

**Structure** : Oxygen apparatus nb. 9  
**Location** : U. S. Steel Košice s.r.o.  
**Investor** : U. S. Steel Košice s.r.o.  
**Designed by** : RNDr. Jozef Terezka  
**Date** : February 2005

**Stamp :**

CONTROL ROOM + T 81

## **Fire prevention project**

### **1.Introduction**

The fire prevention in the structure project level " **Oxygen apparatus nb. 9 – U. S. Steel Košice s.r.o.** " has been designed to meet regulation of MV SR nb. 94/2004 of the Code in relation to STN 92 0201-1/Z1 to STN 92 0201-4/Z1 and relevant STN /Slovak Technical Standards/.

### **2. Building Description**

The subject of the fire prevention regulations is as follows:

- **control room** – one-storey building
- **switch room T81** – one part of the building is one-storey and the other one is two-storey (the floor plan on –1,45 m is from the fire prevention point of view judged as 1.NP by regulations of § 7 in reg. of MV SR nb. 94/2004 of the Code).

Construction and dispositional solution of the relevant premises is stated in the construction part of this project.

### **3.List of the Relevant Standards and Regulations**

STN 92 0201-1/Z1, STN 92 0201-2/Z1, STN 92 0201-3/Z1, STN 92 0201-4/Z1, STN 73 0872, STN 73 0873/Z4, STN 73 0875, regulation of MV SR nb. 94/2004 of the Code, regulation of MV SR nb. 95/2004 of the Code, regulation of MV SR nb. 699/2004 of the Code and relevant STN and provisions.

### **4.Initial Documentation**

- solution of PBS-PO /structure safety requirements – fire prevention/ from the project of the relevant structure for building permit dated 08/2004, arch. nb. 13523.PO<sub>s/a</sub> (technical report), processed by ITES company, U. S. Steel Košice s.r.o.
- opinion copy of ORHaZZ in Košice relating to the project documentation for building permit nb. ORHZ-792/OPP-2004 dated 05.08.2004
- partial condition of the structure
- detailed construction solution of the relevant structure parts –floor plans, sections

### **5.Technical Solution from the Fire Prevention Point of View**

#### **5.1.Fire Section, Fire Risk, Fire Prevention Level, Margin Dimensions**

The fire prevention within this project relates and in full extension regards PBS-PO solution, which had been processed for the building permit and consequently approved by ORHaZZ in Košice, registered as nb. ORHZ-792/OPP-2004 dated 05.08.2004.

From the fire prevention point of view, the planned structure is judged as a production structure in accordance with provisions of § 1 par. 1) let. j) of reg. of MV SR nb. 94/2004 of the Code.

The planned structure has been divided into separate fire sections (FS) in accordance with provisions of §3 and appendix nb. 1, reg. of MV SR nb. 94/2004 of the Law Code and in

accordance with provisions of STN 38 2156 (for the cable space in switch room T81) with the following fire risk values and fire prevention levels (SPB) /fire prevention degree/ :

**- control room**

**the whole building creates one separated FS N1.1 – r.n. 01 – room DCS, r.n. 02 – hall, r.n. 03 – daytime room, r.n. 04 – WC, r.n. 05 – control room including the double-floor space, which is in accordance with 1j) of the appendix 1 reg. of MV SR nb. 94/2004 of the Code.**

$\tau_e = 40 \text{ min}$  – ar. 3.5.1, item 17 chart. L.1 appendix L STN 92 0201-1/Z1

$p_1 = 1,4, p_2 = 0,150$  – item 5.29, 5.39 chart I.1 appendix I STN 92 0201-1/Z1

$k_5 = 1,0$  – ar. 4.5 STN 92 0201-1/Z1 –  $n_p = 1$  – ar. 2.2.8 STN 92 0201-2/Z1 (one-storey building,  $h = 0\text{m}$ )

$k_6 = 1,0$  – ar. 4.6 STN 92 0201-1/Z1, non-flammable structures – ar. 2.6.2 STN 92 0201-2/Z1

$k_7 = 2,0$  – ar. 4.7 STN 92 0201-1/Z1

$k_8 = k_5 \cdot k_6/2,4 = 1,0 \cdot 1,0/2,4 = 0,416$  – ar. 4.3 STN 92 0201-2/Z1

$c_v = 1,0$

$P_1 = p_1 \cdot c_v = 1,4 \cdot 1,0 = 1,4$

$P_2 = p_2 \cdot S \cdot k_5 \cdot k_6 \cdot k_7 = 0,150 \cdot 157,35 \cdot 1,0 \cdot 1,0 \cdot 2,0 = 47,205$

$\tau_{e,k_8} = 40 \cdot 0,416 = 16,64 \text{ min}$  – according to ar. 3.2, char. 2 STN 92 0201-2/Z1 for FS N1.1 is SPB I

**- switch room T81**

**FS N01.1 – r.n. 01, 02 – cable space, in accordance with provisions of ar. 110 STN 38 2156, SPB V in accordance with provisions of ar. 111 STN 38 2156**

$S = 299,37 \text{ m}^2 < 750 \text{ m}^2$  – ar. 112 STN 38 2156

**FS N01.2/N2 – r.n. 01 – low tension switch room 400 V, r.n. 02 – middle tension switch room 6 kV including the staircase leading to the cable space which is in accordance with item 1h) of the appendix 1 of reg. MV SR nb. 94/2004 of the Code.**

$\tau_e = 35 \text{ min}$  – čl. 3.5.1, item 8a) chart. L.1 appendix L STN 92 0201-1/Z1

$p_1 = 1,4, p_2 = 0,150$  – item 5.29 chart I.1 appendix I STN 92 0201-1/Z1

$k_5 = 1,41$  – ar. 4.5, chart 15 STN 92 0201-1/Z1 –  $n_p = 2$  – ar. 2.2.8 STN 92 0201-2/Z1 (two-storey building,  $h = 2,3\text{m}$ )

$k_6 = 1,0$  – ar. 4.6 STN 92 0201-1/Z1, non-flammable structures – ar. 2.6.2 STN 92 0201-2/Z1

$k_7 = 2,0$  – ar. 4.7 STN 92 0201-1/Z1

$k_8 = k_5 \cdot k_6/2,4 = 1,41 \cdot 1,0/2,4 = 0,583$  – ar. 4.3 STN 92 0201-2/Z1

$c_v = 1,0$

$P_1 = p_1 \cdot c_v = 1,4 \cdot 1,0 = 1,4$

$P_2 = p_2 \cdot S \cdot k_5 \cdot k_6 \cdot k_7 = 0,150 \cdot 295,1 \cdot 1,41 \cdot 1,0 \cdot 2,0 = 124,83$

$\tau_{e,k_8} = 35 \cdot 0,583 = 20,41 \text{ min}$  – according to ar. 3.2, tab. 2 STN 92 0201-2/Z1 for PÚ N2.1 is SPB I

**FS N2.2 – r.n. 03 – condensers**

**FS N2.3 – r.n.04 – transformers**

**FS N2.4 – r.n. 04 – transformers**

**FS N2.5 – r.n. 05 – accumulators**

$\tau_e = 30 \text{ min}$  – ar. 3.5.1, item 9b) chart L.1 appendix L STN 92 0201-1/Z1

$p_1 = 1,4, p_2 = 0,150$  – item 5.29 chart I.1 appendix I STN 92 0201-1/Z1

$k_5 = 1,0$  – ar. 4.5 STN 92 0201-1/Z1 –  $n_p = 1$  – ar. 2.2.8 STN 92 0201-2/Z1 (one-storey structure, resp. PÚ,  $h = 0 \text{ m}$ )

$k_6 = 1,0$  – ar. 4.6 STN 92 0201-1/Z1, non-flammable structures – ar. 2.6.2 STN 92 0201-2/Z1

$k_7 = 2,0$  – ar. 4.7 STN 92 0201-1/Z1

$k_8 = k_5 \cdot k_6/2,4 = 1,0 \cdot 1,0/2,4 = 0,416$  – ar. 4.3 STN 92 0201-2/Z1

$c_v = 1,0$

$P_1 = p_1 \cdot c_v = 1,4 \cdot 1,0 = 1,4$

$P_2 = p_2 \cdot S \cdot k_5 \cdot k_6 \cdot k_7 = 0,150 \cdot 17,2 \cdot 1,0 \cdot 1,0 \cdot 2,0 = 5,16$

$\tau_{e,k_8} = 30 \cdot 0,416 = 12,5 \text{ min}$  – according to ar. 3.2, chart 2 STN 92 0201-2/Z1 for FS N2.2 to N2.5 is SPB I

## **5.2.Civil Structures**

The civil structures ensuring stability of the planned building (including fire separating structures) are non-flammable – inflammability degree A, or A1 degree structures according to fire responsiveness, i.e. the structure or the separate FS (fire sections) have non-flammable structure system in accordance with § 13 par. 2 reg. of MV SR nb. 94/2004 of the Code. and ar. 2.6.2 STN 92 0201-2/Z1. The description of the civil structures itself is provided in the Civil Design part of this project. The calculated (required) fire resistance values of the individual civil structures meet requirements stated in ar. 2.3.6, chart 1 STN 92 0201-2/Z1 :

**The control room-** without requirements in accordance with reg. item 11 chart 1 STN 92 0201-2/Z1 – statically independent one-store structure

### **The switch room T81**

FS N01.1 – SPB V /fire prevention degree/

item 1b) - 120

item 2b) - 90/D1 – between r.n. 01- cable space including the staircase into r.n. 01-switch room floor plan + 0,000 m (door) and hatch over r.n. 02 – cable space

item 3a)2. - 120

item 5b) - 120

item 4, 6 to 10 – are not in FS N01.1, or are not necessary

FS N01.2/N2, N2.2, N2.3, N2.4, N2.5 – SPB I

item 1b) - 30

item 1c) - 30

item 2b, c) - 30/D3 – between the staircase and the cable space

item 3a)2. - 30

item 3a)3. - 30

item 4 - 30

item 5b) - 30

item 5c) - 30

item 6 až 10 – are not in FS, or are not necessary

Real fire resistance values of the structures meet all necessary requirements. Fire-resistant door shall be fitted between planned FS N01.1 and N01.2/N2, of min. type EW-90/D1-C (between r.n. 01 – the cable space and the staircase leading to r.n.01 – switch room) and fire hatch in the ceiling in r.n. 02 – cable space of min. type EW-90/D1 (does not have to be equipped with automatic device in accordance with ar. 5.6.8 of STN 92 0201-2/Z1) – see the civil solution of this project. In the process of approval, each part and structure shall be awarded a certificate in accordance with law nb. 90/1998 of the Code about civil products.

The planned FS shall be separated by separating structures meeting all necessary fire- resistance values, including the fire closures. The distribution networks passing from one FS into another one shall be sealed in accordance with requirements of § 40 par. 3) reg. of MV SR nb. 94/2004 of the Code. and ar. 117 of STN 38 2156. After cable channels installation in the control and switch room T81, the main fire prevention barriers shall be fitted in accordance with provisions of ar. 113, 115 STN 38 2156.

## **5.3.Exit Routes**

Evacuation plan of people from the individual FS is solved via unprotected exit routes (UER) leading directly to or through neighboring FS into open space. The real lengths and widths of the UER and their design meet requirements of reg. MV SR nb. 94/2004 of the Code and STN 92 0201-3/Z1, ar. 3.1, 3.2, 6.1c, 7.1, 8.1, 9.1.1, 10.1, 10.6, 11.1 to 11.3, 13, 14 and relevant articles and requirements of STN 38 2156, čl. 147 to 149 and relevant articles.

### **Control room**

FS N1.1

$t_{ud} = 2,36 \text{ min}$  – ch. 5 STN 92 0201-3/Z1 (1 UER ,  $p_1 = 1,4$  )

$v_u = 30 \text{ m.min}^{-1}$ ,  $K_u = 40 \text{ people.min}^{-1}$  – ch. 6 STN 92 0201-3/Z1, flatland exit  
 $E . s = 10$  - ar. 9.3.2 STN 92 0201-3/Z1  
 $s = 1,0$  – ch. 7 STN 92 0201-3/Z1 – UER, mobile people, simultaneous evacuation  
 $u =$  chosen 1,0, real number  $u_{\min} = 1,0$  (door width 0,6 m) - meets requirements  
 $l_{ud} = v_u \cdot (t_{ud} - E . s / K_u \cdot u) = 30 \cdot (2,36 - 10/40 \cdot 1,0) = 63,3 \text{ m}$   
 $l_{\text{real . max.}} = 15 \text{ m} < l_{ud}$  – meets req. – measured in acc. with ar. 10.3.1 STN 92 0201-3/Z1

### Switch room T81

#### FS N01.1

$t_{ud} = 3,8 \text{ min}$  – Ch. 5 STN 92 0201-3/Z1 (2 UER,  $p_1 = 1,4$ )  
 $v_u = 20 \text{ m.min}^{-1}$ ,  $K_u = 25 \text{ people.min}^{-1}$  – tab. 6 STN 92 0201-3/Z1, upward staircase evacuation  
 $E . s = 10$  - ar. 9.3.2 STN 92 0201-3/Z1  
 $s = 1,0$  – ch. 7 STN 92 0201-3/Z1 – UER, mobile people, simult. evacuation  
 $u =$  chosen 1,0, real number  $u_{\min} = 1,5$  (door width 0,8 m) - meets req.  
 $l_{ud} = v_u / 0,75 \cdot (t_{ud} - E . s / K_u \cdot u) = 20 / 0,75 \cdot (3,6 - 10/40 \cdot 1,0) = 89,33 \text{ m}$   
 $l_{\text{real . max.}} = 40 \text{ m} < l_{ud}$  – meets req. – measured in accor. with ar. 10.3.1 STN 92 0201-3/Z1

#### FS N01.2/N2, N2.2 to N2.5

$t_{ud} = 2,36 \text{ min}$  – ch. 5 STN 92 0201-3/Z1 (1 UER,  $p_1 = 1,4$ )  
 $v_u = 30 \text{ m.min}^{-1}$ ,  $K_u = 40 \text{ people.min}^{-1}$  – ch. 6 STN 92 0201-3/Z1, flatland evacuation  
 $E . s = 10$  - ar. 9.3.2 STN 92 0201-3/Z1  
 $s = 1,0$  – ch. 7 STN 92 0201-3/Z1 – UER, mobile people, simult. evacuation  
 $u =$  chosen 1,0, real number  $u_{\min} = 1,5$  (door width 0,8 m) - meets requ.  
 $l_{ud} = v_u \cdot (t_{ud} - E . s / K_u \cdot u) = 30 \cdot (2,36 - 10/40 \cdot 1,0) = 63,3 \text{ m}$   
 $l_{\text{real . max.}} = 20 \text{ m} < l_{ud}$  – meets requ. – measured in accordance with ar. 10.3.1 STN 92 0201-3/Z1

## 5.4. Separating Distances

Separating distances for the individual FS are defined by regulations of STN 92 0201-4/Z1 and they are as follows :

### Control room

#### FS N1.1

Circumferential walls in all directions :

$d_{\max} = 1,1 \text{ m}$  ( $p_0 =$  do 20 %,  $l_u = 21,87 \text{ m}$ ,  $h_u = 3,72 \text{ m}$ ,  $\tau_e = 40 \text{ min}$ )  $< d_{\text{skut.}}$  – meets requirements

### Switch room T81

#### FS N01.1

- without open surface  $d_{\max} = 0 \text{ m}$

#### FS N01.2/N2, N2.2 to N2.5

Circumferential walls in all directions :

$d_{\max} = 0,6 \text{ m}$  ( $p_0$  - without open surface or up to 20 %,  $l_u = 25,6 \text{ m}$ ,  $h_u = 4,55 \text{ m}$ ,  $\tau_e = 30$  a 35 min)  $< d_{\text{real}}$  – meets requ.

Defined separating distances are shorter than the (planned) real ones, including distances from the existing neighboring buildings – they meet requirements of reg. of MV SR nb. 94/2004 of the Code and STN 92 0201-4/Z1 – see drawing of the structure and drawings of the individual floors of this structure.

## 5.5. Fire-fighting Devices

It is not necessary to install an inner fire duct in accordance with provisions stated in § 3 par. 2, § 6 par. 1, § 10 par. 2 b) of reg. Of MV SR nb. 699/2004 of the Code, relating to provisions of ar. 12a, 56aa STN 73 0873/Z4 (inadmissible water extinguishing, built-in space is smaller than 1000 m<sup>3</sup>) in the individual FSs.

Point of intersection of values  $P_1$ ,  $P_2$  FS N1.1, N01.2/N2, N2.2 to N2.5 is below curve in the drawing 1 STN 92 0201-1/Z1 (within acceptable values), i.e. the planned FS meet requirements from the point of view of:

- suggested operation (type and character)
- margin surface
- construction system

T81

- number of floors

and no fire-fighting devices and measures in accordance with ar. 4.4. of STN 92 02 01-1/Z1 are necessary (electric fire signalisation, stable fire-fighting equipment, automatic suction system for combustion products and heat, etc).

Installation of EPS /electric fire signalisation/ device with automatic fire alarm system in the individual FS is not required in accordance with § 88 of reg. of MV SR nb. 94/2004 of the Code and STN 38 2156, ar. 18a STN 73 0875 – values  $N$  for particular FS are lower than 3:

$$FS\ N1.1 : N_{max} = (1,2 \cdot 0,9 + 0,9 \cdot 0,6) \cdot 1,0 = 1,62$$

$$FS\ N01.1, N01.2/N2, N2.2\ to\ N2.5 : N_{max} = (1,4 \cdot 1,1 + 0,9 \cdot 0,6) \cdot 1,1 = 2,3$$

Installation of emergency lights of the exit routes, stable fire-fighting equipment and annunciator in the building or particular FS is not necessary in accordance with § 73, § 87, § 90 of reg. of MV SR č. 94/2004 of the Code and STN 38 2156.

It is necessary to place 20 portable fire extinguishers (PFE) with 6kg ABC-E powder filling in the building, which is in accordance with STN 92 0202-1 and reg. of MV SR nb. 719/2002 of the Code. They shall be distributed as follows :

#### Control room

- r.n. 02-hall – 3 PFE → 1x Pulver

#### Switch room T81

- r.n. 01 – cable space – 4 PFE

- r.n. 02 – cable space – 3 PFE

- r.n. 01 – low tension switch room – 3 PFE

- r.n. 02 – middle tension switch room – 3 PFE

- r.n. 03 – condensers – 1 PFE

- r.n. 04 – transformers – 2 x 1 PFE

- r.n. 05 – accumulators – 1 PFE

$$FS\ N1.1 : M_c = 1,2 \cdot (S \cdot p_1)^{1/2} = 1,2 \cdot (157,35 \cdot 1,4)^{1/2} = 17,8\ kg - 3\ PFE$$

$$FS\ N01.1 : M_c = 1,2 \cdot (S \cdot p_1)^{1/2} = 1,2 \cdot (299,37 \cdot 1,4)^{1/2} = 24,56\ kg - 7\ PFE$$

$$FS\ N01.2/N2 : M_c = 1,2 \cdot (S \cdot p_1)^{1/2} = 1,2 \cdot (295,1 \cdot 1,4)^{1/2} = 24,39\ kg - 6\ PFE$$

FS N2.2 to N2.5 – in each FS 1 PFE in accord. with ch. 2 STN 92 0202-1 – 4 PFE

Plan of PFE meets requirements of § 89 of reg. of MV SR nb. 94/2004 of the Code and STN 92 0202-1. To place the PFEs it is necessary to follow provisions of MV SR nb. 719/2002 of the Code. It is solely financed by the investor.

It is necessary to place „Únikový východ“ /EMERGENCY EXIT/ or „Smer úniku“ /EXIT DIRECTION/ signs to mark the emergency routes and exits. It is also necessary to place

„Nehas vodou ani penovými hasiacimi prístrojmi“ /Do not use water to extinguish the fire/or „Nepovolánym vstup zakázaný“ /Unauthorised entrance prohibited/

signs above the entrances into the building or the particular FS.

Accessibility to the building for fire-fighting cars shall be provided by the existing roads which meet requirements of § 82 reg. of MV SR nb. 94/2004 of the Code. Platforms, inner and outer (control room) emergency routes are not necessary according to § 83 par. 1 a), § 84, § 86 of ref. of MV SR nb. 94/2004 of the Code. The extension ladders shall be used as outer emergency routes for switch room T81, which is in accordance with § 86 of reg. of MV SR nb. 94/2004 of the Code.

The need of extinguishing water in case of an fire alarm in the particular FSs is not specified and required in accordance with § 3 par. 2, § 6 par. 1, § 10 par. 2 b) of reg. of MV SR nb. 699/2004 of the Code, relating to provisions of art. 12a STN 73 0873/Z4 (inadmissible water extinguishing).

The basic extinguishing medium for the planned premises of the particular FSs is CO<sub>2</sub> or ABC-E based powder. The fire emergency action in the relevant building shall be provided by fire brigade ZHÚ U. S. Steel Košice s.r.o. and district fire brigade „Hasičská jednotka Okresného riaditeľstva Hasičského a záchranného zboru v Košiciach.“

**6.Heating,Ventilation, Wiring**

Premises of the particular FS shall be heated through air-conditioning (cooling+heating), in other words, electric devices which are designed in accordance with reg. of MV SR nb. 95/2004 of the Code shall be used. There shall be natural ventilation of the particular FSs, moreover, there shall be electric ventilation in the control and switch rooms T81. The devices have been designed as separate FS units without crossing the separating structures of other FS – without fire prevention requirements, in accordance with reg. of MV SR nb. 94/2004 of the Code and STN 73 0872.

Environment for wiring and its fitting itself, including grounding, connection, measuring, regulation, etc. is specified in Wiring part of this project.

**7.Requirements**

The keeper is obliged to follow all conditions stated in this project.

Košice, February 2005

Designed by : RNDr. Jozef Terezka