SKILLED TO BE A **FIRE EXPERT**

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Arrangements for Firefighters

Authors:

Jan Smolka
Majaczech, z.s.

Kamila Kempná
Faculty of Safety Engineering, VSB – Technical University of Ostrava
Markéta Hošťálková
Fire and Rescue Service, Silesian Moravian District
Eleni Asimakopoulou
University of Central Lancashire

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University of Ljubljana, Faculty of Civil and Geodetic Engineering, Slovenia – project leader

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VSB - Technical University of Ostrava, Czech Republic

Majaczech - Czech Fire Protection Association, Czech Republic

University of Zagreb, Faculty of Civil Engineering, Croatia

Inspektig, L.t.d. Croatia

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Glossary of Acronyms and Terms

FF	Firefighters
FSE	Fire Safety Engineering
ICC	International code Council
IFC	International Fire Code
GIS	Geographical Information System
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Agency
OSRI	Occupational Safety Research Institute

1 Introduction

This module is example of discussion importance between firefighters and fire engineers. During this project, there were performed meetings and discussion with specialist from fire and rescue services and fire engineers in various countries including Slovenia, Croatia, United Kingdom or Czech Republic. Results of those discussions, literature review and previous practice of authors and consultants are reflected in this document.

Operations of fire and rescue service take place in usually dangerous conditions and with time pressure to proceed their firefighting and rescue activities where small delay may cause serious consequences. The delay may be caused by various local conditions which may vary on situation or type of incident. For limiting this delay, there are established organizational and technical features in buildings and surrounding area for increasing efficiency of firefighting and rescue activities. This firefighting feature includes reserved location for parking fire trucks, establishing local artificial water sources, extinguishing systems or supporting firefighting systems (in-built dry pipeline with pumps in high-rise buildings, firefighting elevators, key safes etc.) which helps in fast proceeded intervention of firefighters.

2 Fire engineering and firefighting

The firefighters provide services leads to limit a fire and other dangerous effects of disasters to occupants, surrounding area and value. This is provided usually by evacuation of occupants, proceeding firefighting activities and other activities which leads in limiting spreading of fire or other unwanted effect of the situation which is not only fire but may be posed by chemical substances spreading in area, or natural disasters effect (e.g., floods or strong wind) which impacts the place.

It is not uncommon that the firefighters challenge to hazard combination which need right and specific understanding of dealing which specific and multi-hazard approach during fire and rescue activities.

There is crucial importance to understand the fire safety building design shall consider safety of occupants (health and safety; people and animals), protection of value and health and safety of intervening of fire responders (firefighters, police, emergency services).

- Firefighters provides fire and rescue activities.
- Police provides protection and enclosure of area.
- Emergency and medical responders provide first aid and health care of affected persons and animals.

Previously described activities and participating units provides overview that the most activities are not proceeded only in building affected by fire but these activities are proceeded also in nonaffected parts of buildings and surrounding area of the considered building. These factors pose importance of consideration of building protection for further firefighting features design and fire safety protection.

Figure 1: Example of multi-hazard situation in case of fire when firefighters proceed fire and rescue activities (iDNES.cz, 2020)

Fire Service Features of Buildings and Fire Protection Systems

FIRE AND RESCUE ARE USUALLY PROCEEDED IN DANGEROUS CONDITIONS AND TIME PRESSURE

WHERE

Small delay may cause serious consequences (limited access, lack of extinguishing agents, limited possibilities of evacuation, etc.)

Firefighting organizational and technical features in buildings and surrounding area

↓

Increasing efficiency of firefighting and rescue activities and increase safety of firefighters

↓

DECREASE LOSES ON LIVE AND PROPERTY

First approaches to establish fire safety limiting fire impact, better firefighting approach and extinguishing agents access and methods

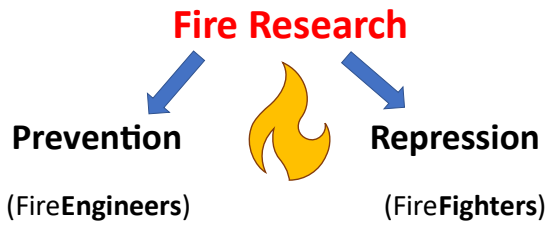

Figure 2: Fire safety research perspectives

3 Building preparedness to firefighting activities

Main purposes of firefighting features in practice may be divided in following area:

- Early fire detection
- Increasing firefighting efficiency
- Occupational safety of firefighters

Figure 3: Application specific firefighting features in time of fire development from origin to fully developed fire

4 Fire apparatus access

Firefighting use a wide range of transportation means to achieve minimum time for intervention. Activities of firefighters include not only firefighting but also intervention in car accidents, chemical accidents, technological accidents, natural disasters, etc. For these purposes there are various types of vehicles which are specifically equipped for specific purposes. The most universal vehicles are pumper which are usually equip with water tank with pump, firefighting equipment, SCBA equipment, car extraction equipment or basic equipment for chemical accidents. Another very common type of vehicles is transport vehicles, ladder or platform engines, technical vehicles special equip for specific purposes e.g., chemical accidents, search and rescue, commanding vehicles, rescue at height, etc.

Main fire engine types:

- Pumper
- Aerial Ladder or platform fire truck
- Technical truck
- Transport vehicle

On Fig. 1 selected are presented selected vehicles including pump engine, ladder engine and transport vehicles are shown.

Fig. 1. Comparison of various firefighting vehicles – I. Pumper, II. Ladder, III. Technical vehicle (POŽÁRY.cz, 2020)

Various types of firefighting vehicles pose specific requirements for access to travel to place of incidents or parking on place of incident. Limitations on route may cause serious delay or limitation in firefighting and rescue activities. May parameters which should be considered are dimensions of vehicles including height, width and length or operational area for parking ladder / platform trucks. Additionally, it needs to be considered also load weight of vehicle. The Table X compare mentioned parameters between main three types of vehicles - pumpers, ladders and transportation vehicles are described in Tab. 1.

Table 1. Parameter's comparison of specified vehicles – pump engine, ladder engine and transport vehicle

Comparison of parameters			
Parameter	*Pumper*	*Ladder*	*Transport Vehicle*
Height	3 150 mm	3 550 mm	3 100 mm
Width	2 550 mm	2 500 mm	1 990 mm
Length	8 400 mm	11 000 mm	7 560 mm
Load weight	12 500 kg	18 000 kg	4 325 kg
Crew	1 + 5 persons	1+1 persons	1 + 8 persons

Typical vehicle access route specification

Example of requirements for fire apparatus access for vehicles in Czech Republic is width 3.5 m and height 4.1 m with minimal axle load to road by 80 kN in Czech Republic. Fig. 2 describes minimal requirements for turnarounds.

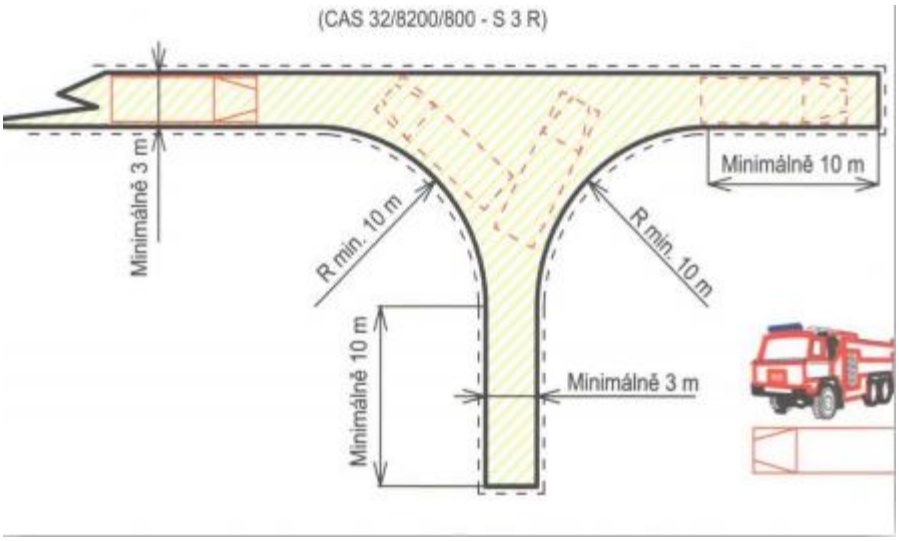

Fig. 2. Recommended road dimensions for Czech firefighting engines (Miková, 2018)

Fig.3, Fig. 4 and Fig.5 shows possible problems of access for firefighting engines.

Fig. 3. Limited access of fire apparatus in underpass (Klaubenschalkova, 2022)

Fig. 4. Example of blocked access routes to fire (Miková, 2018)

Fig. 5. Example of blocked street by wrong parked cars (Miková, 2018)

Important parameter for of apparatus is also access of firefighting platforms which are used for leading fire intervention in high-rise buildings or evacuation of the occupants. This access is affected by distance from building or sloping base where the platform is placed. If the aerial apparatus is too far away, it may pose difficulty to approach to building access. If the aerial apparatus is too close, it may cause difficulty in rotating and movement of apparatus which may prevent to access to the window. Additional factors affecting operational limits of the aerial apparatus are ambient conditions including wind or temperature may have impact on operational distances. Fig.6 presents example of fire platform truck working diagram.

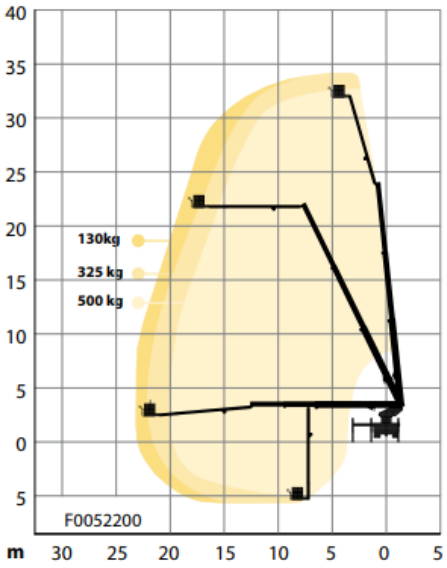

Fig. 6. Working diagram of fire platform truck – Bronto Skylift F34RLX (Bronto Skylift, 2020)

The Fig.7 describes approach height of platforms during high-rise buildings fires and its operation in in case of façade fires.

Fig. 7. Visualization height access of platform trucks (Furby, 2017)

5 Firefighter's access

One of important parts for firefighters providing fast efficient and safe access to building in case of fire is access to a building. The access may be presented by site access, external access on building, key safe, or firefighting elevators.

5.1 Site Access

Firefighters must hand carry all equipment beyond the point where access for apparatus ends. Increased distances and steeply sloped terrain result in additional time and effort to set up ladders, hose lines, and other equipment. These delays can impact search, rescue, and suppression efforts. If the area is easy to negotiate by foot, firefighters can move relatively quickly.

Obstructions and hazards are often found around buildings that may hinder firefighter access. These include fences, landscaping, vehicles, power lines, merchandise, horizontal or vertical distance away from the buildings etc.

Surrounding of the object is also important. The well-arranged place helps the firefighter effectively intervene and use their equipment and technique.

5.2 External access

External access to roof of buildings area used for leading the external firefighting interventions. The most common are external firefighting stairs and ladders.

External firefighting stairs and ladders

Firefighting ladders are mounted on envelope of building and usually they are equipped by dry risers. They are made from non-flammable materials such as steel.

Fig. 8. Roof access and external building access for firefighters (Steelway, 2020)

Roof bridging

The bridging provides possibility to overcome obstacles on the roof which could cause difficulties during fire and rescue intervention. They are equipping at least by one-side railing. It is built in area where obstacles block free movement on the roof for fire and rescue units (e.g. skylights), see Fig 9. The bridging cannot be mount above ventilation, smoke extraction outlets or any other vents where smoke and heat could be extracted eventually.

Fig. 9. Roof access platform example (Unistrutstore, 2020)

5.3 Interior access

The internal firefighting access routes are arranged in protected evacuation routes.

Room and Floor Designations

Coordination of floor and room designations between all features is crucial. These features include stairs, elevators, fire alarm annunciators, building information signs or directories, public address systems, and all pre-incident planning documents. Consistent designations will avoid confusion, especially during time-sensitive emergency operations.

All numbering of floors and rooms should be easily readable and make common sense, even for those unfamiliar with the building. Confusing signage will delay emergency operations

Stairs

Stairs are the primary means of evacuating people and accessing firefighters in a building in a vertical direction.

Stairs should include identification markings of floor levels, direction of escape, exit to the roof, etc. to ensure easy orientation and more effective intervention.

5.4 Firefighting elevators

During firefighting intervention, it is not recommended to use civil non-firefighting elevators. For purposes of firefighting intervention in high-rise buildings, firefighting elevators can be used. Using elevators in case of firefighting intervention has been discussable until nowadays. In case of using firefighting elevators in case of fire, it is recommended to use SCBA and transport maximally 2 – 5 floors below the reported fire floor. (Grimwood, 2017)

Utility and Equipment Identification

Technological devices, electricity and water supplies to the building are a potential risk of fire or accident. For example, main water supply, control valves for sprinklers or drain pipes, fire pumps, electrical service, switchboards, generators and air conditioning equipment are included in the risky group. Their easy operation, which usually is a system on/off should be simple prevention to minimize the risk of fire or spreading of fire. Control devices of the electric system, water, gas and other fuel should be located either in dedicated rooms, which contain marked entrances (Figure 10).

The devices are marked with a simple and understandable pictogram. The devices are in rooms which contain adequate labels. This step provides quick access to facility. The marking should be legible from the view of firefighters (e.g. Fig. 10).

Fig. 10. A room with signage indicating (top to bottom), the main electric service, the location of a secondary electric service, and the fire alarm system control panel. (OSHA, 2015)

5.5 Fire Safety Key Safe

After arriving on the fire scene, firefighters usually must enter the interior of the building for fire and rescue operations. The forces enter the building may pose delay in intervention and additional damages and loses. The key safes are located next to the entrance of the building. The firefighters hold master key which is used for opening the key box with keys and card to control building doors and entrances, elevators, and other equipment (Fig. 11).

Fig. 11. Example of key safe and its location next to a building entrance (HIFI24, 2020) (Hltrade.cz. 2022)

6 Water Supply

Basic categorization of water sources

Water is used as the most common extinguishing agent for fire suppression. The right access with ability to deliver adequate amount of water is important for leading fast and effective fire and rescue activities. The water sources can divide in three categories which are natural, artificial, and multi-purpose water sources.

Natural water sources

It is a case when the source of water is not determined directly for firefighting purposes – river, lake, stream, ponds, sea etc.

Artificial water sources

Water sources built specifically for firefighting purposes - fire tanks, wells, firefighting water supply pipeline, firefighting water reservoirs, fire hydrants, etc.

Multi-purpose water sources

Water reservoir built for multipurpose use including firefighting water supply – swimming e. g. pool, pond, well, water reservoir, dam

Note: Natural water sources without continual flow could not be available in cold weather.

The more common water sources categorization

The most common water source for firefighting in urban interface is a fire hydrant. These hydrants are parts of municipal water distribution systems. The fire hydrants are designed with specific diameters of connections for hose line of fire pumpers which directly provides connection to a pumper.

Hydrants are usually above ground or underground types. The underground fire hydrants are presented only by connectors with flow regulator. This connector requires connection of hydrant which is usually equipment placed in fire pumpers and key for control flow in hydrant (Figure 12.)

Required water flow velocity, pressure, location and distance from buildings is usually defined by local standards.

Fig. 12. Underground hydrant and its usage

The second type is a ground fire hydrant which provides possibility to direct connection to hose line and control with key as seen in Fig.13.

Fig. 13. Fire hydrant in Greece

6.1 Maps, signs and access

These maps are accessible online and can be used by an incident commander or operator operation centre. The online system of water sources mapping is shown on Fig. 14 and Fig.15.

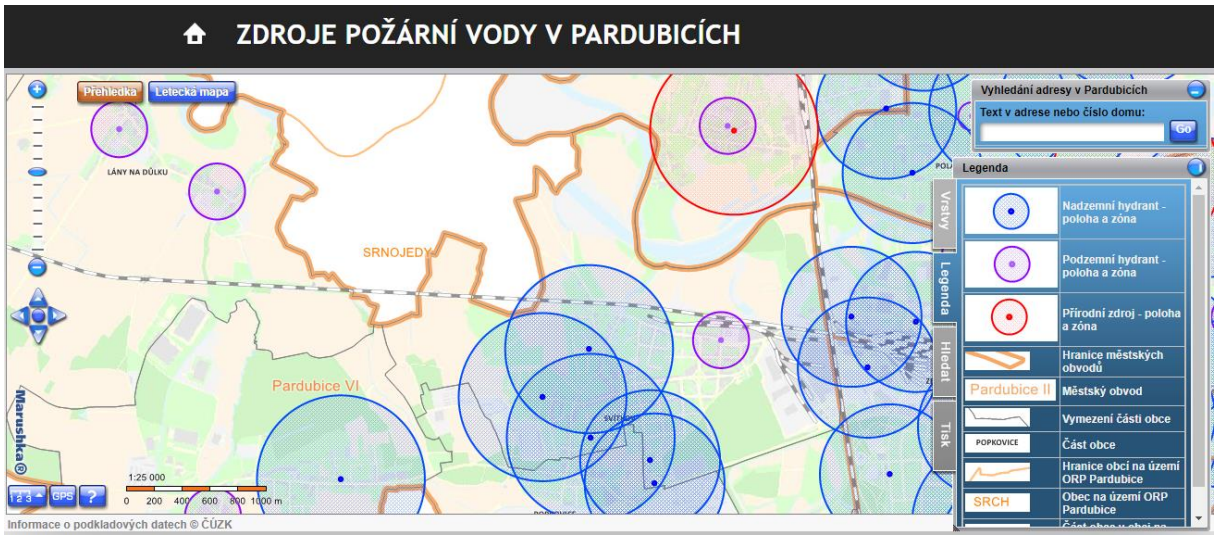

Fig. 14. Map with fire hydrants in area (Pardubice, 2022)

Each fire hydrant description in system contains number of fire hydrant, its state, zone radius, location, address, type of source, diameter, overpressure, water flow, last check and confirmation of operability.

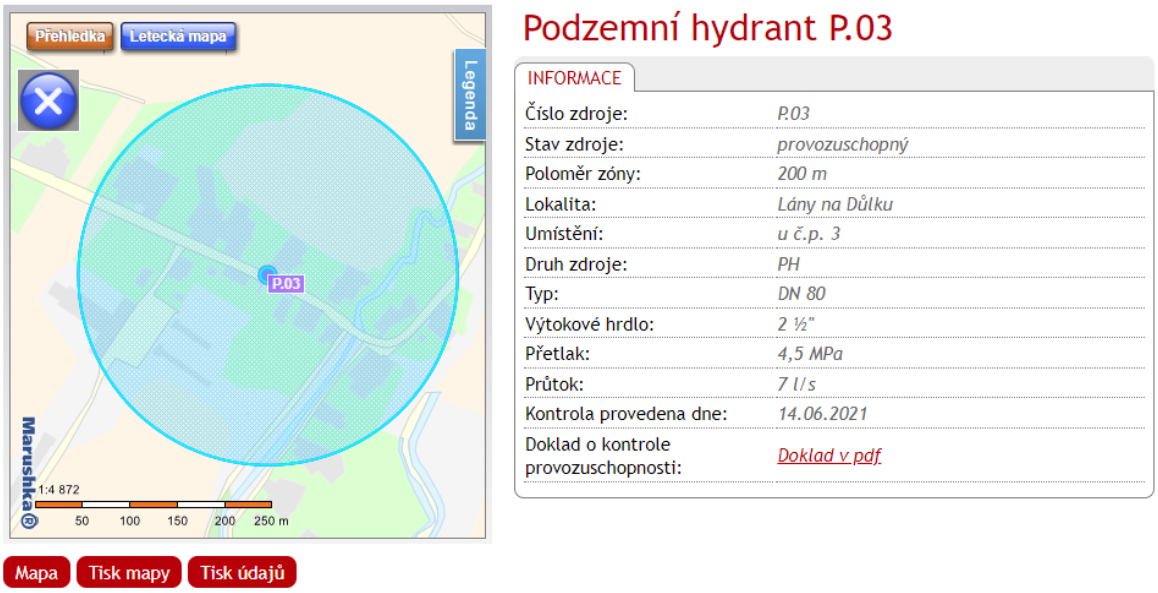

Fig. 15. Description of fire hydrant properties (Pardubice, 2022)

For better orientation of incident commander and firefighters, prescribed firefighting documentation exists with noted location of fire hydrants and other water sources. The following figure shows example of signs for purpose of prescribed firefighting documentation (e.g. Fig. 16 and Fig.17).

Sign in maps

Fire hydrant

Underground fire hydrant

Fig. 16. Example of signs for fire hydrants in map (Hanuška, 1996)

Fire hydrant location sign on site

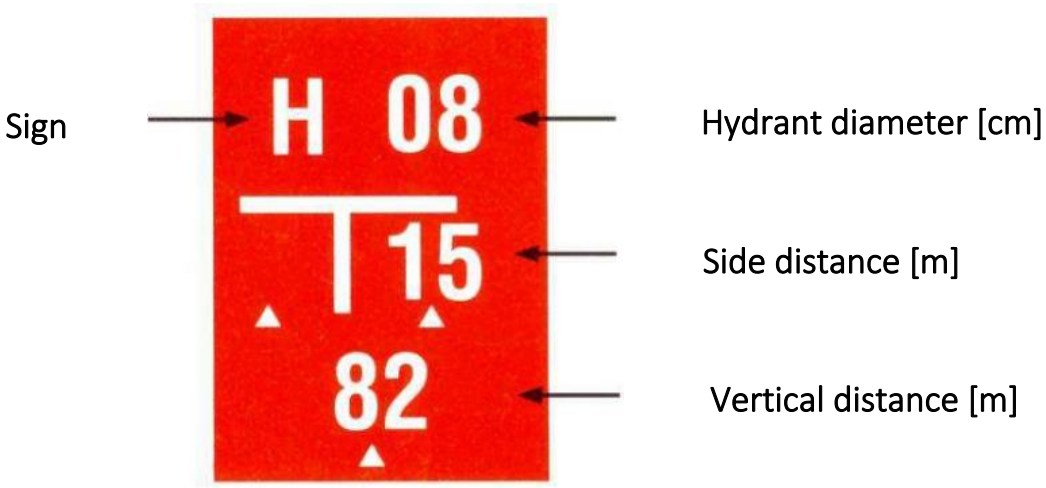

Fig. 17. Explanation of fire hydrant location description (Navarová, 2010)

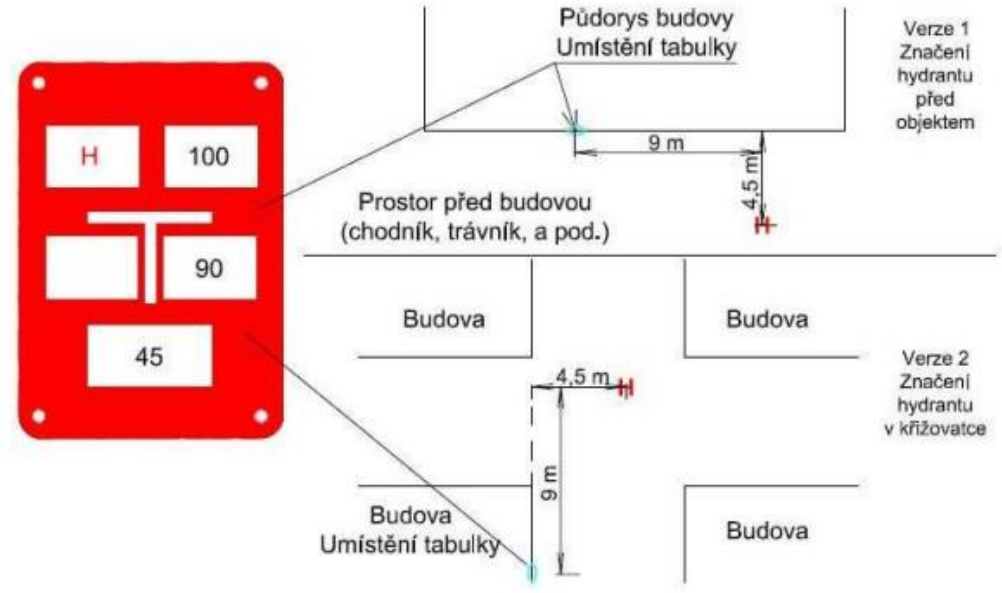

Fig. 18. Use of fire hydrant signs in practice (Navarová, 2010)

6.2 Fails of artificial water sources maintenance

Limited access to water sources or their failure may cause serious consequences in firefighting and rescue activities in case of emergency. In case of lacking water sources, firefighters have to improvise or find alternative water sources which may be time consuming (see Fig. 19 and Fig.20).

Fig. 19. Limited access to underground hydrants (Kůdela, 2010)

Fig. 20. (HZS ČR, 2020)

Example of standards used for design water access:

CSN 73 0873 - Fire protection in buildings – Equipment for fire-water supply

NFPA 1142 - Standard on Water Supplies for Suburban and Rural Firefighting

2018 International Fire code (IFC)

6.3 Potential complications of using fire hydrants

- Function failure of hydrants
- Limited access to fire hydrants – e.g., parked cars, covered by ground
- Pressure decrease in distribution site and distributor is not able to increase the pressure
- Necessity to establish shuttle water transportation which increases requirements on equipment

6.4 Using GIS and plans with hydrants

Using GIS and spatial data from satellites including fire history, water source's location, access routes provide effective tool for establishing fire preventive measures which could be for example establishing artificial or natural water reservoirs, establishing access routes, etc.

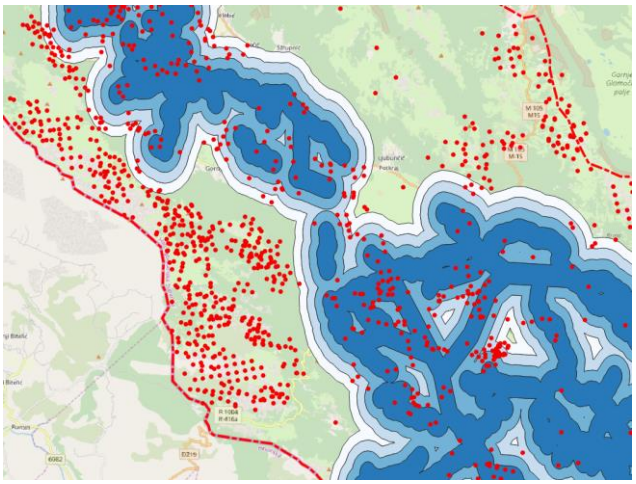

Fig. 21. Visualization of historical fire locations (red dots) and distance from water sources (blue buffer) wildland urban interface

7 Dry Risers

Effective firefighting attack led from with hose line directly connected to pump engine can be effective up to 11th – 12th floor. However, this approach can be risky due high pressure in a hose which can be damaged by high pressure. For firefighting at height, the establishing hose line by firefighters may be physically and technically difficult which is time consuming. The overcoming the height by fully equip firefighters with establishing hose line during using SCBA may cause enormous air consuming. For these reasons it is not recommended to use directly used hose lines from ground pumper for fire higher than 7th floor (Fig.22).

Fig. 22. Dry riser cabinet (Rightconsultgh, 2019)

For mentioned reasons, in modern buildings dry risers are mounted to allow connection of hose lines from pumpers on ground level and then water fill. For establishing required pressure, dry risers are equipped with support pumps. Additionally, as the fire attack hose line is connected on floor of fire attack and then lead fire intervention (Fig. 23).

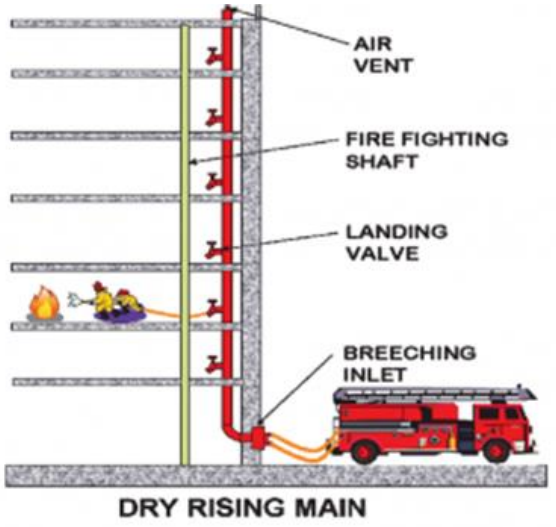

Fig. 23. Use of dry rises in (STARCO, 2022)

Dry risers are also usually located on ladders leading to roof for firefighting of large buildings. This provides easier organization of hose line on place of fire attack.

Fig. 24. Dry riser mounted to ladder for roof access (Wuwejův zápisník, 2014)

Important

Before start pump and water supply in dry riser, it is important to double check every floor if there are not missing covers, filled with trash, bird nests, or any other damage which could make malfunction of dry risers.

Fig. 25. Inappropriate use of dry riser in building (Křečková, 2010)

8 Prescribed Firefighting Documentations

The main purpose of Prescribed Firefighting Documentation is used to summarize information of buildings and objects with specific dangers which could not be observed on first sight. One of reasons for preparing of this document is for them to be used for fire interventions under difficult conditions. Those conditions could include situations where there is:

- Complex footprint and difficulty in orientation
- Smoke in the object is difficult or impossible to exhaust
- Object or technology where intervention of firefighting unit without previous warning may pose danger to firefighter's health and live
- Occurrence of hazardous substances
- Object where must be established and followed exact fire intervention with specified fire equipment and technique

As **hazardous** properties of substances may be concerned explosivity, high flammability, self-ignitability, ability of fast and strong reaction in contact with water, chemical of physical non-stability, toxicity, radioactivity or acidity.

This document is consisting with two parts including Operative plan for fire and rescue activities and Operative cards for fire and rescue activities which provides methods of fire and rescue activities recommendations to fire chef in case of intervention.

8.1 Operative plan for fire and rescue activities

The fire-fighting documentation consists of an operational fire-fighting plan and an operational fire-fighting card which determine the principles of fast and effective firefighting and rescue of persons, animals, and properties. The goal of firefighting documentation is to create a document for the fire fighter's unit. It should provide firefighters with information about objects. It contains complex conditions for intervention and warns of potential dangers and complications for orientation.

The reason for processing the firefighting documentation is a proposal for measures to fire the activities or objects. In assessing the fire hazard, designing, and processing firefighting documentation, the decisive factor is how complex the firefighting conditions are.

8.2 Operative cards

The operational card is a simplified form of the operational plan.

The operating card consists of:

- text part, which contains the basic characteristics of fire safety of buildings and technologies, design of the building, description of escape routes, location of equipment for fire water supply, location and method of control of other fire safety equipment, places of main water shut-off, gas, method of shutdown electricity, setting requirements for special extinguishing agents and procedures,

- graphic part, which contains the plan of the building, location of surrounding buildings, water sources for firefighting, access roads and boarding areas for firefighting equipment, etc.

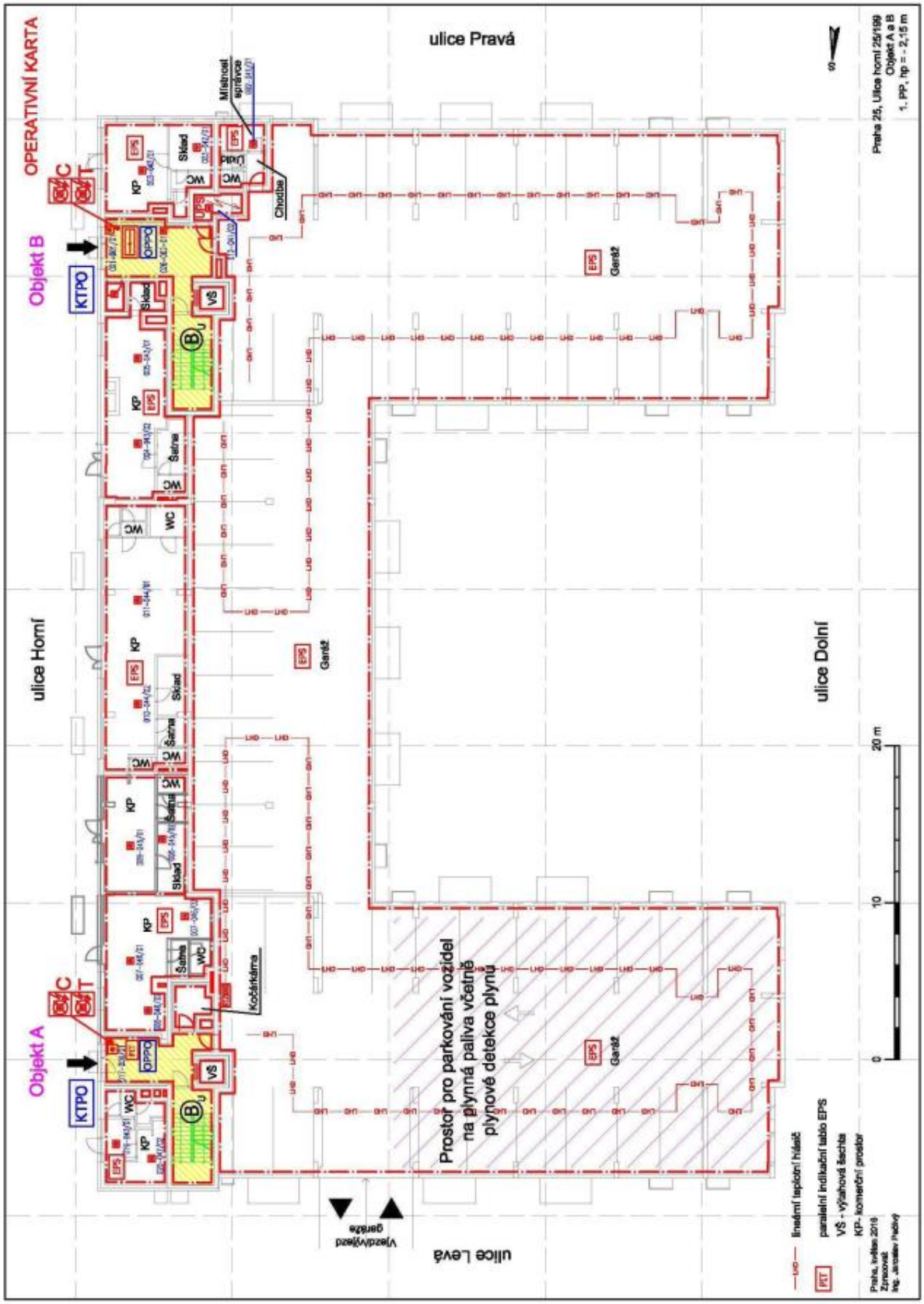

Fig. 26. Example of plan from prescribed firefighting documentation (HZS hl. m. Prahy, 2019)

References

iDNES.cz (2020) *Pneumatika z hořícího jeřábu vletěla oknem do místnosti, kterou zapálila*, *iDNES.cz*. iDNES.cz / Zpravodajstv. Available at: https://www.idnes.cz/brno/zpravy/pozar-jerab-pneumatiky-kozlany-vyskovsko-hasici.A200731_090829_brno-zpravy_vh (Accessed: October 30, 2022).

Pozary.cz. 2020. *Nové Tatry Terra pro HZS Moravskoslezského kraje jsou osazeny nízkofrekvenční sirénou rumbler, nahrazují dosluhující Terrna | POŽÁRY.cz*. [online] Available at: <https://www.pozary.cz/clanek/236852-nove-tatry-terra-pro-hzs-moravskoslezskeho-kraje-jsou-osazeny-nizkofrekvencni-sirenou-rumbler-nahrazuji-dosluhujici-terrna/> [Accessed 25 March 2022].

Pozary.cz. 2020. *Automobilový žebřík Iveco Magirus z pražské stanice v Krči má natáčecí zadní nápravu a sklopný první díl sady | POŽÁRY.cz*. [online] Available at: <https://www.pozary.cz/clanek/222256-automobilovy-zebrik-iveco-magirus-z-prazske-stanice-v-krci-ma-nataceci-zadni-napravu-a-sklopny-prvni-dil-sady/> [Accessed 25 March 2022].

Miková, L., 2018. *Fire Interventing Specifics of Fire Brigade Units During Defeating Extraordinary Events in Densely Populated areas of Towns or Villages*. Bachelor Thesis. Czech technical university in Prague.

Klaubenschalkova, A., 2022. *Ve Františkově se dohadují, jestli pod opraveným mostem projedou hasiči*. [online] iDNES.cz. Available at: <https://www.impuls.cz/regiony/ustecky-kraj/most-zeleznicni-trat-frantiskov-nad-ploucnici-oprava-spory.A171221_110604_imp-ustecky_kov/tisk> [Accessed 25 March 2022].

2020. *Bronto Skylift F-RLX/RPX - VERSATILE AERIAL PLATFORMS*. 1st ed. [ebook] Bronto Skylift. Available at: <https://brontoskylift.com/wp-content/uploads/2019/10/F-RLX-RPX_range_EN-ID-53589.pdf> [Accessed 25 March 2022].

Furby, G., 2017. *London tower fire: Why were taller fire platforms not used?*. [online] BBC News. Available at: <https://www.bbc.com/news/uk-england-london-40357535> [Accessed 25 March 2022].

Steelway.co.uk. 2020. *Steelway | Steel Fabrication Company*. [online] Available at: <https://www.steelway.co.uk> [Accessed 25 March 2022].

Unistrutstore.com. 2020. *Roof Equipment Access Platform*. [online] Available at: <https://unistrutstore.com/media/wysiwyg/Roof-Equipment-Access-Platform.jpg> [Accessed 25 March 2022].

HIFI24. 2020. *SeTec KTPO klíčový trezor požární ochrany*. [online] Available at: <https://www.hifi24.cz/schraner-ktpo-kl%C3%AD%C4%8Dov%C3%BD-trezor-po%C5%BE%C3%A1rn%C3%AD-ochrany> [Accessed 25 March 2022].

Hltrade.cz. 2022. *Klíčový trezor požární ochrany*. [online] Available at: <https://www.hltrade.cz/modules/tableadmin2/external/imageext_new.php?modal=true&image=WG9+Y3N+ZHNjaTAwMjAuanBnfmdhbGVyaWV+b2JyYXpla19jb3VudGVyfjE4fmdhbGVyaWV+MX4zMX5vWQ==&width=640&height=480> [Accessed 25 March 2022].

Stavby a požárně bezpečnostní zařízení – Malá encyklopedie požární bezpečnosto objektů a technologií; MV – GŘ HZS ČR; Praha 2010; Ing. V. Kratochvíl, Ph.D.; Ing. Navarová, Ph.D.; Ing. M. Kratochvíl

Pozary.cz. 2010. *Parkování a hydranty kontrolovali hasiči v okresu Bruntál | POŽÁRY.cz*. [online] Available at: <https://www.pozary.cz/clanek/25323-parkovani-a-hydranty-kontrolovali-hasici-v-okresu-bruntal/> [Accessed 25 March 2022].

2022. *Zdroje vody k hašení požárů na území Pardubického kraje*. [ebook] Pardubice: Hasičský záchranný sbor Pardubického kraje. Available at: <https://www.hzscr.cz/soubor/problematika-zabezpeceni-verejnych-zdroju-vody-k-haseni-pozaru-640568.aspx> [Accessed 25 March 2022].

rightconsultgh. 2019. *Fire*. [online] Available at: <https://fire.rightconsultgh.com/product/wet-riser-vertical-outlet-full-cabinet/> [Accessed 25 March 2022].

Starcofire.com. 2022. *STARCO | Fire Protection Engineers*. [online] Available at: <https://www.starcofire.com/product-info/dry-riser-system> [Accessed 25 March 2022].

Wuwejův zápisník. 2022. *Žebřík s hasicím potrubím*. [online] Available at: <https://blog.wuwej.net/2014/12/04/zebrik-s-hasicim-potrubim.html> [Accessed 25 March 2022].

Křečková, M., 2022. *Suchovod jednoho z panelových domů v Benešově se proměnil v odpadkový koš*. [online] Benešovský deník. Available at: <https://benesovsky.denik.cz/zpravy_region/suchovod-jednoho-z-panelovych-domu-20100817.html> [Accessed 25 March 2022].

Hanuška, Z. 1996. Metodický návod k vypracován dokumentace zdolávání požárů, MV - ředitelství Hasičského záchranného sboru ČR, Jílové u Prahy, ČR: FACOM

HZS hl. m. Prahy (2019) Zásady pro zpracování DZP – HZS hl. m. Prahy. Praha, Czechia: HZS hl. m. Prahy.