ELCA Current Waves
ELECTRICAL CONSULTANTS' ASSOCIATION BANGALORE
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NEWSLETTER

EDITOR'S NOTE

I do hope that you enjoyed reading the inaugural issue of the Current Waves

A function was organised for releasing the inaugural issue of our newsletter 'Current Waves' and launching of website www.elcaindia.com on Thursday 30th January 2003 at Royal Orchid Park Plaza, Bangalore.

The Chief Guest, (second from left) Mr. H. Gangaiah, Chief Electrical Inspector to Government of Karnataka, released the inaugural issue of newsletter 'Current Waves'. Also seen are (L to R) Mr. B. K. Charan Dev, President, ELCA, Mr. M. Lokaraj, Guest of Honour, Joint Secretary, Energy Department, Government of Karnataka, and Mrs. Jayashree Umesh, Secretary, ELCA.

Seen above is Mr. M. Lokaraj, Guest of Honour, who launched the website, www.elcaindia.com during the function.

As I said in the inaugural issue, I welcome both technical and non technical articles from the readers and I request them to send the articles to the editor for publishing. Thank you and happy reading.

J. D. Krupakar

Requirements of Fire Safety & Protection in high rise buildings

by
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1.0 Introduction.

Rapid urbanisation and demand for more space has encouraged the growth of vertical structures. Most of the time the designers or the developers concentrate more on utility comforts and neglect the basic safety of the structure and its users. This poses a major problem to the fire fighters during a crisis situation.

In high rise buildings the fires are to be fought internally because of the height, limitation of the fire fighting equipment and the problem of gaining access to the actual seat of fire. Fire generally spreads by conduction, convection or radiation. Most common passage through which smoke/heat/fire spreads is the vertical openings/shafts, voids, A/C ducts, doors, windows, ventilators etc. 'Stack effect' is another important phenomena in high rise buildings, which spreads the smoke/fire.

Therefore, more emphasis should be given for the protection of both life and property. The life safety is ensured by providing adequate means of protected routes leading first to a place of comparative safety and finally to a place of ultimate safety. The protection of a building and its contents is ensured by providing measures that will help in containing the fire within the place of origin, using fire resisting materials and providing means to detect the fire, raise alarm and suppression of fire, either manually or automatically.

2.0 Role of Karnataka State Fire Services.

Since 13th October 1984, the Karnataka State Fire Services Department is one of the agencies for issue of "No objection Certificate" to high rise buildings (of height 15 metres and above or ground + 4 floors and above) initially, i.e., at the planning stage, and for issue of clearance certificate before occupation. While issuing a "No Objection Certificate" the following fire prevention and fire fighting measures are insisted, as stipulated in the Building Bye laws & National Building Code.

2.1 Width of the road.

A road, which abuts a high rise building to be constructed, shall be more than 12 metres wide. This minimum width is to facilitate free movement of Fire Services vehicles, specially the hydraulic platform and turn table ladder. Further the road should be hard surfaced to carry a minimum weight of 22,000 kgs., the maximum weight of a fire engine.

2.2 Entrance width and height clearance.

Every high rise building should have atleast two means of access, one remote to the other, of minimum width of 4.5 metres with height clearance of five metres. This minimum width and height clearance is essential to facilitate free movement of fire units.

2.3 Setback (open space).

Sufficient open space (setbacks) around the building, as indicated below, is essential to facilitate free movement and operation of Fire Service and other emergency service vehicles and to use as assembly point by the occupants, after evacuation. This open space will also act as fire break between the buildings.

SL. NO	HEIGHT OF BUILDING IN METRES	EXTERIOR OPEN SPACES / SETBACKS TO BE LEFT ON ALL SIDES. (Front, Rear & Sides) Minimum, in metres.
1.	Above 9.5 upto 12	4.5
2.	Above 12 upto 15	5.0
3.	Above 15 upto 18	6.0
4.	Above 18 upto 21	7.0
5.	Above 21 upto 24	8.0
6.	Above 24 upto 27	9.0
7.	Above 27 upto 30	10.0
8.	Above 30 upto 35	11.0
9.	Above 35 upto 40	12.0
10.	Above 40 upto 45	13.0
11.	Above 45 upto 50	14.0
12.	Above 50	16.0

Out of the allowed setbacks, the setbacks to an extent of 6 metres from the building line shall be made hard surfaced to carry a load of 18,000 kgs and shall be free from any structure, projection or construction. The compulsory open space around the building shall not be used for parking.

"Open space" as defined in the NBC, means "an area, forming an integral part of the plot, left open to the sky".

The open space shall be the minimum distance measured between the front, rear and side of the building and the respective plot boundaries. The front, rear and the side of the building shall be the point of the building nearest to the boundary.

2.4 Car Parking.

Provision to park cars shall have to be made at the basement with minimum two ramps, one remote to the other. In addition, provision to park cars in setbacks which are more than 12 metres wide, can be made on the courtyard, by leaving hard surfaced open space of 6 metres free from the building line, for the free movement of fire units.

2.5 Staircases.

Every high rise building should have a minimum of two staircases, one remote to the other, of sufficient width, based on occupancy. These staircases should be designed so as to allow one of its sides to abut the external wall and should be constructed as self contained units, enclosed with smoke-stop-swingdoors of atleast half-an-hour fire resistant on the exit to the lobby. Enclosing of the staircases is necessary to prevent entry of smoke and fire to the staircases area and vice-versa.

If the staircase cannot be ventilated, because of location or other reasons, a positive pressure of 50 pa shall be maintained inside. The mechanism for pressurising the staircase shall operate automatically with the fire alarm.

Staircase is the only safe means of escape and no other means can be used for escape as long as the staircase is not affected. The staircase shall have to be located based on travel distance, specified on the basis of the occupation.

The staircase shall not be extended, in any case, to the basement in order to prevent travel of smoke, fire etc., from the basement to the upper floors. Access to the basement from the ground should be through a separate staircase, not connected to the main staircase.

2.6 Lifts.

Every high rise building shall have a minimum of one lift, capable of carrying a minimum of 8 persons, weighing 544 kgs. The landing doors of the lift enclosures shall open into the ventilated lobby and shall have a fire resistance of not less than half-an-hour. The lift car doors shall also have a fire resistance of half-an-hour. Exit from the lift lobby shall be through a self-closing-smoke-stop swing door of half an hour fire resistance. The lift should have a grounding switch at the ground floor level to ground the lift car in the event of any emergency. Out of the lifts installed, one of the lifts shall be designed as "Fire Lift" with alternate power supply, for use in case of emergency by Fire Services personnel, to carry equipment and other materials to the upper floors and evacuate ambulant patients under controlled situation.

2.7 Service Ducts.

All the service ducts, if provided, shall have to be enclosed by walls of atleast two hours fire resistance and shall have to be sealed at every alternate floor with non-combustible materials, having atleast two hours fire resistance. The sealing at floor level is to prevent travel of smoke and fire to the upper floors through the ducts.

2.8 Alternative power supply.

A standby generator should be installed to supply power for staircase lighting, corridor lighting, fire pump, pressurisation fan and blowers, in the event of disconnection or failure of main supply.

2.9 Fire fighting and safety installations:-

2.9.1 Wet-riser-cum-down comer.

Based on occupancy, one wet-riser-cum-downcomer or only downcomer (G.I., C class pipe) of 150 mm minimum internal diameter has to be provided for every 1000 sq.metres floor area. The system should be connected to the underground and overhead tanks of specified capacity through pumps of specified capacity near the underground static tank and overhead tanks. Single or twin hydrants, depending upon the occupancy, each of 63 mm internal diameter, have to be provided at each floor with sufficient hose pipes and branch pipes, to cover the full extent of floor area of the building. In addition, hose-reel-hose of 12 mm diameter also have to be provided from the landing valve of wet risers at each floor level.

2.9.2 Fire Alarm System.

It is essential to provide a fire alarm system, either manually operated or automatic, in every high rise building. If the system is manual the call box of break glass type has to be provided near each staircase landing of every floor. The automatic system has to be coupled with the detector system. The alarm system shall have to be connected to both the main and alternative power supply.

2.9.3 Fire Detection System.

Suitable smoke or heat detectors, fitted to the alarm system, have to be provided based on the occupancy and risk in every high rise building. Detector

heads should be so mounted that their sensing area is not less than 25 mm or more than 600 mm below the roof of ceiling. This scale is applicable to the open hall and in case of smaller rooms detector heads shall be provided at each room. The control point of the detectors and fire alarm system shall have to be at the entrance lobby on each building.

2.9.4 Sprinkler system.

Automatic sprinkler system is a must for basement parking and other areas. The spacing (coverage) of each sprinkler head shall be 6.96 sq.metres area or on every bay or room. Entire sprinkler systems have to be connected to a separate water tank with a pump capable of delivering water at required pressure. The capacity of the water tank and pump shall be determined based on the number of sprinkler heads.

2.9.5 Escape Route.

The escape route shall be marked with a sign board on the corridor and passage to guide evacuation. Normally the escape route and sign boards must be written in luminous paint for easy identification. This is to guide every occupant of the building who is bound to panic in the event of an accident.

2.9.6 Public Address System.

Every high rise building should have a public address system with two way communication to conduct evacuation in a systematic manner and to communicate any messages to the occupants on every floor from the control room and Vice-versa.

2.9.7 Portable Fire Extinguishers.

Suitable first-aid fire fighting extinguishers shall be provided on each floor to contain and extinguish the fire, at the incipient stage, by the occupants.

2.10 Fire Safety Plan.

It is very important to have a fire safety plan to prevent and extinguish any fire in the building with details of action to be taken by each occupant. In addition to work assignment, the telephone numbers of all emergency services must be indicated in the plan. The plan should be distributed to every occupant and displayed on every floor. One of the occupants of the building shall have to be designated as Fire Safety Director or Fire Safety Warden and it will be his duty to conduct evacuation drill regularly.

2.11 Training.

Atleast 40% of the occupants should be trained in conducting proper evacuation, operation of the systems and equipment and other fire safety provisions in the building.

2.12 Fire Officer.

A qualified Fire Officer with experience of not less than 3 years shall be appointed as caretaker, to maintain fire fighting equipment in good working condition, to lay down fire orders and fire operational plans, to impart training to occupants in fire prevention and evacuation and to keep proper liaison with the local fire services.

The main aim of Karnataka State Fire Services Department is to create safety awareness, prevent fire and save life and property of the Nation. This is possible only with the active participation and co-operation of the planner, developer and the user.

'John, I heard your factory got gutted by fire'
' yes'
'Sorry, what were you manufacturing?'
'Fire extinguishers'

Forthcoming events, at a glance

ELECRAMA-2004
6th International Exhibition of Power, Electronics and Allied Products
3rd - 7th February 2004, New Delhi, India

Light & Electricity - 2003
The 11th international Fair of Light equipment, Electric fittings & Security Systems - at Warsaw, Poland. From October 1- 3, 2003

Electric Indonesia, 2003 Series
The 11th Electric Indonesia Series of Power generation, Renewable energy & electrical equipment Exhibition at Jakarta, Indonesia, from 1 - 4 October, 2003

MATELEC 2004
The international Exhibition of Electrical & Electronic equipment - at Madrid, Spain, from 26 - 30 October 2004.

Presenting the Past

Mr. P. S. S. Thomas, IAS, Chief Guest, Principal Secretary to Government , Energy Department, Government of Karnataka, Inaugurates ELEX - 2000, an Exhibition cum Seminar, organised & conducted by ELCA, held from 14th to 17th April 2000, at Le Meridien, Bangalore.

Mr. K. Krishnamurthy Naik, Chief Electrical Inspector to Government of Karnataka, Guest of Honor, releases 'Guide for Safe Electrical Installation Practice', during the inaugural function of ELEX - 2000

Mr. M. K. G. Pillai, Director General, Central Power Research Institute, Bangalore, Guest of Honour, releases the Exhibition Guide, of ELEX - 2000, during the inaugural function on 14th April 2000

Mr. P. S. S. Thomas, Chief Guest, cutting the ribbon to declare open ELEX - 2000, on 14th April 2000

Mr. P. S. S. Thomas visiting the stalls

A panel discussion under progress during ELEX - 2000

A Seminar session under progress during ELEX - 2000

What do these statements . . . really mean

Extensive report is being prepared on a fresh approach to the problem	We just hired three kids fresh out of college
A number of different approaches are being tried	We are still groping
Preliminary operational tests were inconclusive	The dam thing blew up when we threw the switch on
Test results were extremely gratifying	We were so surprised that the stupid thing worked
The entire concept had to be abandoned	The only person who understood the thing quit
We will look into it	Forget it. We have enough problem for now
Please note and initial	Lets spread the responsibility for the foul up

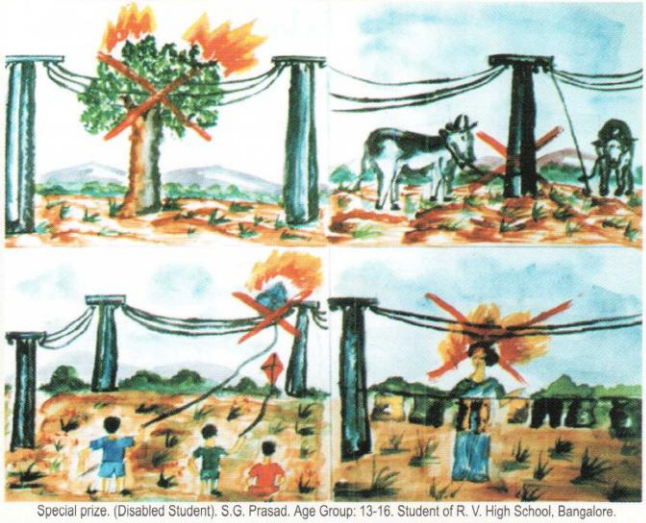
MICROSOFT
Most intelligent customers realise our software only fools teenagers

ACRONYM
A complete random order not yielding meaning

CLASSIFIED ADS FROM THE AMERICAN MEDIA

- Dog for sale: Eats any thing and is fond of children.
- Used cars: why go elsewhere to be cheated? come here first.
- Illiterate? write today for free help.
- We do not tear your clothing with machinery. We do it carefully by hand.
- Wanted: 50 girls for stripping machine operators in factory.
- A superb and inexpensive restaurant. Fine food expertly served by waitresses in appetising forms.
- Wanted: widower with school age children requires person to assume general housekeeping duties. Must be capable of contributing to growth of family.

(Contributed by A. C. Tuteja, Washington)



Special prize. (Disabled Student). S.G. Prasad. Age Group: 13-16. Student of R. V. High School, Bangalore.

Do You wish us to mail

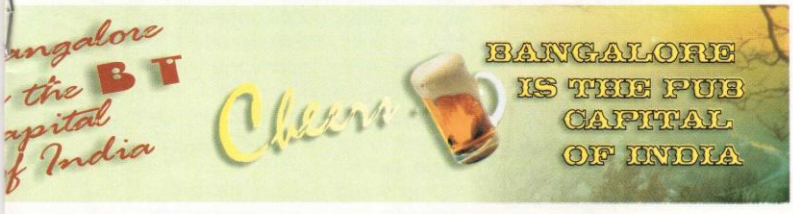
Current Waves

to your friends / colleagues etc?

Please forward their correct & complete mailing address to us.

DON'Ts

- **Do not use water heaters, geysers, electric iron etc., without earth connection.**
- **Do not operate electrical equipment / switches with wet hands.**
- **Do not build house / extension of house underneath a overhead line / in the proximity of lines.**
- **Do not have balconies / windows towards bare power lines.**
- **Do not carry long metallic pipe/ object underneath overhead lines.**



"SWITCHGEAR"

An Insight into application, manufacture, testing and commissioning.

By

R. K. Srinivasa Murthy, B.Sc., B.E.(ET), IISc.

Director, Lotus Powergear Pvt. Ltd.

Bangalore

Generally, the cost of electrical equipment of a project is found to be around 15% of the total project cost and cost of switchgear may hover around 10-15% of the electrical equipment used in the project. This means that switchgear in terms of its share of cost is hardly around 1-2% of the total project cost. Further, the entire gamut of measuring and controlling electrical parameters such as current, voltage, power, energy, power factor etc., and also protection and control of the entire plant are located in the switchgear equipment. Therefore, health of the overall power system depends very much on the right kind of switchgear used for the particular application. This paper aims at bringing into focus the various aspects in selection, design, manufacture and commissioning aspects of switchgear.

1. APPLICATION:

While the principle of protection, metering and control scheme may remain the same for various equipment like generators, transformers, motors etc., irrespective of the segment viz. steel, refinery, paper industries etc., the critical parameters which should be kept in mind by the application engineer varies from one segment to another. For example, disruption of power for any reason beyond the stipulated time may be disastrous in a particular sector, while quality of power i.e. the magnitude of voltage and frequency, may be of utmost importance in some other sector. The consequences of the abnormal conditions may be a catastrophe both for men and material in the work arena. The application engineer therefore has to very closely, study and interact with the enduser which should be the first stage before an attempt is made either to draw up the specification or start the design work. Merely listing out the items required in the switchgear does not in

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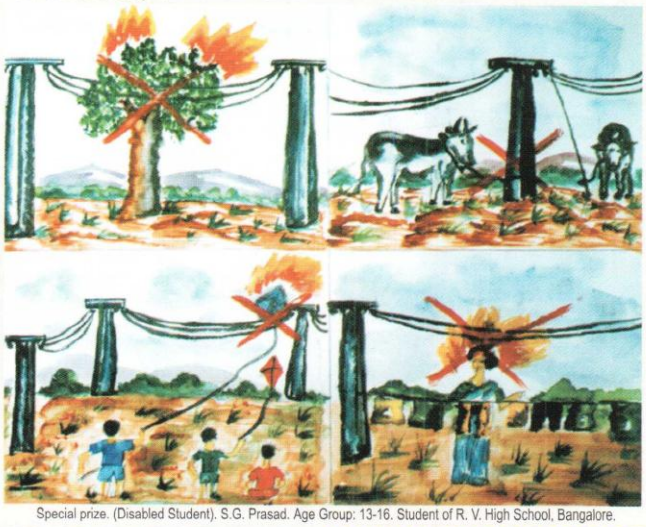

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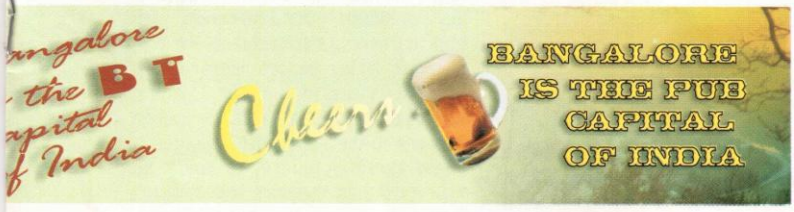

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While the principle of protection, metering and control scheme may remain the same for various equipment like generators, transformers, motors etc., irrespective of the segment viz. steel, refinery, paper industries etc., the critical parameters which should be kept in mind by the application engineer varies from one segment to another. For example, disruption of power for any reason beyond the stipulated time may be disastrous in a particular sector, while quality of power i.e. the magnitude of voltage and frequency, may be of utmost importance in some other sector. The consequences of the abnormal conditions may be a catastrophe both for men and material in the work arena. The application engineer therefore has to very closely, study and interact with the enduser which should be the first stage before an attempt is made either to draw up the specification or start the design work. Merely listing out the items required in the switchgear does not in

most of the time make clear of the application requirement of the project. If the manufactured product has to serve the exacting needs of the user, understanding critical parameters is thus most vital which many a time does not receive due attention during design, manufacture, testing and commissioning.

In the case of switchgear for heavy duty, mobile earth moving equipment like excavator, drillrigs etc., ability of the switchgear to withstand shocks and vibration which could be as high as '5G' is of utmost importance. If this aspect is not taken into consideration (which does not arise at all in the stationary application) there will be a pre-mature failure of components resulting in breakdown of the machines and consequent production loss. It will also be prudent that the switchgear equipment is subject to the vibration test before the design is frozen.

Switchgear acts as a link between the sources like transformers or generators and loads like motors, furnace, lighting etc. Switchgear therefore will have to carryout the functions of protection, controlling, monitoring and other allied aspects. If the protection has to be adequate and effective, then the application engineer must necessarily have the knowledge of both the source and load. This demands that the knowledge of all the electrical equipment is highly essential for making application check. Not only the rating of the items to be protected but also their performance parameters and the load conditions of the system should be readily available at the hands of the application engineer. Therefore, wide exposure and knowledge is essential, as otherwise, the very purpose of protection and control will be defeated.

2. MANUFACTURE:

Many a time, during design and manufacture of switchgear, the operation and maintenance aspect is not given due consideration. This poses a severe restriction on the use of the equipment and the problem may start right at the time of installation, testing and commissioning at site. Deeper the in-sight right at the time of design and manufacturing, better will be the possibility of right performance.

Unlike the standard electrical equipment like motors, transformers, generators etc., switchgear is always a custom-built equipment, designed and manufactured to suit the individual needs of the customer. The requirement of each project varies so widely that there is no way of manufacturing a standard switchgear equipment. This

means that standardization is almost out of question in switchgear. This is particularly relevant in case of small-scale manufacturers who do not make their own circuit breakers, CTs, relays etc. This problem imposes a serious constraint in meeting the quality and also faster cycle in the manufacturing process. Further, even in the inherently non-standard characteristic features of switchgear, experienced manufacturers will certainly have generated necessary expertise and skill for certain basic concepts which come handy and ensure making a product worthy of quality and meeting stringent requirements of the customer.

In some cases, the civil work would almost be completed when switchgear is ordered. Dimensional restrictions are imposed on the manufacturer. Here again, like "placing the cart before the horse" the manufacturer is compelled to compromise on certain basic concepts developed by him and 'somehow' accommodate the components in the given limited space. Difficulty imposed by such a step would be experienced during commissioning or maintenance. Ultimately, the manufacturer gets a bad name of poor engineering / workmanship. To avoid this, in line with a professional project management concept, the switchgear designer has to be consulted and deployed before the civil work is taken up.

It is also seen that in most of the projects, a number of changes are called for at various stages of manufacture such as additional auxiliary contactors for interlocks, change of motor rating etc. When this happens after the drawing approval and fabrication/assembly work, the quality suffers.

Meeting the required degree of protection such as IP54, IP55 etc stringently and consistently in each and every switchboard for each and every application appears to be a great challenge to every manufacturer. The contract may specify type test for degree of protection and hence any particular switchboard may undergo and pass the type test. Theoretically, the same design concept has to be employed for other switchboards of the contract. Because of various reasons, some appearing genuine, it would not be possible to maintain the same manufacturing techniques as per some manufacturers. The practical reasons for this to happen is the poor quality of gaskets, hinges, component mounting, cumulative errors in door bending etc. Thus, type test turns out to be more a formality than serving the fundamental cause. To do justice to the technical requirement it is better that the manufacturer and user have an open discussion on the selection of panels for type tests and the practicality.

3. TESTING

Till recently, it was the practice to restrict the size of the transformer in the LT distribution system to 2000kVA & main busbars in the switchgear to 3200A. However, there appears to be an emerging trend due to the selection of higher source capacity or multiple sources / transformers/ generators operating in parallel necessitating requirement of main busbars to go to as high as 6000/7000A. To handle such high currents, the temperature rise assumes larger importance and it is found that unless proper care is taken in making proper busbar joints, the system is prone to thermal failure. In order to avoid thermal failure, it would be appropriate to measure the milli-volt

drop across each joint and ensure it is within the prescribed limits. This aspect has not received the due attention till now and certainly merits serious compliance in the emerging future.

In most of the cases, primary injection test is not made during factory tests on the completed switchgear assembly. If this is not done, CT secondary connections mixup between metering and protection cores cannot be detected resulting in a serious mistake and remains undetected till a mishap occurs. Also right polarity checks of the CT secondaries is ensured through primary injection test.

During routine tests in the works, functional tests are generally conducted on the switchgear by the application of only the rated value of the power circuit and control circuit voltages. However, in line with the actual operating conditions, the functional tests are to be carried out, besides rated voltages, by applying the permissible upper and lower limits of the power and control circuit voltages to ensure trouble free operation of the protection, control and indication circuits during actual operation of the switchboard at the installation site.

4.COMMISSIONING:

All the conscious effort applied during the various stages of application, design and manufacture of the switchgear, will not find its full utility unless due care is exercised during commissioning. Invariably, there exists a lot of gap between the design group, inspection group and the commissioning group consequently, leading to:

- Many avoidable mistakes through wrong connections, wrong operations etc. because of which there may be malfunctioning or damage of the components.
- Bad name for the consultants and the manufacturer.
- Utility of the equipment to which it is designed is marred.
- Delay in commissioning.

To avoid such a situation, it is recommended that the commissioning engineer be intimately involved during factory tests prior to despatch which will admirably equip him to very effectively handle the equipment, during commissioning. His visit to installation site, a chat with the user and a study of the total system would act as a powerful aid in his hands to observe, absorb and impart some of the key inputs during factory tests. This would bridge the missing link, if any, during design and manufacturer.

It is a good practice to invite and involve the manufacturer during commissioning for a smooth, uninterrupted commissioning work.

The actual working condition cannot be practically created at the factory during testing. Therefore, however thoroughly the testing is made at the factory, some problems may surface only during pre commissioning /Test/Trial run of the plant. Therefore, buying commissioning spares and making them available to the commissioning engineer would strengthen his hand to add effectiveness to his job.

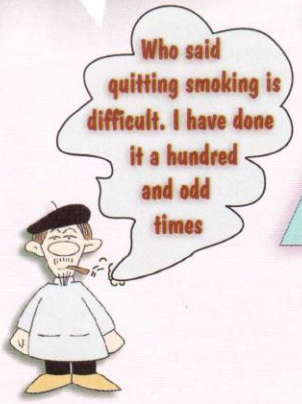
The technical data such as mechanical and electrical checks carried out at the site during commissioning should not only be documented on each switchgear but also compared with the corresponding values of factory tests. Any drastic change in the values should be analysed and brought to the notice of the manufacturer. This will go a long way in the proper maintenance and operation of the equipment so as to derive the optimum use of the equipment.

Because of urgency or some other compelling reason, the commissioning engineer makes changes at site without informing the manufacturer. This should be the last thing for anybody to attempt, for such a change would lead to a lot of other complications on the basic application, mis-match between the manufacturer's drawing and the actual circuitry etc. Again, after something goes wrong, the blame is cooly passed on to the manufacturer or the consultant.

Thus, manufacturing a reliable and consistent quality switchgear and effectively using it to derive the rated performance lies jointly in the hands of the application engineer, manufacturer, consultant, commissioning engineer and the maintenance engineer.

A student in a hostel sent a telegram to his father:
= No mon no fun your son =
His smart father replied:
= Too bad so sad your dad =

POTPOURRI PAGE



A wise man adjusts himself to the ways of the world.
A mad man wants to bend the world to his ways.
Therefore, the progress of the world depends upon the ***mad man.***

- George Bernard Shaw.

"I can't afford a car"
"I thought you had one."
"I have, that's how I found I can't afford one."

☆

Bus Conductor : "How old are you?"
Little Girl : "Only Six"
Bus Conductor : "And when will you be ten?"
Little Girl : "As soon as I get down from this bus"

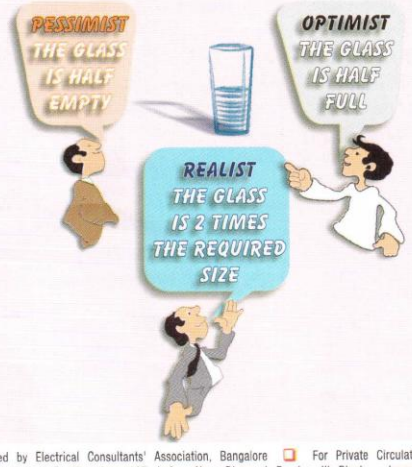
☆

"Give me a cigarette, old man"
"I thought you'd stopped smoking"
"I am just in the first stage"
"What do you mean by first stage?"
"I've stopped buying"

☆

Guest : "Look here! how long must I wait for the half-portion of duck I ordered?"
Waiter : "Till somebody orders the other half. We can't go out and kill half a duck"

Sourced from:
Bulletin of
Humour Club International
Bangalore



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