

Summary of publications related to fire and rescue service

RISE has participated in several different research projects related to rescue services, ranging from powder as the first interference method in the 80's to extinguishing with water mist today. The different research areas are:

1. Technology, tactics and methodology
2. Underground facilities
3. Vehicles and new energy carriers
4. Ventilation
5. Water mist
6. Powder
7. Foam
8. Environment
9. Other

1. Technology, tactics and methodology

Within this field, research is carried out which has not been the center of the extinguishing technique itself, but the different methods in its entirety. One of the latest projects that RISE has participated in was the SWEDISH CIVIL CONTINGENCIES AGENCY-financed "Storskadeproblematik". The project analyzed different major fires that have taken place in Sweden between the years of 1991 and 2013 by how the usages of new extinguishing techniques have been able to decrease the injuries. The report gives tips on how you tactically can think in different scenarios. In another project, "Förmåga och begränsningar av förekommande släcksystem", a study was being made that showed which available extinguishing methods that exist on today's market and portray their ability to be used on external extinguishing. The report describes actual events where different kinds of extinguishing methods are being used in a successful way and the focus is on external environment and working environment. In the back there is a chart that roughly describes the differences between the different extinguishing systems that are the most common in Sweden.

In 2017 at RISE laboratory in Norway, tests were carried out of gas cooling from the outside of the building as well as the extinguishing of construction fires. The report "Slokkemetoder med lite vann" shows that multiple of extinguishing techniques can be used from the outside of the building to lower the temperature in the fire room and eventually extinguish the fire completely. The cutting extinguisher was the most effective tool to use in extinguishing construction fires in cavities.

RISE has also conducted research within ergonomics for the operational emergency personnel. The research did map and analyzed possible replacement for some identified heavy tools, as well as propose various technical solutions or innovations that can increase the ability for more people to use the equipment on an efficient and ergonomic way to avoid damage. The most recent projects was about extinguishment strategies for tall timber building and a pre-study about efficient rescue operation.

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- Vylund, L., & Palmkvist, K. Taktik och metodik för släckning av höga trähus (Extinguishment strategies for tall timber buildings), RISE Rapport 2017:65.
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2. Underground facility

TUSC (Tunnel and Underground Safety Center) is RISE's research platform for underground constructions with a collected specialist competence within fire, risk and safety. For more information about the research within TUSC, go to their website. Under the years of 2012-2014 a project called "Taktik och Metodik i Undermarksanläggningar (TMU)" was performed where full scale extinguishing trials in underground environment were being held and the result is being presented in multiple reports as well as becoming a course at Swedish Civil Contingencies Agency.

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3. Vehicles and new energy carriers

Under the year of 2016 the latest research about the risks with new energy carriers in road tunnels and underground garages was compiled. Within TUSC (Tunnel and Underground Safety Center) research was conducted on gas cylinders and how they are affected of fires and during 2019, large scale trials was held. A pilot study made in 2016 showed that it was not uncommon for people to perish due fires that occurs after a collision. RISE Fire Research AS in Norway made full scale fire trials of electric cars which showed that the batteries in the car can ignite if they are being exposed to powerful collisions. Find out more at RISE expertise pages "Vehicle Fire Safety" or "TUSC".

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4. Ventilation

Under the years 1997-2002 multiple research projects about pressure ventilation were being held together with Södra Älvsborgs Räddningsförbund (SÄRF). The working method that developed gives a good and positive experience from real occurrences. In the report "Storskadeproblematiken" there is an annex that sums up the research that have carried out on ventilations.

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5. Water Mist

RISE has since the beginning of the 21st century studied about water mist and its ability to extinguish fires, both as fixed installed extinguishing system and as an

operative tool by emergency services. "Släcksystem med vattendimma - en förnyad kunskapssammanställning" compiles the recent years technology development within fixed extinguishing systems. In the report "Storskadeproblematiken" there is an annex that sums up the research that have carried out on cutting extinguishers.

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6. Powder

In the 80's multiple projects were being held related to the extinguishing of fires with the help of powder. Amongst other things, attempts were made with powder as first-hand operation in room fires. The result showed that powder is effective on the grounds of lowering the fire gas temperatures and a good tool to have on smaller units. In another project, the extinguishing mechanisms of powder were being studied and there it was shown that the quenching effect of powder appears entirely or largely due to cooling. The effectivity increased with decreased particle size just like for the water mist. In the year of 1999 a trial was being held with different kind of fire extinguishers in home environment and the result of this project led to today's recommendation that every household should have a 6 kilogram ABC powder extinguisher with minimum efficiency class of 43A 233B C.

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7. Foam

Within the competence platform "Fuel Storage Safety" there is a large experience around fire extinguishing with the help of foam. On that site there is links to the project ETANKFIRE that is a research project about how you extinguish ethanol fires. In 2005 all the current experiences and knowledge about A-foam and CAFS was being compiled. Also, find more information within the new project "TEST BED PHAS".

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8. Environment

In 2005 and 2008 multiple trials were being held where emissions from fires were being measured. During 2017 a course was conducted together with Southern Älvsborgs Rescue Service about extinguishing water management. RISE together with Lund University and Brandskyddslaget have developed The Fire Impact tool for training responders about the environmental impacts resulting from their actions. A process was also developed by which the environmental advantages and disadvantages of fire protection systems can be analysed.

<https://www.brandskyddsforeningen.se/forskning/forskningsprojekt/projekt-fran-2016/fire-impact-environment/>

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9. Other

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Med vänlig hälsning

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