

DESIGN OF POL AREA IN FOREIGN OPERATIONS OF THE CZECH ARMED FORCES

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ABSTRACT

The article deals with a petrol filling station and petroleum, oils, and lubricants store in Foreign Operations. It describes layout of the petrol filling station. The paper deals with ballistic protection of the petrol filling station. The article is an output of the project at the Department of Engineers Technologies "Development of Expertise Department focused on the area of verification of material models for protective structures".

Keywords:

Petrol filling station, petroleum, oils, and lubricants store, emergency sump.

ABSTRACT

L'article traite d'une station d'essence de remplissage et de pétrole, les huiles et les lubrifiants magasins dans les opérations étrangères. Il décrit la disposition de la station de remplissage d'essence. Le document traite de la protection balistique de la station de remplissage d'essence. L'article est une sortie du projet au Département d'Ingénieurs Technologies "Développement du Département d'expertise concentré sur le domaine de la vérification des modèles de matériaux pour les structures de protection".

Keywords:

Pétrole station de remplissage, le pétrole, les huiles et les lubrifiants magasin, réservoir de secours.

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1 INTRODUCTION

Obligations in the Peacekeeping Missions include a lot of important tasks. One of them is to construct the base for the own troops. The Military base designing and constructing process is fundamental for security of the troops, for good work conditions for troops and for everyday life of troops. The military base becomes home for deployed soldiers for six months. And the base environment has to provide them not only shelter and good work conditions moreover it has to keep them in well-being as much as it is possible.

Since 1990, the Czech Armed Forces have participated in 29 missions abroad. It is surprising that, since then, nobody seems to have solved issues associated with military bases design in missions abroad for this long time. The aim of the article is to inform about important conditions for designing of the petrol filling station. This part is one of the most important parts of logistic support of the troops at the Military base.

According to Act No. 356/2003 Coll are petrol, oils and lubricants (POL) [1] classified as hazardous chemicals. Fuel is extremely flammable liquid and it is classified as carcinogenic and harmful liquid. POL officer is responsible for storage and dispensing of fuel.



Figure 1 Petrol filling station at the Šajkovac Base in KOSOVO

2 POL (PETROLEUM, OILS, & LUBRICANTS) STORAGE AND HANDLING FACILITIES LOCATION AT THE MILITARY BASE

In the Military base designing process is essential to follow the safety rules for location of the petrol filling station. POL are dangerous, volatile and flammable liquids. Accidents can be prevented by adequate storage and handling. Improper storage and handling can cause explosion, fire, injuries, damage of property, environmental pollution. For those reasons and for the hygiene reasons are not acceptable to locate POL storage and handling facilities close to the mess hall or accommodation premises. The best place where to place the POL storage and handling facilities is a parking area [2].

Another important factor for looking for the suitable place for the POL storage and handling facilities is a study of the potential blast wave spreading from the gasoline tank explosion. The blast wave has to be averted to the open-air space not to endanger staff or base facilities. For POL storage are used truck tanks or superficial tanks (see Table 1)

Table 1 Equipment for POL storage

Type of equipment	Characteristics of the device	Used in the Czech Army	Not yet introduced in the Czech Army	
Gas tankers	For aviation	CAPL – 16M		
	For ground troops	CAP – 6 CAP – 12,5 CA - 18		
Fuel tanks	Underground tank	They are not suitable for use in military missions		
	Superficial tanks	Steel tanks	NP 5 NP 7 NP 10 NP 20	Portable filling petrol station AVK 01.1
		Flexible tanks	V – 3 V – 5 V – 10 V - 25	Flexible tanks produced by Interstate products, Inc. Flexible tanks produced by Berg Flexible Containment company

Installation of the underground tanks is technologically and time-consuming. Moreover, the disturbing of the surface may induce unpredictable claims for compensations for imaginary damages in the future, when the base shall be abandoned. For this reason this type of tanks are not used for POL storage at the military base in missions abroad.

Superficial tanks can be made as steel tanks or as flexible tanks. Superficial tanks meet requirements for quick and easy mobility, quick and easy installing, low weight.

Superficial tanks meet the requirements for environmental protection. Location of the tanks above the ground allows easier control of the undesired oil leakage. Also, fixing of leaks is easier for this type of tanks. The disadvantages of superficial tanks are direct influence of the climate and low ballistic protection.

3 THE EMERGENCY WET WELL

POL storage design has to calculate potential for the accidents which can cause risk of dangerous liquid spill to the surrounding solid. The POL storages have to have the emergency wet well or the oil leakage sump to prevent spills of POL products.

For superficial double-wall tanks is not necessary to set up an emergency wet well. Draft of the emergency wet well is codified by standard ČSN 65 0201.[3]

Although is the emergency wet well constructing by improvised way has to protect against the contamination of groundwater and solid by the oil. For example of the emergency wet well constructing in military mission abroad see Figure 2. Usually the emergency wet well is constructing of the defence walls covered by insulating foil which is petrol resistant.



Figure 2: Emergency wet well

4 MEASURES AGAINST THE WATER

It is necessary to consider measures for ground protection against rain and running water During the POL store designing process. These measures should be sloping surface. It can be combined with the creation of an uncovered or covered drainage system. The uncovered system can consist of drain ditch, gutter, sideslip, cascade or a drain pit. The covered system can consist of drain or dewatering pipelines. Functional drainage is important not only for the area designated for the POL storage, but also for the area used for storing and dispensing fuel

Good drainage should be set in natural cross slope of plain approximately 3.0% towards drainage trenches. Drainage trenches should be placed on longitudinal slope for good water outflow. Minimal depth of the drainage trenches is 0,30m. If the cross slope of drainage trenches is less than 0,5% or greater than 3% his bottom had to be reinforced.

5 BALLISTIC PROTECTION

The ballistic protection can be provided by defence walls, protective concrete elements (T walls), earth embankments or sandbags. In this article there are examples of POL store ballistic protection provided by:

1. Defence walls.
2. Combination of the earth embankment and defence walls.
3. Protective concrete elements called. „T-wall“.

Ad1) POL store ballistic protection consist of defence walls (see Figure 3 and Figure 4): This type of protection is built-up from rectangle with dimensions 24,38 m x 8,48 m. This rectangle consists of Defence walls and is built-up around fuel tanks. The side 24,38 m length is consist of 23 pcs. of Defence wall Mil 1. The side 8,48 m length is consist of 8 pcs. of Defence wall scale 1. Three sides (back side and two lateral sides) are constructing of two vertical joined Defence walls. The high of these three constructions is 2,74 m. The front side is high 1,37 m. It is constructing of one vertical line of Defence walls only. The Defence walls are placed in a pyramid shape, between fuel tanks to empowered ballistic protection. Each pyramid is constructed of twelve Defence walls.



Figure 3: POL store ballistic protection consist of defence walls

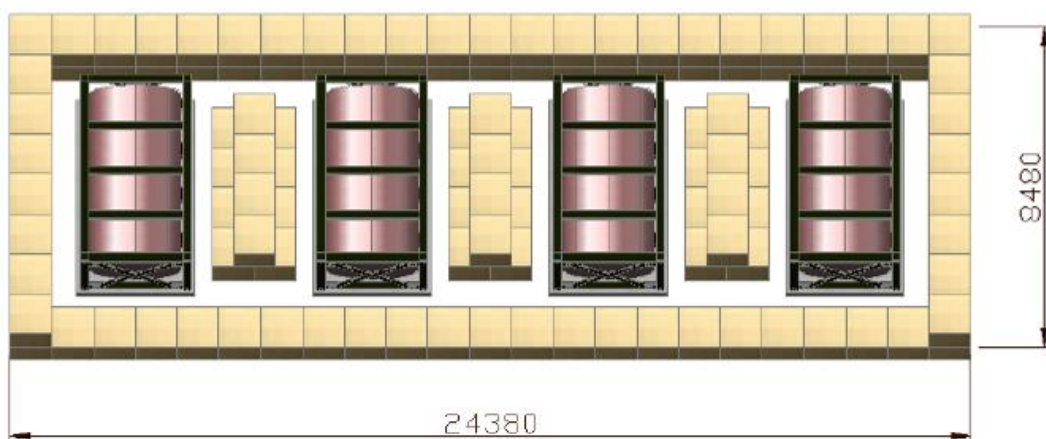


Figure 4: POL store plan view with ballistic protection construct of Defence walls

Ad 2) POL store ballistic protection consist of the earth embankment and Defence walls (see Figure 5): This ballistic protection type consists of earth embankments around of the fuel tanks. Earth embankments are in the truncated

pyramid shape. The earth embankment height is 2,5 m. The width of the earth embankment base is 8 m (see Figure 6).

The earth embankment is continual along the POL store, only for entrance manipulation, checking is it breaking and replaced by four Defence walls. There are Defence walls placed in a pyramid shape, between fuel tanks to empowered ballistic protection. Each pyramid is constructed of twelve Defence walls.

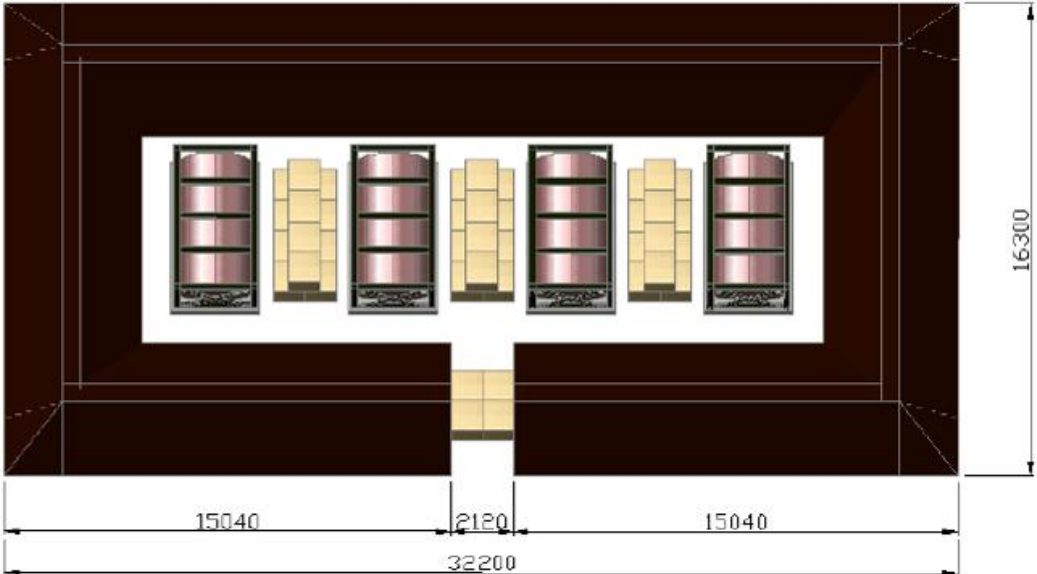


Figure 5: POL store ballistic protection – earth embankments, Defence walls.

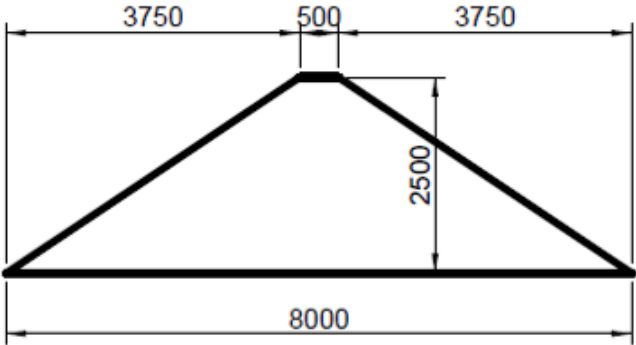


Figure 6: The earth embankment Cross-cut

Ad 3) POL store ballistic protection consists of concrete panel called T-wall (Figure 8): Around the POL store is build-up rectangle constructed of T-walls. There is a gap on the front side. The front side is breaking. There are placed T walls, between fuel tanks to empowered ballistic protection of tanks. For this example is necessary to use 34 pieces.

The T-walls measures can be different. It is depend of the producer. In this example the high is 2,5 m, the base width is 1 m, the wall width is 0,25m. The length of the t-wall is 2 m. See Figure 7.

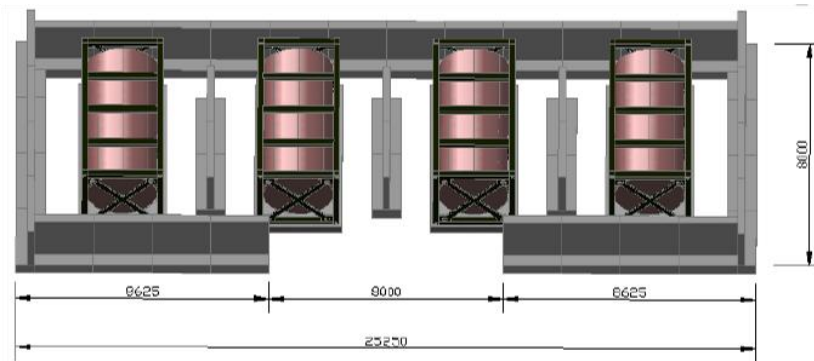


Figure 7: Ballistic protection of the POL store with using “T-walls”

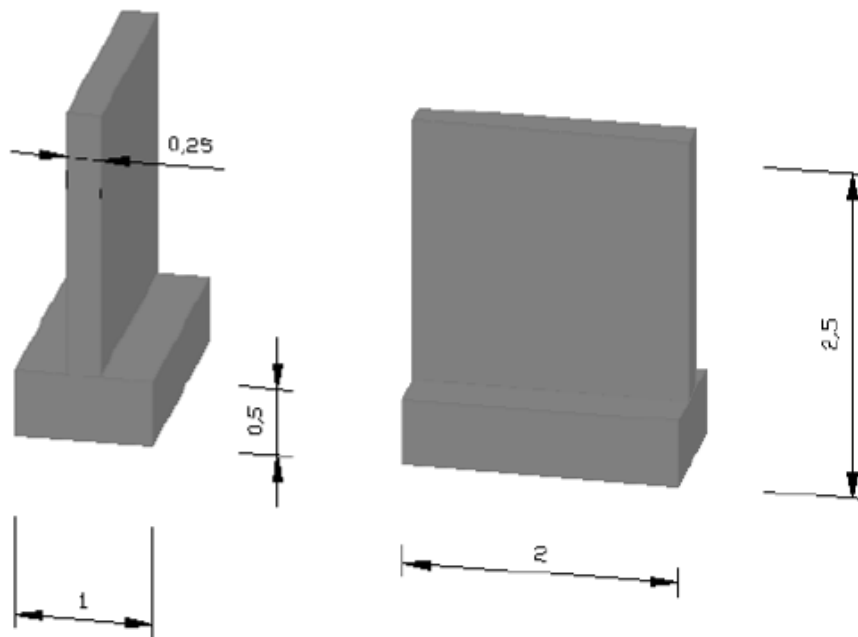


Figure 8: Dimensions of the T-wall

6 DESIGNING OF THE REAL POL STORE INCLUDED FILLING STATION

POL store PHM (see Figure 6-1 and Figure 6-2.) is designed for storage of 80 000 l of fuel. There are designed four container tanks N 20. Three of them are determinate for diesel fuel and one of them is determinate for gasoline. Oil and lubricants are store in ISO-C containers. Vehicle filling of the fuel is provided by Gas tankers CAP-6. Tankers N20 filling is provided by automotive filler CA-18.

6.1 EARTH-REMOVING WORK

- Earth-removing works have to be done for the entire surface on which will be the POL store stand. In this case the area is 475 square meters large.
- Strip the top soil – removing of the humus and subsoil (depth from 20 to 30 cm)
- Grade the ground plane and construct surface drainage to protect the surface for POL store placing.

- Firming the subsoil on the requirement load-bearing capacity by the vibrating roller. In the low load-bearing capacity of the soil possible to modify technological properties of rock.
- Spreading of nonwoven geotextile GeomatexNTB 10. Geotextile separates surface between the soil and gravel to prevent of their mixing on both.
- Spreading, ground levelling and impacting of the gravel layer (layer thickness 20 cm, sieve-fraction 32-63).

6.2 BALLISTIC PROTECTION

There are designing Defence walls for the POL store ballistic protection In this real design. In this case Defence walls incorporated in Czechs Armed Forces are used. These defence walls are called Modul 1 (1,06 x 1,06 x 1,37 m).

Figure No. 9 shows Defence walls which are consist around the tanks and ISO containers. The high of the wall construct of the impact two stacked Defence walls is 2,74m. The front side is construct of one line of the Defence walls which is 1, 37 high. This measurement is for easier entrance manipulation, checking of fuel tanks.

There are placed Defence walls in a pyramid shape, between fuel tanks to empowered ballistic protection. Each pyramid is constructed of twelve Defence walls.

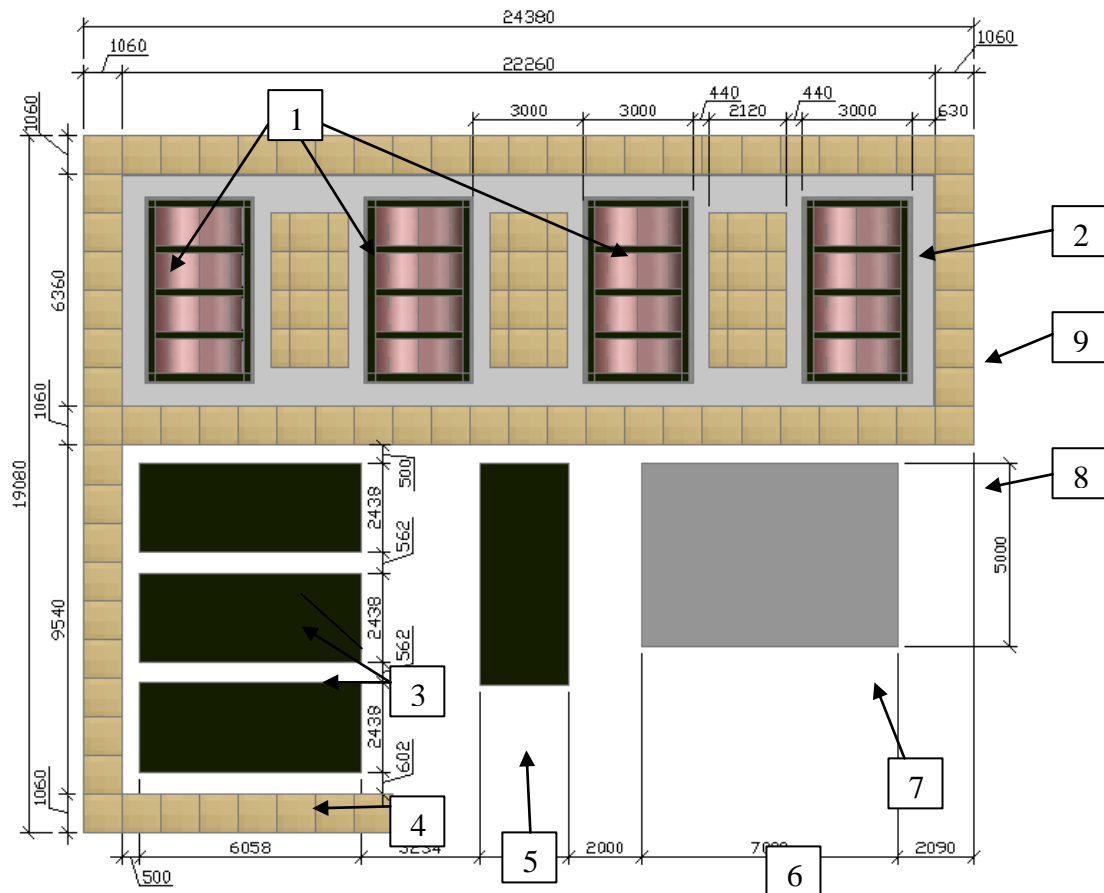


Figure 9: Petrol filling station ground plan (1. Containers tanks N 20 for diesel fuel oil F-54, 2. Container tank N 20 for gasoline F-67, 3. Containers ISO-C for oil and lubricants, 4. Container ISO-C for working stock, 5. Container ISO-C – the storage staff office, 6. Handling places are marked in white, 7. Filling station 8. Defence wall, 9. Insulating foil.

6.3 THE EMERGENCY WET WELL

Reservoir storage of this emergency wet well is designed to retain total storage capacity of full containers. Total storage capacity of full containers is 80 m³ and the designed emergency wet well capacity is 140 m³. The wet well is constructed of Defence walls and the insulated foil 2 mm thick. This insulating foil is resistant to chemicals. Dimensions of the wet well are 22,26 x 6,36 x 1,37 m. The wet well height is 1,37 m. Insulating foil is placed on the Defence walls and on the stabilized soil. It is necessary to do measurements to prevent slippage of the insulating foil of walls.

6.4 MATERIALS

- Defence wall – Size modulus 1 (1,06 x 1,06 x 1.37 m): 165 pieces.
- Container ISO-C (2,438 x 2,438 x 6,058 m): 4 pieces.
- Foundation slab (3 x 5,1 x 0,4 m): 4 pieces.
- Insulating foil 225 m².

7 CONCLUSION

The issue of construction of POL storage and filling station in foreign missions is special. The lack of professional literature and outdated military regulations do not help. The technical means used for the POL storage are obsolete. For his reason soldiers of the Czech Armed Forces solve the problems with POL stores through the NATO forces (for example through USA forces, France atc.). These forces are specialized in POL store and distribute fuel to the other member of alliance.

It is not possible to depend on somebody's cooperation. In the case of deploying the military force in the EU Battle Group, our military had to deal with the issue of fuel alone.

8 ACKNOWLEDGEMENT

The article is an output of the project at the Department of Engineers Technologies “Development of Expertise Department focused on the area of verification of material models for protective structures”.

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- [3] ČSN 65 0201 Flammable liquefied petroleum gas Production and storage.
- [4] ČSN 75 3415 Protecting water from petroleum products. Units for Oil and storage.

Článok recenzovali dvaja nezávislí recenzenti.