1 MEDIUM VOLTAGE SWITCHROOM REQUIREMENTS

1.1 Each medium voltage switchboard shall be housed in a dedicated switchgear room for that switchboard.

1.2 The switch rooms shall be compliant with the seismic requirements of the sites where they are installed.

1.3 The structural stability of the switch room (floors, walls and roof) shall be designed for a catastrophic failure of the switchgear as a result of any venting of gases due to a full prospective short circuit occurring on any circuit of the switchboard. Pressure relief measures shall be built into the room with no compromise on safety of personnel or an arc venting duct installed.

1.4 The clearances around each switchboard shall be as follows:

1.4.1 Rear– Not less than 1500mm but not exceeding 1800mm at every point of the switch room.

1.4.2 Front– Double the depth of the switchboard at every point along the length of the switchboard to allow for the withdrawal and handling of circuit breakers.

1.4.3 Sides– 2500mm on each side of the switchboard.

1.5 Heating, Ventilation and Air Conditioning (Part 2 of IEC 62271–1)

1.5.1 The ambient air temperature shall not exceed 35°C and its average value, measured over 24 hours, must not exceed 30°C. The minimum ambient air temperature will be –5°C

1.5.2 The average relative humidity measured over 24 hours must not exceed 25%; average water vapour pressure measured over 24 hours must not exceed 2,2 kPa; average relative humidity over one month must not exceed 90% and average water vapour pressure measured over one month must not exceed 1,8 kPa.

1.6 The correct positioning of control, communications and power cable entries to the switchgear from either a cable basement or cable duct below shall be specifically determined. The switchgear placement taking into account the switchgear clearances required in clause 6.4 shall be complied with.

1.7 Purpose formed cable ducts or an entry into a cable basement shall be provided below the switchgear to meet amongst other the following requirements:

1.7.1 The depth of the cable duct shall be such that cables below the switchgear shall be installed vertically against the cable duct wall.

1.7.2 The minimum bending radii requirement for all cables installed in the cable duct shall be met.

1.7.3 Suitable chamfering of 90° bends in the cable ducts shall be provided to cater for cable bending radii.

1.7.4 The separation requirements to any communication cables to prevent EMC interference shall be complied with.

1.7.5 Wherever possible the cable duct width shall be such that no additional supports for the switchgear straddling the duct shall be required. If additional support is required it shall be horizontal across the duct and not to the duct floor.

1.8 Where required the switchgear supplier and installer will install custom manufactured frames for the mounting of switchgear tiers. Where frames are to be cast into the floor this shall be co–ordinated with the casting of concrete and shall meet the switchgear suppliers' requirements and specification. The required tolerances in levels by the switchgear supplier in all direction shall be met. A certificate with specific level measurements and tolerances shall be signed off by the switchgear supplier.

1.9 The switchgear room shall be equipped with a double door with sufficient dimensions (width and especially height) to enable the switchgear to be installed into the room. Particular attention shall be paid to the landing area outside the doors, preferably a concrete base to enable the switchgear tier sections to be placed comfortably and safely for further installation into the switchgear room.

1.10 Each switchgear room shall be provided with two doors preferably at opposite ends of the room for access by operating and maintenance personnel and providing an escape route out of the room. The doors shall be provided with panic bar ironmongery to facilitate the easy egress from the room.

1.11 The switchgear installer shall install one lockable steel enclosure correctly dimensioned for the secure and lockable storage of one spare circuit breaker truck which shall be supplied for each switchboard. In the same vicinity the switchgear installer will install a wall mounted cabinet of approximately 1600 wide 1600 high for any switchgear operating tools. A storage space shall be allowed for any trolley to facilitate the withdrawal and insertion of switchgear trucks.

1.12 The roof or ceiling height of the switch room shall be minimum 3 000 from finished floor level to meet the switchgear arc venting requirements, but shall be determined by the final fault rating of the switchgear and the switchgear suppliers arc venting design including possible arc vent ducting, plasma deflectors and absorbers.

1.13 The contractor shall interface with the switchgear supplier for the installation of possible arc vent ducting above the switchgear and to exit ducts. The roof and wall designs shall accommodate these requirements.

1.14 The effect of possible solar radiation and heating on the switchgear shall be taken into account.

1.15 The contractor shall take measures to prevent the ingress of dust into the switchgear room.

1.16 No PLC panel, Battery Charger, Batteries and UPS's shall be housed in the any medium voltage switch room.

2 400 V DISTRIBUTION SWITCHBOARD ROOM REQUIREMENTS

2.1 Switchgear Room Requirements

2.1.1 The switchgear room shall be sized such that the following minimum clearances are provided to walls of the room when the final switchboard is installed:

2.1.1.1 Rear clearance 1100mm and not exceeding 1500mm

2.1.1.2 Side and front clearances 2500mm

2.2 The correct positioning of control, communications and power cable entries to the switchgear from either a cable basement or cable duct below shall be specifically determined. The switchgear placement taking into account the switchgear clearances required in clauses 10.1.1 shall be applied with.

2.3 Purpose formed cable ducts or any entry into a cable basement shall be provided below the switchgear to meet amongst other the following requirements:

2.3.1 The depth of the cable ducts shall be such that cables below the switchgear shall be installed vertically against the cable duct wall.

2.3.2 The minimum bending radii requirement for all cables installed in the cable duct shall be met.

2.3.3 The separation requirements to any communication cables to prevent EMC interference shall be complied with.

2.3.4 Wherever possible the cable duct width shall be such that no additional supports for the switchgear straddling the duct shall be required. If additional support is required it shall be horizontal across the duct and not to the duct floor.

2.3.5 Suitable chamfering of 90° bends in the cable ducts shall be provided to cater for cable bending radii.

2.3.6 No PLC panel shall be housed in any medium or low voltage switchgear room.

3 TRANSFORMER BAY REQUIREMENTS

3.1 Bay Requirements

3.1.1 Each transformer bay shall be sized such that the minimum clearances all round the transformer shall be 1200mm.

3.1.2 A blast wall shall be constructed between all transformers. blast wall height shall extend minimum of 1000mm above the highest point of each transformer.

3.1.3 The blast wall structural integrity shall be such that it will not suffer any structural damage in the event of a catastrophic transformer failure.

3.1.4 The transformer plinths shall be from reinforced concrete and not be oversized to ensure that all main power cables can be terminated vertically onto their respective gland plates.

3.1.5 The minimum bending radii shall be adhered to for power cables terminated onto the glands plates.

3.1.6 A bund area shall be provided to cater for the full transformer oil volume and to ensure that no leakage seeps outside this bunded area. A sump shall be provided at the lowest point to ensure that the oil spillage can be pumped and disposed of in a controlled way.

3.1.7 A separate system shall be provided to enable rainwater to be drained away in a controlled way e.g. a lockable valve arrangement.

3.1.8 Cable entries between bays and into the main building shall be by a cast in cable sealing system e.g. Roxtec.

3.1.9 Once all cables have been installed the bund area shall be filled with crushed stone of a designed maximum size to ensure that no cable outer PVC sheaths are damaged.

3.1.10 Correct positioning of control, communications and power cable entries between bays and into the main building shall be specifically determined to ensure that power cable failures do not damage any control cables or earth conductors.

3.1.11 The separation requirements to any communication cables to prevent EMC interference shall be complied with.

4 BATTERY ROOM REQUIREMENTS

4.1 Battery rooms shall provide easy access for batteries and battery cabinets. In addition, battery rooms shall be dry, well lit, well ventilated and protected against the ingress of dust and foreign matter.

4.2 Battery rooms shall be situated as near to the associated loads as possible.

4.3 Battery rooms shall be situated on the coolest side of the building wherever possible.

4.4 Floor Construction.

4.4.1 Expansion joints shall be avoided.

4.4.2 The floor shall be given a uniform fall, end to end, of not less than 1:200, by applying a cement screed to the concrete. Across this lower end of the floor, an epoxy lined concrete channel shall be provided, sloping towards the outlet.

4.4.3 This outlet shall discharge into a PVC drainpipe that shall be built though the external wall of the battery room, and shall lead to a dedicated drainage system, designed and installed to prevent contamination of ground water.

4.4.4 To prevent fluid discharge from the battery room, a lip of at least 25mm shall be placed on the inside of the door entrance. Alternatively a water channel, complete with the non–corrosive grid cover, shall be installed along the wall.

4.4.5 In lead–acid battery rooms, the electrolyte shall be sulfuric acid (H_2SO_4). The floor shall be given a protective coating of an approved acid–resistant epoxy coating applied in accordance with the manufacturer's specifications to prevent damage by sulphuric acid spillages.

4.4.6 An access passage at least one metre wide between cabinets or other equipment shall be provided.

4.5 Walls

4.5.1 Walls shall be continuous from floor to ceiling and be securely anchored. The walls of lead acid battery rooms shall be protected against electrolyte splashes, by applying an approved light coloured, acid resistant enamel paint.

4.6 Windows

4.6.1 Windows shall preferably not be provided in battery rooms.

4.7 Ceilings.

4.7.1 The ceilings shall be flat preferably and be at least 2,5m above floor level.

4.7.2 Being considerably lighter than air, the hydrogen given off during battery charging will rise and accumulate under the high points of ceilings and overhead structures. All such high points shall be vented to the atmosphere.

4.7.3 Ceilings shall be be given the same paint treatment as walls (see clause 14.5.1).

4.8 Doors

4.8.1 The battery room door shall have the applicable fire and security rating and shall be not less than 800mm wide and 2000mm high. The door shall have one leaf that opens outwards.

4.9 Cable Entry Facilities

4.9.1 Cable openings shall be through the floor.

4.9.2 The cable opening shall be adjacent to the wall and stands where applicable.

4.9.3 PVC or cement cable pipes curved to the bending radius of the cable shall be cast into the floor in such a way that the entry of the cables into the battery room is perpendicular to the floor.

4.9.4 To prevent fluids or foreign matter from entering the pipe, its upper end shall project at least 50mm above the finished floor surface without causing a tripping hazard.

4.10 Ventilation

4.10.1 Battery rooms shall preferably be so positioned and designed that they are subjected to only very slight changes in temperature.

4.10.2 The nominal temperature in the battery room shall be 25°C and the temperature shall be kept as close to this as possible. If the temperature exceeds 35°C, special consideration shall be given to controlling the air temperature. Air used for ventilating battery rooms shall not exceed 25°C.

4.10.3 Hydrogen gas from battery rooms shall be extracted or ventilated to a safe area, i.e. outdoors or to an area where the gas will always dissipate into the atmosphere without possible danger of the gas accumulating in any part of that area.

4.10.4 The maximum hydrogen concentration expected in the battery rooms shall not exceed 1% of the room volume.

4.10.5 If forced ventilation is required to achieve the volumetric concentration in clause 14.10.4 the fan motors shall comply with Class I Division II 'non–sparking' motors to comply with SANS 10108:2017.

4.10.6 The power source for the forced ventilation shall be of the same reliability as the supply to the battery charger e.g. essential services.

4.11 Battery Room Lighting.

4.11.1 The luminaires shall be of the type Exe class Div 1 (T1–T4)

4.11.2 The power source for the forced ventilation shall be of the same reliability as the supply to the battery charger e.g. essential services.

4.11.3 The fittings chosen shall preferably be installed on the ceiling, and shall provide sufficient light output to illuminate the tops of the batteries to a level not less than a maintained 100 lux, in accordance with the OHS Act for battery and charging equipment rooms.

4.11.4 The luminaires shall not be mounted directly over the battery stands or cabinets.

4.11.5 The luminaires shall be positioned in parallel with the battery stands or cabinets. This precaution will facilitate maintenance on the fittings, and will also minimize the obvious dangers of working over the cells.

5 GENERATOR ROOM REQUIREMENTS

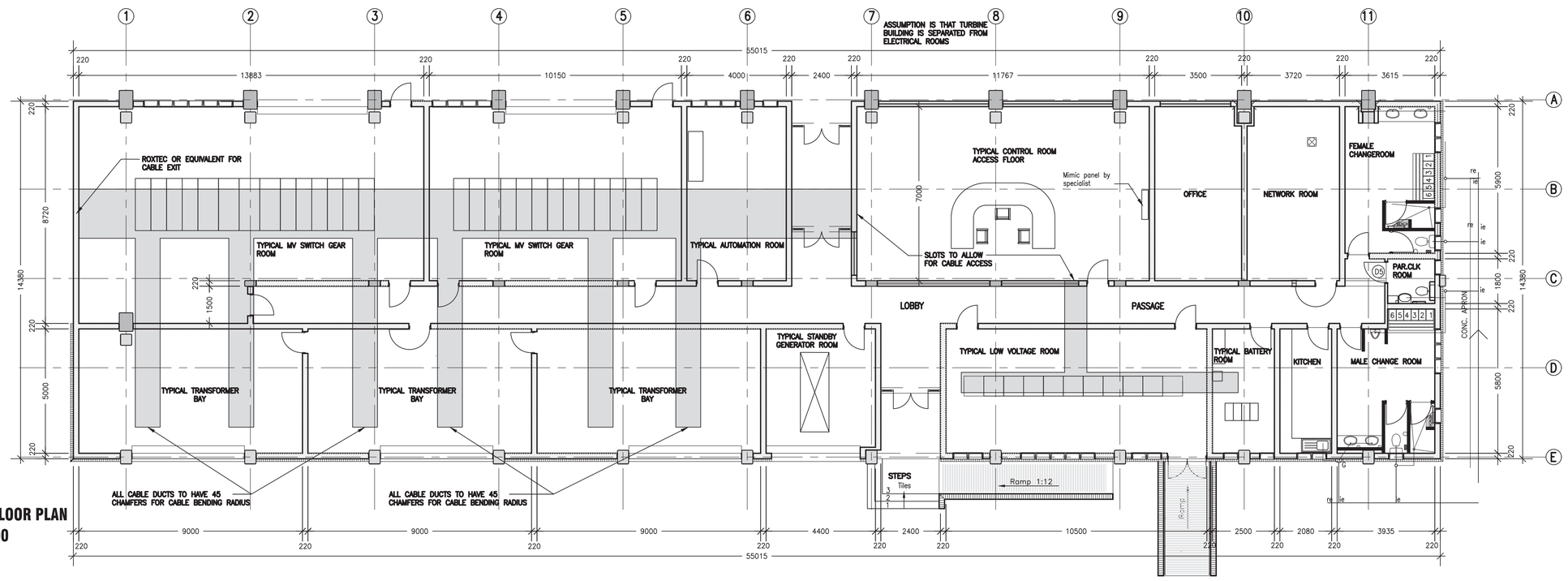
5.1.1 The generator orientation shall facilitate ease of removal of the set for maintenance and re–fuelling.

5.1.2 Air flow arrangement to the engine shall be taken into account.

5.1.3 Exhaust ducting shall be taken overhead and out of the room with a proper design with compensation.

5.1.4 A minimum of 1000mm shall be provided all around the generator for ease of access.

5.1.5 If a dummy load is required this shall be placed taking into account safety and ease of heat dissipation from the room.



TYPICAL FLOOR PLAN
Scale 1:100

DRG. No. RA 40253/101

NOTES

1. ALL LOCAL, NATIONAL BY-LAWS & SANS CODE 10400 & SANS10252 SHALL BE COMPLIED WITH.
2. SITE BOUNDARY PEGS OR CO-ORDINATES TO BE IDENTIFIED BEFORE COMMENCEMENT OF ANY WORK.
3. CONTRACTORS AND SUBCONTRACTORS TO CHECK ALL DIMENSIONS, LEVELS ETC. ON SITE PRIOR TO COMMENCEMENT OF WORK.
4. ALL LEVELS SHOWN ARE FINISHED LEVELS UNLESS OTHERWISE STATED.
5. ALL NEW WORK TO MATCH AND LINE UP WITH EXISTING.
6. NO DIMENSIONS TO BE SCALED, ONLY FIGURED DIMENSIONS TO BE USED AND LARGE SCALE DETAILS SUPERCEDE SMALL SCALE DRAWINGS.
7. ANY QUERIES OR DISCREPANCIES IN DIMENSIONS OR DETAIL ON THE DRAWINGS OR BETWEEN DRAWINGS AND SPECIFICATION TO BE REPORTED TO THE ARCHITECT FOR CLARIFICATION BEFORE RELEVANT MATERIALS ARE ORDERED OR WORK PUT IN HAND.
8. THE INFORMATION ON THIS DRAWING IS THE PROPERTY OF RAND WATER AND IS COPYRIGHT.
9. ALL WALL OPENINGS IE: DOORS, WINDOWS ETC. TO HAVE PRE-STRESSED CONCRETE LINTOLS OVER UNLESS OTHERWISE DETAILED.
10. ALL ELECTRICAL WORK TO BE DONE BY A CONTRACTOR REGISTERED WITH THE ELECTRICAL CONTRACTING BOARD AND TO BE IN ACCORDANCE WITH SANS 10142-1 AND RAND WATER ELECTRICAL SPECIFICATION RW-00320-AS-500.
11. A CERTIFICATE OF COMPLIANCE BY AN ACCREDITED PERSON TO BE PROVIDED FOR THE INSTALLATION.
12. CONTRACTOR TO ALLOW FOR TESTING & INSPECTION OF THE EXISTING ELECTRICAL INSTALLATION AS REQUIRED FOR A CERTIFICATE OF COMPLIANCE AND PROVIDE DEFECTS LIST IF ANY.

REVISIONS

No	DATE	CHECKED	APPROVED	DESCRIPTION

REFERENCE DRAWINGS

NUMBER	TITLE
RW–00320–AS–500	GENERAL ELECTRICAL SPECIFICATION

ISSUED FOR TENDER

BOX 1127
JOHANNESBURG
2000
TEL: 682–0911

RAND WATER

PROJECT No	P.02537	CHECKED	Checker	
NETWORK No	000000		APPROVED	
CONTRACT No	000000	LEAD ARCH	GP MOTSWAI	
DESIGNED BY	S.M.R. MOLIPA	REG No		Pr Arch
DRAWN BY	S.M.R. MOLIPA	DATE		
DATE	MARCH 2021	SECTION HEAD	C TUMBARE	

ZUIKERBOSCH PUMPING STATION

TYPICAL HYDRO POWER ELECTRICAL BUILDINGS

TYPICAL PLAN

STATION	WKS	DOC. TYPE	S
0 0 0	+ 0 0 0 0 0	D A G	A

SCALE AS SHOWN | REVISION

A1 | RA 40253/101 | 0