

# What do we know about sprinkler reliability and can this knowledge be used for other water based extinguishing systems?

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## **Bio:**

His Bachelor thesis was on “Comparison of water mist and sprinkler” and based on his Master thesis, he wrote the book “Reliability Data on Fire Sprinkler System, Collection, Analysis, Presentation, and Validation” (Fedøy & Verma, 2019). He has been part and leader of committees on standards and guidelines and board member of Norway’s only association for all fire branch disciplines, BFO (Association for Fire Safety Norway), where he represents all who work with extinguishing systems in Norway.

## **Abstract**

*Background:* It have been a long-established truth, that sprinkler is very reliable, but there is great confusing what the numbers is for the reliability. There are large level differences between reliability studies. For example, a recent study in the United States (National Fire Protection Association Research, 2017) sets reliability level at 88%, while a study in Australia and New Zealand finds 99.5% (Maybee, 1988), and one in the UK says 93% (Optimal Economics, 2017). Other US studies suggest lower performance. For example, Factory Mutual (FM) says reliability is only 85% (Miller, 1973). These apparent contradictions need to be explained and was the reason for study that lead to the book.

*Objectives:* It is necessary to take a critical review of the relevant studies, based on the desire to seek out the reasons for the diversity in reported reliability levels and the lack of consensus on important concepts. Only when the reason for diversity is understood, then the results can be correctly used. Furthermore, there is also the need to confirm the scientific methods that have been used in finding the different reliability numbers. The validation will give valuable insights in methods used, how they differ and the possibility to improv methods.

*General description:* The study is unique in that it provides a critical review of the relevant literature. After the review, the next task was to find out if data on sprinkler reliability are reliable. Accordingly, investigation how data are collected, analyzed, and presented in selected studies, to determine if this was done using scientifically accepted methods. The critical review is therefore extended to a qualitative document analysis (Jacobsen, 2015) to examine the work of interest. Document analysis is primarily a tool of the social sciences.

While an overview is useful to find out what has been written in a particular area, document analysis is a systematic tool to learn more about the subject of interest. It can be used when:

- a) It is impossible to get primary data.
- b) A researcher wishes to learn how others have interpreted a situation, event, or data;  
or
- c) A researcher wishes to learn what has been done or said.

This book discusses the critical findings of the document analysis.

Finally, the book looks at developing methodologies and proposals for studies with general scientific value.

The reasons for this research are three-fold:

- 1) To increase knowledge of the reliability of fire sprinkler systems. Fires kill many people every year and cost a lot of money. Any improvement in knowledge and the application of this knowledge will create better fire countermeasures, and improved sprinkler systems would save lives and money.
- 2) To give a systematic tool for validating *any* study within the field for engineering. It came as surprise to us how little there was on the subject for the engineering disciplines.
- 3) To give a systematic account of how to collect, analyze, and present reliability data in a scientific way. To the best of the authors' knowledge, no standards, guidelines, or books on this subject are targeted to the engineering disciplines.

*Results:* All investigated studies had problems in four out of seven possible areas: 1. unclear issues, including missing definitions and intentions of the investigations; 2. uncertain data collection process; 3. varying quality of analysis and lack of quality assurance; 4. lack of systematic presentation and discussion.

Based on this finding, the only conclusion can be that none of the reports on sprinkler reliability can be taken into account for a general documentation on reliability. This finding must be incorporated in future studies on other water based extinguishing systems.

**KEYWORDS:** reliability, sprinkler, water based extinguishing systems, validation.

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