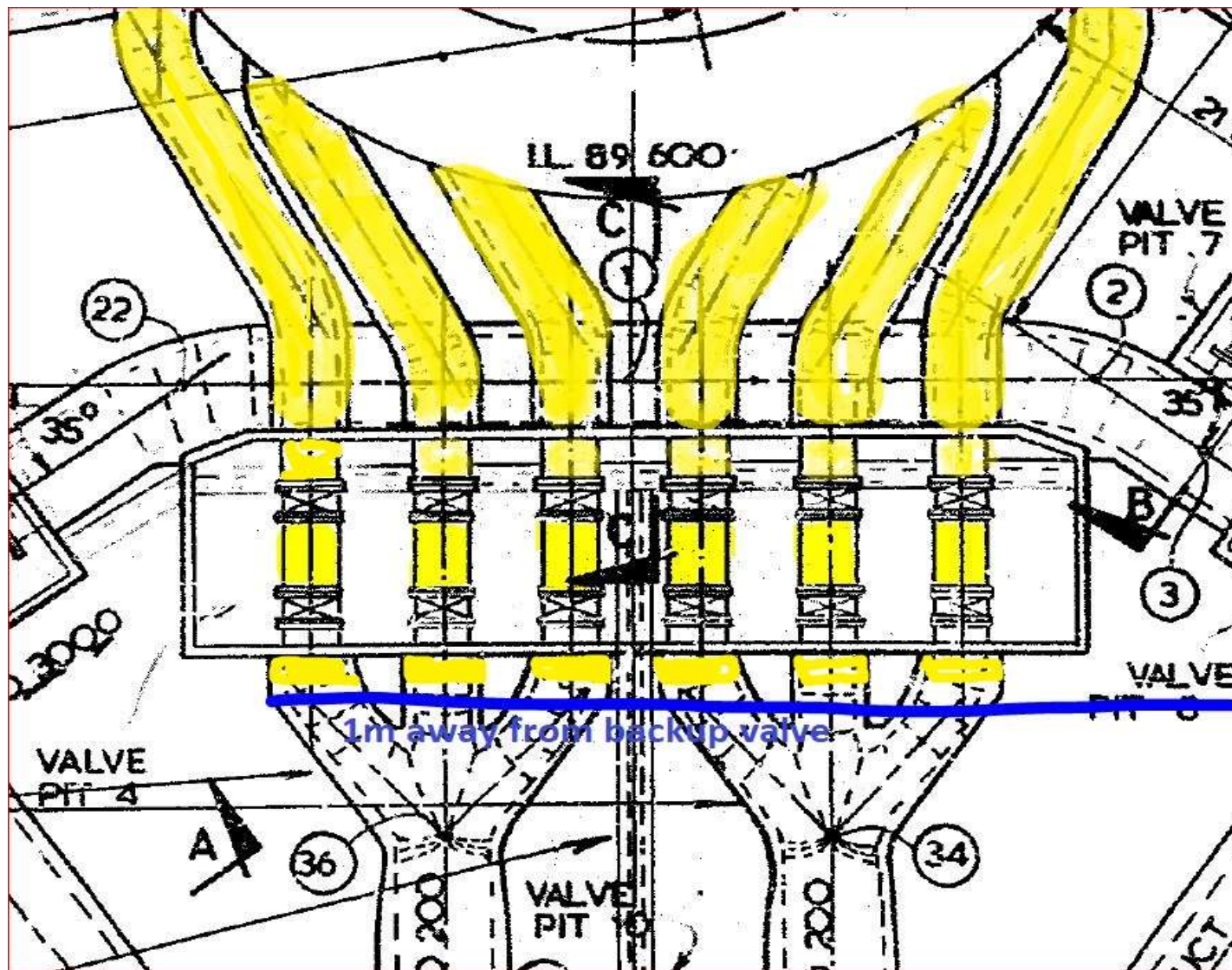


Figure 6: Valve Contractor SOW around ACV and Back up valves