



# Safe planning, installation and operation of urban Ropeways

Dr.-Ing. Georg Schober,  
TÜV SÜD Department of Transportation

# Knowledge.Base. TÜV SÜD certification & inspection body for ropeways

|      |                                      |     |                                         |         |                              |
|------|--------------------------------------|-----|-----------------------------------------|---------|------------------------------|
| 1    | one-stop technical solution provider | 60+ | years of experience                     | 1000+   | ropeway certificates issued  |
| 6    | Ropeway offices worldwide            | 30+ | engineers are dedicated Ropeway experts | 12,000+ | km of wire ropes inspected   |
| 100% | of the top manufacturer are clients  |     |                                         | 300+    | ropeway inspections per year |



Chairlift accident in Bavaria

First appointed inspection body for ropeways by the ministry of transport, Bavaria

TÜV SÜD developed a mathematical model for track rope-brakes

Expansion of Ropeway services in Asia Pacific and Austria

TÜV SÜD became international ropeway certification body

Approval of first urban ropeways in La Paz and London

TÜV SÜD certified first automated ropeway operation system

# How to design a safe ropeway?

# EU-Regulation 2016/424. Safety Report

## Article 8

### Safety analysis and safety report for planned cableway installations

1. The **person responsible for the cableway installation**, determined by a Member State in accordance with national law, shall carry out a **safety analysis** of the **planned cableway installation** or have such a safety analysis carried out.
2. The safety analysis required **for each cableway installation** shall:
  - (a) take into account **all modes of operation** envisaged;
  - (b) follow a recognised or established method;
  - (c) take into account the current state of the art and the **complexity of the cableway installation** in question;
  - (d) ensure that the **design** and **configuration** of the cableway installation **takes account** of the **local surroundings** and **adverse situations** in order to **ensure satisfactory safety conditions**;
  - (e) cover **all safety aspects** of the cableway installation and its **external factors** in the context of the design, construction and operation.
3. The safety analysis shall also cover **the safety devices** and their **effects on the cableway** installation and related subsystems that ensure that the safety devices:
  - (a) are designed to an initial breakdown or failure detected so as to remain either in a state that guarantees safety, in a state that allows the cableway to remain in a fail-safe state;
  - (b) are monitored; or
  - (c) the probability of their failure can be evaluated and their effects are of a standard equivalent to that achieved by the safety devices that meet the criteria set out in points (a) and (b).
4. The safety analysis shall be used to draw up the inventory of risks and dangerous situations, to recommend the measures to be taken to deal with such risks and to determine the list of subsystems and safety components to be incorporated into the cableway installation.
5. **The result of the safety analysis** shall be included in a **safety report**. Article 9

Reviewed  
by a 3rd  
Party!

Follow up  
mature EU  
standards

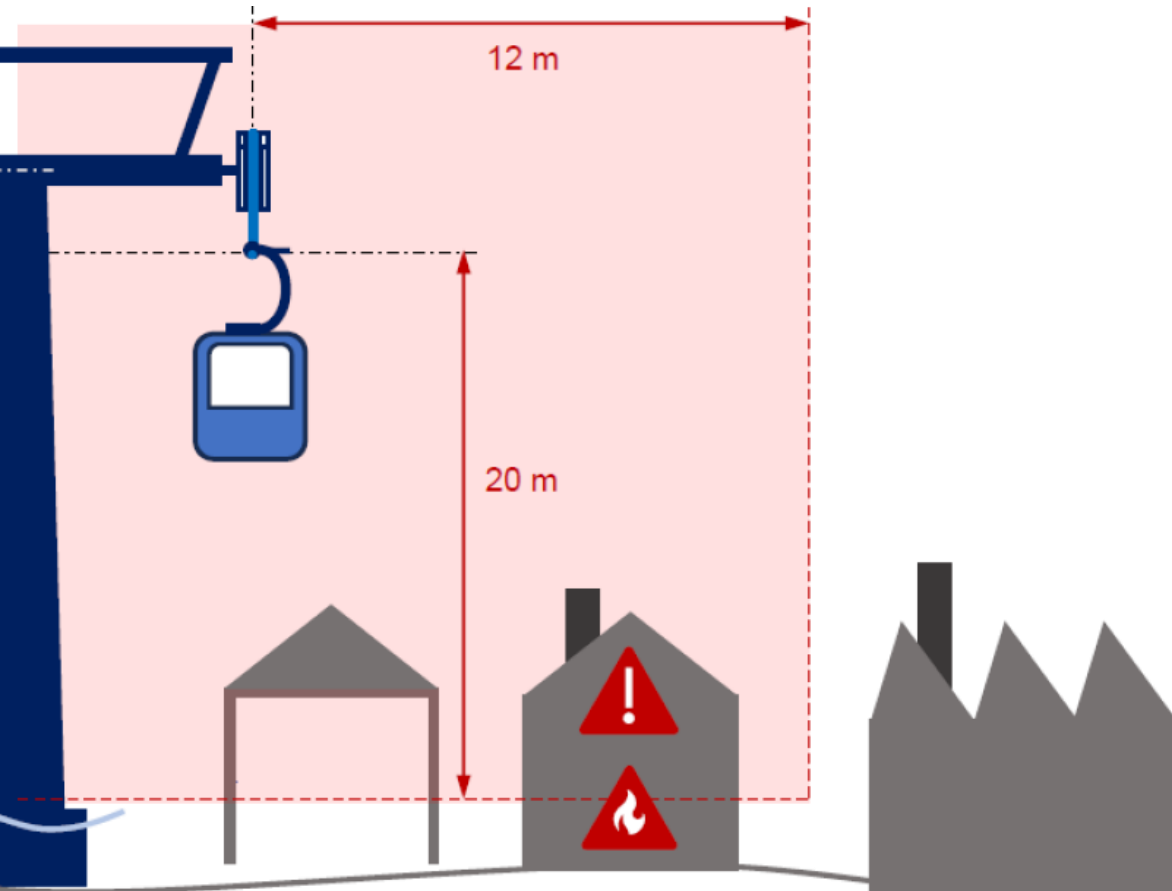
## External influences. Assessment onsite!

To **identify** risks, obstacles or **showstoppers** an **onsite track assessment (OTA)** at an early stage  
- saves time and money



# External influences. Fire Risks

EN 17064



EN 17064

– chapter 8.1:

*“Rooms, buildings and other objects nearby the ropeway must be taken into account in the safety analysis”*

- chapter 8.2:

Possible measures shall respect – structural measures, - technical measures, - organizational measures

How to  
do?  
Standard-  
dized?

TÜV SÜD  
fire risk  
metrics!

# Fire Risks – TÜV SÜD metrics within the 12 m / 20 m zone acc. EN 17064

| Purpose of building                               |      | Construction method               |    | Roof covering                    |        | Fire prevention measures                     |   |
|---------------------------------------------------|------|-----------------------------------|----|----------------------------------|--------|----------------------------------------------|---|
| appartement                                       | o    | stone / brick / concrete / steel  | o  | stone / brick / metal            | o      | Fire alert system                            | o |
| market/store                                      | o    | timber / or burnable facade       | ++ | timber                           | +      | Fire extinguishing equipment at the building | o |
| workshop                                          | +    | plastic/ or burnable fibre facade | ++ | plastic/fibre plates or membrane | ++     | ropeway with „fire mode“ moving cables       | o |
| industry / storage                                | ++   | ...                               |    | ...                              |        | no special measures                          | + |
| industry / Storage with dangerous goods           | ++++ |                                   |    |                                  |        |                                              |   |
| Total sum of o/+                                  |      |                                   |    | oooo                             | oo++   | ++++                                         |   |
| Building fire risc class (FRC)                    |      |                                   |    | FRC 1                            | FRC 2  | FRC 3                                        |   |
| Required distance building-roof to cable (dFRreq) |      |                                   |    | > 8 m                            | > 14 m | > 20 m                                       |   |

-> Changes in construction method or addition of fire prevention measures can reduce the FRC level

## Design. Review!

A **ropeway** installation is always **unique** at its place and with its **specific conditions**.



# Cyber. Security

**Security** and **Cyber**security become much **more relevant** for ropeways in general, especially for **smart** and **urban** systems...



# Cybersecurity. Legal perspective EU

- **Cyber Resilience Act (CRA)**  
affects all products that contain digital elements (software) and are networked. The products are divided into different categories depending on their risk class
- **2<sup>nd</sup> Network and Information Systems Directive (EU 2022/2555) (NIS2)**  
primarily affects companies and organizations that are considered operators of critical infrastructures (KRITIS). It sets minimum standards to ensure the protection of networks and systems (such as metro-systems...)
- **Delegated Act to the Radio Equipment Directive (RED) (EU 2022/30)**  
sets out general requirements for products based on radio technologies. The extends the original regulations to include compliance with cybersecurity and data protection measures.
- **Machinery Regulation (2023/1230)**  
Update of the Machinery Directive 2006/42/EC - now also with requirements for the cybersecurity of products.



# What is important for installation & commissioning?

## Logistics. **Assembly**

In general **more easy**  
for **urban ropeways**  
than for alpine...

...except **splicing**

## Trial. Error



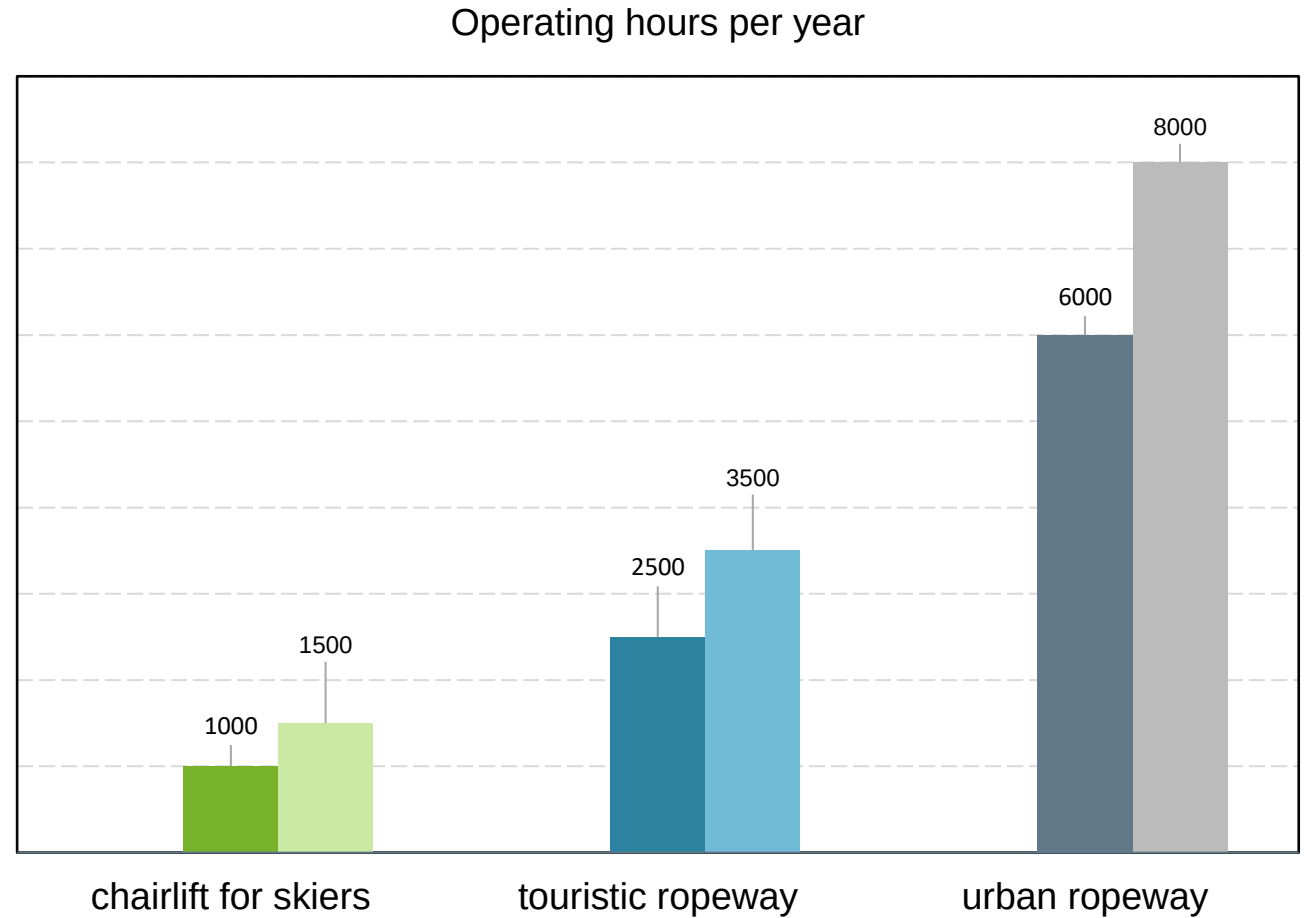
**Load** and **brake** tests at  
**flat - urban** ropeways are  
completely different to  
steep –**alpine** ropeways.

Better to get an **error at**  
**trial**, **instead** at full  
operation.

# Safe operation of urban ropeways?

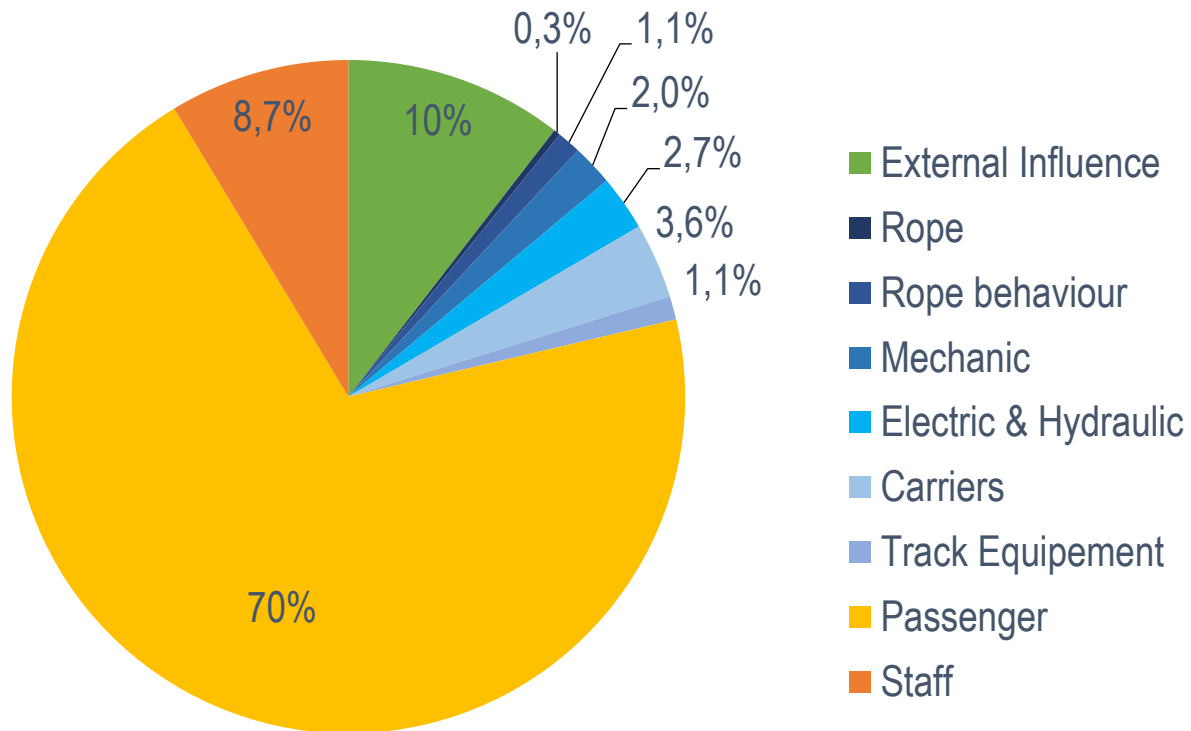
## Operation. Hours

**Urban ropeways need a completely different maintenance schedule than common ropeways.**

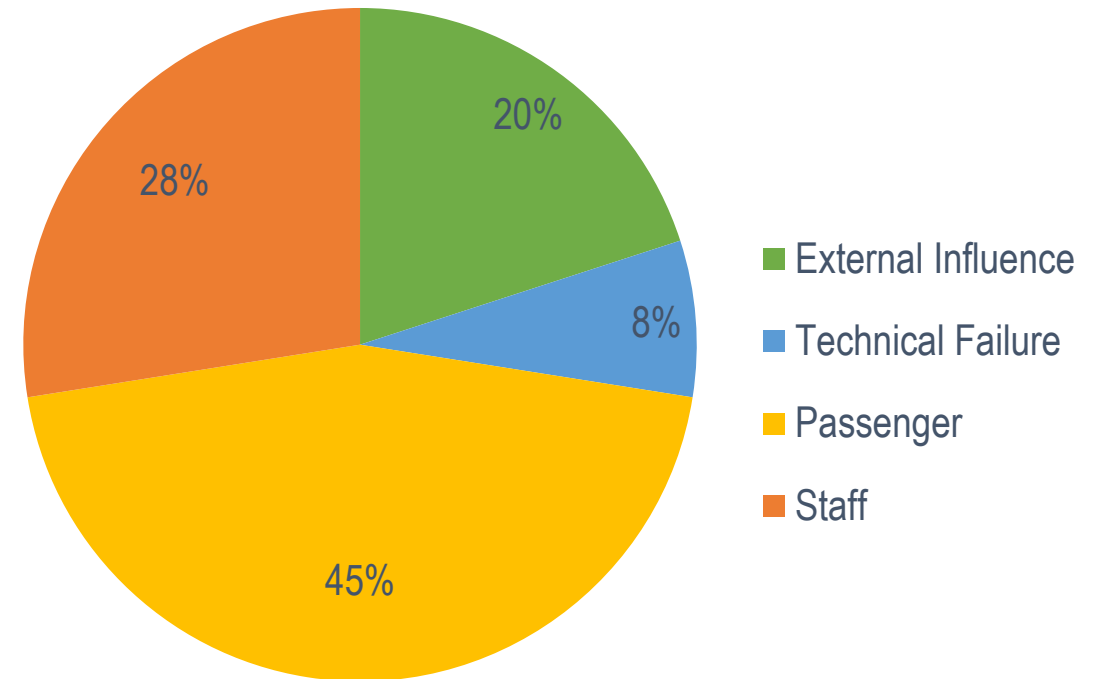


# Manage. Operation

Causes for Incidences\*



Causes for Fatalities\*



\*ITTAB-Statistics 2006-2020

## Personnel. Training. Skills

**Personnel** for ropeways  
must **be trained** with a  
profound technical knowledge  
and well-known **procedures** in  
challenging and **exceptional events**.



## Inspections. **Frequently**

**Inspections** by ropeway **independent experts** are **mandatory** for a **safe** and reliable ropeway **operation**.



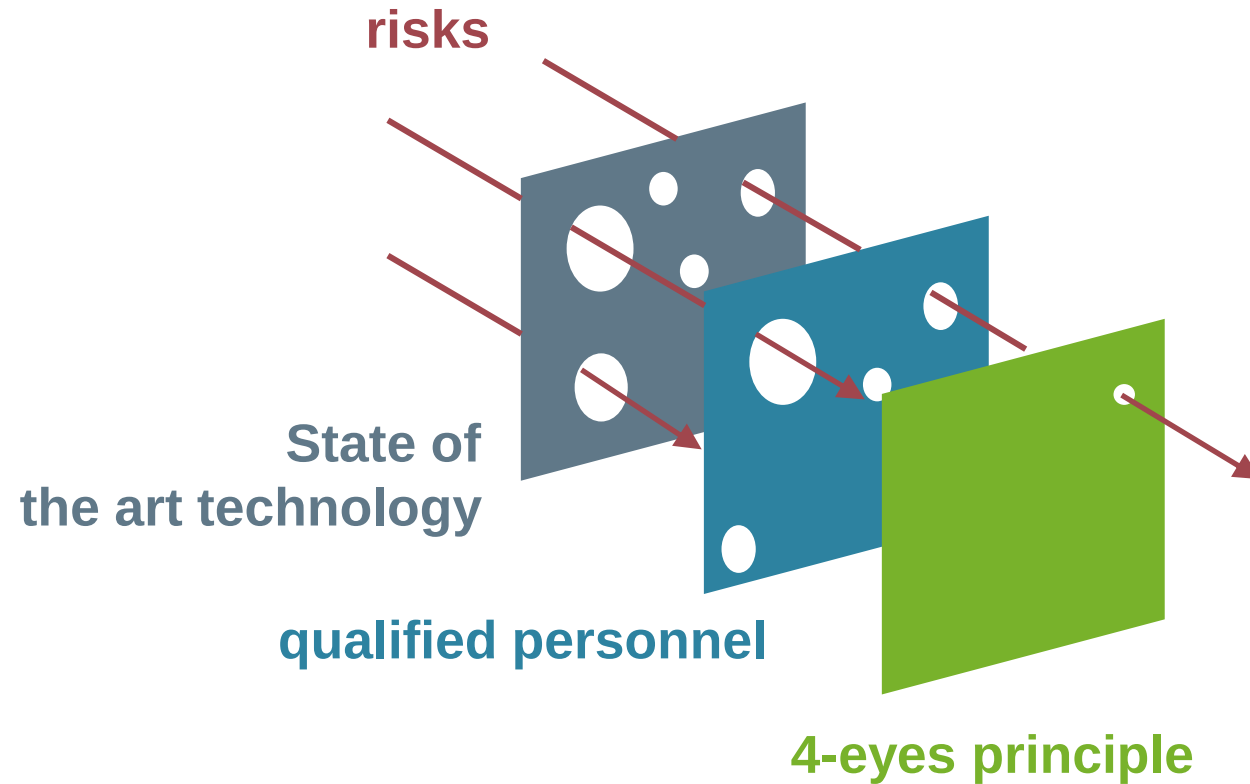
## Structural. Inspections

**Check for loose things,**  
**not to get lost of them!**



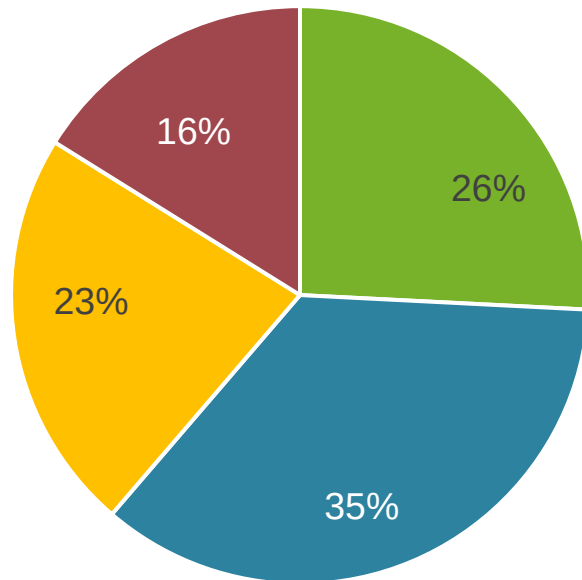
**Why are  
checks by 3<sup>rd</sup> party  
indicated?**

## 4-eyes principle. **Reduce risks!**

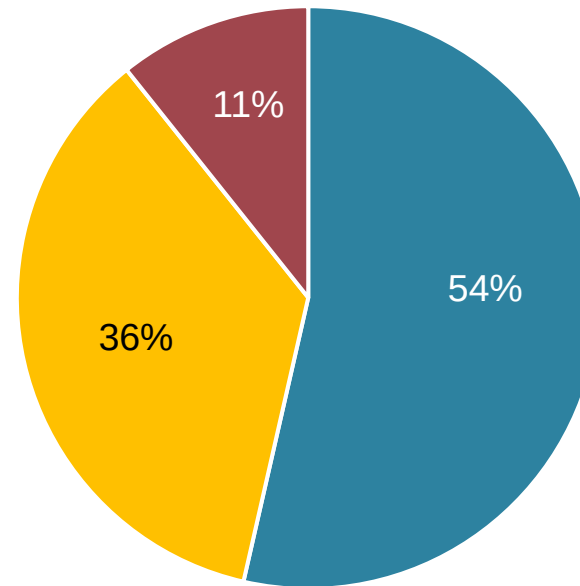


# Identification. In time!

Identify risks and damages before they cost lives or money



Percentage of ropeway installations with findings on annual inspections

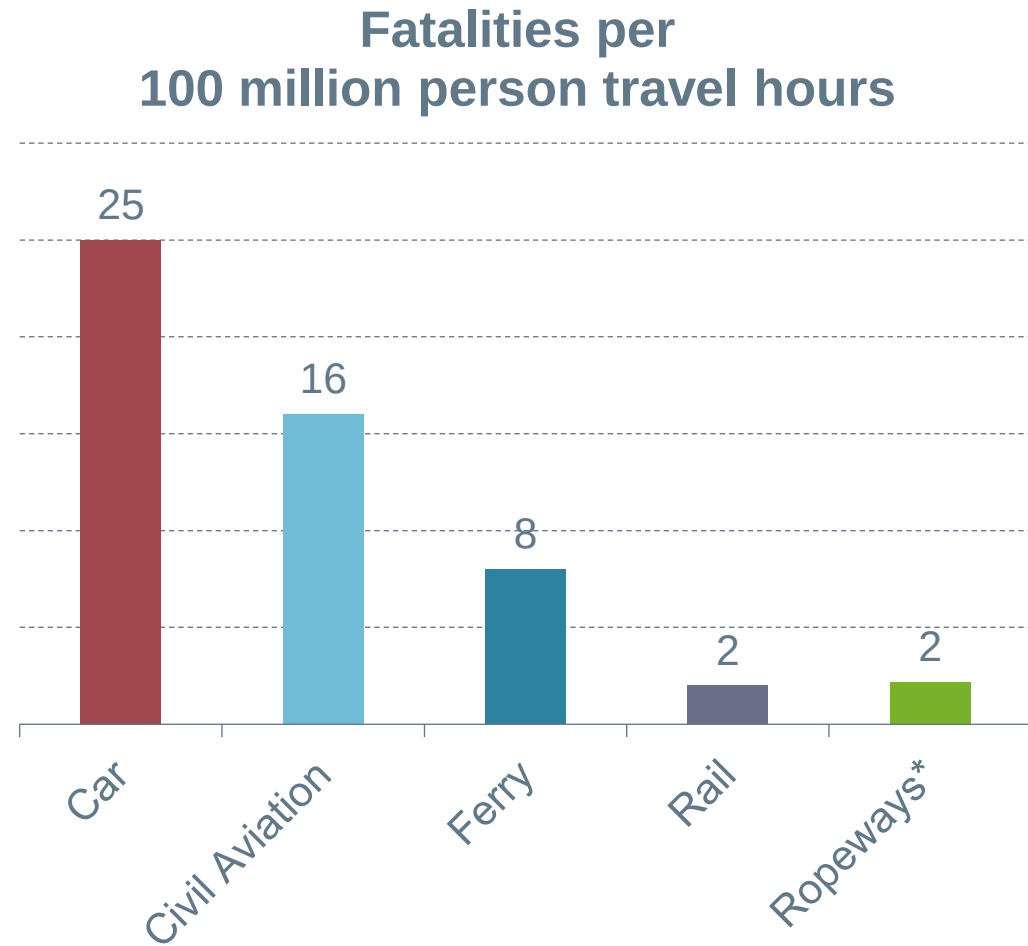


Distribution of findings at annual ropeway inspections

- **Cat. A:** minor or formal deviation
- **Cat. B:** relevant finding,
- **Cat C:** safety critical finding,

## Keep ropeways - **Safe!**

Ropeways have evolved one of the **safest passenger transport** systems, compared to others\*



\*ITTAB-Statistics 2006-2020,  
Values from other modes of transport out of:  
TRANSPORT SAFETY PERFORMANCE IN THE EU  
A STATISTICAL OVERVIEW;  
ISBN: 90-76024-154



Thank you for  
your Attention!

