Periodic comprehensive review of the CEA (Measures relating to Safety and Electric Supply) Regulations, 2010 (as amended)

Revised draft amendment based on the comments received over previous uploaded draft

NOTE: -

"This document contains ONLY those provisions of the regulations in which amendments are proposed, including certain new provisions proposed to be added."

Red color is meant for deletions.

Green color is meant for addition/changes.

Sky blue color is meant for addition/changes after considering comments over previous draft.

Reg.	Existing Provision	Draft Amendment/New Provision [As agreed by the representatives from State Govt. in a meeting held on 18-19 January, 2017]	Justification
		Chapter-I	
2	(1)(j) "conductor" means any wire, cable, bar, tube, rail or plate used for conducting electricity and so arranged as to be electrically connected to a system;	Deleted to re-define to distinguish between conductor, cable, covered conductor and ABC cable.	To make definitions as per IEC60050
		"Designated person" means a person whose name appears in the register maintained under regulation 3(2) by the supplier or consumer, or the owner, agent or manager of a mine, or the agent of any company operating in an oil-field or the owner of a drilled well in an oil field or a contractor.	New Definition
		"Step voltage" means the potential difference between two points on the earth's surface, separated by distance of one pace, that will be assumed to be one metre in the direction of maximum potential gradient, without touching any grounded object.	New Definition
		"Touch voltage" means the potential difference between a grounded metallic structure and a point on the earth's surface separated by a distance equal to the normal maximum horizontal reach, approximately one metre.	New Definition
		"Contact potential" means electric potential difference across the junction of two different substances in the absence of electric current.	New Definition
		"Conductor (of an overhead line)" means a wire or combination of wires not insulated from one another, suitable for carrying an electric current.	New Definition
		"Covered conductors" means a longitudinally water blocked conductor (aluminium, aluminium alloy or ACSR) with triple extruded covering	New Definition

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		(First semiconducting layer, Second XLPE insulation layer and the final XLPE outer layer with UV- and tracking resistant properties) that meets the requirement of ANSI/ICEA S-70-547-2007 with leakage current of less than 1 milliamp on the surface, in line with EN 50397-1 standard.	
		"Modulus of rupture" means stress in a material just before it yields in a flexure test.	New Definition
		"Areal Bunched Cable (ABC)" means a self-supporting assembly of XLPE insulated conductor(s) with a suitable metallic screen to eliminate any magnetic/induction field reaching the external surface and bundled together with an earthed bearer wire of suitable breaking strength	New Definition
		"Neutral point" common point of a star-connected polyphase system or earthed mid-point of a single-phase system	New Definition
		"Nominal voltage (of an electrical installation)" means value of the voltage by which the electrical installation or part of the electrical installation is designated and identified	New Definition
		"Electrical-in-charge" means a person in charge of the electrical department/section/installation responsible for safe operation and maintenance of all electrical systems and declared competent as per Oil Mines Regulations as amended from time to time	New Definition
		"Point of commencement of supply of electricity" means the point at the incoming terminal of the switchgear installed by the consumer.	Shifted from Regulation 16
		"Safety Working Clearance" is the minimum clearance to be maintained in air between the live part of the equipment on one hand and earth or another piece of equipment or conductor on which it is necessary to carry out the work, on the other;	Shifted from Schedule-VII
	(2) Words and expressions used and not defined in these regulations but defined in the Act shall	~~(i) Words and expressions used and not defined in these regulations but defined in the Act shall have the meanings respectively assigned to~~	

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	have the meanings respectively assigned to them in the Act.	~~them in the Act.~~	
		(2)(i) Term or expression used in these regulations and defined in the Act, has the meaning assigned to it in the Act.	Regulations being subordinate to the Act.
		(ii) A term or expression used in connection with a particular standard has the meaning used in that standard, unless the term is defined in the Act or in these regulations, in which case it has that meaning.	To cover definition of left out term, if any.
		(iii) A term used in these regulations and not defined in the Act or these regulations, and to which regulation (2) does not apply, has the meaning given (if any), - (a) in the NEC; and (b) in all other cases, in IEC 60050 (International Electrotechnical Vocabulary).	To cover definition of left out term, if any.
	New Provision	(3) Scope and applicability.- These regulations are applicable to all installation and persons engaged in the generation, transmission, distribution or trading of electricity, or use of electricity supplied or installation, maintenance or use any electric line or electric plant.	Scope and applicability added.
Chapter-II			
3	(1) A supplier or a consumer, or the owner, agent or manager of a mine, or the agent of any company operating in an oil-field or the owner of a drilled well in an oil field or a contractor who has entered into a contract with a supplier or a consumer to carry out duties incidental to the generation, transformation, transmission, conversion, distribution or use of electricity shall designate persons for the purpose to operate and carry out the work on electrical lines and	(1) A supplier or a consumer, or the owner, agent or manager of a mine, or the agent of any company operating in an oil-field or the owner of a drilled well in an oil field or a contractor who has entered into a contract with ~~a supplier or a consumer~~ them to carry out duties incidental to the generation, transformation, transmission, conversion, distribution or use of electricity shall designate ~~persons~~ person(s) for the purpose ~~to operate and carry out the work on electrical lines and apparatus~~ of any or all of the followings; namely:- Regulation 19(3), 28(2), 37(i), 39(2), 44(1), 44(2), 64(1), 105(2),	Designated person(s) is/are referred in Regulation 19(3), 28(2), 37(i), 39(2), 44(1), 44(2), 64(1), 105(2), 105(5), 107(5), 108, and 109(8).

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	apparatus.	105(5), 107(5), 108, 109(8).	
	(2) The supplier or consumer, or the owner, agent or manager of a mine, or the agent of any company operating in an oil-field or the owner of a drilled well in an oil field or a contractor referred to on sub-regulation (1) shall maintain a register wherein the names of the designated persons and the purpose for which they are engaged, shall be entered.	(2) The supplier or consumer, or the owner, agent or manager of a mine, or the agent of any company operating in an oil-field or the owner of a drilled well in an oil field or a contractor referred to ~~on~~ in sub-regulation (1) shall maintain a register (in paper or electronic form) wherein the names of the designated ~~persons~~ person(s) and the purpose for which they are ~~engaged~~ designated, shall be entered.	Editorial changes in view of maintain information in digital form.
	(3) (ii) his name is entered in the register referred to in sub-relgulation (2).	Deleted.	Redundant provision.
4	**Inspection of designated officers and other safety measures.-**	**Inspection of designated ~~officers~~ person(s) and other safety measures. -**	Editorial change.
5	**Electrical Safety Officer.-** (1) All suppliers of electricity including generating companies, transmission companies and distribution companies shall designate an Electrical Safety Officer for ensuring observance of safety measures specified under these regulations in their organisation, for construction, operation and maintenance of power stations, sub-stations, transmission and distribution lines.	**Electrical Safety ~~Officer~~ Officer(s). - (**1) All suppliers of electricity including generating companies, transmission companies and distribution companies shall designate Electrical Safety ~~Officer~~ Officer(s) for ensuring observance of safety measures specified under these regulations in their organisation, for construction, operation and maintenance of power stations, sub-stations, transmission and distribution lines.	Editorial change.
	(2) The Electrical Safety Officer shall be an Electrical Engineering degree holder with at least five years of experience in operation and maintenance of electrical installations	(2) The Electrical Safety Officer shall be an Electrical Engineering degree holder with at least five years of experience in operation and maintenance of electrical installations or an Electrical Engineering diploma holder with at least 10 years of experience in operation and maintenance of electrical installations.	Representation from diploma holders' association for inclusion of diploma qualification. Relevant experience in

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		Provided that the Electrical Safety Officer designated for mines shall possess at least five years of experience in operation and maintenance of electrical installations relevant to the mine ─ coal or oil or metal as applicable	mine is required to assess the safety requirement of electrical installations in mining conditions and having special type of apparatus
	(3) The Electrical Safety Officer designated under sub-regulation (1), shall carryout periodic tests as per the relevant standards and inspection of such installations for ensuring observance of safety measures specified under these regulations at intervals not exceeding one year, and keep a record thereof in Form I or Form II or Form III, as the case may be, of Schedule IV and test reports, and also keep a register of recommended safety requirements duly acknowledged by the owner with date and compliances thereafter; and such records shall be made available to the Electrical Inspector, as and when required.	(3) The Electrical Safety Officer designated under sub-regulation (1), shall carryout periodic tests as per the relevant standards and inspection of such installations for ensuring observance of safety measures specified under these regulations ~~at intervals not exceeding one year~~ at least once in a year, and keep a record thereof in Form I or Form II or Form III or Form-IV, as the case may be, of Schedule IV and test reports, and also keep a register of recommended safety requirements duly acknowledged by the owner with date and compliances thereafter; and such records shall be made available to the Electrical Inspector/ Electrical Inspector of Mines, as and when required.	Making the provision non- negative. Insertion of Form-IV is required for periodic test and inspection of mining installations. For mine installations, the report need to be made available to the Electrical Inspector of Mines.
	(4) For every electrical installation including factory registered under the Factories Act, 1948 (63 of 1948) and mines and oil field as defined in the Mines Act, 1952 (35 of 1952), where more than 250 kW of electrical load is connected, the owner of the installation or the management of the factory or mines, as the case may be, shall designate Electrical Safety Officer having	(4) For every electrical installation including factory registered under the Factories Act, 1948 (63 of 1948) and mines and oil field as defined in the Mines Act, 1952 (35 of 1952),where more than 250 kW of electrical load is connected, the owner of the installation or the management of the factory or mines, as the case may be, shall designate Electrical Safety Officer having qualification and experience specified in sub-regulation (2), for ensuring the observance of the safety provisions laid under the Act and the regulations made thereunder, who shall	Making the provision non- negative.

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	qualification and experience specified in sub-regulation (2), for ensuring the observance of the safety provisions laid under the Act and the regulations made thereunder, who shall carryout recommended periodic tests as per the relevant standards, and inspect such installation at intervals not exceeding one year, and keep a record thereof in Form I or Form II or Form III, as the case may be, of Schedule IV to these regulations; test reports and a register of recommendations in regard with safety duly acknowledged by owner; compliances made thereafter; and such records shall be made available to the Electrical Inspector, as and when required.".	carryout recommended periodic tests as per the relevant standards, and inspect such installation ~~at intervals not exceeding one year~~ at least once in a year, and keep a record thereof in Form I or Form II or Form III or Form-IV, as the case may be, of Schedule IV to these regulations; testreports and a register of recommendations in regard with safety duly acknowledged by owner; compliances made thereafter;and such records shall be made available to the Electrical Inspector, as and when required.	Insertion of Form-IV is required for observance of the safety provisions in mining installations
5(A)	**Chartered Electrical Safety Engineer.-** The Appropriate Government may authorise Electrical Safety Engineers having the qualification and experience as specified in sub-regulation (2) of regulation 5 to assist the owner or supplier or consumer of electrical installations for the purpose of self-certification under regulation 30 and regulation 43.	**5A. Chartered Electrical Safety Engineer.-**(1)The Appropriate Government shall authorise Chartered Electrical Safety Engineers from amongst persons having the qualification and experience as specified by the Authority under sub-regulation (2) of regulation 5 **or having experience in administration of Electricity Act, Rules and Regulations** to assist the owner or supplier or consumer of electrical installations for the purpose of self-certification under regulation 30 and regulation 43.	*Amendment in 5(A) has been sent for approval of the Authority on 06.01.2017.* **Added in the 18-19 Jan meeting.**

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	New Provision	(2) The Appropriate Government shall upload the name of the chartered Electrical Safety Engineer, as soon as any person is authorized as Chartered Electrical Safety Engineer, on the web portal of the Government or Department dealing with matters of inspection of electrical installations for the information of the owner or supplier or consumer.	*Amendment in 5(A) is under process. Status:: awaiting final approval from the Authority.*
	New Provision	(3) The Central Electricity Authority shall, within a period of three months, frame and issue the guidelines including the eligibility conditions for authorizing the Chartered Electrical Safety Engineer.	*Amendment in 5(A) is under process. Status: awaiting final approval from the Authority.*
6	**Safety measures for operation and maintenance of electric plants.-** (1) Engineers and supervisors appointed to operate or undertake maintenance of any part or whole of a thermal power generating station and a hydro power plant together with the associated sub-station shall hold diploma in Engineering from a recognized institute, or a degree in Engineering from a university.	**Safety measures for operation and maintenance of electric plants.-** (1) Engineers and supervisors engaged or appointed to operate or undertake maintenance of any part or whole of ~~a thermal power generating station and a hydro power plant~~ an electric power plant together with the associated sub-station shall hold degree or diploma in **in appropriate trade of** Engineering from a recognized institute or university.	To include conventional as well as RES plants.
	(3) Engineers, supervisors and Technicians engaged for operation and maintenance of electric plants should have successfully undergone the type of training as specified in Schedule-I.	(3) Engineers, supervisors and technicians engaged for operation and maintenance of electric power plants should have successfully undergone the type of training as specified in Schedule-I.	To include conventional as well as RES plants.
	(4) The owner of every thermal power generating station and hydro power plant together with their associated sub-station shall arrange for training of personnel engaged in the operation and	(4) The owner of every ~~thermal power generating station and hydro power plant~~ electric power plant together with their associated sub-station shall arrange for training of personnel engaged or appointed ~~in the operation and~~ to operate and undertake maintenance of his	• To include conventional as well as RES plants. • Recognisation of

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	maintenance of his generating station along with associated sub-station in his own institute or any other institute recognized by the Central Government or the State Government. Provided that separate training shall be given to the persons engaged in operation and maintenance of thermal power stations and hydro power stations including associated sub-stations.	~~generating station~~ electric power plant along with associated sub-station in his own institute or any other institute recognized by the ~~Central Government or the State Government~~ Central Electricity Authority **as per the guidelines framed by the Authority** and shall maintain record of the assessment forms of these personnel (in paper or electronic form) issued by the training institute in the format prescribed in Schedule-I and such records shall be made available to the Electrical Inspector, as and when required. Provided that separate training shall be given to the persons engaged in operation and maintenance of ~~thermal power stations and hydro power stations~~ thermal, hydro, nuclear and renewable electric plants including associated sub-stations.	training institutes is processed by CEA. • Maintaining records in paper or digital form. • Editorial changes.
		(5) The certificate of recognition of the training institute issued by the Central Electricity Authority shall be displayed by the Institute at its website.	
	New Provision	(6) The owner of an electric power plant of capacity **below** 100 MW may customise the duration and syllabus of the training specified in Schedule-I as per the plant capacity.	Customisation as per requirement
7	(1) Engineers or supervisors engaged in operation and maintenance of transmission and distribution systems shall hold diploma in electrical, mechanical, electronics and instrumentation Engineering from a recognized institute or university.	(1) Engineers or supervisors engaged or appointed ~~in operation and maintenance~~ to operate or undertake maintenance of transmission and distribution systems shall hold degree or diploma in ~~electrical, mechanical, electronics and instrumentation~~ **in appropriate trade of** Engineering from a recognized institute or university.	• Maintaining records in paper or digital form. • Editorial changes. • Degree qualification incorporated.
	(3) Engineers, supervisors and Technicians engaged for operation and maintenance of transmission and distribution systems electric	(3) Engineers, supervisors and technicians engaged or appointed ~~for operation and maintenance~~ to operate or undertake maintenance of transmission and distribution systems ~~electric plants~~ should have	Editorial changes.

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	plants should have successfully undergone the type of training as specified in Schedule-II. Provided that the existing employees shall have to undergo the training mentioned in sub-regulation (3) within three years from the date of coming into force of these regulations.	successfully undergone the type of training as specified in Schedule-II. Provided that the existing employees shall have to undergo the training mentioned in sub-regulation (3) within three years from the date of coming into force of these regulations.	
	(4) Owner of every transmission or distribution system shall arrange for training of their personnel engaged in the operation and maintenance of transmission and distribution system in his own institute or any other institute recognized by the Central Government or State Government.	(4) Owner of every transmission or distribution system shall arrange for training of their personnel engaged or appointed ~~in the operation and maintenance~~ to operate and undertake maintenance of transmission and distribution system, in his own institute or any other institute recognized by the ~~Central Government or the State Government~~ **Central Electricity Authority as per the guidelines framed by the Authority** and shall maintain record of the assessment forms of these personnel (in paper or electronic form) issued by the training institute in the format prescribed in Schedule-II and such records shall be made available to the Electrical Inspector, as and when required.	• Maintaining records in paper or digital form. • Recognisation of training institutes is processed by CEA. • Editorial changes.
	New Provision	**(5) The certificate of recognition of the training institute issued by the Central Electricity Authority shall be displayed by the Institute at its website.**	
	(1) The generating company or licensee shall maintain records of the maps, plans and sections relating to supply or transmission of electricity and submit the same to the Electrical Inspector for inspection as and when required by him.	(1) The generating company or licensee shall maintain records of the maps, plans and sections relating to supply or transmission of electricity and record of consumers and submit the same to the Electrical Inspector for inspection as and when required by him.	Transparency in r/o consumers.
11	(1) The licensee shall, after commencing to supply electricity, forthwith cause a plan, to be made in electronic form, of the area of supply,	(1) The licensee shall, after commencing to supply electricity, forthwith cause a plan, to be made in electronic form, of the area of supply, and shall cause to be marked thereon the alignment and in the	Editorial changes.

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	and shall cause to be marked thereon the alignment and in the case of underground works, the approximate depth below the surface of all the existing electric supply lines, street distributing boxes and other works, and shall once in every year cause that plan to be duly corrected so as to show the electric supply lines, street distributing boxes and other works for the time being in position and shall also, if so required by an Electrical Inspector, cause to be made sections showing the approximate level of all his existing underground works other than service lines.	case of underground works, the approximate depth below the surface of all the existing electric supply lines, street ~~distributing~~ boxes and other works, and shall once in every year cause that plan to be duly corrected so as to show the electric supply lines, street ~~distributing~~ boxes and other works for the time being in position and shall also, if so required by an Electrical Inspector, cause to be made sections showing the approximate level of all his existing underground works other than service lines.	
	(4) Global Positioning System (GPS) mapping or mapping through any other latest technology, of existing and old plans and sections shall be completed within five years from the date of commencement of these regulations and new plans and sections shall be compatible to the Global Positioning System mapping or mapping through any other latest technology.	(4) ~~Global Positioning System (GPS) mapping or mapping through any other latest technology, of existing and old plans and sections shall be completed within five years from the date of commencement of these regulations and~~ The licensee shall ensure that all new and old plans and sections shall be compatible to the Global Positioning System mapping or mapping through any other latest technology.	Re-phrased.
Chapter-III			
General safety requirements			
12	**General safety requirements pertaining to construction, installation, protection, operation and maintenance of electric supply lines and apparatus.-** (1) All electric supply lines and apparatus shall be of sufficient rating for power, insulation and estimated fault current	**General safety requirements pertaining to construction, installation, protection, operation and maintenance of electric supply lines and apparatus.-** (1) (a) All electric supply lines and apparatus shall be of sufficient rating for power, insulation and estimated fault current and of sufficient mechanical strength, for the duty cycle which they may be required to perform under the	

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	and of sufficient mechanical strength, for the duty cycle which they may be required to perform under the environmental conditions of installation, and shall be constructed, installed, protected, worked and maintained in such a manner as to ensure safety of human beings, animals and property.	environmental conditions of installation, and shall be constructed, installed, protected, worked and maintained in such a manner as to ensure safety of human beings, animals and property. (b) Save as otherwise provided in these regulations, the relevant provisions, if any, of the Technical Standards for Construction of Electrical Plants and Electric Lines Regulations, Connectivity to the Grid Regulations, Installation and Operation of meters Regulations and Safety requirements for construction, operation and maintenance of electrical plants and electric lines Regulations framed by CEA 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.	
	(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 regulaions shall prevail.	(2) Save as otherwise provided further in these regulations, the relevant Indian Standards or National Electrical Code or International Standard, if any, where relevant Indian Standards are not available, shall be followed to carry out the purposes of this regulation and in the event of any inconsistency, the provisions of these regulations shall prevail.	Adopting International Standards, where relevant IS not available.
	(3) The material and apparatus used shall conform to the relevant specifications of the Bureau of Indian Standards or International Elelctro-Technical Commission where such specifications have already been laid down.	(3) The material and apparatus used shall conform to the relevant specifications of the Indian Standards or National Electrical Code or International Standards where such specifications have already been laid down and where relevant Indian Standards are not available.	• Adopting International Standards, where relevant IS not available. • Adopting NEC.
	(4) All electrical equipment shall be installed above the Mean Sea Level (MSL) as declared by local Municiple Authorities and where such equipment is to be installed in the basement, consumer shall ensure that the design of the	(4) All electrical equipment shall be installed above the Mean Sea Level (MSL) as declared by local Municipal Authorities and where such equipment is to be installed in the basement, consumer shall ensure that the design of the basement should be such that there is no seapage or leakage or logging of water in the basement and shall	• Cross reference to regulation 44(2)(x) • For many sites MSL is not available.

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	basement should be such that there is no seapage or leakage or logging of water in the basement.	ensure compliance of regulation 44(2)(x). Provided that where such MSL is not declared by the local Municipal Authority, Highest Flood Level (HFL) recorded data by the local authority shall be used for this purpose.	
	New Provision	(5) Owner of installation shall display conspicuously **approved** Single Line Diagram **and general arrangement plan** of every electrical installation belonging to him.	Making display of SLD mandatory.
13	**Service lines and apparatus on consumer's premises.-** (1) The supplier shall ensure that all electric supply lines, wires, fittings and apparatus belonging to him or under his control, which are on a consumer's premises, are in a safe-condition and in all respects fit for supplying electricity and the supplier shall take precautions to avoid danger arising on such premises from such supply lines, wires, fittings and apparatus.	**Service lines and apparatus on consumer's premises.-** (1) The supplier shall ensure that all electric supply lines, wires, fittings and apparatus belonging to him or under his control, upto the point of commencement of supply, which are on a consumer's premises, are in a safe-condition and in all respects fit for supplying electricity and the supplier shall take precautions to avoid danger arising on such premises from such supply lines, wires, fittings and apparatus.	It shall be the responsibility of the Supplier.
15	**Identification of earthed and earthed neutral conductors and position of switches and switchgear therein.-** Where the conductors include an earthed conductor of a two-wire system or an earthed neutral conductor of a multi-wire system or a conductor which is to be connected thereto, the following conditions shall be complied with:- (i) an indication of a permanent nature shall be provided by the owner of the earthed or earthed neutral conductor, or the conductor which is to be connected thereto, to enable such conductor to be	**Identification of earthed and earthed neutral conductors and position of switches and switchgear therein.-** Where the conductors include an earthed conductor of a two-wire system or an earthed neutral conductor of a multi-wire system or a conductor which is to be connected thereto, the following conditions shall be complied with:- (i) an indication of a permanent nature shall be provided by the owner of the earthed or earthed neutral conductor, or the conductor which is to be connected thereto, to enable such conductor to be distinguished from any live conductor and such indication shall be provided- (c) in all other cases, at a point corresponding to the point of commencement of supply or ~~at such other points as may be approved by an Electrical Inspector~~ as per IS 732.	Making the identification practice standardised. **"point of commencement of supply" explaination**

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	distinguished from any live conductor and such indication shall be provided- (c) in all other cases, at a point corresponding to the point of commencement of supply or at such other points as may be approved by an Electrical Inspector.		**u/r 16(3) shifted to definition.**
	(ii) no cut-out, link or switch other than a linked switch arranged to operate simultaneously on the earthed or earthed neutral conductor and live conductors shall be inserted or remain inserted in any earthed or earthed neutral conductor of a two wire-system or in any earthed or earthed neutral conductor of a multi-wire system or in any conductor connected thereto.	(ii) no cut-out, link, ~~or~~ switch or circuit breaker other than a linked switch arranged to operate simultaneously on the earthed or earthed neutral conductor and live conductors shall be inserted or remain inserted in any earthed or earthed neutral conductor of a two wire-system or in any earthed or earthed neutral conductor of a multi-wire system or in any conductor connected thereto.	
16	**New Provision**	(4) Save as otherwise provided in these regulations, TN system of earthing as per IS 732 shall be followed by the Supplier to carry out the purpose of this regulation.	Standardising system of earthing.
	Explanation.- For the purposes of sub-regulation (1), the expression "point of commencement of supply of electricity" shall mean the point at the incoming terminal of the switchgear installed by the consumer.	~~*Explanation.*- For the purposes of sub-regulation (1), the expression "point of commencement of supply of electricity" shall mean the point at the incoming terminal of the switchgear installed by the consumer.~~	**Shifted to definition**
19	(2) Every person who is working on an electric supply line or apparatus or both shall be provided with tools and devices such as gloves, rubber shoes, safety belts, ladders, earthing devices,	(2) Every person who is working on an electric supply line or apparatus or both shall be provided with personal protective equipments (PPE), tools and devices such as rubber gloves (IS 4770) and ~~rubber~~ safety footwear (IS 15298) suitable for working	Specifying PPE and applicable standards.

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	helmets, line testers, hand lines and the like for protecting him from mechanical and electrical injury and such tools and devices shall always be maintained in sound and efficient working condition.	voltage, safety belts for working at height (IS 3521), nonconductive ladder, earthing devices of appropriate class, helmet (IS 2925), line tester, hand ~~lines~~ lamp, voltage detector (IS 6863, 6864, 6865 and 6866 as applicable), hand tools (IS 13772) and the like for protecting him from mechanical and electrical injury arc flash and such PPE, tools and devices shall conform to Indian Standards or International Standards and shall always be maintained in sound and efficient working condition.	
	(3) No person shall work on any live electric supply line or apparatus and no person shall assist such person on such work, unless he is designated in that behalf, and takes the safety precautions given in Schedule-III.	(a) No person shall work on any live electric supply line or apparatus and no person shall assist such person on such work, unless he is designated in that behalf under regulation 3(1) or engaged or appointed under regulation 6(1) or regulation 7(1) or under Reg-115 (1) (ii) &(iii) and takes the safety precautions given in Schedule-III (Part-I).	Making provision referential for more clarity. Making the Reg-115 (1) (ii) &(iii) referential Language to be checked with MoL&J
		(b) No person shall operate and undertake maintenance work on any part or whole of an electric power plant together with the associated substation or electric supply line or apparatus and no person shall assist such person on such work, unless he is designated in that behalf under regulation 3(1) **or engaged or appointed under regulation 6(1) or regulation 7(1)** or under Reg-115 (1) (ii) &(iii) and takes the safety precautions given in Part-II, Part-III and Part-IV of Schedule-III.	Provision is related to handling of S/D works in r/o AIS, GIS, HVDC. **Agreed but drafting to be checked with MoL&J.** Making the Reg-115 (1) (ii) &(iii) referential
	(5) All non-current carrying metal parts of switchgear and control panels shall be	(5) For the safety of operating personnel, ~~All~~ all non-current carrying metal parts of switchgear and control panels shall be	For enhanced safety of operating personnel.

Reg.	Existing Provision	Draft Amendment/New Provision [As agreed by the representatives from State Govt. in a meeting held on 18-19 January, 2017]	Justification
	properly earthed and insulating floors or mat conforming to IS-15652: 2006, of appropriate voltage level shall be provided in front of the panels for the safety of operating personnel.	properly earthed and insulating floors or mat conforming to IS 15652, of appropriate voltage level shall be provided in front and rear of the panels ~~for the safety of operating personnel~~ where such personnel are required to stand to carry out operation, maintenance or testing work.	
21	**Cables for portable or transportable apparatus**.- (1) Flexible cables shall not be used for portable or transportable motors, generators, transformers, rectifiers, electric drills, electric sprayers, welding sets or any other portable or transportable apparatus unless they are heavily insulated and adequately protected from mechanical injury.	**Cables for portable or transportable apparatus**.- (1) Flexible cables shall not be used for portable or transportable motors, generators, transformers, rectifiers, electric drills, electric sprayers, welding sets or any other portable or transportable apparatus unless they are heavily insulated for required voltage as per relevant Indian Standards and adequately protected from mechanical injury.	Insulation level (heavily insulated) of cable has been qulaified as per IS
23	(3)(i) to ensure that any gas which may by accident have obtained access to the box shall escape before a person is allowed to enter; and	(3)(i) to ensure that any gas which may by accident have obtained access to the box shall escape before a person is allowed to enter and the box shall have provision for sufficient cross ventilation; and	Deletion of term not relevant.
	(4) The owners of all street boxes or pillars containing circuits or apparatus shall ensure that their covers and doors are kept closed and locked and are so provided that they can be opened only by means of a key or a special appliance.	(4) The owners of all street boxes or pillar boxes containing circuits or apparatus shall ensure that their covers and doors are kept closed and locked and are so provided that they can be opened only by means of a key or a special appliance.	Pillar is replaced by pillar box
24	**Distinction of different circuits.-** The owner of every generating station, sub-station, junction-box or pillar in which there	**Distinction of different circuits.-** The owner of every generating station, sub-station, junction-box or pillar box in which there are any circuits or apparatus, whether intended for operation at	Pillar is replaced by pillar box

Reg.	Existing Provision	Draft Amendment/New Provision [As agreed by the representatives from State Govt. in a meeting held on 18-19 January, 2017]	Justification
	are any circuits or apparatus, whether intended for operation at different voltages or at the same voltage, shall ensure by means of indication of a permanent nature that the respective circuits are readily distinguishable from one another.	different voltages or at the same voltage, shall ensure by means of indication of a permanent nature that the respective circuits are readily distinguishable from one another.	
27	(2) The fire extinguishers shall be tested for satisfactory operation as per relevant Indian Standard at least once a year and record of such tests shall be maintained.	(2) (a) Appropriate type of portable fire extinguisher conforming to appropriate Indian Standards, shall be selected and installed as per IS 2190 for dealing with the fire likely to occur; (b) The fire extinguishers shall be inspected, tested and maintained for satisfactory operation as per ~~relevant Indian Standard~~ IS 2190 and record of such tests shall be maintained.	Specifying the relevant Standard.
	(3) First-aid boxes or cupboards conspicuously marked and equipped with such contents as the State Government may specify, shall be provided and maintained in every generating station, enclosed sub-station, enclosed switching station and in vehicles used for maintenance of lines so as to be readily accessible during all working hours and all such boxes and cupboards shall, except in the case of unattended sub-stations and switching stations, be kept in charge of responsible persons who are trained in first-aid treatment and one of such persons shall be available during working hours.	(3) Sufficient number of first-aid boxes or cupboards conspicuously marked and equipped with such contents as the State Government may specify or as per IS 13115, shall be provided and maintained at appropriate locations in every generating station, enclosed sub-station, enclosed switching station and in vehicles used for maintenance of lines so as to be readily available and accessible ~~during all working hours~~ at the all times and all such boxes and cupboards shall, except in the case of unattended sub-stations and switching stations, be kept in charge of responsible persons who are trained in first-aid treatment and one of such persons shall be available during working hours.	Specifying the relevant Standard.

Reg.	Existing Provision	Draft Amendment/New Provision [As agreed by the representatives from State Govt. in a meeting held on 18-19 January, 2017]	Justification
	(4) Two or more gas masks shall be provided conspicuously and installed and maintained at accessible places in every generating station with capacity of 5 MW and above and enclosed sub-station with transformation capacity of 5 MVA and above for use in the event of fire or smoke: Provided that where more than one generator with capacity of 5 MW and above is installed in a power station, each generator shall be provided with at least two separate gas masks in an accessible and conspicuous place: Provided further that adequate number of gas masks shall be provided by the owner at every generating station and enlosed sub-station with capacity less than 5 MW and 5 MVA respectively.	(4) Two or more gas masks shall be provided conspicuously and installed and maintained at accessible places in every generating station with capacity of 5 MW and above and enclosed sub-station with transformation capacity of 5 MVA and above for use in the event of fire or smoke: Provided that where more than one generator with capacity of 5 MW and above is installed in a power station, each generator shall be provided with at least two separate gas masks in an accessible and conspicuous place. ~~Provided further that adequate number of gas masks shall be provided by the owner at every generating station and enlosed sub-station with capacity less than 5 MW and 5 MVA respectively.~~	Irrelevant provision is deleted. **Not Agreed.**
	New Provision	(5) In every manned generating station, sub-station or switching station of voltage exceeding 650 V, an artificial respirator shall be provided and kept in good working condition.	Shifted from Regulation 28(3).
	New Provision	(6) The locations of fire extinguishers and first-aid boxes, gas masks and artificial respirator shall be displayed in the control room and operator cabin.	

Reg.	Existing Provision	Draft Amendment/New Provision [As agreed by the representatives from State Govt. in a meeting held on 18-19 January, 2017]	Justification
	New Provision	(7) Address and telephone number of the nearest Doctor, hospital with a facility for first-aid treatment for electric shock and burns, ambulance service and fire service shall be prominently displayed near the electric shock treatment chart in control room and operator cabin.	
28	(3) In every manned generating station, sub-station or switching station of voltage exceeding 650 V, an artificial respirator shall be provided and kept in good working condition.	~~(3) In every manned generating station, sub-station or switching station of voltage exceeding 650 V, an artificial respirator shall be provided and kept in good working condition.~~	Shifted to Regulation 27(5).
31	**Testing of consumer's installation.-** (1) Upon receipt of an application for a new or additional supply of electricity and before connecting the supply or reconnecting the same after a period of six months, the supplier shall either test the installation himself or accept the test results submitted by the consumer when the same has been duly signed by the licensed Electrical Contractor.	**Testing of consumer's installation.-** (1) Upon receipt of an application for a new or additional supply of electricity and before ~~connecting the supply or reconnecting the same after~~ commencement of supply or recommencement of supply after the supply has been disconnected for a period of six months, the supplier (electrical power supplying company) shall either test the installation himself or accept the test results submitted by the consumer when same has been duly signed by the licensed electrical contractor and the testing equipment shall be caliberated through a Government authorized or NABL accredited laboratory. ~~for upto voltage of 650 V, and above 650 V the same shall be tested & signed by the Government authorized or NABL Accredited Electrical Testing Laboratory.~~	To ensure proper calibration of testing apparatus and testing of consumer installation.
32	**Installation and testing of generating units.-** The capacity above which generating	**Generating units required to be inspected by Electrical Inspector.-** The capacity above which generating units including	• To match regulation content with title.

Reg.	Existing Provision	Draft Amendment/New Provision [As agreed by the representatives from State Govt. in a meeting held on 18-19 January, 2017]	Justification
	units including generating units producing electricity from renewable sources of energy will be required to be inspected by the Electrical Inspector before commissioning, shall be as per the notification to be issued by the Appropriate Government under the sub-section (1) of section 162 of the Act.	generating units producing electricity from renewable sources of energy will be required to be inspected by the Electrical Inspector before commissioning, shall be as per the notification to be issued by the Appropriate Government.	• There is no such provision for issue of notification u/r 162.
33	**Precautions against leakage before connection.-** (1) The supplier shall not connect with his works the installation or apparatus on the premises of any applicant for supply unless he is reasonably satisfied that the connection will not at the time of making the connection cause a leakage from that installation or apparatus of a magnitude detrimental to safety which shall be checked by measuring the installation resistance as under,- (i) all equipments shall have the insulation resistance (IR) value as stipulated in the relevant Indian Standards; (ii) on application of 500 V DC between each live conductor and earth for a period of one minute the insulation	**Precautions against leakage before connection.-**(1) The supplier shall not connect with his works the installation or apparatus on the premises of any applicant for supply unless he is reasonably satisfied that the connection will not at the time of making the connection cause a leakage from that installation or apparatus of a magnitude detrimental to safety which shall be checked by measuring the installation or apparatus insulation resistance as under,- (i) all ~~equipments~~ apparatus shall have the insulation resistance (IR) value as stipulated in the relevant Indian Standards; (ii) on application of 500 V DC between each ~~live~~ conductor to be charged and earth for a period of one minute the insulation resistance of installation and ~~equipments~~ apparatus	• Specifying IR for rotating machinery and above 33 kV apparatus. • Specifying test voltage for IR measurements.

Reg.	Existing Provision	Draft Amendment/New Provision [As agreed by the representatives from State Govt. in a meeting held on 18-19 January, 2017]	Justification
	resistance of installation and equipment of voltage not exceeding 650 V shall be at least 1 MEGA OHM or as specified in the relevant Indian Standard;	of voltage not exceeding 650 V shall be at least 1 MEGA OHM or as specified in the relevant Indian Standard;	
	(iii) on application of 2.5 kV DC between each live conductor and earth for a period of one minute, the insulation resistance of installation and equipment of voltage exceeding 650 V but not exceeding 33 kVshall be at least 5 MEGA OHM or as specified in the relevant Indian Standard.	(iii) on application of 2.5 kV DC between each ~~live~~ conductor to be charged and earth for a period of one minute, the insulation resistance of installation and ~~equipments~~ apparatus of voltage exceeding 650 V but not exceeding 33 kV shall be at least 5 MEGA OHM or as specified in the relevant Indian Standard. (iv) on application of 5 kV or 10 kV DC between each conductor to be charged and earth for a period of one minute, the insulation resistance of installation and apparatus of voltage exceeding 33 kV shall be at least 500 MEGA OHM or as specified in the relevant Indian Standard. (v) on application of 5 kV or 10 kV DC between pin and cap of clean and dry insulator for a period of one minute, the insulation resistance of insulator shall be at least 2000 MEGA OHM or as specified in the relevant Indian Standard. (vi) for rotating machinery minimum insulation resistance at 40 degree centigrade shall be (n+1) MEGA OHM, where n is the operating voltage in kV;	

Reg.	Existing Provision	Draft Amendment/New Provision [As agreed by the representatives from State Govt. in a meeting held on 18-19 January, 2017]	Justification
	(2) If the supplier declines to make a connection under the provisions of sub-regulation (1) he shall convey to the applicant the reasons in writing for so declining.	(2) If the supplier declines to make a connection under the provisions of sub-regulation (1) he shall convey to the applicant the reasons thereof in writing for so declining.	Grammatical correction.

<table>
<tr>
<td>35</td>
<td>(2) The following controls of requisite capacity to carry and break the current shall be placed as near as possible after the point of commencement of supply so as to be readily accessible and capable of being easily operated to completely isolate the supply to the installation, such equipment being in addition to any equipment installed for controlling individual circuits or apparatus, namely:-

(i) a linked switch with fuse or a circuit breaker by consumers of voltage which does not exceed 650 V;

(ii) a linked switch with fuse or a circuit breaker by a consumer of voltage exceeding 650V but not exceeding 33 kV having aggregate installed transformer or apparatus capacity up to 1000 KVA to be supplied at voltage upto 11 kV and 2500 KVA at higher voltages (above 11 kV and not exceeding 33 kV);

(iii) a circuit breaker by consumers at voltage exceeding 650 V but not exceeding 33 kV having an aggregate installed</td>
<td>(2) The following controls of requisite capacity to carry and break the current shall be placed as near as possible after the point of commencement of supply so as to be readily accessible and capable of being easily operated to completely isolate the supply to the installation, such equipment being in addition to any equipment installed for controlling individual circuits or apparatus, namely:-
<table>
<tr><td>Control</td><td>Voltage</td><td>Aggregate installed transformer or apparatus capacity</td><td>Supplied at voltage</td></tr>
<tr><td>A linked switch with fuse or a circuit breaker by consumers</td><td>Not exceeding 650 V</td><td>-</td><td>-</td></tr>
<tr><td rowspan="2">A linked switch with fuse or a circuit breaker by consumers</td><td rowspan="2">Exceeding 650 V but not exceeding 33 kV</td><td>Upto 500 kVA</td><td>Upto 11 kV</td></tr>
<tr><td>Upto 1250 kVA</td><td>Above 11 kV and not exceeding 33 kV</td></tr>
<tr><td rowspan="2">A a circuit breaker by consumers</td><td rowspan="2">Exceeding 650 V but not exceeding 33 kV</td><td>Above 500 kVA</td><td>Upto 11 kV</td></tr>
<tr><td>Above 1250 kVA</td><td>Above 11 kV and not exceeding 33 kV</td></tr>
<tr><td>A circuit</td><td>Exceeding 33</td><td>-</td><td>-</td></tr>
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</td>
<td>• Protection CT's suitable for 500 KVA and 350MVA fault level are available.</td>
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</table>

transformer and apparatus capacity above 1000 KVA and supplied at voltage upto 11 kV and above 2500 KVA at higher voltages (above 11 kV and not exceeding 33 kV); (iv) a circuit breaker by a consumer of voltage exceeding 33 kV. Provided that where the point of commencement of supply and the consumer apparatus are near each other, one linked switch with fuse or circuit breaker near the point of commencement of supply shall be considered sufficient. (3) In case of every transformer the following shall be provided; namely:- (i) on primary side for transformers a linked switch with fuse or circuit breaker of adequate capacity: Provided that the linked switch on the primary side of the transformer may be of such	breaker by consumers kV Provided that where the point of commencement of supply and the consumer apparatus are ~~near each other~~ separated by a distance less than ~~100~~ **15** metre, one linked switch with fuse(s) or circuit breaker near the point of commencement of supply as required by this clause shall be considered sufficient. (3) In case of every transformer the following shall be provided; namely:- (i) on primary side for transformers a linked switch with fuse or circuit breaker of adequate capacity: Provided that the linked switch with fuse or circuit breaker on the primary side of the transformer may be of such capacity as to carry the full load current and to	Specifying the distance between consumer apparatus and point of commencement of supply.

	capacity as to carry the full load current and to break only the magnetising current of the transformer: Provided further that for all transformers: (a) having a capacity of 5000 KVA and above installed before the year 2000; and (b) having a capacity 1000 KVA and above installed in or after the year 2000, a circuit breaker shall be provided: Provided also that the linked switch on the primary side of the transformer shall not required for the unit auxiliary transformer and generator transformer;	break only the magnetising current of the transformer: Provided further that for all transformers: (a) having a capacity of 5000 KVA and above installed before the year 2000; and (b) having a capacity 1000 KVA and above installed in or after the year 2000, a circuit breaker shall be provided; and (c) having a capacity above 500 kVA installed in or after the year 2017, a circuit breaker shall be provided: Provided also that the linked switch with fuse or circuit breaker on the primary side of the transformer shall not be required for the unit auxiliary transformer and generator transformer;	• To make the provision in line with the capacity specified in the table above.

35	(6) All insulating materials shall be chosen with special regard to the circumstances of their proposed use and their mechanical strength shall be sufficient for their purpose and so far as is practicable of such a character or so protected as to maintain adequately their insulating property under all working conditions in respect of temperature and moisture; and	(6) All insulating materials shall be chosen with special regard to the circumstances of their proposed use and their mechanical strength shall be sufficient for their purpose and so far as is practicable of such a character or so protected as to maintain adequately their insulating property under all working conditions in respect of temperature, moisture and dust; and	
36	(2) Before making an application for commencement of supply or recommencement of supply after an installation has been disconnected for a period of six months or more, the owner or ocupier of a multi-storeyed building shall give not less than thirty days notice in writing to the Electrical Inspector specify therein the particulars of installation and the supply of electricity shall not be commenced or recommenced within this period, without the approval in writing of the Electrical Inspector.	(2) Before making an application for commencement of supply or recommencement of supply after an installation has been disconnected for a period of six months or more, the owner or ~~ocupier~~ occupier of a multi-storeyed building shall give not less than thirty days notice in writing to the Electrical Inspector specify therein the particulars of installation and the supply of electricity shall not be commenced or recommenced within this period, without the approval in writing of the Electrical Inspector.	
	(3) The supplier or owner of the installation shall provide at the point of commencement of supply a suitable isolating device with cut-out or breaker to operate on all phases except neutral in the 3-phase, 4-wire circuit and fixed in a conspicuous position at not more than 1.70 metres above the ground so as to completely isolate the supply to the building in case of emergency.	(3) The supplier or owner of the installation shall provide at the point of commencement of supply a suitable isolating device with cut-out or breaker to operate on all phases except neutral in the 3-phase, 4-wire circuit and fixed in a conspicuous position at not more than 1.70 metres above the ground so as to completely isolate the supply to the building in case of emergency. Provided that supply to emergency services of the building shall be excluded from such isolating device.	
	(5) No other service pipes and cables shall	(5) No other service pipes and cables shall be taken ~~along~~ through	

	be taken along the ducts provided for laying power cables and all ducts provided for power cables and other services shall be provided with fire barrier at each floor crossing.	the ducts provided for laying power cables and all ducts provided for power cables and other services shall be provided with fire barrier at each floor crossing.	
	New provision	(6) Only Fire Retardant Low Smoke and Halogen (FRLSH) power cables shall be used: Provided that where height of the building is ~~30~~ **24** metre or more, distribution of electricity to the floors shall be done using rising mains or bus bar trunking system.	Introducing fire retardant low smoke and halogen cables to reduce fire hazards in building
	New provision	(7) Lightning protection of the building shall be as per IS/IEC 62305-1/2/3/4.	For safety of electrical system in buildings from lightening.
37	**Conditions applicable to installations of voltage exceeding 250 Volts.-** The following conditions shall be complied with where electricity of voltage above 250 V is supplied, converted, transformed or used; namely:-	**Conditions applicable to installations of voltage exceeding 250 Volts.-** The following conditions shall be complied with where electricity of voltage above 250 V is supplied, converted, inverted, transformed or used; namely:-	To include Solar.
	(iii) Every switchboard shall comply with the following,- (a) a clear space of not less than one metre in width shall be provided in front of the switchboard;	(iii) Every switchboard shall comply with the following,- (a) a clear space of not less than one metre in width shall be provided in front of the switchboard; Provided that clear space between panels facing each other shall not be less than 2 metre.	Space between panels was not there in regilations.
Chapter-V			

Safety provisions for electrical installations and apparatus of voltage not exceeding 650 volts			
40	**Test for resistance of insulation.-** (1) Where any electric supply line for use at voltages not exceeding 650 V has been disconnected from a system for the purpose of addition, alteration or repair, such electric supply line shall not be reconnected to the system until the supplier or the owner has applied the test prescribed under regulation 33.	**Test for resistance of insulation.-** (1) Where any electric supply line for use at voltages not exceeding 650 V has been disconnected from a system for the purpose of addition, alteration or repair, such electric supply line shall not be reconnected to the system until the supplier or the owner has applied the test prescribed under regulation 33.	
	(2) The provision under sub-regulation (1) shall not apply to overhead lines except overhead insulated cables, unless the Electrical Inspector otherwise directs in any particular case.	~~(2) The provision under sub-regulation (1) shall not apply to overhead lines except overhead insulated cables, unless the Electrical Inspector otherwise directs in any particular case.~~	Deleted. Making the 40(1) applicable to O/H lines too.
41	**Connection with earth.-** The following conditions shall apply to the connection with earth of systems at voltage normally exceeding 125 V but not exceeding 650 V, namely:- (i) neutral conductor of a 3-phase, 4-wire system and the middle conductor of a 2-phase, 3-wire system shall be earthed by not less than two separate and distinct connections with a minimum of two different earth electrodes or such large number as may be necessary to bring the earth resistance to a satisfactory value as per IS: 3043 both at the generating station and at the sub-station.	**Connection with earth.-** The following conditions shall apply to the connection with earth of systems at voltage normally exceeding ~~125 V~~ 48 V but not exceeding 650 V, namely:- (i) neutral conductor of a 3-phase, 4-wire system and the middle conductor of a 2-phase, 3-wire system shall be earthed by not less than two separate and distinct connections with a minimum of two different earth electrodes or such large number as may be necessary to bring the earth resistance to a ~~satisfactory~~ value as per IS: 3043 both at the generating station and at the sub-station.	Lowering the voltage level to a maximum safe value for human beings. Specifying the Standard instead of keeping subjective value.

	(x) no person shall make connection with earth by the aid of, nor shall he keep it in contact with, any water mains not belonging to him except with the consent of the owner thereof and of the Electrical Inspector.	(x) no person shall make connection with earth by the aid of, nor shall he keep it in contact with, any water mains. ~~not belonging to him except with the consent of the owner thereof and of the Electrical Inspector.~~	This provision is not relevant.
	(xiii) neutral point of every generator and transformer shall be earthed by connecting it to the earthing system by not less than two sepearte and distinct connections.	(xiii) neutral point of every generator and transformer shall be earthed by connecting it to the earthing system by not less than two sepearte and distinct connections without touching the frame as given in IS 3043.	Specifying the Standard.
	(xv)All earthing systems shall, - (a) consist of equipotential bonding conductors capable of carrying the prospective earth fault current and a group of pipes, rods and plate electrodes for dissipating the current to the general mass of earth without exceeding the allowable temperature limits as per relevant Indian Standards in order to maintain all non-current carrying metal works reasonably at earth potential and to avoid dangerous contact potentials being developed on such metal works; (xvi) all earthing systems belonging to the supplier shall in addition, be tested for resistance on dry day during the dry season not less than once every two years.	(xv) All earthing systems shall, - (a) consist of equipotential bonding conductors capable of carrying the prospective earth fault current and a group of pipes, rods and plate electrodes for dissipating the current to the general mass of earth without exceeding the allowable temperature limits as per ~~relevant Indian Standards~~ IS: 3043 in order to maintain all non-current carrying metal works reasonably at earth potential and to avoid dangerous contact potentials being developed on such metal works; (xvi) all earthing systems belonging to the supplier shall in addition, be tested for resistance on dry day during the dry season ~~not less than once every two years~~ at least once a year.	Specifying the Standard. Grammatical change only.

	Explanation:- The expression "Class-II apparatus and appliance" shall have the same meaning as is assigned to it in the relevant Indian Standards.	*Explanation:-* The expression "Class-II apparatus and appliance" shall have the same meaning as is assigned to it in the ~~relevant Indian Standards~~ IS: 302 (Part-1).	Specifying the Standard
42	**Earth leakage protective device. -** The supply of electricity to every electrical installation other than voltage not exceeding 250 V, below 2 kW and those installations of voltage not exceeding 250 V, which do not attract provisions of section 54 of the Act, shall be controlled by an earth leakage protective device whose maximum earth leakage threshold for tripping should not exceed 30 milliamps for domestic connections and 100 milliamps for all other installations, so as to disconnect the supply instantly on the occurance of earth fault or leakage of current:	**Residual Current Device.-**The supply of electricity to every electrical installation other than voltage not exceeding 250 V, below ~~2 kW~~ 1 KW ~~and those installations of voltage not exceeding 250 V,~~ which do not attract provisions of section 54 of the Act, shall be controlled by ~~an earth leakage protective device whose maximum earth leakage threshold for tripping should~~ a Residual Current Device whose rated residual operating current shall not exceed 30 milliamps for ~~domestic connections~~ household and similar application for protection against Electric shock and ~~100 milliamps for all other installations~~ 300 milliamps for all installations for protection against fire due to leakage current so as to disconnect the supply on the occurrence of earth fault or leakage of current:	1. Earth Leakage protective device is voltage operated protective device, which has long been replaced by Residual Current Circuit Breaker also known as RCDResidual Current device is current operated. Indian and IEC standard for RCD or Residual Current Circuit Breaker is IS/IEC 61008 -1 Residual Current Circuit Breaker for Household and similar application. Brief history of Earth Leakage protective device is given below. 2. As per IEC 60364-4-422.3.9 & revised IS 732 (under printing) — 300 milliamps RCD is recommended to prevent

			fire due to leakage current in the building.
43(8)	New Sub Regulation	(8) In case of installations of mines and oil fields, the electrical installations of voltage 1100V and above shall not be connected to supply, unless and until such installation work including alterations or additions or recommencement after shutdown for six months are approved in writing by the Electrical Inspector of Mines. Provided that the electrical installations of voltage below1100V in mines and oil fields are to be self-certified by the Owner/Agent/Manager of the mine before commencement of supply or recommencement after shutdown for six months in the manner specified in sub regulation (1)	As per regulation 102, Electricity shall not be transmitted into a belowground mine at a voltage exceeding 11000 Volts and shall not be used therein at a voltage exceeding 6600 Volts. The electrical apparatus in mine are required to be robust, suitable for rough usage, capable of being worked in the classified explosive/hazardous atmosphere and expected to maintain its performance and integrity in the most adverse conditions of operation for which these equipments are tested, conforming to the relevant standards. The conditions, special conditions mentioned in the test reports; the GA drawings etc., are required to be taken in to

			consideration before commencement of supply to those apparatus. These hazards are more with higher voltages starting from 1100V and such installations /machinery are being deployed increasingly in the active mining conditions and exposed to hazardous atmosphere in modern mining technology.

Chapter-VI			
Safety provisions for electrical installations and apparatus of voltage exceeding 650 volts			
44	**Use of electricity at voltage exceeding notified voltage.-** (1) The Electrical Inspector shall not authorise the supplier to commence supply or where the supply has been discontinued for a period of six months and above, to recommence the supply at voltage exceeding notified voltage to any consumer unless-- (a) all conductors and apparatus situated on the premises of the consumer are so placed as to be inaccessible except to a designated person and all operations in connection with the said conductors and apparatus are carried out by a designated person; (2) The owner shall observe the following conditions, where electricity at voltage exceeding 650 V is supplied, converted, transformed or used,- (iv) he shall ensure that the windings of motors or other apparatus within reach from any position in which a person may require to be, are suitably protected so as to prevent	**Use of electricity at voltage exceeding notified voltage.-** (1) The Electrical Inspector shall not authorise the supplier to commence supply or where the supply has been discontinued for a period of six months and above, to recommence the supply at voltage exceeding notified voltage to any consumer unless-- (a) all conductors and apparatus situated on the premises of the consumer are so placed as to be inaccessible except to ~~a designated person~~ the person(s) designated under regulation 3(1) or engaged or appointed under regulation 6(1) or regulation 7(1) or under Reg-115 (1) (ii) &(iii) and all operations in connection with the said conductors and apparatus are carried out by ~~a designated person~~ the person(s) designated under regulation 3(1) or engaged or appointed under regulation 6(1) or regulation 7(1) or under Reg-115 (1) (ii) &(iii) ; (2) The owner shall observe the following conditions, where electricity at voltage exceeding 650 V is supplied, converted, transformed or used,- (iv) he shall ensure that the ~~windings of motors or other apparatus~~ live parts of all apparatus within reach from any position in which a person may require to be, are suitably	Making the provision referential in r/o 3(1), 6(1) & 7(1). Making the Reg-115 (1) (ii) &(iii) referential

	danger; (vii) where a sub-station or a switching station with apparatus having more than 2000 litres of oil is installed, whether indoor or outdoors, he shall take the following measures, namely:- (a) the baffle walls of four hours fire rating shall be provided between the apparatus,- (i) where there is a single phase transformer banks in the switch-yards of generating stations and sub-stations; (ii) on the consumer premises; (iii) where adequate clearance between the units is not available. (b) provisions shall be made for suitable oil soakpit and where use of more than 9000 litres of oil in any one oil tank, receptacle or chamber is involved, provision shall be made for the draining	protected so as to prevent danger; (vii) where a sub-station or a switching station with apparatus having more than 2000 litres of oil is installed, whether indoor or outdoors, he shall take the following measures, namely:- (a) the ~~baffle~~ separation wall or fire barrier walls of four hours fire rating shall be provided between the apparatus,- (i) where there is a single phase transformer banks in the switch-yards of generating stations and sub-stations; (ii) on the consumer premises; (iii) where adequate clearance between the units as per IS: ~~3034~~ 1646 for O-class oil or as per IEC 61936-1 for K-class oil is not available. (b) provisions shall be made for suitable oil soakpit and where use of more than 9000 litres of oil in any one oil tank, receptacle or chamber is involved, provision shall be made for the draining away or removal of any oil which	Introducing provision for K-class oil as per amendment in IS 1180.

	away or removal of any oil which may leak or escape from the tank, receptacle or chamber containing the same, and special precautions shall be taken to prevent the spread of any fire resulting from the ignition of the oil from any cause and adequate provision shall be made for extinguishing any fire which may occur; (viii) without prejudice to the above measures, he shall take adequate fire protection arrangement for quenching the fire in the apparatus; (ix) he shall ensure that the transformers of 10 MVA and above rating or in case of oil filled transformers with oil capacity of more than 2000 liters are provided with fire fighting system as per IS - 3034: 1993 or with Nitrogen Injection Fire Protection system; (x) where it is necessary to locate the sub-station, or switching station in the basement, he shall take the following measures, namely:- (d) direct access to the transformer room shall be	may leak or escape from the tank, receptacle or chamber containing the same, and special precautions shall be taken to prevent the spread of any fire resulting from the ignition of the oil from any cause and adequate provision shall be made for extinguishing any fire which may occur; **Provided that for 66 kV and above voltage class transformers, provisions of regulation 43(2)(a)(iii) of CEA (Technical Standards for Construction of Electric Plants and Electric Lines) Regulations shall be followed.** (viii) without prejudice to the above measures, he shall take adequate fire protection arrangement for quenching the fire in the apparatus; (ix) he shall ensure that the transformers/reactors of 10 MVA/MVAR and above rating ~~or in case of oil filled transformers with oil capacity of more than 2000 liters are provided with fire fighting system as per IS - 3034: 1993~~ shall be provided with Automatic High Velocity Water Spray System designed and installed as per IS 15325 or with Nitrogen Injection Fire Protection system; (x) where it is necessary to locate the sub-station, or switching station in the basement, he shall take the following measures, namely:-	• 2000 L oil and 10 MVA are not commensurate with each other. • Scope of IS 3034 is for installations of generating plants excluding nuclear.

	provided from outside and the surrounding walls shall be lined with fire bricks;	(d) direct access to the transformer room shall be provided from outside and the surrounding walls ~~shall be lined with fire bricks~~ of four hour fire rating shall be provided as per IS: 1642;	
	(f) fire Retardent Low Smoke (FRLS) cable of two hours rating shall be used.	(f) Fire Retardant Low Smoke zero Halogen (FRLSH) ~~or Low Smoke Zero Haogen (LSZH) or Zero Halogen Fire Resistance (ZHFR) or Fire Survival (FS)~~ cable ~~of mimum two hours rating~~ shall be used.	Foe enhanced fire safety.
	(xi) he shall ensure that oil filled transformers installed indoors in other than residential or commercial buildings are placed at the ground floor or not below the first basement;	(g) oil filled transformers installed indoors in other than residential or commercial buildings are placed not below the first basement; (xi) (a) he shall ensure that oil filled transformers installed indoors in other than residential or commercial buildings are placed not above the ground floor ~~or not below the first basement~~ (b) he shall ensure that K-class oil filled transformer are placed not above the first floor of **power** utility building provided that: • the building structure is sufficiently strong • **transformer is placed in separate room with direct access** • **no flammable material is stored in the room and on the floors above; and** • **such building shall not be used for residential and commertial purposes.**	Shifted from (xi)(a) Provision for allowing placement of transformer upto 1st floor due to space constraints.
	(xiii) he shall ensure that unless the conditions are such that all the conductors and apparatus may be made dead at the same	(xiii) he shall ensure that unless the conditions are such that	

	time for the purpose of cleaning or for other work, the said conductors and apparatus shall be so arranged that these may be made dead in sections, and that work on any such section may be carried on by a designated person without danger;	all the conductors and apparatus may be made dead at the same time for the purpose of cleaning or for other work, the said conductors and apparatus shall be so arranged that these may be made dead in sections, and that work on any such section may be carried on by ~~a person~~ the person(s) designated under regulation 3(1) or engaged or appointed under regulation 6(1) or regulation 7(1) or under Reg-115 (1) (ii) &(iii) without danger;	Making the Reg-115 (1) (ii) &(iii) referential
	(3) All apparatus shall be protected against lightning and apparatus exceeding 220 kV shall also be protected against switching over voltages.	(3) All apparatus shall be protected against lightning and apparatus exceeding 220 kV shall also be protected against switching over voltages as per IS/IEC 60071-1.	Specifying Standard.
	(5) The minimum clearances specified in Schedule-VIII shall be maintained for bare conductors or live parts of any apparatus in outdoor sub-stations, excluding overhead lines of High Voltage Direct Current installations.	(5) The minimum clearances specified in Schedule-VIII shall be maintained for bare conductors or live parts of any HVDC apparatus in outdoor sub-stations, excluding HVDC overhead lines ~~of High Voltage Direct Current installations~~.	Schedule-VIII clearances are for HVDC apparatus.
45	(2) The following protection shall be provided in all systems and circuits to automatically disconnect the supply under abnormal conditions, namly:- (viii) every generating station and sub-station connected to the grid at 220 kV and above shall be provided with disturbance recording and event logging facilities and all such equipment shall be provided with	(2) The following protection shall be provided in all systems and circuits to automatically disconnect the supply under abnormal conditions, ~~namly~~ namely:- (viii) (a) every generating station and sub-station connected to the grid at ~~220 kV~~ 66 kV ~~and above shall be provided with disturbance recording and event logging facilities and all such equipment shall be provided with time synchronization facility for global common time reference~~ and upto 400 kV shall be provided with disturbance recording and event logging facilities as inbuilt feature of	For better Grid control and as per CEA (Technical Standards for Constrcution of Electrical Plants and Electric Lines)

	time synchronization facility for global common time reference but wherever numerical relays with provision of recording fault data are installed, disturbance recorder and event logger may not be installed; (ix) distance protection and carrier communication protection shall be provided for all lines connecting to 400/220 kV substation.	numerical relays and all such equipment shall be provided with time synchronization facility for global common time reference; (b) The generating station and sub-station connected to the grid at 765 kV and 1150 kV shall be provided with stand alone disturbance recording and event logging devices and all such equipment shall be provided with time synchronization facility for global common time reference; (ix) distance protection and carrier communication protection shall be provided ~~for all lines connecting to 400/220 kV substation 66 kV substation and above~~ as per Regulation 43(4) of CEA (Technical Standards for Constrcution of Electrical Plants and Electric Lines) Regulations.	Regulations.
46	**Testing, Operation and Maintenance.-** (1) Before approval is accorded by the Electrical Inspector under regulation 43 the manufacturer's test certificates shall, if required, be produced for all the routine tests as required under the relevant Indian Standards.	**Testing, Operation and Maintenance.-** (1) Before approval is accorded by the Electrical Inspector under regulation 43 the manufacturer's test certificates shall, if required, be produced for all the routine tests as required under the relevant Indian Standards or International Standards where relevant Indian Standards are not available.	For many GIS, HVDC and other apparatus IS are not available.
	(2) No new apparatus, cable or supply line of voltage exceeding 650 Volts shall be commissioned unless such apparatus, cable or supply line are subjected to site tests as per relevant code of practice of the Bureau of Indian Standards.	(2) No new apparatus, cable or supply line of voltage exceeding 650 Volts shall be commissioned unless such apparatus, cable or supply line are subjected to site tests as per relevant ~~code of practice of the Bureau of~~ Indian Standards or International Standards where relevant Indian Standards are not available.	

	(3) No apparatus, cable or supply line of voltage exceeding 650 V which has been kept disconnected, for a period of six months or more, from the system for alterations or repair, shall be connected to the system until such apparatus, cable or supply line are subjected to the relevant tests as per code of practice of Bureau of Indian Standards.	(3) No apparatus, cable or supply line of voltage exceeding 650 V which has been kept disconnected, for a period of six months or more, from the system for alterations or repair, shall be connected to the system until such apparatus, cable or supply line are subjected to the ~~relevant tests as per code of practice of Bureau of Indian Standards~~ to site tests as per relevant Indian Standards or International Standards where relevant Indian Standards are not available.	
	(8) Failures of transformers and reactors of 20 MVA or MVAR and higher capacity shall be reported by the consumer and the suppliers of electricity, within forty eight hours of the occurrence of the failure, to the Central Electricity Authority and the reasons for failure and measures to be taken to avoid recurrence of failure shall be sent to the Central Electricity Authority within one month of the occurrence in the format given in Schedule-IX.	(8) Failures of ~~transformers and reactors of 20 MVA or MVAR and higher capacity~~ sub-station apparatus, transmission line towers and cables of 220 kV and above voltage class shall be reported by the ~~consumer and the suppliers~~ **owner** of electricity, within forty eight hours of the occurrence of the failure, to the Central Electricity Authority and the reasons for failure and measures to be taken to avoid recurrence of failure shall be sent to the Central Electricity Authority within one month of the occurrence in the format given in Schedule-IX.	Modified as per the requirements of CEA (Technical Standards for Constrcution of Electrical Plants and Electric Lines) Regulations.
49	(2) Where electricity is transformed, suitable connection shall be made by connecting with earth a point of the system at the lower voltage and also to guard against danger by reason of the said system becoming accidentally charged above its normal voltage by leakage from a contact with the system at the higher voltage.	~~(2) Where electricity is transformed, suitable connection shall be made by connecting with earth a point of the system at the lower voltage and also to guard against danger by reason of the said system becoming accidentally charged above its normal voltage by leakage from a contact with the system at the higher voltage.~~	Deleted. Not required.

Chapter-VII			
Safety requirements for overhead lines, underground cables and generating stations			
57	**Joints.-** (1) No conductor of an overhead line shall have more than one joint in a span and joints between conductors of overhead lines shall be mechanically and electrically secure under the conditions of operation.	**Joints.-** (1) (a) No conductor or earthwire of an overhead line shall have more than one joint in a span and joints between conductors or earthwires of overhead line~~s~~ shall be mechanically and electrically secure under the conditions of operation.	Provision for joints in E/W is made for safety.
		(b) There shall not be any joint in conductor or earthwire of an overhead line over railway, river, road and power line crossings.	Joints in spans across major crossings not allowed from safety reasons.
	(2) The ultimate strength and the electrical conductivity of the joint shall be as per relevant Indian Standards.	(2) The ultimate strength and the electrical conductivity of the joint shall be as per relevant Indian Standards or International Standards, where relevant Indian Standards are not available.	
	Maximum stresses and factors of safety.- (1) The load and permissible stresses on the structural members, conductors and ground wire of self supporting steel lattice towers for overhead transmission lines shall be in accordance with the specifications laid down, from time to time, by the Bureau of Indian Standards.	**Maximum stresses and factors of safety.-** (1) The load and permissible stresses on the structural members, conductors and ground wire of self supporting steel lattice towers for overhead transmission lines shall be ~~in accordance with the specifications laid down, from time to time, by the Bureau of Indian Standards~~ as per relevant Indian Standards or Internation Standards, where relevant Indian Standards are not available.	
	(2) Overhead lines not covered in sub-regulation (1) shall have the following minimum factors of safety, namely:- (i) for metal supports - 1.5	(2) Overhead lines not covered in sub-regulation (1) shall have the following minimum factors of safety, namely:- (i) for metal supports - 1.5 (ii) for mechanically processed concrete supports -	New technology poles/supports are being used. Factor of Safety needs to be defined or entire provision shall be

	(ii) for mechanically processed concrete supports - 2.0 (iii) for hand-moulded concrete supports - 2.5 (iv) for wood supports - 3.0	2.0 (iii) for hand-moulded concrete supports - 2.5 (iv) for wood supports - 3.0 (v) for Steel mono pole, self supporting - 2.5	deleted. **Given by KPTCL**
58	**Clearance above ground of the lowest conductor of overhead lines.-** (1) No conductor of an overhead line, including service lines, erected across a street shall at any part thereof be at a height of less than- (i) for lines of voltage not exceeding 650 Volts - 5.8 metres (ii) for lines of voltage exceeding 650 Volts but not exceeding 33 kV - 6.1 metres (2) No conductor of an overhead line, including service lines, erected along any street shall at any part thereof be at a height less than- (i) for lines of voltage not exceeding 650 Volts - 5.5 metres (ii) for lines of voltage exceeding 650 Volts but not exceeding 33 kV - 5.8 metres	**Clearance above ground of the lowest conductor of overhead lines.-** ~~(1) No conductor of an overhead line, including service lines, erected across a street shall at any part thereof be at a height of less than-~~ ~~(i) for lines of voltage not exceeding 650 Volts - 5.8 metres~~ ~~(ii) for lines of voltage exceeding 650 Volts but not exceeding 33 kV - 6.1 metres~~ ~~(2) No conductor of an overhead line, including service lines, erected along any street shall at any part thereof be at a height less than-~~ ~~(i) for lines of voltage not exceeding 650 Volts - 5.5 metres~~ ~~(ii) for lines of voltage exceeding 650 Volts but not exceeding 33 kV - 5.8 metres~~ ~~(3) No conductor of an overhead line including service lines, erected elsewhere than along or across any street shall be at a height less than -~~ ~~(i) for lines of voltage upto and including -~~	Clearances in air for system nominal voltages for AC and HVDC have been tabulated in Schedule-X-A and X-B.

	(3) No conductor of an overhead line including service lines, erected elsewhere than along or across any street shall be at a height less than - (i) for lines of voltage upto and including - 4.6 metres 11,000 Volts,if bare (ii) for lines of voltage upto and including - 4.0 metres 11,000 Volts, if insulated (iii) for lines of voltage exceeding 11,000 Volts - 5.2 metres but not exceeding 33 kV (4) For lines of voltage exceeding 33 kV the clearance above ground shall not be less than 5.2 metres plus 0.3 metre for every 33,000 Volts or part thereof by which the voltage of the line exceeds 33,000 Volts; Provided that the minimum clearance along or across any street shall not be less than 6.1 metres.	~~4.6 metres~~ ~~11,000 Volts,if bare~~ ~~(ii) for lines of voltage upto and including - 4.0 metres~~ ~~11,000 Volts, if insulated~~ ~~(iii) for lines of voltage exceeding 11,000 Volts - 5.2 metres~~ ~~but not exceeding 33 kV~~ ~~(4) For lines of voltage exceeding 33 kV the clearance above ground shall not be less than 5.2 metres plus 0.3 metre for every 33,000 Volts or part thereof by which the voltage of the line exceeds 33,000 Volts;~~ ~~Provided that the minimum clearance along or across any street shall not be less than 6.1 metres.~~ The minimum clearance above ground and across road surface of National Highways or State Highways or other roads or highest traction conductor of railway corridors or navigational or non-navigational rivers of the lowest conductor of an alternating current overhead line, including service lines, of nominal voltage system shall have the values specified in Schedule-X-A.	
61	New provision	(6) Recommended width of Right of Way (RoW) shall be as specified **in the recommendation of the Committee on optimisation of RoW.**	Optimisation of ROW

	New provision	(7) In case of transmission lines of 33 kV and below passing through National Parks, Wildlife Sanctuaries and Wildlife Corridors, underground cables or overhead insulated (covered) conductors with the following minimum clearance above ground shall only be used: (i) 6.6 m on level terrian (slope<20 degrees) (ii) 9.1 m on steeper terrain (slpoe> 20 degrees)	Provisions for taking lines through reserved areas.
	New provision	(8) In case of transmission lines of 66 kV and below passing through habitated urban or rural areas insulated (covered) conductors or underground cables shall only be used.	Provisions for taking lines through habitated areas.
63	(6) No work upon such building, structure, flood bank, road and addition or alteration thereto shall be commenced or continued until the Electrical Inspector certifies that the provisions of regulations 58, 60 , 61 and regulation 76 should not be contravened either during or after the aforesaid construction:	(6) No work upon such building, structure, flood bank, road and addition or alteration thereto shall be commenced or continued until the Electrical Inspector certifies that the provisions of regulations 58, 60 , 61, 64 and regulation 76 ~~should not be~~ have not been contravened either during or after the aforesaid construction:	• Reference to regulation 64 incorporated • Grammatical correction.
64	**Transporting and storing of material near overhead lines.-** (1) No rods, pipes or similar materials shall be taken below, or in the vicinity of, any bare overhead conductors or lines if these contravene the provisions of regulations 60 and 61 unless such materials are transported under the direct supervision of a person designated designated in that behalf by the owner of such overhead conductors or lines.	**Transporting and storing of material near overhead lines.-** (1) No rods, pipes or similar materials shall be taken below, or in the vicinity of, any bare overhead conductors or lines if these contravene the provisions of regulations 60 and 61 unless such materials are transported under the direct supervision of a person designated under regulation 3(1) or engaged or appointed under regulation 6(1) or regulation 7(1) or under Reg-115 (1) (ii) &(iii) in that behalf by the owner of such overhead conductors or lines.	Made referential. Making the Reg-115 (1) (ii) &(iii) referential

65	(2) No blasting for any purpose shall be done within 300 metres from the boundary of a sub-station or from the electric supply lines of voltage exceeding 650 V or tower structure thereof without the written permission of the owner of such sub-station or electric supply lines or tower structures; and in case of mining lease hold area, without the written permission of the Electrical Inspector of Mines.	(2) No blasting for any purpose shall be done within 300 metres from the boundary of a sub-station or from the electric supply lines of voltage exceeding 650 V or tower structure thereof without the written permission of the owner of such sub-station or electric supply lines or tower structures; and ~~in case~~ where such installations are for the purpose of mining operations or incidental to the mining, without the written permission of the Electrical Inspector of Mines.	Electrical Inspector of Mines has the jurisdiction for the Electrical installations for mining operations or incidental to the same for which permission/clearance of blasting can be considered.
69	(iii) where an overhead line crosses or is in proximity to another overhead line, guarding arrangements shall be provided so to guard against the possibility of their coming into contact with each other;	(iii) where an overhead line crosses or is in proximity to another overhead line, guarding arrangements shall be provided so to guard against the possibility of their coming into contact with each other; Provided that no guardings are required when line of voltage exceeding 33 kV crosses over another line of 250 V and above voltage or a road or a tram subject to the condition that adequate clearances are provided between the lowest conductor of the line of voltage exceeding 33 kV and the top most conductor of the overhead line crossing underneath the line of voltage exceeding 33 kV and the clearances as stipulated in regulation 58 from the topmost surface of the road maintained;	Provisio is shifted from 69(iv).
77	**Laying of cables.- (**1) No underground power cable of voltage exceeding 33 kV shall be laid without a minimum underground depth of 1.2 meters.	**Laying of cables.- (**1) All underground power cables shall be laid down as per IS 1255 and ~~No~~ no underground power cable of voltage exceeding 33 kV shall be laid without a minimum underground depth of 1.2 meters.	Cable laying depth for all cables as per IS.

Chapter-VIII			
Safety requirements for Electric Traction			
80	**Insulation of lines.-** Every line shall be insulated throughout and a line may consist of either bare conductors supported on structures through insulators or insulated cable.	**Insulation of lines.- (1)** Every line shall be insulated throughout and a line may consist of either bare conductors ~~supported on structures through insulators~~ or insulated cable~~.~~; (2) When overhead conductor or rail is used it shall be supported on the structure through the insulators of the rated insulation level throughout its length; (3) Any access to the conductor rail shall be restricted, necessary procedures shall be developed to permit working during operation and maintenance in the vicinity of the installation and for the emergency de-boarding of the passengers.	
83	**Difference of potential on return.-** Where the return is partly or entirely un-insulated, the owner shall keep a continuous record of the difference of potential, during the working of his system, between every junction of an insulated return with an un-insulated return and the point on the route most distant from that junction, and the difference of potential shall not, under normal running conditions, exceed a mean value of seven volts between the highest momentary peak and the average for the hour of maximum load.	**Difference of potential on return.- (1) Tramway.-** Where the return is partly or entirely un-insulated, the owner shall keep a continuous record of the difference of potential, during the working of his system, between every junction of an insulated return with an un-insulated return and the point on the route most distant from that junction, and the difference of potential shall not, under normal running conditions, exceed a mean value of seven volts between the highest momentary peak and the average for the hour of maximum load. (2) **DC traction.-** (a) Where the running rail is used as negative return, touch potential shall not rise above the following time dependent limits, except in workshops and similar locations where the limit shall be 60 V (for >300 s).	

t s	$U_{te,\,max}$ long-term V	$U_{te,\,max}$ short-term V
> 300	120	-
300	150	-
1	160	-
0,9	165	-
0,8	170	-
0,7	175	-
< 0,7	-	350
0,6	-	360
0,5	-	385
0,4	-	420
0,3	-	460
0,2	-	520
0,1	-	625
0,05	-	735
0,02	-	870

Key

t time duration

$U_{te,\,max}$ permissible effective touch voltage

(b) Every MRTS station shall be provided with an automatic earthing device to connect the negative running rail to the earth in case the touch potential rises above the limits specified in sub-regulation (a);
(c) If the calculated touch potential is above the limits specified in sub-regulation (a), adequate provisions such as (a) reduced length of feeding stations (b) increasing of conductance of the return circuit (c) Insulation of the standing surface (d) reduction in the tripping time needed to interrupt the short circuit (e) voltage limiting device to avoid impermissible rail potential shall be taken.

(3) **AC traction.-** (a) Where return current is through Rails, touch potential w.r.t. ground in running rail, un-insulated return, any metallic pipe, structure or substance in the vicinity shall not exceed following time dependent limits except in workshops and similar locations where the limit shall be 25 V (for >300 s).

Table 4 — Maximum permissible effective touch voltages $U_{te,max}$ in a.c. traction systems as a function of time duration

t s	$U_{te,max}$ long-term V	$U_{te,max}$ short-term V
> 300	60	-
300	65	-
1	75	-
0,9	80	-
0,8	85	-
0,7	90	-
< 0,7	-	155
0,6	-	180
0,5	-	220
0,4	-	295
0,3	-	480
0,2	-	645
0,1	-	785
0,05	-	835
0,02	-	865

Key

t time duration

$U_{te,max}$ permissible effective touch voltage

(b) If the calculated touch potential is above the limits specified in sub-regulation (a), following measures shall be taken to reduce the risk:

		(i) Reduction of the rail to earth resistance e.g. by means of improved or additional earth electrodes; (ii) Equi-potential grounding; (iii) Improvement of the return circuit taking electromagnetic coupling into account; (iv) Insulation of the standing surface; (v) Obstacles or insulated accessible parts; (vi) Access restrictions (fences) including instructions for maintenance staff; (vii) Reduction of fault and/or operation currents; (viii) Voltage limiting device; (ix) Reduction of the tripping time needed to interrupt the short circuit current. (c) Return Conductor (RC), Overhead Protection Conductor (OPC), Buried Earth Conductor (BEC) shall be provided in urban and suburban areas to mitigate the EMC, EMI problem.	
86	**Passengers not to have access to electric circuit.-** Precautions to the satisfaction of an Electrical Inspector shall be taken by the owner of every vehicle to prevent,- (i) the access of passengers to any portion of the electric circuit where there is danger from electric shock; (ii) any metal, hand-rail or other metallic substance liable to be handled by passengers, becoming charged.	**Passengers not to have access to electric circuit.-** (1) Precautions to the satisfaction of an Electrical Inspector shall be taken by the owner of every vehicle to prevent the access of passengers to any portion of the electric circuit where there is danger from electric shock; (2) Any metal, hand-rail or other metallic substance liable to be handled by passengers and becoming charged, shall be connected to earth at suitable intervals. (3) Caution boards for indicating live OHE line at appropriate locations for safeguarding passengers and public to prevent them for coming closer to live OHE line shall also be provided.	

89	**Height of trolley wire and length of span.-** A trolley wire or a traction feeder on the same supports as a trolley wire shall, at no place be, at a height from the surface of the street of less than 5.2 metres except, where it passes under a bridge or other fixed structure, or through or along a tunnel or mineshaft or the like in which case it shall be suspended to the satisfaction of an Electrical Inspector.	**Height of trolley wire ~~and length of span~~** and OHE line**.-** (1) A trolley wire or a traction feeder on the same supports as a trolley wire shall, at no place be, at a height from the surface of the street of less than 5.2 metres except, where it passes under a bridge or other fixed structure, or through or along a tunnel or mineshaft or the like in which case it shall be suspended to the satisfaction of an Electrical Inspector. **(2)** Height of the contact wire of OHE foe AC traction shall be governed by relevant Indian Standards or International Standard in case relevant Indian Standards are not available, except where it passes under a bridge or other fixed structure, or through or along a tunnel or mineshaft or the like in which case it shall be suspended to the satisfaction of an Electrical Inspector.	
90	**Earthing of guard wires.-** Every guard wire shall be connected with earth at each point at which its electrical continuity is broken and shall also be connected with the rails at intervals of not more than five spans.	**Earthing ~~of guard wires.~~-** (1) Every guard wire shall be connected with earth at each point at which its electrical continuity is broken and shall also be connected with the rails at intervals of not more than five spans; (2) The running rail shall be connected to earth in depot areas and at other intermediate locations as per design; (3) In case of system with insulated running rail used for negative return, protective insulations mat shall be provided below the platform floor of at least 2 m width from the edge of the platform and no metallic structure connected to earth shall be provided within the 2 m from the edge of the platform; (4) The reinforcement of structures shall be connected to the earth; (5) All the metallic structures in vicinity of OHE line and return rail shall be connected to earth at suitable periodic intervals; (6) Every overhead protective conductor shall be connected with earth at each point at which its electrical continuity is broken.	
92	**New Provisions**	(3) **Protective Measures.-** (a) The transformer used for the purpose of DC rectifiers shall be provided with DC high speed	

		circuit breakers provided with protections relays. (b) The DC rectifiers, and associated DC switch gear shall be connected to a frame protection relay for operating the circuit breaker in case **of leakage current rises above 40 A.** (c) Portable short circuit devices for connecting the positive supply rails to negative supply rail, and Portable voltage detectors to sense the positive rail voltage, shall be provided at both ends of the section where power block is provided, and /or maintenance is being carried out. (3) **Electrical Clearances.-** The following minimum clearances shall be provided: (a) Minimum vertical and horizontal clearance between any live bare conductor (OHE or pantograph) and any earthed structure of other bodies (Rolling Stock, Over bridges, signal gantries etc.) shall be – Long duration (Static) 250 mm Short duration (Dynamic) 200 mm (b) The dynamic and static clearances for Rigid Overhead Catenary System (ROCS) in underground sections shall be – 25 kV Live Uninsulated Parts to bodies of structures- Long Duration (Static) 250 mm Short Duration (Dynamic) 150 mm* (c) Minimum clearance between 25 kV live metal and a human standing point shall be - Public Area 3500 mm Restricted Area 2750 mm Explanation:- (i) For track maintenance purposes clearance of	

		minimum of 20 mm or more shall also be considered, if required. (ii) Absolute minimum 150 mm in exceptional cases and considering operating climatic conditions and provision of Lightning Arrestor (4) **Electrical Working Clearances.-** Minimum clearance between live conductor or apparatus and such earthed structure or live parts of different elementary sections where men are required to work shall be 2 m. Provided that where the clearance is not obtained the structure shall be protected by earthed metallic screens or prescribed warning boards.	
Chapter-IX			
Additional Safety requirements for mines and oil fields			
94	**Responsibility for observance.-** (1) It shall be the duty of every person in charge of and responsible to the mine including the owner, agent, manager and Engineer of mine and oil field to comply with and enforce the regulations in this chapter and it shall be the duty of all persons employed to conduct their work in accordance with these regulations. (2) In every mine or oil-field while electricity is being used such number of designated supervisors and electricians shall be on duty as the owner may decide.	**Responsibility for observance.-** (1) It shall be the duty of every person in charge of and responsible to the mine including the owner, agent, manager, installation manager and Engineer of mine and oil field to comply with and enforce the regulations ~~in this chapter~~ and it shall be the duty of all persons employed to conduct their work in accordance with ~~these~~ the regulations. ~~(2) In every mine or oil-field while electricity is being used such number of designated supervisors and electricians shall be on duty as the owner may decide as directed by the Electrical Inspector based on the guidelines specified in Schedule-XXXX.~~ (TO be removed from here as it is already covered in 115(1). There we shall mention as per guidelines specified in schedule –XXXX) *Explanation* – For the purposes of this regulation, the word "Engineer" shall	Provision for joints in E/W is made for safety.

	Explanation – ***For the purposes of this regulation, the word "Engineer" shall*** (i) in the case of a coal mine, have the same meaning as assigned to it in the Coal Mines Regulations, 1957; (ii) in the case of a metalliferous mine, have the same meaning as assigned to it in the Metalliferous Mines Regulations, 1961; and (iii) in the case of an oil mine, mean the 'Installation Manager' under the Oil Mines Regulations, 1984.	(ii) in the case of a coal mine, have the same meaning as assigned to it in the Coal Mines Regulations, 1957 as amended from time to time; (ii) in the case of a metalliferous mine, have the same meaning as assigned to it in the Metalliferous Mines Regulations, 1961, as amended from time to time; and (iii) in the case of an oil field, means the Electrical-in-charge ~~under the Oil Mines Regulations, 1984 as amended from to time~~.	
95	(2) The persons specified in regulation 94, shall also give to the Electrical Inspector of Mines not less than seven days notice in writing of the intention to bring into use any new installation in a mine or oil-field giving details of apparatus installed and its location: Provided that in case of any additions or alterations to an existing installation of voltage not exceeding 650 V, immediate notice in writing shall be sent to the Electrical Inspector of Mines before such	(2) The persons specified in regulation 94, shall also give to the Electrical Inspector of Mines not less than seven days notice in writing of the intention to bring into use any new installation in a mine or oil-field giving details of apparatus installed and its location: Provided that in case of any additions or alterations to an existing installation of voltage not exceeding 650 V, immediate notice in writing shall be sent to the Electrical Inspector of Mines before such additions or alterations are brought into use: Provided further that this regulation shall not apply to	

	additions or alterations are brought into use: Provided further that this regulation shall not apply to telecommunication or signaling apparatus.	telecommunication or signalling apparatus. Provided further that in case of emergency which may lead to loss of life or machinery and is deterimental to safety of mine, an immediate intimation shall be given to the Electrical Inspector of Mines giving the healthiness of the apparatus alongwith self certification report of such additions or alterations undertaken.	As requested by representatives of Coal India Ltd.
96	(3) A similar plan on such scale as the Central Government may direct, showing the position of all electric supply lines, shall be kept in the office of any licensee or other person transmitting or distributing electricity in a mine or oil-field.	~~(3) A similar plan on such scale as the Central Government may direct, showing the position of all electric supply lines, shall be kept in the office of any licensee or other person transmitting or distributing electricity in a mine or oil field.~~	
97	**Lighting, overhead lines, communication and fire precautions.-** (1) In a mine illuminated by electricity, one or more flame safety lamps, or other lights approved by the inspector of mines, shall be maintained in a state of continuous illumination in all places where failure of the electric light at any time shall be prejudicial to safety.	**Lighting, overhead lines, communication and fire precautions.-** (1) Adequate illumination by electricity as per relevant IS ~~standards~~ shall be provided in the mines. (2) (a) Provided that in a belowground coal mine, such lighting fixtures shall be of a type approved by the inspector of mines. (b) one or more safety lamps or such lighting system approved by the inspector of mines shall be maintained in all places where failure of the electric light at any time shall be prejudicial to safety. Provided that in a belowground metalliferrous mine or any open cast mine or oil fields, such lighting fixtures shall be suitable for the type of application conforming to the relevant IS or harmonized standards, and adequate emergency lighting system shall be maintained in all places where failure of the electric light at any time shall be prejudicial to safety.	

	(2) Efficient means of communication shall be provided in every mine between the point where the switchgear under sub-regulation (1) regulation 105 is erected, the shaft bottom and other distributing centres in the mines. (3) Fire extinguishing appliances of adequate capacity and of an approved type shall be installed and properly maintained in every place in a mine containing apparatus, other than cables, telecommunication and signaling apparatus. (4) In case of mines, minimum clearance above ground of the lowest conductor of over head lines or over head cables where dumpers or trackless vehicles are being operated, shall not be less than twelve meters in height from the ground across the road where dumpers or trackless vehicles cross.	(4) Efficient means of communication shall be provided in every mine between the point where the switchgear under sub-regulation (1) of regulation 105 is erected, the shaft bottom and other distributing centres in the mines. (5) Fire extinguishing appliances of adequate capacity and of an approved type as per IS 15683 as amended from time to time shall be installed and properly maintained in every place in a mine containing apparatus, other than cables, telecommunication and signaling apparatus. In case of mines, minimum clearance above ground of the lowest conductor of overhead lines or overhead cables where dumpers or trackless vehicles are being operated, shall not be less than twelve meters in height from the ground across the road where dumpers or trackless vehicles cross. Provided where dumper bucket in raised position, the clearance between the top of dumper body and to the lowest conductor of overhead lines or overhead cables shall not be less than 1.00 mtr.	
98	**Isolation and fixing of transformer and switchgear. -** (1) Transformers and switchgear shall be placed in a separate room, compartment or box where necessary to prevent danger of mechanical damage.	**Isolation and fixing of transformer and switchgear. -** (1) Transformers and switchgear shall be placed in a separate room, compartment or box where necessary or in a manner to prevent danger of mechanical damage.	As requested by representatives of Coal India Ltd., This is considering requirements in an opencast mine
99	**Method of earthing.-** Where earthing is necessary in a mine, it shall be carried out by	**Method of earthing.-** (1) Where earthing is necessary in a mine, it shall be carried out by connection to an earthing system at the surface	

	connection to an earthing system at the surface of the mine and in such manner as may be approved by the Electrical Inspector of Mines.	of the mine ~~and in such manner as may be approved by the Electrical Inspector of Mines~~. (2) All metallic sheaths, coverings, handles, joint boxes, switchgear frames, instrument covers, switch and fuse covers of boxes, all lamp holders, unless efficiently protected by an insulated covering made of fire resisting material, and the frames and bedplates of generators, transformers and motors, including portable motors, shall be earthed by connection to an earthing system in the manner specified in sub-regulation (1). (3) Where cables are provided with a metallic covering constructed and installed in accordance with clause (iv) (d) of regulation 106, such metallic covering may be used as a means of connection to the earthing system. (4) All conductors of an earthing system shall have conductivity, at all parts and all joints, at least equal to fifty per cent of that of the largest conductor used solely to supply the apparatus, a part of which desired to be earthed: Provided that no conductor of an earthing system shall have a cross-sectional area less than 0.15 sq. cm. except in the case of the earth conductor of a flexible cable used with portable apparatus where the voltage does not exceed 125 Volts, and the cross-sectional area and conductance of the earthcore is not less than that of the largest of the live conductors in the cable. (5) All joints in earth conductors and all joints in the metallic covering of cables shall be properly soldered or otherwise efficiently made.	

		(6) No switch, fuse or circuit-breaker shall be inserted in any earth conductor. (7) This regulation shall not apply, except in the case of portable apparatus, to any system in a mine in which the voltage does not exceed 30 V.	
100	**Protective equipment.-** (1) In the interest of safety, appropriate equipment shall be suitably placed in the mines for automatically disconnecting supply to any part of the system, where a fault, including an earth fault, occurs and fault current shall not be more than 750 milliampere in installations of voltage exceeding 250 V and upto1100 V for below ground mines and oil fields and 50 ampere in installations of voltage exceeding 1100 V and upto 11 kV in open cast mines and the magnitude of the earth fault current shall be limited to these specified values by employing suitably designed, restricted neutral system of power supply. (2) The operation of the switchgear and the relays shall be recorded daily at the generating	**Protective equipment.-** (1) In the interest of safety, appropriate equipment shall be suitably placed in the mines for automatically disconnecting supply to any part of the system, where ~~a fault, including~~ an earth fault, occurs and fault current shall not be more than 750 milliampere in installations of voltage exceeding 250 V and upto1100 V for below ground mines and oil fields and 50 ampere in installations of voltage exceeding 1100 V and up to 11 kV ~~in open cast mines~~ for belowground and open cast mines and oil mines or oil fields and the magnitude of the earth fault current shall be limited to these specified values by employing suitably designed, restricted neutral system of power supply including neutral monitoring protection. Provided that in a below ground mine, for face equipment working on voltage exceeding 1100V, the earth fault current shall be limited to such safe values considering the unsafe conditions due to touch potential and ignition hazards as recommended by the Electrical Inspector of Mines. (2) The operation of the switchgear and the relays shall be recorded daily at the generating station, sub-station or switch station in a register kept for the purpose and in electronic form. (3) The effectiveness of switchgear and protective system shall always be kept in working order and shall be checked ~~once every three months~~ by calibrating and testing at least once in a year and the result thereof shall be recorded in separate register kept for the purpose and in	

	station, sub-station or switch station in a register kept for the purpose. (3) The effectiveness of the switchgear and the protective system shall always be kept and maintained in working order, shall be checked once every three months and the result thereof shall be recorded in a separate register kept for the purpose.	electronic form. Provided that wherever numerical relays are being used they shall be checked by testing procedure as per guidelines of OEM and periodicity of such checking shall be at least once in a year.	
101	**Earthing metal.-** (1) All metallic sheaths, coverings, handles, joint boxes, switchgear frames, instrument covers, switch and fuse covers of boxes, all lamp holders, unless efficiently protected by an insulated covering made of fire resisting material, and the frames and bedplates of generators, transformers and motors, including portable motors, shall be earthed by connection to an earthing system in the manner specified in regulation 99. (2) Where cables are provided with a metallic covering constructed and installed in accordance with clause (d) of regulation 106, such metallic covering may be used as a means of connection to the earthing system. (3) All conductors of an earthing system shall have conductivity, at all parts and all joints, at least equal to fifty per cent of that of the largest conductor used solely to supply the apparatus, a part of which desired to be earthed:	**Earthing metal.- deleted**	

	Provided that no conductor of an earthing system shall have a cross-sectional area less than 0.15 sq. cm. except in the case of the earth conductor of a flexible cable used with portable apparatus where the voltage does not exceed 125 Volts, and the cross-sectional area and conductance of the earthcore is not less than that of the largest of the live conductors in the cable. (4) All joints in earth conductors and all joints in the metallic covering of cables shall be properly soldered or otherwise efficiently made. (5) No switch, fuse or circuit-breaker shall be inserted in any earth conductor. (6) This regulation shall not apply, except in the case of portable apparatus, to any system in a mine in which the voltage does not exceed 30 V.		
102	**Voltage limits.-** Electricity shall not be transmitted into a mine at a voltage exceeding 11000 Volts and shall not be used therein at a voltage exceeding 6600 Volts: Provided that- (i) where hand-held portable apparatus is used, the voltage shall not exceed 125 V; (ii) where electric lighting is used,- (a) in underground mines, the lighting system shall have a mid or neutral point	**Voltage limits.-** Electricity shall not be transmitted into a belowground mine at a voltage exceeding 11000 Volts and shall not be used therein at a voltage exceeding 6600 Volts. Provided that- (i) where hand-held portable apparatus is used, the voltage shall not exceed 125 V; (ii) where electric lighting is used - (a) in ~~underground~~ belowground mines, the lighting system shall have a mid or neutral point connected with earth and the voltage shall not exceed 125 V between phases; (b) on the surface of a mine or in an open cast mine or oil	

	connected with earth and the voltage shall not exceed 125 V between phases; (b) on the surface of a mine or in an open cast mine, the voltage may be raised to 250 V, if the neutral or the mid point of the system is connected with earth and the voltage between the phases does not exceed 250 V; (iii) where portable hand-lamps are used in underground working of mine, the voltage shall not exceed 30 V; (iv) where any circuit is used for the remote control or electric inter-locking of apparatus, the circuit voltage shall not exceed 30 V: Provided further that in fixed plants, the said voltage may be permitted upto 650 V, if the bolted type plug is used.	mines or oil fields, the voltage may be raised to 250 V, if the neutral or the mid point of the system is connected with earth and the voltage between the phases does not exceed 250 V; (iii) where portable hand-lamps are used in ~~underground~~ belowground ~~coal~~ mines and hazardous area of oil mines or oil fields, the voltage shall not exceed 30 V; (iv)(a) where any circuit is used for the remote control or electric inter-locking of apparatus, the circuit voltage shall not exceed 30 V for below ground mine or hazardous area of oil fields. ~~Provided that in fixed plants on surface of the mines or opencast mines, the said voltage for the remote control or electric inter-locking may be permitted up to 250 V.~~ Provided that in hazardous areas of oil mines or oil fields, the said voltage can be up to 250 volts if the on-off control push-button stations (PBS) or remote controls are housed in an appropriate enclosure like: i. Flameproof enclosure type ‘d’ ii. Pressurised enclosure type ‘p’ iii. Sand filled apparatus type ‘q’ iv. Increased safety enclosure type ‘e’, ‘n’, and ‘o’ Provided further that the control circuit shall have suitable protection against shock hazards, and the trippings due to faults do not adversely affect the operational safety. (b) In fixed plants on surface of the mines or opencast mines, the said voltage for the remote control or electric inter-locking may be permitted up to 250V.	After due deliberations with the Oil mine officials

103	**Transformers.-** Where electricity is transformed, suitable provision shall be made to guard against danger by reason of the lower voltage apparatus becoming accidentally charged above its normal voltage by leakage from or contact with the higher voltage apparatus.	Transformers:- ~~Where electricity is transformed in belowground mines and oil fields, suitable provision shall be made to~~ In mines or oil fields, the transformers used for providing voltages to control circuits or remote control or interlocking or for hand held apparatus, shall have suitable provision to guard against danger by reason of the lower voltage apparatus becoming accidentally charged above its normal voltage by leakage from or contact with the higher voltage apparatus.	
105	**Disconnection of supply.-** (1) Properly constructed switchgear for disconnecting the supply of electricity to a mine or oil-field shall be provided at a point approved by the Electrical Inspector of Mines. (6) If the Electrical Inspector of Mines feels it appropriate, the motor shall be controlled by a switchgear to disconnect automatically the supply in the event of conditions of over-current, over-voltage and single phasing.	**Disconnection of supply.-** (1) Properly constructed switchgear for disconnecting the supply of electricity to a mine or oil-field shall be provided at a point ~~approved~~ recommended by the Electrical Inspector of Mines. (6) ~~If the Electrical Inspector of Mines feels it appropriate, the~~ The motor shall be controlled by ~~a switchgear~~ a protective mechanism to disconnect automatically the supply in the event of conditions of over-current~~, over-voltage~~ under voltage or no voltage and single phasing. (8) Every feeder of the mine shall be controlled in a manner so as to disconnect the supply automatically in the event of conditions of over-current, short circuit, single phasing, under-voltage as relevant.	
107	(3) Every flexible cable intended for use with portable or transportable apparatus shall be connected to the system and to such apparatus by properly constructed connectors: Provided that for machines of voltage exceeding 650 V but not exceeding 33 kV a bolted type connector shall be used and the trailing cable shall be suitably anchored at the machine end. Provided further that where there are space limitations for multiple on-board motors	(3) Every flexible cable intended for use with portable or transportable apparatus shall be connected to the system and to such apparatus by properly constructed connectors: Provided that for machines of voltage exceeding 650 V but not exceeding ~~33 kV~~ 11KV a bolted type connector shall be used and the trailing cable shall be suitably anchored at the machine end. Provided further that where there are space limitations for multiple on-board motors and equipment for transportable or portable machines, direct entry flexible cable with elastomeric sealing rings, compression gland, packing gland or sealing box which does not alter the flame proof property may be permitted and if a cable entry can accept any	

	and equipment for transportable or portable machines, direct entry flexible cable with elastomeric sealing rings, compression gland, packing gland or sealing box which does not alter the flame proof property may be permitted and if a cable entry can accept any sealing ring with same outside diameter but different internal dimension, the ring shall have a minimum uncompressed axial height of twenty millimeter for circular cables of diameter not greater than twenty millimeter and twenty five millimeter for circular cables of diameter greater than twenty millimeter.	sealing ring with same outside diameter but different internal dimension, the ring shall have a minimum uncompressed axial height of twenty millimeter for circular cables of diameter not greater than twenty millimeter and twenty five millimeter for circular cables of diameter greater than twenty millimeter.	
108	**Portable and transportable machines.-** The person designated to operate an electrically driven coal-cutter, or other portable or transportable machine, shall not leave the machine while it is in operation and shall, before leaving the area in which such machine is operating, ensure that the supply is disconnected from the flexible cable which supplies electricity to the machine and when any such machine is in operation, steps shall be taken to ensure that the flexible cable is not dragged along by the machine: Provided that all portable and transportable machines used in underground mines shall operate on remote control from the concerned switchgear with pilot core protection.	**Portable and transportable machines.-** The person designated to operate an electrically driven coal-cutter, or other portable or transportable machine, shall not leave the machine while it is in operation and shall, before leaving the area in which such machine is operating, ensure that the supply is disconnected from the flexible cable which supplies electricity to the machine and when any such machine is in operation, steps shall be taken to ensure that the flexible cable is not dragged along by the machine: Provided that all portable and transportable machines used in underground mines shall operate on remote control from the concerned switchgear with pilot core protection. Provided further that the portable and transportable machines used in open cast mines shall have the provision such that the power supply to the machine from concerned switchgear is remotely controlled from the machine.	

109	**Sundry precautions.-** (2) All apparatus other than portable and transportable apparatus shall be housed in a room, compartment or box so constructed as to protect the contents from damage occasioned by falling material or passing traffic.	**Sundry precautions.-** ~~(2) All apparatus other than portable and transportable apparatus shall be housed in a room, compartment or box so constructed as to protect the contents from damage occasioned by falling material or passing traffic.~~	
110	**Precautions where gas exists.** (5) In any oil mine at any place within zone-0 hazardous area no electrical equipment shall be used and where it is not practicable, intrinsically safe apparatus are only to be used with the prior approval of the Inspector. (8) In an oil mine where concentration of inflammable gas exceeds twenty percent of its lowest explosive limit, the supply of electricity shall be cut-off immediately from all cables and apparatus lying within thirty metres of the installation and all sources of ignition shall also be removed from the said area and normal work shall not be resumed unless the area is made gas-free: Provided that such disconnection shall not apply	**Precautions where gas exists.** (5) In any oil mine at any place within zone-0 hazardous area no electrical equipment shall be used and where it is not practicable, intrinsically safe apparatus are only to be used which shall be conforming to relevant Indian standards or harmonized standards. ~~with the prior approval of the Inspector~~ and such installation of apparatus shall conform to relevant Indian standards/ harmonized standards and the details of installation, certified by the Owner/ Agent/ Manager/ Installation manager shall be submitted to the Electrical Inspector of mines. (8) In oil fields where concentration of inflammable gas exceeds twenty (20) percent of its lower explosive limit (LEL) a system should be in place to activate an audio alarm at appropriate location. On activation of such alarm immediate action shall be taken to make operations safe and to isolate the cause in order to ensure safety of men, equipment, environment. In case the LEL rises to forty (40) percent, the supply of electricity shall be cut-off ~~automatically~~ immediately from all cables and apparatus lying within thirty metres of the installation and all sources of ignition shall also be removed from the said area and normal work shall not be resumed unless the area is made gas-free: Provided that such disconnection shall not apply to intrinsically safe	After deliberations with the Oil mine officials at New Delhi and Ahmedabad on 26.04.2017 and 27.04.2017, suitably finalised.

	to intrinsically safe environmental monitoring scientific instruments. (9) Any such disconnection or reconnection of the supply shall be noted in the log sheet which shall be maintained in the form set out in Schedule-XIII and shall be reported to the Electrical Inspector of Mines *Explanation* – For the purpose of this regulation; (2) The following areas in an oil-mine or oil-field shall be known as hazardous areas, namely:- (i) an area of not less than ninety metres around an oil-well where a blow-out has occurred or is likely to occur, as may be designated by the Engineer-incharge or the seniormost official present at the site; (ii) an area within ninety metres of an oil-well which is being tested by open flow; (iii) an area within fifteen metres of : (a) a producing well-head or any point of open discharge of the crude there from or other point where emission of hazardous atmosphere is normally likely to arise; or (b) any wildcat or exploration well-head being drilled in an area where	environment monitoring scientific instruments. (9) Any such disconnection or reconnection of the supply shall be noted in the log sheet in hard copy and electronic form which shall be maintained in the form set out in Schedule-XIII and shall be reported to the Electrical Inspector of Mines Explanation – For the purpose of this regulation; (2) The following areas in oil mine or oil fields shall be known as hazardous areas, namely:- (i) an area of not less than ninety metres around an oil-well where a blow-out has occurred or is likely to occur, as may be designated by the ~~Engineer-in-charge~~ Installation Manager or the senior most official present at the site; (ii) an area within ~~ninety~~ sixteen metres of an ~~oil-well~~ open discharge of petroleum bearing fluid from a well under production test. ~~which is being tested by open flow;~~ (iii) an area within fifteen metres of : (a) a producing well-head or any point of open discharge of the crude there from or other point where emission of hazardous atmosphere is normally likely to arise; or (b) any wildcat or exploration well-head being drilled in an area where abnormal pressure conditions are known to exist; or (c) ~~any exploration or interspaced well-head being drilled in the area where abnormal pressure conditions are known to exist;~~	This was inadvertently left out of existing provision Revised to make consistent with the Gazettee notification issued by DGMS.

	abnormal pressure conditions are known to exist; or (c) any exploration or interspaced well-head being drilled in the area where abnormal pressure conditions are known to exist; (iv) any area within four and one half meters of : (a) any producing well-head where a closed system of production is employed such as to prevent the emission or accumulation in the area in normal circumstances of a hazardous atmosphere; or (b) exploration or interspaced well-head being drilled in an area where the pressure conditions are normal and where the system of drilling employed includes adequate measures for the prevention in normal circumstances of emission or accumulation within the area of a hazardous atmosphere; or (c) an oil-well which is being tested other than by open flow.	(iv) any area within ~~four and one half~~ three meters of : (a) any producing well-head where a closed system of production is employed such as to prevent the emission or accumulation in the area in normal circumstances of a hazardous atmosphere; or (b) exploration or interspaced well-head being drilled in an area where the pressure conditions are normal and where the system of drilling employed includes adequate measures for the prevention in normal circumstances of emission or accumulation within the area of a hazardous atmosphere; ~~or~~ (c) ~~an oil-well which is being tested other than by open flow.~~	
111	**Shot-firing.** (3) The provisions of regulation 107 shall apply in regard to the covering and protection of shot-firing cables, and adequate precautions shall	**Shot-firing.** (3) The ~~provisions of regulation 107 shall apply in regard to the covering and protection of shot-firing cables~~ construction of short firing cables shall conform to IS 5950 (or latest version) and adequate	

	be taken to prevent such cable touching other cables and apparatus.	precautions shall be taken to prevent such cable touching other cables and apparatus.	
114	**Earthing of neutral points. -** Where the voltage of an alternating current system exceeds 30 Volts, the neutral or mid-point shall be earthed by connection to an earthing system in the manner specified in regulation 99. Provided that when the system concerned is required for blasting and signaling purposes, the provisions of this regulation shall not apply. Provided further that in case of unearthed neutral system adequate protection shall be provided with the approval of the Inspector	**Earthing of neutral points. -** Where the voltage of an alternating current system exceeds 30 Volts, the neutral or mid-point shall be earthed by connection to an earthing system in the manner specified in regulation 99. Provided that when the system concerned is required for blasting and signaling purposes, the provisions of this regulation shall not apply. Provided further, that in case ~~of unearthed neutral system adequate protection shall be provided with the approval of the Inspector~~ ~~wherein~~ of an unearthed neutral system ~~is used~~, it shall be equipped with a suitable ground protection system ~~that~~ approved by the Electrical Inspector of Mines to ~~automatically isolate the supply of the faulty location.~~ ensure isolation of power supply to the faulty section in appropriate manner.	Reviewed as per deliberations with ONGC officials
115	**Supervision.** - (1)(i) One or more electrical supervisors as directed by the Electrical Inspector of Mines shall be appointed in writing by the owner, agent or manager of a mine or by the agent or the owner, of one or more wells in an oil field to supervise the installation. (ii) The electrical supervisor so appointed shall be the person holding a valid Electrical Supervisor's Certificate of Competency, covering mining installation issued under sub-regulation (1) of regulation 29.	**Supervision.** - (1)(i) One or more electrical supervisors ~~as directed by the Electrical Inspector of Mines~~ shall be appointed in writing by the owner, agent or manager of a mine or by the agent or the owner, of one or more wells in an oil field to supervise the installation and such number of supervisors shall be on duty as per guidelines of schedule XIV. (ii) (a) The electrical supervisor so appointed shall be the person holding a valid Electrical Supervisor's Certificate of Competency, covering mining installations issued by the Appropriate Government ~~under sub-regulation (1) of regulation 29.~~ ~~(ii)(b) In case of oil fields, the electrical supervisor so appointed shall be the person holding a valid Electrical Supervisor's Certificate of~~	

		~~Competency, issued under sub-regulation (1) of regulation 29.~~ **OR** (ii) (b) The person holding degree in Electrical Engineering from a recognized institute or university with two years experience in the mines (coal/oil/metal) and having undergone the training as provided under Reg-116 or the diploma in Electrical Engineering from a recognized institute or university with three years experience in the mines (coal/oil/metal) and having undergone the training as provided under Reg-116 or a certificate in electrical trade, preferably with a two years course from a Industrial Training Institute recognized by the Central Government or the State Government with seven years experience in the mines (coal/oil/metal) and having undergone the training as provided under Reg-116 can be appointed by the Owner/Agent/Manager of a mine or by the ~~agent or the owner~~ owner or agent of one or more wells in an oil fields to supervise the installations. iii) ~~One or more~~ Adequate number of electricians as per guidelines mentioned in schedule **XIV** shall be appointed in writing by owner, agent or manager of a mine or by the ~~agent or the owner~~ owner or Agent of ~~in~~ an oil field for carrying out the duties. ~~(iv) The Electrician shall be a person holding license under sub-regulation (1) of regulation 29.~~ The Electrician shall be a person holding work permit issued by appropriate Government. OR	
	(iii) One or more electricians as directed by the Electrical Inspector of Mines shall be appointed in writing by the owner, agent or manager of a mine or by the agent or the owner, of one or more wells in an oil field for	The person holding a certificate in electrical trade, preferably with a two years course from a Industrial Training Institute recognized by the Central Government or the State Government with two years experience in the mines (coal/oil/metal) and having undergone the training as provided under Reg-116 can be appointed by the	

	compliance with the duties specified in this regulation. (iv) The Electrician shall be a person holding license under sub-regulation (1) of regulation 29.	Owner/Agent/Manager of a mine or by the ~~agent or the owner~~ owner or Agent, of one or more wells in an oil field~~s~~ to perform the duties.	
115 A	**Proposed new Regulation**	**115A. Training of personnel engaged for operation and maintenance of electrical installations in Mines and oil fields:** (i)The persons engaged for operation and maintenance of electrical installations in Mines are required to undergo the type of training meant for the particular mining installations (Coal/Oil/Metal) as per Schedule-XV Part-I,II & III as applicable (ii) The Owner /Agent of the mine shall arrange for training of their personnel engaged in the operation and maintenance of electrical installations of mines in his own institute or any other institute recognized by the Central Government or State Government. Provided that the existing employees shall have to undergo the training mentioned in sub-regulation 116(i) within three years from the date of coming into force of these regulations. (iii) The refresher training shall be imparted at a periodicity of intervals not more than two years. A register or in electronic form by the Owner/Manager/Agent of a mine or by the owner or agent, of one or more wells in an oil fields of the mine shall be maintained wherein the names of the persons trained, due date of refresher training etc., shall be entered. The register maintained shall be produced before the Electrical Inspector whenever required by him.	The Regulation with provision of training is proposed in consistency with the Revised Draft Reg-115

	Additional safety requirements for HVDC	
	General Safety requirements.- (1) A wire mesh shall be provided beneath the walk way; wherever consutructed above the hanging valves in the valve hall. (2) Very early smoke detection acquisition apparatus shall be provided in the valve hall to facilitate the early detection of fire in the valve hall. (3) Cables used for sensitive measurements shall be laid in separate and completely screened or covered channels or galvanised steel pipes. (4) A separate emergency source of illumination with automatic initiation shall be provided in every room or campartment of HVDC station. (5) No oil immersed apparatus shall be kept with in the valve hall. (6) All doors of compartments containing modules equipped with laser diodes and junction boxes of the fibre optic cables shall be locked and marked with laser warning symbols. **Fencing of filter banks.-** (1) AC and DC filter banks area shall be efficiently protected by fencing or other means not less than 1.8 metres in height so as to prevent access to the conductors and apparatus therein by any unauthorised person and the fencing of such area shall be earthed efficiently. (2) The gate of fencing and earth switch of the filter bank shall be interlocked such that the gate can be opened only after the disconnection and discharging of the filter bank completely. (3) The smoothing reactor shall be fenced all around and the fence shall not fall in the Magnetic Clearance Contour (MCC) of the smoothing reactor. **Earthing requirements.-** (1) Converter transformer shall be provided with separate perimeter earthing conductor.	

	(2) The line side neutral of the converter transformer bank shall be grounded at one point only. (3) Grounding grid shall not be reinforced under the air core reactors. (4) Every part of support structure circumference of the air cored reactor shall be earthed at one point only. (5) Radio Frewuency Interference (RFI) screen of valve hall shall be electrically connected and effectively earthed. (6) Metallic sheeting, prefabricated strcuture members and trusses housing HVDC apparatus shall be electrically connected and efficiently earthed. (7) Insulating pads shall be provided between the steel reinforcement, used as earthing in foundation beneath the smoothing reactor, wherever they are crossing each other.	
Additional safety requirements for GIS		
	General Safety requirements.- (1) A separate emergency source of illumination with automatic initiation shall be provided in every room or campartment of GIS station. (2) Cable cover protection unit shall be provided between flanges of GIS and cable termination unit. (3) GIS installation of ~~400 kV~~ 220 kV and above voltage shall be provided with partial discharge monitoring system. **Earthing requirements.-** (1) Enclosure of GIS bay shall be earthed for high frequency transient voltage, as per OEM recommendations, apart from the regular earthing. (2) Earthing of GIS installation shall be as per relevant Indian Standard or IEEE-80. (2) Travelling wave energy generated inside the GIS due to switching operations shall be diveted to the ground by providing effective earthing from bushing shroud to the ground.	

	Testing requirements.- GIS installation shall be tested at site for High Voltage Power frequency test before commissioning and after any repairs involving opening of pressurized compartments or as per OEM recommendations.	
	Additional safety requirements for Solar Installations	
	General safety requirements.- (1) Solar modules without shrouded connectors should be covered with lightproof material during installation. (2) Proper Segregation and clearance to be provided between positive and negative components including wiring, terminal boxes etc inside the combiner box. (3) Transparent acrylic sheets shall be provided between the positive and negative terminals and terminal points shall be covered with insulating materials as well to prevent any accidental contact after opening the box. (4) All interior and exterior DC conduit, enclosures, cable assemblies, junction boxes, combiner boxes, and disconnectors shall be identified with permanent marking. (5) Clear pathways of minimum 75 cm in width for roof access and emergency exit shall be provided for roof top system. (6) Solar installations shall be efficiently protected by fencing or other means not less than 1.8 metres in height so as to prevent unauthorised entry. (7) Disconnection switches or circuit breakers provided to disconnect the PV system from all other conductors of the system shall be located at a readily accessible location and shall be manually operable. (8) PV modules shall have qualification plus test certificates in addition to the type test certificates as per relevant IS/IEC standards.	

	(9) The inverter shall be provided with maximum power point tracking (MPPT) function. (10) SCADA system shall be provided to start or stop the grid inverter. (11) Inverter shall be capable of automatic start/stop and synchronisation with grid. (12) Inverter shall be provided with LCD touch screen or display panel for locally and manually control of the main equipments. (13) Three phases on the AC side and positive and negative conductor on the DC side shall be marked and identified with different colours. **Earthing requirements.-** (1) One point of the output circuit of PV system of voltage exceeding 50 V dc shall be provided with a connection to earth, in addition to the normal system earthing, for the purpose of limiting the imposed voltages from outside sources and stabilize the voltage to earth during normal operation. Provided that if there is Ground-Fault Protection (GFP) device in the circuit, the grounding shall only be at that point. (2) Earthing for AC and DC system shall be interconnected so as to have equipotential system. (3) DC input negative earthing function shall be provided to prevent potential induced degradation (PID) (4) The frame of inverter cabinet shall be connected with the earthing bus bar through the earthing termonals using flexible braided copper wire. (5) The inverter shall be provided with negtive earthing on DC input side, Ground fault detector interruption. (6) Protective earthing shall be made inside the inverter cabinet. **Protection, testing and interlocking requirements.-** (1) Every combiner box shall be provided with suitable Type-1 Surge Protective device with arc extinguishing capability to avoid any risk of fire.	

	(2) Surge protection device shall be installed to reduce surge induce failures of electrical and electronic system. (3) The input circuits of combiner box shall be provided with over current protection. (4) The output circuits of combiner box shall be provided with isolation protection. (5) The combiner box for outdoor use shall be protected against corrosion, rust and sunlight exposure and a protection class of IP65 or above is required. (6) Ingress protection (IP) for PV module and junction box/connectors shall be no less than IP65 and IP67 respectively. (7) Earth fault protection for PV array and inverter shall be provided. (8) The open circuit voltage measurement, polarity, short circuit and string check test shall be carried out at site. (9) Suitable lightning system shall be provided for the solar plant as per IS/IEC 62305-1/2/3/4-2010 (as amended). (10) The inverter in the PV systems connected to the grid, shall be provided with anti-islanding protection for the purpose of detecting islanding and stop supplying power if the grid is down. (11) The inverter shall be provided with atleast fuse and disconnecting switch at DC input and circuit breaker and emergency stop switch at the AC output. (12) Inverter cabinet and components inside shall be protected from corrosion. (13) No volt relay shall be provided for net metering.	

	(14) The transformers of capacity 1000 kVA and above used for solar installations and having unearthed winding shall be protected against incipient faults by differential protection. **Handling of solar installations apparatus.-** (1) Persons designated under regulation 3(1) or engaged or appointed under regulation 6(1) or regulation 7(1) shall be provided with dark glasses in addition to the PPEs before entering the solar installations. (2) No person shall work on any PV system even if the disconnect switch is open and no person shall assist such person on such work, unless he is designated in that behalf under regulation 3(1) or engaged or appointed under regulation 6(1) or regulation 7(1) and takes the safety precautions given in Schedule-III (Part-I) as the output circuit of PV system is always live. **Clearance requirements PV modules and switchgear panels for solar installations.-** (1) There shall be a minimum clearance of 500 mm between finished ground level and bottom of any PV modules. (2) LT panels facing front to front of each other shall be provided with minimum 1500 mm clearance. (3) In case of HT panels facing each other, front clearance shall be 2000 mm and side and rear clearance shall be minimum 1000 mm and 800 mm clearance respectively. **Requirement to prevent fire for solar installations.-** (1) Fire fighting system for inverter room and control room shall be as per relevant provisions of CEA (Technical Standards for Construction of Electrical plants and Electrical Lines) Regulations. (2) Enclosure of combiners box shall be made of fire retardant material with self-extinguishing property and free from Halogen. (3) Fire Resistance Low Smoke zero Halogen (FRLSH) cable shall be used. (4) Fire detection, alarm and control system shall be provided as per relevant IS.	

	(5) Adequate lightening protection with earthing shall be provided. **Insulation resistance of inverter.-** Insulation resistance when measured with 2.5 kV DC for 1 minute between input circuit and ground, between output circuit and ground and between input and output circuit shall be atleast 2 MEGA OHM.	

Additional safety requirements for Wind Farms			
	Additional safety requirements for wind energy farms shall be as stipulated in IEC 61400.		
Chapter X **Miscellaneous**			
116	**New provision**	**(3) Power to relax.-** The Authority may by specific order for the reasons to be recorded in writing and after giving an opportunity of hearing to the person likely to be affected, may relax any of the provisions of the regulations in its own motion or on an application made by an interested person.	
	New provision	**(4) Power to remove difficulty.-** If any difficulty arises in giving effect to any provisions of these regulations, the Authority may, through an order, make such provision not inconsistent with the provisions of the Act or Electricity Rules made thereunder, as appear to be necessary for removing the difficulty in giving effect to the objectives of these regulations.	

Schedule-III

Handling electric supply lines and apparatus for carrying out shut down work or testing

[See sub-regulation (3) of regulation (19)]

Part-II

Precautions to be observed

(1) Before commencement of any shut down work or testing in an electric supply line or apparatus, the Engineer or Supervisor in-charge of the work or testing shall identify the possible hazards, such as; electrocution, flash over, fall of person from height, fall of objects from height, failure of Tools & Plants, fire, etc., that may be encountered while carrying out the work or testing near charged area and take necessary precaution to protect the working personnel.

(2) The Engineer or Supervisor in-charge of the work shall, before commencement of any work, brief the entire working group or gang of the hazards that may be encountered and the necessary precautions to be taken by them.

(3) The Engineer or Supervisor in-charge of the work shall obtain proper Permit-To-Work (PTW) from the concerned Operation In-charge(s) and ensure that the electric supply line or apparatus or section is isolated from all sources of energy, de-energised and earthed.

(4) The Engineer or Supervisor in-charge of the work shall ensure that adequate and appropriate local earths are fixed at the zone of working, and the earthing rods remain connected to the isolated section of the electric supply line or apparatus or section till all men and materials have been moved away to safe zone and PTW is returned on completion of the work.

(5) If the local earths are required to be removed for any testing purpose, the same shall be done only when all the working personnel are in the safe zone, on the ground or on the tower, and in the presence of the Engineer or Supervisor. If the working personnel are required to go up or approach the conductor(s) subsequently for any work, such as, removal of test leads, tightening or adjustment, they shall be permitted to proceed only after re-fixing the local earths, as required.

(6) The Engineer or Supervisor in-charge of the work shall positively confirm by suitable means that the electric supply line or apparatus or section is totally dead before giving clearance for the working personnel to approach same.

(7) The Engineer or Supervisor in-charge of the work shall, while carrying out the shut down work or testing, ensure that working personnel are maintaining safe distance from the adjacent charged electric supply line or apparatus or section, and also, no objects, such as, Tools & Plants, ladders, cranes, man-lifts, etc., are moved, so as to infringe the safe distance, endangering the working personnel.

(8) Mobile cranes, derricks, man lifts and wheel mounted ladders shall be effectively earthed when being moved or operated in close proximity with energized apparatus or section.

(9) Portable ladders and poles shall be carried only in the horizontal position when being moved in close proximity with energized lines or equipment or area.

Further Precautions to be observed

(1) Adequate and effective supervision shall be ensured by the owner as well as the contractor for all activities while working or testing on electric supply lines and apparatus when any shut down work or testing is done near charged electric supply line or apparatus or section.

(2) Lone worker shall never be allowed to work on electric supply lines, equipments and apparatus or while testing.

(3) Sufficient supervisory personnel shall be deployed for close monitoring while various type of works are under progress at the same or different locations. Supervising work shall never be delegated to the sub-contractors' personnel.

(4) The deployed Supervising Personnel shall not leave the working spot when shut down work at height or testing is in the progress, as the working personnel may not be aware of the consequences of unsafe practices. No other work, which requires them to move out of the location, shall be undertaken by Supervising personnel, when shut down work or testing is in the progress.

(5) Wherever shut down activities are required to be carried out for more than one day on the any electric supply lines, apparatus or section, earthing(s) provided at the said work site shall be inspected by the Engineer or Supervisor every day morning for their healthiness, fitness and proper tightening, before giving clearance for the working personnel to climb the tower or structure to resume the work.

Schedule-III

Handling HVDC apparatus for carrying out shut down work or testing

[See sub-regulation (3) of regulation (19)]

Part-III

Precautions to be observed

(1) The Engineer or Supervisor in-charge of the work shall obtain proper Permit-To-Work (PTW) from the concerned Operation In-charge(s) and ensure that the electric supply line or apparatus or section is isolated from all sources of energy, de-energised and earthed.
(2) Before commencement of any shut down work or testing of HVDC apparatus, the Engineer or Supervisor in-charge of the work or testing shall identify the possible hazards, such as; electrocution, flash over, fall of person from height, fall of objects from height, failure of Tools & Plants, fire, etc., that may be encountered while carrying out the work or testing near charged area and take necessary precaution to protect the working personnel.
(3) The Engineer or Supervisor in-charge of the work shall, before commencement of any work, brief the entire working group or gang of the hazards that may be encountered and the necessary precautions to be taken by them.
(4) Attach warning labels to all neighboring installation parts (to be removed after the works have been carried out).
(5) The Engineer or Supervisor in-charge of the work shall allow access to the Valve hall, DC Filter Area, AC Filter Area and DC hall (if any) only when the apparatus therein are completely de-energised effectively earthed.,

(6) The work on AC/DC filter bank shall only begin after grounding the entire capacitor bank.

(7) There shall be at least 10 minutes time gap between grounding the entire capacitor bank and starting the work on bank. There after unit must be short circuited.

(8) The de-energized bushing shall be checked for stored charge by touching all the surfaces of both indoor and outdoor side composite insulators and all other parts of the bushing using a proper test instrument.
(9) The gas pressure inside HVDC through wall bushing shall be reduced to a level prescribed by the manufacturer before starting any work or handling of the bushing.

Schedule-III

Handling Gas Insulated Switchgear (GIS) apparatus for carrying out shut down work or testing

[See sub-regulation (3) of regulation (19)]

Part-IV

Precautions to be observed

(1) The Engineer or Supervisor in-charge of the work shall obtain proper Permit-To-Work (PTW) from the concerned Operation In-charge(s) and ensure that the electric supply line or apparatus or section is isolated from all sources of energy, de-energised and earthed.
(2) Operation, maintenance and repair must be carried out by trained and certified personnel only.
(3) Before commencement of any shut down work or testing of GIS apparatus, the Engineer or Supervisor in-charge of the work or testing shall identify the possible hazards, such as; electrocution, flash over, fall of person from height, fall of objects from height, failure of Tools & Plants, fire, etc., that may be encountered while carrying out the work or testing near charged area and take necessary precaution to protect the working personnel.
(4) The Engineer or Supervisor in-charge of the work shall, before commencement of any work, brief the entire working group or gang of the hazards that may be encountered and the necessary precautions to be taken by them.
(5) Wear hearing protection during operation.
(6) Take care when touching the enclosure at any time as enclosures may heat up to the temperature of 70°C.

(7) Observe the procedures for storage, transportation, and the use of filling equipment.
(8) Wear the personal protective equipment: respirator mask (self-contained breathing equipment if necessary), protectiveoverall, protective gloves, safety shoes, safety glasses.

(9) Attach warning labels to all neighboring installation parts (to be removed after the works have been carried out).
(10) Provide proper electrical clearance as required by interlocking rules. Mark e.g. main circuits and control circuits withappropriate tags.

(11) Block off neighboring live parts with screens, insulating mats or spacer grids in order to prevent unintended contacts.
(12) While working on any compartment in GIS, the immediate adjacent compartment(s) must be also depressurized for safety of the working person.
(13) SF6 gas following events such as arc faults becomes contaminated and contains poisonous substances. Hence, handling of SF6 in such cases must be done using proper PPEs and by a trained personnel preferably from the original equipment manufacturer (OEM).
(14) The switchgear installation shall not be operated if the density of SF6 gas indicated at the density monitors is not in the operating range.
(15) Do not remove any protective covers if an assembly is energized.

(16) The Engineer or Supervisor in-charge of the work shall ensure that adequate and appropriate local earths are fixed at the zone of working, and the earthing rods remain connected to the isolated section of the electric supply line or apparatus or section till all men and materials have been moved away to safe zone and PTW is returned on completion of the work.

Schedule-IV

Form of Inspection Report

[See sub-regulation (3) of Regulation (30) and sub-regulation 4 of Regulation 5 and sub-regulation 2 of Regulation 95]

FORM IV
(Electrical Installations in Mine)

Report No. _____ Date of Inspection :

Name of the Inspecting Office or self certification by owner---:

Date of Last inspection or self certification_____

1. Name of the Mine
2. Name of the Owner
3. Name of the Agent
4. Name of the Mine Manager
5. Name of the installation Manager(Oil Mines)
6. (i) Name of the Mine Engineer

   (In case of Oil Mines, Electrical-in-charge)

   (ii) Names of the Sectional Engineers
7. Name of the Mine Safety Officer
8. Name of the designated Electrical Safety Officer
9. Name(s) of the Electrical Supervisors
10. Name of the work men Inspector(Electrical)
11. (i). Details of working seams/ sections, drilling Installations / production installations):
12. Working place Inspected:
13. Name of the persons accompanied during inspection:
14. Voltage and system of supply (Descriptive as necessary):
15. Particulars of the situation of the mine, details of the mine, power supply arrangement to the mine/ section, installations/apparatus installed and their location as per mine plan: (Above details giving locations etc., and relevant electrical layouts shall be attached as annexures)

16. Illumination levels, where applicable:

17. Presence of methane / other explosive gases, if any :

18. Humidity, Quantity and quality of air and temperature, as applicable :

19. General remarks on condition of installations:

Sl. No.	Regulation Nos.	Requirements	Report
1	Reg-95	On or before the first day of February in every year, notice in the form set out in Schedule-XI or Schedule-XII whichever is applicable is sent.	Yes/No
2.	Reg-96	The plans specified under this regulation are kept in the office of the mine manager and available to the electrical Inspector of mines.	Yes/No
3	Reg. 97	I. Adequate illumination by electricity without causing glare and strain shall be provided in the mines. II. Whether efficient means of communication is provided between the point where the switchgear under sub-regulation (1) regulation 105 is erected, the shaft bottom and other distributing centers in the mine. III. Adequate emergency lighting system shall be maintained in all places where failure of the electric light at any time shall be prejudicial to safety IV. Whether Fire extinguishing appliances of adequate capacity and of an approved type are installed and properly maintained in every place containing apparatus, other than cables, telecommunication and signaling apparatus. V. Is minimum clearance above ground of the lowest conductor of over head lines or over head cables where dumpers or trackless vehicles are being operated, not less than twelve meters in height VI. The dumper bucket in raised position, the clearance between the top of dumper body and to the lowest conductor of overhead lines or overhead cables shall not be less than 1.00 mtr.	Yes/No Satisfactory/Not satisfactory Yes/No Satisfactory/Not satisfactory Yes/No Satisfactory/Not Satisfactory Yes/No Satisfactory/Not Satisfactory Maintained/ Not maintained Maintained/ Not maintained
4	Reg. 98	I. Are Transformers and switchgear placed in a separate room, compartment or box where necessary or in a manner to prevent danger of mechanical damage? II. Is the room, compartment or box substantially constructed and kept dry & illuminated III. Is efficient ventilation provided for all	Yes/No Yes/No Yes/No

		apparatus installed therein?	
5	Reg. 99	I. Is earthing carried out by connection to an earthing system at the surface of the mine and in a manner approved by Electrical inspector of mines. II. Are all metallic sheaths, coverings, handles, joint boxes, switchgear frames, instrument covers, switch and fuse covers of boxes, all lamp holders, unless efficiently protected by an insulated covering made of fire resisting material, and the frames and bedplates of generators, transformers and motors, including portable motors, earthed by connection to an earthing system in the manner specified in regulation 99. III. Are all conductors, of an earthing system having conductivity, at all parts and all joints, at least equal to fifty per cent of that of the largest conductor used solely to supply the apparatus	Yes/No Yes/No Satisfactory/Not satisfactory Yes/No
6	Reg. 102	I. Is automatically disconnection of supply to any part of the system, where a fault, including an earth fault, occurs is employed. II. Whether suitably designed, restricted neutral system of power supply has been deployed for restricting the earth fault current to 750 milliampere in installations of voltage exceeding 250 V and upto1100 V for below ground coal mines& Oil mines and 50 ampere in installations of voltage exceeding 1100 V and up to 11 kV in belowground, open cast mines and oil mines or oil fields III. Whether in a below ground mine, for face equipment working on voltage exceeding 1100V, the earth fault current is limited to such safe values considering the unsafe conditions due to touch potential and ignition hazards IV. Whether the operation of the switchgear and the relays are recorded daily at the generating station, sub-station or switch station in a register kept for the purpose or in electronic form V. Whether effectiveness of switchgear and protective system is maintained in working order and are checked by calibrating and testing at least once in a year and the result thereof are recorded in separate register kept for the purpose and in electronic form.	Yes/No Yes/No Yes/No Yes/No Yes/No
7		I. Is operating voltage of Hand-held portable apparatus used is within 125 V? II. Whether the lighting system in belowground mine has a mid or neutral point connected	Yes/No Yes/No

	Reg. 103	with earth and the voltage not exceeding 125 V between phases is used? III. For Electric lighting in the surface of a mine or in an, open cast mine whether the neutral or the midpoint of the system is connected with earth and the voltage between the phases is not exceeding 250 V? IV. Is the voltage of portable hand-lamps used in underground working of mine exceeding 30V?	Yes/No Applicable/Not applicable Yes/No
8	Reg. 104	Whether the transformers used for providing voltages to control circuits or remote control or interlocking circuit or for hand held apparatus are having provision to guard against danger by reason of the lower voltage apparatus becoming accidentally charged above its normal voltage by leakage from or contact with the higher voltage apparatus.	Yes/No
9	Reg. 105	I. Whether properly constructed switchgear for disconnecting supply of electricity provided at a suitable point or as recommended by Electrical inspector of mines. II. Whether a person designated to operate the said switchgears is available within easy reach thereof. III. Whether the main mechanical ventilator operated by electricity is interlocked with the switchgear so as to automatically disconnect the power supply in the event of stoppage of main mechanical ventilator. IV. Whether every motor is controlled by switchgear to disconnect supply from the motor and from all apparatus connected thereto and whether such switchgear is so placed to easily operate by the person designated to operate the motor. V. Is the switchgear so placed, disconnects the supply automatically, in the event of conditions of over-current, over-voltage and single phasing? VI. Is the Auxiliary fan interlocked with the switchgear controlling power supply to the in bye face equipment of below ground coal mine for automatic disconnection of power supply in the event of the stoppage of the auxiliary fan. VII. Whether every feeder of the mine are controlled in a manner so as to disconnect the supply automatically in the event of conditions of over-current, short circuit, single phasing, under-voltage as relevant	Yes/No Yes/No Yes/No Applicable/ Not applicable Yes/No Yes/No Yes/No Applicable/ Not Applicable Yes/No

			Applicable/ Not applicable
10	Reg. 106	I. Whether all cables are covered with insulating material and efficiently protected from mechanical damage and supported at sufficiently frequent intervals and in such a manner as to prevent damage to such cables	Yes/No Satisfactory/Not satisfactory
		II. Whether all cables are protected by a metallic covering and which contain all the conductors of a circuit and the sheath of metal-sheathed cables and the metallic armouring of armoured cables is of a thickness not less than that recommended in the relevant standard of the Bureau of Indian Standards	Yes/No Satisfactory/Not satisfactory
		III. Is the metallic covering of every cable electrically and mechanically continuous throughout, earthed by a connection to the earthing system of conductivity specified therein and efficiently protected against corrosion?	Yes/No Satisfactory/Not satisfactory
		IV. 4. Whether the metallic covering of every cable is having a conductivity at all parts and at all joints at least equal to fifty per cent of the conductivity of the largest conductor enclosed by the said metallic covering	Yes/No Satisfactory/Not satisfactory
		V. Are the cables and conductors where connected to motors, transformers, switchgear and other apparatus, installed so that they are mechanically protected by securely attaching the metallic covering to the apparatus and the insulating material at each cable end is efficiently sealed so as to prevent the diminution of its insulating properties;	Yes/No Satisfactory/Not satisfactory
		VI. Whether properly constructed and certified glands or bushes are used to prevent abrasion or to secure gas-tightness	Yes/No
11	Reg. 107	I. Whether Flexible cables used for portable or transportable apparatus are covered with insulating material which are efficiently protected from mechanical injury.	Yes/No
		II. Is the flexible metallic covering of the cable, used by itself to form an earth conductor for such apparatus without an earth conductor	Yes/No/Not applicable
		III. whether flexible cable use with portable or transportable apparatus connected to the	

		system and to apparatus by properly constructed connectors IV. At every point where flexible cables are joined to main cables, whether a circuit breaker is provided which is capable of automatically disconnecting the supply from such flexible cables? V. Is every flexible cable attached to portable or transportable machine is examined periodically by the designated person? VI. Whether Flexible cable exceeding in specified length being used with any portable or transportable apparatus VII. Are Flexible cables used with apparatus other than portable or transportable apparatus?	Yes/No Yes/No/ Not applicable Yes/No/ Not applicable Yes/No
12	Reg. 108	Whether all portable and transportable machines operate on remote control from the concerned switchgear with relevant provision.	Yes/No/ Not applicable
13	Reg. 109	I. Whether all apparatus maintained reasonably free from dust, dirt and moisture, and kept clear of obstruction. II. Whether the notices in Hindi and local language of the district, so designed and protected as to be easily legible at all times, be exhibited at the places of importance with regard to safety. III. Whether all apparatus, including portable and transportable apparatus, operated only by those persons who are designated for the purpose. IV. Where a plug-and-socket-coupling other than of bolted type is used with flexible cables, whether an electrical inter-lock or other approved device provided to prevent the opening of the coupling while the conductors are live.	Yes/No Satisfactory/Not satisfactory Yes/No Yes/No Yes/No/Not applicable
14	Reg. 110	Furnish the point wise report of compliance on the relevant provisions of this regulation as applicable to the particular mine/installations	Yes/No Satisfactory/Not satisfactory/Nat applicable
15	Reg. 112	I. Whether adequate precautions are taken to prevent signal and telephone wires coming into contact with other cables and apparatus. II. Is the voltage used in any one circuit exceeds 30Volts?	Yes/No Yes/No
		III. Whether the bare conductors, where used	Yes/No

		are installed on suitable insulators.	
16	Reg. 113	I. Whether Haulage by electric locomotives on the overhead trolley-wire system, at voltage not exceeding 650 V I. Whether haulage by storage battery locomotives used with the prior consent in writing of the Electrical Inspector	Yes/No Yes/No
17	Reg. 115	I. Whether electrical supervisors, as directed by Electrical Inspector are appointed in writing by the owner, agent or manager of a mine or by the agent or the owner, of one or more wells in an oil field to supervise the installation. II. Whether electricians as directed by the Inspector, are appointed in writing by the owner, agent or manager of a mine or by the agent or the owner, of one or more wells in an oil field for compliance with the duties specified in this regulation. III. Whether persons appointed to operate, supervise, examine or adjust any apparatus are competent to undertake the work which he is required to carry out as directed by the Engineer. IV. Whether the electrical supervisor is maintaining log-book made up of the daily log sheets prepared in the form set out in Schedule- XIII.	Yes/No Yes/No Yes/No Satisfactory/Not satisfactory Yes/No
18	Reg. 116	Whether the persons engaged for operation and maintenance of electrical Installations have undergone training meant for the particular mining installations	Yes/No Satisfactory/Not satisfactory
19		Any other observations/comment based on the inspection	

Date :

Signature of the Inspecting Officer/Self- certifying owner

Name _____

Designation _____

File No. _____

Copy forwarded to Chief Electrical Inspector of Mines / Electrical Inspector of mines for……

Schedule-IX

Form for reporting failure of Transformers or Reactors of rating

20 MVA/MVAR and above

[See sub-regulation (8) of regulation (46)]

(1) Type of Equipment (Transformer or Reactor)
(2) Capacity (MVA/MVAR)
(3) Location (A
(4) Date of failure
(5) Year of manufacture
(6) Date of Installation
(7) Make
(8) Reasons for failure
(9) Measures being taken to avoid recurrence of failure

Date :

(Signature and name of Manager/Executive

Engineer of the installation)

TO:

The Secretary

Central Electricity Authority

New Delhi

Schedule-IX

Part-A

Form for reporting failure of substation equipment & cable of 220 kV and above voltage class

[See sub-regulation (8) of regulation (46)]

1. Name of Substation
2. Utility/Owner of substation
3. Faulty Equipment/cable
4. Rating plate details
   (e.g. MVA, MVAR, Voltage, current, voltage ratio, CT ratio, PT/CVT ratio, tap range, basic insulation level, continuous operating voltage & rated voltage & nominal discharge current of SA, short circuit withstand current & time, duty cycle, size of cable etc., as applicable for equipment/cable)
5. Make/Manufacturer
6. Serial No.
7. Year of manufacturing
8. Date of commissioning
9. Date and time of occurrence/discovery of fault
10. Fault discovered while equipment was in (Service/Maintenance)
11. Present condition of equipment (Completely damaged/reparable)
12. Details of previous maintenance (provide list of all maintenance activity & tests carried out along with date of testing/maintenance and test results)
13. Details of previous failure of same equipment/cable (if the equipment was used after repair or replacement of some parts)
14. Sequence of events leading to failure
15. Details of protection provided for the equipment/cable
16. Details of protection operated during fault and their settings
17. Atmospheric condition at the time of fault
18. Details of Tests done on equipment/cable after failure
19. Details, if any other equipment & accessories affected/damaged by faulty equipment
20. Reason for failure
21. Measures to be taken to avoid recurrence of failure
22. Date of restoration/replacement of faulty equipment/cable
23. Conclusion/recommendations

Note: Attach factory & commissioning test reports; event logger/disturbance recorder data & photographs of failed equipment, if available.

Date : (Signature and name of Manager/Executive

Engineer of the installation)
Contact details (Address /Mobile No./Phone No./Email)

To,

The Secretary

Central Electricity Authority

Sewa Bhawan, R.K.Puram

New Delhi-110066

Part-B

Form for reporting failure of Towers of 220 kV and above voltage class Transmission lines

[See sub-regulation (8) of regulation (46)]

1. Name of Transmission line with voltage level:
2. Length of line (km):
3. Type of configuration [(S/C, D/C, S/C strung on D/C towers, narrow base etc.)
4. Number of Towers and Type of Towers failed: [suspension / tension/dead end /special tower
   /river crossing tower/ Powerline crossing/Railway Crossing etc., with / without extension
   (indicate the type & length of extension)]
5. Tower location No. with reference to nearest substation(indicate Name):
6. Name and size of conductor:
7. No. of sub-conductors per bundle and bundle spacing:
8. Number and size of Ground wire/OPGW (if provided):
9. Type of insulators in use(Porcelain / Glass / Polymer):
10. Configuration of insulators (I / V / Y / tension)
11. No. of insulators per string and No. of strings per phase:
12. Year of construction / commissioning:
13. Executing Agency:
14. Weather condition on the date of failure:
15. Terrain Category:
16. Wind Zone (1/2/3/4/5/6) and velocity of wind:
17. Details of earthing of tower (pipe type/ Counter poise):
18. Line designed as per IS: 802 (1977/1995/any other code):
19. The agency who designed the line:
20. Any Special consideration in design:
21. Date and time of occurrence/discovery of failure:
22. Power flow in the line prior to failure:
23. Any missing member found before / after failure of towers:
24. Condition of foundation after failure:
25. Brief Description of failure: [along with photographs(if available), other related information like tower schedule, newspaper clipping for cyclone / wind storm etc.]
26. Probable cause of failure:
27. Details of previous failure of the line / tower:
28. Whether line will be restored on Emergency Restoration System (ERS) or Spare tower will be used:
29. Likely date of restoration:
30. Present Status:
31. Details of any Tests carried out after failure:
32. Single line diagram / clearance diagram of the failed tower(s) with all dimensions (Horizontal and vertical dimensions including the base width of tower)

33. Tower spotting data
34. Tower Schedule for the failed section
35. Sag tension calculation considered for the design of towers
36. Any other relevant information:

Date : (Signature and name of Manager/Executive

Engineer of the installation)
Contact details (Address /Mobile No./Phone No./Email)

To,

The Secretary

Central Electricity Authority

Sewa Bhawan, R.K.Puram

New Delhi-110066

Schedule-X-A

Minimum clearance in air above ground and across road surface of National Highways or State Highways or roads, other than National or State Highways, or highest traction conductor of railway corridors or navigational or non-navigational rivers for lowest conductor of an alternating current overhead lines, including service lines, of nominal voltage system

[See sub-regulation (5) of regulation (58)]

Nominal voltage of system	Clearance above ground			Clearance between conductor and road surface across National Highway **and State Highway (4 lane and more)** (m)	Clearance between conductor and road surface across State Highway **(less than 4 lane)** (m)	Clearance between conductor and road surface across roads other than National or State Highways (m)	Clearance between conductor and rail level across Railway Corridor (m)	Clearance above HFL for River crossing	
	Across Street (m)	Along Street (m)	Elsewhere (m)					Navigational river (m)	Non-navigatiional river (m)
Upto 650 V	5.80	5.50	4.60	**U/G Cable**	5.80	5.80	U/G Cable		
3.3 kV	6.50	5.80	4.60	**U/G Cable**	11.60	6.50	U/G Cable		
6.6 kV	6.50	5.80	4.60	**U/G Cable**	11.60	6.50	U/G Cable		
11 kV	6.50	5.80	4.60	**U/G Cable**	11.60	6.50	U/G Cable		
22 kV	6.50	5.80	5.20	**U/G Cable**	11.60	6.50	**U/G Cable**		
33 kV	6.50	5.80	5.20	11.60	11.60	6.50	14.10		
66 kV	6.50	6.10	5.50	11.60	11.60	8.10	14.10	19.00	6.50
110 kV	6.50	6.10	6.10	11.60	11.60	8.10	14.60	19.00	6.50
132 kV	6.50	6.10	6.10	11.60	11.60	8.10	14.60	19.22	6.50

220 kV	7.02	7.02	7.02	12.52	12.52	9.02	15.40	20.10	7.02
400 kV	8.84	8.84	8.84	14.00	14.00	10.84	17.90	21.90	8.84
765 kV	18.00*	18.00*	18.00*	18.80	18.80	17.00	23.40	25.55	15.00
1150 kV	24.00*	24.00*	24.00*	30.00	30.00	26.00	23.00 (from highest traction conductor)	29.90	24.00

For V>33 kV Min clearance is 5.1816 (17 ft) + 0.3048 m (1 ft) for every additional 33 kV or part there of.
For navigable rivers, clearances shall be fixed in relation to the tallest mast in consultation with the concerned navigational/port authorities. The clearances being generally followed by utilities in respect of navigable rivers for A.C transmission lines as per 2006 Memorandum of Ministry of Shipping, Road Transport and Highways is as follows:

In case of accessible frozen rivers/lakes, the minimum clearance above frozen rivers/lakes should be equal to the minimum clearance in air above ground.

Upto 220 kV, electric fields are of marginal interest. (Source: Transmission Line Reference Book - 345 Kv and Above, EPRI)

* Higher clearance due to predominantly induction effects and high electrostatic field (ICNIRP limit: 10 kV/m in RoW) at voltage exceeding 400 kV are adopted.

Schedule-X-B

The minimum clearance in air above ground and across road surface of National Highways or State Highways or roads, other than National or State Highways, or highest traction conductor of railway corridors or navigational or non-navigational rivers for lowest conductor of High Voltage Direct Current (HVDC) overhead line of nominal voltage system

[See sub-regulation (6) of regulation (58)]

Sl.No.	DC Voltage ~~(kV)~~	Ground Clearance ~~(mtrs.)~~ (m)	Clearance between conductor and road surface across National Highway (m)	Clearance between conductor and road surface across State Highway (m)	Clearance between conductor and road surface across roads other than National or State Highways (m)	Clearance between conductor and highest traction conductor across Railway Corridor (m)	Clearance above HFL for River crossing	
							Navigational River (m)	Non-navigatiional River (m)
1.	100 kV	6.10						
2.	200 kV	7.30						
3.	300 kV	8.50						
4.	400 kV	9.40						
5.	500 kV	10.60 (12.5)*					20.03	6.75
7.	800 kV	13.90 (18.0)*				20.0	27.70	11.00

* Higher clearance due to predominantly high electrostatic field (ICNIRP limit: 10 kV/m in RoW) at voltage exceeding 400 kV

SCHEDULE XIV

PART-I

Guidelines for determining adequacy of designated supervisors on duty in every mine or oil-field while electricity is being used

[See sub-regulation (1)(i) of regulation (115)]

Adequate number of electrical supervisors shall be designated in a mine for conducting the operation and maintenance works of electrically operated machinery/ equipment/ apparatus in accordance with the provisions of Regulations.

1. In case of belowground mine having conventional and semi-mechanized workings, at least one electrical supervisor shall be designated in each working district in each shift of operation/ maintenance.
2. In case of belowground mechanized mines consisting of Longwall machinery, continuous miners, Blasting Gallery or alike equipment, at least two electrical supervisors shall be designated for each machinery and associated apparatus/ substations in each shift of operation/ maintenance
3. In opencast mine consisting of Dragline, Bucket wheel excavators, High capacity shovels or any alike equipment, at least one supervisor shall be designated for each such machinery/ equipment inclusive of their switchgear based on size & type of equipment in each shift of operation/ maintenance.

   Provided that where the aggregate capacity of machinery is less than 2MVA, the HEMM and associated switchgear can be grouped to bring under one supervisor.
4. In opencast mine consisting of HEMM such as Electrically operated Shovels & Drilling Machines, associated switchgear, distribution lines, substations etc., at least one electrical supervisor shall be designated in each shift of operation/ maintenance for maximum up to six numbers of such electrically operated machinery/ equipment.
5. In case of opencast mines consisting of small and conventional electrical machinery such as substation equipment, distribution lines, production machinery, pump installations or any alike equipment, one electrical supervisor shall be designated in each shift of operation/maintenance.
6. In case of oil/ gas/ coal based power plants with associated substations which are supplying electricity to mine installations and forming part of mine, one electrical supervisor in general shift of operation/ maintenance shall be designated.
7. In case of oil fields, where electrically operated drilling rigs inclusive of generators, substation apparatus and other electrical machinery are in use, one electrical supervisor in general shift of operation/ maintenance per rig shall be designated.
8. In oil fields of production installations, group gathering stations, well pads or any alike installations where substations and electrically operated equipment are in use, at least one electrical supervisor in general shift of operation/ maintenance shall be designated.
9. For the surface installations of a mine consisting of substations, switch stations, distribution lines and other electrically operated machinery/ equipment, at least one electrical supervisor in each shift shall be designated for operation/ maintenance.

Provided that where the aggregated capacity of substations and downstream electrically operated machinery is more than 10MVA, additional electrical supervisor shall be designated in each shift of operation/ maintenance.

PART-II

Guidelines for determining adequate number of designated electricians on duty in every mine or oil-field while electricity is being used

[See sub-regulation (1)(iii) of regulation (115)]

Adequate number of electricians shall be designated in a mine for conducting the operation and maintenance works of electrically operated machinery/ equipment/ apparatus in accordance with the provisions of Regulations:

1. In case of belowground mine having conventional and semi-mechanized workings, at least two electricians shall be designated for each working district in each shift of operation/ maintenance.
2. In case of belowground mechanized mines consisting of Longwall machinery, continuous miners, Blasting Gallery or alike equipment, at least four electricians shall be designated for each machinery/ associated apparatus/ substations in each shift of operation/ maintenance
3. In opencast mine consisting of Dragline, Bucket wheel excavators, High capacity shovels or any alike equipment, at least two electricians shall be designated for each such machinery/ equipment inclusive of their switchgear based on size & type of equipment in each shift of operation/ maintenance.

   Provided that where the aggregate capacity of machinery is less than 1MVA, the HEMM and associated switchgear can be grouped to bring under one electrician.
4. In opencast mine consisting of HEMM such as Electrically operated Shovels & Drilling Machines, associated switchgear, distribution lines, substations etc., at least one electrician shall be designated in each shift of operation/ maintenance for maximum up to two numbers of such electrically operated machinery/ equipment.
5. In case of opencast mines consisting of small and conventional electrical machinery such as substation equipment, distribution lines, production machinery, pump installations or any alike equipment are in use, at least one electrician shall be designated in each shift of operation/maintenance and additional electrician shall be designated based on the type and size of installations and the area to be covered.
6. In case of oil/ gas/ coal based power plants with associated substations which are supplying electricity to mine installations and forming part of mine, at least one electrician in each shift of operation/ maintenance shall be designated.
7. In case of oil mines, where electrically operated drilling rigs inclusive of generators, substation apparatus and other electrical machinery are in use, two electricians in each shift of operation/ maintenance per rig shall be designated.
8. In oil fields of production installations, group gathering stations, well pads or any alike installations, where substations and electrically operated equipment are in use, at least one electrician in each shift of operation/ maintenance shall be designated. Where the

distance between such installations exceeds one KM, additional electrician shall be designated based on the type and size of installations and the area to be covered.

9. For the surface installations of a mine consisting of substations, switch stations, distribution lines and other electrically operated machinery/ equipment, at least two electricians in each shift shall be designated for operation/ maintenance.

   Provided that where the aggregated capacity of substations and downstream electrically operated machinery is more than 5MVA additional electricians shall be designated in each shift of operation/ maintenance.

Guidelines for determining adequate number of designated electricians on duty in every mine or oil-field while electricity is being used

[See sub-regulation (1)(iii) of regulation (115)]

Adequate number of electricians shall be appointed in a mine for conducting the operation and maintenance works of electrically operated machinery/ equipment/ apparatus in accordance with the provisions of Regulations:

10. In case of belowground mine having conventional and semi-mechanized workings, at least two electricians shall be deployed for each working district in each shift of operation/ maintenance.
11. In case of belowground mechanized mines consisting of Longwall machinery, continuous miners, Blasting Gallery or alike equipment, at least four electricians shall be deployed for each machinery/ associated apparatus/ substations in each shift of operation/ maintenance
12. In opencast mine consisting of Dragline, Bucket wheel excavators, High capacity shovels or any alike equipment, at least two electricians shall be appointed for each such machinery/ equipment inclusive of their switchgear based on size & type of equipment in each shift of operation/ maintenance.
    Provided that where the aggregate capacity of machinery is less than 1MVA, the HEMM and associated switchgear can be grouped to bring under one electrician.
13. In opencast mine consisting of HEMM such as Electrically operated Shovels & Drilling Machines, associated switchgear, distribution lines, substations etc., at least one electrician shall be deployed in each shift of operation/ maintenance for maximum up to two numbers of such electrically operated machinery/ equipment.
14. In case of opencast mines consisting of small and conventional electrical machinery such as substation equipment, distribution lines, production machinery, pump installations or any alike equipment are in use, at least one electrician shall be appointed in each shift of operation/maintenance and additional electrician shall be appointed based on the type and size of installations and the area to be covered.
15. In case of oil/ gas/ coal based power plants with associated substations which are supplying electricity to mine installations and forming part of mine, at least one electrician in each shift of operation/ maintenance shall be appointed.
16. In case of oil mines, where electrically operated drilling rigs inclusive of generators, substation apparatus and other electrical machinery are in use, two electricians in each shift of operation/ maintenance per rig shall be appointed.
17. In oil fields of production installations, group gathering stations, well pads or any alike installations, where substations and electrically operated equipment are in use, at least one electrician in each shift of operation/ maintenance shall be appointed. Where the distance between such installations exceeds one KM,

additional electrician shall be appointed based on the type and size of installations and the area to be covered.

18. For the surface installations of a mine consisting of substations, switch stations, distribution lines and other electrically operated machinery/ equipment, at least two electricians in each shift shall be appointed for operation/ maintenance.

    Provided that where the aggregated capacity of substations and downstream electrically operated machinery is more than 5MVA additional electricians shall be appointed in each shift of operation/ maintenance.

[Subject to review based on the further discussion]

Training of personnel engaged for operation and maintenance of electrical installations in Mines

(i)The persons engaged for operation and maintenance of electrical installations in Mines are required to undergo the type of training meant for the particular mining installations (Coal/Oil/Metal).

(ii) The refresher training shall be imparted at a periodicity of intervals not more than two years. A register by the Owner/Manager/Agent of a mine or by the agent or the owner, of one or more wells in an oil fields of the mine shall be maintained wherein the names of the persons trained, due date of refresher training etc shall be entered. The register maintained shall be produced before the Electrical Inspector whenever required by him.

(iii) The Owner /Agent of the mine shall arrange for training of their personnel engaged in the operation and maintenance of electrical installations of mines in his own institute or any other institute recognized by the Central Government or State Government.

Provided that the existing employees shall have to undergo the training mentioned in sub-regulation 116(i) within three years from the date of coming into force of these regulations.

[Subject to review based on the further discussion]

SCHEDULE X V

TRAINING SYLLABUS FOR ELECTRICAL SUPERVISOR AND ELECTRICIANS OF MINES

General Instructions

1. The content of training courses and on the job training / practical training may be designed keeping in view the technical requirements as applicable.

2. The periodical refresher training may be customized as per the assessment and requirement.

3. After the lecture course is completed, the trainees are required to be taken on visit to a few modern power stations, testing labs, mechanized mine, manufacturer facilities of transformer, motors, switchgears etc.,

4. Facilities of training institute / for creation of training institute:

    I. The training institute shall have devoted facilities – building, residential and recreation facilities

    II. The training institute shall have a full time Head of institute and adequate number of teaching faculty /staff. The institute may engage visiting faculty from operations in order to enhance the operating skills of the trainee.

    III. The training institute shall have adequate number of lecture halls, seminar and conference hall/ auditorium, library, computer centre, workshop, laboratories etc.,

    IV. The institute shall have facilities to arrange refresher courses to those personnel who are already designated electrical supervisor in their work fields.

    V. The institute shall fill up the Assessment form for Electrical Supervisors/ Electricians towards the performance of each participant.

5. The threshold marks for passing through the evaluation test, inclusive of practical test and written shall be 50% of total marks.

PART-I

TRAINING SYLLABUS FOR ELECTRICAL SUPERVISOR OF MINES (For Coal or Metal Mines)

Item No	Particulars	Number of Hours
1	Electrical Machineries: I. Operation maintenance, pre-commissioning test of different types of motors (AC &DC) II. Operation maintenance, pre-commissioning test of different types of generators (AC &DC), III. Operation maintenance, pre-commissioning tests of different types of transformers.	4
2	Electric Drives and Control: (i) Operation maintenance of Different types of starters including AC Drive, DC Drive, soft starters etc.,	2
3	Switchgear and protective devices: (i) Operation maintenance, pre-commissioning tests of different types of circuit breakers (ii) Different types of protective schemes/protective devices and their operation maintenance,	2
4	Earthing system: Requirements, types of earthing, maintenance, chemical earthing and relevant provisions of IS - 3043.	3
5	Neutral system of power supply: a. solid neutral earthing, restricted neutral earthing, isolated neutral earthing , advantages / disadvantages; b. provisions of the Regulation for suitably designed restricted neutral system of power supply and the requirement of neutral fail safe relay	3
6	Operation and maintenance of substations and generating stations including maintenance of storage battery and related auxiliaries.	3
7	Design and layout of sub-station, Safety in sub-station, switchyard and switchboards i. Safe working clearance; ii. Guarding of live apparatus; iii. Standard Operating Procedure (SOP) of circuit breakers, transformers, isolators, surge arresters, instrument transformers, storage tanks etc.,	3
8	Operation, maintenance of overhead lines and underground cables I. Safety measures in overhead lines II. Types of stays, its markings, grouting, stay insulator, binding etc., III. Types of guarding and clearances, earth/neutral wire, anti-climbing devices, and their erection. IV. Selection and fixing of control devices viz. Linked switches, fuses, isolators, and earthing switches, lightning arrestors etc. V. Cables and conductors, their classification, construction, insulation types, laying, mining type cables and the related standards, cable jointing techniques and junction boxes	4

9	Electrical apparatus and machinery for mine installation (as applicable for a particular type of mine Oil/Coal/Metal) I. Winders, man riding system, cranes II. Electrically operated HEMM, portable transportable machinery, dragline, bucket wheel excavator, SDL,LHD, Road header, shearer, continuous miner III. Salient features of Flameproof and intrinsically safe apparatus for use in hazardous atmosphere of mine (coal/Oil) and relevant provisions of the IS/IEC 60079 series of standards, operation and maintenance of the flameproof and intrinsically safe apparatus; IV. LMD, Environment monitoring system V. Circuit diagram of Drill control panel, GEB, different types of circuit breakers, starters, Lighting & Signaling unit. VI. Safety requirement of belt conveyor system installed in the belowground coal mine, OCP VII. Safety requirements of Drilling Rig in oil mine VIII. Any other special type of Electrical machinery / apparatus used in mines(coal/oil/metal)	8
10	General safety: I. Procedure for obtaining permission to work for carrying out operations and maintenance of electrical equipment (permit to work as per **IS:5216)**; II. Safety in electrical workshop III. Firefighting equipment, their type, use and periodical maintenance, indicators, and recorders etc. IV. First aid training, resuscitation of persons suffering from electric shock etc.,	4
11	Legislation/statutes as amended from time to time: I. Provisions of Central Electricity Authority(measures relating to safety and electric supply), Regulations 2010; II. Provisions of Electricity Act,2003 III. Relevant provisions of the mines Act, 1952 IV. Relevant provisions of the Coal Mines Regulation,1957 V. Relevant provisions of Metalliferous Mines Regulation, 1961 VI. Relevant provisions of Oil Mines Regulation, 1984	5
12	On-Site emergency management plan in case of contingency related to electricity: I. Emergency response procedure including response to off-site emergency management plan and crisis and disaster management plan; II. Risk assessment information giving possible nature of incidents and events giving rise to emergency conditions, risk analysis and impact assessment;	3
13	Record keeping I. Maintenance of Supervisors log sheet II. Register of designated persons III. History sheets of the electrical equipment/apparatus with regard to the repair/maintenance	3

	IV. Maintaining and updating the circuit diagram of the installations and electrical apparatus like breakers, starters etc. V. Register recording the testing of relays using secondary injection kit and the due date of testing VI. Register recording the testing of CTs and relays using primary injection kit and the due date of testing VII. Register for maintenance of flameproof and intrinsically safe apparatus(coal/Oil mine)	
14	On Job training/ Practical/Laboratory Training I. Practical tests(type, routine) of transformer, motor II. Testing of CTs including relays through primary injection kit III. Testing of relays through secondary injection kit IV. First aid training V. Operation of different types of fire extinguishers	8
15	Written Examination to evaluate performance, feedback on training	1
Duration of the training course in hours		56

PART-II

TRAINING SYLLABUS FOR ELECTRICAL SUPERVISOR OF MINES (FOR OIL MINES)

Item No	Particulars	Number of Hours
1	Brief introduction of AC/DC Motors, alternators, transformers and their application, operation and maintenance.	4
2	Brief Introduction of Switchgear, Protection techniques, operation and maintenance.	4
3	I. Earthing system: Requirements, types of earthing, maintenance, chemical earthing and relevant provisions of IS - 3043. II. Neutral system of power supply: Solid neutral earthing, restricted neutral earthing, isolated neutral earthing , advantages / disadvantages;	4
4	I. Measurement of Insulation Resistance, earth electrode resistance II. Maintenance of Battery bank	3
5	I. Lock-out/Tag out (permit to work as per IS:5216) and PTW system II. Hazardous area classification and selection of equipment for hazardous area. Salient features of Flameproof and intrinsically safe apparatus for use in hazardous area and relevant provisions of the IS/IEC 60079 series of standards, operation and maintenance of the flameproof, intrinsically safe apparatus and other apparatus conforming to the relevant Ex standards	5
6	Record keeping: I. Maintenance of Supervisors log sheet II. Register of designated persons III. History sheets of the electrical equipment/apparatus with regard to the repair/maintenance	3

	IV. Maintaining and updating the circuit diagram of the installations and electrical apparatus like breakers, starters etc. V. Register recording the testing of relays using secondary injection kit and the due date of testing VI. Register recording the testing of CTs and relays using secondary injection kit and the due date of testing VII. Register for maintenance of flameproof and intrinsically safe apparatus(coal/Oil mine)	
7	Design layout, Safety in sub-station, switchyard and switchboards i. Safe working clearance; ii. Guarding of live apparatus; Standard Operating Procedure (SOP) of circuit breakers, transformers, isolators, surge arresters, instrument transformers, storage tanks etc.	3
8	Operation, maintenance of overhead lines and underground cables I. Safety measures in overhead lines II. Types of stays, its markings, grouting, stay insulator, binding etc., III. Types of guarding and clearances, earth/neutral wire, anti-climbing devices, and their erection. IV. Selection and fixing of control devices viz. Linked switches, fuses, isolators, and earthing switches, lightning arrestors etc. V. Cables and conductors, their classification, construction, insulation types, laying, mining type cables and the related standards, cable jointing techniques and junction boxes	3
9	General safety: I. General Safety to be observed in oil and gas mine and adherence to operator's Safety Rules. II. Firefighting equipment, their type, use and periodical maintenance, indicators, and recorders etc. III. First aid training, resuscitation of persons suffering from electric shock etc.	3
10	Legislation: I. Provisions of Central Electricity Authority (measures relating to safety and electric supply), Regulations 2010; II. Provisions of Electricity Act,2003 III. Relevant provisions of the mines Act, 1952 IV. Relevant provisions of Oil Mines Regulation, 1984 (amended version)	5
11	On job training/ practical/Laboratory training	4
12	Written examination to evaluate the performance for awarding the License	1
	Total	42

PART-III

TRAINING SYLLABUS FOR ELECTRICIANS OF MINES

Item No	Particulars	Number of Hours
1	Basic Electrical Engineering: (i) Symbols of various electrical items/ machines/elements (ii) Sketches and circuit diagrams for the electrical systems / installations i.e. different types of distribution networks, starters and other electrical apparatus (iii) Different types of tools and devices being used to maintain the electrical installations / apparatus such as Insulation tester, earth tester, multimeter etc.,	3
2	Electrical Machineries: I. Different types of motors (AC &DC), their applications, operation and maintenance II. Different types of generators (AC &DC), their application, operation and maintenance III. Different types of transformers, cooling of transformers, transformer oil, protective devices in the transformer, the common causes of failures, operation & maintenance.	3
3	Electric Drives and Control: Starting and speed control of motors, different types of starters and their operation maintenance	2
4	Switchgear and protective devices: I. General Idea on Operation & Maintenance of different types of circuit breakers , CT/PT II. General idea on different types of relays such as over-current, earth fault relays, broken conductor/negative sequence/ unbalance/single phasing preventer, Differential protection etc., III. Various protective schemes with circuit diagram: for motors, generators, transformers, capacitor banks etc.,	3
6	Earthing system: Requirements, types of earthing, maintenance, chemical earthing and relevant provisions of IS - 3043.	2
7	Neutral system of power supply: I. Solid neutral earthing, restricted neutral earthing, isolated neutral earthing, advantages / disadvantages II. Provisions of the statutory Regulation for suitably designed restricted neutral system of power supply and the requirement of neutral fail safe relay	2
9	Operation and maintenance of substations and generating stations including maintenance of storage battery and related auxiliaries	3
10	Protection against voltage surges and lightning	1
11	Operation, maintenance of overhead lines and underground cables I. Safety measures in overhead lines II. Types of stays, its markings, grouting, stay insulator, binding etc., III. Types of guarding and clearances, earth / neutral wire, anti-climbing devices and their installation / erection. IV. Selection and fixing of control devices viz. Linked switches, fuses,	4

	isolators, and earthing switches, lightning arrestors etc., V. Cables and conductors, their classification, construction, insulation types, laying, mining type cables and the related standards, cable jointing techniques and junction boxes	
12	Electrical apparatus and machinery for mine installation (as applicable for a particular type of mine like Coal/Metal/Oil) I. Winders, man riding system, cranes II. Electrically operated HEMM, portable transportable machinery, dragline, bucket wheel excavator, SDL,LHD, Road header, shearer, continuous miner III. Salient features of Flameproof and intrinsically safe apparatus for use in hazardous atmosphere of mine (coal/Oil) and relevant provisions of the IS/IEC 60079 series of standards, operation and maintenance of the flameproof and intrinsically safe apparatus IV. LMD, Environment monitoring system V. Circuit diagram of Drill control panel, GEB, different types of circuit breakers, starters, Lighting & Signaling unit. VI. Safety requirements of belt conveyor system installed in the belowground coal mine, OCPs etc., VII. Safety requirements of Drilling Rig in oil mine VIII. Any other special type of Electrical machinery / apparatus used in mines (coal / oil / metal)	8
13	General safety: I. Procedure for obtaining permission to work for carrying out operations and maintenance of electrical equipment (Permit to work as per **IS:5216)**; II. Safety in electrical workshop III. Firefighting equipment, their type, use and periodical maintenance, indicators, and recorders etc., IV. First aid training, resuscitation of persons suffering from electric shock etc.,	4
14	Legislation/statutes as amended from time to time: Relevant regulations of Provisions of Central Electricity Authority(measures relating to safety and electric supply), Regulations 2010	4
15	On Job training/ Practical/Laboratory Training I. Erection and pre commissioning testing of transformers, motors, generators, switchgear II. Measurement of earth resistance, insulation resistance etc., III. Testing of CTs, relays etc., IV. First aid training V. Operation of different types of fire extinguishers	8
16	Written Examination to evaluate performance, feedback on training	1
Duration of the training course in hours		48