

PROPOSED CIVIL WORKS AT VOI 33/11 KV SUBSTATION					
BILL OF QUANTITIES					
ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
SECTION. 1					
Preliminaries					
A	Allow for a temporary site office ,notice board, shelves and , store for materials and tools storage. To accomodate 7 people and all furniture and meeting accesories	ITEM	1		
B	Allow for clean water for the works	ITEM	1		
C	Allow for all the necessary statutory approvals for the worksby relevant county authorities ;Replication of drawings to required formats by county government;Endorsement by relevant professional persons; and submit a set of approved drawings before commencement ,including site registration.	ITEM	1		
C	Allow for temporary sign post for the proposed works	ITEM	1		
D	Allow for security and insurance for the proposed works	ITEM	1		
E	Allow for supply of power connection for use for the works.	ITEM	1		
F	Allow for a qualified personel conservant with Kenya Power safety regulations for the entire contract period;with capacity to receive safety permits and double up a ssafety officer	ITEM	1		
G	Allow for prompt communication and updates facilitation to client supervision team including communication and project data storage, 2 no.laptops, 2 no.hard drives,airtime etc	ITEM	1		
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ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SECTION 2				
	SWITCHYARD REHABILITATION & REINSTATEMENT				
1	Switch yard 2000 SM				
A	Clear working area of all the site of existing ballast and rubbles	ITEM	1		
B	Scoop loose top soil by cutting average 400mm deep to receive imported fill	SM	2,000		
C	Provide average 300 mm thick selected well compacted imported murrum fill, compacted in layers of 150mm thick using a plate compactor to achieve slope	CM	700		
D	Prepare and apply Gradiator 4TC or equal and approved insecticide to surfaces of blinding as per Manufacturer's written instructions	SM	2,000		
E	Apply suitable weed killer, herbicide to surfaces of blinding as per the Manufacture's written instructions	SM	2,000		
F	1000 gauge polythene or other equal and approved membrane laid on compacted and treated quarry dust with weltd laps of 200mm wide.	SM	2,000		
G	Supply and spread uniformly 150mm thick 'one inch' (1") ballast in switch yard to match existing-re use existing ballast wher not sufficient top up with new supply	SM	1,600		
H	precast concrete chanel 200mm high at the ballast perimeter to prevent ballast spill over as restraint	LM	220		
3	Cable ducts				
A	Supply and install 150mm diameter medium gauge PVC pipes as ducts. with and including 150mm thick concrete class 20 surround and murrum compaction underlying pipe bases as per as per engineer's detailed drawing-in all locations;	LM	70		
	TOTAL THIS PAGE				

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
SECTION 4					
DRAINAGE WORKS					
A	PERIMETER OPEN DRAIN				
	Excavate on site drain trench not exceeding 1.5m deep including plunking and strutting, disposal of soil to receive drainage channels and forming sloping sides in well compacted murrum bed, (hydraulic depth 1m ,Trapezoidal area 0.9sqm)	LM	150		
	Lay (600mm) dia precast concrete invert block drains to a suitable fall with grooved edge and tongued joints filled with cement/sand mortar (1:3) and laid on 50mm thick plain concrete bed 100mm	LM	150		
	Supply and lay on sides of sloped trench (75x230mm wide) precast concrete slabs jointed in 1:3 cement sand mortar,including proper joint treatment with waterproof Mortar	SM	500		
	Extra over for allowing inlet openings from collection chambers 150mm with PVC pipe;all including surface treatment and joint sealant max 40 inlet ports	ITEM	1		
B	MAN HOLES				
	Drop Manholes 600 x 600 x avrg 450mm deep (Internal) comprising :1000 x1000 x 150 mm thick mass concrete Class 20 base : 150mm Solid concrete block walls : 150mm Thick VRC Class 20 top slab/or cover; with heavy duty meshed/grilled manhole cover : 12mm internal render to base and walls : including step irons : all necessary excavation, disposal and formwork, with outlet PVC pipes as per type A or B across the sitchyard terminating to the open drain max 5 no chambers;	ITEM	1		
	TOTAL THIS PAGE				



ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
D	STORM INTERCEPTER CHANEL				
	TWIN RCC chanel 600mm deep 250mm wide ;200mm thick walls with 12mm steel bars at 150mm spacing with 8mm binders at 150mm ;overlying a concrete base 150mm thick with smooth finishes;groove 50mmwith angle edge nosing with grating heavy duty made of 25mm twisted bar on a 50x50 angle framing perfectly fitting the groove	LM	8		
	150mm Thick P.V.C HD Stormwater drainage pipe ; including excavation not exceeding 500mm deep (average 4500mm) and backfilling to approval. Starting and fermating at manhole chambers to all switchyard manhole drain pits	LM	100		
E	SOAKPIT-DIAMETER 1200mm				
a	Excavation and cart away 0-3m	LM	3		
b	Excavation and cart away 3-6m	LM	3		
c	Excavation and cart away 6-9m	LM	3		
d	Excavation and cart away 9-12m	LM	3		
e	Excavation and cart away 12-17m	LM	5		
	Allow for construction of masonry blocks minimum 1.2m top depth and covering with RCC slab 150mm thick with 12 mm steel at 150mm spacing including all provisions for concrete ,steel and builders work	ITEM	1		
	Connection and termination of all incomming strom water with ogees and drain pipes.	ITEM	1		
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ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	CABLE TRENCH				
	Trench 600mm wide TO 1200MM wide-length 260 Metre various locations				
A	BULK excavation for trench 1.0-1.5m wide from reduced level not exceeding 1.2 m deep.	CM	580		
B	Load, cart away from site excavated materials and dispose at areas designated by local authority.	CM	400		
C	Fill in and ram selected backfill materials around trench.	CM	140		
	Trench bed				
D	50mm plain concrete(1:4:8) blinding on cable trench bed 1.5m wide	SM	310		
	Vibrated reinforced concrete class				
	20/20 1:2:4/20 as described in:				
E	In 150mm thick trench base with smooth steel finish	CM	40		
F	In 150mm thick vertical walls	CM	66		
	fairface form work to				
G	Sides of trench wall	SM	880		
	Steel reinforcement bars including tvina bendina spacer blocks tvina wires and fixing high tensile bars to BS 4461				
I	Y 8mm in cable trench	KG	3,650		
	Precast concrete trench covers (external cable trenches)				
K	Provide and put in place (1000x300x75mm) thick precast concrete trench covers reinforced Y8 bars spaced at 100mm both ways with handles for lifting;with all edges protected with angle section 25x25mmx3mm	NO	550		
	DITTO for 1200mm trench	NO	350		
	Cable trays				
	Fabricate and fix cable trays,in 50x50x6mm thick RHS frame WITH 50x50x4mm RHS ties at 300mm c/c welded in themain frame and raised 200mm above the cable trench floor with same size supports,ALL steel work PAINTED to clients approval with 2 coats and undercoat primer	LM	160		
L	Allow for grooves 300x300mmx600mm deep at 800mm spacing besides the cable trench edge A MAX OF 6	ITEM	1		
	TOTAL THIS PAGE				



ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
ELEMENT NO.3					
	OIL sump chamber 6m x 5m x 3m deep; perimeter 200mm thick block walling; internal plaster complete with niru finish; with ring beam at every 2m interval 250x200mm with 4 nos. 12mm bars and 8mm shear links at 200mm spacing; cover slab with manhole opening 150mm reinforced with 8mm steel bothways at 150mm spacing; heavy duty steel cover; including pvc pipe 4" connecting with the main transformer pit not exceeding 6m away -in two compartments	ITEM	1		
	Allow for connection to soak pit	ITEM	1		
ROAD REHABILITATION					
ACCESS ROAD					
2 Paving blocks (Access road)					
A	Excavate for 5m wide access road depth not exceeding 750mm and cart away the spoil	CM	600		
B	Average 300mm thick selected well compacted hardcore fill, compacted in layers of 150mm thick using 10 tonne vibrating roller to receive paving blocks	CM	240		
C	300mm approved compacted murrum fill in 150mm layers	CM	250		
D	50mm thick approved and well compacted quarry dust blinding on hardcore	SM	750		
E	Heavy duty industrial concrete paving blocks size (210x105x80mm) minimum strength 49N/mm square laid to slope on quarry dust and compacted	SM	750		
F	125 x 250mm splayed kerb to BS 340 including 125 x 100mm channel iron and including concrete Class "E" foundation and 100mm haunching to back of kerb including all necessary excavation, formwork and disposal	LM	390		
G	Ditto but curved	M	50		
3 Painting					
A	Prepare and apply approved gloss paint to kerblines; 125mm girth; colour to engineer's approval	LM	440		
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ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	GATE				
	Fabricate and fix a primary substation gate as per DRAWING the consisting of 75x50x8mm mainframes and 50x50x3mm intermediate members and bracings with small wicket openable door 1m wide with closing latches 14 gauge plate; including gate columns ,fastening,assembly and all works 6m x2.0m	NO	1		
	Extra over for painting with cooperate colours and logo	ITEM	1		
	ELEMENT NO.4				
	CONTROL BUILDING REFURBISHMENT				
a	Remove existing floor tiles and keep at designated area NOT less than 400mm wide	LM	20		
b	backfill to make up levels of existing panel room floor by 1.2 m depth in 200mm compacted layers with inert material and hardcore	CM	120		
c	ditto to 600mm depth	CM	40		
d	Perimeter walling 200mm masonry wall to act as permanent formwork to trenches 1200mm wide	SM	40		
e	Ditto for 600mm trenches	SM	30		
f	polythene 1000g under floor base	SM	200		
g	floor concrete class 20/20 150mm thick	SM	200		
h	BRC mesh A 142 to floor	SM	200		
i	Nosing angle iron 50x50x3mm to all trench edges with anchors to floor	LM	120		
j	concrete blinding to cable trenches 600-1200mm deep and	SM	45		
k	steel 8mm to cable trenches	KG	970		
l	Formwork marine ply or such to internal trench faces		120		
m	cable ducts for feeder and incomers in sets of 2 nos. and 4 nos. 200mm above cable trench base protruding to the external cable trench at 150mm above external trench base-200mm dia. Pvc HD pipes	LM	80		
	TOTAL THIS PAGE				

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
INTERNAL WALL PARTITIONS					
n	Breaking tiles 600mm wide and excavation of wall and column bases 600mm and 1000mm sq. respectively	CM	30		
o	50mm thick plain concrete (1:4:8) blinding under strip and columns foundations.	SM	30		
Vibrated reinforced concrete class 20/25 1:2:4/25 as described in:					
p	Strip foundation (600x250)mm	CM	5		
q	Column bases size (1250x1250x250)mm	CM	2		
r	Columns size (250X250)mm	CM	3		
s	RING beam 300 x 200	CM	3		
Steel reinforcement bars including tying bending spacer blocks tying wires and fixing high tensile bars to BS 4461 to strips, columns and bases					
u	Y8-16mm	KG	500		
Sawn formworks to					
aa	Sides of column size 250 x 250 mm	SM	40		
bb	Sides of floor slab 150-200mm girth.	LM	55		
	Sides of plinth beam 300x200	SM	25		
Foundation walling					
cc	225mm thick approved natural stone walling bedded and jointed in mortar (1:3) UP TO 1m above ground	SM	45		
dd	allow for for submitting design proposal, drawings and sketches for the headroom extension and existing roof modification before implementation	ITEM	1		
TOTAL THIS PAGE					

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ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	ELEMENT NO 6				
	SUPERSTRUCTURE				
1	Walling				
a	Pluvex No 1 or other equal and approved bituminous damp proof course to B.S 743. 225mm wide under walling (m.s) including for 200mm long laps (measured net no allowance included for the laps)	LM	35		
b	225mm thick approved smooth hand dressed natural stone walling in cement mortar (1:4) including for hoop iron in every alternate course.	SM	140		
	Vibrated reinforced concrete class				
	20/25 1:2:4/25 as described in:				
c	In columns size 250x250mm	CM	2		
d	In ring beam and upstand size 450-600x200mm	CM	2		
	Steel reinforcement bars including tying bending spacer blocks tying wires and fixing high tensile bars to BS 4461 in upstands ring beam and slab canopies				
i	Y 8mm-16MM	KG	500		
	Sawn form work to				
p	Sides and soffits of ring beam	SM	45		
	Making up headroom height to 4 m by masonry block works including all builders work finishes and like	ITEM	1		
	create 1000x2400 door openings to new partition rooms for charger and battery including all builders work and fixing aluminium powder coated off white grey door and burglar grill with 12mm steel bars complete with 3 lever locks and door accessories including door stopper and door closer	NO	2		
	supply and fix gypsum fire proof ceiling including the metal rails and accessories and paint 3 coats of final brilliant white paint	SM	200		
	Allow for temporary roofing work while raising headroom	ITEM	1		
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ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	ELEMENT NO. 7				
	ROOF CONSTRUCTION AND COVERING				
	<u>re construct existing roof by removing existing sheets and trusses at the marked 11kv board room area and raise the same by increasing headroom to 4m</u>				
1	hoisted 4m high above finished floor level				
	Carefully removing trusses and refix at 4m headroom	ITEM	1		
	carefully removing sheets and refixing at 4m headroom	ITEM	1		
	Making good all gutters work and rainwater harvesting works with additional pipes as maybe required	ITEM	1		
	Fix emergency lighting at 3.5m on two control room faces 40watt bulkhead including all electrical and buil;ders work	ITEM	1		
	FINISHES				
1	Floor finishes				
c	terazo paving to wood floated floor screed including all the necessary strips	SM	200		
d	100mm skirting ditto	LM	70		
e	12mm thick internal quality lime plaster finished smooth with steel trowel to NEW walls and make good existing	SM	350		
a	Prepare surface and apply undercoat and 3 coats of 1st quality silk vinyl emulsion paint to plastered walls internally and externally.	SM	350		
H	suply and fix new roofing sheets at the refurbished area and cart away to kplc designated location within the depot	ITEM	1		
I	Allow for safe guarding the existing equipment rooms against vibrations dust,falling objects and access	ITEM	1		
	TOTAL THIS PAGE				



ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
ELECTRICAL INSTALLATIONS WORKS					
A	Electrical builders work to power supply points and distribution board lighting points; sockets; including chasing and making good all works as described	ITEM	1		
B	Electrical distribution board, Electrical lighting work and accessories, fluorescent bulbs, socket outlets, switches AS Follows 12 nos 4 feet fluorescent lamps; 4 nos ball fittings, 16 nos 13 amp sockets, cooker unit sockets 1 no.; provision for data and TV cable in all operator room, CCTV with 6 no cameras and VDU in controller room including supply and fixing of 110v DC distribution board 12 way Rated 100 Amps.	ITEM	1		
c	Supply and install 420volts AC Autochangeover Distribution panel with technical specifications as attached in the technical spec document (KP) / 6C.1 / 13 / TSP / 09 / 092)	ITEM	1		
ELEMENT NO. 7 - SMOKE DETECTORS					
a	Allow for Hardwired Smoke detectors installations; including a battery back up; to be carried out by a nominated sub-contractor-member OR approved type	ITEM	1		
b	Allow for general attendance on specialist contractor	ITEM	1		
c	Builder's work in connection with Smoke detector installations; cut away for and attend in all trades on the sub-contractor installing the following points in a mainly concealed system; including chases, holes and recess notching in timber etc; and making good all finishes for cut in boxes, electrical wiring, mounting brackets, smoke detector feeds, fire alarm points etc	ITEM	1		
ELEMENT NO. 8 - AIR CONDITIONING					
Air conditioning-stand alone type					
Supply and fix air conditioners complete with all fixing accessories to control room temperatures from approved suppliers					
a	24000 BTU	ITEM	4		
b	allow for fume extractor with opening diameter not less than 500x500mm including supply of extractor and fix in battery room 60 cubic meters	ITEM	1		
C	allow for grooves 300x300x600mm deep on cable trench edge for fixing panels	NO.	8		
TOTAL THIS PAGE					

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
ELEMENT NO. 9 - FIRE EXTINGUISHERS					
	Supply and fix controlled discharge 9 litre carbon dioxide gas fire extinguisher manufactured to BS EN 3-9:2006, Bs 7863:2009, BS 5306-4:2001 and the cylinder manufactured to BS 5045 complete with the following:	No	4		
	Charge and fixing bracket, Pictorial instructions, Colour code, Servicable on site, discharge horn and hose, Brass hot stamping, Operating valve, Local Fire Brigade approval				
	Ditto but DRY powder fire extinguishers	No	4		
	Ditto fire blanket 6' x 4' container	no	2		
CABLE TRENCH ACCESSORIES- INTERNAL					
600x600mmx6mm thick chequered plate trench covers					
a	reinforced with 40x40mmx3mm thick SHS all round primed and apply 3 coats of first quality gloss paint.	NO	70		
	Ditto for 1200mm wide trench	NO	50		
Precast concrete trench covers (external cable trenches)					
r	Provide and put in place (1500x300x75mm) thick precast concrete trench covers reinforced Y8 bars spaced at 100mm both ways with handles for lifting; with all edges protected with angle section 25x25mmx3mm	NO	340		
s	allow for handles and grooves for lifting and opening for 10% of all covers	ITEM	1		
†	allow for C- channel framing to support the 11kv board 150x50x8mm to form support at every board edge including grouting on floor, painting and the like	LM	40		
TOTAL THIS PAGE					

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	PERIMETER WALLING-BOUNDARY WALL 2.4M HIGH				
	(Substructures)				
L	Excavate for foundation trench 600mm wide commencing at reduced level and not exceeding 1.5m deep.	CM	170		
M	extra Excavations for widening column bases size (1.0x1.0)m	CM	40		
N	Ditto exceeding 1.5m but n.e 3.0m	CM	15		
O	Extra over for excavation in all classes of rock at any depth.	CM	3		
P	Load, cart away from site surplus excavated materials and dispose at areas designated by local authority.	CM	128		
Q	Fill in and ram selected imported materials around foundation and columns.	CM	100		
R	Provide all the necessary planking and strutting to uphold sides of trenches.	ITEM			
S	Allow for keeping all excavations water free by pumping, bailing or otherwise.	ITEM	1		
T	50mm thick (1:4:8) mass concrete blinding to walling and column bases	SM	180		
	Vibrated reinforced concrete class				
	20/25 1:2:4/25 as described in:				
U	Foundation strip size (200x600)mm	CM	120		
V	Column bases (1000x1000x300)mm	CM	22		
W	Columns (200x300)mm	CM	15		
X	Plinth beam 300x200mm	CM	13		
	Sawn/Steel form work to				
A	Vertical sides of column	SM	300		
B	Vertical sides of ground beam	SM	120		
	Steel reinforcement bars including tying bending spacer blocks tying wires and fixing high tensile bars to BS 4461				
C	Y 8-16MM	KG	4000		
	TOTAL THIS PAGE				



ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	225mm thick natural stone substructure walling in cement sand mortar (1:3) including and reinforced with 20 SWG hoop iron in every two alternating course.				
F	225mm thick natural stone wall	SM	250		
G	25mm thick cement/sand (1:4) rendering on plinth area finished smooth to receive bituminous paint-400mm high	SM	80		
H	Allow for and create 100mm diameter weep holes at ground level every 3.0m centers on masonry/concrete wall and prevent ingress using wire mesh grouted in cement sand mortar.	No.	70		
2	Superstructure-Walling				
I	200mm thick machine-cut or fair faced dressed natural or approved concrete blocks stone walling in cement/sand (1:4) mortar including 20G hoop-iron in every alternate courses. Internally plastered and external horizontal joints keyed in cement/sand mortar (1:3)	SM	450		
J	350mm wide pre-cast concrete coping twice weathered and twice throated fixed to wall.	LM	140		
K	(800x550)mm square concrete coping weathered and throated on all sides fixed to double columns.	No.	20		
L	(550x450)mm square concrete coping weathered on all columns.	No.	41		
M	extra over for key pointing externally	SM	420		
N	allow for internal plaster whole wall	SM	420		
3	Expansion Joint				
N	40mm thick construction joint in flex cell or equal and approved expansion joint and (25x25)mm expedite sealer	SM	22		
	TOTAL THIS PAGE				



ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
4	Razor Wire				
	<i>Supply and fix Razor Wire at the top of boundary wall conforming to the following specifications.</i>	LM	180		
○	Coil size-450mm diameter, Blade profile-ripper razor wire, Stretch factor-maximum of 10m per coil and secured to wall with galvanised steel plates at 1m centers.				
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ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
2	SWITCH YARD PLINTHES 33KV FEEDER BAYS				
	Switchgear Foundation plinth for the following 33kv KPLC steel Structures, to +150mm on new proposed feeder bay re arrangement consisting of ,14no.33kvA/B switches, 4Nos.CBs plinth, 6nos.33kvCTs, 3nos. 33kvVTS & 4nos. post insulator/SD-2 leged ; , 4NO.11KV ABS, 2no security lights,2 no lightning arrester,2 n0.11kv CB,1 no. NCT,10NO. for UG/OH transition; as per the General arrangement drawing(GA) and all to structural engineers details.-Total 60 nos. no.plinth				
F	Excavate foundation pits commencing from reduced level but not exceeding 1.5 m deep	CM	130		
G	Ditto but not exceeding 3.0metres	CM	10		
K	Backfill and ram selected excavated material around foundations	CM	190		
H	Cart away surplus excavated materials from Site to municipal council designated dumping site.	CM	90		
I	Disposal of water and Strutting	ITEM	1		
J	Blinding mix (1:4:8 - 50 mm)	SM	80		
K	Class 25(20) in foundations Bases	CM	30		
L	Class 25(20) in stub col bases with face finishes	CM	60		
M	steel 8 to12mm to bases and column	KG	5000		
N	Shuttering to columns stubs	SM	340		
O	Edges: 75 to 300 mm to plinths	LM	270		
P	grouting bolts /inserts and the like by holding in position when pouring concrete not exceeding 600mm long-bolts supplied by client	NO	240		
Q	13mm thick plaster (1:3mix) to top surface of foundations with smooth finish trowelled	SM	70		
R	Attendance for KPLC staff to do earthing before all blinding including security for all copper strip edges	ITEM	1		
A	supply and install 32mm heavy duty PVC flexible conduit fastened on switchgear plinth reinforcement to lengths not exceeding 5.0metres in every plinth and to flush with finished plinth level for earthing conductor.	ITEM	1		
TOTAL THIS PAGE					

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
2	SWITCH YARD PLINTHES BUS BAR GANTRIES 1.5X 2.0M				
	Switchgear Foundation plinthes for the following 33kv gantry steel structures, to +150mm on the new proposed bays consisting of , 2nos.33kv BUSBAR ASSEMBLY. General arrangement drawing(GA) and all to structural engineers details.-Total 3 no.plinths				
F	Excavate foundation pits commencing from reduced level but not exceeding 1.5 m deep	CM	20		
G	Ditto but not exceeding 3.0metres	CM	20		
K	Backfill and ram selected excavated material around foundations	CM	28		
H	Cart away surplus excavated materials from Site to municipal council designanated dumping site.	CM	12		
I	Disposal of water and Strutting	ITEM	1		
J	Blinding mix (1:4:8 - 50 mm)	SM	10		
K	Class 25(20) in foundations Bases	CM	2		
L	Class 25(20) in stub col bases with face finishes	CM	10		
M	steel 8 to16mm to bases and column	KG	650		
N	Shuttering to columns stubs	SM	30		
O	Edges; 75 to 300 mm to plinths	LM	30		
P	grouting bolts /inserts and the like by holding in position when pouring concrete not exceeding 600mm long-bolts supplied by client	NO	32		
Q	13mm thick plaster (1:3mix) to top surface of foundations with smooth finish trowelled	SM	25		
R	Attendance for KPLC staff to do earthing before all blinding including security for all copper strip edges	ITEM	1		
A	supply and install 32mm heavy duty PVC flexible conduit fastened on switchgear plinth reinforcement to lengths not exceeding 5.0metres in every plinth and to flush with finished plith level for earthing conductor.	ITEM	1		
TOTAL THIS PAGE					

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
4	2 NO. TRANSFORMER PLINTH 2X7.5MVA				
E	Excavate pit foundations not exceeding 1.5 metres deep from reduced levels	CM	105		
F	Return fill and ram suitable excavated material to the sides of the plinths	CM	15		
G	Cart away from site surplus excavated materials	CM	39		
H	Plain concrete 50mm thick blinding 1:4:8 to footing	SM	50		
	Vibrated Reinforced Concrete Class 25/20 mm Aggregate in:-				
I	Base	CM	20		
J	PEDESTALS	CM	11		
K	COVER SLAB-300mm thick	CM	4		
	High Tensile Steel Reinforcement Bars: Cold Worked to BS 4461 (Provisional)				
L	8 mm-16MM diameter	KG	3200		
	Fairface Formwork to:-				
N	Sides of base 225-300mm wide	LM	24		
O	Ditto slab	LM	17		
P	Vertical sides of footing	SM	51		
	Hardcore filling				
A	Approved hardcore filling compacted to Engineer's approval AND MARRUUM layer 300mm	CM	36		
B	Blind surface of hardcore with lean concrete	SM	15		
C	1000 gauge polythene sheet laid over hardcore	SM	15		
	SUMP RCC WALLING				
	Mass insitu concrete (1:4:8) in:-				
D	Strip footing	SM	28		
	Vibrated Reinforced Concrete Class 25/20 mm Aggregate in:-				
	Base	CM	6		
E	Walling finished fair face	CM	6		
	Formwork				
F	Vertical sides of base	SM	50		
G	Vertical sides of walling	LM	56		
	High Tensile Steel Reinforcement Bars: Cold Worked to BS 4461 (Provisional)				
H	8-12 mm diameter	KG	1000		
	TOTAL THIS PAGE				



ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
J	allow for transformer pit grating made of 50x50x6mm angle iron fixed on pedestal and wall of sump to suport grating including grating with 20mm gaps on a mainframe of 50x50x6mm ms angles and similar size welded at 20mm centres including all painting ,steel work and fixing to client approval	ITEM	2		
K	OIL sump chamber 2m x 5m x 2m deep; perimeter 200mm thick block walling; internal plaster complete with niru finish; with ring beam at every 2m interval 250x200mm with 4 nos.12mm bars and 8mm shear links at 200mm spacing; cover slab with manhole opening 150mm reinforced with 8mm steel bothways at 150mm spacing; heavy duty steel cover; including pvc pipe 4"connecting with the main transformer pit not exceeding 6m away.-in two compartments and connect to soakpit	ITEM	1		
L	Provide galvanized 125 x 75mm U Channels welded to triangular shape (1.5x1.2x1.9metres); placed in reinforced concrete size, 1.0x1.0metres), with approx. 150mm of the lip exposed above the concrete, including 50mm diameter hole drilled on exposed section.	NO	2		
TOTAL THIS PAGE					



ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	PIT (LATRINE & GUARD HOUSE COMBINED 3.5 M X 5 M PLAN AREA)				
	Excavation				
a	Oversite excavation to reduce levels commencing from existing ground level; 150mm deep	SM	40		
b	Excavate from reduced level strip foundation and not exceeding 1.5 m deep	CM	23		
c	Excavate from reduced level strip foundation and not exceeding 3.0m deep	CM	23		
d	Excavate from reduced level strip foundation and not exceeding 4.5m deep	CM	23		
e	Excavate from reduced level strip foundation and not exceeding 6.5m deep	CM	23		
f	Extra over excavation in rock	CM	2		
g	Remove surplus soil from site to a place approved by local authority	CM	94		
	Mass concrete mix(1:4:8)in				
a	50mm thick blinding in strip foundations	SM	15		
	Vibrated reinforcement insitu concrete class 20/20: with minimum cube crushing strength of 20N/mm at at 28 days:in				
b	150mm thick ground floor slab	SM	18		
c	strip foundations and footings 200mm	CM	5		
	Supply and fix steel bar structural concrete work including cutting bending hoisting tying wire spacer blocks and supporting all in position				
d	8-12 MM bars	KG	400		
	TOTAL THIS PAGE				



ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	Mesh fabric reinforcement				
e	Mesh reinforcement No.A142 size 200x200 mm weighing 2.22kg per square meter; in floor slab; including all necessary supports	SM	18		
	Sawn formwork to:				
f	Edges: slabs 75-150mm girth	M	16		
g	Vertical sides; strip footing;200mm high	M	60		
	Walls				
h	200mm thick natural stone foundation walls; machine dressed square; bedded and jointed in cement and sand (1:4) mortar; reinforced with 20SWG Hoop iron in every alternate course	SM	70		
	Anti-termitate treatment				
i	Approved anti-termite chemical treatment; applied by approved professional pest control specialist; applied strictly in accordance with the manufacturers' instructions; ten (10) year guarantee	SM	18		
	DPM				
j	Gauge 1000 polythene damp proof membrane	SM	18		
	25mm thick cement/sand(1:4) rendering on concrete or stonework; wood float finished to plinths; externally				
k	Plinths; externally	SM	5		
	Prepare surfaces and apply undercoat and two finishing coats black bitumastic or othe equal approved water resistant paint on rendered surface				
l	Plinths; externally	SM	6		
	Sawn formwork to				
m	sides and soffits beams	SM	10		
	TOTAL THIS PAGE				

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ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	<u>Supply and fix square twisted steel bars in structural concrete including cutting, bending, hoisting, tie wire, spacer blocks and supporting all in position</u>				
n	8mm bars	KG	300		
p	12mm bars	KG	250		
	<u>Vibrated reinforcement insitu concrete class 20/20; with minimum cube crushing strength of 20N/mm at 28 days in</u>				
q	ring beams	CM	2		
	<u>External walls</u>				
	<u>Machine dressed natural stone walling bedded in cement/sand mortar 1:4) with minimum stone crushing strength of 7N/mm²; reinforced with 20SWG Hoop Iron in every alternate course</u>				
r	200mm thick walls	SM	40		
s	Extra over external walling for horizontal key pointing	SM	40		
	<u>Bitumious felt or other equal approved damp proof course ; in cement/sand(1:3) mortar</u>				
t	200mm wide	SM	6		
	<u>SUNDRIES</u>				
u	Make holes on 100mm thick concrete slab for 150mm diameter PVC pipe	NO	1		
v	Provide and fix 100mm thick PVC vent with cap average length 3m	M	3		
w	Allow for roof slab 150mm thick with 10mm and 8mm steel with ring beam 300mm deepmna at all walls complete with all concrete, formwork ,proping and the like as unit	SM	15		
	TOTAL THIS PAGE				



ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	The following in 3 No; Steel Structural rof spanning 3.2m ; hoisted to a height of approximately 2.4m from around level				
a	150 x 150 x 2mm Z purlins bedded in masonry wall with cement sand mortar	M	15		
b	Drill holes in steel members for 12mm bolts in Z purlins	NO	23		
c	12mm bolts	NO	23		
d	Supply and fix 26g mild steel trough roofing sheets type LT5; factory prepainted to approved standard colour; laid with 150mm end lap and 94mm side laps; fixed to metal purlins including hook bolts, washers and nuts at 1000mm centres including perimeter cladding with 450mm eaves	SM	35		
	Wrot Cypress: Prime grade				
e	200x 25mm fascia board; chamfered one edge	M	15		
	Prepare surfaces; apply three coats first grade gloss paint to approval; on timber surfaces to				
f	200mm girth; on fascia board	SM	3		
	OPENINGS				
	Concrete Louvres				
g	150x150x150mm concrete louvre blocks fixed with cement sand mortar	SM	2		
	Window cill				
h	Supply and fix 200mm clay window cill; bedded and jointed in cement/sand (1:3) mortar; pointed in matching coloured cement to windows	M	6		
	TOTAL THIS PAGE				



ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
DOORS					
i	Mild steel light door size 965 x 2100mm complete with all iron mongery as per drawing SK.No.06249	NO	4		
Iron mongery					
Supply and fix Assa Abloy' or equal approved Iron mongery: matching screws; locks to include a set of 3 keys: available from their authorised local dealers to approval					
j	100mm mild steel butt hinges	NO	12		
k	3 lever steel casement rebated door lock with handles	No	4		
Prepare surfaces, three coats gloss oil paint to metal surfaces					
l	Doors internally and externally	SM	10		
FINISHES					
FLOOR FINISHES					
screed: cement/sand (1:3) on concrete					
m	30mm thick to receive floor tiles	SM	18		
Supply and fix approved ceramic floor tiles on screed: joints pointed in matching cement grout to approval					
n	300x300x10mm thick approved ceramic tiles	SM	18		
WALLING					
Backing: 10mm cement/sand (1:4); on masonry or concrete: wood float finished to					
p	walls to receive Ceramic tiles	SM	75		
TOTAL THIS PAGE					

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	SUBSTATION EARTHING				
A	earth nests as per engineers location on site in 2mx2mx1m deep including all excavations ,and backfilling	nos.	4		
	earthing trenches 500mm deep 300mm wide with earthing nest consistingsupply and fix of 150mm square bare copper ,meshed to grids not over 500mm square with earthing rods 5/8"x7';all under KPLC supervisionall this to underly blinding in:-(EXCAVATION AND BACKFILL AND RED SOIL SUPPLY ONLY)				
B	In grids 3m to 5 m both ways	LM	880		
C	2.4m high x 10 gauge chainlink fence, complete with 4mm diameter 5 strands of galvanized plain wire pass through 3.0m high 50x50x3mm cranked SHS posts placed at 3.0m centers, 12 gauge barbed wire on 450mm cranks, including, excavation and erection works, 1:3:6 mix mass concrete surround at 600mm deep.	LM	20		
D	Supply and fix grill gate 6m x2.5m made of 575x50x4mm framing and 50x50x4mm bracings with wire mesh 6mm complete with gate columns and all builders work including all painting and fixing.	ITEM	2		
	Allow for connection to the existing foul drainage system including all plumbing,builders and water works	ITEM	1		
TOTAL THIS PAGE					

SUMMARY PAGE				
TOTAL FROM PAGE 1				
TOTAL FROM PAGE 2				
TOTAL FROM PAGE 3				
TOTAL FROM PAGE 4				
TOTAL FROM PAGE 5				
TOTAL FROM PAGE 6				
TOTAL FROM PAGE 7				
TOTAL FROM PAGE 8				
TOTAL FROM PAGE 9				
TOTAL FROM PAGE 10				
TOTAL FROM PAGE 11				
TOTAL FROM PAGE 12				
TOTAL FROM PAGE 13				
TOTAL FROM PAGE 14				
TOTAL FROM PAGE 15				
TOTAL FROM PAGE 16				
TOTAL FROM PAGE 17				
TOTAL FROM PAGE 18				
TOTAL FROM PAGE 19				
TOTAL FROM PAGE 20				
TOTAL FROM PAGE 21				
TOTAL FROM PAGE 22				
TOTAL FROM PAGE 23				
TOTAL FROM PAGE 24				
TOTAL FROM PAGE 25				
TOTAL FROM PAGE 26				
SUBTOTAL				
ALLOW NCA FEES				
ALLOW 16% VAT				
TOTAL CARRIED TO FORM OF TENDER				
Amount in words:				
Company Stamp				
Signed:				
Name: Address:				
Contract Period: Weeks				





TITLE:
**SPECIFICATION FOR 420V
AC AUTOCHANGEOVER
DISTRIBUTION PANEL**

Doc. No.	KPI/6C.U/13/TSP/09/092
Issue No.	1
Revision No.	0
Date of Issue	2015-10-27
Page 1 of 23	

TABLE OF CONTENTS

0.1 Circulation List

0.2 Amendment Record

FOREWORD

1. SCOPE
2. REFERENCES
3. TERMS AND DEFINITIONS
4. REQUIREMENTS
5. TESTS AND INSPECTION
6. MARKING AND PACKING
7. DOCUMENTATION

ANNEX A: **Guaranteed Technical Particulars** (to be filled and signed by the Manufacturer and submitted together with relevant copies of the Manufacturer's catalogues, brochures, drawings, technical data, sales records for previous five years, four customer reference letters, details of manufacturing capacity, the manufacturer's experience and copies of complete type test certificates and type test reports for tender evaluation, all in English Language)

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TITLE:
**SPECIFICATION FOR 420V
AC AUTOCHANGEOVER
DISTRIBUTION PANEL**

Doc. No.	KP1/6C.1/13/TSP/09/092
Issue No.	1
Revision No.	0
Date of Issue	2015-10-27
Page 2 of 23	

0.1 Circulation List

COPY NO.	COPY HOLDER
1	Manager, Standards
Electronic copy (pdf) on Kenya Power server (http://172.16.1.40/dms/browse.php?folderId=23)	

0.2 Amendment Record

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
0	2015-10-27	New Issue	Michael Apudo Zacheaus Oluoch Jeremiah Kinda Adrian Sagwe	Standards Technical Services, Nairobi
				Dr. Eng. Peter Kimemia

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DISTRIBUTION PANEL**

Doc. No.	KP1/6C.1/13/TSP/09/092
Issue No.	1
Revision No.	0
Date of Issue	2015-10-27
Page 3 of 23	

FOREWORD

This specification has been prepared by the Standards Department in collaboration with Central Construction Section and Technical Services Section, Nairobi, both of The Kenya Power and Lighting Company Limited (KPLC) and it lays down requirements for 400V AC Auto-Changeover Distribution Panel (ACDP) for use in the substation. It is intended for use by KPLC in purchasing the equipment.

The bid shall be submitted complete with information that confirms satisfactory service experience of the supplier with products which fall within the scope of this specification.

1. SCOPE


- 1.1. This specification intended to cover design, engineering, manufacture, assembly, painting, inspection, testing at manufacturer's works, and delivery to site inclusive of packing & transportation, testing and commissioning assistance of AC Auto-changeover (ACP) and AC Distribution Board (ACDB) complete with all accessories.
- 1.2. The specification also covers inspection and tests of the AC Auto-Changeover Distribution Panel (ACDP) complete with all accessories as well as schedule of Guaranteed Technical Particulars to be filled, signed by the manufacturer and submitted for tender evaluation.
- 1.3. The specification stipulates the minimum requirements for AC Auto-Changeover Distribution Panel (ACDP) with all accessories acceptable for use in the company and it shall be the responsibility of the Suppliers & Manufacturer to ensure adequacy of the design, good workmanship and good engineering practice in the manufacture of the AC Auto-Changeover Distribution Panel (ACDP) complete with all accessories for KPLC.
- 1.4. The specification does not purport to include all the necessary provisions of a contract.

2. REFERENCES

The following standards contain provisions which, through reference in this text constitute provisions of this specification. Unless otherwise stated, the latest editions (including amendments) apply:

IEC 61439-1, 2 & 3: Low Voltage switchgear and Control gear assemblies --Part 1: General rules; --Part 3: Distribution boards

IEC 61557-1&10: Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c - Equipment for testing, measuring or monitoring of protective measures -- Part 1: General requirements; -- Part 10:

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Date: 2015-10-27	Date: 2015-10-27



TITLE:
**SPECIFICATION FOR 420V
AC AUTOCHANGEOVER
DISTRIBUTION PANEL**

Doc. No.	KPI/6C.1/13/TSP/09/092
Issue No.	1
Revision No.	0
Date of Issue	2015-10-27
Page 4 of 23	

Combined measuring equipment for testing, measuring or monitoring of protective measures.

IEC 60947-1,2, 3&6-1: Low-voltage switchgear and controlgear --Part 1:General rules;--Part 2: Circuit Breakers;Part 3: Switches, Disconnectors, Switch-Disconnectors and Fuse Combination Units--Part 6-1: Multiple function equipment – Automatic transfer switching equipment

IEC 61010-1&2-33: Safety requirements for electrical equipment for measurement, control, and laboratory use --Part 1: General requirements; --Part 2-033: Particular requirements for hand-held multimeters and other meters, for domestic and professional use, capable of measuring mains voltage,

IEC TS 60815-1: Selection and dimensioning of high-voltage insulators intended for use in polluted conditions - Part 1: Definitions, information and general principles

3. TERMS AND DEFINITIONS

For the purpose of this specification, the definitions given in the reference standards shall apply.

- Class PC: ATSE (Automatic transfer switching equipment) that is capable of making and withstanding, but is not intended for breaking short-circuit currents.
- O: Represents a breaking operation;
- CO: Represents a making operation followed, after the appropriate opening time, by a breaking operation;
- t: Represents the time interval between two successive short-circuit operations which shall be as short as possible, allowing for the resetting time



4. REQUIREMENTS

4.1. Service Conditions

4.1.1. Physical conditions

The 400VAC Auto change over panel and distribution board complete with all accessories shall be tropicalized, designed and constructed for continuous indoor operation in tropical areas and harsh climatic conditions including areas exposed to:

- Altitudes of up to 2200m above sea level,
- Humidity of up to 95%,
- Average ambient temperature of +30°C with a minimum of -1°C and a maximum of +40°C,

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Date: 2015-10-27	Date: 2015-10-27



TITLE:
**SPECIFICATION FOR 420V
AC AUTOCHANGEOVER
DISTRIBUTION PANEL**

Doc. No.	KP1/6C.1/13/TSP/09/092
Issue No.	1
Revision No.	0
Date of Issue	2015-10-27
Page 5 of 23	

- d) Heavy saline conditions along the coast and
- e) Annual mean isokeraunic level of up to 180 thunderstorm days.
- f) Seismic level (Horizontal acceleration). : 0.3 g (horizontal); 1.5g (vertical)

4.2. Design and Construction

4.2.1. General

- 4.2.1.1. The AC auto-changeover distribution panel shall be a modular equipment **rated** 400V at 50Hz consisting of AC Auto-changeover compartment interfaced to an AC Distribution Board. The panel shall comply with the requirements of IEC 61439-1, 2 & 3 and IEC 61010-1&2-33.
- 4.2.1.2. The AC Auto-changeover compartment shall be designed for use as an automatic supply change over panel, which will automatically changeover the supply from the mains to the alternative supply and back again. A third off side shall be **provided** to be selected manually in the absence of power from the two normal **sources** using independent, manually operated switch.
- 4.2.1.3. The AC Auto-change-over panel compartment shall have two (2) three (3) phase incoming circuits complete with controls and auxiliary circuits, each with:
 - a) An Automatic transfer switching equipment (ATSE) units rated 250A 400V at 50Hz designed, manufactured and tested in accordance with IEC 60947-1 and IEC 60947-6-1. The ATSE shall be 4-pole in design as per the circuit diagram in Annex B and Fig. 1 of IEC 60947-6-1. The solid neutral pole on the contactor shall be lined with a copper bar per breaker. The ATSE shall be mechanically and **electrically** inter-locked so that the preferred alternative supply and the mains supply **CANNOT** be connected to the load at the same time.
 - b) An independently manual operated switch suitable for making, breaking and isolating, rated 250A, 400 V AC at 50Hz designed, manufactured and tested in accordance with IEC 60947-1 and IEC 60947-3 that provide each automatic transfer switch with two-way bypass-isolation.
- 4.2.1.4. AC Distribution compartment shall be equipped with two (2) number 4-pole Switch Fuse Disconnecter Units manufactured in accordance with IEC 60947-3, OR MCCBs manufactured in accordance with IEC 60947-1 & 2 rated 250A, 400V AC at 50Hz, a suitably rated busbar (load bus) and sixteen (16) number of outgoing feeders controlled by suitably rated MCBs designed, manufactured and tested in **accordance** with IEC 60898-1. In case of tripping of any outgoing feeder MCBs, visual and audible alarm arrangement.



Issued by: Head of Section, Standards Development	Authorized by: Head of Department, Standards
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Date: 2015-10-27	Date: 2015-10-27



TITLE:
**SPECIFICATION FOR 420V
AC AUTOCHANGEOVER
DISTRIBUTION PANEL**

Doc. No.	KP1/6C.1/13/TSP/09/092
Issue No.	1
Revision No.	0
Date of Issue	2015-10-27
Page 6 of 23	

- 4.2.1.5. The design shall also include two (2) other compartments namely-Instruments compartment and Feeder compartment. These compartments shall have doors as described below.
- a) For instrument compartment, one (1) door with indicating instruments, indicating lamps, selector switches, and nameplate mounted on it.
 - b) For feeders' compartment, one (1) inner door with one opening for handle to operate switch fuse units/MCCBs and cutouts for outgoing MCBs. One outer door without cutouts with non-breakable transparent sheet shall be provided.
- 4.2.1.6. The AC auto-changeover distribution panel shall be designed to facilitate cable entry from the bottom through entry holes of removable plates provided at the bottom of the cubicle. All the accessories required for termination of cable in the AC auto-changeover distribution panel such as screwed brass cable gland, terminal block etc. shall be provided. Glands shall project above the gland plate. The bottom plate shall have the following holes, perforated and easily punched out:
- a) 8nos. 25mm² holes on the distribution side.
 - b) 8nos. 20mm² holes on the distribution side.
 - c) 3nos. 32mm² holes on the side with input Automatic transfer switching equipment (ATSE) units.
- 4.2.1.7. Terminating cables shall be armored and armored rods shall be connected to the earth bus. After isolation of power and control circuit connections it shall be possible to safely carryout maintenance in a compartment with the bus bar and adjacent circuit live. Necessary shrouding arrangement shall be provided for this purpose over the cable terminations located in cable alley.
- 4.2.1.8. The connections from bus bars from the Auto-Change-Over Unit to the main Switch Fuse Disconnecter Unit/MCCBs shall be fully insulated/shrouded and securely bolted. The partition between the feeder compartment and cable alley may be non-metallic and shall allow cable cores with lugs to be easily inserted in the feeder compartment for termination.
- 4.2.1.9. Necessary and safe earthing arrangement with supply of all accessories required for safe earthing shall be within the scope of supply.
- 4.2.1.10. A galvanized steel earthing shall be provided at the bottom of each panel and shall extend throughout the length of the AC auto-changeover distribution panel. It shall be welded/bolted to the frame work of each panel and the breaker earthing contact bar vertical bus shall be provided in each vertical section which shall in turn be bolted/welded to main horizontal ground bus.

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Date: 2015-10-27	Date: 2015-10-27



TITLE:
**SPECIFICATION FOR 420V
AC AUTOCHANGEOVER
DISTRIBUTION PANEL**

Doc. No.	KPI/6C.I/13/TSP/09/092
Issue No.	1
Revision No.	0
Date of Issue	2015-10-27
Page 7 of 23	

- 4.2.1.11. The earth bus shall have sufficient cross-section to carry momentary short circuit and short line fault currents to earth bus without exceeding the allowable temperature rise.
- 4.2.1.12. The horizontal earth bus shall be projected out of the AC auto-changeover distribution panel ends and shall have predrilled holes for bolted connection between this bus to sub-station earthing conductor. A joint spaced and taps to earth bus shall be made through at least two bolts. All non-current metal works of the AC auto-changeover distribution panel shall be effectively connected to the earth.
- 4.2.1.13. The AC auto-changeover distribution panel shall be dust and vermin proof and suitable for use in tropical climate. All ventilating louvers and holes shall be covered with fine non-ferrous wire mesh from inside. The panels shall have at least IP55 protection against enclosure as per IEC 60529:2013 and at least IK08 impact protection as per IEC 62262:2002.
- 4.2.1.14. Suitable rust resisting primer paint (Powder coated Pebble Grey RAL -7032 in colour) shall be applied on the panel after the same is polished and the primer shall be evenly sprayed. The colour of the exterior of the panel shall be of same colour as that of the main control and relay panel. The colour of the interior panel shall be as to provide a colour contrasting background for the wiring inside the cubicle.
- 4.2.1.15. The AC auto-changeover distribution panel shall be mounted on galvanized stands of about 200mm for free standing with removable gland plates for cable entry and shall be complete with channel bottom plates, grouting bolts, earthing bolts, washers, cable glands etc.
- 4.2.1.16. The temperature rise of horizontal and vertical bus-bars when carrying rated current along its full run shall not exceed 40°C with Silver plated joints and 40°C with all other type of joints over an outside ambient temperature of +30°C in accordance with IEC 61439-1.
- 4.2.1.17. All identical circuit breakers and module chassis of same test sizes shall be fully interchangeable without doing any modification work. MCCBs and MCBs shall comply fully with IEC 60947-1 & 2 and IEC 60898-1 & 2 respectively.

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TITLE:
**SPECIFICATION FOR 420V
 AC AUTOCHANGEOVER
 DISTRIBUTION PANEL**

Doc. No.	KPI/6C.1/13/TSP/09/092
Issue No.	1
Revision No.	0
Date of Issue	2015-10-27
Page 8 of 23	

Table 1: Requirements for 400V AC Auto-change-over Distribution Panel

Sr. No	Description	Technical Particulars	
400V ACDP – In accordance with IEC 61439-1,2 & 3			
1	Dimensions	Height of complete panel (mm.)	1800 (max.)
		Working height (mm.), min	450(min.) to 1650(max.)
		Length (mm.),min	As per requirement.
		Width(mm), min	750 mm (max.)
2	Sheet steel thickness of panel (mm.), min	3	
3	Panel board finish paint	Powder coated Pebble Grey RAL -7032	
4	Ingress Protection	IP55	
5	Clearances	5.5 mm for Upk 6.0 kV as per IEC 61010-1	
6	Creepage distances	25.4 mm for Urms 1800 V, Pollution level III	
7	Insulation resistance of the equipment	>10MΩ	
8	Resistance to corrosion	Severity test A for interior siting	
9	Effective continuity between exposed conductive parts of the assembly and the protective circuits	< 0.1 Ohm	
10	Grade of insulation Level of equipment and wiring (KV)	1.1	
11	Power frequency withstand voltage, Vrms	3.5 kVrms	
12	Lightning impulse voltage, Vpeak	6.0 kVpk	
13	Annunciation for blowing of fuse or tripping of breaker	Alarm and visual indication	
14	Ammeter range	0 to 300 Amps	
15	Voltmeter range	0 to 600 Volts	
16	Accuracy class of Ammeter & Voltmeter	1% of full scale deflection	
17	Current density of Copper for Bus bar (A/sq.mm.)	0.75	
18	Wiring for annunciation scheme shall be done with copper of cross-section area (mm ²)	1.5 (Stranded)	
19	Internal wiring (connection to MCBs) cable size/type & colour	4.0mm ² /10mm ² Insulated copper wire – Red ,yellow& Black as applicable	
20	Earth wiring size and colour code	2.5mm ² Insulated copper wire -Yellow/green wire	
21	Lifting lugs	Test run with the maximum mechanical load	

4.2.1.17.1. Relays and releases for the ATSE shall be defined using the following characteristics:

- Standard of manufacture, where applicable;
- Type of relay or release;
- Rated values;
- Current setting or current setting range;
- Time-current characteristics
- Influence of ambient air temperature,

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Date: 2015-10-27	Date: 2015-10-27



TITLE:
**SPECIFICATION FOR 420V
AC AUTOCHANGEOVER
DISTRIBUTION PANEL**

Doc. No.	KP1/6C.1/13/TSP/09/092
Issue No.	1
Revision No.	0
Date of Issue	2015-10-27
Page 9 of 23	

4.2.2. Main Equipment and other Technical Information for A.C. Auto-change Distribution Board

4.2.2.1. One set of tinned copper bus bars of adequate continuous rating 250A at 50Hz, short circuit rating of 10kA for 1s; having continuous current density of 0.75 A per mm² shall be provided.

4.2.2.2. Auxiliary Relays and contactors for alarm as well as visual indication against tripping of incoming two (2) 250A 4-pole switch fuse disconnecter units/MCCBs as well as outgoing feeder MCBs shall be provided. However, indication will not go off till the restoration of failure. Facility for manual and electrical interlocking of the two (2) input switch fuse disconnecter units/MCCBs and a control voltage for the ACDP shall be 230V AC. Tripping indication shall be provided for the two incoming circuits.

4.2.2.3. Two (2) 250A 4-pole manual bypass switches meant to connect main bus to one of the incoming supplies. The bypass-isolation switch shall permit load by-pass to either normal or emergency power source and complete isolation of the automatic transfer switch, independent of transfer switch position. Bypass and isolation shall be possible under all conditions including when the automatic transfer switch is removed from service. The equipment shall operate as follows:

- a) The bypass-isolation switch shall have provisions for operation by one person through the movement of a maximum of two handles at a common dead front panel in no more than 15 seconds.
- b) It shall provide a lock, which must energize to unlock the bypass switch, to prevent bypassing to a dead source and a means to prevent simultaneous connection between normal and emergency sources.
- c) Operation of bypass handle shall allow direct connection of the load to the normal (or emergency) source, without load interruption or by using a **break-before-make** design, or provide separate load interrupter contacts to momentarily interrupt the load to ensure

4.2.2.4. Two (2) 250A 4-pole self-acting equipment containing the transfer switching devices (ATSE) and other necessary devices for monitoring supply circuits and for transferring one or more load circuits from one supply to another. These shall be the main sources that are auto-changed in case of failure of any of the source. The equipment shall operate as follows:

- a) The operating sequence of ATSE shall consists of an automatic transfer of a load from the normal supply to an alternative supply in the event of a monitored supply deviation and automatically returning the load to the normal supply when it is restored. The transfer shall be with a pre-set time delay and may include an off position.

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TITLE:
**SPECIFICATION FOR 420V
 AC AUTOCHANGEOVER
 DISTRIBUTION PANEL**

Doc. No.	KPI/6C.I/13/TSP/09/092
Issue No.	1
Revision No.	0
Date of Issue	2015-10-27
Page 10 of 23	

- b) In the case of both the normal and the alternative supplies being present, the ATSE shall assume the normal supply position. A variation in the power supply characteristics being monitored shall signal the ATSE to operate when a deviation from the specified limits occurs, for example, abnormal changes in voltage or frequency of the supply.
- c) The ratings and characteristics of control circuit devices and auxiliary circuits shall comply with the requirements of IEC 60947-5 (see note of clause 1).

Table 2: Ratings of the Auto Transfer Switches and the Manual Bypass Switch in accordance with IEC 60947-1, 3 & 6-1

Sr. No.	Property	Units	Requirement	
			Auto-Transfer Switch as per IEC 60947-1 & 6-1	Manual Bypass Switch as per IEC 60947-1 & 3
1	Utilization category		AC-33A	AC-22A
2	Class of equipment		PC	
3	Rated duty			
4	Rated voltage	V		400
5	Maximum power frequency or d.c. recovery voltage.	V		1000
6	Dielectric strength at 50z in 1 min	kV		10
7	Rated impulse withstand voltage	kV		12
8	Rated thermal current	A		250
9	Rated operational power	kW		75
10	Rated operational current, Ie	A		250
11	Rated breaking and making capacity, I	A	1,500	750
12	Rated short time withstand current, Icw for 1s	A		8
13	Rated short time making capacity, Icm	kA		30
14	Rated conditional short-circuit current, Ip	kA		40.5
15	Power loss per pole	W		6.5
16	Operating cycle			O-I-O-II-O
17	Number of operating cycles corresponding to the rated operational current	Cycles		8,000
18	Number of mechanical operations	Oper.		16,000

4.2.2.5. 'ON', 'OFF' and 'TRIP' indicating lamps for both the Incoming Switch Fuse Disconnecter Units/MCCBs along with required number of push button shall be provided.

Issued by: Head of Section, Standards Development

Authorized by: Head of Department, Standards

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Date: 2015-10-27

Date: 2015-10-27



TITLE:
**SPECIFICATION FOR 420V
AC AUTOCHANGEOVER
DISTRIBUTION PANEL**

Doc. No.	KP1/6C.1/13/TSP/09/092
Issue No.	1
Revision No.	0
Date of Issue	2015-10-27
Page 11 of 23	

- 4.2.2.5. One (1) digital A.C. voltmeter having a scale range of 0-600V.A.C. with approximately 72 x 144 mm² diameter flush mounted, type having accuracy +/- 1% of full scale, shall be provided. The meters shall have overvoltage category of at least CAT IV 600V as per IEC 61010-1 and shall conform to IEC 61557: Parts 1, 2, 3, 4 & 10 standards.
- 4.2.2.7. Two (2) digital A.C. ammeters with approximately 72 x 144 mm² diameter flush mounted, having range of 0-300 Amps and accuracy +/- 1% of full scale shall be provided for measurement of load current flowing to the A.C. auto-change distribution panel. The meters shall have overvoltage category of at least CAT IV 600V as per IEC 61010-1 and shall conform to IEC 61557: Parts 1, 2, 3, 4 & 10 standards.
- 4.2.2.8. Doors at the back of the panel shall be provided for inspection with door switch for illumination of the lamp to be provided inside the panel with separate switch fuse unit for controlling the lamp.
- 4.2.2.9. All the indicating lamps shall be of panel mounting cluster LED type. The lamps shall have suitable size plates marked with its function, wherever necessary. Lamps shall have translucent lamp covers of 'RED', 'GREEN' & 'WHITE' colour for indicating, 'ON', 'OFF' and 'AUTO-TRIP' indication of incoming switch fuse unit. One (1) indicating lamp is to be provided for tripping of outgoing feeder and AC supervision.
- 4.2.2.10. Space heater shall be provided for preventing harmful moisture condensation in all the compartments. The space heaters shall be suitable for continuous operation of 240V AC, 50HZ single phase supply and shall be automatically controlled by thermostats. Necessary isolating switches and HRC fuses shall be provided.
- 4.2.2.11. All the A.C. MCBS, A.C. Auxiliary Relays, isolating copper links, A.C. emergency MCBS, & A.C. emergency contactors, A.C. bells, indicating lamp for indicating A.C. fail of main bus, A.C. contactors etc. shall be provided. Three (3) Push Button for testing annunciation scheme, resetting annunciation scheme and accept of fault and bell cancellation shall be provided.
- 4.2.2.12. There shall be one (1) terminal board/block for all feeder outlets including cable glands, a facility to select the phase-phase voltage levels and to pick contacts indicating loss of incoming supplies to the remote terminal unit.
- 4.2.2.13. The AC Control and distribution board shall be equipped with double pole MCBs with a Type C tripping characteristic in accordance with IEC 60898-1. The MCBs shall be AC type rated 240V. The outgoing distribution cables shall be connected directly to the relevant MCB. The MCBs shall have the following characteristics;
- Circuit-breakers suitable for A.C circuits with a time constant of T < 4 ms.
 - Rated short-circuit capacities up to and including 10 kA
 - Instantaneous tripping of more than 5In up to and including 10In – C-type curve

Issued by: Head of Section, Standards Development	Authorized by: Head of Department, Standards
Signed: 	Signed: 
Date: 2015-10-27	Date: 2015-10-27



TITLE:
**SPECIFICATION FOR 420V
 AC AUTOCHANGEOVER
 DISTRIBUTION PANEL**

Doc. No.	KPI/6C.1/13/TSP/09/092
Issue No.	1
Revision No.	0
Date of Issue	2015-10-27
Page 12 of 23	

- d) Rated impulse withstand voltage (U_{peak}) of 4 kV
- e) Two-pole circuit-breakers with two protected poles.

Table 3: Technical requirements for MCCB and MCBs as per IEC 60947-2 and IEC 60898-1 & 2 respectively

Sr. No.	Property	Requirement	
1	Type of Breaker	Moulded case	MCB
2	Method of mounting	Surface-type	Flush-type;
3	Utilization Category	A	
4	Current rating	2 x 250A	1x10A, 8x16A, 4x25A and 4x32A ,2x63A
5	Rated Voltage	240V AC per pole	
6	No. of poles	4	2
7	Type of terminals:	Screw type for external copper conductors	
8	Insulating Voltage	690 V	
9	Rated Impulse Withstand Voltage of main Circuit U_{imp}	8 kV	4 kV
10	Temperature rise	40°C	
11	Instantaneous tripping current	Type C	
12	I^2t characteristic	To be provided by manufacturer	
13	Rated Continuous Current at 40°C	As per Rating	
14	Short-time withstand capacity, I_{cw} for 0.1s	5kA	1.5kA
15	Ultimate Short Circuit Breaking Capacity I_{cu}	30 kA	10 kA
16	Service Short Circuit Breaking Capacity I_{cs}	100% of I_{cu}	
17	Ultimate Short Circuit Making Capacity I_{cu}	63kA	Type C tripping current
18	Maximum power loss	Manufacturer to state	As per Table 15 of IEC 60898-1:2002
19	Suitable for Isolation	Yes	
20	Shunt Release Voltage	230V AC	
21	Permissible Variation in Voltage	85% to 110%	
22	Number of operating cycles	8,000	
23	Termination suitable for Copper	Yes	
24	Insulation Material conforming to Glow Wire Test	Yes	
25	Thermal Over load Settings	Adjustable	
26	Short Circuit Setting	4-pole	Fixed for 2 Pole
27	Degree of protection	IP20	

4.2.3. Factory Wiring

Wiring and labeling either by color-code or by numbered/lettered wire markers shall be done at the factory with proper wire bundling. Labels shall match those on the shop drawings. This shall be as follows:

- a) Current carrying wires shall be black with clearly indicated ferrule labels showing the phase.

Issued by: Head of Section, Standards Development	Authorized by: Head of Department, Standards
Signed:	Signed:
Date: 2015-10-27	Date: 2015-10-27



TITLE:
**SPECIFICATION FOR 420V
AC AUTOCHANGEOVER
DISTRIBUTION PANEL**

Doc. No.	KP1/6C.1/13/TSP/09/092
Issue No.	1
Revision No.	0
Date of Issue	2015-10-27
Page 13 of 23	

- b) Earthing wiring shall be done using yellow/green wires.
- c) Control cabling shall be done using grey colour wires with ferrule marking.
- d) Voltage carrying wires shall be colour coded (Red, Yellow, Blue, and Black).

4.3. Quality Management System

- 4.3.1. The supplier shall submit a quality assurance plan (QAP) that will be used to ensure that the 400V ACDP physical properties, tests and documentation, will fulfill the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfill the requirements of ISO 9001:2008.
- 4.3.2. The Manufacturer's Declaration of Conformity to applicable standards and copies of quality management certifications including copy of valid and relevant ISO 9001: 2008 certificate shall be submitted with the tender for evaluation.

5.0. TESTS AND INSPECTION

- 5.1. The 400V ACDP shall be inspected and tested in accordance with the requirements of IEC 61010-1, IEC 60947-1, 2, 3 & 6.1, IEC 61439-1&2, IEC 60898-1&2, IEC 60529 standards and requirements of this specification. It shall be the responsibility of the supplier to perform or to have performed the tests specified and whatever other tests he normally performs at works.
- 5.2. Copies of previous Type Tests Reports issued by a third party testing laboratory that is accredited to ISO/IEC 17025 shall be submitted with the tender for the purpose of technical evaluation. The accreditation certificate to ISO/IEC 17025 for the same third party testing laboratory used shall also be submitted with the tender document (all in English Language) Copies of type test reports to be submitted with the tender (by bidder) for evaluation shall be as stated below:

A. Complete assembly as per IEC 61010-1, IEC 61439-1&2

- (i) Electromagnetic compatibility (EMC)
- (ii) Switching tests on the equipment.
- (iii) Impulse overvoltage tests on the equipment -Clearances
- (iv) Dielectric voltage withstand tests on the equipment - Controlled overvoltage
- (v) Functional tests on the equipment.

B. Circuit Breakers as per IEC 60947-1, 2, 3 & 6.1 and IEC 60898-1 & 2

- a) Temperature-rise
- b) Tripping limits and characteristics
- c) Dielectric properties
- d) Operational performance capability
- e) Overload performance (where applicable)

Issued by: Head of Section, Standards Development

Authorized by: Head of Department, Standards

Signed:

Signed:

Date: 2015-10-27

Date: 2015-10-27



TITLE:
**SPECIFICATION FOR 420V
AC AUTOCHANGEOVER
DISTRIBUTION PANEL**

Doc. No.	KPI/6C.1/13/TSP/09/092
Issue No.	1
Revision No.	0
Date of Issue	2015-10-27
Page 14 of 23	

- f) Short-circuit breaking capacities
- g) Short-time withstand current (where applicable)
- h) Performance of integrally fused circuit-breakers

5.3. Routine and sample test reports for the 400V ACDP to be supplied shall be submitted to KPLC for approval before shipment/delivery of the goods. KPLC Engineers will witness tests at the factory before shipment.

5.4. Tests to be witnessed at the factory before shipment shall be in accordance with requirements of this specification and shall include the following:

A. Complete assembly as per IEC 61010-1, IEC 61439-1&2

- a) Degree of protection of enclosures
- b) Clearances and creepage distances
- c) Protection against electric shock and integrity of protective circuits
- d) Incorporation of built-in components
- e) Internal electrical circuits and connections
- f) Terminals for external conductors
- g) Mechanical operation
- h) Electrical tests
 - Wiring, operational performance and function
 - Insulation resistance tests of the equipment
 - Checking of wiring and continuity of the circuit.
 - Power frequency voltage test of 3.5 kV for one minute between wiring and earth terminal.
 - Insulation resistance value of all equipment connected in 400V ACDP and functions of the same.
 - Dielectric voltage withstand tests - Measuring clearances
- i) Functional tests of the equipment
- j) Dimensional and overall checks.

B. Switches and Circuit Breakers as per IEC 60947-2 and IEC 60898-1 & 2

- a) Tripping limits and characteristics
- b) Dielectric properties
- c) Mechanical operation and operational performance capability
- d) Overload performance (where applicable)
- e) Verification of dielectric withstand
- f) Verification of temperature-rise
- g) Verification of overload releases
- h) Verification of under-voltage and shunt releases (if applicable)
- i) Verification of main contact position (for circuit breakers suitable for isolation)

Issued by: Head of Section, Standards Development

Authorized by: Head of Department, Standards

Signed:

Signed:

Date: 2015-10-27

Date: 2015-10-27



TITLE:
**SPECIFICATION FOR 420V
AC AUTOCHANGEOVER
DISTRIBUTION PANEL**

Doc. No.	KP1/6C.1/13/TSP/09/092
Issue No.	1
Revision No.	0
Date of Issue	2015-10-27
Page 15 of 23	

5.5. On receipt of the goods KPLC will perform any of the tests specified in order to verify compliance with this specification. The supplier shall replace without charge to KPLC the 400V ACDP which upon examination, test or use; fail to meet any of the requirements in the specification.

6.0. MARKING AND PACKING

6.1. PACKING

4.3.3. The 420V ACDP shall be carried in a sturdy transport case with hard-foam interior, water tight, air-tight, dust proof, chemical resistant and corrosion proof. The total case dimensions shall not exceed 3800mm x 1200mm x 1200mm in size.

6.1.1. The housing shall be complete with a gasket to seals the lid when closed so as to protect the equipment against water and dirt while the instrument is carried through rainstorms or other hazardous conditions. The lid shall be secured by two latches and a handle for portability. A compartment shall also be provided for storage of test cables and line cord.

6.1.2. The accessories shall be packed in suitable matching bag with a shoulder carrying strap and a hand grip.

6.2. MARKING

The 400V ACDP and its accessories shall be marked in a permanent manner with the following information (in English Language):

- a) Standard to which the 400V ACDP complies
- b) Name of manufacturer
- c) Type of 400V ACDP (description of type, number and overall size of sections)
- d) Year and month of manufacture and serial number
- e) Maximum permissible measurement limits
- f) The words "**Property of Kenya Power & Lighting Co**" shall be engraved permanently on each 400V ACDP while the other parameters shall be marked on a permanent label.
- g) The overvoltage protection category and duty rating e.g. category IV-field
- h) The 400V ACDB shall be provided with a separate permanent label displaying advice to the user.
- i) In addition, the 400V ACDB shall be marked with the necessary labels that conform to IEC 61010-1 clauses 5.1.2 to 5 and its accessories

Issued by: Head of Section, Standards Development	Authorized by: Head of Department, Standards
Signed:	Signed:
Date: 2015-10-27	Date: 2015-10-27



TITLE:
**SPECIFICATION FOR 420V
AC AUTOCHANGEOVER
DISTRIBUTION PANEL**

Doc. No.	KP1/6C.1/13/TSP/09/092
Issue No.	1
Revision No.	0
Date of Issue	2015-10-27
Page 16 of 23	

7.0. DOCUMENTATION, WARRANTY AND TRAINING

7.1. Warranty and Training

- 7.1.1. The 400V ACDB shall be backed by a minimum 12-months factory warranty.
- 7.1.2. If the ACDP new to KPLC, then a two day Training on the equipment shall be carried out by the Supplier's engineer on a KPLC site. The supplier shall meet the cost of this training.
- 7.1.3. After tender award, factory inspection and certification by two KPLC's engineers or third party shall be carried out before shipment of the Equipment.
- 7.1.4. Technical support and software, where applicable upgrades shall be provided free of charge to KPLC for a period of not less than 36 months.
- 7.1.5. The Bidder shall submit a clause by clause statement of compliance with the specifications together with copies of relevant manufacturer's catalogues, brochures, technical data and proven test reports clearly marked to support each clause, all in English language for evaluation. The manufacturer's type reference/designation of the item offered shall also be indicated.
- 7.1.6. In the case of tender award, technical detailed design drawings for the 400V ACDP shall be submitted to the procuring entity for approval before manufacture commences.

7.2. Documentation

- 7.2.1. The bidder shall submit its tender complete with technical documents required by Annex A (Guaranteed Technical Particulars) for tender evaluation. The technical documents to be submitted (all in English language) for tender evaluation shall include the following:
 - a) Guaranteed Technical Particulars signed by the manufacturer;
 - b) Copies of the Manufacturer's catalogues, brochures, detailed design drawings and technical data;
 - c) Sales records for the last five years and at least four customer reference letters;
 - d) Details of manufacturing capacity and the manufacturer's experience;
 - e) Copies of relevant type test reports by a third party testing laboratory accredited to ISO/IEC 17025;
 - f) Copy of accreditation certificate to ISO/IEC 17025 for the third party testing laboratory;
 - g) Manufacturers letter of authorization, ISO 9001:2008 certificate and other technical documents required in the tender.

Issued by: Head of Section, Standards Development

Authorized by: Head of Department, Standards

Signed:

Signed:

Date: 2015-10-27

Date: 2015-10-27



TITLE:
**SPECIFICATION FOR 420V
AC AUTOCHANGEOVER
DISTRIBUTION PANEL**

Doc. No.	KPI/6C.1/13/TSP/09/092
Issue No.	1
Revision No.	0
Date of Issue	2015-10-27
Page 17 of 23	

7.2.2. The successful bidder (supplier) shall submit the following documents/details to The Kenya Power & Lighting Company for approval before manufacture:

- a) Guaranteed Technical Particulars signed by the manufacturer;
- b) Design Drawings with details of the 400V ACDP to be manufactured for KPLC. The drawings shall include:
 - (i) Single line diagram for each type of 400V ACDP.
 - (ii) Dimensional drawing showing clearly the location of meter switches, MCBs, MCCB etc. in the 400V ACDP arrangement in plan and elevation with foundation details.
 - (iii) Wiring diagram of 400V ACDP showing the interconnection between terminals of various equipment and devices on and within the panel including approved schematic drawings.
 - (iv) Take off terminal connection arrangement.
 - (v) Catalogue of 400V ACDP equipment.
 - (vi) Ten (10) sets of approved drawings and ten (10) copies of Catalogue of 400V ACDP equipment shall be submitted to the Chief Engineer (Technical Services – Nairobi Region) for our record and distribution to site.
- c) Quality assurance plan (QAP) that will be used to ensure that the design, material; workmanship, tests, service capability, maintenance and documentation will fulfill the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfill the requirements of ISO 9001:2008
- d) Detailed test program to be used during factory testing;
- e) All documentation necessary for safety of the equipment as specified in IEC 61010-1 clause 5.4 shall be provided with the equipment.
- f) Manufacturer's undertaking to ensure adequacy of the design, good engineering practice, adherence to the specification and applicable standards and regulations as well as ensuring good workmanship in the manufacture of the ACDP for The Kenya Power & Lighting Company;
- g) Packaging details (including packaging materials).

7.3 The supplier shall submit **recommendations** for use, care, storage and routine inspection/testing procedures, all in the English Language, during delivery of the 400V ACDP to KPLC stores

Issued by: Head of Section, Standards Development	Authorized by: Head of Department, Standards
Signed:	Signed:
Date: 2015-10-27	Date: 2015-10-27



TITLE:
**SPECIFICATION FOR 420V
 AC AUTOCHANGEOVER
 DISTRIBUTION PANEL**

Doc. No.	KP1/6C.1/13/TSP/09/092
Issue No.	1
Revision No.	0
Date of Issue	2015-10-27
Page 18 of 23	

ANNEX A: *Guaranteed Technical Particulars (to be filled and signed by the supplier and submitted together with copies of the Manufacturer's catalogues, brochures, drawings, technical data, sales records and copies of test certificates for tender evaluation)*

Tender No Bidder's Name & Address

	Description	Bidder's Offer
1	Name of the manufacturer and country of origin	Specify
	Type Reference Number or Model Number	Specify
2	Applicable Standards	Specify
3	Terms and Definitions	Specify
4	Requirements	
4.1	Service conditions	Specify
4.2	Design and Construction	
4.2.1.1	AC auto-changeover distribution panel rating	Specify
4.2.1.2	AC auto-changeover with a third off switch in absence of power from 2 normal sources	Specify
4.2.1.3	ATSE rating	Specify
	ATSE design	Specify
	Solid neutral poles on contactors with copper bar per breaker	Specify
	Mechanical and electrical interlocks availed	Specify
	Independent manual switch	Specify
4.2.1.4	AC Distribution compartment with 4 pole switch fuse disconnecter units	Specify
	With 16 outgoing feeders and MCBs	Specify
	With Visual and audible alarms for feeders tripping	Specify
4.2.1.5	Audio visual indication for AC supply	Specify
	Manual cancellation and reset of alarm for failure of AC supply	Specify
4.2.1.6	Acceptance and cancellation of the audible alarm shall be provided for	Specify
	The visual alarm shall only be cancelled upon supply restoration	Specify
4.2.1.7	Instrument compartment features	Specify
	Feeder compartment features	Specify
4.2.1.8	Cable entry at bottom of panel	Specify
	Entry holes of removable plates	Specify
	Cable termination accessories e.g. screwed brass cable gland and terminal blocks provided	Specify
	8no.x25mm ² holes on distribution side	Specify
	8no.x20mm ² holes on distribution side	Specify
	3no.x32mm ² holes on ATSE side	specify
4.2.1.9	Armored termination cables with armored rods connected to earth bus	Specify
	After isolation of power and control circuits, safe maintenance is possible	Specify

Issued by: Head of Section, Standards Development	Authorized by: Head of Department, Standards
Signed:	Signed:
Date: 2015-10-27	Date: 2015-10-27



TITLE:
**SPECIFICATION FOR 420V
 AC AUTOCHANGEOVER
 DISTRIBUTION PANEL**

Doc. No.	KPI/6C.1/13/TSP/09/092
Issue No.	1
Revision No.	0
Date of Issue	2015-10-27
Page 19 of 23	

	with adjacent circuit and bus bar live	
4.2.1.10	Connections from bus bars well insulated	Specify
	Partition between feeder compartment and cable alley material	Specify
	Partition allows cable cores with lugs to be easily inserted in feeder compartment	Specify
4.2.1.11	Safe earthing done	Specify
	All required earthing accessories provided	Specify
4.2.1.12	Galvanized steel earthing provided- welded/bolted to framework and breaker earthing contact bar	Specify
4.2.1.13	Earth bus cross section able to withstand short circuit and line fault currents to earth bus without exceeding allowable temperature rise	Specify
4.2.1.14	Earthing bus protrudes from panel and has predrilled holes for bonding to substation earthing	Specify
4.2.1.15	Panel shall be dust and vermin proof	Provide test report
4.2.1.16	Rust resistant primer paint applied	Specify
	Color of paint	Specify
4.2.1.18	Temperature rise of bus bars at rated current	Specify
4.2.1.19	Identical circuit breakers and module chassis shall be interchangeable	Specify
Table 1	Table 1: Requirements for 400V AC Auto-change-over Distribution Panel	
	Dimensions:	
	Height of complete panel (mm)	Specify
	Working height (mm), min	Specify
	Length(mm), min	Specify
	Width(mm), min	Specify
	Sheet steel thickness of panel(mm), min	Specify
	Panel board finish paint	Specify
	Ingress protection	Specify
	Clearances	Specify
	Creepage distances	Specify
	Insulation resistance of the equipment	Specify
	Resistance to corrosion	Specify
	Effective continuity between exposed conductive parts of the assembly and the protective circuits	Specify
	Grade of insulation level of equipment and wiring (KV)	Specify
	Power frequency withstand voltage, V_{peak}	Specify
	Power frequency withstand voltage, V_{rms}	Specify
	Annunciation for blowing of fuse or tripping of breaker	Specify
	Ammeter range	Specify
	Voltmeter range	Specify
	Accuracy class of Ammeter & Voltmeter	Specify

Issued by: Head of Section, Standards Development

Authorized by: Head of Department, Standards

Signed:

Signed:

Date: 2015-10-27

Date: 2015-10-27



TITLE:
**SPECIFICATION FOR 420V
 AC AUTOCHANGEOVER
 DISTRIBUTION PANEL**

Doc. No.	KP1/6C.1/13/TSP/09/092
Issue No.	1
Revision No.	0
Date of Issue	2015-10-27
Page 20 of 23	

	Current density of Copper for bus bar (A/sq.mm)	Specify
	Wiring for annunciation scheme shall be done with copper of cross-section area (mm ²)	Specify
	Internal wiring (Connection to MCBs) cable size/type & colour	Specify
	Earth wiring size and colour code	Specify
	Lifting lugs	Specify
4.2.1.19.1	Relay characteristics	Standard of manufacture
		Type of relay or release
		Rated values
		Current setting / current setting range
		Time-current characteristics
		Influence of ambient air temperature
4.2.2.1	A set of tinned copper bus bars provided	Specify
	Rating of copper bus bars/ short circuit rating	Specify
4.2.2.2	Auxiliary relays with audio visual tripping indication/ electrical and mechanical interlocking/ tripping indication	Specify
4.2.2.3	Bypass isolation switch	Operation
		Locks/interlocks operation
		Operation of bypass handle to allow for direct connection of load to the normal(or emergency) source
Table 2	Utilization category	Specify for Auto transfer switch and bypass switch
	Class of equipment	
	Rated duty	
	Rated voltage	
	Maximum power frequency or dc recovery voltage	
	Dielectric strength at 50z in 1 min	
	Rated impulse withstand voltage	
	Rated thermal current	
	Rated operational power	
	Rated operational current, I _o	
	Rated breaking and making capacity, I	
	Rated short time withstand current, I _{sw} for 1s	
	Rated short time making capacity, I _{cm}	
	Rated conditional short-circuit current, I _p	
	Power loss per pole	
	Operating cycle	
	Number of operating cycles corresponding to the rated operational current	
	Number of mechanical operations	
4.2.2.5	ON, OFF, TRIP indicating lamps provided	Specify
4.2.2.6	Digital voltmeter	Scale range
		Flush mounted

Issued by: Head of Section, Standards Development

Authorized by: Head of Department, Standards

Signed:

Signed:

Date: 2015-10-27

Date: 2015-10-27



TITLE:
**SPECIFICATION FOR 420V
 AC AUTOCHANGEOVER
 DISTRIBUTION PANEL**

Doc. No.	KP1/6C.1/U3/TSP/09/092
Issue No.	1
Revision No.	0
Date of Issue	2015-10-27
Page 21 of 23	

		Dimensions	
		Accuracy	Specify
		Overvoltage category	Specify
4.2.2.7	Digital Ammeter	Scale range	Specify
		Flush mounted	Specify
		Dimensions	Specify
		Accuracy	Specify
		Overvoltage category	Specify
4.2.2.8	Panel lamp at back of door with door switch		Specify
	Separate switch fuse unit		Specify
4.2.2.9	Indicating lamps	Panel mounting cluster LED type	Specify
		With size plate marked with its function	Specify
		With Translucent lamp covers RED, GREEN, WHITE	Specify
4.2.2.10	Space heaters	Suitable for continuous operation at 240V 50Hz	Specify
		With thermostats	Specify
		Isolating switches provided	Specify
4.2.2.11	All MCBs, Auxiliary relays, Isolating copper links, Emergency MCBs & contactors, bells, indicating lamps provided		Specify
	Push buttons for testing, resetting and cancellation provided		Specify
4.2.2.12	One Terminal board /block	with facility to select phase-phase voltage levels	Specify
		Shall pick contacts indicating loss of incoming supply	Specify
4.2.2.13	A.C Circuit breakers time constant		Specify
	Rated short circuit capacities		Specify
	Instantaneous tripping characteristics		Specify
	Rated impulse withstand voltage (U_{peak})		Specify
	Two pole circuit breakers with two protected poles		Specify
Table 3	Type of breaker		Specify
	Method of mounting		Specify
	Utilization category		Specify
	Current rating		Specify
	Rated voltage		Specify
	No. of poles		Specify
	Type of terminals		Specify
	Insulating voltage		Specify
	Rated impulse withstand voltage of main circuit U_{imp}		Specify
	Temperature rise		Specify
	Instantaneous tripping current		Specify
	I^2t characteristics		Specify
	Rated continuous current at 40°C		Specify
	Short-time withstand capacity, I_{cw} for 0.1s		Specify

Issued by: Head of Section, Standards Development

Authorized by: Head of Department, Standards

Signed:

Signed:

Date: 2015-10-27

Date: 2015-10-27



TITLE:
**SPECIFICATION FOR 420V
 AC AUTOCHANGEOVER
 DISTRIBUTION PANEL**

Doc. No.	KPI/6C.I/13/TSP/09/092
Issue No.	1
Revision No.	0
Date of Issue	2015-10-27
Page 22 of 23	

	Ultimate short circuit breaking capacity I_{cu}	Specify	
	Service short circuit breaking capacity I_{cs}	Specify	
	Ultimate short circuit making capacity I_{cu}	Specify	
	Maximum power loss	Specify	
	Suitable for isolation	Specify	
	Shunt release voltage	Specify	
	Permissible variation in voltage	Specify	
	Number of operating cycles	Specify	
	Termination suitable for copper	Specify	
	Insulation material conforming to glow wire test	Specify	
	Thermal over load settings	Specify	
	Short circuit setting	Specify	
	Degree of protection	Specify	
4.2.3	Wiring and labeling done at factory	Current carrying wires (black) with ferrule labels	Specify
		Earthing wire yellow/green	Specify
		Control cables grey with ferrule marking	Specify
		Voltage carrying wires coded Red, Yellow, Blue and Black	Specify
4.3	Quality Management System	Provide	
	Quality Assurance Plan	Provide	
	Copy of ISO 9001:2008 certificate	Provide	
	Manufacturer's experience	Provide	
	Manufacturing capacity (Units per month)	Provide	
	List of previous customers	Provide	
	Customer reference letters	Provide	
5.1	Test standards and responsibility of carrying out tests	Provide	
5.2	Copies of Type Test Reports submitted with tender	Provide	
5.3	Acceptance tests to be witnessed by KPLC at factory before shipment	Provide	
5.4	Test reports to be submitted by supplier to KPLC for approval before shipment	Provide	
5.5	Replacement of rejected panels	Provide	
6.1	Packing	Provide	
6.2	Marking	Provide	
7.1	Warranty and training	Provide	
7.2	Documents submitted with tender	Provide	
	Documents to be submitted by supplier to KPLC for approval before manufacture	Provide	
8.0	Statement of compliance to specification	Provide	

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Authorized by: Head of Department, Standards

Signed:

Signed:

Date: 2015-10-27

Date: 2015-10-27

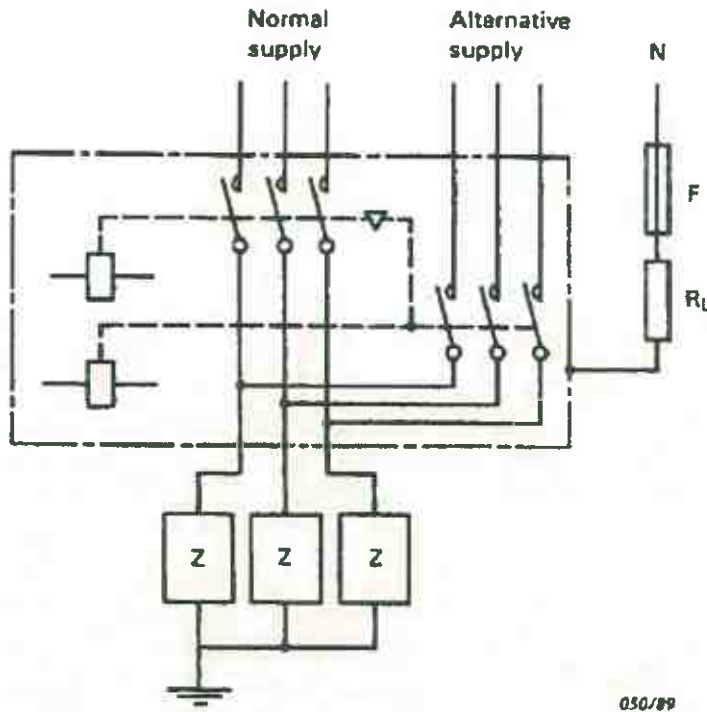


Fig. 1: Connection circuit of ATSE showing the electrical conditions without the mechanical conditions.

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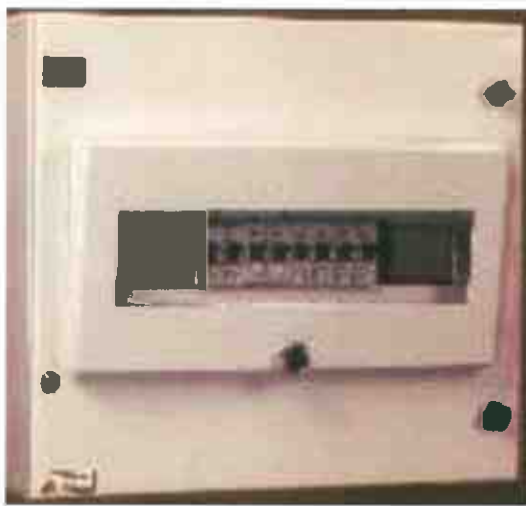
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Samples

3Phase AC distribution board



2. Consumer Unit



3. DC Distribution Board



4. Exhaust Fan

132/33kv Control room - Electrical accessories requirements

1. For 132-33Kv substation we would prefer a **floor standing, 3-phase AC distribution board with automatic change over switch**. The specifications can be obtained from the turnkey department since they have been installing them in their new control rooms.
2. However, where floor standing ACDB cannot be provided a wall mounted wall mounted **3Ph.-6way ACDB** shall be installed 1.6 meters high direct above the control cable trench in the relay panel room. The ACDB shall be fitted with following accessories;
 - i. 2nos.of 32A Triple pole MCBs
 - ii. 6nos. of 16A Double pole MBCs
 - iii. 6nos. of 10A Double pole MCBs
 - iv. 3nos. of 4-6A Single pole MBCs
 - v. 8nos. 2.0'' (inches) PVC conduits joining the board and the cable trench.
3. **Consumer unit** should be installed next to the ACDB as shown in the drawing complete with following MCBS;
 - i. 4nos. of 16A double pole
 - ii. 4nos. of 10A double pole.
 - iii. 3nos, 1.5'' (inches) PVC conduit joining the unit and the trench.
4. **DC distribution board**, where floor standing DC Distribution board cannot be installed, a wall mounted DC board shall be installed complete with the following accessories,
 - i. 2nos. of 32A double pole MCBs
 - ii. 6nos. of 16A double pole MCBs
 - iii. 6Nos. of 10A double pole MCBs.
 - iv. 6nos. 2'' inches. PVC conduits joining the board and the cable trench.
5. Codifications in the control room design.
 - Introduce **Exhaust fan** and permanently close the door joining the relay panel and Battery room
 - Introduce battery room door from outside.
 - Control cable trench should be modified as shown in the drawing.
 - All wall mounted AC/DC supply distribution board should be less than 2M high.

132/33kv Metering room - Electrical accessories requirements

1. **3Ph-4way distribution board** shall be mounted 1.6M direct above the control cable trench as indicated in the drawing. It shall be fitted with following accessories;
 - i. 1nos.of 32A Triple pole MCBs
 - ii. 4nos. of 16A Double pole MCBs
 - iii. 2nos. of 10A Double pole MCBs
 - v. 3nos. of 4-6A Single pole MCBs
 - vi. 4nos. 2'' (inches) PVC conduit joining the board and trench.

1. DC distribution board not required.

2. Introduce **exhaust fan** and close permanently the door joining the relay panel and battery room.

3. **Consumer unit** should be installed next to the ACDB as shown in the drawing complete with following MCBs;
 - i. 3nos. of 16A double pole
 - ii. 3nos. of 10A double pole.
 - iii. 2nos, 1.5'' (inches) PVC conduit joining the unit and the trench.