Federal Ministry
Republic of Austria
Climate Action, Environment,
Energy, Mobility,
Innovation and Technology

Topical Peer Review II on Fire Protection

National Presentation of Austria

Country Review Workshop
30 September – 3 October 2024
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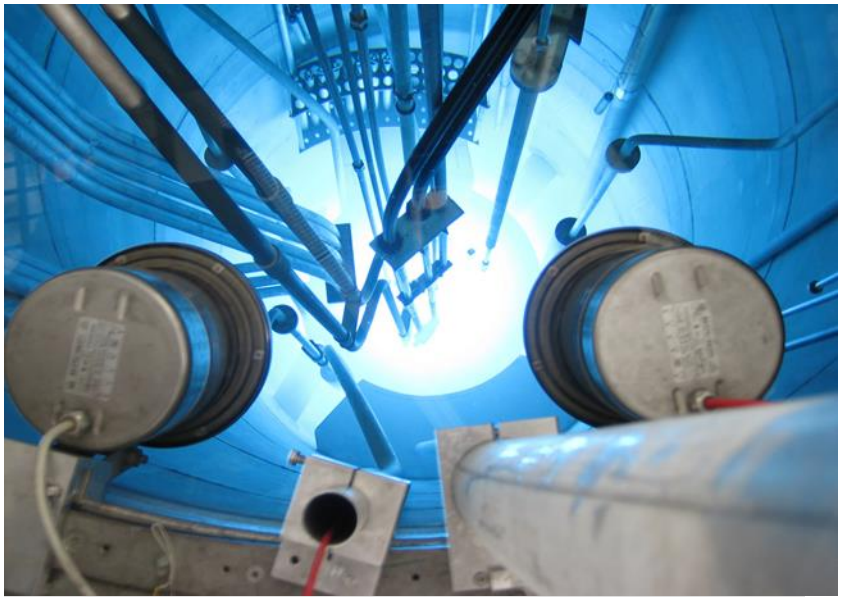
National Presentation Outline

- Candidate installation and improvements
- Regulations
- Fire safety analysis
- Fire protection (Active/Passive)
- Conclusions

Candidate Installation



- TRIGA Mark II research reactor located in Vienna
- First criticality 1962
- Licensee: Vienna University of Technology
- Maximum thermal power 250 kW
- Continued operation planned until 2040

Research Reactor – Improvements PSR 2014

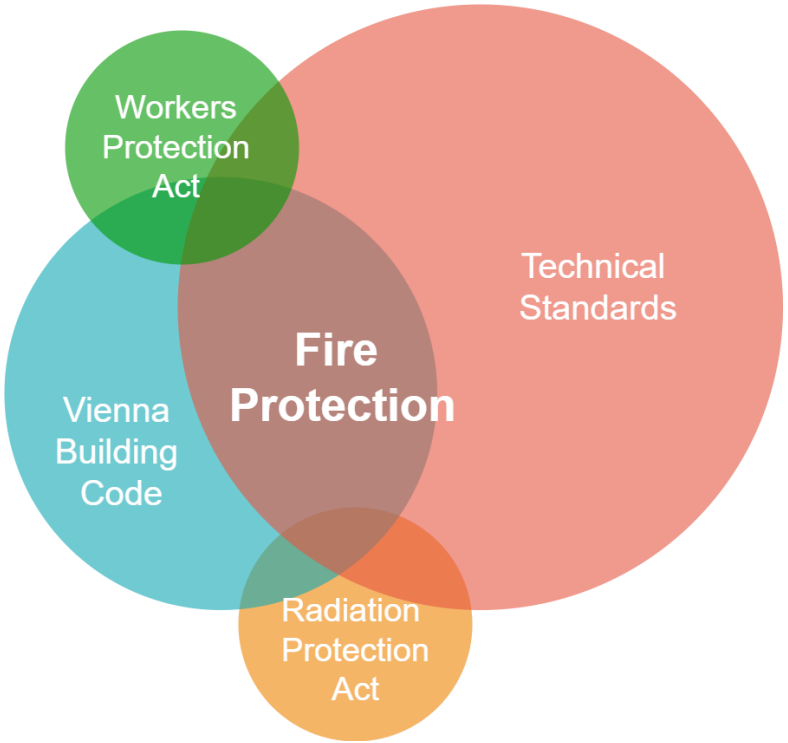
- Instrumentation and control system (picture)
- Primary circuit
- Purification circuit
- Filter systems reactor hall
- Physical protection system
- Radiation warning system

Research Reactor – Improvements Fire Protection

- Reconstruction of the stairwell (old stairwell was partly made of wood)
- Partial renewal of fire doors
- Renewal of floor covering (flame-retardant material)
- Storage room was repurposed for an oil tank (additional compartmentation)
- Construction of a neighbouring institute building (prevention of mutual interference of the buildings)

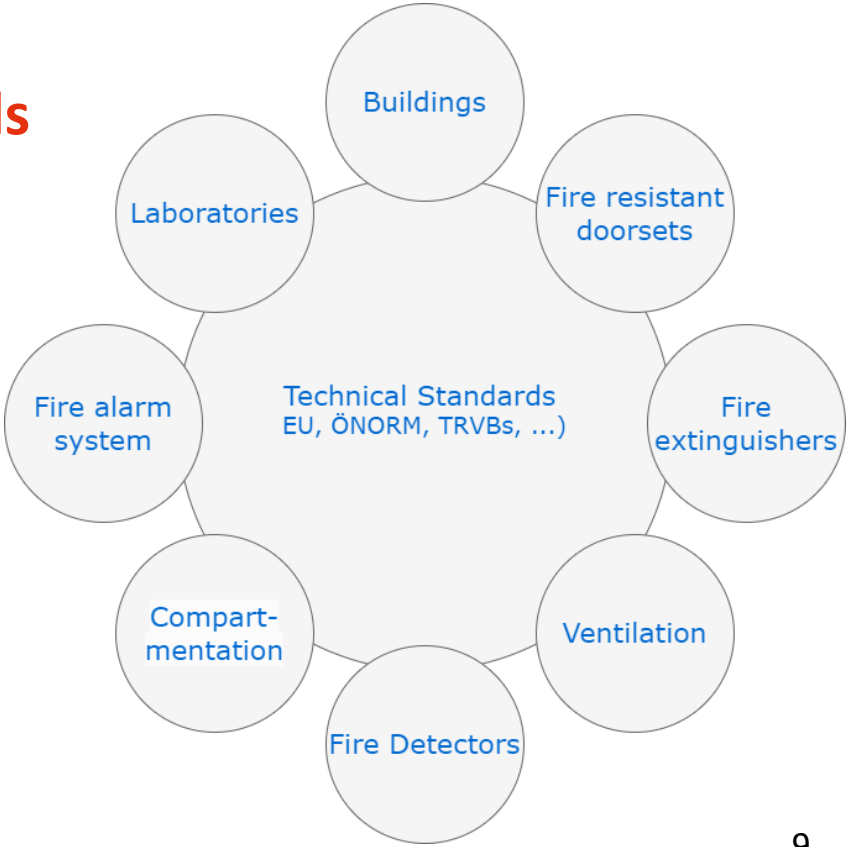
Regulations - Overview

- Fire protection is subject of many laws, regulations and standards
- Various Authorities
- Together they aim to ensure:
  - Safety of personnel and public
  - Preservation of building structures
  - Prevention of radioactive release

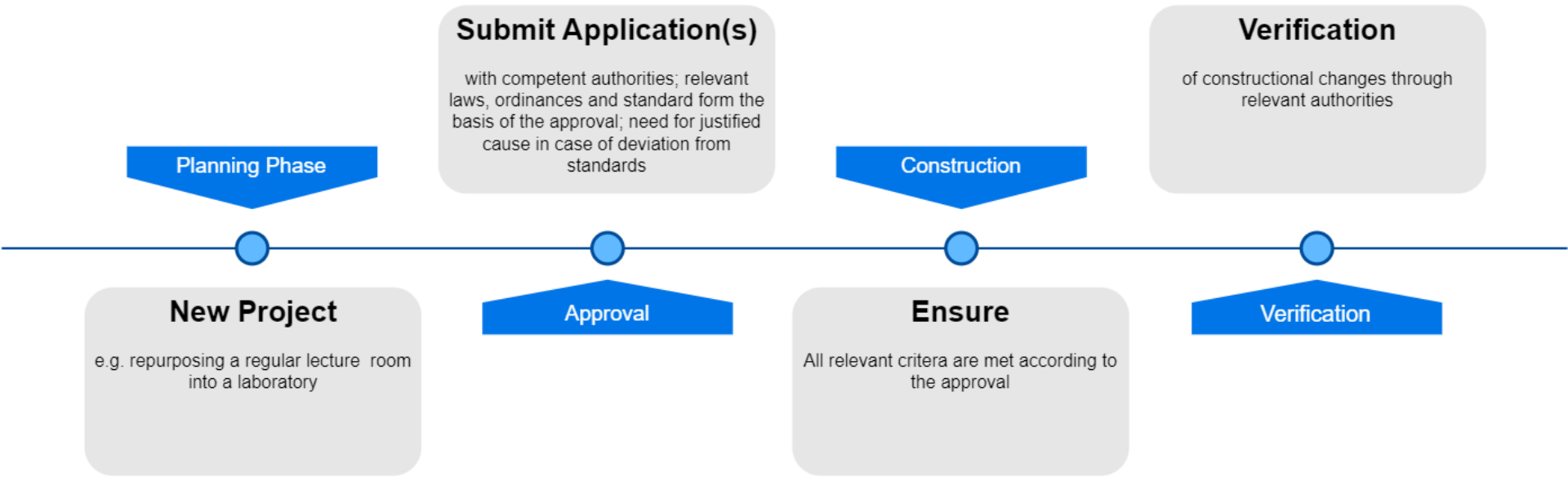


Regulations – Technical Standards

- Specific and detailed requirements
- Regarding specific areas or topics
- Duty to justify deviations
- Achieve at least the same level of fire protection



Fire Safety Analysis - Process



Fire Safety Analysis – Key Assumptions

- If one or more essential systems fail, the reactor will shut down automatically
- Due to low decay heat of reactor core, natural convection of the cooling water in the tank is sufficient for heat dissipation
- In case of fire, smoke detectors will automatically alarm the fire brigade
- The fire brigade will be on site in a few minutes (regular training simulations)
- Application of graded approach

Fire Safety Analysis - Most Penalising Scenario

- Fire is not a trigger of the worst possible scenarios
- It can be a possible side effect
- E.g. after a big plane crash

Active Fire Protection – Fire Detection

- Automatic fire alarm system in accordance with Austrian standards
- Detection of incipient fires at the earliest possible time
- In total 608 fire detectors:
  - Most of them regular smoke detectors
  - Heat detectors
  - Ventilation duct detectors

Active Fire Protection – Fire Detection

- Criteria for selection and installation of fire detectors:
  - Room height
  - Monitoring area
  - Ceiling or roof shape
  - Existing fire loads
  - Air flow
  - Ambient temperatures

Active Fire Protection – Automatic Actions

- Alarm siren
- Forwarding alarms to the Vienna Professional Fire Brigade
- Ventilation system shutdown (except for the reactor hall)
- Release of escape doors
- Closing of fire doors
- Release of elevators
- Activation of emergency lighting
- Activation of smoke extractors in staircases

Active Fire Protection – Fire Suppression

- No automatic fire extinguishing systems are in place
- All fire alarms are automatically forwarded to the Vienna Professional Fire Brigade
- Fire fighters arrive on-site within a few minutes (regular drills)
- Various hand-held fire extinguishers are strategically distributed

Passive Fire Protection – Compartmentation

- Suitable fire barriers are in place according to technical standards
- Fire barriers consist of reinforced concrete, except for doors
- Seperate fire compartments:
  - Floor by floor
  - If necessary, individual rooms (reactor hall, laboratories, areas with increased risk of fire)
  - Stairwells

Passive Fire Protection - Ventilation Management

- General areas: ventilation system shuts down in case of fire
- Reactor hall:
  - Ventilation continues to run in normal mode (negative pressure)
  - Ventilation system can be manually switched to emergency mode
  - Fast shut down of the reactor, if the exhaust air flow falls below 50% of the maximum value
  - Fire dampers close automatically at high temperatures
  - Fire dampers are checked and tested anually

Strengths and Weaknesses

- Strong cooperation between stakeholders (e.g. licensee organizes regular exercises with Vienna Professional Fire Brigade)
- Fire dampers in the reactor hall only close at high temperatures to ensure the safety of people being evacuated
- There have been no fires in more than 60 years of operation
- To minimize damage when extinguishing small incipient fires, fire blankets can be used as a supplement to existing fire extinguishers

Conclusions

- Fire protection is subject of numerous laws, regulations and standards
- Regular inspections ensure that potential weaknesses are identified and remedied accordingly
- Fire protection at the research reactor is continuously improved
- Recommendation:
  - Supplement the existing fire extinguishers with fire blankets

Thank you for your attention!

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