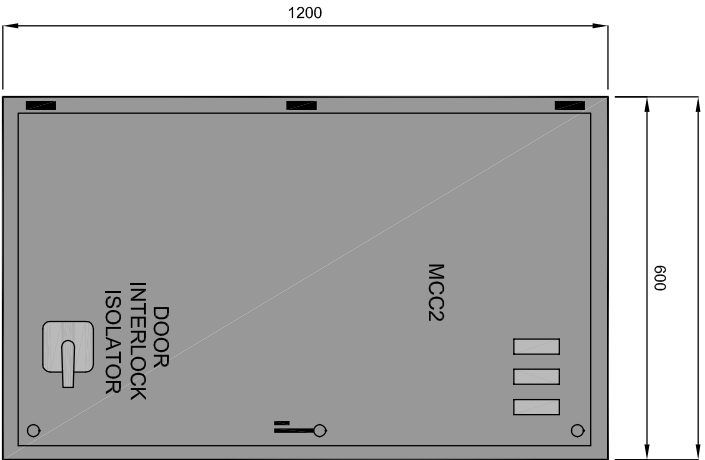


MCC01

DB REF. No : MCC01				
Equipment	Summer Load (kW)	Winter Load (kW)	Starting @400/350	
VAV Diffuser	68.5	68.5	0	0
Connected Load	68.5	68.5	0	0
Total	68.5	68.5	0	0
Notes				
System :	400 Volt/ 3 Phase / 4 Wire			
Incoming cable entry :	Top			
Outgoing cable exit :	Top			
Panel Access :	Front			
Wiring Diagrams By :	HVAC Subcontractor			
Labels :	English			
Fault Level:	10 KA			
Weather Proof:	No (IP 55)			



MCC02

DB REF. No : MCC02				
Equipment	Summer Load (kW)	Winter Load (kW)	Starting @400/350	
VAV Diffuser	67.5	67.5	0	0
Connected Load	67.5	67.5	0	0
Total	67.5	67.5	0	0
Notes				
System :	400 Volt/ 3 Phase / 4 Wire			
Incoming cable entry :	Top			
Outgoing cable ext :	Top			
Panel Access :	Front			
Wiring Diagrams By :	HVAC Subcontractor			
Labels :	English			
Fault Level:	10 KA			
Weather Proof:	No (IP 55)			

SWITCHBOARDS AND CONTROL BOARDS (CONTINUES)

ISOLATORS
The incoming isolating switch shall be of the same manufacture and frame size as the largest moulded case circuit breaker in the relevant distribution board and shall incorporate an operating handle of a different color to those of the breakers.

COMBINATION FUSE SWITCH UNITS
The fuse switch shall be the triple pole type in accordance with SANS 152 & SANS 60947-3 as applicable. Fuse switch units shall be of the double air-break quick-make quick-break type and shall have a spring mechanism smoothly driven by a spring on both sides of the mechanism. Fuse gear comprising HRC fuse cartridges carried on the cover also forming the operating level, is regarded as a fuse isolator and is not acceptable.

FUSE AND FUSE HOLDERS
High rupturing capacity (HRC) fuses shall comply with the requirements of SANS 172 with a fusing factor of 1. Each fuse link and holder shall incorporate a visual inspection for fault location. Fuses/current characteristics shall be chosen to suit the application:
a) Cable protection : The fusing factor shall not exceed 1
b) Motor circuits : Time-lag characteristics shall be such that the starting currents will not cause deterioration of the fuse.
c) Distribution system : The total operating 1st let through by secondary (minor) fuses shall be less than that of primary (major) fuses in any specific branch.

Pilot LIGHTS
Pilot lights shall have covered lenses, which can be removed to effect lamp replacement without having to remove or open the panel. Pilot lights shall be of the LED type or equal approved.

Run : Green
Trip : Red
Indicator : Amber

AMMETERS
The ammeters scales shall be direct reading with a full scale deflection corresponding to approximately 120% of the rated circuit current. Full load ratings shall be indicated with a red line on the ammeter. All ammeters to be fitted with zero adjustment and shall be flush mounted.

VOLTMETERS
Voltmeters shall be of the flush panel mounting, 400VdV moving iron, suppressed zero type, scaled from 0-500 Volt. The 400 Volt mark shall be clearly indicated by a red line on the scale.

INSTRUMENT TRANSFORMERS
Instrument transformers shall be carefully matched to their loads in respect of rating, burden and of accuracy.

HOURMETERS
Hourmeters shall comply with the requirements specified in BS 89 for instruments of "industrial grade" accuracy. Numerals shall be white on a black background and shall be clearly defined. The hourmeter shall have 7 digits with a range from 0 to 99999.99 hours.

- LABELLING**
- Labels : Care shall be taken to ensure that all equipment is labeled and that accurate descriptions and safety warnings notices are provided as required by SANS 10142-1. Labels shall also be provided for:
 - a) To identify each switchboard and each outgoing circuit, and
 - b) For all equipment on the inside and outside of the switchboard indication function and rating.
 - Labels shall correspond to the equipment description or circuit diagrams.
 - Materials : Labels shall consist of engraved laminated plastic having black characters on a white background.
 - Fixing of labels : Labels may be either individually secured by means and bolts and nuts or may be held in a purpose made holder.
- Labels glued in position are not acceptable.

SWITCHBOARDS AND CONTROL BOARDS

GENERAL
All switchboards shall be totally enclosed, vermin and insect proof, dust - and waterproof to IP54 Standard. Surface mounted switchboards shall be used only where they are not larger than 1200mm wide x 1200mm high. All other switchboards shall of the floor standing type. The name of the switchboard manufacturer shall appear on each switchboard.

All switchboards shall comply with the requirements of the clause 6.6 of the latest SANS 10412-1 regulations.

All panels with a fault level rating of less and equal to 10kA shall comply with clause 6.6.3 & 6.6.4 and panels with a fault level rating higher than 10kA, shall comply with clauses 6.6.5 & 6.6.6.

CONSTRUCTION OF SURFACE MOUNTED SWITCHBOARDS
The switchboard shall consist of a 1.6mm sheet metal enclosure, suitably braced with the necessary reinforced fixings for wall mounting. All joints shall be welded. A 20mm front edge, beyond which no equipment must protrude, shall be provided.

All equipment shall be mounted on a strengthened 2mm chassis, rigidly fixed to the enclosure.

The front shall be covered by a hinged 2mm panel(s) with machine punched slots and holes for the flush mounting of circuit breakers, instruments, indicator lights, push buttons, etc. Motor protection units, etc shall not protrude beyond the panel. Instruments, indicator lights and control push buttons can also be mounted on the panel(s). The panel(s) shall have a square key operated lock, solid hinges and minimum 1 level lock. All front panels shall be hinged. Removable front panels with retaining pins and latch are not acceptable.

CONSTRUCTION OF FLOOR STANDING SWITCHBOARDS
Floor standing switchboards shall be totally enclosed, and shall be of multi-layered, fixed pattern, sectional construction, allowing for the logical grouping of equipment behind individual hinged panels. All switchboards shall be suitable for mounting against a wall and shall provide for front access to all equipment and terminations, but top panels shall also be removable.

The switchboards shall consist of 1.6mm sheet metal enclosure and a 1-4 channel base frame, sufficiently braced to support all equipment and span floor trenches and access holes. The maximum height of the switchboard shall be 2.5m.

Top, and rear removable panels of 2mm minimum steel shall be fixed with studs and chromium plated brass dome nuts and washers or hex nuts and bolts.

Access to all sections of the switchboard shall be via hinged front panels consisting of 2mm minimum steel steel with square key operated, non-thermo fasteners designed to draw the panel closed. Panels fixed by nuts and bolts or captive screws are not acceptable. Unhinged panels with retaining pins and latch are not acceptable. Hinged panels shall be distised with 20mm upturns and be equipped with rubber or neoprene seals. The panels shall be suitably braced and stiffened to carry the weight of flush mounted equipment and to prevent warping. Long pedestal type or smaller hinges with two bolts per hinge shall be used on all panels for flush mounted protection relays and on panels higher than 600mm. Three hinges shall be provided on panels higher than 1 meter. Hinges with single bolts may be used on smaller panels.

Earthcompartments shall be provided with an appositive means of isolation. A clutch type operating handle interlock with the hinged panel to open in the "off" position only, shall be provided for isolators or moulded case circuit breakers that are not flush mounted.

BUSBARS
Busbars shall consist of high conductivity (Density 1.6 A/mm²) copper and shall be rated to carry the current corresponding to the full load rating of the incoming switch. Reduced section neutrals will not be permitted; busbars shall be enclosed in a chamber, which shall have cover plates allowing access to their full length. Busbars and connections shall be color coded. Earth bars of tinned copper shall be provided in all boards with adequate cross sectional area.

Each bar must be sufficiently bonded to the metal framework of the board, and shall be of adequate size to accommodate a separate earth wire for each circuit requiring one.

WIRING
Conductors for control, instrumentation, monitoring, alarm and for low voltage supply circuits that are bunched and bound or installed in PVC wiring channels shall be installed along the sides of the individual switchboard sections, and must be accessible from the front. The minimum sizes for these conductors are 1.5mm² PVC insulated stranded annealed copper. Switchboards wiring shall be neatly done and finished either with the aid of approved wiring channels or faced with best quality lacing material at suitable intervals.

Circuits shall be marked with numbered ferrules to facilitate circuit identification. These numbers must correspond with the board-wiring diagram.

TERMINATIONS

Terminals for all outgoing control, instrumentation, monitoring, alarm and low voltage supply circuits shall be located at the bottom and/or top of the switchboard and shall be accessible via hinged front panels. These terminals shall be installed away from terminals for power circuits and must terminate on numbered terminal strips. The correct terminal size shall be used for each conductor. Only one conductor terminal will be allowed. Bridging controls on terminals shall be used for parallel-connected circuits. All outgoing power cables shall terminate within 300mm of the gland plate to avoid long leads. Where this is not possible, the lead must be separately braced. Power cable sizes up to and including 70mm² may terminate on clamp type terminals where the clamping screws are not in direct contact with the conductor. Connections to the equipment can then be made with cables that are similarly connected to the clamp terminal. All power cable sizes larger than 70mm² shall terminate on busbars that are connected to the associated equipment. Conductors shall have lugs that are sweated or crimped. Lopping of incoming supply wiring to larger circuit breakers and contactors etc. is not acceptable. Each device shall be individually connected to the supply busbars.

EQUIPMENT - MOUNTING OF EQUIPMENT

Equipment to be mounted on the chassis shall be mounted by means of a DIN rail, bolts, washers and nuts or by bolts screwed into tapped holes in the chassis plate. In the latter case the minimum thickness of the chassis plate shall be 2mm. The latter method shall not be used where boards will be subjected to vibration or mechanical shocks. Self-lapping screws will not be accepted.

In designing the switchboard the following requirements shall be strictly adhered to:

- a) A minimum of 50mm between any piece of equipment and the frame or internal partitioning. This minimum space is required on all sides of the equipment. In the case of a single row of single-pole circuit breakers, the spacing on one side of the row may be reduced to 20mm if the incoming side of the circuit breakers is busbar connected.
- b) A minimum of 75mm between horizontal rows of equipment. The maximum outside dimensions of equipment shall be considered.
- c) Circuit breakers up to a fault rating of 10kA may be installed adjacent to each other. For higher ratings a minimum of 40mm shall be allowed between circuit breakers or isolators.
- d) Sufficient space shall be provided for wiring, allowing for the appropriate bending radius.
- e) Space for future equipment shall be allowed as specified.
- f) Time switches shall not be located amongst switchgear.

STARTERS, CONTACTORS AND RELAYS
Starters shall be provided for all electrically driven mechanical equipment and shall be as specified or otherwise required by local supply authorities or system requirements.

Contactors shall be of the open or totally enclosed, double or triple pole, electromechanically operated air-leak type suitable for 220/250V or 380/440V supplies and shall comply with SANS 60947-4; contactors shall have a rating at least 10% higher than the circuit breaker protecting the contactor.

Protecting tripping devices shall be of the manual reset type and shall provide for protection under all conditions of motor operation. The overload tripping device shall be adjustable within a range of 75 to 125% of the motor rating. All overload relays shall be adjustable, manual reset units combined with single-phase protection.

MINIATURE CIRCUIT BREAKERS

Miniature circuit breakers shall be of the single and three pole clip-in type and shall be rated for 250 to 400 volts respectively, and shall have a making and breaking capacity as indicated on the drawing. The breaker contacts shall be of non-welding materials and the service life of the breakers shall be at least 20 000 operations, both mechanically and electrically when carrying the rated load. All breakers shall be in accordance with SANS and shall have thermal magnetic trips.

MOULDED CASE CIRCUIT BREAKERS

Moulded case circuit breakers shall comply with SANS 156 & SANS 60947-2. Protection shall be thermallymagnetic, providing an inverse characteristic for overload conditions and an instantaneous characteristic for fault conditions. Circuit breakers shall afford close excess current protection. Gapped tripoles of single phase circuit breakers used in three phase applications are acceptable, provided that trip mechanisms are internally linked.

Revisions:

Rev.	Description	Date	By
0	Issued for Tender	01-11-2017	FMB

Standard Notes:

This drawing shall not be used as a construction/installation drawing.

Routes and zones have been allocated to this service, location dimensions are indicative of these.

To prepare his construction/installation drawing the (sub)contractor shall adhere to this co-ordination principle and shall inspect all the architect's drawings, including structural and other services design drawings pertaining to the works. The (sub)contractor shall ensure that the work is carried out in accordance with all other services and ensure that in doing his work he shall not obstruct the fixing of future maintenance of other services.

The (sub)contractor shall be responsible for correct field dimensions, clearances and heights, quantities, fabrication processes and techniques of construction co-ordination of his work with that of all other trades, providing all devices necessary for safe and satisfactory operation.

Legend:

- Ammeter/Volmeter Phase Selector Switch
- Isolator
- Volt meter
- Ammeter
- Indicator light
- Auto/Off/Manual Selector Switch

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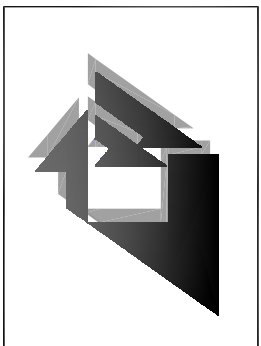
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SPOORMAKER & PARTNERS
MECHANICAL & ELECTRICAL
CONSULTING ENGINEERS

Project:

SARS ALBERTON

Drawing Title:

HVAC Electrical Motor
Control Center
for VAV Diffusers

Designed	Drawn	Checked	Passed	Date	Scale
MD	FMB	SE	MD	01.11.2017	NTS
Drawing Status: Issued for Tender					
Project Number	Division	Service	Drawing Number	Revision	

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