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An Innovational Safety Perspective For Reliability Assessment Of Fire Extinguisher Considering Multiplicity Events

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ABSTRACT: *Reliability evaluation of an engineering system or component or element is very important in order to forecast its availability or unavailability and other important directories related to the component or system as a whole. Reliability is the adjustable which tells about the availability or unavailability of the module under proper working conditions for a given period of time. A lot many researches has been reported for reliability analysis of distribution system. Monte Carlo simulated has been used to evaluate the modified reliability indices for radial and meshed distribution system. Strap bootstrapping technique was also used to obtain the reliability and its different parameters in literature. Customer based evaluation of the reliability was also carried out for the distribution system under study. Different optimization techniques such as particle swarm optimization, differential evolution, teaching learning-based optimization were also reported in literature for analysis of various reliability parameters. In view of above, in this project a study based on reliability analysis of fire extinguishers installed for safety purpose is evaluated and different variable are obtained. For evaluating the reliability of the fire extinguishers, a large number of events of different parameters have been taken into consideration and reliability indices were obtained. A fire extinguisher is very important to control in case of fire for safety purpose.*

Keywords: *Internet of Things technology, FDS, FFTA, AHP.*

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I. INTRODUCTION:

Buildings constitute majority of built infrastructure and play a pivotal role in socio-economic development of a country. Most of the buildings are designed to last for several decades and provide residential and functional operations to large number of inhabitants throughout their design life. This paper carried out full-scale fire-extinguishing experiments in the bus cabin. The parameters of temperature distribution, smoke concentration and fire-fighting time in the passenger cabin of the bus are analyzed, so as to verify the fire-fighting performance of the self-developed water-based fire extinguishing agent and the fixed fire-extinguishing system in the passenger cabin [1]. This paper combines application features of IOT technology according to fire-fighting business requirement to discuss the fire-fighting IOT systematic frame, plan society fire-fighting safety management IOT technology system, and propose priority development points of society fire-fighting safety management IOT technology, thereby providing reference for technology research and development of IOT technology in society fire-fighting safety management field [2]. this paper uses FDS software to carry out a fire and smoke spread computer numerical simulation and obtains available safe evacuation time; simultaneously, it obtains required safe evacuation time in this underground construction by using an empirical formula computation method. After a comparison of these two kinds of time, it puts forward 6 measures to control fire smoke, which can provide reference for the improvement of this construction's fire safety planning and design [3]. The fire supervision and administrative authorities so as to improve the fire safety management efficiency for these organizations and units, offer a scientific tool to the organizations to improve their fire safety management level, extend the functions of fire remote monitoring control system, and promote fire prevention and control capability of the whole community [4]. The results show that high pressure water mist system has good cooling and heat radiation blocking effect, and has good fire control and extinguishing effect for tunnel oil fire;the suitable additive can effectively improve the fire control and extinguishing effect of water mist extinguishing system used in road tunnel [5]. This paper adopts FDS to simulate fire development of an indoor pedestrian street in a most recently designed large-scale shopping mall in China. The influences of fire locations, smoke extractions, and fire-extinguishing systems on fire development were mainly studied [6]. The results indicated that the integral level of fire safety for the underground parking area was safety level and corresponding solutions, meliorative suggestion were presented to improve the fire safety management level [7]. The result shows that fire sources and fuels are the main causes of tunnel fires, and the failure of fire extinguishing equipments is in the second place. In order to reduce the risk of tunnel fire, the factors of tunnel

fire and their logical relationships should be analyzed comprehensively, the possibility of tunnel fire should be monitored dynamically, and fire protection strategies should be established, which is significant to the safe operation and sustainable development of transportation[8]. The sizes of the polygons in close proximity to metropolis significantly hinder fire fighting. Increasing the level of safety is possible, both with the use of constructive measures and the introduction of modern developments in the field of fire fighting. Evaluation of the effectiveness of the measures taken is possible through the use of computer modeling [9]. The system the fire safety practices is going to implement for the fire crackers industry. In that the root cause for the fire is to be analyzed and prevent from the fire before it is triggered. Through this hazardous fire accidents can be avoided and many lives can be saved [10].

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II. IMAPACT OF FIRE HAZARD

Commercial and Domestic Buildings contain several direct and indirect sources that contribute to fire hazard; and in the event of a fire there is significant risk to life, structure, property and environment from the initial development stages of fire itself.

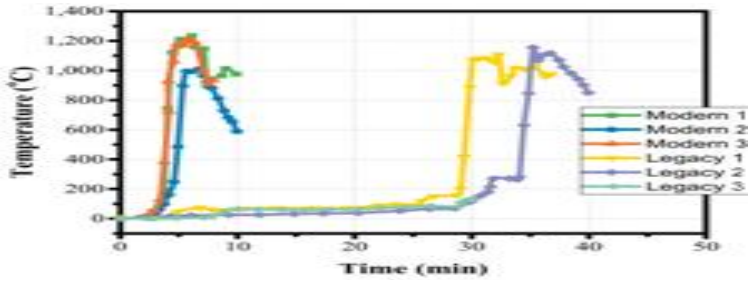
- **Sources of fire hazard:** Any actions, materials, or conditions that might increase the size or severity of a fire or that might cause a fire to start are called fire hazards. The hazard might be a fuel that is easy to ignite or a heat source like a defective appliance. Fire hazard constitute of all factors present in a building that can cause ignition, aggravate fire severity, incapacitate building fire safety provisions, and hinder escape or firefighting operations.
- **Impact on life safety:** Any interior building element designed to protect and evacuate the building population in emergencies, including fires and earthquakes, and less critical events, such as power failures. Apart from toxic smoke and burning, biggest risk to life safety during post-flashover phase is partial or complete collapse of structure which can inhibit firefighting operations and kill trapped inhabitants under collapsed debris.
- **Impact on structural safety**: Structural safety means the continued capability of load bearing members of a building or structure to transmit actual and design live and dead loads to a foundation or other load-bearing members within the allowable working stresses of the materials or assembly of materials involved.
- **Impact on environmental safety:** The guidance, policies, and practices enforced in order to ensure that the surrounding environment is free from hazards that will warrant the safety and well-being of workers and employees, residents near industrial operations, as well as the prevention of accidental environmental**.**

III. FIRE PROTECTION MEASURES

Most of the current fire protection measures are prescriptive and based on similar fire safety principles. The first line and foremost strategy to tackle fire hazards is prevention of fire occurrence. Because it is not always possible to prevent fire, impact of fire should be managed by either managing fire itself or by managing exposed persons and the property. The other effective method of controlling fire is through suppression using automated or manual fire protection provisions. In case of automatic fire suppression systems, it is essential that both fire detection equipment and fire suppression equipment work simultaneously. The automatic provisions for fire suppression include automated sprinklers, condensed aerosol fire suppression systems, and gaseous fire suppression systems.

- **Building codes and standards:** Building codes and standards provide guidelines for both design and assessment of fire resistance of structural members and assemblies. In case of building fire design, codes specify function of building elements under fire exposure, permissible limit of fuel load density, required fire ratings for building elements, recommendations on type of materials, minimum member dimensions to achieve required fire rating, and guidelines for evacuation.

➢ **Modern building fires:** Modern buildings are designed with open architecture glazing with transparent glass windows and false ceilings to facilitate larger open office spaces for comfort and aesthetics. These open spaces, false ceilings, and large openings do not provide required compartmentation for fire safety.

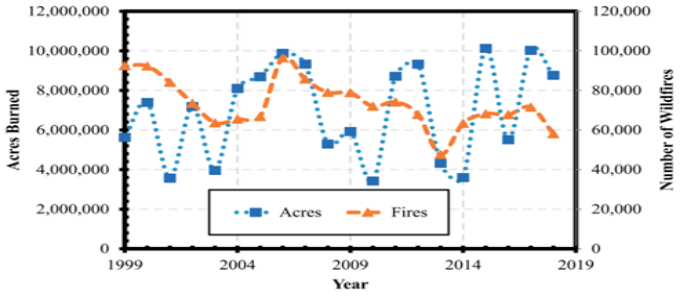


➢ **Improving fire protection features in buildings:** this risk-based classification should be integrated with building design using performance-based codes and standards to make building codes more effective in evaluating realistic fire performance of building. The provision of fire safety in each risk-based category should be justified on the account of classified risk, and special emphasis should be given to the use of cost-effective alternate strategies to attain desired level of fire performance.

➢ **Regulation and enforcement:** Regulation and enforcement are one of the leading problems in developing countries which is often overlooked by current fire safety strategies. There should be a legal provision of severe fines/penalties which can be implemented using an appropriate mechanism. Such provisions do not exist in several developing countries, and according to authors is one of the leading causes of fire hazard in developing countries.

➢ **Common and civic sense:** Common/civic sense and public awareness is one of the most neglected cause of fire hazard and is the leading cause of fires in both developing and developed countries across the globe. Common sense includes keeping ignition source and fuel source away from each other, keeping household items with high potential of ignition away from the reach of children, proper dispose of inflammables, use of fire extinguishers, or taking other necessary precautions to avoid accidental fires.

➢ **Fire hazard from wildfires:** With the continuously changing habitat for humans it is important to account for all new factors that can contribute to the fire hazard. Wildfires represent one such example which have resulted from recent excessive human encroachment in wild lands.



IV. CONCLUSION

Based on the information presented above, the following conclusions can be drawn: Fire represents a severe hazard in both developing and developed countries and poses significant threat to life, structure, property, and environmental safety. Current fire protection measures lead to an unquantified level of fire safety in buildings, provide minimal strategies to mitigate fire hazard, and do not account for contemporary fire hazard issues. Implementing key measures that include improving fire protection features in buildings, proper regulation and enforcement of building code provisions, enhancing public awareness, and proper use of technology and resources are key to mitigating fire hazard in buildings. Major research and training needs required to improve fire safety in buildings include developing cost-effective fire suppression systems, rational fire design approaches, characterizing new materials, developing performance-based codes, and understanding fire hazard from wildfires.

REFERENCES

[1]. C. Singh, "Markov cut-set approach for the reliability evaluation of transmission and distribution systems", IEEE Trans. on Power Apparatus and Systems, Vol. PAS-100, No. 6, 1981, pp. 2719-2725.

[2]. R. Billinton, "Composite system reliability evaluation", IEEE Trans. on Power Apparatus and Systems, Vol. PAS-88, No. 4, 1969,

pp. 276-281.
[3]. E. Wojczynski, R. Billinton, "Effects of distribution system reliability index distributions upon interruption cost/reliability worth estimates", IEEE Trans. on Power Apparatus and Systems, PAS-104, Vol. 11, 1985, pp. 3229-3235.
[4]. K. Verma, A. Srividya, H. M. R. Kumar, "A framework using uncertainties in the composite power system reliability evaluation", Electric Power Components and Systems, Vol.30, No. 7, 2002, pp. 679-691.
[5]. Z. Zheng, L. Cui, Alan G. Hawkes, "A study on a single-unit Markov repairable system with repair time omission", IEEE Trans. on Reliability, Vol. 55, No.2, 2006, pp. 182-188.
[6]. P. Jirutitijaroen, C. singh, "Comparison of simulation methods for power system reliability indexes and their distributions", IEEE Trans. on Power Systems, Vol.23, No.2, 2008, pp. 486-493.
[7]. O. Dzobe, C. T. Gaunt, R. Herman, "Investigating the use of probability distribution functions in reliability-worth analysis of electric power systems", Int. J. of Electrical Power and Energy Systems, Vol. 37, 2012, pp. 110-116.
[8]. S. Bae, J. O. Kim, "Reliability evaluation of customers in a microgrid", IEEE Trans. on Power Systems, Vol. 23, No. 3, 2008, pp. 1416-1422.
[9]. R. Billinton, P. Wang, "Reliability-network-equivalent approach to distribution-system-reliability evaluation", IEE Proc. generation, transmission and distribution, Vol. 145, No. 2, 1998, pp. 149-153.

BIOGRAPH

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