

	Report	Technology
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Date: **2023/06/06**

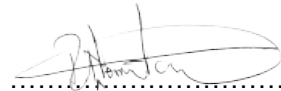
Functional Responsibility



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Engineering Design Work Lead

Date: **2023-06-15**

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Date: **2023/06/15**

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CLASSIFICATION AND SIGNATORIES

As per Project Engineering Change Management (240-53114026) this engineering change is classified as:

Level	Criteria	Engineering Change Committee	Mark with "X"
1	Proposed change affects any of: <ul style="list-style-type: none">• Compliance to SRD• Health and safety• Time or cost greater than 5% on overall project• Regulatory compliance; or avoidance of major equipment damage; or prevention of production loss.	Approval: Client representative Approval: All affected EDWLs Authorisation: Project Engineering Manager	
2	Proposed change affects multiple systems or disciplines (COE) or impact on: <ul style="list-style-type: none">• Plant reliability• Availability• Environmental• Operations	Approval: All affected EDWLs Authorisation: Project Engineering Manager	X
3	Proposed change affects one plant system or discipline (COE) and has no impact on: <ul style="list-style-type: none">• Safety• Operations• Environment	Approval: EDWL Authorisation: Project Engineering Manager	


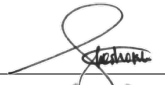





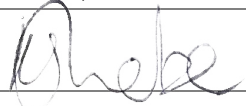
As per Project Engineering Change Management (240-53114026) table 2.5, the status of this engineering change assigned by the change review panel is:

Classification	✓	Comments
Authorised	✓	
Authorised with comments		
Rejected		
Rework		

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APPROVAL BY ENGINEERING CHANGE REVIEW PANEL:

Name	Discipline	Designation	Signature
Zak Jiyane	BMH	EDWL	
Koketjo Seshoka	Chemical	LDE	
Justin Varden	Chemical	Chief Engineer	
Hendrik Mathebula	LPS	LDE	
Mpho Ramunenyiwa	Electrical	LDE	
Tau Chokoe	Civil and Structural	LDE	
Mandla Patric Nkosi	Configuration Management	LDE	
Kgaugelo Shebe	Control and Instrumentation	LDE	

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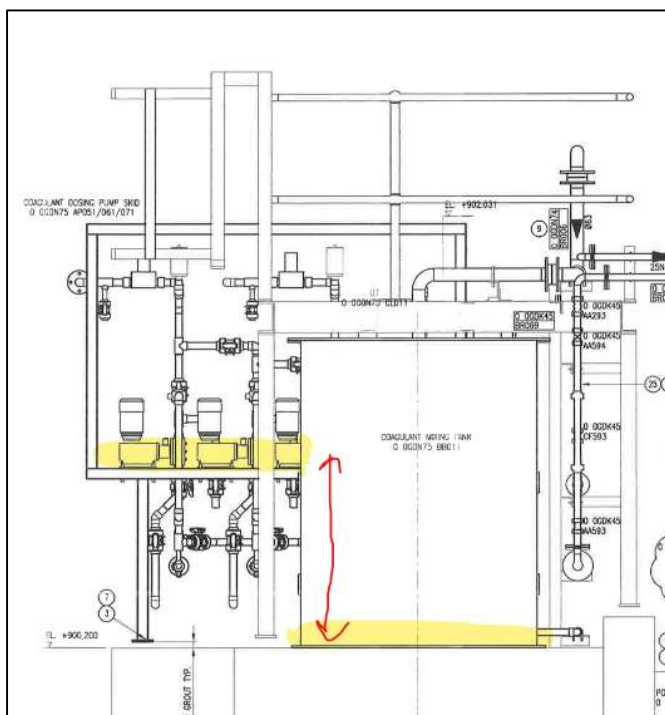
1. INTRODUCTION

The water treatment plant clarifier was constructed by package 08 as a civil structure. The mechanical overflow pipes were not included in that package nor any other package. Mechanical designs were created (0.84/58781 and 0.84/61041 sheets 1 and 2) including protective coating specifications (RTD/MAT/21/026) but not implemented. This Engineering Change report covers the request for the fabrication, installation, corrosion protection and commissioning of these pipes.

The dosing pipes of the polymer at the clarifier discharges into the second slow mixing chamber. This change report proposes that the polymer dosing pipes be extended to the first slow mixing chamber and both dosing pipes be fitted with isolation valves. This change will provide an option to increase the polymer residence time and allow for either discharge point to be utilized.

The coagulation dosing point is currently located at the inlet chambers of the clarifiers. This change report proposes that an additional dosing point is added on the common inlet pipeline before the inlet mixer with isolation valves.

The coagulant dosing pumps suction is placed at approximately 40% of the tank level. Although the pumps are positive displacement pumps, they are unable to pump the coagulant when the level in the tank is below the suction of the pump (see GA figure below). This change report proposes that the pumps suction is dropped or lowered to below 10% of the tank level to allow for the "Low" 15% alarm and "Low Low" 10% level alarm/interlock to be activated during operation as per the design.



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2. SUPPORTING CLAUSES

2.1 SCOPE

1. The review and update of the existing design, manufacture, protective coating, installation, testing, commissioning, and handover of the clarifier overflow pipes and pipe supports as per the design given.
2. The design, manufacture, installation, testing, commissioning, and handover of the coagulant and polymer dosing lines with their isolation valves.
3. The lowering the coagulant dosing pumps suction level.
4. All new plant items to be labelled at the plant.
5. The updating of all applicable documentation.

2.1.1 Purpose

Request for Design (RFD) document number RFD-WTP-91 triggered an Engineering Change Proposal (ECP) as the proposed changes were complex. The purpose of the document is to outline the baseline changes in scope and associated impacts emanating from the RFD document. These cover the clarifier overflow piping and the clarifier chemical dosing system.

2.1.2 Applicability

This document shall apply to Medupi Power Station Water Treatment Plant Clarifier.

2.2 NORMATIVE/INFORMATIVE REFERENCES

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

[1] ISO 9001 Quality Management Systems.

2.2.2 Informative

None

2.3 DEFINITIONS

Definition	Description
polymer	Synonymous with flocculant.

2.3.1 Disclosure Classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.4 ABBREVIATIONS

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Abbreviation	Description
ECP	Engineering Change Proposal
RFD	Request For Design
WTP	Water Treatment Plant

2.5 ROLES AND RESPONSIBILITIES

Impact Assessment Team Leader: The impact assessment team leader shall be selected by the EDWL and his/her function is to; leads the impact assessment and compile the engineering change report

Engineering Design Work Lead (EDWL): The EDWL shall ensure that the engineering change request is relevant, reviewed and fit for purpose to be implemented on the relevant plant area(s). The EDWL shall verify that the engineering change impact assessment team is duly constituted of all affected stakeholders.

Project Engineering Manager (PEM): The project engineering manager authorises the engineering change based on engineering change control committee comments. The role change authoriser may be delegated by the project engineering manager to a professionally registered chief engineer, for example the project integration chief engineer.

2.6 PROCESS FOR MONITORING

This document is governed by the Project Engineering Change Management (240-53114026) procedure.

2.7 RELATED/SUPPORTING DOCUMENTS

[2] RFD-WTP-91 Design Change Notice: Water Treatment Plant and PDRT discharge pipe

3. CHANGE SCOPE

3.1 ENGINEERING BASELINE

1. Clarifier Overflow Pipes

a. Current design

- I. The clarifier overflow pipes were excluded from the original design. There is a current mechanical design for the pipes that requires manufacturing, installation, commissioning, and handover.

b. Proposed change

- I. Review the current design, update as required, manufacture, install, corrosion protect, commission and handover the clarifier overflow pipes and pipe supports.

2. Clarifier chemical dosing points (flocculant, coagulant)

a. Current design

- I. Currently, the flocculant is discharged into the second slow mixing chambers in both clarifiers.

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- II. The coagulant is currently dosed at the inlet chamber of the clarifier.

b. Proposed change

- I. The installation of additional dosing points with manually accessible isolating valves for both lines in the first slow mixing chambers of both clarifiers to allow for the option of increased residence time.
- II. The installation of an additional dosing point at the clarifier inlet pipe before the inline mixer and isolation valves.

3. Coagulation pumps suction level

a. Current design

- I. The coagulant suction level is at approximately 50% of the tank. This makes about 40% of the volume of the tank unavailable for use. This increases the frequency that the bulk chemical will need to be refilled. Furthermore, the bottom half of the chemical will never be utilised based on the current configuration.

b. Proposed change

- I. It is proposed that the suction point or level of the pumps is decreased to between 5% and 10% to allow for the LL level protection to activate during normal operation.

Table 1: Affected Baselines

Affected Baseline	Scope of Baseline
Water Treatment Plant System 1 – Clarifier Thickener P&ID	0.84/4666
Water Treatment Plant Clarifier Polymer Dosing Sections – Piping General Arrangement	0.84/25226
Water Treatment Plant Clarifier Raw Water Overflow Pipeline (sheets 1 & 2)	0.84/61041

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3.2 AFFECTED SYSTEMS

Table 2: Affected Systems

System
WTP Raw Water Clarifier overflow pipes (north and south)
WTP Raw water Clarifier common inlet pipe
WTP Raw water Clarifier inlet chamber
WTP Raw Water Clarifier coagulant dosing pumps

3.3 AFFECTED DOCUMENTATION

Table 3: Affected Documentation

Document Title	Document Reference ID
Sub-System 3a Clarifier/Thickener A	200-23229
Water Treatment Plant System 1 – Clarifier Thickener P&ID	0.84/4666
Water Treatment Plant System 5 – Coagulant Dosing P&ID	0.84/4747
00 GDB00 00 GDN18 EA100 Sub-System 68 Polymer dosing system	200-23860

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4. IMPACT ASSESSMENT

4.1 IMPACT ASSESSMENT TEAM MEMBERS

Table 4: Impact Assessment Team Members

Impact assessment team member	Designation
Phumlile Nkomo	Chemical Engineer
Marius van Niekerk	Civil and Structural Engineer
Banele Mbendane	Electrical Engineer
Mduduzi Dhlamini	CM Technician
Sphindile Khanyile	C&I project Engineer
Kudzai Pakachena	LPS Engineer

4.2 IMPACT ASSESSMENT CHECKSHEET

Table 5: Impact Assessment Check sheet

1	Technical	Impacted?
1.1	Physical impact this change may have:	
1.1.1	Changes in electrical installation (switchgear, cabling, controlling equipment, motor or actuator replacement, supply services eg sewerage, lighting, air conditioning, etc.)	No impact
1.1.2	Change to plant configuration (additional requirements for mounting or assembly, Space allocation)	Yes
1.1.3	Handling (cranes, transport), storage and preservation requirements, testing	No impact
1.2	Changes to documentation (drawings, specifications, operating & maintenance philosophy)	Yes
1.3	Risk assessment (technical – increase in operating parameters such as Temperature pressure, electrical and/or mechanical power, change to operational requirements), impact on cooling/auxiliary systems	No impact
1.3.1	Hazard Analysis and Operability Study (HazOp)	No impact
1.3.2	Failure Modes, Effects and Criticality Analysis (FMECA)	No impact
1.4	Reliability Study / Assessment (could form part of a combined RAM study)	No impact
1.5	Availability Study / Assessment (could form part of a combined RAM study)	No impact

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1.6	Maintainability Study / Assessment (could form part of a combined RAM study)	No impact
1.7	Maintenance requirements (special tools, training, clean conditions, impact on station personnel or previous experience)	No impact
1.8	Supply chain (preferred local supply), availability of spares.	No impact
1.9	Operational changes (limiting time of operation or condition of operation – ventilated or air conditioned room, special care in starting/stopping)	No impact
1.10	Compliance with SRD, Contract and referenced standards and specifications	No impact
1.11	Guarantees and warranties violations	No impact
1.12	Efficiency	No impact
1.13	Constructability	No impact
1.14	Other Engineering Disciplines Interfaces Impact	Yes, CM, LPS, Civil
1.15	Scope impact with regards to Division of Responsibilities (DoR)	No impact
2	Financial	
2.1	Capital Cost breakdown of proposed costs (including proposed cost savings)	Yes
2.2	Life Cycle Cost analysis	No impact
2.3	Cost benefit analysis (consider impact on Unplanned Capability Loss Factor, Unit Capability Factor, Planned Capability Loss Factor etc.)	No impact
3	Safety	
3.1	Inherent safety design has not been compromised,	No impact
3.2	Additional plant or equipment required to comply with Occupational Health and Safety Act, Act 85 of 1993	No impact
3.3	Need for revised design calculations	No impact
3.4	Noise considerations	No impact
4	Environmental	
4.1	Assessment of impact on operational conditions affecting discharge to atmosphere	No impact
4.2	Assessment of impact on operational conditions affecting waste removal and processing	No impact
4.3	Assessment of impact of accidental release of pollutants (oils, gases, waste water, etc.)	No impact
5	Operating	
5.1	Have the Experiential Record and Lessons Learnt from operating plant been taken into consideration?	No impact
5.2	Is there someone in Operating that should be referred to (to give input)?	No impact

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6	Lessons learnt	
6.1	Has this change been identified on the lessons learnt register for future projects?	No
7	Timing	
7.1	Assessment of the impact with respect to the project programme	Yes

4.3 IMPACT DESCRIPTIONS AND REQUIRED ACTIONS

4.3.1 Technical Impact

Changes to documentation (drawings, specifications, operating & maintenance philosophy

- The drawings, operating manuals and maintenance manuals will require updates

Other Engineering Disciplines Interfaces Impact

- The proposed change affects Configuration Management as additional items will need to be captured and labelled on the plant.

Capital Cost breakdown of proposed costs (including proposed cost savings)

- The proposed changes will increase the cost of the P04A contract as it is outside the scope of the contract.

4.3.2 Financial

- A quantity surveyor (QS) report has been compiled for the project and circulated to the approval committee.

4.3.3 Safety

Need for revised design calculations

- N/A

4.3.4 Environmental

- N/A

4.3.5 Operating

- The operation of the coagulant dosing pumps will be aligned with the design, allowing for the low low level protection to be activated at 10%

4.3.6 Lessons learnt

- Employ integration of scope additions after contract award. Attention to detail would have picked up the missed mechanical scope and assigned it accordingly whilst the contractor was on site.
- Commissioning check sheets to include the verification of all plant interlocks. The location of the coagulant suction pipe position does not allow for the full usage of the coagulant tank and

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does not allow for the confirmation of the low-level alarm and pump protection. This could have been picked up during commissioning.

4.3.7 Timing

- These changes may result in an extension in the construction time and the extent will only be known after the Contractor has completed the design and determined the construction impact.

5. ACTION ITEMS RESOLUTION

N/A

6. CONCLUSIONS AND RECOMMENDATIONS

It is recommended that the request for the additional scope for the P04A contract is performed to allow for the optimization and handover of the WTP raw water clarifier to Eskom Generation as per the user requirements specification (URS) requirements.

7. AUTHORISATION

This document has been seen and accepted by:

Name & Surname	Designation
Willie Beetge	Civil Engineer
Kudzai Pakachena	LPS Engineer
Banele Mbendane	Electrical Engineer
Mduduzi Dhlamini	Configuration Management Engineer
Sphindile Khanyile	C&I Engineer

8. REVISIONS

Date	Rev.	Compiler	Remarks
April 2023	1	P Nkomo	First Revision – DRC AWC
April 2023	2	P Nkomo	Comments expanded DRC – rejected, comments given
April 2023	3	P Nkomo	Comments addressed
May 2023	4	P Nkomo	Scope Change

9. DEVELOPMENT TEAM

The following people were involved in the development of this document:

- Phumlile Nkomo

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