



**IWMA**  
International Water Mist Association

**20<sup>th</sup> International Water Mist Conference (IWMC)**

**in Warsaw on 27<sup>th</sup> and 28<sup>th</sup> October 2021**

Case Study:

# **Bus garage water mist protection Project at the Sondrio Provincial Transport Company**

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Responsabile STPS Gestione Qualità – Sicurezza – Ambiente.

# FIRE SAFETY & BUSESSES





# Where we are?

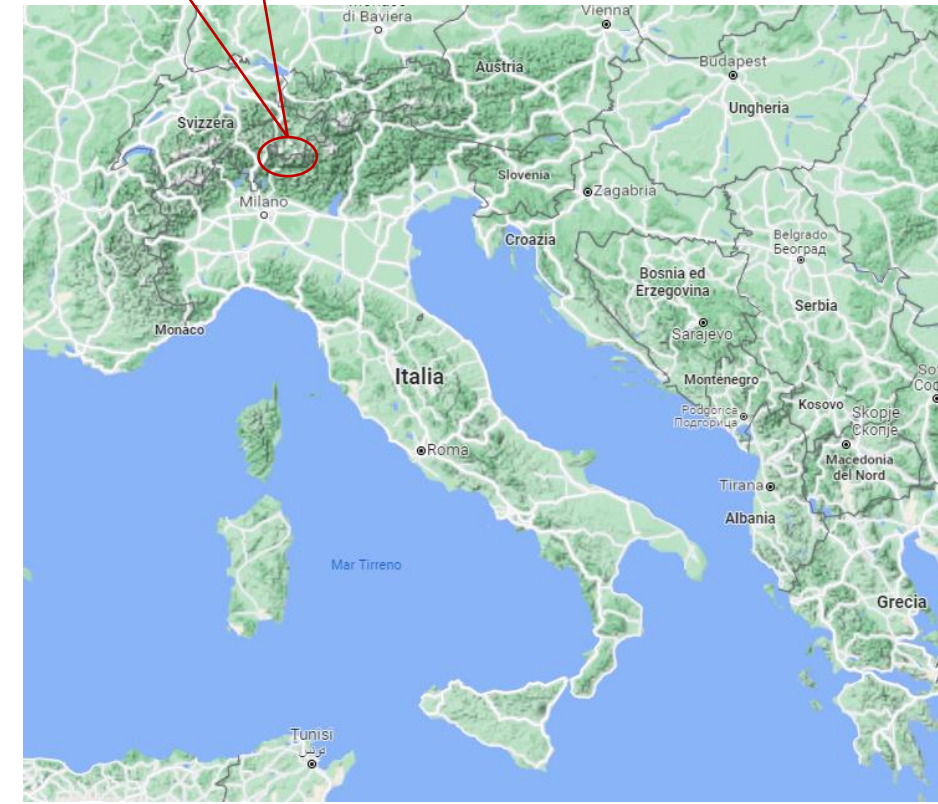
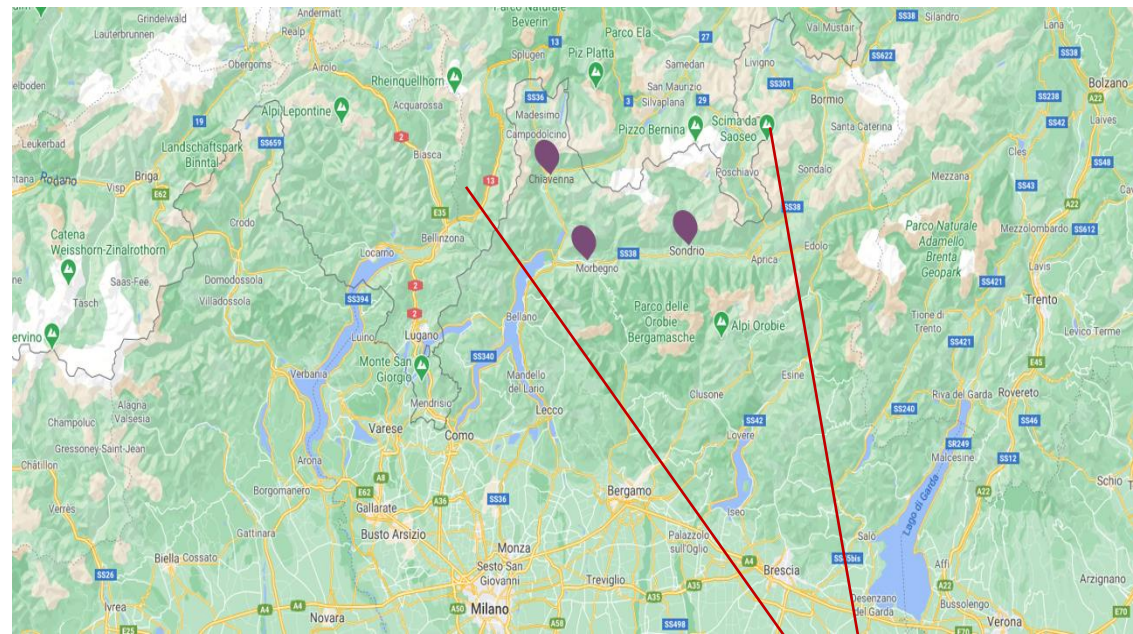
The headquarters of the company is located in Sondrio, in a property owned, also prepared for the storage of buses.

Located throughout the territory, the STPS has other properties, functional for an optimal management of services and the rolling stock:

The bus depot with attached workshop and offices in Morbegno, in the square in front of the railway station;

The bus depot with office in Chiavenna, in the bus departure area;

The garages of Madesimo, Tartano, Buglio in Monte, Mello, Caspoggio, Lanzada, Aprica and Tirano.



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# Core Business

STPS own more than 75 busses for public transportation and move more than 2 million people per year in the Valtellina Area.

STPS own also 20 touring buses and move tourists around Italy and Europe.



# REAL DANGER

Cases of fires on public transport are increasingly being reported on the news. The phenomenon is on the rise.

## Why do buses catch fire?

According to recent research, the main causes of a bus fire can be traced back to two areas:

- the progressive aging of the fleet
- and the increase in the percentage of buses approved according to increasingly stringent European anti-pollution standards, which have higher operating temperature.





# REAL DANGER

Cases of ... report are ... reported on the ... phenomenon is on the rise.

**18 July 2021 one of our busses catches fire**

## Why do buses catch fire?

According to recent ... causes of ... the main causes of ... can be traced back

**Bought in August 2018 (4 years old) - Average of STPS fleet 6,5 years**

- the progressive aging of the fleet
- and the increase in the percentage of buses approved according to increasingly stringent European anti-pollution standards, which have higher operating temperature.



# Engine space



Meeting the increasingly stringent emissions limits has led Bus and Coach manufacturers to develop innovative technologies and this has significantly increased on-board equipment.

Euro 5 and Euro 6 vehicles require complex engineering to meet the environmental performance regulations.

The engine and technical compartments on these vehicles leave little space available, and when active, produce increased temperatures, especially in the engine compartment in the rear area of the bus.



# BUS STORAGES

Public Transport Fleet Operators such as STPS, often operate in buildings where offices and headquarters are situated alongside or above the vehicle storage and maintenance depots, often close to busy passenger departure points.

STPS quickly recognized that the fire risk and safety of personnel and passengers in their head office and other depots was becoming a matter of priority.



# Key points

- No fixed fire systems installed
- No fire detector in the bus storage
- External fire brigades - not far (less than 5 minutes) but in case of large fire high risk to themselves
- Massive volumes of water to extinguish the fire = serious water damage
- Downtime (Public transportation is an essential service for the population)
- loss of revenues, restoration costs

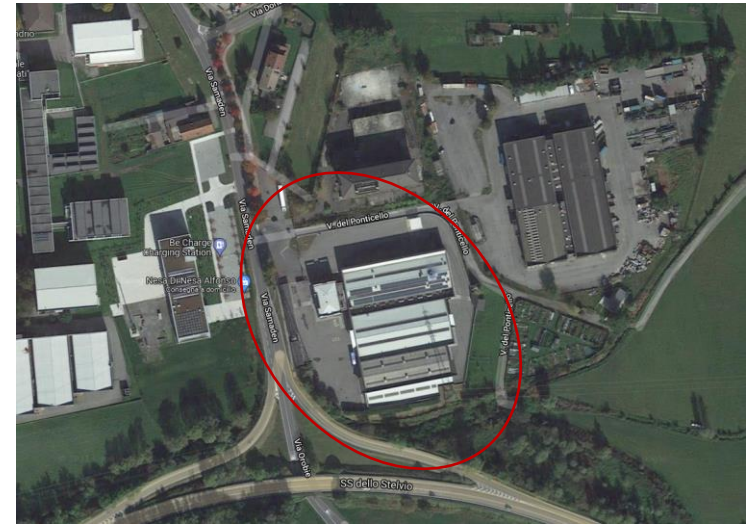
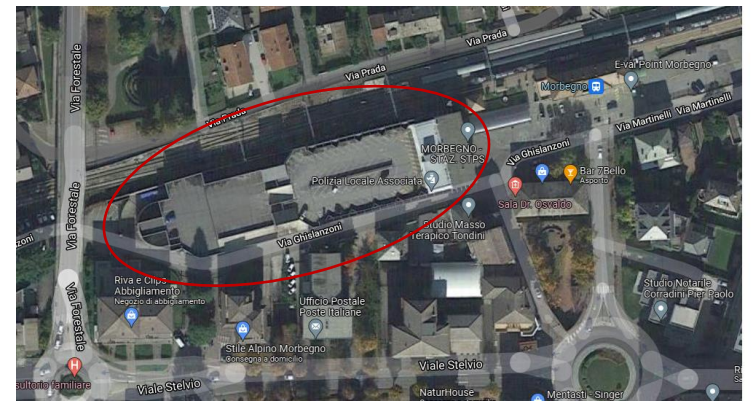




# INCREASING FIRE SAFETY

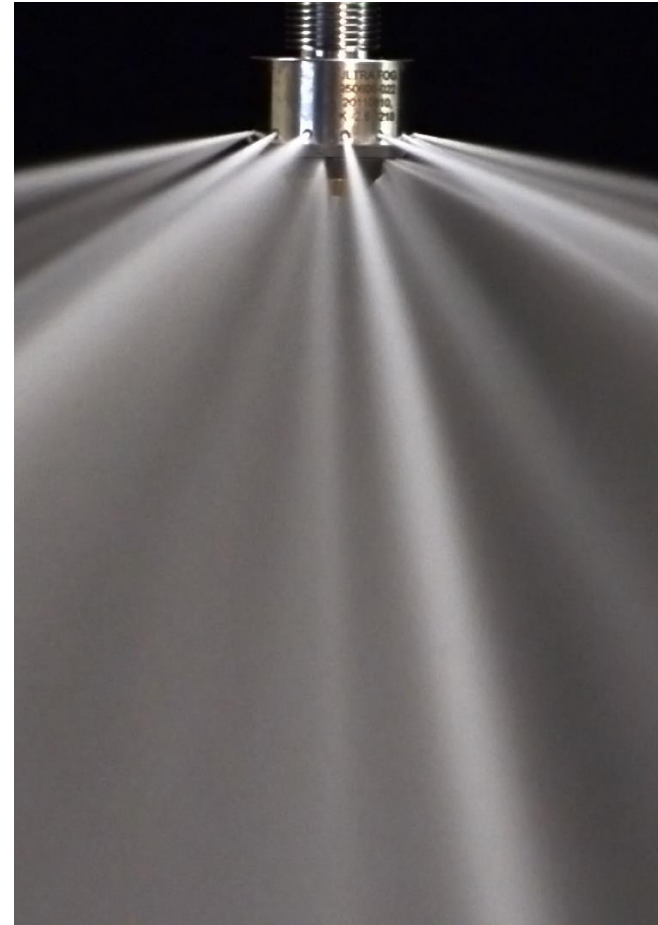
In 2019, STPS decided to launch a major fire safety investment project, and water mist was selected as the preference extinguishing solution for start fire protection in the three largest sites:

- 2019 Morbegno site
- 2020 Sondrio site (Headquarter)
- 2021 Chiavenna site



# Why is WATERMIST a good choice?

- An automatic fixed fire suppression system acts as a first responder to fire, even when the building is unattended
- It is designed to suppress fire, but above all it will control and limit the fire growth, allowing time for external responders to arrive at the scene

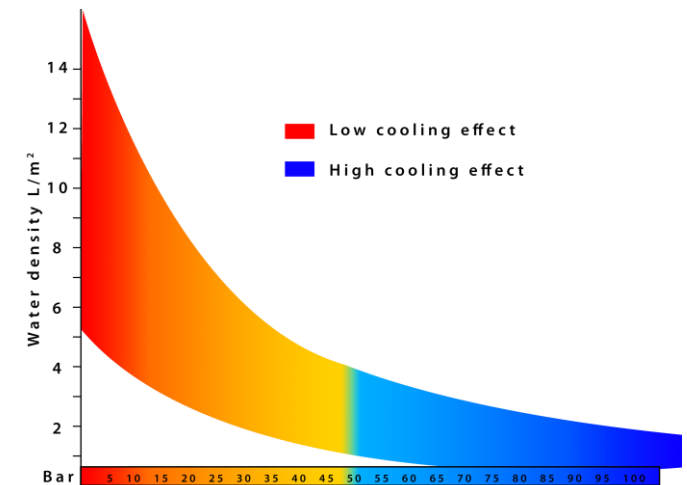
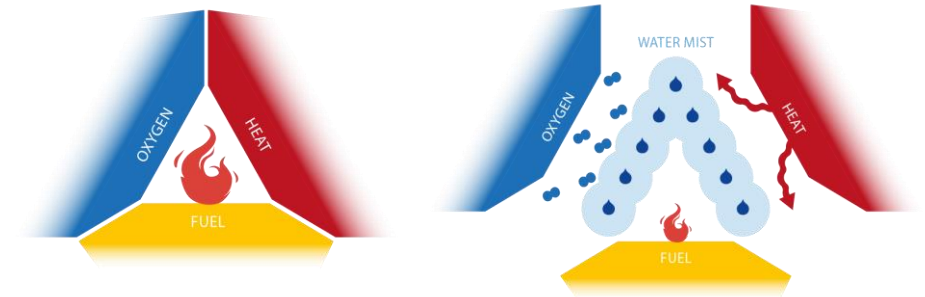




# The effect of water mist

The very small water droplets allow the water mist to control, suppress or extinguish fires.

- Water absorbs a large amount of heat - The energy is rapidly extracted from the fire by the enormous surface that is formed by the huge number of very small droplets.
- Smaller water drops = increased surface area and increased ability to absorb heat and cool surroundings. When the water droplets evaporate, they expand in the air further depriving the fire of oxygen, effectively creating a double extinguishing attack on the fire.
- Pressure increases the ability of the water to penetrate the fire plume
- Less water = facilitates evacuation and reduces down time



# The advantages of Ultra Fog water mist

- Less complex logistics for refill (handling and pressure filling [not 300 bar] system requirements).
- Safe for people – no risk given by accidental release and no need for delays in activation
- System weight and space reduction. Lower installation and maintenance costs.
- Prevents re-ignition by cooling the environment below flashpoint
- Water Mist acts like an Inert gases extinguish fire by reducing the level of oxygen in a given space, leading to a limited margin of safety.
- Protected area does not need to be vented due to over pressure or walls made non-permeable.
- Potable water, and only water.
- Reduced thermal shock.
- Pump-station in one piece (plug & play) with automatic change over between FW and SW – vastly smaller footprint.
- Solution: Wet, pre action and dry pipe glass bulb nozzle.
- Full scale tests can be conducted.



# The Ultra Fog water mist benefit



Safe for people and environment (only water is used)



High Cooling Effect



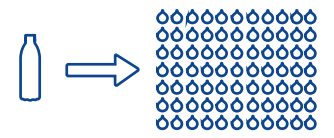
Shield against thermal radiation



Large expansion during vaporisation, reduces amount of oxygen close to the fire



80-90% less water than traditional sprinkler system = less damage



1 litre of water turns into 1700 litres of vapour!



# Technology

- Automatic nozzle water mist system activation based on an individual automatic nozzle that operates when its thermal reale element is heated to its thermal rating (57°C), allowing water mist to discharge over fires area.
- Wet pipe system protected Morbegno site
- Pre-action systems for Sondrio e Chiavenna sites.





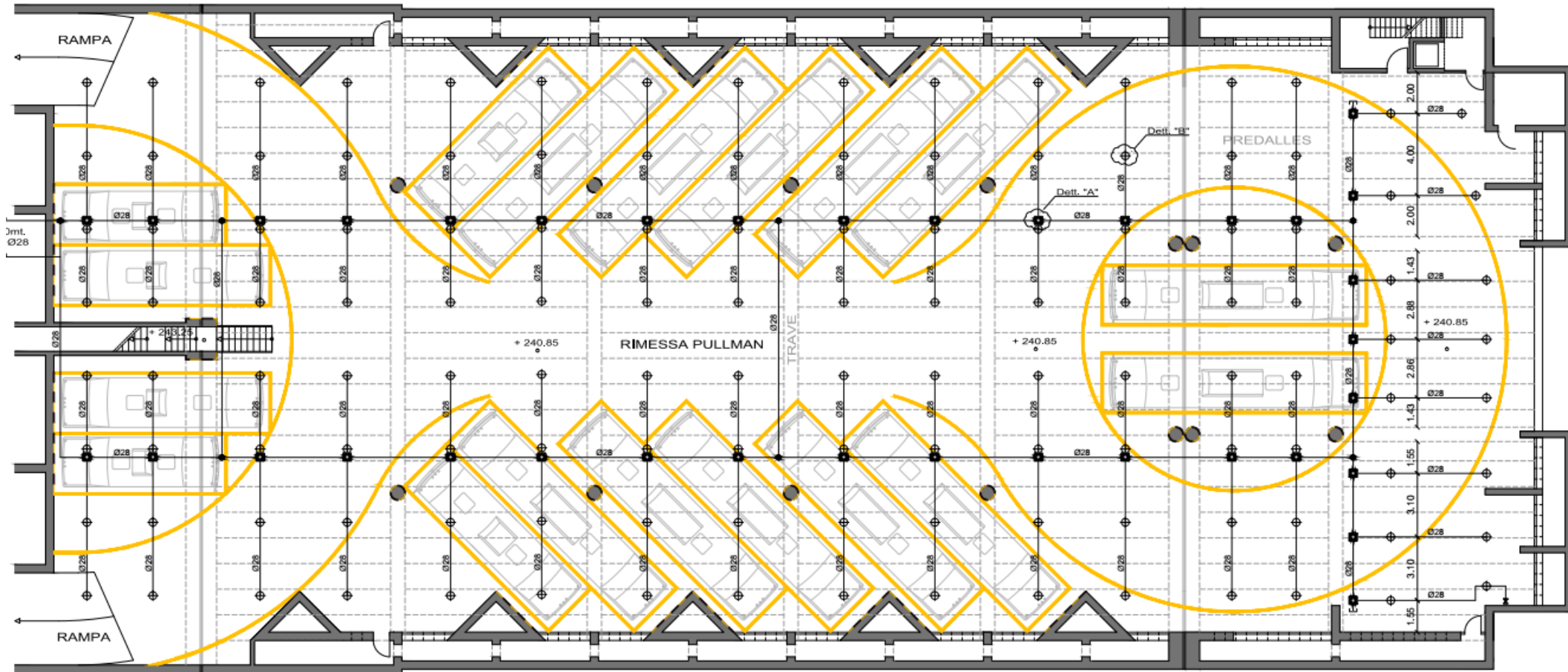
# Data projects

- Height sites: up to 5 meters.
- Water mist code NFPA 750 – EN 14972-1.
  
- Design authority: EN UNI 12845 (local code)
- Hazard classification: OH-2
- Demanding area: 144 m<sup>2</sup>
- Operating sprinkler heads: Nr. 9 in Morbegno and Sondrio sites  
Nr. 10 in Chiavenna site.
  
- Section valve 1 in Morbegno site;  
3 In Sondrio site;  
2 in Chiavenna site.
  
- Design water supply: 420 l/min.
- Pressure design: 100 bar
- Pump type: Ultra Fog Master Pump Unit 4 (up to 450 l/min@100bar)
  
- Approval: DNV Type Approval Certificate N° F-20364 “Fixed water-based firefighting system for ro-ro spaces and special category spaces equivalent to that referred to in resolution A.123 (V)

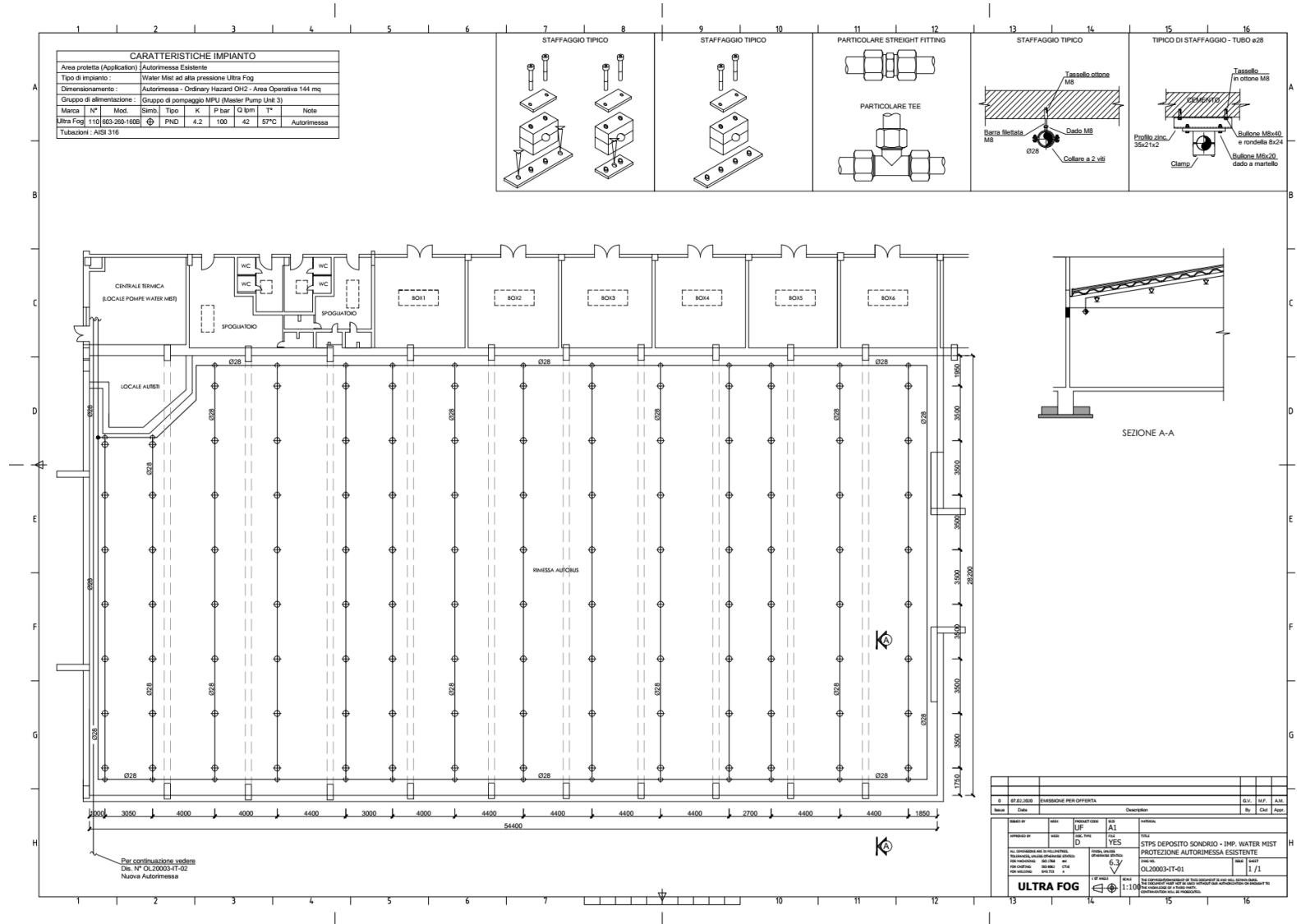




# MORBEGNO SITE 2019



# Sondrio site (headquarter) main garage 2020









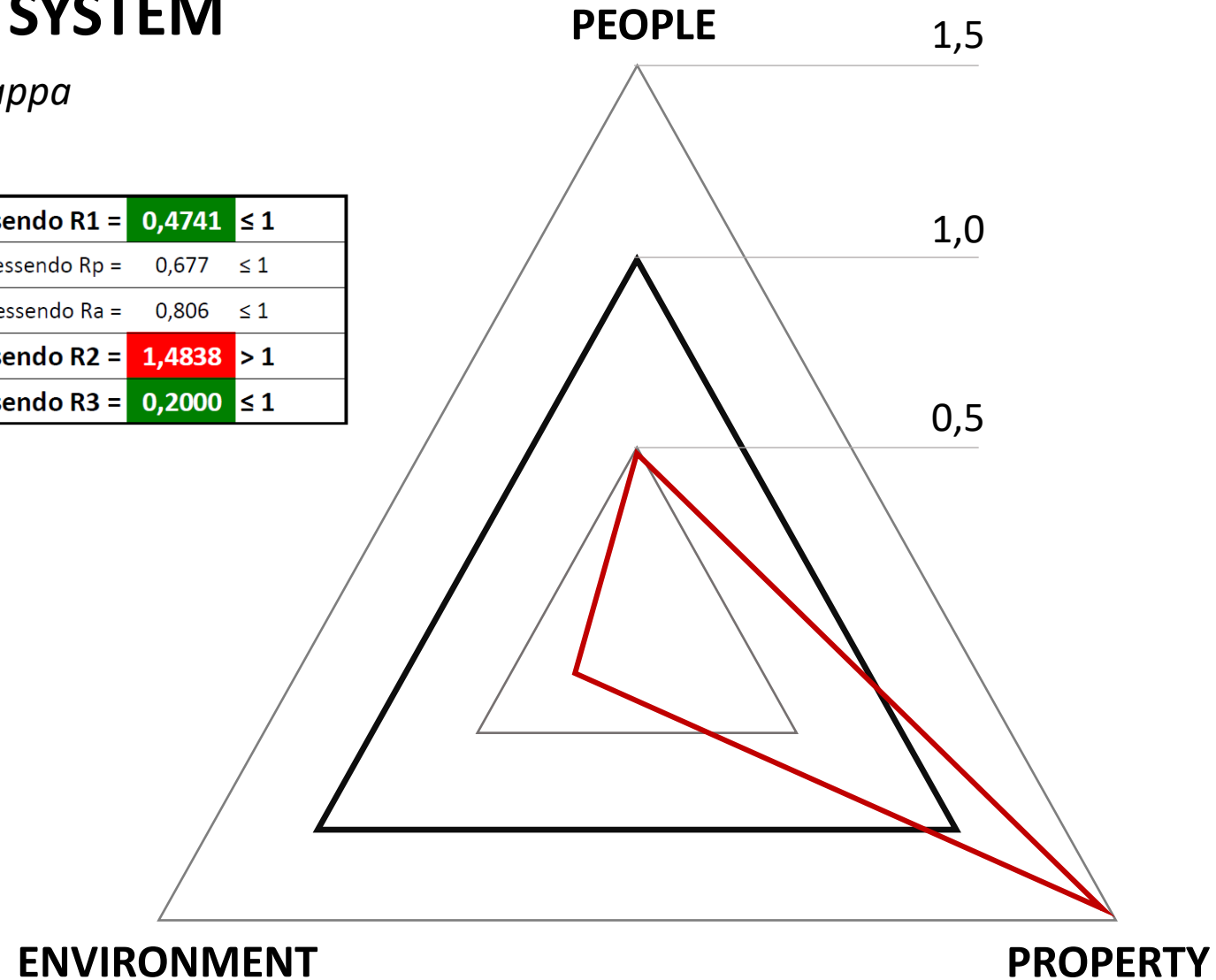
# RISK ASSESSMENT

## SONDRIO WITHOUT WATERMIST SYSTEM

FRAME Rev.05/20 - © Studio Tecnico Ass.to Cinalli-Zappa

"Fire Risk Assessment Method for Engineering"

<b>R1</b>	<b>La Protezione degli OCCUPANTI risulta ADEGUATA essendo R1 = 0,4741 ≤ 1</b>
Rp	La Protezione dei Prodotti risulta ADEGUATA essendo Rp = 0,677 ≤ 1
Ra	La Protezione dell'Attività risulta ADEGUATA essendo Ra = 0,806 ≤ 1
<b>R2</b>	<b>La Protezione dei BENI risulta NON ADEGUATA essendo R2 = 1,4838 &gt; 1</b>
<b>R3</b>	<b>La Protezione dell'AMBIENTE risulta ADEGUATA essendo R3 = 0,2000 ≤ 1</b>



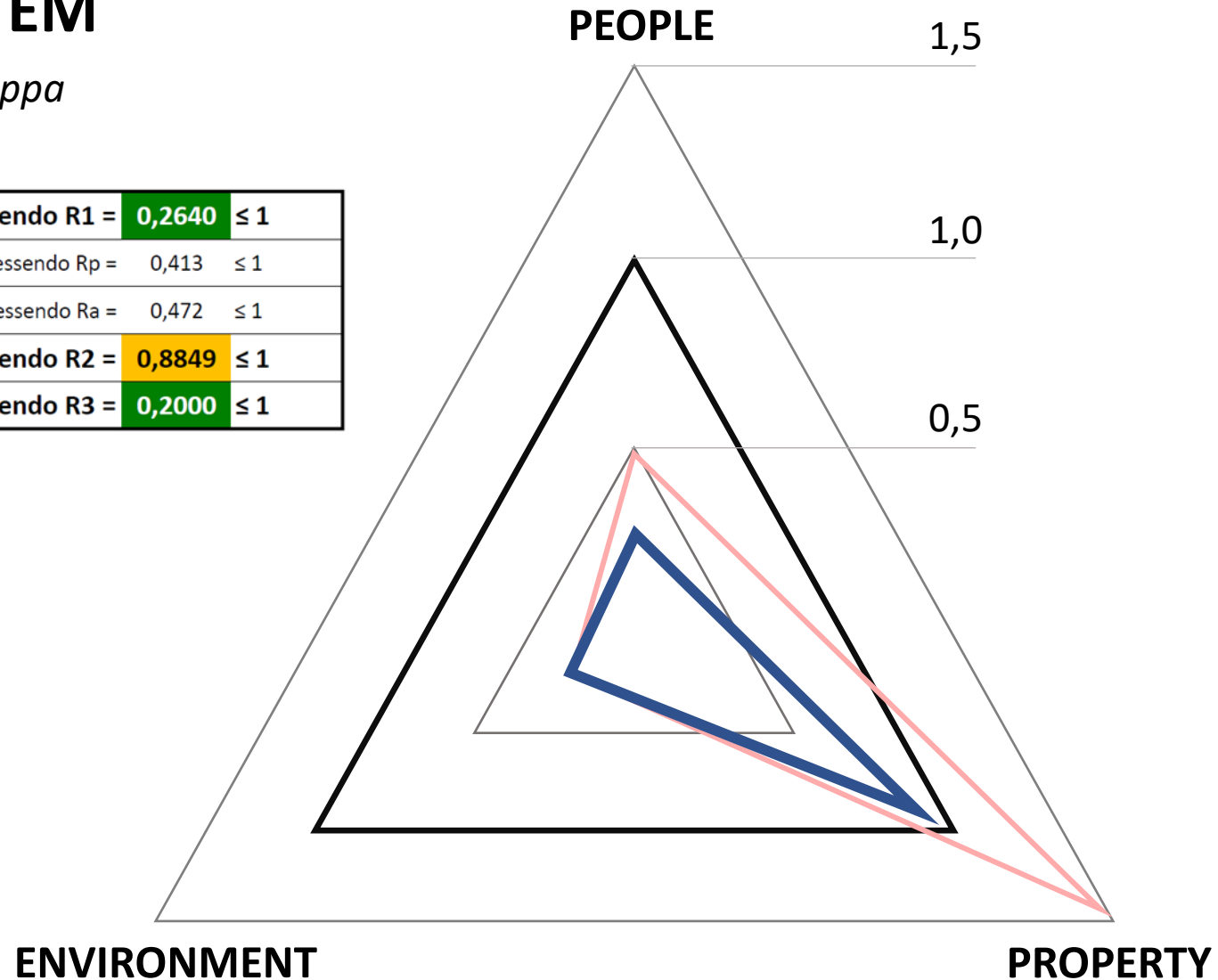
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## SONDRIO WITH WATERMIST SYSTEM

FRAME Rev.05/20 - © Studio Tecnico Ass.to Cinalli-Zappa

"Fire Risk Assessment Method for Engineering"

<b>R1</b>	<b>La Protezione degli OCCUPANTI risulta ADEGUATA essendo R1 = 0,2640 ≤ 1</b>
Rp	La Protezione dei Prodotti risulta ADEGUATA essendo Rp = 0,413 ≤ 1
Ra	La Protezione dell'Attività risulta ADEGUATA essendo Ra = 0,472 ≤ 1
<b>R2</b>	<b>La Protezione dei BENI risulta ADEGUATA essendo R2 = 0,8849 ≤ 1</b>
<b>R3</b>	<b>La Protezione dell'AMBIENTE risulta ADEGUATA essendo R3 = 0,2000 ≤ 1</b>





# 18 July 2021 An STPS catches fire..



The event was  
filmed...





# Water mist system in a bus



- STPS has therefore started a project to protect its buses when they are in service.
- They provide for the protection of the engine compartment, the catalyst area and the brake circuits





Thank you for your attention

