

# **ELECTRICAL SAFETY AUDITING REPORT CONTENTS**

## **◆ Management Abstract**

The management abstract as the name implies contains the salient observations noted during the audit and the recommendations in a nutshell. The top management is a busy lot and generally appreciates when matters are presented in a crisp and focussed manner, highlighting the most critical aspects. They will be eager to understand those hazards that are harmful to their employees and to the property. Any prudent management will consider seriously potential hazards that can affect their business (directly as well as indirectly) and will take immediate action. Considering the importance of this section, every care has to be taken in choosing appropriate words and to effectively convey the message, depending upon the criticality of the hazard.

## **◆ Introduction**

This section generally contains the ESA scope of work, exclusions in the audit scope, assistance provided during the audit, details of the audit team, client's officials contacted during the audit, audit methodology, and the audit duration. This section can also contain summary of the client's safety system, safety auditing policy, training strategy, Accident Prevention Programme, and the management commitment towards safety. The details of client's business interests and other specific details of the plant process also could form part of this section.

## **◆ Overview of Electrical System**

The overview section contains the details of the electrical power supply and the power distribution. This section can also discuss the details of critical electrical installations, name plate details of critical electrical equipment, recent alterations/additions carried in the electrical installation, captive generation details, etc. This section can also discuss about the future expansion plans with respect to electrical capacity.

## **◆ Specific Observations and Recommendations**

This is the most important section containing the specific observations and recommendations in the plant observed during the audit. Normally, the observations are noted area/plant wise. Checklist method is found effective and various standards (both statutes and non-statutes) are available for reference. The format for this section is given in this paper.

## **◆ Lightning Protection System Evaluation**

The review of the existing lightning protection system of the plant as per the applicable national (IS: 2309) and international standards (NFPA 780) is carried out in this section on a sample basis. The various maintenance aspects are also evaluated in this section. If required, the fundamental step of ascertaining the need for protecting buildings /structures by calculating the risk factor is also carried out. The experience the audit team gained while auditing other similar plants /installations are also discussed in the report for the benefit of the client.

◆ **Electro-Static Hazards- Control Measures**

ESD (Electro-Static Discharges) is a critical area where the potential ESD hazards are to be identified and necessary solutions are to be provided. Making the client aware of the potential accidents that can occur due to Electro-static discharges, minimum ignition energy required for fire /explosion, concept of equipotential bonding and earthing, etc. are also crucial to make them understand the ESD hazards in the right light. Many plants handling flammable chemicals do not understand the concepts of ESD and hence do not follow de-canting procedure that is very unsafe. The reference standards used for identifying and controlling electro-static hazards are IS:7389 and NFPA 77.

◆ **Hazardous Areas – Observations and Recommendations**

This is another crucial area that needs to be evaluated critically. Although hazardous areas are critical, they are mostly neglected in most of the hazardous plants. The design principle of flameproof equipment makes it a special equipment that needs 'special care'. Area classification into zones and installing various types of electrical equipment are the critical factors in controlling accidents in hazardous areas. Once the hazardous areas are classified and the right electrical equipments are installed, the onus of maintaining these special electrical equipments becomes the duty of the electrical maintenance personnel. In almost 90 % of the cases, the maintenance of these electrical equipments is not up to the required level.

The hazardous area classification is carried out by process experts depending upon the possibility of existence of flammable vapour/gases as per IS:5572 /OISD 113 /API RP 500. The selection of electrical equipments is carried out as per IS:5571 and is to be maintained as per IS:13346 and IS:2148 provides the details of special features of flameproof equipments.

◆ **Review of Electrical Accidents and Control Measures**

The electrical accident record in the plant is analyzed in this section. Discussions are also carried out with electrical and safety officers to fully understand the accident and to pinpoint the root cause. The accidents report format as well as the root cause identification methods are analyzed and recommendations are provided.

◆ **Review of Fire Hazards and Fire Protection Measures for Electrical Installations**

This section covers the identified potential electrical fire hazards, fire prevention methods and the fire protection strategies to be adopted by the client. The suitable fire detection (LHS –Linear Heat Sensing cable, smoke/fire detectors) and extinguishing medium (fixe as well as portable) are also recommended depending upon the application. The focus areas will be the electrical installation / equipment where potential of fire hazards are relatively high such as MCC/PCC rooms, transformers, power plants, DG rooms, cable galleries, warehouses, store rooms, office buildings, etc.

◆ **Electrical Maintenance Review**

The electrical maintenance aspects in toto will be reviewed in this section. The standards followed competency of O&M personnel, tests carried out as part of maintenance, etc. will be reviewed in detail. Implementation slippage, test value interpretation, appropriateness of action taken, etc. will also be evaluated. Various national standards (partial list provided in this paper) are used for this purpose.

◆ **Review of Electrical Test Records and Test Procedures**

Tests that are carried on sample basis are evaluated in this section. Tests are carried out when it is felt that the values recorded are not credible. Normally, the following tests are carried out.

5. Insulation resistance values of select cables / motors
6. Load current measurements of feeders/motors
7. Earth resistance tests

The test procedures that are adopted in the plant are also verified against national standards. OSD standards as well as national standards provide valuable guidance regarding acceptable values. The load currents measured are checked against the current carrying capacity of cable/motor after applying applicable rating/de-rating factors to identify overload condition.

◆ **Annexures (for reference, guidelines, etc.)**

This section consists of various published reference materials that could be beneficial to the client in the area of electrical safety. The plant electrical single line diagram and the key electrical equipment lay out diagram may also be attached in this section for future ready reference.

◆ **Photographs (to highlight electrical hazards)**

This is an important section, which is used to highlight electrical hazards identified in the plant. The permission to photograph plant sections is taken in the pre-audit meeting. Generally, auditing agencies maintain confidentiality of the safety audit report as well as the photographs.

Once the photograph is attached in the report with the relevant caption, management appreciates the hazard in a better manner than when it is expressed in text form.

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