IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE)
e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 18, Issue 4 Ser. I (Jul. – Aug. 2021), PP 07-09
www.iosrjournals.org

Design of Fire Sprinkler System – A Review

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Abstract
System consisting with Sprinkler main pipes from pump room, piping network inside the floor area with properly designed pipe supports, Sprinkler control valve located outside the building and isolation valves. Sprinklers shall be standard response upright/pendant type, 68 deg. C temperature rating and shall design to cover 9 to 12 sq. m. At each floor sprinkler distribution header shall tapped off from sprinkler riser with isolation valves and flow switches on each distribution header and flow switch shall be connected to fire alarm panel to monitor in case of water flow in the event of fire.
A sprinkler system consists of a water supply and one or more sprinkler installations; each installation consists of a set of installation control valves and a pipe array fitted with sprinkler heads. The sprinkler heads are fitted at specified locations at the roof or ceiling, and where necessary between racks, below shelves, inside ovens or stoves or below obstructions.
A sprinkler has two functions to perform. It must first detect a fire, and must then provide an adequate distribution of water to control or extinguish it. The classic use of the sprinkler is in the hot gas layer which forms beneath the ceiling of an enclosure in which a fire is developing. The sprinklers operate at pre-determined temperatures to discharge water over the affected part of the area below, the flow of water through the alarm valve initiating a fire alarm. The operating temperature is generally selected to suit ambient temperature conditions. Only sprinklers in the vicinity of the fire, i.e., those which become sufficiently heated, operate. It should not be assumed that the provision of sprinkler system entirely obviates the need for other means of fighting fires and it is important to consider the fire precautions in the premises as a whole. Structural fire resistance, escape routes, fire alarm systems, particular hazards needing other fire protection methods, provision of hose reels and fire hydrants and portable fire extinguishers, safe working and good handling methods, management supervision and good housekeeping all needs to be in consideration. It is essential that sprinkler systems should be properly maintained to ensure operation when required.
Keywords *– Sprinkler System, Fire safety, Fire Prevention, Sprinklers, FAS*

Date of Submission: 28-06-2021 Date of Acceptance: 12-07-2021

I. Introduction

This project is intended to design and manufacture an automatic Fire Sprinklers, where the fire sprinkler can be inserted and tested. The test fire sprinkler is to be fitted with pipes and connections along with the tube bulb that could be exchangeable for many number of testing in which we can show it many times and change the bulb every time we test. The project is very important to the industries, as through understanding the characteristics of different types of the fire sprinklers so that we could be able to use every one in their specific location and task. This is also very important from the safety prospective as this will lead to a safe social environment to cover many areas such as operation plants, schools, hospitals gas stations and more. The project

will show more details about the specifications and dimension and radius of covering the area of the intended to put the fire off of it. Also to show the students how the fire sprinklers working mechanism occurs and how does it really work. Also to demonstrate the different kinds of the distribution flow of the nozzle that could give more efficient and effective result as they could be varied with the environment and the nature of the place or building. For example, school would have different type of fire sprinklers than the chemical industry and so the flow rate and the medium used to put the fire such as Foam, Water and weather it will be wet or dry.

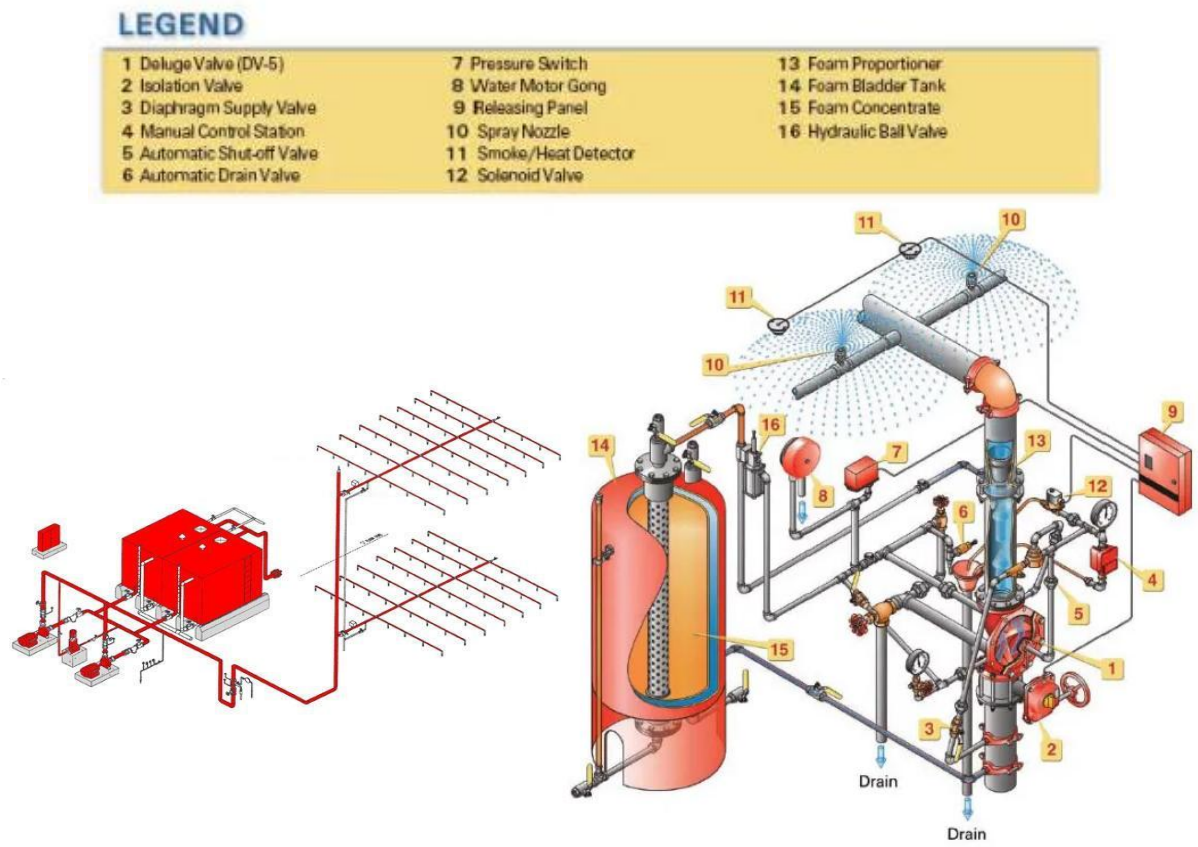

FIG. FIRE SPRINKLER SYSTEM

PROJECT BACKGROUND

The modern fire sprinkler system, as we know it today, had its start in 1812. Architect William Congreve installed the first one in the Theatre Royal, Drury Lane in London. It consisted of a series of pierced pipes, which led to a large container of water that was released in the event of a fire. In the 1870's, Philip Pratt invented the first automatic sprinkler system. The automatic fire sprinkler was then improved by Henry Parmalee and later perfected by Frederick Grinnell in the 1890's.

While originally used to protect commercial buildings, fire sprinkler systems are now found in almost every building. They have even started to be installed most recently in residential homes. Today, buildings in the India and All over the world are required by local code to have properly working fire sprinkler systems installed in them.

METHODOLOGY USED TO CARRY OUT STUDY

Specifically, when designing fire sprinkler systems, design document preparation should include, but not be limited to,

1. Selection of the type of system,
2. Selection of Separate electrical driven fire pumps sprinkler system and common jockey pump and Diesel engine driven pump used for hydrant and sprinkler system. However the diesel engine driven for both the system shall be common
3. The electrical pump shall shall have appropreate discharge & head. The minimum pressure required at the farthest and remotest sprinkler is 3.5bars and pump head is calculated accordingly.
4. Selection of pipe size and sprinkler pump as per requirement
5. Selection of system components,
6. Establishing the design area,

7. Determining the required design/flow requirements
8. Determining the available system water supply
9. a preliminary system layout,
10. Hydraulic calculations to verify adequacy of the proposed water supply and
11. Selecting water storage capacity as per requirement

Identifying interrelationships with other building fire protection systems.

II. Result

The goal of this experiment is to show the when sprinkler will break based on temperature on each type. Upon the experiment that we have done on the fire sprinkler on Wet Pipe System, the temperature break on 69^0C. As the red bulb standard will break at the temperature of 68 degree Celsius we have only one degree as the difference between the standard and the experimental in which could be considered as human error. Constructing the project without the help of pump was our first plan to check whether the system will run properly or not. Obviously, it have found to be running poor without the pump ; so in order to compensate the minor /major losses through the pipes we should add the pump to get the expected results in which the fire sprinklers will work accordingly and operate within the acceptable limit and afford the sufficient flow and velocity to extinguish the fire. Also after adding pump water spry radius of sprinkler was found 1.5 meters which is in line with standard. Pressure at pump outlet was 6.5 bars and at remote sprinkler it was 5 bars so there was loss of 1.5 bar pressure due to friction loss in pipe and pipe fittings.

III. Conclusion

In conclusion it is important to have a fire protection system in place as a part of a building's safety plan. Without a fire protection system, the lives of those who are inside the building are placed at a high risk in the event an emergency. The systems recommended for use like the fire alarm systems, sprinkler systems, fire pumps, and smoke control systems use some amount of actions to notify of the fire and smoke conditions, help slow the growth of the fire or to help put out the fire altogether. The plan that is recommended follows the guidelines provided by NFPA and if they are put into use in India will be a safe place to work and in case of a fire the building will include protections that will result in minimum loss.

IV. Recommendation

Building should be provided by fire fighting system, because the fire may happen once in a lifetime, but this time the outcome may be disastrous. No one knows when the fire will occure.

Give priority to the work of the fire-fighting when designing buildings. Many of the international standards for fire-fighting systems probably cannot be applied, which reduces the effectiveness of the control system because of the provision of architectural priorities.

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Khare G. N., et. al. "Design of Fire Sprinkler System – A Review." *IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE)*, 18(4), 2021, pp. 07-09.