Construction Measurement III
SBQ3314

Electrical Installations : Single & Three Phase

Dr. Sarajul Fikri Mohamed

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Electrical installation and components

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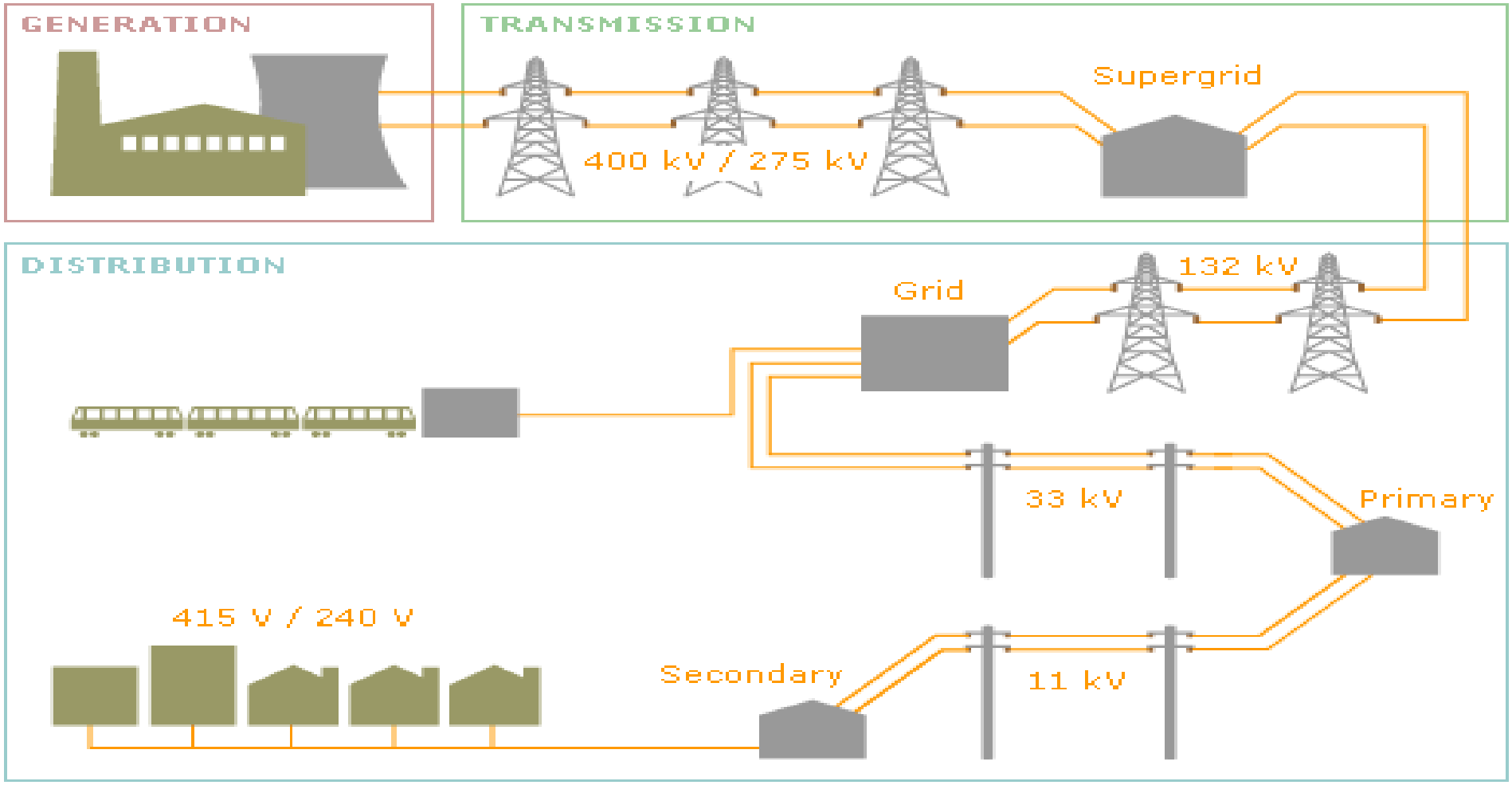
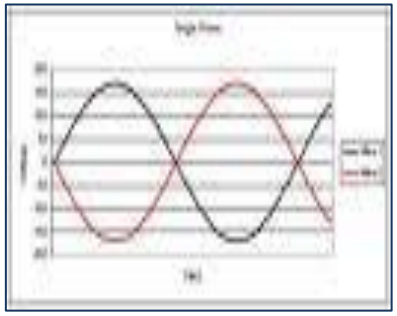
Power transmission and distributions



Single and Three Phase

Single Phase



- For domestic uses, three phase voltage are very high and dangerous to the home owner
- Therefore, low voltage electrical supply normally used for domestic use such residential
- Standard voltage for single phase is 240 v. Normally one live wire will be used with one neutral wire. The code are as follows:
  - RN
  - YN
  - BN

Three Phase

- Carrying voltage is 415 v and can exceed 880 v for industrial user. The industries that use heavy machineries such as steel factory and cement factory need to have three phase electrical system.
- Three phase systems may have three live wire and neutral wire
- Live wires identified based on colour coded and the code are as follows:
  - LI or R (red): Single Phase
  - L2 or Y (yellow): Second Phase
  - L3 or B (blue) : Three Phase

Main Components

- INCOMING SERVICES
- MAIN INSTALLATION
- POWER INSTALLATION
- LIGHTING INSTALLATION
- ELECTRICAL APPLIANCES
- CONDUIT AND FITTING
- CABLES
- LIGHTNING PROTECTION SYSTEM
- TESTING

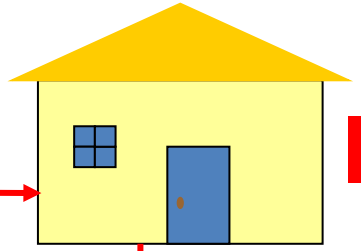
Electrical Distribution

INCOMING SERVICES

TESTING

POWER INSTALLATION

ELECTRICAL APPLIANCES



LIGHTNING PROTECTION

FINAL SUB-CIRCUIT

MAIN INSTALLATION

CABLE

CONDUIT

LIGHTING INSTALLATION

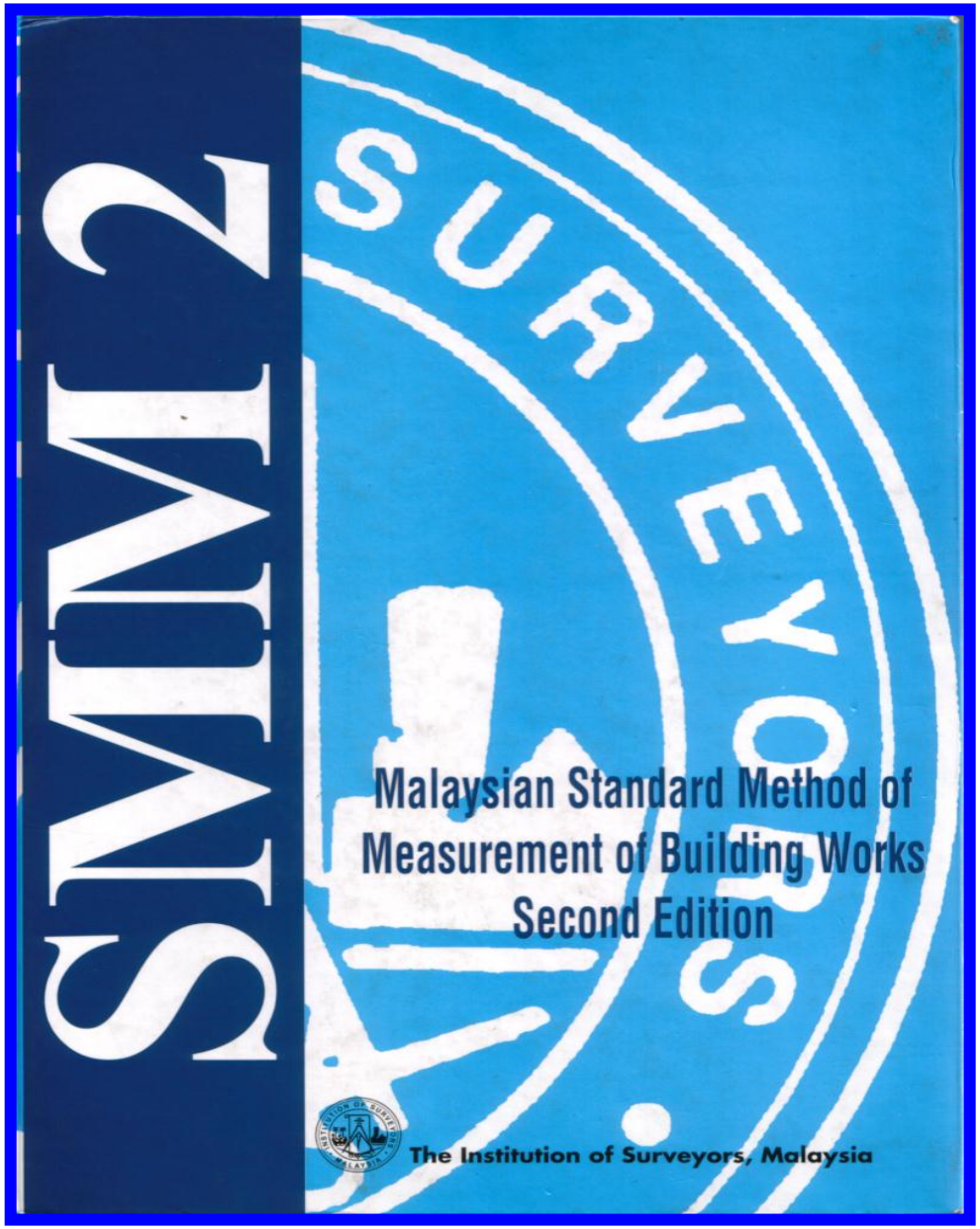
Main Components

POWER INSTALLATION	LIGHTING INSTALLATION	ELECTRICAL APPLIANCES
3 pin switch socket	Fluorescent light Wall light EXIT sign High bay light EL light	Exhaust fan Sweep ceiling fan
CONDUIT & FITTING	**CABLES**	**TESTING**
Chased into brickwall Ceiling level	2x1c/2.5mm PVC cable 2x1c/1.5mm PVC cable	On completion of the electrical installation test all switches, switch socket, wiring etc and make good all defects an leave everything perfect working order to the satisfaction of the S.O and TNB

SMM2 measurement rules

Measurement Rules

SECTION R



Related SMM2 Clauses

Clause	Description
R4-R5	Equipments and Control Gear
R6-R8	Fittings and Accessories
R9-R13	Conduits, trunking and cable tray
R14-R17	Cabling
R18	Final Sub-circuits
R19	Earthing
R20-R21	Ancillaries
R22	Sundries
R23-R24	Builder's Work

Incoming Services

INCOMING SERVICES - EXTERNALLY

INCOMING SERVICES - INTERNALLY

Cadangan Membina Dan Menyiapkan Sebuah Makmal Komputer Di Sekolah Kebangsaan Sri Selangor, Petaling Jaya, Selangor.

ELEMENT: ELECTRICAL SERVICES ubb/N/01

BIL	KETERANGAN	UNIT	KUANTITI	HARGA (RM)	JUMLAH (RM)
A	**Preamble**				
	All quantities in this bill are provisional quantities subject to remeasurement upon construction of the said item. The tenderer must allow for testing the electrical installation and handling over of test certificate to S.O.				
B	**Incoming Services-Externally (All Provisional)**				
	100mm UPVC class 'D' pipe complete with long bend extended beyond drain for entry of TNB, incoming cable to MSB inclusive of excavation and backfilling.	M	3.05		
	4 x 25mm² pilestas (AC) cable in UPVC class 'D' pipe (M/S) buried underground to TNB panel.	M	3.05		
C	**Incoming Services-Internally (All Provisional)**				
	75mm x 38mm electrical trunking from meter to DB/M3B.	M	1.00		
	25mm x 25mm Telekom PVC trunking from lighting arrestors run at high level and drops to computer server.	M	1.00		
	To Collection				

Measurement Rules : Classification of Work

R.2 CLASIFICATION OF WORK

a. Incoming services
b. Standby equipment
c. Mains installation-switch gears, sub-main cables.
d. Power installation
e. Lighting installation
f. Heating installation
g. Electrical appliances
h. Electrical work
k. Clock installation
l. Sound distribution
m. Alarm system
n. Earthing system installation
p. Lightning protection installation
q. Special services
r. Any other installation
s. Trunking, ducting and cable trays

Measurement Rules : Location of Works

LOCATION OF ELECTRICAL WORKS

R3 - Location of work

a. Internally
b. Externally

Example

Cl R.2.1(d)
Classification of work

Cl R.3.1(a)
Location of Work

ITEM	DESCRIPTION	UNIT
A	POWER INSTALLATION (INTERNALLY) Cable 2 x 1C-2.5mm2 PVC insulated colour coded cable as specified drawn into conduit.	M

Cl R.14.2
Generally

Cl R.15.2(a)
Cables

Main Installations (Equipments)

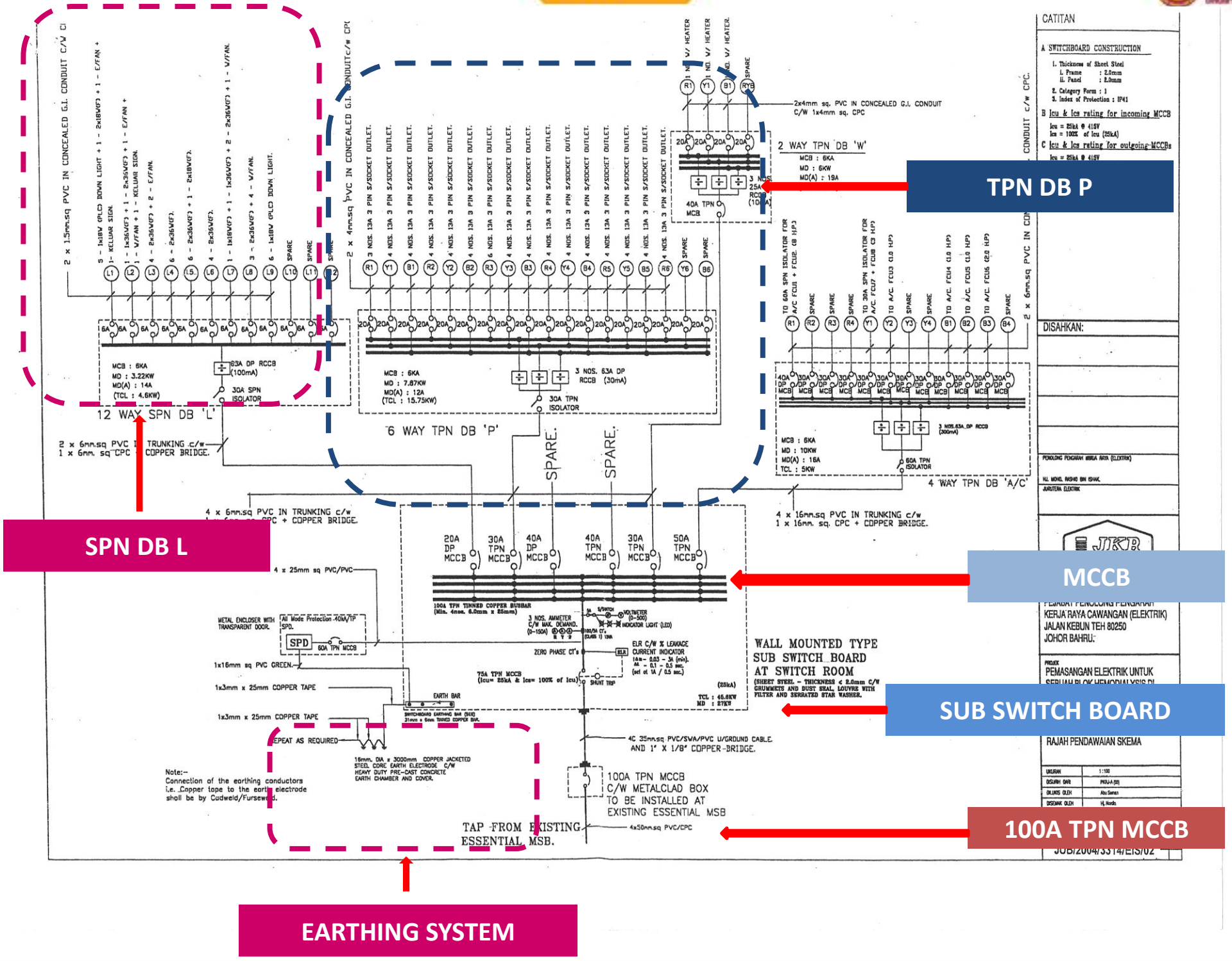
Measurement Rules : Equipment

EQUIPMENT AND CONTROL GEAR (NO)

R4 – Equipment (generator, motors)

Control gear (isolator, switch fuses)

- Packaged item described with a manufacturer's detail.
- Limiting dimension on size shall be given.
- Connecting cable ends or cable tails shall be deemed to be included with the item.
- Platework and supporting steelwork – Section P.



WALL MOUNTED SUB SWITCH BOARD

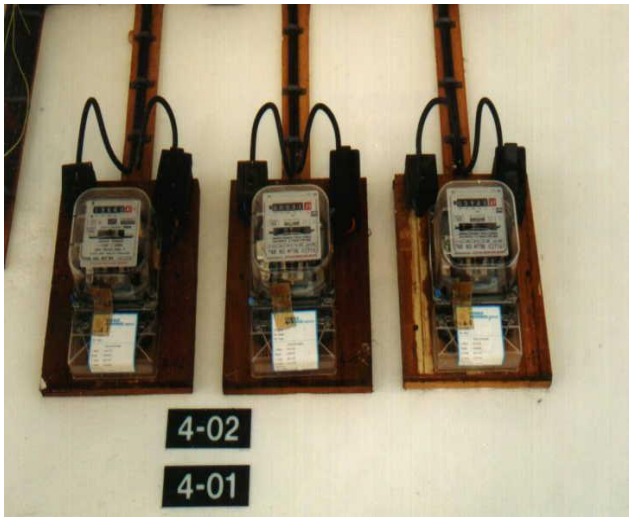
MAIN SWITCH C/W INDICATOR LIGHTS

Cadangan Membina Dan Menyiapkan Sebuah Makmal Komputer Di Sekolah Kebangsaan Sri Selangor, Petaling Jaya, Selangor.

ELEMENT: ELECTRICAL SERVICES ubb/N/02

BIL	KETERANGAN	UNIT	KUANTITI	HARGA (RM)	JUMLAH (RM)
D	**Mains Installation-Internally (All Provisional)**				
	Metal clad main switch board of wall mounted floor standing type model no. 3b and including 60A/100A TPN cut-off fuse C/W neutral link, 75A TPN MCCB and surge protector and all associated accessories.	NO	1		
	Wall mounted metal clad distribution board inclusive 30A SPN MCB, 30A SPN current-operated 100mA ELCB comprising of 13 nos 6A MCB and all associated accessories.	NO	1		
	Wall mounted metal clad distribution board inclusive 60A TPN MCCB, 60A TPN current-operated 300mA ELCB comprising 17 nos of 30A MCB, 5 nos of 20A MCB, 6 nos aircond point and all associated accessories.	NO	1		
E	**Power Installation-Internally (All Provisional)**				
	3 nos 13A 3pin switch socket outlets mounted 300mm from first floor level complete with 2 x 2.5mm²/1C PVC in concealed UPVC trunking.	NO	2		
	4 nos 13A 3pin switch socket outlets mounted 300mm from first floor level complete with 2 x 2.5mm²/1C PVC in concealed UPVC trunking.	NO	2		
	4 nos 13A 3pin switch socket outlets mounted under of table complete with 2 x 2.5mm²/1C PVC in concealed UPVC trunking.	NO	4		
	To Collection				

METERING BOARD



- To monitor and record the total amount of electrical energy that is being consumed for the purpose of charging consumers through the issuance of electricity bills .
- Property of TNB
- 2 types of meter
  - Analog
  - Digital

TNB CUT OUT FUSE

- Consumer's back up protection
- 2 purposes:
- As a measure of back up protection to the fuse in the Distribution Board and also ELCB
- As mean of cutting of electrical supply to the consumers when required
- Cutout fuse is connected to live wire and it is use to control current supply. Both belong to TNB.

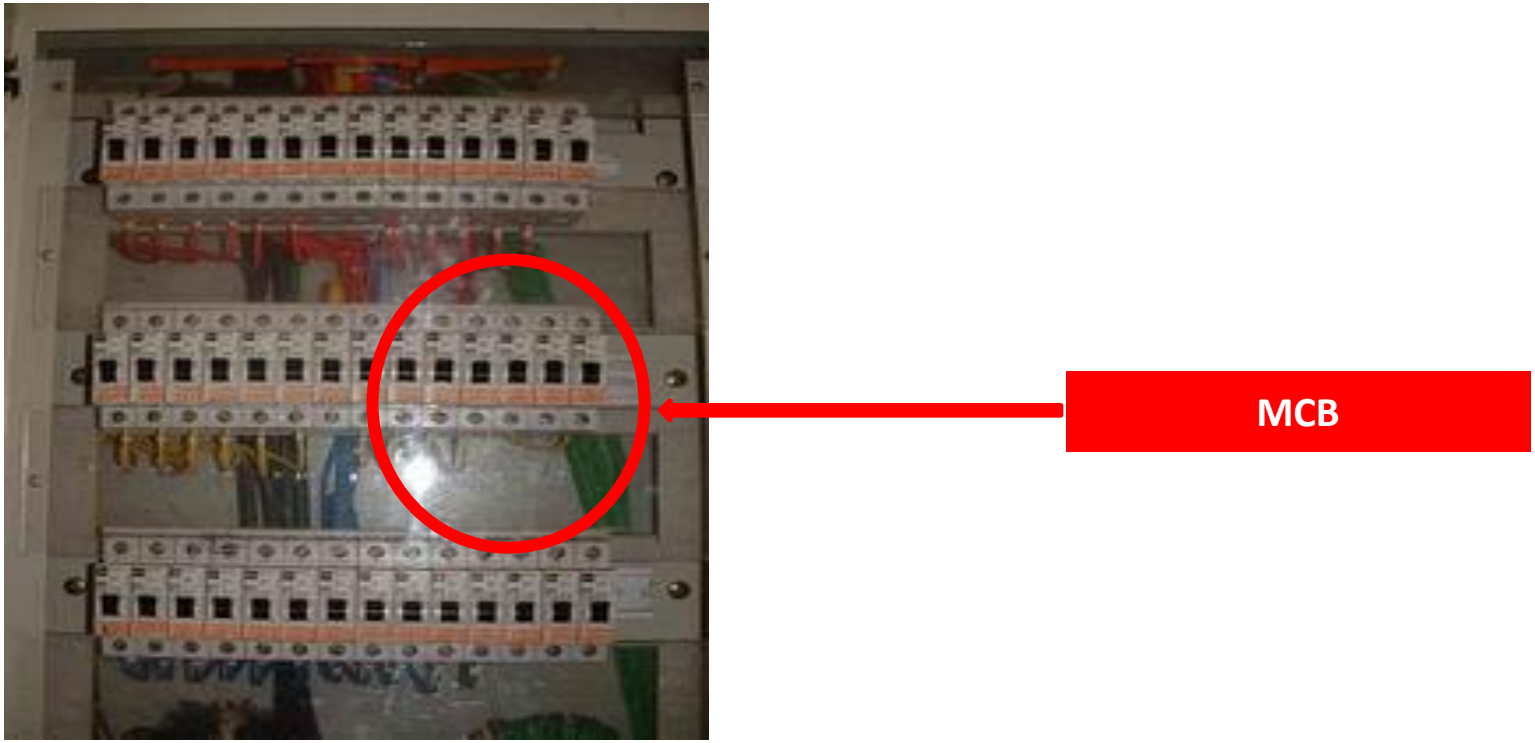
DISTRIBUTION BOARD

Cadangan Membina Dan Menyiapkan Sebuah Makmal Komputer Di Sekolah Kebangsaan Sri Selangor, Petaling Jaya, Selangor.

ELEMENT: ELECTRICAL SERVICES ubb/N/02

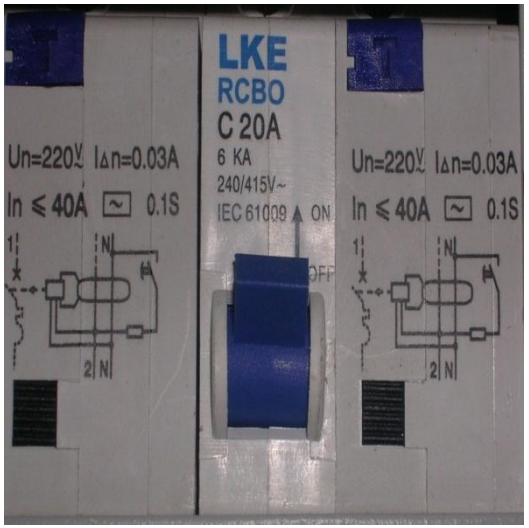
BIL	KETERANGAN	UNIT	KUANTITI	HARGA (RM)	JUMLAH (RM)
D	**Mains Installation-Internally (All Provisional)**				
	Metal clad main switch board of wall mounted floor standing type model no. 3b and including 60A/100A TPN cut-off fuse C/W neutral link, 75A TPN MCCB and surge protector and all associated accessories.	NO	1		
	Wall mounted metal clad distribution board inclusive 30A SPN MCB, 30A SPN current-operated 100mA ELCB comprising of 13 nos 6A MCB and all associated accessories.	NO	1		
	Wall mounted metal clad distribution board inclusive 60A TPN MCCB, 60A TPN current-operated 300mA ELCB comprising 17 nos of 30A MCB, 5 nos of 20A MCB, 6 nos aircond point and all associated accessories.	NO	1		
E	**Power Installation-Internally (All Provisional)**				
	3 nos 13A 3pin switch socket outlets mounted 300mm from first floor level complete with 2 x 2.5mm²/1C PVC in concealed UPVC trunking.	NO	2		
	4 nos 13A 3pin switch socket outlets mounted 300mm from first floor level complete with 2 x 2.5mm²/1C PVC in concealed UPVC trunking.	NO	2		
	4 nos 13A 3pin switch socket outlets mounted under of table complete with 2 x 2.5mm²/1C PVC in concealed UPVC trunking.	NO	4		
	To Collection				

Excess Current Protection : MINIATURE CIRCUIT BREAKERS (MCB)



- An electromechanical or electro thermal devices which break the circuit in the case of excess current
- It will cut off any faulty circuit immediately
- Sensitive to lightning
- 2 types of excess current protection:
    - Earth Leakage Circuit Breaker: ELCB
    - Miniature Circuit Breaker: MCB

RESIDUAL CURRENT CIRCUIT BREAKER (RCCB)

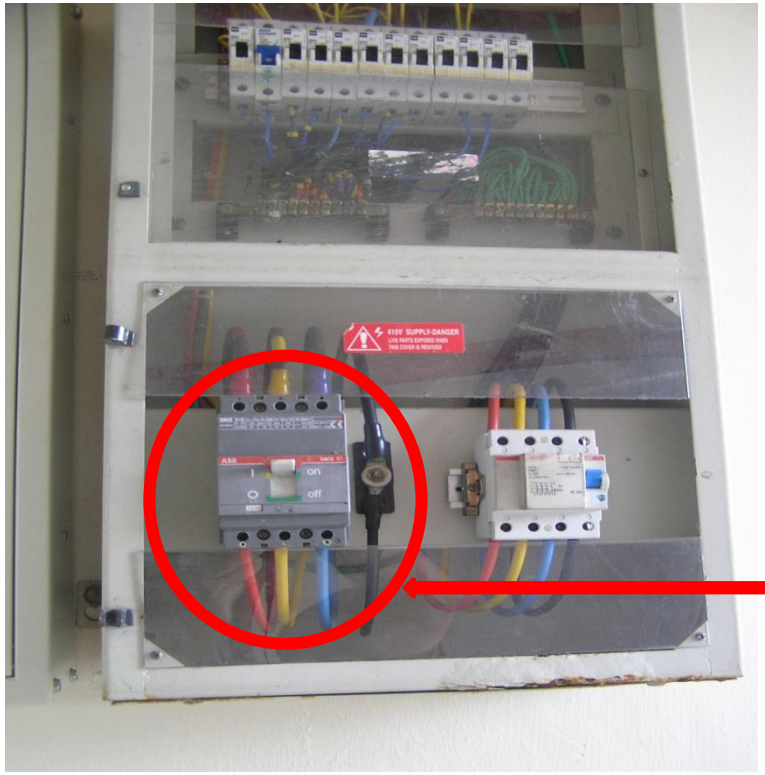


RCBO – INSIDE A DISTRIBUTION BOARD

RCCB – INSIDE A DISTRIBUTION BOARD

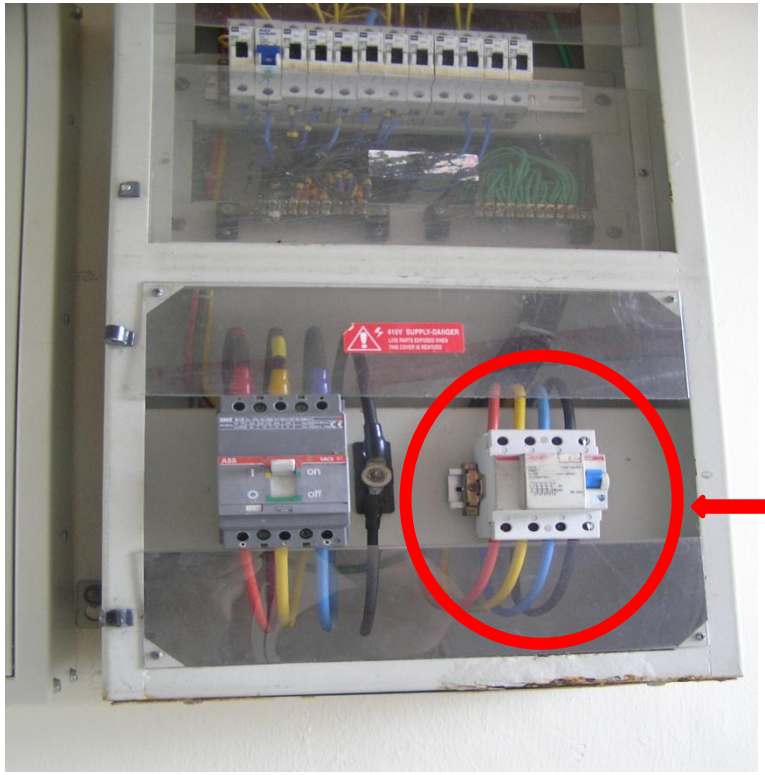
- To ensure freedom from risk of shock it is important that the earth connection linking the metalwork of electrical equipment has a very low resistance.
- RCCB provide a possible solution. The current-operated type compare the current flowing in the line and neutral of a circuit.
- In the case of fault the current flow will no longer be equal and the device will disconnect the supply.

Main Switch : ELECTRICAL INSTALLATIONS



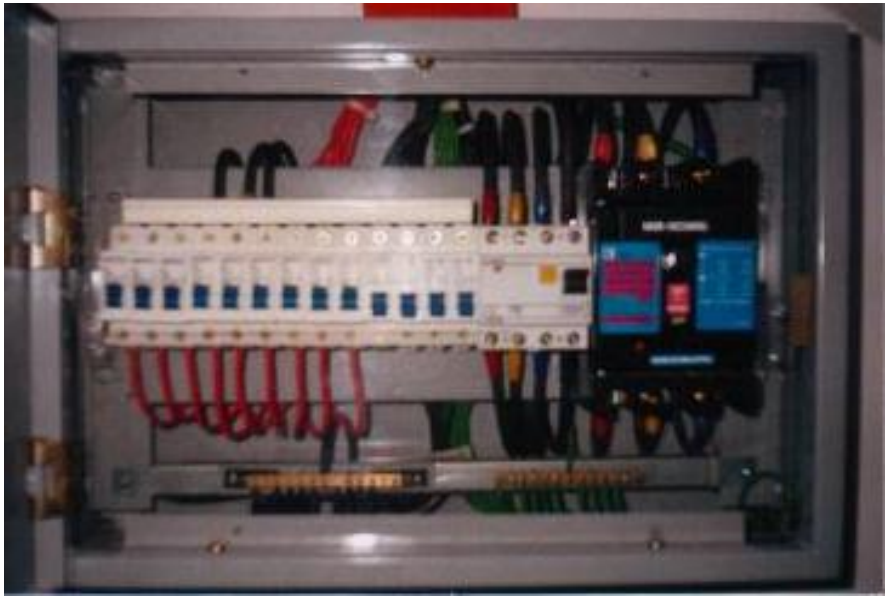
- Locate at the main incoming supply of the consumer's Distribution Board
- The purpose is to cut all of the power supply to the consumer in the event that any maintenance work needs to be carried out.
- Connect, cut off and control the current if their any excess current.
- A two terminal one way switch that contains fuse.

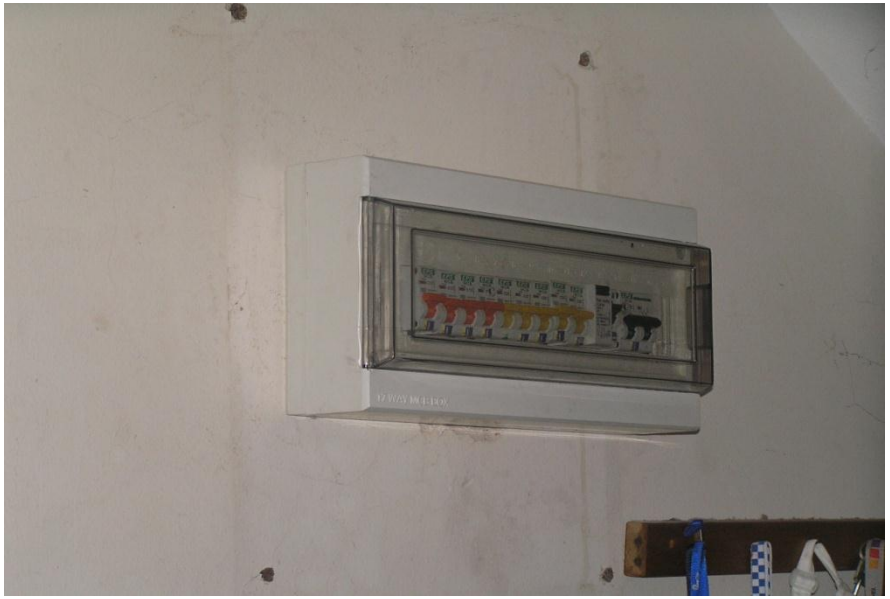
Circuit Breaker : ELCB : ELECTRICAL INSTALLATIONS



- A mechanical device to connect and cutout circuit
- It will cut off any faulty circuit immediately
- Sensitive to lightning
- 2 types:
    - Earth Leakage Circuit Breaker: ELCB
    - Miniature Circuit Breaker: MCB

Distribution Board : ELECTRICAL INSTALLATIONS





- This is where distribution of electrical energy to various connected load take place inside the consumer premises.
- It also distributes the path for the earthing and neutral wire, and acts as means of flowing leakage and return current respectively.

Miniature circuit breaker : MCB

Distribution Board : ELECTRICAL INSTALLATIONS

- Usually for houses and small loaded.
- Situated inside building.
- Including equipment such as circuit breaker and fuse
- SMM2 Refer to clause R.4.1(NO.)

Measurement Rules : ELECTRICAL INSTALLATIONS

EQUIPMENT SUPPORTS : R5

- Equipment supports enumerated and described (NO)
- Method of fixing given in the description with clauses R.1.5-6.

Measurement Rules : ELECTRICAL INSTALLATIONS

FITTING AND ACCESSORIES (N0)

R6 Fittings (clock , alarm bells)
Accessories (socket outlets)

R7 Pendant fittings – NO *length stages 300mm*

R8 Accessories - NO (in gang)

a) rated capacity

b) type

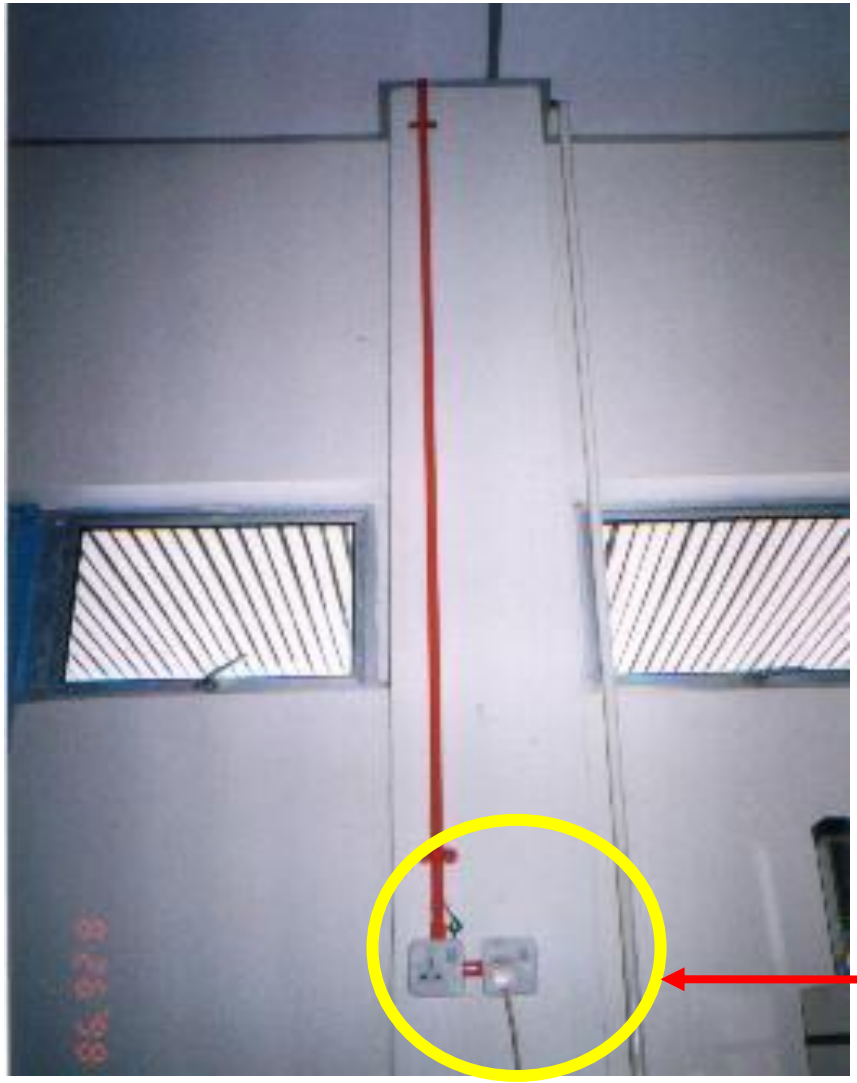
c) no. accessories in each gang

Power Installations

Measurement Rules : ELECTRICAL INSTALLATIONS

- Switch socket outlet & socket point.
- Different Types for different capacity.
- SMM2 Refer to clause R.18.2 (No.)

Power Installation : ELECTRICAL INSTALLATIONS



SOCKET

Power Installation : ELECTRICAL INSTALLATIONS

13A 2 gang s/s/o

Bell push switch

13A 2 gang s/s/o with neon

Telephone socket

Lighting Installation : ELECTRICAL INSTALLATIONS

- Fluorescents Lights and emergency light.
- Specification refer to manufacturer.
- SMM2 Refer to clause R.4.1(NO.)

Electrical Appliances

Electrical Appliance : ELECTRICAL INSTALLATIONS

- Fan, MATV point and telephone point.
- SMM2 Refer to clause R.6, R.22.1 (NO.)

Conduit, Trunking & Cable Tray

Measurement Rules : ELECTRICAL INSTALLATIONS

CONDUIT, TRUNKING AND CABLE TRAYS

R9.1 – Conduit and fittings. (m)

a) type

b) size

c) specification

d) saddles & crampets pattern

e) nature of background

Except for final sub-circuit (measured overall conduit fittings) e.g tees, elbows, bend, cover plates, bushes, locknuts, nipples, stopping-lugs and reducing bushes), short running lengths and branches).

Measurement Rules : ELECTRICAL INSTALLATIONS

CONDUIT, TRUNKING AND CABLE TRAYS

Classification :

a) conduits fixed to surfaces

b) conduits fixed in chases

c) conduits embedded in floor screeds

d) conduits embedded in concrete

Conduit inside the suspended ceiling

Conduits fixed in chases brickwall

Measurement Rules : ELECTRICAL INSTALLATIONS

CONDUIT, TRUNKING AND CABLE TRAYS

R9.2 – Special boxes, adaptable box, floor trap boxes, purposes made boxes, rectangular junction boxes required for drawing in cables , flameproof boxes & expansion joint

(NO – EXTRA OVER)

Measurement Rules : ELECTRICAL INSTALLATIONS

CONDUIT, TRUNKING AND CABLE TRAYS

R9.3 – Flexible conduits & extensible conduit (NO)

i) size ii) overall length iii) type
iv) size & type termination glands

R9.4 – Components & special boxes (N0)
(for making connection of conduit in trunking)

Trunking

Measurement Rules : ELECTRICAL INSTALLATIONS

CONDUIT, TRUNKING AND CABLE TRAYS

R10.1 Trunking (m)

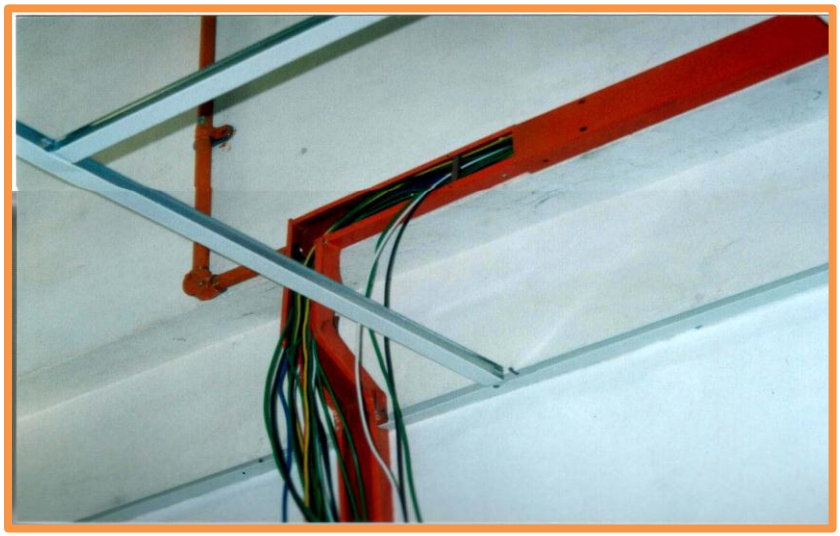
i) type
ii) size
iii) no & size compartment
iv) method of connecting

R10.2 Fitting (NO) and EXTRA OVER

R10.3 Connection between trunking & item of equipment & control gear use flanges and or the forming of apertures (N0)

Measurement Rules : TRUNKING

- A rectangular metal made system that either horizontally or vertically fixed to wall.
- A good mechanical protection.
- Made from 18 gauge steel sheet.
- Available size:
  - 50mm x 50mm
  - 70mm x 100mm
  - 150mm x 75mm
  - 150mm x 150mm
- Equipped with bend, tee, and junction.



Fixed to wall using bracket

Run at ceiling level

Cadangan Membina Dan Menyiapkan Sebuah Makmal Komputer Di Sekolah Kebangsaan Sri Selangor, Petaling Jaya, Selangor.

ELEMENT: ELECTRICAL SERVICES ubb/N/05

BIL	KETERANGAN	UNIT	KUANTITI	HARGA (RM)	JUMLAH (RM)
I	**Electrical Appliances In Concrete Buildings Internally (All Provisional)**				
	ACSU starter panel.	NO	1		
	Aircond point.	NO	6		
J	**Cables In Concrete Buildings Internally (All Provisional)**				
	2 x 6mm²/1C in concealed UPVC conduits.	M	11.53		
	4 x 6mm²/1C in concealed UPVC conduits.	M	30.53		
	2 x 1.5mm²/1C in concealed UPVC conduits.	M	186.41		
	2 x 2.5mm²/1C in concealed UPVC conduits.	M	112.06		
K	**Conduits And Fittings In Concrete Buildings Internally (All Provisional)**				
	20mmø Galvanised Iron class 'B' conduits with screw joints and run at underfloor level.	M	132.00		
	20mmø Galvanised Iron class 'B' conduits with screw joints and chased into brickwall.	M	16.78		
	50mm x 25mm underfloor trunking for power point.	M	56.03		
	75mm x 25mm underfloor trunking for computer services.	M	56.03		
	To Collection				

Measurement Rules : ELECTRICAL INSTALLATIONS

CONDUIT, TRUNKING AND CABLE TRAYS

R10.4 Pin racks (NO)

i) type; and ii) size

R11.1 Busbar Trunking (m)
Clauses R.10.1
a) type; b) width; c) rated capacity; and
d) method of capacity

R11.2 Tap-off units, feeder units, fire barries & the like (NO)

Cable Tray

Measurement Rules : ELECTRICAL INSTALLATIONS

CONDUIT, TRUNKING AND CABLE TRAYS

R12.1 Trays (m)
i) type; ii) width; and iii) method of jointing

R12.2 Stools (NO)
i) type; and ii) size

R12.3 Fitting (NO and EXTRA OVER)

Cable

Measurement Rules : ELECTRICAL INSTALLATIONS

CABLES

R15.1 – Cables (m)

measured as the net length of the conduit, trunking or tray.

other cable measured as fix (without any allowance for sag) between boxes, equipment control gear, fittings, accessories etc.

except for final sub-circuits.

Measurement Rules : ELECTRICAL INSTALLATIONS

Cables

R15.2 Cables (m)

i) type ii) size iii) classification

CLASSIFICATION

a) drawn into conduits or ducts

b) laid or drawn into trunking

c) laid or drawn into trunking and laced into ciucuit

d) fixed to surfaces

e) wrapped around pipework

f) laid in trenches

g) fixed to insulators in overhead lines

h) suspended from catenary cables

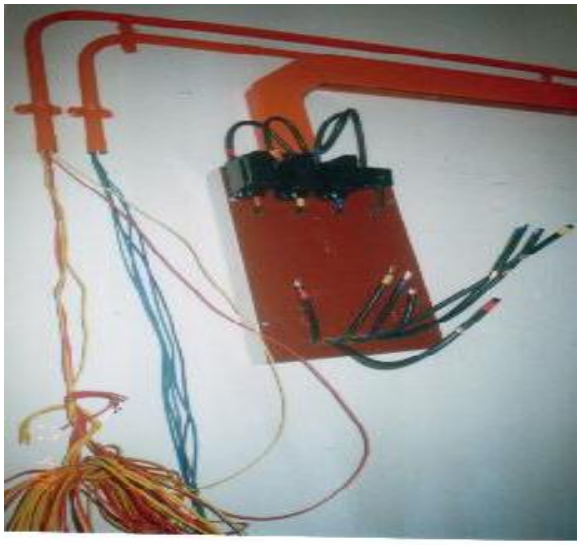
R15.4 Cable joints (NO)

R15.5 Line taps (NO)

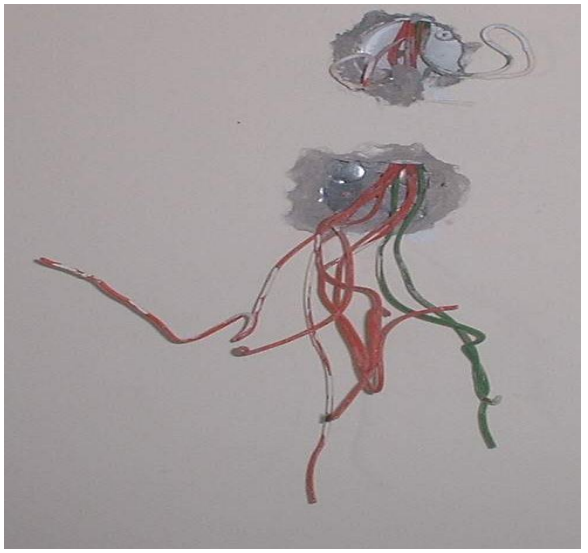
i) size ii) type of cable iii) shrouds (type)

Measurement Rules : CABLE CLASSIFICATIONS

Underground cable



Fixed to wall



Fixed in ceiling

Measurement Rules : ELECTRICAL INSTALLATIONS

CABLE

R15.6 Cable termination glands (NO) i) type & size of cable ii) type of gland

R15.7 Conduit: boxes, adaptable boxes & the like used with cable termination glands (NO - *separately)*

i) type ii) size of cable iii) joint-boxes, sealing boxes (type)

R16.1 Components for supporting cable given in the description of the cable stating type and spacing.

Alternatively, components of combination system (NO)

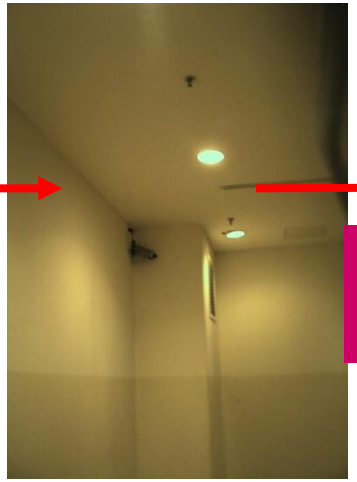
Measurement Rules : ELECTRICAL INSTALLATIONS

CABLE

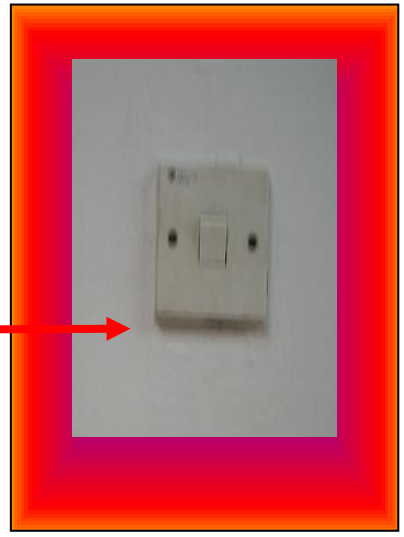
R17 Connections to public mains, making good public highway and other work which may only carried out by Public Undertaking or Local Authority – PROVISIONAL SUM

Measurement Rules : FINAL SUB CIRCUIT

Cable (m)



Final sub-circuit (nos)



Stating the ampere rating based on classification of point.

Measurement Rules : FINAL SUB CIRCUIT

FINAL SUB-CIRCUITS

R18.1 Distribution sheets and drawing showing layout shall be given.

R18.2 Points (NO)

i) cable & conduit installations

ii) ampere rating

iii) classification

CLASSIFICATION

a) Lighting points: one way or two way

b) Socket or switch socket points

c) Immersion heater points, cooker outlet points etc.

Lightning Protection System

Measurement Rules : ELECTRICAL INSTALLATIONS

EARTHING

R19.1 Tapes for earthing (m)

i) size; ii) type; and
iii) type & spacing of saddles, cleats, clip holdfasts & the like

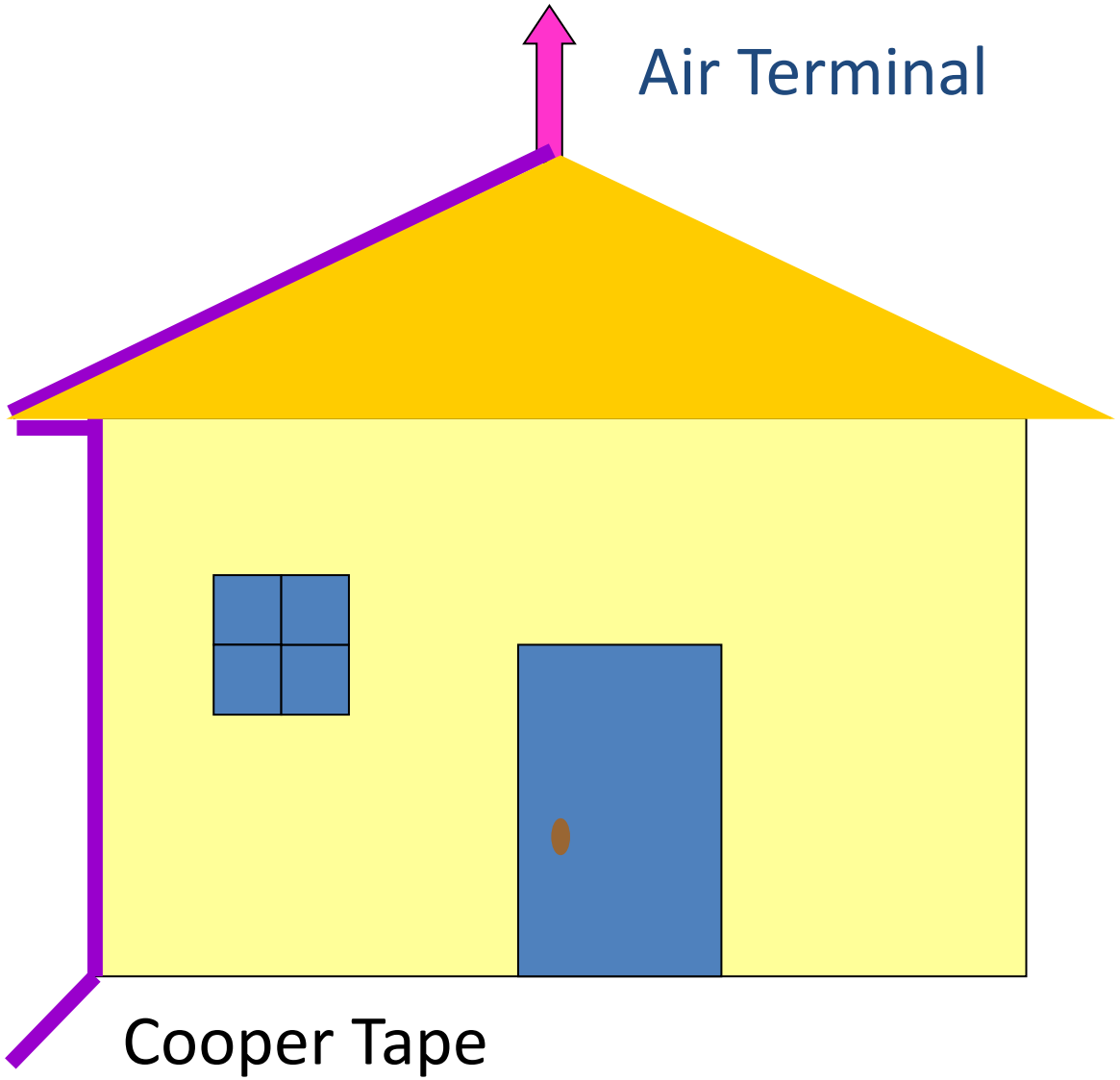
R19.2 Conductor connections & junctions (NO)

i) type; and ii) size

R19.4 Test clamps (NO)

i) type ii) size; and iii) method of connecting

Measurement Rules : LIGHTNING PROTECTION SYSTEM



COOPER TAPE

ELECTRODE CHAMBER

Cadangan Membina Dan Menyiapkan Sebuah Makmal Komputer Di Sekolah Kebangsaan Sri Selangor, Petaling Jaya, Selangor.

ELEMENT: ELECTRICAL SERVICES ubb/N/04

BIL	KETERANGAN	UNIT	KUANTITI	HARGA (RM)	JUMLAH (RM)
	Lighting Installation-Internally (All Provisional) (Cont'd)				
	3 x 36W recessed mounted fluorescent light fitting with low loss ballast C/W acrylic diffuser 2 x 1.5mm²/1C PVC in concealed UPVC conduits with 5A switch.	NO	16		
	3 x 36W recessed surface fluorescent light fitting with low loss ballast C/W acrylic diffuser 2 x 1.5mm²/1C PVC in concealed UPVC conduits with 5A switch.	NO	16		
H	**Lightning Protection-Externally (All Provisional)**				
	25mm x 3mm copper tape at roof including propose made copper or brass clips at 1000mm internals and connecting to roof tapes.	M	29.00		
	Brass test clamp complete with screws.	NO	2		
	500mm High Solid Copper air termination with formed thread complete with bronze nut and appropriate thickness copper air terminal base.	NO	2		
	300mm x 300mm x 300mm deep concrete Earth Electrode Chamber complete with concrete cover from ground level, lightweight screed to prevent ingres of water, 16mmø solid drawn copper Earth Electrode, copper tape and 50mmø UPVC pipe.	NO	2		
	To Collection				

Earth electrode pit

Cooper strip

Measurement Rules : LIGHTNING PROTECTION SYSTEM

EARTHING

R19.5 Earth electrodes (NO)

i) type ii) size; and iii) driving electrode into ground

R19.6 Air termination points (NO)

i) type ii) size; and iii) method of connecting

Measurement Rules : LIGHTNING PROTECTION SYSTEM

ANCILLARIES

R20 Loose keys, tools, spares and the like (NO – separately)

i) type; and ii) quantity

Rack for holding tools (NO)

Measurement Rules : LIGHTNING PROTECTION SYSTEM

SUNDRIES

R22.1 Marking the position of holes, mortice, chases & the like (ITEM)

R22.2 General earth bonding & earthing (ITEM)

R22.3 Disconnecting, setting aside & refixing equipment (ITEM)

R22.4 Temporary operating each installation (ITEM)

R22.5 Testing each installation (ITEM)

R22.6 Preparing plans or diagrams of the installations (ITEM)

Testing

Cadangan Membina Dan Menyiapkan Sebuah Makmal Komputer Di Sekolah Kebangsaan Sri Selangor, Petaling Jaya, Selangor.

ELEMENT: ELECTRICAL SERVICES ubb/N/06

BIL	KETERANGAN	UNIT	KUANTITI	HARGA (RM)	JUMLAH (RM)
L	**Sundries**				
	Test the lighting and fitting installation described in specification.	ITEM			
M	**Testing**				
	On completion of the electrical installalion test all switches switch sockets, wiring etc. and make good all defects an leave everything perfect working order to the satisfication of the S.O and TNB.	ITEM			
	To Collection				

Taking Off List

TAKING OFF LISTS
DOMESTIC – HOUSING SINGLE PHASE

1. Main Installation

-	meter panel	no
-	distribution board	no
-	cables	m
-	conduits	no
-	sundries	
	= mark holes	item
	= general bonding	item
	= testing	item

TAKING OFF LISTS
DOMESTIC – HOUSING SINGLE PHASE

2. Power Installation

- fitting & accessories		
= socket		no
- cables		m
- conduits		m
- sundries		
= mark holes		item
= general bonding		item
= testing		item

TAKING OFF LISTS
DOMESTIC – HOUSING SINGLE PHASE

3. Lighting Installation

- fittings & accessories		
= switch		no
- cables		m
- conduits		m
- final sub circuit		no
- sundries		
= mark holes		item
= general bonding		item
= testing		item

TAKING OFF LISTS
DOMESTIC – HOUSING SINGLE PHASE

4. Electrical Appliances

- fitting & accessories		
= switch		no
- cables		m
- conduits		m
- final sub circuit…		no
- sundries		
= mark holes		item
= general bonding		item
= testing		item

TAKING OFF LISTS
DOMESTIC – HOUSING SINGLE PHASE

5. Earthing System Installation

- cables	m
- copper tape	no
- test clamps	no
- conductor connection	no
- earth electrodes	no
- air termination	no
- sundries	
= mark holes	item
= testing	item

Heading & Description

ITEM	DESCRIPTION	UNIT	QUANTITY
	MAIN INSTALLATION(EXTERNALLY)		
A	Metering board to shop TNB kwh meter single phase complete with cut out fuse, neutral link, interconnecting cables and all necessary accessories to TNB's requirement	NO	1
B	150mm diameter corrogated pipe as specified including all short running length extended beyond drain.	M	12
C	100mm diameter PVC pipe complete with long bend extended beyond drain for entry of TNB incoming cable to distribution board.	M	21

ITEM	DESCRIPTION	UNIT	QUANTITY
	POWER INSTALLATION (INTERNALLY)		
	Galvanised steel conduit with screw joint including all short running lengths, bends, tees, saddles, crampets, locknut and circular conduit box		
A	20mm Diameter conduit chased in brickwall.	M	36
B	20mm Diameter conduit fixed to ceiling.	M	21
C	20mm Diameter conduit embedded in floor screed.	M	20

ITEM	DESCRIPTION	UNIT	QUANTITY
A	LIGHTING INSTALLATION (INTERNALLY) Cable 2 x 1C-2.5mm2 PVC insulated colour coded cable as specified drawn into conduit.	M	127
B	Fittings and Accessories 6 Ampere 1 gang 1 way wall mounted flush type switch for light complete with PVC face plate mount to brickwall at 1200mm from finished floor level.	NO	2
C	Final sub-circuit of galvanised steel conduit installation of 2 x 1.5mm^2 PVC insulated cable drawn into galvanised steel conduit (m/s) in circuit comprising of 1 lighting point.	NO	16

ITEM	DESCRIPTION	UNIT	QUANTITY
	LIGHTNING PROTECTION INSTALLATION (EXTERNALLY)		
A	Lightning air terminal with approved hold fasts including 25mm x 3mm copper tape and roof conductor with and including gun conductor with earth electrode.	NO	1
B	25mm x 3mm bare copper tape fixed with and including cast brass saddles at one metre centres including bends, sets and saddles fix at roof.	M	13
C	Test clamp, size 20mm x 40mm connected to conductor, screwed to brickwall vertically.	NO	2