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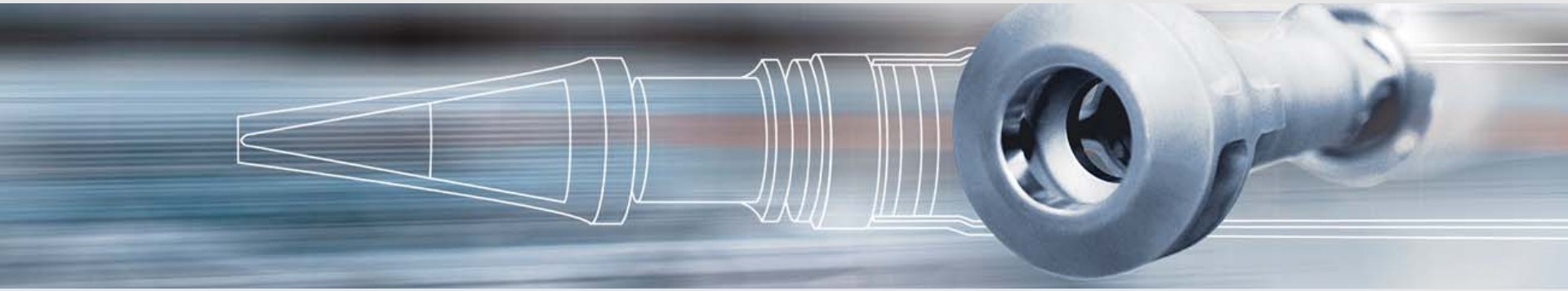
105/120/125 mm PELE Firing Results



NDIA - 40th Annual Armament Systems:
Guns-Ammunition-Rocket-Missiles Conference & Exhibition
New Orleans, LA; April 25 - 28, 2005

Dr. Lutz Börngen, Wolfgang Stein

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Penetrator with Enhanced Lateral Effect

Cooperation: GEKE, ISL
Teaming Agreement with General Dynamics - OTS
Support: BWB-Germany, Royal Netherlands Army

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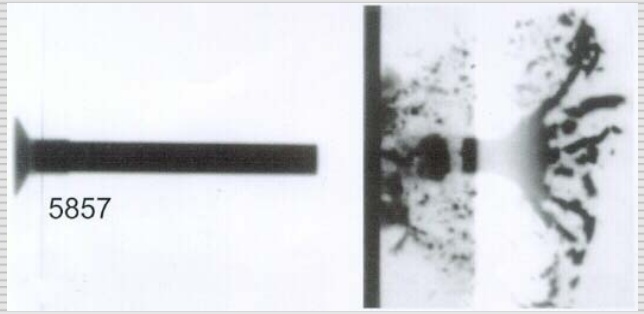
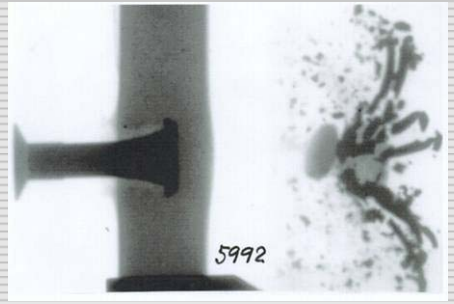
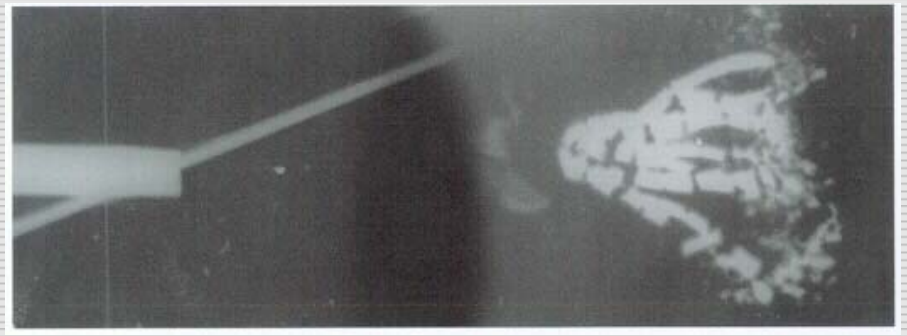
PELE - Principle of function

- Tungsten casing penetrates a target similar to a KE penetrator
- The internal medium, with a lower density, cannot penetrate the target
- Due to generated high internal pressure, the Tungsten casing expands and disintegrates into fragments







Source: ISL

105/120/125 mm PELE Firing Results

Characteristics

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KE rounds

MBT

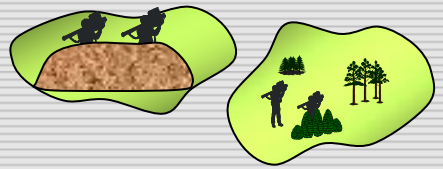
PELE rounds

Point targets in urban areas, e.g. snipers and rocket launcher operators

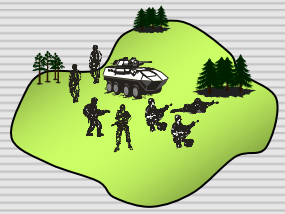
Walls and earthen targets, e.g. dugouts, sandbag barriers

Light armored or unarmored fast-moving vehicles

HE rounds



1st Priority: Guided missile positions behind / under cover



2nd Priority: dismounted infantry and light armored vehicles

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Rheinmetall's idea

Use of in-service or older generation ammunition

Modify the ammunition with a goal of reducing collateral damage

If possible, increase performance in certain targets

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Ammunition tested in 2002 - 2004

105 mm

- KE – PELE modified DM33
- MP – PELE modified DM68

120 mm

- KE – PELE modified DM33 A1/A2
- MP – PELE modified DM12 A1 (M830)

125 mm

- KE – PELE modified BM 15

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Targets

Buildings

- Double Reinforced Concrete - 200 mm (8”) - STANAG 4536
- Clay Brick Wall - 450 mm (18”)
- Double Reinforced Concrete - 200 mm with Container

Light armored vehicles

- Spaced RHA Target - 10mm at 60° NATO
- RHA Target - 100 mm at 60° NATO
- Armored Observation Vehicle (former Jagdpanzer Cannone 90 AT)
- Other NATO targets

Firing positions - snipers

- Sand Bag Wall - 500 mm (20”)
- Trunk - 400 mm (16”)

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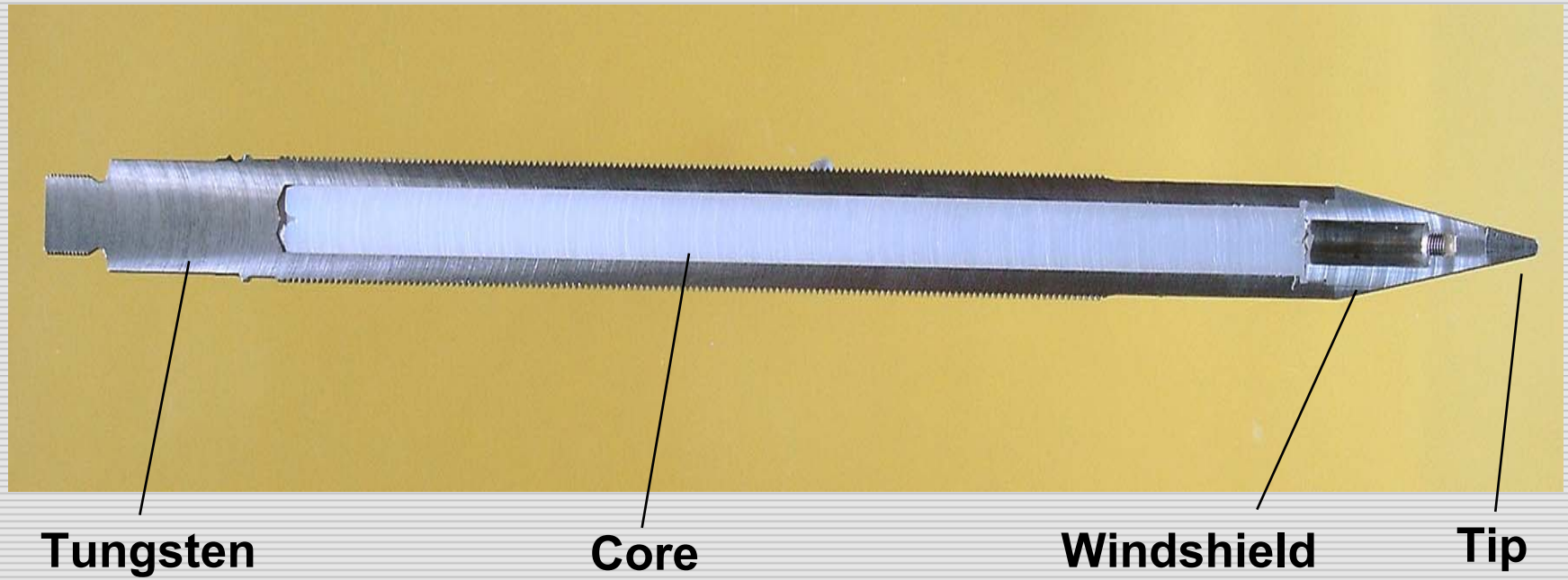
120 mm DM 33 KE - PELE

Sectional view of the PELE-Penetrator



120 mm DM 33 KE - PELE

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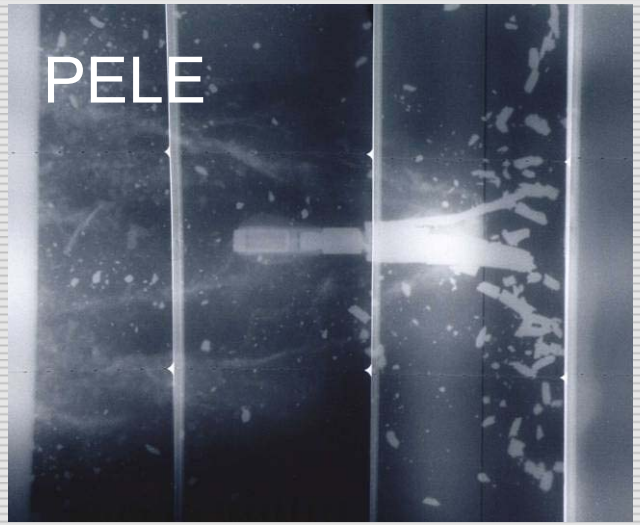
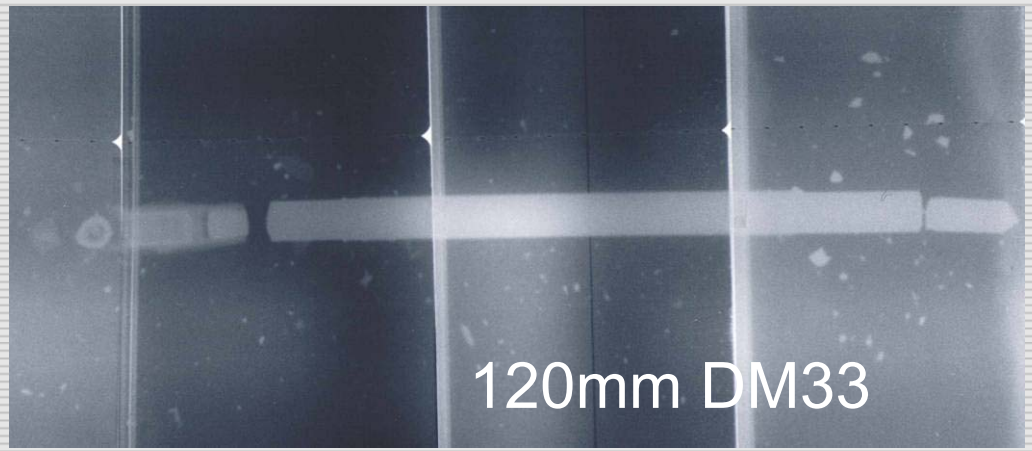
200 mm Double Reinforced Concrete



X-ray 500 mm behind target

PELE: distinct dismantling into many fragments

KE: fractures at predetermined points at tip and screwed joint of stabilizing fins, penetrator remains unbroken, few fragments from the tip of the penetrator and concrete fragments



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120 mm DM 33 KE - PELE

200 mm Double Reinforced Concrete with Container

120 mm DM 33 KE - PELE

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200 mm Double Reinforced Concrete with Container

Rear side of concrete inside the container

Performance of fragments and overpressure inside the container:

Large destruction inside container with Minimum Collateral Damage

120 mm DM 33 KE - PELE

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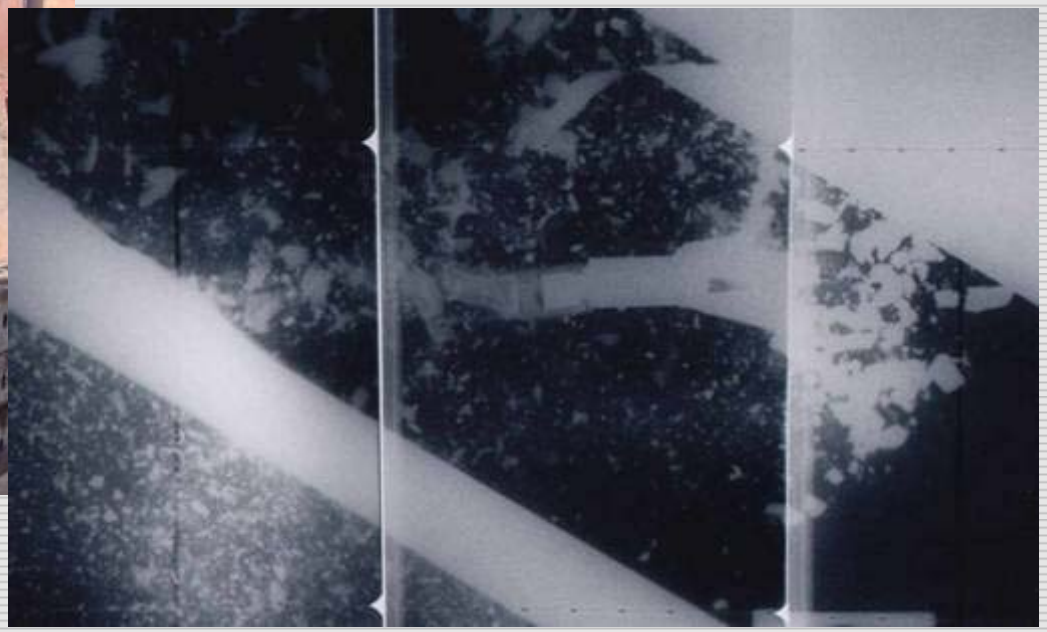
Spaced RHA Target at 60° NATO (4 x 10mm)

Target arrangement

X-ray: Penetrator & fragments behind target



120 mm DM 33 KE - PELE

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100 mm RHA Target at 60° NATO

Due to fragmentation of the PELE, the hole diameter is increased compared to a KE-penetrator and the energy of the PELE is totally absorbed by the target and contributes to its destructive power.

Only little of the energy of the KE penetrator is absorbed by the target.

After penetration, the KE penetrator still has a large residual amount of kinetic energy

120 mm DM 33 KE - PELE

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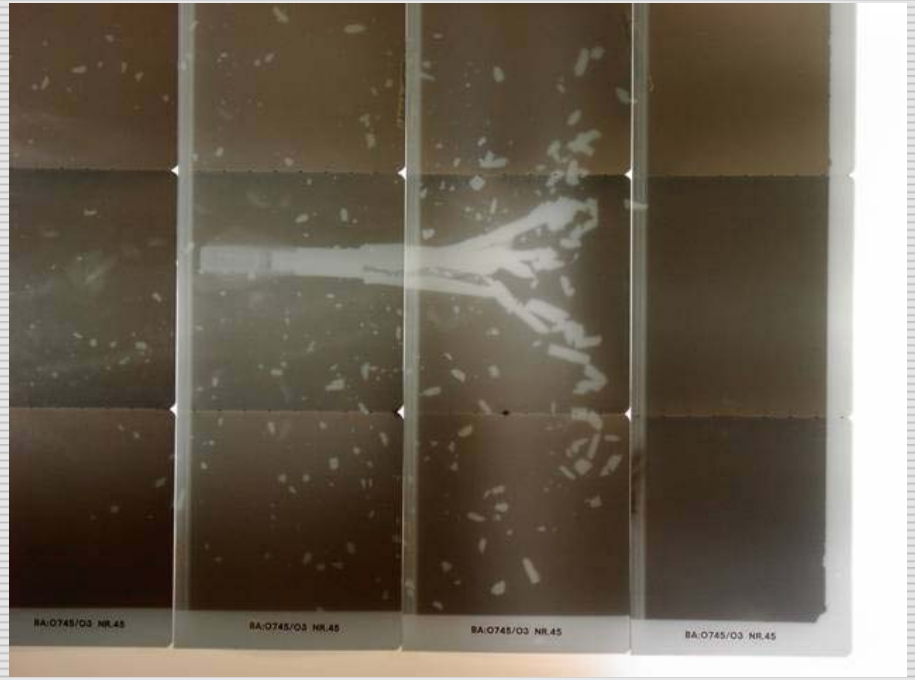
450 mm (18”) Clay Brick Wall

Front

Rear



X-ray: 500 mm behind target

105/120/125 mm PELE Firing Results

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MP - PELE

120 mm

**Modified HEAT –
DM12 A1**

105mm

**Modified Training
Round DM68**

120 mm MP - PELE

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200 mm Double Reinforced Concrete

Impact of the 120 mm MP-PELE at the concrete wall




120 mm MP - PELE

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200 mm Double Reinforced Concrete - US Specifications

Three rounds provide an opening in the wall for the infantry

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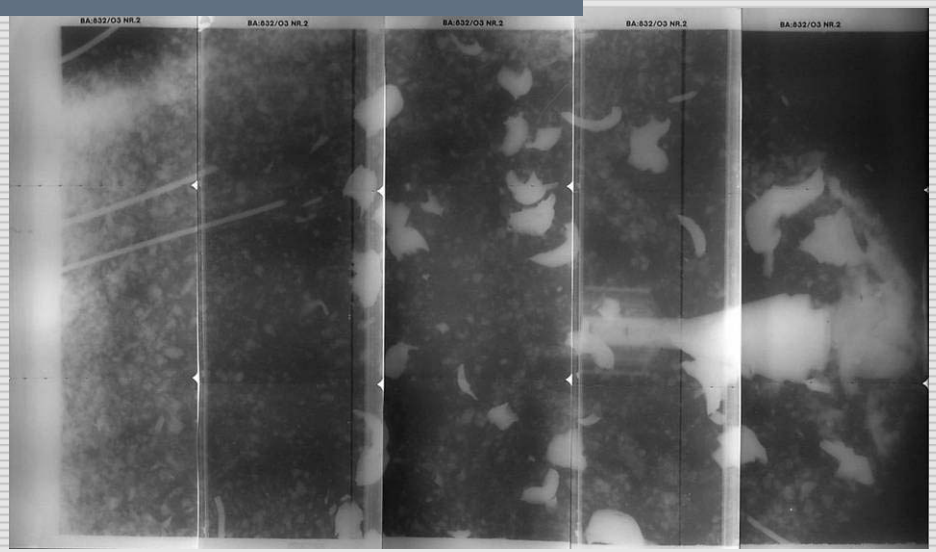
105 mm MP - PELE

200 mm Double Reinforced Concrete – US Specifications extracted from Mobile Gun System ORD

Front



X-ray: 500 mm behind target

Rear

Diameter of the hole ~ 500 mm (20”)

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105 mm MP - PELE

Armored Observation Vehicle

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Summary

- Test of PELE-ammunition in the calibers 105/120/125 mm - full- and subcaliber Projectile
- PELE-function shown at a variety of targets from a clay brick wall to heavy armor plate
- PELE ammunition offers a possibility of precise and effective engagement of several targets in MOUT (Military Operations in Urban Terrain) with a Minimum of collateral damage
- The new ammunition combines penetration capability with improved fragmentation effect - without any detonator and explosives
- The new ammunition can be used with all existing weapon systems (smoothbore and rifled cannons)
- Upgrade or recycling of existing large caliber ammunition (full- or subcaliber)
- Rapid fielding availability

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120 mm DM 33 KE - PELE

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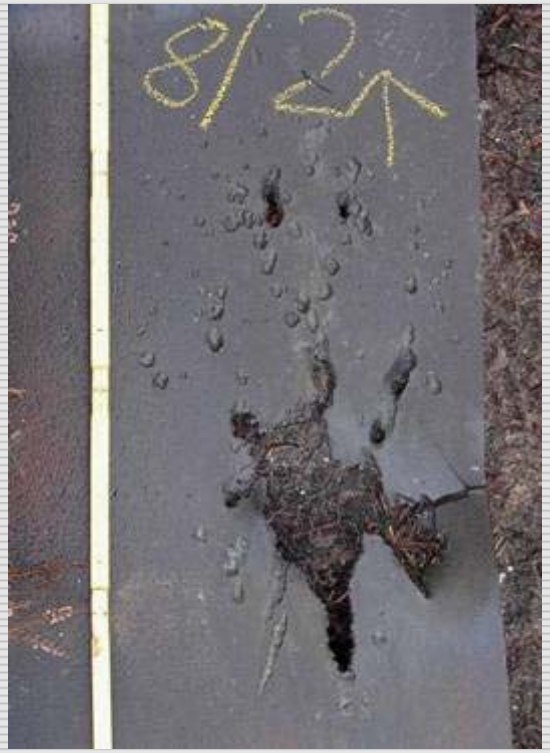
120 mm DM 33 KE - PELE

Spaced RHA Target at 60° NATO (4 x 10mm)

1. Plate (10mm)

2. Plate (10mm)



The disintegration of the penetrator at the first plate leads to a wide-spread impact (approx. 0.8 m x 0.8 m; 31” diameter) on the second plate

120 mm DM 33 KE - PELE

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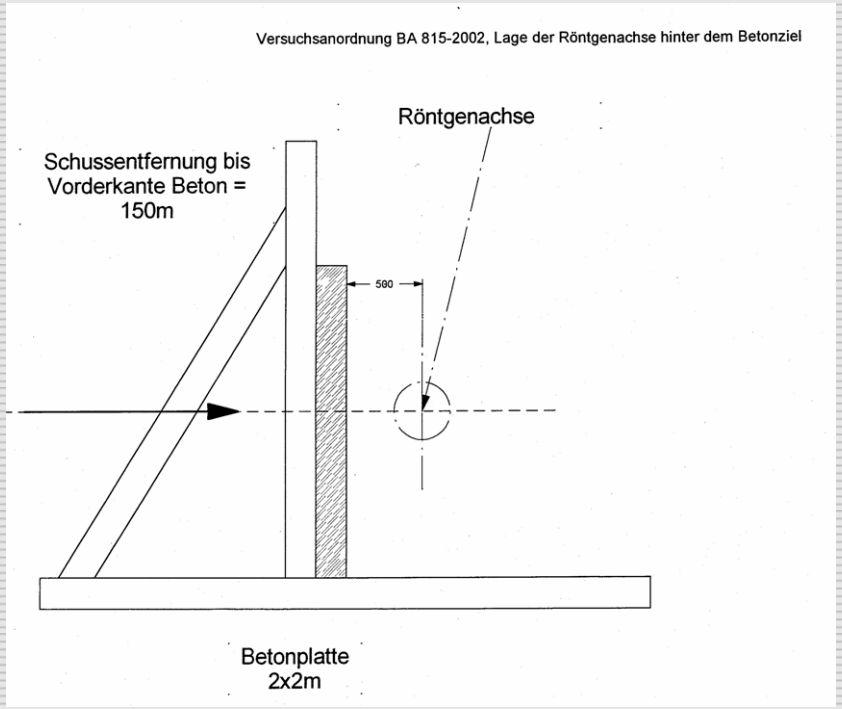
200 mm (8”) Double Reinforced Concrete



120 mm DM 33 KE - PELE

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Target TGL 15 B1 - Armored Infantry Vehicle

Plate 1

Plate 2

Witness Plate

120 mm MP - PELE

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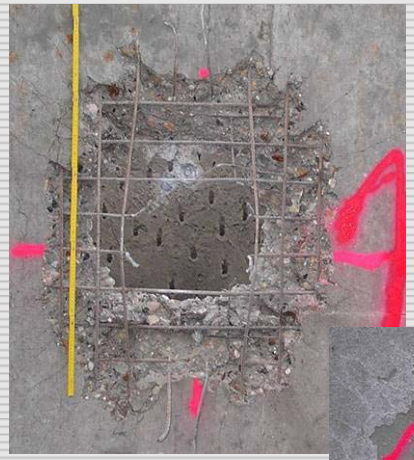
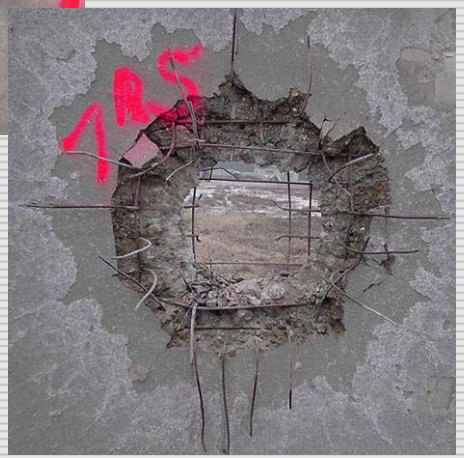
200 mm Double Reinforced Concrete

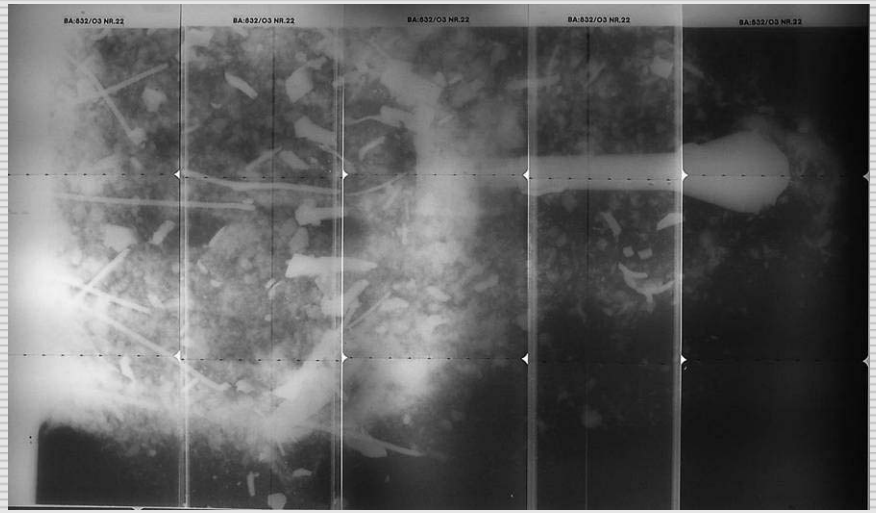


Front



Rear

Diameter of the hole ~ 600 mm (24”)



X-ray: 500 mm behind target

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125 mm BM 15 KE - PELE

105/120/125 mm PELE Firing Results

125 mm KE - BM 15 - PELE

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Complete 125mm BM15-PELE round

- **main propellent charge on the right**
- **incremental propelling charge with the PELE-projectile assembly on the left**

PELE-projectile in flight, 9m after leaving the muzzle

125 mm KE - BM 15 - PELE

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Effect on closed rooms (i.e. 20 ft. Steelcontainer) after penetrating a 10mm RHA-Plate 60° NATO