



ELECTRICAL SAFETY AUDITS

Perspective

Electrical hazards continue to threaten safety of the people and property in the form of shocks, burns, injury, fire and explosion. With electricity having become an indispensable part of our life, managing it is inevitable.

As per National Crimes Records Bureau (NCRB) of India, around 15 people die every day due to electrical accidents (almost 3% of the total accidental deaths). NFPA, USA studies reveal electricity to be the ignition source for 22% of total fires.

Fires due to electrical reasons are very probable, especially in industries that handle flammable chemicals. In service industries such as ITES / BPO, telecommunications, business interruption losses due to electrical hazards (fire in server / UPS room, damage of expensive communication equipment, transformer fire, loss of data, fire in cable gallery, etc.) could be substantial.

The expert audit team with Cholamandalam MS Risk Service (CMSRS) helps you to identify your electrical risks so that they can be managed effectively.

Audit Methodology

Electrical Data Request

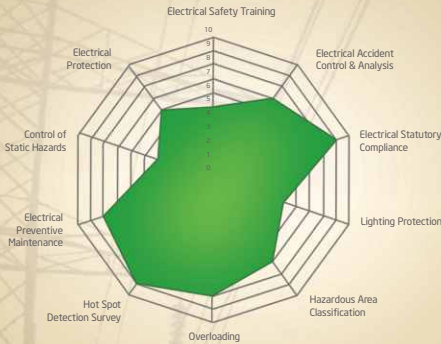
Site Study

- > Opening Meeting
- > Physical Inspection
- > Sample Tests
- > Discussion
- > Document Review

Management Briefing

Submission of Report

Electrical Risk Radar



Highlights of the Study

- > Use of software for lightning protection risk assessment (based on BS 6651)
- > Free Surge Protection Survey (if required)
- > Chola Risk Radar (overall electrical risk level for top management)

Typical Scope of Electrical Safety Audit

- Verification of statutory compliance with respect to Indian Electricity rules.
- Physical inspection to identify electrical hazards (shock fire, explosion, overloading) and to suggest electrical safety solutions.
- Review of plant lightning protection system (need, adequacy, installation and maintenance)
- Review of static electricity hazards in the plant operations (if applicable)
- Review of hazardous area classification and selection of flameproof electrical equipment in the plant, including maintenance aspects (if applicable)
- Review of electrical preventive maintenance system (including tests, documentation, history cards etc.,)
- Review of electrical accidents and near-misses in the plant to identify the root causes
- Review of electrical systems & procedures (work permits, interlocks, Lock Out Tag Out (LOTO) system etc.,)
- Review of the importance given to electrical safety in the company safety policy, safety committee, continuous electrical risk identification, etc.,
- Review of the earthing system (installation & maintenance aspects), including sample earth resistance tests.
- To identify areas of overloading by carrying out load current measurements and compared against cable current carrying capacity calculation
- Hotspot detection using infra-red hot spot detection equipment/thermal imaging (optional)

Reference Standards For The Audit (as Applicable)

- National Electrical Code (NEC)
- OISD Standards (if applicable)
- NFPA Standards
- TAC Regulations
- Indian Electricity Rules, 1956
- Relevant Indian Standards

About Cholamandalam MS Risk Services (CMSRS)

A joint venture between Murugappa Group of India and Mitsui Sumitomo Insurance Group of Japan, CMSRS offers specialized and innovative risk management solutions to clients across Asia. The company has technical collaboration with InterRisk Research Institute & Consulting Inc., Japan and Interisk Asia Pte Ltd., the risk management arm of Mitsui Sumitomo Insurance Group.

The Company started its Risk Service operations in 1994 and has executed more than 300 consulting assignments in safety and risk management in India and abroad. Based in Chennai, with regional teams at Delhi and Mumbai, CMSRS has access to national and international standards and exposure to a variety of industry and service sectors.

Some of the key services include Safety and Risk Management, Process and Fire Safety, Electrical Risk Management and Environment Consulting.

Electrical Risk Management Services

- Comprehensive Electrical Safety Audit
- Lightning Protection Surveys
- One / Two Day Electrical Safety Training
- Hazardous Area Classification Reviews
- Thermal Imaging Inspections



Our Safety and Risk Management Areas

Safety and Risk Management

Safety

- Comprehensive Safety Audit
- Safety Perception Survey
- Disaster Management Planning
- Specialised Safety Training

Process and Fire Safety

- Quantitative Risk Assessment (QRA)
- HAZOP Studies
- Layer of Protection Analysis
- Fire safety Audit / Fire Risk Assessment

Environment Service

- Environment Due Diligence
- Environment Impact Assessment &
- Environment Management plan
- Environment Management System as per ISO 14001
- Corporate Sustainability Reporting

Insurance Support Service

- Risk Management and Insurance Planning Study
- Risk Inspection Survey
- Fire Extinguishing Appliances inspection for insurance discount
- Machinery Breakdown & Loss of Profit Studies (MLOP)

A partial list of our **Prestigious Clientele**

Hindustan Petroleum Corporation Limited
Bharat Petroleum Corporation Limited
Chennai Petroleum Corporation Limited
Mangalore Refinery and Petrochemicals Limited
Cairn Energy Limited
East India Petroleum Limited
Chambal Fertilizers and Chemicals Limited
Coromandel Fertilizers Limited
Bombay Dyeing Limited
Hind Lever Chemicals Limited
Shell India Marketing Private Limited
Accenture
Ahmedabad Electricity Company
GMR Energy Private Limited, Tanirbavi
ST-CMS Electric Company
Orchid Chemicals and Pharmaceuticals
Shasun Drugs and Chemicals Limited
Toyota Kirloskar Motors
Aditya Cements
Vikram Cements
TI Diamond Chain
ABB
Surat Electricity Company
Visaka Cements
Monsanto
Chevron Texaco

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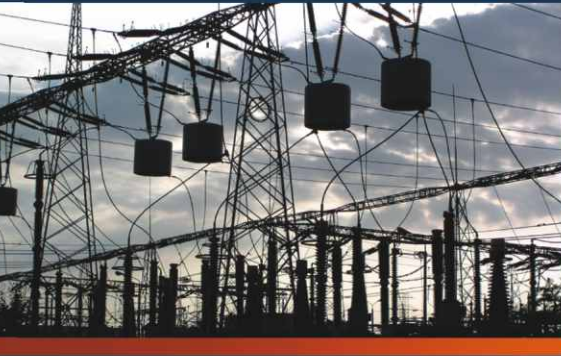
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Cholamandalam MS Risk Services Ltd

(A joint venture between Murugappa Group and Mitsui Sumitomo Insurance group)
Manage Risks Profitably



LIGHTNING PROTECTION RISK ASSESSMENT

Perspective

Lightning is one of the most threatening natural risks impacting the industry and the individuals as well and hence a proactive and scientific approach is required to mitigate the risk posed by lightning. Lightning protection study is highly site specific, with many designs unique to individual facilities and structures. CMSRS offers a comprehensive lightning protection risk assessment study including review of existing surge protection systems.

Objective:

- Evolve lightning protection system specification / Review of existing lightning protection against national and international standards
- Study the maintenance aspects of lightning protection system (for existing systems) and suggest suitable corrective actions
- Review existing surge protection system

Methodology:

- Carry out risk assessment to determine the need for lightning protection for each structure based on BS 6651 software
- Evolve lightning protection system specific for each structure
- Study existing surge protection system and suggest modifications, if required
- Submission of detailed report including prioritization of structure for erection of lightning protection system based on risk assessment

Standards Adopted for Study:

- IS 2309 Code of Practice on Protection of Buildings and Allied Structures against Lightning
- NFPA 780 - OISD 180
- BS 6651 - APIRP 2003

CMSRS Expertise in Lightning Protection Risk Assessment:

- Senior Consultant of CMSRS was trained in Lightning Protection by National Lightning Safety Institute (NLSI) of USA
- Use of software for carrying out lightning protection risk assessment, based on BS 6651
- Association with engineering design specialists to provide technical support on establishing design specification / bill of materials for the evolved lightning protection system
- Executed specialist lightning protection survey for leading petrochemical plants, engineering industries and petrochemical refineries





ELECTRICAL SAFETY TRAINING

Perspective

CMSRS can offer customized inplant training to the plant engineers in specialized electrical safety topics and duration depending on the client's requirement.

A 2-day training on electrical safety would focus on the following aspects

DAY 1:

1. Principles of Accident Prevention
2. Introduction to Electrical safety Hazards (shock, fire etc.)
3. National / International Standards and Statutes on Electrical Safety
4. Electrical Safety Systems. Procedures and Practices (work Permit system, LOTO, Line clearance etc.)
5. Electrical Fire Hazards and Control Measures
6. Electrical Preventive Maintenance and Safety
7. Earthing & Electrical Hazard Control

DAY 2:

8. Global Developments in Electrical safety
9. Hazardous Area Classification
10. Static Electricity Hazards and controls
11. Electrical Accident Investigation
12. Case Studies
13. Sydicate Exercise
14. Site visit to identify electrical hazards and address field electrical safety issues
15. Post Training Evaluation

Highlights of the Training Programme:

- Customized to suit the client's requirements and target audience (electrical / non-electrical engineers / safety officers)
- Training handled by experienced loss prevention engineers with extensive experience in electrical safety
- Highly interactive training sessions supported with films on electrical safety
- Comprehensive course material for participant's reference
- Certificate of participation for successful candidates





HAZARDOUS AREA CLASSIFICATION (HAC) REVIEW

Perspective

In an operational plant, over a period of time several extension and modification projects take place for a variety of reasons. However during such exercises the hazardous area classification is seldom reviewed, as it is considered a designer's job.

This is evident from the number of fire accidents that happen due to electrical causes in the process industries. CMSRS offers hazardous area classification review as a niche electrical safety service to various industry segments.

Scope

- Review Hazardous Area Classification in the plant against the existing HAC drawings / documents based on IS 5572 and API2003
- Review electrical equipment installed in plant based on IS 5571 (type of protection, temperature, classification, Gas group etc.,)
- Review electrical equipment maintenance practices followed in plant against IS 13346 and IS 13408 (part III)
- Review Plant Management of change procedure from Hazardous Area Classification perspective HA Review of dust-prone areas as per IS 14154 (zones 20,21,22)

Highlights of Study:

- Comprehensive Hazardous Area Classification Review Report with recommendations and implementation priority
- CADD drawings with re-classified areas plotted

CMSRS Expertise in Hazardous Area Classification

- Study carried out by experienced loss prevention engineers with extensive experience in electrical safety auditing and risk management
- Senior Consultants of CMSRS are trained at central Mining Research Institute (CMRI) Dhanbad on Hazardous Area Classification and Flameproof Equipment Testing Team members are OHSAS 18001 certified lead auditors
- CMSRS engineers have carried out Hazardous Area Classification and electrical risk assessment studies for speciality chemicals, pharmaceutical plants, petrochemical refineries, LPG bottling plants, fertilizer plants, oil terminals etc.,

HAC Training Programme covering the following areas:

- Hazardous Area Classification Concepts
- Selection of Electrical Equipment in Classified Areas
- Design Features of various explosion protection equipment (flameproof, intrinsically safe, increased safety etc)
- Statutory Approvals
- Installation and Maintenance Guidelines for special
- Electrical equipment
- Case studies
- Electrical safety Auditing guidelines for Hazardous Areas.



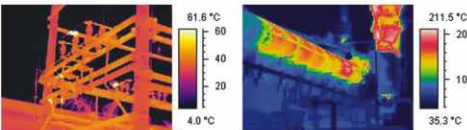
THERMAL IMAGING INSPECTIONS ThermaCheckSM

Perspective

Cholamandalam MS Risk Services Ltd (CMSRSL) offers ThermaCheckSM an innovative service to detect electrical failures and for predictive maintenance of electrical equipment. ThermaCheckSM detects failure precursors that is not visible to the naked eye.

Electrical failures are preceded by rise in temperature and sound. All objects that have a temperature above zero degree Kelvin emit infrared radiation, which can be measured on the infrared spectral band of the electromagnetic spectrum. The technique of measuring and viewing this energy is called Thermal imaging. In precise, thermography is nothing but capturing heat images on film.

The electrical maintenance practices over a period of time have advanced from breakdown maintenance to predictive maintenance practices using advanced techniques like thermal imaging. If timely corrective action is taken after assessing the criticality of the situation, electrical equipment failures can be avoided.



Application

While thermal imaging has innumerable applications in industry, few of the thermal images on electrical equipment are presented below to depict the effectiveness of the technique.

Advantages of Thermal Imaging

- Thermography survey can be carried on operating equipment and hence no business interruptions
- Accurate hotspot / fault detection and hence avoidance of unplanned power outages
- Facilities planned shutdown to address problems if they are critical
- Reduction in overall failure rate of equipment
- Faster mode of troubleshooting and predictive maintenance
- Enhanced safety and loss prevention
- Reduced inspection and operational costs

CMSRS Expertise in Thermal Imaging

- Use of latest FLIR thermocam with state of the art technology for carrying out survey
- Survey carried out by team lead by experienced loss prevention engineer with extensive experience in electrical safety auditing
- CMSRSL engineers are trained in thermal imaging techniques by infrared training Centre, Sweden
- Interpretation of results based on international guidelines / good engineering practices
- Rich experience in carrying out thermography survey for power plants, electronics manufacturing facility etc.

Survey Objective

- Identify equipment / connections which require thermography survey
- Carry out thermal imaging of equipment (process / electrical / mechanical) in operation to identify hotspots
- Factors like age of the equipment reliability level have to be considered before carrying out Risk/ Reliability based maintenance.

Survey Methodology

- Carry out rapid risk assessment of site to identify equipment which require survey.
- Carry out thermal imaging
- Interpret the results obtained from thermal imaging
- Categorize equipment into three risk levels
- "Alarming" required immediate repair
- "Caution" required corrective action in the next available opportunity
- "Check and Monitor" warrants investigation
- Submission of Report

