



***Methane ignition, methane  
and coal dust explosion  
and accident with multiple casualties  
on 21 November 2006  
in Halemba Coal Mine  
(Ruda Śląska, Poland)***

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## **Methane ignition, methane and coal dust explosion**

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**On 21 November 2006 at 4.30 p.m. methane ignition and explosion took place at the 1030 m level in the area of longwall 1 (coal bed 506, batch E) in Halemba Coal Mine.**

**As a result of this occurrence an accident with multiple casualties happened. 23 people were fatally injured and 1 suffered minor injuries.**



# The most serious mine disasters related to methane explosion in the history of Polish hard coal mining

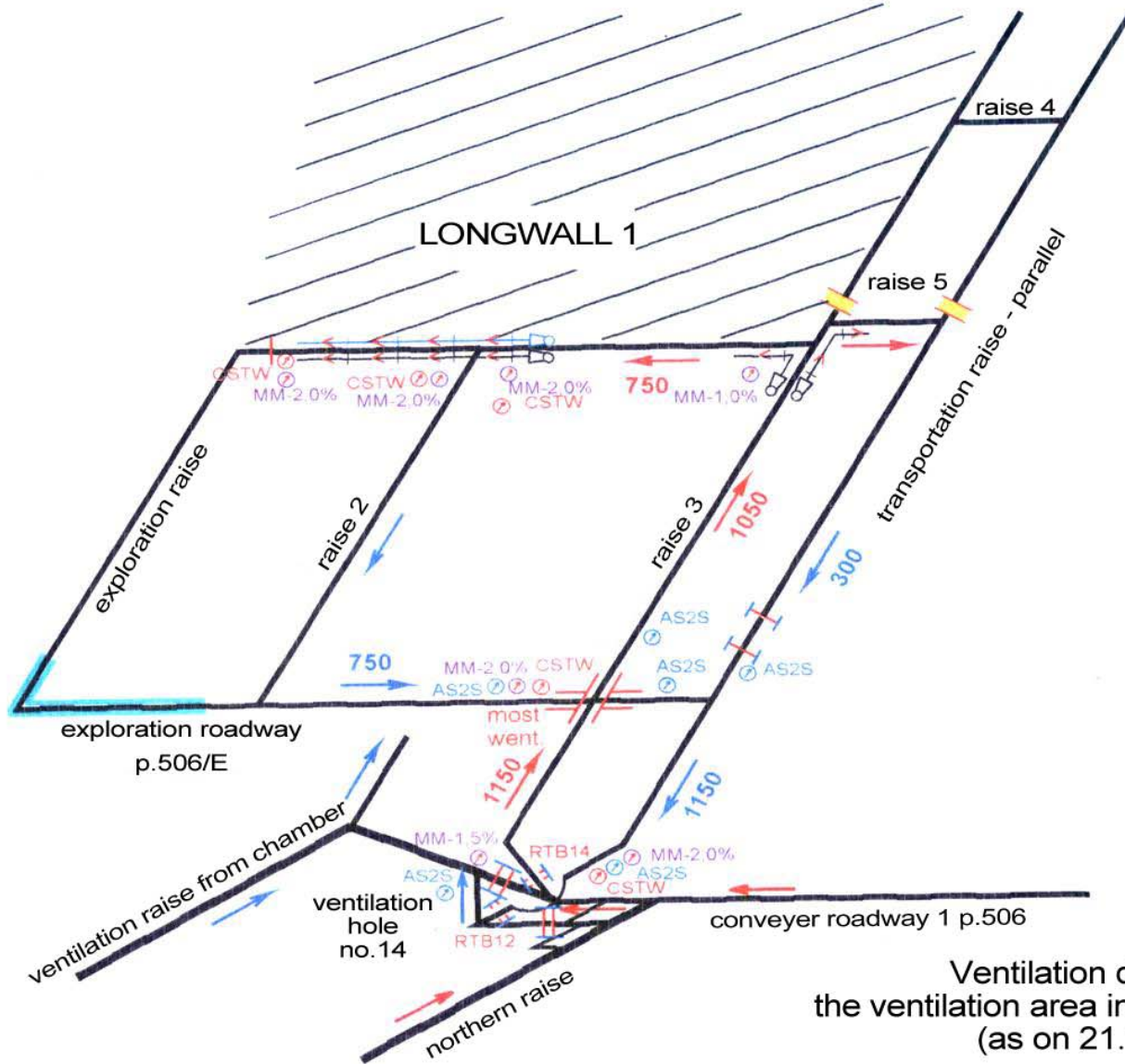
Year	Coal mine	Cause	Number of casualties
1945	Brzeszcze Coal Mine	Methane explosion	9
1950	Jankowice Coal Mine	Methane explosion	29
1958	Nowa Ruda Coal Mine	Methane explosion	14
1959	Moszczenica Coal Mine	Methane explosion	9
1961	Polska Coal Mine	Methane explosion	9
1968	Niwka-Modrzejów Coal Mine	Methane explosion	5
1974	Silesia Coal Mine	Methane explosion	34
1987	Mysłowice Coal Mine	Methane and coal dust explosion	18
1990	Halemba Coal Mine	Methane explosion	19



# Geological and mining conditions

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- The longwall 1 in coal bed 506 was launched on 20 September 2004.
- The coal bed 506 was counted to the 4th category of methane hazard , 3rd degree of rock burst hazard and class B of coal dust explosion hazard.
- In the period from 17 to 21 November 2007 exceeded threshold values of methane concentration were 44 times registered by a detector. The values were exceeded, in the area of roof support recovery, in total time of 336 minutes. 9 times (out of 44) the concentration exceeded explosive values. Despite this fact the employees were not evacuated from the endangered zone.
- The methane ignition, methane and coal dust explosion happened at 4.30 p.m.



Ventilation diagram for  
the ventilation area in the coal bed 506/E  
(as on 21.11.2007)



# Accident in Halembe Coal Mine - animation

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# Rescue operations

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Rescue operations in Coal Mine Halemba were conducted in two stages:

**Stage I** – rescue for the people (conducted from 21 November 2006, 4.30 p.m. to 24 November, 1.30 a.m.)

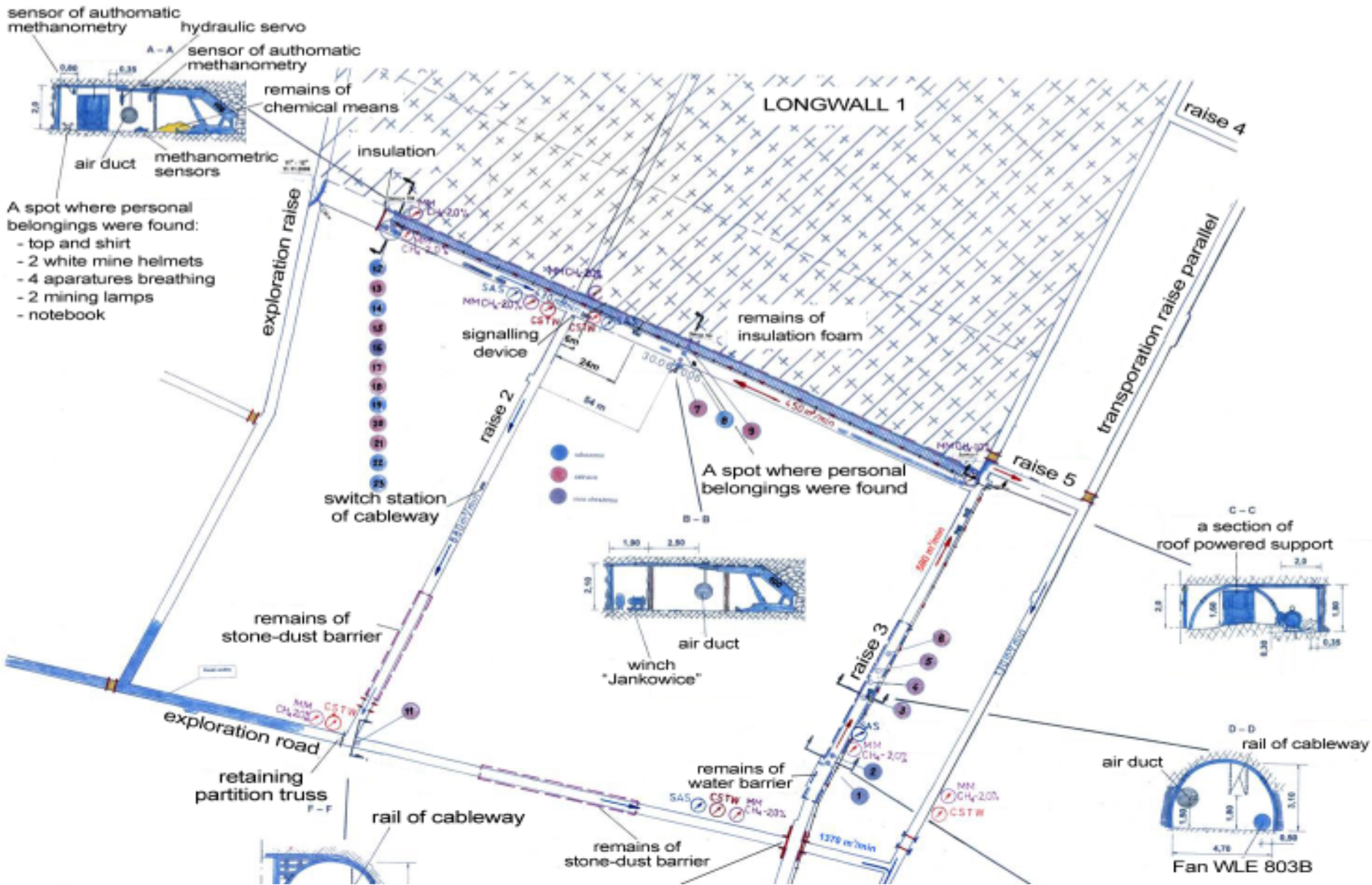
- lack of information about 23 workers employed in the area of the accident,
- at 4.50 p.m. rescue teams from District Rescue Station in Zabrze and a team of emergency service for testing from Central Rescue Station in Bytom were called
- a danger zone was established for this area
- the rescue teams from collieries were supported by rescue workers with special qualifications
- rescue teams in the number from 2 to 12 were employed on each shift, depending on workload



# Rescue operations

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- the bodies of 6 miners were found and transported to a base
- additional chromatographic lines were installed and workings were penetrated
- ventilation dams in the air crossing were repaired
- mine drainage in the area was put into operation
- remaining 15 miners were found in the longwall area and 2 in neighboring headings
- the last body was transported to the surface on 24 November 2006 at 1.30 p.m.





# Rescue operations

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**Stage II** – operations aimed at improvement of mine atmosphere conditions before an on-site visit in the area of the longwall 1.

- After the bodies were transported to the surface, the main goal was to enable the commission to access the area of the longwall 1 and to make an inspection at the place of the accident
- On 16 December 2006 due to an increase of fire hazard in cavities of longwall 1 the endangered zone was sealed.
- In the first half of March a plan of rescue operations related to opening and ventilation of the sealed zone.
- From 10 to 24 April 2007 initial preventive works were conducted in order to open the area (demolition of cemented stopping, drilling drainage hole).
- From 24.04 to 10.05.2007 the works were conducted under the regime of rescue operations (pumping water, installation of the lines for remote gas monitoring, installation of separate ventilation, penetration of headings by rescuers).

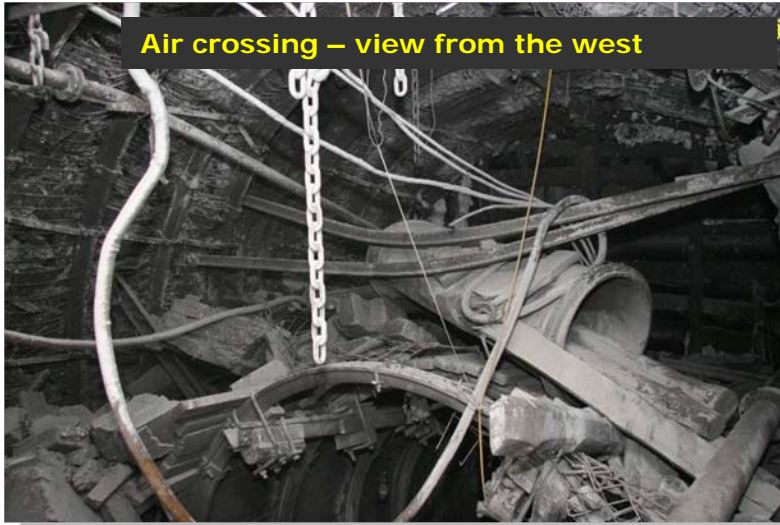


# Rescue operations

- On 10.05.2007 after inspection of accessible headings in the area of longwall 1 and ensuring that gases in ventilated headings are within permissible concentration limits the rescue operation manager decided to stop working under the regime of rescue operation.
- On 10 and 11.05.2007 the members of the Commission inspected the place of the accident.
- The work related to opening and ventilation of the area of longwall 1 (coal bed 506) were conducted for 31 days, including 18 days of work under regime of rescue operations, by 292 rescue teams. There were 2-10 rescue teams employed on each shift, including teams of rescue divers on 27-28.04.2007. In the area of longwall 1 two stone-dust barriers were reconstructed, 14 methanometers were installed, 7 CO sensors and 6 anemometers. High-duty Korfmann's fans were used for ventilation of headings. Meetings of the advisory committee were called 4 times by the management of the operation to give opinions on conducted and planned operations.



# Effects of methane and coal dust explosion



Air crossing – view from the west



A fan WLE 804 B – view from the west



Personal belongings of the victim



Remains of explosion-proof barrier in the raise 2



# Commission

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**On 21 November 2006 the President of the State Mining Authority appointed a Commission for accident investigation. The SMA's President became the chairman of the Commission.**

- **commission convened 8 times**
- **6 working teams were appointed at the first meeting**
- **18 expert opinions and studies were made**
- **on 3.01.2007 and 10-11.05.2007 2 on-site visits were made in the area of the accident**
- **Commission completed work on 31.05.2007**

**Work results, studies and expert opinions, analyses of witness reports, collected evidence and results of on-site visits were useful to elaborate the causes and circumstances of the occurrence, as well as to draw conclusions in order to avoid such accidents in the future.**



# Causes of methane ignition, methane and coal dust explosion and accident with multiple casualties

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## I. Cause of methane ignition and explosion

1. Hazardous accumulation of methane in the area of the liquidated longwall 1 (coal bed 506).
2. Initiation that caused fire and subsequent methane explosion in the areas of methane accumulation.
3. The Commission determined that the ignition was not caused by: blasting operations, welding, mechanical sparking from the friction of winch rope against metal elements of longwall equipment, ESDs from chemical agents and personal protective equipment or use of open flames.

A probable cause of ignition could be: poor condition of electrical appliance, ESDs of the screen that was used in this area, spontaneous fire in goafs or sparks from rock burst friction



# **Causes of methane ignition, methane and coal dust explosion and accident with multiple casualties**

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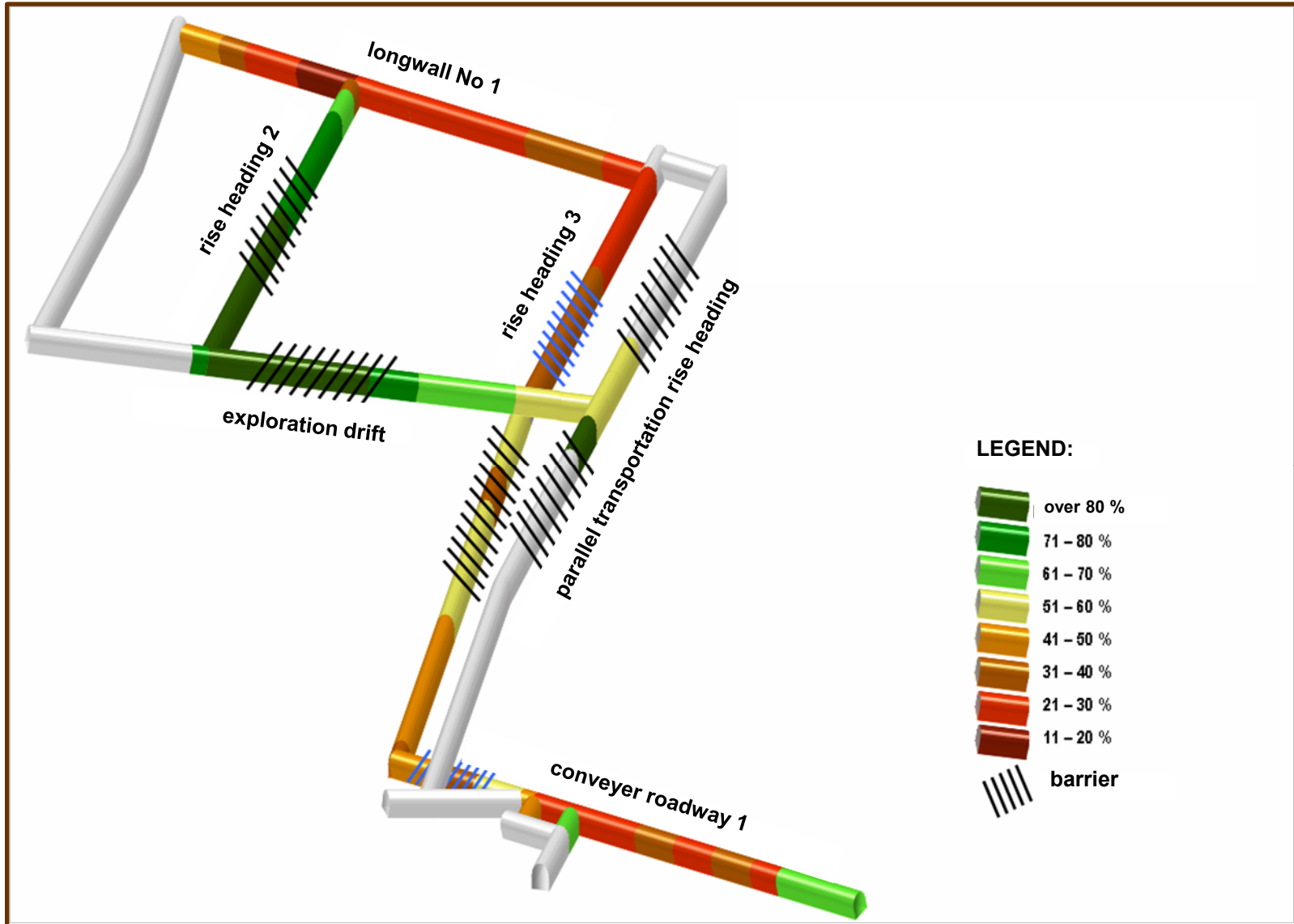
## **II. Causes of coal dust explosion**

**Coal dust explosion was initiated in liquidated longwall 1, in the section that was ventilated with separate ventilation.**

**Coal dust explosion and its spreading resulted from breach of regulations on coal dust explosion control.**



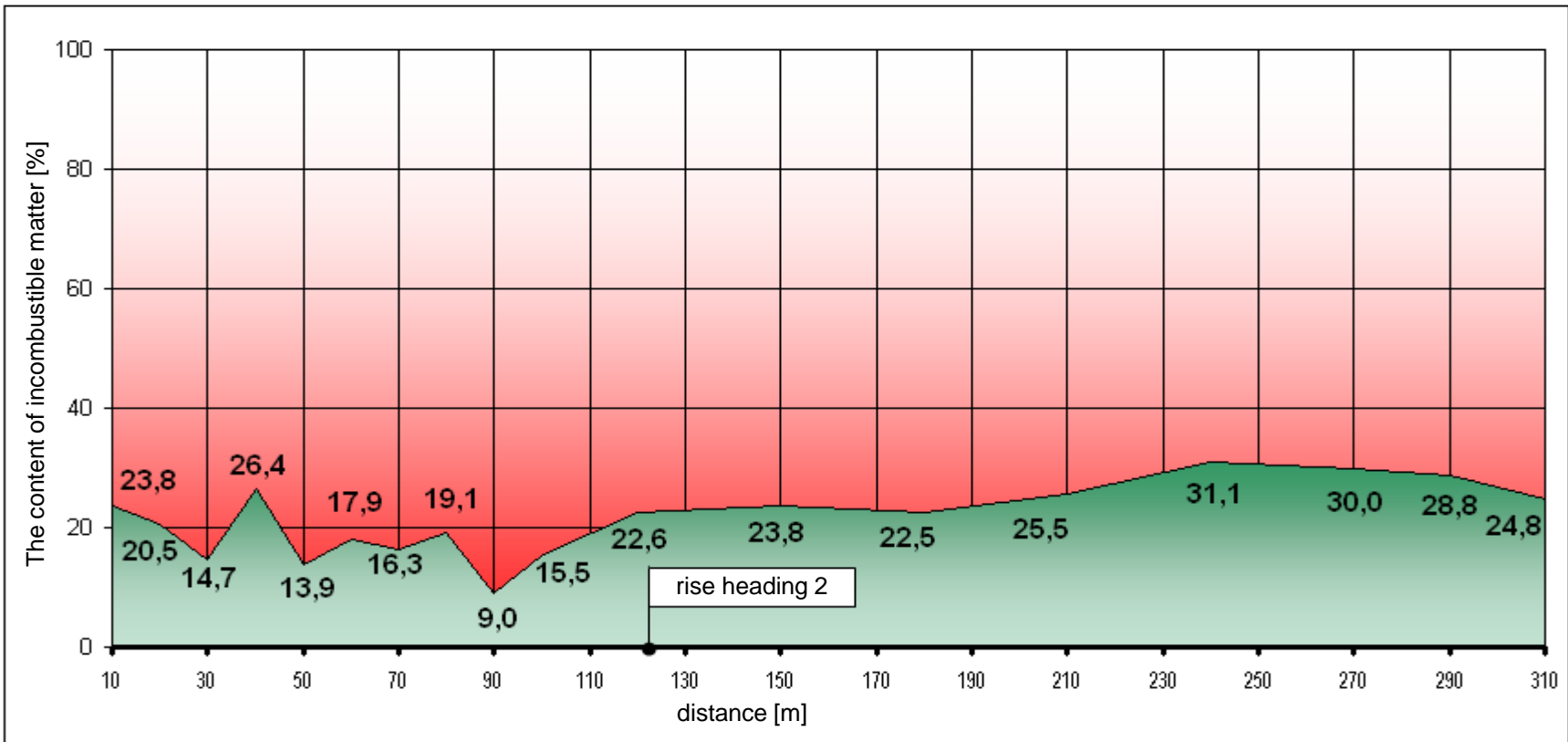
# The content of incombustible matters in mine dust





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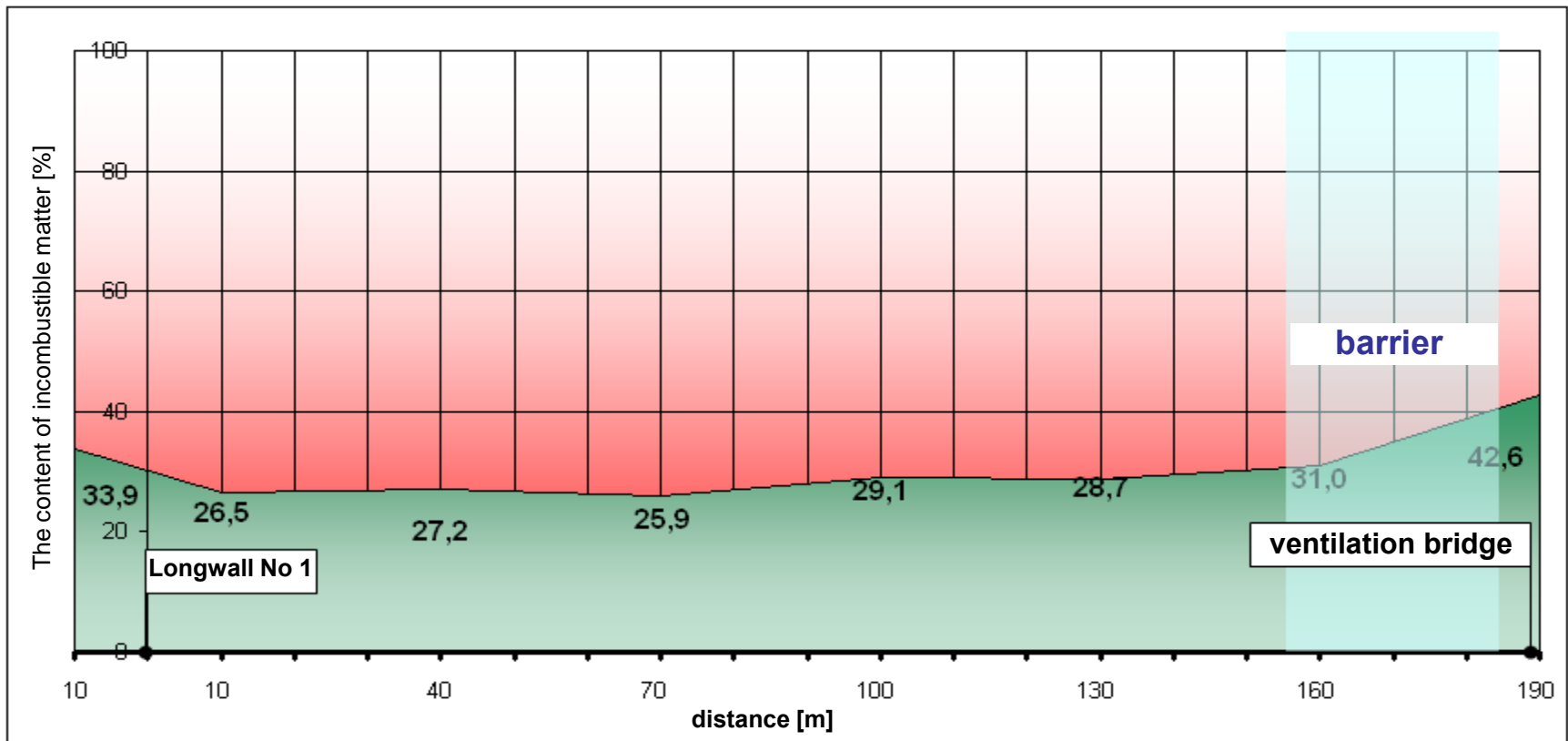
## Longwall No 1 seam 506





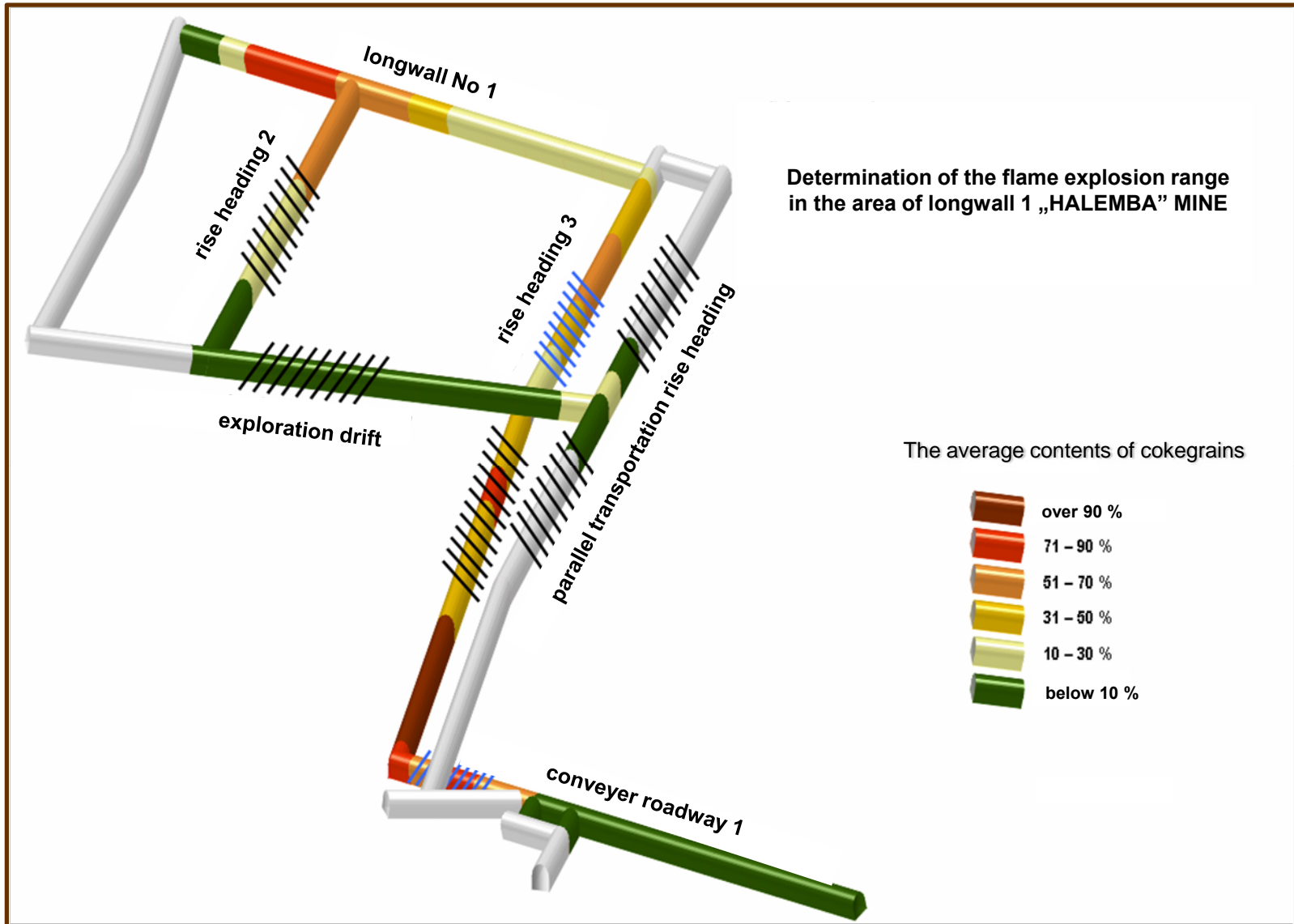
# The content of incombustible matters in mine dust

## rise heading 3





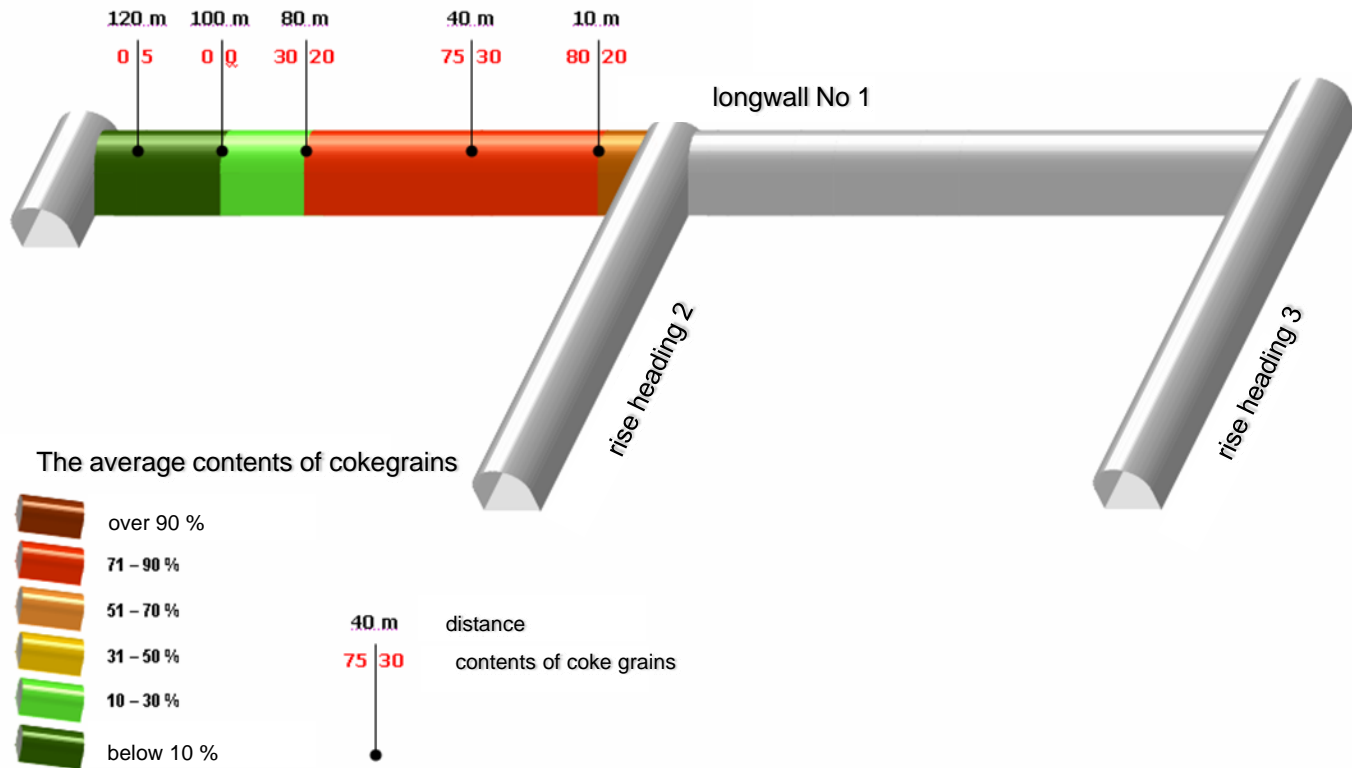
# Determination of the flame explosion range





# Determination of the place of ignition of explosion

Determination of the place of ignition of explosion  
in the area of longwall 1 „HALEMBA” MINE





## Conclusions of the Commission

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**The Commission formed conclusions related to:**

- I. Coal Mine "Halemba"**
- II. coal mining companies**
- III. research units**
- IV. changes in mining regulations**