

ABCs of LIGHTNING SAFETY FOR EPCM OPERATIONS AT HIGH VALUE INDUSTRIAL PROJECTS

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1.0 Overview. Absolute lightning safety is impossible. Risk management principles must be applied even where danger probabilities are low since consequences are high. Lightning safety objectives include: a) safety for workforce personnel; b) minimizing work stoppages, and; c) continuity of electrical/electronic operations. Airports, Computer Centers, Explosives Storage, Processing Facilities, Observatories, Mining Sites, Petrochemical Operations ... the nature and scope of each construction project is unique. A detailed site inspection should evaluate risks and should provide acceptable solutions.

2.0 Workforce Personnel Safety. Under direct lightning attachments, no place is safe nor can it be made safe. Only degrees of safety are possible: Very Safe; Somewhat Safe; Unsafe. The generalized safety template consists of six components.

2.1 Lightning detection gives advance warning of approaching lightning. In turn this provide time to implement safety plans. Detection may be as simple as hearing thunder. It may require adopting sophisticated resources. What are available detection options? Their costs? Their pros and cons? What's best for your situation?

2.2 Notification from Central Control to the workforce provides various warning stages. What alert methods are most suitable? Email? Texting? Loudspeaker? 800 MHZ radio? Strobe Lights? Combinations? What alert radii are suitable?? How best to coordinate safety while reducing work stoppages?

2.3 Shelter. No place outside is safe. Are automobiles safe? Mobile machinery with ROPS canopies? Large permanent work camp buildings and dormitories? Tented cafeterias? Modified shipping containers? Are there on-site "safer" structures where all workers can shelter which are 3-4 minutes' walk from work activities?

2.4 Resume outdoor activities. How long to wait in shelter? Who determines this and what is the basis for decision?

2.5 Policy Statement at the Corporate Level and Procedural Statement customized for the site.

2.6 Education. Lightning safety is a part of the overall EPCM Safety Program. The topic ranks alongside No Drug Tolerance – No Harassment – No Alcohol – Company PPE Requirements – Etc. Lightning Safety information in company newsletters and posters on bulletin boards. Toolbox meetings conducted by supervisory staff. Inclusion into new employee indoctrination.

3.0 Minimizing Work Stoppages. Safety is the prevailing directive. Work stoppages are expensive. On a two dimensional plot where does safety intersect productivity? Is a Three Stage Alert system useful:

3.1 Yellow Alert – Lightning Threat is identified and is possible at XX miles/km.

3.2 Orange Alert – Lightning Threat is Imminent at YY miles/km. Be aware of hazard.

3.3 Red Alert – Proceed to Pre-Designated Safe Shelters at ZZ miles/km. No one allowed outside.

What about crane operations? Should indoor welding and use of electrical tools continue? Are workers on elevated scaffolds and exposed building interiors safe? How to control arrival and departure for start-of-shift and for the end-of-shift workforce? At what point does Employer to Employee safety responsibility start/stop? Who else in the industry is doing what for these issues?

4.0 Continuity of Electrical/Electronic Operations. A first step is to analyze and to identify activity priorities. Security. Communications. IT. The electrical Sub-Station and LV circuits. Various processes such as welding, pumping, lighting and other electrical operations dependent upon “clean” power. All the implemented employable defenses must be substantiated by codes and standards such as ANSI, NFPA, IEEE, IEC and others. Beware “smoke and mirrors” solutions offered by vendors. Focus on Bonding, Grounding and Surge Protection Devices (SPDs) as described by NEC 250/285, NFPA-780, IEC 62305 and others.

5.0 Conclusion. Seek advice from those with 20+ years’ global success at high value EPCM operations.

6.0 References.

6.1 IEEE 142 Grounding, IEEE NY NY

6.2 IEEE 1100, Powering and Grounding Electronic Equipment, IEEE NY NY

6.3 Lightning Protection for Engineers, NLSI, Louisville CO

6.4 API 2003, Protection Against Ignitions Arising out of Static, Lightning and Stray Currents, API NY NY