



ELECTRICAL

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NEWS LETTER

TAMILNADU ELECTRICAL INSTALLATION ENGINEERS' ASSOCIATION 'A' GRADE (Regn. No. 211/1992)

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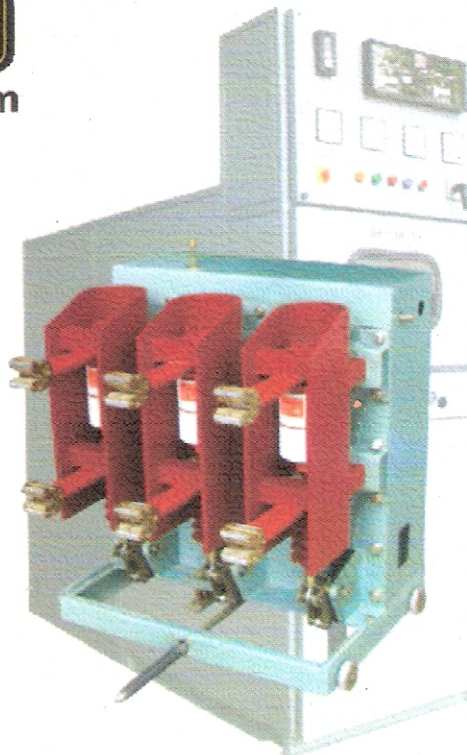
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Phase 1 : 15th - 19th April 2013 9:30-18:00

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Phase 3 : 1st - 5th May 2013 9:30-18:00

Website : <http://www.cantonfair.org.cn/en/>

LED expo Mumbai 2013



Date : 4th - 6th May 2013
Venue: Nehru Centre, Worli, Mumbai, India
Website : www.theledexpo.com

LED EXPO THAILAND 2013



Event Profile : LED EXPO THAILAND 2013 is dedicated to the science, technology and application of LEDs and solid-state lighting. LED Expo has evolved as a No.1 premier exhibition & the biggest & only show exclusively for this segment in India & now set to make a mark in Thailand.

Date : 23rd - 25th May 2013
Venue : IMPACT Exhibition and Convention Center, Hall 4, Bangkok, Thailand

Website: www.ledexpo-thailand.com

EDITORIAL

Dear Members and Friends,

SEASONS GREETINGS AND BEST WISHES FOR A GOOD AND PROSPEROUS PERIOD AHEAD!!

Tamilnadu continues to reel under Power Shortages and the Government efforts are on in full swing to get over the situation. Capacity additions are very important to meet increasing demands, but it is also necessary that efforts are done on war footing to reduce the 'Demand' through avoiding wastes and increasing End Use Efficiency. Solar Initiatives by both Central and the State Governments are very timely and added focus on using Solar for Pumping for Irrigation can also help substantially. .

February 28th is Celebrated as "Science Day" in our Country. I was listening to a French Archeologist, Historian and Researcher, recently, when he was deliberating in great detail about the Harappan and Saraswathi River based Civilization of India or Bharat of BC Era, 1000s of years back, based on excavations and research. The Knowledge and Engineering and skills displayed in Town planning and urban living etc seems to have had no parallel anywhere in the World. We often hear a comment these days that India has more 'Cell Phone Connections' today than the number of toilets in the country. Even in Harappan Civilization time, Toilets are found in all the dwellings and there has been systematic Sewage collection etc. We are certainly one of the old civilizations with a background of Scientific Knowledge and thinking, and we could also adopt and progress with the help of modern scientific developments and Technological advancements of the world, particularly in the last 110 years. We certainly have to gallop in the path of Inclusive Growth and Progress keeping in mind about our great heritage and capability.

We thank all those members who have helped us by participating in the advertisements appearing for the issue January 2013 – Ganapathy Electrical Engineering Company, Bracecorp Publications Pvt. Ltd., Prolite Autoglo Limited, Power Links, Universal Earthing Systems Pvt. Ltd., Intrans Electro Components Pvt. Ltd., Pentagon Switchgear Private Limited, K-Lite Industries, Cape Electric Corporation, Easun Reyrolle Limited, Hensel Electric India Pvt Ltd., Elmeasure Measurements Pvt Ltd., OBO Bettermann India Pvt. Ltd., Galaxy Earthing Electrodes (P) Ltd., Ashlok Safe Earthing Electrode Ltd.

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- 189. Essyen Electricals (P) Ltd, (2012-13)
- 190. Mr. Justin K. Kurian, (2012-2013), *Non- Member*
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(Please help us to serve you better).

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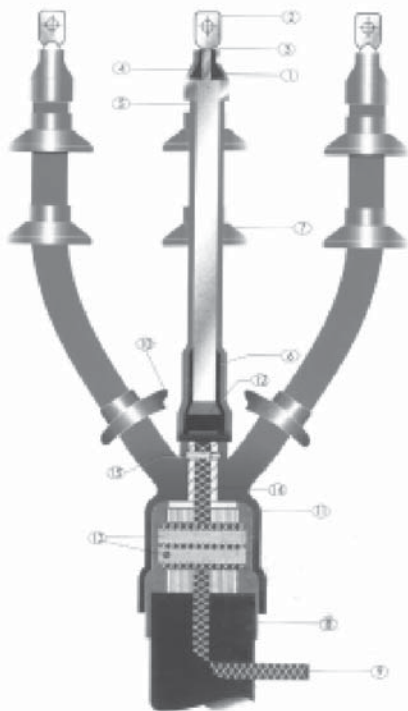
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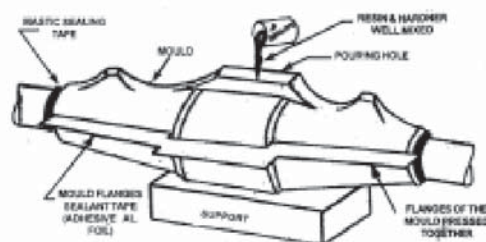
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Please reconnect with the topics mentioned in my last article.

4.5 DIAGNOSIS OF LIFE SPAN OF OIL-IMMERSED TRANSFORMER BY THE DETERMINATION OF CARBON-DI-OXIDE DISSOLVED IN OIL

4.5.1 We know that by sampling of insulating paper or pressboard, the remaining life of an oil-filled transformer can be assessed. But this method required the cessation of transformer operation. Alternatively, we can try to estimate the residual life of the transformer from the dissolved products in the oil. In this respect the Carbon-di-Oxide and furfural dissolved in the transformer Oil play important roles.

By determining the quantum of CO_2 and other hydrocarbon gases that got dissolved into the oil, the residual life of a transformer can be assessed since there is a good correlation between the amount of CO_2 and the degree of polymerization of insulating paper in oil-immersed transformers. Analysis of dissolved fault gases like CO_2 and CO by using “An Expert System Software” along with the data on the electrical and physio-chemical properties of the transformer oil from the date of commissioning to the date of study will reveal the residual life of an oil-filled Transformer.

4.5.2 This diagnostic method has certain limitations and boundary conditions. These are listed as follows:

- i. *Data acquisition on CO_2 concentration has to be performed prior to the vacuum degassing treatment of oil which is required for Dissolved gas analysis. This step will help to prevent the escape of CO_2 gas during vacuum degassing gas analysis. This step will help to prevent the escape of CO_2 gas during vacuum degassing of oil under test.*
- ii. *This method is unsuitable for Nitrogen-sealed type oil-immersed transformers since dissolved CO_2 gas escapes from the oil into the nitrogen space.*
- iii. *Concentration of CO_2 gas depends on the temperature that prevails at the time of oil sampling. It is evident from the field data that shows the concentration of CO_2 is about the two times the CO_2 concentration that is noticed in winter.*
- iv. *Certain Portion of CO_2 gas, once generated from the decomposed insulating paper and it depends on the temperature of the oil. Thus the temperature dependent characteristics of the concentration of the dissolved CO_2 gas warrants a special focus.*

4.6 DIAGNOSIS BY FURFURAL DISSOLVED IN OIL

4.6.1 The cellulose insulation used in the oil-filled transformers degrades when subjected to heating and electrical breakdown. The transformers generally face these abnormal conditions during their service period. When the insulating paper is facing decomposition, as described in earlier article, alcohol, aldehyde, acid, and finally CO_2 are formed in steps. The derivatives of Furfurals which are soluble in oil, are generated at the aldehyde decomposition (third stage). The amount of furfurals dissolved in oil is proportional to the decrease in the degree of insulating paper Polymerization. Overheating and electrical discharges generate a large quantity of Furfurals and CO_2 . The levels of 2-Furfural derivation are determined with the aid of High Performance Liquid Chromatography (HPLC). By monitoring and comparing the levels of 2 Furfurals derivation with the data already available for the transformers of various ratings and age, the remaining life of the transformers in point can be assessed. Furfural does not evaporate during the vacuum degassing treatment of oil which is normally carried out at $70^\circ C$. Abnormal Conditions experienced by the oil-filled transformers are generally diagnosed by the oil-dissolved gas analysis. Hence the analysis of dissolved furfurals by High Performance Liquid chromatography will facilitate the residual life of oil-filled transformers.

4.6.2 Thus we have several techniques for the assessment of the remaining life span of oil-filled transformers. These techniques are enumerated as follows:

- i. *Estimation from Degree of Polymerization of Cellulose paper and insulation structures.*

- ii. *Estimation from the quantum of Co and Co₂ present in the oil samples taken from the transformers*
- iii. *Estimation from the Furfurals dissolved in the oil*
- iv. *Estimation from the close short circuits and other kinds of faults experienced by the transformers during its service period.*

5.1 So far we have learnt the techniques related to the estimation of residual life of Power System equipment like generators, transformers and Cables. Now Let us turn our focus on the life assessment of old substations.

5.2 We know that the term “Life Assessment” refers to the systematic evaluation of existing plant and substation equipment condition. “Life Extension” is the term used to indicate the initiation of a work plan to extend the useful life of a plant or an equipment. Presently the life assessment or extension does not find wide appeal even though most of the inservice plant/substation equipment crossed their useful life spans. In consideration of the significance of this need, the topic viz the life assessment/extension of older substation has been given a detailed focus.

5.3 First let us review the problems encountered at the substations. Those problems are brought out as follows.

5.3.1 Overdutied or overtaxed equipment

It is a common problem experienced in many substations. While designing a substation normally an ultimate load is taken as the base and based on this load, equipment and their ratings are selected. Likewise the prevailing fault level or short circuit level is taken as a base for drawing the specifications of the equipment.

In addition, the substation is constructed in stages; in the first stage only a portion of the ultimate or final arrangement is commissioned and then the capacity of the substation is gradually expanded or enhanced in phases depending upon the incidence of further loads or load growth. This goes on until the ultimate capacity of the station is reached.

5.3.2 This arrangement often leads to certain unexpected events in some cases the added loads exceed the designed capacity of the station; in some other cases, the short-circuit or fault level increased due to the addition of more generating Capacity. All these make the station to experience overstressed or over dutied. These problems pose greater threats to the stability and security of the substations and its equipment and are considered as most serious and require immediate corrective efforts.

5.3.3 Reliability

The next problem that require attention is reliability. The standard “bathtub” failure curve shows that the older a piece of equipment, the greater will be its failure or the more likely it is to fail. The failure may be an ordinary electrical insulation failure or a component failure.

The first failure may be treated as a fault and rectified; in the second case, the component failure may render an equipment as “in-operative.” That is it makes the equipment as a threat to the reliability of the existing system. (eg) When a relaying system fail to clear a fault or the breaker does not trip on a fault. In all these conditions the equipment is expected to operate properly but it failed to operate, when required to do so.

Kindly stay tuned for next article.

(To be continued...)

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WHAT IS THE DIFFERENCE?

Between IMMIGRATION and EMIGRATION

EMIGRATION is the act and the phenomenon of leaving one’s native country to settle in another country. It is the same as immigration but from the perspective of the country of origin.

IMMIGRATION is the movement of people from one nation-state to another. While human migration has existed throughout human history, immigration implies long-term permanent residence (and often eventual citizenship) by the immigrants: tourists and short-term visitors are not considered immigrants.

FIRE ALARM SYSTEM



A fire alarm system is an active fire protection system that automatically or manually detects fire and initiates protective measures such as

- Alerting the inmates of a building
- Identifies the location of fire
- Initiates fire controlling measures such as shutting down the power, activation of fire dampers in AC system etc..
- Initiates the fire sprinkler systems
- Initiates a series of Fire Exit sequences.

A fire alarm system will typically include manual call points, detectors, control and indicating equipment, fire alerting devices, interconnections, safety control outputs, power supplies, and wiring.

The protected building shall be subdivided into detection “zones”, and alarm indication of these will be provided to fire fighters to effectively reach the troubled spot at the shortest possible time.

Fire Alarm System Design

The overall design objective of a fire detection and alarm system is to detect fire as early as possible, and having good tolerance to false activation. Once a fire is detected, the actions taken by the system need to be consistent with the building’s overall design, its evacuation plan, and the integrated fire protection strategy for the premises.

This system design should be performed by trade certified competent engineers with experience in fire protection. This design is incorporated with the Architect’s design team during the design phase of the building project.

National Building Code states In the case of apartment buildings exceeding three storeys above ground level, a certificate of approval from the Director of Fire Force or an officer authorized by him should be obtained before issue of the building permit. All other requirements in respect of fire protection shall conform to Part IV, **Fire Protection** National Building Code of India.

Every floor of any kind of residential accommodation exceeding 150 sq. meters of floor area with a capacity of more than 20 persons should possess at least two doorways, as remote as practicable from each other. At least one staircase should be provided as a fire exit as defined by the National Building Code.

The detailed plan showing the arrangement of pipe lines, booster pumps and water-tanks at various levels should be submitted for approval of the concerned authority along with the plans and sections of the buildings. Every building standing at a height of more than 25 metres is to be provided with diesel generators which can be utilized in case of power failure.

Detection Devices

Fire alarm systems have detection equipments connected to them to detect the fire/smoke. Below is a list of common detection devices:

- **Manual Call Points** – devices to allow people to manually activate the fire alarm. These are usually located near exits and on exit routes within the premises so that building occupants will be able to locate one within a reasonable travel distance after discovering (or causing) a fire.
- **Heat Detectors** – devices which are designed to operate when the temperature or rate-of-rise of temperature exceeds a predetermined value. These are most commonly based around either a simple bi-metal thermostatic switch, or a thermistor-based electronic circuit
- **Smoke Detectors** – devices which detect visible or invisible products of combustion, usually emitted prior to the flaming stage. These are most typically point type devices operating on photoelectric (light-scattering)

or ionization chamber principles. Other (less common) device types include: projected beam smoke detectors and air-sampling (aspirated) smoke detectors. Some of these can be incredibly sensitive indeed, so precautions need to be taken to avoid false activations.

- **Carbon Monoxide Fire Detectors** – devices which detect the poisonous carbon monoxide (CO) gas characteristic of smouldering fires. These are primarily used in life safety applications (e.g. sleeping occupancies). For the highest level of life safety CO detectors are usually employed in conjunction with heat or other smoke detection (e.g. multi-sensor detectors), or sprinklers.
- **Flame Detectors** – devices which detect the infrared or ultraviolet radiation from a flaming fire. These are most typically used in commercial and industrial applications where a fast flaming fire can be expected (e.g. aircraft hangar, fuel storage depot), and can also be used outdoors.
- **Sprinkler System Alarm Valve** – the main alarm output from a fire sprinkler system will generally indicate on the zone index of a fire alarm system and initiate alerting (general building evacuation). The sprinkler system will be required to have its own remote connection to the fire brigade.

Advances in technology in recent years have allowed for multiple detection principles (heat, smoke, CO, flame) to be incorporated into one detector. These so-called multi-sensor detectors are becoming more common. Their particular attractions are improved detection and improved immunity to false activations (nuisance alarms).

Alerting Devices

For new installations, a specific standard Alarm tone is now mandatory, with an interspersed verbal message (except for very small buildings). The voice message will generally be something like “Evacuate the building using the nearest fire exit”, and provides positive direction to building occupants. Now most of the buildings use general PA systems for alerting the inmates.

Although point-type sounders are available to produce this standard alerting signal, it is now most common to have a central tone and voice generator/amplifier located at the fire alarm control panel, with a network of loudspeakers to reproduce the signal around the building.

EWIS Systems

A EWIS (Emergency Warning and Intercommunication System) is an enhanced system for fire alarm alerting and evacuation control in larger or more complex buildings. Instead of the whole building receiving the (evacuation) alerting signal simultaneously, the premises are instead subdivided into multiple evacuation zones. In response to signals from the fire alarm system, the EWIS system controls a zone-by-zone staged/phased evacuation according to a pre-programmed scheme.

A EWIS system is also designed to enable either the fire service or a designated building warden to take manual control of the evacuation, including directing Public Address (PA) messages to all or selected evacuation zones.

The rationale behind audio evacuation systems is, though conventional fire alarm notification devices alert occupants of a building of the presence of an emergency, they do not provide detailed information to the occupants, such as evacuation routes or instructions. Nor do they allow occupants in the greatest danger to have unimpeded access to escape routes.

EWIS systems usually permit multiple messages. For instance, “non fire” messages can be programmed for situations such as a hazardous material spill, gas leaks, security breaches, etc.

They can also be used to provide non-emergency building Public Address facilities.

Reliability

The reliability of fire alarm systems is required to be much higher than some other building systems, due to the reliance placed on active fire protection systems for life safety. Mains power supplies are expected to fail under fire conditions, so battery back-up is expected. Batteries are known to fail, so are tested almost continuously both for continued presence and capacity. Circuits are automatically checked for fault conditions, producing fault signals in case of failure. Wiring circuits are installed with redundant paths.

Because reliability is so important, monthly testing and annual auditing of fire detection and alarm systems by a qualified trade practitioner is mandatory. Fire detection systems are invariably listed on a building's compliance schedule, and evidence of satisfactory test and survey must be submitted to the Territorial Local Authority before the building's annual warrant of fitness (for continued occupation) can be issued. It's always better to give Annual Maintenance Contract to the company which has installed the fire alarm system rather than maintained by a third party.

Analogue Addressable Systems

"Conventional" fire detection and alarm systems are hard-wired to each group of detection devices. The control and indicating equipment is unable to distinguish alarm and fault conditions from individual devices within the group and the actual alarm decision is made at each device.

"Analogue Addressable" systems provide knowledge of the exact location and status of every device at the control and indicating equipment. Furthermore, the alarm decision is generally made by the control equipment, rather than the detection device itself.

In general, Analogue Addressable systems offer the following distinct advantages:

- **Pre-alarm Indication** – Incidents can be investigated, and possibly resolved, before the Fire Service is called.
- **Maintenance Alert** – dirty detectors can increase false alarms, but unnecessary cleaning wastes money. Maintenance alert facilities show which detectors need cleaning.
- **Individual Detector Identification** – each detector is uniquely identified. A full description of a detector's precise location is displayed at the fire control panel, or on remote annunciators. This speeds the location of a fire or a fault.
- **Wiring Faults** – cut wires or short circuits on wiring do not generate false alarms, and are easier to locate.
- **Adjustable Sensitivity** – each detector can be tailored to its environment to give optimum sensitivity to fire phenomena and resistance to environmental influences or permitted activities (e.g. food preparation).
- **Multi-Sensor Detectors** – multi-sensor/multi-criteria detectors use sophisticated algorithms to make them less likely to generate a false alarm, but more likely to respond promptly to a real fire.

Overall, these technical advantages increase system performance and reduce unwanted building evacuations and calls to the Fire Service. Although analogue addressable systems can cost a little more initially, this can be recouped in reduced maintenance and false alarm costs, while offering the benefits of superior performance.

False Alarms

In spite of technological advancements, the false alarm rate from fire detection and alarm systems remains prevalent. False alarms disrupt – business, staff, and customers. Repeated false alarms lead to complacency, and danger of real alarms being ignored.

Detector selection and placement, good building maintenance, regular detection system maintenance, awareness among the maintenance personnel shall substantially reduce the incidence of false alarms.

Domestic Smoke Alarms

- **Ionisation or Photoelectric?**

Smoke Alarms are primarily used in domestic residential situations. They are different from the Smoke Detectors used in Fire Detection and Alarm Systems because they have a built-in alerting device, and are designed, tested, and manufactured to different standards. The most common examples are the battery-operated units

Early warning of the presence of smoke in a building is critical to life safety. Some fires can grow rapidly making escape very difficult, especially if the occupants are asleep, and/or the escape routes are smoke-logged. The time difference between escaping from a building or dying in a fire can often be measured in seconds. Sometimes fires

Challenges are what make life interesting; overcoming them is what makes life meaningful. – JOSHUA J. MARINE

can smoulder for hours, filling the premises with toxic fumes. Without the early warning provided by a smoke alarm, occupants can perish as they sleep without ever waking.

Commercially available domestic smoke alarms are usually either ionisation chamber or photoelectric (light scattering) types.

Ionisation smoke alarms respond well to fast flaming fires, but can give much slower response to smouldering fires. Escape routes can therefore become more smoke-logged before a warning is given. Ionisation detectors are also prone to nuisance alarms from cooking activities, so must be sited well away from kitchens.

Photoelectric smoke alarms respond to visible smoke, so can give a slower response to fast flaming fires with invisible products of combustion. They are also prone to nuisance alarms from steam, so must be sited well away from bathrooms and saunas.

On balance, photoelectric is the preferred technology for new installations as it offers more consistent detection performance across all the likely fire scenarios in a residential environment.

Automatic Fire Sprinklers

Automatic fire sprinklers are the most effective protection against fire. A fire starts somewhere in the protected building causing the sprinkler heads immediately above the fire to operate. Water is discharged from the operating sprinkler heads controlling the fire.

- Not every sprinkler head operates. Statistically 65% of fires are controlled by the operation of a single sprinkler head. 95% of fires are controlled by five sprinkler heads or less.
- Sprinklers are on guard 24 hours a day, seven days a week to protect you and your property from fire.
- Sprinklers use less water and cause less wet-down damage than manual fire fighting. You can restore wet documents and equipment but you cannot restore ashes or life.
- Sprinklers are extremely reliable
- Effective sprinkler protection should give you leverage in reducing insurance premiums and ease building code compliance. But more importantly they will protect your property and people from fire.

Standards

What is Passive Fire Protection?

Fire Safety Precautions can be defined as being *“the combination of all methods used in a building to warn people of an emergency, provide for safe evacuation, and restrict the spread of fire, and includes both active and passive protection.”* Passive fire protection features relate to incorporation of materials in fire protection/Spreading / Containment in the construction stage itself, which are generally part of the building as compared to active features such as sprinklers, detectors, alarms, etc. Examples of PFP features in typical buildings are:

- fire rated walls, floors, ceiling and roofs
- fire and smoke control doors
- fire and smoke stopping seals, collars, pillows, blankets, etc for services penetrations
- fire rated protective coatings for structural steel members etc
- fire and smoke dampers/curtains
- fire rated glass systems
- fire rated lift landing doors
- fire rated ducting

Fire Evacuation

Introduction

If a fire broke out in your building, would you know what to do or where to go for help? Whether it is your work place or somewhere you're visiting for the first time, it is important that you and everyone else in the building are

aware of what to do in the event of a fire. Knowing and not knowing could mean the difference between getting out safely or, worst case scenario, losing a life. Having a simple set of fire procedures or an evacuation scheme in place can help ensure that you and everyone else gets out of the building safely.

What is an ‘evacuation procedure or scheme’?

The simplest explanation would be, a plan designed to remove people from a dangerous place to a place of safety. It is a way of ensuring people evacuate promptly, safely and orderly in an emergency, also helping people to remain calm and reducing chances of someone being hurt while evacuating.

Evacuation procedures are the ‘What we do’ and How we do it’ etc in the case of a fire evacuation. This can be as simple as a notice on the wall in a prominent place to advise the occupants of a building what they must do in the event of a fire emergency and how to get to a place of safety outside the building.

An evacuation scheme includes things like:

- What to do if you discover a fire
- What to do if you are warned of a fire
- Who are the Fire Wardens in the building
- What is the role and duties of a Fire Warden
- How to evacuate from a building to a safe place
- How everyone is accounted for during an evacuation
- How persons with disabilities will be assisted during a evacuation
- Where Fire Action notices are located in the building
- How an evacuation scheme needs to be maintained
- How to safely operate fire fighting equipment in the building

Why would I need an evacuation scheme?

As the **OWNER** of a building, Its better to have an evacuation scheme if the building is used for any one or more of the following:

- The gathering together, for any purpose, of 100 or more persons
- Providing employment facilities for 10 or more persons
- Providing accommodation for more than 5 persons
- Storing or processing hazardous substances in quantities exceeding the prescribed minimum amounts
- Providing early childhood facilities
- Providing nursing, medical or geriatric care
- Providing specialised care for people with disabilities
- Providing accommodation for persons under lawful detention

FIRE DRILL AND EVACUATION

PROCEDURES FOR HIGH RISE BUILDINGS

Fire drills shall be conducted, in accordance with the fire safety plan, at least once every three months for existing buildings during the first two years. Thereafter, fire drills shall be conducted at least once every six months.

All occupants of the building shall participate in the fire drill. However, the occupants of the building, other than building service employees, are not required to leave the floor or use the exits during the drill.

A sign shall be posted and maintained in a conspicuous place on every floor at or near the lift landing in accordance with the requirements, indicating that in case of fire, occupants shall use the stairs unless instructed otherwise

In addition to the above, NBC has a detailed Fire protection measures in place.

God gives every bird it's food, but does not always drop it into the nest.

LIGHTING AND ENERGY CONSERVATION - 1

INTRODUCTION:

What is light?

The light is a form of energy transmitted by electro magnetic radiation. All the energy in our earth is received from the sun through electro magnetic radiation. The energies from the sun are radiated in a wide spectrum of wave lengths varying from 10^{-14} meters to 10^4 meters. The very high frequency end of the spectrum is gamma rays, and spreads to X-rays, ultra violet, infra red and the lower end is radio frequency. The electro magnetic radiation between ultra violet and infra red is in the form of visible light. Again this visible light spectrum is from 380 nm to 760 nm (nm is nanometre i.e. 10^{-9} meters) recognised by the human eye as different colours of light from violet to red as shown in the figure No. 1, below:

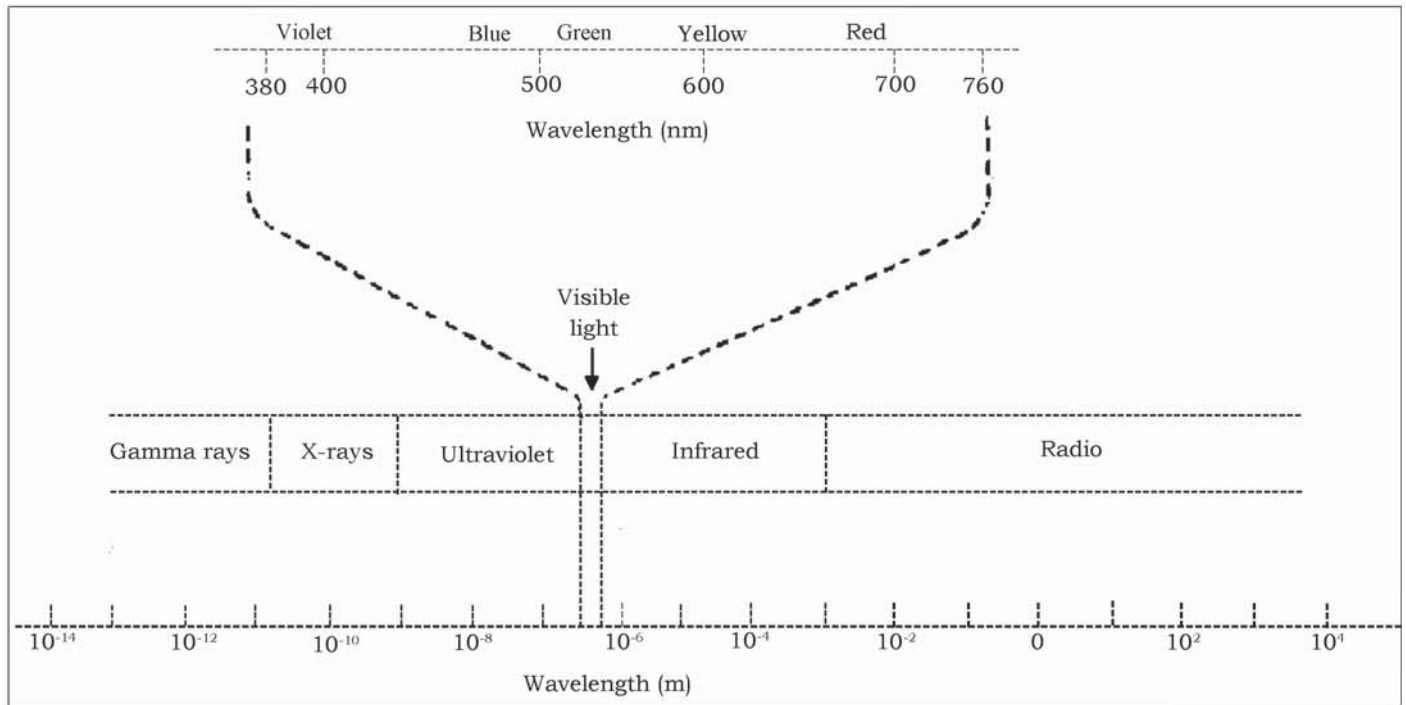


Figure 1

The light and the human eye:

Thus light is not simply defined as energy in the same way as other forms of radiation. It is defined as the visual effect created by that energy. To “simplify” matters, in 1935, the International Commission on Illumination (CIE) adopted the standard response curve, $V(\lambda)$, which defines the spectral response of a typical person under “photopic” conditions, Figure 1, bold curve. “Photopic” refers to high light levels typical of daylight and interior lighting. Note also that the $V(\lambda)$ curve is applicable only to the small central area of the eye’s field of view. It does not apply to off-axis viewing.

The artificial source of light: Incandescent and discharge lamps:

Any material heated to incandescence emits light; earliest way of producing light by electricity was to pass an electrical current through a resistance that is a metallic filament, which becomes heated and emits radiation. Discharge lamps were then invented which rely on the passage of an electrical current through a gas or vapour for their operation.

Electrical energy and lighting:

The lighting loads, depending upon the type of industry, account for about 5 - 15 per cent of electrical energy consumption in an industrial plant. Especially, textile, pharmaceutical and paper industries use high percentage of

energy for lighting, not to mention commercial establishments; hence conservation in the lighting energy assumes high priority.

Energy conservation in lighting:

The judicious application of luminaries (light fittings) goes a long way in conservation of energy in lighting; apart from this, the lighting design is to be efficient, based on the following guidelines

1. Installing proper Luminaire to provide required lumens, based on the task.
2. Use of more of natural light
3. Selection of energy efficient source and luminaire
4. Ambient temperature at which the luminaire is installed,
5. Proper control and maintenance

Lighting units - Illuminance, Luminance and Units:

Before identifying the ways and means of conserving energy in lighting, it is important to understand the lighting units; as there bound to be some confusion over units. However, the subject is not too complicated. The units are explained below:

Illuminance. This is the amount of light falling on a surface, and is the traditional method of designing and measuring lighting.

Units of illuminance are:

Footcandle (English) = 1 lumen per square foot

Lux (Metric) = 1 lumen per square meter

LIGHTING TERMINOLOGY:

Luminance. This is the light quantity reflecting from a surface. The eye see this reflected light, and it is therefore a better measure of lightning level than illuminance. Many roadway lightning systems, particularly in Europe, are designed on the basis of luminance.

The unit of luminance is the candela per square meter (cd/sq.m). Candelas per square foot is almost never used passing through a resistance. i.e., a metallic element, which becomes heated to incandescence level, emits radiation. Most of the energy is spent on heating and only a small portion is radiated as lighting energy. The efficiency is as low as 12 lumen per watt.

How are lamp lumens determined?

Both in theory and in practice, the determination of lamp lumens involves knowing the Spectral Power Distribution, (SPD), of the lamp and the visual response of the eye. Light is defined as energy as evaluated by the human eye.

To determine lamp lumens, the power of the light at each wavelength λ , in the visible spectrum is multiplied by the $V(\lambda)$ value or eye sensitivity at the equivalent wavelengths. Then all of these multiplied values are summed to find the lumen output. This may be stated as:

$$\text{Lamp Lumens} = K \sum \text{Lamp Power} (\lambda) \cdot V (\lambda) \cdot \Delta \lambda$$

K is a constant to account for units.

It can be recognised from the curve (Fig no.2) that the eye response to 500 to 560 N.M. wave length is greatest, that is the yellow light.

The artificial source of light:

The earliest source of electrical lighting was the incandescent lamp. The efficiency of conversion of electrical energy to lighting energy of this lamp is extremely low. These lamps rely for their operation on the heating effect of electrical current watt. In commercial establishments and certain type of industries, with most of the areas where lighting required is air conditioned, this heat load constitutes additional load on the air conditioning requirements.

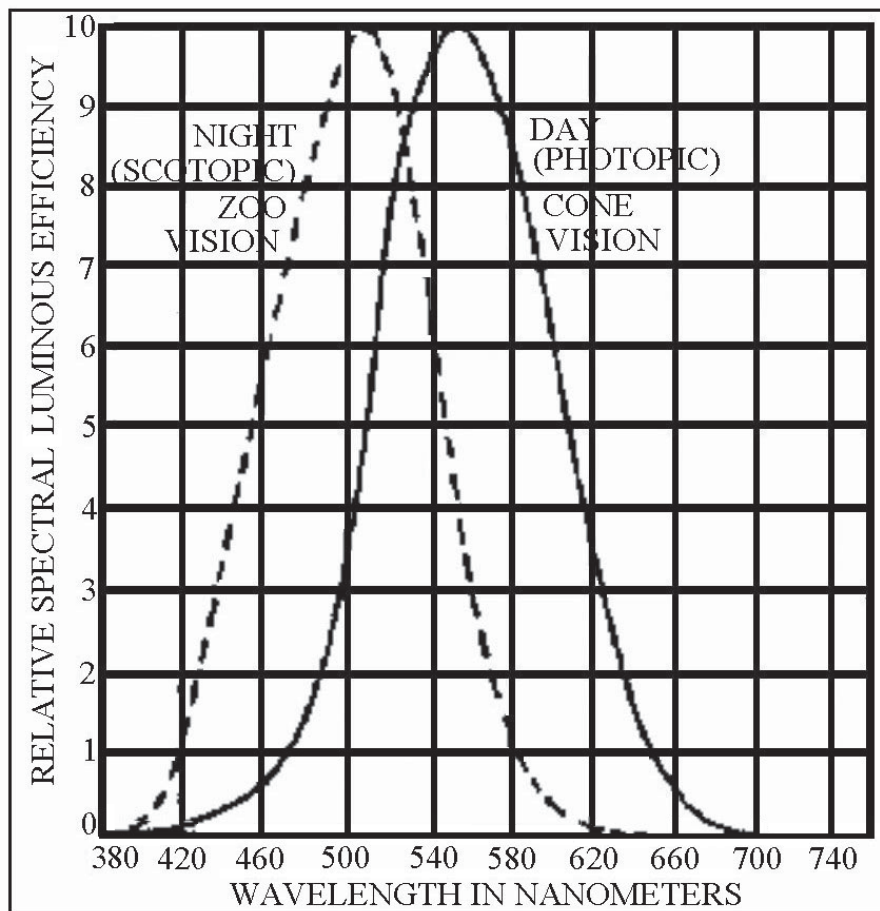


Figure 2 - The $V(\lambda)$ curve (bold) for photopic vision, and the $V'(\lambda)$ curve (dashed) for scotopic vision.

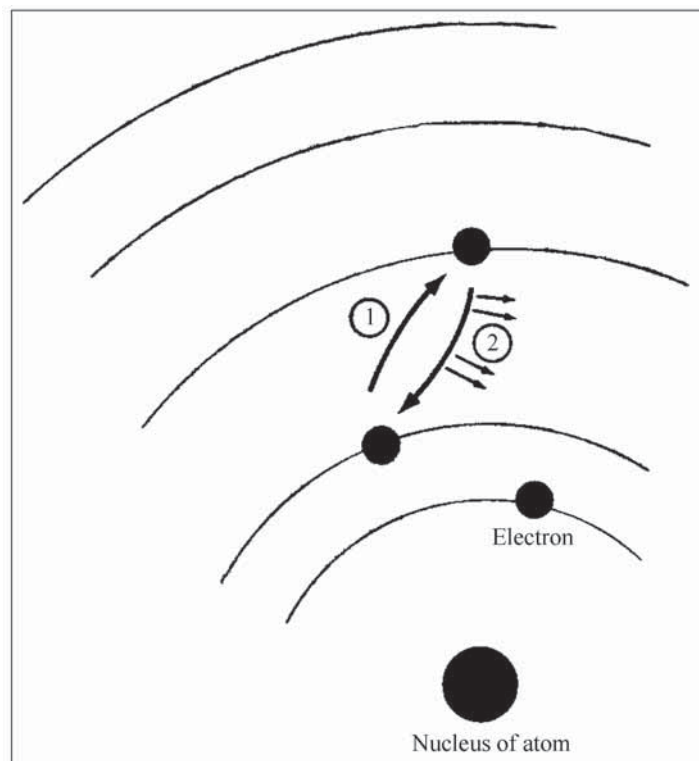


Figure 3 - Emission of light from gas discharges. (i) Application of energy displaces electron to higher energy level orbit; (ii) Electron remains in higher energy level orbit for typically nanoseconds before returning to its original energy level orbit. In doing so, light is emitted, the wavelength of which depends upon the difference in energy between the two orbits.

Discharge Lamps:

Figure 3 shows the emission of light from gas discharges and Figure 4 shows the application of this principle to practical discharge lamps, which rely on ionisation and excitation for their operation.

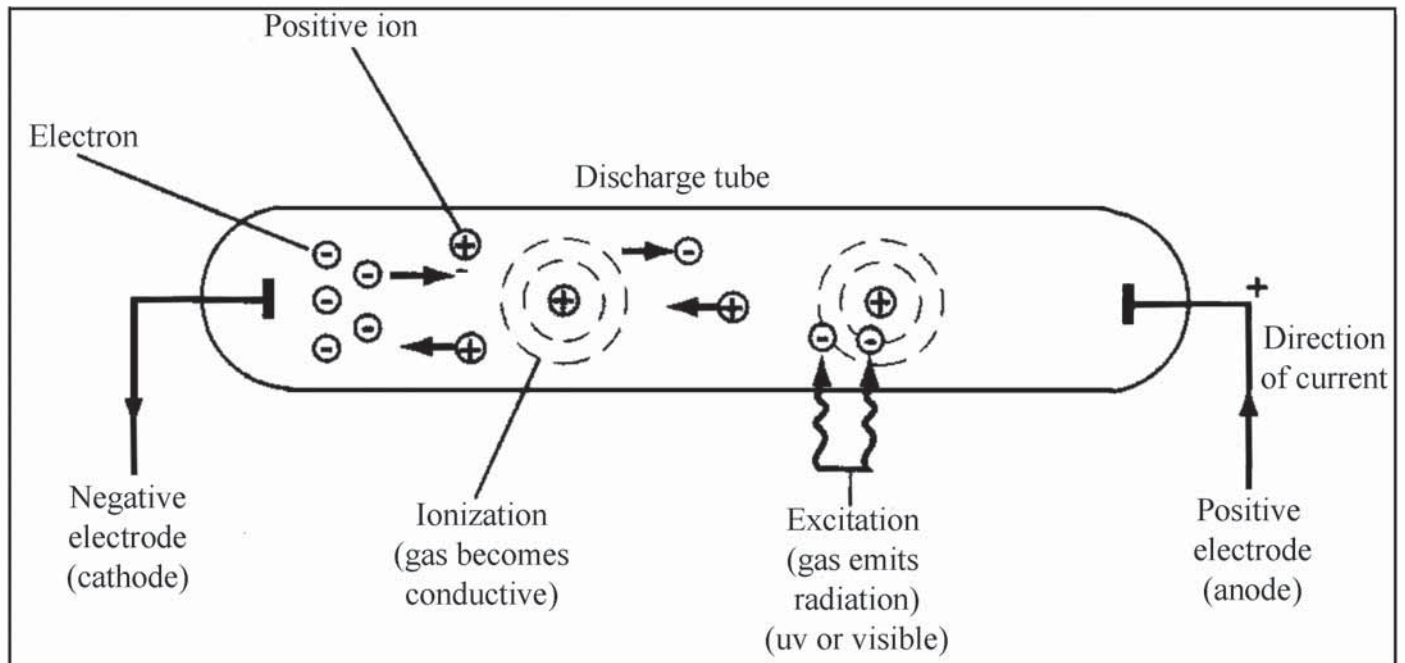


Figure 4 - Light production in discharge lamp.

The types of discharge lamps currently available include the following:

- Low pressure mercury or fluorescent
- High pressure mercury
- Metal halide
- Low pressure sodium
- High pressure sodium
- Mercury blended and
- induction

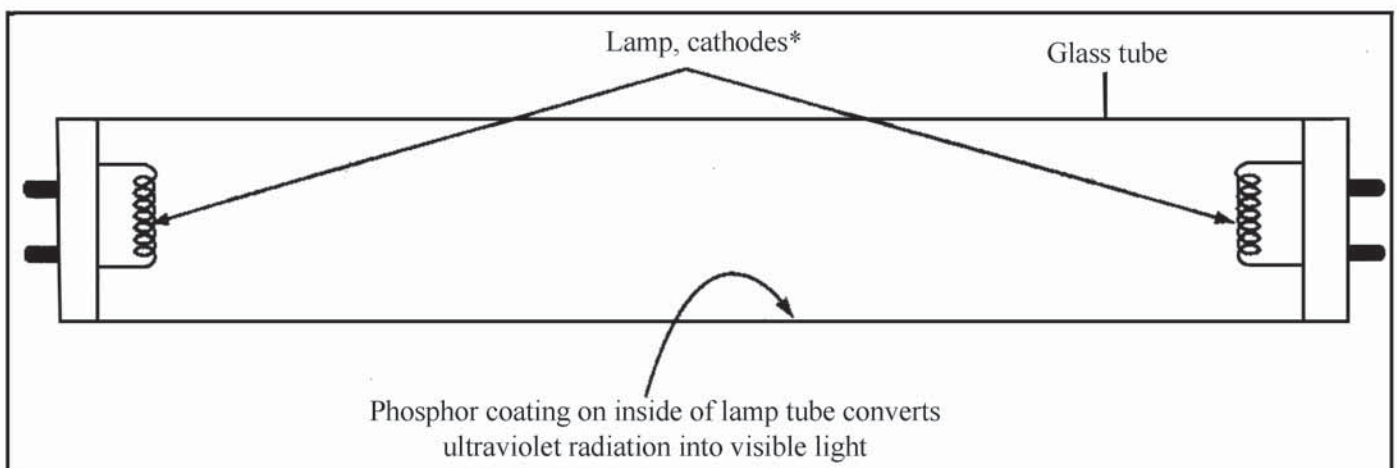


Figure 5 - Tubular fluorescent lamp. * The term cathodes is often used when referring to both electrodes, even though they take on the roles of anode and cathode alternately.

Low pressure mercury vapour or fluorescent lamps:

In the fluorescent lamp, the electrical discharge produced has two major spectral lines. Approximately 85 per cent of the output is at a wavelength of 254 nm and approximately 15 per cent of the output is at a wavelength of 185 nm. Both of these spectral lines are in the UVC band. It is necessary therefore to convert these incident wavelengths into wavelengths in the visible part of the spectrum. This is achieved by internally coating the glass discharge tube with phosphors which have the ability to absorb incident wavelengths in the UV band and subsequently re-radiate them at longer wavelengths which lie within the visible spectrum. The wavelength of the light produced by a fluorescent lamp is influenced by the composition of the phosphors coated on the inside of the lamp glass wall.

Initially halo phosphates were used in order to make high efficiency white lamps and, by the 1970s, phosphor development had led to the introduction of narrow waveband phosphors, which separately emitted red, blue and green light (hence tri-phosphors), which, when combined, produced white light. Multi-phosphors have enabled an even greater selection of lamp colours.

Fluorescent lamps have several constructional forms, the tubular version shown in Fig. 5 are being used extensively. Electronic circuitry allows some tubular lamps to be successfully dimmed in a process which involves high frequency operation.

The fluorescent lamp has one major disadvantage when operated at reduced temperatures. Consider a fluorescent lamp operating at an ambient temperature of, say 0°C. Assuming that the lamp would strike at that temperature, which is not guaranteed, the light output after the lamp had reached luminous stability, would be typically 50 per cent of that expected if the lamp was operating in a normal room temperature of 20°C, as shown in figure 6. It can thus be seen that fluorescent lamps are not normally used for external applications in cold regions or in the internal applications where low ambient temperatures are prevalent.

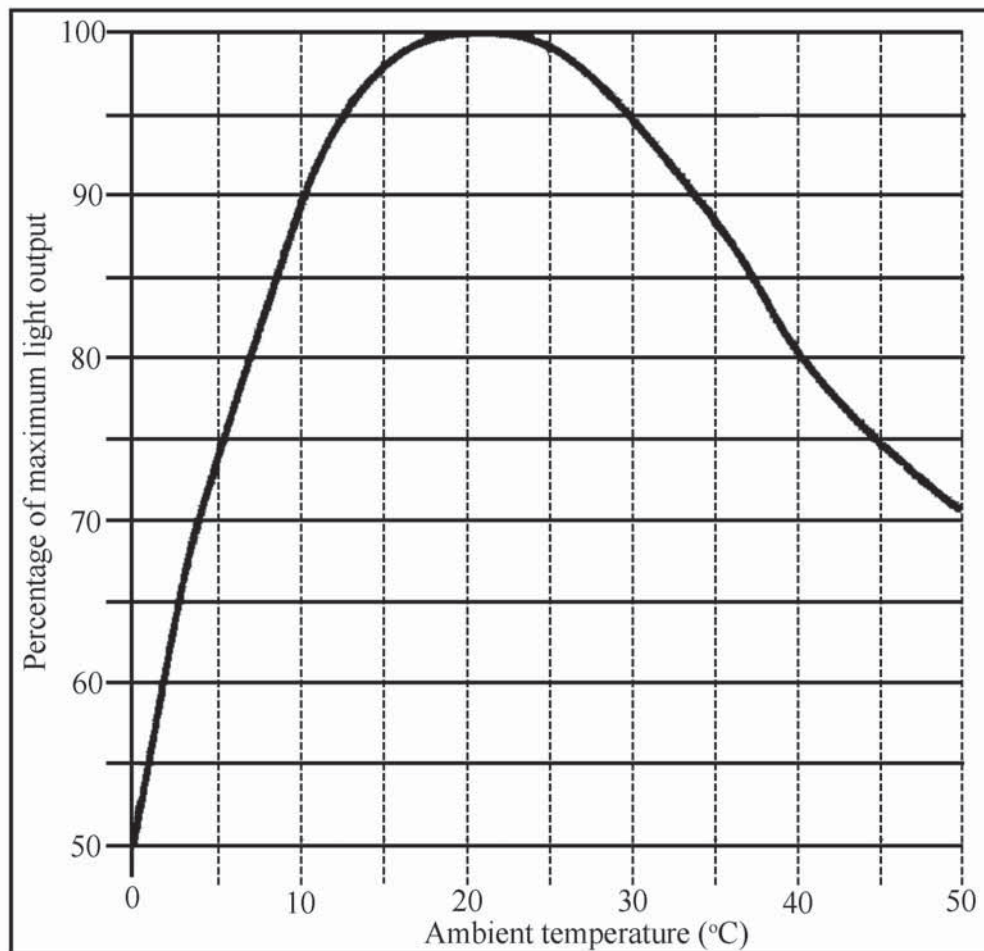


Figure 6 - Typical effect of ambient temperature on light output of tubular fluorescent lamp.

When used in low ambient temperatures, fluorescent lamps will often produce symptoms characterized by regions of high and low brightness of light output from the lamp, appearing as hoops, which may appear to be either stationary, move in either direction along the length of the lamp or even oscillate. This phenomenon is referred to as striations, which occur as a consequence of unstable conditions in the gas discharge. They may also appear in new lamps this being due to the mercury not being totally absorbed into the lamp phosphor coating.

Special fluorescent lamps which have a predominantly red output have been used for dark adaptation applications. Rods in the retina are relatively insensitive to red light, and, as a consequence, the rhodopsin does not get bleached by light of this colour. The cones can function adequately with red light and it follows that an individual who is indoors and adapted to red light and who then moves swiftly to view a dark night scene externally, will still be able to see adequately as the rods will be able to respond almost immediately. The rhodopsin will still be intact and therefore no period of dark adaptation will be necessary.

Fluorescent lamps will usually re-strike immediately after a momentary loss of electrical supply. Fluorescent lamps can be operated in any position. Figure 7 shows the constructional features of one type of compact fluorescent lamp. Fluorescent lamps operating on high frequency supplies are finding increasing use in interior applications. The major benefits of using fluorescent lamps on such supplies include:

- almost total elimination of flicker,
- the ability to control the light output from the lamp.

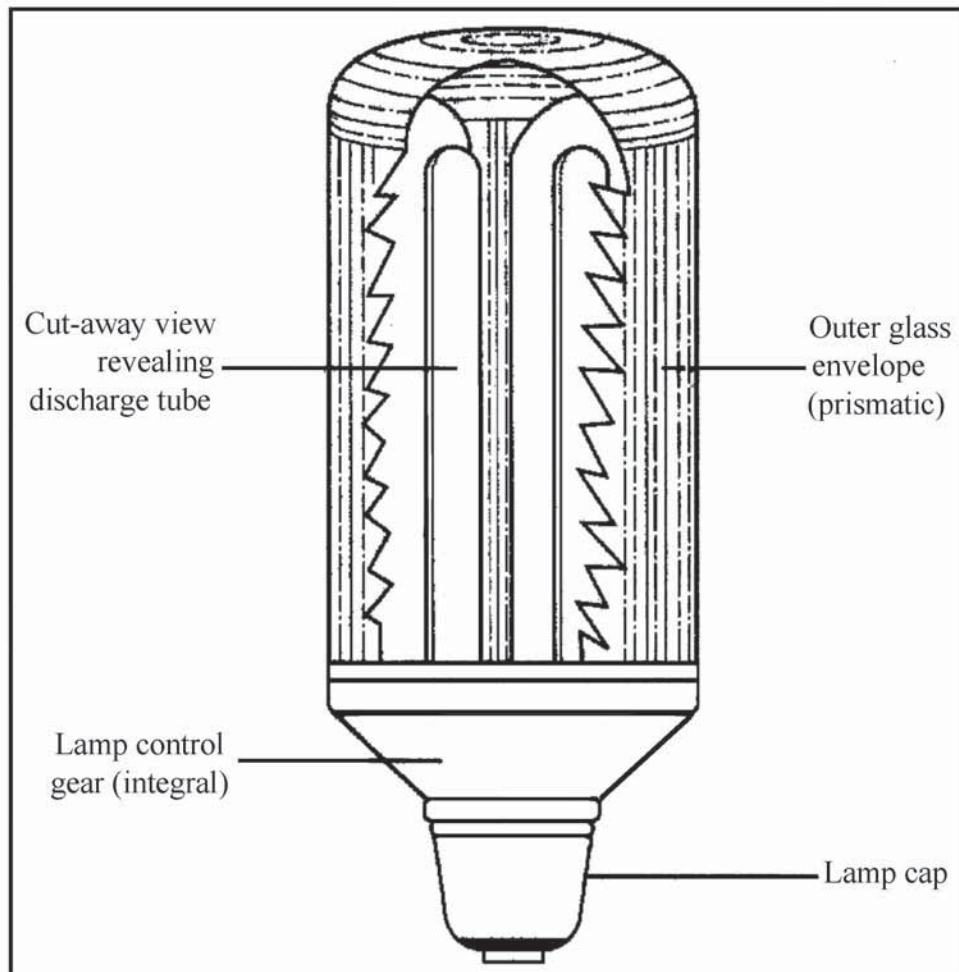


Figure 7 - Compact fluorescent lamp. Other forms are available.

Fluorescent lamps operated at high frequency can be used in energy management systems; it is usual to control the light output from them automatically in sympathy with the illuminance from the prevailing daylight so that in

combination the illuminance on the working plane in an interior remains approximately constant. The electrical power consumption of lamps and control gear (operating in combination) is correspondingly reduced when the light output is deliberately dimmed.

Twenty-six millimetre diameter fluorescent lamps use a combination of krypton and argon as the fill gas, typically in a 3 or 1 ratio. The fill gas aids starting in conventional or hot cathode lamps, since lamp starting is achieved by pre-heating the electrodes so as to create sufficient ionisation of the mercury vapour. Cold cathode lamps, often used in advertising signs, rely on a relatively high lamp voltage for establishment of the arc. Lamp life for cold cathode lamps is much greater than for hot cathode lamps.

The electrodes used for cold cathode lamps are typically plain nickel or iron cylinders, whose size is substantial in order to keep the current density at their surface to an acceptably low value.

High pressure mercury vapour lamps:

The constructional features of the high pressure mercury vapour lamp is shown in figure 8. At higher pressures the mercury discharge is predominantly concentrated in the blue and green regions of the visible spectrum, together with some ultraviolet wavelengths. The outer envelope of the lamp is usually coated with phosphor, which absorbs the ultraviolet emitted and converts it into wavelengths at the red end of the visible spectrum, where little is emitted by the discharge itself.

This has the effect of correcting the colour of the lamp and earlier forms of this lamp were often known as 'colour corrected mercury vapour lamps'.

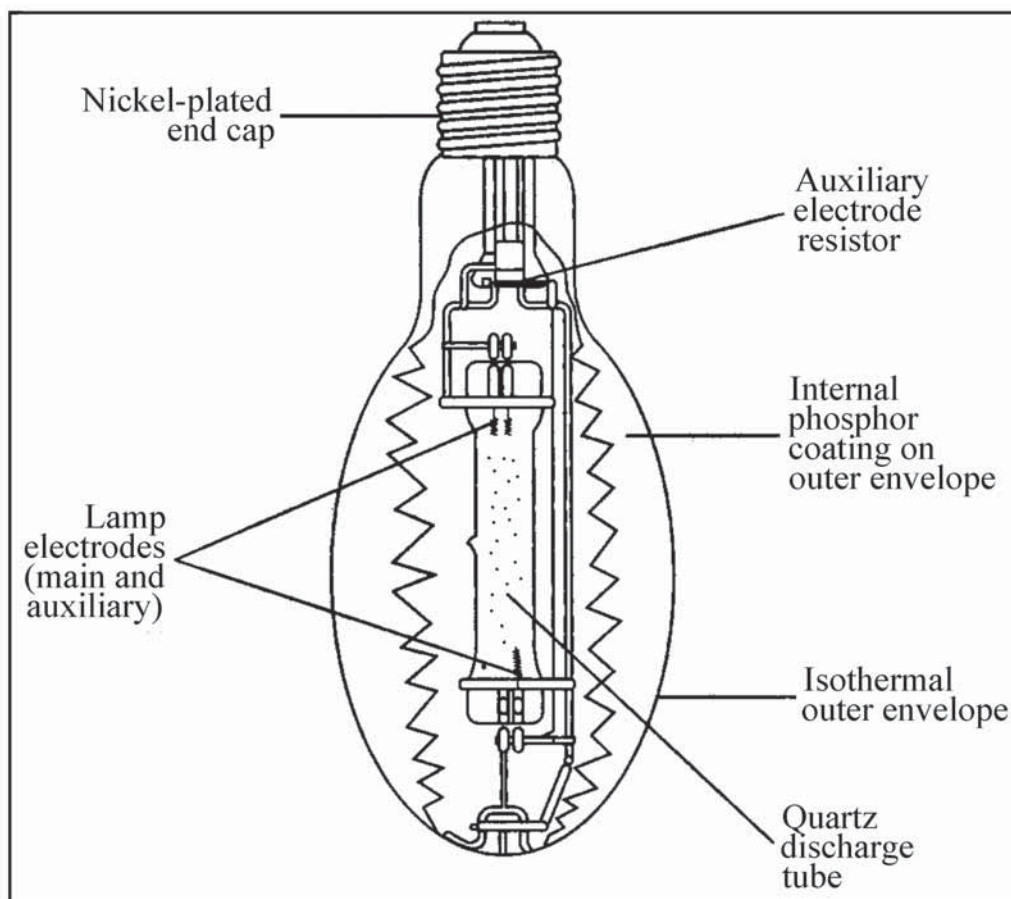


Figure 8 - High pressure mercury vapour lamp.

(To be Continued)

by Sri K.R. Govindan, Kavoori Consultants

(Paper presented at the National seminar on building code organised by ENFUSE and BEE July 2012)

The thing always happens that you really believe in; and the belief in a thing makes it happen. - FRANK LLOYD WRIGHT

SURGE PROTECTION

IEEMA had a brief interaction with Professor Dr. Ing. Volker Hinrichsen, Chairman of IEC TC 37 Committee on Surge Arresters. Interview by Mr. Rajeev N Ketkar, IEEMA, Mumbai.

Q: What is the significance of surge arresters in electrical power systems of the grid?

A: The power system cannot be managed without insulation coordination where the stresses arising from the system are compared to the strength of dielectric equipment. Surge arresters are the most important devices for insulation coordination. Usually over voltages in the switching and the lightning overvoltage range are so high that the equipment will not survive. It can partly be insulated against the occurring switching over voltages but definitely not against lightning over voltages as doing this would be totally uneconomical. Therefore, power systems without such arresters cannot be operated.

Q: From the point of view of bequeathing very large volumes of power from one region to another, only from the perspective of surge arresters, which system out of AC or HVDC, is more suitable?

A: Surge arresters have to adapt to the system requirements. If the power is to be transmitted over 1000 to 3000 kms, very high AC or DC voltage are required for better operations. This decision should not depend on available surge arrester technology. Surge arresters need to and can be developed as per system requirement.

Q: You are also the Chairperson of IEC Committee for surge arresters. Are there any kind of recommendations that IEC is making to the Indian grid operators and ESCOs?

A: The IEC standards are international standards and the approach to the standards is universal. However as in Europe, where the IEC standard is adopted to European standards, same can be done in other countries by having annexes to the IEC standards. Standardization is always made internationally and while adapting them for a certain country, the Committee needs inputs from that country. IEC is working on standardization for surge arresters for UHV, HVDC systems, to be adapted in India.

IEC 60071-1 which is the standard for insulation coordination, was arranged upto 800 KV level, a couple of years ago. The standard was adapted to the Chinese and Indian requirements taking into consideration the voltage levels of 1100 KV in China and 1200 KV in India. These two insulation levels were integrated.

Q: Being the keynote speaker at the conference on HV Surge Arresters, would you share your opinion on Indian transmission and distribution system on adherence to global practices and standards. Should there be some kind of common code that needs to be developed for setting up benchmarks and standards? What do you feel is really the gap area for various standards that need to be brought into the transmission and distribution system?

A: International rules should follow or at least take into account national practices and that is why we are keen that all interested parties to work in the working groups. India should also take part in the working groups in development of the standards to place their national needs and requirements. In arrester standardization, to date mainly European members as from Switzerland, Sweden, Germany, US and Japanese members participate in the working group where countries like China, India, Brazil should also be actively present. In the Arrester Committee, we are missing the Indian input besides others. You have a chance to give comments to both yes and no, through active participation in the voting process.

Q: You are looking at huge range of transmission voltages all the way from 110 KV to now we are looking at 1200 kV, it is incredible that there is no voice from the Indian side.

A: When you are working in a working group on standardization, it is a two-fold benefit as you learn from other countries and also give your feedback which Indians should realize. We don't want to make international standards which cover only Europe which is not the idea of IEC standards.

Q: We are also looking at a very ambitious smart grid project in India eventually going forward. In fact, anything in terms of smart grid metering standardization or voltage transmission systems standardization, or even the surge arresters for setting up something like this because I think an organization similar to yours is IEEE-SA which is currently in talks with various Indian stakeholders in this smart grid project.

In terms of standards, what kind of an experience would IEC perhaps be in a position to share with the stakeholders in the Indian smart grid space?

A: I think there is standardization of smart grids but I am not actively following that. There is something in IEEE-SA and there might be something in IEC which I don't follow. Smart grid is a wide area and if you ask 10 people what is a smart grid, you get 12 answers. There is no special aspect of smart grid for surge arresters as smart grid is just an electric power system which has a communication system overlaid and so on. Smart grid is just a power grid with a communication system and you have to just integrate your renewables and that is nothing new from an electrical point of view. It is a new operational concept with the same equipment.

Q: India witnessed a massive transmission failure leading to the collapse of three different grids within 48 hours affecting 700 million people in the month of August and the entire world knows about it. Once again, from the perspective of grid discipline and maintenance of various regional grids that are connected to one singular grid, is there any role that the surge arresters play in the maintenance of grids?

A: I don't think so. The surge arresters are there and they operate very calmly like a fuse, where nothing is moving. You never think about a fuse in your power system which helps in emergency cases. It is the same for arresters. An arrester that fails may cause a blackout but usually cannot prevent them. It is more an operational aspect. I don't think that surge arresters or more surge arresters, other surge arresters would have helped in all the blackouts which we know. To my information, I know about the blackout that we had in Italy a couple of years ago which was just due to poor maintenance of their overhead lines. It had been caused due to the trees which were not cut and there was a flash over to the tree. This is a problem of minimizing the cost or a wrong cost optimization. The trees should be cut so that they don't grow to an infinite height. The devices like circuit breakers or transformers may burn or explode especially when they are (too) old, but new equipment like the disconnectors, circuit breakers, surge arresters, instrument transformers usually don't contribute to blackouts.

Q: As you are in India to participate in the conference, what kind of an impact do you feel that a conference like this should have on the industry and from the perspective of your specialization, what kind of an experience would you want to share with the platform that such conference offers?

A: I tried to bring the point related to UHV arresters in the tutorials. Basically, a UHV arrester is just an arrester where technology is same and you apply metal oxide resistors. In this case, however, you have thousands of metal oxide resistors in one surge arrester where our special consideration remains on quality control, on controlling the potential distribution in the arresters, and some consideration is kept for insulation coordination protective distances. The arresters have limited protective distances where they are effective which I want to bring to the notice of the audience.

Q: Is India really not participating when you are making the standards. Through these conferences, do you think some sort of awareness can be generated to reach out to the engineers, actually to those levels of people who can come and participate in the voting or a more active participation? Do you think it is possible?

A: I think it will have some impact. I don't know why Indian utilities and manufacturers don't participate might be considering that their problem would not be discussed or it is too expensive. The transmission system operators have problems to send their engineers internationally to solve their national problems. But if you want to have impact on your national standards, you have to start with international standardization. If it is difficult to send people, then read at least the circulated documents, have questions, write down the comments and send it to IEC. Like other countries India should participate in their voting comments which are very nicely organized within IEC. There is a committee draft to give technical comments and at voting stage where it could be said "yes" or "no". There are many possible ways to have impact on standards. The engineers from India could work in the working groups by taking part in the voting process or write comments and send it to the IEC. A more active role of India would be definitely appreciated.

Q: What is your advice to the Indian manufacturers particularly of surge arresters? IEEMA is a body which represents the power equipment industry. 95 per cent of our members are from the T&D sector.

A: I don't know all the manufacturers. I know few big names for high voltage arresters. I had realized that they have smart designs and modern concepts. But if you compare it with the activities in China, they are trying to

develop new materials which have different electric characteristics in order to serve better the requirements in UHV. In India, maybe, they are making arresters according to modern design concept for polymeric housing but not with very newest metal oxide technology. I just realized that in China, there is very, very high activity to develop new materials. The core materials of the surge arresters are the metal oxide resistors and that might be the key for solving the problems which come in UHV arrester. The problem is that the arresters must have extremely low protection levels and they have to fight against high temporary over voltages at the same time for which you may need better or other protection characteristics. The development in this direction needs to take place. At a certain point, you find the conventional arresters where we have arrester technology for 30 years now that it may not be able to fulfill all the requirements with regard to low protection levels, may require new modern materials development. I also learned during the conference that quality problems, especially with live long sealing against moisture ingress, seem to be more severe than the world average for certain makes and designs. This might also be a field to work in.

Q: In China?

A: The Chinese are very active in publications which you must see relatively. When Chinese people write a publication it does not necessarily mean that they have practically solved the problem. I think the Indian people are more like Europeans. They don't go to the world and tell everybody that they have a new concept and make everything better than before. I think that is neither the Indian way nor the European way; but often that is the Chinese way today. If there is something a little bit better, they just write a couple of papers about it. What I request is just a reasonable thinking about the needs in making that development and write papers about it. But you have to also deliver a product that fulfills the requirements. From European point of view, I get Chinese publications very often but very seldom an Indian publication.

Q: Your views about the R&D practices in India as well.

A: I cannot give an answer because I mainly know the European practice. I don't know how it is implemented in India.

Q: Can you tell me about the new product development internationally may be in European market in the broad field of electrical equipment with which you are associated?

A: I think it was a challenge in itself to develop equipment for the UHV system. I am speaking about 1100 KV for China and speaking about 1200 KV for India and 800 KV DC for China. There has been some very exciting development in circuit breaker, instrument transformer, and power transformer. It was a challenge, of course, but more conventional approaches as long as it is AC, you have bigger sizes, some impact on designs, but that is more a conventional development of existing AC equipments. For DC, I think converter technology has developed very much. To say, we have in house voltage source controlled converter (VSC) named HVDC light or HVDC Plus which is used in Europe, to connect offshore wind power farms to the grid. They operate at 300-350 KVDC and their technology is VSC which means, for instance, that they can have a black start. They don't depend on power from an active grid to start the systems. They can start from the beginning. That was one of the most important developments to have a light HVDC system. The conventional HVDC point-to-point connections are making use of thyristors which is conventional technology. The VSCs are making use of IGBTs which can operate in totally different mode than thyristors. You can manage many more things with IGBTs.

The most important challenge for the future in my opinion would be the development of a DC circuit breaker. We have no DC circuit breaker so far. ABB has published that they have one but it is a prototype. And whenever we want to come away from just the DC line, as usually today, we need circuit breakers. We go from point A to point B with 2000 kms HVDC today. But we are not able to make a grid today with DC because the missing apparatus is a circuit breaker. In order to configure a grid network, you need disconnectors, circuit breakers and the circuit breakers for DCs are just not available. The problem is that it will be an incredibly expensive development. Therefore, the manufacturers are waiting for the grid and the grid people are waiting for the breaker. It is a closed loop unfortunately which is the next thing to come but a future. There is one prototype presented by ABB, not yet finalized, but under development.

Q: Do you think India is self reliant in producing state-of-the-art equipment that are used today in electrical segment?

A: I think engineering skills are very high in India so that should not be a problem. The problem may be the different approach which I can tell from European view. The Chinese are acting very aggressively. They say that

they want to have an 800 kV system and they make it. They want to have 1100 KV systems and they make it. They reproduce equipment. They have no problems buying equipment from anywhere and rebuilding it and making their own design from it. That is may be not good style from a non-Chinese point of view but it is a fact. Sometimes that is my feeling but I cannot prove it that Indians are a little bit on the other side. They are too calm, too moderate and take too much time. I just heard that the 1200 KV system maybe will come in 2015 or 2016. I am wondering why it takes so much time. The Chinese have installed it two years ago. I think the Indians have thought about it for a much longer time. It obviously takes much more time from the first idea to implementation in India, when you compare it with a much more progressive procedure in China. I don't want to compare India always with China. I have my critic of the Chinese approach. But I give lectures and tell my students every year that there will be a 1200 KV system in India but I don't know when and I have been telling it for five years now. When will it come? This is what is wondering me sometimes as why it is taking so much time. What is the problem? Is it money or is it that you believe you really don't need it? What is the reason for that? I strongly believe that the engineering skills are very high in India and easily sufficient to build the new 1200 kV system.

Q: Do you think the quality of surge arresters hamper power? Does it lead to some kind of loss in power transmission if an inferior quality of surge arrester is used?

A: It can. Modern surge arresters should have a failure rate which you nearly cannot count. They have excellent service records. If you are manufacturing according to the state-of-the-art, arrester failures usually don't happen. If they happen in a bigger quantity, let us say the failure rate in high voltage surge arresters becomes one or two per cent, that will have an impact on the system reliability. Whenever you have an arrester failure, there will be a short circuit in the substation. You have to remove the arrester in order to restart the service. A failing arrester could really have impact on the safe operation of the system.

Q: Are there any cheap electrical equipment in the world in the electrical market hampering the whole transmission system? You have surge arresters or electrical equipments of different brands from different manufacturers. There are cheap substitutes which are available.

A: We do know this in distribution, which sometimes is a problem because the distribution is a market where the prices are extremely low. The cost pressure is extreme and you have a wide variety of quality. In the distribution system, even the surge arresters may cause failure of the system. Surge arresters, because they are so simple, have a tendency to be too lean because everybody who can mould a holding over a stick can say I make a surge arrester. I buy metal oxide resistors and out a holding on sides and I sell surge arresters. So the quality can be made very, very poor. But then, it also depends on the customer. In distribution, the customers very often purchase by price; they take the cheapest offer. In high voltage, it is a different case. In high voltage, you have acceptance tests, specifications and so, the risk is not that high in high voltage. I don't think if I have to identify which were the devices which make the biggest problem in the system. I think the main problem is that the equipment, in some cases, is too old. If you have modern devices, for instance instrument transformers, circuit breakers etc., you will have reliable operation of the system. The point is that devices of the system are sometimes 50-60 years old. They were designed for 30 years lifetime. After 30 years, they are almost free and you cannot keep the transmission system operate continuously making it very cheap. The age of the existing equipment and not the quality of the new equipment is in most cases the problem. So sometimes, it should be more often replaced which is, of course, an optimization process of economic decision. To my information, whenever we have failures, for example Europe for which I get information about, the reason is too old equipment, transformers and circuit breakers of 25 years failed, and sometimes, they are 40 years old. Aged equipment is the main problem.

At the end...

Never forget, I am far away in Europe and I have a very special European view and the view depends on the degree of information. I am not quite sure that I am really informed about everything that happens here in India. That may be a point of view which has no sound base. Therefore, when I am critical, I have to be careful. I cannot say this is wrong or that is wrong because I cannot prove it. It is just an impression. It is maybe a subjective point of view. I don't want to blame anybody here. I just told you what my impression is. That is not always based on real information, sometimes which is subjective. But that is what you see from Europe.

Courtesy: Ieema Journal, Jan 2013



TAMILNADU ELECTRICAL INSTALLATION ENGINEERS ASSOCIATION 'A' GRADE

OUR PUBLICATIONS

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4	(1) Installation of Captive generator (2) Electricity H.V. & M.V. Installation Proposals (3) Precautionary Measures to be taken in Design & Installation of building services including Electrical Services (4) The Indian Standard Specification	90
5	Self Certification Procedure	60
6	1. Allowable Current Density in Bus Bar Installations 2. Electricity-Details on Implementation of renewable Energy Devices 3. Electricity-Electrical Inspectorate service rendered by Inspectorate scale of fees 4. Electricity-Captive Power Plant of Industries and other consent	50
7	1. Electricity Guidance Notes for New, Extension to Existing or Modification of Electrical Work 2. Indian Electricity Act 1910 & Rules 1956 Statutory Appeal	90
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16	A Treatise on Power Quality with a Focus on Harmonics	300

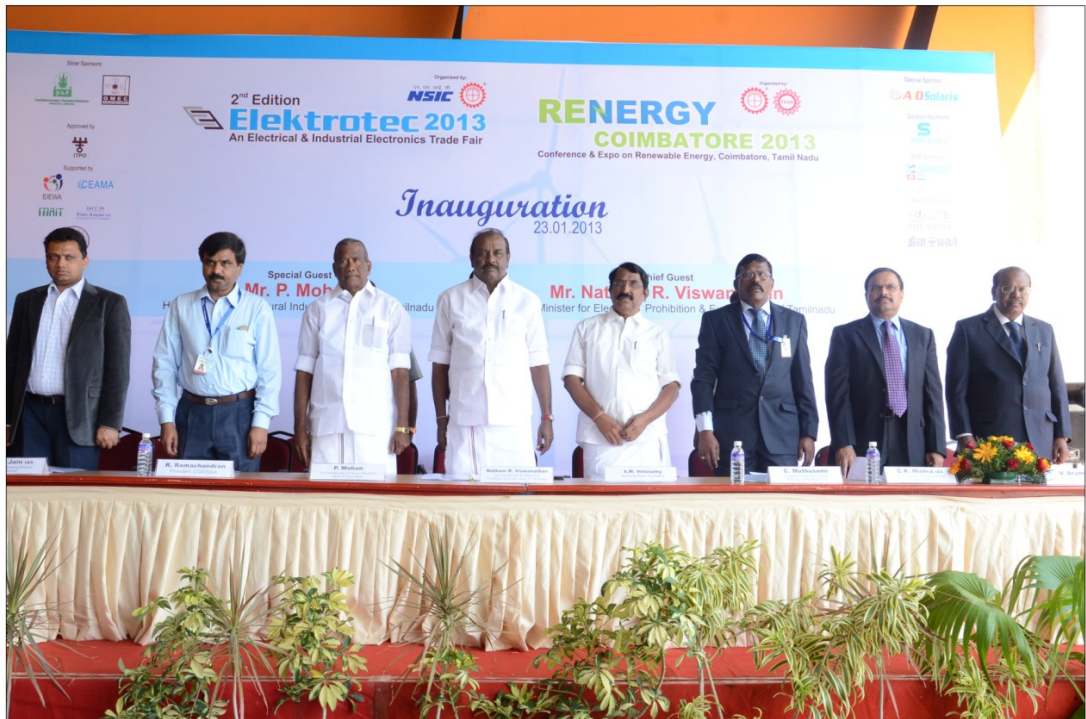
OTHER PUBLICATIONS

1	National Electric Code 2011 (NEC 2011)	4,070
2	National Lighting Code 2010 (NLC 2010)	3,370
3	Saving of Electricity by System Management	450

N.B. Packing & Forwarding charges Extra

PLEASE NOTE: Outstation members are requested to send the payment by D.D. only in favour of "TAMILNADU ELECTRICAL INSTALLATION ENGINEERS ASSOCIATION 'A' GRADE"

ELEKTROTEC 2013



INAUGURAL FUNCTION - L to R: Shri. Sudeep Jain, I.A.S., Chairman cum Managing Director, TEDA, Chennai, Shri. R. Ramachandran, President, CODISSIA, Shri. P. Mohan, Hon'ble Minister for Rural Industries, Govt. of Tamil Nadu, Shri. Natham R. Viswanathan, Honourable Minister for Electricity, Prohibition & Excise, Govt. of Tamilnadu, Shri. S.M. Velusamy, Mayor, Coimbatore, Shri. C. Muthusami, Chairman Elektrotec 2013 & Renergy Coimbatore 2013, Shri. C.K. Mishra IAS, Joint Secretary, Ministry of MSME, New Delhi, Shri. V. Arumugam, Zonal General Manager, NSIC, Chennai



MINISTERS at THE TANGEDCO PAVILION

ELEKTROTEC 2013

Elektrotec 2013 was the 2nd edition of Electrical & Industrial Electronics Fair being brought out by CODISSIA – The Coimbatore District Small Industries Association and NSIC, Government of India and is one of the largest electronics sector trade events in India. The fair focused on the technology that would enhance the energy efficiency and help in energy conservation which is the need of the hour.

There was also a Parallel Event on Renewable Energy titled “**RENERGY COIMBATORE 2013**” jointly with the **Tamilnadu Energy Development Agency, Government of Tamilnadu** which focused on the green energy products.

The fair was Inaugurated on 23rd Jan 2013 at 10.30 am

Felicitation Address was made by **Shri. V. Arumugam**, Zonal General Manager, NSIC, Chennai & **Shri. Sudeep Jain**, I.A.S., Chairman cum Managing Director, TEDA, Chennai.

Presidential Address was given by **Shri. C.K. Mishra**, IAS, Joint Secretary, Ministry of MSME, New Delhi

Special Address & Release of Elektrotec 2013 Fair Directory was by, **Mr. P. Mohan**, Hon'ble Minister for Rural Industries, Govt. of Tamil Nadu who was the **Guest of Honour**

Release of RENERGY COIMBATORE 2013 Fair Directory was by Chief Guest **Mr. Natham R. Viswanathan**, Honourable Minister for Electricity, Prohibition & Excise, Govt. of Tamilnadu.

Both Elektrotec and Renergy Coimbatore 2013 featured high proportion of latest technology exhibits and had a comprehensive product range from market leaders in India and abroad. Both these fairs had a confluence of solution providers, traders / distributors, industrial & engineering establishments in addition to concerned government departments. In addition, the future oriented information exchange, discussions, decisions, buying – selling and investments also had taken place.

Both Elektrotec and Renergy Coimbatore 2013 fairs had exclusive Technical Seminars where industry leaders shared their experience and views with the delegates for the enlightenment of all.

The following Technical Seminars are conducted:

- ELECTRICAL SAFETY FOR INDUSTRIAL APPLICATIONS by Sahar Power Solution, Tirupur
- SELECTION OF SOLAR POWER SYSTEMS FOR INDUSTRIAL, COMMERCIAL AND DOMESTIC APPLICATIONS by Mr. T.N. SIVAKUMAR, Energy Control Corporation, Coimbatore
- DEFENCE BUSINESS FOR MSMEs by Col K.V. Kuber (Retd), Consultant, NSIC, New Delhi
- POWER SAVING CONCEPT BY LED LAMPS by HAVELLS Limited
- ENERGY MONITORING, ANALYSIS AND SOLUTION FOR EFFECTIVE SAVINGS by Sri Boomidurga Marketing (P) Ltd
- LV CIRCUIT BREAKERS and its FEATURES by INDO ASIAN Limited
- STRATEGY ON POWER MANAGEMENT PANEL DISCUSSION by TANGEDO & TANTRANSO with Industrial Experts
- PRESENT POWER POSITION IN TAMILNADU by Mr. S. Gandhi, President, Power Engineers Society of Tamilnadu, Coimbatore
- HARMONICS & IMPLEMENTATION by Mr. V. Dhanaraj, B.E., FIE, Addl. Chief Engg TNEB (Retd)

Total No. of Stall - 221 Stalls; Area - 3176 Sq. Mt.;

No. of Business Visitors - 7800; No. of General Visitors - 15,000;

Business Enquiries Generated - INR 200 Crores (Approx)

EARTHING - 1

FOREWORD

Earthing provides safety of persons and apparatus against earth faults. Any system is characterised by the type of distribution system, which include types of systems of live conductors and types of system earthing. The different types of earthing systems are also covered. The choice of one system or the other would depend on several considerations as each offer different degree of performance/safety.

This Code summarises the essential requirements associated with earthing in electrical installations. These relate to general conditions of soil resistivity, design parameters of earth electrode, earth bus and earth wires and methods of measurements. Particular requirements for earthing depending on the type of installation are covered in respective Sections of the Code.

1 SCOPE

This Code covers general requirements associated with earthing in electrical installations. Specific requirements for earthing in individual installations are covered in respective Parts of the Code.

NOTES

1. *This Section shall be read in conjunction with the provisions of IS 3043.*
2. *Additional rules applying to earth leakage circuit-breaker systems are covered in Annex A.*

2 REFERENCES

For further details, the following standards may be referred:

<i>IS. No.</i>	<i>Title</i>
732: 1989	Code of practice for electrical wiring installations (third revision)
3043: 1987	Code of practice for earthing (first revision)
IS 8437(Part 1) : 1993	Guide on effects of current passing through human body: Part 1 General aspects
IS 8437(Part 2) : 1993	Guide on effects of current passing through human body: Part 2 Special aspects
IS/IEC 60947 - 2 :2006	Low voltage switchgear and controlgear: Part 2 Circuit breakers
IS/IEC 60947-4-1:2002	Low-voltage switchgear and controlgear: Part 4 Contactors and motor-starters, Section 1 Electromechanical contactors and motor-starters

3 GENERAL REMARKS

3.0 General

3.0.1 The subject of earthing covers the problem relating to the conduction of electricity through earth. The terms earth and earthing have been used in this Code, irrespective of reliance being placed on the earth itself, to denote a low impedance return path of the fault current. As a matter of fact, the earth now rarely serves as a part of the return circuit but is being used mainly for fixing the voltage of system neutrals. The earth connection improves service continuity and avoids damage to equipment and danger to human lives.

3.0.2 The object of an earthing system is to provide as nearly as possible a surface under and around a station which shall be at a uniform potential and as nearly zero or absolute earth potential as possible. The purpose of this is to ensure that in general all parts of apparatus, other than live parts, shall be at earth potential, as well as to ensure that operators and attendants shall be at earth potential at all times. Also by providing such an earth surface of uniform potential under and surrounding the station, as nearly as possible, there can exist no difference of potential in a short distance big enough to shock or injure an attendant when shortcircuits or other abnormal occurrence take place.

3.0.3 Earthing associated with current-carrying conductor is normally essential to the security of the system and is generally known as system earthing, while earthing of non-current carrying metal work and conductor is essential to the safety of human life, of animals and of property and is generally known as equipment earthing.

3.0.4 Earthing shall generally be carried out in accordance with the requirements of *Indian Electricity Rules*, 1956 as amended from time to time, and the relevant regulations of the electricity supply authority concerned. The following clauses of *The Indian Electricity Rules*, 1956 are particularly applicable: 32, 51, 61, 62, 67, 69, 88 (2) and 90.

3.0.5 All medium voltage equipment shall be earthed by two separate and distinct connections with earth through an earth electrode. In the case of high and extra high voltages the neutral points shall be earthed by not less than two separate and distinct connections with earth each having its own electrode at the generating station or sub-station and may be earthed at any other point provided no interference is caused by such earthing. If necessary, the neutral may be earthed through a suitable impedance.

3.0.5.1 In cases where direct earthing may prove harmful rather than provide safety (for example, high frequency and mains frequency coreless induction furnaces), relaxation may be obtained from the competent authority.

3.0.6 Earth electrodes shall be provided at generating stations, substations and consumer premises in accordance with the requirements.

3.0.7 As far as possible all earth terminals shall be visible.

3.0.8 All connections shall be carefully made; if they are poorly made or inadequate for the purpose for which they are intended, loss of life or serious personal injury may result.

3.0.9 Each earth system shall be so devised that the testing of individual earth electrode is possible. It is recommended that the value of any earth system resistance shall not be more than 5.0, unless otherwise specified.

3.0.10 It is recommended that a drawing showing the main earth connection and earth electrodes be prepared for each installation.

3.0.11 No addition to the current-carrying system either temporary or permanent, shall be made, which will increase the maximum available earth fault current or its duration until it has been ascertained that the existing arrangement of earth electrodes, earth busbar, etc, are capable of carrying the new value of earth fault current which may be obtained by this addition.

3.0.12 No cut-out, link or switch other than a linked switch arranged to operate simultaneously on the earthed or earthed neutral conductor and the live conductors shall be inserted on any supply system. This however, does not include the case of a switch for use in controlling a generator or a transformer or a link for test purposes.

3.0.13 All materials, fittings, etc, used in earthing shall conform to Indian Standards wherever these exist. In the case of materials for which Indian Standard specifications do not exist, the materials shall be approved by the competent authority.

3.1 Design Considerations

3.1.1 System Earthing

3.1.1.1 The regulations that every medium, high and extra high voltage equipment shall be earthed by not less than two separate and distinct connections with earth is designed primarily to preserve the security of the system by ensuring that the voltage on each live conductor is restricted to such a value with respect to the potential of the general mass of the earth as is consistent with the levels of insulation applied. Distinct connection with the earth shall be provided for lightning protection system for buildings or other installations. Distinct earthing system shall be provided for centralized electronic system of any building.

3.1.1.2 The earth system resistance should be such that when any fault occurs against which earthing is designed to give protection, the protective gear will operate to make the faulty portions of plant harmless. In most cases such operation involves isolation of the faulty main or plant by circuit-breaker or fuses. In the cases of underground system there may be no difficulty, but in the case of overhead line system protected only by fuses there may be difficulty in so arranging the value of the earth resistance that a conductor falling and making good contact with earth shall cause the fuses in the supply to operate.

NOTE: *Earthing may not give protection against faults which are not essentially earth faults. For example, if a phase conductor of an overhead spur line breaks, and the part remote from the supply falls to the*

ground, it is unlikely that any protective gear relying on earthing will operate since the major fault is the open-circuit against which earthing gives no protection.

3.1.2 Equipment Earthing

The object of equipment earthing is to ensure effective operation of the protective gear in the event of leakage through such metal work, the potential of which with respect to neighbouring objects may attain a value which would cause danger to life or risk of fire.

3.1.3 Soil Resistivity

3.1.3.1 The resistance to earth of an electrode of given dimensions is dependent on the electrical resistivity of the soil in which it is installed. It follows, therefore, that an overriding consideration in deciding which of the alternative methods of protection is to be adopted for a particular system or location is the soil resistivity in the area concerned.

3.1.3.2 The type of soil largely determines its resistivity and representative values for soils generally found in India are given at Annex B. Earth conductivity is, however, essentially electrolytic in nature and is affected therefore by moisture content of the soil and its chemical composition and concentration of salts dissolved in the contained water. Grain size and distribution and closeness of packing are also contributory factors since they control the manner in which the moisture is held in soil. Many of these factors vary locally and some seasonally and, therefore, the values given in Annex B should be taken only as a general guide. Local values should be verified by actual measurement and this is especially important where the soil is stratified, as owing to the disposition of earth current, the effective resistivity depends not only on the surface layers but also on the underlying geological formation.

3.1.3.3 The soil temperature also has some effect on soil resistivity but is important only near and below freezing point, necessitating the installation of earth electrode at depths to which frost will not penetrate.

3.1.3.4 While the fundamental nature and properties of a soil in a given area cannot be changed, use can be made of purely local conditions in choosing suitable electrode sites and of methods of preparing the site selected, to secure optimum resistivity. Reference is drawn to IS 3043.

3.1.4 Potential Gradients

It is necessary to ensure, especially in case of large electrical installations, that a person walking on the ground or touching an earthed object, in or around the premises shall not have large dangerous potential differences impressed across his body in case of a fault within or outside the premises. Such danger may arise if steep potential gradients exist within the premises or between boundary of the premises and an accessible point outside. For this the step potential and touch potential should be investigated and kept within safe limits. Within an earthing grid, the step and touch potentials may be lowered to any value by reducing the mesh interval of the grid. The situation is more difficult in the zone immediately outside the periphery where the problems may exist even for the theoretical case of a single plate covering the sub-station area. This problem may be serious in small station where the grid may cover only a limited area. Attempts should be made to design a substation so as to eliminate the possibility of touch contact beyond the earth-system periphery, when the limitations on step potential become less exacting. While assessing the touch potential, the method of earthing of the object touched, for example, whether it is earthed directly below or remotely should be kept in view in order to consider the possibility of occurrence of large potential differences. Special attention should be paid to the points near the operating handles of apparatus and, if necessary, potential equalizer grillages of closer mesh securely bonded to the structure and the operating handle should be buried below the surface where the operator may stand when operating the switch.

3.1.5 At consumer's premises where the apparatus is protected by fuses, the total earth circuit impedance shall not be more than that obtained by graphs given in Fig. 1.

4 EARTH ELECTRODES

4.1 Material

4.1.1 Although electrode material does not affect initial earth resistance, care should be taken to select a material which is resistant to corrosion in the type of soil in which it will be used.

4.1.2 Under ordinary conditions of soil, use of copper, iron or mild steel electrodes is recommended.

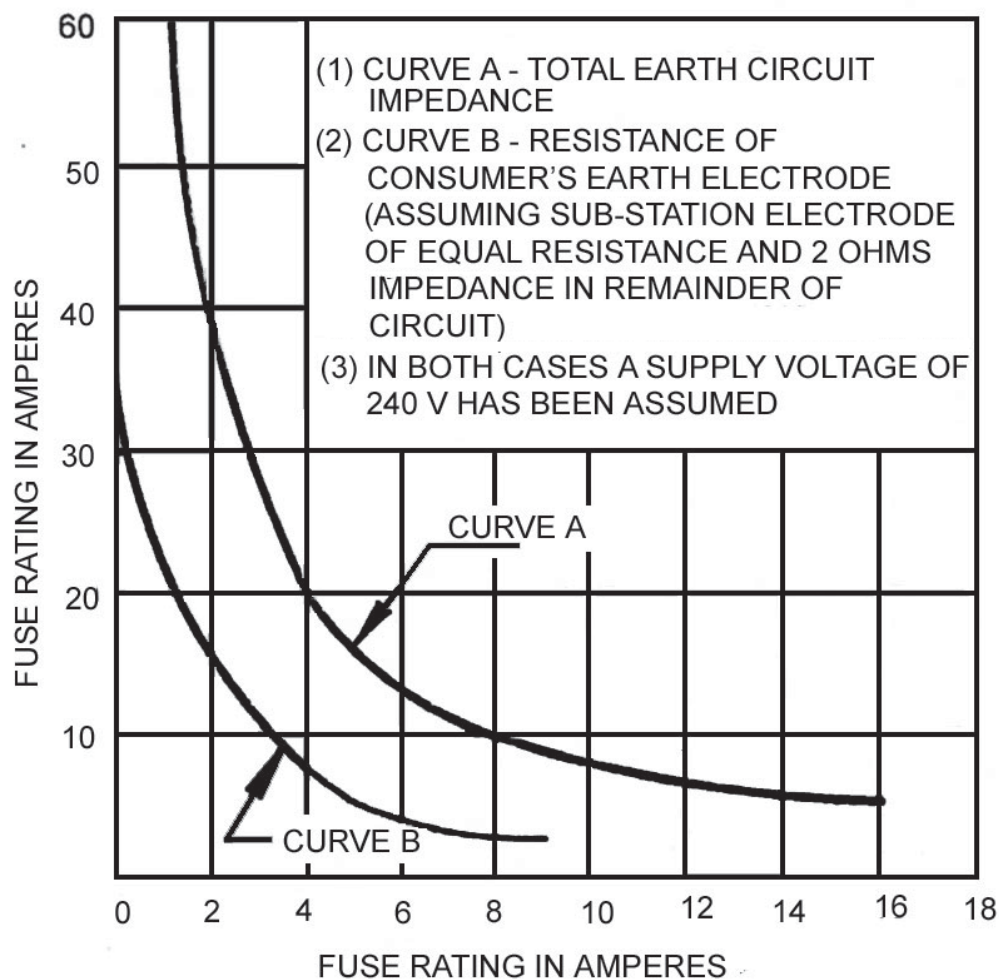


Fig.1: Recommended Earth Circuit Impedance of Resistance for Different Values of Fuse Rating

4.1.3 In cases where soil conditions point to excessive corrosion of the electrode and the connections, it is recommended to use either copper electrode or copper clad electrode or zinc coated (galvanized) iron electrodes.

4.1.4 In direct current system, however, due to electrolytic action which causes serious corrosion, it is recommended to use only copper electrodes.

4.1.5 The electrode shall be kept free from paint, enamel and grease.

4.1.6 It is recommended to use similar material for earth electrodes and earth conductors or otherwise precautions should be taken to avoid corrosion.

4.2 Current Loading

4.2.1 An earth electrode should be designed to have a loading capacity adequate for the system in which it forms a part, that is, it should be capable of dissipating without failure, energy in the earth path at the point at which it is installed under any condition of operation of the system. Failure is fundamentally due to excessive rise of temperature at the surface of the electrode and is thus a function of current density and duration as well as electrical and thermal properties of soil.

4.2.2 Two conditions of operation occur in system operation, namely;

- a) Long duration overloading as with normal system operation, and b) Short time overloading as under fault conditions in directly earthed system.

"The greater danger for most of us lies not in setting our aim too high and falling short; but in setting our aim too low, and achieving our mark." - MICHELANGELO

4.3 Voltage Gradient

4.3.1 Under fault conditions the earth electrode is raised to a potential with respect to the general mass of the earth. This results in the existence of voltages in the soil around the electrode which may be injurious to telephone and pilot cables whose cores are substantially at earth potential owing to the voltage to which the sheaths of such cables are raised. The voltage gradient at the surface of the earth may also constitute danger to life.

4.3.2 Earth electrodes should not be installed in proximity to a metal fence to avoid the possibility of the fence becoming live, and thus dangerous at points remote from the substation, or alternatively giving rise to danger within the resistance area of the electrode which can be reduced only by introducing a good connection with the general mass of the earth. If the metal fence is unavoidable, it should be earthed.

4.4 Types of Earth Electrodes

The following types of earth electrodes are considered standard:

- a) Rod and pipe electrodes,
- b) Strip or conductor electrodes,
- c) Plates electrodes, and
- d) Cable sheaths.

For details regarding their design, reference shall be made to IS 3043.

4.5 Design Data on Earth Electrodes

4.5.1 The design data on the various types of earth electrodes is given in Table 1.

Table 1 Design Data on Earth Electrodes

(Clause 4.5.1) All dimensions in millimetres

Sl. No.	Measurement	Types of Electrodes				
		Rod	Pipe (see Note 1)	Strip	Round Conductor	Plate (see Note 2)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Diameter (not less than)	16 mm ¹⁾	38 mm ¹⁾	—	—	—
		12.5 mm ²⁾	100 mm ²⁾	—	—	—
ii)	Length of conductor/rod	3 500 mm	3 500 mm	500 mm	15 000 mm	1 500 mm
iii)	Depth upto which buried	3 750 mm	3 550 mm			3 200 mm
iv)	Size	—	—	25 mm x 1.60 mm ²⁾ 25 mm x 4 mm ¹⁾	3.0 mm ^{2 2)} 6 mm ^{2 1)}	1 200 mm x 1200 mm ³⁾ 600 mm x 600 mm ¹⁾
v)	Thickness	—	3.15 mm ¹⁾	—	—	6.30 mm ²⁾ 3.5 mm ¹⁾

1) Steel or galvanized iron. 2) Copper. 3) Cast iron

NOTES

1 A typical illustration of pipe earth electrode is given in Fig.2.

2 A typical illustration of plate electrode is given in Fig.3. If two or more plates are used in parallel, they shall be separated by not less than 3.0 m.

3 Adequate quantity of water to be poured into sump every few days to keep the soil surrounding the earth pipe permanently moist.

4.5.2 Effect of Shape on Electrode Resistance

The resistance of any electrode buried in the earth is in fact related to the capacitance of that electrode and its image in free space. The relationship is given by:

$$R = \frac{100 \rho}{4 \pi C}$$

where R = resistance in an infinite medium; ρ = resistivity of the medium (soil); in ohmmetre; and C = capacitance of the electrode and its image in free space.

In practical case, the capacitance is divided into two by the plane of earth's surface so that,

$$R = \frac{100 \rho}{4 \pi C}$$

a) For rod or pipe electrodes, the formula is

$$R = \frac{100 \rho}{4 \pi C} \log_e \frac{2l}{d} \text{ ohms}$$

where l = length of rod or pipe, in cm; and d = diameter of rod or pipe, in cm.

b) For strip or round conductor electrodes,

$$R = \frac{100 \rho}{4 \pi C} \log_e \frac{4l}{d} \text{ ohms}$$

where l = length of the strip, in cm; and t = width (strip) or twice the diameter (conductors), in cm.

c) For plate electrodes,

$$R = \frac{\rho}{4} \sqrt{\frac{\pi}{A}} \text{ ohms}$$

where A = area of both sides of plate, in m².

4.5.3 Effect of Depth of Burial

To reduce the depth of burial without increasing the resistance, a number of rods or pipes shall be connected together in parallel (*see* Fig.4). The resistance in this case is practically proportional to the reciprocal of the number of electrodes used so long as each is situated outside the resistance area of the other. The distance between two electrodes in such a case shall preferably be not less than twice the length of the electrode.

5 EARTH BUS AND EARTH WIRES

5.0 General

5.0.1 The minimum allowable size of earth wire is determined principally by mechanical consideration for they are more liable to mechanical injury and should therefore be strong enough to resist any strain that is likely to be put upon them.

5.0.2 All earth wires and earth continuity conductors shall be of copper, galvanized iron, or steel or aluminium.

NOTE: *Bare aluminium shall not be used underground.*

5.0.3 They shall be either stranded or solid bars or flat rectangular strips and may be bare provided due care is taken to avoid corrosion and mechanical damage to it. Where required, they shall be run inside metallic conduits.

(To be Continued)

Courtesy: National Electrical Code 2011

*The fundamental concept in social science is Power, in the same sense in which
Energy is the fundamental concept in Physics.*

HELP LINE

Query:

While disposing Fluorescent Lamps & CFLs, what are the precautions to be taken & why?

Mr. Dinesh, Maruthi Electricals, Chennai

Explanation:

The fluorescent light bulbs containing mercury emits UV radiation when electrically excited. This UV radiation interacts with the chemicals present on the inside of the bulb, thereby producing light.

Mercury is a neurotoxin and it can be hazardous if released into the environment. There are no proper ways to dispose Mercury. A light bulb contains approximately 5mg of mercury & this could contaminate approximately 1,90,000 litres of water.

Mercury is a volatile metal and it is present everywhere. If a CFL bulb is broken accidentally, it can release mercury into the environment. The US EPA has given information on how to clean up a broken CFL. It suggests us to use rubber gloves, keep the windows open and double bagging the broken pieces.

The radiation from the UV and blue light emitted from CFL is a risk to people suffering from skin ailments because it aggravates the symptoms because of exceptional sensitivity to light. It is advised to use double envelope CFLs which largely mitigates any other risks.

The British Dermatological Association has advised people with skin disease to use Incandescent light bulbs because there are skin sensitive issues with the usage of Fluorescent bulbs with mercury. Mercury is neuro-toxic substance and linked to a wide range of health effects, including irreversible damage to the human nervous system. The severity of health effects from mercury exposure is influenced by the following factors:

- (i) Chemical form of mercury, i.e., inorganic or organic mercury,
- (ii) Dose,
- (iii) Age of the person exposed,
- (iv) Duration of exposure,
- (v) Route of exposure i.e., inhalation, ingestion, dermal contacts, and
- (vi) Health of the person exposed

It is estimated that total Mercury consumption in FTL sector is around 7.5 MT Hg /annum, (considering about 250 million units/annum of production and average 30 mg of Mercury in each FTL). Consumption in CFL sector is around 1.0 MT Hg /annum, considering about 200 million units /annum of production and average 5 mg of Mercury in each CFL. Also with inadequate ways to dispose these bulbs we are creating a Mercury Time bomb.

International Practices for Mercury Management in FL Sector:

As per the available information in the international scenario on collection, handling, transportation, treatment and disposal of mercury-bearing lamps, most western countries follow the WEEE. (Waste Electrical & Electronics Equipment) Directives based on the concept of Extended Producers' Responsibility.

USA has independent market-oriented system, where the consumer is required to pay money and put efforts, both, for collection, transportation, treatment and disposal at the recycling centres recognized by the concerned regulatory authority.

Germany follows The Recovery and Disposal Act for recycling the used FLs, in the special Lamp Recycling Facilities developed under the 'Law of Waste Production and Consumption'. However, the exact details, on the actual system of collection & recycling process and the agency responsible for this, could not be accessed.

In **Sweden**, as per the 'Waste Ordinance', the responsibility for the collection, treatment, recycling and disposal of used FLs rests with the producers.

In **Finland**, as per the WEEE Directive being followed, the Municipalities have an obligation to arrange collection of FLs and other Hg containing wastes from households and the waste lamps are being treated only by a company authorized for handling hazardous waste.

Japan follows the 'Law for Promotion of Effective Utilization of Resources', with the collection of used lamps through local governing bodies and treatment/disposal through common authorized lamp recycling facilities.

China follows the 'Law of Environmental Protection'; however, the exact details on the system for recycling process could not be accessed. The Waste Disposal Act is implemented in Taiwan for the recycling of used fluorescent lamps. As per this Act, the Retailers are responsible for the operation of collection centres, whereas authorized recycling facilities are responsible for the lamp recycling/disposal process.

In **India** still we are in the process of evolving new strategy for effective disposal of used FL / CFLs. Governments around the world should insist manufacturers to produce light bulbs that are electromagnetically clean and contains no toxic chemicals.

HELP LINE

We are happy to announce our Helpline to serve our
Members / Readers.

This Helpline shall provide you guidelines for your
Electrical Related queries.

We shall try to provide solutions for your queries
from replies sought from Experts in respective fields.

Since most of the queries shall be location specific.
We request you to clarify the replies published,
with Local Authorities.

We request you to treat these replies only as
guidelines.

We look forward to serve you better.

Please send your queries to our mail id:
tneleengrassn@vsnl.net

THE SUN GOD SURE HAS A SOLUTION FOR TN



Anticipating the difficult power situation, Ms. Jayalalithaa unveiled in October 2012 an ambitious plan for 1000 MW of solar power. To be administered by the Tamil Nadu Energy Development Agency (TEDA) and TANGEDCO, the plan has met with lukewarm response from solar energy developers because of ambiguities in pricing and other uncertainties. Tenders for only 500 MW from eligible private developers are being processed. Ultimately, solar power from the developers is expected to flow into the State grid by the end of 2013. The situation is bleak for the coming summer.

Power shortage has affected all categories of consumers, big and small. It's a fallacy that shutdowns reduce *power consumption*. The widely used standby power system — battery, inverter combination, for periods ranging from one to six hours for households, schools, hospitals, small business

establishments and government offices — actually takes power *in advance from the same supply mains* and stores it in the battery. Power is saved only where this is inadequate and diesel engines are used. So the standby power cannot cope with shutdowns of 8-12 hours in force in many parts of the State.

Fortunately, the solar plan for Tamil Nadu includes decentralised captive power generation by rooftop systems for *in situ* consumption by individual households. This can either be independent of the grid (off-grid) or supplement the grid. A generation-based incentive of Rs. 2 a unit is planned for off-grid solar PV installations with a TANGEDCO approved meter.

As an illustrative example, a 3BHK residence needs about 300 units a month for efficient CFL lighting, fans, low wattage (300 watts) kitchen appliances, a small TV & refrigerator and washing machine. Air-conditioners are excluded in this estimate. A properly installed 2.5-kWp solar PV system generates 10-15 kWh (units) during 8 a.m.- 4 p.m. on a sunny day (ie., 300-450 units a month). For high consumption electrical appliances, the household may have to depend on the grid supply but the monthly consumption will definitely move to the lower tariff slab and make a big difference to the net bill.

A million houses or apartments in Tamil Nadu installing similar rooftop systems will reduce the power demand from the grid by more than *10 million units* (kWh) a day and enable shorter and less frequent shutdown periods. Similar rooftop systems of bigger capacities if installed in educational institutions, hospitals, and government offices for captive use could conserve hundreds of millions of units (kWh) and will result in considerable relief all round until the planned thermal stations, solar parks and solar power plants become operational.

Bank can chip in

A good 2.5-kWp system costs Rs 2.5-Rs. 3 lakh approximately. Already burdened with an ever-increasing cost of living, the middle class will find it difficult to pay this amount upfront. Public sector banks, which offer car and two-wheeler loans with attractive EMIs, can make a contribution to Tamil Nadu's solar plan by offering loans for rooftop solar systems at low and affordable interest rates, say, 3 or 4 per cent. Foolproof modalities could be worked out for direct payment to the installing company and recovery of the loan from the user in affordable EMIs in five years.

Loans for buying cars and two-wheelers are meant for increased production of personal transport which, besides increasing traffic density, heavily pollutes the environment. On the other hand, assistance by banks to solar and wind power generation will contribute to green economy by reducing carbon emission, and resulting pollution and fossil fuel consumption.

For this plan to be succeed, rooftop PV systems must become mandatory for residential buildings, single houses or apartment buildings with an adequate terrace area exposed to the sun for at least six hours; and not affected by the shadow of adjacent buildings during 9 a.m.-4 p.m; and this mandate is linked to the bank loan.

The State/Central governments must encourage banks to extend low interest loan facility for systems not exceeding 4 kWp per household. It must also exempt PV solar developers, installers, and users from the VAT and service taxes.

Decentralised power generation from a large number of rooftop PV installations will result in a win-win scenario for citizens, the solar panel industry, and the government. And the banks, too, can claim carbon credit!

(D.V. Subramanian is a retired meteorologist. email: dvsmani1229@gmail.com)

Courtesy: The Hindu, dt: 20.01.2013

ENERGY STORY IN BRIEF (Part 28)

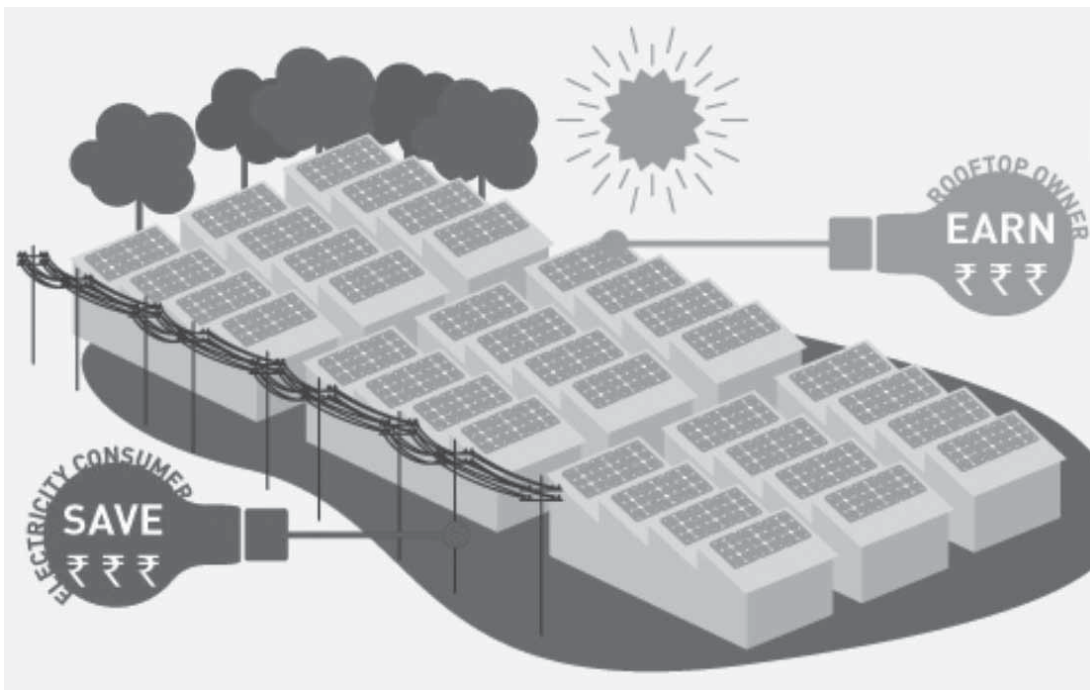
Solar Energy – Rooftop Solar PV Systems:



Picture 1-Building Rooftop Solar



Picture 2-Inverter and Storage



Industrial Rooftop Solar



Building Rooftop Solar

General:

Harnessing of non polluting renewable energy resources to control green house gases is receiving impetus from the government of India. The solar mission, which is part of the National Action Plan on Climate Change has been set up to promote the development and use of solar energy for power generation and other uses with the ultimate objective of making solar energy competitive with fossil-based energy options. The solar photovoltaic device

systems for power generation had been deployed in the various parts in the country for electrification where the grid connectivity is either not feasible or not cost effective as also some times in conjunction with diesel based generating stations in isolated places, communication transmitters at remote locations. With the downward trend in the cost of solar energy and appreciation for the need for development of solar power, solar power projects have recently been implemented. A significant part of the large potential of solar energy in the country could be developed by promoting grid interactive or stand alone solar Rooftop Solar photovoltaic power systems of varying sizes as per the need and affordability coupled with ensuring adequate return on investment.

Tamil Nadu's Solar Energy Policy can also help in addressing the supply-demand mismatch. The State's solar initiative can draw on the strengths of its robust wind power programs. By setting the ambitious target of 3,000 megawatt (MW) solar power generation by 2015, the Tamil Nadu policy makes itself distinct in certain respects from policies of other States. The point that Domestic consumers, who opt for rooftop solar power installations, will be eligible to receive generation-based incentive (GBI), is bound to instill greater public interest.

The first 1 GW under Tamil Nadu's policy will be achieved through competitive bidding, with the remaining 500 MW driven by private power purchase agreements (PPAs) with power consumers who must fulfill solar purchase obligations.

The policy is targeting another 350 MW from rooftop PV plants, including 300 MW from the rooftops of government owned buildings, and 50 MW from privately owned or domestic rooftops. Net metering will be available for these projects.

The remaining 1.15 GW will be added through renewable energy credit projects.

Rooftop Solar PV:

With the Prices of Solar Panels becoming more and more competitive, it is time that the large scale and immediate potential available in Rooftop PV Solar be tapped more vigorously.

As shown in pictures 1 and 2, Stand Alone PV Installations are coming up which should increase in numbers substantially with more attractive incentives and subsidies. What is shown in pictures 1 and 2 is a 1200 W Installation which is able to generate about 6 Units per day.

Large scale installations in Buildings and Factory Rooftops can help harness large amount of Solar Energy which can be used directly meeting part of the total energy requirements.

Use and Pay Solution:

One of the important developments that can help in a big way and very quickly in harnessing the Solar Energy is "Use and Pay" arrangement by Solar Companies. In this arrangement or Contract or System, the roof areas suitable for Solar Energy are identified and an agreement is arrived between the owners of the Factory or Building premises for the Installation of the Solar Panels and the Systems. Some of the important components of the arrangement are as under:

- a) The Energy Consumption pattern of the Factory or the Building is studied and the Solar PV Capacity is decided which would be about 30 to 35% of consumption during day time when Solar Energy will be generated.
- b) The Solar Energy generated, (with necessary Controls and Systems) is planned to be consumed directly by the user.
- c) The entire Installation will be done on the Rooftops by the Solar Energy Services Company (SESC) at their cost. It will be installed and maintained with the support of the Factory or the Building owners, with the ownership of the installation resting with the Solar Company for the specified period of say, 15 years, after which the ownership would be transferred to the Factory/ Building.
- d) The entire Energy, as and when generated would be metered and consumed by the Factory/ Building. Necessary Power Purchase Agreement (Tariff to be decided and it could be same as Utility Tariff depending on the support and subsidies) would be arrived between the SESC and the Factory/ Building.

- e) As the arrangement is based on generate and use fully, and use and pay, the Technical responsibility will fully rest on the Solar Company, which will make it comfortable for the user. The Solar Company will also feel comfortable as all generated Power would be metered and paid for promptly, say on fortnightly basis.
- f) The Financial Model should be able to result in a “Win Win” situation for all stake holders.
- g) The Capital costs would be low as there is no ‘Storage’ involved. The maintenance costs will also be lower and the life of the entire System can easily be put at about 20 to 25 years.



A Case Study:

Recently a Process Industry was studied for such an Installation and the important details are as under:

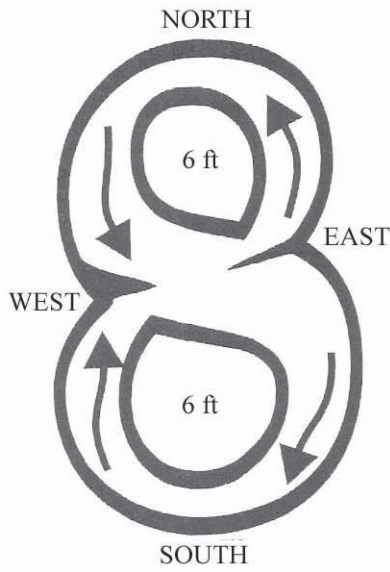
- a) The total roof area fit for Solar PV Installation was found to be 60,000 Sq.Ft.
- b) The Energy Consumption is 1050 Units per hour, almost the same for all the 24 Hrs of the day.
- c) Installation of 200 or 250 KW System using about 25,000 to 30,000 Sq.Ft of area of the roof area was planned.
- d) It was estimated that the total units per day in case of 250KW would be about 1200 Units, for about 300 days and the Financial Model is planned on this basis.

If one looks around on a sunny day either in an Industrial area or in a Commercial or IT Dominated area, the enormous possibilities can be seen. As the situation now seems favorable on all counts of Supply, Demand and Costs, it is time that fast track actions are planned. (To be continued)

S. Mahadevan, B.E., F.I.E., M.B.A., Consultant, Energy and Energy Efficiency, Mobile: 98401 55209

	<ol style="list-style-type: none"> 1) Dates are free from cholesterol and contain very low fat. Dates are rich in vitamins and minerals. 2) They are rich source of protein, dietary fiber and rich in vitamin B1, B2, B3 and B5 along with vitamin A1 and C. 3) It helps improve the digestive system as it contains soluble and insoluble fibers and different kinds of amino acids. 4) Dates are great energy boosters as they contain natural sugars like glucose, sucrose and fructose. To get more advantage add dates to milk and make it a very nutritious snack. 5) Dates are very low in calories and are extremely suitable for health conscious people.
<p style="text-align: center;">HEALTH BENEFITS OF CONSUMING DATES</p>	<ol style="list-style-type: none"> 6) Dates are rich in potassium and reduced in sodium. This helps regulate a healthy nervous system. Researchers have revealed the fact that potassium intake up to a certain extent can reduce risk of stroke. 7) Dates also help in lowering of the LDL cholesterol. 8) Dates have high iron content and are very useful in treating anemia. The patients can eat many dates for better advantages. 9) Dates also have fluorine that slows down the process of tooth decay.
	<ol style="list-style-type: none"> 10) It helps people suffering from constipation. Soak dates overnight and take it along with water to have added advantage. 11) Dates help in weight gain and are beneficial for those who suffer from over slimming problem. 12) Dates are excellent for alcoholic intoxication. Cures abdominal cancer. 13) It also helps in improving eye sight and helps in curing night blindness as well. <p style="text-align: center;"><i>“The best thing is that it does not have any side effect on the body and is completely natural as well as it works better than medicine.”</i></p>

8 NghL! eP 8 NghL!!



mi dtUfFk; j wfhyr; #oypy; cl y; kwWk; csS MNuhf;fpaj; i j Ngz ;g; ghJ fhggj py; ei l ggawrp K f;fpa mqfK; t f;f;f;pdwJ. ek; cl ypy; fhy; ghj k; csSq; f, ehf;F Mfpa %dW , l qfs;py; cl ypd; mi dj J mtaq;fS k; Neubj ; nj hl HG nfhs;sf; \$ba Gs;sf; cz ;L. vdNt el ggJ ek; cl ypd; mtaq;fS; mi dj J f;FNk eyk; gaf;ff; \$baJ.

8 NghL! eP 8 NghL!!

gurri d;fs; , yyhky; ei l ggawrp a tll bypUej gbNa vl ;L 8 tbt;py; el ggJ kpFej gyi dj; j Uf;fwJ. gyUf;F gyt;g khd gurri d;fs; t;pyf;AssJ. vl ;L vd;whNy gyUk; gaggLtJz ;L. Mdhy; vl ;bd; rpwgi gg; ghHf;Fk NghJ nry;tj; i j j; j UK; yl Rkpi a m\;l (vl ;L) yl Rkp;fshf \$Wf;pdNwhk; Nahfj j pi d vl ;l hf ghj; J S Nshk; j pi rfs; vl ;L! vz ; rj j pfs; vd;f;pdNwhk;! vz ; rhz ; cl kG vd;f;pdNwhk;

gapw;rp

fhi y myyJ khi y ntWk; tapw;py; , ggawrp;py; <Lgl Ntz ;Lk; , ggaw;rp; a tll ;bw;F ntsp;py; , l kpUej hNyh myyJ tll ;L

khbggFj p;pyNyh myyJ tll ;bd; mi wfs;pyNyh nraj pl yhk; vl ;L tbt;j i j ti ue;J nfhs;STk; mfyk; 6 mb e;sk; 12 mb , Uf;FkhW mi kff;Tk; , l kpUej tykhf gl j j py; fhl ;bagb el ff Ntz ;Lk; e;sggFj p ti f;F nj wf;fhfTk; mfyggFj p f;f;f;F Nkw;fhfTk; mi kff;Tk; , yyht;pbYk; j twpy; y. j pd rhp 30 epkl Neuk; el ej hy; NghJ khdJ. mj pfhi y guk;k K \$Hj j j j py; el ej hy; mj pf gyd; fpi l f;Fk;

gad;fs;

- xU thug; gapw;rp;pyNyNa J}f;fkpd; k gurri dahy; mtj ;ggLgtH J}f;fj; i j ngwyhk;
- xU thu fhyj j pNyNa caH , uj j mOj j k; rkepi yggLk;
- fhy;t;py ghj vhp;ry; fhy; kwWk; ghj kWj t;pg Nghdwi t xU thuggawrp fhyj j pNyNa t;pyf; t;Lk;
- tapW cgGrk; gurri d ci l atUf;F xU thu fhy Kbt;pyNyNa khwwk; nj hpatUK;
- %l ;L t;pyf;F , uz NI thuj j py; eyy gyi dg; ngwyhk;
- cl ypy; Nj i taww nfhOgG , ggawrp;pd; , uz ;L thu Kbt;pyUej Fi waj ; nj hl q;Fk;
- eh;popTg; gurri d cs;stHfs; xU thu gapw;rp;pyNyNa eyy khwwk; ngwyhk;
- mbf;fb r;sp;g;pbj J ci w r;sp;ahy; mtj ;ggLgtUf;F gapw;rp nj hl q;f;pa ehs; Kj wnfhz NI r;sp; nts;ptuj ; nj hl q;Fk; %f;fi l gG t;pyFk;
- gapw;rp;py; gj J epkl k; j hz ;ba gpwF, , ayghf ROK i d Rthr; k; mi ktj hy; kdj py; Mokhf mbf;fb epi d;f;Fk; t;prak; ekf;F i f\$Lk;
- el f;f Mukggj j 10 epkl q;fs;pyNyNa kdk; Mygh epi yf;F tUK; nj at;f epi yf;F te;J t;pl yhk;
- kd mOj j k; kd , Wf;fk; kd ci sr;ry; kdr; Nr;hHT t;pyFk;
- KJFj j z ;Lg; gurri d;fs; gy t;pyFk;
- capuhw;py; rfj p ekf;F \$Lk;
- Nj i taww nfhOgGfs; ek;f;Tj hy; khui l gG cUt;htJ j Lf;fggLk;
- fz ghHi t nj spti l Ak;

FwpgG : fharry; mj pf j i yty; neLe;J ugaz k; nraj tH, mWi t r;pf;ri r nra;J MWkhj k; Kbaj tH , ggawrp;py; j Fej ty;YeH MNyhri dapd;wp <Lgl Ntz ;Lk; ;

Courtesy: K. Arokiasamy, D.C.E., B.E., AE. (Retd.), Tamilnadu Water Supply & Drainage Board, Coimbatore

SUNDARA SASTRI SATYAMURTI



Sundara Sastri Satyamurti (August 19, 1887 – March 28, 1943) was an Indian independence activist and politician. He was acclaimed for his rhetoric and was one of the leading politicians of the Indian National Congress from the Madras Presidency, alongside S. Srinivasa Iyengar, C. Rajagopalachari and T. Prakasam. Satyamurti is regarded as the mentor of K. Kamaraj, Chief Minister of Madras state from 1954 to 1962.

Born in 1887 in Thirumayam in the princely state of Pudukkottai, Satyamurti studied at the Maharajah's College, Madras Christian College and the Madras Law College. After practising as a lawyer for some time, Satyamurti entered politics at the suggestion of leading lawyer and politician, S. Srinivasa Iyengar who would later become his mentor. Satyamurti participated in protests against the Partition of Bengal, Rowlatt Act and the Jallianwalla Bagh massacre and the Simon Commission. Satyamurti was jailed in 1942 for his activities during the Quit India Movement. He was later released, but died on March 28, 1943, due to heart failure.

Satyamurti was the President of the provincial wing of the Swaraj Party from 1930 to 1934 and the Tamil Nadu Congress Committee from 1936 to 1939. He was a member of the Imperial Legislative Council from 1934 to 1940 and Mayor of Madras from 1939 to 1943.

Early life

S. Satyamurti was born at Thirumayam in Pudukkottai state on August 19, 1887. At school he was a fine and diligent student characteristics which he carried on into his political career. He graduated from the prestigious Madras Christian College and later went on to do law and started practicing as an advocate prior to his initiation in the national movement. He plunged into politics at an early age winning college elections and eventually emerging as one of the foremost leaders of the Indian National Congress and a doyen of the freedom movement. In 1919, when the Congress decide to send its representative to the Joint Parliamentary Committee (of the UK) to protest the Montagu-Chelmsford reforms and the Rowlatt Act, thirty-two-year-old Sathyamurthi was chosen as a delegate. When Sri. Sathyamurthy was in Britain, he functioned as the London Correspondent of The Hindu, in place of the actual Correspondent who had taken a 10-day leave of absence. He was known for his honesty; integrity; his belief in racial, communal and religious harmony and equality; and firm belief in constitutional government and parliamentary democracy in India, which led him to take a view opposed to Gandhiji's which in the 1920s was not for participating in the colonial legislature. He was also noted to be strongly opposed to the Caste System in Hinduism.

Political life

S. Satyamurti joined India's main Political Party the Indian National Congress when he was a young man. At the time the party advocated racial equality between Europeans and Indian's of all creeds and castes; and demanded Dominion Status within the British Empire. Which the British rulers had refused to grant. Sri. Satyamurti was one of the leading lights of Swarajists who laid the foundation for parliamentary democracy in India, the others being C.R. Das and Motilal Nehru. It required extraordinary courage of conviction to take a view opposed to Gandhiji's, who had captivated the entire nation, which in the 1920s was not for participating in legislature. But, it was left to the people like Satyamurti, Das and Motilal Nehru to impress upon the need for acquiring experience in legislature. Therefore though Gandhiji did not approve of the decision of the Swarajists, he did not stop them from pursuing their own path. Thus it was due to his relentless efforts in the legislature that the Congress romped home in the 1937 elections to the Madras Legislative Assembly. Though he neither became the Premier (that was the name kept for the post of Chief Minister then) nor a Minister in the State Cabinet, his work for the party is still remembered by many. When Sri. Satyamurti became the Mayor of Madras in 1939, World War II had begun. The city of Madras was in the grip of an acute water scarcity and it was left to him to impress upon the British Government and colonial Governor the importance of agreeing to the proposal of Madras Corporation for building a reservoir in Poondi, about 50 km west of the city, to augment the water supply position, especially in light of catastrophic

global Events namely the Second World War. In those days, the tenure of Mayorship was only for a year but due to his relentless efforts, diplomacy in dealing with the British Governor and his administrative abilities the foundation stone for the reservoir was laid in a matter of eight months. Though Satyamurti was not alive to see the commissioning of the reservoir in 1944, the completion of the work in four years is considered, even by today's standards, something that is difficult to match. Till date, the Poondi reservoir is the only reservoir built purely for the purpose of Madras water requirements.



POONDI RESERVOIR

Political Mentor

Sri. Satyamurti is also remembered today as the political mentor of Thiru. Kumaraswami Kamaraj, who was the Chief Minister of the State between 1954-1963. It was because of his strong devotion to Sri. Satyamurti that Thiru. Kamaraj got the Poondi reservoir named after Satyamurti. Additionally, the headquarters of the Tamil Nadu Congress Committee was named Satyamurti Bhavan in his honour and in recognition for the tireless work that he did for the Tamil Nadu Congress and for the goal of Indian independence as a parliamentary democracy.

Stance against abolition of Devadasi system

Satyamurti is one of the notable opponents of the movement to abolish the Devadasi system. He argued that with the removal of the Devadasis from the Temple would trigger a similar demand, by non-Brahmin forces, to go after the Temple priests too. His maneuvers to dilute/delay Dr. Muthulakshmi Reddi's legislation against the Devadasi system would end in failure.

Arrests and Death

Similar to many prominent Indian patriots Sri Satyamurti was arrested and incarcerated numerous times by the British. He was arrested in 1930 while trying to hoist the Indian national flag atop Parthasarathy Temple in Madras. He was also actively involved in the Swadeshi movement and was arrested in 1942 for performing "Individual Satyagraha" at the height of the Quit India Movement. He was tried and deported to Amravathi Jail in Nagpur and was hurt in the spinal cord during the journey. He succumbed to his injuries at General Hospital, Madras on March 28, 1943. Sri. S.Satyamurti died on March 28 in Madras. Two years before the end of WWII (August 15, 1945) and four years before India's Independence (Aug 15, 1947). He was a highly regarded politician of rare abilities and was deeply mourned by his colleagues and the people of Madras Presidency to whom he had dedicated his life, to bring them freedom and justice. The prominent Madras paper The Hindu dedicated a whole column to Sri. Sathyamurthy under the caption ***Tribune of the people***. It said "He was a born freedom-fighter, a leadmine fighter as the Scots say to whom the fight was the thing."

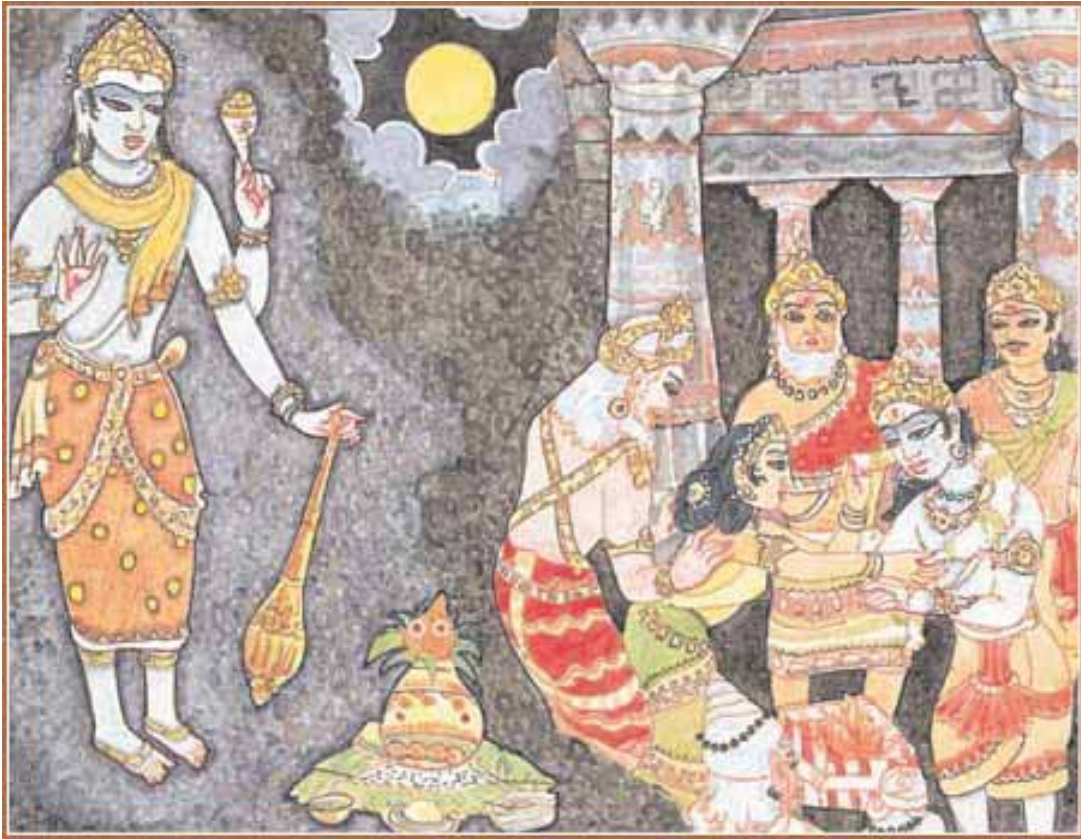
Honors

His fearless action earned him a title *Dheerar*. He is otherwise called as Dheerar Sathyamurthy. A commemorative stamp on him was released in 1987.

You always pass failure on the way to success. – MICKEY ROONEY

HOME FESTIVALS

Panguni (March/April)



This month brings the popular nine-day festival of Ram Navami, celebrating the birthday of Lord Rama, an incarnation of Lord Vishnu. When the full moon rises, Vishnu in the form of Satyanarayana is worshiped before a decorated kumbha pot with a branch of mango leaves placed in its mouth and a coconut on top. Rice is spread on banana leaves and the sacred vessel is completed with a tray of fruits, flowers and betel leaves & nuts. This month is also known for Sita's marriage to Rama. King Janaka, Dasaratha and priests surround the sacred fire, as Sita garlands Rama in Janaka's royal palace.

(To be continued)

Bharathathin Dharmam

(ghuj j j pɔ; j Hkk)

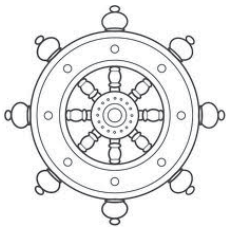
YAKSHA PRASNA

Aranyaka Parva - Mahabharata 33 (118)

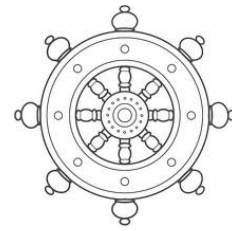
118. Q: “You have truly commented on all the questions. Please answer now — Who is the person that is possessed of all wealth?”

A: ‘As long as one's fame touches heaven and earth by his good deed one will be called a man. He to whom the things likable and not likable, or sorrow and happiness, or the past and the future are the same, he is possessed of all wealth.’

*Hindu Dharma is like a boundless ocean teeming with priceless gems.
The deeper you dive the more treasures you find. – MAHATHMA GANDHI*



CONCEPT OF DHARMA



TERRIBLE CONSEQUENCES – IF DHARMA PERISHES

The value of human life based on Dharma and the resultant samskriti constitute the soul of our Nation. Their destruction is disastrous not only for Bharat but also for the entire humanity. In this regard, Swami Vivekananda had warned the entire humanity in the following words:

“Shall India die? Then from the world all spirituality will be extinct, all moral perfection will be extinct, all sweet-souled sympathy for religion will be extinct, all ideality will be extinct, and in its place will reign the duality of lust and luxury as the male and female deities, with money as its priest fraud, force and competition as its ceremonies, and the human soul as its sacrifice”.

The message is loud and clear. If Dharma which is the soul of India perishes, then India which is the personification of Dharma dies and those will be the consequences.

Infact, because of deterioration of values of Dharma, owing to adverse influence of physical enjoyment based on western lifestyle, we are already having the taste of such consequence. The TV and Cinema, indulge in shameless presentation of lust and related crimes. Obscene advertisements for commercial purposes, ugly exhibition of beauty in the guise of beauty competitions, are going on in such a scale as would destroy the moral and physical fabric of the youths. Large scale frauds in every field including sports, rampant corruption at all levels of administration of State, have become a threat to peaceful and decent social life. Therefore, before it is too late, we must heed to the warning of Swami Vivekananda and prevent destruction of Dharma and Samskriti and save humanity from catastrophe.

WALKING THE DOG

True story.....



Reportedly, a woman was flying from Seattle to San Francisco.

Unexpectedly, the plane was diverted to Sacramento along the way.

The flight attendant explained that there would be a delay, and if the passengers wanted to get off the aircraft the plane would re-board in 50 minutes.

Everybody got off the plane except one lady who was blind.

A man had noticed her as he walked by and could tell the lady was blind because her guide dog lay quietly underneath the seats in front of her throughout the entire flight.

He could also tell she had flown this very flight before because the pilot approached her, and calling her by name, said, "Kathy, we are in Sacramento for almost an hour. Would you like to get off and stretch your legs?"

The blind lady said, "No thanks, but maybe Buddy would like to stretch his legs."

All the people in the gate area came to a complete stand still when they looked up and saw the pilot walk off the plane with a guide dog for the blind! Even worse, the pilot was wearing sunglasses! People scattered.

They not only tried to change planes, but they were trying to change airlines!

THINGS AREN'T ALWAYS AS THEY APPEAR.....



HUMOUR



WHY SAD?

Q: Why was the math book sad

A: Because it had too many problems

COWARD

Bob: "So, you say that you won the conversion with your wife yesterday."

Joe: "Yes, she came crawling on her hands and knees."

Bob: "Really? What did she say?"

Joe: "Come out from under the bed, you coward".

CHECK OUT COUNTER

A woman was waiting in the checkout line at a shopping center. Her arms were laden with a mop and broom and other cleaning supplies. By her hard glances and deep sighs, it was obvious she was in hurry and not a happy camper about the slowness of the line.

When the cashier called for a price check on a box of soap, the woman remarked indignantly, "Well, I'll be lucky to get out of here and home before Christmas!"

"Don't worry, ma'am," replied the clerk. "With a good tail wind and that brand new broom you have there, you'll be home in no time."

SMARTER WOMAN

Joe was a single guy living at home with his father and working in the family business. When he found out he was going to inherit a fortune when his sick father died, he decided he needed a wife with whom to share his fortune.

One evening at an investment seminar he spotted the most beautiful woman he had ever seen. Her beauty took his breath away. "I may look like just an ordinary man," he said to her, "but in just a few years, my father will pass, and I'll inherit his large fortune."

Impress, the woman took his business card and three months later, she became Joe's stepmother.

Women are so much better at estate planning than men!!

CARGO DESTINATION

A man at the airline counter tells the rep. "I'd like this bag to go to Berlin, this one to California, and this one to London.

The rep says, "I'm sorry sir. We can't do that."

The man replied: Nonsense. That is what you did last time I flew with you.

WHERE'S MY ROLEX?

A lawyer opened the door of his BMW, when suddenly a car came along and hit the door, ripping it off completely. When the police arrived at the scene, the lawyer was complaining bitterly about the damage to his precious BMW. "Officer, look what they've done to my Beemer!" he whined.

"You lawyers are so materialistic, you make me sick!" retorted the officer, "You're so worried about your stupid BMW, that you didn't even notice that your left arm was ripped off!"

"Oh my god", replied the lawyer, finally noticing the bloody left shoulder where his arm once was, "Where's my Rolex!"

“TIRUKKURAL” AND MANAGEMENT -2



Interesting analysis and details from some of the International Management Reviews on Tirukkural is given below for understanding the Theme and the Messages of Tirukkural.

It is useful to keep in mind the present-day discussion on leadership theories from the Western traditions before looking at an ancient Indian text from a leadership perspective. The wisdom embedded in ancient Indian tradition has perennial values that transcends time and space; is applicable to every period of history and has cross-cultural appeal.

The leadership is defined as a process by which one individual influences others towards the attainment of organizational goals. Leadership is gradually distinguished from management.

Management involves planning, organizing, staffing, directing and controlling and the manager is someone who performs these functions. Leadership, on the other hand, deals with influence. A leader's ability to influence others

depends on various factors other than his formal position of authority. Some focus on the traits of effective leaders, for example, the theory that leaders are born, not made. Traits include physical, mental and social. This is one of the approaches in the historical development of leadership research.

Some models suggest that the whole notion of leadership is an evolutionary process, as things are constantly changing. Leadership theories focus on the effectiveness of the leader's charisma. This topic of leadership continues to be one of the most researched and published topics in the social sciences. To be sure, efficiency seems to be the key criterion.

Out of the three sections of the *Tirukkural*, entitled *Aram*, *Porul*, and *Inbam*, the focus of this presentation is on the second section of the work, which deals with “Wealth” and “Management” and in essence dealing with state administration. In fact, the management of public life is said to consist of various factors like the Art of governance, Art of administration by ministers, Defense structure, Economic resources, Army structure and Allies.

The Art of Governance:

There are 24 chapters in the section on the art of governance by the king. It starts by defining the six attributes of a good king. A good king must have trained armies, responsible citizens, economic resources, capable ministry, supportive allies, and sustainable fortresses (v.381). The next verse 382 talks about the qualities of a good ruler, namely: courage, generosity, knowledge, perseverance in abundance (382), alertness, learning, bravery (383), easy access to people and gentleness in words (386), ability to render justice according to the laws of the land (388), and acceptance of well-meant criticism with patience and forbearance (389).

Finally, as essential qualities of a good ruler, he must also have the four attributes of generosity, graciousness, justice, and concern for citizens' welfare (390). Here, the core value that receives significant attention is justice. This value is elaborated upon in detail: in the context of dealing with criminals, as the ultimate basis for all religious and righteous living, and in the capacity for the ruler to be accessible to people and consult men of wisdom in dealing with difficult matters. What gives victory to the ruler is not the spear, which is the symbol of his military might, that he carries as a powerful monarch, but rather the scepter that he carries as the symbol of justice (546).

Administration by the Ministers:

The next section deals with the art of administration by the minister in charge. In 11 chapters, the minister's functions are described. A good minister is a statesman who has mastered good projects for execution, means of

performance, timing and place of action (631). The minister needs five traits, namely: courage, lineage, study of statecraft, loving care of the people, and driving energy (632). His method of procedure is further classified in the way he strengthens the kingdom by dividing the foes, strengthening the existing alliances, and buying back old friends (633). Then the defense structure is described in ten couplets. A fortress must have a moat of clear water with an esplanade of land with all-round line of sight, backed by hills and woods of shady trees. Its walls must be high, broad and strong, not easily attacked by the enemy. After describing the essential features of a fortress, the concluding word says all excellences of the fort come to nothing if the commander is not a man of ability in action.

Then comes the discussion of the economic resources, including acquisition of wealth. What is important here for our theme is the set of values that are articulated as having great importance for when we are trying to create wealth, which is indispensable for any surviving nation. The way of the world is such, (752) that the poor are despised and rich are praised. But then wealth is also praised as an unfailing lamp that dispels darkness. But it is said that earning wealth must be faultless. The end and means must be without taint of evil (754).

Wealth must be collected from people with compassion and love (755). Compassion, which is the child of love, can be tended by the caretaker for prosperous wealth (756).

What is a Prosperous Nation?

A prosperous nation must have productive land, competent labor, organizers, and undiminished wealth (731). A prosperous nation should not have warring sects and destructive internal strife nor should it have murderous offences that disturb the King's peace (735). Thus, the five ornaments of a nation are unfailing health, wealth, rich harvests, popular pleasures, and security (738).

Management Styles

The desired management styles that must be practiced are also explicitly pointed out. In chapter 68, in ten couplets this is summed up. It is worth quoting this chapter in full:

- A decision is taken after due deliberation, but once it is decided, delay in implementation and dilatoriness in execution are positively wrong (671).
- Things which may be done at leisure could be implemented slowly; but things requiring prompt action should not be put off even for a moment (672).
- Whenever the way is clear, to act immediately is right where this is not so, it is better to deliberate and arrive at the best method for implementation (673).
- Unfinished work and un-reconciled enmity are like smoldering sparks in embers, which can rise up to overwhelm the perfunctory man (674).
- Resources, means, action-plan, time, and place are the five factors which need to be considered and cleared, before embarking on action (675).
- Before commencing any action, it is wise to consider in depth the objective, obstacles, and benefits or reactions upon completion (676).
- In order to decide how best a particular job may be done, it is wise to tap the expertise of a person who knows it inside out (677).
- It is a good policy to plan one successful project to lead to another, just as we use one elephant to capture another (678).
- Even more urgent than rewarding friends is the need for making friends with your enemies (679).
- The weak should free themselves from continuous alarms by entering into alliance

(To be continued)

THE CN TOWER



The CN Tower is an awe-inspiring architectural and engineering wonder of the world that is a symbol of pride for Toronto residents and all Canadians. The Tower's new lighting system is designed to architecturally enhance the CN Tower structure and elegantly illuminate this national icon and landmark.

The CN Tower's new exterior lighting is the latest upgrade in its ongoing proactive implementation of leading edge systems and technologies to ensure the efficient operation of Canada's National Tower.

For almost a decade the CN Tower maintained minimal exterior lighting appearing dimly lit in the night skyline while searching for advances in technology that would present an energy efficient solution to lighting Canada's National Tower. The CN Tower implemented a Color Kinetics® lighting system that merges patented Chromacore® technology with microprocessor-controlled light emitting diodes (LEDs). The first major breakthrough in the lighting industry in over 100 years, Chromacore has enabled an entirely new kind of lighting intelligent LED illumination -- recognized by designers and industry experts as a revolutionary invention, both technically and aesthetically. The very same Color Kinetics fixtures illuminate other high-profile landmarks around the world, including the London Eye in the UK, the Hollywood Bowl and the LAX Gateway at Los Angeles International Airport.

CN Tower Lighting Schedule

Each night beginning at sunset the CN Tower features programmed lighting that pays tribute to Canada's colours. Throughout the year the CN Tower lighting program recognizes citywide events, charitable events and causes, seasons and special holidays and a special program to honour repatriated Canadian soldiers.

This intelligent LED illumination system is energy efficient, cost effective and provides a number of added unique benefits:

Lower power consumption

The CN Tower calculates that the maximum energy consumption of the vibrant LED-illuminated Tower will use over 60% less energy than the fully lit Tower of the 1990s.

- Each LED fixture uses less than 20% of the energy required to light a comparable conventional colour changing lighting fixture.
- While some of the former conventional fixtures lighting the CN Tower were each as large as a washing machine, each of the new LED fixtures is no larger than a shoebox.

Millions of colours and infinite effects

- Microprocessor controlled, each fixture can produce 16.7 million colours. Intelligent digital control makes the system programmable from a single computer console. Each fixture has a unique "address" that can be programmed individually to create an infinite variety of lighting effects.

Directional lighting

- Unlike conventional light sources, one of the unique benefits of LEDs is that they are directional; light output can be controlled and precisely directed. Therefore the resulting lighting will illuminate the Tower while ensuring light output does not "spill" or interfere with nearby hotels, office towers or residences.

Low maintenance

- The LED technology installed at the CN Tower is designed to achieve excellent performance standards and with its intended use is expected to last in excess of 10 years, requiring minimal fixture replacement and maintenance. Unlike conventional lighting systems, the new system will not require frequent replacement and disposal of light bulbs.
- LEDs radiate little to no heat, they do not emit ultraviolet (UV) radiation or (IR) infrared which makes them ideal for illuminating areas at the Tower without degradation such as the radome and other sensitive areas

Installation: Due to the uniqueness of the CN Tower structure, the sheer size and accessibility of certain locations posed a number of design challenges that had to be overcome. Over a period of three months all conventional fixtures, formerly used on the Tower structure including giant xenon lighting fixtures atop the Tower's main pod roof and at the base of the Tower were decommissioned and replaced with 1,330 Color Kinetics fixtures. The fixtures were installed and positioned directionally. The most challenging aspect involved the installation of 768 fixtures throughout the Tower's three main elevators shafts. Considered one of the longest elevator hoistways on the planet at 1,122 feet tall, installation involved riding atop each elevator on a work platform to complete the installation in that area.

Directional lighting also presents new opportunities to test how directional and coloured LED systems might mitigate bird mortality as current theories suggest that changes in light colour signatures may have beneficial effects. As it has for over a decade, the CN Tower supports bird friendly practices by dimming exterior lighting during migration periods to prevent potential bird collisions and at the same time conserve energy.

Courtesy: <http://www.cntower.ca/Intro.html>