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FIRE RISK ASSESSMENT AS THE KEY ELEMENT OF A BOW-TIE BASED FIRE SAFETY MANAGEMENT SYSTEM (FSMS) TO DESIGN FIRE SAFETY STRATEGY FOR RAILWAY STATIONS. CASE STUDIES IN ITALY.

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ABSTRACT

Railway stations are nowadays, among several other specific occupancies characterized by the presence of masses of people often in fast transit (as ports and airports), a clear example of infrastructures open to the public that are constantly subject to modifications.

Changes take place to install temporary stores, new stores or facilities (even schools, health care facilities and hotels), advanced security measures due to recent episodes, new utility systems, and networks. Besides this, railway stations occupants population is particularly heterogeneous and much more different from the population in different and more controlled occupancies (ports and airports), also because railway station is more than an infrastructure hub.

This modification process, in Italy, is even 'dangerous' because the majority of the biggest railway stations are located in heritage buildings that pose both physical and permitting related constraintsBack in 2011, a specific decree requested railway stations to obtain their fire certificate for the entire entity and not limiting the fire certificates to single occupancies.

Railway station can be recognized being a single unique special occupancy and raises the need for a fire safety general design strategy to overcome the limits of specific occupancies and to find a general approach able to consider all the additional and common areas that connect/server tracks and commercial retail stores.

Complexity becomes even worse considering that railway stations are on-always changing asset due to new commercial needs (growing number of passengers due to a specific competition among fares with air traffic especially at national level facilitated by the increase of high-speed trains connections) and the stop operation for any revamping activities (even fire and security implementation of new measures).

On the basis of this very impressive complexity and considering a several years renovation on period without any business interruption a fire safety management plan has been defined at central level for the main thirteen railway stations located in Italy.

This article deals with the new fire design strategy selected to increase the fire safety level of those assets. Fire safety plan started from the construction of a fire safety management system (FSMS) to deal both with the initial intervention phase and with the future use/ modification of the railway stations.

FSMS is composed by elements common to all the stations at a centralized level and customized elements specific to each single station. This plan enforces the use of a common approach, name assumptions, methods, tools with a shared dashboard with fire safety related KPI's (Key Performance Indicators) to track the fire safety level during time comparing different areas of the same station as well as different stations in a global benchmarking activity for the upper management. Dashboard serves as a decision tool to allocate resources also.

FSMS encompasses several aspects: culture of safety, global policy, organization and people, training, fire risk assessment, inspection/maintenance, emergency response, audit and feedback.

Key element point of the entire process is the fire risk assessment. This has been conducted with the Bow-Tie methodology to identify the top events to be considered for subsequent more in-depth assessment also recurring to the use of simulation methods (fire & evacuation) in a performance based environment to take into account all the specific aspects of the complexities. Bow-Tie will also be used to demonstrate/verify the impact of modifications (in organization, systems, assets, compartments), even with the support of an hazid method to verify temporary modifications impact on the overall fire safety level (closure of emergency exit due to temporary construction sites inside the station and impact on evacuation strategy) in order to meet the requirements of a specific management of change process.

The activity conducted showed a lot of benefits and demonstrated how to manage all the requirements coming from the application of several regulations in complex realities effectively. All the process has been supported by a cloud-based IT platform.

Application of the FSMS resulted also in the possibility to collect information's, data, documents, performance indicators results to support the fire certificate request to the authorities, to take better informed decisions, to real-time demonstrate to all the stakeholders the activities in place, the design intent with the intended results and the path to achieve those.