FireFighting

Smoke Control in High Rise Fires

Basics Principles and Tactics
Rescue vs. Firefighting depend on Smoke Spread

Prof. Dr.-Ing. Michael Reick
Our Fire Fighting Experience is influenced by our equipment, tactic, training, members, built environment and tradition.
Successful Fire Fighting

Tactical Decision

Rescue People

Extinguish the Fire

Air/Smoke Flows

or

Defend in Place

Fire Ventilation

Safe Place Concept

Fire Dynamics

Hazardous Areas / Safe Attack&Egress Routes

(Smoke = Toxic Gases + High Temperature + Low Visibility)

=> **Stairway Protection / Smoke Flow Control** is a **key factor**
New York
Manhattan
John Street
Nov. 2016

View from a Civilian:
https://www.youtube.com/watch?v=GqozRpx9BIs
Paris, France:
You can fight the way you are trained!
Two of many lessons learned!?

Rescue through smoke! => smoke hoods

Stairway protection! => smoke curtains
Housing Situation in Germany

Mio. of people living in these houses

Number of Apartments per House

38 Mio.

42 Mio.

Mio. of units

1 2 3 bis 6 7 bis 12 13 bis 20 > 20
Flow Path Control

Fire in a closed compartment vs. Fire with flows?

Extinguishment vs. Containment?

SOPs?
Multiple Flows / Bi – or Uni-Directional Flows

Fire can exchange gases within the building and/or to the outside:

Flow of Smoke
Flow of Air
Fire in a multi-story building:

*The stairway is the most important room!*
**Interior attack:**

**open doors** allow

- *a*) *smoke spread*
- *b*) *air flow to the fire*
Interior attack:

First hoseline interferes with the safety design of the building!

Door squeezes the first line!

*Train in these buildings!*
7 possibilities to do “Door Control”

1) Keep the door closed
2) Close the door behind you
3) Control the door with staffing
4) Control the door with a chock, ..
5) Cut the door partially
6) Prepare all doors for that purpose
7) Control openings as needed with a tool
Bidirectional flow

Unidirectional flow

Improved unidirectional flow

1: Start safe: limit air flow

2: fire controlled: ventilate!!

Always avoid:
**Improved unidirectional flow**

Bidirectional flow

creates a lot of turbulence

increases volume of ignitable gases

*Improved* unidirectional flow!

Just with blocking the upper part of the entrance door!
Major influences on fire ventilation
Apartment fire in Heilbronn - 2006
Apartment fire in Munich – 2008
26.10.2009 – Würzburg

Fire in Hospital
Apartment fire in Vienna – 2014
Highrise Fire in Göppingen, Germany, Nov. 21, 2019

Fully developed apartment fire with 1 person inside; A: lobby / B: dry riser / C+D: double door system double door system to stairs with dry riser water supply between the doors; smokestopper used!
some universal statements

The experience of the fire service all around the world is limited to …

• “… how we have always done it”
• … the equipment we used so far
• … how we trained and fought so far
Be aware of yourself and your environment

- Buildings
- Society
- Fire service
  (tradition, strength, experience)
- What others do differently and why

some universal statements
some universal statements

Know your strategy:

“Rescue” vs. “Extinguishment”
- a) “Full Evacuation”
- b) “Defend in place”
- a) aggressive
- b) defensive

(confinement)

Know the basics:
- Tactics
- Fire dynamics
- Skills for Extinguishment
- Smoke spread control
some universal statements

Smoke spread control is essential

• Know your environment regarding building ventilation and that you interfere with it!
• Nearly every action on the fire ground can influence smoke spread!
• Smoke is killing people!
some universal statements

Be able to do basic things that are common around the world!

- Protect the stairway!
  Given building systems / smoke curtains

- Get water on the fire – fast!
  But do not encourage fire and smoke spread

- Rescue through smoke filled areas!
  Smoke hoods (filter and air supply)

Attack-Team:
Equipped to rescue one person with smoke hood (filter vs. air supply)

RIT-Team:
Equipped to rescue one uncouscious person up to four cooperating civilians
some universal statements

Stabilize the situation first  
(Do not make it worse!)  
Do not allow smoke spread

Protect egress routes (stairways!)  
Especially if you use a “stay in place” tactic
Smoke Control and Stairway protection is essential *(especially in highrise fires!)*