

OR TAMBO TERMINAL A REFURBISHMENT Stage 3 – Design Report

**Structural, Mechanical, Electrical,
ICT and Fire Services**



Document Reference Number: 60476403-01-0000-M-J-003-R

Quality information:

Document name	Ref	Prepared for	Prepared by	Date	Reviewed by
Stage 3 - Design Report	For Issue	ACSA	[REDACTED]	04 April 2017	[REDACTED]
Compiled by: [REDACTED]	Reviewed by: [REDACTED]	Approved by: [REDACTED]	Date: 04 April 2017		

Revision history:

Revision	Revision date	Details	Name	Position
00	22/03/2017	Initial issue date	[REDACTED]	[REDACTED]
01	04/04/2017	Updated content	[REDACTED]	[REDACTED]

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Executive Summary

01



1 Executive Summary

This report contains the detail designs and associated cost estimates for rectifications as identified during the initial visual conditional assessments. The rectification items were jointly decided between the relevant ACSA maintenance departments and [REDACTED] to form part of this project's scope of works for all engineering disciplines.

All observations with recommendations were presented in the Condition Assessment Report (Stage 1 of this project) issued 22/06/2016. The observations were summarized with the relevant party responsible i.e. ACSA Maintenance or [REDACTED] Team for each item in the Priority List Report. The observations in the Priority reports were discussed with the relevant disciplines ACSA Head of Departments and signed off as to which party is responsible for specific work. This action assisted in defining the scope of works for the designs to be a part of the Terminal A Refurbishment Project and thus which items requiring design will be presented in this report. In addition, the design scope of works has been discussed during biweekly design coordination meetings.

The table below summarizes the costs for remedial works and designs are discussed within this report. A more detailed overview of the cost per discipline is available in the Cost Estimate Report, attached as an appendix with this report. Also for an overall project cost refer to the project QS's report.

Table 1: Summary Table of all Disciplines Cost Estimations

Description and Project Reference	Cost Estimate
STRUCTURAL	Costing done by Project QS
MECHANICAL SERVICES – LIFTS & ESCALATORS	R 189 110.00
MECHANICAL SERVICES – HVAC	R 970 911.00
MECHANICAL SERVICES – WET	R 1 325 942.00
FIRE PROTECTION	R 3 725 050.00
ELECTRICAL SERVICES	R 18 565 500.00
ELECTRONIC SERVICES	R 11 522 825.00
ENGINEERING SERVICES COST ESTIMATE TOTAL	R 36 299 337.97
Excl. VAT, Contingencies, P&G's, PS (Items included in QS Cost Report)	

1.1 Energy Efficiency Overview

The compliance of currently installed systems and its components with the latest SANS energy efficiency requirements and possibility to adopt more sustainable design was scrutinized in detail in the Condition Assessment Report, Section 4 – Building Codes Review.

1.1.1 Mechanical Equipment

Whilst, for majority of mechanical systems it was difficult to determine its efficiency due to lack of available information, there are few instances where it was possible to recommend some improvements, such as insulation of hot water pipes and hot water generation by means of renewable energy-heat pumps. These items are included in detailed design for this project.

The space heating within the premises is being conducted by electric heating elements. However, electrical resistance heating should be avoided at all cost as it is the least preferred method for space heating in terms of current requirements and the aim to, in general, lower energy consumption and greenhouse emissions. These should be replaced with more energy efficient type using renewable source of heating. Due to the fact that the Client is already exploring other means to generate energy for space heating - Feasibility study is being currently conducted as a part of a different project, improvement on space heating is excluded from this project.

1.1.2 Electrical Equipment

For the lighting consumption report that includes analysis on energy consumption of currently installed light fittings and the proposed fittings, together with annual financial savings should the current fittings be replaced, refer to Appendix J in this document.

1.2 Design Risks

The change of environment from the time when the initial visual site condition assessments took place in February 2016 till April 2016 until the time of design implementation could have an impact on the design. This will be dealt with by allocating the additional funds that may be required for design updates in the Provisional Sum item stated in the Cost Estimate Report.

Testing of fire installations is pivotal, along with visual inspections, to determine overall condition of fire installations, fire systems performance and code compliance. The testing was to be organized by ACSA maintenance department and witnessed by [REDACTED] team prior issue of this report. However, due to some logistic issues on ACSA's side the testing never took place.

Therefore, for the purpose of this report, it is assumed that all fire services are working, well maintained and are tested regularly. The following findings and corrective actions are therefore based on visual inspections only.

This poses a massive risk both to the proposed design and costing. Once testing of the entire emergency system is complete only then it will be possible to provide an accurate design and costing to bring the entire system, both existing and proposed upgrades to be code compliant.

1.3 Locally Sourced Equipment

Care has been taken to be in line with the requirements from ACSA to use, as far as possible, locally sourced equipment. Only when adequate local equipment was not available would imported equipment be specified for designs.

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Structural Report

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2 Structural Report

2.1 Introduction

This report contains the performance specifications of the structural corrective designs for the issues identified in the Condition Assessment Report, which was summarized and put to a scale of importance in the Priority Report. The issues identified, were discussed with the relevant ACSA maintenance department head and signed off on.

This report is to be read in conjunction with the Conditional Assessment Report, Priority Report and Stage 2 Concept Design Report for a complete understanding of the project.

This report is divided into sections based on the type of corrective design specifications required. For ease of reference see the below extracted table from the Structures Priority Report with the issues which will be referred to in this report. The table below refers to the locations of the issues identified during the visual conditional site inspections.

Table 2: Extract from Summarized Priority Table from the Structures Priority Report

Ref.	Corrective Action	Part of Section within this Report
<u>Basement Level (-1)</u>		
1	Disintegrated tar layer to be replaced	2.4
2	Concrete remedial work to damaged plinths. Install corner protection to all concrete plinth corners.	2.2
3	Inspect and repair; movement joints in the concrete slab over the Basement Level (-1).where water ingress appears. Movement joints to be repaired at top of slab to prevent water ingress.	2.3
<u>Upper Roof Level (5)</u>		
9	Horizontal cracks along concrete upstand beam of concrete roof to be repaired.	2.2
10	Areas were ponding of water on the roof accurse to be addressed. Blocked full bores to be cleaned. 16 Fullbores to be reinstalled.	2.5

2.2 General Repairs to Structural Concrete

2.2.1 Structural Concrete Repairs less than 40mm deep

2.2.1.1 Materials

- Only materials within their “Use by date” may be used. Batch numbers and expiry dates must be noted.
- Partial mixing of materials is not allowed. Full utilization of manufacturer’s containers is required to ensure consistency.
- The use of materials from various manufacturers on the same repair is prohibited. To comply to the conditions of the manufacturers guarantee the contractor must only use the materials from one supplier on the repair.
- No repair work may be undertaken with ambient temperatures below 7°C and falling, or above 40°C.
- Bonding material may be mixed by hand, but micro concrete materials may only be mixed using proper slow speed drills and paddles, or pan mixers.

2.2.1.2 Removal of Defective Concrete

- Defective concrete shall be broken out by mechanical means to sound alkaline concrete.
- The contractor shall ensure that adequate supervision of all breaking out operations is provided such that over-break is limited to 10mm.
- Feathered edges to cut out areas are not permissible and a minimum rebate at right angles to the surface of 10mm is required to be formed to receive the repair material.
- The use of heavy power tools which could lead to fracturing of surrounding concrete or reinforcement damage is not permitted. All breaking out shall be carried out using hand held sharp electrical tools in order to avoid unnecessary damage to the remaining concrete.
- Following removal of defective concrete, the repair area must be brushed clean to ensure that it is dust and laitance free.

2.2.1.3 Application of Bond Coats

- The concrete within the repair area is to be pre-saturated for a period of no less than 24hrs, however in the event that pre-saturation is deemed not adequate a wet to dry epoxy can be used as a Repair Bonding Agent. The contractor may use one of the following products:
 - Epidermix® 344 (ABE Construction Chemicals)
 - Sikadur 32®-N (Sika South Africa)
 - MasterBrace® 1414 (Formerly known as Concreasive 1414) (BASF South Africa).
- Application of the Repair Bonding Agent must be in strict accordance with the manufacturer’s specification.
- The bond coat shall be applied to the pre-dampened surface (saturated, surface dry) of the concrete repair area. The bond coat shall be applied immediately prior to application of the repair mortar whether applied as the priming bond coat or between successive layers of repair mortar. Following mixing of the Repair Bonding Agent, the contractor will have approximately 30-45 minutes to apply the subsequent repair mortar.

2.2.1.4 Mortar Placement

- The repair mortars specified for structural repairs less than 40mm deep are as follows:
 - Durarep® FR and /or Durarep® FC (ABE Construction Chemicals) - Durarep® FR can be used for thicknesses between 0mm and 70mm whereas Durarep® FC is used only for fairing; i.e. blowholes, etc. **NOTE:** ABE products are prescribed as self-curing; therefore no additional curing compound is required.

- Sika ® Monotop® 615 HB and Sika®Monotop® 620 (Sika South Africa) - Sika ® Monotop® 615 HB is a cementitious repair mortar that can be used for repairs from 5mm to 70mm in depth. Sika®Monotop® 620 is a levelling or fairing mortar for repairs between 1.5mm to 5.0mm thickness. Generally the Sika ® Monotop® 615 HB is finished off by using the Sika®Monotop® 620. **NOTE:** Sika products are prescribed as self-curing; therefore no additional curing compound is required.
- Emaco® S73, Emaco® R303 and Mastercure® 181 (BASF South Africa) - Emaco® S73 is a repair mortar suitable for repairs from 10mm to 50mm in depth. When using Emaco® S73 the defective concrete is to be broken back to a minimum depth of 10mm. Emaco® R303 is a levelling or fairing mortar for minor repairs up to a maximum of 2.5mm. When using either or both together, the manufacturer specifies the use of Mastercure® 181 as a curing/protection layer for the completed repair.
- Pro-Struct® 528VO-MCI (StonCor Africa) - Pro-Struct® 528VO-MCI is a concrete vertical overhead repair mortar with a migrating corrosion inhibitor for reinforcement protection that is suitable for thin and thick repairs. A perimeter edge of 10mm minimum depth should be provided for a durable repair. Materials, equipment and surfaces must be between 2°C and 32°C at the time of placement.
- All repair mortars must be stored, prepared and applied to the repair are in strict accordance with the manufacturer's specification.
- The product to be used must be applied to the repair areas within 30-45 minutes of bond coat application in layers not exceeding the manufacturer's specifications.
- The repair area is to be troweled flush with the surrounding concrete and with an equivalent finish to the concrete on the rest of the structure.
- Each repair is to be cordoned off for a period of not less than 48 hours to allow the repair mortar to set.

2.2.1.5 Post repair inspection and testing

- The objective is to reach better or equal durability and structural strength than the surrounding in situ material. No sagging, measurable cracking or delamination may be present.
- Following the mandatory 48 hour curing period the contractor must notify the engineer for an inspection of the completed repair work.

2.2.2 Structural Repairs Greater then 40mm deep

2.2.2.1 Materials

- Only materials within their "Use by date" may be used. Batch numbers and expiry dates must be noted.
- Partial mixing of materials is not allowed. Full utilization of manufacturer's containers is required to ensure consistency.
- The use of materials from various manufacturers on the same repair is prohibited. In order to conform to the conditions of the manufacturers guarantee the contractor must only use the materials from one supplier on the repair.
- No repair work may be undertaken with ambient temperatures below 7°C and falling, or above 40°C.
- Bonding material may be mixed by hand, but micro concrete materials may only be mixed using proper slow speed drills and paddles, or pan mixers.

2.2.2.2 Removal of Defective Concrete

- Defective concrete shall be broken out by mechanical means to sound alkaline concrete.
- The contractor shall ensure that adequate supervision of all breaking out operations is provided such that over-break is limited to 10mm.
- Feathered edges to cut out areas are not permissible and a minimum rebate at right angles to the surface of 10mm is required to be formed to receive the repair material.

- Where reinforcement is exposed during the breaking out process, the contractor must remove the concrete at least 20mm beyond the exposed bar(s) and clear all loose material away from around the exposed bar(s).
- The use of heavy power tools which could lead to fracturing of surrounding concrete or reinforcement damage is not permitted. All breaking out shall be carried out using hand held sharp electrical tools in order to avoid unnecessary damage to the remaining concrete.
- Following the removal of the defective concrete, the repair area must be brushed clean to ensure that it is dust and laitance free.

2.2.2.3 Protection of Reinforcement

- Any exposed reinforcement must be protected against corrosion before a repair takes place. The following anti-carbonation coatings may be used:
 - Durarep® ZR Primer (ABE Construction Chemicals);
 - Sika Armatec® 110 Epocem® (Sika South Africa); and
 - MasterEmaco 8100 AP (BASF South Africa).
- All corrosion protection materials must be stored, prepared and applied to the repair area in strict accordance with the manufacturer's specification.
- All exposed steel to be coated must be cleaned and prepared prior to application. Dust and laitance must be removed and the steel must be dry.
- The contractor must follow the manufacturer's specification for elapse time between primer/corrosion protection and repair mortar application. The contractor must ensure that this delay does not exceed the allowable.

2.2.2.4 Application of Repair Mortar in Shallow Areas

- Where the repair area is made up of defective concrete less than 40mm thick and patches exceeding the 40mm threshold, the contractor must repair the smaller areas first in accordance with the methods laid out in *Section 2.2.1* of this document.
- Only when these areas have been repaired to the satisfaction of the engineer, work can begin on the areas where the defective concrete exceeds a depth of 40mm.

2.2.2.5 Construction of Formwork

- Where the defective concrete exceeds a depth of 40mm the contractor must use an infill mortar/micro-concrete. To support this material, temporary shuttering needs to be constructed to support the repair material until it has fully set.
- Temporary shutters must be constructed from timber and propped either from the ground below or from an adjacent structure.
- Where the shuttering interfaces with the concrete structure the joint needs to have a strip of groutex tape installed to ensure there is no grout loss during the casting of the repair.
- Care should be taken that formwork is watertight and constructed in line with normal concrete practice. The minimum thickness at any point of shuttering to be filled is 40mm.
- The form work is to be constructed with two openings at the top. The first opening is for the gravity feed system where the repair mortar will enter and the second is the bleeding hole to allow air to escape during casting.

2.2.2.6 Placement of Repair Mortars

- The repair mortars specified for structural repairs greater than 40mm deep are as follows:
 - Durarep® FR, Durarep® FC, Duragrout®, Durarep® FMC (ABE Construction Chemicals) – Durarep® FR and Durarep® FC are used in accordance with *Clause 2.2.1.4* of this document. Duragrout® is a non-shrinkage grout that can be used as a bedding grout or where a cast in place requires a repair behind it. Durarep® FMC is a cementitious micro-concrete that can be used for thicknesses between 50mm and 250mm. **NOTE:** ABE products are prescribed as self-curing; therefore no additional curing compound is required.
 - Sika® Rep LW and Antisol®-E (Sika South Africa) - Sika® Rep LW is a cementitious repair mortar that can be applied to any thickness in layers not exceeding 50mm. Sika® Monotop® 620 can be used again as a finishing/fairing mortar. Due to the size of the repair, the manufacturer suggests hydrating the repair for a period of not less than 24 hours or applying Antisol®-E as a curing compound.
 - Emaco® S74 and Emaco® S75 (BASF South Africa) - Emaco® S74 is a repair mortar with aggregate included suitable for repairs 40mm to 300mm thick. Emaco® S75 is a repair micro-concrete that is suitable for repairs between 20mm to 300mm thick. With each repair the use of Masterkure® 181 is suggested as a curing/protection layer for the completed repair.
- All repair mortars must be stored, prepared and applied to the repair area in strict accordance with the manufacturer's specification.
- Each repair is to be cordoned off for a period of not less than 48 hours to allow the repair mortar to set.
- Using a standard gravity feed box, the repair mortars are allowed to flow into the formwork.
- The mortar is to be agitated during each bucket using a length of reinforcing bar. Care must be taken to remove pockets of air from the repair area.
- Three cubes for compressive strength testing must be sampled for each 1m³ or part thereof. This requirement must be constantly be under review. Careful planning of repairs must be done in order to avoid uneconomical use.
- The mortar must be continuously placed until seepage is noted from the bleeding hole.
- When reaching this point the feeding box must be removed and the formwork needs to be filled up by hand using a trowel or spade.
- Once the formwork has been confirmed as full, both the openings must be covered with plastic and the repair must be left for not less than 72 hours until all the mortar is fully set.

2.2.2.7 Removal of the Shuttering

- After the mandatory 72 hour setting period, the shuttering can be removed from the repair.
- The surface of the repair should be worked such that it is flush with the level of the surrounding concrete and has an equivalent finish to the rest of the structure.
- Once the shuttering is removed and the surface works are completed, the repair area can be cured.
- Water curing is not allowed. The method of curing to be applied should prevent loss of moisture from the outer most layer of the repair mortar. *See Clause 2.3.5 for the various curing options.*

2.2.2.8 Post Repair Inspection and Testing

- The objective is to reach better or equal durability and structural strength than the surrounding in situ material. No sagging, measurable cracking or delamination may be present.
- On repairs done by shuttering and mass infill placement, the soundness of the repair can be correlated by Schmidt Hammer tests.
- Following the mandatory 24 hour curing period, the contractor will notify the engineer for an inspection of the completed repair work.

2.2.3 Corner Protection for Concrete Plinths

2.2.3.1 Fixing of Angle Irons

- After the completion of remedial work to the concrete plinths, the vertical and horizontal corners must be protected against damage due to traffic by fixing 90x90x6mm angle irons against the vertical and horizontal corners of the plinths.
- The angle irons can be fixed to the vertical and horizontal corners of the plinths with galvanized M8 anchor bolts.
- The contractor may use one of the following chemical anchor products:
 - RG M8 x110 threaded rod with Superbond Resin Capsule RSB from Fisher®
 - M8 galvanized universal adhesive anchor HIT-MM Plus or HFX from Hilti®
- Chemical anchors must be applied strictly in accordance with the manufactures specifications.

2.2.3.2 Paint Specification: (Alkyd system 010)

- Steel surface must be cleaned from all oil, rust and debris.
- Apply primer coat (Carbocoat GP18) to 75 micron DFT.
- Apply top coat (Carbocoat AD51) to 40 micron DFT.

All paint work to comply strictly with the supplier's specification.

2.3 Movement Joints

2.3.1 Joint Preparation

- Remove all damaged joint filler material.
- After the damaged joint filler material has been removed, the inside faces of the joint shall be wire-brushed or sand blasted to remove all laitance and contaminants.
- The joint shall then be cleaned and blown out with compressed air to remove all traces of dust.
- Solvents shall not be used for removing contaminants from the concrete and porous surfaces.
- After the joint has been finally cleaned, a primer (if any) must be applied to the joint surfaces (*refer to Clause 2.3.3 of this document*).
- Insert a backing cord into the joint to the correct depth as per data sheet specification if needed. The backing cord shall be of an expanded polyethylene closed cell type. It shall be noted that the backing cord to be used must not be a joint former type material, but a round compressible polyethylene cord which must be inserted into the joint to establish the correct depth of the joint seal should the joint former material not be adequate to establish the correct depth.

2.3.2 Joint Sealants

- The following joint sealants may be used for exterior applications:
 - Sikasil®-728 NS (Sika South Africa) - Sikasil®-728 NS is a non-sag, one-component, ultra-low modulus elastomeric, neutral cure silicone sealant for sealing of joints in pavements according to ASTM D-5893 such as highways, airports, bridges, parking structure top decks, expansion joints and saw cut joints.
 - Colpor 200 (Fosroc (Pty) Ltd South Africa) - Colpor 200 is a cold applied , high performance, hydrocarbon resistant polyurethane pavement joint sealant for the horizontal and vertical sealing and maintenance of joints in concrete roads, concrete runways, parking and cargo areas and hard standings for example.

- MasterSeal® SL 1™ (BASF South Africa) - MasterSeal® SL 1™ is a one-component elastomeric, self-levelling polyurethane sealant suitable for expansion joints in concrete floors and decks exterior and interior.
- The following joint sealants may be used for interior applications:
 - Sikaflex® PRO-3 (Sika South Africa) - Sikaflex® PRO-3 is a one part, moisture curing, elastic joint sealant with high mechanical resistance for indoor and outdoor applications. It is suitable for movement and connection joints in floors, indoor and outdoor applications for pedestrian and traffic areas and in ceramic tiles such as in public buildings etc. for example.
 - MasterSeal® SL 1™ (BASF South Africa) - MasterSeal® SL 1™ is a one-component elastomeric, self-levelling polyurethane sealant suitable for expansion joints in concrete floors and decks interior and exterior.

2.3.3 Priming

- After the preparation of the joint, a primer (if required) must be applied to the joint faces as specified by the manufacture.
- Sikasil®-728 NS requires a primer. The primer to be used is Sika® Primer-3 N and can be applied using a brush.
- Colpor 200 requires a primer. Joint surfaces must be primed with Primer No. 20
- MasterSeal® SL 1™ does not require a primer for most applications. Refer to manufacturer's specifications.
- Sikaflex® PRO-3 requires a primer. Porous substrates have to be primed with Sika® Primer-3 N by using a brush.
- Primers, where applicable shall be applied strictly in accordance with the manufacturer's instructions.
- Unless otherwise specified, the primer shall be applied within the temperature range of 10°C and 40°C and the sealant shall be applied after the curing period of the primer and within the period when the primer remains active

2.3.4 Sealant Application

- Sealants shall be applied strictly in accordance with the manufacturer's instructions by a person skilled in the use of the particular type of sealant. Trapping of air and the forming of voids in the sealant shall be avoided. The sealant shall be finished to a neat appearance to the specified depth.
- The temperature of the site area must be checked. Application shall NOT take place under 5°C or over 35°C or as stated in the technical data sheet of the product.
- When using caulking gun nozzles, they shall be checked for joint size suitability. The nozzle must be able to enter the joint. **NB.** Too large a nozzle will cause unwanted air entrapment.
- When a caulking gun is going to be used, the sealant shall be extruded by compressing the trigger of the caulking gun and during the extrusion process the nozzle shall be pushed along the joint length making sure that the joint sealant material is firmly seated against the backing cord and sides of the joint.
- The joint sealant shall be further seated and profile smoothed by hand using a suitable lubricant.
- Feathered edges that may be left by the caulking gun nozzle or profiling process shall re-seated into the joint. This is achieved by hand, using a suitable lubricant. All surplus sealant and other foreign matter shall be removed in accordance with the directions of the manufacturer of the sealant.
- Two-part thermosetting chemically curing sealants shall not be applied after expiry of the specified pot-life period which commences once the base and activator of the sealant have been combined.

2.3.5 Curing

- Curing of single component joint sealants takes place due to the presence of atmospheric moisture.
- Should rain be eminent the exterior joints shall be covered with plastic to protect the fresh sealant from water exposure.

2.3.6 Adhesion Test

- An adhesion test should be made seven days after the sealant application.
- The test can be conducted manually by compressing adjacent to the edges of the joint with the thumb; ensuring that the movement capability for the specific sealant is not exceeded and adhesion of sealant to joint faces are achieved.
- Should de-lamination occur from the face of the joint, the sealant shall be removed and replaced by following the whole process again.

2.4 Replacement of Tar Layer

2.4.1 Basic Specifications for New Asphalt Layer on Existing Concrete Surface Bed

- Existing asphalt to be milled off and all loose concrete or concrete screed must be removed from the area where the new asphalt has to be placed.
- All damage areas and potholes to be repaired to obtain a sound and reasonably level base upon which the asphalt can be placed.
- Immediately before applying the tact coat, the surface shall be broomed and cleaned of all loose or deleterious material.
- A tact coat shall be applied to the surface to be paved. The tact coat shall consist of a 60% bitumen emulsion diluted 50:50 with water and applied at 0.5l/m².
- All exposed portions of kerbing, channelling, manhole covers, etc. shall be protected when the tact coat is applied.
- The tact coat shall not be applied more than 24 hours before the paving is done.
- A 40mm thick continuously graded (medium grade) asphalt surfacing using 50-70 penetration grade binder shall be applied. A typical mix proportion for continuously graded (medium grade) is:
 - Aggregate – 93.5%
 - Bitumen – 5.5%
 - Active filler 1%
- Where joints occur in the concrete surface bed on which the asphalt layer will be placed, corresponding joints need to be cut in the completed asphalt layer.
- Outside edges not terminating against kerbs for example shall be trimmed at an angle of 45°.
- The asphalt layers shall be rolled by using the correct rollers for the task as soon as possible after it has been laid. Such rolling shall commence and be continued only for so long as it is effective and does not have any detrimental effect.

2.5 Blocked Fullbores

2.5.1.1 Fullbores to be Repaired or Reinstalled

- All fullbores needs to be inspected for damage and blockage.
- Where existing fullbores have been covered by waterproofing material, they need to be uncovered and cleaned.
- Damaged fullbores and fullbores that are block by concrete or other debris and that cannot be cleaned from the outside needs to be replaced.
- Where fullbores have been uncovered from waterproofing or replaced, the waterproofing layer must be repaired around such fullbores.

2.6 Quantities

Ref.	Corrective Action	Quantity	Location reference
1	Disintegrated tar layer to be replaced	1535m ²	Refer to Appendix A
2	Concrete remedial work to damaged plinths. Install corner protection to all concrete plinth corners.	4x6m long plinths 52m long 90x90x6 angle irons. 80xM8 Chemical anchor bolts for fixing angle irons.	Refer to Appendix A
3	Inspect and repair; movement joints in the concrete slab over the Basement Level (-1).where water ingress appears. Movement joints to be repaired at top of slab to prevent water ingress.	20m long x25mm wide.	Refer to Appendix A
9	Horizontal cracks along concrete upstand beam of concrete roof to be repaired.	17m long.	Refer to Appendix A
10	Areas were ponding of water on the roof accurse to be addressed. Blocked full bores to be cleaned. 16 Fullbores to be reinstalled.	16x150mmø	Upper Roof

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Mechanical Services Lifts & Escalators

03



3 Mechanical Services – Lifts & Escalators

3.1 Introduction

The condition of escalators & lifts were presented in the Conditional Assessment Report issued on 22/06/2016. Most findings and observations relating to the condition of equipment is maintenance related. Thus during the sign-off meeting between ACSA Maintenance and [REDACTED] team it was decided that no items requiring mechanical action will be taken further by [REDACTED]. That ACSA maintenance will rectify all the items, as detailed in the Priority Report (Appendix I in this report).

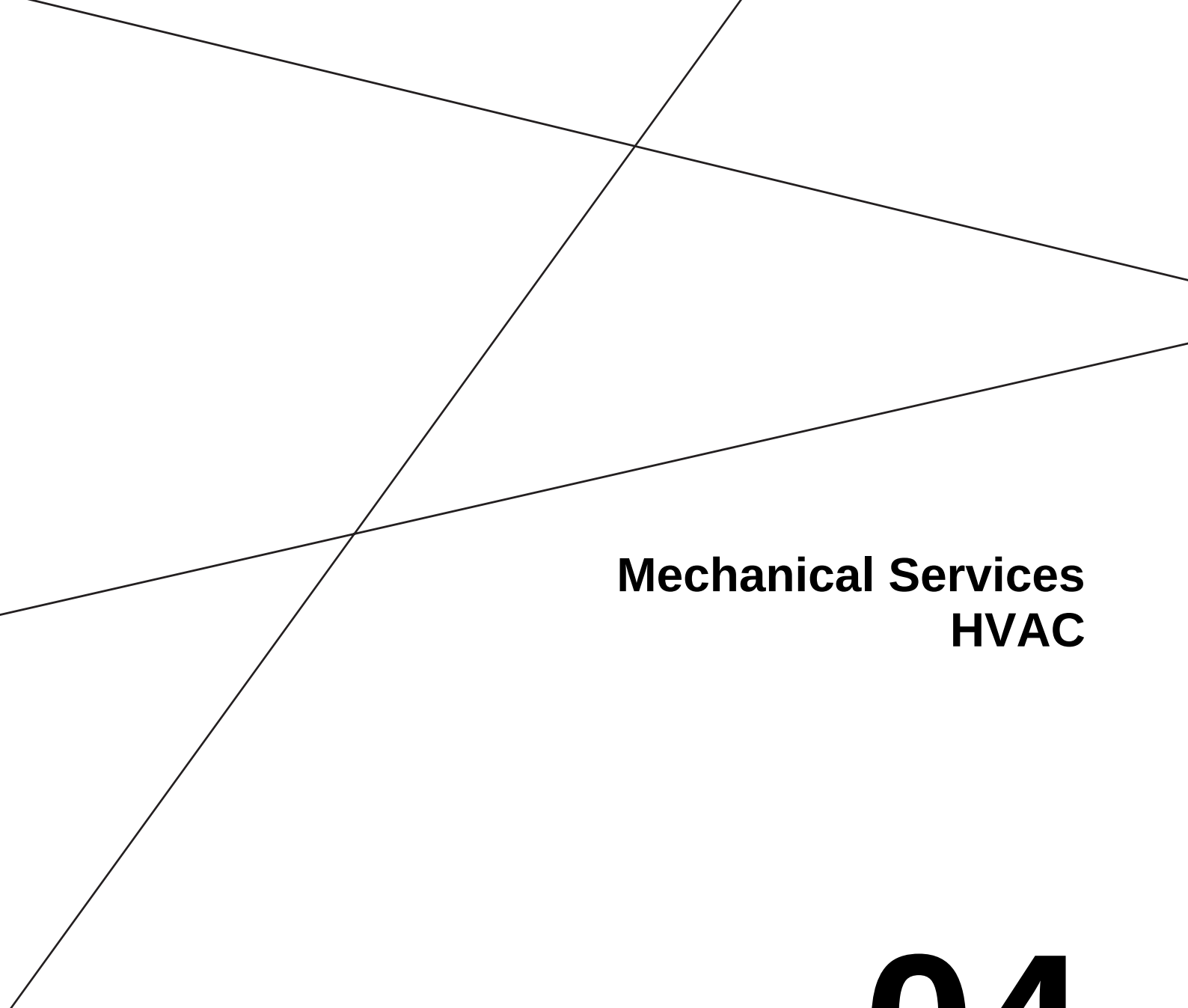
No emergency testing was conducted ensuring the lifts are interfaced with the fire systems at the time of this report issue date. The functional result during an emergency testing would be for lifts to stop and return to the home level as programmed. ACSA has commented on the start-up process showing problems of the escalators motors after emergency testing is done, this will be investigated once emergency testing of all disciplines is done.

The following items to be taken note of by ACSA maintenance:

- Regular periodical testing and maintenance of all lifts and escalators must be done ensuring all systems are functional.
- Statutory documentation record keeping is required of all testing and maintenance carried out.

Take note of the following:

- It was requested by the Client to allow for two wheelchair lifts at staircases on the Arrivals Concourse level. This item will be presented as a separate item in the Cost Estimate Report and the overall costing presented by the project QS's. Refer to Appendix B for the locations of the wheelchair lifts.
- No items require design input as discussed and agreed upon during the sign-off meeting, thus Lifts & Escalators will not be discussed further in this report.

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Mechanical Services HVAC

04

4 Mechanical Services – HVAC

4.1 Introduction

This report contains the final design concepts for the issues identified in the Condition Assessment Report as issued on 22/06/2016, which was summarized and put to a scale of importance in the Priority Report issued on 11/07/2016. The initial design concepts were compiled and presented in the Stage 2 Report, issued in August 2016. In the Stage 2 Report different design options were explored with associated costs and pros and cons on each option presented, consequently the final recommendation has been put forward.

This report is to be read in conjunction with the above mentioned documentation and all of their appendices. This report is divided into sections based on the building levels and different designs required.

During the Priority Report sign-off procedure the issues identified during the visual site inspection were discussed with the discipline specific Head of Departments on ACSA's side and agreed upon. Only items identified in the HVAC Priority Report requiring action from [REDACTED] are considered for design concepts. Just before this report has been issued, a follow up session with the ACSA HVAC HOD maintenance department took place to ensure that all issues have been captured and that there is no new items that would require [REDACTED] attention.

For ease of reference see the table below extracted table from the HVAC Priority Report with the issues which will be referred to in this report. For the full report refer to Appendix I in this report.

Table 3: Extract from Summarized Priority Table from the HVAC Priority Report

Ref.	Corrective Action	Part of Section within this Report
<u>Basement Level (-1)</u>		
9	Habitable rooms and spaces fresh air ventilation design.	4.2.1
13	Crisplant Mechanical workshop to be installed with a new ventilation system to match the type of work being conducted in this space, as the current system is inadequate	4.2.2
<u>Arrivals Concourse Level (0)</u>		
	No current issues to be address on this level	
<u>Arrivals Mezzanine Level (1)</u>		
14	Ventilation system design for Bytes Restaurant change rooms.	4.3.1
<u>International Departures Level (2)</u>		
16	Air Curtains design for main entrance door (1No) – Pilot Project	4.4.1
<u>Departures Mezzanine Level (3)</u>		
20	The Baggage handling carousels area (3/02) – fresh air design.	4.5.1

Ref.	Corrective Action	Part of Section within this Report
<u>Lower Roof Level (4)</u>		
21	The window fans along the gridlines AD to be replaced as it is currently not in working order and interferes with the ventilation system performance.	4.6.1
<u>Upper Roof Level (5)</u>		
25	The supply and return duct insulation on the AHU serving the Hotel is badly damaged and must be fixed or replaced.	4.7.1
<u>Toilet Extraction Systems</u>		
26	Toilet ventilation system design for 6 toilets (missing fan) –Arrivals Mezzanine, International Departures and Departures Mezzanine Levels.	4.5.2
27	Toilet ventilation system design – Departures Mezzanine Level (3-A25/I1). Male and female toilets to be included.	4.7.2
28	Toilet ventilation system design – Dep mezzanine Female (3-A26/I1) and Male. Architectural layout required as toilets are not shown on the current drawings.	
<u>General – All Levels</u>		
29	Wire centers A/C systems upgrade.	4.7.3

4.2 Basement Level

4.2.1 REF 9 – Habitable Store Rooms

4.2.1.1 Design Brief

In accordance with the SANS 10400:O – Lighting and Ventilation standard, all occupied spaces require a certain amount of ventilation based on the type of space as per the activities performed in the space.

The basement store rooms are occupied by tenants during office hours. The passage has a fresh air duct with grilles for the air to move into the passage area. The rooms have simple door grilles and louvres to allow the flow of air into the store rooms from the passage. The door grilles are in a deteriorated state (clogged with dust). The Basement fresh air supply systems were not in operation during visual inspections, thus no fresh air where being supplied to the basement passage. ACSA maintenance is to ensure the operation and running of the fresh air fans (situated in Plantroom 1 on Upper Roof Level) going forward.

Take note that some of the occupied spaces that have been identified to have insufficient air movement include offices (occupied by tenants) that were previously ablution facilities.

4.2.1.2 Proposed Design

It is proposed to use the existing fresh air duct in the basement passage to provide the store rooms with fresh air. The duct is connected to the fresh air fans in Plantroom 1 on the roof level. Fresh air is provided to the passage and pulled into the occupied store rooms via the door grilles. Due to pressure difference being created by installing wall mounted fans at the back walls in the store rooms a sufficient air flow will be created.

It is proposed the exhausted air to be removed from the store rooms by the wall mounted fans. The air will be exhausted to the parking area of the basement. This area is open to atmosphere on both ends of the additional air added to this space would not have a significant impact on the air balance within the parking space.

It is also recommended that all louvres and grilles be cleaned to allow the sufficient movement of air.

Refer to the attached Mechanical HVAC layout drawing (60476403-01-0000-M-AA-300-D & 60476403-01-0000-M-AA-301-D) in Appendix C for an illustration of the design as described above.

4.2.1.3 Design Assumptions

The spaces ceiling heights are obtained from the room data sheets supplied by the architects. The store room areas ceiling height is estimated on average at 3 m. in the offices that are located in the old ablution facilities the ceiling height is average at 2.7 m.

The following loads are identified for the spaces:

- Lighting load in the space 15 W/m²;
- Computer load is approximately 60 W (LCD Monitor included);
- Occupancy being one person performing office work;

Thus the Total cooling Load for the space is 8.9 kW i.e. 22.1 W/m².

4.2.1.4 Design Risks & Controls

The design is based on utilizing the existing fresh air supply system which serves the basement area and other levels. The risk identified is that this fresh air system has not been functional during the visual inspections. The maintenance team on site did investigate the equipment (fresh air fans) and advised that the motors need maintenance and repairs which they have included in their maintenance schedule.

A minor risk is the record keeping of the maintenance performed on the fresh air system. The maintenance information needs to be captured and recorded so that it can be used for future analysis of the equipment. When the equipment reaches end of expected life the maintenance records can be consulted. It can then be determined if the equipment must be replaced with immediate effect or there is still time remaining.

4.2.1.5 Cost Estimate

Refer to the Bill of Quantities presented in the Cost estimate report issued to the Project Quantity Surveyors on 31 January 2017.

4.2.2 REF 13 – Crisplant Mechanical Workshop Ventilation

4.2.2.1 Design Brief

The Crisplant workshop is currently being ventilated via a small capacity wall mounted fan only. There is a option for additional extraction via exhaust grille connected to the basement extract fans. However the fans are not in operation and therefore there is insufficient ventilation of the space. Given the nature of the work performed in the workshop, such as grinding, welding, etc., there is a need for a better mechanical ventilation system that would provide higher air-changes per hour and assist in reducing the dust accumulation.

4.2.2.2 Proposed Design

It is proposed to replace the existing wall mounted fan with a bigger capacity fan to be able to exhaust air from the space at a higher air flow rate. The system would be independent from the existing basement ventilation that is not deemed to be reliable.

Refer to the attached Mechanical HVAC Layout drawing (60476403-01-0000-M-AA-302-D) in Appendix C for the location of the fan. The height installation of the fan needs to be determined prior installation

4.2.2.3 Design Assumptions

The space is located with a perimeter wall on an exterior boundary wall of the building. The workshop is used primarily during the hours form 8h00 till 17h00. The ceiling height of the space is approximated at 3 m.

The following loads are identified for the spaces:

- Lighting load in the space 15 W/m^2
- Equipment load is approximately 200 W (grinder, welder, etc.)

Thus the Total cooling Load for the space is 3.3 kW i.e. 59.2 W/m^2 .

The above information was used in the heat load calculations to select the right sized capacity equipment.

4.2.2.4 Design Risks & Controls

N/A

4.2.2.5 Cost Estimate

Refer to the Bill of Quantities presented in the Cost estimate report issued to the Project Quantity Surveyors on 31 January 2017.

4.3 Arrivals Mezzanine

4.3.1 REF 14 – Bytes Restaurant Change Rooms Ventilation

4.3.1.1 Design Brief

On the Arrivals Mezzanine Level the Bytes staff uses one of the store rooms as change rooms, which don't have any ventilation system installed. In accordance with the SANS requirements this space need to be ventilated to comply with the legislation. Therefore, ventilation system needs to be implemented to allow fresh air (whether conditioned or not) to be supplied to the space and a portion of the air to exit via the undercut door.

It is proposed to utilize the air from the air handling unit that serves the corridor adjacent to the change room.

4.3.1.2 Proposed Design

It is proposed to install a new diffuser in the store room and connect the diffuser to the existing system duct running close by in the area. The existing system is supplying conditioned air from the air handling unit no 30, located in plantroom 2 on the upper roof level.

Refer to the attached Mechanical HVAC layout drawing (60476403-01-0000-M-AA-303-D) in Appendix C for an illustration of the design as described above.

4.3.1.3 Design Assumptions

The ceiling height obtained from the Room data sheets provided by the Architects is 2.7m.

The following loads are identified for the spaces:

- Lighting load in the space 15 W/m²

Thus the Total cooling Load for the space is 0.7 kW and i.e. 28.4 W/m². (From HAP calculation)

4.3.1.4 Design Risks & Controls

This design adds on to the load of the air handling unit No. 30, but the percentage added on is less than 2%, it is negligible and is assumed that it won't increase the load beyond the capacity of the air handling unit.

4.3.1.5 Cost Estimate

Refer to the Bill of Quantities presented in the Cost estimate report issued to the Project Quantity Surveyors on 31 January 2017.

4.4 International Departures

4.4.1 REF 16 – Air Curtains (Pilot Project)

4.4.1.1 Design Brief

ACSA mechanical maintenance department requested [REDACTED] to do a recommendation on the most efficient and functional arrangement for the entrance doors used at the International Arrivals level. The aim of the door arrangement is for the outdoor air to have the smallest effect upon the air conditioning of the interior building.

Based on the three different door arrangements used currently it is recommended that the main entrance door be sliding type complete with adequately sized air curtains.

Air curtains are typically installed on any frequently used entrance, as they minimize the amount of unconditioned air from the outside entering the building. Air curtains work by disrupting and minimizing natural convection, and provide a continuous stream of air circulated across a doorway serving a conditioned space.

During the sign-off discussions of the Priority Report ACSA requested that air curtains be implemented as a pilot project on one set of the doors for the time being, and if this arrangement deemed satisfactory, the curtains will be implemented throughout premises at a later stage.

4.4.1.2 Proposed Design

New air curtains to be installed above the existing sliding door entrance on the International Arrivals level. This section of the project is to be monitored by ACSA mechanical maintenance department to determine whether this pilot project is 1) successful and 2) to be implemented at the rest of the entrances on this level.

The design of the air curtain will be suitable to discharge air across the whole height and width of the opening at a supply air temperature that is acceptable for the comfort of those passing through the doorway. The heat output of the air curtain must be sufficient to temper the volume of air coming in at the entrance from the outside. A key factor is getting the jet stream right. If the jet stream has too little velocity or is too powerful it won't be effective. Thus the selection of the appropriate equipment is very important.

4.4.1.3 Design Assumptions

N/A

4.4.1.4 Design Risks & Controls

Air curtains needs to be sized correctly to be effective. This equipment is seen as specialized.

4.4.1.5 Cost Estimate

Refer to the Bill of Quantities presented in the Cost estimate report issued to the Project Quantity Surveyors on 31 January 2017.

4.5 Departures Mezzanine

4.5.1 REF 20 – Baggage Handling Carousels Area

4.5.1.1 Design Brief

During the visual site condition inspection it was observed that the baggage handling carousels area on the Departures Mezzanine level do not have any dedicated fresh air system to the area. The space is being air conditioned by Fan Coil Units (FCU's) located in area that are suspended from the concrete slab (soffit).

The baggage handling carousels area is from time to time occupied by staff members and thus fresh air ventilation is required for this space.

4.5.1.2 Proposed Design

The design incorporates mechanical ventilation. Making use of weather louvres, filters and wall fans to be installed on the exterior wall of the space, fresh air can be incorporated directly into the space. Further along the space an exhaust grill with ducting and in-line axial fan exhausting on the upper roof level is to be installed to create the intended air flow direction across the space.

Refer to the attached Mechanical HVAC layout drawing (60476403-01-0000-M-AA-304-D) in Appendix C for an illustration of the design as described above.

4.5.1.3 Design Assumptions

This design is not intended to thermally treat the air in the space, as there are dedicated fan coil units for it, but simply provide sufficient ventilation into the space.

4.5.1.4 Design Risks & Controls

The pressure balance of the area and surrounding areas are unknown, which is why natural ventilation has not been implemented, but instead mechanical ventilation is chosen for the design to ensure the air movement.

Unconditioned fresh air is to be added to the space which could affect the air temperature of the space.

4.5.1.5 Cost Estimate

Refer to the Bill of Quantities presented in the Cost estimate report issued to the Project Quantity Surveyors on 31 January 2017.

4.5.2 REF 27&28 – New Exhaust System Design for the Toilets

4.5.2.1 Design Brief

On the Departures Mezzanine Level the following rooms 3-A25/I2 and 3-A26/I1 (as per the Architectural room ID's) were identified on site as being ablution facilities. With the completion of a visual conditional inspection, the only attempt for ventilation was a hole in the ceiling (made by removing some of the ceiling tiles). This quick-fix is not in accordance with the National Building Regulations (SANS) or ASHRAE requirements.

A completely new exhaust system has to be designed and installed in accordance with the respective applicable standards and mechanical specifications.

4.5.2.2 Proposed Design

The new system would consist out of disc valves in the ceiling to exhaust the air out of the space and ductwork connected to the disc valves to transfer the foul air to an exhaust fan, at roof level. Existing service shafts will be used for the duct work to connect the disc valves with the exhaust fan on the Upper Roof Level.

Refer to the attached Mechanical HVAC layout drawing (60476403-01-0000-M-AA-304-D) in Appendix C for an illustration of the design as described above.

4.5.2.3 Design Assumptions

The ceiling height was of 2.4m obtained from the Room data sheets as provided by the Architects, which was taken into consideration during the design calculations.

4.5.2.4 Design Risks & Controls

The existing service shaft chosen for the design might not have sufficient space for new duct work to run in it. This risk must be clarified prior system installation.

4.5.2.5 Cost Estimate

Refer to the Bill of Quantities presented in the Cost estimate report issued to the Project Quantity Surveyors on 31 January 2017.

4.6 Lower Roof

4.6.1 Window Fans Replacement

4.6.1.1 Design Brief

A passage opposite the aircraft viewing deck on the Lower Roof level has square plate axial fans installed along the exterior wall/window of the building. The window mounted fans are installed along the passage together with weather louvres. Upon discussion with the UTS staff responsible for the mechanical equipment maintenance it has been communicated that these fans are disconnected from the power supply and do not form part of the current maintenance plan.

According to maintenance personnel the fans were disconnected during one of the refurbishment projects and never connected back after the project's completion.

No as-built information was available at the time of this report concerning the connectivity, controls, capacity or age of the fans. Considering the passage's general air flow arrangement it is clear that the intention was to "wash" the space with the fans on the one side and weather louvres on the other side of the passage. The current capacity/size of the fans is deemed adequate, therefore it is recommended the fans be replaced with new fans of the same capacity.

4.6.1.2 Proposed Design

There are a total of six square plate axial fans installed at present. The fans identity tag presented the following information as summarized below.

- Manufacturer: Elta Fans
- Model: SCP 500-6 (6 poles)
- Electricity supply: 220-240V, single phase, 50Hz
- Rev/s: 14

The existing fans are not included in the maintenance scheduling therefore it is difficult to establish what lead to the disconnecting of the fans from the power supply. Therefore, it is highly recommended that the new fans are included in the mechanical equipment maintenance schedule. The installation of new fans and the importance of the fans functionality are important in the air flow path.

The power supply and control of the fans must be independent upon any other system to avoid accidental power cut to the fans.

4.6.1.3 Design Assumptions

It is assumed the currently installed fans are close to their expected life, thus replacement is recommended.

It is assumed the capacity of the current fans is adequate to the design of the area.

4.6.1.4 Design Risks & Controls

The reason for the disconnecting of power to the fans cannot be ascertained.

4.6.1.5 Cost Estimate

Refer to the Bill of Quantities presented in the Cost estimate report issued to the Project Quantity Surveyors on 31 January 2017.

4.7 Upper Roof

4.7.1 Replace Duct Insulation of the AHU Serving the Hotel

4.7.1.1 Design Brief

On the exposed slab area of the Upper Roof Level is the ducted air handling unit that supplies the 3 star hotel. The external duct insulation is in a deteriorated state as seen during the visual site conditional inspections. It is recommended the insulation is replaced in order to reduce conditioned air heat loss.

4.7.1.2 Proposed Design

The type on duct insulation to be used must be suitable for outdoor use, i.e. must be suitable to handle the direct sunlight, rain and other external factors of being exposed to the elements.

This section of the refurbishment project is reflected in the cost estimate BOQ as a priced item for the general maintenance work to be performed by a suitable contractor.

4.7.1.3 Design Assumptions

The thickness of the new installed insulation to match the existing.

4.7.1.4 Design Risks & Controls

N/A as no design is being done. It is only an item in the bill of quantities.

4.7.1.5 Cost Estimate

Refer to the Bill of Quantities presented in the Cost estimate report issued to the Project Quantity Surveyors on 31 January 2017.

4.7.2 REF 26 – New Exhaust Fan for Ablution Blocks

4.7.2.1 Design Brief

Three ablution blocks on three different levels (Arrivals Mezzanine, International Departures and Departures Mezzanine Level) share the same exhaust fan, which was located in Plantroom 2 on the Upper Roof Level. This fan was removed when some of the air handling units in the plantroom were refurbished and new ductwork was installed. The fan was never reinstalled again, thus leaving the bathrooms without a functioning exhaust system. It was also noted during the visual inspection that some of the disc valves in the toilets are damaged, dirty or missing. A new exhaust air fan complete with sound attenuators needs to be reinstalled to comply with the building regulations and produce a functional exhaust air system, along with other necessary components of exhaust system.

4.7.2.2 Proposed Design

It is recommended that a new exhaust fan be sized based on the requirements of the existing facilities. It is the intention to utilize as much as possible the existing components, ductwork, grilles, etc. in order to economize on the installation. For that reason it is important that the existing ductwork to be pressure tested and made good if there are leaks or damaged sections.

The new exhaust fan will be sized and selected based on the requirements based on the volumes of all three ablution blocks together, based on the National Building requirements and specifications (SANS).

4.7.2.3 Design Assumptions

Existing as-built services drawings are required to determine the location of a new fan, if these drawings are not available it will be the contractor's responsibility to check and verify on site fan location and connections.

The fan sizing will be based on the available as-built information. Using the as-built drawings current air flows of the disc valve it is possible to calculate the amount of exhaust air for two of the three bathrooms. The third bathroom has no available as-built information. The assumption was made that the system would be similar to the other two bathrooms.

The existing extraction system based upon the as-built drawings available.

Level Name	Volume [m ³]	Ventilation Design [l/s]	Notes
Departures Mezzanine Level	210	1990	The summing of air flows of the exhaust air grilles on the as-built drawing.
International Departures Level	188	2000	Considering the main duct as from the as-built drawing available.
Arrivals Mezzanine Level	250	2289	No as-built information available, but based on similarity and area size difference of about 15% to Departures Mezzanine levels air flow is estimated.
Total	648	6279	N/A

4.7.2.4 Design Risks & Controls

The ducting and fan arrangement in Plantroom 2 might not be able to replicate previous positions due to the current space restrictions. If this is the case, an alternative arrangement must be sought during installation process.

4.7.2.5 Cost Estimate

Refer to the Bill of Quantities presented in the Cost estimate report issued to the Project Quantity Surveyors on 31 January 2017.

4.7.3 REF 29 – Wire Centre's A/C System Upgrade

4.7.3.1 Design Brief

The Wire Centre's associated with Terminal A of the airport where inspected and identified to be in need of upgrade of their A/C systems. Some of the Wire Centre's don't even have any A/C system installed. Which has an impact on the performance of the electronic equipment stored within.

Problems identified include condensate dripping, units generally lacking maintenance with missing controllers, etc.

4.7.3.2 Proposed Design

Wire Centre's with no A/C installed is to be fitted out with a new system. Drip trays and condensate pipes to be installed for new systems as well as units displaying leaks currently.

4.7.3.3 Design Assumptions

The positions of new A/C units are to be confirmed on site by the contractor.

4.7.3.4 Design Risks & Controls

The A/C units will be sized on 10% redundancy. Any future expansion of the electrical equipment within the wire-center needs to take this into consideration.

The locations of the A/C systems outdoor units are limited to the Basement level and the Upper Roof level.

4.7.3.5 Cost Estimate

Refer to the Bill of Quantities presented in the Cost estimate report issued to the Project Quantity Surveyors on 31 January 2017.

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**Mechanical Services
Wet Services**

05

5 Mechanical Services – Wet Services

5.1 Introduction

This report contains the initial concept designs for the issues identified in the Condition Assessment Report, which was summarized and put to a scale of importance in the Priority Report. This report is to be read in conjunction with the Priority Report for a complete list of issues highlighted. For the comments on the issues highlighted refer to the main Condition Assessment Report.

This report is divided into sections based on the type of design required. Within the individual sections it is divided into the proposed initial concept designs required for the issues highlighted in the Priority Report.

It should be noted that although compliance to SANS 204 is applicable to new installations, done after 2011, we recommend energy efficiency hot water generation and hot water insulation, as exercising best practice. In addition, the age of current installations lead us to believe that the system is soon due for replacement in any case.

For ease of reference see the below extracted table from the Wet Services Priority Report with the issues which will be referred to in this report.

Table 4: Extract from Summarized Priority Table from the Wet Services Priority Report

Ref.	Corrective Action	Part of Section within this Report
<u>General – Applicable for all Levels</u>		
1	The hot water supply needs to be insulated to conform to the SANS 204 standard for energy efficient buildings	5.2.1
2	Hot water generation system needs to be redesigned to limit the use of electrical resistance heating by implementing heat pump system or other heat recovery system in order to conform to the SANS 204 standard for energy efficient buildings.	5.2.2
<u>Basement Level (-1)</u>		
3	Stand-by submersible sump pump to be installed to prevent stoppages due to pump blockages.	5.3.1
<u>Arrivals Concourse Level (0)</u>		
	No current issues for [REDACTED] to address on this level	
<u>Arrivals Mezzanine Level (1)</u>		
4	Install separate drains for the suspect holding area male and female ablutions facilities from those of the international departures ablutions located above.	5.4.1
<u>International Departures Level (2)</u>		
5	Design and install secure floor drains in the International departure level public area to drain the water from the frequent activation of sprinklers as well as for general cleaning purposes.	5.5.1

Ref.	Corrective Action	Part of Section within this Report
<u>Departures Mezzanine Level (3)</u>		
6	Reroute the sewage pipe on the Departure Mezzanine Level (100 Ø from the small office ablutions located on Lower Roof Level that are not in scope area) that occasionally leaks through to the international check-in counters, to nearby risers.	5.6.1
<u>Lower Roof Level (4)</u>		
	No current issues for [REDACTED] to address on this level	
<u>Upper Roof Level (5)</u>		
7	Review of the maintenance schedule of mechanical equipment related to the domestic water supply storage tank, as well as spare parts and interchangeability records, to ensure that the system is adequately maintained.	

5.2 General

5.2.1 REF 1 – Insulation of Hot Water Supply

5.2.1.1 Design Brief

According to SANS 204 Energy efficiency in buildings - Section 4.5.2.4: “All exposed pipes to and from the hot water cylinders and central heating systems shall be insulated with pipe insulation material with an R-value” in accordance with table 2 below. This compliance is applicable for installations after 2011.

Table 5: R-values for pipe insulation material

1	2
Internal diameter of pipe	Minimum R-value *
≤ 80 mm	1,00
> 80 mm	1,50
* Determined with a hot surface temperature of 60 °C and an ambient temperature of 15 °C.	

5.2.1.2 Proposed Design

This item is only to be priced in the cost estimate Bill of Quantities and does not require design calculations.

5.2.1.3 Design Assumptions

The scope of piping needs to be confirmed with the Client (ACSA). It can be divided into sections based on the levels and gridlines as presented in the Architectural models.

5.2.1.4 Design Risks & Controls

Not all Hot water supply pipes are exposed or accessible. This could be a time risk when installation takes place.

5.2.1.5 Cost Estimate

Refer to the Bill of Quantities presented in the Cost estimate report issued to the Project Quantity Surveyors on 31 January 2017.

5.2.2 REF 2 – Hot Water Generation System

5.2.2.1 Design Brief

Currently at OR Tambo Terminal A in all ablutions within the scope of this project, potable hot water is provided through electrical resistance heating of water in geysers. This does not conform to the requirements of SANS 204 for energy efficient buildings which state that a minimum of 50% by volume of the annual average hot water heating requirements needs to be provided by means other than electric resistance heating.

The implication of the above is that the energy usage of the hot water generation system needs to be minimized as much as possible in order to comply with the National Building Regulations.

5.2.2.2 Proposed Design

It is proposed to replace the currently installed geysers with Heat Pumps for the hot water generation of the ablution facilities. Based on the design calculations it is recommended to use storage vessels of 150 liters capacity connected to the condenser unit. The location of the condenser unit is recommended to be in close proximity to the storage vessel, but if need be it can be situated either in the basement or on the roof slab, dependent on the distance.

The condenser unit of the heat pump should run on environmentally friendly refrigerant, which is approved by the current regulating building standards.

5.2.2.3 Design Assumptions

The following assumptions and bases for design were made:

- Hot water storage capacity (150 litres) is based on current geyser size as the peak demand and the rate of recovery could not be established due to data unavailability at the time of conducting this report.
- All electrical geysers to be replaced due to its age.
- Recovery rates calculations:
 - for staff ablutions - three shift are assumed, each 8 hours in duration;
 - public ablutions - 2 hrs recovery rate (worst case scenario);
- The supply water temperatures from the municipal connection will range between 12.5°C in winter and 17.5°C in summer.

The distance between the condenser unit and storage vessel is within the limits and thus not affecting the efficiency of the Heat Pump system negatively.

It is important that all new installed heat pumps be included in the preventative maintenance schedule.

5.2.2.4 Design Risks & Controls

The efficiency of the system could be affected negatively if installation on the system is not done properly.

Insulation of the storage vessel is critical aspect in keeping the water at the desired hot temperature.

5.2.2.5 Cost Estimate

Refer to the Bill of Quantities presented in the Cost estimate report issued to the Project Quantity Surveyors on 31 January 2017.

5.3 Basement

5.3.1 REF 3 – Stand-by Submersible Pump at Basement Sump

5.3.1.1 Design Brief

The sump pump used for emptying the sump in the Terminal A basement often gets blocked because of solids getting sucked in and getting stuck in the pump's impeller.

5.3.1.2 Proposed Design

For this application, the additional pump needs to be a 4 pole submersible shredder pump with a tungsten carbide tip impeller and serrated suction cover capable of shearing oversized solids before discharging. The 4 pole motor will reduce the impeller tip speed which in turn provides a longer wear life of parts, larger flow volume and higher solid passing ability.

It is proposed that the new shredder pump is used as the duty pump with the existing pump used as a standby (since the new pump would be in a better condition and more fit for purpose than the existing pump). It is important that the maintenance team include the new pump in a dedicated preventative maintenance schedule or register.

5.3.1.3 Design Assumptions

The shredder pump size is limited by the area of the sump manhole which is 800mmx800mm. A sump pump with a larger drainage capacity could be installed if the manholes were to be widened to 1000mmx800mm.

5.3.1.4 Design Risks & Controls

There must be sufficient electrical power supply to the new sump pump to be installed.

Due to the weight of the sump pump it is recommended that guide rails be installed to assist with the lowering and lifting operation of the sump pump.

5.3.1.5 Cost Estimate

Refer to the Bill of Quantities presented in the Cost estimate report issued to the Project Quantity Surveyors on 31 January 2017.

5.4 Arrivals Mezzanine

5.4.1 REF 4 – Separate Drains for Ablution Facilities in Suspect Holding Areas

5.4.1.1 Design Brief

As per the existing installation, the 100Ø cast iron drain pipeline from the ablution facilities of the SAPD Suspect Holding Areas ties into the 100Ø soil stack main located in the pipe shaft next to the lift transfer core. This soil stack main also provides drainage to the ablution facilities located on the Departures Mezzanine Level located above.

This soil stack main frequently gets blocked due to foreign debris being flushed down by the suspects that are being kept in these Suspect Holding Areas. These blockages causes backed up blockages to the Departures Mezzanine ablutions located two levels above.

5.4.1.2 Proposed Design

By separating the drain pipeline of the ablution facilities for the Suspect Holding Areas from the 100 Ø soil stack main and providing these ablutions with its own dedicated separate high density polyethylene pipe (HDPE) 110Ø drain line with soil stack will resolve the issue of backed up blockages affecting the ablution facilities located on the Departure Mezzanine Level.

The proposed alterations to the existing drainage pipelines located in the pipe shaft to resolve this issue are indicated on the attached Mechanical Wet Services Layout drawing (Drawing number 60476403-01-0000-MP-AA-001-D) in Appendix D.

5.4.1.3 Design Assumptions

It is assumed that there is capacity in space for the proposed new drain line and soil stack to be installed.

5.4.1.4 Design Risks & Controls

Access to and space capacity within the service shafts might be a risk to this design. In this instance an alternative pipe routing to be explored by prospective contractor.

5.4.1.5 Cost Estimate

Refer to the Bill of Quantities presented in the Cost estimate report issued to the Project Quantity Surveyors on 31 January 2017.

5.5 International Departures

5.5.1 REF 5 – Floor Drains for International Departure Public Area

5.5.1.1 Design Brief

The fire sprinklers located in the International Departure Check-In area are sometimes incorrectly activated causing fire water to rain down on the floor of this check-in area. This information was communicated from the maintenance team during the visual site conditional inspections.

Since there are currently no floor drains installed, this area will get flooded with no other means of cleaning up expect extensive manual labor which is time consuming. The possibility of property damage also exists due to water damage if the pooled water remains for an extended time period.

5.5.1.2 Proposed Design

The proposed installation of the floor drains is indicated on the layout drawing (Drawing number 60476403-01-0000-MP-AA-002-D) provided in Annexure D. The design has made provision for 16 floor drains to drain any water accumulation in this area.

The installation of floor drains will also allow general cleaning of the public space.

5.5.1.3 Design Assumptions

Sloping of the area is not included in the design and it is assumed that the floor of the check-in area is completely level.

It is assumed that there is capacity in space for the proposed new installation of the floor drains along with the drain pipes.

5.5.1.4 Design Risks & Controls

Additional as-built drawings will be required to ensure that this proposal does not clash with any existing services.

5.5.1.5 Cost Estimate

Refer to the Bill of Quantities presented in the Cost estimate report issued to the Project Quantity Surveyors on 31 January 2017.

5.6 Departures Mezzanine

5.6.1 REF 6 – Rerouting of Sewage Pipelines

5.6.1.1 Design Brief

The 100Ø uPVC drain pipeline for the small office ablutions and kitchenettes located on the Lower Roof Level ties into the 160Ø uPVC main drain pipeline located in the baggage handling area on the Departures Mezzanine Level.

This 100Ø uPVC drain pipeline does not have sufficient slope and incorrectly ties into the 160Ø uPVC main drain pipeline so that the drainage of the pipeline is inadequate which causes blockages and leaks. Visible floor damage can be observed below the tie-in to main drain pipeline which was caused by droplets leaking from the tie-in connection during blockages. These droplets soak through the damaged floor and drips down onto the international check in counters located on the level below.

5.6.1.2 Proposed Design

A similar drain pipeline runs from the small office ablutions and kitchenettes located to the south of the facilities on the Lower Roof Level. Although this drain line does not have an adequate slope to optimally drain sewage it does not present any of the drainage or blockage issues of the existing other drain line. There is also no existing soil stack near the drain line with any drainage or blockage problems.

Rerouting drain line with issues to the nearby soil stack will resolve the current pressing issue.

The proposed alterations to the existing drainage pipelines of the small ablution facilities and kitchenettes located on the Lower Roof Level are indicated on the layout drawing (Drawing number 60476403-01-0000-MP-AA-003-D) provided in Annexure D.

5.6.1.3 Design Assumptions

It is assumed that there is capacity in space for the proposed rerouting of the drainpipes.

5.6.1.4 Design Risks & Controls

Obtaining the correct drainage slopes and correctly tying into the main drain pipeline by rerouting these pipelines is not possible due to the obstructions and constraints within the baggage handling area.

Rerouting the drain line with no issues to the nearest soil stack will be a much more cost intensive exercise for a pipeline that does not present any drainage issues.

5.6.1.5 Cost Estimate

Refer to the Bill of Quantities presented in the Cost estimate report issued to the Project Quantity Surveyors on 31 January 2017.

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Fire Protection

06

6 Fire Protection

6.1 Introduction

This report contains the final design concepts for the issues identified in the Condition Assessment Report as issued on 22/06/2016. These issues were summarized and put to a scale of importance in the Priority Report issued on 11/07/2016. The initial design concepts were compiled and presented in the Stage 2 Report, which was issued in August 2016. In the Stage 2 Report different design options were explored with associated costs and pros and cons on each option presented, thereafter, the final recommendation was put forward.

This report is to be read in conjunction with the above mentioned documentation and all of their appendices. This report is divided into sections based on the building levels where different design approach is required.

6.2 Design Brief

For the purpose of this report it is assumed that all fire systems within scope areas are working, maintained and tested regularly. However, this will only be confirmed once testing of all systems is completed, and only then it will be possible to develop required designs accompanied with accurate costs.

It is recommended that emergency tests be conducted at the very beginning of Phase II of this project to enable fire engineers to commence with required designs on time as to prevent any delays in project implementation.

6.3 Proposed Design

6.3.1 Level -B1 – Basement 1 Level

6.3.1.1 Fire Protection

Hydrants, Fire Hose Reels and Fire Extinguishers

Although equipment has been serviced, some equipment has been removed from fire allocated positions.

Where equipment is missing it will be replaced with new equipment, see drawings indicating new installations.

6.3.1.2 Statutory Emergency Signage

Existing signage is present, quantities has been addressed and found to be not compliant with code of practice. In certain areas the signage has been removed.

Where signage is missing or insufficient it will be replaced with new signs, see drawings indicating new installations.

6.3.1.3 Fire Detection System

Fire Detection is installed in most areas. Areas have been identified to have insufficient fire detection coverage, this includes: point detection, sounders and strobes.

It is essential that the fire detection is interfaced with all relevant systems namely: Smoke extraction, Lifts, access controlled doors and voice evacuation.

Due to changes in tenant occupancies, tenant layout changes, some detection layouts / installation is out of rule. Protection distances have been interfered with as new walls have been installed and protected areas have been enlarged with bigger distances to cover. In certain areas no point detection has been installed.

Through the visual site inspection, areas identified to be non-code compliant will be upgraded by installing the necessary fire detection equipment. See drawings indicating the new installation.

Further to this, if additional equipment to an existing system is not possible a new system would need to be installed with a new fire panel, this will depend on contractor's willingness to tie into existing systems, therefore taking ownership of entire installation.

6.3.1.4 Automatic Sprinklers Protection

Sprinkler protection to be installed underneath ducting's in storage and operations room facilities.

Areas such as conveyer belts leading to baggage handling area needs to be sprinkler protected.

Sprinkler heads are damaged and pressed out of the ceiling space due to excessive weight on sprinkler piping sometime in the past.

Where automatic sprinklers are required due to tenant fit out changing these additional sprinklers will need to be installed to the existing system. See drawing indicating additional sprinklers required.

6.3.2 Level 0 – Arrivals Concourse Level

6.3.2.1 Fire Protection

Hydrants, Fire Hose Reels and Fire Extinguishers

Although equipment has been serviced, some equipment has been removed from fire allocated positions.

Where equipment is missing it will be replaced with new equipment, see drawings indicating new installations.

6.3.2.2 Statutory Emergency Signage

Existing signage is present, quantities has been addressed and found to be not compliant with code of practice. In certain areas the signage has been removed.

Where signage is missing or insufficient it will be replaced with new signs, see drawings indicating new installations.

6.3.2.3 Fire Detection System

Fire Detection is installed in most areas. Areas have been identified to have insufficient fire detection coverage, this includes: point detection, sounders and strobes.

It is essential that the fire detection is interfaced with all relevant systems namely: Smoke extraction, Lifts, access controlled doors and voice evacuation.

Due to changes in tenant occupancies, tenant layout changes, some detection layouts / installation is out of rule. Protection distances have been interfered with as new walls have been installed and protected areas have been enlarged with bigger distances to cover. In certain areas no point detection has been installed.

Through the visual site inspection, areas identified to be non-code compliant will be upgraded by installing the necessary fire detection equipment. See drawings indicating the new installation.

Further to this, if additional equipment to an existing system is not possible a new system would need to be installed with a new fire panel, this will depend on contractor's willingness to tie into existing systems, therefore taking ownership of entire installation.

6.3.2.4 Automatic Sprinklers Protection

Sprinkler protection to be installed underneath ducting's in storage and operations room facilities.

Areas such as conveyer belts leading to baggage handling area needs to be sprinkler protected.

Sprinkler heads are damaged and pressed out of the ceiling space due to excessive weight on sprinkler piping sometime in the past.

Where automatic sprinklers are required due to tenant fit out changing these additional sprinklers will need to be installed to the existing system. See drawing indicating additional sprinklers required.

6.3.3 Level 1 – Arrivals Mezzanine Level

6.3.3.1 Fire Protection

Hydrants, Fire Hose Reels and Fire Extinguishers

Although equipment has been serviced, some equipment has been removed from fire allocated positions.

Where equipment is missing it will be replaced with new equipment, see drawings indicating new installations.

6.3.3.2 Statutory Emergency Signage

Existing signage is present, quantities has been addressed and found to be not compliant with code of practice. In certain areas the signage has been removed.

Where signage is missing or insufficient it will be replaced with new signs, see drawings indicating new installations.

6.3.3.3 Fire Detection System

Fire Detection is installed in most areas. Areas have been identified to have insufficient fire detection coverage, this includes: point detection, sounders and strobes.

It is essential that the fire detection is interfaced with all relevant systems namely: Smoke extraction, Lifts, access controlled doors and voice evacuation.

Due to changes in tenant occupancies, tenant layout changes, some detection layouts / installation is out of rule. Protection distances have been interfered with as new walls have been installed and protected areas have been enlarged with bigger distances to cover. In certain areas no point detection has been installed.

Through the visual site inspection, areas identified to be non-code compliant will be upgraded by installing the necessary fire detection equipment. See drawings indicating the new installation.

Further to this, if additional equipment to an existing system is not possible a new system would need to be installed with a new fire panel, this will depend on contractor's willingness to tie into existing systems, therefore taking ownership of entire installation.

6.3.3.4 Automatic Sprinklers Protection

Sprinkler protection to be installed underneath ducting's in storage and operations room facilities.

Areas such as conveyer belts leading to baggage handling area needs to be sprinkler protected.

Sprinkler heads are damaged and pressed out of the ceiling space due to excessive weight on sprinkler piping sometime in the past.

Where automatic sprinklers are required due to tenant fit out changing these additional sprinklers will need to be installed to the existing system. See drawing indicating additional sprinklers required.

6.3.4 Level 2 – International Departures Level

6.3.4.1 Fire Protection

Hydrants, Fire Hose Reels and Fire Extinguishers

Although equipment has been serviced, some equipment has been removed from fire allocated positions.

Where equipment is missing it will be replaced with new equipment, see drawings indicating new installations.

6.3.4.2 Statutory Emergency Signage

Existing signage is present, quantities has been addressed and found to be not compliant with code of practice. In certain areas the signage has been removed.

Where signage is missing or insufficient it will be replaced with new signs, see drawings indicating new installations.

6.3.4.3 Fire Detection System

Fire Detection is installed in most areas. Areas have been identified to have insufficient fire detection coverage, this includes: point detection, sounders and strobes.

It is essential that the fire detection is interfaced with all relevant systems namely: Smoke extraction, Lifts, access controlled doors and voice evacuation.

Due to changes in tenant occupancies, tenant layout changes, some detection layouts / installation is out of rule. Protection distances have been interfered with as new walls have been installed and protected areas have been enlarged with bigger distances to cover. In certain areas no point detection has been installed.

Through the visual site inspection, areas identified to be non-code compliant will be upgraded by installing the necessary fire detection equipment. See drawings indicating the new installation.

Further to this, if additional equipment to an existing system is not possible a new system would need to be installed with a new fire panel, this will depend on contractor's willingness to tie into existing systems, therefore taking ownership of entire installation.

6.3.4.4 Automatic Sprinklers Protection

Sprinkler protection to be installed underneath ducting's in storage and operations room facilities.

Areas such as conveyer belts leading to baggage handling area needs to be sprinkler protected.

Sprinkler heads are damaged and pressed out of the ceiling space due to excessive weight on sprinkler piping sometime in the past.

An automatic sprinkler system needs to be installed in the International Departures Level. See drawings indicating the new design.

Where automatic sprinklers are required due to tenant fit out changing these additional sprinklers will need to be installed to the existing system. See drawing indicating additional sprinklers required.

6.3.5 Level 3 – Departures Mezzanine Level

6.3.5.1 Fire Protection

Hydrants, Fire Hose Reels and Fire Extinguishers

Although equipment has been serviced, some equipment has been removed from fire allocated positions.

Where equipment is missing it will be replaced with new equipment, see drawings indicating new installations.

6.3.5.2 Statutory Emergency Signage

Existing signage is present, quantities has been addressed and found to be not compliant with code of practice. In certain areas the signage has been removed.

Where signage is missing or insufficient it will be replaced with new signs, see drawings indicating new installations.

6.3.5.3 Fire Detection System

Fire Detection is installed in most areas. Areas have been identified to have insufficient fire detection coverage, this includes: point detection, sounders and strobes.

It is essential that the fire detection is interfaced with all relevant systems namely: Smoke extraction, Lifts, access controlled doors and voice evacuation.

Due to changes in tenant occupancies, tenant layout changes, some detection layouts / installation is out of rule. Protection distances have been interfered with as new walls have been installed and protected areas have been enlarged with bigger distances to cover. In certain areas no point detection has been installed.

Through the visual site inspection, areas identified to be non-code compliant will be upgraded by installing the necessary fire detection equipment. See drawings indicating the new installation.

Further to this, if additional equipment to an existing system is not possible a new system would need to be installed with a new fire panel, this will depend on contractor's willingness to tie into existing systems, therefore taking ownership of entire installation.

6.3.5.4 Automatic Sprinklers Protection

Sprinkler protection to be installed underneath ducting's in storage and operations room facilities.

Areas such as conveyer belts leading to baggage handling area needs to be sprinkler protected.

Sprinkler heads are damaged and pressed out of the ceiling space due to excessive weight on sprinkler piping sometime in the past.

Where automatic sprinklers are required due to tenant fit out changing these additional sprinklers will need to be installed to the existing system. See drawing indicating additional sprinklers required.

6.3.6 Level 4 – Lower Roof Level

6.3.6.1 Fire Protection

Hydrants, Fire Hose Reels and Fire Extinguishers

Although equipment has been serviced, some equipment has been removed from fire allocated positions.

Where equipment is missing it will be replaced with new equipment, see drawings indicating new installations.

6.3.6.2 Statutory Emergency Signage

Existing signage is present, quantities has been addressed and found to be not compliant with code of practice. In certain areas the signage has been removed.

Where signage is missing or insufficient it will be replaced with new signs, see drawings indicating new installations.

6.3.6.3 Fire Detection System

Fire Detection is installed in most areas. Areas have been identified to have insufficient fire detection coverage, this includes: point detection, sounders and strobes.

It is essential that the fire detection is interfaced with all relevant systems namely: Smoke extraction, Lifts, access controlled doors and voice evacuation.

Due to changes in tenant occupancies, tenant layout changes, some detection layouts / installation is out of rule. Protection distances have been interfered with as new walls have been installed and protected areas have been enlarged with bigger distances to cover. In certain areas no point detection has been installed.

Through the visual site inspection, areas identified to be non-code compliant will be upgraded by installing the necessary fire detection equipment. See drawings indicating the new installation.

Further to this, if additional equipment to an existing system is not possible a new system would need to be installed with a new fire panel, this will depend on contractor's willingness to tie into existing systems, therefore taking ownership of entire installation.

6.3.6.4 Automatic Sprinklers Protection

Sprinkler protection to be installed underneath ducting's in storage and operations room facilities.

Areas such as conveyer belts leading to baggage handling area needs to be sprinkler protected.

Sprinkler heads are damaged and pressed out of the ceiling space due to excessive weight on sprinkler piping sometime in the past.

Where automatic sprinklers are required due to tenant fit out changing these additional sprinklers will need to be installed to the existing system. See drawing indicating additional sprinklers required.

6.3.7 Level 5 – Upper Roof Level

6.3.7.1 Fire Protection

Hydrants, Fire Hose Reels and Fire Extinguishers

Although equipment has been serviced, some equipment has been removed from fire allocated positions.

Where equipment is missing it will be replaced with new equipment, see drawings indicating new installations.

6.3.7.2 Statutory Emergency Signage

Existing signage is present, quantities has been addressed and found to be not compliant with code of practice. In certain areas the signage has been removed.

Where signage is missing or insufficient it will be replaced with new signs, see drawings indicating new installations.

6.3.7.3 Fire Detection System

Fire Detection is installed in most areas. Areas have been identified to have insufficient fire detection coverage, this includes: point detection, sounders and strobes.

It is essential that the fire detection is interfaced with all relevant systems namely: Smoke extraction, Lifts, access controlled doors and voice evacuation.

Due to changes in tenant occupancies, tenant layout changes, some detection layouts / installation is out of rule. Protection distances have been interfered with as new walls have been installed and protected areas have been enlarged with bigger distances to cover. In certain areas no point detection has been installed.

Through the visual site inspection, areas identified to be non-code compliant will be upgraded by installing the necessary fire detection equipment. See drawings indicating the new installation.

Further to this, if additional equipment to an existing system is not possible a new system would need to be installed with a new fire panel, this will depend on contractor's willingness to tie into existing systems, therefore taking ownership of entire installation.

6.3.7.4 Automatic Sprinklers Protection

Sprinkler protection to be installed underneath ducting's in storage and operations room facilities.

Areas such as conveyer belts leading to baggage handling area needs to be sprinkler protected.

Sprinkler heads are damaged and pressed out of the ceiling space due to excessive weight on sprinkler piping sometime in the past.

Where automatic sprinklers are required due to tenant fit out changing these additional sprinklers will need to be installed to the existing system. See drawing indicating additional sprinklers required.

6.3.8 Level 6 – Roof Level

6.3.8.1 Fire Protection

Hydrants, Fire Hose Reels and Fire Extinguishers

Although equipment has been serviced, some equipment has been removed from fire allocated positions.

Where equipment is missing it will be replaced with new equipment, see drawings indicating new installations.

6.3.8.2 Statutory Emergency Signage

Existing signage is present, quantities has been addressed and found to be not compliant with code of practice. In certain areas the signage has been removed.

Where signage is missing or insufficient it will be replaced with new signs, see drawings indicating new installations.

6.3.8.3 Fire Detection System

Fire Detection is installed in most areas. Areas have been identified to have insufficient fire detection coverage, this includes: point detection, sounders and strobes.

It is essential that the fire detection is interfaced with all relevant systems namely: Smoke extraction, Lifts, access controlled doors and voice evacuation.

Due to changes in tenant occupancies, tenant layout changes, some detection layouts / installation is out of rule. Protection distances have been interfered with as new walls have been installed and protected areas have been enlarged with bigger distances to cover. In certain areas no point detection has been installed.

Through the visual site inspection, areas identified to be non-code compliant will be upgraded by installing the necessary fire detection equipment. See drawings indicating the new installation.

Further to this, if additional equipment to an existing system is not possible a new system would need to be installed with a new fire panel, this will depend on contractor's willingness to tie into existing systems, therefore taking ownership of entire installation.

6.3.8.4 Automatic Sprinklers Protection

Sprinkler protection to be installed underneath ducting's in storage and operations room facilities.

Areas such as conveyer belts leading to baggage handling area needs to be sprinkler protected.

Sprinkler heads are damaged and pressed out of the ceiling space due to excessive weight on sprinkler piping sometime in the past.

Where automatic sprinklers are required due to tenant fit out changing these additional sprinklers will need to be installed to the existing system. See drawing indicating additional sprinklers required.

6.3.9 Wire Closets (Centers)

6.3.9.1 Fire Detection System

None of the wire closets located have any fire detection located within.

These wire closets will be fitted with a fire detection system.

Further to this, if additional equipment to an existing system is not possible, a new system would need to be installed.

6.4 Design Assumptions

Based on the above all designs are based on a visual inspection only with limited access in certain areas.

All Fire Protection Systems are assumed to be working, maintained and tested regularly. This will only be confirmed once testing of all systems is done.

We assume that the emergency lighting aspect for the entire building has been integrated into all areas. No systems were tested therefore we assume that all systems are non-compliant. The emergency systems need to be tested.

In some instances the corrosion of piping is present due to leaking connections. Equipment need to be serviced properly and leaks to be repaired. This is considered to be maintenance issues.

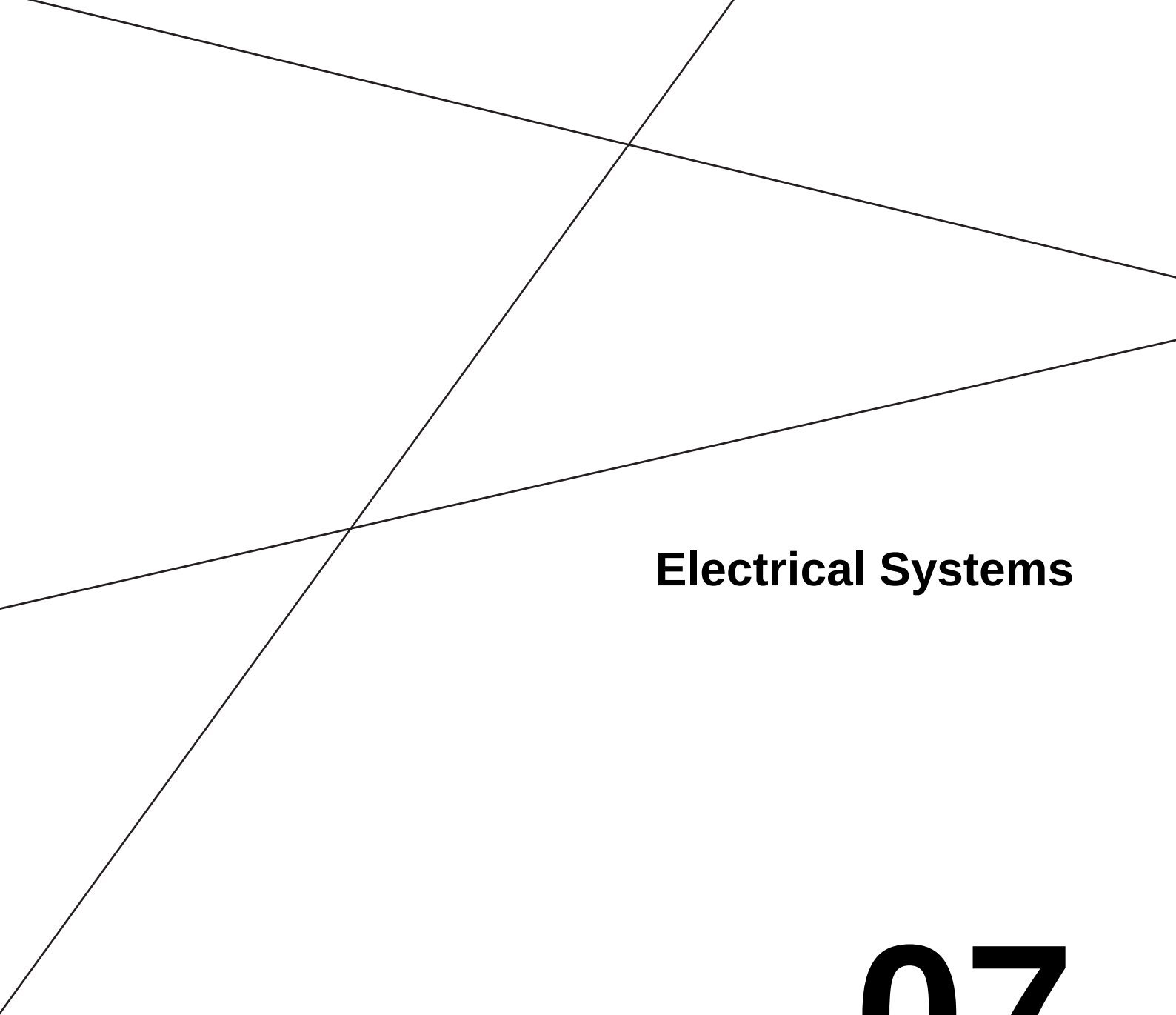
We assume that the smoke control systems aspect for the entire building has been integrated into all areas. No systems were tested. The systems need to be tested.

We assume that the Air-conditioning systems aspect for the entire building has been integrated into all areas. No systems were tested, it is recommended that the systems are tested.

6.5 Design Risks and Controls

The fact that testing of the emergency systems didn't take place it poses a massive risk both, the proposed design and the costing. Once testing of the entire emergency system is complete it will be possible to provide an accurate design and costing to bring the entire system, both existing and proposed upgrades to be code compliant.

Without regular testing and maintenance systems life expectancy deteriorates at a faster rate. It is also required by the codes of practice that this is done on a regular bases Therefore both need to be done periodically ensuring a functional code compliant system.

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Electrical Systems

07

7 Electrical Systems

7.1 Introduction

This report outlines the design of the electrical installation for ACSA Terminal A Building at OR Tambo International Airport. The installation has been designed to ensure that it is energy efficient, that the installation complies with South African National Standards energy efficiency in buildings and to optimize electrical systems maintainability. This is an existing building and the electrical design is part of refurbishment for Terminal A.

Project Overview:

This report is to be read in conjunction with the above mentioned documentation and all of their appendices. This report is divided into sections based on the Terminal A building levels and different designs required.

Only items identified in the Electrical Priority Report requiring action from [REDACTED] is considered for design concepts. During the Priority Report sign-off procedure the issues identified during the visual site inspection were discussed with the discipline specific Head of Departments on ACSA's side. In addition, some design issues were discussed during biweekly design coordination team meetings where design items were determined and agreed upon for [REDACTED]'s action.

For ease of reference see the below extracted table from ELECTRICAL Priority Report with the issues which will be referred to in this report.

Table 17: Extract from Summarized Priority Table from the Electrical Priority Report

Ref.	Corrective Action	By Whom	Part of Section within this Report
<u>General – Applicable for all substations</u>			
1	Differential Protection Scheme and cable VTs Install differential schemes and cable VTs on the remaining substations.	ACSA Engineering	N/A
2	MV Switchgear - Internal Arc Classification Future replacements of MV switchgears should be designed in accordance with IEC 62271-200. Confirm that substation 2 and 5 are designed in accordance with IEC 62271-200.	ACSA Engineering	N/A
3	Electrical Protection Settings Conduct protection settings review of the entire MV switchgear.	ACSA Engineering	N/A
4	Substation Automation system Install and configure a substation automation system to incorporate, monitor and control the entire MV switchgear	ACSA Engineering	N/A
5	Building Management System (BMS) Incorporate the electrical systems into the new BMS system. [REDACTED] does not know the specifications adopted into the new BMS as it currently in the tender stages.	ACSA Engineering	N/A
6	Decommissioning of Substations 6 and 7 Decommission substations 6 and 7. - Decommissioning of MV switchgear and apparatus - Removal of MV switchgear and apparatus - Removal of power transformers	ACSA – Terminal A Refurbishment project	7.4

Ref.	Corrective Action	By Whom	Part of Section within this Report
	- Naming and tagging of MV cable - Re-routing of MV cable to the mini subs - Commissioning of mini subs to the loads		
7	Substations Load Profiles and MV System Analysis Conduct a load profile study on substations 2 and 5.	ACSA Engineering	N/A
8	MV and MLV cable schedules Medium Voltage and Main Low Voltage cable schedule needs to be conducted and the cables maned/renamed and tagged. Included in scope - Containment of MV and MLV cables - Ringing of MV and MLV cables - Documentation - Spacing between MLV cables in accordance to SANS 10142-1	ACSA – Terminal A Refurbishment project	7.5
9	Main Rotary UPS (Install a complete new system) Install a complete new Rotary UPS in substations 2 and 5.	ACSA Engineering	N/A
10	Main Rotary UPS (Conversion Option) Use the currently installed back-up diesel generators to convert to a Rotary UPS in substations 2 and 5.	ACSA Engineering	N/A
11	Power all lights circuit from Emergency Power In line with SANS 101114-2, ACSA engineering decided that all lights be power from emergency supply in the whole Terminal A building. - Load calculations - DB sizing - Construction	ACSA – Terminal A Refurbishment project	7.6
12	Main Low Voltage (MLV) It is recommended that the covering of exposed electrical circuits is corrected in line with the requirements of IEC 61439-1&2 or any other applicable standard.	ACSA Maintenance	N/A
13	Earthing & Lightning Protection Summary of Findings The following is the summary of the findings on the earthing & lightning protection systems condition; - Earth conductors in the roof are not interconnected - Some of the conductive equipment in the roof are not bonded to the earth network - Lightning protection for tall structures in the roof do not have air terminal and down conductors as specified in SABS 03. Recommendations - Earthing and lightning protection should be tested for continuity - Earth resistivity of the earth rods should also be tested, the results	ACSA – Terminal A Refurbishment project	7.11

Ref.	Corrective Action	By Whom	Part of Section within this Report
	should not exceed 1 ohm - We also recommend that the entire earthing and lightning protection system should be checked by a lightning protection specialists for compliance with SANS 62305-3, protective of physical damage to structures and life hazard. - Specialized earthing system audit should be conducted.		
14	<i>Distribution Boards</i> Inspect and Test all Distribution Boards and provide a Certificate of Compliance.	ACSA – Terminal A Refurbishment project	7.10
15	<i>Lighting</i> Lighting for all areas to be brought up to standard. Incorporate Energy Efficient Lighting solutions.	ACSA – Terminal A Refurbishment project	7.8

7.2 Design Brief

7.2.1 Electrical Services

The design of the electrical installation shall be suitable for the ACSA Terminal A. The scope of work covers the electrical installation design as described herein after that includes, but not limited to the following:

- A Design solution for decommissioning Substations 6 and 7 transformers on the lower and upper roof levels;
- A Design solution for refurbishing the existing electrical distribution system;
- Design of energy efficient lighting installations;
- Design of small power installation;
- A Design solution for refurbishing the electrical conduit/wire-ways.

7.2.2 Green Design

Although [REDACTED] are not going to any formal accreditation, certain green aspect will be included in the design. These include efficient lighting and lighting controls, exterior lighting that reduces lighting pollution and smart metering.

Generators are currently installed on site as alternative power supply, together with Uninterrupted Power Supply (UPS).

7.2.3 Maintainability

All installations require easy access for maintenance and this approach was kept in mind during design process. This is to keep the maintenance costs down and for safety reasons. The importance of regular maintenance will be reflected in maintenance time reduction, as well as contributing to safety of personal that maintain the electrical installations.

7.2.4 Distribution Boards

All main LV distribution boards are floor standing (orange) with red covers for essential loads, orange/ white covers for non-essential loads and purple covers for Uninterrupted Power Supply (UPS) load.

7.3 Exclusions from the Electrical Scope

7.3.1 MV Reticulation and SCADA (Priority ref. 1 to 4)

The MV reticulation within the Terminal A footprint has been excluded from scope of this project. In order to provide a design solution on the MV infrastructure, one needs to look at the site wide electrical infrastructure as a whole. A system model will have to be generated for the complete installation. From the model the following can be reviewed;

- Load Flows
- Fault Levels
- Protection
- Arc Fault levels

There is also a need for a proper SCADA system for proper supervision and control of the complete Airport Network.

7.3.2 BMS (Priority ref 5)

There is a need for a BMS system at Terminal A but it is our understanding that there is already a project under way for the BMS solutions within the Terminals.

7.3.3 Rotary UPS Solution (Priority ref. 9 and 10)

The option of incorporating a new Rotary type UPS solution was investigated for this project. The main issue of having a centralized UPS solution for this building is the amount of voltage drop on the cables due to the size of the building.

The advantage of a Rotary UPS solution is that it provides instant back-up power via fly wheel.

The most economical solution would be to incorporate a Rotary UPS solution that feeds into the local MV network. Power will run from the generator to the various load points on the MV network. In case of power failure all non-essential loads can then drop out by use of motorized breakers controlled via a centralized SCADA system.

For this reason the Rotary UPS solution has been excluded for this project.

The existing LV Generators undergoes frequent testing and are in a reasonable condition.



7.4 Decommissioning of Substations 6 & 7 (Priority ref. 6)

7.4.1 Proposed Design

There are two substations currently on the Terminal A roof - Substation 6, on the upper roof, and Substation 7, on the lower roof. The main concern about these substations is the accessibility of the transformers for overhaul or replacement. These transformers are now nearing their end of life. Although the transformers are well maintained the risk of major fault becomes greater. If, for any reason, a transformer needs to be replaced it will be very timely and costly exercise to replace due to constrained access to the Terminal A roof. For this reason a design solution is provided within this section for removing the Substations 6 and 7 transformers.

The solution will be to re-supply the LV loads on the roof from the basement substations. There is currently a spare 2 MVA transformer available in the basement substation 5 that can be utilised to supply the additional loads. The LV boards will have to be retained as there are still LV loads on the boards. The only real issue is the distance between the basement and the roof and because of that, the resultant cable sizes. The current loads on the boards are significantly less which means the breakers can be down-scaled to minimise the supply cable size to the substation LV boards.

The loads on the Substations 6 and 7 LV boards are significantly less than before due to the fact that the entire roof HVAC chillers plant has been relocated to the basement Chiller Room.

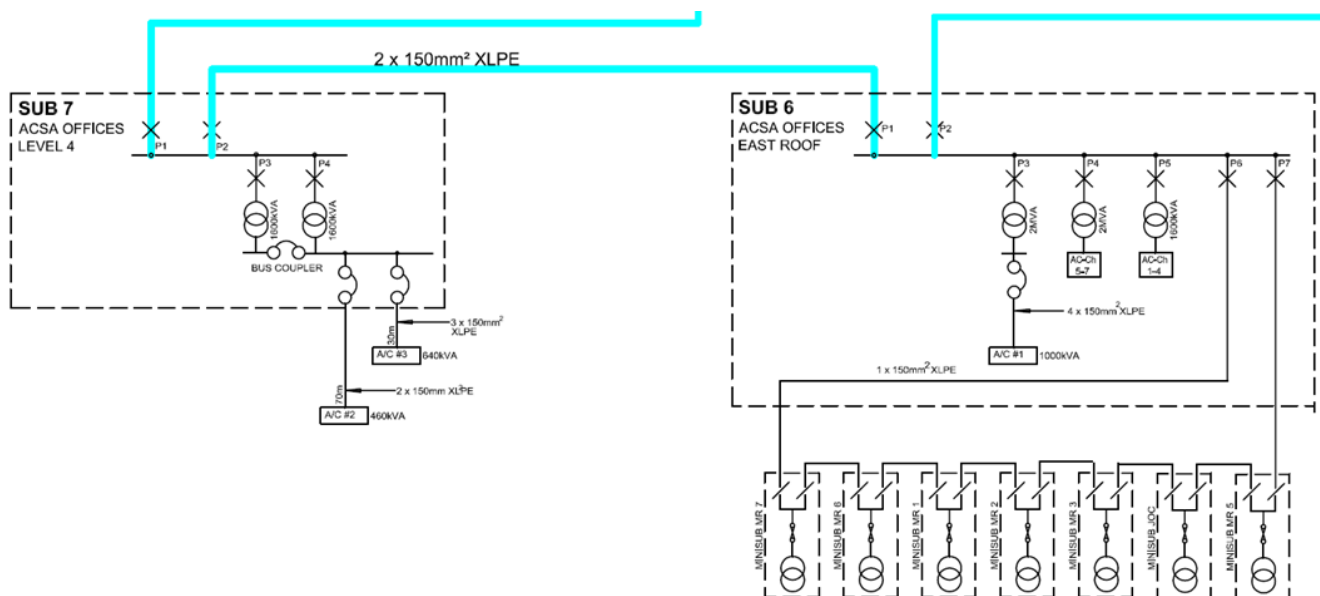


Figure 1: Single Line Diagram of Existing Substations 6 and 7

7.4.1.1 Substation 6

Substation 6, located on the upper roof of Terminal A, consists of;

- 11kV Switchboard 6H with the following incomers and feeders;
 - Incomer 6H1: Substation 5
 - Incomer 6H2: Chiller Plant Substation
 - Feeder 6H3: 2MVA Transformer 6T1
 - Feeder 6H4: 2MVA Transformer 6T2
 - Feeder 6H5: 1.6MVA Transformer 6T3
 - Feeder 6H6: Mini-sub MR7 (Ring Feed)
 - Feeder 6H7: Mini-sub MR5 (Ring feed)
- 2MVA Transformer 6T1 feeding "Main LV Panel Substation 6"

- 2MVA Transformer 6T2 feeding “Main LV Board T2 Normal”
- 1.6MVA Transformer 6T3 feeding “Main LV Panel Sub 6”

7.4.1.2 Estimated Substation 6 Loads

Table 6: Substation 6 Main LV Panel

MAIN LV Panel SUB STATION 6					
Incomer		3200A			
	Loads	Breaker	Status	Measured/ Estimated Load	
1	A/C Plantroom 7	500A	ON	102	A
2	Chiller Pumps -Plant Room 7	400A	ON	0	A
3	SAA Lounge	125A	ON	40	A
4	DB-R4	125A	ON	40	A
5	OLD PLANT ROOM	160A	ON	0	A
6	R4 500A	500A	ON	200	A
7	R3 300A	300A	ON	100	A
8	AC PL8	125A	ON	36.77	A
9	AC PL9	125A	ON	28.72	A
10	AC PL10	225A	ON	54	A
11	R 4.20	160A	ON	100	A
Estimated Max Demand				701.49	A

Table 7: Substation 6 Main LV Board

MAIN LV Board T2 Normal					
Incomer		3200A			
	Loads	Breaker	Status	Measured/ Estimated Load	
1	AC DB 1	1250A	ON	115	A
2	A1 - AC Node 1 AHU U5-1	125A	ON	32	A
3	A2 - AC Node 2 AHU U5-2	125A	ON	0	A
4	A3 - Airside North Smoke Fan	225A	ON	30	A
5	A10 - 601A	125A	ON	30	A
6	A11 - 601-B1	200A	ON	30	A
7	A12 - 601B	200A	ON	30	A
8	B1 -DB 607(B)	250A	ON	30	A
9	B2 - DB 606 (B)	250A	ON	30	A
10	B3 - ?	300A	ON	30	A
11	B7 - DB AL2	250A	ON	30	A
12	B8 - 604C	250A	ON	30	A
13	B9 - 602D	300A	ON	30	A
14	B10 - 606D	400A	ON	30	A
15	B11 - 603 D	400A	ON	30	A
16	B12 - 604D	350A	ON	30	A
	Other			100	A
Estimated Max Demand				637	A

7.4.1.3 Substation 7

Substation 7, located on the lower roof Level 4, consists mainly of;

- 11kV Switchboard 7H with the following incomers and feeders;
 - Switchroom – South Incomer
 - Substation 6 Incomer
 - Transformer 7T1 Feeder
 - Transformer 7T2 Feeder
- Transformer 7T1
- Main LV Board T1
- Transformer 7T2
- Main LV Board T2
- Substation 7 Essential Board

7.4.1.4 Estimated Substation 7 Loads

Table 8: Substation 7 Main LV Board T1

Main LV Board T1

Incomer 2500A

	Loads	Breaker	Status	Measured/ Estimated Load	
1	A1 - DB710	150A	ON	40	A
2	A2 - DB704	160A	ON	30	A
3	A3 - DB 709	60A	ON	10	A
4	A10 - DB703	350A	ON	100	A
5	B1 - DB 705	800A	ON	20	A
	Estimated Max Demand			200	A

Table 9: Substation 7 Main LV Board T2

Main LV Board T2

Incomer 2500A

	Loads	Breaker	Status	Measured/ Estimated Load	
1	A1 - DB701	125A	ON	40	A
2	A2 - DB702B	160A	ON	30	A
3	A3 - Unit 95 DB 711	60A	ON	10	A
4	A4	200A	ON	50	A
5	A5 - DB 708	160A	ON	20	A
6	A6 - DB 707	80A	ON	20	A
7	A10 - Standby Board Normal	400A	ON	200	A
8	B1	1000A	ON	300	A
	Estimated Max Demand			670	A

7.4.1.5 Design Solution

The existing Substations 6 and 7 LV loads can be supplied from the Basement Substation 5 Spare 2MVA transformer.

A new 3200A LV switchboard will have to be installed at Substation 5 to supply the Substations 6 and 7 LV loads.

The incomers on the existing LV boards will have to be reconfigured for the revised loadings.

The final loads on the existing boards will have to be confirmed by the contractor.

Refer to drawing 6076403-01-0000-E-100-P- for detail.

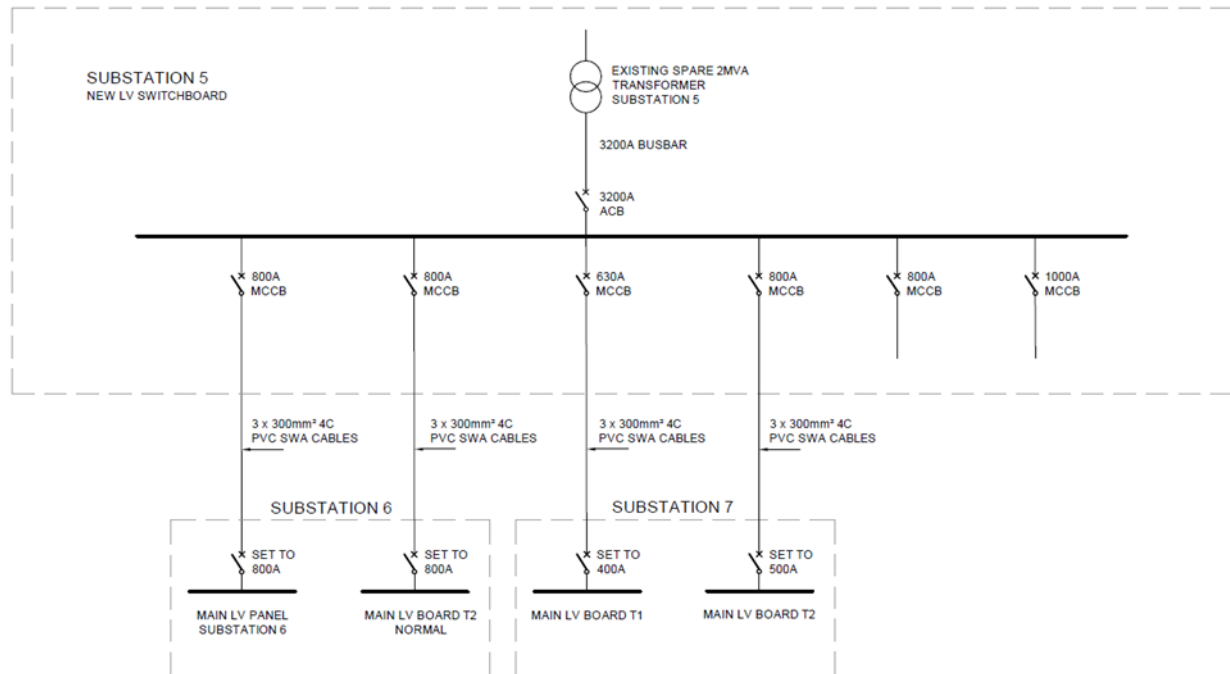


Figure 2: Line Diagram of Substations 6 and 7

7.4.2 Design Assumptions

- The existing LV loads on Substation 6 and 7.
- The LV cable lengths from Substation 5 to Substation 6 & 7. We were unable to identify the exact cable route.

7.4.3 Design Risks & Controls

The contractor will need to measure the exact existing electrical loads and cable lengths after which the designs will need to be reviewed and revised as necessary.

7.5 MV and LV cable schedules (Priority ref. 8)

7.5.1 Proposed Design

Medium Voltage and Main Low Voltage cable schedule needs to be conducted and the cables named/renamed and tagged.

Included in scope

- Containment of MV and MLV cables
- Ringing of MV and MLV cables
- Documentation
- Spacing between MLV cables in accordance to SANS 10142-1

7.5.2 Design Assumptions

N/A

7.5.3 Design Risks & Controls

The exact quantities of cabling are unknown. The final quantities will need to be re-measured.

7.6 Power all lights from Emergency Power (Priority ref. 11)

7.6.1 Proposed Design

ACSA engineering requested that all non-essential lighting within the Terminal A Areas gets transferred to essential power.

It is understood that there are currently ample capacity on the existing generators supplying Terminal A. since this project includes replacement of all lighting with LED type already this will be feasible.

All lighting circuits currently supplied from non-essential boards will need to be transferred to essential boards.

The essential boards that are too small will need to be extended to facilitate the additional circuits.

With all lighting being LED the final lighting loads for the entire building is estimated at 150 kW.

There are currently 3 x 800 kVA generators at Substation 5 and a 500 kVA generator at Substation 2 to supply the essential loads.

[REDACTED] was unable to confirm the percentage of lighting currently on essential power due to the lack of as-built information available.

7.6.2 Design Assumptions

N/A

7.6.3 Design Risks & Controls

The possibility exist that the infrastructure is not sized for providing essential power to all lighting. If this is the case we would recommend that the back-of house areas gets excluded.

7.7 Small Power Design

7.7.1 Proposed Design

Power-skirting will be installed to provide power to the following areas (if there is no currently installed power-skirting or if the currently installed needs to be replaced):

- Individual Offices
- Open Plan Working Areas
- Receptions
- Rest Areas
- Stock Rooms
- Pause Areas

Also, the following sockets will be provided:

- For normal general use – New SANS 164-2 sockets, with the older three-pin socket. The new sockets use up considerably less space than the current three-pin sockets, and they're safer.
- For dedicated use – 2 round pin and shaved earth pin type colour Red (not on earth leakage).

Normal socket outlets will be protected against overload by 20A single pole circuit breakers and by earth leakage. Dedicated socket outlets will be protected by 20A circuit breaker but not by earth leakage. The earthing shall be by means of green PVC insulated single core cable earth wire connected to the main board earth board bar. Reticulation to the outlets will be via PVC insulated conductors. The power point for the various areas will be determined by the furniture which is currently there and equipment layout, and will be confirmed with the architect and client.

The proposed outlets for various areas are:

Area	Sample Picture
Normal switch socket outlets (SSO's)	 SANS 164-2 sockets, with the older three-pin socket visible on the right. The new sockets use up considerably less space than the current three-pin sockets, and they're safer
Dedicated socket outlets (DSSO's)	

Modula Power which can be combined with the socket outlets and ITC units	
Power skirting (offices)	
Floor boxes	

7.7.2 Design Assumptions

N/A

7.7.3 Design Risks & Controls

The final quantities of what gets installed might differ as some installations might deteriorate further from the time of assessment to construction. The quantities will need to be re-measured.

7.8 Internal Lighting

7.8.1 Proposed Design

LED light fittings will be installed throughout the building and working areas for general lighting.

Different types of luminaires have been specified for specialized applications. The LED light fittings will be more energy efficient, and will have longer life span.

Passive movement/occupancy sensors with lighting level sensors will be used throughout each work space inside the building.

Occupancy sensors will be positioned in such a way that each sensor covers a radius of 7 meters. Each room will have its own sensor mounted in the ceiling. There will be normal light switches in the store rooms instead of occupancy sensors. In a room which has a diameter of more than 14 meters, more occupancy sensors will be installed and each sensor will cover a radius of 7 meters.

Escalators and Stairs

LED disc type light fittings will be installed in the main circulation areas. The light fittings will be connected to light lifters to be used for motorizing the fittings down for maintenance access. The light fittings can be hoisted down in sections with control switch located within the local distribution board.

7.8.1.1 Lighting Levels

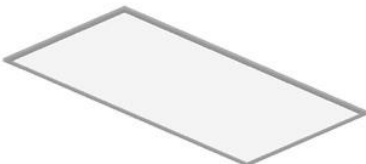
Lighting design will comply with the relevant regulations and will aim to achieve the following minimum maintained lighting levels

Table 10: Area Lighting Levels

AREA	LUX LEVELS
Indoor Parking Bays	75
Baggage Areas	150
Store Rooms, Cold stores, stock rooms	150
Offices	300
Departures Hall	200
Circulation and corridors	150
Check-in Desks	300
Toilets	150
Meeting rooms, Board rooms	400
Kitchen	250

7.8.1.2 Proposed Light Fittings

The type of light fittings will be investigated and proposed in conjunction with the Architects, consequently the Client will approve and confirm the fittings for the various areas. However, the proposed lighting fittings types are as follows:

Area	Description	Picture
Offices, Open Plan, Rest Room, Security Rooms, Passages, Walkways, Meeting Rooms	36W 600x600mm Recessed LED Panel	
Offices, Open Plan, Rest Room, Security Rooms, Passages, Walkways, Meeting Rooms	70W 600x1200mm Recessed LED Panel	
Boardrooms, Meeting Rooms, Toilets, Change Rooms	LED Downlights 12W	
Parking Bays, Baggage Areas, Store Rooms, Stock Rooms, Transformer Room, LV Room	LED Vapourline 48W and 60W	
Stair Cases, Escalators	LED Disk	

Basement Driveway	LED Bulkhead	
Escalators	Lighting Lifter	

Existing circuits will be utilized to supply the new fittings.

Refer to the Electrical Design Appendix for the lighting design calculations and drawings.

7.8.1.3 Lighting Controls

Motion Sensors will be used to control the lights in all floors of the building. Each room will have its own sensor for better control and there will be a 7 meter radius covered by each sensor. Wall mounted sensors will be installed in the meeting rooms and board rooms. In most of the rooms, normal switches are currently installed; these should be changed to occupancy sensor.

All sensors will be positioned in a way to make sure that lights remain off in all spaces which are unoccupied. As soon as people occupy the spaces, lights will turn on. There will be a time delay to make sure that the sensors allows for sufficient time before the lights turn off if there is no movement that has taken place. In areas such as store rooms and stock rooms, normal switches will be used to control the lights. These should be in line with what is required per room all the time.

7.8.2 Design Assumptions

N/A

7.8.3 Design Risks & Controls

The final quantities of luminaires to be installed will have to be re-measurable. ACSA engineering is currently in the process of installing LED luminaires in some areas.

7.9 Power Factor Correction and Harmonic Filtering

7.9.1 Proposed Design

An allowance has been made for power factor correction and Harmonic Filters on the main incoming supplies. Once all new installations are completed, a load survey will be required to establish the exact requirements for PFC and Harmonic Filtering.

7.9.2 Design Assumptions

N/A

7.9.3 Design Risks & Controls

N/A

7.10 Distribution Boards

7.10.1 Proposed Design

The requirement for periodic inspection testing and reporting is set out in regulation 89 of the 2007 Safety Health and Welfare at work Regulations which states that “an employer shall ensure that an existing electrical installation is tested by a competent person in an appropriate manner and that all defects found during the testing and inspection of an electrical installation are rectified promptly so as to prevent danger.”

For Commercial buildings the Suggested Period between Inspection & Testing is 5 years.

Any Board which have not been tested within the last 2-3 years will be inspected and tested as part of the Terminal A refurbishment scope of works. The testing will then be followed by the required remedial works and Certificate of Compliance (COC).

There are an assumed total of 130 Distribution boards within the Terminal A building footprint. The exact quantities of DBs are unknown due to the lack to as-built information available at this point in time.

Of the 130 DBs about 8 are new and wouldn't require a COC. All of the other DBs require testing and inspection with associated remedial works.

The final cost will have to be re-measurable as it is ultimately dependent on the extent of remedial works required.

Refer to the Electrical Design Appendix for a detailed list of the Distribution Boards within Terminal A.

Access Control to Electrical Distribution Boards

Unauthorized access to Electrical Distribution boards is a major security concern, especially within in public spaces.

Access will be restricted by the use of high security padlocks which cannot be removed by use of a bolt cutter.

All locks can have the same key which means maintenance will only require a single key for access to all electrical rooms.



Figure 3: C35 Professional High Security Padlock

7.10.2 Design Assumptions

The final quantity of Distribution Boards located within the Terminal A footprint.

7.10.3 Design Risks & Controls

The final quantity of Distribution boards and associated remedial works required for providing a COC will have to be re-measurable.

7.11 Building Earthing and Lighting Protection (Priority ref. 13)

7.11.1 Proposed Design

The complete earthing and lightning protection installation for the building will be inspected by a specialized earthing and lightning protection contractor. The installation shall be inspected in accordance with SANS 10313/ IEC 61024 and the contractor will issue a certificate of compliance.

The contractor will perform all the necessary remedial works required for providing a compliant installation.

The contractor will review the following main components:

- Complete earthing of the MV to the LV electrical installation;
- Equipotential bonding;
- Lighting protection system from the roof to the ground termination.

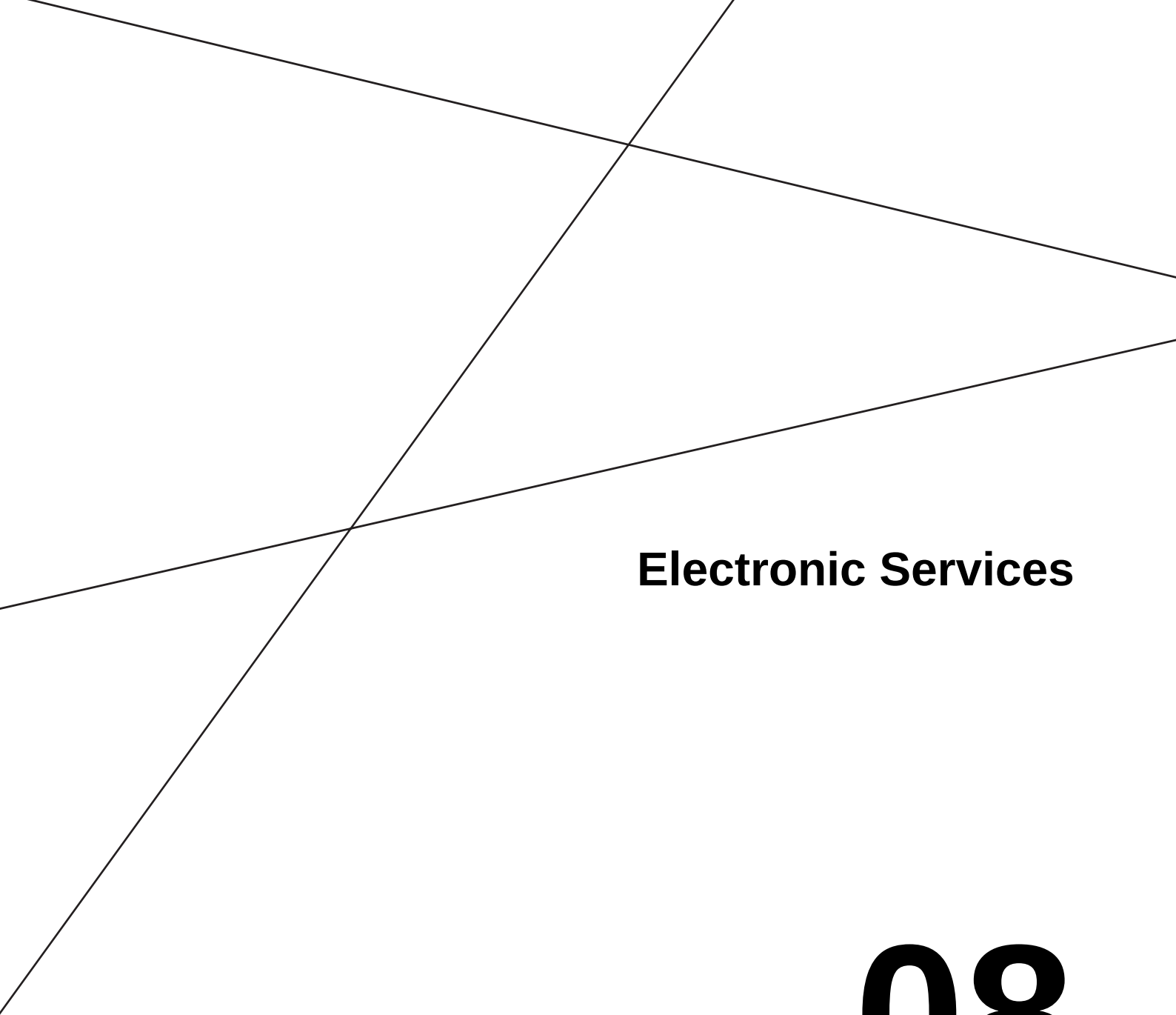
All earthing on the roof shall be repaired/replaced as deemed necessary.

7.11.2 Design Assumptions

N/A

7.11.3 Design Risks & Controls

N/A

Three thin, dark grey lines intersect to form a large triangle on the left side of the page. One line is horizontal, another is vertical, and the third is diagonal, creating a complex geometric pattern.

Electronic Services

08

8 Electronic Services

8.1 Introduction

The following services were assessed during the condition assessment period: Access Control, Closed Circuit Television (CCTV), Foot Count, Telecommunications, IT services, Building Management Services (BMS), Integrated Management Control Systems (IMCS), Public Address (PA), Flight Information Display Systems (FIDS), Community Access Television (CATV), Uninterruptable Power Supplies (UPS) and IT Infrastructure. The Access Control, CCTV, Foot count, Telecommunications, IT Services, BMS, IMCS, PA, FIDS and CATV systems currently have ongoing projects and upgrades under the normal maintenance contracts. The IT infrastructure and UPS systems for the Wire Centers and Computer rooms would need to be upgraded to the latest technology. The cabling is being used for all above services and due to the site being a live site, an upgrade will be very difficult unless being done in parallel to the existing infrastructure.

Appendix J – ICT indicates all Wire Centres and Computer Rooms from where the cabling will have to be installed in parallel to the current infrastructure.

Ref.	Corrective Action	By Whom	Part of Section within this Report
<u>General – Applicable for all Levels</u>			
1	New cable routes needs to be installed and CAT6A shielded twisted pair cables needs to be installed due to electrical cables in cable racks and EMI in ceilings.	[REDACTED]	8.2.4
2	Wire Centre's needs drastic housekeeping. This will safeguard the maintenance going forward.	ACSA IT Infrastructure Maintenance	N/A
3	Equipment Rack clean-up to free up rack space and tidy up of racks	[REDACTED]	8.2.4
4	UPS Equipment in all Wire Centers and Computer Rooms	[REDACTED]	8.2.4
5	Netbotz Environment and Data Centre Information Management system	[REDACTED]	8.2.4
<u>Lower Roof Level (4)</u>			
6	Wire Centre 16A needs to be renovated/rebuild. Most of the floor tiles are not in position and this creates a health risk to people working in this space. Housekeeping needs to be done. The lights in this room is also not functioning which makes it even more dangerous.	[REDACTED]	8.2.4
7	Wire Centre 16B needs drastic housekeeping. Using this space as storage creates a fire risk.	ACSA IT Infrastructure Maintenance	N/A

8.2 General

8.2.1 Performance Requirements

This part of the specification describes the performance requirements of the various components and systems of the ICT systems under the sections to follow. The Information technology and Telecommunications (IT&T) physical platform for Terminal A is already installed. The current network is a live network and should be treated as such. New containment and cables will be installed parallel to the current infrastructure where after a switchover to the new technology will be done. The new containment and cabling needs to be installed before the end devices are transferred to the new cable installed for each device. Upgrading of Terminal A IT infrastructure to be on the same technical level as latest technology. Installation of CAT7 copper cables in addition to the current live network will be part of this project. The fibre cables for Terminal A is already supplied and installed.

8.2.2 Redundancy

The copper cabling should include redundancy to minimize the downtime on the Mission Critical Areas whilst the primary link is being repaired. In summary, the copper cabling from the various Wire Centres that forms part of the scope would need to be replaced with CAT7 Shielded cables to each data point on that wire centre to enable the network to run with newer technology for the next 10 – 15 years. A Primary and Secondary cable needs to be installed to Mission Critical Areas, Hard to reach Areas and Work Areas to cut down on downtime and maintenance costs. When the primary point fails the secondary can be utilized by simply patching at the Wire Centre and at the end device which will assist in a higher uptime of the network and also to cut down on callout fees. Copper cabling will connect the end devices to the Wire Centres. This solution will ensure 99% uptime on the current network.

8.2.3 Specifications

The Specification for the works shall embrace SANS, BICSI, British Standards (BS) and British European Standards (BS EN) as the governing standards. The use of other National and International standards shall be used as identified in the Specification.

The Specification shall set the standards to which the works shall comply. Where contradiction or discrepancies between the Specifications is identified by the Contractor, he shall submit details of any such contradiction or discrepancy to the Engineer in writing prior to undertaking the works. The decision of the Engineer shall be considered final.

8.2.4 Scope of Work

The scope of works mainly comprises the design, supply and installation of the IT&T physical platform, an access control system and CCTV cameras for the Wire Centres and LV rooms. The physical platform might differ depending on the specific area of installation. The UPS solutions in all Wire Centres need to be assessed and maintenance needs to be done on all UPS systems to ensure that the backup power solution is in working order.

8.2.4.1 Communication Infrastructure

This section establishes a communications infrastructure to be used as signal pathways for voice and high-speed data transmission. The Contractor shall:

- Ensure that the Terminal A Copper horizontal network is fully functional.
- Ensure that all UPS's in Wire Centres and Computer rooms are fully functional.
- Comply with all Master Specifications documents and the following requirements for a complete project installation.
- Provide a structured cabling system as described hereafter that includes, but is not limited to, terminating, labelling and testing of: data copper, and voice copper horizontal cabling, cable connectors, communications outlets and terminations, and equipment racks/cabinets for networking hardware and patch panels.
- Follow industry standard installation procedures for communications cable to ensure that the mechanical and electrical transmission characteristics of this cable plant and equipment are maintained.

8.2.4.2 Data, Voice, Security and BMS Communications Network

This section covers a complete installation of both permanent and channel links for a data, voice, security and building management communications network utilizing copper transmission media that includes, but is not limited to the following. The Contractor shall:

- Terminate, test, label and document all copper cable.
- Test and maintain or replace all UPS equipment.
- Provide, install, terminate, test, and document all data horizontal cable.
- Provide and place all termination devices such as, but not limited to, modular patch panels, termination blocks and information outlets (jacks and plates).
- Provide in quantities specified interconnect components such as, but not limited to, copper patch cords and fly leads.
- Provide and place horizontal and vertical cable support devices such as, but not limited to, rack and wall-mounted horizontal and vertical cable management, cable runway, telecommunications cable runway, and all required mounting hardware, unless otherwise noted.
- Provide and install approved fire stopping systems in all communication pass-through, conduits and cable trays, and ceiling, wall and floor penetrations in coordination with other trade services.
- Provide all appropriate consumable items required to complete the installation.
- Ensure that grounding and bonding in Rack rooms to grounding bus is provided.
- Provide complete documentation and demonstration of work.
- Provide indexed and organized complete Test Results of all copper cable and their components.
- Provide Submittals as outlined below.
- Conduct a final document handover meeting with client, consultant, and PM to review.
- Provide a Manufacturer's Extended Product Warranty and System Assurance Warranty for this wiring system and UPS's.
- Provide a fully functional system to the Engineer.

8.2.5 Warranty

The Supplier shall provide a minimum one (1) year warranty on installation and workmanship plus an Extended Product Warranty and System Assurance Warranty for these systems and shall commit to make available local support for the product and system during the Warranty period.

The Extended Product Warranty shall apply to all passive structured cabling system components and active equipment and shall cover the replacement or repair of defective products and labour for the replacement or repair of such defective products for a minimum of one (1) year.

The System Assurance Warranty provides a complete system and product warranty that shall be extended to the client, ensuring the structured cabling system shall be free of defects in materials and workmanship, shall meet or exceed applicable performance requirements defined in the most current version of the Commercial Building Telecommunications Cabling Standards, and support all current and future network applications for a minimum of twenty (20) years.

System Certification: Upon successful completion of the installation and subsequent inspection, the client shall be provided with a numbered certificate, from the manufacturer, registering the installation.

8.2.6 Maintenance

Support Availability: The Contractor shall commit to make available local support for the product and system during the Warranty or Extended Warranty period. The UPS's in the Wire centres and Computer rooms should form part of the Maintenance Agreement.

8.2.7 Risk

The risk of live data points being damaged during the parallel installation of the new data points does exist. Care needs to be taken that minimal or none disruptions to currents systems occurs. When data cabinets are going to be tidied the risk that some of the fibre and copper patch leads might be damaged. Care needs to be taken that no or minimal damage occurs. Contingencies need to be put in place to mitigate the minimal downtime of the live system.

8.3 Data Points List

Table 11: Data Points List

Floor	Wire Centre	Network Switches	Active Copper Data points	Active Fibre Data points	UPS size	Comments
Arrivals	4	4 x 24 Port	96	4	3kVA	No UPS Photo
Arrivals	7	1 x 24 Port 1 x 48 Port	72	2	3kVA	UPS battery fully loaded
Arrivals	50	4 x 24 Port	96	2	3kVA	UPS battery fully loaded
Arrivals	51	4 x 24 Port	79	2	8kVA+3kVA	8kVA UPS battery fully loaded, 3kVA UPS no Power
Arrivals	52	4 x 24 Port	96	2	3kVA	3kVA no power
Arrivals	54	4 x 24 Port	96	4	10-30kVA	UPS battery fully loaded
Arrivals	55	2 x 24 Port	48	2	3kVA	UPS battery fully loaded
Arrivals	56	2 x 24 Port	48	2	3kVA	UPS battery fully loaded
Arrivals Mezzanine	8	2 x Cisco 6500	0	122	15kVA x 2 10kVA	Mains not available. Input Freq/Volt out of range
Arrivals Mezzanine	53	3 x 24 Port	72	2	15kVA x 2 10kVA	UPS Faulty
Arrivals Mezzanine	58	3 x 24 Port	63	2	3kVA	UPS battery fully loaded
Arrivals Mezzanine	60	3 x 24 Port	62	2	8kVA	UPS battery fully loaded
Arrivals Mezzanine	61	2 x 24 Port	48	2	8kVA	UPS battery fully loaded
Arrivals Mezzanine	62	4 x 48 Port	163	2	3kVA	UPS battery fully loaded
Basement	3	3 x 24 Port	72	2	3kVA	UPS battery fully loaded
Basement	18	3 x 24 Port	28	2	3kVA 4kVA	UPS battery fully loaded
Basement	19 PABX	1 x 24 Port	24	2	8kVA x 2	UPS battery fully loaded
Basement	28	4 x 24 Port	83	4	3kVA	UPS battery fully loaded
Basement	29	3 x 24 Port	48	2	8kVA	UPS Faulty
Basement	35	1 x 24 Port	12	1	3kVA	UPS Faulty
Departure Mezzanine	3	3 x 24 Port	72	2	3kVA + 8kVA	UPS Faulty
Departure Mezzanine	6	3 x 24 Port	72	2	8kVA	UPS battery fully loaded
Departure Mezzanine	7	2 x 48 Port	96	2	3kVA	UPS Battery Faulty
Departure Mezzanine	11	4 x 24 Port	72	4	3kVA	UPS battery fully loaded
Departure Mezzanine	70	2 x 24 Port	48	2	8kVA x 2	UPS battery fully loaded
Departures	4	3 x 24 Port	50	2	3kVA	UPS Faulty
Departures	5	2 x 24 Port	48	2	3kVA + 8kVA	UPS Faulty
Departures	8	4 x 24 Port	93	3	8kVA	UPS Battery Faulty
Departures	10	3 x 24 Port	60	2	8kVA	UPS battery fully loaded
Departures	27 SITA	Not Checked	Not Checked	Not Checked	Not Checked	No UPS Photo
Departures	71	2 x 24 Port 1 x 48 Port	67	2	8kVA	UPS battery fully loaded
Lower Roof	14	4 x 24 Port	96	2	3kVA	UPS battery fully loaded
Lower Roof	16A	4 x 24 Port	96	2	Not Checked	No UPS Photo
Lower Roof	16B	Not Checked	Not Checked	Not Checked	Not Checked	No UPS Photo
Lower Roof	72	2 x 24 Port	47	2	8kVA x 2	No UPS Photo
Upper Roof	CR1	2 x 48 Port 1 x 24 Port 2 x Cisco 6500	106	85	Not Checked	No UPS Photo
Upper Roof	CR2	Not Checked	Not Checked	Not Checked	Not Checked	No UPS Photo
Upper Roof	12	4 x 24 Port	95	2	3kVA	UPS Faulty
Upper Roof	13	2 x 24 Port	48	2	8kVA	UPS battery fully loaded
Upper Roof	15	4 x 24 Port	96	2	3kVA	UPS battery fully loaded
Total			2568	285		

9 Appendix A – Structures

Appendix from Stage 1 Report
Conditional Assessment Report

Appendix C – Mechanical



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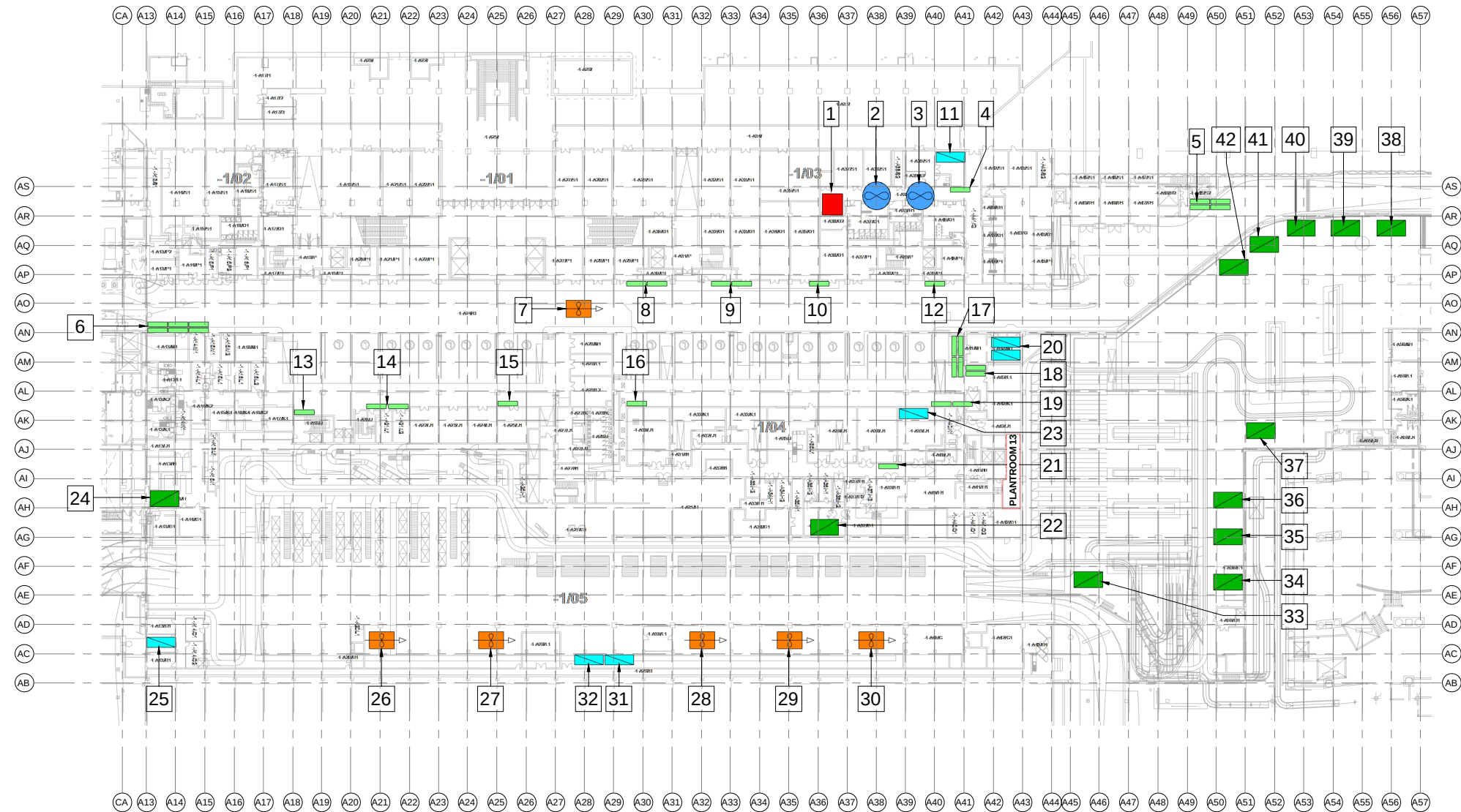
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APPENDIX C1: LAYOUT DRAWINGS



BASEMENT 1 LEVEL LAYOUT DRAWING



EQUIPMENT LEGEND

-  ROOF FAN
-  EXHAUST FAN
-  AIR HANDLING UNIT
-  SPLIT OUTDOOR UNIT
-  FAN COIL UNIT
-  SPLIT INDOOR UNIT
-  OU
-  IU

LEGEND

1. AHU - NO LABEL - CIAT
2. FAN 1
3. FAN 2
4. SPLIT OU
5. SPLIT OU x 4
6. SPLIT OU x 6
7. EXHAUST FAN 1
8. SPLIT OU x 2
9. SPLIT OU x 2
10. SPLIT OU
11. SPLIT IU
12. SPLIT OU
13. SPLIT OU
14. SPLIT OU x 2
15. SPLIT OU
16. SPLIT OU
17. SPLIT OU x 4
18. SPLIT OU x 2
19. SPLIT OU x 2
20. SPLIT IU x 2
21. SPLIT OU
22. FCU - NO LABEL
23. SPLIT IU
24. FCU - NO LABEL
25. SPLIT IU
26. EXHAUST FAN BB1
27. EXHAUST FAN BB2
28. EXHAUST FAN BB3
29. EXHAUST FAN BB4
30. EXHAUST FAN BB5
31. SPLIT IU (4-WAY CASSETTE)
32. SPLIT IU
33. FCU 53 - VIKING
34. FCU 51 - VIKING
35. FCU 49 - VIKING
36. FCU 50 - VIKING
37. FCU - NO LABEL - VIKING
38. FCU 39 - VIKING
39. FCU 40 - VIKING
40. FCU 41 - VIKING
41. FCU 42 - VIKING
42. FCU 43 - VIKING

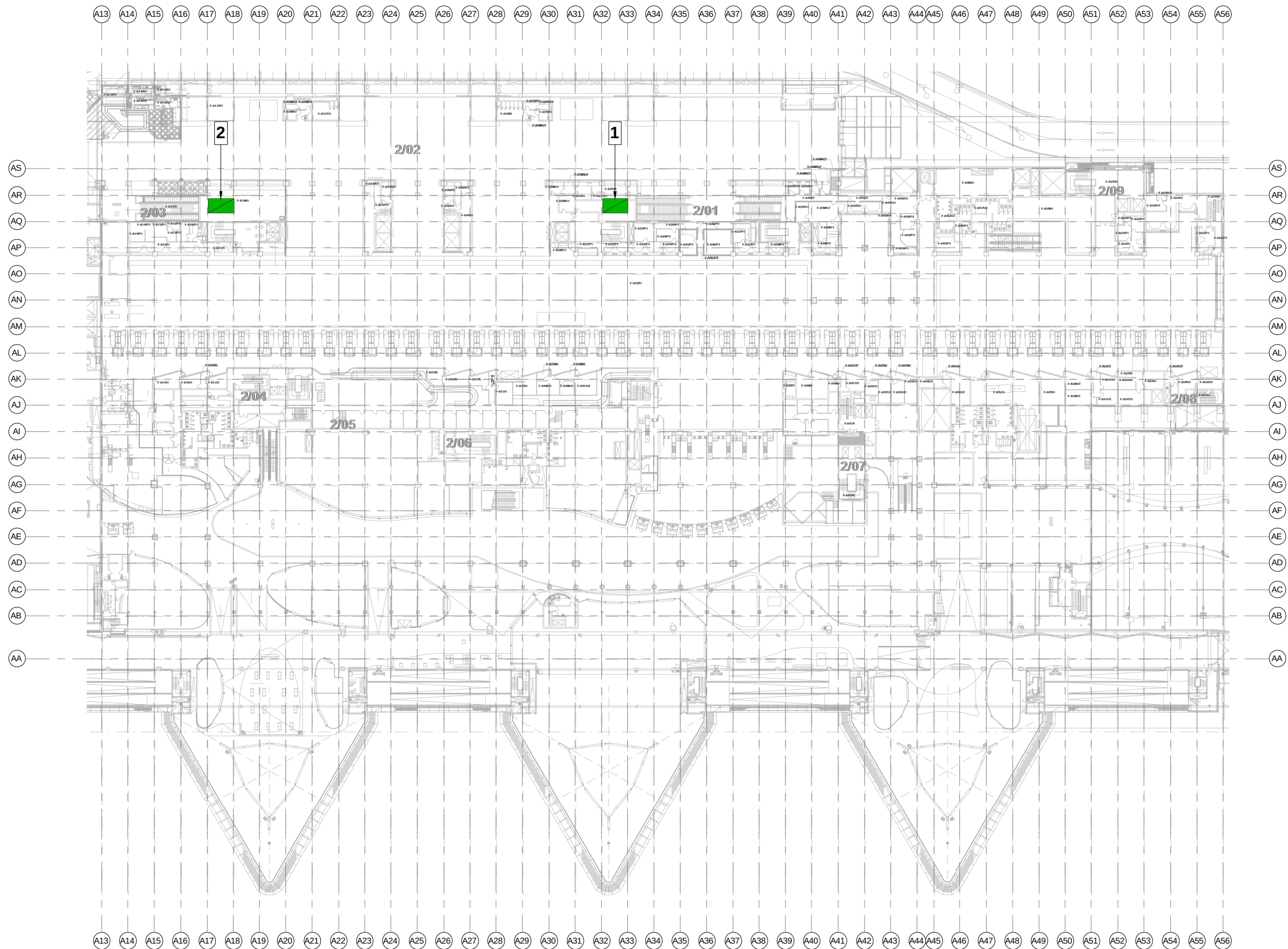
1 -1 - BASEMENT LEVEL LAYOUT
AA-001 SCALE N.T.S



ARRIVALS MEZZANINE LEVEL LAYOUT DRAWING



INTERNATIONAL DEPARTURES LEVEL LAYOUT DRAWING



EQUIPMENT LEGEND

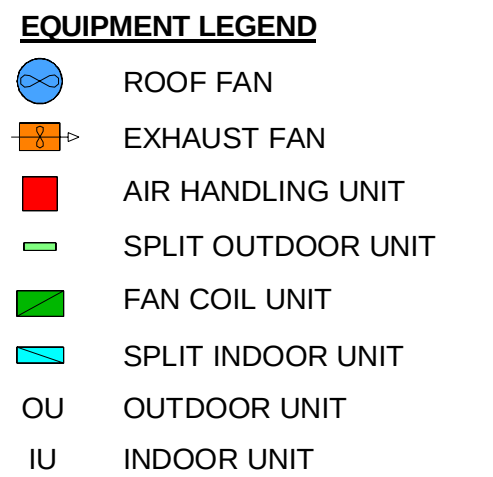
-  ROOF FAN
-  EXHAUST FAN
-  AIR HANDLING UNIT
-  SPLIT OUTDOOR UNIT
-  FAN COIL UNIT
-  SPLIT INDOOR UNIT
- OU OUTDOOR UNIT
- IU INDOOR UNIT

LEGEND

- 1. FCU - NO LABEL
- 2. FCU 107



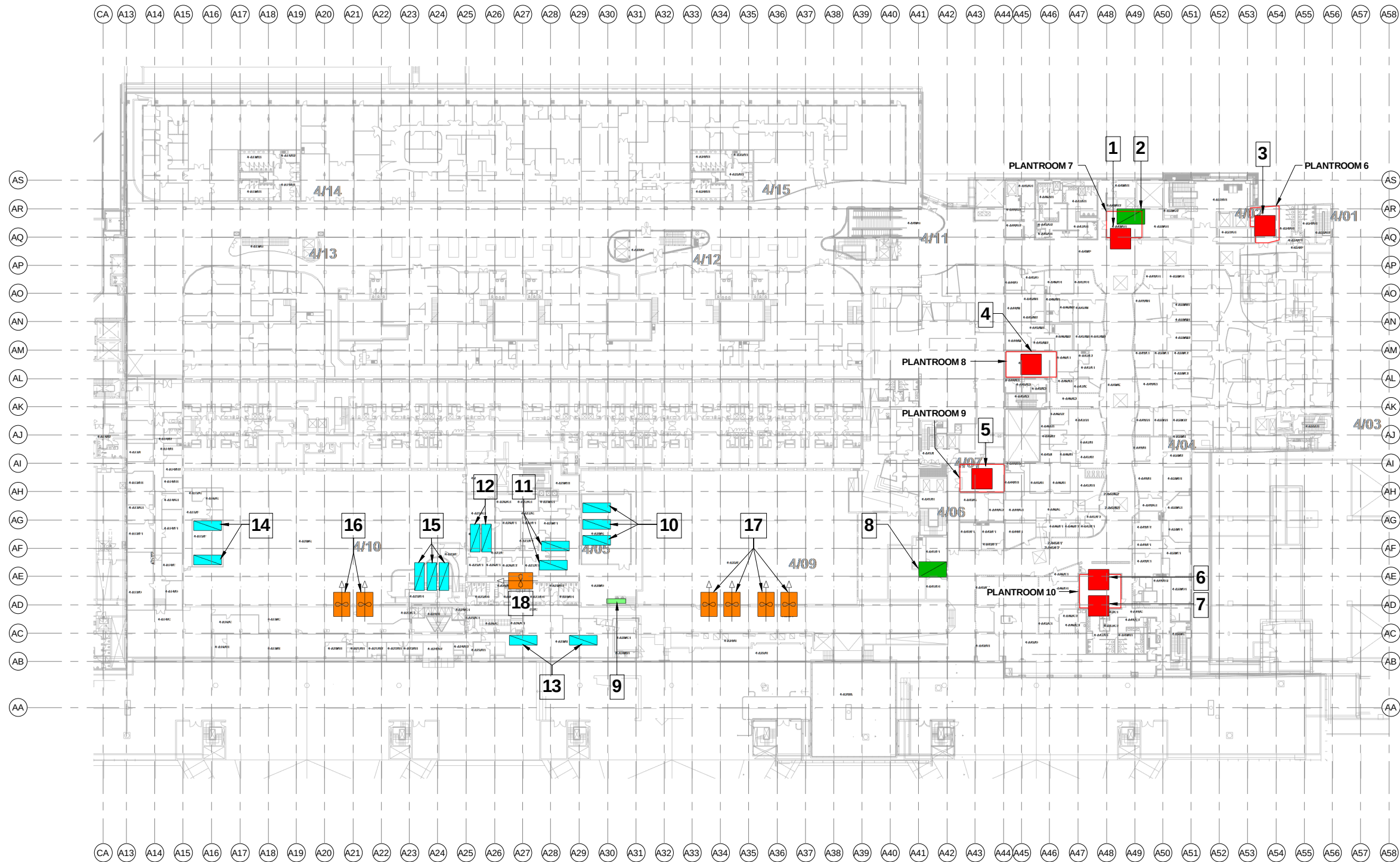
DEPARTURES MEZZANINE LEVEL LAYOUT DRAWING



1. AHU 14/15
2. AHU 23/22
3. AHU 28/27
4. AHU 34/33
5. AHU 40/39
6. AHU 112
7. AHU 113
8. AHU 114
9. AHU 115
10. FCU 59
11. FCU - NO LABEL
12. AHU 117
13. SPLIT IU 1 - WIRE CENTRE 70
14. SPLIT IU 2 - WIRE CENTRE 70
15. FCU - NO LABEL x 2
16. FCU 93
17. FCU 36
18. FCU 92
19. FCU 35
20. FCU 19
21. FCU 18
22. FCU 17
23. FCU 33
24. FCU 34
25. FCU 16
26. FCU 15
27. FCU - NO LABEL
28. FCU - NO LABEL
29. FCU - NO LABEL
30. FCU - NO LABEL
31. FCU - NO LABEL
32. FCU - NO LABEL
33. FCU - NO LABEL
34. AHU - NO LABEL
35. AHU - NO LABEL



LOWER ROOF LEVEL LAYOUT DRAWING



EQUIPMENT LEGEND

-  ROOF FAN
-  EXHAUST FAN
-  AIR HANDLING UNIT
-  SPLIT OUTDOOR UNIT
-  FAN COIL UNIT
-  SPLIT INDOOR UNIT
- OU OUTDOOR UNIT
- IU INDOOR UNIT

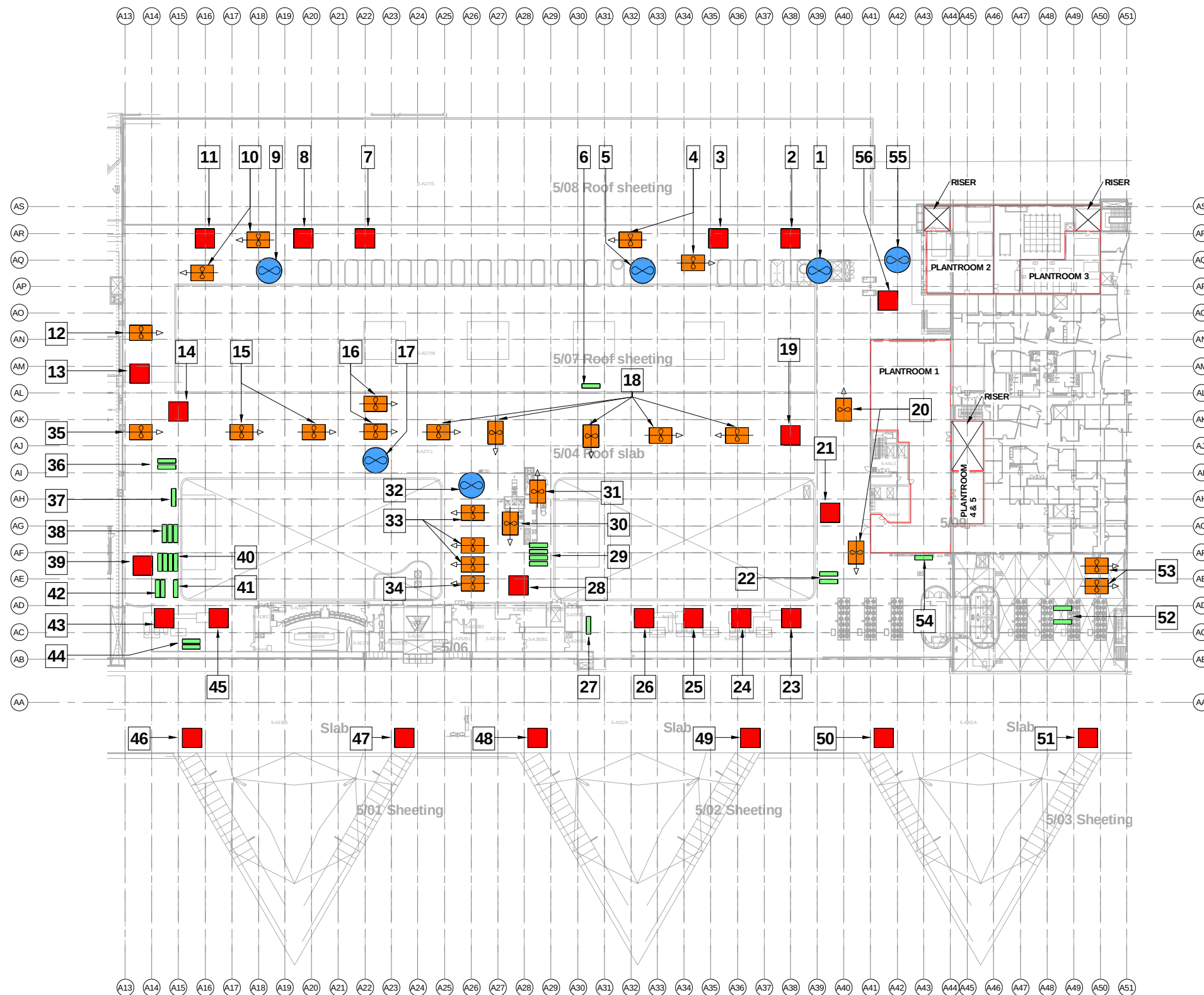
LEGEND

1. AHU 84
2. FCU 95
3. AHU 83
4. AHU 85
5. AHU 86
6. AHU 87
7. AHU 88
8. FCU - NO LABEL
9. SPLIT OU
10. SPLIT IU x 3
11. SPLIT IU x 2
12. SPLIT IU x 2
13. SPLIT IU x 2
14. SPLIT IU x 2
15. SPLIT IU x 3
16. FAN - WINDOW MOUNTED x 2
17. FAN - WINDOW MOUNTED x 2
18. TOILET EXHAUST FAN

1 4 - LOWER ROOF LAYOUT
AA-104 SCALE N.T.S



UPPER ROOF LEVEL LAYOUT DRAWING



EQUIPMENT LEGEND

- ROOF FAN
- EXHAUST FAN
- AIR HANDLING UNIT
- SPLIT OUTDOOR UNIT
- FAN COIL UNIT
- SPLIT INDOOR UNIT
- OU OUTDOOR UNIT
- IU INDOOR UNIT

LEGEND

- ROOF FAN 2
- AHU - WEST WING UNIT 1
- AHU - UNIT 5
- TOILET EXHAUST FAN
- ROOF FAN 3
- SPLIT OU
- AHU - WEST WING UNIT 2
- AHU - WEST WING UNIT 3
- ROOF FAN - NO LABEL
- TOILET EXHAUST FAN
- AHU - UNIT 4
- EXHAUST FAN
- FAU 1
- AHU 40
- TOILET EXHAUST FAN
- EXHAUST FAN 1 AND 2
- ROOF FAN
- TOILET EXHAUST FAN
- AHU 120
- TOILET EXHAUST FAN
- AHU - UNIT 104
- SPLIT OU
- AHU 5.11
- AHU 5.7
- AHU 5.8
- AHU 5.12
- SPLIT OU
- AHU - NO LABEL
- SPLIT OU x 4
- REFUSE EXHAUST FAN 5.23
- TOILET EXHAUST FAN 5.24
- ROOF FAN 6
- TOILET EXHAUST FAN
- BASEMENT EXHAUST FAN
- TOILET EXHAUST FAN
- SPLIT OU x 2
- SPLIT OU
- SPLIT OU x 3
- FAU 2
- SPLIT OU x 4
- SPLIT OU
- SPLIT OU x 2
- AHU 5.9
- SPLIT OU x 2
- AHU 5.10
- AHU 5.6
- AHU 5.5
- AHU 5.4
- AHU 5.3
- AHU 5.2
- AHU 5.1
- SPLIT OU x 2
- EXHAUST FANS
- SPLIT OU
- ROOF FAN 1
- AHU 121



APPENDIX C2: INSPECTION SHEETS

BAESMENT LEVEL

Inspection Date	Unit Type & Number	Constant Volume or Variable?	Location/Area of Unit (Gridlines)	Maintenance Log Records	Year of installation	Make of Unit	Area being Supplied by Unit	ACSA HVAC Maintenance Comments	End User Comments	Thermal Condition at Supply Area	Heating	Ductwork & Insulation Condition	Chilled Water Pipework Insulation Condition	Fresh Air	Remarks & Other Notes	Corrective Actions/ recommendations	Expected Life (Years)	Overall Equipment Condition		
																		Good	Fair	Bad
2016/02/29 2016/05/25	AHU XXX	No Info	-1-A39/A 37 & R-S)		No Info	CIAT	the sub-station transformer, according to maintenance	no access to unit due to no key for lock	-	-	No Info	Good; Ducting is uninsulated	Average	No Info	No labelling or any identification tags on unit;	Insulation of ducts and chilled water pipes to be repaired by Maintenance (ACSA)	-			
2016/02/29	AHU 32	No Info	-1-A42/J1 (42-43 & J-K)		No Info	Viking	No Info	-	-	-	No Info	Good; Small tears in insulation	Average	No Info	-	Insulation of ducts and chilled water pipes to be repaired by Maintenance (ACSA)	-			
2016/05/25	Split OU	-	-1-A24/O (32 & P)		No Info	Wintair	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	Refrigerant - R410A	-	-			
2016/05/25	Split OU	-	-1-A24/O (33 & P)		No Info	York	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	Refrigerant - R22	Unit to be replaced in future with unit using refrigerant okayed by regulations	-			
2016/05/25	Split OU	-	-1-A24/O (36 & P)		No Info	York	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	Refrigerant - R22	Unit to be replaced in future with unit using refrigerant okayed by regulations	-			
2016/05/25	Split OU	-	-1-A24/O (40 & P)		No Info	Diakin	Wire Centre 58	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	Refrigerant - R22	Unit to be replaced in future with unit using refrigerant okayed by regulations	-			
2016/05/25	Split OU	-	-1-A39/R (40-41 & S)		No Info	York	-1-A39/S1 (39-40 & S)	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	-	-	-			
2016/05/25	Split IU	-	-1-A39/S1 (39-40 & S)		No Info	York	-1-A39/S1 (39-40 & S)	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	Air temperature controlled by occupants via remote	-	-			
2016/05/25	Split OU	-	(49 & R-S)		No Info	Diakin	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	-	-	-			
2016/05/25	Split OU	-	(49 & R-S)		No Info	Diakin	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	-	-	-			
2016/05/25	Split OU	-	(49 & R-S)		No Info	Diakin	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	-	-	-			
2016/05/25	Split OU	-	(49 & R-S)		No Info	Diakin	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	-	-	-			
2016/05/25	Split OU	-	(41 & N)		No Info	Hisense	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	Refrigerant - R410A	-	-			
2016/05/25	Split OU	-	(41 & N)		No Info	Hisense	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	Refrigerant - R22	Unit to be replaced in future with unit using refrigerant okayed by regulations	-			
2016/05/25	Split OU	-	(41 & M)		No Info	gmc aircon	-1-A41/M1 Telkom Wire Centre (41-43 & M-N)	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	Refrigerant - R410A	-	-			
2016/05/25	Split IU	-	(41 & M)		No Info	gmc aircon	-1-A41/M1 Telkom Wire Centre (41-43 & M-N)	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	-	-	-			
2016/05/25	Split OU	-	(41 & M)		No Info	general	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	Refrigerant - R22	Unit to be replaced in future with unit using refrigerant okayed by regulations	-			
2016/05/25	Split OU	-	(41-42 & M)		No Info	Diakin	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	-	-	-			
2016/05/25	Split OU	-	(41-42 & M)		No Info	Carrier	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	Refrigerant - R410A	-	-			
2016/05/25	Split OU	-	(40-41 & K-L)		No Info	LG	Wire Centre 59	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	-	-	-			
2016/05/25	Split OU	-	(40-41 & K-L)		No Info	LG	Wire Centre 59	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	-	-	-			
2016/05/25	Split OU	-	-1-A24/O (30 & P)		No Info	Diakin	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	Refrigerant - R22	Unit to be replaced in future with unit using refrigerant okayed by regulations	-			
2016/05/25	Split OU	-	(20-21 & K-L)		No Info	York	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	-	-	-			
2016/05/25	Split OU	-	(20-21 & K-L)		No Info	York	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	-	-	-			
2016/05/25	Split OU	-	(18 & K-L)		No Info	LG	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	-	-	-			
2016/05/25	Split OU	-	(13-14 & N)		No Info	LG	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	-	-	-			
2016/05/25	Split OU	-	(13-14 & N)		No Info	LG	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	-	-	-			
2016/05/25	Split OU	-	(13-14 & N)		No Info	Gree	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	-	-	-			
2016/05/25	Split OU	-	(13-14 & N)		No Info	Gree	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	-	-	-			
2016/05/25	Split OU	-	(13-14 & N)		No Info	Dunham-Bush	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	-	-	-			
2016/05/25	Split OU	-	(29-30 & K-L)		No Info	Mitsubishi	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	-	-	-			
2016/05/25	Split OU	-	(38 & I)		No Info	Infinity	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	Refrigerant - R22	Unit to be replaced in future with unit using refrigerant okayed by regulations	-			
2016/05/25	Split OU	-	(29-30 & P)		No Info	Daikin & Bush	Wire Centre 54	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	Refrigerant - R22	Unit to be replaced in future with unit using refrigerant okayed by regulations	-			
2016/05/25	FCU xx	No Info	-1-A35/G1 (35-36 & G-H)		No Info	No Info	-1-A35/G1 (35-36 & G-H)	-	-	-	No Info				-	Maintenance to inspect unit and comment on functionality of unit	-			
2016/06/03	Split OU	-	13 & G		No Info	Dunham-Bush	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	Refrigerant - R410A	-	-			
2016/06/03	FCU xx	No Info	13 & H		No Info	No Info	-1-A13/H (13-14 & G-H)	-	-	-	No Info				-	Maintenance to Label unit for identification	-			
2016/06/03	Split IU	-	-1-A13/B1 (13 & C)		No Info	York	-1-A13/B1 (13 & C)	-	-	21.6°C (2016/06/03)	Reverse refrigerant cycle	N/A	N/A	N/A	Refrigerant - R410A; the room also has an extraction fan situated above door;	-	-			
2016/06/03	Fan B81	-	-1/05		No Info	Woods	-1/05 Baggage handling space where fan is situated	-	None		-	N/A	N/A	N/A	Exhaust fan removing air out of the baggage handling space;	-	-			
2016/06/03	Small Wall Mounted Exhaust Fan	-	-1-A26/L1 Crisplant Workshop Room (26-27 & C-D)		No Info	No Info	-1-A26/L1 Crisplant Workshop Room (26-27 & C-D)	-	Not enough fresh air being supplied to workshop; take into account that welding, soldering and other technical mechanical processes is taking place in this area. A lot of dust accumulate due to the type of work being completed in this workshop	20.6°C (2016/06/03)	-	N/A	N/A	No dedicated conditioned supply of fresh air;	The small extract fan is semi blocked by the passing duct	investigate requirements regarding ventilation for workshop activities	-			
2016/06/03	Split OU (more than one)	-	Shaft connecting top level conveyers with basement system (20-23 & J)		No Info	York and other unknown	No Info	Very old units - all of them not in use anymore either because unit not functional anymore or just not applicable	None	N/A	Reverse refrigerant cycle	N/A	N/A	N/A	the condenser units are very old and dirty; maintenance access to the units are difficult because they are above baggage conveyer belt on a slope, thus no space for a ladder and no even ground for a ladder to be placed;	Maintenance to investigate units and remove the outdated equipment	-			

2016/06/03	Split IU	-	Office Space (27-28 & C-D)		No Info	Dunham-Bush	Office Space (27-28 & C-D)	None	Satisfied	20.3°C (2016/06/03)	Reverse refrigerant cycle	N/A	N/A	N/A	Refrigerant - R410A; the split unit seems to only be supplying air and not air that was cooled, as the unit was set at 17°C and that was not the room temperature even with the door being open and taking into account that the ambient temperature at that is even lower than 17°C;	Maintenance to attend to unit with regards to the thermostat	-				
2016/06/03	4-way cassette	-	Server Room (28-29 & C-D)		No Info	York	Server Room (28-29 & C-D)	unit is not functional	the air conditioning is not working	22.3°C (2016/06/03)	Reverse refrigerant cycle	N/A	N/A	N/A	Unit seems old and is not working	Unit to be fixed or replaced.	-				
2016/06/03	Split OU	-	Server Room (28-29 & C-D)		No Info	York	Server Room (28-29 & C-D)	unit is not functional	the air conditioning is not working	-	Reverse refrigerant cycle	N/A	N/A	N/A	Refrigerant - R22	Unit to be replaced in future with unit using refrigerant okayed by regulations	-				
2016/06/03	Split OU	-	(31-32 & C-D)		No Info	Dunham-Bush	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	Refrigerant - R410A	-	-				
2016/06/03	Split OU	-	(31-32 & C-D)		No Info	Dunham-Bush	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	Refrigerant - R410A	-	-				
2016/06/03	Split OU	-	(31-32 & C-D)		No Info	Dunham-Bush	No Info	-	-	-	Reverse refrigerant cycle	N/A	N/A	N/A	Refrigerant - R410A	-	-				
2016/06/03	Fan BB3	-	-1/05		No Info	Woods	-1/05 Baggage handling space where fan is situated	-	None		-	N/A	N/A	N/A	Exhaust fan removing air out of the baggage handling space;	-	-				
2016/06/03	Split OU	-	(33-34 & C-D)		No Info	Panasonic	No Info	unit is not functional	-		Reverse refrigerant cycle	N/A	N/A	N/A	-	Maintenance to investigate units and remove the outdated equipment	-				
2016/06/03	Fan BB4	-	-1/05		No Info	Woods	-1/05 Baggage handling space where fan is situated	-	None		-	N/A	N/A	N/A	Exhaust fan removing air out of the baggage handling space;	-	-				
2016/06/03	Fan BB5	-	-1/05		No Info	Woods	-1/05 Baggage handling space where fan is situated	-	None		-	N/A	N/A	N/A	Exhaust fan removing air out of the baggage handling space;	-	-				
2016/06/03	FCU 53	N/A as unit is not ducted	-1/05 (45-46 & E-F)		No Info	Viking	-1/05 Baggage handling space where fan is situated	-	None	18.5°C - 19.2°C (2016/06/03)	No Info	No ducting	Good;	No dedicated supply of fresh air;	-	Provision for fresh air recommended; Insulation of ducts and chilled water pipes to be repaired by Maintenance (ACSA); Re-labelling of unit for identification; maintenance to investigate the functioning of units as during the inspection the DB wasn't functional.	-				
2016/06/03	FCU 50	N/A as unit is not ducted	-1/05 (50-51 & G-I)		No Info	Viking	-1/05 Baggage handling space where fan is situated	-	None	18.5°C - 19.2°C (2016/06/03)	No Info	No ducting	Good;	No dedicated supply of fresh air;	-		-				
2016/06/03	FCU 49	N/A as unit is not ducted	-1/05 (50-51 & G-I)		No Info	Viking	-1/05 Baggage handling space where fan is situated	-	None	18.5°C - 19.2°C (2016/06/03)	No Info	No ducting	Good;	No dedicated supply of fresh air;	-		-				
2016/06/03	FCU 51	N/A as unit is not ducted	-1/05 (50-51 & G-I)		No Info	Viking	-1/05 Baggage handling space where fan is situated	-	None	18.5°C - 19.2°C (2016/06/03)	No Info	No ducting	Good;	No dedicated supply of fresh air;	-		-				
2016/06/03	FCU xx	N/A as unit is not ducted	-1/05 (51-52 & K-L)		No Info	Viking	-1/05 Baggage handling space where fan is situated	-	None	18.5°C - 19.2°C (2016/06/03)	No Info	No ducting	Good;	No dedicated supply of fresh air;	-		-				
2016/06/03	FCU 39	N/A as unit is not ducted	-1/05 (56-57 & Q-R)		No Info	Viking	-1/05 Baggage handling space where fan is situated	DB not working	None	18.5°C - 19.2°C (2016/06/03)	No Info	No ducting	Good;	No dedicated supply of fresh air;	Unit supports seem a bit aged and skew.		-	-			
2016/06/03	FCU 40	N/A as unit is not ducted	-1/05 (54-55 & Q-R)		No Info	Viking	-1/05 Baggage handling space where fan is situated	DB not working	None	18.5°C - 19.2°C (2016/06/03)	No Info	No ducting	Good;	No dedicated supply of fresh air;	-		-				
2016/06/03	FCU 41	N/A as unit is not ducted	-1/05 (52-53 & Q-R)		No Info	Viking	-1/05 Baggage handling space where fan is situated	DB not working	None	18.5°C - 19.2°C (2016/06/03)	No Info	No ducting	Good;	No dedicated supply of fresh air;	-		-				
2016/06/03	FCU 42	N/A as unit is not ducted	-1/05 (52-53 & Q-R)		No Info	Viking	-1/05 Baggage handling space where fan is situated	DB not working	None	18.5°C - 19.2°C (2016/06/03)	No Info	No ducting	Good;	No dedicated supply of fresh air;	-		-				
2016/06/03	FCU 43	N/A as unit is not ducted	-1/05 (51-52 & Q-R)		No Info	Viking	-1/05 Baggage handling space where fan is situated	DB not working	None	18.5°C - 19.2°C (2016/06/03)	No Info	No ducting	Good;	No dedicated supply of fresh air;	-		-				
2016/06/03	Extract fans or means of ventilation to Sub-Stations need to be inspected															Not inspected					

TOILETS - EXTRACTION FANS

Inspection Date	Bathroom Name	Extraction Grills or Diffusers	Location/Area of bathroom (Gridlines)	Year of installation of Fan	Make of Fan	Location of Fan	End User Comments	ACSA HVAC Maintenance Comments	Comments/ Remarks	Corrective Actions/ Recommendations	Overall Equipment Condition
2016/06/03	-1-A16/Q1	yes; diffusers	(15-17 & Q-R)	No Info	No Info	Upper Roof Level	Satisfied	None	Bathroom is also a change room and locker room	-	Fair
2016/06/03	-1-A37/Q1	yes; diffusers	(37-38 & Q-R)	No Info	No Info	Upper Roof Level	None	None	Bathroom was locked during inspection, thus not sure if system is operational	To be inspected	To be inspected
2016/06/03	-1-A39/R1	yes; diffusers	(38-39 & Q-R)	No Info	No Info	Upper Roof Level	None	None	Bathroom was locked during inspection, thus not sure if system is operational	To be inspected	To be inspected

GENERAL NOTES

2016/05/25	Take Note:	most of the door grills seems to be blocked by dirt- it is recommended that the door grills be cleaned from dust so to allow for sufficient ventilation to come through to the areas.
2016/05/25	Take Note:	there is a lot of ducts running through some of the store rooms
GENERAL	Take Note:	the architectural layout being used is not up to date as it differs to what is on site in reality
2016/06/03	Take Note:	on the external wall towards air side there is a lot of weather louvres allowing for fresh air to be supplied to the area
2016/06/03	Take Note:	the ambient temperature was 14.1°C at 09h30
2016/06/03	Take Note:	the general open space temperature within the baggage handling area was 18.5°C -19.2°C
2016/06/03	Take Note:	there is a lot of split units all over the basement level; most of them don't have any identification labelling or any indication whether they are still function or still in use - word of mouth info is used to estimate whether the units are still being used or in working order

Key:

Good -

exceptional preventative maintenance; performance exemplary; excellent housekeeping

Fair -

few repairs required; adjustments required; operationally adequate

Bad -

equipment being neglected; equipment in need of repair; little or no housekeeping

ARRIVALS CONCOURSE LEVEL

Inspection Date	Unit Type & Number	Constant Volume or Variable?	Location/Area of Unit (Gridlines)	Maintenance Log Records	Year of installation	Make of Unit	Area being Supplied by Unit	ACSA HVAC Maintenance Comments	End User Comments	Thermal Condition at Supply Area	Ductwork & Insulation Condition	Chilled Water Pipework Insulation Condition	Fresh Air	Remarks & Other Notes	Corrective Actions	Recommendation	Expected Life	Overall Equipment Condition		
																		Good	Fair	Bad

NO UNITS ON THIS LEVEL TO BE INSPECTED, AS SCOPE OF WORK ONLY INCLUDED ABLUTION BLOCKS, LIFTS AND ESCALATORS

TOILETS - EXTRACTION FANS

Inspection Date	Bathroom Name	Extraction Grills or Diffusors	Location/Area of bathroom (Gridlines)	Year of installation of Fan	Make of Fan	Location of Fan	End User Comments	ACSA HVAC Maintenance Comments	Comments/ Remarks	Corrective Actions/ Recommendations	Overall Equipment Condition
2016/05/11	0-A46/R 0-A48/R F13M; F13F	yes; general good condition	45-46 & R-S	No information	unknown	Upper Roof Level - Plantroom 2	None	Fan is old, but still works	None	-	Fair
2016/05/11	0-A47/B1 0-A48/C1 F12M; F12F	yes; general good condition	47-49 & B-D	No information	unknown	Upper Roof Level - Plantroom 1	None	None	System not working	Maintenance to investigate why system is not working; is it the fan or diffusers;	BAD
2016/05/11	0-A13/Q1 0-A15/Q1 F16M; F16F	yes; general good condition	13-16 & P-R	No information	unknown	Upper Roof Level	Ladies - a bit of a bad smell build up	None	Seems to be working fine	-	Fair

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adjustments required
operationally adequate

Bad -

equipment being neglected
equipment in need of repair
little or no housekeeping

GENERAL NOTES

-	Take Note:	Inspection of level took place on the 11/05/2016
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ARRIVALS MEZZANINE LEVEL

Inspection Date	Unit Type & Number	Constant Volume or Variable?	Location/Area of Unit (Gridlines)	Maintenance Log Records	Year of installation	Make of Unit	Area being Supplied by Unit	ACSA HVAC Maintenance Comments	End User Comments	Thermal Condition at Supply Area	Heating	Ductwork & Insulation Condition	Chilled Water Pipework Insulation Condition	Fresh Air	Remarks & Other Notes	Corrective Actions/ Recommendations	Expected Life (Years)	Overall Equipment Condition		
																		Good	Fair	Bad
2016/05/19	AHU 36	VAV	Plantroom 6 1-A37/E (37-39 & D-G)		1998-2007	Viking	offices on air side adjacent to plantroom 6	None	None	22.2°C (2016/05/11)	Heating element in diffuser (0.5kW)	Good, small tears	Good	Fresh Air is being supplied to plantroom via duct through to external weather louvre	Unit DB Labelled incorrectly	-	-			
2016/05/19	AHU 35	VAV	Plantroom 6 1-A37/E (37-39 & D-G)		2007	Viking	Immigration, SAA Rest Room and transfer passage; 1-A45/C1	None	None	No Inspected	Heating element in diffuser (0.5kW)	Good, small tears	Good	Fresh Air is being supplied to plantroom via duct connected to external weather louvre	-	-	11			
2016/05/19	AHU 34	VAV	Plantroom 6 1-A37/E (37-39 & D-G)		2007	Viking	State Protocol Lounges (outside scope of work area)	None	None	N/A - outside scope	No information available	Good, small tears	Good	Fresh Air is being supplied to plantroom via duct connected to external weather louvre	Unit is within scope, area being supplied is partially outside scope area	-	11			
2016/05/19	AHU 37	VAV	Plantroom 6 1-A37/E (37-39 & D-G)		2007	Viking	State Protocol Lounges (outside scope of work area)	None	None	N/A - outside scope	No information available	Good, small tears	Good	Fresh Air is being supplied to plantroom via duct connected to external weather louvre	Unit is within scope, area being supplied is partially outside scope area	-	11			
2016/05/19	FCU 79	No Info	Police Station 1-A43/J1 (43 & J-K)		1998	No Information	Police Station Offices 1-A43/J1 (43 & J-K)	None	Satisfied	23.8°C (2016/05/11)	Heating element in diffuser	Good, small tears	Good	FA Through ceiling void	Return air grills in ceiling are not ducted; Occupants have access to units DB; ; Ceiling void acts as plenum;	Unit maintenance cost to be compared to possible replacement of unit	2			
2016/06/14	Split IU	-														Not inspected				
2016/06/14	Split IU	-														Not inspected				
2016/06/14	FCU 70	-	1-A48/E1 (48-49 & E-F)		1998	Rickard	48-49 & E-F; a computer room in Immigration Offices	None	None			-	-			Not inspected				
2016/06/14	AHU 38	VAV	Plantroom 5 1-A55/Q1 (55-56 & Q-R)		2007	Viking	N/A - outside scope	Unit - good condition, was installed as part of A1A2 project in 2007	-	-	No information available	-	-	-	unit not inspected as advised by maintenance department that unit still in good condition and taken into account that the unit supplies area outside of scope	-	11			

TOILETS - EXTRACTION FANS

Inspection Date	Bathroom Name	Extraction Grills or Diffusors	Location/Area of bathroom (Gridlines)	Year of installation of Fan	Make of Fan	Location of Fan	End User Comments	ACSA HVAC Maintenance Comments	Comments/ Remarks	Corrective Actions/ Recommendations	Overall Equipment Condition
2016/05/19	1-A47/C	yes; grills are a bit dirty	47-49 & B-D	No Information	Unknown	Upper Roof Level	None	None	None	Maintenance to clean grills	Fair
	1-A48/C										
2016/05/19	1-A39/H1	yes; grills are a bit dirty	39-40 & H-I	No Information	Unknown	Upper Roof Level	None	None	None	Maintenance to clean grills	Fair
2016/05/19	1-A39/H2										
2016/05/19	1-A36/f		36-37 & F-G							to be inspected	To be inspected
2016/05/19	1-A39/Q	yes; general good condition	38-42 & Q-S	No Information	Unknown	Upper Roof Level - Plantroom 2	None	Fan is disconnected from ducting; there is no fan in the plantroom on the upper roof level	this systems duct is connected to two bathrooms on two other floors as well.	Design and install new extract system.	BAD
	1-A41/R1										
2016/05/19	1-A13/Q1	yes; general good condition	13-15 & P-R	No Information	Unknown	Upper Roof Level	None	None	None	-	Good
	1-A14/Q1										

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GENERAL NOTES

2016/05/19	Take Note:	the ambient temperature measured at 09H50 was 14.1°C
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INTERNATIONAL DEPARTURES LEVEL

Inspection Date	Unit Type & Number	Constant Volume or Variable?	Location/Area of Unit (Gridlines)	Maintenance Log Records	Year of installation	Make of Unit	Area being Supplied by Unit	ACSA HVAC Maintenance Comments	End User Comments	Thermal Condition at Supply Area	Heating	Ductwork & Insulation Condition	Chilled Water Pipework Insulation Condition	Fresh Air	Remarks & Other Notes	Corrective Actions/ Recommendations	Expected Life (Years)	Overall Equipment Condition		
																		Good	Fair	Bad
2016/05/05	4-way cassette	-	32-33 & S-beyond	N/A Privately owned	The Sweet Shop	N/A Privately owned	The Sweet Shop; 31-32 & S-beyond	N/A Privately owned	It works well	N/A Privately owned		N/A Privately owned	N/A Privately owned	N/A Privately owned	None; N/A Privately owned	N/A Privately owned	Privately owned	N/A Privately owned		
							Office part of 2-A32/Q Aviareps Ticket Sales Offices, next door to room where unit is situated; 30-33 & Q-S						Average; a few tears at the elbows		The FCU supplies the ticket sales office next door to the room where the FCU is situated; There is no labelling or identification on the unit; There is an additional duct in the Simba chip store room that seems to be running up to the roof. This duct is sucking air out of the occupied space. There is no evidence of air being supplied to the occupied space, thus no ventilation. Room does have a very old and dirty door grill.	-	-			
2016/05/05	FCU xx	No info	31-33 & Q-R		No Info	unknown		None	None	23.6°C (2016/05/05)	No info	Average, A few tears		None, no dedicated fresh air being supplied to unit			-			
2016/05/05	Split IU	-	26-27 & R-S		No Info	Daikin	2-A26/R1 Wire Centre 71; (26-27 & Q-R)	None	N/A	21.7°C (2016/05/05)		N/A	N/A	N/A	There is a very large drip-tray installed underneath the unit; unit is a Room Air Conditioner fan Coil Unit thus no refrigerant	-	-			
2016/05/05	FCU 107	No info	17-18 & Q-R		No Info	unknown	2-A18/Q The Made in SA shop; (17-20 & Q-S)	Unit is new to their knowledge	None	-	No info	Good	Good	No information	Diffusers ducted; unit is being switched on and off directly at units DB;	-	-			
2016/06/03	Split IU (x 4)	-	Electric Sliding Door Entrance - Air curtain		No Info	AllianceAir	Unit is creating an air curtain by the entrance	they are aware that the units are switched off;	N/A due to public area	13.6°C (2016/06/03)	Reverse refrigerant cycle	N/A	N/A	N/A	Units are not working properly, when swithced on there is no cooling or heating. The fans are working and they make a loud rattling noise; replace the units or refurbish so that they are fully functional	Units to be replaced with adequet working units or be refurbished to achieve fully functional cababilities on the units again.	-			

TOILETS - EXTRACTION FANS

Inspection Date	Bathroom Name	Extraction Grills or Diffusors	Location/Area of bathroom (Gridlines)	Year of installation of Fan	Make of Fan	Location of Fan	End User Comments	ACSA HVAC Maintenance Comments	Comments/ Remarks	Corrective Actions/ Recommendations	Overall Equipment Condition
2016/05/05	2-A21/S1 Male	Yes; Diffusers	20-22 & S-beyond	No Info	unknown (500l/s)	Plantroom 34/33	None (public)	the system works	After inspection it appears that new fans are being installed.	To be future confirmed with ACSA maintenance	Good
2016/05/05	2-A28/S Female	Yes; Diffusers	28-30 & S-beyond	No Info	unknown	Plantroom 28/27	None (public)	the system works	After inspection it appears that new fans are being installed.	To be future confirmed with ACSA maintenance	Good
2016/05/05	2-A45/Q1 Male	Yes; Diffusers	45-49 & P-R	No Info	unknown	Upper Roof Level - Plantroom 2	Bad smell build up	System not working	this systems duct is connected to the bathroom on the floor above (Departures Mezzanine) thus also is sharing the fan that is disconnected from the duct system. Inside the ceiling the	Design and install new extract system.	BAD
2016/05/05	2-A47/Q1 Female	Yes; Diffusers	45-49 & P-R	No Info	unknown	Upper Roof Level - Plantroom 2	Bad smell build up	System not working		Design and install new extract system.	BAD

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GENERAL NOTES

	Take Note:	the ticket offices 2/03 on the checking in-side for gridlines 14-20 is supplied by AHU 112 and 113, that is situated above on the Departures Mezzanine Level
	Take Note:	the ticket offices 2/01 & 2/09 on the checking-in side is mostly supplied by units from the upper roof level Plantrooms 1, 2 and 3.
	Take Note:	the double volume 2/02 area on the checking-in side is being supplied by units from Plantroom 1 on the roof.
	Take Note:	the double volume area on the ground side is being supplied from units in plantrooms outside on the above mezzanine level. 15/14 & 23/22 & 28/27 & 34/33 & 40/39
	Take Note:	on the 2016/05/11 the ambient air temperature was 15.6 °C at 09h50 with the inside temperature being 18°C
	Take Note:	on the 2016/05/19 the ambient air temperature was 14.1°C at 09h50 with the inside temperature being 16.7°C
	Take Note:	on the 2016/06/03 the ambient air temperature was 14.1°C at 09h30 with the inside temperature being 17.8°C

DEPARTURES MEZZANINE LEVEL

Inspection Date	Unit Type & Number	Constant Volume or Variable?	Location/Area of Unit (Gridlines)	Maintenance Log Records	Year of Installation	Make of Unit	Area being Supplied by Unit	ACSA HVAC Maintenance Comments	End User Comments	Thermal Condition at Supply Area	Heating	Ductwork & Insulation Condition	Chilled Water Pipework Insulation Condition	Fresh Air	Remarks & Other Notes	Corrective Actions/ Recommendation	Expected Life (Years)	Overall Equipment Condition		
																		Good	Fair	Bad
2016/04/28	FCU 36	Ducted Supply Air	52-53 & P-Q		1998	Viking	Lift Lobby 6 Diffusors 3-A52/R	None	N/A as Public Area with changing people	19°C (2016/05/11)	-	Good	Good	Plantroom space acts as plenum; no dedicated fresh air being supplied	Situated in own small plant room;	-	2			
2016/04/28	FCU 93	VAV	50-51 & Q-R		1998	Viking	Diffusers in passage by escalators 3-A48/P1	End of Feb. the FCU motor was removed to be serviced.	None	22.3°C (2016/06/03)	-	Average; a few tears	Good	Plantroom space acts as plenum; Dedicated fresh air being supplied via fresh air duct, with fresh air fan situated in Plantroom 2 on Upper Roof Level	Situated in own small plant room; the air filters are a bit dented;	Maintenance department to fix motor and re-install within unit; Replace unit if motor is unrepaired;	2			
2016/04/28	FCU 92	VAV	52-53 & P-Q		1905/06/20	Unknown	Old Nando's offices No Architect Room ID (52-55 & P-R)	Not accessible	Not occupied space	Not inspected	-	not inspected	not inspected	Ducted from unit (as per dwg)	Electrical heaters within duct work (9kW) according to drawing	Try to inspect unit when access is obtained in due time	2	Not inspected		
2016/04/28	FCU xx	Ducted Supply Air	45-46 & P-Q		No information	Unknown	Kenya Airways Offices 3-A45/Q1 3-A45/Q2 3-A46/P1 3-A45/P1 3-A46/P2 3-A46/P3	Not sure as to age of units; Ceiling tiles where left open to attend to leak in ceiling	During end of Feb there was a leak in the ceiling area where the unit sits; complaint about not consistent air temperature	22.6 °C (2016/05/11)	-	Average; a few tears	Partially damaged	-	Situated in ceiling space of Kenya Airways Offices; with visual inspection - the side panels where gaping due to missing bolts; electrical wiring is also messy; No identification information on unit ; Insulation in bad condition at the plenum connection to the FCU;	Preventative maintenance required for unit and insulation on unit	-			
2016/04/28	FCU xx	Ducted Supply Air	45-46 & P-Q		No information	Unknown	Ethiad Offices 3-A49/Q1 3-A50/Q1 3-A48/P1 3-A49/P1	The controls for the units are in the ceiling, thus the occupants don't have access to it; ACSA in control of setting the set-point temperature (22°C); Occupants can only change the diffusers air flow rate; Not sure as to age of unit;	During end of Feb there was a leak in the ceiling area where the unit sits; complaint about not consistent air temperature	24°C (2016/06/03)	-	Average; a few tears	Partially damaged	-	Situated in ceiling space of Kenya Airways Offices; with visual inspection - the side panels where gaping due to missing bolts; electrical wiring is also messy; No identification information on unit	Preventative maintenance required for unit and insulation on unit	-			
2016/04/28	Split IU	-	40 & Q-R		2015 According to Maintenance	Dunhum-Bush	Wire Centre 70 No Architect Room ID	Newly installed units of about 6-8 months	N/A because not occupied space	Must be kept at 20°C to accommodate servers	Reverse refrigerant cycle	N/A	N/A	-	Drip-tray installed below unit with drainage pipe; Invertor technology unit; Refrigerant R410A	-	-			
2016/04/28	Split IU	-	40 & Q-R		2015 According to Maintenance	Dunhum-Bush	Wire Centre 70 No Architect Room ID	Newly installed units of about 6-8 months	N/A because not occupied space	Must be kept at 20°C to accommodate servers	Reverse refrigerant cycle	N/A	N/A	-	Drip-tray installed below unit with drainage pipe; Invertor technology unit; Refrigerant R410A	-	-			
2016/04/28	AHU 31	VAV	Upper Roof Level - Plantroom 1		2013	Viking	ACS Offices [3-A41/M1; 3-A42/M1; 3-A43/M1; 3-A44/M1; 3-A43/N2; 3-A43/N1; 3-A43/O2; 3-A43/O1; 3-A43/P1; 3-A42/P1; 3-A41/P1; 3-A43/Q2; 3-A42/Q2; 3-A41/P1]	unit and layout in the office space has been newly refurbished (2015) and not yet handed over to ACSA maintenance team; some diffusers got reheating settings on the diffusers themselves,	no direct controls for occupants	22.2°C - 23°C (2016/05/11)	-	not inspected for this level	not inspected for this level	Plantroom Space acts as plenum, with fresh air being supplied directly to plantroom via weather louvres	-	-	17			
2016/04/28	AHU 31	VAV	Upper Roof Level - Plantroom 1		2013	Viking	Singapore Offices [3-A41/O; 3-A41/N2; 3-A41/O2; 3-A41/O1]	lots of call-outs for this area due to space being supplied by same unit as ACS offices and there occupancy schedule are different;	a lot of variation experienced in the room temperature; over weekends the system is off; when ACS is not there the system is off;	21.7°C - 23.7°C (2016/05/11)	-	not inspected for this level	not inspected for this level	Plantroom Space acts as plenum, with fresh air being supplied directly to plantroom via weather louvres						
2016/04/28	FCU xx	Ducted Supply Air	37-38 & P-Q		No information	Viking	Saudi Arabian Airlines Offices [3-A36/P1]	No identification tag on unit	Complaint about inconsistency with regards to air temperature	23.4°C (2016/06/03)	-	Average; a few tears	Average; pipe connecting points exposed	Plantroom space acts as plenum; no dedicated fresh air being supplied	Situated in ceiling space by UTS Store room, next door to office space;	-	-			
2016/04/28	AHU 117	Ducted Supply Air	37-38 & P-Q		No information	Viking	Emirates Ticket Sales Office on floor below (International Departures)	None	None	21.2°C (2016/06/03)	-	Average; a few tears	Good	Plantroom space acts as plenum; no dedicated fresh air being supplied	Situated in own small plant room as accessed through UTS Store room;	-	-			
2016/04/28	AHU 115	Ducted Supply Air	27-28 & P-Q		No information	Viking	TAAG Offices [3-A26/P1; 3-A27/P1; 3-A27/Q1; 3-A26/Q1]	2016/05/11 - old unit, occupants have access to units controls on DB; suggested to install new unit in roof as to take control access away from occupants	None	22.6°C (2016/05/11)	-	Good	Good	-	Situated in same room that is being used as the kitchen space of TAAG Offices; Air filters are a bit bent; might be considered a safety hazard	-	-			
2016/04/28	AHU 114	Ducted Supply Air	22-23 & P-Q		No information	Viking	Vanderlande Offices [3-A23/P1; 3-A23/Q2; 3-A22/Q; 3-A23/Q1]	Recently serviced the motor of the unit;	Complaint about inconsistency with regards to air temperature;	23.6°C (2016/06/03)	-	Average; a few tears	Good	-	Situated in ceiling space of Vanderlande Offices;	-	-			
2016/02/26								Motor needs a service soon	Complaint about inconsistency with regards to air temperature; unit is making a rattling noise		-				Situated in ceiling space of Vanderlande Offices; the VSD is also in ceiling void, but it is just between some electrical wiring;					
2016/04/28	AHU 113 & AHU 112	Ducted Supply Air	16-17 & P-Q		No information	Viking Both	Both units supply the DELTA Offices and Ticket sales offices on International Departures level below;	None	None	21.4°C (2016/06/03)	-	Average; a few tears	Average; pipe connecting points exposed	-	-	-	-	-		
2016/02/26								None	None		-					Situated in small plant room next door to DELTA Offices;	-	-		
2016/04/28	AHU xx	Ducted Supply Air	21-22 & I-J; 3-A33/I1		No information	CIAT	Panis Offices;	None	Maintenance to the unit is being conducted	24.2°C (2016/06/03)	-	Average; a few tears	Average; a few tears at elbow	-	Situated in own plant room;	-	-			
2016/02/29	AHU xx	Ducted Supply Air	33-34 & I-J; 3-A21/I1		No information	CIAT	Surrounding offices	No identification tag on unit	None	23.9°C (2016/06/03)	-	Bad; lots of exposed ducting	Bad; a lot of exposed piping	-	Situated in own room; Room 39;	-	-			
2016/02/29	AHU 15/14 (6000/s)	VAV	On Ground side, closest to road area		2005	ECOAIRE	International Departures Double Volume Shopping Area	None	N/A as Public Area with changing people	N/A due to serving public area , thus ever changing occupants	-	Good, small tears	Good	Plantroom Space acts as plenum, with fresh air being supplied directly to plantroom via weather louvres	None at present	-	10			
2016/02/29	AHU 23/22 (6000/s)	VAV	On Ground side, closest to road area		2005	ECOAIRE	International Departures Double Volume Shopping Area	None	N/A as Public Area with changing people	N/A due to serving public area , thus ever changing occupants	-	Good, small tears	Good	Plantroom Space acts as plenum, with fresh air being supplied directly to plantroom via weather louvres	None at present	-	10			
2016/02/29	AHU 28/27 (6000/s)	VAV	On Ground side, closest to road area		2005	ECOAIRE	International Departures Double Volume Shopping Area	None	N/A as Public Area with changing people	N/A due to serving public area , thus ever changing occupants	-	Average; a few tears	Good	Plantroom Space acts as plenum, with fresh air being supplied directly to plantroom via weather louvres	None at present	-	10			
2016/02/29	AHU 34/33 (6000/s)	VAV	On Ground side, closest to road area		2005	ECOAIRE	International Departures Double Volume Shopping Area	None	N/A as Public Area with changing people	N/A due to serving public area , thus ever changing occupants	-	Average; a few tears	Good	Plantroom Space acts as plenum, with fresh air being supplied directly to plantroom via weather louvres	None at present	-	10			
2016/02/29	AHU 40/39 (6000/s)	VAV	On Ground side, closest to road area		2005	ECOAIRE	International Departures Double Volume Shopping Area	None	N/A as Public Area with changing people	N/A due to serving public area , thus ever changing occupants	-	Good, small tears	Good	Plantroom Space acts as plenum, with fresh air being supplied directly to plantroom via weather louvres	Plantroom area also contains other equipment such as a fan, geyser, etc. (refer to photos for details)	-	10			
2016/05/11	FCU 35	Unit is ducted	Baggage sorting carousels		1998	Viking	ticket sales office on level below	None	None	22.2°C (2016/05/11)	-	Good, small tears	Average; a few tears at elbow bends	No dedicated duct to unit; surrounding space acts as plenum for unit	Provision for fresh air recommended; Insulation of ducts and chilled water pipes to be repaired by Maintenance (ACSA)	Provision for fresh air recommended; Insulation of ducts and chilled water pipes to be repaired by Maintenance (ACSA)	2			
2016/05/11	FCU 19	N/A as unit is not ducted	Baggage sorting carousels		1998	Viking	the baggage sorting carousels area		None	22.2°C (2016/05/11)	-	N/A as unit is not ducted	Average; a few tears at elbow bends	No dedicated duct to unit; surrounding space acts as plenum for unit			2			
2016/05/11	FCU 18	N/A as unit is not ducted	Baggage sorting carousels		1998	Viking	the baggage sorting carousels area		None	22.2°C (2016/05/11)	-	N/A as unit is not ducted	Average; a few tears at elbow bends	No dedicated duct to unit; surrounding space acts as plenum for unit			2			
2016/05/11	FCU 17	N/A as unit is not ducted	Baggage sorting carousels		1998	Viking	the baggage sorting carousels area		None	22.2°C (2016/05/11)	-	N/A as unit is not ducted	Average; a few tears at elbow bends	No dedicated duct to unit; surrounding space acts as plenum for unit			2			

2016/05/11	FCU 34	VAV	Baggage sorting carousels		1998	Viking	An area outside our scope of work area		None	22.2°C (2016/05/11)	-	Good, small tears	Average; a few tears at elbow bends	No dedicated duct to unit; surrounding space acts as plenum for unit		Provision for fresh air recommended; Insulation of ducts and chilled water pipes to be repaired by Maintenance (ACSA)	2			
2016/05/11	FCU 16	N/A as unit is not ducted	Baggage sorting carousels		1998	Viking	the baggage sorting carousels area		None	22.2°C (2016/05/11)	-	N/A as unit is not ducted	Average; a few tears at elbow bends	No dedicated duct to unit; surrounding space acts as plenum for unit		Provision for fresh air recommended; Insulation of ducts and chilled water pipes to be repaired by Maintenance (ACSA)	2			
2016/05/11	FCU xx (White Housing)	N/A as unit is not ducted	Baggage sorting carousels				the baggage sorting carousels area; the units chilled water piping is disconnected, thus unit is not functional		None	22.2°C (2016/05/11)	-	N/A as unit is not ducted	N/A as piping is disconnected	No dedicated duct to unit; surrounding space acts as plenum for unit	the baggage handling space and carousels temperature measured 22.2 °C ; the baggage handling space and carousels have a lot of big ducts running through the space;	inspect if unit should be removed or replaced by new unit	-			
2016/05/11	FCU 15	N/A as unit is not ducted	Baggage sorting carousels		1998	Viking	the baggage sorting carousels area	the units are suspended from the slab above; maintenance to the units are accessible for most, but two units are right above baggage conveyer systems, thus allowing no space for ladders to be positioned; the units with the white housing are much older than the units in blue housing (Viking Make)	None	22.2°C (2016/05/11)	-	N/A as unit is not ducted	Average; a few tears at elbow bends	No dedicated duct to unit; surrounding space acts as plenum for unit	maintenance of some of the units is a bit of a problem due to the units not being easily accessible by the maintenance team- mostly carousels posing as obstructions; the area where the units are situated and supplying the area are occupied from time to time; No evidence of Fresh Air being provided to the space (thus not in accordance with SANS F/A regulations); units are suspended from the slab;	Provision for fresh air recommended; Insulation of ducts and chilled water pipes to be repaired by Maintenance (ACSA)	2			
2016/05/11	FCU xx (White Housing)	N/A as unit is not ducted	Baggage sorting carousels			Unknown	the baggage sorting carousels area		None	22.2°C (2016/05/11)	-	N/A as unit is not ducted	Average; a few tears at elbow bends	No dedicated duct to unit; surrounding space acts as plenum for unit		Provision for fresh air recommended; Insulation of ducts and chilled water pipes to be repaired by Maintenance (ACSA); Re- labelling of unit for identification	-			
2016/05/11	FCU xx (White Housing)	N/A as unit is not ducted	Baggage sorting carousels			Unknown	the baggage sorting carousels area		None	22.2°C (2016/05/11)	-	N/A as unit is not ducted	Average; a few tears at elbow bends	No dedicated duct to unit; surrounding space acts as plenum for unit		Provision for fresh air recommended; Insulation of ducts and chilled water pipes to be repaired by Maintenance (ACSA); Re- labelling of unit for identification	-			
2016/05/11	FCU xx (Blue Housing)	Unit is ducted	Baggage sorting carousels			Viking	the baggage sorting carousels area		None	22.2°C (2016/05/11)	-	Good, small tears	Average; a few tears at elbow bends	No dedicated duct to unit; surrounding space acts as plenum for unit		Provision for fresh air recommended; Insulation of ducts and chilled water pipes to be repaired by Maintenance (ACSA); Re- labelling of unit for identification	2			
2016/05/11	FCU xx (White Housing)	N/A as unit is not ducted	Baggage sorting carousels			Unknown	the baggage sorting carousels area		None	22.2°C (2016/05/11)	-	N/A as unit is not ducted	Average; a few tears at elbow bends	No dedicated duct to unit; surrounding space acts as plenum for unit		Provision for fresh air recommended; Insulation of ducts and chilled water pipes to be repaired by Maintenance (ACSA); Re- labelling of unit for identification	-			
2016/05/11	FCU xx (White Housing)	N/A as unit is not ducted	Baggage sorting carousels			Unknown	the baggage sorting carousels area		None	22.2°C (2016/05/11)	-	N/A as unit is not ducted	Average; a few tears at elbow bends	No dedicated duct to unit; surrounding space acts as plenum for unit		Provision for fresh air recommended; Insulation of ducts and chilled water pipes to be repaired by Maintenance (ACSA); Re- labelling of unit for identification	-			
2016/05/11	FCU xx (White Housing)	N/A as unit is not ducted	Baggage sorting carousels			Unknown	the baggage sorting carousels area		None	22.2°C (2016/05/11)	-	N/A as unit is not ducted	Average; a few tears at elbow bends	No dedicated duct to unit; surrounding space acts as plenum for unit		Provision for fresh air recommended; Insulation of ducts and chilled water pipes to be repaired by Maintenance (ACSA); Re- labelling of unit for identification	-			
2016/05/11	FCU xx (White Housing)	N/A as unit is not ducted	Baggage sorting carousels			Unknown	the baggage sorting carousels area		None	22.2°C (2016/05/11)	-	N/A as unit is not ducted	Average; a few tears at elbow bends	No dedicated duct to unit; surrounding space acts as plenum for unit		Provision for fresh air recommended; Insulation of ducts and chilled water pipes to be repaired by Maintenance (ACSA); Re- labelling of unit for identification	-			

TOILETS - EXTRACTION FANS

Inspection Date	Bathroom Name	Extraction Grills or Diffusers	Location/Area of bathroom (Gridlines)	Year of installation of Fan	Make of Fan	Location of Fan	End User Comments	ACSA HVAC Maintenance Comments	Comments/ Remarks	Corrective Actions/ Recommendations	Overall Equipment Condition
2016/05/11	F2M; 3-A31/Q1	yes; general good condition	30-32 & Q-R	No information	unknown	Upper Roof Level- Plantroom 2	None	Fan is old, but still works	grills are dusty and dirty	-	Fair
2016/05/11	F2F; 3-A32/Q1	yes; general good condition	32-33 & Q-R	No information	unknown	Upper Roof Level- Plantroom 2	None	Fan is old, but still works	grills are dusty and dirty	-	Fair
2016/05/11	3-A45/R1; 3-A46/Q1	yes; general good condition	45-46 & R-S	N/A	N/A	Upper Roof Level- Plantroom 2	smells build up in bathroom	Fan is disconnected from ducting 2015 during ACS AHU return Air upgrade; the fan was in the way of the return air duct path; there is no fan in the plantroom on the upper roof level	Some of the flexi- duct is not connected to any grills; some of the grills are connected to exhaust grills but this is not positioned in the ceiling as a opening, they are just in the ceiling with no access to the bathroom air space	Design and install new extract system.	BAD
2016/05/11	3-A47/R1; 3-A47/Q1	yes; general good condition	46-48 & R-S	N/A	N/A	Upper Roof Level- Plantroom 2	smells build up in bathroom	Fan is disconnected from ducting 2015 during ACS AHU return Air upgrade; the fan was in the way of the return air duct path; there is no fan in the plantroom on the upper roof level	Some of the flexi- duct is not connected to any grills; some of the grills are connected to exhaust grills but this is not positioned in the ceiling as a opening, they are just in the ceiling with no access to the bathroom air space	Design and install new extract system.	BAD
2016/05/11	Female	yes; grills are a bit dirty	40-41 & I-J	No information	unknown	Upper Roof Level- Plantroom 2	None	None	None	-	Good
2016/05/11	Male	yes; grills are a bit dirty	40-41 & G-I	No information	unknown	Upper Roof Level- Plantroom 2	None	None	None	-	Good
2016/05/11	F20F 3-A40/G1	yes; grills are a bit dirty	40-41 & I-J	No information	unknown	Upper Roof Level- Plantroom 2	None	None	None	-	Good
2016/05/11	F20M	yes; grills are a bit dirty	40-41 & G-I	No information	unknown	Upper Roof Level- Plantroom 2	None	None	None	-	Good
2016/05/11	3-A25/I2	No grills or diffusers	25-26 & I-J	N/A due to no fan	N/A due to no fan	N/A due to no fan	None	No exhaust fan	some of the ceiling tiles are left open; not shown on architectural drawings as ablution facilities	Design and install new extract system.	BAD
2016/05/11	3-A25/I1	No grills or diffusers	25-26 & I-J	N/A due to no fan	N/A due to no fan	N/A due to no fan	None	No exhaust fan	some of the ceiling tiles are left open; not shown on architectural drawings as ablution facilities	Design and install new extract system.	BAD

Key:

Good -

exceptional preventative maintenance performance exemplary excellent housekeeping

Fair -

few repairs required adjustments required operationally adequate

Bad -

equipment being neglected equipment in need of repair little or no housekeeping

GENERAL NOTES

2016/05/11	Take Note:	the corridor temperature measured on this day was 20.7°C
2016/05/11	Take Note:	the ambient temperature measured at 09H50 was 15.6°C
2016/05/11	Take Note:	ACS and Singapore Airlines share a big AHU that is situated on the roof; the unit has a schedule; the ACS offices and thus unit has recently been refurbished, but the unit and additional information has not yet been handed-over to the ACSA maintenance team;
2016/05/11	Take Note:	ACS offices temperature is 22.2°C ; some diffusers have heating settings; the occupants have no controls for the HVAC system;
2016/05/11	Take Note:	Singapore Airlines temperature range from 21.7°C - 23.7°C and take into consideration that it is a very small open office space;
2016/05/11	Take Note:	the AHU situated on the roof supplying the offices close to the bathrooms (B4) on the air side is constant volume units and thus in winter time have a too strong air flow coming through, occupants request unit be turned off during this time.
2016/05/11	Take Note:	on the Air side the bathrooms (B4) - the one set of bathrooms has no extraction grills, the other set of bathrooms extraction fan is not working;
general	Take Note:	Architect drawings not accurate as to what is on site at the present time
general	Take Note:	HVAC drawings not accurate as to what is on site a present moment in time

Future recommendation: investigate and compile the unit's technical specifications in an informative document format

LOWER ROOF LEVEL

Inspection Date	Unit Type & Number	Constant Volume or Variable?	Location/Area of Unit (Gridlines)	Maintenance Log Records	Year of Installation	Make of Unit	Area being Supplied by Unit	ACSA HVAC Maintenance Comments	End User Comments	Thermal Condition at Supply Area	Heating	Ductwork & Insulation Condition	Chilled Water Pipework Insulation Condition	Fresh Air	Remarks & Other Notes	Corrective Actions/ Recommendations	Expected Life in Years	Overall Equipment Condition		
																		Good	Fair	Bad
2016/02/29	AHU 83	VAV	Plantroom 6 4-A53/Q1 (53-54 & Q-R)		1998	Viking	Area outside Scope - Projects and Planning Offices (P&P Offices)	None	None	22.8°C (2016/05/17)	48 kW - 3 Step	Good	Good; a little bit of condensate formed at the valves	Fresh Air Louvre in wall on inside of Cladding of plantroom	An outdoor unit of a possible split AC unit is situated in the plantroom; Contains a geyser with electrical wires exposed;	Maintenance to repair insulation of ducts, test fire dampers and consider the refurbishment of unit as life expectancy years are low;	2			
2016/02/29	Split OU	-	Plantroom 6 4-A53/Q1 (53-54 & Q-R)		No Info	Mitsubishi	Unknown	None	-	-	-	-	-	-	Situated in plantroom 6; Refrigerant R22	Labelling of unit; unit to be listed for replacement with a unit that uses a refrigerant okayed by standards;	-			
2016/02/29	AHU 84	VAV	Plantroom 7 4-A48/Q1 (48-49 & Q-R)		1998	Viking	Offices adjacent to the P&P Offices	None	None	22.6°C (2016/05/17)	21kW - 3 Step (Info from DWG)	Good; Small tears	Average; Valves rusted; condensate forming at bends and valve connections	Dedicated fresh air duct connected to unit; fresh air coming from fresh air fans in plantrooms on upper roof level	Contains a geyser with electrical wires exposed	Maintenance to repair insulation of ducts, test fire dampers and consider the refurbishment of unit as life expectancy years are low;	2			
2016/02/29	FCU 95	No Info	Plantroom 7 4-A48/Q1 (48-49 & Q-R)		1998	Viking	Offices adjacent to the P&P Offices	None	None	22.6°C (2016/05/17)	12kW - 2 Step (Info from DWG)	Good	Average; Valves rusted; condensate forming at bends and valve connections	Dedicated fresh air duct connected to unit; fresh air coming from fresh air fans in plantrooms on upper roof level	DB Labelling suggest unit is FCU, but DWG's suggest unit is AHU;	Maintenance to repair insulation of ducts, test fire dampers and consider the refurbishment of unit as life expectancy years are low;	2			
2016/02/29	AHU 85	VAV	Plantroom 8 4-A45/L1 (44-46 & L-M)		1998	Viking	Offices adjacent to the P&P Offices	Unit tends to make a bit of a noise	None	22.5°C (2016/05/17)	21kW - 3 Step (Info from DWG)	Good; Small tears	Good; a little bit of condensate formed at the valves	Dedicated fresh air duct connected to unit; fresh air coming from fresh air fans in plantrooms on upper roof level	Plantroom area is also used as on of the maintenance team members office space (a separate room in the plantroom itself)	Maintenance to repair insulation of ducts, test fire dampers and consider the refurbishment of unit as life expectancy years are low;	2			
2016/02/29	AHU 86	VAV	Plantroom 9 Outside Scope Area (42-44 & H-I)		1998	Viking	Offices adjacent to the P&P Offices	Unit tends to make a bit of a noise	None	22.3°C (2016/05/17)	27kW - 3 Step (Info from DWG)	Average; Tears in insulation	Average; Valves rusted; condensate forming at bends and valve connections	Dedicated fresh air duct connected to unit; fresh air coming from fresh air fans in plantrooms on upper roof level	Plantroom is situated outside scope of work area, but supplies air to area inside scope of work; Plantroom is also used by maintenance team as chill/meeting area.	Maintenance to repair insulation of ducts, test fire dampers and consider the refurbishment of unit as life expectancy years are low;	2			
2016/02/29	AHU 87	VAV	Plantroom 10 4-A47/D1 (47-49 & D-E)		1998	Viking	Offices adjacent to the P&P Offices	Unit tends to make a bit of a noise	None	22.0°C (2016/05/17)	27kW - 3 Step (Info from DWG)	Good; Small tears	Average; A few cracks; Condensate forming at bends and valve connections	Dedicated fresh air duct connected to unit; fresh air coming from fresh air fans in plantrooms on upper roof level	Plantroom has a small skylight, with what seems like a mechanical louvre as well;	Maintenance to repair insulation of ducts, test fire dampers and consider the refurbishment of unit as life expectancy years are low;	2			
2016/02/29	AHU 88	VAV	Plantroom 10 4-A47/D1 (47-49 & D-E)		1998	Viking	Offices adjacent to the P&P Offices	Unit tends to make a bit of a noise	None	21.8°C (2016/05/17)	27kW - 3 Step (Info from DWG)	Good; Small tears	Average; A few cracks; Condensate forming at bends and valve connections	Dedicated fresh air duct connected to unit; fresh air coming from fresh air fans in plantrooms on upper roof level	Plantroom has a small skylight, with what seems like a mechanical louvre as well;	Maintenance to repair insulation of ducts, test fire dampers and consider the refurbishment of unit as life expectancy years are low;	2			
2016/05/17	4-way cassette	-	4-A28/E1 (28 & C)		No Info	Diakin	Open plan office space where situated	None	None	23.6°C (2016/05/17)	Reverse refrigerant cycle	-	-	-	the office space has a raised floor with small circular return air grills; this office space also has grills in the ceiling	Investigate the double extraction system aka the floor grills and ceiling grills	-			
2016/05/17	4-way cassette	-	4-A28/F2 (29 & C)		No Info	Diakin	Open plan office space where situated	None	None	23.6°C (2016/05/17)	Reverse refrigerant cycle	-	-	-	the office space has a raised floor with small circular return air grills; this office space also has grills in the ceiling	Investigate the double extraction system aka the floor grills and ceiling grills	-			
2016/05/17	4-way cassette	-	15-19 & C-D		No Info	Unknown	Open plan office space where situated; ECC offices	None	Satisfied	23.2°C (2016/05/17)	Reverse refrigerant cycle	-	-	-	No information available regarding the age of the units	-	-			
2016/05/17	4-way cassette	-	15-19 & C-D		No Info	Unknown	Open plan office space where situated; ECC offices	None	Satisfied	23.2°C (2016/05/17)	Reverse refrigerant cycle	-	-	-	No information available regarding the age of the units	-	-			
2016/05/17	Window Mounted fan	Constant Volume	20-22 & D		No Info	Unknown	close to door of ECC offices	Fan is old and not being used;	None	N/A	-	-	-	-	The fan cover is missing - safety hazard as moving parts are exposed; fan not on	Maintenance to cover the moving parts as it is a safety hazard	-			
2016/05/17	Window Mounted fan	Constant Volume	20-22 & D		No Info	Unknown	close to door of ECC offices	Fan is old and not being used;	None	N/A	-	-	-	-	fan not on	investigate the purpose of the fan and if it is necessary or can it be removed to safe on electrical bill	-			
2016/05/17	Split OU	-	30 & D		No Info	LG (Inverter V)	No labelling	None	None	N/A	-	-	-	-	Refrigerant - R410A; Unit doesn't seem to be old - clean and overall good condition	-	-			
2016/05/17	4-way cassette	-	Office (28 & E)		No Info	Unknown	Security Compliance Office (25-29 & E-I)	occupants have remotes for temperature control	the system is linked - meaning that one office can't have heating on when the other is on cooling	21.0°C (2016/05/17)	Reverse refrigerant cycle	-	-	-	Units seem not to be to old	-	-			
2016/05/17	4-way cassette	-	Office (27 & E)		No Info	Unknown	Security Compliance Office (25-29 & E-I)	occupants have remotes for temperature control	the system is linked - meaning that one office can't have heating on when the other is on cooling	21.0°C (2016/05/17)	Reverse refrigerant cycle	-	-	-	Units seem not to be to old	-	-			
2016/05/17	4-way cassette	-	Office (28 & F)		No Info	Unknown	Security Compliance Office (25-29 & E-I)	occupants have remotes for temperature control	the system is linked - meaning that one office can't have heating on when the other is on cooling	21.0°C (2016/05/17)	Reverse refrigerant cycle	-	-	-	Units seem not to be to old	-	-			
2016/05/17	4-way cassette	-	Office (27 & F)		No Info	Unknown	Security Compliance Office (25-29 & E-I)	occupants have remotes for temperature control	the system is linked - meaning that one office can't have heating on when the other is on cooling	21.0°C (2016/05/17)	Reverse refrigerant cycle	-	-	-	Units seem not to be to old	-	-			
2016/05/17	4-way cassette	-			No Info	DB - Dunham Bush	Waiting Room, Security Compliance Room	None	None	25.8°C (2016/05/17)	Reverse refrigerant cycle	-	-	-	The area where the air is coming through into the space is a bit dusty and dirty	Maintenance to clean fins where the supplied air passes over to enter the space being supplied;	-			
2016/05/17	Split IU	-			No Info	LG	Waiting Room, Security Compliance Room	None	None	25.8°C (2016/05/17)	Reverse refrigerant cycle	-	-	-	The area where the air is coming through into the space is a bit dusty and dirty	Maintenance to clean fins where the supplied air passes over to enter the space being supplied;	-			
2016/05/17	FCU xx	No Info			No Info	Unknown	ACSA Call Centre 3rd Floor	Only discovered unit recently so it is an old unit; unit position makes it difficult to maintenance due to the office layout, it is situated right above a partition	None - didn't know about unit	22.7°C (2016/05/17)	No Info	Average; a few tears	Good	No information	Unit is positioned above wall partition, making maintenance access difficult when having to replace parts of the unit;	Unit need to be inspected by Maintenance to establish a accurate expected life and unit needs to be added to the maintenance schedule as it was only recently discovered;	-			
2016/05/17	4-way cassette	-			2016	Diakin	ACSA Call Centre 3rd Floor	recently installed (2 moths old)	Satisfied	22.7°C (2016/05/17)	Reverse refrigerant cycle	-	-	-	New units	ensure a maintenance schedule is set up for newly installed units	15			
2016/05/17	4-way cassette	-			2016	Diakin	ACSA Call Centre 3rd Floor	recently installed (2 moths old)	Satisfied	22.7°C (2016/05/17)	Reverse refrigerant cycle	-	-	-	New units	ensure a maintenance schedule is set up for newly installed units	15			
2016/05/17	Split IU	-	Aviation Weather Centre Offices (44-46 & B-E)		N/A due to 3rd party Asset	York	Computer Room within the aviation weather centre	N/A due to 3rd party Asset	N/A due to 3rd party Asset	N/A due to 3rd party Asset	N/A due to 3rd party Asset	N/A due to 3rd party Asset	N/A due to 3rd party Asset	N/A due to 3rd party Asset	3rd Party Asset	N/A due to 3rd party Asset	N/A	N/A Privately owned		
2016/05/17	Split IU	-	Aviation Weather Centre Offices (44-46 & B-E)		N/A due to 3rd party Asset	No Label	Computer Room within the aviation weather centre	N/A due to 3rd party Asset	N/A due to 3rd party Asset	N/A due to 3rd party Asset	N/A due to 3rd party Asset	N/A due to 3rd party Asset	N/A due to 3rd party Asset	N/A due to 3rd party Asset	3rd Party Asset	N/A due to 3rd party Asset	N/A	N/A Privately owned		
2016/05/17	Split IU	-	29-30 & E-H		No Info	Unknown	Alone standing Lecture Hall	None	None	not inspected - room was locked on day of inspection	Reverse refrigerant cycle	-	-	-	Room was Locked, thus couldn't inspect units from close by or identify refrigerant used;	-	-			
2016/05/17	Split IU	-	29-30 & E-H		No Info	Unknown	Alone standing Lecture Hall	None	None	not inspected - room was locked on day of inspection	Reverse refrigerant cycle	-	-	-	Room was Locked, thus couldn't inspect units from close by or identify refrigerant used;	-	-			
2016/05/17	Split IU	-	29-30 & E-H		No Info	Unknown	Alone standing Lecture Hall	None	None	not inspected - room was locked on day of inspection	Reverse refrigerant cycle	-	-	-	Room was Locked, thus couldn't inspect units from close by or identify refrigerant used;	-	-			
2016/05/17	Wall Mounted Fan	Constant Volume	32-38 & D		No Info	Unknown	Passage Area	Fan is not connected anymore; it was disconnected before UTS took over Maintenance responsibilities	N/A - Public area	-	None	-	-	-	Fans would extract the air from the passage area that would then be replaced by the air moving in via the weather louvres	Maintenance to fix wiring of fans or to remove fans completely if equipment is redundant	-			
2016/05/17	Wall Mounted Fan	Constant Volume	32-38 & D		No Info	Unknown	Passage Area	Fan is not connected anymore; it was disconnected before UTS took over Maintenance responsibilities	N/A - Public area	-	None	-	-	-	Fans would extract the air from the passage area that would then be replaced by the air moving in via the weather louvres	Maintenance to fix wiring of fans or to remove fans completely if equipment is redundant	-			
2016/05/17	Wall Mounted Fan	Constant Volume	32-38 & D		No Info	Unknown	Passage Area	Fan is not connected anymore; it was disconnected before UTS took over Maintenance responsibilities	N/A - Public area	-	None	-	-	-	Fans would extract the air from the passage area that would then be replaced by the air moving in via the weather louvres	Maintenance to fix wiring of fans or to remove fans completely if equipment is redundant	-			

TOILETS - EXTRACTION FANS

Inspection Date	Bathroom Name	Extraction Grills or Diffusors	Location/Area of bathroom (Gridlines)	Year of Installation of Fan	Make of Fan	Location of Fan	End User Comments	ACSA HVAC Maintenance Comments	Comments/ Remarks	Corrective Actions/ Recommendations	Overall Equipment Condition
2016/05/17	No- Architect Room ID	ceiling mounted exhaust fan	48-49 & B; single bathroom in weather centre office	Unknown	No tag - unknown	small bathroom in weather centre office	Satisfied	None	Suggest Labelling of fan so to create connection to abluition facilities	-	Good
2016/05/17	4-A47/B1; 4-A48/B1;	yes; general good condition	47-50 & B-D; Male and Female	Unknown	No tag - unknown	Upper Roof Level - Plantroom 1	None	None	Suggest Labelling of fan so to create connection to abluition facilities	Include unit in maintenance schedule	Fair
2016/05/17	4-A46/R1; 4-A47/R1;	yes; general good condition	45-48 & Q-S; Male and Female	Unknown	No tag - unknown	Upper Roof Level - Plantroom 2	None	None	Suggest Labelling of fan so to create connection to abluition facilities	Include unit in maintenance schedule	Fair
2016/05/17	4-A54/Q1; 4-A54/Q1	yes; general good condition	54-56 & Q-R; Male and Female	Unknown	No tag - unknown	Upper Roof Level - Plantroom 5	None	None	Suggest Labelling of fan so to create connection to abluition facilities	Include unit in maintenance schedule	Fair
2016/05/17	4-A27/D1	yes; general good condition	27-29 & D-E	2016	No tag - unknown	Shaft space behind abluition facilities	None	Newly installed fan -2016	Suggest Labelling of fan so to create connection to abluition facilities	-	Good
2016/05/17	4-A28/D1; 4-A28/D2	yes; general good condition	27-29 & D-E	2016	No tag - unknown	Shaft space behind abluition facilities	None	Newly installed fan -2016	Suggest Labelling of fan so to create connection to abluition facilities	-	Good
2016/05/17	4-A25/D1	yes; general good condition	25-26 & D-E	2016	No tag - unknown	Shaft space behind abluition facilities	None	Newly installed fan -2016	Suggest Labelling of fan so to create connection to abluition facilities	-	Good
2016/05/17	4-A26/D1	yes; general good condition	25-26 & D-E	2016	No tag - unknown	Shaft space behind abluition facilities	None	Newly installed fan -2016	Suggest Labelling of fan so to create connection to abluition facilities	-	Good

Key:

Good -

exceptional preventative maintenance performance exemplary excellent housekeeping

Fair -

few repairs required adjustments required operationally adequate

Bad -

equipment being neglected equipment in need of repair little or no housekeeping

GENERAL NOTES

2016/05/17	Take Note:	the ambient temperature measured at 10H00 was 16.4°C
2016/05/19	Take Note:	the ambient temperature measured at 09H50 was 14.1°C
2016/05/11	Take Note:	the ambient temperature measured at 09H50 was 15.6°C
2016/05/17	Take Note:	the general passage temperature at three different locations where 19.2°C , 21.3°C and 20.8°C
2016/05/17	Take Note:	the viewing deck and passages close to this area have a lot of weather louvres which allow for air from the outside to directly enter in to the indoor space
2016/05/17	Take Note:	the passage next to the viewing deck on the ground side has fans that assist with the extraction of air to the outside; these fans are disconnected
2016/05/17	Take Note:	Stallion Security Offices is being supplied by plantroom 9, room temperature measured to be 23.4°C
2016/05/17	Take Note:	a lot of ducting is exposed in the area on gridlines 50 & C which is close to plantroom 10 and behind the bathrooms there

UPPER ROOF LEVEL

Inspection Date	Unit Type & Number	Constant Volume or Variable?	Location/Area of Unit (Gridlines)	Maintenance Log Records	Year of installation	Make of Unit	Area being Supplied by Unit	ACSA HVAC Maintenance Comments	End User Comments	Thermal Condition of Supply Area	Heating	Ductwork & Insulation Condition	Chilled Water Pipework Insulation Condition	Fresh Air	Remarks & Other Notes	Corrective Action/ Recommendation	Expected Life in Years	Overall Equipment Condition		
																		Good	Fair	Bad
Equipment within scope of work area that was inspected																				
2016/06/09	U5.1 FCU	No Info	5/03 Sheeting		1999	Viking	N/A - Outside Scope	-	-	N/A - Outside Scope	54 kW 3 Step	Average; a few tears	Good	FA being supplied via Weather Louvre	None	-	3			
2016/06/09	U5.2 FCU	No Info	5/03 Sheeting		1999	Viking	N/A - Outside Scope	-	-	N/A - Outside Scope	45 kW 3 Step	Good, small tears	Good	FA being supplied via Weather Louvre	None	-	3			
2016/06/09	U5.3	No Info	5/02 Sheeting		1999	Viking	N/A - Outside Scope	-	-	N/A - Outside Scope	45 kW 3 Step	Good, small tears	Good	FA being supplied via Weather Louvre	None	-	3			
2016/06/09	U5.4	No Info	5/02 Sheeting		1999	Viking	N/A - Outside Scope	-	-	N/A - Outside Scope	45 kW 3 Step	Good, small tears	Good	FA being supplied via Weather Louvre	None	-	3			
2016/06/09	U5.5	No Info	5/01 Sheeting		1999	Viking	N/A - Outside Scope	-	-	N/A - Outside Scope	No Info	Good, small tears	Good	FA being supplied via Weather Louvre	None	-	-			
2016/06/09	U5.6	No Info	5/01 Sheeting		1999	Viking	N/A - Outside Scope	-	-	N/A - Outside Scope	No Info	Good, small tears	Good	FA being supplied via Weather Louvre	None	-	-			
2016/06/09	U5.7	No Info	35-36 & C-D		1999	Viking	N/A - Outside Scope	-	-	N/A - Outside Scope	72 kW 3 Step	Good, small tears	Good	FA being supplied via Weather Louvre	None	-	3			
2016/06/09	U5.8	No Info	34-35 & C-D		1999	Viking	N/A - Outside Scope	-	-	N/A - Outside Scope	72 kW 3 Step	Good, small tears	Good	FA being supplied via Weather Louvre	None	-	3			
2016/06/09	U5.9	No Info	14-15 & C-D		1999	Viking	N/A - Outside Scope	-	-	N/A - Outside Scope	No Info	Good, small tears	Good	FA being supplied via Weather Louvre	None	-	-			
2016/06/09	U5.10	No Info	16-17 & C-D		1999	Viking	N/A - Outside Scope	-	-	N/A - Outside Scope	No Info	Good, small tears	Good	FA being supplied via Weather Louvre	None	-	-			
2016/06/09	U5.11	No Info	37-38 & C-D		1999	Viking	FA Shaft to Below	-	-	-	150 kW Duct Heater	Good, small tears	Good	FA being supplied via Weather Louvre	Fresh Air 3300m³/s Cooling 100 kW	-	3			
2016/06/09	U5.12	No Info	32-33 & C-D		1999	Viking	FA Shaft to Below	-	-	-	150 kW Duct Heater	Good, small tears	Good	FA being supplied via Weather Louvre	Fresh Air 3300m³/s Cooling 100 kW	-	3			
2016/06/09	F5.23 Axial Fan	No Info	28-29 & H-I		1999	Donkin	No Information	-	-	-	-	Good	-	-	-	Label unit with specs and general info	-			
2016/06/09	F5.24 Axial Fan Toilet Exhaust	No Info	28-29 & H-I		1999	Donkin	No Information	-	-	-	-	Good	-	-	-	Label unit with specs and general info	-			
2016/06/09	F5.25 Axial Fan Toilet Exhaust	No Info	18-19 & H-I		1999	Donkin	N/A - Outside Scope	-	-	-	-	Good	-	-	-	Label unit with specs and general info	-			
2016/06/09	AHU - FAU 1	No Info	13-14 & L-M		No info	Viking	FA Dropper Duct to Arrivals Mezzanine Level	-	-	-	No Info	Average; a few tears	Average;	FA being supplied via Weather Louvre	Fresh Air Handling Unit	-	-			
2016/06/09	AHU - FAU 2	No Info	13-14 & E-F		No info	Viking	FA Dropper Duct to Arrivals Mezzanine Level	-	-	-	No Info	Average; a few tears	Average;	FA being supplied via Weather Louvre	Fresh Air Handling Unit	-	-			
2016/06/09	AHU - unit 104	No Info	39-40 & F-H		No info	Viking	No Information	-	-	-	No Info	Average; a few tears	Average;	FA being supplied via Weather Louvre	-	-	-			
2016/06/09	AHU - Unit 4	No Info	15-16 & Q-R		No info	Viking	No Information	-	-	-	21 kW	Good; Uninsulated	Average;	FA being supplied via Weather Louvre	-	-	-			
2016/06/09	AHU - Unit 5	No Info	34-36 & Q-R		No Info	Viking	No Information	-	-	-	21 kW	Good; Uninsulated	Average;	FA being supplied via Weather Louvre	-	-	-			
2016/06/09	AHU - Unit 6	No Info	19-20 & Q-R		No Info	Viking	No Information	-	-	-	21 kW	Good; Uninsulated	Average;	FA being supplied via Weather Louvre	-	-	-			
2016/06/09	AHU - West Wing Unit 1	No Info	37-39 & Q-R		No Info	Viking	N/A - Outside Scope	-	-	N/A - Outside Scope	No Info	Good; Uninsulated	Average;	FA being supplied via Weather Louvre	-	-	-			
2016/06/09	AHU - West Wing Unit 2	No Info	28-30 & Q-R		No Info	Viking	N/A - Outside Scope	-	-	N/A - Outside Scope	No Info	Good; Uninsulated	Average;	FA being supplied via Weather Louvre	-	-	-			
2016/06/09	AHU - West Wing Unit 3	No Info	21-23 & Q-R		No Info	Viking	N/A - Outside Scope	-	-	N/A - Outside Scope	No Info	Good; Uninsulated	Average;	FA being supplied via Weather Louvre	-	-	-			
2016/06/09	AHU 120	No Info	38-39 & K-L		No info	Viking	No Information	-	-	-	No Info	Average; Some rusted bolts	Average; Lots of cracks in insulation	FA being supplied via Weather Louvre	-	-	-			
2016/06/09	AHU 121	No Info	41-42 & P-Q		No Info	Thermopac	SARS Offices	-	-	N/A - Outside Scope	No Info	Average; Some rusted bolts	Average; Lots of cracks in insulation	FA being supplied via Weather Louvre	Donkin Fan is connected to Return Air Duct of unit; Return Air duct has some dents;	-	-			
2016/06/09	AHU 40	No Info	14-15 & K-L		No Info	Viking	N/A - Outside Scope	-	-	N/A - Outside Scope	No Info	Bad; Insulation damaged	Average; Lots of cracks in insulation	FA being supplied via Weather Louvre	-	-	-			
2016/06/09	AHU xx	No Info	27-28 & D-E		No Info	Viking	N/A - Outside Scope	-	-	N/A - Outside Scope	No Info	Good; Uninsulated	Average;	FA being supplied via Weather Louvre	-	-	-			
2016/06/09	Basement Extract Fan	No Info	28-29 & G-H		No Info	Donkin	No Information on specific area in Basement	-	-	-	-	Rusted; Uninsulated	N/A	N/A	-	-	-			
2016/06/09	Exhaust Fan	No Info	50-51 & D-E		No Info	No Info	No Information	-	-	-	-	Good	N/A	N/A	-	-	-			
2016/06/09	Extract Fan 1	No Info	21-22 & K-L		No Info	Woods	No Information	-	-	-	-		N/A	N/A	-	-	-			

2016/06/09	Extract Fan 2	No Info	21-22 & K-L		No Info	Woods	No Information	-	-	-	-		N/A	N/A		-	-		
2016/06/09	Extract Fans	No Info	13-14 & M-O		No Info	Dynamic Fans	No Information	-	-	-	-	Small dents	N/A	N/A	the flap is loose	Maintenance department to attend to unit	-		
2016/06/09	RF 1 - Roof fan	No Info	41-42 & Q-R		No Info	Donkin	No Information	-	-	-	-		N/A	N/A	Fan is working; Internal blade is turning smoothly	-	-		
2016/06/09	RF 2 - Roof fan	No Info	39-40 & P-Q		No Info	Donkin	No Information	-	-	-	-		N/A	N/A	Fan is not working; No internal blade	Maintenace department to attend to unit	-		
2016/06/09	RF 3 - Roof Fan	No Info	32-33 & P-Q		No Info	Donkin	No Information	-	-	-	-		N/A	N/A	Fan is working;	-	-		
2016/06/09	RF 4 - Roof fan	No Info	18-19 & P-Q		No Info	Woods	No Information	-	-	-	-		N/A	N/A	Fan seems to be working	-	-		
2016/06/09	RF - Roof fan	No Info	21-22 & J-K		No Info	Woods	No Information	-	-	-	-		N/A	N/A	Fan is not working; No internal blade	Maintenance department to attend to unit	-		
2016/06/09	Toilet Exhaust Fan	No Info	40-41 & F-G		No Info	Elta Fans	No Information	-	-	-	-		N/A	N/A	No Labelling on unit	Maintenance to label unit with ablution block name that it is serving	-		
2016/06/09	Toilet Exhaust Fan	No Info	39-40 & K-L		No Info	Elta Fans	No Information	-	-	-	-		N/A	N/A	No Labelling on unit	Maintenance to label unit with ablution block name that it is serving	-		
2016/06/09	Toilet Exhaust Fan	No Info	34-35 & Q-R		No Info	No Info	No Information	-	-	-	-		N/A	N/A		Maintenance to label unit with ablution block name that it is serving	-		
2016/06/09	Toilet Exhaust Fan	No Info	32-33 & R-S		No Info	No Info	No Information	-	-	-	-		N/A	N/A		Maintenance to label unit with ablution block name that it is serving	-		
2016/06/09	Toilet Exhaust Fan	No Info	17-18 & R-S		No Info	Ziehl	No Information	-	-	-	-	Ducting dented	N/A	N/A	Fan seems to be working; No mesh over exhaust air exit; is dented and rusted;	Duct Maintenance to label unit with ablution block name that it is serving	-		
2016/06/09	Toilet Exhaust Fan	No Info	15-16 & P-Q		No Info	Dynamic Fans	No Information	-	-	-	-	A few rusted bolts	N/A	N/A		Maintenance to label unit with ablution block name that it is serving	-		
2016/06/09	Toilet Exhaust Fan	No Info	13-14 & J-K		No Info	Elta Fans	No Information	-	-	-	-		N/A	N/A		Maintenance to label unit with ablution block name that it is serving	-		
2016/06/09	Toilet Exhaust Fan	No Info	17-18 & J-K		No Info	Elta Fans	No Information	-	-	-	-		N/A	N/A		Maintenance to label unit with ablution block name that it is serving	-		
2016/06/09	Toilet Exhaust Fan	No Info	20-21 & J-K		No Info	Elta Fans	No Information	-	-	-	-		N/A	N/A		Maintenance to label unit with ablution block name that it is serving	-		
2016/06/09	Toilet Exhaust Fan	No Info	23-24 & J-K		No Info	Elta Fans	No Information	-	-	-	-		N/A	N/A		Maintenance to label unit with ablution block name that it is serving	-		
2016/06/09	Toilet Exhaust Fan	No Info	26-27 & J-K		No Info	Elta Fans	No Information	-	-	-	-		N/A	N/A		Maintenance to label unit with ablution block name that it is serving	-		
2016/06/09	Toilet Exhaust Fan	No Info	30-31 & K-L		No Info	Elta Fans	No Information	-	-	-	-		N/A	N/A		Maintenance to label unit with ablution block name that it is serving	-		
2016/06/09	Toilet Exhaust Fan	No Info	32-33 & K-L		No Info	Elta Fans	No Information	-	-	-	-		N/A	N/A		Maintenance to label unit with ablution block name that it is serving	-		
2016/06/09	Toilet Exhaust Fan	No Info	35-36 & K-L		No Info	Elta Fans	No Information	-	-	-	-		N/A	N/A		Maintenance to label unit with ablution block name that it is serving	-		
2016/06/09	Split OU	N/A	14-15 & I-J		No Info	York	No Information	-	-	-	-	N/A	N/A	N/A	No Specifications tag; Refrigerant unknown;	Unit to be replaced in future with unit using refrigerant okayed by regulations	-		
2016/06/09	Split OU	N/A	14-15 & I-J		No Info	Unknown	No Information	-	-	-	-	N/A	N/A	N/A	Refrigerant- R22; No unit make name tag;	Unit to be replaced in future with unit using refrigerant okayed by regulations	-		
2016/06/09	Split OU	N/A	14-15 & G-H		No Info	LG	No Information	-	-	-	-	N/A	N/A	N/A	Refrigerant - R22	Unit to be replaced in future with unit using refrigerant okayed by regulations	-		
2016/06/09	Split OU	N/A	14-15 & F-G		No Info	York	No Information	-	-	-	-	N/A	N/A	N/A	Refrigerant - R22	Unit to be replaced in future with unit using refrigerant okayed by regulations	-		
2016/06/09	Split OU	N/A	14-15 & E-F		No Info	York	No Information	-	-	-	-	N/A	N/A	N/A	Refrigerant - R22	Unit to be replaced in future with unit using refrigerant okayed by regulations	-		
2016/06/09	Split OU	N/A	14-15 & E-F		No Info	York	No Information	-	-	-	-	N/A	N/A	N/A	Refrigerant - R22	Unit to be replaced in future with unit using refrigerant okayed by regulations	-		
2016/06/09	Split OU	N/A	14-15 & E-F		No Info	Mitsubishi	No Information	-	-	-	-	N/A	N/A	N/A	Refrigerant - R22	Unit to be replaced in future with unit using refrigerant okayed by regulations	-		
2016/06/09	Split OU	N/A	14-15 & E-F		No Info	Mitsubishi	No Information	-	-	-	-	N/A	N/A	N/A	Refrigerant - R22	Unit to be replaced in future with unit using refrigerant okayed by regulations	-		
2016/06/09	Split OU	N/A	14-15 & D-E		No Info	Mitsubishi	No Information	-	-	-	-	N/A	N/A	N/A	Refrigerant - R22	Unit to be replaced in future with unit using refrigerant okayed by regulations	-		
2016/06/09	Split OU	N/A	14-15 & D-E		No Info	Mitsubishi	No Information	-	-	-	-	N/A	N/A	N/A	Refrigerant - R22	Unit to be replaced in future with unit using refrigerant okayed by regulations	-		
2016/06/09	Split OU	N/A	14-15 & D-E		No Info	York	No Information	-	-	-	-	N/A	N/A	N/A	Refrigerant - R22	Unit to be replaced in future with unit using refrigerant okayed by regulations	-		
2016/06/09	Split OU	N/A	14-15 & B-C		No Info	LG	Wire Centre 53	-	-	-	-	N/A	N/A	N/A	No Info on refrigerant	Unit to be replaced in future with unit using refrigerant okayed by regulations	-		
2016/06/09	Split OU	N/A	14-15 & B-C		No Info	LG	No Information	-	-	-	-	N/A	N/A	N/A	Refrigerant - R22	Unit to be replaced in future with unit using refrigerant okayed by regulations	-		
2016/06/09	Split OU	N/A	28-29 & E-F		No Info	Dunham-Bush	No Information	-	-	-	-	N/A	N/A	N/A	Refrigerant - R410A	Unit to be labelled to display location of IU	-		
2016/06/09	Split OU	N/A	28-29 & E-F		No Info	Dunham-Bush	No Information	-	-	-	-	N/A	N/A	N/A	Refrigerant - R410A	Unit to be labelled to display location of IU	-		
2016/06/09	Split OU	N/A	28-29 & E-F		No Info	Dunham-Bush	No Information	-	-	-	-	N/A	N/A	N/A	Refrigerant - R410A	Unit to be labelled to display location of IU	-		
2016/06/09	Split OU	N/A	28-29 & E-F		No Info	Dunham-Bush	No Information	-	-	-	-	N/A	N/A	N/A	Refrigerant - R410A	Unit to be labelled to display location of IU	-		
2016/06/09	Split OU	N/A	39-40 & E-F		No Info	Daikin	No Information	-	-	-	-	N/A	N/A	N/A	Refrigerant - R410A	Unit to be labelled to display location of IU	-		
2016/06/09	Split OU	N/A	39-40 & E-F		No Info	Daikin	No Information	-	-	-	-	N/A	N/A	N/A	Refrigerant - R410A	Unit to be labelled to display location of IU	-		
Equipment outside scope supplying areas within scope of work area on other levels																			
2016/06/09	AHU 2	Constant	Plantroom 1			Viking	International Departures - Double Volume Area 35-44 & M-P	None	None	17.8°C (2016/06/03)		Good, small tears	Good	FA via weather louvre to plantroom space which acts as plenum	No VSD installed;	-	-		
2016/06/09	AHU 22	VAV	Plantroom 1		2007	Viking	Arrivals Mezzanine Level - Immigration Offices 44-51 & D-J	None	Satisfied	22.6°C (2016/05/11)		Good, small tears	Good	FA via weather louvre to plantroom space which acts as plenum	-	-	11		

2016/06/09	AHU 26	Constant	Plantroom 1			Viking	Departures Mezzanine - 39-45 (as indicated on unit label)	None	None	To many varing areas just to have one temp reading		Good, small tears	Good	FA via weather louvre to plantroom space which acts as plenum	No VSD installed;	-	-				
2016/06/09	AHU 3	Constant	Plantroom 1			Viking	International Departures - 40-44 & I-Q	None	None	18.7°C (2016/06/03)		Good, small tears	Good, small cracks on elbows of piping	FA via weather louvre to plantroom space which acts as plenum	No VSD installed;	-	-				
2016/06/09	AHU 32	Constant	Plantroom 1			Viking	International Departures - Check-in Counters 45-56 & K-M	None	None	19.3°C (2016/06/03)		Good, small tears	Good	FA via weather louvre to plantroom space which acts as plenum	No VSD installed;	-	-				
2016/06/09	AHU 4	Constant	Plantroom 1			Viking	Departures Mezzanine - 36-42 & G-K	Unit is working, but switched off because occupants complain office to cold	In winter the air flow is to strong, making the office very cold, thus we ask maintenance to turn off the air-con	24.6°C (2016/06/03)		Good, small tears	Good, small cracks on elbows of piping	FA via weather louvre to plantroom space which acts as plenum	No VSD installed;	-	-				
2016/06/09	AHU 5	Constant	Plantroom 1			Viking	International Departures - 34-44 & G-K	None	None	19.5°C (2016/06/03)		Good, small tears	Good, small cracks on elbows of piping	FA via weather louvre to plantroom space which acts as plenum	Area supplied is partially within scope - the security check counters; No VSD installed;	-	-				
2016/06/09	AHU 21	VAV	Plantroom 2			Viking	International Departures - Offices 40-44	None	None	21.7°C (2016/06/03)		Good, small tears	Good	FA via weather louvre to plantroom space which acts as plenum	-	-	-				
2016/06/09	AHU 29	Constant	Plantroom 2			Viking	International Departures - Double Volume 44-49 & M-P	None	None	17.6°C (2016/06/03)		Good, small tears	Good, small cracks on elbows of piping	FA via weather louvre to plantroom space which acts as plenum	No VSD installed;	-	-				
2016/06/09	AHU 31	VAV	Plantroom 2		2013	Viking	Departures Mezzanine - ACS and Singapore Offices 40-44 & M-R	Unit and ACS Office layout been newly refurbished (2015), not yet handed over to ACSA maintenance team; Diffusers have heating elements; Maintenance receive lots of call-outs from occupants to change temp; ACS offices and their occupancy schedule is different from Singapore Working hours;	-	-	Diffusers heating elements	Good, small tears	Good, small cracks on elbows of piping	FA via weather louvre to plantroom space which acts as plenum		Maintenance to adjust schedule of when unit is running to accommodate both occupied spaces	17				
2016/04/28							ACS Offices 3-A41/M1; 3-A42/M1; 3-A43/M1; 3-A44/M1; 3-A43/N2; 3-A43/N1; 3-A43/Q2; 3-A43/O1; 3-A43/P1; 3-A42/P1; 3-A41/P1; 3-A43/Q2; 3-A42/Q2; 3-A41/P1]		No direct controls for occupants in office space - no thermostats	22.2°C - 23°C (2016/05/11)											
2016/04/28							Singapore Offices A41/O; 3-A41/N2; 3-A41/Q2; 3-A41/O1]		A lot of variation experienced in the room temperature; When ACS is not there the system is off;	21.7°C - 23.7°C (2016/05/11)											
2016/06/09	AHU 77	Constant	Plantroom 3			Viking	International Departures - Double Volume 49-5 & M-P	None	None	17.7°C (2016/06/03)		Good, small tears	Good, small cracks on elbows of piping	FA via weather louvre to plantroom space which acts as plenum	No VSD installed;	-	-				
2016/06/09	AHU 76	Constant	Plantroom 3			Viking	International Departures - Double Volume xx & M-P	None	None	17.7°C (2016/06/03)		Good, small tears	Good, small cracks on elbows of piping	FA via weather louvre to plantroom space which acts as plenum	No VSD installed;	-	-				
2016/06/09	AHU 28	Constant	Plantroom 3			Viking	International Departures - Ticket Sales Offices 49-56 & P-S	None	None	20.7°C (2016/06/03)		Good, small tears	Good, small cracks on elbows of piping	FA via weather louvre to plantroom space which acts as plenum	No VSD installed;	-	-				
2016/06/09	AHU 30	Constant	Plantroom 3		1998	Viking	Arrivals Mezzanine Level - 50-55 & Q-S	Unit is Working	None	Not inspected		Good, small tears	Good	FA via weather louvre to plantroom space which acts as plenum	The supplied area is stuffy;		2				
2016/06/09	AHU 78	Constant	Plantroom 3			Viking	International Departures - Ticket Sales Offices 48-51 & P-S	None	None	22.7°C (2016/06/03)		Good, small tears	Good	FA via weather louvre to plantroom space which acts as plenum	No VSD installed;	-	-				
2016/06/09	AHU 24	Constant	Plantroom 3		1998	Viking	Arrivals Mezzanine Level - 45-50 & Q-S	Unit is out of order	None	Not inspected		Good, small tears	Good, small cracks on elbows of piping	FA via weather louvre to plantroom space which acts as plenum	No air coming through the 3 supply diffusers in corridor; Bytes staff change rooms without any ventilation;		2				
2016/06/09	Toilet exhaust duct - no fan	-	Plantroom 2		-	-	-	Fan is disconnected from ducting 2015 during ACS AHU return Air upgrade; Fan was in the way of the return air duct path; No fan in the plantroom on the upper roof level;	-	-	-	-	-	-	3 Levels have abluion block systems that is dependant upon this fan - Arrivals Mezzanine, Departures Mezzanine and International Departures		-				
2016/06/09	Basement F/A Supply	-	Plantroom 1		-	Not Inspected	-	-	-	-	-	-	-	-	Room was locked, thus no information on system inside except for the name - Basement F/A Supply						

GENERAL NOTES																				
	Take Note:	on the 2016/06/03 the ambient air temperature was 14.1°C at 09h30																		
	Take Note:	there is a lot of split OU all over the roof; some are still being used while others are not;																		
	Take Note:	as a general observation a lot of the mesh grills over the exhaust ducts are dirty and it is recommende that these grille get cleaned;																		

Key:

Good -

exceptional preventative maintenance performance exemplary excellent housekeeping

Fair -

few repairs required adjustments required operationally adequate

Bad -

equipment being neglected equipment in need of repair little or no housekeeping



APPENDIX C3: FIGURES

BASEMENT -1 LEVEL



Figure 1: Example of Split Outdoor Units – Condensers



Figure 2: The damaged ducting of the large exhaust fan



Figure 3: Un-ducted FCU suspended from the ceiling slab in the Baggage Handling area of the basement



Figure 4: Basement exhaust fan - BB1 as labelled on site



Figure 5: Crisplant Mechanical Workshop - the small wall mounted fan semi blocked by the passing duct



Figure 6: Baggage carousels connecting level shafts - all HVAC equipment not in use anymore



ARRIVALS CONCOURSE LEVEL

No photos used as references for this level.

ARRIVALS MEZZANINE LEVEL



Figure 7: FCU 79 supplying the Police Station Office



INTERNATIONAL DEPARTURES LEVEL

No photos used as references for this level.



DEPARTURES MEZZANINE LEVEL



Figure 8: Kenya Airways Offices – FCU missing panel bolts



Figure 9: Kenya Airways Offices – FCU Chilled Water pipping and Electrical Wiring condition



Figure 10: UTS Store Room - FCU Chilled Water pipping condition



Figure 11: TAAG Offices - AHU 115 in same space as occupants' kitchen area



Figure 12: FCU xx (GL 33-34 & I-J) in office room acting as plantroom



LOWER ROOF LEVEL



Figure 13: Damaged chilled water piping insulation as for Plantroom 7 units



Figure 14: Damaged chilled water piping insulation for Plantroom 8 units

UPPER ROOF LEVEL



Figure 15: Example of Chilled Water Piping condition of AHU 121



Figure 16: Example of a typical Roof Fan



Figure 17: Toilet Exhaust Fan - Leg support of fan



Figure 18: Toilet Exhaust Fan - Ducting dented



Figure 19: Condensate drains for Air Handling Units



Figure 20: Toilet Exhaust Fan with no mesh at exhaust air exit



Figure 21: Example of Chilled Water Piping insulation cracked at an elbow bend



Figure 22: Toilet Exhaust Fan - example of blade condition



Figure 23: Fans mounted to weather louvres serving the Viewing Deck on the Lower Roof Level



Figure 24: Toilet Exhaust duct with no fan in Plantroom 2

12 Appendix D – Wet Services

17 Appendix I – Priority Lists Combined Report

STRUCTURAL

Priority Report

For

ACSA OR Tambo International Airport
Terminal A Refurbishment Project

REPORT NO. : 01
REVISION : 02
PROJECT NO. : 60476403
COMPILED BY : T. du Toit
DATE : 02 August 2016

ISSUE AND REVISION RECORD

Rev	Date	Originator	Checker	Description
00	01 July 2016	T. du Toit		First issue for information
01	01 August 2016	T. du Toit		Second issue for information
02	01 August 2016	T. du Toit		Third issue for information



1. INTRODUCTION

This report is to summarize and add a priority scaling to the issues highlighted and commented on in the Condition Assessment Report

This report is structured in a table format listing the issues with the allocated priority scaling per floor level.

The priority scale is based on:

- **High:** Structural components in a critical condition
- **Medium:** Structural components in a bad but not in a critical condition
- **Low:** Structural components with minor concerns.

Refer to Appendices B1 and B2 from the Condition Assessment Report for figures and locations of the findings as recorded during the site inspections.

2. SUMMARIZED PRIORITY TABLE

Ref.	Corrective Action	By Whom	Priority
<u>Basement Level (-1)</u>			
1	Disintegrated tar layer to be replaced.	AECOM	Medium
2	Concrete remedial work to damaged plinths. Install corner protection to all concrete plinth corners.	AECOM	Medium
3	Inspect and repair; movement joints in the concrete slab over the Basement Level (-1).where water ingress appears. Movement joints to be repaired at top of slab to prevent water ingress.	AECOM	High to prevent water leakage Medium for condition.
4	Damaged areas to soffit of concrete slab over Basement to be repaired.	ACSA Building Maintenance	Low
5	Cracks that have formed in plaster over joints due to applying plaster finishing over the joints in walls and joints between concrete columns needs to be repaired for aesthetical reasons.	ACSA Building Maintenance	Low
6	Damaged brick wall to be repaired.	ACSA Building Maintenance	Low
<u>Arrivals Concourse Level (0)</u>			
<u>Arrivals Mezzanine Level (1)</u>			
<u>International Departures Level (2)</u>			
7	Part of joint sealant absence at a joint between two specific concrete columns. Needs only to be repaired for aesthetical reasons.	ACSA Building Maintenance	Low
8	Loose steel member resting on shop front window frame and dry wall of the Wrapping Service shop to be removed. It is causing a safety risk.	ACSA Building Maintenance	High due to Safety risk

Ref.	Corrective Action	By Whom	Priority
<u>Departures Mezzanine Level (3)</u>			
<u>Lower Roof Level (4)</u>			
<u>Upper Roof Level (5)</u>			
9	Horizontal cracks along concrete upstand beam of concrete roof to be repaired.	AECOM	Medium
10	Areas were ponding of water on the roof accurse to be addressed. Blocked full bores to be cleaned. 16 Full bores to be reinstalled.	AECOM	High to prevent water leakage
11	Rusted roof sheeting to be cleaned and protected by applying correct protective paint.	ACSA Building Maintenance	Medium
12	Loose roof sheeting and roof sheeting panel's absence.	ACSA Building Maintenance	High
13	Gutter mesh to be fitted in place properly.	ACSA Building Maintenance	Medium

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Project: TERMINAL A REFURBISHMENT AND REDEVELOPMENT

Assessment & Priority Report Sign Off

Structures

Name	Position	Signature	Date
[Redacted]	Facilities Maintenance	[Signature]	2016/08/02
[Redacted]	[Redacted]	[Redacted]	
[Redacted]	[Redacted]	[Signature] REOURG D.	2016/08/02
[Redacted]	[Redacted]	[Redacted]	02/08/16
[Redacted]	Maintenance		
[Redacted]	ACSA HVAC Maintenance		
[Redacted]	[Redacted]		
[Redacted]	Maintenance		
[Redacted]	Maintenance		
[Redacted]	[Redacted]		
[Redacted]	Infrastructure		

Important Note:

Representatives from the various ACSA User Departments acknowledge receipt of the Assessment & Priority Reports compiled by the consultant team (Ikemeleng Architects & AECOM) and confirm that the findings in the reports are a true reflection of the building and its various sub-systems.

Escalators & Lifts

Priority Report

For

**ACSA OR Tambo International Airport
Terminal A Refurbishment Project**

REPORT NO. : 01
REVISION : 00
PROJECT NO. : 60476403
COMPILED BY : P. Mossop
DATE : 11 July 2016



ISSUE AND REVISION RECORD

Rev	Date	Originator	Checker	Description

1. INTRODUCTION

This report is to summarise and add a priority scaling to the issues highlighted and commented on in the Condition Assessment Report.

This report is structured in a table format listing the issues with the allocated priority scaling per floor level.

The priority scale is based on:

- **High:** Immediate repair required
- **Medium:** Short term repair required – within next 2 years. Equipment / system operationally adequate – repairs and adjustments required.
- **Low:** Long term repair required. Equipment / system have minor concerns

Refer to Appendix A Part 2 and Part 3 from the Condition Assessment Report for the specific equipment locations and details as recorded during the site inspections.



2. SUMMARIZED PRIORITY TABLE

Ref.	Corrective Action	Elevator/ Escalator	By Whom	Priority
<u>General – Elevators Applicable for all Levels</u>				
1	Findings from Annex B (Comprehensive Report) report not attended to and signed after completion.	All	ACSA Maintenance	High
2	Internal lights faulty.	L2A L7A L7B L14A L14B L15A L16A L16B L17A L17B L18A L18B L32 L33 – Trolley Lift L34A L34B L35A L35B	ACSA Maintenance	High
3	Landing lights faulty.	L7A L14A L14B	ACSA Maintenance	High



Ref.	Corrective Action	Elevator/ Escalator	By Whom	Priority
		L15A		
4	Faulty/Missing buttons.	L6 L7A L14A L14B L15A L17A L18A L18B L32	ACSA Maintenance	High
5	Incorrect internal buttons.	L6 L17A	ACSA Maintenance	High
6	Cab floor level and landing floor level do not align.	L7A L15A L16A L16B L18A L35A	ACSA Maintenance	High
7	Faulty door.	L14A L15A L16A L16B L17A L17B L18A L18B	ACSA Maintenance	High



Ref.	Corrective Action	Elevator/ Escalator	By Whom	Priority
		L32 L35A L35A		
8	Control panel cabinets are unlocked.	L14A L14B L15A L16A L16B L17A L17B L18A L18B	ACSA Maintenance	High
9	Internal floor display panel faulty.	L33 – Trolley Lift	ACSA Maintenance	High
10	Intercom not working.	L32 L35A	ACSA Maintenance	High
11	Lose floor panel.	L2A L15A L16A L16B L17A L17B L18A L35A	ACSA Maintenance	Medium
12	Internal mirror missing.	L7B L34A	ACSA Maintenance	Medium



Ref.	Corrective Action	Elevator/ Escalator	By Whom	Priority
13	Internal balustrade missing.	L15A L16A L16B L17A	ACSA Maintenance	Medium
14	Incorrect/Missing signage.	L14A L14B L15A L16A L16B L17A L17B L18A L18B	ACSA Maintenance	Medium
<u>General – Escalators Applicable for all Levels</u>				
15	Findings from Annex B report not attended to and signed after completion.	All	ACSA Maintenance	High
16	Hand rails damaged.	AE15 AE16 AE17 AE18 AE19 AE20 AE36 AE37	ACSA Maintenance	High
17	Step comb groove has a sharp edge.	AE09 AE10	ACSA Maintenance	High



Ref.	Corrective Action	Elevator/ Escalator	By Whom	Priority
		AE17 AE18 AE19 AE20 AE34 AE35 AE36 AE37		
18	Step lights faulty.	AE09 AE10 AE11 AE12 AE15 AE16 AE17 AE18 AE19 AE20 AE34 AE35 AE36 AE37	ACSA Maintenance	Medium
19	Comb lights faulty.	AE15 AE16 AE19 AE20	ACSA Maintenance	Medium



Ref.	Corrective Action	Elevator/ Escalator	By Whom	Priority
20	Side skirting damaged.	AE09 AE10 AE20 AE34 AE35 AE36 AE37	ACSA Maintenance	Medium
21	Guide/Step plates worn.	AE11 AE12 AE15 AE16 AE17 AE18 AE19 AE20 AE34 AE35 AE36 AE37	ACSA Maintenance	Medium
22	Side/Skirting brushes damaged/missing.	AE09 AE10 AE11 AE12 AE17 AE18 AE34	ACSA Maintenance	Medium



Ref.	Corrective Action	Elevator/ Escalator	By Whom	Priority
		AE35 AE36 AE37		

HVAC

Priority Report

For

ACSA OR Tambo International Airport Terminal A Refurbishment Project

REPORT NO.	:	01
REVISION	:	01
PROJECT NO.	:	60476403
COMPILED BY	:	A van Eeden
DATE	:	11 July 2016



1. INTRODUCTION

This report is to summarize and add a priority scaling to the issues highlighted and commented on in the Condition Assessment Report.

This report is structured in a table format listing the issues with the allocated priority scaling per floor level.

The priority scale is based on:

- **High:** Immediate repair required
- **Medium:** Short term repair required – within next 2 years. Equipment / system operationally adequate – repairs and adjustments required.
- **Low:** Long term repair required. Equipment / system have minor concerns

Refer to Appendix C2 from the Condition Assessment Report for the specific equipment locations and details as recorded during the site inspections.

Ref.	Corrective Action	By Whom	Priority
7	A proper log or record keeping of any maintenance activities system should be implemented. This system would list all equipment as an assist and keep record of all maintenance actions performed on equipment, thus giving better insight for when unit is approaching end of expected life whether to be replaced or just refurbished.	ACSA HVAC Maintenance	High
<u>Basement Level (-1)</u>			
8	The chiller controls to be checked, as once the chilled water being supplied exceed the set point temperature of 7°C a second chiller should kick in to assist with the demand and reduce the chilled water temperature back to within the acceptable temperature range of approximately 5°C. This process of a back chiller kicking in and assisting in the load is not currently happening.	ACSA HVAC Maintenance	High
9	Habitable rooms and spaces fresh air ventilation design. Architect to assist with drawings as some of the spaces not shown on current layout.	 IKEMELENG	High
10	The basements extraction fans BB1 – BB5 to be inspected as to whether it is the fan faulty or the electrical wiring of the DB that is not functional.	ACSA HVAC Maintenance	High
11	The FCU in the ACSA Trolley Room pause area to be investigated as to whether it is the FCU itself not functional or the electrical wiring of the DB.	ACSA HVAC Maintenance	High
12	The broken down 4-way cassette unit (York) in the server room on the baggage handling side to be inspected and decided whether unit is to be fixed by refurbishment or simply replaced by a new unit.	ACSA HVAC Maintenance	High
13	Crisplant Mechanical workshop to be installed with a new ventilation system to match the type of work being conducted in this space, as the current system is inadequate		High
<u>Arrivals Concourse Level (0)</u>			



Ref.	Corrective Action	By Whom	Priority
	signage as to link the equipment and systems.	Maintenance	
23	AHU 24 in Plantroom 3 – Inspect and rectify the unit.	ACSA HVAC Maintenance	Medium
24	AHU 31 in Plantroom 2 – The operating schedule should be changed to accommodate the working hours of both occupants being supplied by the unit. Have the unit run from Monday to Saturday.	ACSA HVAC Maintenance	High
25	The AHU serving the Hotel should be inspected and the duct insulation that is badly damaged should be fixed / replaced.		Medium
<u>Toilet extraction Systems</u>			
26	Toilet ventilation system design for 6 toilets (missing fan) – Arrivals Mezzanine, International Departures and Departures Mezzanine Levels.		High
27	Toilet ventilation system design – Departures Mezzanine Level (3-A25/I1). Male and female toilets to be included.		High
28	Toilet ventilation – Dep mezzanine Female (3-A26/I1) . Architectural layout required as toilets not shown on the drawings.	 IKEMELENG	High

PHOTOS:

Refer to Appendices C from the Condition Assessment Report.



WET SERVICES

Priority Report

For

ACSA OR Tambo International Airport
Terminal A Refurbishment Project

REPORT NO.	:	01
REVISION	:	01
PROJECT NO.	:	60476403
COMPILED BY	:	J van Oordt
DATE	:	14 July 2016



ISSUE AND REVISION RECORD

Rev	Date	Originator	Checked by	Description
00	06 July 2016	J van Oordt		Issued for information



1. INTRODUCTION

This report is to summarize and add a priority scaling to the wet services issues highlighted and commented on in the Condition Assessment Report

This report is structured in a table format listing the issues with the allocated priority scaling per floor level.

The priority scale is based on:

High	Wet services infrastructure components in a critical condition / Non-conforming
Medium	Wet services infrastructure components in a dilapidated condition bad but not in a critical condition / Improvement required
Low	Minor concerns regarding wet services infrastructure components.

Refer to Appendices D from the Condition Assessment Report for figures and locations of the findings as recorded during the site inspections.



2. SUMMARIZED PRIORITY TABLE

Ref.	Corrective Action	By Whom	Priority
<u>General – Applicable for all Levels</u>			
1	The hot water supply needs to be insulated to conform to the SANS 204 standard for energy efficient buildings	ACSA Maintenance	High
2	Hot water generation system needs to be redesigned to limit the use of electrical resistance heating by implementing heat pump system or other heat recovery system in order to conform to the SANS 204 standard for energy efficient buildings.		High
3	Design review of PRV sizing, available back pressure and pipe supports. To be confirmed whether this is still an issue.		Medium
4	Notices to not flush any foreign materials down the toilet to be installed at ablution facilities that are regular affected by blockages due to the flushing of foreign materials.	ACSA Maintenance	Medium
5	Installation of water meters to monitor water consumption.	ACSA Maintenance	Low
6	Floor drains to be installed in pipe shafts and riser service shafts to enable drainage of accumulated water during blockages or services.		Low
<u>Basement Level (-1)</u>			
7	Investigate blockages of sump pump and prepare solution		High
8	Indicate “No loading area” on floor so that access to the isolation valves of the water main is not restricted.	ACSA Maintenance	Medium
9	Reroute drain pipe currently discharging water on the floor in service shaft in basement area (causing a slipping hazard), so that it discharges into nearby gully located in area -1/02 (-1-A14/P1).	 ACSA Contractor	Medium
10	Investigate reinstatement of lavatory located in area -1/03 (-1-A49/S2) that has been closed down.		Low
<u>Arrivals Concourse Level (0)</u>			
11	Lock that grants access to the service shaft to the north of (0-A48/C1) needs to be replaced with one that could be opened using the master key.	ACSA Maintenance	Low



Ref.	Corrective Action	By Whom	Priority
<u>Arrivals Mezzanine Level (1)</u>			
12	Install separate drains for the suspect holding area male and female ablutions facilities from those of the international departures ablutions located above.		Medium
<u>International Departures Level (2)</u>			
13	Design and install floor drains in the International departure level public area to drain the water from the frequent activation of sprinklers as well as for general cleaning purposes.		High
<u>Departures Mezzanine Level (3)</u>			
14	The two number of sewage pipes on the Departure mezzanine level (100 Ø from the small office ablutions located on Lower Roof Level that are not in scope area) that occasionally leaks through to the international check-in counters needs to be rerouted to the slope of the pipe are suitable for a drain pipes.		High
<u>Lower Roof Level (4)</u>			
15	No current issues that require corrective action	-	N/A
<u>Upper Roof Level (5)</u>			
16	Review of the maintenance schedule of mechanical equipment related to the domestic water supply storage tank, as well as spare parts and interchangeability records, to ensure that the system is adequately maintained.		Low
17	Samples of the water inside the domestic water supply storage tank needs to be tested for Legionnaires' disease on a regular basis	ACSA	High

PHOTOS:

Refer to Appendices D from the Condition Assessment Report

Project: TERMINAL A REFURBISHMENT AND REDEVELOPMENT
Assessment & Priority Report Sign Off

Mechanical Services (Including Lifts&Escalators, HVAC and Wet Services)

Name	Position	Signature	Date
[REDACTED]	ACSA Manager Buildings and	[REDACTED]	02/08/2016
[REDACTED]	[REDACTED]	[REDACTED]	
[REDACTED]	[REDACTED]	[REDACTED]	02/08/16
[REDACTED]	[REDACTED]	[REDACTED]	02/08/16
[REDACTED]	[REDACTED]	[REDACTED]	28/07/16
[REDACTED]	[REDACTED]	[REDACTED]	28/07/2016
Raymond Muya	ACSA HVAC	[REDACTED]	28/7/2016
[REDACTED]	Maintenance	[REDACTED]	28/7/2016
[REDACTED]	Maintenance	[REDACTED]	
[REDACTED]	[REDACTED]	[REDACTED]	
[REDACTED]	Infrastructure	[REDACTED]	

Important Note:

Representatives from the various ACSA User Departments acknowledge receipt of the Assessment & Priority Reports compiled by the consultant team (Ikemeleng Architects & AECOM) and confirm that the findings in the reports are a true reflection of the building and its various sub-systems.



Fire Protection

Priority Report

For

ACSA OR Tambo International Airport
Terminal A Refurbishment Project

REPORT NO. : 01
REVISION : 00
PROJECT NO. : 60476403
COMPILED BY : Nico Niehaus
DATE : 11 July 2016



ISSUE AND REVISION RECORD

Rev	Date	Originator	Checker	Description
00	11 July 2016	Nico Niehaus	L Swanepoel	First issue for information



1. INTRODUCTION

This report is to summarize and add a priority scaling to the issues highlighted and commented on in the Condition Assessment Report.

This report is structured in a table format listing the issues with the allocated priority scaling per floor level.

The priority scale is based on:

- **High:** Equipment in critical condition
- **Medium:** Equipment bad but not in critical condition
- **Low:** Equipment have minor concerns

Refer to Appendix E from the Condition Assessment Report for the specific equipment locations and details as recorded during the site inspections.



2. SUMMARIZED PRIORITY TABLE

Ref.	Subject	Corrective Action	By Whom	Priority
4.1	General	Based on the below all findings is based on visual inspection with limited access in certain areas. Requirements and proposed designs to be submitted to the Local Authority: Ekurhuleni Fire Department for scrutiny and approval thereof before final Fire Protection acceptance of the entire structure will be achieved. Based on the approval of Fire Protection Systems we proposed that all systems needs to be checked and tested as a unit in order to confirm and certify all. Fire Design Report with associated drawings needs to be submitted to the local authority for approval	ACSA Management	High
4.2	Safety Distances	Existing		N/A
4.3	Different Occupancies in a Building	Storage facilities have been created inside office spaces and therefore created a higher fire risk. Stacking heights also impeded on the fire installation which will have an effect on the operating methods of the proposed systems. In some circumstances empty gas cylinders is stored within the building. Due to the fact that the entire building is equipped with different occupancies we assume that all these tenant layouts have been approved at the Local Authority – Fire Department. Chaos in storage facilities needs to be addressed and stacking heights needs to be lowered.	ACSA Management	High



4.4	Division Area	All levels are linking with staircases from basement to top office levels. Areas do create lobbies but fire rating needs to be addressed. Division area has been addressed by means of fire protection systems being installed. Division area to be maintained.	ACSA Management & Tenants	High
4.5	Fire Performance	Existing – We assume that the building fire performances are compliant and within the previous required limits as per the approved fire protection designs referring to structural stability. Fire protection systems have been installed and been maintained on a regular basis with day to day faults to be addressed. In certain areas and levels doors are being wedged into the permanent open position which has a negative effect on the rule. This includes fire doors being damaged and removed. Fire performance to be achieved therefore all fire doors and walls to be replaced and repaired.	ACSA Management & Tenants	High
4.6	Fire resistance of occupancy-separating and division-separating elements	In certain areas and levels doors are being wedged into the permanent open position which has a negative effect on the rule. This includes fire doors as well as smoke and draft doors. This includes fire doors being damaged and removed. Fire resistance to be achieved therefore all fire doors and walls to be replaced and repaired.	ACSA Management & Tenants	High

4.7	Fire stability of structural elements	In certain areas and levels doors are being wedged into the permanent open position which has a negative effect on the rule. This includes fire doors as well as smoke and draft doors. This includes fire doors being damaged and removed. Exposed steel beams in basements to be fire protected to structural stability required in code of practice. Fire stability to be achieved therefore all fire doors and walls to be replaced and repaired.	ACSA Management & Tenants	High
4.8	Tenancy-separating elements	Existing – Fire doors & walls are damages and broken open. This includes fire doors being damaged and removed. All fire doors and walls to be replaced and repaired.	ACSA Management & Tenants	High
4.9	Partition walls and Partitions	Existing To maintain	ACSA Management & Tenants	Low
4.10	Protection of openings	Existing – Fire doors & walls are damages and broken open. This includes fire doors being damaged and removed. All fire doors and walls to be replaced and repaired.	ACSA Management & Tenants	High
4.11	Raised access and suspended floors of combustible material	Existing		N/A
4.12	Roof assemblies and coverings	Existing		N/A
4.13	Ceilings	Existing – Old and damaged	ACSA Management	Low
4.14	Floor coverings	Existing – Old and damaged.	ACSA Management	Low
4.15	Internal finishes	Existing To maintain	ACSA Management & Tenants	Low



4.16	Provision of escape routes	Existing routes in the entire building have been in place for a long time and all existing. The management of tenants and security relating matters are responsible for the provided escape routes not being compliant as doors are locked, obstructions being placed in routes, locking devices not approved as installed on doors etc. All escape routes to be free of any obstructions and all routes to be cleared.	ACSA Management & Tenants	High
4.17	Exit doors	Existing – Exit doors have been obstructed by security requirements as security gates have been installed preventing escape safely. Ironmongery has been removed and locking devices have been installed non-compliant with what is accepted. Break glass boxes have been installed with a key to use in case of emergency, whereby some boxes do not have a key anymore or the key does not fit the lock installed. All exit doors to be free of any obstructions and all routes to be cleared. Ironmongery and exit procedures to be in place for safe evacuation and escape through these doors.	ACSA Management & Tenants	High
4.18	Feeder routes	Existing To maintain	ACSA Management & Tenants	Medium
4.19	Emergency routes	Existing – Routes are being placed at risk as fire doors are wedged open and some doors totally removed. Minimum installation of handrails could be found as well. Emergency routes to be addressed therefore all fire doors and walls to be replaced and repaired. Handrails to be installed.	ACSA Management & Tenants	High
4.20	Dimensions of components of escape routes	Existing To maintain	ACSA Management & Tenants	Medium



4.21	Width of escape routes	Existing - Compliant with minimum width of 1100mm		N/A
4.22	Basements	Existing – Fire protection systems, Fire Resistance, Structural Stability and Integrity being affected. Fire stopping also to be addressed. Work to be maintained.	ACSA Management & Maintenance	Medium
4.23	Stairways and other changes of level along escape routes	Existing To maintain	ACSA Management & Tenants	Medium
4.24	Ventilation of stairways in an emergency route	Existing – We assume that the ventilation aspect for the staircases has been integrated into the existing staircase / building designs. No systems could be tested therefore we assume that all is in order. Systems to be tested.	ACSA Management & Maintenance	High
4.25	Pressurization of emergency routes and components	Existing – We assume that the ventilation aspect for the staircases has been integrated into the existing staircase / building designs. No systems could be tested therefore we assume that all is in order. Systems to be tested.	ACSA Management & Maintenance	High
4.26	Openings in floors	Existing - Opening to be fire stopped due to cabling being installed for other reasons. Work to be maintained.	ACSA Management & Maintenance	Medium
4.27	External stairways and passages	Existing To maintain	ACSA Management & Tenants	Medium
4.28	Lobbies, foyers and vestibules	Existing – Most of these areas is linking all levels of the building together and therefore open lobbies are created. We assume that these areas have been addressed in the approved fire designs. To be discussed and approved during Fire submission.	ACSA Management	Medium

4.29	Marking and signposting	Although existing signage is present, quantities has been addressed and found to be not compliant with code of practice. In certain areas signage have been removed. Signage is also limited to no visibility. Signage to be upgraded to compliant requirements.	ACSA Management & Maintenance	High
4.30	Provision of emergency lighting	Existing – We assume that the emergency lighting aspect for the entire building has been integrated into all areas. No systems were tested therefore we assume that all systems is non-compliant. Systems to be tested.	ACSA Management & Maintenance	High
4.31	Fire detection and alarm systems	Existing – Fire Detection sounders being broken and taped up was detected. Based on the entire system functional we assume that the fire detection system aspect for the entire building has been integrated into all areas. We have noticed that a few fire detection panels with faults being indicated that needed to be addressed. Due to changes and tenants being replaced, tenant layout changes and therefore some detection layouts / installation is out of rule. Protection distances have been interfered with as new walls have been installed and protected areas have been enlarged with bigger distances to cover. In certain areas no point detection has been installed. No systems were tested therefore we assume that all systems is non-compliant Systems to be tested.	ACSA Management & Maintenance	High
4.32	Provision and maintenance of fire-fighting equipment, installations and fire protection systems	Existing – Compliant Some instances the corrosion of piping is present due to leaking connections. Equipment to be serviced properly and leakage to be repaired.	ACSA Management & Maintenance	Medium



4.33	Water reticulation for fire-fighting purposes	Existing - We assume that all water supply is compliant Systems to be tested	ACSA Management & Maintenance	High
4.34	Hose reels	Existing – Compliant Some instances the corrosion of piping is present due to leaking connections. Although equipment has been serviced, some equipment has been removed from out of fire extinguisher boxes. Equipment to be serviced properly and leakage to be repaired.	ACSA Management & Maintenance	Medium
4.35	Hydrants	Existing - We assume that all water supply is compliant Systems to be tested	ACSA Management & Maintenance	High



4.36	Automatic sprinkler and other fixed extinguishing systems	The automatic sprinkler installation needs to be extended to ceiling level as no installation is present on International Departures Level. Sprinkler protection to be installed underneath ducting's in storage and operations room facilities. Areas such as conveyer belts leading to baggage handling area needs to be sprinkler protected. Sprinkler heads are damaged and pressed out of the ceiling space due to excessive weight on sprinkler piping sometime in the past. Sprinkler heads have been installed with protection caps below them on request from someone. Further to this have all these caps being painted and the operating procedures have been interfered with This means that paint needs to be burned away, then the link will activate to relieve the cap and only then the sprinkler head will activate if possible. The effect on the operation method of sprinkler head creates a concern. No systems were tested therefore we assume that all systems is non-compliant. An automatic sprinkler system needs to be installed in the Departures Hall of International Flights on ceiling level as well as in the ceiling void of this area. General maintenance to be adhered to as well.	ACSA Management & Maintenance	High
4.37	Portable fire extinguishers	Existing – Although these equipment have been serviced the general state of each needs to be addressed. In other areas equipment have been removed. Equipment to be serviced properly and leakage to be repaired.	ACSA Management & Maintenance	Medium
4.38	Mobile fire extinguishers			N/A

4.39	Fire-stopping of inaccessible concealed spaces	Existing – Compliant although general maintenance will have to be done as seals have been broken. Work to be maintained	ACSA Management & Maintenance	Medium
4.40	Protection in service shafts	Existing – Compliant although general maintenance will have to be done as opening exists horizontally as well as vertically. Work to be maintained	ACSA Management & Maintenance	Medium
4.41	Services in structural or separating elements	Existing – Compliant although general maintenance will have to be done. Work to be maintained	ACSA Management & Maintenance	Medium
4.42	Smoke control	Existing – We assume that the smoke control systems aspect for the entire building has been integrated into all areas. No systems were tested therefore we assume that all systems is non-compliant. Systems to be tested.	ACSA Management & Maintenance	High
4.43	Air-conditioning and artificial ventilation systems	Existing – We assume that the Air-conditioning systems aspect for the entire building has been integrated into all areas. No systems were tested therefore we assume that all systems is non-compliant. Systems to be tested.	ACSA Management & Maintenance	High
4.44	Lift shafts	Existing – Compliant although general maintenance will have to be done as seals have been broken. Work to be maintained	ACSA Management & Maintenance	Medium



4.45	Lifts	Existing – We assume that all lifts and relevant aspects for the entire building have been integrated into all areas. This means the interfacing of the lifts to all fire protection systems as well. We assume that none of the lifts have been equipped with fire doors and smoke seals until proven otherwise. No systems were tested therefore we assume that all systems is non-compliant. Systems to be tested.	ACSA Management & Maintenance	High
4.46	Fireman's lift			
4.47	Stretcher lift	Existing – We assume that all lifts and relevant aspects for the entire building have been integrated into all areas. This means the interfacing of the lifts to all fire protection systems as well. No systems were tested therefore we assume that all is in order. Systems to be tested.	ACSA Management & Maintenance	High
4.48	Stage and backstage areas			N/A
4.49	Seating arrangements in auditorium or halls and on grandstands			N/A
4.50	Parking garages	Existing – We assume that the smoke control systems aspect for the entire building has been integrated into all areas. No systems were tested therefore we assume that all systems is non-compliant. Systems to be tested.	ACSA Management & Maintenance	High
4.51	Operating theatres and intensive, high or critical care units			N/A
4.52	Installation of liquid fuel dispensing pumps and tanks	Existing To maintain	ACSA Management & Maintenance	Medium



4.53	Installation of other tanks	Existing To maintain	ACSA Management & Maintenance	Medium
4.54	Access for fire-fighting and rescue purposes	Existing - Compliant		Existing
4.55	Presumed fire resistance of building materials and components Work to be maintained	Existing - Compliant	ACSA Management & Maintenance	Medium
4.56	Building materials	Existing - Compliant		N/A
4.57	Single-storey category 1 buildings for H3 and H4 occupancies	Existing - Compliant		N/A
4.58	Guest house and bed and breakfast accommodation	Existing - Compliant		N/A
4.59	Health care facilities	Existing - Compliant		N/A



Electrical Installation – Low Voltage
Priority Report

For

ACSA OR Tambo International Airport
Terminal A Refurbishment Project

REPORT NO. : ●
REVISION : ●
PROJECT NO. : ●
COMPILED BY : ●
DATE : ●



ISSUE AND REVISION RECORD

Rev	Date	Originator	Checker	Description
00	04 July 2016			



1. INTRODUCTION

This report is to summarize and add a priority scaling to the issues highlighted and commented on in the Condition Assessment Report.

This report is structured in a table format listing the issues with the allocated priority scaling per floor level.

The priority scale is based on:

- **High:** Equipment in critical condition
- **Medium:** Equipment bad but not in critical condition
- **Low:** Equipment have minor concerns

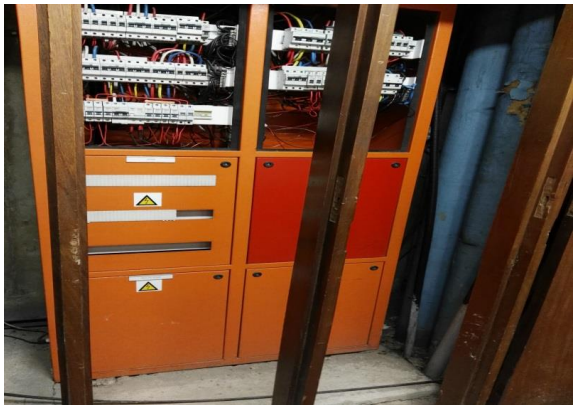
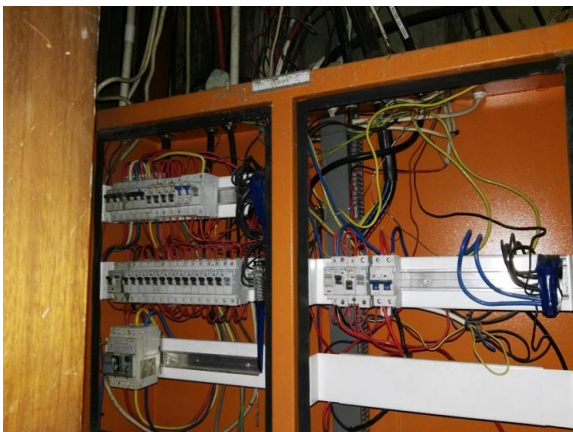
This report summarizes the Scope of Works for the following Electrical Systems;

- Low Voltage Distribution Boards
- Cabling Systems

Refer to the Condition Assessment Report for the specific details as recorded during the site inspections.



2. SUMMARIZED PRIORITY TABLE

Ref.	Corrective Action	By Whom	Priority
<u>General – Applicable for all Levels</u>			
1	Carry out Periodic Testing and Inspection of all Distribution boards. COCs will be required for all DBs. Remedial action to be carried out on the boards that don't comply as per SANS 10142-1 Annex P Set up a Periodic Testing and Inspection database to keep track on progress. The following boards require urgent remedial action; - A/C-DB- 207B – Departures Mez.:  - A/C DB-107B – Departures Mez.:  - DB-S1 – Basement	ACSA Electrical Infrastructure Maintenance	High



Ref.	Corrective Action	By Whom	Priority
2	Resolve Cabling Issues. - Add Containment where required - Tidy up Cabling - Split Power and Comms. Cabling - A photograph showing a chaotic arrangement of white and black cables bundled together and running horizontally above an orange electrical control cabinet. The cables are not organized or contained. A photograph showing a dense, disorganized bundle of thick black power cables and thinner orange communication cables running vertically along a wall or ceiling structure.	ACSA Terminal A Refurb Contractor	Medium



Ref.	Corrective Action	By Whom	Priority
3	Install sufficient Access Control to all main DB Rooms/Risers. Ether Card access or combination locks.	ACSA Terminal A Refurb Contractor	Medium
4	Introduce an Energy Metering System as part of the Green energy initiative.	ACSA Terminal A Refurb Contractor	Low



ELECTRICAL – LIGHTING AND SMALL POWER

Priority Report

For

**ACSA OR Tambo International Airport
Terminal A Refurbishment Project**

REPORT NO. : 

REVISION : 

PROJECT NO. : 

COMPILED BY : 

DATE : 



ISSUE AND REVISION RECORD

Rev	Date	Originator	Checker	Description
00				First issue for information



1. INTRODUCTION

This report is to summarize and add a priority scaling to the issues highlighted and commented on in the Condition Assessment Report.

This report is structured in a table format listing the issues with the allocated priority scaling per floor level.

For Lighting, the priority scale is based on:

- **High:** Luminaires/lamps in critical condition – require immediate attention.
- **Medium:** Luminaires/lamps in bad but not in critical condition – require attention soon.
- **Low:** Luminaires/lamps have minor concerns – require attention in the near future.

For Small Power, the priority scale is based on:

- **High:** Small power in critical condition – require immediate attention.
- **Medium:** Small power in bad but not in critical condition – require attention soon.
- **Low:** Small Power have minor concerns – require attention in the near future.

Refer to Appendix H from the Condition Assessment Report for the specific equipment locations and details as recorded during the site inspections.



2. SUMMARIZED PRIORITY TABLE FOR LIGHTING

Ref.	Corrective Action	By Whom	Priority
<u>Basement Level (-1)</u>			
1	Basement Parking 4/8 and 5/8: There are lamps which are not working in some part of the basement and should be replaced.	ACSA Electrical Maintenance	Medium
2	Magazine Storage: There are lamps which are not working and should be replaced	ACSA Electrical Maintenance	Medium
3	Trolley Repair Store: There are lamps which are not working and should be replaced in this store	ACSA Electrical Maintenance	Medium
4	Alcohol Store: There are lamps which are not working and should be replaced	ACSA Electrical Maintenance	Medium
5	Security Room: There are lamps which are not working and they should be replaced. More luminaires needs to be installed in order to meet the minimum required lux levels.	ACSA Electrical Maintenance/ Project Team	High
6	Camera and Accessories Store: There are lamps which are not working and should be replaced. More luminaires should be installed in order to meet the minimum required lux levels.	ACSA Electrical Maintenance/ Project Team	High
7	Clothing Store: There are lamps which are not working and should be replaced.	ACSA Electrical Maintenance	Medium
8	Menzies Aviation Office: Most of the lamps are not working and should be replaced.	ACSA Electrical Maintenance	High
9	Luggage Area Entrance: There are few lamps which are not working and they should be replaced.	ACSA Electrical	Low



Ref.	Corrective Action	By Whom	Priority
		Maintenance	
10	Luggage Area: There are few lamps which are not working and they should be replaced.	ACSA Electrical Maintenance	Low
<u>Arrivals Concourse Level (0)</u>			
11	Stair Cases: There are few lamps which are not working and should be replaced.	ACSA Electrical Maintenance	Low
12	Ablutions: There are few lamps which are not working and should be replaced.	ACSA Electrical Maintenance	Low
<u>Arrivals Mezzanine Level (1)</u>			
13	Stair Cases: Most of the lamps are not working and should be replaced. More luminaires need to be installed in order to meet the minimum required lux levels	ACSA Electrical Maintenance/ Project Team	High
14	1/10 Office 4: There are few lights which are not working and should be replaced	ACSA Electrical Maintenance	Medium
15	1/10 Office 6: Most of the lamps are not working and should be replaced.	ACSA Electrical Maintenance	High
16	Passage 3: There are few lamps which are not working and should be replaced.	ACSA Electrical Maintenance	Medium
<u>International Departures Level (2)</u>			
17	Ticket Office 1: There are few downlights which are not working and they should be replaced. Downlights not suitable for office space and should be replaced.	ACSA Electrical Maintenance/ Project Team	Medium



Ref.	Corrective Action	By Whom	Priority
18	Ticket Office Passage: There are lamps which are not working and should be replaced. More luminaires needs to be installed in order to meet the minimum required lux levels.	ACSA Electrical Maintenance/ Project Team	Medium
19	Check-In Counters: All luminaires should be properly maintained (Luminaires were very dirty during inspections, they should be maintained in accordance with manufacturers recommendations).	ACSA Electrical Maintenance	High
20	Ticket Office 2: Luminaires not suitable for an office space. More lights needs to be installed in order to meet the minimum required lux levels.	ACSA Electrical Maintenance/ Project Team	High
21	Circulation: Most of the lamps are not working and they should be replaced.	ACSA Electrical Maintenance	High
22	Toilet: Some of the lamps are not working and should be replaced.	ACSA Electrical Maintenance	Low
23	Departure Hall: There are lamps which are not working and should be replaced.	ACSA Electrical Maintenance	Medium
<u>Departures Mezzanine Level (3)</u>			
24	Etihad Offices: There are lamps which are not working and they should be replaced.	ACSA Electrical Maintenance	Medium
25	Management Open Plan Offices: There are lamps which are not working and should be replaced	ACSA Electrical Maintenance	High
26	Singapore Open Plan Office: There are few lamps which are not working and they should be replaced. Switch is not working, lights are always on, and it should be fixed.	ACSA Electrical Maintenance	Medium



Ref.	Corrective Action	By Whom	Priority
27	DB Room: There is no switch, lights are always on, there should be a switch installed	ACSA Electrical Maintenance	Low
28	SAUDI Offices: There are few lamps which are not working and they should be replaced.	ACSA Electrical Maintenance	Medium
29	Kitchen: There are few lamps which are not working and they should be replaced	ACSA Electrical Maintenance	Low
30	Offices 1-6: Most of the lamps are not working in most of the offices and they needs to be replaced.	ACSA Electrical Maintenance	High
<u>Lower Roof Level (4)</u>			
31	Security Compliance Office: There are lamps which are not working and they should be replaced.	ACSA Electrical Maintenance	Medium
32	Toilet: There are lamps which are not working and they should be replaced	ACSA Electrical Maintenance	Medium
33	Open Plan Offices: There are lamps which are not working and they should be replaced.	ACSA Electrical Maintenance	Medium
34	Weather Services Kitchen: Most of the lamps are not working and they should be replaced.	ACSA Electrical Maintenance	High
35	Board Room: There are few lamps which are not working and they should be replaced.	ACSA Electrical Maintenance	Medium
36	Stair Cases: There are lamps which are not working and should be replaced.	ACSA Electrical	High



Ref.	Corrective Action	By Whom	Priority
		Maintenance	
37	Turkish Airlines Offices: There are many lamps which are not working and they should be replaced	ACSA Electrical Maintenance	High
38	Air-China Offices: There are few lamps which are not working and should be replaced	ACSA Electrical Maintenance	



3. SUMMARIZED PRIORITY TABLE FOR SMALL POWER

Ref.	Corrective Action	By Whom	Priority
<u>Basement Level (-1)</u>			
1	Kitchen: Socket outlets are ageing in the kitchen, they should be properly maintained	ACSA Electrical Maintenance	Medium
2	Security Room: Power skirting should be maintained on regular intervals and should be tied up properly, all missing enclosures should be replaced	ACSA Electrical Maintenance	Medium
<u>Arrivals Concourse Level (0)</u>			
<u>Arrivals Mezzanine Level (1)</u>			
3	Security Offices: There should be more socket outlets in the security office as they did not have sufficient socket outlets at the time of inspections.	ACSA Electrical Maintenance/ Project Team	High
4	1/10 Office: There are loose cables next to socket outlets in this office; they should be tied up properly as they can be a tripping hazard.	ACSA Electrical Maintenance	High
<u>International Departures Level (2)</u>			
5	Ticket Office (2/04): There should be more sockets outlets installed in this office as the ones which are installed are not sufficient. The power skirting is old, all loose enclosures should be closed and the power skirting should be properly maintained.	ACSA Electrical Maintenance/ Project Team	High
6	British Airways Ticket Office: Power skirting on ticket purchase desks is ageing and falling apart, it should be replaced.	ACSA Electrical Maintenance/ Project Team	Medium



Ref.	Corrective Action	By Whom	Priority
<u>Departures Mezzanine Level (3)</u>			
7	Management Open Plan Offices: Power skirting is ageing, dirty and it is falling apart in this office, it should be replaced. Socket outlets are insufficient, there should be more installed.	ACSA Electrical Maintenance/ Project Team	High
8	Singapore Open Plan Office: There are too many loose cables on the floor which maybe a tripping hazard, they should be tied up properly. There should also be more socket outlets installed	ACSA Electrical Maintenance/ Project Team	High
<u>Lower Roof Level (4)</u>			
9	Security Compliance Office: There are too many loose cables which need to be tied up next to the socket outlets.	ACSA Electrical Maintenance	High
10	Air-China Offices: There should be more normal socket outlets on this office. Currently they have too many dedicated socket outlets which they don't need.	ACSA Electrical Maintenance/ Project Team	High

4. CONCLUSION

We would like to recommend the use of the LED luminaires for the whole of Terminal A Building. This would be cost saving and energy saving solution. LEDs will consume far less energy and long life and ease maintenance them compared to what is currently installed (T5, T8 and CFL lamps). Project team will be responsible for the selecting the right type of LEDs and also the lighting design.

Sockets outlets and power skirting in most areas are very old, new small power points should be provided for. Project team will be responsible for the design of all small power points and installation.



ICT
Priority Report

For

ACSA OR Tambo International Airport
Terminal A Refurbishment Project

REPORT NO. : [REDACTED]
REVISION : [REDACTED]
PROJECT NO. : [REDACTED]
COMPILED BY : [REDACTED]
DATE : [REDACTED]



ISSUE AND REVISION RECORD

Rev	Date	Originator	Checker	Description
00				



1. INTRODUCTION

This report is to summarize and add a priority scaling to the issues highlighted and commented on in the Condition Assessment Report.

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- **Low:** Equipment have minor concerns

Refer to the Condition Assessment Report for the specific details as recorded during the site inspections.



2. SUMMARIZED PRIORITY TABLE

Ref.	Corrective Action	By Whom	Priority
<u>General – Applicable for all Levels</u>			
1	New cable routes needs to be installed and CAT6A shielded twisted pair cables needs to be installed due to electrical cables in cable racks and EMI in ceilings.	ACSA IT Infrastructure Contractor	Low
2	Wire Centre's needs drastic housekeeping. This will safeguard the maintenance going forward.	ACSA IT Infrastructure Maintenance	Low
3	Equipment Rack clean-up to free up rack space and tidy up of racks	ACSA IT Maintenance	Low
<u>Lower Roof Level (4)</u>			
4	Wire Centre 16A needs to be renovated/rebuild. Most of the floor tiles are not in position and this creates a health risk to people working in this space. Housekeeping needs to be done. The lights in this room is also not functioning which makes it even more dangerous.	ACSA IT Infrastructure Maintenance	High
5	Wire Centre 16B needs drastic housekeeping. Using this space as storage creates a fire risk.	ACSA IT Infrastructure Maintenance	Medium



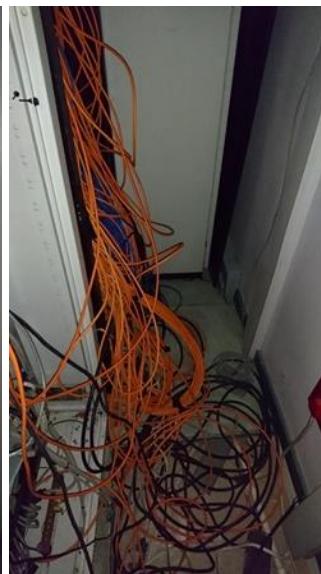
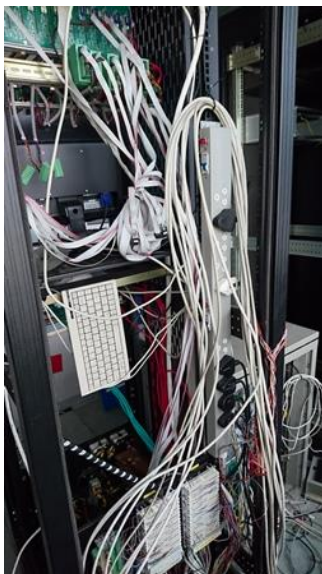
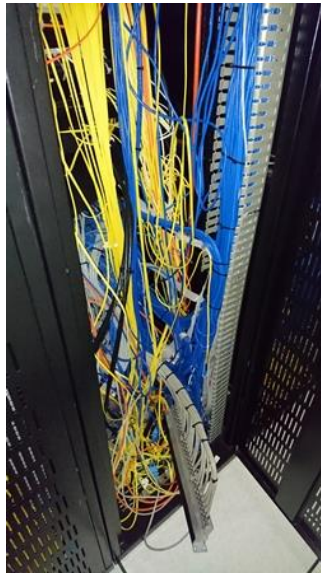
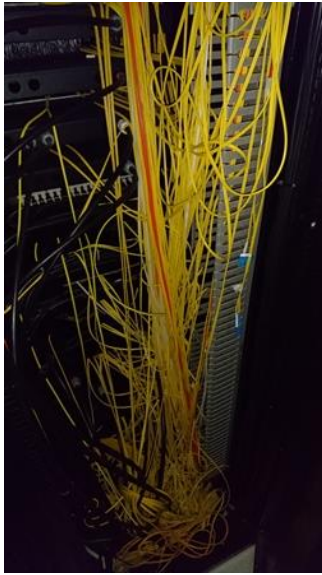
PHOTOS:

Cable Routes



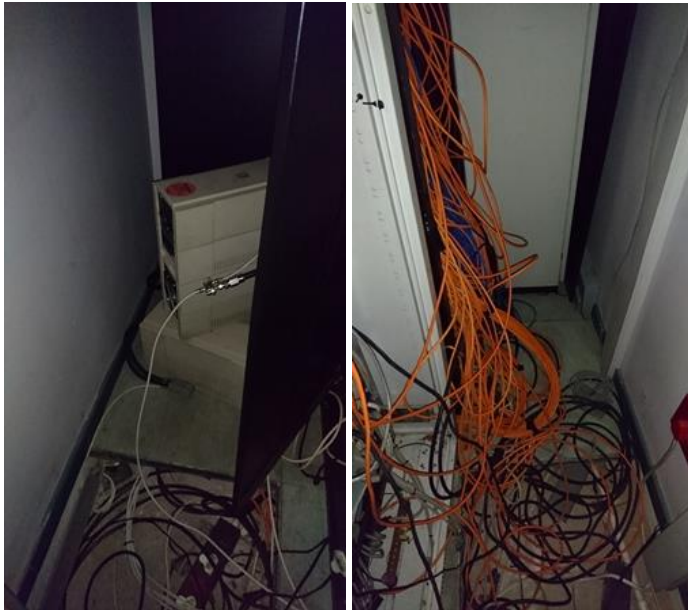


Equipment Racks



Wire Centre 16A



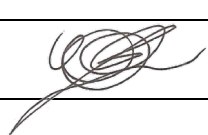


Wire Centre 16B



Project: TERMINAL A REFURBISHMENT AND REDEVELOPMENT
Assessment & Priority Report Sign Off

Electrical

Name	Position	Signature	Date
[REDACTED]	Facilities Maintenance		
[REDACTED]	Maintenance		
Vusi D. [REDACTED]	ACSA Building Maintenance		
P. [REDACTED]			
[REDACTED]			
[REDACTED]	Maintenance		
[REDACTED]			
[REDACTED]	Maintenance		
[REDACTED]	SA M. [REDACTED]		
[REDACTED]	Maintenance		11 August 2016
[REDACTED]			
[REDACTED]	Infrastructure		

Important Note:

Representatives from the various ACSA User Departments acknowledge receipt of the Assessment & Priority Reports compiled by the consultant team (Ikemeleng Architects & [REDACTED]) and confirm that the findings in the reports are a true reflection of the building and its various sub-systems.

18 Appendix J – ACSA Energy Management: Lighting Consumption

Introduction

This report will cover the comparison between the currently installed light fittings and the proposed new light fittings. The comparison will assist in determining the energy savings that would be achieved if the proposed new energy efficient lights were used.

All light fittings for all levels will be added together in order to calculate the total connected load and also the estimated load for the recommended light fittings. The estimated annual financial savings is then calculated.

Terminal A: Existing Light Fittings and Proposed New Lights

Existing Light Fittings

Most of light fittings which are installed in the Terminal A have T8 Lamps which are not energy efficient and have a shorter life span. Other types of light fittings are compact fluorescents, which are also not energy efficient. There are few areas which have LED light fittings installed. The table below has the summary of all light fittings which are currently installed in the Terminal A (All levels).

Table 12: Estimated lighting load for existing light fittings

Type of Light Fittings	Wattage	Quantities	Total Wattage
3x36W 600x1200mm Recessed Fluorescent Panel	108W	936	101 088W
3x18W 600x600mm Recessed Fluorescent Panel	54W	1025	55 350W
70W 600x1200mm Recessed LED Panel	70W	42	2 940W
2x36W Weather Proof Light Fittings / Open Channels	72W	748	53 856W
2X58W Weather Proof Light Fittings/ Open Channels	116W	637	73 892W
30W LED Downlight	30W	175	5 250W
2x18W CFL Downlight	36W	1127	40 572W
TOTAL			332 948W

Recommended Light Fittings

Recommended light fittings which are all LED light fittings are energy efficient and they have a longer life span (approximately double the life span of the currently installed light fittings). The table below has the estimated load for the recommended light fittings.

Table 13: Estimated electrical load for the recommended light fittings

Type of Light Fittings	Wattage	Quantities	Total Wattage
70W 600x1200mm Recessed LED Panel	70W	988	69 160W
36W 600x600mm Recessed LED Panel	36W	1072	38 592W
48W LED Weather Proof Light Fittings	48W	785	37 680W
60W LED Weather Proof Light Fittings	60W	651	39 060W
52W LED Downlight	52W	175	8 944W
10W LED Downlight	10W	1191	5 739W
70W LED Disk	70W	44	3 080W
TOTAL			202 255W

Conclusion

The currently connected electrical load for lighting is approximately 332,9 kW which will be reduced to 202,25 kW with the implementation of more energy efficient LED lighting. This means the load will be reduced by 130,69 kW.

This will equate to a possible saving of **R 1 631 440.72** per annum. This is based on an average 18 hour day for all lighting. (130.69kW x 1.90kW/h x 18hrs x 365 days)

This presents a payback period of 4-5 years.

These light fittings will not only reduce the energy consumed, there will also be less maintenance required. Installed luminaires (T8 Lamps) have a life span of approximately 25 000 hours with the new fittings having a life span of approximately 50 000 hours. This means that the life span of the new light fittings have double the life span that of the currently installed light fittings which will also present a significant saving in maintenance cost.

About

ld. We design

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companies had revenue of approximately US\$10 billion

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