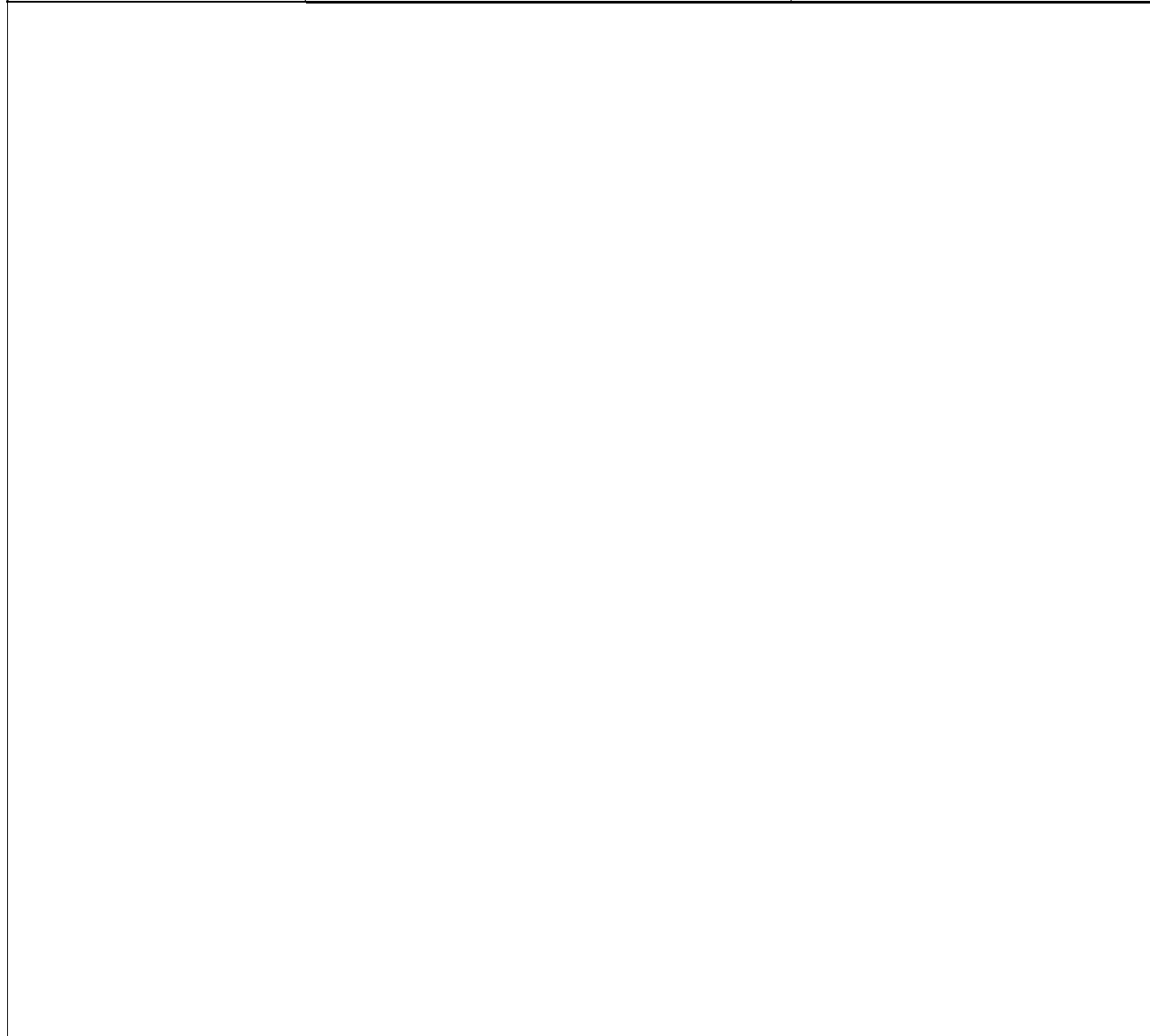


	Scope of Work Matimba Coal Silos Defects Repairs	Doc. no.
		Revision 0
		Total pages 10
Matimba Power Station		Reference Document:



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1. ABBREVIATIONS

CO	: Corrosion
CS	: Concrete Split
FVS	: Future Visible Steel (reinforcement)
HC	: Honeycombing
REP	: Repair (defect on previous repair)
RT	: Rust Trace
SL	: Spalling
US	: Unsticking
VS	: Visible Steel (reinforcement)
WT	: Wire Tie (exposed wire tie on concrete surface)

2. REFERENCES

The following documents have been used as basis for scope of works for repairs of Matimba silos:

1. Matimba Power Station Silo 1 Assessment Report
2. Matimba Power Station Silo 2 Assessment Report
3. Matimba Power Station Silo 3 Assessment Report
4. Matimba Power Station Silo 4 Assessment Report
5. Matimba Power Station Silo 5 Assessment Report
6. Matimba Power Station Silo 6 Assessment Report

3. REPAIR PROCEDURES

3.1 GENERAL

The storage, delivery, surface preparation, mixing, application, monitoring and finishing (curing, drying, setting, etc.) of any product to be used in any of the defect repairs described in this scope of work shall strictly comply with product Manufacturer's requirements for correct application of the selected product.

3.2 ASSUMPTIONS

- Types of defects to be repaired under this scope of work include line cracks, surface defects and point defects.
- Line cracks are linear openings or defects measured by length along the opening and are to be repaired in accordance with line crack repair methods (e.g. epoxy injection).
- Additional defect characteristics (i.e. US, CO, CS, VS, FVS, HC, REP, RT, SL, WT per assessment reports) on LINE cracks are to be treated and repaired in similar way as point defects.
- Surface defects are defects spread over a considerable surface area of the concrete. These defects include crazing, spalling, honeycombing, etc., which are to be repaired by chipping out the defective concrete and applying new concrete or specified repair product (e.g. repair mortar) within the defined perimeter of the defective concrete surface.
- Crazing defects that include reinforcement, spalling, concrete split and other defect characteristics (i.e. US, CO, CS, VS, FVS, HC, REP, RT, SL and WT per assessment reports) are to be repaired as spalling defects to ensure deep repair.
- All surface defects that are not categorized as crazing are to be treated and repaired as spalling defects regardless of other defect characteristics.
- Point defect is a localized defect existing as a defect on specific point on the surface of the concrete or as a surface defect spread over a very small surface area. The defect may include spalling, concrete split, defect on previous concrete repair, exposed wire tie or reinforcement, etc.
- It is assumed that each point defect will fall within 200mm X 200mm surface area for repair as a surface defect. Point defects that include corrosion, spalling, concrete split and others (i.e. US, CO, CS, VS, FVS, HC, REP, RT, SL, and WT per assessment reports) are treated and repaired as spalling defects to ensure deep repair.

3.3 LINE CRACK REPAIRS

3.3.1 Preparation

- Prepare the repair area and mark the crack.
- V-cut into the crack to a minimum of 25mm depth and 6mm width groove (or as prescribed by repair material's manufacturer) along the crack line
- Clean the groove to make it free of any loose material, dust or any contaminants that may compromise the epoxy/sealant.
- For crack injection, core drill nipples along the crack. Size, number and spacing of injection nipples to be per sealant product manufacturer's requirements.
- Preparation of the area to be repaired must comply with Manufacture's requirements for the repair products to be used.

3.3.2 Repair/Sealant Application

- Ensure area is properly cleaned and prepared.
- Apply a suitable bond breaker at the bottom of the groove prior to the application of an epoxy sealant.
- Prepare and apply a sealant to the groove by injecting a suitable (non-sag) epoxy to complete the crack repair. Preparation (e.g. mixing) and application of the sealant to comply with manufacturer's requirements.
- Cure or allow for drying of the sealant in line with manufacturer's requirements.

3.4 SURFACE DEFECTS REPAIR

3.4.1 Crazeing Repairs

3.4.1.1 Preparation

- Prepare the surface by cutting a square/rectangular perimeter around the affected area, chipping down a minimum depth of 20mm from the concrete surface.
- The chipped area is to be cleaned by removing any loose material, dust or contaminants prior to applying the repair mortar.
- Preparation of the area to be repaired must comply with Manufacture's requirements for the repair products to be used.

3.4.1.2 Application of repair method/material

- Crazeing repairs generally do not require reinforcement repairs. However, ensure that any exposed and defective reinforcement in the crazeing area has been repaired prior to applying concrete repair mortar/sealant. Reinforcement repairs to be done per procedure for repair of defective/exposed reinforcement.

- Ensure substrate has been properly cleaned and prepared.
- Apply a suitable approved concrete bonding agent (epoxy resin) on the substrate that will ensure that old concrete bond sufficiently to the new mortar.
- Apply the concrete repair mortar (non-shrinkage and watertight) using a trowel and finish with a mortar render, if necessary, to achieve the same surface finish as the rest of structure.
- Cure the repair work for at least 7 days or as specified in the Manufacturer's Technical Data Sheet of the product used.

3.4.2 Spalling Repairs

3.4.2.1 Preparation

- Prepare the surface by cutting a square/rectangular perimeter around the affected area, chipping down a minimum of 50mm behind the exposed circumferential reinforcing.
- Remove all loose material, dust or contaminants prior to applying repair product.
- Preparation of the area to be repaired must comply with Manufacture's requirements for the repair products to be used.

3.4.2.2 Application of repair method/material

- Ensure that any exposed and defective reinforcement in the defective area has been repaired prior to applying concrete repair. Reinforcement repairs to be done per procedure for repair of defective/exposed reinforcement.
- Conduct final checks to ensure the substrate has been properly cleaned and prepared.
- Apply a suitable approved concrete bonding material on the substrate that will bond the old concrete to the new mortar.
- Apply the concrete repair mortar (non-shrinkage and watertight) using a trowel and finish with a mortar render, if necessary, to achieve the same surface finish as the rest of the structure.
- Cure the repair work for at least 7 days or as specified in the Manufacturer's Technical Data Sheet of the product used.

3.5 POINT DEFECTS REPAIR

- Follow repair method for repairing crazing defects to repair concrete defects that are not deep (less than 20mm) and do not include reinforcement problems.
- Where concrete defects are of considerable depth and include reinforcement defects, follow the method for repairing spalling defects. Reinforcement to be repaired per procedure to repair defective reinforcement.
- Repair over a minimum surface perimeter of 200mm X 200mm around the defect.

3.6 DEFECTIVE REINFORCEMENT REPAIRS

Repair is required where reinforcement is exposed, corroded or somewhat defective due to concrete damage or exposed and damaged by removal of concrete during preparation for concrete repair. Defective reinforcement must be treated or repaired as appropriate.

3.6.1 Preparation

- Remove concrete around corroded/damaged/unbonded reinforcement until good and well bonded reinforcement is found to ensure all defective reinforcement is exposed
- Ensure the reinforcement is properly secured to ensure it does not move during repair.
- The superficial corroded reinforcement must be cleaned to remove all rust and loose material. Clean the reinforcement by wire brushing or abrasive treatment (sandblasting) to pull off all rust and corrosion deposit.
- Cut and replace any reinforcement parts that have been damaged or corroded excessively. Replace damaged reinforcement per reinforcement replacement procedure. This should be done prior coating the overall repaired reinforcement with a primer or bonding agent.

3.6.2 Reinforcement Replacement

Depending on the extent and nature of defect, some parts of the reinforcement may need to be cut out and replaced e.g. if corrosion has significantly damaged/pitted the steel, the affected bars should be removed and replaced. The damaged reinforcement must be replaced as follows:

- The pitted circumferential bar must be removed, or cut at the extremities, and be replaced with a new reinforcement bar with an equivalent diameter and steel grade.
- The new reinforcement bar must be welded to the remaining bar and each weld should be at least 100mm long with a 4mm throat.
- Ensure that the correct welding rods are used for specific steel grade.
- Coat/Treat all reinforcement with suitable (high alkaline or zinc-rich) coat to prevent future corrosion. This should be done in line with coating product manufacture's requirements prior to sealing the affected area with repair mortar.

3.6.3 Reinforcement Coating

- Ensure that brushing and abrasive treatment of all affected reinforcement has been done properly and all rust has been removed.
- Chemically treat the reinforcement by applying suitable coating/primer and/or concrete bonding agent. Ensure sufficient coat is applied such that the reinforcement has been passivated to prevent future corrosion.
- Allow coating to dry in line with manufacturer's requirements before applying repair mortar/epoxy.

3.6.4 Exposed Wire Ties

- Allow for 200mm X 200mm surface perimeter repair around exposed wire tie.
- Cut out 50mm depth of concrete and cut the remaining exposed wire tie. Ensure reinforcement is not damaged.
- Repair concrete and any remaining defective reinforcement per spalling and reinforcement repair procedures as described in this document.

4. BILL OF MATERIALS

Item No	Description	Unit	Quantity
1 EXTERNAL REPAIRS			
1.1	<u>Crack Repairs</u>		
1.1.1	Crack Preparation	m	1407
1.1.2	Crack Injection (including bond breaker)	m	1407
1.2	<u>Crazing Repairs</u>		
1.2.1	Saw-cut, chipping and removal of defective concrete to a depth of 20mm for Crazing	m ²	48
1.2.2	Application of concrete bonding agent	m ²	48
1.2.3	Hand applied repair mortar on Crazing repairs (20mm thick)	m ²	48
1.3	<u>Spalling Repairs</u>		
1.3.1	Saw-cut, chipping and removal of defective concrete to a depth of 50mm for Spalling	m ²	43
1.3.2	Application of concrete bonding agent	m ²	43
1.3.3	Hand applied repair mortar on Spalling repairs (50mm thick)	m ²	43
1.4	<u>Cutting and Removal of Defective Reinforcement</u>		
1.4.1	Old Y12 reinforcement	m	4.29
1.4.2	Old Y16 reinforcement	m	10.72
1.4.3	Old Y20 reinforcement	m	4.29
1.4.4	Old Y25 reinforcement	m	2.14
1.4.5	Old R8 reinforcement	m	1.07
1.4.6	Old R10 reinforcement	m	1.07
1.4.7	Old R12 reinforcement	m	1.07
1.5	<u>Reinforcement Repairs</u>		
1.5.1	Wire brushing of cut reinforcement	m ²	49
1.5.2	Application of corrosion inhibitor and bonding agent to steel reinforcement	m ²	49
1.5.3	New Y12 reinforcement	m ²	9
1.5.4	New Y16 reinforcement	m ²	21
1.5.5	New Y20 reinforcement	m ²	9
1.5.6	New Y25 reinforcement	m ²	4
1.5.7	New R8 reinforcement	m ²	2
1.5.8	New R10 reinforcement	m ²	2
1.5.9	New R12 reinforcement	m ²	2
			-

Item No	Description	Unit	Quantity
2 INTERNAL REPAIRS			
2.1	<u>Crack Repairs</u>		
2.1.1	Crack Preparation	m	279
2.1.2	Crack Injection (including bond breaker)	m	279
2.2	<u>Crazing Repairs</u>		
2.2.1	Saw-cut, chipping and removal of defective concrete to a depth of 20mm for Crazing	m ²	30
2.2.2	Application of concrete bonding agent	m ²	30
2.2.3	Hand applied repair mortar on Crazing repairs (20mm thick)	m ²	30
2.3	<u>Spalling Repairs</u>		
2.3.1	Saw-cut, chipping and removal of defective concrete to a depth of 50mm for Spalling	m ²	85
2.3.2	Application of concrete bonding agent	m ²	85
2.3.3	Hand applied repair mortar on Spalling repairs (50mm thick)	m ²	85
2.4	<u>Cutting and Removal of Defective Reinforcement</u>		
2.4.1	Old Y12 reinforcement	m	8.49
2.4.2	Old Y16 reinforcement	m	21.23
2.4.3	Old Y20 reinforcement	m	8.49
2.4.4	Old Y25 reinforcement	m	4.25
2.4.5	Old R8 reinforcement	m	2.12
2.4.6	Old R10 reinforcement	m	2.12
2.4.7	Old R12 reinforcement	m	2.12
2.5	<u>Reinforcement Repairs</u>		
2.5.1	Wire brushing of cut reinforcement	m ²	98
2.5.2	Application of corrosion inhibitor and bonding agent to steel reinforcement	m ²	98
2.5.3	New Y12 reinforcement	m ²	17
2.5.4	New Y16 reinforcement	m ²	42
2.5.5	New Y20 reinforcement	m ²	17
2.5.6	New Y25 reinforcement	m ²	8
2.5.7	New R8 reinforcement	m ²	4
2.5.8	New R10 reinforcement	m ²	4
2.5.9	New R12 reinforcement	m ²	4