AHPI-NFE Certified Electrical Safety Auditor for Hospitals

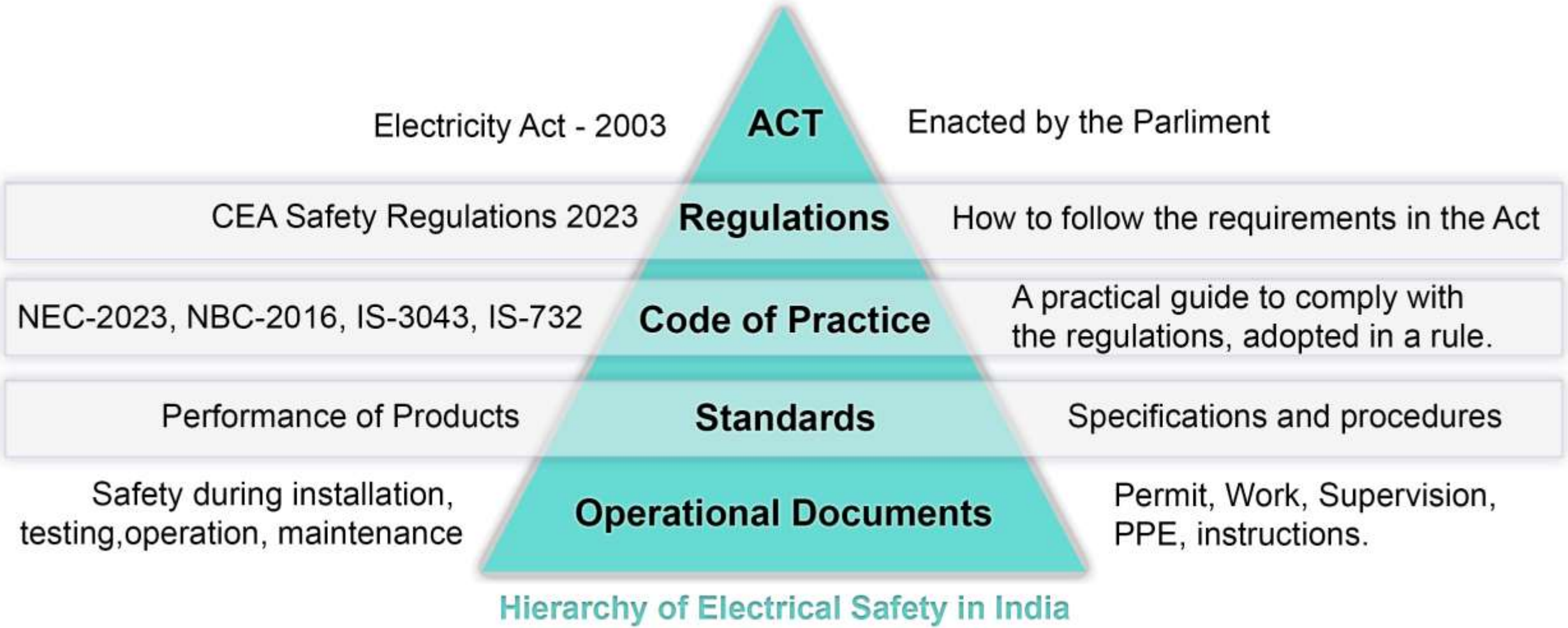
Association of Healthcare Providers (India) represents the majority of healthcare providers in India.

It works as "not for profit" organization and advocates with the government, regulatory bodies and other stake holders on issues, which have bearing on enabling its members organizations to deliver appropriate healthcare services to community at large. The association functions through an empowered secretariat which facilitates the members organizations in improving their systems, processes and outcomes on continuous basis, in line with the vision, mission and objectives of the association.

NATIONAL FEDERATION OF ENGINEERS FOR ELECTRICAL SAFETY,

- Society Registered in chennai a not-for-profit organisation
- An association of engineers working in the field of electrical safety and standardisation,
- Vison - make every electrical installation free of accidents such as electrocution and fire due to short circuits.

Hierarchy of Electrical safety in India



Hierarchy of Electrical Safety in India

Provisions for Punishment (Section 146 of The Electricity Act):

Noncompliance of any of the Regulations in The CEA (MSES) Regulations, 2010 notified under section 53 of The Electricity Act 2003, can be treated as violation to attract section 146 of The Electricity Act 2003 (penal provision):

> Whoever, fails to comply with any order or direction given under this Act, within such time as may be specified in the said order or direction or contravenes or attempts or abets the contravention of any of the provisions of this Act or any rules or regulations made thereunder, shall be punishable with imprisonment for a term which may extend to three months or with fine which may extend to one lakh rupees, or with both in respect of each offence and in the case of a continuing failure, with an additional fine which may extend to five thousand rupees for every day during which the failure continues after conviction of the first such offence.

General Safety requirements

~~**OLD: Chapter III**~~
~~**General safety requirements**~~
~~**12. General safety requirements, pertaining to construction, installation, protection, operation and maintenance of electric supply lines apparatus: -**~~
~~(2) Save as otherwise provided in these regulations, the relevant code of practice of the Bureau of Indian Standards or National Electrical Code, if any, may be followed to carry out the purposes of this regulation and in the event of any inconsistency, the provisions of these regulations shall prevail.~~

Chapter III
General safety requirements
14. General safety requirements pertaining to construction, installation, protection, operation and maintenance of electric supply lines and apparatus

(2) Save as otherwise provided in these regulations, the relevant standards including National Electrical Code and National Building Code shall be followed to carry out the purpose of these regulations and where relevant Indian standards are not available, International standards shall be followed and in the event of any inconsistency, the provisions of these regulations shall prevail.

(3) The material and apparatus used shall conform to the relevant standards.

Journal of Clinical Anesthesia (2014) 26, 414–424

ELSEVIER

Journal of Clinical Anesthesia

Special Article

Fires in Indian hospitals: root cause analysis and recommendations for their prevention☆,☆☆

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Received 4 June 2013; revised 15 December 2013; accepted 26 December 2013

Keywords:
Air conditioner;
Hospital fire;
Oxygen;
Safety;
Ventilation

Abstract There is an increase in the incidence of intraoperative fire in Indian hospitals. It is hypothesized that oxygen (O_2) enrichment of air, is primarily responsible for most of the fires, particularly in intensive care units. As the amount of ignition energy needed to initiate fire reduces in the presence of higher O_2 concentration, any heat or spark, may be the source of ignition when the air is O_2-rich. The split air conditioner is the source of many such fires in the ICU, neonatal intensive care unit (NICU), and operating room (OR), though several other types of equipment used in hospitals have similar vulnerability. Indian hospitals need to make several changes in the arrangement of equipment and practice of handling O_2 gas, as well as create awareness among hospital staff, doctors, and administrators. Recommendations for changes in system practice, which are in conformity with the National Fire Protection Association USA, are likely to be applicable in preventing fires at hospitals in all developing countries of the world with warm climates.

Accident in Hospitals

Table 1 Hospital fire incidents reported in newspapers, 2004 to 2010

Sl No	Year	Day	Time	Country	City	Location of fire	Casualties/injuries
1	2004	Aug 30	4:43 PM	USA	Chicago, IL	Cigarette	One death
2	2006	Jan 03	2:00 AM	India	Hyderabad	Incubator	One baby death
3	2006	July 06	Midnight	USA	Dayton, OH	Air conditioner	No injuries
4	2007	Mar 07	8:00 AM	USA	New York, NY	Space heater	No injuries
5	2008	Jan 02	1:30 PM	England	London	Air conditioner	No injuries
6	2008	Jan 23	Early Morning	USA	Minneapolis, MN	Incubator	One baby burned
7	2008	Mar 13	4:15 AM	India	Ahmedabad	Incubator	One baby death
8	2008	Mar 13	2.30 AM	India	New Delhi	Incubator	One baby death
9	2008	Nov 16	Night	India	Meerut, UP	Incubator	One baby burned
10	2009	Jan 10	7:00 AM	Philippines	Manila	Ventilator	No injuries
11	2009	Jan 31	3:00 AM	India	Patiala, Punjab	Incubator	5 babies burned
12	2009	Feb 11	2:00 AM	England	London	Electrical room basement	Hundreds Evacuated
13	2009	May 03	Afternoon	India	Allahabad	Incubator	One baby death
14	2010	Feb 02	9:30 AM	India	Hyderabad	Diesel generator/short circuit	One death, 38 injuries
15	2010	Feb 03	9:20 AM	India	Kolkata	Short circuit in meter box	No injuries
16	2010	April 15	1:30 AM	India	Mancherial, AP	Incubator	One baby death
17	2010	April 19	2:30 PM	India	Katni, MP	Air conditioner	8 babies evacuated
18	2010	May 14		India	Nashik, Maharashtra	Electrical short circuit in ICU	One death
19	2010	June 14	11:30 AM	India	Siliguri, WB	Air conditioner	No injuries
20	2010	Aug 17		Romania	Bucharest	Air conditioner	5 baby deaths
21	2010	Sep 13	Midnight	Pakistan	Lahore	Air conditioner	3 pt deaths
22	2010	Nov 20	5:20 PM	Pakistan	Lahore	Switchboard	No injuries

ICU=intensive care unit, pts=patients.

Accident in Hospitals

Table 2 Hospital fire incidents reported in newspapers, 2011 and 2012

Sl No	Year	Day	Time	Country	City	Location of fire	Casualties/injuries
1	2011	Mar 09	Early morning	India	Beed, Maharashtra	Incubator	Two baby deaths
2	2011	May 27	11:30 AM	Bangladesh	Chittagong	Electrical short circuit in store room	No injuries
3	2011	June 28	10.30 PM	India	Chandigarh	Ventilator	One person injured
4	2011	July 24	5:10 AM	India	Chennai	Air conditioner	Two pt deaths
5	2011	Nov 23	7:24 PM	England	Bristol	O_2 cylinder	One pt injured
6	2011	Dec 09	2:30 AM	India	Kolkata	Air conditioner	93 deaths
7	2012	Jan 08	Not known	India	Hisar, Haryana	Electric stabilizer	No injuries
8	2012	Mar 20	3:00 AM	India	Jorhat, Assam	Radial warmer	26 babies rescued
9	2012	Mar 21	9:00 AM	India	Kolkata	Air conditioner	No injuries
10	2012	Mar 22	8:40 AM	India	Medinipur, WB	Air conditioner	No injuries
11	2012	April 06	Afternoon	India	Allahabad	Air conditioner	No injuries
12	2012	April 21	1:00 AM	India	Guwahati, Assam	Air conditioner	No injuries
13	2012	May 31	3:50 PM	India	Delhi	O_2 line	40 pts saved
14	2012	June 08	3:15 PM	Pakistan	Lahore	Air conditioner	7 baby deaths
15	2012	June 14	5:00AM	Australia	Adelaide	Kitchen	No injuries
16	2012	July 01	Early morning	India	Moradabad, UP	Air conditioner	Two deaths
17	2012	July 02	5:00PM	India	Delhi	Air conditioner	No injuries
18	2012	Aug 17	11:30 AM	India	Cuttack, Orissa	Air conditioner	No injuries
19	2012	Aug 23	Evening	India	Mumbai	Air conditioner	No injuries
20	2012	Aug 29	7:50 PM	India	Delhi	Electrical box	No injuries
21	2012	Sep 05	5:00PM	India	Jaipur, Rajasthan	Air conditioner	No injuries
22	2012	Sep 06	11:15 PM	India	Madurai	Air conditioner	No injuries
23	2012	Sep 06	2:19 AM	USA	Durham, NC	Defibrillator	One death, three injuries
24	2012	Sep 08	8:15 PM	India	Bokaro, Jharkhand	Air conditioner	Three deaths
25	2012	Sep 25	3:30 PM	India	Ludhiana, Punjab	MCB box (NICU)	No injuries
26	2012	Sep 25	5:00 PM	USA	Linton, IN	Motor (air handling unit)	No injuries
27	2012	Oct 02	10:30 PM	India	Kolkata	Air conditioner	No injuries
28	2012	Oct 23	4:06 AM	Taiwan	Tainan	Storage room	13 deaths, 60 injuries
29	2012	Nov 24	10:00 PM	India	Kolkata	Air conditioner	No injuries

Pt(s)=patient(s), MCB=microcircuit breaker, NICU=neonatal intensive care unit.

Accident in Hospitals

Table 3 Hospital fire incidents reported in newspapers: 2013 (up to September)

Sl No	Year	Day	Time	Country	City	Location of fire	Casualties/Injuries
1	2013	Jan 01	5:30 PM	USA	Dayton, OH	Transformer	No injuries
2	2013	Jan 05	2:30 AM	India	Mangalore, Karnataka	Air conditioner	No injuries
3	2013	Jan 09	10.30 AM	India	Mangalore	Air conditioner	No injuries
4	2013	Jan 13	3:20 AM	India	Bikaner, Rajasthan	AC and heater	4 infants injured
5	2013	Feb 19	9:09 AM	Pakistan	Karachi	Ultrasound laboratory (basement)	Several injuries
6	2013	Feb 20	Not known	USA	Portland, OR	Alcohol-soaked hand sanitizer, static electricity	One person injured
7	2013	Feb 23	12 Noon	India	Kolkata	Air conditioner	No injuries
8	2013	March	6:00 PM	Canada	Ottawa	O_2 cylinder	One person injured
9	2013	Mar 06	7:50 AM	Spain	Madrid	O_2 container	3 persons injured
10	2013	April 20	4:45 AM	Canada	Ottawa	O_2 cylinder	4 persons injured
11	2013	April 20	Not known	India	Ramanathapuram, Tamilnadu	Air conditioner	No injuries
12	2013	April 21	12 Noon	India	Allahabad	Air conditioner	No injuries
13	2013	April 26	2 AM	Russia	Ramensky, near Moscow	Electrical short circuit	38 pt deaths at psychiatric hospital
14	2013	May 01	morning	Russia	Tambov, Russia	Cigarette smoking	One pt death
15	2013	May 09	morning	Russia	Krasnodar , Russia	Cigarette smoking	One pt death
16	2013	May 22	6:30 AM	Phillipines	Davao	Electrical overload	195 persons evacuated
17	2013	May 23	2 PM	India	Chromepet, TN	Electrical short circuit	No injuries
18	2013	May 24	5:35 PM	Pakistan	Lahore	Electrical short circuit	No loss of life
19	2013	May 29	11 AM	India	New Delhi	Air conditioner	No injuries
20	2013	June 17	Not known	India	New Delhi	Short circuit in AC	No injuries.
21	2013	June 18	4 AM	India	Pune	Electrical short circuit	No injuries. Equipment burnt.
22	2013	June 22	Not known	Pakistan	Karachi	Electrical short circuit	No injuries
23	2013	July 05	Not known	India	Sheikhupura, Punjab	Electrical fire	One injury
24	2013	July 26	Not known	China	Liaoyuan, Jilin	Power distribution	39 deaths
25	2013	Aug 01	Morning	Pakistan	Karachi	AC machine	No injuries
26	2013	Aug 05	Evening	India	Cuttack, Orissa	AC machine	No injuries
27	2013	Aug 22	9 AM	Lebanon	Beirut	Office scanner	No injuries
28	2013	Aug 25	6-30 PM	India	New Delhi	X-ray unit	No injuries
29	2013	Sept 13	Pre-dawn	Russia	Luka, Novgorod	Cigarette	37 deaths
30	2013	Sept 30	10 AM	England	Edinburgh	Air conditioner	No injuries

Pt(s)=patient(s), AC=air conditioner.

Electrical Safety in Hospitals – WHY?

- Patient is unconscious/unresponsive
- Too many critical life saving equipment to which he is connected (Shock / fire)
- Too many critically ill patients in the affected environment
- Too many sensitive electrical equipment in the environment
- Hazardous (O_2 and Anesthetic gas)
- Electrical resistance of skin, which is normally an important protection against harmful electric currents is bypassed.
- Conductive instruments in contact with the bloodstream or heart muscle (shock)
- Electric and magnetic interference may disturb certain medical examinations or treatments.

DEFIBRILLATOR

CAUTERY MACHINE

INTRA CARDIAC DEFIB PADDLE

Electrical Hazards and Conditions

Common electrical accidents in a hospital:

1. Electric Shock
2. Ignition of Fire from electricity
3. Reliability (EMI)

Electrical safety in Hospitals:

- Safety from electrocution to patients and medical professional are mandatory in general locations and in medical locations.
- Safety from fire is required for the installation and connected electrical and bio medical equipment.

Need of the Course:

- To avoid shock hazards and fire in medical locations and hospital premises.
- **National Electrical Safety Regulations of Govt of India 2023 made compliance to NEC of India 2023, mandatory in Hospitals and Medical locations. Violation is punishable under section 146 of The Electricity Act 2003.**

Who will be trained: Professionals in Hospitals handling Bio Medical equipment and MEP equipment.

Content of Training: Modern international practices on electrical and bio medial safety and the recommended practice as per National Electrical Code of India 2023.

Duration and Mode of training:

- 16 hours **ONLINE** theoretical class.
- 6 to 8 hours of **DIRECT** (in a common location) practical class on inspection, testing, maintenance, usage of electrical installation and bio medical appliance.

Eligibility:

- Any professional working as electrical / electronic / bio medial engineer in AHPI member hospitals and having an experience of >1 year.
- Any other electrical /electronic / bio medial engineering professional having >2 year experience.

Course fee: Rs. 10,000/- per participant

Trainers

1. S. Gopa Kumar, member MT40, IEC and ETD 20 BIS
2. S. Appavoo, Chief Electrical Inspector to Govt of Tamilnadu (retd).
3. Krish Theobald, Electrical expert IET, UK.
4. Jay Phadke, Radiation Safety Specialist
5. Amaya Shaji, Bio Medical engineer
6. Vinoth V, Electrical Testing Specialist.

Course starts on August 14

#	Subject of Theoretical Training (ONLINE)	Reference	Duration in hours	Consideration for test and certification
1	Fundamental aspects of safety standards for medical electrical equipment	IEC 60513	1	Applied parts, body current, Type of ME equipment and system, Protection against hazards Category AP/APG locations Safety services System earthing TN-S/IT system challenges Medical locations & Protective measures
2	Type of electrical equipment, Type of medical equipment, Testing, classification, identification, marking and documents of ME & MES, Protection against electrical, mechanical, excessive radiation, temperature hazards from ME equipment. oxygen rich environments	IS 13450-1 IEC 60601-1)	2	
3	Fundamentals of Electrical safety in general locations including selection of wires, wiring,	IS732	3	
4	System earthing and equipment earthing & its application for ME equipment and system	IS732 IS13450 IS17512	2	
5	Group 0, Group 1 and group 2 medical locations and safety requirements in the locations	IS17512	2	
6	Medical electrical equipment – Recurrent test and test after repair of medical electrical equipment	IEC 62353	2	
7	Verification of Electrical Installation	IS732 NEC P1 S17	2	
8	Verification of Electrical Installation in group 1 and group 2 locations	IS17512 NEC P3, S9	2	

#	Subjects of Practical	Reference	Duration
1	Medical electrical equipment Recurrent test and test after repair of medical electrical equipment	IEC 62353	2
2	Electrical Installation safety audits, inspection, and Testing	IS732 / NEC P1 S17	2
3	Medical installation and medical location safety audit	IS17512	2