



सत्यमेव जयते



भारत सरकार/Government of India
श्रम एवं रोजगार मंत्रालय/Ministry of Labour & Employment
खान सुरक्षा महानिदेशालय/Directorate General of Mines Safety



DGMS (Tech) Circular No. 10 of 2020

Dhanbad, dated: 23/06/2020

To,
Owners/Agents/Managers of all mines

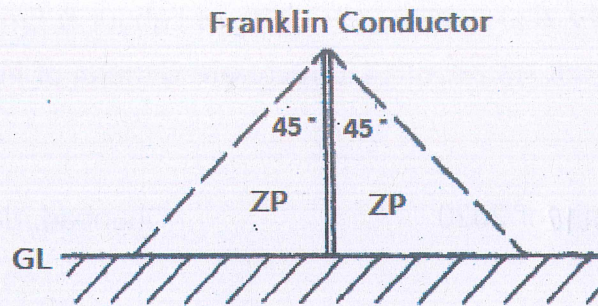
Subject: Protection against lightning in mines-Reg.

- 1.0 Of late, it is observed that there have been spurts in incidents related to lightning in the mines as a number of persons and installations got hit by the lightning in direct or indirect manner, endangering their safety in the process. Following measures are suggested herewith to be followed in mines as to prevent occurrence of incidents related to lightning:
- 2.0 In case of every mine, the Lightning risk assessment study shall be carried out with an emphasis to calculate Expected number of lightning flashes per square kilometre per year as elaborated in IS-2309 or IS/IEC-62305. It is instructed that the mine shall mandatorily be equipped with adequate lightning protection in the event of measure of **Exposure risk** i.e. **Expected number of lightning flashes per square kilometre per year** coming in excess of 10^{-5} (1 in 100,000).
- 3.0 Even if the calculation of **Exposure risk** is in moderation of 10^{-5} (1 in 100,000), the adequate lightning protection shall be provided in the following areas of mine in the interest of safety:
 - a) Where large numbers of people congregate;
 - b) Where the blasting operations are carried out.
 - c) Where the explosives are stored;
 - d) Where the overhead lines passing through the mine periphery;
 - e) Where the pumping installations are there which necessitate the continuous presence of an operator or maintenance crew at the site;
 - f) At the top of OB dump yard, which are more vulnerable and liable to attract lightning with likelihood of injuring the persons employed there.

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4.0 Depending upon the type of application, following lightning protection systems (LPS) shall be provided as a safeguard against lightning:

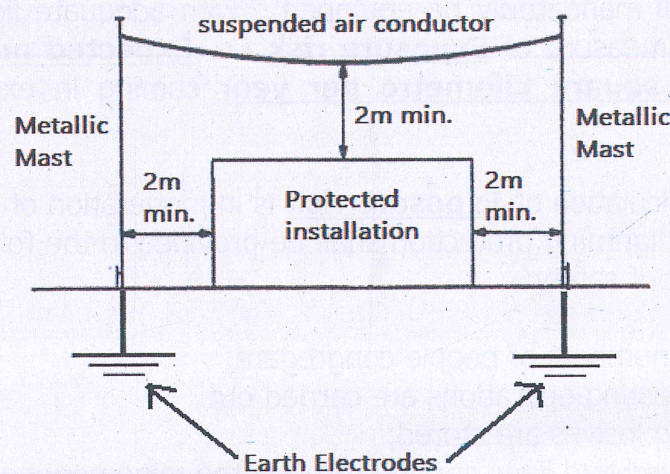
4.1 **Conventional air terminal (Franklin Rod/conductor):** This shall be provided in the manner that the site to be protected shall be within **45'** of Zone of Protection (i.e. ZP) in the manner as depicted below:



4.1.1 The ZP shall be further reduced to **30'** for important places, where dangers associated with lightning are more or which require fool-proof lightning protections.

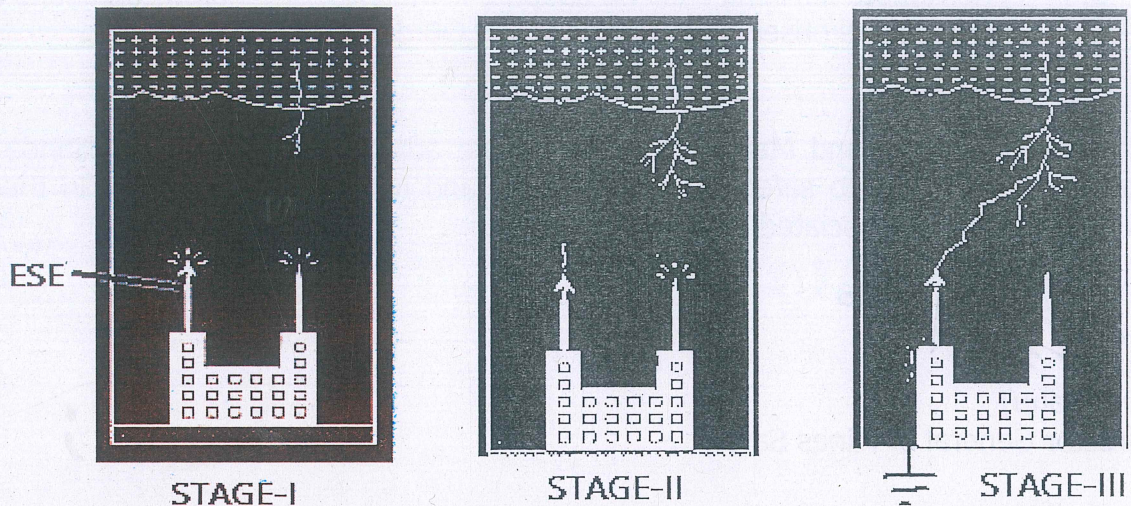
4.1.2 The Franklin or lightning conductor shall be so installed as to cover the places like blasting site, places of people congregation, etc in respective Zone of Protection (ZP).

4.2 **MESHED CONDUCTOR NETWORK or Faraday's Cage:** By providing Electrostatic shielding using metallic wires in criss-crossed manner and grounding the same minimum at two independent places in the manner as shown below. The installations to be protected include outdoor of a sub-station i.e. switchyard, explosive room, etc.



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- 4.3 **IONIZING AIR TERMINAL or EARLY STREAMER EMISSION (ESE):**
ESE system functions by generating an upward ladder through the respective air terminal as to meet the downward leader progressing downward from the cloud at a certain speed as to preferentially strike the lightning to the relevant point as demonstrated below:

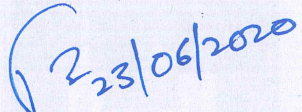


- 4.3.1 The design and specifications of ESE system to be installed shall be in accordance with the relevant Indian/international standard and should be tested in an NABL or internationally recognized laboratory as a prerequisite prior to its use.
- 4.4 The provisions as mentioned in IEC 62305-3 shall be followed with regard to protection of various installations of oil mines against lightning.
- 4.5 The records related to lightning survey and maintenance shall be properly maintained.
- 4.6 This circular is not exhaustive and provisions of relevant standards shall be followed depending upon the merit of the case.
- 5.0 All the remedial measures as elaborated above won't deliver the desired outcome if the lightning pulse so collected is not discharged safely to earth through efficient type of grounding system. Following points with regard to earthing systems being used in conjunction with LPS shall be followed scrupulously:
- 5.1 The earthing system used in conjunction with LPS shall be in accordance with IS-3043 and be designed in such a manner as to prevent the risks of conduction, Induction and Feedback while discharging the lightning strike to earth.

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- 5.2 The earthing system being used with lightning protection system (LPS) shall be independent from existing grounding system.
- 5.3 The magnitude of earth pit resistance (collective) shall be within 2Ω or as mentioned in relevant standards as to keep the hazards associated with step and touch potentials within safe limits.
- 5.4 The remote earthing shall be adopted if the local grounding conditions are not favorable as observed in locations like OB dump yard, quarry, etc.

All Owners, Agents and Managers of mines are advised to ensure compliance of the above guidelines as to safeguard the persons and machineries deployed in the mines from the hazards associated with lightning strike.


(D K Sahu)
Director General of Mines Safety