dsb Direktoratet for samfunnssikkerhet og beredskap

Test Program with Small Concrete “kasun” Houses

done by

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Et trygt og robust samfunn – der alle tar ansvar

A regulators challenge

- Balancing safety and security considerations
- Implementing the increased public (politician) demand of stricter security regulations

Weapon- / Ammunition- / Explosive-magazine (house) (No: Kasun)

2002, Introductory trials:

- 2 m x 2,5 m x 2,2 m
- 15 cm reinforced concrete

  (20 cm in front)
- Security door

2003, Extensive tests:

- 2 x 2 x 2 m

Safety study of small ammunition/explosives houses

Objectives

- Establish Q-D for small concrete houses
- Demonstrate by full scale tests the amount of explosives that may be stored before concrete ”kasun” structures start to break up
- Document pressure and debris around small ammunition houses after detonation of high explosive contents
- Compare the effect in vented and closed storages
- Study the effect of water mitigation

Test

- Loading densities in the range 0.025 – 6.25 kg/m^3 (0.2 – 50 kg)
- C4
- PETN based plastic explosive

- Instrumentation:
  - Pressure gauges – three different directions at four different distances (+ inside)
  - High speed video
  - Pre-selected debris collection sectors

0,2 kg C4

0,6 kg C4

1,0 kg C4

Damage levels

- No damage was observed after detonation of 0.2 kg

Charge weight 0.6 kg

Charge weight 1.0 kg

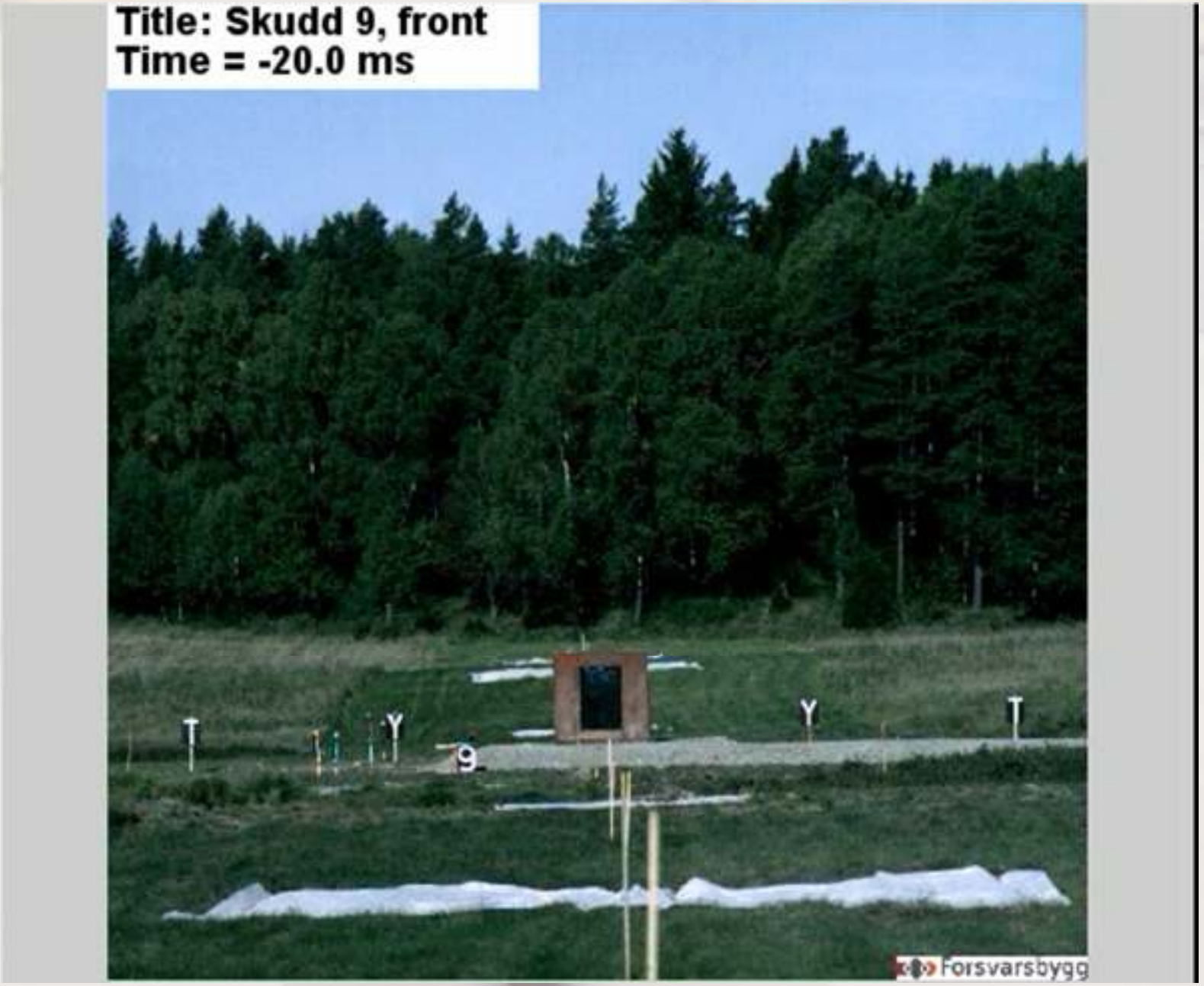
Damage levels after tests with 2.0 kg PETN

Closed door

Vented (door removed)

Closed **door, Water mitigation (6 l water**)

10 kg
PETN



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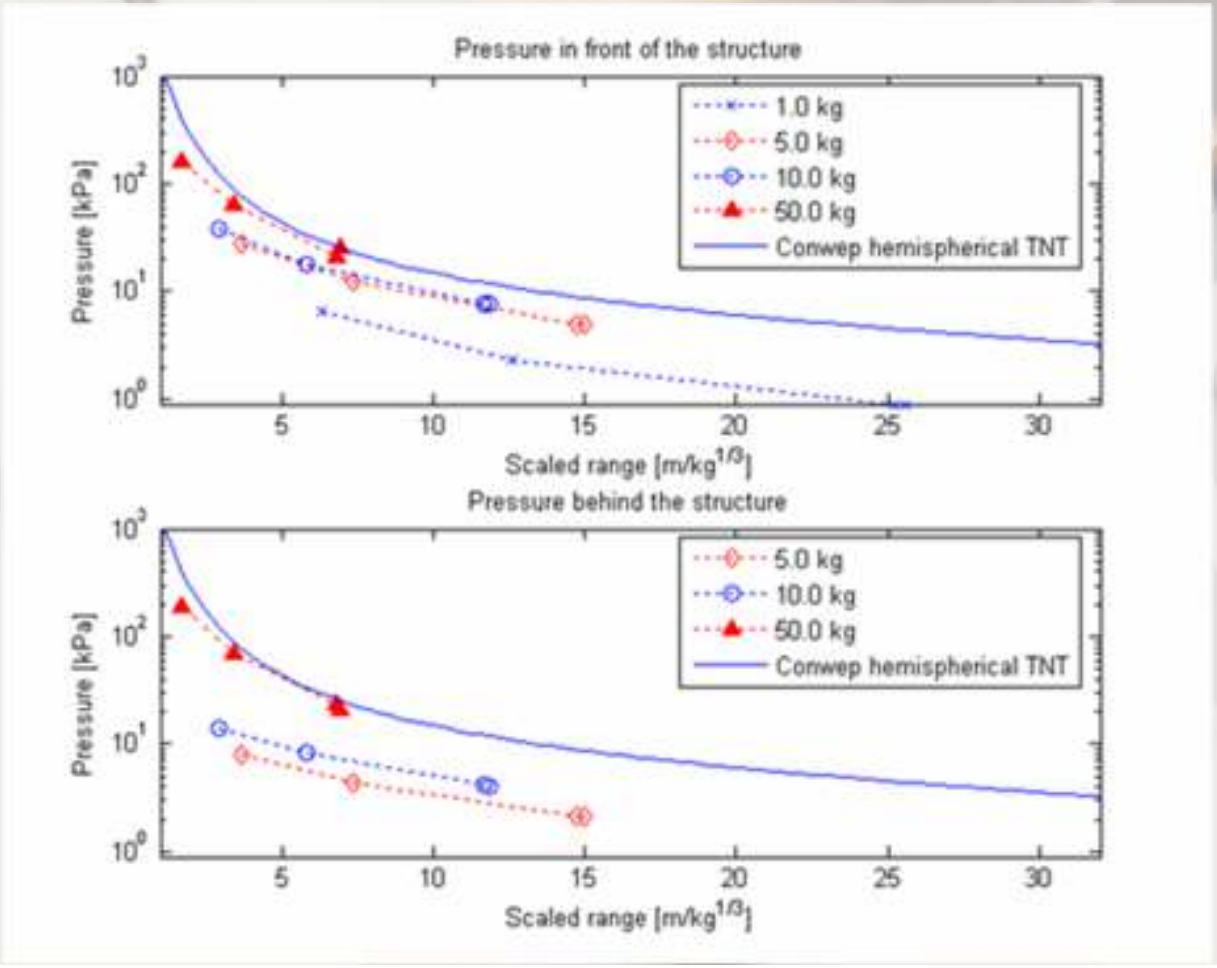
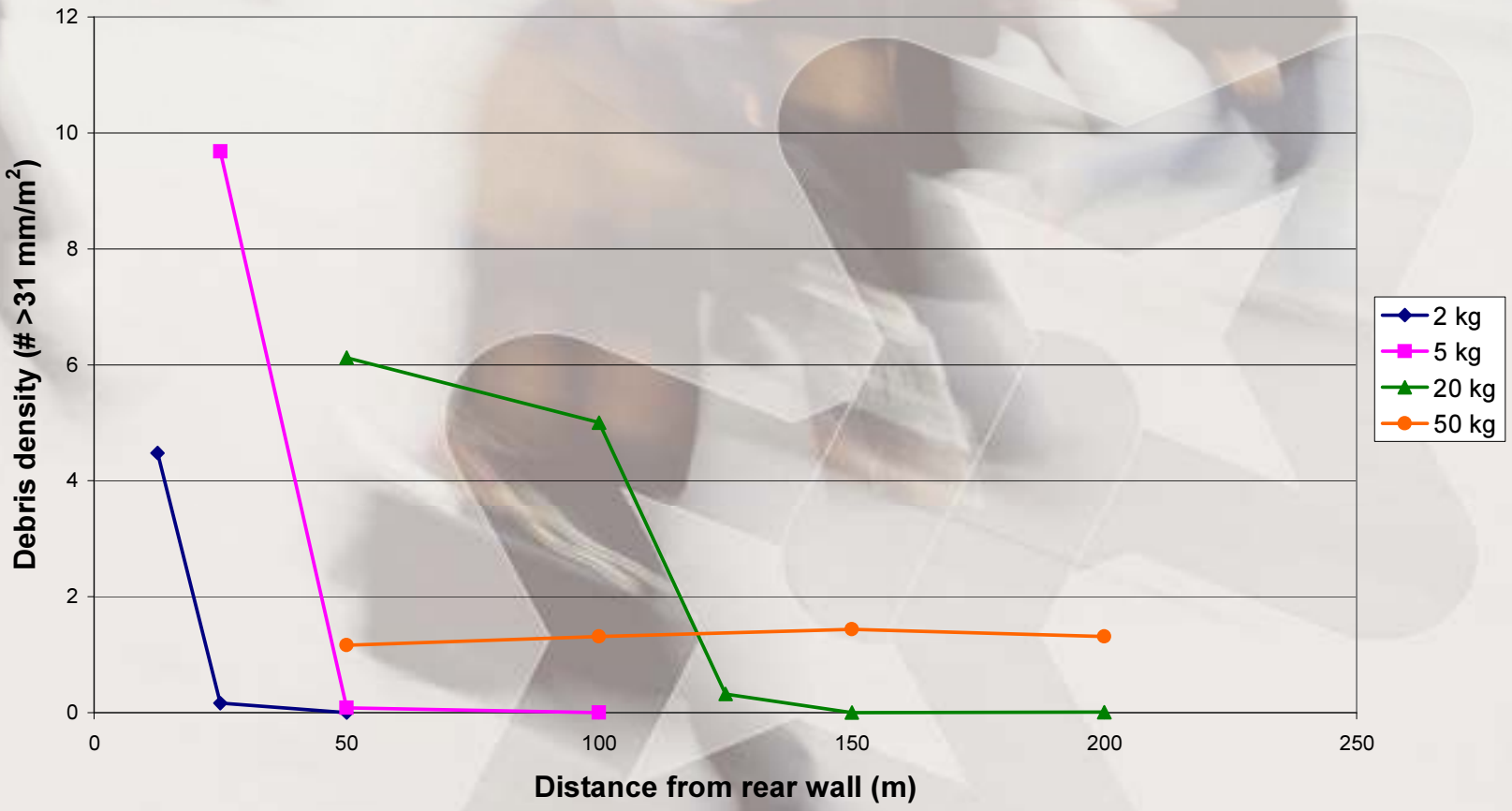
50 kg
PETN

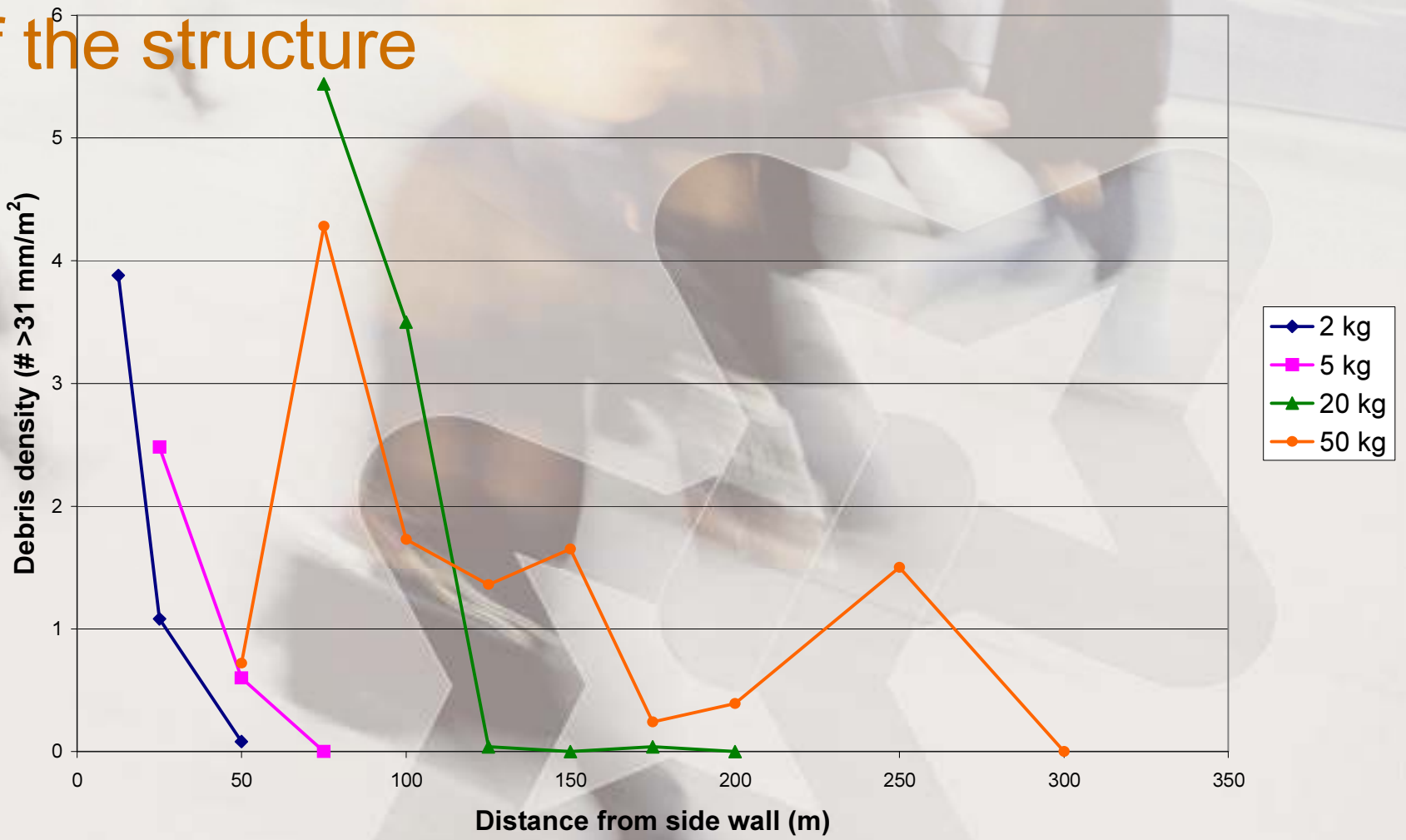
Pressure levels in front of and behind the structure



Debris density (number of debris larger than 31 mm per square meter) in the rear direction



Debris density (number of debris larger than 31 mm per square meter) to the side of the structure



Summary

- The test program has resulted in a large database for air blast and debris distribution around small concrete ammunition houses
- Results of the trials will be used in risk analyses of similiar storages
- A good set of data has been provided for the support of the further development of the DISPRE 3 software (Klotz Group effort)

Further information and Conclusions

- - are to be found in the test report:

  Report_main_final.pdf

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Thank you for your attention!