



IT Infrastructure Standards and Specifications

Annexure D

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1. Governance

- Prior to any procurement by the Service Provider, a low-level design is to be presented to ACSA IT Management, Technical Leads and Infrastructure Program Manager, for review and approval.
- Following the above process will ensure the ACSA standards have been interpreted correctly, and there will be no challenges in handing over from project to operations
- Technical leads will sign off all gateway approvals, for the project and Service Provider to move from one project phase to the next
- All designs to be accompanied by a detailed bill of materials which will be signed off
- All project work requires ITAC and CAB approvals

2. Physical infrastructure

2.2. Trenching

The following design rules apply to all new installations for mechanical trenching and maintenance of duct pipe and direct buried fibre optic cables or pipes are to be installed below ground level, Inroad kerbstone or onto a solid structure such as road crossing, bridges conditions.

2.2.1. GPRS standard minimum depths

- The standard minimum ground cover required for ground penetration radar scanning is:
 - 450 x 40 mm new fibre duct lines in off roads conditions
 - 200 x 15 mm for new fibre duct lines in kerbed roads (i.e. where there is a possibility of road reforming or grading of the road edge)

2.2.2. Mechanical trenching – off road

- The minimum ground cover as detailed in section 3.2.1 above can be reduced for suburban build to 400 x 40 mm where it is practical and within local authority way leave conditions.
- This reduced minimum cover is only allowed when a special protection cover of a concrete mortar mix is used, this mortar is re-excavatable, self-compacting and permeable.
- This concrete mortar protection cover should be a minimum of 150 mm in depth. This concrete mortar must have a red pigment in it. Warning tape is to be installed immediately above the concrete protection layer.

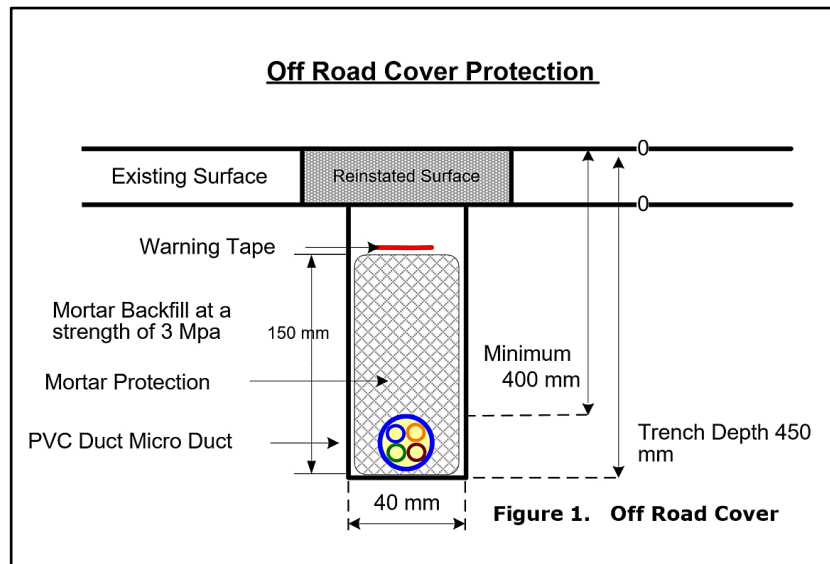


Figure 1 Off road cover protection

2.2.3. Micro kerbstone trench depths

- Inroad Kerb stone micro trenching, 200 mm x 15 mm is considered the minimum acceptable cover for fibre micro duct cable, allowing small overs and unders. Where practical the target cover should be 170 mm.

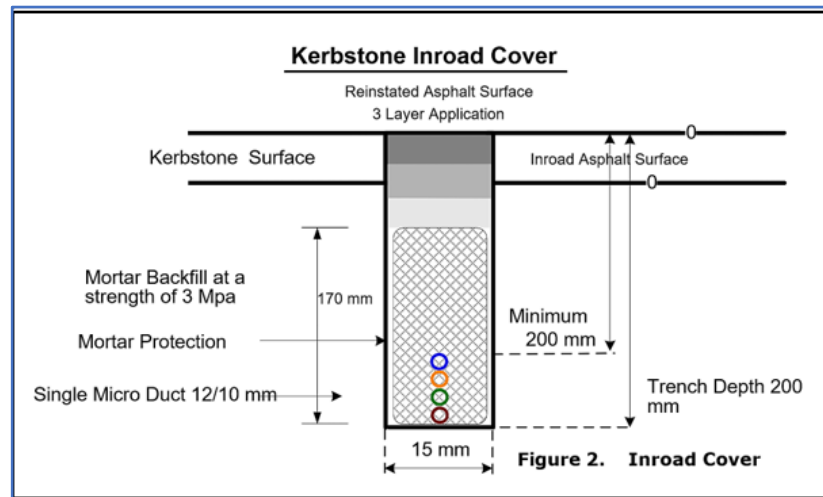


Figure 2 Kerbstone Inroad Cover

- Micro Kerbstone depths is referenced within local authority way leave conditions. Concrete mortar mix is used, this mortar is re-excavatable, self-compacting and Permeable.
- This concrete mortar protection cover should be a minimum of 170 mm in depth. This concrete mortar must have a red pigment in it.

2.2.4. Micro pavement trench depths

- Micro trenching in interlocking block pavements shall be 200 mm x 15 mm and is considered the minimum acceptable cover for fibre micro duct cable, allowing small overs and unders. Where practical the target cover should be 170 mm.
- Micro Kerbstone depths is referenced within local authority way leave conditions. concrete mortar mix is used, this mortar is re-excavatable, self-compacting and Permeable. This concrete mortar protection cover should be a minimum of 170 mm in depth. This concrete mortar must have a red pigment in it.

2.3. Fibre Cabling

- Covering Sheath Colour: ORANGE
- Flame retardant cables or low smoke zero halogen protective outer casing.
- Installations to adhere to TIA/EIA568-B standards.
- UPC connectors are deployed in transport systems designed for digital signal transport, while APC connectors are preferred for RF video signal transport.
- For systems such as RF video and high fibre sensitivity applications, the APC connector is preferred because these particular systems are extremely sensitive to any back reflections from connectors within the network.
- Number of patches to be kept to a minimal at all times.
- Max number of connections points per permanent link on campus backbone [core – core]: 4
 - [core device - patch cable - patch panel - horizontal cable -patch panel - patch cable - distribution device].
- Max number of connections points per permanent link on campus backbone [core - distribution]: 4
 - [core device - patch cable - patch panel - horizontal cable - patch panel - patch cable - distribution device].
 - [core device - patch cable - patch panel - horizontal cable - patch panel - patch lead - patch panel - horizontal cable - patch panel - patch cable - distribution device].
- Max number of connections points per permanent link on building backbone[distribution – access – end device]: 6
 - [core device - patch cable - patch panel - horizontal cable - patch panel -patch lead - patch panel - horizontal cable - patch panel - patch cable - distribution device].
- Max number of splices / joints on a channel link before replacement: 3 [subject to confirmation of db loss on cable]
- Standard campus backbone / building backbone / horizontal cabling: Optical Single mode 2 (OS2) Orange Sleeve.
- Patch Leads: OS2 Yellow and Optical Multimode 4 (OM4) Purple and Aqua Blue only [less impurities in core].
- Indoor fiber must have warning labels every 15m along its route and at every cable entry and exit point.
- Outdoor fiber must have warning labels every 15m along its route and at visible point (i.e. Manhole & junction box, cable entry and exit point.) along its route.

- As a minimum standard all campus distribution layer, the cabling must be as per the below fiber specification:
 - Indoor Blown Fibre Standard:
 - Option A = 12 core single mode blown fibre
 - Option B = 24 core single mode blown fibre
 - Option C = 48 core single mode blown fibre
 - Option D = 96 core single mode blown fibre
 - Option E = 192 core single mode blown fibre
 - Standard duct size and colour orange:
 - Option A = 4 way Micro-duct
 - Option B = 7 way Micro-duct
 - Option C = 12 way Micro-duct
- As a minimum standard all conventional fibre cores for from distribution lay to end point termination cabinet the cabling must be as per the below Fiber Spec:
 - Option A = 12 core single mode
 - Option B = 24 core single mode
 - Option C = 48 core single mode
 - Option D = 96 core single mode
 - Option E = 192 core single mode
- Long runs indoor : Single Mode=9 micron core. Cladding diameter = 125um. Min supported length=5000m @1G / 10G
- Devices within a room: Multi mode = +50 micron core [OM4]. Multi-mode = 62.5 micron core [OM1]. Cladding diameter = 125um.
- Max 300m distance @10g. Orange jackets =OM1/OM2. Aqua Jackets=OM3/OM4.
- Multimode:

Transmission Standards	100 Mb Ethernet	1 Gb (1000 Mb) Ethernet	10 Gb Ethernet	40 Gb Ethernet	100 Gb Ethernet
OM1 (62.5/125)	up to 550 meters	220 meters (SX)	33 meters (SR)	Not supported	Not supported
OM2 (50/125)	up to 550 meters	550 meters (SX)	82 meters (SR)	Not supported	Not supported
OM3 (50/125)	up to 550 meters	550 meters (SX)	300 meters (SR)	100 meters	100 meters
OM4 (50/125)	up to 550 meters	1000 meters (SX)	>400 meters (SR)	150 meters	150 meters

- Modular fiber cabling systems must be OM4 standard. Frame mountable.

	Single mode	Multi-Mode
Insertion Loss	0.25db	0.2db
Return Loss	>60db	>30db

- Open trenching: heavy duty duct construction cable and armored cable required. Inner ducts [rodent free] must be used for all fiber in open trenching. Use 3 x 32mm inner ducts hosted in a 110mm pvc duct [capable of carrying 3x96core cables].
- Covering Sheath: UV resistant. High impact resistant. Flame retardant. Water resistant, rodent free.
- Usage at Roadway crossings – 110mm Corrugated PVC Rodent free.

- Minimum of 250 depth and covered with concrete.
- Ceramic tip connectors, UV curable, <3Db loss with load on fiber axial. Ip44.
- Fiber-inter connections or distribution units: Preferably 40-degree angled connection panels (stress relief on bend). 24 port patch panels.
- Dust covers or dust caps for unused slots
- Operating temp: -40degrees to 70degrees
- Test docs: continuity and maintenance of polarity, length, propagation delay, optical attenuation of link (2 wave lengths/2 directions) using light source and power meters. Test to be performed at 10G ratings. Test results must be recorded by power meter and not handwritten [FLUKE meter required]. Using ODF's. (Fibre Frame)
- Return loss max: - 45db
- No incomplete splicing in manholes where restriction of closing runways may affect works.
- Use bend control accessories during installation: min bend radius = 20 X cable diameter
- With long run fibre Tank Dome Joints are required to be used.
- Dome Joints need to be fixed with a bracket/s inside Manholes.

2.4. Fiber Splicing and termination

2.4.1. Indoor fibre requirements

- Arc fusion splicing.
- Splice loss = <0.03db.
- Loss per 200m = <0.07db.
- 30mm sheath visible past the end of the entry gland for fiber patch panel.
- 925mm of removed outer sheath coiled in clockwise direction on spool.
- 300mm slack before entry gland to allow removal of fiber panel.
- Pigtails to be wrapped counter clockwise.
- All splices must be covered by splice protection sleeves.
- Buffer lengths are per cable manufacturers specifications.
- Fibers must be organized into a fiber splice chip by colours or numbers for future amendments. Chip cover to be labelled appropriately.
- Splicing done within dust proof / external particle free environment.
- All fiber joints to be enclosed within watertight / air – tight housing. Housing to have durable labels.
- Sufficient slack in every manhole – mounted coil boxes at each manhole to coil up slack cabling.
- All ports to be cleaned by Isopropyl alcohol.
- Dome joint junction boxes required for ring networks and outdoor usage. Full updated documentation / legends per patch station.
- Termination boxes in office spaces: LC 6 port termination boxes. IP66 rated +-200mmX200mmX30mm
- Plug and play 12port termination LC OEM-4 units only acceptable. Rack mountable.

2.4.2. Outdoor fibre requirements

- No through splices at individual WC's or termination points
- Direct splicing required on 2 separate fibre panels (Route A & B)

2.5. Long Distance end device locations

- Power over fibre (PoF) solution

2.6. Long range solution

- Indoor and outdoor PoE extenders
- 1x extender from cabinet to end device.
- Max distance 200m

2.7. Copper Cabling (Cat7 ORANGE SOLID CABLE)

- Colour: Orange for horizontal runs within Type A/B/C rooms.
- Colour: Orange for patch leads.
- Within Type A rooms = Cat7 S-Ftp LSZH 10G 750MHZ
- Within Type B rooms = Cat7 S-Ftp LSZH 10G 750MHZ
- Within Type C rooms = Cat7 S-Ftp LSZH 10G 750MHZ
- Between Servers, Storage and network device uplinks to the network = Cat7 S-Ftp LSZH 10G 750MHZ
- Horizontal Cables = Cat7-SFTP LSZH = Supportive of 10 000mb/s (10G)@>750MHz
- Current revision date – June 2011. Next revision – Jan 2014
- Meet or exceed ISO/IEC 11801 Cat6a or Cat7 component requirements.
- CAT7-SFTP = 4 pair-23 American Wire Gauge (AWG) copper cable wires, 100 ohms, shielded twisted pairs, RJ45 connectors. Foiled twisted Pairs – each pair enclosed in laminated aluminium foil minimizing crosstalk. Outer braiding minimizing alien cross talk.
- Cable properties to ensure max resistance against electromagnetic interferences and alien crosstalk
- LSZH - Low smoke. Zero halogen cable properties. FRNC- Flame retardant and non-corrosive cable properties.
- Max cable diameter: less than 7.5mm
- Outdoor Cabling must have UV protection and IP66 rated connections and junction points.
- Operating temperatures: -20degrees to + 60degrees

- Use conduit / trunking if exposed to sunlight or higher than 50degree temperatures. Use conduit / trunking for all outdoor applications.
- Max number of connections between access layer switch and end device from a wire centre: 4
 - [switch - patch lead - patch panel - horizontal cable - termination box - patch lead - device].
- Max number of connections between access layer switch and end device within a secondary data center or core centre: 4
 - [switch - patch lead - patch panel - horizontal cable - patch panel - patch lead - device].
- Max number of connections between access layer switch and end device within a primary data centre: 6
 - [switch - patch lead - patch panel - horizontal cable - patch panel - horizontal cable - patch panel - horizontal cable - patch panel - patch lead - device].
- Max single copper run (between patch panel and termination box): 90m
- Max patch lead length for workspaces: 10m
- Max total distance for copper run = 100m including patch and fly leads.
- Each cable run from patch panel to floor connectors must be continuous with no breaks or joints. No joints will be accepted.
- 7 strand patch leads will only be used in workspace areas [no more than 20%db loss on channel performance allowed].
- Solid Conductor patch cables [horizontal cables] to be used as patch leads in data rooms.
- Note: Possible 20% loss on permanent links. -4db =80% loss. 7 strand patch cable=20% db loss.
- Test docs: wire map / length / attenuation / near end cross talk loss on permanent links and not channel links.
- Only “permanent link” test results will be accepted
- Avoid interferences like routing around air conditioning units.
- Patch leads loses 20% db – made up of 7 cables only. Consider using horizontal cables for patch leads only.
- Link Runner test to only for troubleshooting and to determine VLAN and connection
- FLUKE Copper test results required for new installations and to be submitted with handover/sign off.

2.8. Patching

- Leads to adhere to latest ANSI/TIA/EIA-569-B standards – with factory fitted 8 pin connectors.
- Each cabinet will be represented by a patch panel with Primary and Secondary datacenters.
- Every primary data center must have a distribution interconnect cabinet. (Passive Cabinet) Dedicated fibre and copper cabinet eg. ODF
- Wire centers will run from patch panel directly to switch – single cross connections.
- Copper patch leads to be factory terminated and distance specific – minimum slack.
- Factory supplied patch leads to be only used at work area cabling zones [user end- min slack.

- Fiber patch runs will be above cabinets – 1st fiber panel will be mounted at the top of cabinet.
- Patching: overhead fiber trays for fiber cables between cabinets.
- Copper patch runs will overhead if possible be under cabinets – 1st copper panel will be at the bottom of the cabinet.
- Should fiber and copper be in the same cabinet – Fiber panels will be mounted first from top and first copper panel will be from bottom up.
- All cables to be patched downwards into brush panels below in wall mount cabinets and outdoor cabinets only.
- Labels on patch panel to be visible as per labelling standards.
- Looms/ bundles of 24 to start from patch panel. Jacket removal point to be kept to minimum - not to compromise cable integrity. Jackets to remain up to connecting block – twists to remain up to connecting points [0mm untwist].
- Patch connectors to be positioned correctly into patch panels without any stress on the cable or additional twists– no forcing connectors place.
- Cable bending not exceeding 35mm radius in fiber and 65mm in copper. 10 x outer diameter for fiber.
- Strain relief boot clips must be used [preferably colour coded as below]
 -].
- Fiber patch leads to be factory terminated - supplied with distances closest to requirements

2.9. Patch Panels and Consolidation Points

- Copper: 24 port panels. Shielded patch panels where applicable.
- Fiber: 24 port panels. Environment temperature: -40~+80° C. Insulated Resistance: $\geq 21 \times 10^9 \Omega / 500V$ (DC). Fiber bending radius: $\geq 40mm$
- Consolidation points: 8 / 16 / 24 blocks installed along cable route FOR OFFICE SPACES ONLY [horizontal cabling outside the room].
- Every consolidation block will have a unique number per site. Used for office spaces where 1 point for every 4m².
- Horizontal Distribution Points: In a room must be centrally located between active equipment allowing patch leads to be connected.
- 1rack unit (1U) rack mounted patch panels. 19 inch wide. >1 000 repeated wire insertions without incurring permanent deformations.
- Fiber: Interchangeable adapter plates - LC adapters only.
- Copper: RJ45 patch panels. CAT 7 shielded sockets. Gold plated contact elements.
- Cables to be routed from patch panels in bundles of 24.
- Panels to be mounted >150mm from front door of cabinet.
- Adequate label space above for each port
- Patch cables loop below/downwards from patch panel into brush panels
- Colour: Black Patch panels

- To be earthed. Gold contacts.
- Entry Glands / support guiders on rear left and rear right sides of panels.
- Fiber panels will be above copper panels if in the same cabinets.
- Type-A Room: Passive Cabinets – shielded copper patch panels. Separate copper and separate fiber distribution cabinets.
- Type-B Room: Passive Cabinets – shielded copper patch panels. Separate copper and separate fiber distribution cabinets.
- Type-C Room: Active and Passive Cabinets - shielded copper patch panels where applicable if STP cables used (eg: Fiber on 42U downwards Copper on 35U downwards– refer to drawing on cable management).

2.10. Floor / terminations boxes / plugs or end point connections

- Indoor cabling installations
- Offices: dual port recessed panels fixed against floor trunking [RJ45]. Blanking panels for unused ports.
- Ceilings / areas with no trunking: single port surface mount boxes [RJ45].
- Gold plated contact elements.
- Shielded keystones where applicable – compulsory where SFTP cables are required.
- Termination Panels [1U patch panel – to be located centrally to active equipment requiring copper connectivity] required if devices are in same wire centre as access switch.

2.11. Outdoor Cabling Installations

- IP66 rated interchangeable keystones and connection joints for outdoor points.
- Eg. Telegartner & Waterproof RJ45
- IP66 Rated Junction boxes to house Wallboxes and Keystones.
- All Wallboxes and Junction boxes to be fixed to permanent structure or pole with a Stainless-Steel Banded Strap to secure.
- All entry and exit points into junction boxes need to be installed facing down with the holes facing the floor.
- All entry and exit points need to have entry grommets installed.
- Critical system termination points must be enclosed in a secure IP66 Rated pvc box with entry and exit glands via bosal or PVC Piping [cctv cameras/access control].
- Termination Panels [1U patch panel – to be located centrally to active equipment requiring copper connectivity] required if devices are in same wire centre as access switch.
- All Outdoor equipment and cabinets need to be properly earthed.

2.12. Brush Panels [All Rooms]

- To BE USED ONLY UPON APPROVAL IN Type E / F / G /H FACILITIES ONLY.

- To be located below patch panels and switches.
- Colour: White or black.
- 1.5mm thick metal framework.
- 1U height.
- 341mm x 21.5mm opening for brushes.
- 4 x mounting holes per panel.

2.13. Cable Management, Routing and Trenching

- Max bend - Fiber patch leads: 25mm
- Max bend – Co Axial leads: 50.5mm radius[Rj11]
- Max bend – Co Axial leads: 33 mm radius[Rj16]
- Max bend – Copper looms: 100mm radius
- Max bend – Fiber cased covered: 150mm radius
- Copper loom of 24 = 40mm diameter.
- PVC Conduit or Sprague for single cable: 25mm
- Trench Sleeve: >110mm (Material to be used Dependent on Requirement).
- Distance for data cables from shielded electrical cables [greater than 5Kva] = 300mm.
- Distance for data cables from unshielded electrical cables [greater than 5Kva] = 600mm.
- Each U-space to be separately maintained / managed vertically and horizontally in cabinet through the cable routing cycle.
- Velcro cable ties on all routes. No Plastic Cable ties. No glue guns/staples. Risks are too high cutting cable ties locked around a cable. Only Velcro strips are allowed to be used in the Data Centre and Disaster Recovery Centre
- Velcro to be installed at every 500mm inside Wire Centres and Core Rooms. Velcro at every 3000mm in cable ways. Both must be finger tight.
- Avoid slack in cabinets. If required then do not exceed 3m / 4 coils and maintain max bends.
- Cable bundles not to exceed 24 cables per bundle or loom.
- Cable managers in cabinets must NOT EXCEED HEIGHT OF patch panel: eg 1rack unit patch panel = 1 rack unit of a plastic cable manager. Cabinet cable manager must be plastic.
- Cables to be locked in place within a room and outside a room using Velcro.
- Cable routing to be guided as per building design, preliminary investigations and discretion of ACSA tender approved / certified / qualified cabling teams.
- Shortest distance for routing must always be investigated and capacity planning along routes must be considered.
- Preferred [Stainless Steel Bollard] Figure 10 – Figure 12.
- Sleeves: min diameter - 110mm to accommodate capacity planning as per cable tray / cable duct distribution routing diagrams.

- PVC sleeves [Concrete sleeves]: Rodent Free, UV resistant, weatherproof, accidental damage protection and self-draining.
- Min trench depth: 0.5m. min trench width: 200mm (ensure safe distance between services). Special Requirements require formal approval from Client.
- Avoid interferences like routing around air conditioning units.
- Prior to any trenching, a full investigation of route must be provided to stakeholders – assurance that no services will be disrupted during trenching.
- Cabinet Cable Manager
 - A: 43U spacer (2x45mm=90mm wide, 12x45mm=540mm depth) o Cabinet Cable Manager
 - B: 42U spacer (2x45mm=90mm wide, 10x45mm=450mm depth) Cabinet Cable Manager
 - C: 20U spacer (2x45mm=90mm wide, 5x45mm=225mm depth) o Cabinet Cable Manager
 - D: 16U spacer (2x45mm=90mm wide, 4x45mm=180mm depth) Cabinet Cable Manager
 - E: 9U spacer (2x45mm=90mm wide, 2x45mm=90mm depth).

2.14. Cable Trays / Cable Ducts And Flooring

- Suspended Ceilings / overhead fiber management trays made up of shatterproof light weight plastic / pvc maintaining a 50mm max bend radius.
- Overhead fiber management trays should be made up of light weight Metal Material.
- Self-extinguishing or non-flammable. 100mm above cabinets – 100mm above highest cabinet maintained if cabinet heights vary.
- Cable bends in trays and ducts > 110degrees bend radius.
- Hot dipped galvanized before fabrication. Zinc electroplated after fabrication. Wire-mesh cable trays for exterior and corrosive environmental applications. Non water retention. Welded at intersections – 50 x 50mm grid patterns. U-shaped with equal height side walls.
- All cable trays must be earthed.
- Supports attached to ceilings, walls or floors. Punched hole pattern that accepts tray attachment hardware. Steel supports.
- Cable Tray
 - Cable Tray SPEC1: width=100mm. height=40mm. support weight per 1000mm=40kgx2
o
 - Cable Tray SPEC2: width=200mm. height=45mm. support weight per 1000mm=60kgx2
o
 - Cable Tray SPEC3: width=300mm. height=50mm. support weight per 1000mm=80kgx2
 - Cable Tray SPEC4: width=400mm. height=60mm. support weight per 1000mm=100kgx2
 - Cable Tray SPEC5: width=600mm. height=60mm. support weight per 1000mm=120kgx2
- 3 layered ceiling suspended cabled tray systems preferred. (Power, Fibre, UTP). Formal approval required from Client in special circumstances.

- All suspended ceilings / mounted or floor cable trays must allow for multi layered installations – first installation must start at lowest layer. (Power, Fibre, UTP). Formal approval required from Client in special circumstances.
- Horizontal cable tray separations [data tray parallel to electrical] preferred over multi layered tray systems in raised floors to minimize resistance and maximize air flow.
- All suspension nuts (if applicable) must be installed above lowest layer to accommodate for future cable tray installations above lowest layer.
- Multi layered cabled trays: min distance between trays = 60mm allowing air flow.
- Bend radius = width of cable tray (width of larger cable tray if two are interlinked).
- Max stacked height of cables in a cable tray: 120%
- Min height above ground for floor trays: 60mm for air flow
- Min distance from ceiling for ceiling suspended trays: 60mm
- Suspension bars: 1000mm apart. Dual support beams. Adjustable with butterfly lockable nuts (ceiling and floor trays for multi tray installations and height adjustments). Wall L-shape brackets where applicable.
- Data Cable Trays: Preferred Overhead / under cabinets possible.
- Electrical Cable Trays: Rear of cabinets Overhead
- Incoming routes to be located furthest from air con locations – preferable centre of rooms
- Cross connect cable trays [trays linking rows] should run centrally through room equal distance between cabinets.
- Min dist. bet electrical cables and copper data / telecoms cables: 300mm.
- Radio frequency transmission cables to be separated at 600mm away from data cables.
- Radio frequency transmission cables to be separated at 300mm away from electrical cables
- Conduits in offices - preferable located on solid walls opposite doors/entrances - away from feet when seated. Data with voice to be separated from power. Separate conduits for power and data. (P801)
- No Cabling on ceiling tiles - ensure cables run through a conduit or cable tray to termination point / end device.
- Copper cables must run in looms or bundles of 24 in cable trays.
- No sharp edging – Grommets and polishing required where applicable.
- Cable trays should not exceed 60% for first installation for certification.
- Sleeves: min diameter- 110mm to accommodate capacity planning.
- Flexible PVC sleeves [Preferable: Concrete sleeves]: Rodent Free, UV resistant, weatherproof, accidental damage protection and self-draining.
- Min trench depth: 0.5m. min trench width: 200mm (ensure safe distance between services). Special Requirements require formal approval from Client.

2.15. Ducting

- 4/7 Way 12/10 mm direct buried duct shall be used in a Mechanical Trench for Off Road Conditions illustrated in figure 1.
- A Single 12/10 mm Direct buried duct shall be used in Mechanical Trench for inroad kerbstone trenching illustrated in Figure 2 and 3.

2.16. Bending radius of fibre cable

- The allowable bending radius for fibre optical cable is as follows:
- For zero cable tension, allowable Bending Radius = $10 \times D$
- For cable under tension, allowable Bending Radius = $20 \times D$
- Where D is the outside diameter of the cable.

2.17. Distance between joints

- When carrying out a route survey, consideration should be given to maximize the floating-in distances between planned joint positions.
- Drum length for a buried route = $D + 40m$
- Where;
 - D = distance between joint positions measured on the road.
 - 40m = jointing allowance, 20m at each end.
- At each joint, manhole marker to be installed

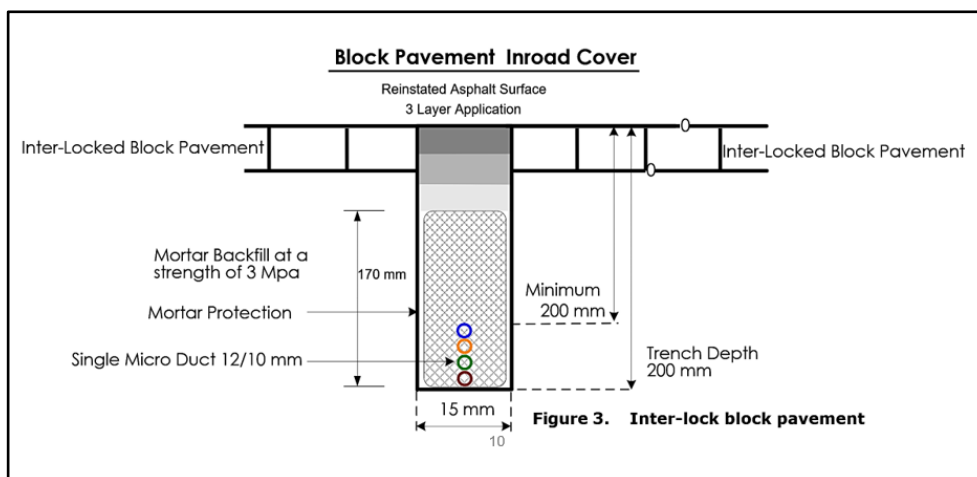


Figure 3 Block pavement inroad cover



Figure 4 Manhole and marker

2.18. Labeling

2.18.1. General

- Label material resistant to the environmental conditions at the area of installation (such as moisture, heat, or ultraviolet light), and should have a design life equal to or greater than that of the labelled component.
- Machine typed labels – no handwritten labels.
- Patch Leads to be labelled with Clip-On labels
- Label Texts = Black wording.
- Labels must have White backgrounds.
- Use of adhesive wrap around cable labels with clear protective film wrap around.
- Only self-adhesive labels to be used on cabinets, equipment and cables.
- Changeable labels above every port on patch panels – adhesive not required. Alternating heights if label width restricts all labels in a straight row. _-_-_-_-_-
- High resistant [double protective film] cable labels for installations in areas exposed to high levels of environmental threats [eg: manholes].

2.18.2. Label and Font Sizes

- Cabinet labels = Vinyl 19mm wide (not on doors but upper fixed framework. Cabinets sequencing starts from furthest unit away from door –
- working towards the door in a snake formation – sequencing also needs to account for future installations of cabinets within isles – furthest left
- if door is central). Font = bold / all caps / B- max large full fit (16mm wide writing).
- Servers labels / switches labels / rack mounted equipment labels = Vinyl 9mm wide (pref: located on left upper corner.). Font = bold / all caps / B- max large full fit (7mm wide writing).

- Cable labels = Vinyl 9mm wide. Font = as per naming conventions / B- max large full fit (7mm writing double line).
- Ports on patch panels = Vinyl <6mm wide (Preferable above each port). Font = as per naming convention letter casing / B- max large full fit (<4mm writing).
- Patch Leads = <6mm wide. Font = as per naming conventions / B- max large full fit (5.5mm wide writing double line).
- Door Name Labels = 120mm [height]. 200mm [wide]. Black background – Bronze Fonts. Door number font=75mm. “restricted area” & “unauthorized entry prohibited” font = 10mm.
- Door Labels = Perspex with protective film [Preferable]. Vinyl with protective film as alternative.
- Safety signs as per safety requirements
- Registers and rules as per standards and branding policies.

2.18.3. Labeling intervals

- All Cables = At every bend along its route. 1x label at each end of the bend. Distance apart of both labels = < 4x radius of the bend.
- All Cables = At both sides of walls if running through a wall.
- All Cables = Every 5m for open / exposed areas greater than 10m long [cable trays / risers].
- All Cables = 1x Label centrally for open / exposed areas under 10m long [cable trays / risers].
- All Cables = 2x Labels in every accessible area [maintenance holes].
- All Cables = Every 3m within office areas [office trunking / floor trunking].
- Fiber Patch Leads = Every 1m [eg: fiber overhead trays / in cabinets]
- Copper Patch Leads = Every 1m
- Fiber Inter-Connect Leads = Every 1m
- Copper Inter-Connect Leads = Every 1m
- Copper cables: +-75mm from termination points [max. bend integrity to be maintained].
- Fiber cables: +-100mm from termination points [max. bend integrity to be maintained].
- Fiber must have “warning” labels every 10m along its exposed route [eg: trays] and in every visible opening [eg: maintenance holes]. Labels to
- include “ACSA” name for identification.
- Co-Axial: +-100mm from termination points [max. bend integrity to be maintained].

2.18.4. Equipment and Panel Labels

- Heat generating equipment numbering to be sequenced from down-up as per installation standards.
- Floor grid representation sequenced furthest from door [A-1/B-2/C-3]. Furthest left if door is central.
- Copper Patch Panels sequencing from down-up in Type: A/BC/D/E/F/G/H rated rooms

- Access Layer switches sequencing from down-up in Type: A/B rated rooms [to be confirmed with ACSA-IT as per room layout – applicable to larger than 1u switches].
- Access Layer sequencing from up-down in Type: C/D/E/F/G/H rated rooms.
- Fiber Patch Panels sequencing from up-down in Type: A/BC/D/E/F/G/H rated rooms.
- Cabinets sequenced furthest from the door. Furthest left if door is central. S-formation towards door.

2.18.5. Device Labels:

- Servers; enclosures; storage devices; switches and all physical devices installed into the rack must be labelled on the front and back of the device. (i.e. JNBMPROXYSRV1)
- UPS units must be labelled with hard labels (i.e. airport; room; device: “ORTIA-DC-UPS-A”)
- HVAC units must be labelled with hard labels (i.e. airport; room; device: “ORTIA-DC-AC-1”)
- PDP units must be labelled with hard labels (i.e. airport; room; row; device: “ORTIA-DC-ROW-1-PDP-1”)
- PDU units must be labelled with hard labels (i.e. airport; room; row; device: “ORTIA-DC-ROW-1-CAB-1-PDU-1”)
- CCTV camera labelling (i.e. airport; room; camera number-SW/Port: “ORTIA-Cargo-CAM1- JNB-TB-CWH10-CAB-1-1”)
- Access control labelling (i.e. airport; room; camera number-SW/Port: “ORTIA-PIA-ACC-1- JNB-TB-CWH10-CAB-1-1”)
- AP devices must be labelled (i.e. airport; room; AP name; Mac address/ SW/port: “ORTIA-TB-AP11-745120HN06- JNB-TB-CW10-CAB-1-1”)
- FIDS devices must be labelled (i.e. airport; room; device name; Mac address/ SW/port: “ORTIA-TB-FID22-745120HN06- JNB-TB-CW10-CAB-1-1”)

2.19. Wire Centre : outdoor IP65 rated

- The new solution must cater for all new IP65 outdoor wire centers where required to accommodate for the additional expansion. (All UTP points must not exceed 90m).
- The outdoor unit will be a grid type solution supported by 10kva UPS and inverter with solar panels to support a maximum load of 8kw
- The electrical supply provisioned for the cabinet must be 3 phase essential supply (i.e. generator supply)
- The cabinet must be installed on a concrete plinth – plinth to be 100mm above surface

2.19.1. Physical

- Rack Configuration: Double
- Rack Height: (25U) 1067mm
- Width (rack): 1200mm
- Width (Extension Closet): N/A
- Rack Depth (mm): 850mm

- Total Cabinet Depth (mm): 998.45mm
- Rack weight: 230kg
- Bottom Plinth Height: 200mm
- Total Cabinet Height incl. plinth & canopy: 1400mm
- Total Cabinet Width: 1800mm
- Rack Weight Capacity: 850kg
- Doors and Housing: 2.5mm 3CR12 stainless steel
- Anti-Rust: Zinc Phosphate
- Paint: Powder Coated with robust outdoor paint
- Colour (Standard): RAL 7035 Light Grey Exterior Texture Internal

2.19.2. Conformance

- Warranty: 1 Year
- Standard: ISO 9001:2000, IEC 297 1975, BS 5954:1980

2.19.3. Security

- Door Lock Front- Cabinets padlock able Swing handle
- Door is sealed with a rubber seal for weather proofing
- Concealed hinges and 3point locking system
- Keypad with maglock configuration

2.19.4. Door configurations

- Solid steel
- Shrouds for fans and filter
- Free cooling vents with vermin

2.19.5. Other

- 19" adjustable uprights
- Upper and lower plinth
- 10KVA Rackmount UPS including Battery
- 0U Mounting for fibre trays
- Environmental sensors including, flood, smoke, door contacts, temperature, humidity inputs
- Earthing – proper electrical grounding - <0.75ohm resistance. Earthing mats.
- Protective Bollards or Steel barricading poles <850mm surrounding the cabinet. Colour: yellow and black striping

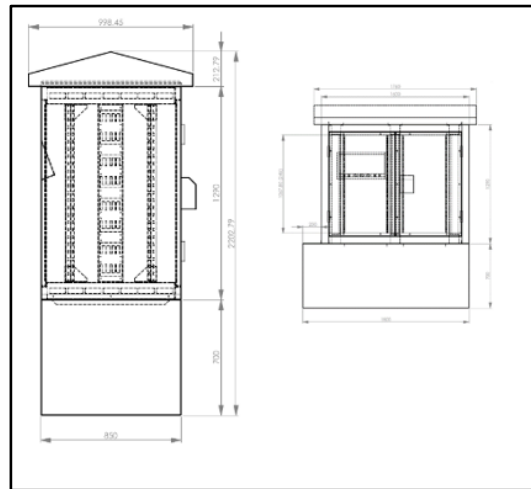


Figure 5 Front & side view outdoor cabinet

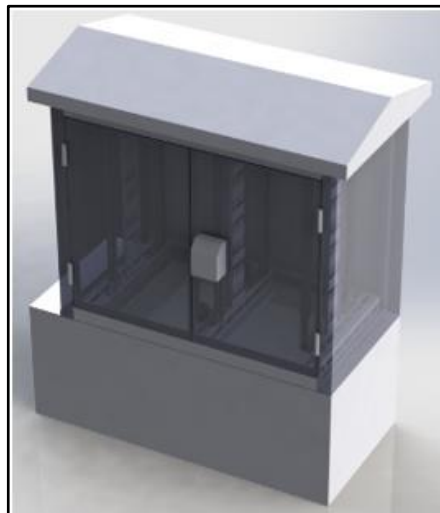


Figure 6 Front view of outdoor cabinet

2.20. Wire Centre: Type D - Indoor Enclosures.

- High end IP66 Rated/Certified outdoor cabinets.
- Preferable: Type C room specifications.
- Weather resistant: water resistant-angled rain canopy for drainage.
- Weather resistant: flood proof and high-pressure cleaning resistant.
- Weather resistant: wind resistant and airtight cabinet.
- Weather resistant: temperature resistant - outer wall with-standing between -60degrees to +180degrees.
- IP66 Rating/Gentrification for enclosure structure. Dust-tight - No ingress of dust at a partial vacuum of 20 mbar inside the enclosure. Protected against powerful water jets. Water directed at the enclosure from every direction in a power-full jet must not have any harm-full effects.
- Vibration resistant: from wind / water / movement / tremor.
- Electrical supply: Three phase and single-phase essential power supply.

- UPS – 15min standby.
- Structure: Anodized / corrosion protective anti-rusting properties.
- Vandalism protection cabinets – aluminum outer walls. >3mm thick walls. Steel inner walls.
- Lockable unit. Padlock handle with access control (mag lock and reader). Air conditioned. [Automatic door closing mechanism and alerting within 60seconds of door remaining opened].
- Interior light: 240V, 60w. Switch controlled.
- Where required due to environmental constraints (MSP, Parking, Baggage) a concrete platform construction as plinth. Raised 150mm above ground level. Allow for cable entry plates. Use of cable entry grommets to seal entry plates and cabling.
- Cable entry sleeving from under into cabinet via concrete platform. Pipe termination = 100mm high.
- Cable management system: 4inch trays from cable entry sleeving to equipment.
- Cable management system: as per 42/47 cabinet cable management systems.
- Protective Bollards or Steel barricading poles <850mm surrounding the cabinet. Color: yellow and black striping.
- Manhole routing connection for cabinet <2500mm away.
- Air-conditioned units – average indoor temp=23degrees. Max heat load=75% cooling capacity.
- Internal environmental monitoring and fire detection systems.
- Total Max height of Cabinet: 2200mm (includes platform) measured above taxi way.
- Cabinet Depth: 600mm to 1000mm. Cabinet Color: White [with protective coating for outdoor elements]
- Earthing – proper electrical grounding - <0.75ohm resistance

2.21. Fire–Stopping

- Fire stopping must be conducted in all penetrations created during the installation and maintenance of data and telecoms cables. Fires sealing to ensure compartments [floors/rooms] are not breeched – raising the risk of a fire spreading to other compartments.
- Use Mechanical fire stop systems for Cable Entry / Exit points in every room: consisting of pre-manufactured products and devices that are pre-shaped and sized to fit into or around standard penetrations made by conduits, cables, core holes, and other penetrations within the tier room. They fit and expand into standard sized building openings and are secured and held into place by tension.
- Use Non-mechanical fire stop products to fit and expand into non-standard building openings. They can fit into irregularly shaped or irregular size openings [putties/chalk/foam]. In-situ foamed sealant or fire barrier sealants should be used. Use of fire stopping pillows for temporary and permanent fire barriers in vertical rises, ceilings, cable trays, partitioning walls and raised floor systems. Warning: do not mix non-mechanical fire-stoppers
- Every service penetration requires re-sealing.
- Every penetration requires updating of a log register located under the fire seal

3. Servers (Compute) Platform Standards

Microsoft Environment Servers
HP DL 380 * (Standalone Servers) or latest equivalent
HP BL460C * (Blade Servers) or latest equivalent
All production servers are to be blade servers. *Depending user volumes and application requirements.

3.2. Specification

- All hardware devices are to be covered by minimum 5-year extended OEM warrantee and either 24x7x4 HPE Partner Support Services.
- The supplier must be able to supply the exact specification detailed below or latest equivalent specification which has been approved by the ACSA IT Infrastructure Division and Information Technology Architecture Committee.

Description	
Standard Blade Servers	
Virtual host C7000	HPE ProLiant BL460c or latest equivalent
	256 Gig memory
	Latest CPU
	HPE 240GB SATA disk
	16Gb Fibre Channel Host Bus Adapter
	5 Year HPE warranty 24x7 Support
	HPE OneView for Blade Server including 3-year 24x7 Support
	HPE One View w/Ilo Support
	VPP L1 VMware vSphere 6 Enterprise Plus for 1 processor
	Production Support/Subscription VMware vSphere 6 Enterprise Plus for 1 processor for 5 years
	VPP L1 VMware vRealize Operations 7 Standard (Per CPU)
	Production Support/Subscription for VMware vRealize Operations 7 Standard - vSOM Entitlement (Per CPU) for 5 years
Virtual Host Synergy	HPE Synergy 480 or latest equivalent
	HPE 32GB microSD Flash Memory Card
	512 Gig memory
	HPE Synergy Converged Network Adapter

Synergy Storage	HPE Smart Array
	Latest CPU
	5-Year HPE warranty 24x7 Support
	HPE Synergy CTO Disk Drive Enclosure
	HPE SAS drives Mixed use
	HPE SAS Write Intensive use
VSAN	VMware vSAN Enterprise License
Virtual Servers	Standard specification for virtual servers
Blade server	Memory not bigger than 48 Gig
	Virtual CPU not bigger than 12
	C drive: OS 130 Gig
	D Drive: Application 100 Gig
	Database and Log drive will be separate for SQL requirements
	(Rest of requirements will be reviewed as per request)
	HPE ProLiant BL460c Gen10 or latest equivalent
	HPE QMH2672 16Gb Fibre Channel Host Bus Adapter
	HPE 240GB SATA
	(Rest of requirements the requester will have to supply, Memory, CPU)
	HPE OneView for Blade Server including 3-year 24x7 Support
	HPE One View w/Ilo Support
	5-Year HPE warranty 24x7 Support
Standalone Server	HPE ProLiant DL360 Gen10 or latest equivalent
	HPE StoreFabric SN1100Q 16Gb Dual Port Fibre Channel Host Bus Adapter
	HPE 240GB SATA
	(Rest of requirements the requester will have to supply, Memory, CPU)
	HPE OneView for Blade Server including 3-year 24x7 Support
	HPE One View w/Ilo Support
	5-Year HPE warranty 24x7 Support
	VPP L1 VMware vSphere 6 Enterprise Plus for 1 processor
	Production Support/Subscription VMware vSphere 6 Enterprise Plus for 1 processor for 5 years
	VPP L1 VMware vRealize Operations 7 Standard (Per CPU)
	Production Support/Subscription for VMware vRealize Operations 7 Standard - vSOM Entitlement (Per CPU) for 5 years

4. Backup and Storage Platform Standards

4.2. Backup Storage Specifications

- Backup infrastructure within the ACSA environments has been standardized on Dell EMC Data Domains (Backup) appliances. Depending on the size of the site, capacity can or cannot be added to the existing

equipment. For larger airports, backup storage is able to grow as the requirement arises. Small sites are limited to the capacity available built into the appliances.

- Redundancy and High Availability is to be built into the appliances and data protection storage providing Multiple Shared Uplinks, Dual Power Supplies as well as separate Processors per Device.
- All data domains (backup) devices are to be covered by minimum 5-year extended OEM warrantee and Dell EMC ProSupport Plus with 4-Hour Mission Critical On-site Response.
- The supplier must be able to supply the exact specification detailed below or latest equivalent specification which has been approved by the IT Infrastructure Division and Information Technology Architecture Council (ITAC).

PID	PID Description
Standard Datacentre Data (Backup) Appliance	
AVMA1200FG4S	AVAMAR G4S M1200 STORAGE NODE FLD INST
456-104-248	EMC BACKUP SUITE DPA ENABLER=CA
456-104-123	DATA PROT S BACKUP 51-150TB=CA
456-103-951	BACKUP AND RECOVERY MANAGER - NETWORKER
456-104-247	EMC BACKUP SUITE AVAMAR ENABLER=CA
Standard Datacentre Data Domain (Backup) Storage Device Large	
DD4500-2E45	SYSTEM, DD4500+2ES30,3TB SAS HDD, NFS, CIFS
DD4500-CTL-B	SYSTEM, DD4200, CTL, NFS, CIFS
DDRACK-40UN	RACK, DATA DOMAIN,40U
L-BST-4200	LICENSE, BOOST, DD4200
L-REP-4200	LICENSE, REPLICATOR, DD4200
U-DDOE-ACT-NC	LICENSE DD OE PER TB UPG ACTIVE=CB
Standard Datacentre Data Domain (Backup) Storage Device Medium	
DD4200-2E45	SYSTEM, DD4200+2ES30,3TB SAS HDD, NFS, CIFS
DD4200-CTL-B	SYSTEM, DD4200, CTL, NFS, CIFS
DDRACK-40UN	RACK, DATA DOMAIN,40U
L-BST-4200	LICENSE, BOOST, DD4200
L-REP-4200	LICENSE, REPLICATOR, DD4200
U-DDOE-ACT-NC	LICENSE DD OE PER TB UPG ACTIVE=CB
Standard Datacentre Data Domain (Backup) Storage Device Small	
DD2500-1E45	SYSTEM, DD2500+1ES45 SAS,81TB, NFS, CIFS
DDRACK-40U	RACK; DATA DOMAIN;40U
L-BST-2500	LICENSE, BOOST, DD2500
L-REP-2500	LICENSE, REPLICATOR, DD2500
L-XCAP2500-B	LICENSE, DD2500 EXP CAP, MORE THAN 66TB

4.3. SAN Network Specifications

- The ACSA storage network infrastructure utilises Dell EMC OEM switches to provide fibre channel switching connectivity within the storage environment. This standard is applied to all airports and offices with storage infrastructure spread throughout South Africa. It utilises a Two-Tier Core-Edge Design connecting storage units and access hosts via Fibre Channel Switching Technology.
- The storage network is designed and built to cater for High Availability and Redundancy by providing two physically separate fabrics (A & B) connecting storage and host with multiple paths to utilize. Multi ASIC, Dual Power Supplies, Multiple Link Trunking, Port Virtualisation and 32Gbps SFPs all combine to provide cutting edge performance within a stable and highly redundant portfolio.
- The core switches, located in all main data centres, utilizes 48 port with 4 additional QSFP port or 96 port with 8 additional QSFP port switches capable of 32Gbps speeds with either single mode or multi model SFP's and cabling. Inter Switch Links (ISL) connectivity between each switch is provided via 4 single mode fibre links configured as a single trunk.
- Edge switches are blade system based and depends on the system being connected to the SAN network. These switches connect at a minimum speed of 16Gbps and supports the fibre channel port virtualisation (NPIV) standard.
- All storage network devices are to be covered by minimum 5-years extended OEM warrantee and Dell EMC ProSupport with 4-Hour Mission Critical On-site Response
- The supplier must be able to supply the exact specification detailed below or latest equivalent specification which has been approved by the ACSA IT Infrastructure Division and Information Technology Architecture Council (ITAC).

PID	PID Description
Standard Indoor Datacentre Core 96 Port Switch	
DS-6630R-B-EP	DS-6630R-B 96P/96P 32GB RTF ENT SWITCH
BRSFP16G10KLW	BRCD LBL 16GB 10KM LONG WAVE SFP
INTCABPWRCB-B	C14-TO-C13 1M INTERNAL CAB POWER CORDS-B
W-PS-HW-001	PROSUPPORT W/NBD-HARDWARE WARRANTY
M-PSM-HW-E-002	PROSUPPORT W/MISSION CRITICAL-HARDWARE
WU-PSM-HW-001	PROSUPPORT W/MISSION CRITICAL-HW WARRANT
M-PSM-SW-E-002	PROSUPPORT W/MISSION CRITICAL-SOFTWARE
PS-BAS-FCIA	FC INFRA ASSESSMENT
DS-6630B-ENT	DS-6630B ENTERPRISE SW BUNDLE=MA
Standard Indoor Datacentre Core 48 Port Switch	
DS-6620R-B-24	DS-6620R-B 48P/48P 32GB RTF 24SPF ENT SWITCH
BRSFP16G10KLW	BRCD LBL 16GB 10KM LONG WAVE SFP
INTCABPWRCB-B	C14-TO-C13 1M INTERNAL CAB POWER CORDS-B

W-PS-HW-001	PROSUPPORT W/NBD-HARDWARE WARRANTY
M-PSM-HW-E-002	PROSUPPORT W/MISSION CRITICAL-HARDWARE
WU-PSM-HW-001	PROSUPPORT W/MISSION CRITICAL-HW WARRANT
M-PSM-SW-E-002	PROSUPPORT W/MISSION CRITICAL-SOFTWARE
PS-BAS-FCIA	FC INFRA ASSESSMENT
DS-6620B-ENT	DS-6620B ENTERPRISE SW BUNDLE=MA
Standard Indoor Datacentre Edge Switch	
751465-B21	HPE Virtual Connect 16Gb 24-port Fibre Channel Module for c-Class BladeSystem
QK724A	HPE B-series 16Gb SFP+ Short Wave Transceiver
H7J36A5 X0W	HPE VC 16GB 24 Support

4.4. SAN Storage Specifications

- All Storage Array, Hyper-Converged devices are to be covered by minimum 5-year extended OEM warrantee and Dell EMC ProSupport Plus with 4-Hour Mission Critical On-site Response or for out-of-radius devices.
- The supplier must be able to supply the exact specification detailed below or latest equivalent specification which has been approved by the IT Infrastructure division and Information Technology Architecture Committee.

PID	PID Description
Standard Datacentre Shared Storage Array	
40U-RK-DRLKAF	UNITY AFA RACK W/DOOR LOCK
40U-PWR-IECAF	CAB POWER CORD IEC309
D32BD32AD25AF	UNITY 450F 2U DPE 25X2.5 DRIVE EMC RK
D3SL16FAF	UNITY 2X4 PORT 16G FC IO
D3F-2SFXL2-15360	UNITY AFA 15.36TB SSD 25X2.5
D3TX-TWAX-1MAF	1M ACTIVE TWINAX CABLE QTY 4
M-PSM-HWE-005	PROSUPPORT W/MISSION CRITICAL-HARDWARE
458-002-525	UNITY AFA BASE SOFTWARE+ D@RE=IC
M-PSM-SWE-005	PROSUPPORT W/MISSION CRITICAL-SOFTWARE
456-112-850	SRM UNITY 450F=IC
RP-LNX-GPL	RECOVERPOINT LINUX GPLV3 DISTRIBUTION
458-001-574	RP ADV REM FOR UNITY 400F/450F =IC
458-001-573	RP ADV LOC FOR UNITY 400F/450F =IC
M-PSM-SW-D3-001	PROSUPPORT W/MISSION CRITICAL-SOFTWARE
Standard Datacentre Hyper-Converged Storage Array	
	2 C13 PWRCORDS W/ BS546 PLUGS 250V 10A
	HCIA CHASSIS W/ 1600 PS AND FAN
	HCIA DISK PACK 1X800GB SSD 5X1.2TB HDD
	HCIA ND 12COR CPU 128GBMEM 10GE RJ45 VLP
	HCIA FIELD INSTALL KIT 10GE RJ45

	HCIA MANAGER SOFTWARE =MA
	ENHANCED HARDWARE SUPPORT
	ENHANCED SOFTWARE SUPPORT
	HCIA SOFTWARE VLP =IB
	ENHANCED SOFTWARE SUPPORT
	RECOVERPOINT FOR HCIA
	RECOVERPOINT FOR VM FOR HCIA =IB
	ENHANCED SOFTWARE SUPPORT
Standard Datacentre Video Security Storage Array	
VSS16K-EMCKIT12	VSS1600 INSTALL KIT FOR 12 DRIVE DPE
VNX16K-B12	VNXE1600 ;2XSP DPE;12X3.5, NO SFP, TWIN
VNX16K-DAE-12	2U DAE WITH 12 X 3.5 INCH DRIVE SLOTS
V5-SP-L9X4TB-NL	VNXE1600 3.5 SYSTEM PACK 9X 4TB NLSAS
VNX16K-PWR-13	2 C13 PWRCRD W/ BS546 PLUGS 250V 10A
V5-PS07-040	VNXE1600 4TB NL SAS 12X3.5
VNX16K-16GSFP	16GB SFP QTY 4 FOR FC CONNECTION
W-BASHW-001	BASIC HARDWARE WARRANTY
WU-PS-HWE-003	PROSUPPORT W/NBD HARDWARE WARRANTY UPG
M-PS-HWE-003	PROSUPPORT W/NBD HARDWARE SUPPORT
VNX16K-UNI	BUNDLED FAST CACHE AND REPLICATION=IC
M-PS-SWE-003	PROSUPPORT W/NBD SOFTWARE SUPPORT
458-000-974	VNXE1600 BASE SW+OE DUAL SP ECOSYS =IC

4.5. Network (Routers and Switches) Platform Standards

- The ACSA network infrastructure is made up entirely of Cisco Systems networking devices which has become the standard throughout all sites. Switching infrastructure is broken down into Access, Distribution/Aggregation and Core (Data Center).
- ACSA currently uses two network infrastructure topologies: Three-tier and Two-tier hierarchical Network models.

4.5.1. Network Device Specifications

- All Core network devices are to be covered by at least a minimum of 5-year extended OEM warrantee and either 24x7x4 Cisco Partner Support Services or Cisco SmartNet Support. The supplier must be able to supply the exact specification detailed below or latest equivalent specification.

Network (LAN)	
Core and Distribution Switches	Cisco Catalyst 4500X Series Switches (Core devices for regional airports) Cisco Catalyst 6500-E Series Switches (Phasing out by 2022) Cisco Catalyst 6800 Series Switches Cisco Catalyst 6807 Series Switches (Used as MPLS PE nodes)

	Cisco Catalyst 3850 Series Switches (High density CCTV areas) Cisco Catalyst 9500 Series Switches (Used as MPLS PE nodes)
Access Switches	Cisco Catalyst 2960-X Series Switches Cisco Catalyst 3560CG Series Switches (Small and outdoor wire centres) Cisco Catalyst 3650 Series Switches Cisco Catalyst 3750-X Series Switches (Phasing out in 2021 – 9200/9300/9400/9500) Cisco Catalyst 3750E Series Switches (Phasing out in 2020) Cisco Catalyst 3850 Series Switches Cisco Catalyst 9300-X Series Switches (New standard for high density Wire Centres)
Network ports	Must be Gigabit capable with POE (Power over Ethernet)
Data Center Switches	Cisco Nexus 7010 Series Switches (Phasing out in 2020) or latest equivalent Cisco Nexus 9300 Series Switches
Industrial Ethernet Switches	Cisco IE3000 Series Switches or latest equivalent Cisco IE3400 Heavy Duty Series or latest equivalent
Wireless LAN Controller	Cisco WiSM-2 Cisco WiSM-2 High Availability (EOL) or latest equivalent (replacement)
Wireless Access Point:	Cisco 702, 1820, 2702, 2802, 3602, 3702, 1552, 1562, 1572
Wireless Control System	Cisco Prime Infrastructure

Network (Cabling)	
<100M @ 100MBs	CAT7 plus Patch Lead 1.5m or latest equivalent
<100M @ 1000MBs	CAT7 plus Patch Lead 1.5m or latest equivalent
<412m	Fibre (Multimode)
<2km	Fibre (Multimode)
<20km	Fibre (Single Mode)
>1.5m and <30m	LC-LC Fibre Patch Lead LC-SC Fibre Patch Lead LC-ST Fibre Patch Lead SC-SC Fibre Patch Lead SC-ST Fibre Patch Lead ST-ST Fibre Patch Lead

4.6. Workstation and video wall requirements

- Workstation
 - DELL Precision Tower 3420, Intel Core i7-7700 (Quad Core 3.6GHz, 4.2Ghz Turbo, 8MB, w/ HD Graphics 630), 16GB (2X8GB) 2400MHz, M.2 512GB PCIe NVMe, Quadro P1000, 4GB, 4 mDP, LP (PWS 3420),
- Wired Mouse
- Multimedia Keyboard Intel Dual Band Wireless 8260 (802.11ac)

- Windows 10 Pro (64bit) English
- Monitor
 - DELL 24 Monitor P2417H -60.5cm (23.8") Black
 - X4 (with monitor splitter)
- Video Wall
 - Type: LCD screen
 - 40" inch Display Panels x6

4.7. Warrantees and guarantees

- All installations will be handed over to ACSA at the end of the project with all warrantees, guarantees, with service support certifications
- All warranties, guarantees, certifications and licenses must comply and be ceded to ACSA
- The supplier must transfer all warrantees

4.8. Support and maintenance

- The Support and Maintenance must be transferred to the current IT Infrastructure Maintenance Contractor. Therefore, all handover documentation must be in detail for the easy transfer. The tenderer must provide support and maintenance for the duration of the specified and agreed period
- The supplier shall train the current ACSA Maintenance Contractor on the 1st Line Maintenance, and System Set-Up and Configuration.

4.9. IT Performance measures

- The design needs to present the latest and efficient technologies solutions that are aligning to ACSA standards.
- The solution design must be signed off by IT Infrastructure Technical Leads before commencing with any tasks

4.10. Documentation

- Audit of Trenching routes – proof of no service disruptions prior to works
- Fire ratings of rooms – before collapse of the structure (hard copy)
- Pressure sealing testing – ability to retain a fire (hard copy) and fire suppression release.
- Equipment layout per cabinet (hard copy)
- Room layout (hard copy)
- Electrical reticulation (hard copy)
- Cabling diagram and legends (hard copy)
- End to End Cable testing

- Updating of Infrastructure X database: assets / capacity / cabling / EMS / layouts (soft copy)
- Cabling installation handover to user
- As built documentation
- CAD drawings for all installations
- Asset schedules for all assets installed
- Gateway signoff by all Technical leads
- CAB approvals for all installations
- Weekly reports on project progress
- Project documentation per ACSA methodology
- Any COC's
- Warrantees