

# Budget planning

The important points that are to be considered in planning a budget are

- The general state of affairs for the electrical construction industry in the area
- The overhead and profit percentage
- Market placement

# Time card

Daily Time Card Sheet:

<u>Daily Time Card</u>							
Name: _____				Date: _____			
Job Number _____				Job Name: _____			
Section	1	2	3	4	5	6	7
Hours							

Section 1-Slab, site, temp.   Section 1-Interior Raceway   Section 3-Dist Equip   Section 4-  
Wire   Section 5- Light fixtures   Section 6-Trim   Section 7- Other  
Work Week-Wed, Thru, Tues   Payday-Friday PM

# Service Order

## Service Order

Billed: \_\_\_\_\_

Customer-\_\_\_\_\_

Address-\_\_\_\_\_

Phone-\_\_\_\_\_

Job Address-\_\_\_\_\_

Job Phone-\_\_\_\_\_

Description-\_\_\_\_\_

Job assigned to:

Date:

Completed:

Material

Labor

Other

Invoice P.O #	Amount	Date	Hours	Other

# Purchase Order

Purchase Order		
To _____	Date _____	
Ship To _____		
Shipping Instructions _____		
Deliver The Following-----As specified		
Herein		
<div></div>		
Submit Two Invoices		
Beating this PO number		
<div>0000</div>	<div>5702</div>	<div>4</div>
By: _____		
Received _____	and _____	acknowledged
by _____	Date _____	



# Job Review Sheet

## Job Review Sheet

Job Name: \_\_\_\_\_ Job Number \_\_\_\_\_

Reviewer \_\_\_\_\_ Date \_\_\_\_\_

	Hours	Material \$	Est Hours	Est Mat \$	Hrs Results	Mat \$ results
Section 1						
Section 2						
Section 3						
Section 4						
Section 5						
Section 6						
Section 7						
Total						

Job Costs

Week Ending	Item	Amount	P.O #	Complete
Estimated Job Costs=			Actual Costs=	

Comments:

# Bid Pricing + speciality Work

## **(3) What is bid pricing?**

Bid pricing means the material prices that a electrical contractor uses in the calculation of a bid price quote.

## **(4) Explain your own words for specialty work.**

Specialty work is the most profitable area of work of a contractor/company where the profit is usually calculated in a percentage basis. It is important as competing in a market usually requires sizeable investment of both time and money. There are usually two divisions of specialty work:

- a. Special types of installations
- b. Special service to specific types of consumers.

The former refers to specialized electrical, electronic or mechanical installations such as telephone work, fire alarm systems , security systems etc while the later refers to providing special service to certain consumers.

# General Contracting Terms

- (a) **Bonding:** It is a debt security in which the authorized issuer owes the holders a debt and depending on the terms of the bond , is obliged to pay interest at fixed intervals .
- (b) **Contract:** A contract is a legally enforceable agreement between two or more parties with mutual obligations, which may or may not have elements in writing.
- (c) **Documenting:** It is the process of writing and classifying official information/ material or evidence that serves as a record.
- (d) **Arbitration:** It is a method of resolving contract disputes without going through the regular legal channels which is voluntarily chosen by both parties.

# Biding Tactics

Bidding tactics are the different tricks that contractors use to try to figure out who is bidding what and how to protect their own prices while finding out their competitors' prices. Some bidding tactics are:

- a. The undercut technique:** Here a general contractor who is willing to tell the electrical contractor the other electrical prices, the general contractor hopes to get the lowest price.
- b. The bait and switch technique:** This is primarily used by reputable contractors who are trying to protect themselves from unethical competition.
- c. The out of town fake:** This is similar to the bait and switch but for jobs where there are a number of contractors from other town bidding on the project.
- d. The outright deception:** This is the worst one of them where the contractor deceits and calls up several electrical contractors to try to solicit bids from them.



# Marketing Plan

The following are the steps involved in developing a market plan :

**a. Analyzing the marketplace:** Analysis of the market is the stepping stone to a better market plan. To make a reasonably accurate market analysis, it is necessary to gather all the pertinent information that can be found about the project, carefully review each piece of information and slowly consolidate all of the facts to get a good picture of the market. The first step in doing so is to establish your own company followed by cost estimation, finding out about other contractors' work within your area and future estimation of the market.

**b. Trends in the market:** It is very important for every contractor to stay in touch with new trends as this will help broaden your project in every part of the country. Regional trend, market trend, trends in installation equipment, management trends everything needs to be studied.

**c. Analyzing your local market:** Each market has its own characteristics and peculiarities. Even different marketplaces within a certain region can be vastly different so it is very important to analyze own market and know how much work of each type is available for each particular location.

**d. Choosing market segments:** After getting all the pertinent information together, it is necessary to review it and make some firm decisions as to which segments of the market you want to work. It is a very critical decision to go through a slow, careful analysis before making any firm decisions.

**e. Being in the right place at the right time:** It is the essence of what makes the good profit in the electrical business. Identifying where the right place to be is and when to be there makes a big difference.

# Leadership

**a. Leadership:** One of the major jobs of managers is to be the leaders. A leader should possess following characters:

- i) Must direct the activities
- ii) Make rules
- iii) Collect pertinent information
- iv) Make plan and implement it
- v) Must have clear vision of what exactly the organization needs to achieve

# Employee

## **b) Employee:**

i) Employees are the company's assets

ii) Good employees are few and far between so all companies should try to keep key people happy, make workforce stable and hire the best possible people they can.

iii) All employees should be aware of company's policies and purposes and the outcome they are going to achieve from that job.

# Working together, Motivating people

**c) Working together:** Team work is the fundamental aspect of any organization. All staffs should work together to make an organization] successful as one cohesive unit with one common set of goals, working together towards achieving objectives.

**d) Motivating people:** Every employer should provide a comfortable, stress free environment with opportunities to grow within an organization for each employee. There should be proper balance between productivity and pleasantness so that every employee can work with the full efforts in that organization.



# Job Accounting

Job accounting system includes following sections:

**1. Complex systems:** This system is used by very large electrical contractors as it is very difficult and expensive to operate for a small or medium sized contractors and also they are not accurate than sectional type of sections. There are extra clerical costs for gathering and

tabulating all of the figures. Furthermore, any information we can obtain will need clarification before they can be used. Therefore, it is not that the complex systems gives us unreliable information but that they cost a lot more and don't really provide information that is substantially superior.

# Job Accounting

**2. Sectional systems:** This system is designed for simplicity. The office people do almost no more work than a simple cost record. All the purchases and material invoices are checked automatically by the system. In this type of system the job is divided into several sections which are accounted for separately. The best ways to divide jobs are as follows:

- a. Section One: Slab, site work and temporary power
- b. Section Two: Interior raceway
- c. Section Three: Distribution Equipment
- d. Section Four: Wire
- e. Section Five: Light fixtures
- f. Section Six: Trim out
- g. Section Seven: Special systems or other

# Service Work

- i. Should have a large enough market to sustain a service business. Usually this requires a population of at least 250,000 in the area. Rarely can an extensive business be carried out in an area with less of a population than this.
- ii. Need to have electricians that can handle the pressure that service work places upon them. This is a very important consideration as most electricians cannot handle service work for more than a day or two. A service electrician has to be experienced, capable of thinking on his feet and somewhat of a diplomat.
- iii. Need to be prepared to handle more paper work than other electrical contractors. Service work requires more billings, pricing and collections than new construction.
- iv. Need a good estimator/salesperson to handle the large number of estimates to be made and quotes that must give out.

# Establishing Business

## **a. Getting help from professionals:**

It is practically impossible to be expert in every aspect of a business. An electrical contractor is supposed to be good a good contractor and apart from this in every other aspects of business he should seek help of the professional like in accounting and capital.

## **b. Corporations and liability:**

In the construction business, the possibility of large lawsuits and large losses are ever present. The entire industry is by nature tumultuous. Things don't always go as they are planned, and some people don't do what they said they would do. The end result of situations like this is that a number of subcontractors will go out of business and perhaps one or two suppliers with them. So a businessman should always be aware of this fact.

**c. Insurance:** A business is likely to go through ups and downs and there are always excessive liabilities inherent to the industry. So a business should always be insured although the type of insurance can vary depending upon the nature of the business.



# Establishing Business

**d. Management succession:** One of the most interesting facts about the construction business is that only about one in five of the construction companies doing business today will survive into the next generation. This means that once the owner of the company either dies or retires, the company will go out of business in a short period of time. So the next generation of management must be trained to do the whole job if the company survives.

**e. Investments:** Outside investments are an important part of an electrical contractor's personal financial planning so a business should always invest some of the profit in other investments like real estates, stocks, bonds and commodities to have number of more benefits as they relay pay back well.

# (1) Residential Electrical Installation Specification

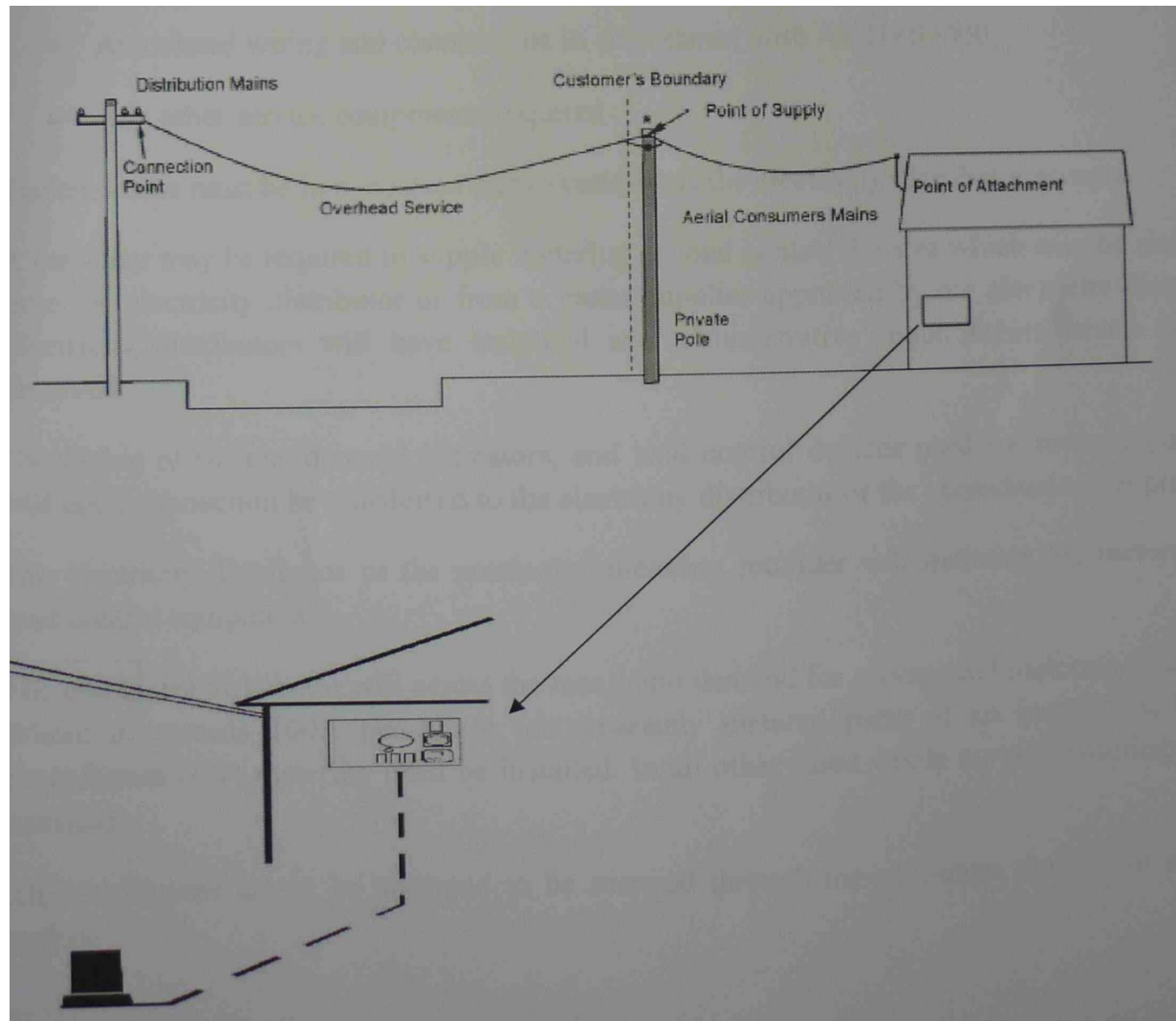
## **Job (1)**

**You are required to manage the electrical supply connection to a residential property. The supply is to be taken from the overhead pole. You need to sketch the diagram & provide the outlines of the specifications for the following tasks by referring NSW electrical services rule.**

## **Tasks:**

- 1) Metering equipments**
- 2) Connection to supply**
- 3) Earthing**
- 4) Service route point of attachment to take power from over head poles**
- 5) Customer main cable requirement**
- 6) Service cable connection between pole and house**

# Residential Electrical Installation Specification



# Residential Electrical Installation Specification

## 1. Metering equipments specifications:

The electricity distributor will require the customer to provide and install service and metering equipment on the customer's premises.

The customer must arrange to provide and install at the customer's cost:

- Service Protective Devices
- Service fuses/service circuit breakers
- Service neutral/active links
- Metering and load control devices
- The meter/switchgear enclosure
- Associated wiring and connections in accordance with AS/NZS3000
- Any other service equipments required



# (1) Residential Electrical Installation Specification

The enclosure must be in a location and in conditions the electricity distributor accepts.

A customer may be required to supply metering or load control devices which may be purchased from the electricity distributor or from a meter supplier approved by the electricity distributor. Electricity distributors will have technical and administrative requirements which must be observed.

Ownership of meters, demand indicators, and load control devices used for revenue purposes, will upon connection be transferred to the electricity distributor or the accredited meter provider.

The electricity distributor or the nominated metering provider will maintain the metering and load control equipment.

The electricity distributor will assess the maximum demand for service and metering equipment. Where it exceeds 100A per phase for separately metered parts of an installation Current Transformer (CT) metering must be installed. In all other cases whole current metering will be installed.

All installations are to be arranged to be metered through the minimum number of standard meters.

# (1) Residential Electrical Installation Specification

## **2. Connection to supply:**

Under the Electricity Supply Act 1995 a person who owns or occupies premises must apply to the electricity distributor to obtain approval for the provision of customer connection services to those premises. Such services must be provided under a relevant customer connection contract. Connection services to customers' premises may only be provided by accredited service providers and their individual employees, as authorized by the electricity distributor.

# (1) Residential Electrical Installation Specification

## 3. Earthing

New electrical installations, and alterations or additions to existing installations must be earthed using a Multiple Earthed Neutral (MEN) system complying with the requirements of AS/NZS 3000.

The main earthing conductor or a bonding conductor must not be connected to the service neutral link or bar. The MEN connection must be made at the first downstream consumers neutral link CNL. All subsequent consumers neutral links installed at the service position/main switchboard must originate from the first downstream consumers neutral link (at which the MEN connection is established).

Exceptions may arise in high voltage installations, mining or similar large outdoor installations.

For specialist applications the electricity distributor must be consulted on proposals for alternate earthing methods.

# Residential Electrical Installation Specification

## **4. Service route and point of attachment to take power from the overhead pole.**

The following factors should be taken into consideration for the service route and point of attachment:

- a. The location of the electricity distributor's poles in the street supplying adjacent properties.
- b. A transformer located on the pole selected for the connection of a service.
- c. The position, including its height above ground, of the point of attachment.
- d. The existence of trees and large shrubs.
- e. Required clearances.
- f. The location of any additional pole.
- g. The selection of the point of attachment to ensure that the route of the service is clear of swimming pools, vegetation and other relevant building features such as doors, windows, balconies and entrances.
- h. The location of other utility services
- i. Mitigation of bush fire risks in accordance with the electricity distributor's Bush Fire Risk Management Plan and Procedures.

Connections are not permitted at pole substations unless no practical alternative exists. The electricity distributor must approve the proposed connection in advance.



# Residential Electrical Installation Specification

## Phase Selection

Single-phase customers should be connected to the following phase arrangement:

- (a) Reconnect existing service cable to the same phase as previously connected, or
- (b) Connect the new overhead service cable as listed in table below.

For lot of street number ending in:	Connect to
1	A Phase
2	B Phase
3	C Phase
4	A Phase
5	B Phase
6	C Phase
7	A Phase
8	B Phase
9	C Phase
10	A Phase
20	B Phase
30	C Phase

Fig: Phase Selection

# Residential Electrical Installation Specification

## **Crossing of Adjoining Property:**

A route crossing an adjoining property is only acceptable provided a suitable easement is obtained over the property. The only acceptable methods to prevent crossing of private properties are:

- a. A post/pole erected by the customer on the customer's property in accordance with AS/NZS 3000 standard.
- b. The point of supply will be at the post/pole.
- c. Where approved by the electricity distributor's construction standards a suspended service (or mid span suspended service from ABC mains) not exceeding 100A, may be used where:
  - i) The customer's property is on the same side of the street as the distribution system.
  - ii) The distance between the line poles does not exceed 45m.
  - iii) The suspended service line at 90° to the mains does not exceed 20m (longer distances may be approved by the electricity distributor).
  - iv) Written application for each individual installation must be submitted to the distributor.

# Residential Electrical Installation Specification

A private pole should be installed to avoid a suspended service. A mid span/suspended service is only permitted as a last resort. Unusual building and distribution pole locations may warrant a suspended service which should be discussed with the distributor. The electricity distributor will not consider the installation of a distribution pole unless there is no practical alternative. Note: If a customer is required to relocate an existing cross property overhead service that is not installed with an easement, the customer is responsible for the associated cost.

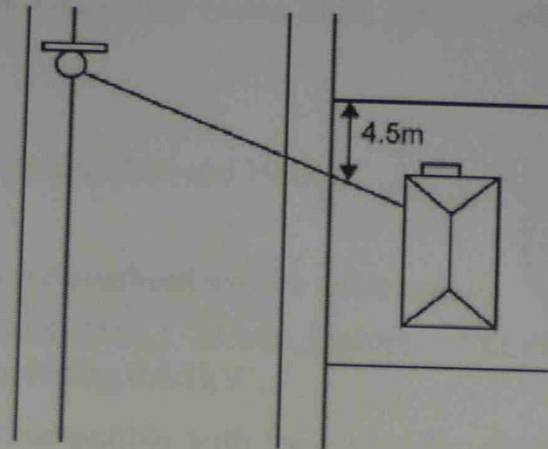
**Crossing of Swimming Pool Zones** An overhead service or unprotected aerial consumers mains must not cross a swimming pool zone as defined by AS/NZS 3000.

**Details of Service Route** When notifying the electricity distributor of completed works, the accredited service provider must supply details of the service including a sketch of the route. The Notification of Service Work (NOSW) form to be submitted to the electricity distributor provides a means of supplying this information.

Typical sketch of an 'As Constructed' Overhead Service from the Distributor's pole to the point of supply Diagram

# (1) Residential Electrical Installation Specification

UEENEE071 Assignment



Note: The following details must be included in the sketch:

1. Pole number and if the pole has an LV open point (links) which side of the links the service connection was made
2. Distance between the point where the service crosses the front boundary and the nearest side boundary of the customer's property.



# (1) Residential Electrical Installation Specification

## 5. Consumer Mains Cable Requirement:

### 1. Consumer Mains:

#### a. Electrically Un-Protected Aerial Consumer Mains

Electrically Unprotected aerial consumers mains must comply with the same requirements as the overhead service with regard to cable size and compliance with the Australian

#### b. Other than Aerial

Electrically Unprotected consumers mains must have a minimum cross sectional area of  $16\text{mm}^2$  copper or  $25\text{mm}^2$  Aluminum, XLPE insulated.

#### c. Alterations and Additions

Alterations or additions to existing consumers mains must be treated as a new installation. Refer to clause 1.5.11. This need not be applied where additional phase conductors are added to existing electrically unprotected single-phase consumers mains provided the cross-sectional area of the additional conductors is not smaller than the existing conductors.

# (1) Residential Electrical Installation Specification

## **Bush Fire Precautions**

Electrically Unprotected aerial consumers mains must be installed with regard to mitigation of bush fire risks in areas defined as bush fire areas by the Rural Fire Service and the electricity distributor's Bush Fire Risk Management Plan and procedures in accordance with AS/NZS 3000.

# (1) Residential Electrical Installation Specification

Service Cable connection between Pole and House:

## Minimum Requirements

The minimum requirements for overhead service cable are:

(a) Compliance with AS/NZS 3560.1 Electric cables - 'XLPE insulated-aerial bundled For working voltages up to an including 0.6/1kV'.

If these requirements are incompatible with the electricity distributor's distribution system design standards the electricity distributor will specify the conductor size.

Table below specifies the only service cables that may be used for various service ratings. Any intermediate service ratings (based on the assessed demand of the installation) must use the next largest service rating/cable available, e.g. a 350 Amp assessed service rating must use 2 x 95mm<sup>2</sup> Al 4-core cables (i.e. a 400 Amp)

Cable CSA (mm <sup>2</sup> )	Conductor material	Cable Core	Service Rating (Amps)
25	Al	1 X Twin or 4 Core	100
95	Al	1 X 4 Core	200
2 X 95	Al	2 X 4 core	400

Note: Prior to carrying out work at the point of attachment contact the accredited service provider installing the overhead service to ascertain the cable type and configuration to be used.

**Existing Overhead Service Cable Ratings** When a customer applies for the connection of additional loads the existing overhead service must be replaced where the assessed maximum demand will exceed its current carrying capacity. Overhead services less than 77.044 (6mm<sup>2</sup>) must always be replaced.

## (2) Metering Specification

You are required to manage an electrical metering connection to a residential property. You need to refer the provided diagram and provide the outlines of the specifications for the following tasks by refereeing NSW Electrical service rule.

1. Location of service and metering equipments
2. Facilities for installation of meter and service equipments
3. Renewable fuse
4. Connection at services and metering equipments
5. Spacing between meter and high current conductors
6. Sealing services and metering equipments
7. Earthing

You also need to provide the metering circuit containing one metering ser that measure lighting power, hot water system for one unit.



## (2) Metering Specification

### 1. Location of service and metering equipments:

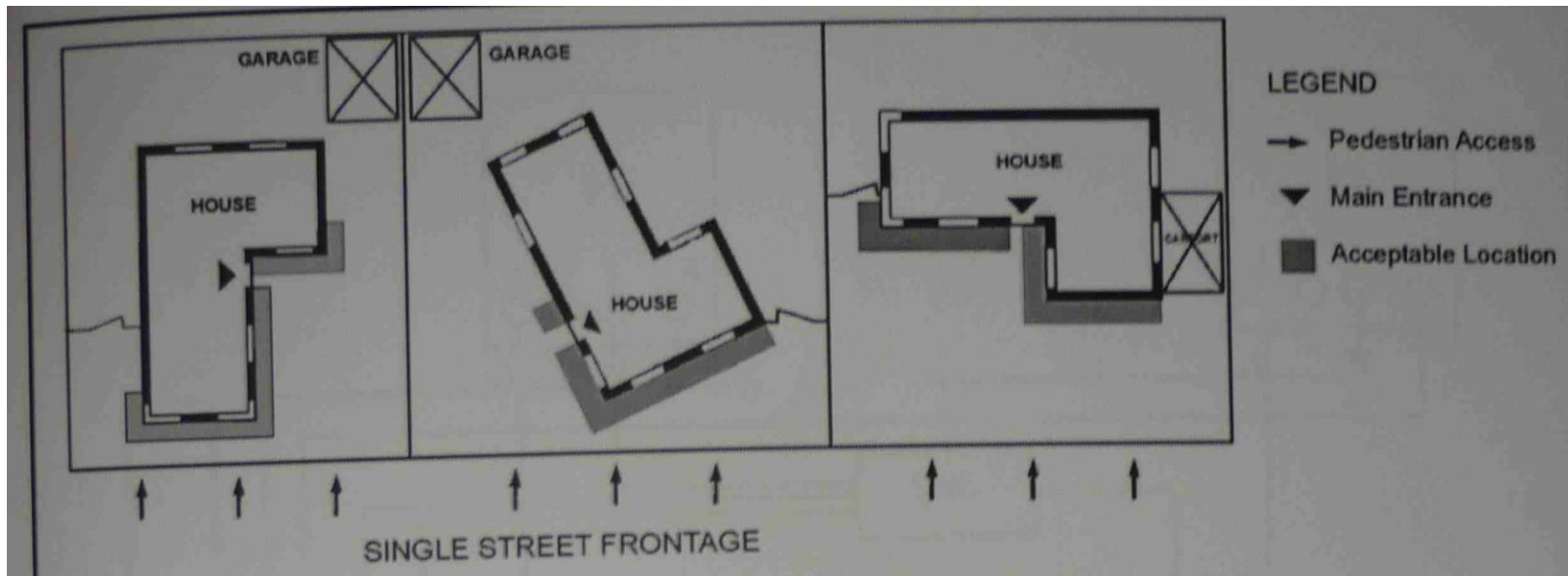
The service and metering equipment must be located where ready pedestrian access is maintained, in one of the following locations:

- (a) On the face of the residence facing the front boundary.
- (b) On the adjacent side wall within 1.5m of that face or associated corner window or verandah.
- (c) On a private pole.
- (d) Within the front boundary fence so that distributor meter reading and maintenance of service and metering equipment may be carried out without introducing a safety hazard.

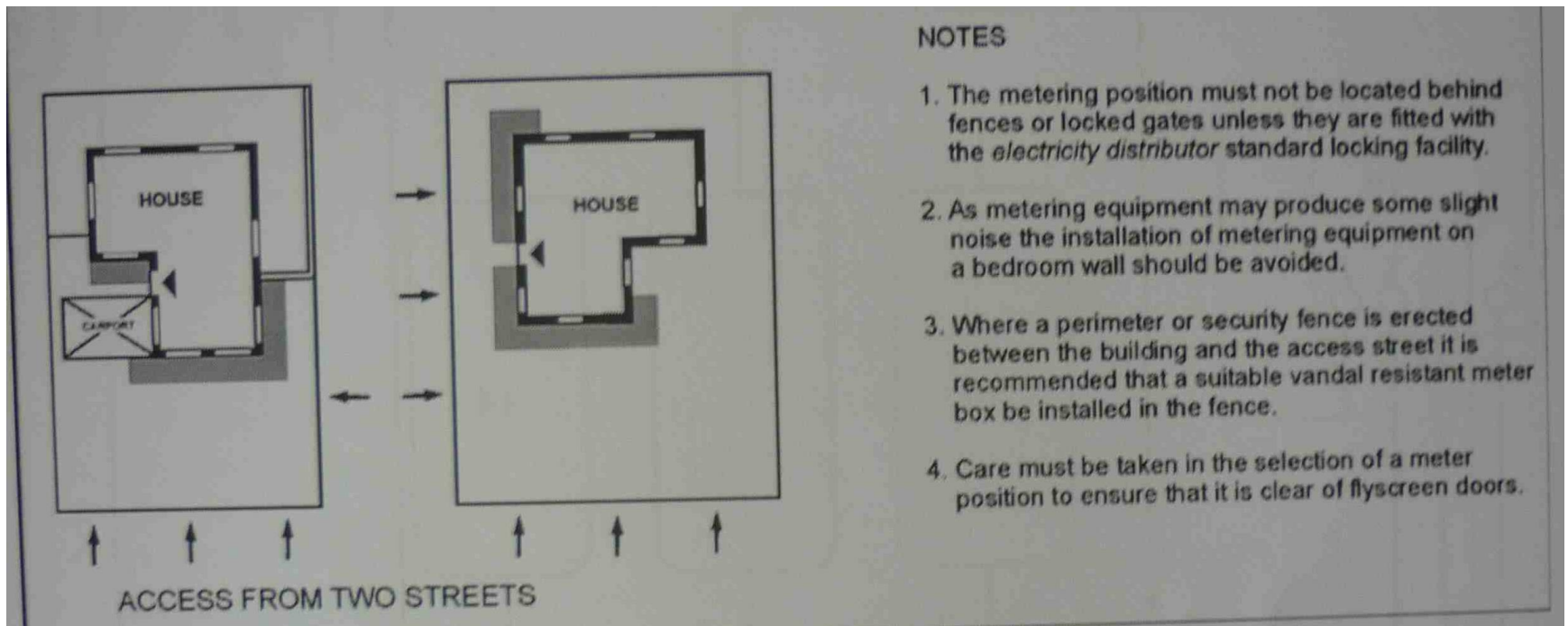
Where the main entrance is on the side of a residence the service and metering equipment may be installed on that side not further than 1.5 meters beyond the main entrance subject to access being available.

Suitable locations are shown in Figure below.

## (2) Metering Specification



## (2) Metering Specification



## (2) Metering Specification

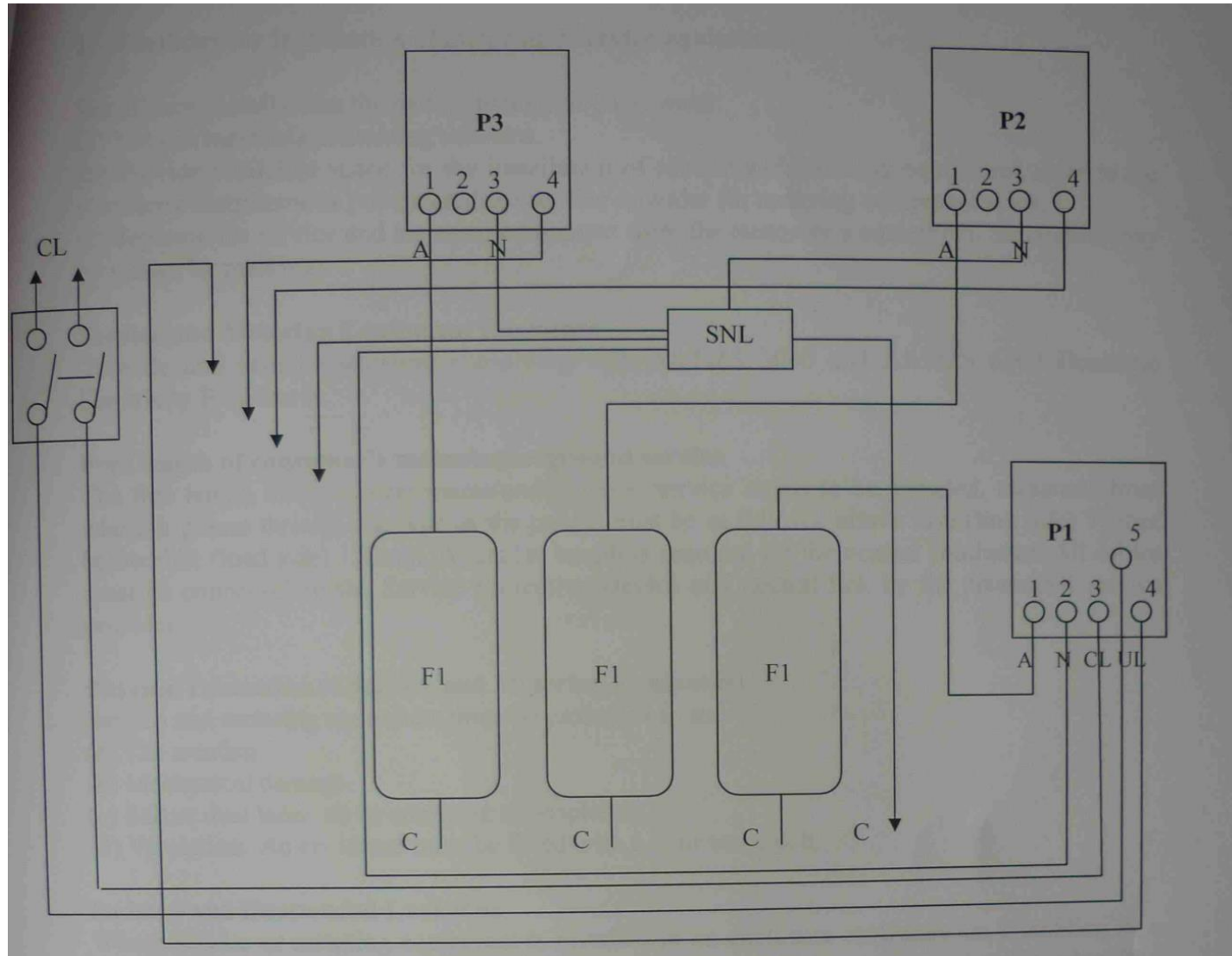
The service and meter position must not be located behind fences or locked gates unless they are fitted with the electricity distributor standard locking facility.

Where a perimeter or security fence is erected between the building and the access street it is recommended that a suitable vandal resistant meter box be installed in the fence.

As metering equipment may produce slight noise the installation of metering equipment on a bedroom wall should be avoided.



## (2) Metering Specification



## (2) Metering Specification

### LEGEND

A Active terminal C Load-control device F Service Protective

Device L Load terminal M Meter MC Controlled load meter N Neutral terminal SNL Service neutral link on

back of panel P Positions PTL Principal Tariff Load P1 First position used in  
each layout CL Connection to controlled-load main switch or contactor CM consumers  
mains/underground service mains UL Uncontrolled Load

# (2) Metering Specification

## **2. Facilities for installation of meter and service equipments**

For all new installations the meter/switchgear panel must:

- (a) Not use materials containing asbestos.
- (b) Provide sufficient space for the installation of service and metering equipment, refer to the electricity distributor or your accredited service provider for metering equipment sizes.
- (c) Separate the service and metering equipment from the customer's equipment. Separation may be shown by marking.

### **Service and Metering Equipment Enclosure**

Provide and install enclosures complying with AS/NZS 3000 and AS/NZS 6002 Domestic Electricity Enclosures.

### **Free length of consumer's mains/underground service**

The free length of consumers mains/underground service mains to be installed, measured from where it passes through the hole in the panel, must be as follows: above fuse (line side) 75mm; below fuse (load side) 150mm. A similar length is required for the neutral conductor. All cables must be connected to the Service Protective Device and neutral link by the accredited service provider.

# (2) Metering Specification

## **Physical Protection of Service and Metering Equipment**

Service and metering equipment must be protected from:

- (a) The weather.
- (b) Mechanical damage.
- (c) Salt or dust laden air or corrosive atmospheres.
- (d) Vandalism. An enclosure must be fitted with a door and catch.

## **Isolated and Unattended Locations**

Where service or metering equipment is installed in an enclosure externally on a building or a pole in an isolated and unattended location, the enclosure must be constructed using galvanised steel or equivalent material of sufficient strength to achieve protection against vandalism, weather or other external factors. Such enclosures must be kept locked at all times using the electricity distributor's standard locking system. This requirement does not apply for service and metering equipment enclosures on construction sites.

## **Top Hinged Switchboard Doors**

If the door is hinged at the top, provide a stay fastened to the enclosure to hold the door open greater than 90 degrees.

## **Glazed Switchboard Doors**

Do not glaze the door if the enclosure is exposed to sunlight or the risk of breakage is high.



## (2) Metering Specification

Ensure the facilities for mounting the electricity distributor's service and metering equipment and associated surrounds and enclosures, are securely fixed to a wall or rigid supporting structure.

**Service Protective Device and Service Fuse Rating Selection** The service protective device and service fuse rating must be suitable for the design of the installation. Multiple service fuses are allowed in accordance with Table below.

Service Rating	Service Protective Device Rating	Comments
100A	1 X 100A	Maximum of 4 customers per service fuse.
200A	2 x 100A	Multiple service protective devices may be installed for this service rating only. Maximum of 8 customers per phase.
	1 x 200A	See Note 4
300A	1 x 300A/315A	This may cause some grading problems with substation distributor fuses, which if blown are not able to be replaced by the customer. See Note 4
	250A	If there are restrictions these fuses may be used as this size would grade. See Note 4
400A	1 x 400A	This may cause some grading problems with substation distributor fuses, which if blown are not able to be replaced by the customer. Fuses must be to Class Q1 to BSS 88, 1975. You may be requested to install bars or have a combination of fuse ratings. See Note 4



## (2) Metering Specification

### 3. Renewable Fuse:

When altering service mains or consumers mains terminated at existing re-wirable service fuse or carrying out any work on existing rewirable service fuses, replace the re-wirable service fuse assembly with a service pro device complying with clause 4.7 of the rule.

### 4. Connection for service and metering equipments:

The *customer* must arrange with an accredited service provider for the installation and connection of service equipment. If the cables other than thermoplastic or elastomer insulated stranded copper-conductor cable are used, the cables must be connected in an approved manner, to a cable of the required type and size for connection to this equipment.

Only connect a single cable to any one terminal of the service and metering equipment.

## (2) Metering Specification

For installations containing twin element off-peak water heaters, or a contactor as per clause 4.11.3 two cables may be connected into the meter load terminal.

The two cables must be twisted together.

Where there is the need to connect more than one meter to one phase of an unmetered supply or sub main, use links to arrange the circuits connected to the meters.

Install meter wiring of not less than  $4\text{mm}^2$  on the load side of the service fuses and service neutral link. The wiring must be suitable for the maximum demand that it will carry.

If two load terminals are provided in the service fuse, you may connect an additional cable to supply a separately metered portion of the installation. Where more than two portions of the installation have to be supplied from one service fuse, you must provide and install a suitable, sealable service active link.

## (2) Metering Specification

### **Cable Preparation**

If the conductor size is small, compared to the tunnel terminal of the service and meter equipment, the conductor strands must be twisted and doubled over before they are clamped. Soldering is not acceptable.

### **Maximum Conductor Sizes for Services of up to 100A Rating**

The maximum total conductor cross-sectional area which is permitted to be terminated directly at meters and 100 A service fuses is  $35 \text{ mm}^2$ .

### **Flexible Switchboard and Panel Wiring**

Flexible switchboard and panel wiring may be used to connect service and metering equipment, provided it is installed in accordance with the manufacturer's specifications.

## (2) Metering Specification

### **5. Spacing between meter and high voltage conductors:**

External magnetic fields damage meters. We must provide and maintain the following minimum spacing between meters and current carrying conductors.

#### **Multicore Cables and Bunched Single Core Cables**

No special requirement for spacing is needed where the separation between all conductors of a circuit is due solely to the solid insulation and sheathing on the conductors, (eg, multicore cables or a group of single core cables in flat or bunched formation).

#### **Spaced Single Core Cables, Busway or Busbars**

Where the separation between conductors of the same circuit exceeds that in clause 4.15.1 but does not exceed 160mm, refer to Table

## (2) Metering Specification

*Maximum current in conductor nearest to meter (A)	Minimum spacing between conductor and meter (mm)
150	Nil
200	100
400	500
600	700
1000	900
1500	1200
2000	1400
3000	1700
4000	2000

The maximum current in the conductor is that determined by maximum demand calculation with AS/NZS 3000 for consumers mains.

Table above gives the minimum spacing between any point on the meter and any point on the nearest conductor of the circuit. Calculate the intermediate measurement proportionally.



## (2) Metering Specification

### 6. Sealing service and metering equipments:

Spacing may be reduced if the meters or conductors are mounted within a suitable shielding enclosure. Determine the spacing by multiplying the value from under mentioned table by a factor. Table below indicates the multiplying factors for various thickness of mild steel. If other thicknesses or materials are proposed, the electricity distributor will determine the factor.

Thickness of mild steel plate (mm)	Multiplying factor
5.0	0.25
2.5	0.5
1.2	0.75

Make sure all service and metering equipment, unmetered links and paralleling links can be sealed. A nylon/plastic sealing wire will be used to seal them.

Where seals on a service protection device are required to be broken the Level 2 authorized person/electricity distributor must re-seal them. A charge for resealing may apply.

The customer must suitably enclose and provide for the sealing of all equipment installed on the line side of the meters, and all metering connections.

Note: Some electricity distributors may require sealing by locking, check with the electricity distributor.

## (2) Metering Specification

### **Multiple, Single and Large Installations**

The customer must be able to replace ruptured unmetered fuses, without electricity distributor staff attending to remove seals and reseal equipment. Sealable escutcheon panels may be used with either front or back connected fuses or circuit breakers to allow this.

Individual items of equipment such as unmetered links must be sealed. In some cases it may be better to provide a sealable cover or panel over equipment which the customer does not need to access for maintenance.

### **Earthing:**

The electrical installation main earth is not normally directly connected to the electricity distributor's earthing system.

Written acceptance from the electricity distributor is necessary before such an arrangement may be carried out.

# (3) Generation Plant Specification

You need to install a generating plan for a small factory.

Prepare Specifications and design diagram for the following aspects.

- (1) Condition of fuse
- (2) Spacing for conductors
- (3) Change over equipments
- (4) Operating procedure
- (5) Protection

# (3) Generation Plant Specification

## 1. Conditions of Use

Stand-by generating equipment must only be used under the conditions agreed to by the electricity distributor.

In general, stand-by generating equipment must not be used to operate in parallel with the electricity distributor's distribution system unless it complies with the requirements of Clauses 8.4 or 8.5.

Applications to connect generating systems intended to operate in parallel with the distribution system will be individually assessed. Connection of these systems must be approved by the electricity distributor and meet the requirements of Clauses 8.4, 8.5 and 8.6.

Inquiries or proposals for generation of electricity into the network shall be directed to the electricity distributor.

# (3) Generation Plant Specification

## 2. Spacing for Conductors

Conductors must be suitably spaced from all the other conductors of the installation, to limit the damage to the customer's electrical installation if an internal generator fault occurs.

## 3. Changeover Equipment for Non-Parallel Operation

The connection of the stand-by plant to the electrical installation should normally be made on the load side of the electricity distributor's metering equipment. This is so the electricity distributor's metering will not meter the generated energy. However, this may be unavoidable where an installation has multiple customers metering. Typical arrangements are shown in Figures below.

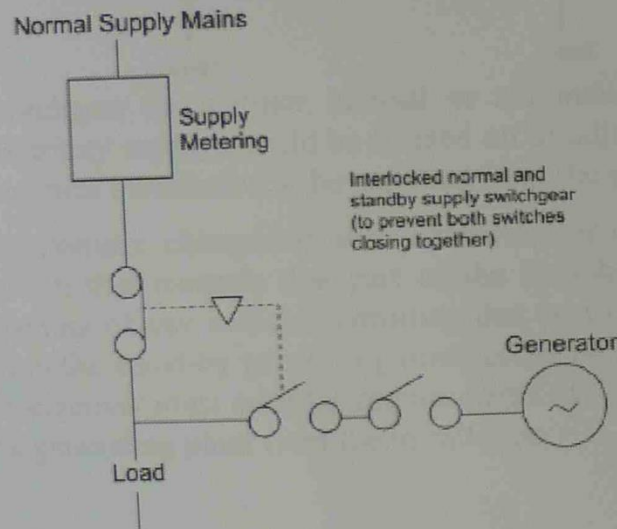


Fig:

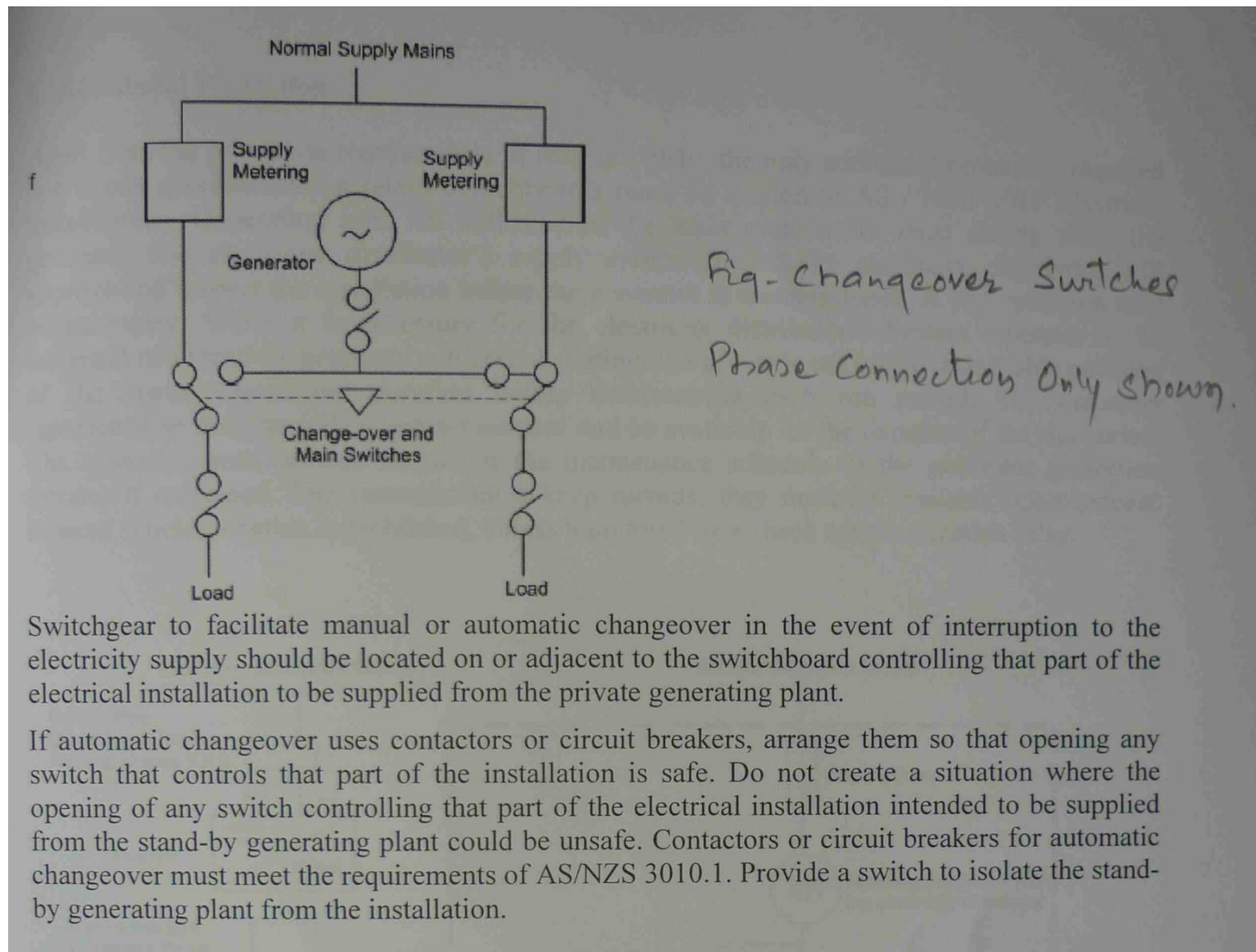
Suitably interlocked switches

Phase connection only shown

This interlocking may be electrical/mechanical or by keying



# (3) Generation Plant Specification



# (3) Generation Plant Specification

## 4. SCTT Operating Procedure

The time period for operating in parallel with the distribution system during the disconnection or reconnection function of the SCTT for any occurrence should not be longer than 1 second for each operation. The short transfer period eliminates the need for protection against reverse power flow and vector shift. This time period includes:

The period for disconnection includes:

- (a) Closing the generator isolating device to the distribution system once generator and mains supply are synchronized.
- (b) Isolation from the distribution system and transfer of the load to the generator.

The period for reconnection includes:

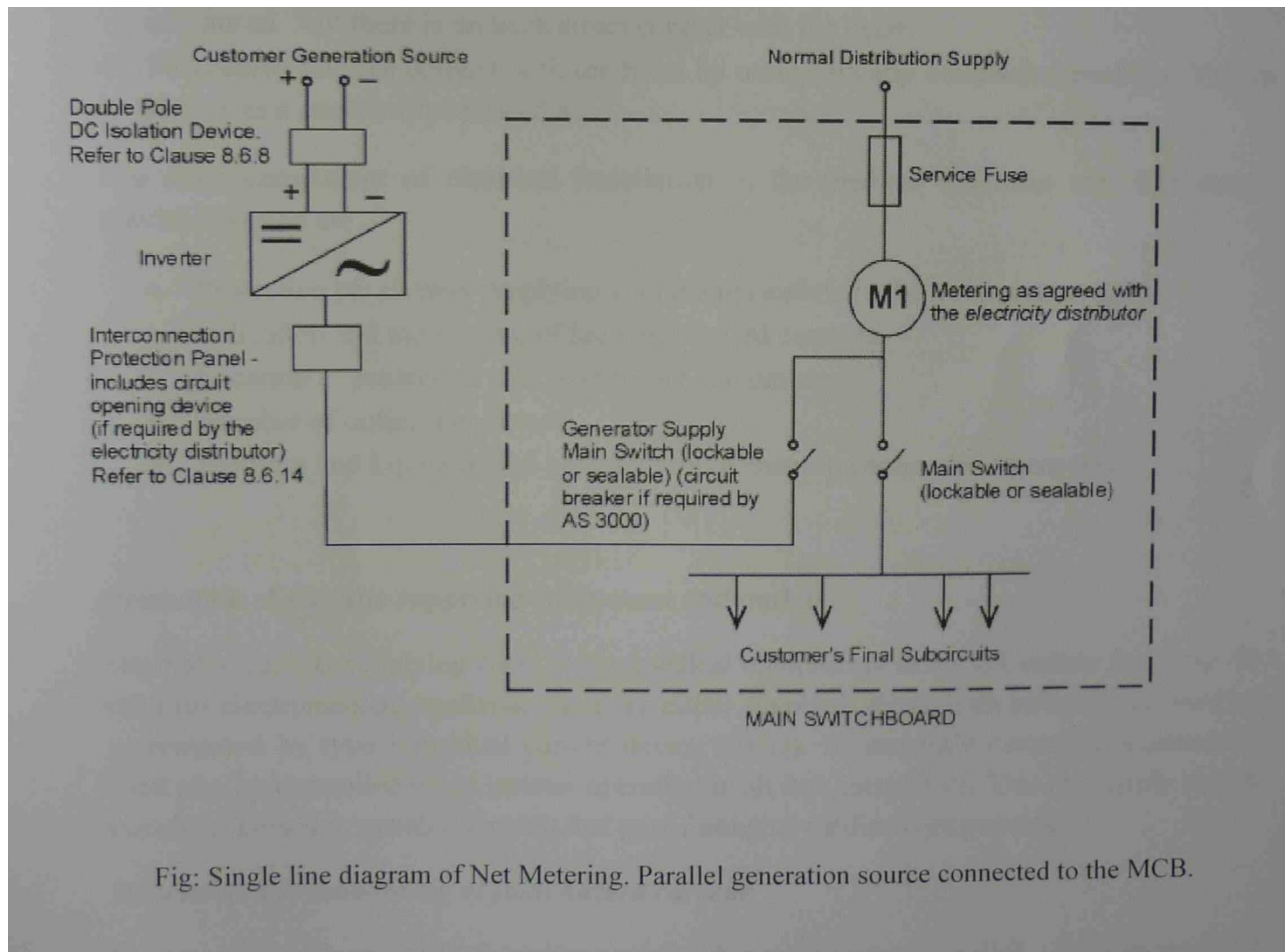
- (a) Transferring the load from the generator to the distribution system once generator and mains supply are synchronized.
- (b) Disconnecting the generator.

# (3) Generation Plant Specification

## 5. Additional Protection

Apart from the protection requirements in AS/NZS 3010, the only additional protection required is a check synchronization relay. Switchboards must be labeled to AS / NZS 3010 Electrical installations—Generating sets. An indicator on the main switchboard must clearly show the generator and electricity distributor's supply system status. The electricity distributor will approve and inspect the installation before the generator is commissioned. A test operation may be necessary. When it is necessary for the electricity distributor's System Operator to be informed of a stand-by generator run period, a minimum of one hours notice is desirable advising of the starting time and duration before commencing each run period. The customer representative must provide a contact number and be available for the duration of the run period. The customer must provide details of the maintenance schedule of the generator protection devices if requested. The customer must keep records; they must be available upon request. Manual synchronization is prohibited, unless monitored by a check synchronization relay.

# (3) Generation Plant Specification





# (4) Electro-medical Equipments Specifications

In locations where medical treatments using electrical equipments are administered, special need to be taken with electrical installations to provide patients with additional protection against electric shock. Circuits carrying higher currents such as sub mains also interfere with electrical equipments.

Many medical procedures involve the use of electrically operated equipments for the purpose of diagnosis therapy or in monitoring patients. This equipment is generally known as electro medical equipment.

The specific areas in which the electrical installation requires consideration are those where,

- A patient is connected to electromagnetic equipment such that the impedance of the skin is reduced but there is no such direct contact with the heart.
- Procedures involve contact with the heart by an electrically conductive medium. This is known as a cardiac type procedure.



# (4) Electro-medical Equipments Specifications

The main component of electrical installation in the medical treatment area that attract special attention are

- Protection of circuits supplying equipments outlets in the treatment area.
- Indication and monitoring of fault and hazard currents.
- Location of protection and monitoring equipments
- Number of outlets per circuits
- Earthing and Equipotential bonding arrangement in cardiac treatment areas

# (4) Electro-medical Equipments Specifications

## **Protection of circuits supplying equipment and outlets**

Generally circuits supplying fixed electromedical equipments or socket outlets that may be used for electromedical appliances must be either supplied through an isolation transformer or protected by type I residual current device (RCD). Permanently connected equipments must also be controlled by an isolator operating in all live conductors. This may apply also to circuits enclosed in metallic conduit that pass through a cardiac type procedure.

## ***Indication and monitoring of fault hazard current:***

In areas where electromedical equipment is used, socket outlets supplied through an RCD must be fitted with an indicator to show that power is available .

# (4) Electro-medical Equipments Specifications

The current that flows from any isolated supply to earth must not exceed a preset value. Isolation transformer must be provided with a line isolation monitor LIM that continually checks the hazard current. When the hazard current exceeds the preset value the LIM activates an alarm.

## *Location of protection and monitoring equipment:*

protection and monitoring equipment must be accessible without the use of key and the indication and monitoring devices must be located within the treatment area. This equipment can be installed as a separate device or is available as a complete unit incorporating socket outlets, an RCD and/or a isolation transformer indication and LIM

# (4) Electro-medical Equipments Specifications

## *Number of outlets per circuit:*

AS 3003 generally stipulates the minimum number of sockets outlets per circuit. The standard also limits the number of points supplied from an isolation transformer.

Earthing arrangement in cardiac treatment areas:

In addition to the earthing requirements of AS 3000 Equipotential earthing is required in a designated area where cardiac type procedures are performed.

Equipotential earthing involves earthing equipment and the exposed metal f circuits supplied through an RCD or from an isolation transformer, by an earthing conductor with resistance not exceeding 0.1 ohm. This earthing conductor is known as the EP bus. Equipment and exposed metal not protected by RCD or supplied from an isolation transformer must be earthed separately, via earthing conductors connected to a single connection on the EP bus known as the EP junction. The resistance of the earthing conductors must not exceed 0.01 ohm. The return earthing conductor is connected from the EP junction to the normal MEN



# (4) Electro-medical Equipments Specifications

Circuits supplying electromedical equipment must be supplied through an isolation transformer or protected by a type I (10ma) RCD. The choice will depend on either the medical procedure or the type of equipment that will be used in medical treatment area with RCD protection, supply is interrupted when the RCD detects a fault, whereas an isolated supply is not. When a fault occurs on an isolated supply, an alarm indicated the potential risk of electrocution.

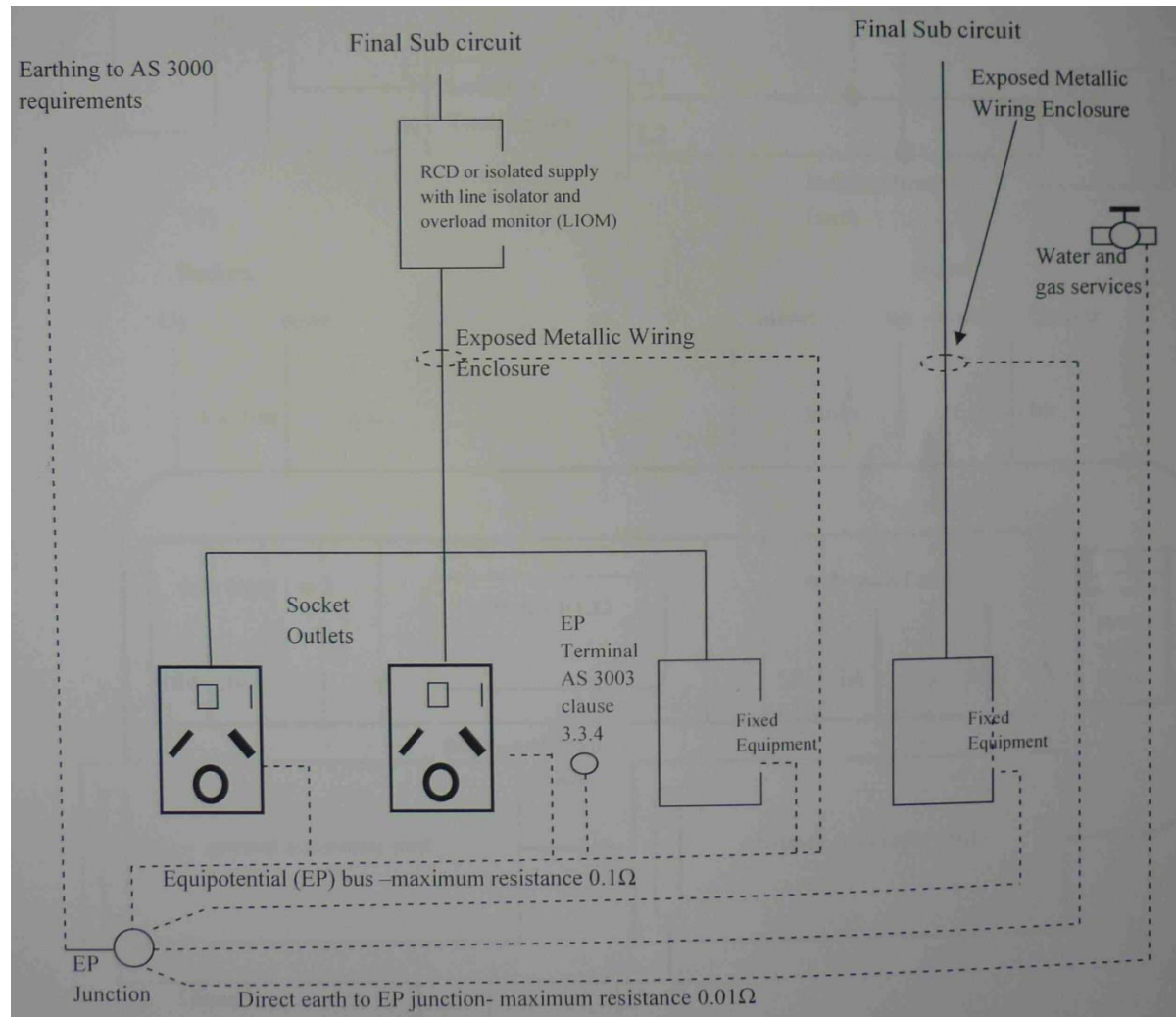
An isolation supply consists of an isolating transformer that provides a power source with electrical isolation from earth, plus a suitable monitor. Isolated supplies are normally used where open heart procedures are carried out. They are also used where uninterrupted supply

is required even if an electrical fault should occur. The category of use is normally confined to areas where life support equipment is in use. All other locations within cardiac protected areas can be serviced by a type I RCD.

An electrician undertaking installation or maintenance work in medical treatment area should consult AS 3000 for details of specific requirements. The appendixes of this standard provide information and methods for implementation of the various sections and clauses. Manufacturers of equipments of use in medical treatment areas can also be useful source of information.



# (4) Electro-medical Equipments Specifications



# Sales & marketing questions

Q3. Before performing sale and marketing, what questions are to be raised?

Whether you are starting a new business or launching a new product, conducting a marketing analysis is the first step in determining if there is a need or audience for your idea. Knowing the market's needs and how it is currently serviced provides you with key information that is essential in developing your product/service and marketing plan. Too often, businesses spend thousands of dollars launching a "new" idea with a limited market because of competition. The owner is forced to reevaluate his strategy and determine if there is room for another player.

Although the quality of the product is critical, your development of the best product on the market will not necessarily correlate with the most sales. Up to 50 percent of a product's price can be for marketing. The company who wins the marketing game generally will capture the larger share of the market. For related information, see Identify Your Target Market.

# Market Analysis

Conducting a market analysis will help you:

1. Prepare to enter a new market
2. Launch a new product/service
3. Start a new business

At the completion of this exercise, you should be able to:

- Explain the concepts of a marketing analysis
- Determine if there is a need for your idea or product/service
- Identify a new market
- Analyze your current market
- Gain a competitive advantage
- Begin to establish a marketing plan

# OH Conductors

Q5. Describe the clearance requirement for OH conductors?

The use of overhead 11kV mains in urban areas shall be in accordance with Ausgrid's Electrical Standard ES10 Requirements for Electricity Supply to Developments, Section 6.1 Urban Area Works.

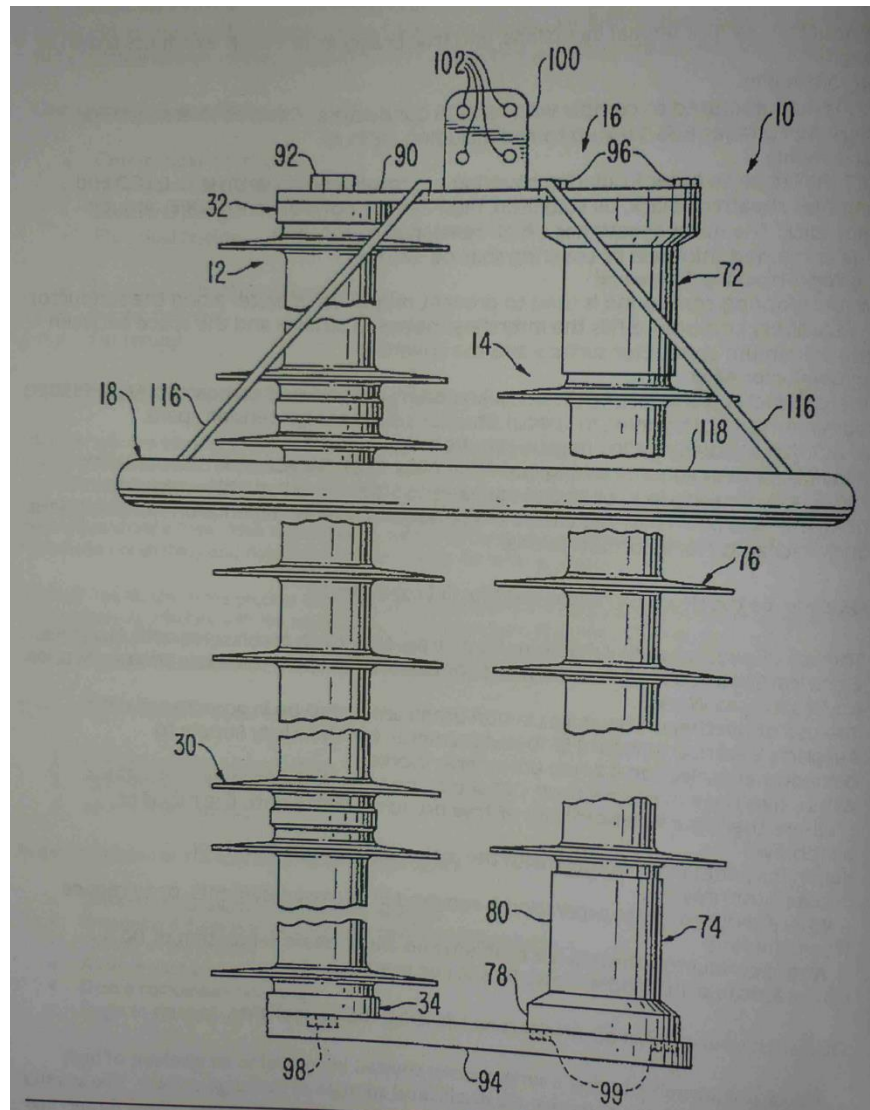
The use of overhead 11kV mains in non-urban areas shall be in accordance with Ausgrid's Electrical Standard ES10 Requirements for Electricity Supply to Developments, Section 6.2 Non Urban Area Works.

Where overhead mains are used, CCT should be used in the following situations:

- ☐ Where there is a significant risk of tree branches falling onto the mains or windblown debris may come into contact with the mains, and disrupt supply or initiate bushfires etc.
- ☐ Where reduced phase separation is required in narrow easements, or to reduce tree trimming.
- ☐ Where conductor clashing is a problem and wider phase separation of BC is not practicable. In all other cases BC shall be used.



# Surge Arrester





# (5) Distribution Transformer Specification

A distribution transformer is a transformer that provides the final voltage transformation in the electric power distribution system, stepping down the voltage used in the distribution lines to the level used by the customer. If mounted on a utility pole, they are called **pole-mount transformers** (or colloquially a **pole pig**). If the distribution lines are located underground, distribution transformers are mounted on concrete pads and locked in steel cases, thus known as **pad-mount transformers**. Because of weight restrictions transformers for pole mounting are only built for primary voltages under 30 kV.

Distribution transformers are classified into different categories based on certain factors such as

- Type of insulation - liquid-immersed distribution transformers or dry-type distribution transformers
- Number of Phases - single-phase distribution transformers or three-phase distribution transformers
- voltage class (for dry-type) – Low voltage distribution transformers or medium voltage distribution transformers
- Basic impulse insulation level (BIL), for medium-voltage, dry-type.

## (6) HV Aerial Cable Specification

Q9. Write the specifications for HV aerial bundled cables.

Three types of High Voltage overhead mains systems are currently in use in the Ausgrid 11kV distribution network. These are: Bare Conductor (BC), Covered Conductor Thick (CCT) and Aerial Bundled Cable (ABC), however no new HV ABC constructions shall be undertaken except under extraordinary circumstances and with express approval of Ausgrid Network Engineering. Therefore details of only the two systems, BC and CCT, are documented in this standard. SWER systems use BC only.

# (7) OH Line Construction Specification

Q10. Write down the required Australian Standards for OH line construction.

The use of overhead 11kV mains in urban areas shall be in accordance with Ausgrid's Electrical Standard ES10 Requirements for Electricity Supply to Developments, Section 6.1 Urban Area Works.

The use of overhead 11kV mains in non-urban areas shall be in accordance with Ausgrid's Electrical Standard ES10 Requirements for Electricity Supply to Developments, Section 6.2 Non Urban Area Works.

Where overhead mains are used, CCT should be used in the following situations:

- ☐ Where there is a significant risk of tree branches falling onto the mains or windblown

debris may come into contact with the mains, and disrupt supply or initiate bushfires etc.

- ☐ Where reduced phase separation is required in narrow easements, or to reduce tree trimming.

- ☐ Where conductor clashing is a problem and wider phase separation of BC is not practicable.

In all other cases BC shall be used.

# (8) 11 KV Pin Insulator Specification

Q11. Sketch 11KV pin construction, cross arm structure and provide the materials list. Describe safety testing. Also provide relevant Australian standard references.

This specification covers 11KV Disc. type & 11KV/ 22KV Pin Type Insulators for 11/22KV H.T. over head power lines. Except when they conflict with specific requirement in this specification, the insulators shall comply with the Indian Standard specification, IS 731/1971 and the latest version thereof. The insulators fittings shall comply with the Indian Standard specification IS- 2486/Part-I/1993, IS-2486/Part.II/ 1989 or the latest version thereof.



# (9) 11/ 22 KV pin insulator specification

The electrical and mechanical particulars of 11KV Disc. and 11/22KV Pin insulators shall be as per the Guaranteed Technical Particulars shown in Annexure-A & B attached herewith, measured at the following standard atmospheric conditions.

1. Ambient temperature 20 Deg. C
2. Barometric pressure 1013 mill bars
3. Absolute Humidity 11 Grams of water per cubic mtrs.  
Corresponding to 63% relative humidity at 20 Deg C.



# (9) 11/ 22 KV pin insulator specification

The following shall constitute the type tests (Cl.No.10.1.1 of IS-731/1971). However, the test voltage value shall be as per GTP enclosed.

- a) Visual examination.
- b) Verification of dimensions.
- c) Visible discharge test.
- d) Impulse voltage withstand test (+ ve wave & -ve wave)
- e) Impulse voltage flashover test (+ ve wave & -ve wave)
- f) Dry and wet power frequency voltage withstands test.
- g) Dry and wet power frequency flashover voltage test.
- h) Temperature Cycle test.
- i) 24 Hours mechanical failing load test (for disc. insulators only) or mechanical performance test.
- j) Electro mechanical failing load test (for disc. insulators only)
- k) Mechanical failing load test (for pin insulators only)
- l) Puncture test.
- m) Porosity test.
- n) Galvanizing test (for disc. insulators only)

The tests shall be carried out on the two samples in the order mentioned

in the Cl.10.1.1 of IS-731/1971. All the tests shall be carried out in the

# Risk assessment before work

Before any work commences on site the contractor shall nominate a competent person to be responsible for co-ordinating risk assessments of all operations where risk is foreseeable and ensuring that appropriate control measures are established and incorporated into safe systems of work. The contractor shall use these safe systems of work as the basis for the health and safety method statements. All method statements shall be developed in reasonable time to allow co-ordination of hazardous works.

The objective of risk assessment, is to highlight project related hazards and to develop methods to deal with those hazards.

# Risk assessment before work

These assessments shall be in writing and include but not restricted to the following activities:

- Major Construction Elements
- General public and third party safety
- Location of site access/egress
- Vehicle movements on and off site
- Vehicle, Machinery and equipment hazards within the site
- Vehicle/Pedestrian segregation
- Temporary services distribution
- Siting of static plant and equipment
- Scaffolding
- Trench/Ground works
- Hazardous Chemicals
- Services Clearances
- Construction Materials
- Storage, use and disposal of substances hazardous to health
- Noise
- Working at heights
- Excavation and underground services
- Manual Handling
- Use of portable hand tools
- Emergency procedures including evacuation routes
- Fire
- Materials storage
- Site hoarding
- Contaminated ground

# Risk assessment before work

Once the hazards have been identified, the risk should be assessed. This should include at least one of the following:

- visual inspection
- auditing
- testing
- technical or scientific evaluation
- an analysis of injury and near-miss data
- discussions with designers, manufacturers, suppliers, importers, employers, employees or other relevant parties
- quantitative hazard analysis.



# (10) OH Conductor Specification

Q13. Write the specifications for LV OH conductor, fitting, erection , fusing and de-energizing procedures.

An **overhead power line** is an electric power transmission line suspended by towers or utility poles. Since most of the insulation is provided by air, overhead power lines are generally the lowest-cost method of transmission for large quantities of electric energy. Towers for support of the lines are made of wood (as-grown or laminated), steel (either lattice structures or tubular poles), concrete, aluminium, and occasionally reinforced plastics. The bare wire conductors on the line are generally made of aluminium (either plain or reinforced with steel, or sometimes composite materials), though some copper wires are used in medium-voltage distribution and low-voltage connections to customer premises. A major goal of overhead power line design is to maintain adequate clearance between energized conductors and the ground so as to prevent dangerous contact with the line. <sup>[1]</sup> Today overhead lines are routinely operated at voltages exceeding 765,000 volts between conductors, with even higher voltages possible in some cases.



# (10) OH Conductor Specification

Aluminium conductors reinforced with steel (known as ACSR) are primarily used for medium and high voltage lines and may also be used for overhead services to individual customers. Aluminium conductors are used as it has the advantage of lower resistivity/weight than copper, as well as being cheaper. Some copper cable is still used, especially at lower voltages and for grounding.

While larger conductors may lose less energy due to lower electrical resistance, they are more costly than smaller conductors. An optimization rule called Kelvin's Law states that the optimum size of conductor for a line is found when the cost of the energy wasted in the conductor is equal to the annual interest paid on that portion of the line construction cost due to the size of the conductors. The optimization problem is made more complex due to additional factors such as varying annual load, varying cost of installation, and by the fact that only definite discrete sizes of cable are commonly made.

# (10) OH Conductor Specification

Since a conductor is a flexible object with uniform weight per unit length, the geometric shape of a conductor strung on towers approximates that of a catenary. The sag of the conductor (vertical distance between the highest and lowest point of the curve) varies depending on the temperature. A minimum overhead clearance must be maintained for safety. Since the temperature of the conductor increases with increasing heat produced by the current through it, it is sometimes possible to increase the power handling capacity (uprate) by changing the conductors for a type with a lower coefficient of thermal expansion or a higher allowable operating temperature.

Power lines sometimes have spherical markers "of one colour" to meet International Civil Aviation Organization recommendations.

Use of the area below an overhead line is restricted because objects must not come too close to the energized conductors. Overhead lines and structures may shed ice, creating a hazard. Radio reception can be impaired under a power line, due both to shielding of a receiver

# (10) OH Conductor Specification

In the area surrounding overhead lines it is dangerous to risk interference; e.g. flying kites or balloons, using ladders or operating machinery.

Overhead distribution and transmission lines near airfields are often marked on maps, and the lines themselves marked with conspicuous plastic reflectors, to warn pilots of the presence of conductors.

Construction of overhead power lines, especially in wilderness areas, may have significant environmental effects. Environmental studies for such projects may consider the effect of brush clearing, changed migration routes for migratory animals, possible access by predators and humans along transmission corridors, disturbances of fish habitat at stream crossings, and other effects

# Residential contracting work

As any electrician will testify, the electrical system of most homes is complex and sensitive. While electrical systems are designed to be robust and dependable, their balance can be disturbed through improper treatment, resulting in the need for specialised electrical services.

And so it follows that particular features of any home's electrical system need to be treated with care. Unfortunately, these important electrical features are not always treated so mindfully and many common mistakes with their treatment occur. These mistakes can easily be avoided when a person knows what to do.

# (11) Telecommunication Specification

The Information & Telecommunication Systems segment is active in a wide range of areas, from hardware such as communications infrastructure, hard disk drives and other storage products, to the provision of systems integration services based on these products and consulting services. The Hitachi Group leverages these IT capabilities to create new value for people everywhere.



# (11) Telecommunication Specification

The Group 3 specification was mostly formed by the International Telegraph and Telephone Consultative Committee (CCITT). The CCITT is part of the International Telecommunication Union (ITU), which is part of the United Nations. Participating countries have signed treaties which allow the resulting standards to be meaningful. In the United States, The Telecommunication Industries Association (TIA), which is part of the Electronic Industries Association (EIA), is responsible for handling telecommunication matters. The TR-29 group, Facsimile Equipment and Systems, eventually became the U.S. fax technical group for CCITT.

TR-29 has been very active in helping create fax standards. In fact, TR-29 produced the U.S. national standards for Group 3 and Group 4 before the CCITT standards were published. There are therefore separate standards numbers for EIA and CCITT: "Group 3 Apparatus for Transmission" is both EIA-465 and CCITT T.4, while "Procedures for Document Facsimile Transmission" is both EIA-466 and CCITT T.30.

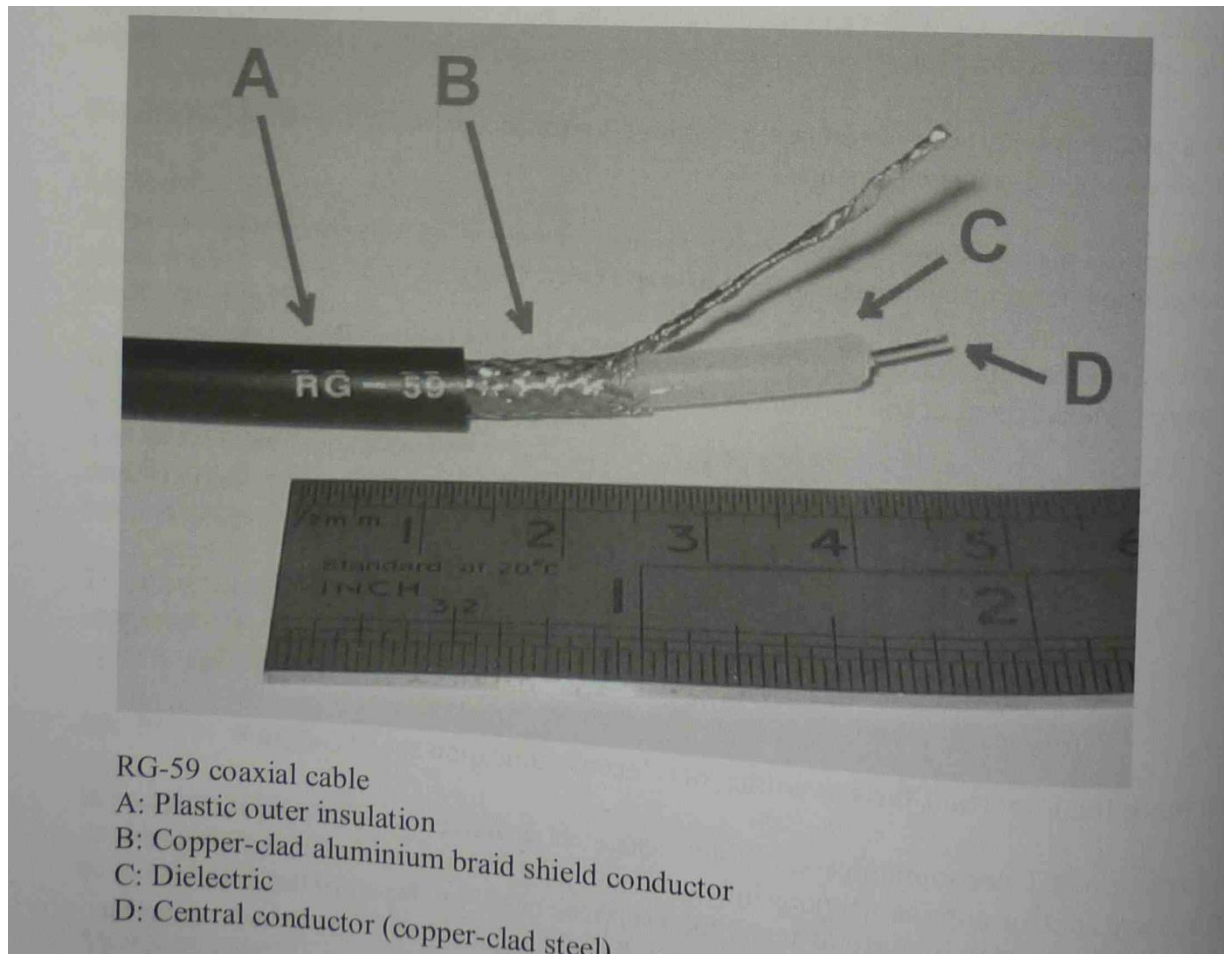
# (11) Telecommunication Specification

**Packet mode** communication may be utilized with or without intermediate forwarding nodes (packet switches or routers). In all packet mode communication, network resources are managed by statistical multiplexing or dynamic bandwidth allocation in which a communication channel is effectively divided into an arbitrary number of logical variable-bit-rate channels or data streams. Statistical multiplexing, packet switching and other store-and-forward buffering introduces varying latency and throughput in the transmission. Each logical stream consists of a sequence of packets, which normally are forwarded by the multiplexers and intermediate network nodes asynchronously using first-in, first-out buffering. Alternatively, the packets may be forwarded according to some scheduling discipline for fair queuing, traffic shaping or for differentiated or guaranteed quality of service, such as weighted fair queuing or leaky bucket. In case of a shared physical medium, the packets may be delivered according to some packet-mode multiple access scheme.

# (11) Telecommunication Specification

**Packet switching** is a digital networking communications method that groups all transmitted data – regardless of content, type, or structure – into suitably sized blocks, called packets. Packet switching features delivery of variable-bit-rate data streams (sequences of packets) over a shared network. When traversing network adapters, switches, routers and other network nodes, packets are buffered and queued, resulting in variable delay and throughput depending on the traffic load in the network.

# (11) Telecommunication Specification





# Insurance

The insurance needs of the Electrical Contracting Industry.

Your clients can benefit from:

- Insurance designed especially for Electrical Contractors
- Broad Cover: Safeguarding your clients and their business.
- Offer of lower premiums: Saving money for your clients.
- Quick and Simple process: No need to fill out forms – cover arranged over the phone.

Clients, who are Electrical Contractors, can select the relevant cover that they require from our range of trade policy options that are specifically suited to Electrical Contractors' business needs.

Insurance solution provides protection for:

- Public Liability
- Motor Vehicle
- Income Protection
- Tools of Trade
- Business Pack
- Industrial Special Risks
- Home Warranty



# Electrical Contracting Paper work

## Sole Proprietor

- Completed application form which includes Business and Technical Nominee Consent Forms
- Copy of Liability Insurance Certificate of Currency
- Copy of Business Name Certificate (if applicable)
- Copy of LEA or LEM Certificate
- Copy of Registered Electrical Contractors Business Course Completion Certificate

## Partnership

- Completed application form, which includes Business and Technical Nominee Consent Forms
- Copy of Liability Insurance Certificate of Currency
- Copy of Business Name Certificate (if applicable)
- Copy of LEA or LEM Certificate Copy of Registered Electrical Contractors Business Course Completion Certificate

## Corporation

- Completed application form, which includes Business and Technical Nominee Consent Forms
- Copy of Liability Insurance Certificate of Currency

# Electrical Contracting Paper work

ELECTRICAL WORK REQUEST (EWR) <small>(submit to responsible Retailer or Distribution Company)</small>		To: .....
		<small>(Retailer/ Distribution Company)</small>
<b>WORK SITE ADDRESS:</b>	CUSTOMER:.....	PHONE NO:.....
	STREET NAME & NO: .....	LOT No:.....
	.....	
	SUBURB/LOCALITY:.....	POSTCODE:.....
		MELWAYS/VIC RDS REF:.....
<b>INSTALLATION:</b>	House <input type="checkbox"/> Flat/Unit <input type="checkbox"/> Shop <input type="checkbox"/> Factory <input type="checkbox"/> Farm <input type="checkbox"/> Office <input type="checkbox"/> Builders Pole <input type="checkbox"/> BTS Perm <input type="checkbox"/>	
<b>ADDITIONAL</b>	Dual/Multi Occupancy <input type="checkbox"/> Private OH Line <input type="checkbox"/> H/V <input type="checkbox"/> Embedded Network <input type="checkbox"/> Grid Connection / Solar <input type="checkbox"/>	
<b>INFO:</b>	Are private mains on public land? Y <input type="checkbox"/> N <input type="checkbox"/> Is EWP Req'd? Y <input type="checkbox"/> N <input type="checkbox"/> Is Traffic Control Req'd? Y <input type="checkbox"/> N <input type="checkbox"/>	
<b>TYPE OF WORK:</b>	Alteration / Addition <input type="checkbox"/> Description of works:..... New Installation <input type="checkbox"/> Un-metered supply <input type="checkbox"/>	
<b>SUPPLY CONNECTED:</b> YES <input type="checkbox"/> NO <input type="checkbox"/>	<b>ACCESS:</b> To meter position & switchboard <input type="checkbox"/> PI Lock <input type="checkbox"/> workmen on site <input type="checkbox"/>	
<b>SUPPLY REQUIRED:</b>	OVERHEAD <input type="checkbox"/> Length of Overhead cable ..... Mtrs <small>Note: Further details of installation equipment may need to be provided to, and the responsible Distribution Company may require coordination of supply arrangements.</small>	
	UNDERGROUND <input type="checkbox"/> Pole to pit <input type="checkbox"/> Has pit been installed? Y <input type="checkbox"/> N <input type="checkbox"/> O/H to U/G Conversion <input type="checkbox"/>	
	URD <input type="checkbox"/> (If pit has not been installed please call Distribution Company)	
	SUBSTATION <input type="checkbox"/> TERMINATION: GROUP METERING <input type="checkbox"/> PILLAR <input type="checkbox"/> SUBSTATION <input type="checkbox"/> FOLCB <input type="checkbox"/> PIT <input type="checkbox"/>	
	NEW MAINS: NO. PHASES 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> SIZE: ..... mm	
	NEW MAX DEMAND: Total for Installation..... Amps per phase	
	IF DUAL/MULTI OCC INSTALLATION: individual occupancy ..... Amps per phase	
<b>METERING REQUIRED:</b>	EXISTING METER NUMBER/s .....	RETAILER .....
Domestic <input type="checkbox"/> Commercial / Industrial <input type="checkbox"/>	Grid Connection / Solar: Gross <input type="checkbox"/> Net <input type="checkbox"/>	Solar KVA Rating: .....
<b>METERING</b>		
Basic Metering <input type="checkbox"/>	Switching Service / 2A Sync <input type="checkbox"/>	(Not available from all DB's)
Interval Metering <input type="checkbox"/>	No. Phases	No. of litres..... Single / twin element
Single Rate (for total consumption) 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/>	Hot Water	KW Rating / per phase .....
Two Rate (peak / off peak) 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/>	Floor Heat (No Boost available)	1PH <input type="checkbox"/> 2PH <input type="checkbox"/> 3PH <input type="checkbox"/>
Current Transformer Metering: <input type="checkbox"/>	Climate Saver(Powercor Only)	
	Max Demand: ..... Amps ..... KW	Have CT's been installed? Y <input type="checkbox"/> N <input type="checkbox"/>
<b>TRUCK APPOINTMENT:</b>		
Do you require a truck appointment? Y <input type="checkbox"/> N <input type="checkbox"/>		
Appointments are not necessarily supplied for all requests, unless you are required to complete work in conjunction with the Distribution Company.		
If truck appointment is required, preferred time/date with Distribution Company: Date: ...../...../..... Time: ..... am / pm		
Acceptance of charges for the truck appt: Retailer <input type="checkbox"/> Fields Works Order <input type="checkbox"/> REC <input type="checkbox"/>		
<b>INSPECTION:</b> Do you require the Dist. Company to provide this service? Y <input type="checkbox"/> N <input type="checkbox"/> (Not all Dist. Companies provide this service)		
The CES will be: Provided to Retailer <input type="checkbox"/> Provided at Appointment <input type="checkbox"/>		
CES Number:..... Licensed Electrical Inspector:.....		
I acknowledge that by submission of this notice the requirements of the relevant Distribution Company have been adhered to, and certify the electrical work this notice pertains to complies with the current Victorian Service Installation Rules (SIR's) and Electrical Safety Act and Regulations. I also acknowledge the initial connection of prescribed work will not be connected without a Certificate of Electrical Safety and that I am responsible for any associated Distribution Company charges unless the Retailer has accepted all charges.		
Retailers are not permitted to amend this document or the Certificate of Electrical Safety		
THE WORK WILL BE SAFE TO CONNECT ON: DATE: ...../...../..... OR at Completion of Truck Appointment		
REGISTERED ELECTRICAL CONTRACTOR: .....		
REGISTERED ADDRESS: .....		
RESPONSIBLE PERSON: (Please Print) .....		
SIGNATURE: .....		
REC No: .....		
PHONE No: .....		
FAX No: .....		
MOBILE No: .....		
DATE: ...../...../.....		

# Electrical Contracting Paper work

- Copy of Business Name Certificate (if applicable)
- Copy of LEA or LEM Certificate
- ASIC Extract of Directors & Secretaries
- Copy of Certificate of Company Name
- Letter from person authorized to make application on behalf of a Corporation, if the applicant is not a Director or Secretary of the Company, on company letterhead

# Hourly Charge

Very first thing you need to know is not be misled by an electrician's hourly prices. Home owners pay much attention to the electrician's hourly rate but it's essential to also focus on the electrician's capabilities to fix your electrical complications. The hourly fee of an electrician differs. It is encouraged that you ought to decide on an electrician that has plenty of skill and completely equipped with electrical equipments even if he charges more rather hiring inexperienced electrician that are operating with no enough resources and has no components for electrical issues. The hourly price only has meaning when it's taken along with the company's do the job quality, devices and encounter.



# (12) Pulling cable into conduit

Pre-installed Cable-in-Conduit (CIC) saves time and labor by allowing one-step placement of both cable and duct. The integrity of the cable is protected during the installation process by the PE duct. Testing prior to and after the duct has been extruded around cable is performed to ensure no performance loss. Cable-in-Conduit can be provided with fiber, coaxial, twisted pair and electrical cables.

# (12) Pulling cable into conduit

Where bends in conduits are encountered in a run, the cables shall be lubricated with a cable pulling lubricant, supply item # OC8050, to facilitate drawing in. Petroleum based products are not acceptable. During installation operations, cables, both 11 kV and low voltage, must not be bent to a radius of less than 12 times the overall diameter of the cable. These conditions shall be strictly adhered to, particularly where cables turn into road crossings, conduit entry, etc.

Rollers must be used where cables are installed in an open trench using a pulling rope and eye, cable rollers are to be used at frequent intervals to support the cables and must never be more than 3 metres apart. Care must be taken to ensure that the cable **does not** enter or leave the rollers at an angle that exceeds the bending radius of the cable.

The rollers are to be placed securely to prevent movement. Before driving any spikes to secure the rollers, care must be taken to avoid other utilities' equipment, which may exist below. The pulling rope must be equipped with a swivel and be attached to the cable by a stocking grip with pulling eye.

# (13) Concrete Work Specification

## CONCRETE WORK

- Concrete mixes
- Weigh-batching
- Mixing concrete
- Workability of concrete
- Test cubes
- Percolation tests
- Transporting concrete
- Placing concrete
- Blinding coat
- Vibrators
- construction joints
- Expansion joints
- Joining new and old concrete
- Surface finish to concrete
- Concreting in cold weather
- Curing concrete
- Fixing bolts, etc.
- Pipes through concrete walls
- Tests for watertightness
- concreting records.

# Construction Bidding

**Construction bidding** is the process of submitting a proposal (tender) to undertake, or manage the undertaking of a construction project. The process starts with a construction estimate from blueprints and take offs.

The tender is treated as an offer to do the work for a certain amount of money (firm price), or a certain amount of profit (cost reimbursement or cost plus). The tender which is submitted by the competing firms is generally based on a bill of quantities, a bill of approximate quantities or other specifications which enable the tenders attain higher levels of accuracy, the statement of work.



# Bill of Quality

For instance, a bill of quantities is a list of all the materials (and other work such as amount of excavation) of a project which have sufficient detail to obtain a realistic cost, or rate per described item of work/material. The tenders should not only show the unit cost per material/work, but should also if possible, break it down to labour, plant and material costs. In this way the individual who is selecting the tender will be quite confident that the tender is feasible. Bids are not only chosen on cost alone. Sometimes contractors submit lower tenders to win the contract and win the work. Either the costs that the contractor incurs is greater than the price he is charging the client (as a consequence of a lower tender determining the contract sum), and thus is likely to go insolvent, or he will claim for "loss and/or expense" due to discrepancies in the contract documents (this can be done deliberately). The lowest tender is not always a feasible tender. The lowest tender is the most likely to increase the contract sum, the most throughout the course of the project.

# Bid

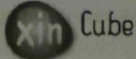
**Bid** solicitation is the process of making published construction data readily available to interested parties, including construction managers, contractors, and the public. There are several services, including government entities and private planrooms, that allow project owners to release project details to solicit and obtain contractor bids. These services act as a gateway for project owners to release project information to a large group of contractors, general contractors or subcontractors in an attempt to solicit bids. Many of these services are subscription based or charge a flat rate for project data.

# Work Document

**Work document:** There are many formats and styles of Statement of Work document templates that have been specialized for the Hardware or Software solutions being described in the Request for Proposal. Many companies create their own customized version of SOWs for use within their industry or vertical that have been either specialized or generalized to accommodate the typical request and proposals they receive.

It is important to note that in most cases the Statement of Work being agreed upon is a binding contract. Master Service Agreements or Consultant/Training Service agreements postpone certain work specific contractual components that are addressed in individual Statement(s) of Work.

# Quotation



**Xin Cube Inc**  
 380 Francisco St  
 San Francisco  
 CA 94133  
 US  
 Tel: (415) 989-1188 Fax: (415) 989-2288  
 Email: admin@xincube.com  
 Website: www.xincube.com

Invoice No: **INV10100005**  
 Currency: **USD**

**Invoice**

---

Bill To  
**John**  
**Synex Inc**  
 128 AA Juanita Ave  
 Glendora  
 CA 91740 US

Ship To  
**John**  
**Synex Inc**  
 128 AA Juanita Ave  
 Glendora  
 CA 91740 US

Phone:                      Fax:

Phone:                      Fax:

Date	19-Oct-2010	Order No		Sales Person	Charles Wooten
Shipping Date	19-Oct-2010	Shipping Terms		Terms	30 Days

ID	SKU / Description	Unit Price	Qty	Amount
PS.V860.05	AMD Athlon X2DC-7450, 2.4GHz/1GB/160GB/SMP-DVD/VB	580.00	6.00	3,480.00
PS.V880.37	PDC-E5300 - 2.6GHz/1GB/320GB/SMP-DVD/FDD/VB	645.00	4.00	2,580.00
LC.V890.02	LG 18.5" WLCD	230.00	10.00	2,300.00
HP.Q754.71	HP LaserJet 5200	1,100.00	1.00	1,100.00

Note:  
Thanks for you business!

Sub Total: 9,460.00  
 Discount: 0.00  
 GST 473.00  
 0.00  
 0.00  
 Shipping: 0.00  


---

**Total: 9,933.00**  
 Deposit: 0.00  
**Amount Due: 9,933.00**

Page : 1 / 1



# (13) Insulation Co-ordination

Q53. Describe insulation co-ordination & OH line protection.

Insulators are commonly used as a flexible coating on electric wire and cable. Since air is an insulator, in principle no other substance is needed to keep power where it should be. High-voltage power lines commonly use just air, since a solid (e.g., plastic) coating is impractical. However, wires which touch each other will produce cross connections, short circuits, and fire hazards. In coaxial cable the center conductor must be supported exactly in the middle of the hollow shield in order to prevent EM wave reflections. Finally, wires which expose voltages higher than 60V can cause human shock and electrocution hazards. Insulating coatings help to prevent all of these problems.

Some wires have a mechanical covering which has no voltage rating; e.g.: service-drop, welding, doorbell, thermostat. An insulated wire or cable has a voltage rating and a maximum conductor temperature rating. It may not have an ampacity (current-carrying capacity) rating, since this is dependent upon the surrounding environment (e.g. ambient temperature).

# Office Work

Office -it is a place in which business, clerical and professional activities takes place. Management -executive ability to handle a business. Hence, office management is the administrative handling, controlling and maintaining a balance process of work inside the office of an organization whether big or small company/business, which is necessary to achieve the best service it can provide to the people who will receive a great benefit.

The office manager is the coordinator of the work system. An office manager is responsible for planning, organization, and controlling the clerical aspect of the organization, including the preparation, communication, coordination and storage of data to support production and marketing. Also, their tasks are to monitor the work processes and to evaluate the outcome. The outcomes of work are intended for what can be called the final receiving system, as for instance, client, customer, and other departments.

# Project Management

**Project management** is the discipline of planning, organizing, securing, and managing resources to achieve specific goals. A project is a temporary endeavor with a defined beginning and end (usually time-constrained, and often constrained by funding or deliverables), undertaken to meet unique goals and objectives, typically to bring about beneficial change or added value. The temporary nature of projects stands in contrast with business as usual (or operations), which are repetitive permanent, or semi-permanent functional activities to produce products or services. In practice, the management of these two systems is often quite different, and as such requires the development of distinct technical skills and management strategies.

The primary challenge of project management is to achieve all of the project goals and objectives while honoring the preconceived constraints. Typical constraints are scope, time, and budget.[1] The secondary—and more ambitious—challenge is to optimize the allocation and integrate the inputs necessary to meet pre-defined objectives.

The entire purpose of estimation theory is to arrive at an estimator, and preferably an implementable one that could actually be used. The estimator takes the measured data as input and produces an estimate of the parameters.



# Estimator

## Estimator, superintendent

It is also preferable to derive an estimator that exhibits optimality. Estimator optimality usually refers to achieving minimum average error over some class of estimators, for example, a minimum variance unbiased estimator. In this case, the class is the set of unbiased estimators, and the average error measure is variance (average squared error between the value of the estimate and the parameter). However, optimal estimators do not always exist.



# Estimator

- In order to arrive at a desired estimator, it is first necessary to determine a probability distribution for the measured data, and the distribution's dependence on the unknown parameters of interest. Often, the probability distribution may be derived from physical models that explicitly show how the measured data depends on the parameters to be estimated, and how the data is corrupted by random errors or noise. In other cases, the probability distribution for the measured data is simply "assumed", for example, based on familiarity with the measured data and/or for analytical convenience.
- After deciding upon a probabilistic model, it is helpful to find the limitations placed upon an estimator. This limitation, for example, can be found through the Cramér–Rao bound.
- Next, an estimator needs to be developed or applied if an already known estimator is valid for the model. The estimator needs to be tested against the limitations to determine if it is an optimal estimator (if so, then no other estimator will perform better).
- Finally, experiments or simulations can be run using the estimator to test its performance.

# Superintendent

## SUPERINTENDENT:

- Visit each job site daily
- Discuss each job in detail with job foremen
- Discuss each job in detail with general contractor weekly
- Maintain good relationship with other traders
- Take care to maintain good attitude among foremen and workers
- Prepare purchase orders
- Order inspections
- Take care of all correspondences regarding job
- Maintain good relationship with inspectors
- Prepare estimates for job
- Teach apprentices
- Maintain office.

# Aspect of electrical contracting

The aspects of electrical contracting are

- Trade Competency
- Specification and Standards
- Business Aspects
  - Business Nature
  - Risk Assessment
- Project Planning / Project Management
  - Material (Material Management)
  - Service Schedule
  - Time Plan
  - Financial Plan
  - Technical Expertise
  - Human Resources Plan
- Legal Aspects
  - Contract Law
  - OHS Standards
  - Industrial Rules Regulation

# Marketing

Questions for performing Sale and Marketing are

- What does our market look like for next year?
- What are the long term forecasts for the markets we are in?
- Who are our chief competitors?
- What are their strengths and weakness?
- Should we look in to a different type of market?
- What will it take to get in to these markets?
- Are there any profitable new markets opening up?
- What is our most profitable type of work?
- Can we get more of these types of jobs?
- Do we really need them?
- Who are our best customers?
- Are they happy with the services which they provide from us?



# (14) Aerial bundled cable specification

AS 1222 (Steel conductors & stays – Bare overhead)

AS 1531 (Conductors – Bare over head, Aluminum, Aluminum Alloy)

AS 1746 (Conductors – Bare over head, Hard drawn copper)

AS 3607 (Conductors – Bare overhead , Aluminum, Aluminum Alloy Steel Reinforce)

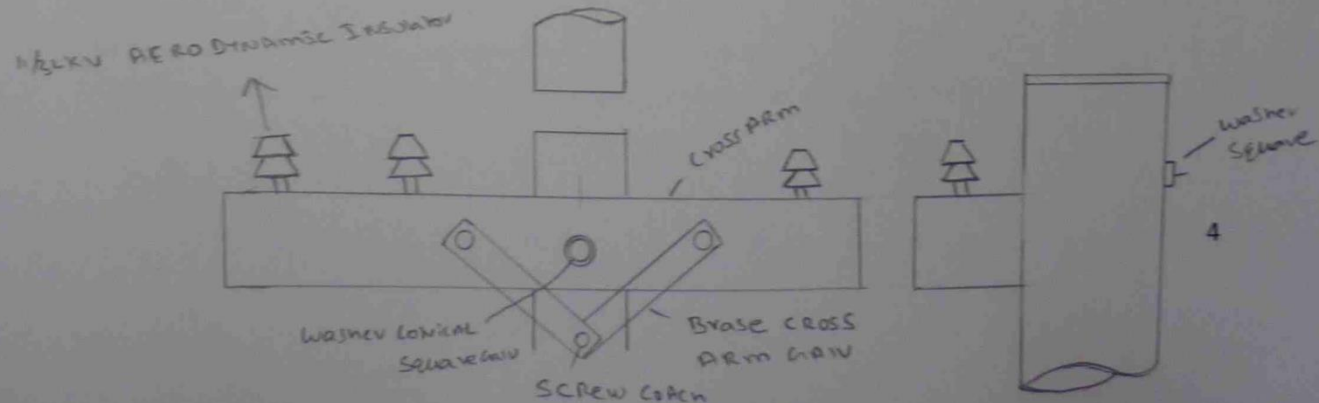
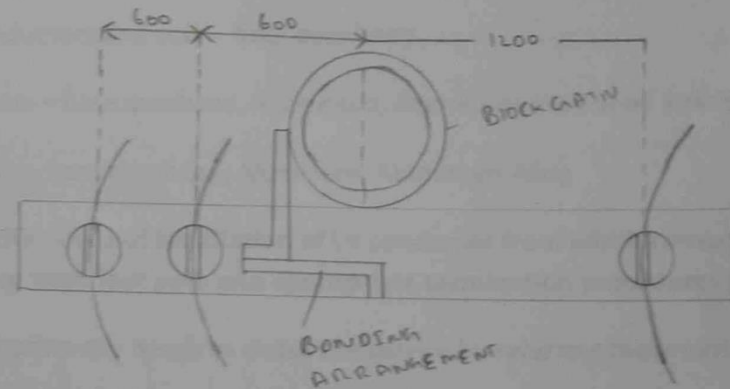
# (15) OH Line Specifications

- Minimum acceptable IR (Insulation resistance)
  - 400 m $\Omega$  Phase to Phase
  - 100\* m $\Omega$  Phase to Earth
- AS 1307.2 Surge arresters – metal oxide type for AC system
- AS 1824.1 Insulation Co-ordination
- AS 1824.2 Insulation Co-ordination Application type
- AS 3675 Conductors – covered overhead for working voltage 6.35/11KV
- AS 3599.1 Electrical Cable, Aerial Bundled
- AS 3766 Fittings for Aerial Bundled Cable
- ESAAHB Guideline & maintenance of OH
- 1999 Distribution & Transmission Line

# (15) OH Line Specifications

11) Sketch 11KV pin construction, cross arm structure and provide the materials list. Describe safety testing. Also provide relevant Australian standard references.

The contractor to provide technical construction service for 11KV, pin construction 2700 cross structure.



# (15) OH Line Specifications

## Fittings:

- Fittings need to comply with AS 3766 Mechanical fitting for low voltage aerial bundled cable.
- Are insulated sleeves needed to be used. Lugs must be heat shrink, 95mm<sup>2</sup> LV, M213-50 cambre die.
- LV suspension must be provided as necessary.
- The clearance of LV cable from structures must be followed as per attached table.

Location	Minimum clearance	
	ABC	Bare
Vertically above any structure	2.7m	3.7m
Vertically above structure where person can stand	0.1m	2.7m
In any direction from any radio TV aerial	0.1m	1.5m
In any direction from those parts of any structure not normally accessible to persons	0.1m	0.6m



# (15) OH Line Specifications

**Erection:** Pulling tension must not exceed 4KN.

**Immediate support:** Angle of deviation

**Mid Span Joint:** Must be avoided

**LV Suspended services:** Suspended services may be used where consumer poles cannot be used for a Three Block Spacing, for narrow frontage blocks or to avoid property crossing.

**Fuse or Link Disconnecter:** A Fuse or link Switch Disconnecter can be installed either as a Link Switch or a Fuse Switch. Each unit includes:

- A pole mounting Bracket
- A set of 3, 630A Link Blades
- A link storage Kit

Ground clearances for new LV aerial conductors are:

- Over the carriage way of roads – 6 meters
- Over ground other than the carriage way of road - 6 meters
- Over ground which by its nature cannot be traversed by vehicle or mobile plant – 5 meters

# Purchasing

## 15) What are the steps to be followed for purchasing?

Material account is 50 → 70% of most electrical projects. Purchasing is a very important function.

Steps for purchasing:

- Verify that your material list is correct.
- Make photo copy of your estimate sheet (cover up price & labour figures)
- Break down your material list in to sections.
- Give copies of the material list to your local suppliers.
- Issue purchase orders to low bidders provided, they can give you the proper material and deliver them on time.

# Purchase Order

## Purchase order

Dated: 15/09/11

To,

Global Supply Co

Shipped to,

Ausgrid

Shipping Instruction: Deliver as directed

Deliver the following - As per specified here in

{Price information and delivery procedures}

List: # 12 Thin Copper Wire 200m

# 10 Thin Copper Wire 300m

Submit Invoice

Bearing this P.O.Number

Company Name:

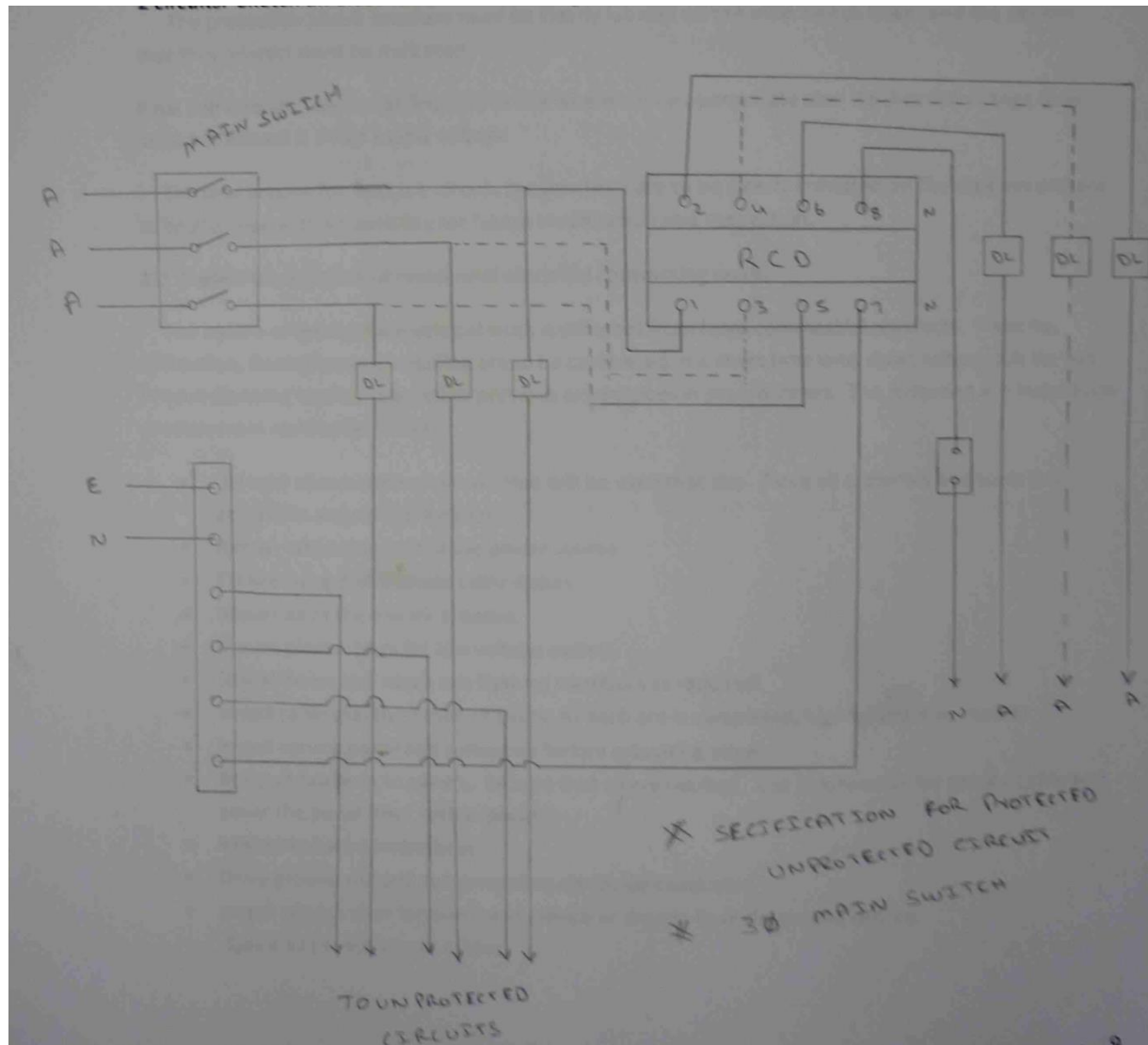
Received and Acknowledged By:

Dated:

**Getting Submittal:** Especially, this is very important for the contracts. Incorrect or late submittal can be cause Expensive delays.

**Delivery schedule:** Make sure your sales person to call the factory to verify delivery dates.

# (16) Electrical Installation Specification





# (16) Electrical Installation Specification

**Main Supply Wire:** The main supply wire must have the approximate size and the calculation of the size must be in accordance with maximum demand and AS 3008 requirement.

**Main Switch:** Main switch must be accordance with AS 3000:2007. Its location and accessibility must be in accordance with AS 3000:2007.

**RCD:** RCD must be capable of protecting two circuits. This size of RCD must be compatible with the circuit current and voltage. RCD must follow AS 3000:2007.

**Sub Main/Over Load Protection:** Over Load Protection device classification must be appropriate to circuit over current protection requirement. The operation time must meet the protection time requirement.

The protection circuit breakers must be clearly labeled on the main switch board and the devices that they protect must be indicated.

**Final Sub-circuit:** The size of final sub circuit wire must be appropriate size. So that the voltage drop must not exceed  $\pm 5\%$  of supply voltage.

The connections for final sub-circuit, the junctions are to be clearly indicated on the diagram and are to be provided with accessibility for future modification and renovation.

# (17) Residential Electrical Wiring

The nature of residential electrical work is different from large commercial contracts. Planning, Estimation, Quotation and Installing are to be completed in a short time with short notice. Job lay out; Pre Job planning is to be referred to previous experiences in several times. The following are installation procedures in residential works:

- UN load all materials and tools that will be used that day. Place all materials and tools in an accessible and central location.
- Run an extension cord to the power source.
- Fill and hang the required cable dishes.
- Mount all of the electrical boxes.
- Mount plaster rings for low voltage outlets.
- Drill all holes and notch any framing members as required.
- Install cable exactly shown on plans, As each are is completed, highlighted it by marker.
- Install service panel and connector before mounting panel.
- Bring all cables in to panels. Be sure that all are marked. Use a connector for service cable and cover the panel front with cupboard.
- Mount and wire meter base
- Drive ground rod and run grounding electrode conductor.
- Install service riser for over head service or drop in to underground service.
- Splice all branch circuit cables.

# (18) Important facts in telecommunication system

Important facts in writing of telecommunication specifications are:-

- The type of electrical signal used to transmit the data
- The type of loads used for each symbol being transmitted
- The meaning of the symbols
- How the flow of data is controlled
- How to detect and correct errors.
- *Protocol*: Type of characters being transmitted.
- *Transmission media*: There are four types of media that can be used in transmitting information. 1) Copper wire, 2) Coaxial cable, 3) Optical fibre, 4) Wireless
- *Loading*: Load coils are frequency added to loops longer than 5.4km. Load coils are low pass filters.

# (19) Telecommunication Specification

The specification for telecommunication system are

- The types of electrical signal
- Type of load
- Type of transmission media
- Type of protocol
- The kind of switching system.

# Insurance

**Insurance:** Appropriate Insurance cover for all equipments, Assets, Tools, Materials, Staff and Professional service must be arranged.

The Insurance cover needs to be regularly updated depending on market value of assets, Expansion and complexity of the Electrical Service.

Three main types of insurance are there

- General Liability Coverage
- Comprehensive Automobile Liability Coverage
- Workmen's Compensation Coverage.

**General Liability Coverage:** Supplementary Package may be required from time to time depending on expansion or changing nature of the contract works.

**Completed Operation Coverage:** A general liability covers losses while the contractor is on the job but not after completed operation coverage fill this gap.



# Paper work

Paper work consists of involves, billing, payroll, purchase order, etc.,

Key factors in processing paper work smoothly

- Having enough information
- Getting the information when needed
- Having enough people to handle the work.

Purchase Order

- One Copy → Vendor
- One Copy → Folders to check all invoices
- One Copy → P.O file. (Purchase Order)

Billings

- One Copy → Job folder
- Two Copy → Customer

# Paper work

## Time Cards

- One Copy → Pay Roll
- One Copy → Job Folder

## Incoming Invoices

- One Copy → Job Folder
- One Copy → Book Keeper's amount payable basket

# Service order form

**Service Order**

Billed: \_\_\_\_\_

Customer \_\_\_\_\_

Address \_\_\_\_\_

Phone \_\_\_\_\_

Job Address \_\_\_\_\_

Job Phone \_\_\_\_\_

Description \_\_\_\_\_  
\_\_\_\_\_

Job Assigned To: \_\_\_\_\_ Date: \_\_\_\_\_ Completed: \_\_\_\_\_

Material	
Invoice	Amount

Labour	
Date	Hour

Other

Rate: \_\_\_\_\_

Quoted Amount: \_\_\_\_\_

# Cutting cost

The aspects of cutting cost are

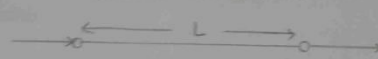
- Buying materials more cheaply (market survey, judge price and quality)
- Making it easier for supplier (it will make it easier for your supplier to sell you material that is not subject to unfair competition)
- How much should I pay judge with total amounts & benefits
- Store the commodity items in mass at the time of discount offered on bidding price.

# (20) Pulling cable into conduit

Pulling cables in to conduit

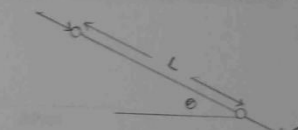
- $T_0$  = Tension at the commencement of a section (N)
- $T$  = Tension at the end of a section (N)
- $M$  = Mass of cable per unit length ( $\text{Kg m}^{-1}$ )
- $\mu$  = Coefficient of friction in a given section
- $W$  = Equivalent cable force per unit length  $98/m$  ( $\text{N-m}^{-1}$ )
- $L$  = Length of straight level section(m) or length of inclined section (m)
- $R$  = Radius of horizontal bend (m)
- $\theta$  = Angle of subtended arc in bend (Radian)
- $F$  = Side wall force ( $\text{Nm}^{-1}$ )

STRAIGHT SECTION



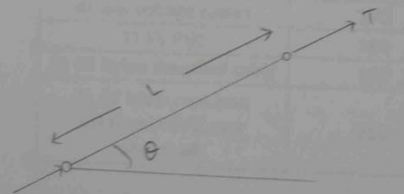
$$T = T_0 + \mu WL$$

DOWNWARD INCLINE



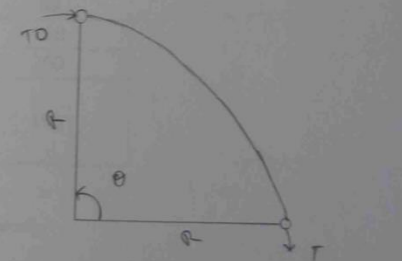
$$T = T_0 - WL(\sin\theta + \mu\cos\theta)$$

UPWARD INCLINED



$$T = T_0 + WL(\sin\theta + \mu\cos\theta)$$

HORIZONTAL BEND



$$T = T_0 \cosh \mu \theta + \sqrt{(T_0)^2 + (\mu R)^2 \sinh^2 \theta}$$

$$\cosh \theta = \frac{e^{\theta} + e^{-\theta}}{2}$$



# Getting work + Doing work

**Getting work:** Advertising, phone yellow book, advertising needs people attention, creativity in advertising, cost effectiveness, good salesmanship, phone socialization, financial back ground, bank guarantee.,

**Doing the work:**

- UAN
- Enough tools to handle diverse range of jobs
- Electrical + Mechanical + Electronics equipments /tools
- Related fields & multi skills
  - Electrical +Plumbing
  - Housing + Data Cabling + Telecom cabling
  - Electrical fitting + Sheet metal + Mechanical fitting etc.,
- Diversed range of catalogues and supplier information's.
- Source of spare parts and ordering information.
- Material request preparation skills.

# (21) Concrete work specification

All concrete shall be in accordance with the requirements of AS3600.

- (a) **Cement:** Cement shall be type GP general purpose Portland cement
- (b) **Fine Aggregate:** Fine aggregate must be clean, sharp, hard, durable grain. Uniform in quality and free from harmful amount of soft or flaky particles, dust, lumps, loam, clay, slag, organic or other deleterious substances complying with AS2758.1.
- (c) **Coarse Aggregates:** Coarse aggregates shall comply with AS 2758.
- (d) **Testing Aggregates:** Testing aggregates shall comply with AS 1141.
- (e) **Water:** Water shall comply with the provisions of AS 3600
- (f) **Reinforcement:** Reinforcement shall be either steel bars complying with AS 4671 or hard drawn steel wire complying with AS 4671. It shall be accurately cut to size and bend to shape and shall be free from scale oil and loss rust.

# Specialist work

Specialty work is almost always more profitable than regular electrical installation on a percentage basis. There are two divisions of specialty work.

- Special types of installations
- Special service to specific types of customers

***Special types of installations:*** Telephone work, Fire Alarm System, security Systems, Television system, Lightning Protection System, Traffic Lighting Installations, High Voltage work.

***Growing Area of specialist works:***

- Energy Management
- Lightning Protection – Greatly determined by Geography
- Fire Alarm Work – (Related to building industry)
- Telephone work/cable TV Telecommunication

# Design & build work

Design & build work are

- The amount of competition for job is far less, sometimes nonexistent.
- The Electrical contractor is compensated for providing the design service that is usually done by an engineer.
- The customer usually gets a better price for the same quality of work by using a qualified design/build contractor.
- Co-operation during the construction process is usually better on design/build projects than on contract bid projects.

# Design & build work

## *Requirements:*

- The contractor must develop a great deal of trust in his customers.
- The contractor must offer the customer a better value for money
- The installation must be done in a first class manner
- The contractor and all of his personnel's must maintain a high standard of courtesy to the customers
- The customers' interest must take precedence over the contractors
- The Electrical contractor must have ability to perform installation properly
- The Electrical Contractors ability to handle all details of designs
- The project must meet all codes.



# (22) Substation specification

The following standards are to be applied for substation sitting, selection, site selection, electrical construction and pole positioning.

NS 0113 – Site selection - Civil Design

NS 0114 - Electrical Design Standard for chamber type substation

NS 0116 – Design standard for distribution earthing

NS 0117 – Design standard for kiosk type substation

NS 0122 – Pole mounted substation construction

NS 0179 – Vegetation safety clearance.

# Job Accounting

Accounting → Financial Accounting

→ Managerial/Cost/Job Accounting

Financial Accounting → Daily Financial Record (Monthly, Quarterly and Yearly for Taxation)

Job Accounting or Job cost accounting is critical to almost any Electrical Contracting Enterprise without it; there is no way to check the progress and outcomes of individual jobs.

Job Accounting system composes of the records of the cost of materials and labour.

# Job Order Form

Job Name: \_\_\_\_\_

Job Number: \_\_\_\_\_

Section: \_\_\_\_\_

Week Ending	Hours	Hours to date	Materials	Material to Date	%	Purchase order No.	Complete

Estimated Hour: \_\_\_\_\_ Estimated Materials: \_\_\_\_\_ Final Review: \_\_\_\_\_

# Job Review Form

**Job Review:**

Job Name: \_\_\_\_\_ Job Number: \_\_\_\_\_ Reviewer: \_\_\_\_\_ Date: \_\_\_\_\_

[illegible]

# Contract Bid Work

Contract bid work:

General  
Contractor

Electrical  
Contractor

Building  
Contractor

Building service contractor

Contract

Legal Consideration

Documentation

Arbitration



# Bonding + Contract

## Bonding:

- For contract bid work, bonding can be critical. In return for a fee (usually around 1.2% of the contract price)
- A bonding company will guarantee the project completion to the owner's general contractor for the specified amount.

## Contracts:

- The contents of contract is very important
- The contract spells out exactly how the job will be run.
- Need to clarify the meaning of contract by Attorney.
- Try to make reasonable change to contract.

# Documentation, Arbitration, Bidding

**Documentations:** Oral communication is virtually impossible to prove at court. Job delays, change orders, early acceptance etc., must be formally written down.

## **Arbitration:**

- A method of resolving contract disputes without going through the regular legal channels.
- The dispute is resolved by an impartial judge mutually selected by both parties.
- Cheaper in resolving matters at court.

## **Bidding:**

*Bidding Information:* Name of the Job, Location, Start Date, End Date.

*Financial Information:* Bid Bond, Construction time, Liquidated damages, Wage Rate.

*Design Information:* Architect, Engineer, Owner.

# Quotation

Quote Sheet				
Job			Date	
Supplier	Item	Price	Bill of Material	Date & Time

Bid Summary	
Project	Hours
Material	Job Cost
Finance	Net Cost
Total	<input type="text"/>

# Sectional job schedule

practicable.

55) Explain sectional job schedule.

Job Name \_\_\_\_\_

Date Prepared \_\_\_\_\_

Job Number \_\_\_\_\_

BY \_\_\_\_\_

Section(1) Slab, Site, Temp – Hours – Worker/Week

Section(2) Interior Race Way - Hours - Worker/Week

Section(3) Distribution Equipment – Hours – Worker/Week

# Sectional job schedule

Month	JAN				FEB			
WEEK	1	2	3	4	1	2	3	4
Section(1)								
Section(2)								
Section(3)								
Total								



# Composite Schedule

## Composite Schedule:

Date Prepared \_\_\_\_\_

BY \_\_\_\_\_

Month	JAN				FEB			
	1	2	3	4	1	2	3	4
WEEK								
Section(1)								
Total number of workers needed								

# Cash flow schedule

**Cash flow Schedule:**

Prepared BY \_\_\_\_\_

Date \_\_\_\_\_

[illegible]

# Owner

## Owner

Mon – Friday

AM – Assist superintendent or others in getting the day started.

See to it that everybody is working and happy

Other activities

PM - Make sure that everyone is getting their work done

Other activities

Saturday

AM – Review all jobs, General review and Planning

PM – Other activities

# Estimator

Monday – Thursday

AM – Plan the day's work. Assist superintendent or others as required to get them started

See salesmen etc From 8:30 to 9:30AM

Prepare Estimated Bid Jobs, Plan Jobs etc.,

PM – Prepare estimate etc.,

Talk to sales person, superintendent etc as required from 4PM until end of the day. Take care of any messages on clip board.

Friday:

AM – Review all jobs with superintendent. Check invoices, purchase orders, job accountings etc., Prepare billing, change order etc., Return approved invoices to bookkeepers for payment. Return job folders to bookkeepers. Give billings information to bookkeepers or secretary for preparation.

PM – Preparer estimates, see salesman as required. Take care of messages

# Characteristics of contracting

