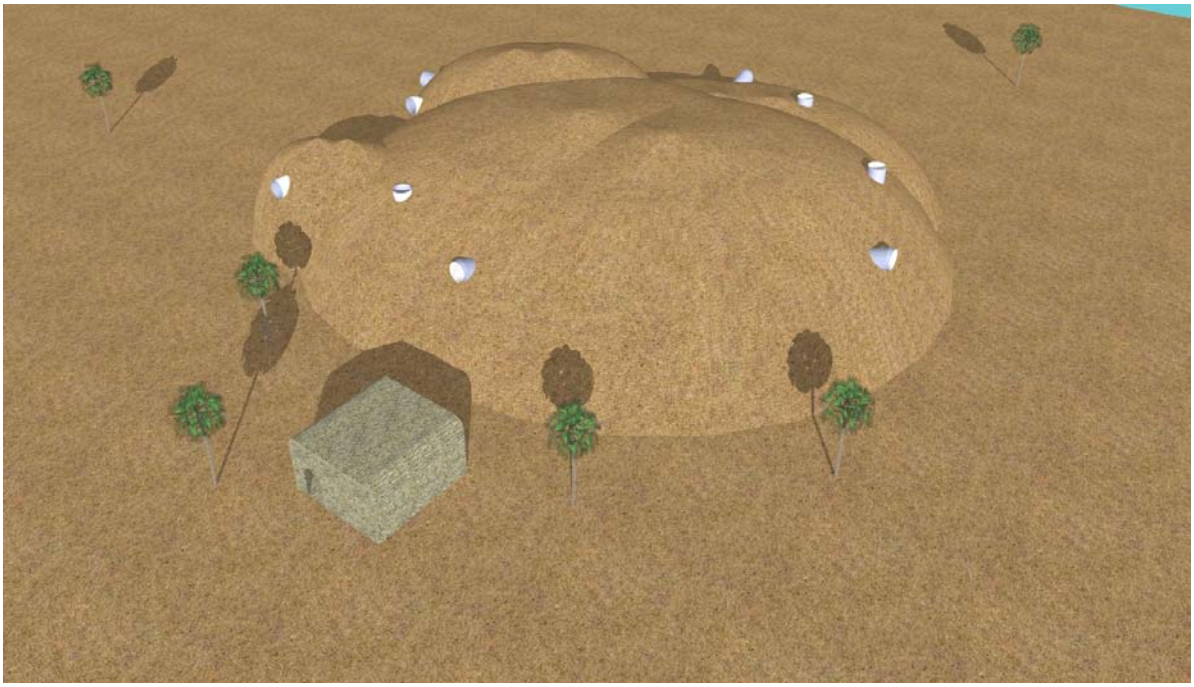
CAVE AND TUNNEL TRAINING POLYGON

JAKUB UNDERGROUND

TECHNICAL DESCIRPTION OF THE FACILITY



1. Purpose

1.1. Operations of police forces against terrorists and criminals can take place also in mountains, which offer suitable conditions for them to hide and base their activities.

1.2. Caves are natural occurrences, created by geological processes in mountain, primarily rocky areas. Besides natural caves, overhangs and rocky gorges there can be also artificial caves, cleverly constructed for certain purpose. These are often interconnected with tunnels, thus creating cave and tunnel systems.

1.3. Cave and tunnel systems are at present frequently used by terrorists to hide persons, weapons, ammunition and other necessary material. They may contain medical rooms, kitchens and radio-communication centers. They are used as commanding standpoints in the phase of planning, organizing and preparation for operation.

1.4. With respect to significant accumulation of forces and logistic basis of terrorists it is not possible to omit police operations in mountain terrain in spite of the disadvantages for counter-terrorist forces. It is necessary to find new efficient ways of counter-terrorist operations. This naturally implies the necessity of focused training of police units in mountain countries by modeling training conditions and simulating efficient activities and tactical procedures.

1.5. Cave and tunnel polygon JAKUB UNDERGROUND offers to large extent the possibility of high-quality training of police forces against terrorists and criminals, covering not only in mountain cave, but also in sewers and underground constructions.

2. Technical description

Training polygon consists of modular block system of individual constructional elements, which can be interconnected and combined into various systems. Variability of modular system allows choosing width, length and height of chosen set of polygon, frequency and layout of constructional elements and combination of their training functions.

2.1. Basic variant of the construction of training polygon has elliptical basis 40 m x 30 m. Basic variants can also be combined into larger wholes.

2.2. Basic set of cave and tunnel polygon JAKUB UNDERGROUND consists of

- Cave
- Connecting tunnels
- Corridors
- Shafts
- Technologies
- Monitoring and control center
- Exterior of the set

2.4. **Caves** are basic constructional and functional elements of training polygon. They consist of steel construction with one or several entrances at the sides. Construction of caves has rectangular section profile. They are piled to three floors.

2.4.1. Caves can have various dimensions. The basic module of cave has dimensions: length 3 m, width 3 m, height 2.4 m. Central cave has dimensions: length 6 m, width 3 m (6 m), height 2.4 m.

2.5. **Connecting tunnels** are basic constructional and functional elements of training polygon, horizontally crossing the training polygon, providing entry and exit points for the cave system. Caves are connected to tunnels. They are piled into three floors.

Tunnels have steel construction. Construction of tunnels can have rectangular or round section profile. They can be of different lengths. Tunnels with round profile have diameter 1.4 m or 1.8 m. Rectangular profiles are 1.8 high and 1.4 m wide.

2.6. **Corridors** interconnect individual caves and tunnels in vertical or horizontal directions. They contain wooden or metal ladders and foot steps. They allow moving from one floor of the training polygon to another. They have round profile with diameters from 1.0 m to 1.4 m.

2.7. **Shafts** are vertical elements of the cave and tunnel polygon. They are made of iron parts with round profile, reaching up to 10 m with diameters from 1.0 m to 1.8 m.

2.7.1. Depending on the purpose shafts have specific construction:

a) shaft for training with grenades thrown into the cave and tunnel system
- besides the top opening the shaft is fully closed,
- basis of the shaft is up to 2 m embedded in concrete,
- all along the shaft inside perimeter has ballistic protection consisting of steel ring 8 mm thick and rubber 40 mm thick.

b) shaft for training extraction of persons from depths of cave and tunnel system
- the shaft has in different levels access points into the connecting tunnels,
- the bottom part of the shaft, up to one meter, contains emergency exit
- the shaft has in its full length installed steel foot steps.

2.8. All training elements (caves, tunnels, corridors, shafts have ballistic protection, allowing shooting inside the polygon)

Technology – caves, tunnels, connecting corridors and shafts contain technology allowing situational training of policemen:

- the entire inside area can have efficient ballistic protection,
- installed is strong lighting with ballistic protection with the possibility of various effects (twilight, flashing light etc.),
- installed is also acoustic device with ballistic protection for efficient control of training and acoustic effects,
- also additional facilities are installed:

- smoke set – allows filling the interior of the polygon with harmless smoke,
- ventilation and filtration set – removes exhausts from firing in the polygon interior,
- electrical network plug – allows lighting the entire inside of the polygon and its vicinity,
- monitoring system – gives the coordinator of training full control over the situation inside of the polygon and in its vicinity,
- warning system – provides signalization for start and end of training, as well as during the training, for unauthorized persons.

2.10. **Monitoring and control center** consists of a 12 m high tower.

The upper part of the tower contains closed room, where the personnel fulfill tasks related to control and safety of training and polygon. In the upper part the tower contains a walk platform. The room is entered through vertical ladder with safety protection. The room contains acoustic device for controlling the training, siren and panel controlling warning lights and lighting at night – operator's panel.

The lower part of the tower contains closed room, where the personnel fulfill monitoring and methodological tasks. The monitor shows views from all video-cameras located in the interior and exterior of the polygon. Based on recorded visual information it is possible to carry out methodological analysis of training and evaluate them.

2.11. **Exterior of the polygon** can be irregular with holes, channels and banks. Outside shape of cave and tunnel polygon is copula-like, accessible from all sides. At certain points entries to and exits from connecting tunnels are installed, thus providing access to the entire polygon.

2.12. Some entries into ground-floor connecting tunnels start in **small ground-floor houses** with steel construction and dimensions 6 x 3 x 2 m.

2.13. The whole construction is covered with sand, earth and rubble.

2.14. **Technical description of ballistics of polygon**

2.14.1. Cave and tunnel polygon JAKUB UNDERGROUND assumes the use of weapons with live or simulation ammunition. At the same time it is possible to use practice, live and universal grenades.

2.14.2. Ballistic protection is designed for safe use of the following types of ammunition:

- ammunition for pistols and revolvers with metal case and soft core,
- ammunition for machine rifles caliber 9 mm Luger
- ammunition for machine and attack rifles caliber from 5x45 to 7.62x39 with frangible bullets (e.g. Simunition Greenshield) or FMJ bullet with soft core

2.14.3. Perfect ballistic protection of all walls, ceilings and floors of the cave and tunnel polygon JAKUB UNDEGROUND is provided by a combination of high-quality steel plates and rubber plates with different thickness, in versions depending on the

function. Steel plates prevent bullets from penetration and rubber plates prevent their return into the training area. This protection has long lifetime.

2.14.4. In cave and tunnel polygon JAKUB UNDERGROUND, which allows using grenades, it is possible to use offensive or universal grenades. It is not allow to use defensive grenades. During intense training it is recommended to use training grenades or simulation version of grenades.

3. Description of function

3.1. Cave and tunnel polygon JAKUB UNDERGROUND is a multi-functional training facility allowing to train a wide spectrum of activities and model situations related to cave and connecting tunnel objects:

- monitoring objects,
- firing at objects,
- approaching objects,
- seizing objects,
- surveying objects,
- minesweeping and placing mines in objects,
- fight in vicinity and inside of objects using weapons and close fight,
- using grenades in objects,
- finding criminals, drugs, weapons and other objects of police interest,
- seizing terrorists and criminals, guarding and interrogation,
- using imitation and coercive measures,
- guarding objects and restoring order in vicinity,
- activities with police dogs.

3.11. To achieve the necessary level of mastering the activities it is possible to use in cave and tunnel polygon JAKUB UNDERGROUND live, training and laser shooting, live and training grenades, acoustic and optical effects and smoke.

3.12. Cave and tunnel polygon JAKUB UNDERGROUND, as purpose-built training module, complies with the requirements of:

a) simulation training – training of police specialists allowing perfect mastering of partial elements and procedures,
b) situational training – training of police specialists for mastering complex tactical situations by police teams (preparation, coordination, execution of operations, communication, safety etc.),
c) methodological training – training of specialists with examples, control, evaluation, succession and continuity,
d) safety training – training of specialists carried out on model of the object with high level of passive and active safety elements,
e) ecological training – training of specialists with limited negative impact on the environment,
f) economical training – intense and frequent training of specialists using training facility with high level of robustness.

3.13. Cave and tunnel polygon JAKUB UNDERGROUND can be used by the police for training:

- Individual – as a separate mean of specific training
- Complex – as a part of methodologically comprehensive training complex.

4. Technical parameters

4.1. Total dimensions	30 m width 40 m length + 6 m height (above the ground) - 3 m height (underground) 9 m total height
4.2. Total number of modules	83 pieces
4.3. Cave dimensions	3 m width (possibly 6 m) 6 m length 2.4 m height
4.4. Section of tunnels	1.4 m x 1.8 m or pipe ϕ 1.4 m to ϕ 1.8 m
Total length of tunnels in proposal	120 m
4.5. Section of connecting corridors	pipe ϕ 1.0 m or ϕ 1.4 m
Total length of tunnel in the proposal	80 m
4.6. Number of caves in 1st floor of proposal	2 pieces
4.7. Number of caves in 2nd floor of proposal	4 pieces + 1 piece house on the surface
4.8. Number of caves in 3rd floor of proposal	1 piece

5. Technical documents

5.1. Technical and other documents for cave and tunnel polygon JAKUB UNDERGROUND include:

- revision report after assembly and yearly revision controls,
- expert opinion of a ballistic expert,
- operational and training documentation (safety and methodological principles of training, instructions for maintenance and repairs etc.)

6. Operational instructions

6.1. The product maintains functionality in the temperature range from -40℃ to +70℃.

6.2. The facility allows parallel training of up to 30 trainees

6.3. Training is carried out within intentions of current orders, regulations and methods of breaching police training

6.4. Only trained instructors are allowed to supervise training.

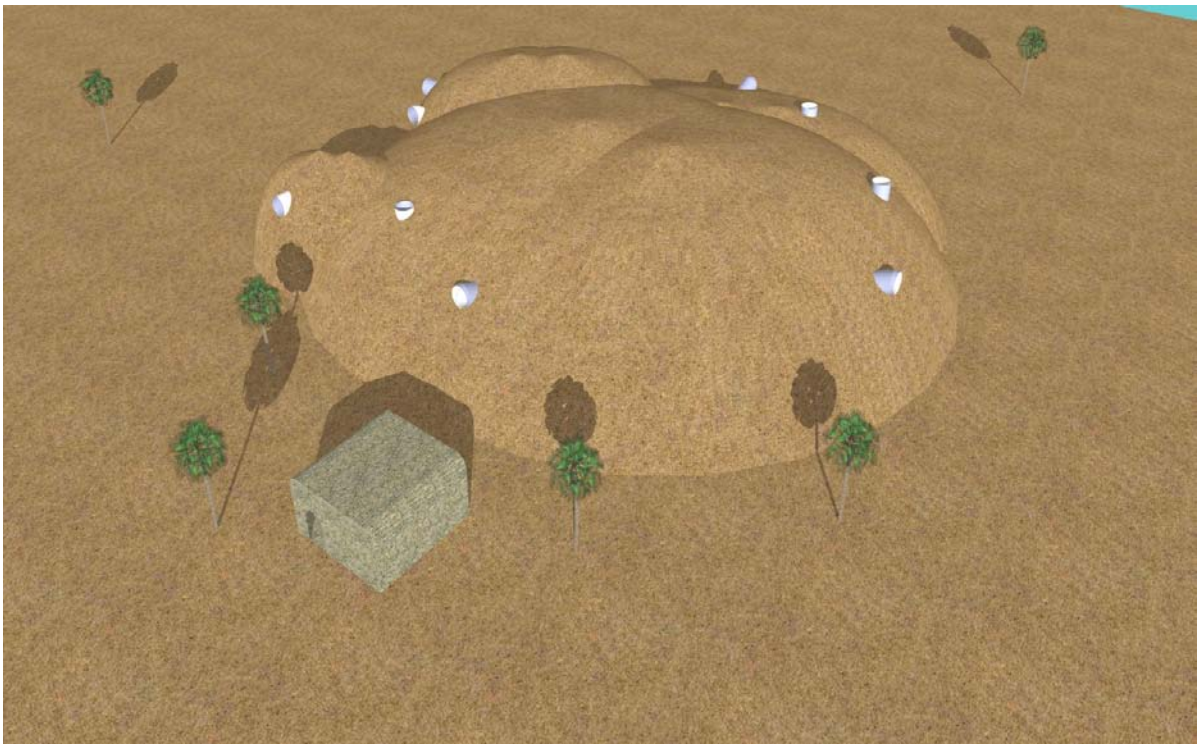
6.5. All parts of the cave and tunnel polygon JAKUB UNDEGROUND must be maintained clean. For this reason dirt (mud, dust, pollutants) is expected to be removed in 3-month intervals.

6.6. With respect to its surface treatment the steel part of the carrying construction does not require special maintenance within the lifetime. This part also does not require conservation (lubrication).

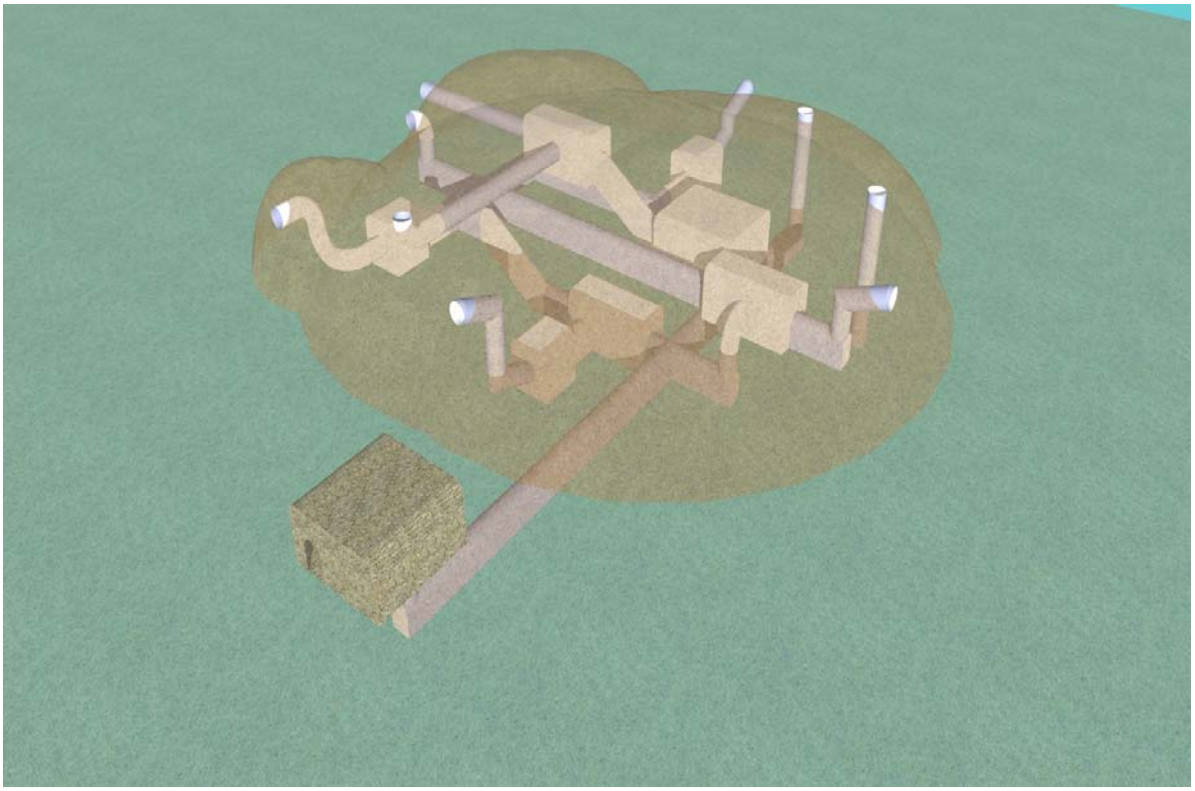
6.7. Complex revision controls of the carrying construction and training modules are carried out by the provider 1x per year until the end of guarantee at own cost, after expiration of the guarantee at the cost of the customer. In case of satisfactory functional condition and completeness of the simulator the provider issues for the customer “Record on revision control and its outcomes”

6.8. All repairs on the polygon are carried out by the provider.

7. Graphical addendum

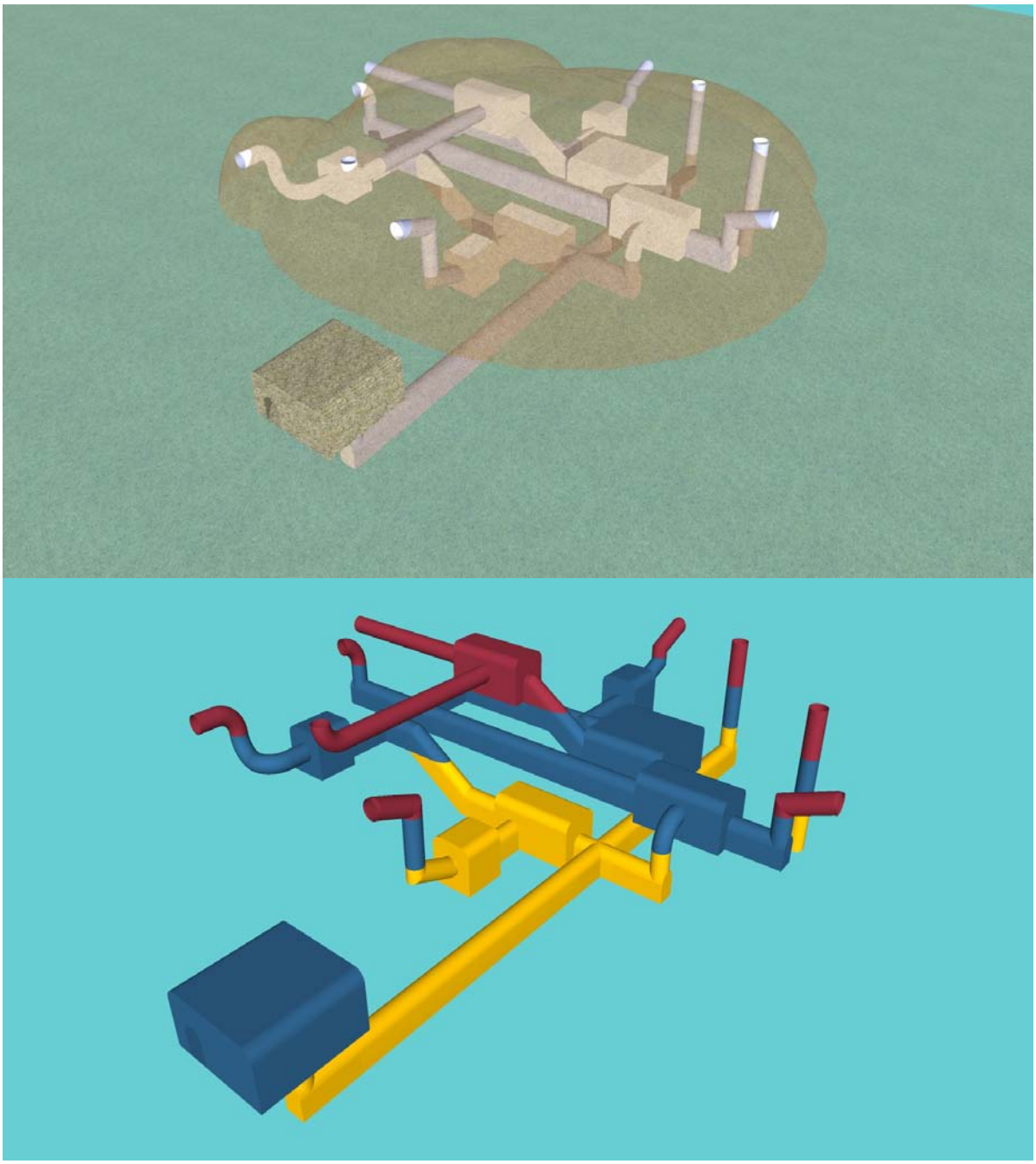


GENERAL PERSPECTIVE VIEW



GENERAL RÖNTGEN VIEW

SEGMENTATION VIEW



COLOUR	Simulator floor	From the Ground	Real Depth	Total Length
	3. FLOOR	1. FLOOR	+ 6 m	20 m
	2. FLOOR	GROUND FLOOR	+ 3 m	30 m
	1. FLOOR	UNDERGROUND	- 3 m	40 m