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
Penetrator with Enhanced Lateral Effect

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

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

HE rounds

- 1st Priority: Guided missile positions behind / under cover
- 2nd Priority: dismounted infantry and light armored vehicles
- Light armored or unarmored fast-moving vehicles
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
105/120/125 mm PELE Firing Results

Ammunition tested in 2002 - 2004

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Type</th>
<th>Modified</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>105 mm</td>
<td>KE – PELE</td>
<td>modified</td>
<td>DM33</td>
</tr>
<tr>
<td></td>
<td>MP – PELE</td>
<td>modified</td>
<td>DM68</td>
</tr>
<tr>
<td>120 mm</td>
<td>KE – PELE</td>
<td>modified</td>
<td>DM33 A1/A2</td>
</tr>
<tr>
<td></td>
<td>MP – PELE</td>
<td>modified</td>
<td>DM12 A1 (M830)</td>
</tr>
<tr>
<td>125 mm</td>
<td>KE – PELE</td>
<td>modified</td>
<td>BM 15</td>
</tr>
</tbody>
</table>
105/120/125 mm PELE Firing Results

## 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”)
105/120/125 mm PELE Firing Results

120 mm DM 33 KE - PELE

Sectional view of the PELE-Penetrator

- Tungsten
- Core
- Windshield
- Tip
105/120/125 mm PELE Firing Results

120 mm DM 33 KE - PELE

200 mm Double Reinforced Concrete

**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

X-ray 500 mm behind target

120 mm DM 33
105/120/125 mm PELE Firing Results

120 mm DM 33 KE - PELE

200 mm Double Reinforced Concrete with Container

BA.NR.: 03_0832
Schuß Nr.: 204
105/120/125 mm PELE Firing Results

120 mm DM 33 KE - PELE

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
105/120/125 mm PELE Firing Results

120 mm DM 33 KE - PELE

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

X-ray: Penetrator & fragments behind target

Target arrangement
105/120/125 mm PELE Firing Results

120 mm DM 33 KE - PELE

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.

Copyright by Rheinmetall
105/120/125 mm PELE Firing Results

120 mm DM 33 KE - PELE

450 mm (18") Clay Brick Wall

Front

Rear

X-ray: 500 mm behind target
105/120/125 mm PELE Firing Results

MP - PELE

120 mm
Modified HEAT – DM12 A1

105mm
Modified Training Round DM68
120 mm MP - PELE

200 mm Double Reinforced Concrete

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

Three rounds provide an opening in the wall for the infantry
105/120/125 mm PELE Firing Results

105 mm MP - PELE

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

Front

Rear

Diameter of the hole ~ 500 mm (20”)

X-ray: 500 mm behind target
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
Questions

Discussions

are appreciated
105/120/125 mm PELE Firing Results

120 mm DM 33 KE - PELE
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.
105/120/125 mm PELE Firing Results

120 mm DM 33 KE - PELE

200 mm (8”) Double Reinforced Concrete
105/120/125 mm PELE Firing Results

120 mm DM 33 KE - PELE

Target TGL 15 B1 - Armored Infantry Vehicle

Plate 1  Plate 2  Witness Plate
105/120/125 mm PELE Firing Results

120 mm MP - PELE

200 mm Double Reinforced Concrete

Diameter of the hole ~ 600 mm (24’’)

Front

Rear

X-ray: 500 mm behind target
125 mm BM 15 KE - PELE
105/120/125 mm PELE Firing Results

125 mm KE - BM 15 - PELE

Complete 125mm BM15-PELE round
- main propellant charge on the right
- incremental propelling charge with the PELE-projectile assembly on the left

PELE-projectile in flight, 9m after leaving the muzzle
105/120/125 mm PELE Firing Results

125 mm KE - BM 15 - PELE

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