

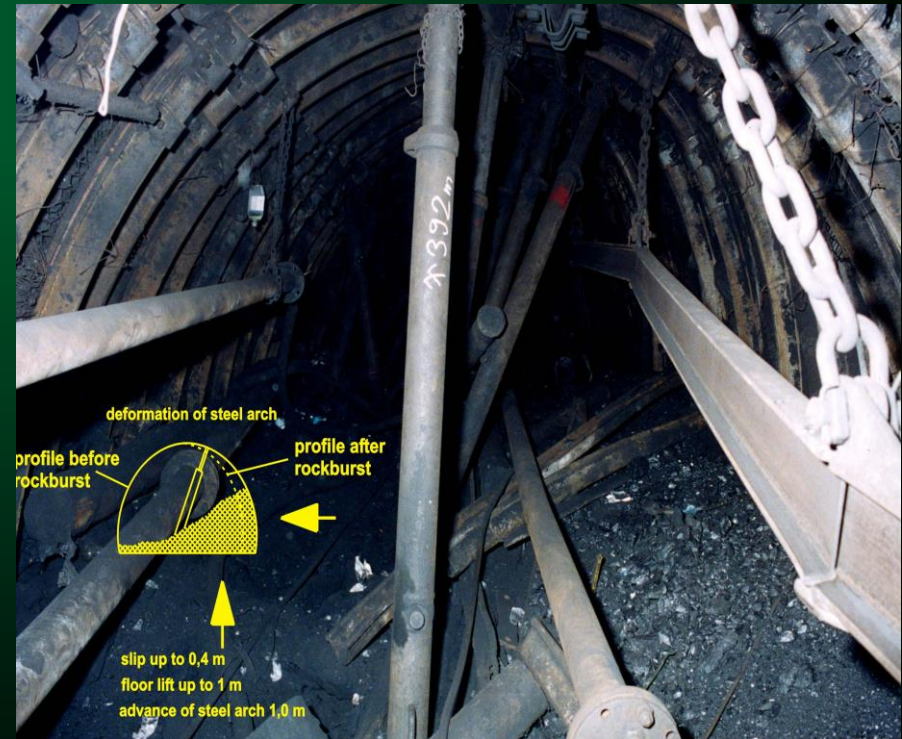


LEGISLATION CHANGES AFTER SERIOUS ROCKBURST

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ROCKBURST – THE MOST DANGEROUS PHENOMENON IN UNDERGROUND HARDCOAL MINING



ROCKBURST PREVENTION :

□ Decree the Czech Mining Office No. 659/2004 Coll.

□ Labour rules No. 659/2004 Coll.

□ Methodical instructions:

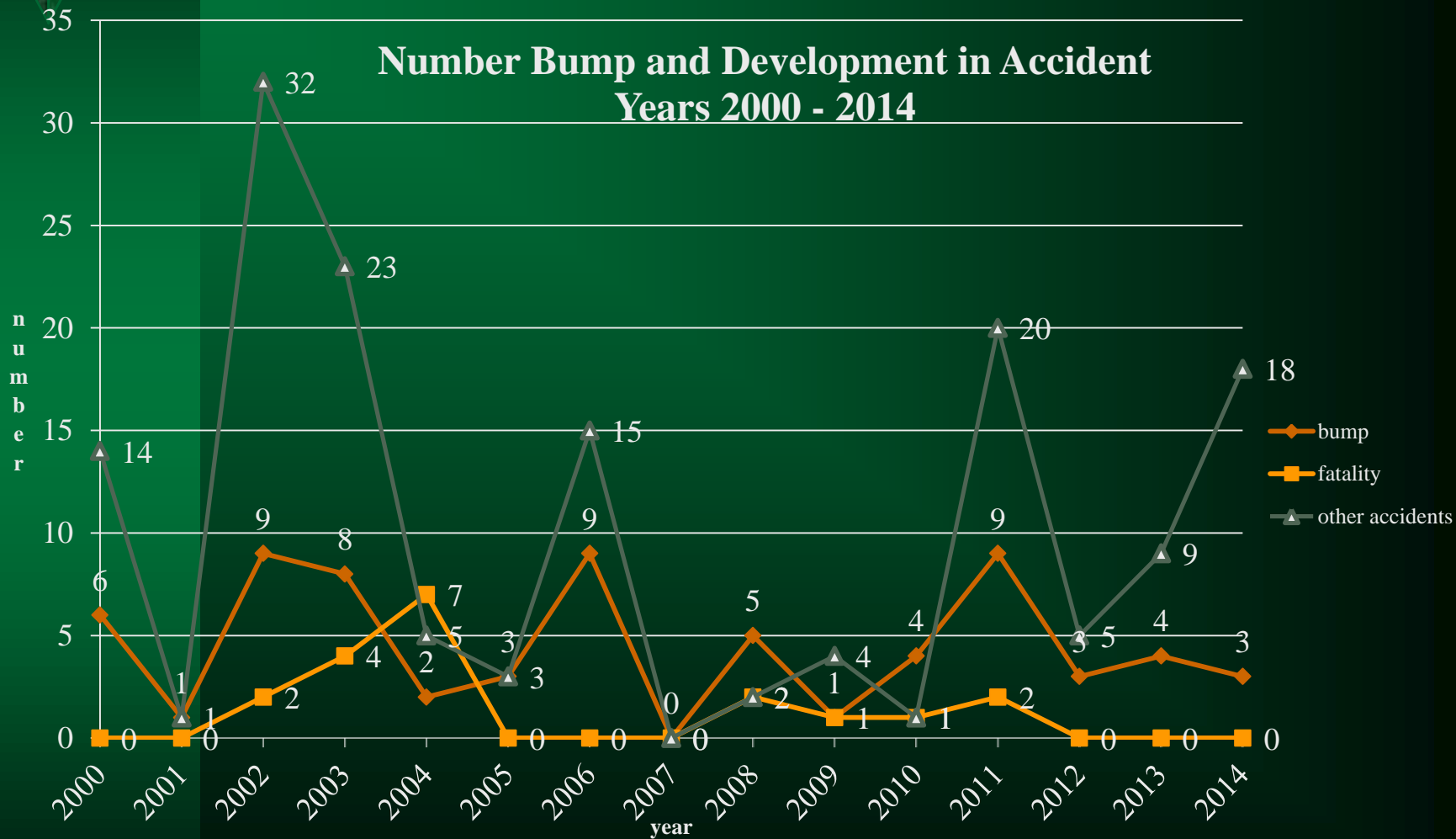
- Application of the Labour rules.
- Mining concept.
- Regional prognosis.
- Individual observation.
- Destress drilling.
- Means of rockburst prevention.
- Destress blasting.
- Wetting.
- Driving and mining in areas of safety pillars.
- Seismic monitoring (seismological and seismoacoustic) and its evaluation.
- Rockburst documentation.



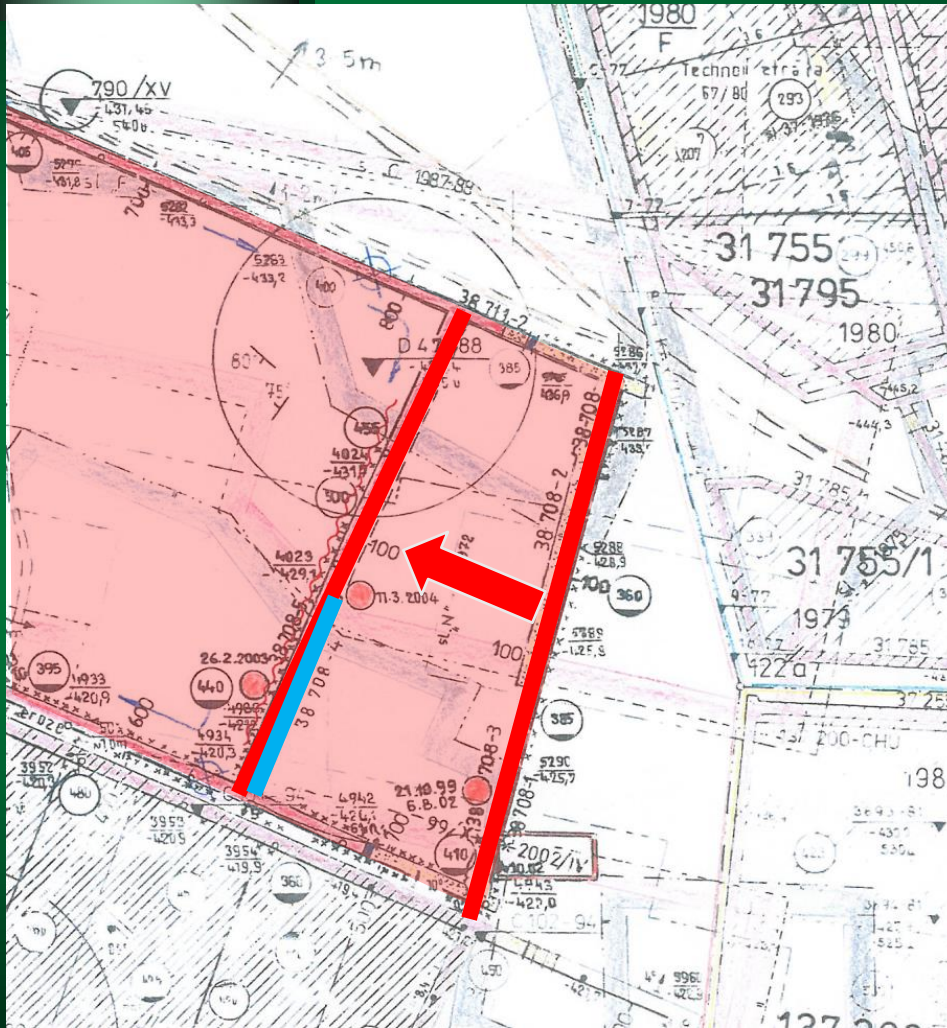
MAIN CAUSES OF THE SERIOUS ROCKBURSTS

- **Impact of additional stress from previous mining in the overburden seams.**
- **Impact of additional stress from mining in mined seam.**
- **Occurrence of rigid competent rock layers between seams (sandstones and conglomerates).**

ROCKBURTS NUMBER AND ACCIDENT OVERVIEW 2000-2014



THE MOST SERIOUS CASE OF THE PERIOD ROCKBURST AT LAZY MINE



- Prepared longwall in 7th mining block – depth 680 m.
- The first plan of crosscut localization – unsuccessful (rockburst and heating).
- Crosscut was removed Westwards.
- Driving of the first cut of crosscut (steel arch support, profile 5.5 x 4 m, weight category 29 kg/m, spacing 0.5 m).
- Driving of second cut (final width 9 m).
- Rockburst occurrence in the stationing 79 m.



ROCKBURST PREVENTION

■ **Local prognosis:**

- Regular test drilling \varnothing 42 mm (test to face length 16 m, side test boreholes length 9 m) – not detected dangerous conditions.
- Seismic monitoring (seismology and seismoacoustic (recorded low seismic activity)).

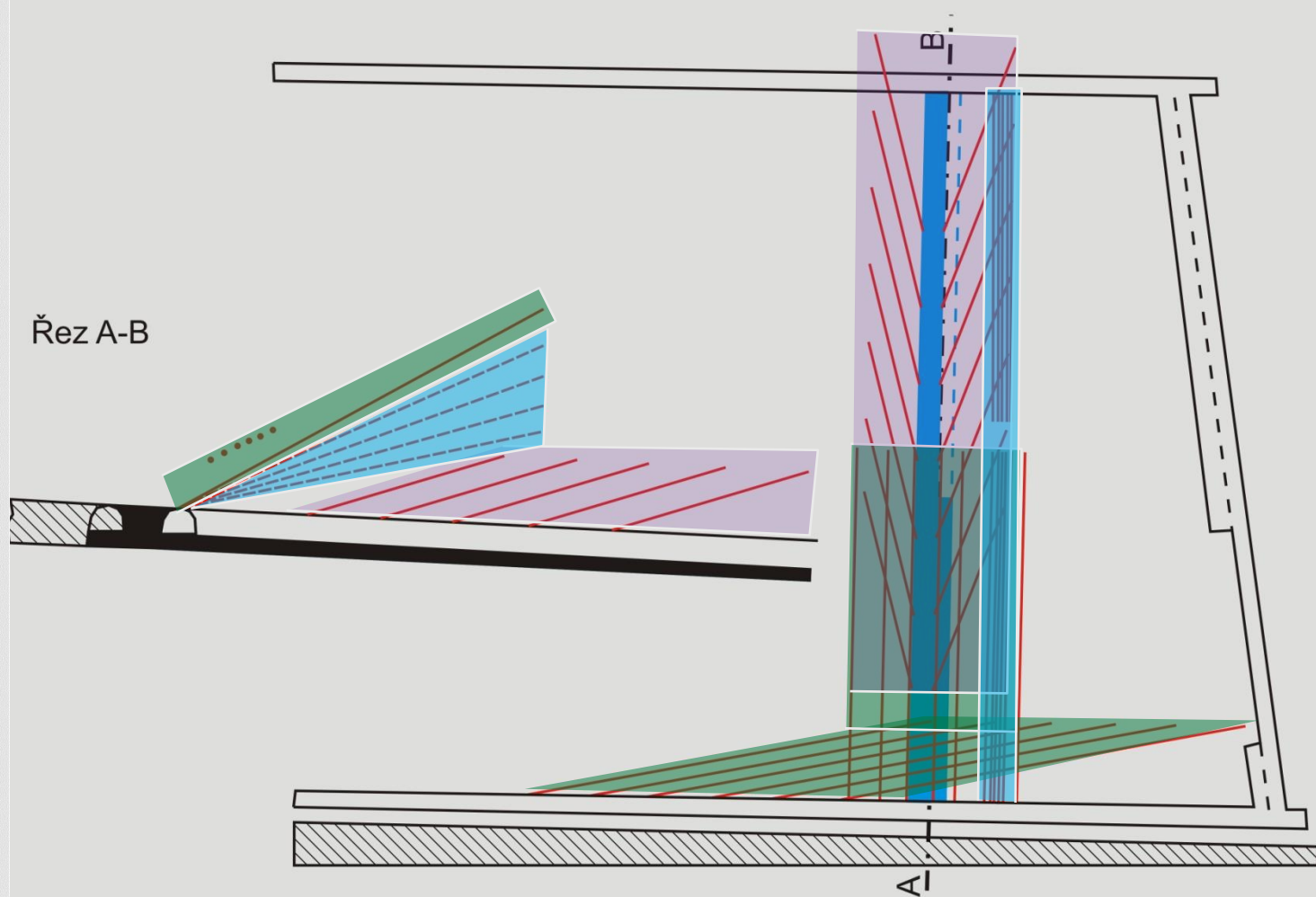
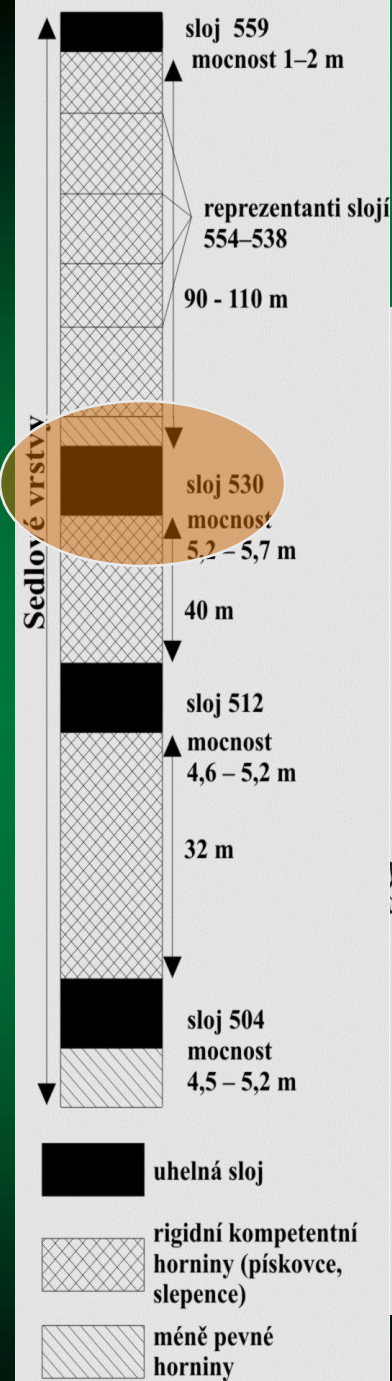
■ **Active rockburst measures:**

- Regular distress blasting in coal seam (preconditioning in the face and both sides of crosscut).
- Regularly distress blasting in roof rocks.

■ **Passive rockburst measures:**

- Extended dangerous area (distance 400 m from the driving face).
- Restricted movement of miners and its number in dangerous area (during driving operations max. 9, out of driving operations max. 14).
- Support strengthening:
 - Anchoring side steel arch support (anchors Boltex, length 2.5 m, spacing 1 m).
 - Installation of longwall powered support before crosscut extending.

SCHEME OF DESTRESS BLASTING





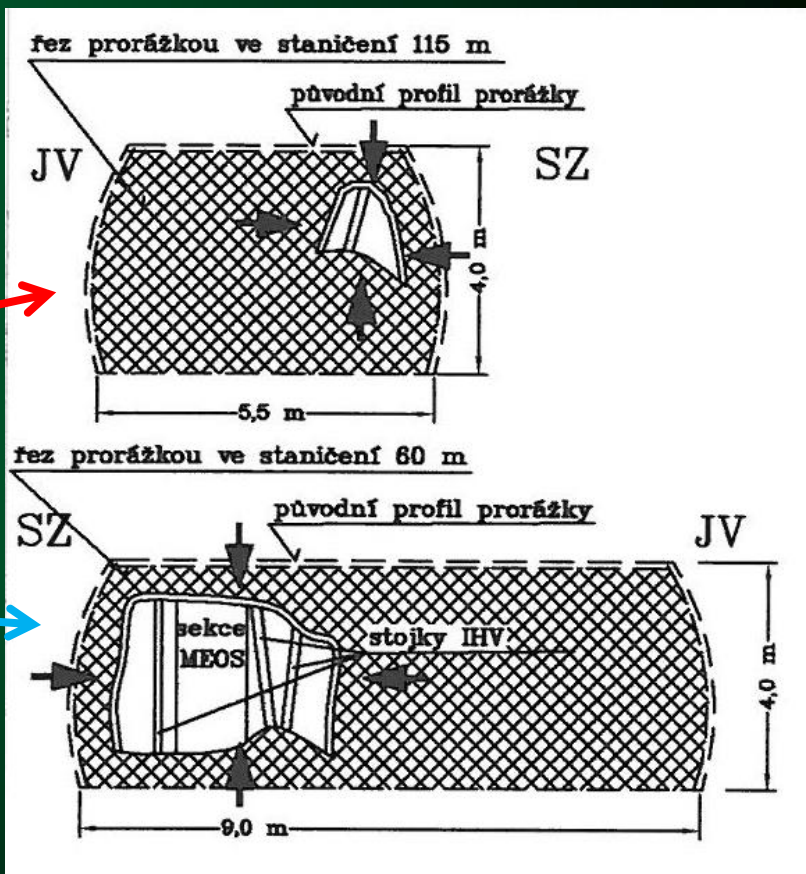
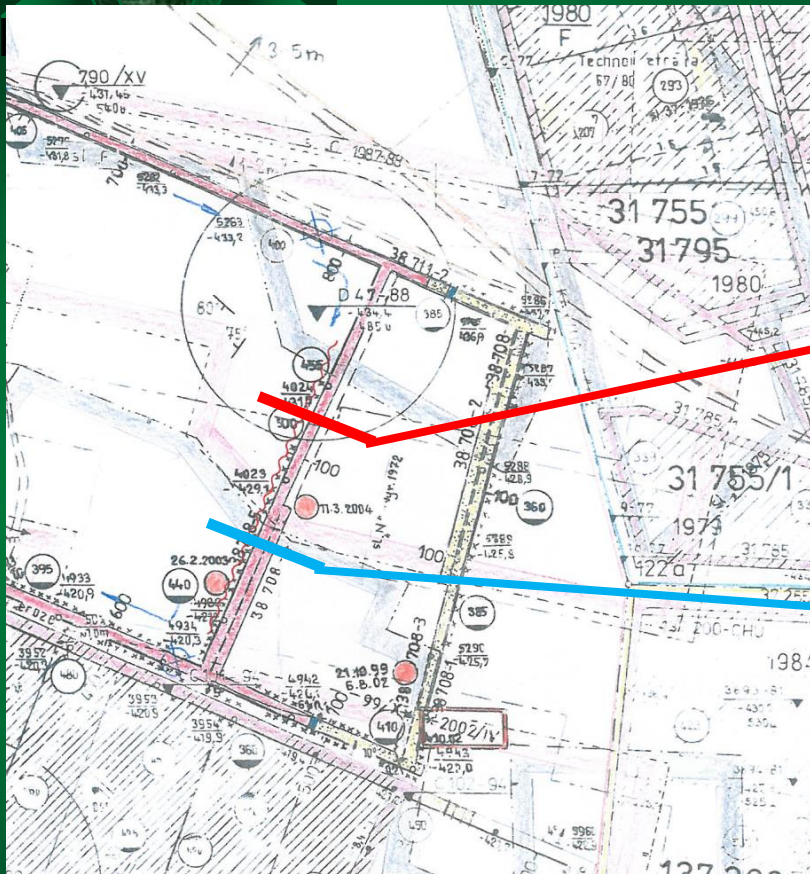
DESTRESS BLASTING PARAMETERS

- Borehole diameter from 75 – 105 mm into the roof competent rocks.
- Dip + 30°.
- Length of boreholes up to 100 m.
- Spacing of boreholes from 5 – 12 m (according to purpose and situation).
- Pneumatic loading of explosives into the boreholes.
- Using of rock explosives (Perunit a Danubit type).
- Shot firing without delay.
- Fired explosive charges from 840 kg – 2880 kg.

DESTRESS BLASTING IMPLEMENTATION

Stage	No. of Boreholes	Explosive charge [kg]	Seismic energy [J]	Seismic effect (success of stress release)
1	3,4,5,51	2616	6.7E+03	1.2
2	1,2,6,7	2733	6.0E+03	1.0
3	I,II,III	1272	2.6E+03	1.0
4	22,23,25	2784	3.0E+04	5.1
5	24,26	2040	2.1E+04	4.9
6	XIII,XIV	840	1.6E+03	0.9
7	IV, V,VI	1200	1.8E+04	7.1
8	XV,XVI,XVII	1248	2.4E+03	0.9
9	VII,VIII,IX	1248	2.1E+03	0.8
10	XVIII, XIX,XX	1248	2.7E+03	1.0
11	X,XI,XII	984	2.9E+03	1.4
12	8,9,10	2736	2.0E+04	3.5
13	11,12,13,14	2880	1.4E+04	2.3

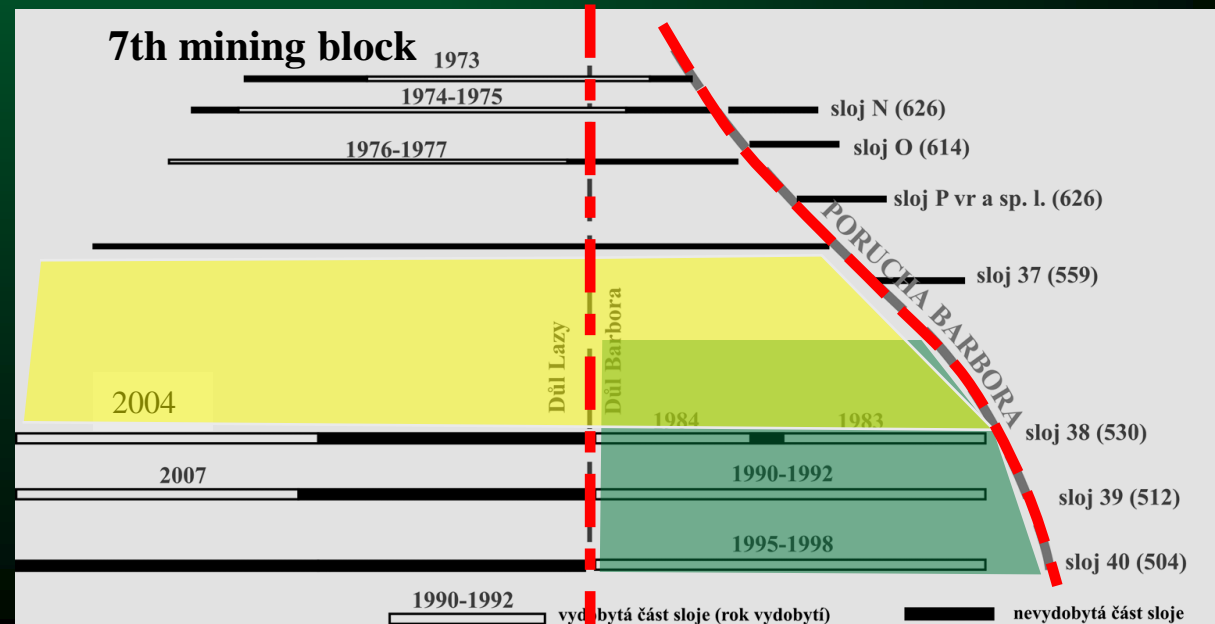
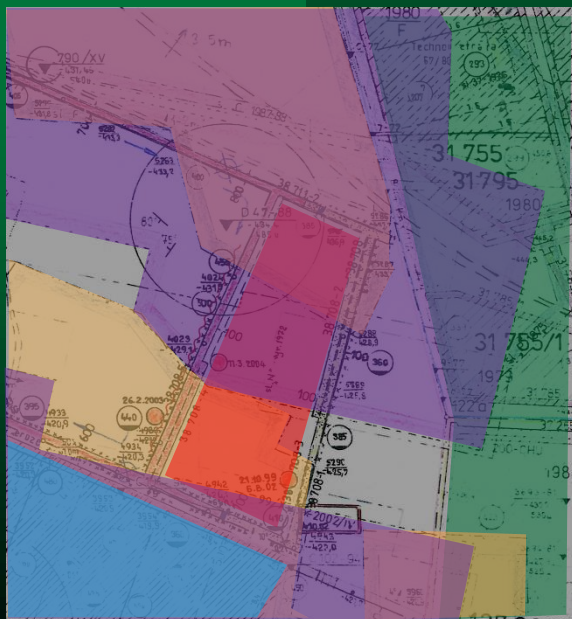
EXAMPLE – LAZY COLLIERY



- Very strong rockburst.
- Seismic energy $3.0E+06$ J
- Intensive surface vibration.
- Damage of crosscut (more than 120 m)
- 7 fatalities

CAUSATION OF ROCKBURST

- Impact of additional stress from previous mining in overburden.
- Impact of additional stress from previous mining in the exploited seam.
- Impact of left unmined pillar eastwards from crosscut.
- Disrespecting of natural border of mining block (tectonic fault Barbora VS geometric boarder).
- Previous mining of thickness coal seam in neighbouring colliery (eastwards) in advance before mining in 7th mining block.
- Occurrence of thickness competent strata (thickness 110 m) in overburden of exploited seam.





TIGHTEN REGULATIONS

Decree of the Regional Mining Office:

- Selected mining blocks with very high rockburst risk.
- Additional regulations and restrictions in mining block:
 - 1 longwall mining is allowed only contemporarily.
 - Simultaneous longwall mining and driving in the other seams is allowed in mutual distance more than 200 m.
 - Driving in the same seam is allowed only when longwall mining stops.
 - Seismic monitoring realised by authorised persons only (authorization by Regional Mining Authority).
 - Only 1 working place with impact into the rock mass (driving or mining) is allowed.
 - Maingate and tailgate cross-section min. 16 m².
 - Strengthening of steel arch support of gates by probes with spacing max. 1m in area of additional stress from longwall face must be performed (90-120 m according to conditions)
 - Miners staying in longwall gates during mining operations (apart necessary operators) is prohibited.
 - Maximum longwall advance must be stated according to local geological and geomechanical conditions.
 - Expert commission for evaluation of rockburst prevention and rock mass behaviour must be established for every longwall (period of meeting – 1 time per two weeks)



**THANK YOU VERY MUCH FOR
YOUR ATTENTION!**

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