



Interim overview of research



Preface

Fire prevention and fire suppression = 1 profession!

Combination of different research methods

participative practical research

Research Projects

Case studies: underdeveloped fires & elderly in home fires

DATA

command & control

Quadrant model

Practical research Quadrant model

defensive external attack

offensive external attack

defensive internal attack

offensive internal attack

A new standard: "Theory of the predictable outcome"

(for fire prevention and for fire suppression)

Basis:

1. Do we know where the fire is??
2. Can we reach it?
3. Do we have sufficient cooling capacity?

→ Put it out!

1 x NO = predictable outcome!



NVBV kennisdag 14 juni 2017
 Ricardo Weewer, professor Fire Service Science
 the Netherlands Fire Service Academy

Preface

Fire prevention and fire suppression = 1 profession!

de Brandweer over morgen
 Fire Service vision 2040

Reduction of the probability of a fire

Reduction of the effects of a fire

The new fire safety doctrine

knowledge of fire and fire development

Combination of different research methods

Kennisontwikkeling

simulaties FSE	fire investigation
business intelligence	full scale experiments

participative practical research



Toepassing van FSE simulaties om branden te begrijpen



Research Projects

Case studies:
underventilated fires & elderly in home fires



fire behaviour and escape in single family dwellings

command & control



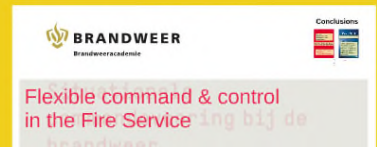
Quadrant model



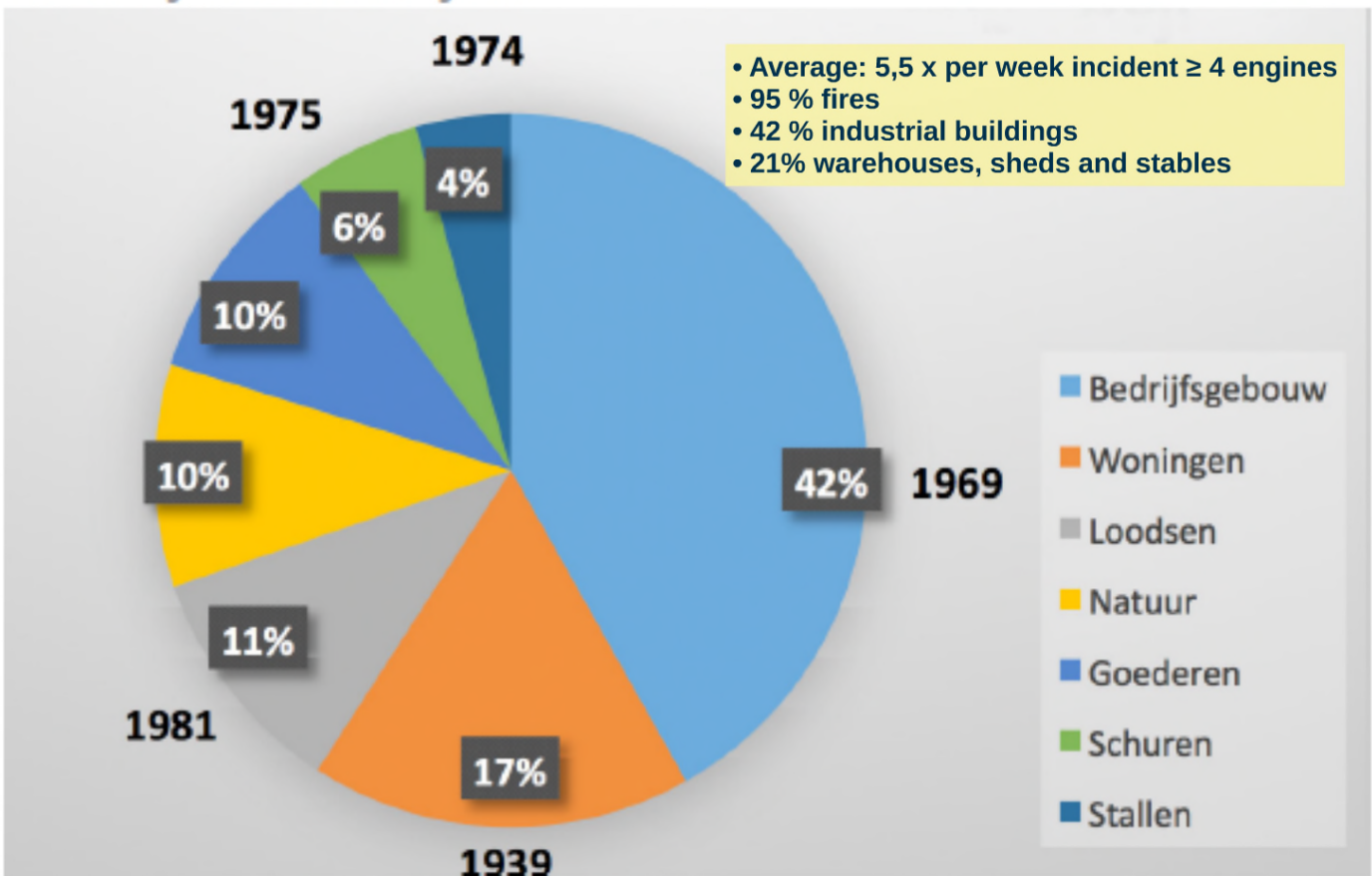
DATA



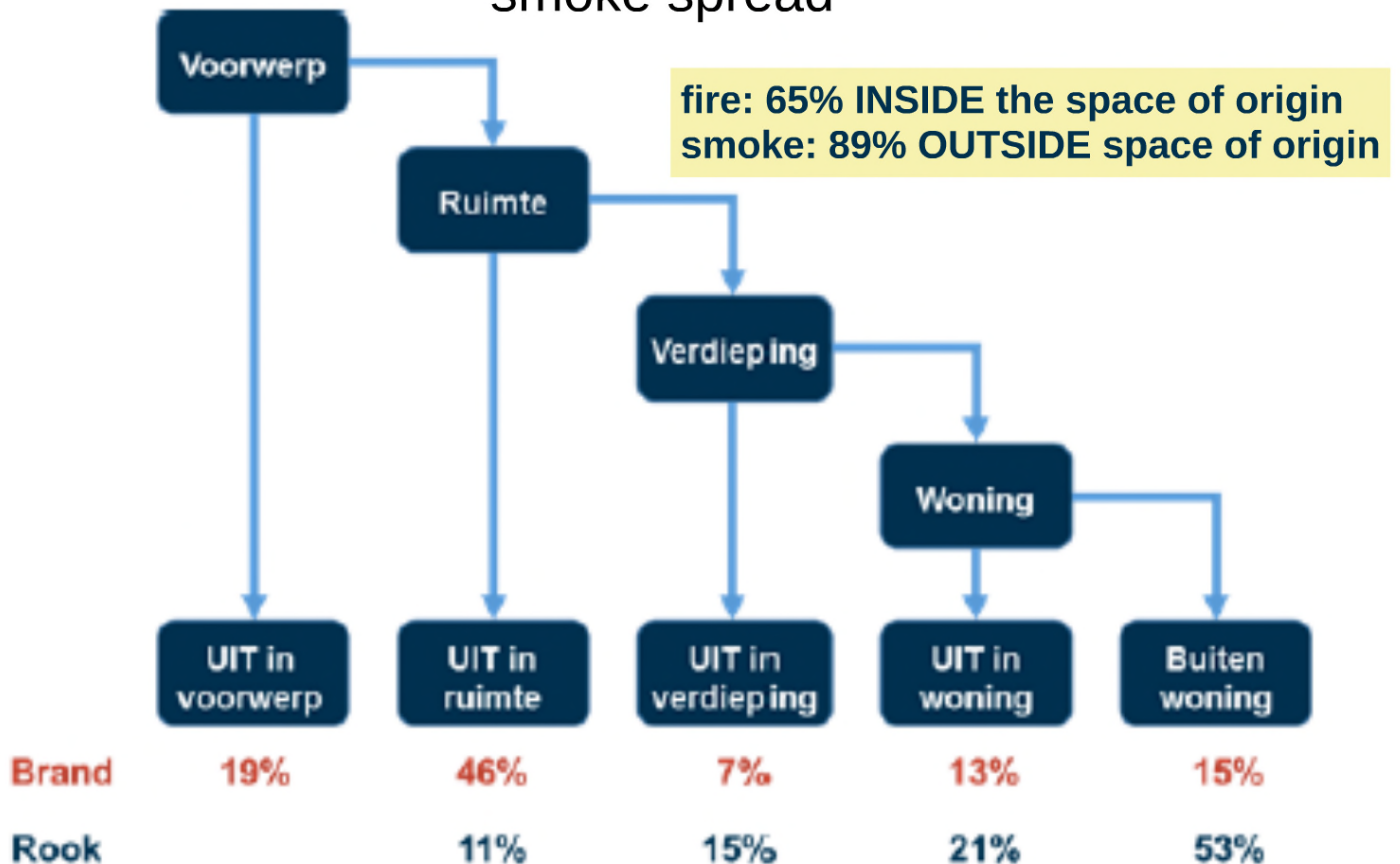
command & control



Bronobject en bouwjaar



smoke spread



Case studies: underventilated fires & elderly in home fires



SMOKE SPREADS OUTSIDE COMPARTMENT

- fire resistance \neq smoke resistance
- (sub) fire compartments ?
- first extinguish the fire or first rescue ?

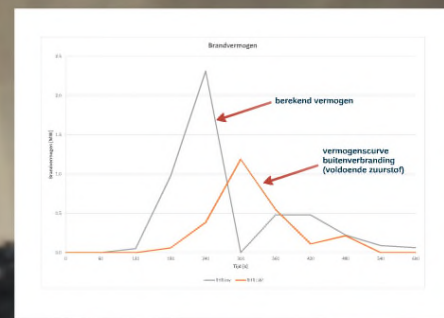
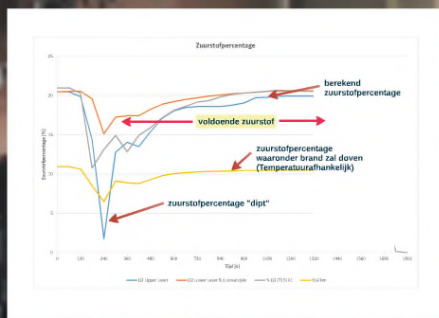
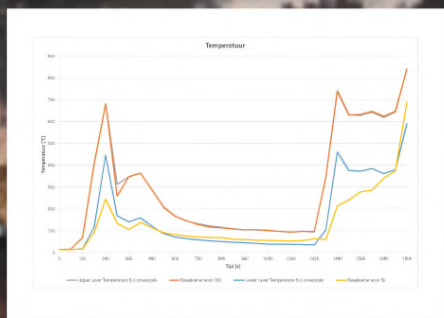
Brandweer redt slechthorende vrouw uit woning in Dordrecht Verzorgingshuis Weidum - stroomd om rook

conclusion:
Premisions of the law are NOT true!

- branden ontstaan niet altijd in eigen woning
- bewoners vaak niet binnen 30 min in veiligheid
- zelfstandig wonen \neq zelfredzaam
- brand en rook blijven niet in appartement



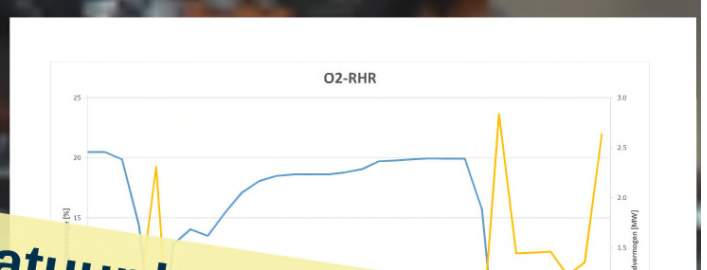
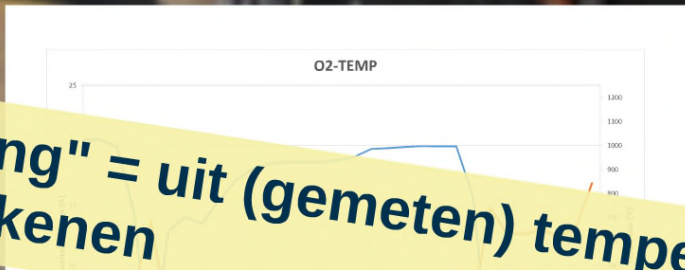
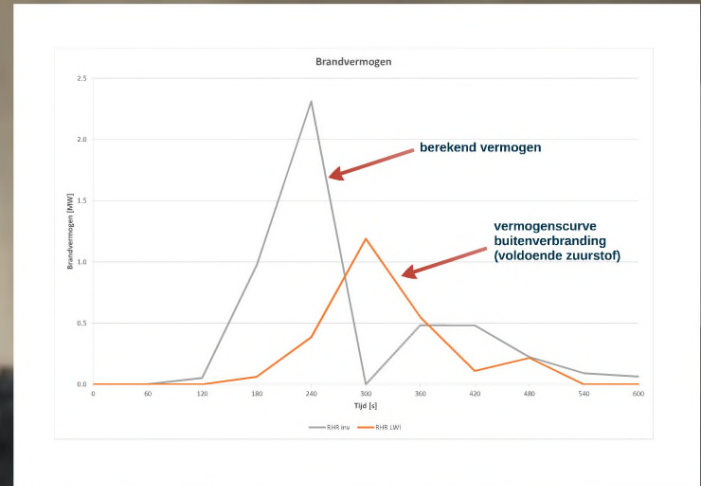
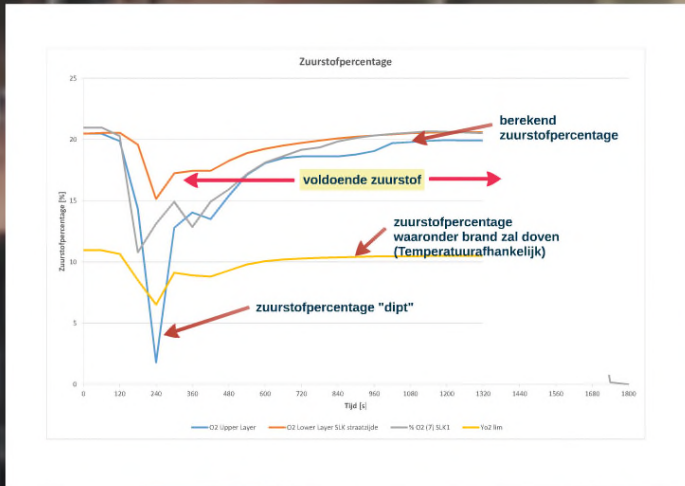
Wetenschap gekoppeld aan praktijk Proef 6 Zutphen: brand in bed in slaapkamer, deur open



"inversed modelling" = uit (gemeten) temperatuur het vermogen terugrekenen

Plan gekoppeld aan praktijk

Brand in bed in slaapkamer, deur open



ing" = uit (gemeten) temperatuur berekenen



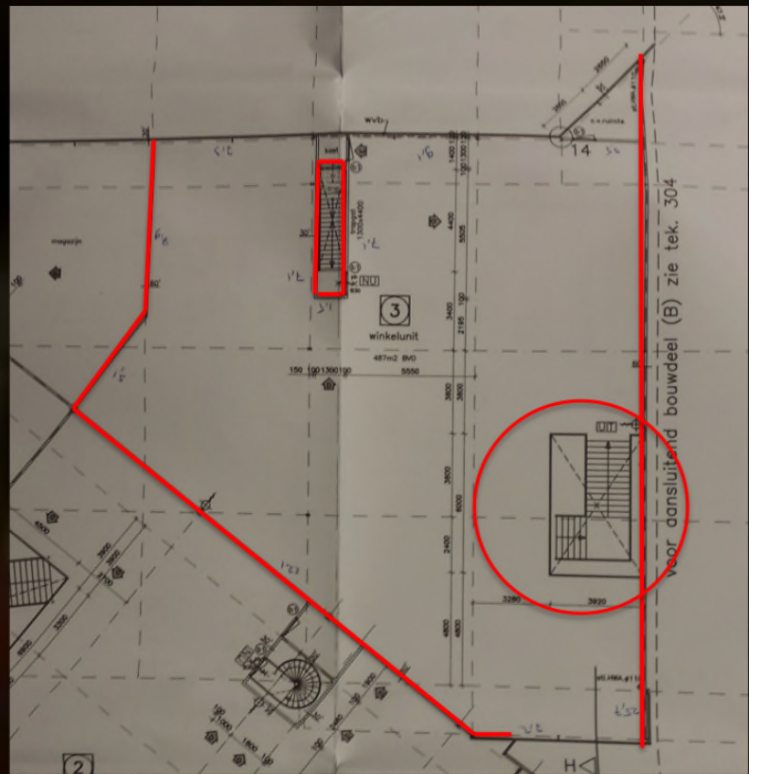
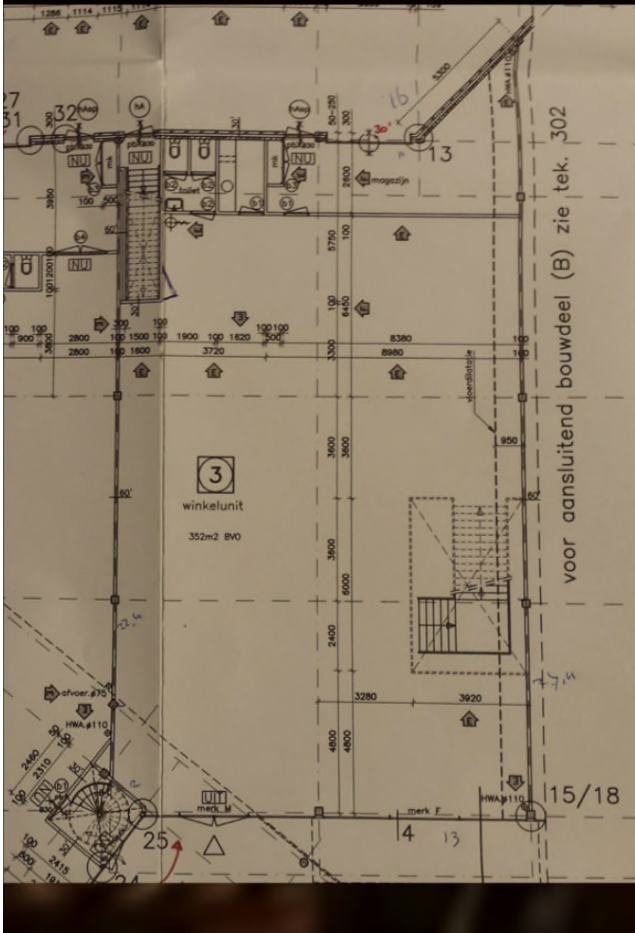
MEDIA TV

GROTE BRAND IN MEUBELZAAK

Brouwerstraat, Sliedrecht

4 maart 2016

Gebouwbeschrijving



16:58 u • Brandmelding (GMC)

17:06 u • TS 1 ter plaatse

17:18 u • OvD ter plaatse
Strategie: inpakken en wachten op uitslaand

17:36 u • HOvD ter plaatse
bijgestelde strategie: cobra en gat in dak

18:07 u • Cobra gealarmeerd

18:39 u • Gat in dak (hoogwerker)

19:17 u • Inzet Cobra
na temperatuur daling afblussen LD

20:26 u • Brandmeester

Diagram of building layout showing fire zones and escape routes. The building is divided into three zones: 1e inzet (blue), 2e inzet (green), and 3e inzet (orange). The total area is 487 m². A red arrow points to the "ingang vluchttrap" (escape staircase entrance). A red box highlights the "Vlucht trappenhuis" (escape staircase). A red box highlights the "Trapwinkel" (staircase angle). A red box highlights the "Roobol" (fire hose reel). A red box highlights the "60 min" fire resistance rating. A red box highlights the "30 min" fire resistance rating. The building is situated between "Roobol" and "Kwantum".

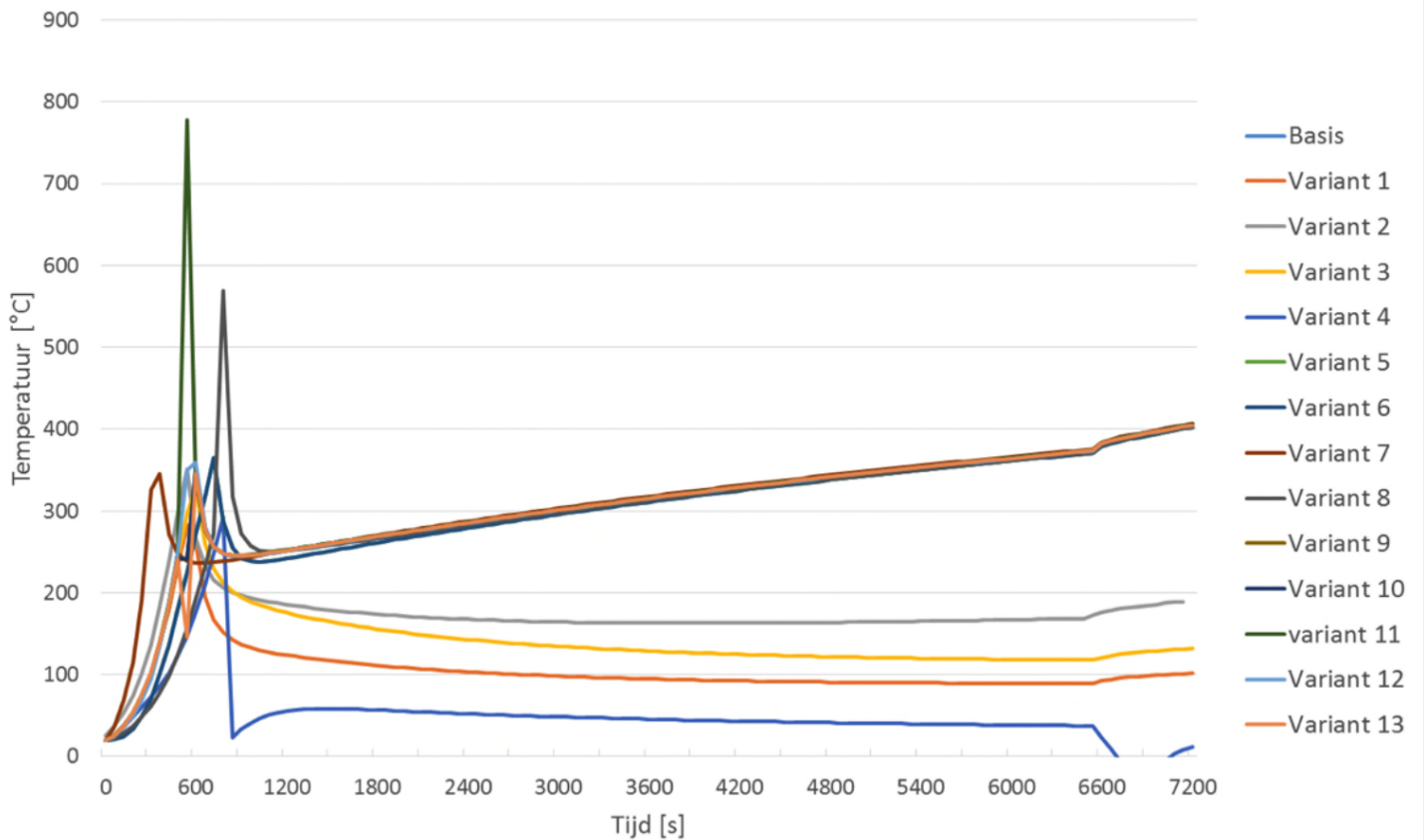
Incidentbeschrijving



- 16:58 u • Brandmelding (GMC)
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Gevoeligheidsanalyse



Research Projects

Case studies:
underventilated fires & elderly in home fires

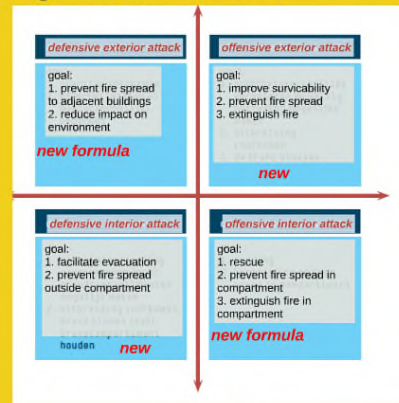


fire behaviour and escape in single family dwellings

command & control



Quadrant model



Practical research Quadrant model

defensive external attack



effect of smoke to be investigated

1. water on adjacent wall is better than water screen
2. smoke reduction is probably impossible

IMPACT

effectivity techniques



Electromagnetic fields?

TU Delft

size up



Command & control

Human Factors



offensive external attack



finished 2015
summary report: soon

Buildings



Techniques



1. offensive exterior attack in the fire room is the best --> a thorough size up is necessary
2. techniques with long streams in large compartments
3. room-for-room tactic
4. meer ruimten: het hang ervanaf



Smoke explosions!



defensive internal attack



Fire development and smoke alarms

1. standard fire development does not exist
 2. smoke spreads faster than we thought
- ability can be longer thought

offensive internal attack

defensive external attack

off



effect of smoke to be investigated



1. water on adjacent wall is better than water screen
2. smoke reduction is probably impossible

IMPACT

effectivity techniques



Electromagnetic fields?

fundamental research after 2015
TU Delft
University of Technology

size up



Command & control
Human Factors



situational command & control

Bui



Task	Person 1	Person 2	Person 3	Person 4
T1	Green	Red	Red	Red
T2	Green	Red	Red	Red
T3	Green	Red	Red	Red
T4	Green	Red	Red	Red
T5	Green	Red	Red	Red
T6	Green	Red	Red	Red
T7	Green	Red	Red	Red
T8	Green	Red	Red	Red
T9	Green	Red	Red	Red
T10	Green	Red	Red	Red

Task	Person 1	Person 2	Person 3	Person 4
T1	Green	Red	Red	Red
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T4	Green	Red	Red	Red
T5	Green	Red	Red	Red
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T7	Green	Red	Red	Red
T8	Green	Red	Red	Red
T9	Green	Red	Red	Red
T10	Green	Red	Red	Red



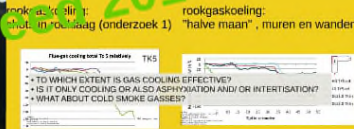
Smoke explosions!



defensive internal attack



Rookgaskoeling met DLS(ONeSeven), schuim, water



verkenning en Fysieke belasting



- hoe ver komt de rook uitvallen en hoe groot is het te verwachten oppervlak?
- zonder HD straal
- met HD straal
- met HD straal en WBC
- koude, verdichte rook

Case study underventilated fires



Sandwich panels / breaking of windows



Fire development and smoke alarms



1. standard fire development does not exist
 2. smoke spreads faster than we thought
- ...ability can be longer thought
- "it depends"

offensive internal attack



Fire development and smoke alarms



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HÉ DOE DE DEUR DICHT!



+



=



ve internal at

Sandwich panels / breaking of windows

Establishing flammability ranges of building insulation materials
Graduation study

Fire Behavior Of Sandwich Panel Core Materials In The Pre-flashover Phase
Indicative research

Fire behavior of synthetic insulation materials in building constructions
Literature study

THESIS BUILDING TECHNOLOGY

SAFETY DURING AN INTERVENTION OF THE FIRE SERVICE |
An experimental research to the influence of pressure build-up on the pane behaviour during fire in well insulated dwellings.

TU/e Technische Universiteit Eindhoven University of Technology

BRANDWEER TU/e Technische Universiteit Eindhoven University of Technology

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Decision making under pressure

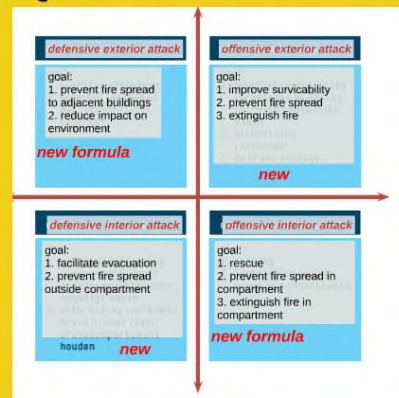


Forgiving infrastructure



fire behaviour and escape in single family dwellings

Quadrant model



A new standard:

"Theory of the predictable outcome"

(for fire prevention and for fire suppression)

- Take time!

- We have more time than we think!
- all closed = pause, open = speed up!

Basis:

1. Do we know where the fire is??
2. Can we reach it ?
3. Do we have sufficient cooling capacity?

--- > Put it out!

1 x NO = predictable outcome!

THINK OUTSIDE
approach from
outside > exterior
size up

maybe go inside:

- Signals (stroming)
- Maximum distance!
- Door management!
- Cooling capacity
- Transitional Attack

Sofa: ca 2,5 MW --> HD (125l/min)= ca 2,5 MW
Appartment 40 m2: ca 10MW --> LD (400 l/min) = ca 10 MW
industrial building / warehouse 1000 m2: ca 500 MW --> ??



Do we know where the fire is??

- Signals (stroming)

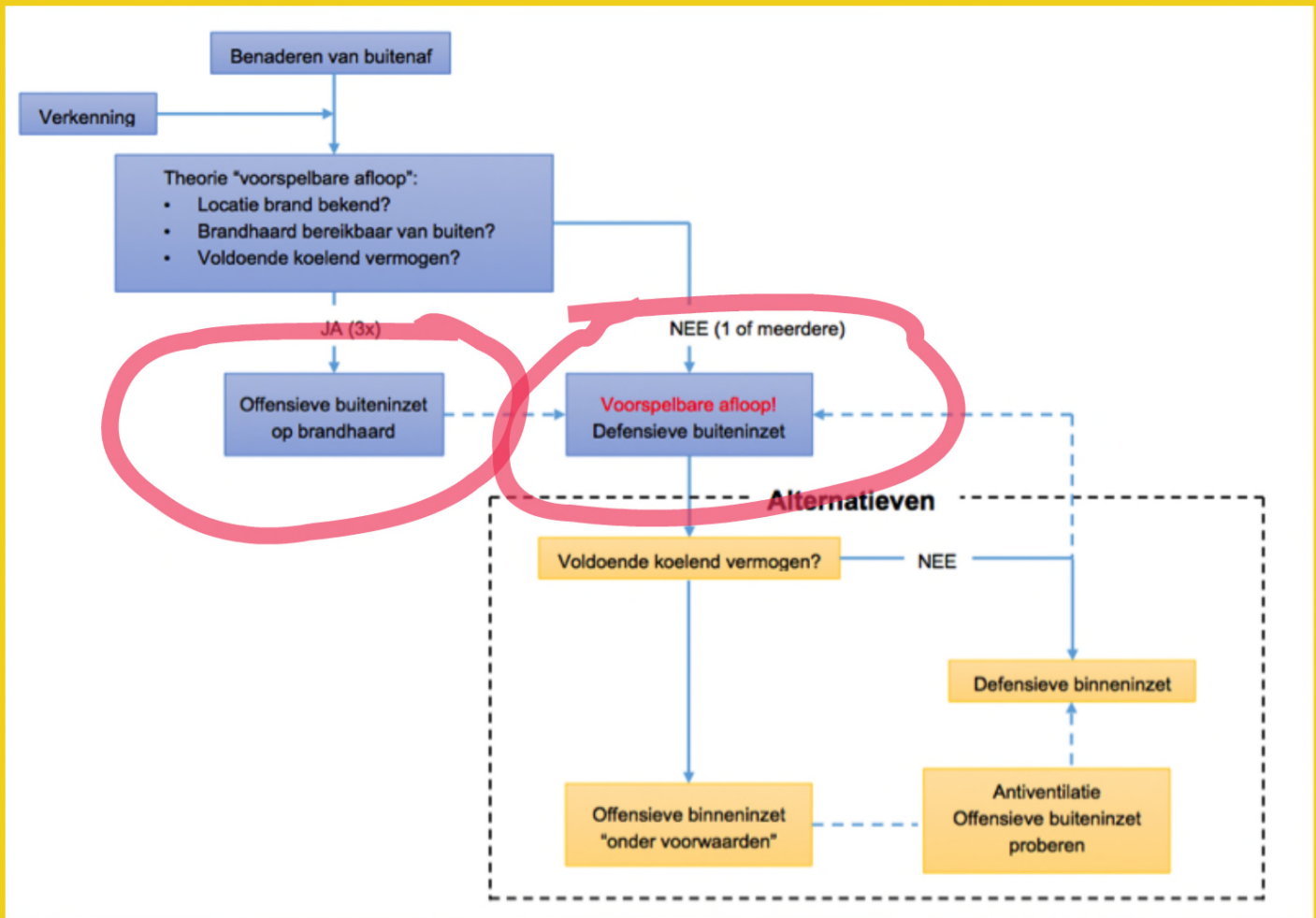
- Maximum distance!
- Door management!
- Cooling capacity
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Do we have sufficient cooling capacity?

Sofa: ca 2,5 MW --> HD (125l/min)= ca 2,5 MW
Appartment 40 m2: ca 10MW --> LD (400 l/min) = ca 10 MW
industrial building / warehouse 1000 m2: ca 500 MW --> ??

Can we reach it?
Predictable outcome!





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- defensive external attack
- offensive external attack
- defensive internal attack
- offensive internal attack

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Other notes: 'Take time!', 'We have more time than we think!', 'All closed - push open - opened up!', 'Think outside the box!', 'maybe go inside!', 'Signals (strong)', 'Minimum distance!', 'Door management', 'Cooling capacity', 'Transitional Attack'.

Small photo of Ricardo Weewer at the bottom left.

NVBV kennisdag 14 juni 2017
 Ricardo Weewer, professor Fire Service Science
 the Netherlands Fire Service Academy

