CENTRAL
MINING
INSTITUTE

Methane Hazard Prevention in the Light of Polish Mine Safety Regulations

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Location of major Polish coal basins

Absolute methane bearing capacity, methane drainage, amount of economically utilized methane and coal production output in Polish hard coal mines in the years 2008-2018

Specification	Year										
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Absolute methane bearing capacity (mln m^3/year)	**880.9**	**855.7**	**834.9**	**828.8**	**828.2**	**847.8**	**891.2**	**933.0**	**933.8**	**948.5**	**916.1**
Methane drainage (mln m^3/year)	**274.2**	**259.8**	**255.9**	**250.2**	**266.7**	**276.6**	**321.1**	**339**	**342.1**	**337**	**317**
Amount of economically utilized methane (mln m^3/year)	**156.5**	**159.5**	**161.1**	**166.3**	**178.6**	**187.7**	**211.4**	**197.1**	**195**	**212**	**203.1**
Number of the hard coal mines	**31**	**31**	**32**	**31**	**31**	**30**	**30**	**31**	**23**	**23**	**21**
Hard coal output (mln tones)	**83.6**	**77.3**	**76.1**	**75.5**	**79.2**	**76.5**	**72.5**	**72.2**	**70.4**	**65.5**	**63.4**

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THE POLISH MINING LAW

ACT of 9 June 2011, Geological and Mining Law

and two main executive acts of this act related to ventilation:

- Regulation of the Minister of the Environment of 29 January 2013 on natural hazards in mining plants
- Regulation of the Minister of Energy of 23 November 2016 on detailed requirements for the operation of underground mining plants

CATEGORIES OF METHANE HAZARD IN POLAND

- I[st] methane hazard category - *0.1 to 2.5 m^3/Mg (daf)*
- II[nd] methane hazard category - *2.5 to 4.5 m^3/Mg (daf)*
- III[rd] methane hazard category - *4.5 to 8.0 m^3/Mg (daf)*
- IV[th] methane hazard category - *>8.0 m^3/Mg (daf) or if there was sudden outflow of methane or outburst of methane and rocks*

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WORKINGS IN METHANE FIELDS IN UNDERGROUND COAL MINES CAN BE CLASSIFIED:

- to the endangered with methane explosion (degree "a"), if the concentration of methane in the ventilation air above 0.5% is excluded,
- to „b”degree of methane explosion hazard if in normal ventilation conditions the concentration of methane in air higher than 1% is excluded,
- to „c” degree of methane explosion hazard, if in normal ventilation conditions the concentration of methane in air can be higher than 1%.

PRINCIPLES OF CLASSIFYING WORKINGS IN METHANE FIELDS IN UNDERGROUND COAL-MINING TO THE DEGREES OF METHANE EXPLOSION HAZARD

Instruction No. 18 issued by the Central Mining Institute

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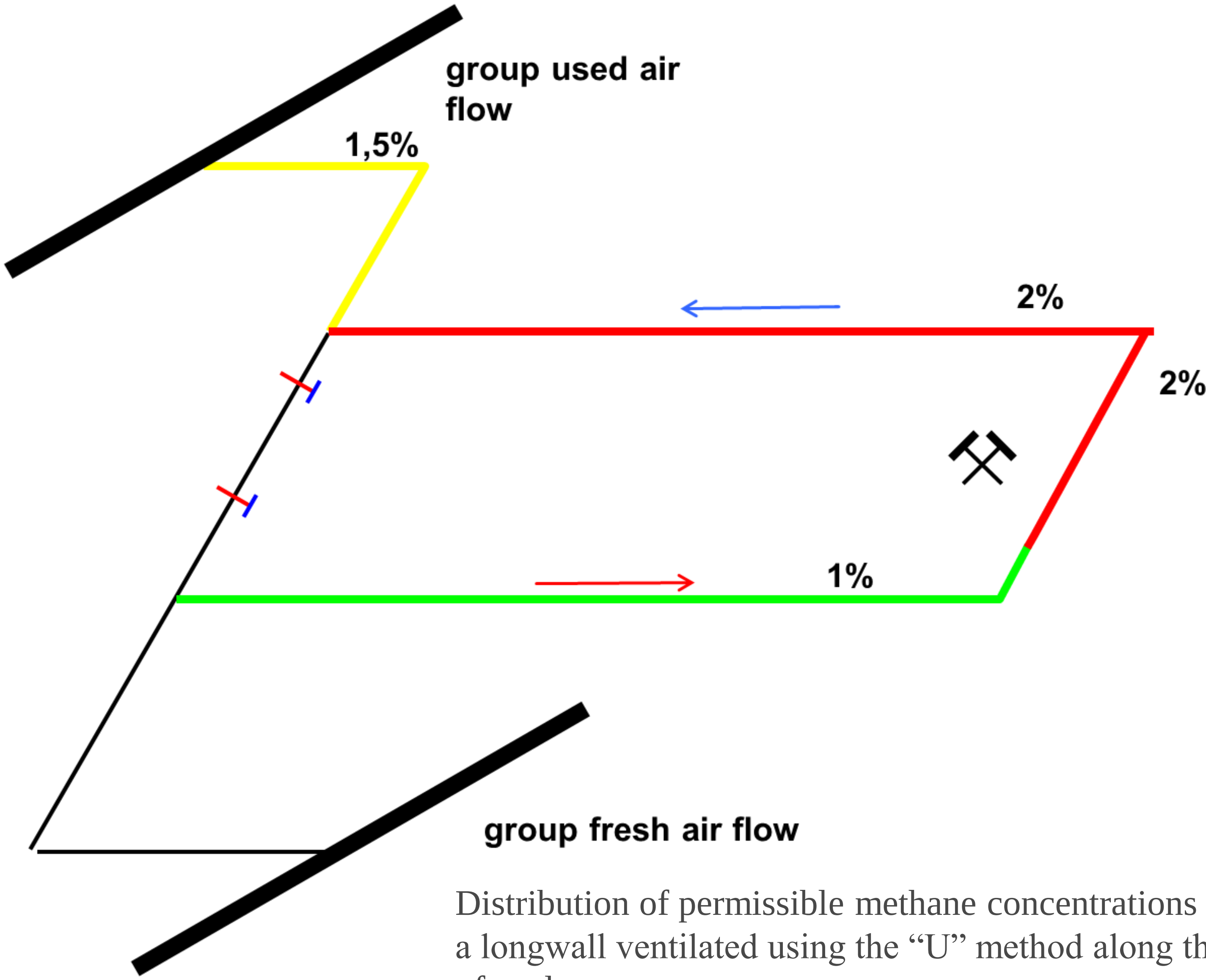


Distribution of permissible methane concentrations within a longwall ventilated using the "U" method along the body of coal

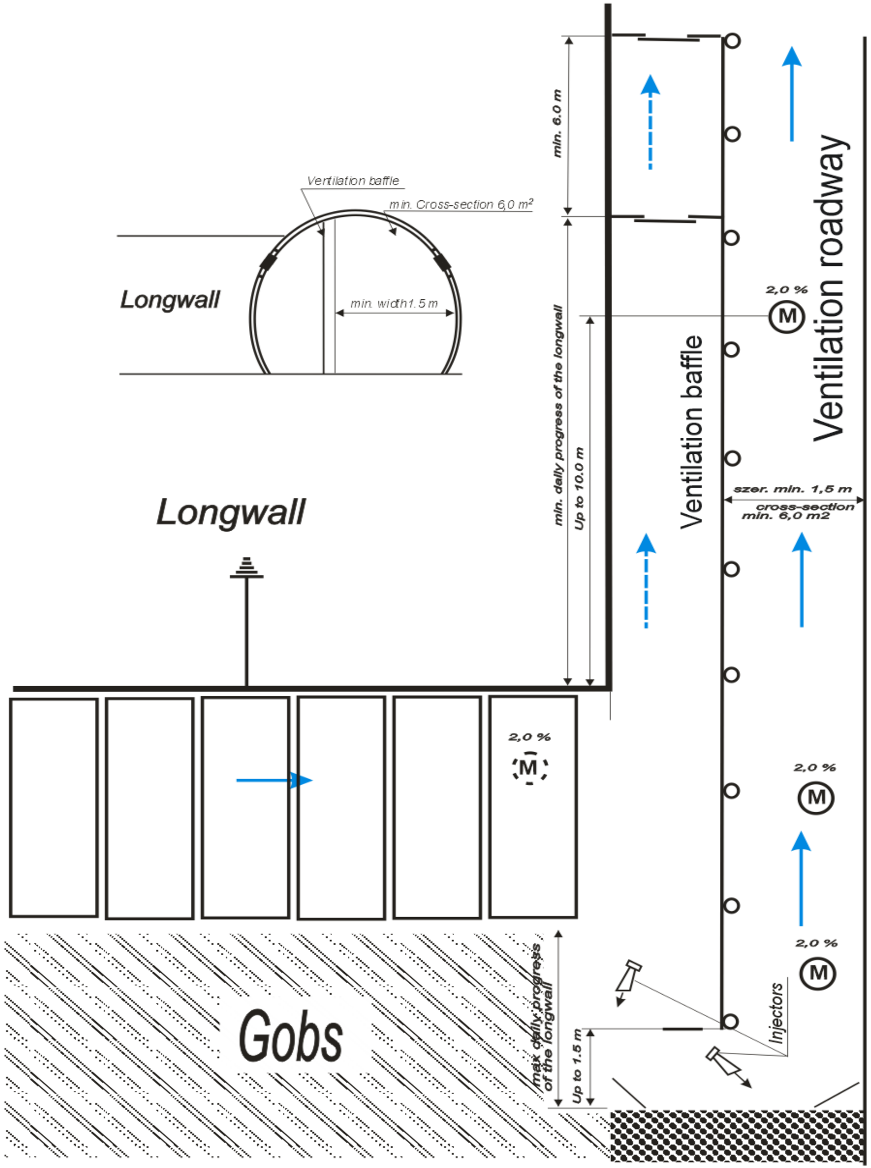
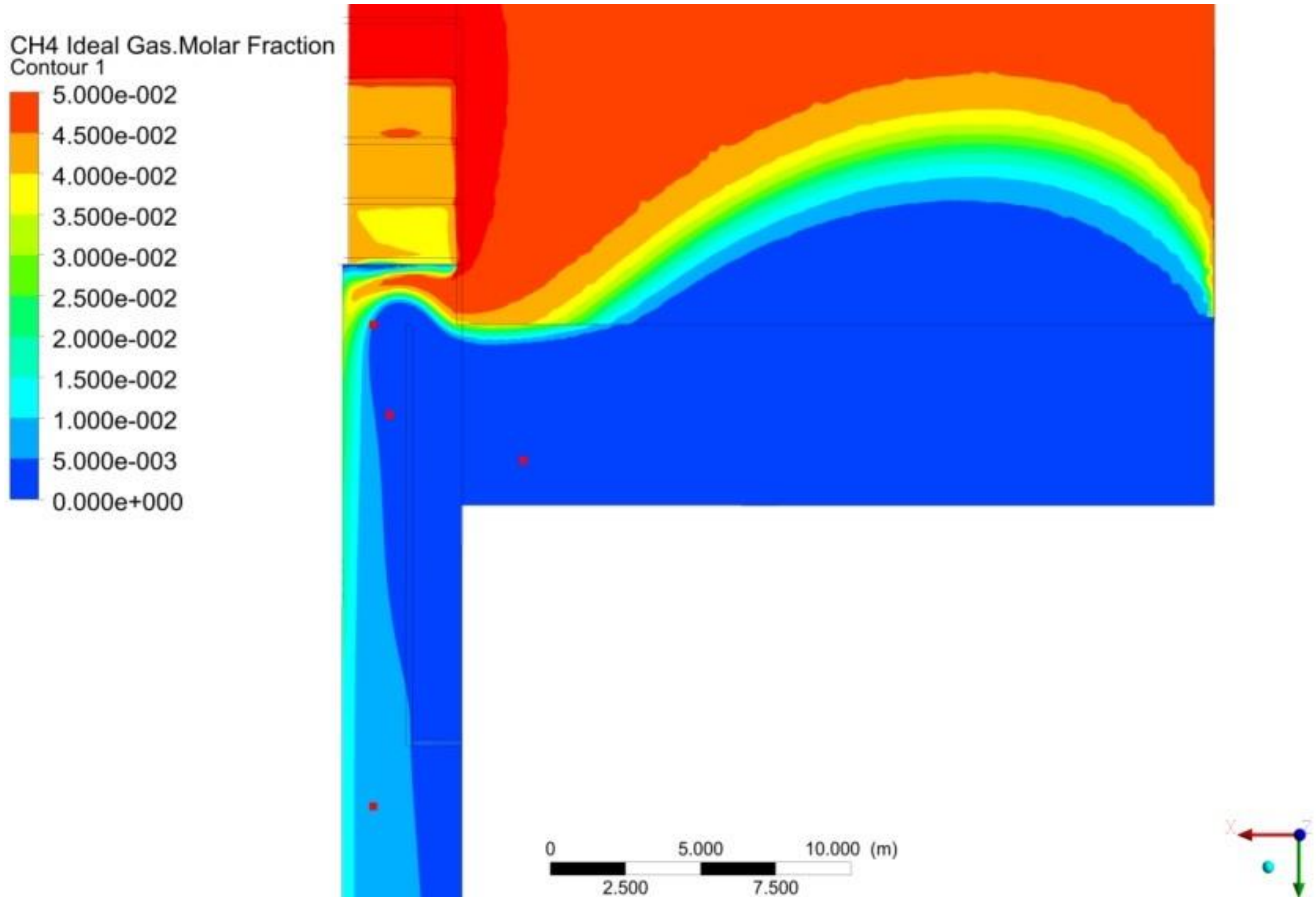


Diagram of the intersection of the longwall ventilated in the “U” system with the ventilation roadway, with the location of methane sensors and the system of auxiliary ventilation equipment for dilution of methane



Location of methane sensors in the area of the longwall ventilated in the “U” type system with the ventilation roadway liquidated with insulating baffles with a length of the dead end of 2meters, under the following ventilation and methane conditions: ventilation methane content Q=10m3/min, =1000 m3/min. Horizontal 2D arrangement at the level of the sensor in the longwall

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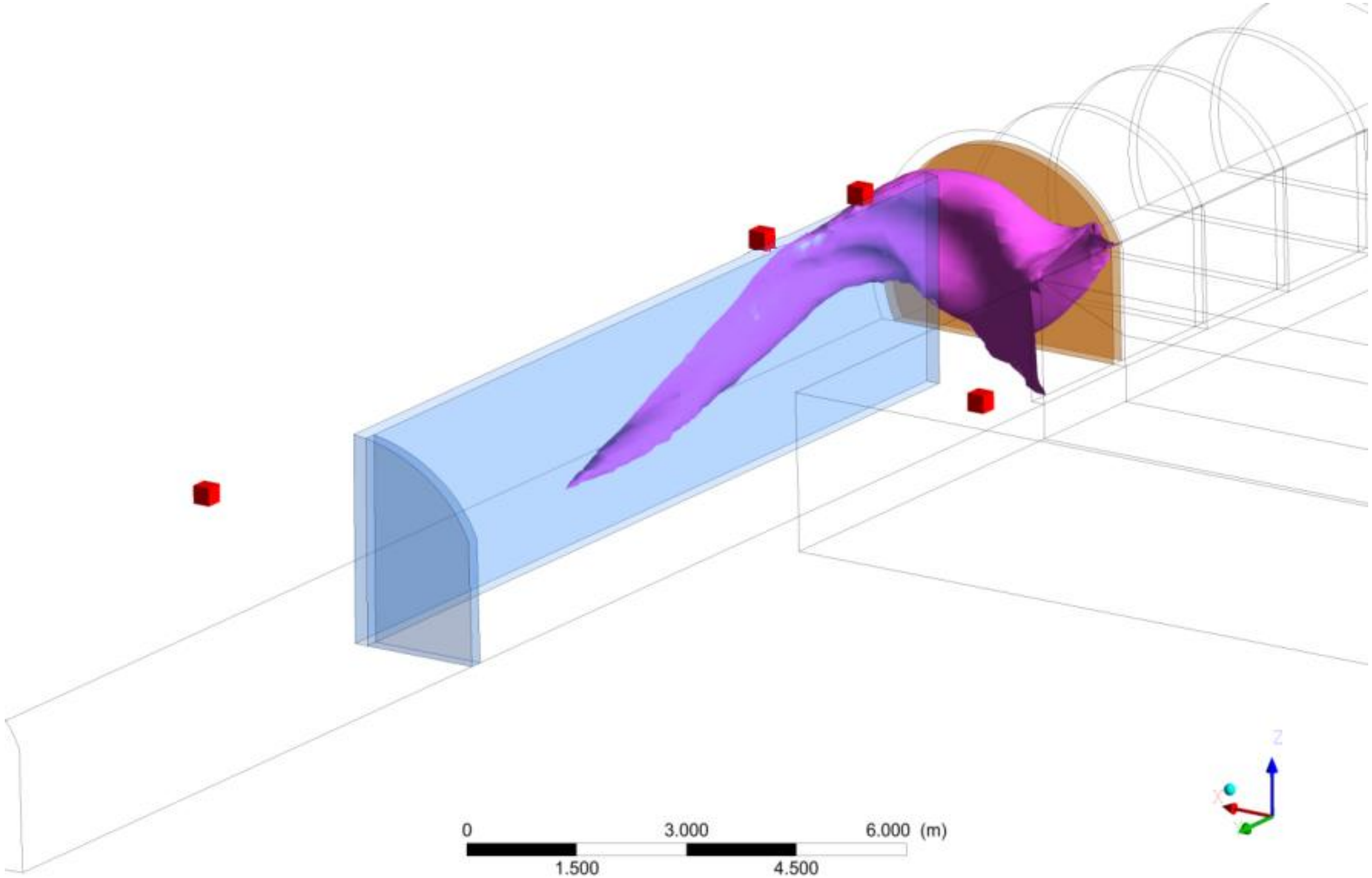

Location of methane sensors at the intersection of the longwall ventilated in the “U” type system with the ventilation roadway liquidated with insulating baffles with a length of the dead end of 2 meters, under the following ventilation and methane conditions: ventilation methane content Q=10 m3/min, =1000 m3/min. The results of calculations obtained from the 3D Model no 3 (applied boundary surface of methane concentration of 3% CH4).

Methane hazard monitoring

- Measurements of methane concentration (automatic and individual)
- Measurement of methane concentration in the methane drainage pipelines
- Measurement of air flow speed in the workings
- State of closure of ventilation dams, that affects the ventilation conditions, as well as changes in the distribution of aerodynamic potentials in the environment of longwalls

PRINCIPLES OF LONGWALL CONDUCTING IN METHANE HAZARD CONDITIONS

Instruction No. 17 issued by the Central Mining Institute

Criterial absolute methane bearing capacity V_{KR}, $V_{KR\text{-}O}$
≥
Absolute methane bearing capacity (forecasted or real)

$$V_{KR} = \frac{V_p c_m k}{100\,n} + \frac{V_L\left(\frac{c_m}{n} - c_p\right)}{100 - \frac{c_m}{n}} - V_{D(CH_4)}$$

$$V_{KR\text{-}O} = 100 \cdot V_{KR} / (100 - E)$$

where:

V_p – volume of the air flow rate flowing through the longwall, m^3/min
V_L – volume of the air flow rate supplying the outlet from the longwall – the auxiliary air duct (longwall U) or air flow rate supplying the longwall (Y type ventilation), m^3/min
c_m –acceptable methane concentration in the air current of the outlet, $c_m = 1.5$ %
c_p – methane concentration in the air supply,
k – coefficient determining the unevenness of the air velocity distribution in the wall, $k = 0.85$
n – coefficient determining the unevenness of methane emission, $n = 1.55$
$V_{D(CH4)}$ – the amount of methane flowing into the longwall from other sources, m^3/min
E - efficiency of the methane drainage of the exploited longwall, %.

Methane prevention for the longwalls:

- Selection of the proper ventilation system for the longwall
- Ensuring the required air volumes in the area of the longwall
- Methane hazard monitoring system
- Effective actions to combat the methane accumulations in the places of possible initiation of ignition or explosion
- Technology of methane drainage of the longwall environment

THANK YOU FOR YOUR ATTENTION

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