6.5x25 CBJ

Ballistic gelatin 10%

CBJ Tech – Test protocol

Date: 2019-11-25	**Location**: Kungsbacka, Bunker (indoor test facility)	**Weather conditions**: Indoor, 21 deg C
Weapon systems tested: Glock 17 gen 3 in 6.5x25 CBJ.		
Ammunition tested: 6.5x25 CBJ APDS, 6.5x25 CBJ HET and 6.5x25 CBJ Sinter		
Targets tested: Ballistic gelatin 10% @+4 deg C.		
People present: Mikael Johansson, Bertil Johansson		
Additional information:		

Background, Purpose and Goal

Ballistic gelatin is commonly used to evaluate the terminal effect of small arms ammunition projectiles in living tissue. Many aspects of the terminal effect can be determined with proper knowledge about how to correlate between the generated cavities in gelatin and the performance in living tissue.

The purpose of this test is to evaluate the penetration depth in bare gelatin, when shooting 6.5x25 CBJ APDS, 6.5x25 CBJ HET and 6.5x25 CBJ Sinter from a typical pistol. In the law enforcement community in USA and Europe, this is a key aspect when evaluating the terminal performance of small arms ammunition.

The goal is to determine if the penetration depth of the 6.5x25 CBJ APDS, the 6.5x25 CBJ HET and the 6.5x25 CBJ Sinter lies within the desired 300-450mm in bare gelatin.

Test Setup

All gelatin blocks have been prepared according to the internationally accepted wound profile method defined by Fackler and Malinowski. Water was heated to +50 deg C and 10 weight percent gelatin powder was added and immediately mixed properly. The solution was poured into forms and cooled to +4 deg C and maintained at that temperature for 96 hours. Each block was immediately shot after removal from the refrigerator. The size of the gelatin blocks are 250x220x350mm.

Test Setup: Projectiles from left to right: APDS, HET and Sinter.

The cartridges used for this test were 6.5x25 CBJ APDS, the 6.5x25 CBJ HET and the 6.5x25 CBJ Sinter.

The test weapon used was a Glock 17 gen 3 with a custom 6.5x25 CBJ barrel with 114mm length.

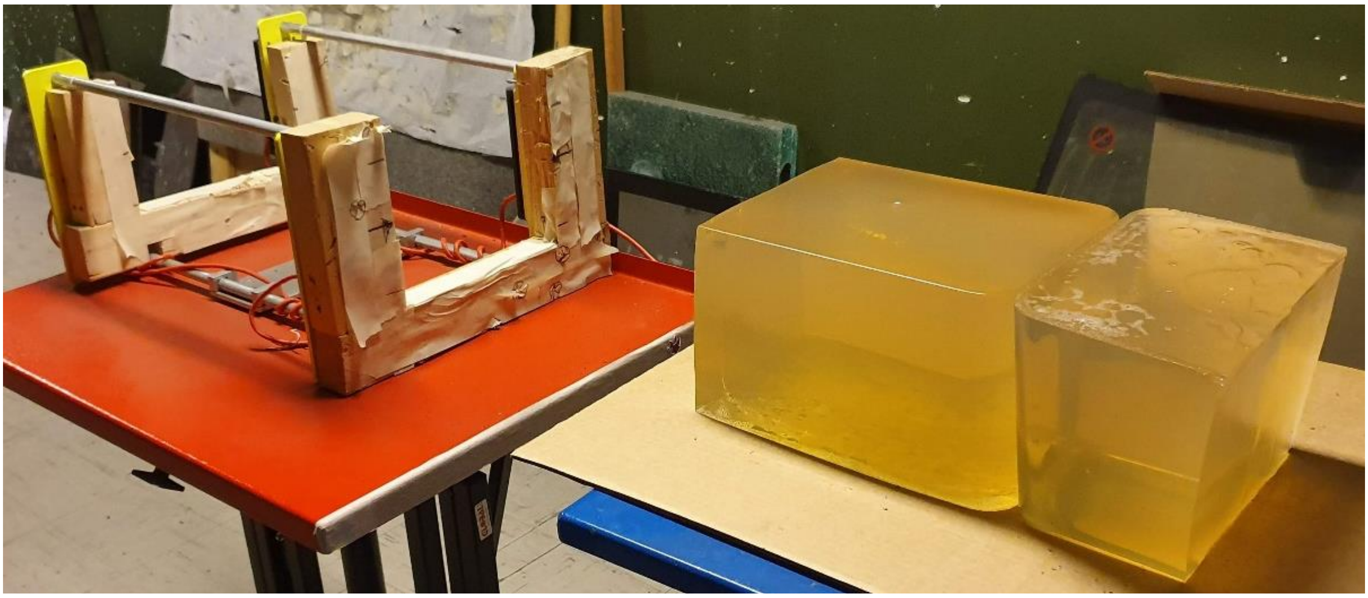
Test 1

Two blocks of gelatin positioned one after the other gives a total depth of about 700mm along the barrel axis. The 6.5x25 CBJ APDS, 6.5x25 CBJ HET and 6.5x25 CBJ Sinter was fired at these blocks of gelatin and the total penetration depth was measured. The distance between the first block and the muzzle was 5m.

Test 1: Setup

Test 2

Two shortened blocks of gelatin (one 300mm long and one 150mm long) were positioned one after the other to create a total depth of 450mm along the barrel axis. A chronograph was positioned after the gelatin blocks to measure the retained velocity and energy of each projectile after penetrating 450mm gelatin. The distance between the first block and the muzzle was 5m.



Test 2: Setup

Test 3

One shortened block of gelatin was positioned to create a total depth of 300mm along the barrel axis. A chronograph was positioned after the gelatin block to measure the retained velocity and energy of each projectile after penetrating 300mm gelatin. The distance between the block and the muzzle was 5m.

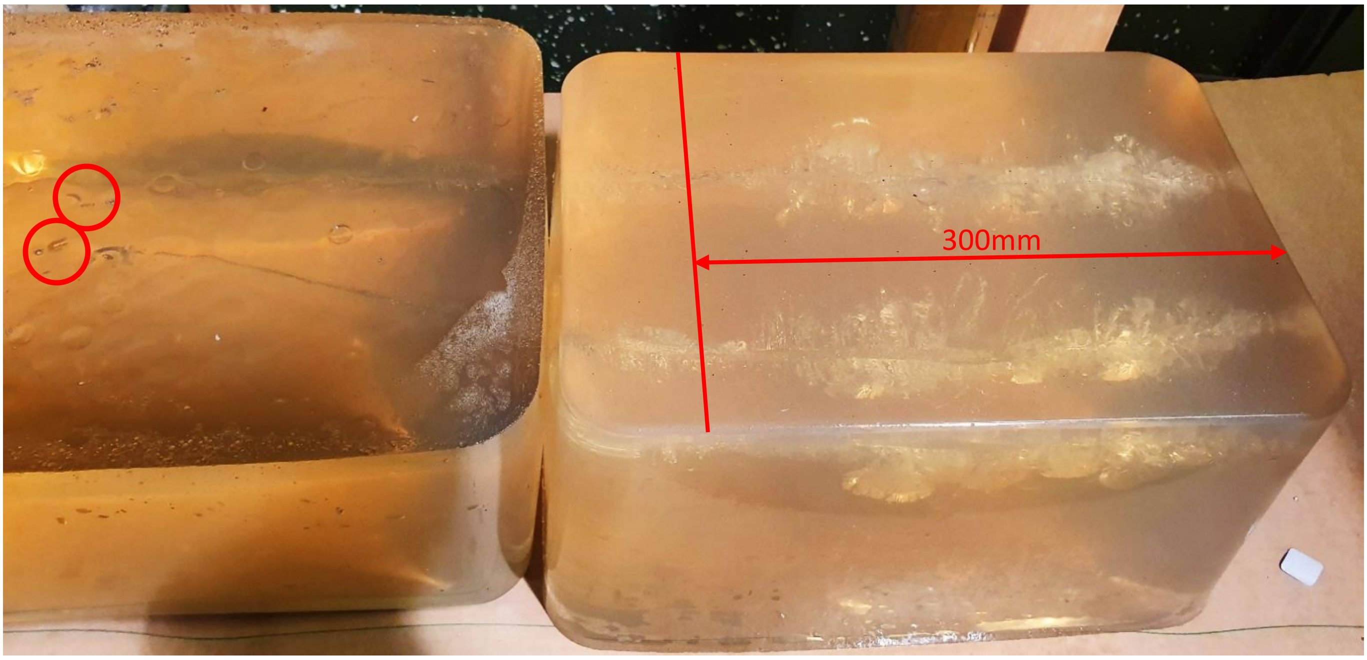
Results

Test 1

The penetration depth in bare gelatin were as follows:

- 6.5x25 CBJ APDS: 620mm
- 6.5x25 CBJ HET: 570mm
- 6.5x25 CBJ Sinter: 570mm

The cavities were very similar in size and distribution, and it can clearly be seen that most of the energy is delivered to the gelatin within the first 300mm.



Test 1: Bare gelatin shot with 6.5x25 CBJ HET and 6.5x25 CBJ Sinter.

Test 1: Recovered projectiles.

This picture shows recovered projectiles, removed from the ballistic gelatin. They show now signs of deformation apart from rifling striations. The APDS projectile on the left does not have any striations because it has a discarding sabot, that interacts with the rifling in the bore.

Test 2

The measured velocities at 5m distance from the muzzle were:

- 6.5x25 CBJ APDS: 708,0m/s => 501,3J
- 6.5x25 CBJ HET: 706,2m/s => 623,4J
- 6.5x25 CBJ Sinter: 705,1m/s => 621,5J

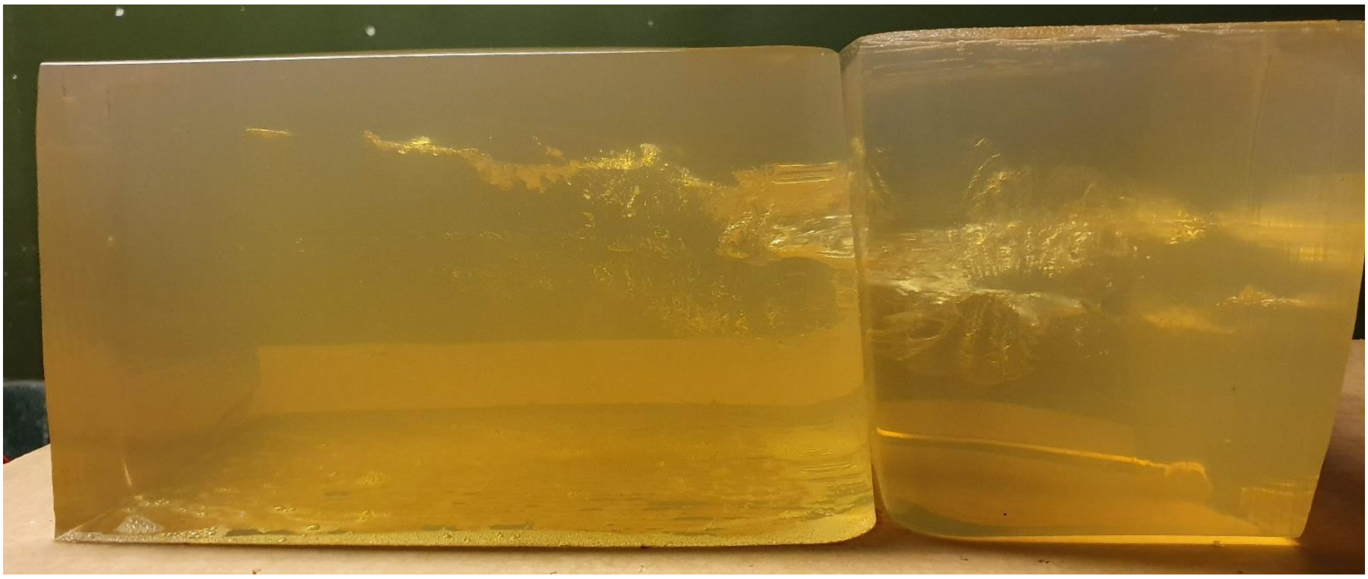
The measured velocities after penetrating 450mm bare gelatin were:

- 6.5x25 CBJ APDS: 149,3m/s => 22,3J
- 6.5x25 CBJ HET: 54,3m/s => 3,7J
- 6.5x25 CBJ Sinter: No data after several attempts.

The amounts of energy transferred in 450mm gelatin were:

- 6.5x25 CBJ APDS: 479J => 95,6%
- 6.5x25 CBJ HET: 619,7J => 99,4%
- 6.5x25 CBJ Sinter: No data after several attempts.

Test 2: Setup to measure the velocity after penetrating 450mm gelatin.



Test2: Blocks after being hit with one 6.5x25 CBJ APDS and one 6.5x25 CBJ HET.

Test 3

The measured velocities at 5m distance from the muzzle were:

- 6.5x25 CBJ APDS: 708,0m/s => 501,3J
- 6.5x25 CBJ HET: 706,2m/s => 623,4J
- 6.5x25 CBJ Sinter: 705,1m/s => 621,5J

The measured velocities after penetrating 300mm bare gelatin were:

- 6.5x25 CBJ APDS: 324,2m/s => 105,1J
- 6.5x25 CBJ HET: 219,4m/s => 60,1J
- 6.5x25 CBJ Sinter: No data after several attempts.

The amounts of energy transferred in 300mm gelatin were:

- 6.5x25 CBJ APDS: 396,2J => 79%
- 6.5x25 CBJ HET: 563,3J => 90,4%
- 6.5x25 CBJ Sinter: No data after several attempts.

Summary

The 6.5x25 CBJ APDS has a tungsten core projectile that weighs 2g. It has less kinetic energy than the heavier HET and Sinter projectiles, that both weigh 2,5g and have similar muzzle velocities. The higher density of the tungsten core projectile enables it to maintain more velocity after penetrating gelatin, compared to the HET and Sinter projectiles. Despite the difference in kinetic energy, the sizes of the cavities were still very similar.

The HET and Sinter projectiles showed an identical behavior and performance in gelatin in this test, so results from one is applicable to the other.

In bare gelatin, the penetration depth is greater than the desired 300-450mm, for all three tested projectiles. All projectiles had 100% retained weight and did not show any signs of deformation apart from rifling striations.

When examining the size and distribution of the cavities from all three projectile types in ballistic gelatin, it clearly shows that the significant energy transfer occurs within the first 300mm. After that, the cavities are small and after 450mm gelatin, the cavities are minimal.

For the relatively small 6.5x25 CBJ projectiles, compared to 9x19mm, the resistance from the ballistic gelatin is very small and is not comparable to living tissue when the velocity is low during the last centimeters of penetration. As shown in the tests, the 3,7J of energy left of the 6,5x25 CBJ HET projectile after penetrating 450mm gelatin may not even be enough to penetrate the skin.

Therefore, to correctly evaluate the terminal performance of these projectiles, the focus should be on the main cavity´s size and distribution rather than total penetration depth. The tail of the cavity should be disregarded if the focus lies on determining the actual terminal performance of small arms ammunition projectiles of this size.