

## RADIATION RESISTANT CABLE – DEFINITIONS

Consumers in major areas of cable applications, such as coal mining, utility distribution and building wire, develop a cable language that is peculiar to their industry. About ten percent of the language consists of acronyms, equipment or accessory names or environment. Specifications or standards for these industries are difficult to interpret unless you have a working knowledge of their nomenclature. Cables for nuclear generating stations are a good example. A basic radiation environment vocabulary is required to intelligently evaluate, discuss, and recommend cables for this application. The following is a basic radiation vocabulary that will be useful in discussing radiation resistant cables.

Class 1E is the safety classification of the electric equipment and systems that are essential to emergency reactor shutdown, containment isolation, reactor core cooling and containment, and reactor heat removal, or otherwise are essential in preventing significant release of radioactive material to the environment.

Containment is that portion of the engineered safety features designed to act as the principal barrier, after the reactor system pressure boundary, to prevent the release, even under conditions of a reactor accident, of unacceptable quantities of radioactive material beyond a controlled zone.

Nuclear Reactor is an assembly designed for a sustained fission chain reaction. Reactors are named on the basis of the heat transfer medium or coolant used.

Coolant is the flowing fluid which removes heat from a heat-producing reactor. The heat transferred by the coolant is eventually converted into output power. Liquid sodium, light water, gas, and heavy water are examples of coolants. Reactors are defined by their coolant and its phase as follows:

1. BWR = Boiling Water Reactor
2. HTGR = High Temperature Gas Cooled Reactor
3. LMFBR = Liquid Metal Fast Breeder Reactor
4. PWR = Pressurized Water Reactor

Design Basis Events (DBE) are postulated abnormal events used in the design to establish the performance requirements of the structures, systems, and components.

Design Life is the time of interval for which equipment will be installed or operable.

LOCA (Loss of Coolant Accident) is an extreme situation with an environment consisting of temperature, pressure, chemicals, post-accident spray, radiation, etc.

Qualified Life is the period of time for which satisfactory performance can be demonstrated for a specific set of service conditions.

Cobalt-60 is the isotope most often used in solid radiation sources and is used by facilities performing radiation tests on cables.

Radiation is defined by:

- Dose: The amount of energy per unit mass of material deposited at each point of an irradiated sample by radiation.
- Dose Rate: The rate at which energy is delivered.
- Exposure Rate: The product of the intensity of the radiation field and time of exposure.
- Absorbed Dose: The actual amount of energy absorbed by the sample.
- Integrated Dose: Cumulative radiation dosage over a given period of time.

RAD (Radiation Absorbed Dose) is the unit of absorbed dose – it designates energy delivered by high energy radiation.

To get some feel for this very small quantity of energy, use the relationship:

$$1 \text{ rad} = \text{one watt}\cdot\text{second}/\text{kilogram}; \text{ where one watt}\cdot\text{second} = \text{one Joule} = 0.24 \text{ calories} = 0.000000278 \text{ kWh.}$$

Some representative values of radiation dose in rads:

Maximum permissible yearly dose for radiation workers . . . . .	5
To kill insects in grain . . . . .	50,000
To vulcanize rubber . . . . .	5,000,000

Components are the items from which a system is assembled (for example, resistors, capacitors, wire, connectors, transistors, tubes, switches, springs, etc.).

Auditable Data as a whole is technical information which is documented and organized so as to be readily understandable and traceable in order to verify independently all inferences or conclusions based on the data.