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1. Zonal Hazard Analysis

Summary:

Zonal Hazard Analysis is an analysis of the physical disposition of the system and its components in its installed or operating domain. It is used to examine Hazards and Safety concerns which result from where a system is located.

1.1. Zonal Hazard Analysis

1.1.1. Description and Purpose

1.1.1.1.

Zonal Hazard Analysis is an analysis of the physical disposition of the system and its components in its installed or operating domain. It is used to examine Hazards and Safety concerns which result from where a system is located. It thus complements many of the Safety Analysis approaches which examine only functions of systems, by considering functionally unrelated systems that are located close together.

1.1.1.2.

The technique is used to determine a number of factors such as:

- Determination of compliance with design rules e.g. correctly supported and mounted pipework, or cabling to reduce stress during operation.
- Identification of potential cascade failures due to system interaction.
- Identification of potential areas for system maintenance errors.
- Identification of potential areas for system malfunction due to the environment.

1.1.1.3.

Zonal Hazard Analysis is used to examine the complex interactions that can occur between systems and is specifically concerned with their relative physical positions. Zonal Hazard Analysis examines the layout of systems to determine whether the actual location of the equipment introduces a Hazard, for example, placement of an aerial on a ships mast, or an electrical junction box mounted below a water pipe.

1.1.1.4.

Zonal Hazard Analysis is also used to determine whether a fault at a particular location can affect the independence of the equipment; for example a hydraulic failure could affect a supposedly independent electrical system in the same vicinity or, alternatively, a steam leak could cause the area, in which isolation of the leak can be effected, to be inaccessible to the operator. The identification of this particular Hazard would lead to the recommendation to provide a remote isolation facility that is protected from the effects of the steam leak.

1.1.2. When It Might be Used

1.1.2.1.

Zonal Hazard Analysis should start as soon as physical layout is being considered within the design process. The analysis should be based on the latest issue of drawings, physical mockups or synthetic simulations, together with examination of the first representative system installation. The usefulness of a 3D-CAD tool from the very early conceptual phase should not be overlooked.

1.1.3. Advantages, Disadvantages, and Limitations to The Defence Sector or The Particular Domain

1.1.3.1.

Advantages

- The technique considers the installation of the equipment and examines the potential safety problems associated with that installation.
- The use of Zonal Hazard Analysis provides the potential to discover how various parts of a system might influence, or might be influenced by their surroundings. These surroundings could be either physical

(equipment / human etc.) or environmental (temperature / humidity / wild life (bird strike or pollution) / sea etc.).

- Maintenance and Procedural errors can be reviewed to establish any potential areas for concern, which could be missed if individual systems were only considered in isolation. The need to enter a hazardous area, for example to isolate the system electrically may be discovered when Zonal Hazard Analysis is conducted.

1.1.3.2.

Disadvantages

- Unless detailed installation drawings, CAD or mock-ups are available, the results of the analysis may be generated late in the design process, at a point where changes are likely to be expensive.

1.1.4. Sources of Additional Information

1.1.4.1.

A list of software programs (e.g., Computer tools and related techniques) includes but is not limited to:

- [Defence Standard 00-970 Volume 2 Issue 1: Design and Airworthiness Requirements for Service Aircraft - Rotorcraft](#) [1]
- [Defence Standard 00-970 Part 1, Section 5, Leaflet 2: Design and Airworthiness Requirements for Service Aircraft - Powerplant Fuel Systems - Recommendations and Definitions](#) [1]
- Safety, Reliability and Risk Management - An Integrated Approach (2nd Edition), ISBN 0-7506-4016-2

1.1.5. Additional Comments

1.1.5.1.

Zonal Hazard Analysis should address matters such as, but not limited to:

- The clearances from moving parts
- Thermal heating and cooling, vibration, ionizing and non-ionizing radiation
- The existence of sharp corners and edges
- The stresses on pipes and cables
- The difficulty of access to the system and its components, its installation and removal
- Electric shock
- The positioning of components within the system
- Any common cause events which affect the system
- The spatial relationship of the operators to the equipment.

1.1.5.2.

Zonal Hazard Analysis is particularly useful in identifying possible common cause Hazards i.e. where failure of a component, or part of a system, may cause associated hazards in the immediate area.

1.1.5.3.

The Zonal Hazard Analysis techniques are also used to assess the effects of the migration of Hazards into adjacent physical areas or compartments. They can be used to identify the routes by which the Hazards may spread and in so doing, solutions can be developed to control and mitigate the effects of the Hazard.

1.1.5.4.

Checklists can be utilized in the process to identify Hazards. They can also be used to check that designs comply with certain standards and codes of practice, or that protective measures are correctly employed. They are however, reliant on the knowledge and experience of those persons compiling the lists and, whilst they could provide significant safety benefits for systems and equipment, they depend heavily upon the ability of the analyst(s).

1.1.5.5.

Individuals, or teams, of people may utilize checklists to assist as part of the Zonal Hazard Analysis process, to identify Hazards at any stage of the design process.

1.1.5.6.

During a safety programme there may be individual System Hazard Analyses covering the discrete Hazard Analyses for the particular parts of a system. Where a number of systems are fitted to a platform, the integration of these systems should also be subject to a Zonal Hazard Analysis. A system may achieve a

relatively low risk classification when considered in isolation, but when installed on a platform or next to another system there may be potential external influences, which could introduce new Hazards or increase Risks.

1.1.5.7.

A simple example is a fuel tank. There may be discrete safety concerns associated with a fuel tank; however, these concerns would be escalated were it proposed to place the fuel tank directly beneath a flight deck.

1.2. Version Control

1.2.0.1.

Version 2.3 to 3.0 Uplift

Major uplift from the Acquisition System Guidance (ASG) to online version.

Source URL: <https://www.asems.mod.uk/toolkit/zonal-hazard-analysis>

Links

[1] <https://www.asems.mod.uk/ExtReferences>