Eskom	Scope of Work	GROOTVLEI

Title: **Grootvlei Power Station: South Smoke Stack Repairs**

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CONTENTS

1. INTRODUCTION

Grootvlei Power Station is situated close to the town of Balfour in Mpumalanga province. The Power Station consists of six units with a capacity of 200 MW each and the total installed capacity is 1200 MW. The first of six units was commissioned in 1969. Three of the units were mothballed in 1989 and the rest in 1990. Grootvlei was one of the power stations being recommissioned. The return to service of the first unit occurred during 2007 and all six units were recommissioned during 2010. The power station is currently 51 years old.

Concrete is a durable construction material and, if designed and placed properly, will give long service under normal conditions. However, many concrete structures are deteriorating, often prematurely, and require remedial measures to reinstate their safety and/or serviceability. Consequently, the need for repair and protection has grown considerably in recent years.

Following the condition assessment performed, there are no serious defects discovered on the concrete walls. However, the top rim refractory brick walls exhibit serious cracks which are a cause for concern.

Therefore, this document provides the scope of works relating to the refractory bricks repair work, which will be performed by the *Contractor*. Refer to figure 1 below illustrating a cross-section of the bricks.

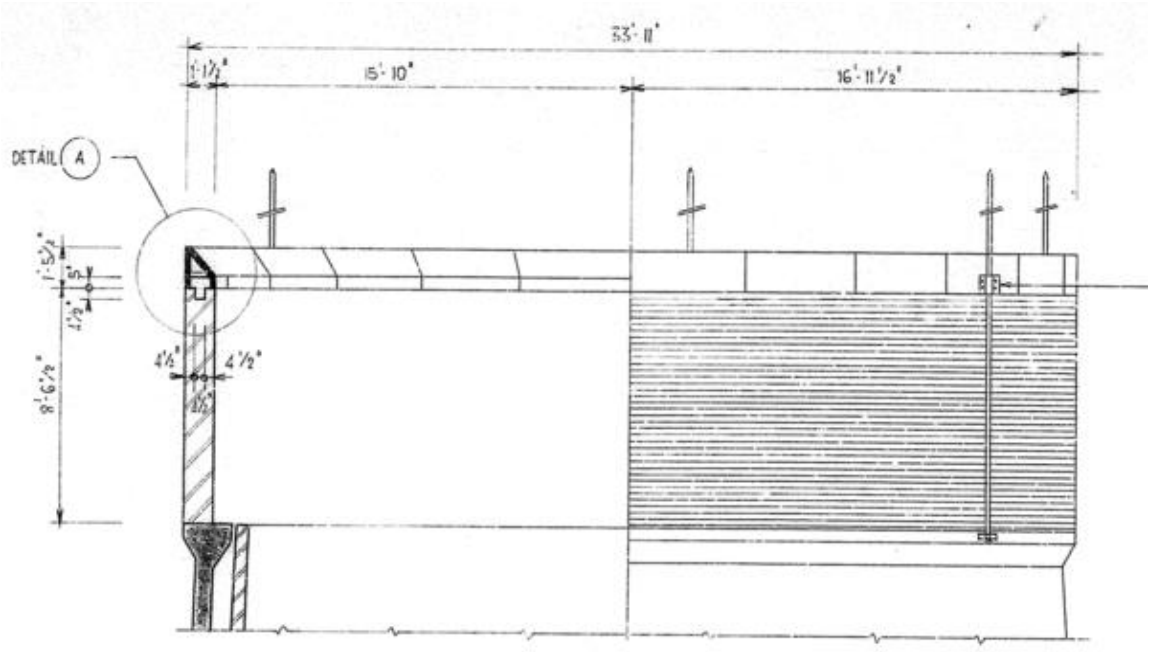

Figure 1: Top Rim Wall Refractory Bricks

2. SUPPORTING CLAUSES

2.1 SCOPE

This document covers the scope of works relating to refractory bricks repairs on the chimney stacks, where the works are to be performed by the *Contractor*. This document outlines all the requirements required to complete the repair works.

2.1.1 Purpose

The purpose of this document is to outline the minimum requirements and the scope of activities required from the *Contractor* for the execution of the works.

2.1.2 Applicability

This document applies to Grootvlei Power Station and all other stakeholders involved in the project.

2.2 NORMATIVE/INFORMATIVE REFERENCES

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

2.2.1Normative

[1] Eskom Health, Environment and Quality (SHEQ) Policy 32-727
[2] ISO 9001 Quality Management Systems
[3] National Environmental Management Act (NEMA) 107 of 1998
[4] Construction Regulations, 2014
[5] Occupational Health and Safety Act No. 85 of 1993
[6] 240-99527377: Inspection Manual for Civil Works at Eskom's Power Station
[7] SANS 10400: The application of the National Building Regulation
[8] 240-56364545: Structural Design and Engineering Standard

2.2.2Informative

[9] Condition Assessment Report

2.3 DEFINITIONS

N/A

2.3.1 Disclosure Classification

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

2.4 ABBREVIATIONS

Abbreviation	Description
QA	Quality Assurance
QC	Quality Control
QCP	Quality Control Plan
MPa	Megapascal
ITP	Inspection Test Plan
SANS	South African National Standards
WTP	South Smoke Stack
BOQ	Bill of Quantity

2.5 ROLES AND RESPONSIBILITIES

Grootvlei Power Station will be responsible for appointing an appropriate *Contractor* to perform the repairs as indicated in this document.

The *Contractor* shall be responsible to deliver work according to specification

The *Engineer* shall monitor construction quality during construction

2.6 PROCESS FOR MONITORING

The *Contractor* submits a quality control plan for approval by *Employer*.

2.7 RELATED/SUPPORTING DOCUMENTS

Condition Assessment Report

3. EMPLOYER'S OBJECTIVES AND PURPOSE OF THE WORKS

The objective and purpose of the works is to:

- Regain the overall structural integrity of the chimney stacks top rim so that operation of the plant can continue until the refurbishment project can commence/be executed.
- Prevent collapse and falling of refractory bricks.

(Refer to appendix for the nature of defects)

3.SCOPE OF WORKS TO BE CARIED OUT IN THE SOUTH SMOKE STACK

3.1 DESCRIPTION OF THE WORKS

The *Contractor* shall adhere to the South African Environment Protection Act, the Waste Management code of practice and the South African Occupational Health and Safety Act No. 85 (OHS Act), the regulations promulgated thereunder and Eskom Health, Environment and Quality (SHEQ) Policy 32-727 for demolition, removal, separation and disposal of scrap, waste and hazardous materials.

Each of the two Chimney Stacks is founded on pilled foundations with shells constructed using a ring formwork and the pouring was done in multiple lifts of approximately 9 meters, with internal and external reinforcement, adding to a total of approximately 150 meters of height.

The shell concrete cover to the reinforcement according to the design drawings is of 50 mm. Shell internals are cladded with Refractory Dusty Bricks which are supported by reinforced concrete corbels. The Chimney Stack top ring wall is designed and constructed with Refractory Bricks. During the assessment walkdown, it was observed that severe cracks have occurred around the periphery of the top rim.
The work shall consist of:

- Removal and disposal of loose debris.
- Repairing of refractory brick wall.
- Repairing of access cat ladder to a usable condition.
- Procurement of all materials required to complete the works.
- Provide all necessary equipment, including safety equipment, tools and materials required for the works.
- Ensure that surrounding equipment and structures are not damaged during execution.
- Supplying material and the mixing and placing of the chosen repair product as described on the product manufacturer’s application manual and this specification.
- Supplying, fabricating, constructing, maintaining and removing temporary works, including false work and formwork.
- The quality control (QC) testing of all material.

3.2 EMPLOYERS DESIGN

The Employer has conducted a visual assessment of the chimney stacks to assess the extent of the deteriorated of the structures. The following was observed:

i. Heat resistance refractory bricks have severely cracked.
ii. Steel cat ladders are unsafe for use, with evidence of corrosion.
iii. Delamination of the top ring grout.

3.3 CONTRACTOR'S REQUIREMENTS

1. The Contractor takes full accountability and liability for the works as described in the scope of works.
2. The Contractor is required to confirm and verify all information supplied by the Employer prior to being used in the works.
3. The Contractor adheres to all design requirements, codes of standards and regulations stated in this scope of works and any other requirements applicable for the successful completion of works.
4. Any discrepancy or ambiguity between the Employer's Specifications or requirements is to be immediately brought to the attention of the Project Manager for clarification.
5. Where the Contractor requires additional information to design or install certain components of the Plant, the Contractor notifies the Project Manager of the Contractor's requirements a minimum of one (1) week before continuing with the works.
6. Any damages to existing infrastructure and services resulting from the works is repaired/ made good by the Contractor at his own expense. This is subject to the Contractor supplying a method statement for the repair works to the Project Manager for review and acceptance prior to conducting the repair works.
7. The Contractor quantifies the limitations and risks in the form of a detailed risk assessment, which is reviewed and accepted by the Project Manager prior to commencing with construction work.

3.4 CONSTRUCTION

3.4.1 General

The *Contractor*:

1. Adheres to the South African Environment Protection Act, the waste management code of practice and the South African Occupational Health and Safety Act No. 85 of 1993, the regulations promulgated thereunder and Eskom Safety, Health, Environment and Quality (SHEQ) Policy 32-727 and Waste Management Procedure, as well as the National Building Regulations and SANS 10400 for all works.

2. Submits a comprehensive method statement (including a comprehensive risk assessment) detailing the proposed methods for the entire works to the *Project Manager* for acceptance prior to the start of the works. Refer to Section 4.4.5 for method statement requirements.

3. Submits a project specific safety file to the *Project Manager* for comments / acceptance.

4. Submits a detailed level 3 schedule for the *works* to the *Project Manager* for acceptance after contract award.

5. Takes all necessary precautions to ensure that none of the existing structures / facilities not forming part of the *works* is damaged during construction. The *Contractor* is liable for all damages that may occur and repairs are to be done at no additional cost to the *Employer*.

6. The *Contractor* disposes of all waste material at a waste disposal site to be approved by the *Project Manager*. The waste disposal site is selected to suit the classification of the materials to be disposed of. Certificates of disposal are required to be submitted to the *Project Manager*.

7. Continuously monitors the conditions within the working and surrounding areas for any hazardous substances or situations, and in such case, the *Contractor* is required to take necessary precautionary measures.

8. Manages access to the working areas and the Site.
9. Manages activities on Site to ensure that no interference takes place between the *works* and that of others.
10. The *Contractor* is responsible for the design and erection of all the temporary supports required for the *works*. In addition to the aforementioned, the *Contractor* adheres to the following:

- The *Contractor* is restricted to the designated working areas
- The *Contractor* is not to enter any other areas and ensures that his employees abide by the applicable regulations
- The *Contractor* performs all hoisting and lifting by qualified riggers
- The *Contractor's* Equipment does not impair the operation or access to the plant/building
- The *Contractor* provides any temporary or expendable materials required for the storage of materials

- The *Contractor* safeguards and secures all items whilst in the *Contractor's* custody and control, until completion of the works;
- Plant and equipment not forming part of the *works* are not to be modified without written permission from the *Project Manager*. Modification in this sense includes, but is not limited to the following:
  - Welding onto existing plant,
  - Drilling into structural steel or concrete,
  - Cutting or removing
  - Loading adjacent structures.

11. The Contractor ensures that a complete QCP, risk assessment, method statement and ITP's, where applicable are submitted to the *Project Manager* for review and acceptance before the works can commence. During reviews of the ITP's, the *Project Manager* provides the necessary intervention points.

12. All items that are assembled and constructed off site are listed and provided to the Pro*jec*t *Manager*. From this, an ITP is developed between the Project Manager and the *Contractor* to determine the intervention points.

3.4.2 Construction, Erection and Monitoring

1. The *Contractor* is responsible for the construction of all *works* in accordance with the accepted designs, drawings, and specifications.

2. The *Contractor* is responsible for the safety of all personnel involved in the *works* as well as the safety of all personnel at Grootvlei Power Station affected by the construction of the *works*.

3. The *Contractor* is required to confirm all site dimensions, levels and cast-in items positions on site prior to any fabrication of steel members.

4. The *Contractor* notifies the *Project Manager* of any defects that have occurred or are foreseen in order to reduce further damages that may occur.

5. The *Contractor* is responsible for the design, erection, maintenance, and removal of all temporary works required for the execution of the *works*. Refer to Section 4.4.1 for requirements for temporary works.

6. The *Contractor* takes full professional accountability and liability for all temporary items required for the execution of the works.

3.4.3 Plant and Material Supply

1. The *Contractor* provides all tools and equipment for the handling of material and the proper execution of the works.
2. The *Contractor* takes reasonable care to ensure that equipment used does not cause damage to any existing infrastructure. In the event that such damages do occur to the surrounding infrastructures, the *Contractor* is responsible for repairing such damages and is liable for all costs associated with the repairs.
3. The *Contractor* is to supply, deliver, offload and temporarily store (as may be required) all materials needed to carry out the works.

3.4.4 Storage Facilities

1. The *Contractor* is to make his own arrangements with regard to storage facilities and laydown areas that are required to complete the works. All laydown areas on Site are as per agreement with the Project Manager.
2. All storage facilities (Plant, Material and Equipment) will be within the boundaries of the Site in order not to affect the operations of Others.

3.4.5 Method Statement

1. As a tender returnable, the *Contractor* submits a general Construction Work Method Statement taking into consideration the various phases of the project.
2. This Method Statement clearly illustrates how the Contractor accounts for the risks of this project and is tailored to address the specified project objectives and requirements.
3. The Method Statement includes, as a minimum and where applicable, the following:

a) Constraints identified and considered by the *Contractor*.

b) Interfacing with Others; the Contractor illustrates an understanding of the work that is to be completed by Others and accommodates for the completion of such work in his methodology.

c) Description and illustrations of a construction traffic plan, use of laydown areas and plot plan.

d) Shifts and hand overs for the various sections of the works, this information is to enable the *Employer* to integrate the programmes of the various contractors.

e) Design tools and systems that the *Contractor* plans to use.

f) Construction methodology and sequence of construction taking into consideration access restrictions and safety requirements.

g) Detailed risk assessment which lists risks specific to the works and is accompanied with associated proposed mitigations.

h) List and description of plant and machinery required to carry out the civil and structural components of the works.

i) Inspection and quality control plan.

j) A clear description of the responsibilities of the Contractor's personnel involved with the works, including (where applicable) his Project Manager, Site Quality Manager, Site Engineer, Health and Safety Manager, Technical Office Manager, Production Manager, Supervisor, Environmental Officer, Fabricator, Erection Engineer, Shop detailer, Transporter and other personnel required for the civil and structural works.

k) Construction sequencing considerations, which take into account any constraints.

l) Health, safety and quality control for the activity.

m) All plant, equipment and machinery required to complete activity.

n) Manufacturer's literature/ Technical Data Sheets for all materials used including product description, composition, material and performance properties, installation and application procedures, use limitations and recommendations.

o) Plan for confining, collecting and disposing of waste materials as a result of removal operations, where applicable.

p) Works required to safeguard existing infrastructure and services.

q) A Steelworks Method Statement which describes the following as a minimum:

- Method of fabrication and erection;
- The physical location of manufacturing and fabrication;
- Erection procedures which includes considerations for modularisation and construction sequencing, including a lifting and rigging plan;
- Transportation;

4. All Method Statements are reviewed and accepted by *Project Manager* prior to commencing any work.
5. The Contractor submits a new Construction Work Method Statement, a month prior to commencing with any construction activities and after Contract Award, which covers all the aspects listed above, and any additional requirements or changes arising from negotiations or clarifications, for acceptance by the Project Manager. This Method Statement is to include interfaces with Others. This new method statement includes a sequential erection procedure which clearly shows detailed consideration for stability requirements of the structure (if applicable) at all stages during erection.

3.4.6 Constructability Analysis

1. The *Contractor* uses the *Employer's* standard: 240-107981296, Constructability Assessment Guideline to perform the constructability analysis.

2. The *Contractor* has a structured process in place for constructability analysis, for the optimum use of construction knowledge and experience in planning, design, procurement, and field operations to achieve the *Employer's* objectives.

3. Qualified people with adequate skills in construction knowledge and experience are involved from the beginning of the project, to maximize the benefits of the constructability analysis. This process includes examining design options, where applicable, that minimize construction costs while maintaining standards of safety, security, quality, cost and schedule, and is initiated in the front end planning process. The Contractor considers various phases of the project and demolition activities, where applicable, that includes manpower plans, organization, construction equipment usage, material storage and handling and preparation of construction facilities.
4. The *Contractor* submits a Constructability Analysis Report based on the Method Statement to the *Project Manager*, for his review and acceptance. The (first) submission of the report is submitted as part of the tender documents and clearly indicates how the Tenderer takes into account interfaces with other contractors where applicable, together with the Site and time constraints and rigging studies. This report clearly illustrates how the construction would be completed within the allowable timeframes and highlights the risks of meeting this requirement. The *Contractor* is required to plan his activities to avoid the following interface risks and any other risks relevant to the works:

a) Interface issues arising from working in close proximity to Others;

b) Access to Site;

c) Material storage;

d) Delivery;

e) Other Works related risks;

5. This report clearly illustrates the construction sequencing and durations for the completion of the works within the contract period. The Contractor submits a risk assessment as part of the Work Method Statement, which is informed by the Constructability Analysis Report that advises on a proposed approach and methodology to mitigate risks described above and any other risks, which may impede successful execution of the works.
6. The second submission of the Constructability Analysis further elaborates on the first submission and is submitted one week after design completion of the works. This report is a revision on the first submission to take into account the Contractor's final design/proposal and includes consideration for modularised construction for faster construction durations.

3.4.7 Construction Programme

1. As part of the Method Statement and as a tender returnable, the *Contractor* submits a Level 3 construction programme considering all the interfaces and time constraints.
2. This programme does not omit key activities. Timing of the activities is consistent with the Construction Work Method Statement.
3. The programme is to show that the *Contractor* has a clear understanding of the full scope of works, including the accompanying risks. The programme is to be logical and realistic.
4. The Contractor submits a Programme for all the phases of the *works* to the *Project Manager* for his acceptance.
5. This programme is accompanied with the following:

a) A comprehensive narrative which describes the basis of the programme;

b) A list of assumptions that the programme was based on;

6. The programme clearly indicates the following:

a) Activities of all the project work to be done by the *Contractor* and the other work covered by the contract that is being done by the sub-contractors;

b) Logical links/ sequence/ relationships that connect the various activities together (showing all hold points);

c) Master schedule is to show Links/logic, the CPM (Critical Path Method) technique is used for programme and planning. The critical path is clearly illustrated.

d) The works is completed within accepted durations that are in consistence with key dates provided in the Contract Data. Milestone dates in line with Key Date/Contract Data shown on the schedule.

e) Schedule Work Package Classifications (Deliverable, Engineering, Procurement, Manufacturing, Supply, Construction and Installation Work Packages)

f) The amount of shifts planned per day for each section of the works.
g) The way in which the *Contractor* plans to interface with Others. Interface points with Others are identified in the programme;
h) A comprehensive description of each activity, including the name and designation of the responsible person;
i) Full details of all terminal point release requirements;
j) Any erection or commissioning activities that may affect other maintenance and construction activities on Site;
k) Identifies when services are required for commissioning purposes;
l) Sufficient information with regard to the activity duration and a description to enable measurement of the progress of the activity within the required update period;
m) Each description in the programme explains and represents the performance of the activity, including tangible deliverables or products;
n) Resources required to perform an activity for each activity that requires resource assignment;
o) Single source of responsibility or ownership per activity.

3.5 DELIVERABLES

The *Contractor* provides the following document deliverables as part of the *works*.

3.5.1 Tender Phase

The tenderer submits the following as a minimum in the tender submission:

1. Method Statement (including Constructability Analysis, QCP and Risk Assessment) for the entire works clearly demonstrating understanding of and compliance with the full scope as detailed in the Scope of Works.

2. Relevant experience in installation and construction of similar projects. List of verifiable relevant references (minimum of 3 projects) must be provided for works completed within the last 5 years. References to include contact numbers and name of client, description of scope in the project and the cost of the project as a minimum.

3. CV's of the proposed key resources each having a minimum of 5 years' relevant experience (construction manager, site engineer/agent). Construction manager to be professionally registered with SACPCMP or similar professional body. Engineer/technician to be professional registered with the Engineer Council of South Africa. Copy of valid certificate to be provided. Organogram of site team to also be provided clearly indicating the roles that the resources will fulfil in the project.

4. CIDB Grading 6GB

3.5.2 Planning phase

1. A Level 3 schedule (schedule with defined activities) for the design scope clearly highlighting all activities involved, major milestones and provision.
2. Detailed Method Statement (including constructability analysis) for the execution of the works.
3. Risk Assessments.
4. Project specific safety file.
5. Project Quality Control Plan.

3.5.3 Pre-Construction/Installation

1. Detailed method statements for the construction of the works
2. Inspection and Test Plans (ITP's) indicating all intervention points
3. Quality Control Plans (QCP's)
4. Construction Programme
5. Project Specific Safety File (updated)
6. Any temporary works required as part of construction signed by a professionally registered Structural Engineer/Technician
7. Detailed Risk Assessments (updated)
8. Visual Assessment Report

3.5.4 Post Construction/Installation

1. QA returnables (monthly)
2. As-Built drawings

2.6 MATERIALS

The *Contractor* is required to supply all materials necessary for the repair and restoration of deteriorated wall areas as follows:

a) The *Contractor* is required to supply the recommended wall repair products or similar approved.

b) The *Contractor* is required to supply and install all temporally and access related works required.

c) The *Contractor* is required to obtain approval from the *Employer* for the products and material intended to use for wall repair.

2.7 CONSTRUCTION METHODS

2.8 SURFACE PREPARATION

Prior to any repairs, the *Contractor* is required to remove all dust, dirt, water and debris from the surface of the walls to be repaired.

The *Contractor* is required to supply and erect appropriate protection barriers/shrouding or other approved means as required on the chimney stacks so as to completely contain all loose or flying debris from the surface preparations. The means of containment shall be subject to the approval of the *Employer*.

The *Contractor* is required to remove all areas of unsound mortar and grout by chipping or other approved methods. The *Contractor* shall exercise caution and take care not to damage any existing wall and capping.

The *Contractor* ensures that all equipment that may be on the way of the repair is temporarily removed and will be reinstalled after the repairs have been completed.

2.9 REPAIR OF BRICKS

- Ceiling of mortar between the cracks
- Grout replacement around the capping
- Application of a SikaWrap-230 C around the top rim wall periphery as per attached product data sheet (refer to figure 2 below). Three horizontal lines of 300mm width all around.

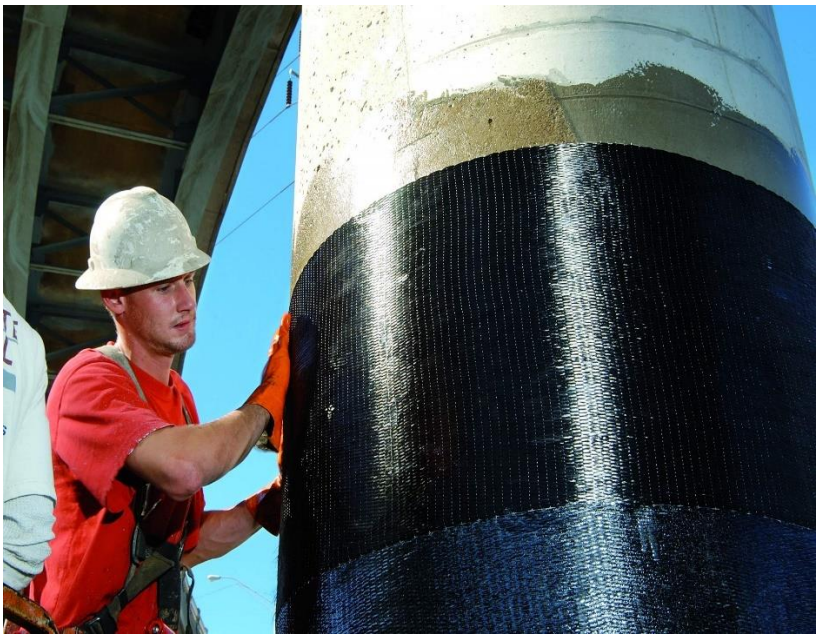

Figure 2: Sika Wrap Application

[A detailed repair method should be provided by the contractor]

2.10 METHOD OF MEASUREMENT

Repairs will be measured on an area basis. The area to be paid for will be the total number of square metres of wall repaired in accordance with this specification as computed from measurements made by the Engineer.

2.11 BASIS OF PAYMENT

Repairs will be paid for at the Contract Unit Price per square meter for repairs measured as specified herein, which price will be payment in full for performing all operations herein described and all other items incidental to the Work. Refer to appendix B for a guideline for cost breakdown per item.

2.12 INFORMATION ISSUED BY THE EMPLOYER

The following drawings and standards are issued to the *Contractor* for information.

Document number	Document Title	Revision
240-107981296	Constructability Assessment Guideline	1

APPENDIX A: TYPICAL DEFECTS

Diagonal brick wall cracks: Southern Chimney