

**PROJECT PARTICULAR SPECIFICATION:  
STRUCTURAL ASSESSMENTS**

**PS STR**

**UMHLANGA WASTEWATER TREATMENT WORKS  
EMERGENCY REMEDIATION WORKS**

**Contract No. WS7741**

**Rev 0**



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## **PREAMBLE**

This Project Specification forms an integral part of the contract. This specification shall be read in conjunction with all Project, Client and Particular Specifications.

## **PS STR 1      PREAMBLE**

It is noted that during the assessments, Clarifiers (1) and (2) have been found full of effluent, unfortunately assessments of floor slabs and part of the walls could not be undertaken.

Note the assessment carried out by structural engineers is based only on visual inspections and the recommendations provided are based on elements which are visible to the naked eye on site, elements hidden under water or ground are not covered on this assessment.

All structural elements mentioned below are exposed to wet conditions and some carry and retain sewage, therefore the selection of repair materials is to be able to resist and prevent corrosion and also be waterproof. All materials recommended for repair to be used should be applied in strictly accordance to the manufacture's specifications.

## **PS STR 2      CLARIFIER 1**

The structure has a two outer ring wall which form a through/channel of 600mm wide with inner forming the depth of the tank and has 8No. expansion joints. The outer ring wall 200mm thick forms a through/channel with inner wall. The overall diameter of the clarifier is approximately 24.3m.

### **PS STR 2.1      VISUAL ASSESSMENT**

It was not difficult to assess the external part of Clarifier 1 and the following structural defects were noted were noted.

1. Minors cracks on the outer ring. (signs of leakage) (refer to photo No. 04, 05 & 06).
2. Deposition of sludge on half-way across the channel, this meant the clarifier is tilted to one side. (refer to photo No. 01 & 02).
3. Could not inspect the floor slab because of effluent. (structural damage unknown) (refer to photo No. 03).

### **PS STR 2.2      RECOMMENDATIONS**

1. Engagement with the Geotechnical engineer and specialist to assess the cause of the tilt (whether its settlement or uplift) and design recommendations on how to rectify the Tilt. A detailed survey is required to determine by how much the clarifier has tilted and whether this tilt affects its operations or functionality.
2. Unfortunately, the Clarifier (1) floor slab could not be inspected for any structural damage due to effluent in the tank/clarifier. Only upon successful drainage of the clarifier (1), it would be possible for full visual assessment to be carried out.
3. It was noted from the operations personnel that every time the clarifier drained, the water filled up the structure suggesting that there might be surrounding ground water seepage into the Clarifier. It is recommended that further investigation to be carried out, from the visual assessment there is indication of cracking of internal walls which might result in ground water seepage.

## PS STR 2.3      REFERENCED IMAGES



Clarifier (1) Photo 01-Sludge Deposition



Clarifier (1) Photo 01-Sewage spill



Clarifier (1) Photo 01-Shows Tilt



Clarifier (1) Photo 02-Sludge Deposition



Clarifier (1) Photo 01-Shows Tilt



Clarifier (1) Photo 03-Water in Clarifier.



Clarifier (1) Photo 04-Outer wall cracks (0.2-0.3mm)



Clarifier (1) Photo 05-Outer wall cracks (0.2-0.3mm)



Clarifier (1) Photo 06-Outer wall cracks (0.2-0.3mm)

**PS STR 3 CLARIFIER 2****PS STR 3.1 LAYOUT**

The structure has two outer ring walls which forms a through/channel of 600mm wide with inner forming the depth of the tank and has 8No. expansion joints. The outer ring wall 200mm thick forms a through/channel with inner wall. The overall diameter of clarifier is approximately 24.3m.

**PS STR 3.2 VISUAL ASSESSMENT**

The outer part of the tank (Clarifier 2) was accessible and the following structural defects were noted:

1. Minors cracks on the outer ring. (sign of leakage) (refer to photo No. 7,8 & 9)
2. Could not inspect the floor slab because of effluent. (structural damage unknown) (refer to photo 10)
3. Small diameter hole on the side of the tank

**PS STR 3.3 RECOMMENDATIONS/REMEDIAL WORKS**

1. Seal or close the small diameter hole on the using non shrink grout or similar approved.
2. The clarifier floor slab could not be inspected for any structural damage due to effluent in the tank/clarifier, upon successful drainage of the clarifier, it would be possible for full visual assessment to be carried out.
3. It was noted from the operations personnel that every time the clarifier drained, the water filled up the structure suggesting that there might be surrounding ground water seepage into the Clarifier. It is recommended that further investigation to be carried out, from the visual assessment there is indication of cracking of internal walls which might result in ground water seepage.



Clarifier (2) Photo 07-Outer wall cracks (0.2-0.3mm)



Clarifier (2) Photo 08-Outer wall cracks (0.2-0.3mm)



Clarifier (2) Photo 09-Detail outer wall cracks (0.2-0.3mm)



Clarifier (2) Photo 10-Water in Tank

## PS STR 4      SCREW PUMP ROOM

On the assessment of the Screw Pump Room it depicted signs of spalling probably due to the suspended slab restrained to columns below. Cracks have developed at the interface of column and slab, with the column having vertical and inclined cracks, on the other end column-beam connection both elements are cracked, with column having vertical cracks and beam with single diagonal crack. (refer to photo No. 12)

Expansion joint on the suspended slab opened/failed. (refer to photo No. 12)



Screw Pump Room Photo 11-Elevation



Screw Pump Room Photo 12-Failed expansion Joint and column spalling



Screw Pump Room Photo 13-Failed expansion Joint and column spalling



Screw Pump Room Photo 15-Beam Spalling



Screw Pump Room Photo 14-Diagonal crack on beam



Screw Pump Room Photo 16-Deatil Beam spalling

## PS STR 5 DESIGN OF REMEDIATION WORKS

The Contractor shall be responsible for the design of the underpinning activities to reinstate the existing clarifier. The level of clarifier the Clarifier is to match Clarifier 2. This is inclusive of all applicable investigations, labour, specialists, testing and geotechnical/survey investigations required. The Contractor is to provide the following to the Engineer for approval prior to the commencement of any remedial works:

1. Design report of proposed solution.
2. Geotechnical results.
3. Civil and structural drawings of remedial works.
4. Method statement of remedial works.

The design must be done by an ECSA Professional Engineer and all drawings to be signed by an ECSA registered Professional Engineer. The Professional Indemnity for design shall be covered by the Contractor.

## PS STR 6 CONSTRUCTION OF REMEDIATION WORKS

The Contractor shall also be responsible for the construction of the design undertaken in PS STR5 to reinstate the clarifier. The rate is to be inclusive of all plant, labour, materials, supervision, specialist equipment and any ancillary items the Contractor deems necessary.