Underground mining

"Underground mining"

Abstract

The degree project contains page 62, fig. 8, Table. 20.8 Sources of literature.

The object is to develop a block 1-406 number 4 Mine (mine 6P, mine "Tulukuevskoe"). Located between exploration lines 47 - 50 along strike, between III and IV horizons.

The main objective of the project - working out the balance of ore with a maximum extraction of metal from the bowels of the traditional way of working out using high-performance self-propelled bottom hole and auxiliary equipment, as well as create a safe working environment for employees in this unit.

Applicable system of development: "The horizontal layers of hardening bookmark" option working out the "top-down".

Ventilation unit is carried out by obscheshahtnoy depression. Fresh air is supplied to the V IV horizon horizon through the ventilation shaft rising from 4.5 6P with the fan installed capacity of 180 WATER -30 m^3 / sec.

From the trunk stream of fresh air 6P goes to block 1-406 mine workings on the following: shtreku1-402 11K-400 crosscut, drift 1-419.

At the working layers of the block, fresh stream of air flows through the insurgent 1-406/1 and 1-406/2, as well as a transport ramp number 1 on the substage followed her divorce in the working layers of the block.

The outgoing air stream, with the debugging layer unit is given in the crosscut 11K-300, followed by its branch to the trunk of 11K and below the surface.

Submission of hardening stowing the bookmark is a set of "The March" by the number 2 mine Concrete Delivery Truck transportation unit to backfill wells drilled from the surface. From stowing stowing mixture well served by pipelines in the stope waste layer.

Rocks and ores because of the large predominance of clay minerals are prone to caking. In connection with this pickup trucks in the rock mass is accomplished by loading of the ore passes under the 1-406 / $_{1.2}$, with the help of TORO-151D transport unit vectors m number number 1, 2 through the racks are located in the crosscut 11K-400 and a roadway - 419.

Mining haul mass with working layers of the block is projected to IV horizon with transportation of the rock mass in the trunk of 11K.

Projected unit is located outside the protected zones of ground buildings and structures.

Introduction

The field "Tulukuevskoe" is a part Strel'tsovskaya group of fields.

For the field "Tulukuevskoe" question to find effective methods of mechanization on the basic processes is crucial, since the mine in real time, the traditional means of mechanization of work and have little or no experience with modern high-performance mechanical means of treatment and the tunnel works on the basis of self-propelled equipment that is deterrent to the growth of productive capacity of the enterprise and its technical and economic indicators.

Mechanical means for cleaning and tunnel work should provide reduced labor costs for drilling and blasting, loading and transportation of ore, as well as performing various kinds of service jobs.

The most dramatic increase in labor productivity is the introduction of mobile drilling rigs.

In the domestic mining industry and abroad are now much widespread Scooptrams that comprehensively carry out the operations of loading, transporting and unloading of the rock mass.

Scooptrams require fewer staff, have greater maneuverability, to cut off the mountain during the mass change of a few faces and transport it to develop a small section with a small radius of curvature, increase the intensity of treatment and the tunnel works, their safety, reduce the time set- concluding transactions.

Of the auxiliary machinery necessary to use the entire fleet of vehicles, produced by both domestic and foreign enterprises, which provides a more efficient use of the basic self-propelled equipment and increase the level of mechanization of labor in the basic operations downhole cycle up to 90 ... 98%.

A. Terms and geological information about the field

1.1 General reduced Notices of the field area

The field "Tulukuevskoe" is located in the southeastern Transbaikal region, within the Krasnokamensk district of Chita region, 35 km north of the border between Russia and China, passing through the Argun River.

District location, under favorable economic conditions. It is linked by rail with the Trans-Siberian Railway, a dense network of dirt roads improved and the neighboring settlements. The leading sectors of the economy in the region are mining and agriculture.

In the area known large deposits of high quality sand, gravel, limestone, coal, and fluorite.

1.2 Mining and geological characteristics of the deposit

1.2.1 The main mining and geological data

Major mining and geological data on the preparation and testing unit 1-406 are presented in Table 1.

Table 1

Number p / p	Name	Is one.measurement	The value of indicators
A	Balance reserves of ores		
	Ore-	t.t	41.8
	-Content of	%	0.282
	Metal	t	117.9
2	Losses:		
	Ore-	%	5
	Metal	%	4.6
3	Dilution	%	36.7
4	The reserves		
	Ore-	t.t	62.9
	-Content of	%	0.179
	Metal	t	112.
5	The volume of ODA: - Vertical - Horizontal - Inclined - Kubazhnye	m / m^3 m / m^3 m / m^3 m^3	86/367 140/1200 540/5132 60
5	Output layer	tons / month	5000
6	Annual production unit	tons / year	60,000

1.2.2 The geological characteristics of

The field "Tulukuevskoe" is located in the southeastern part of Streltsovsky ore field.

Block 1-406 is located in the southern part of the field "Tulukuevskoe" between exploration lines 47-50, the decline - between III and IV horizons.

Host rocks : in the block are trachydacites top cover (occurring in the southwestern part of the block), the average basalts cover lavobrekchii basalts pack raznogalechnyh conglomerates making up to 50% of the rock unit overlying horizons of sandstones, tuffs and tufolav felsites.

Trachydacites top cover occur in the southwestern part of the block and bounded on the north-eastern side of the tectonic suture. North-eastern part of the basalts occupy the middle cover and lavobrekchii basalts constitute up to 10% of the rock block.Raznogalechnye conglomerates are opened at the bottom of the unit block at elevations 480-535 m, they have a pebble structure grubosloistuyu texture and are composed of rounded pebbles dacite, basalt and other types of underlying rocks, ranging in size from 1 to 15 cm, constituting up to 70-80 % volume of the rock.

Fine-grained polymictic sandstone composition, monocline (at an angle of 5-20 ^{0}) lie on the conglomerates, forming a tectonic contact, in the form of a fiber failure. In accordance with the sandstones overlie tuffs felsites.

Characteristics of ore bodies : in the block are two main types of mineralization - steeply dipping ore bodies are vein-like and lenticular shape, have a capacity of 1 to 10 meters, interrupted by a fall, and along strike. The second type are sheet-like form of mineralization, bed thickness up to 6 meters.

Mining conditions : According to the classification of rocks of Streltsovsky ore field, the strength of the country rocks on a scale of PP Protodjakonova are displayed in table number 2

Table 2. The fortress of rocks and ores on a scale of PP Protodjakonova

Name	Host rocks	Ore
Trachydacites	f = 10-14	
Basalts	f = 11-15	
Lavobrekchii basalts	f = 10-12	
Conglomerates	f = 14-16	f = 12-14
Sandstone	f = 6-11	f = 6-8
Tuffs felsites	f = 5-11	f = 5-10
Tufolavy felsites	f = 6-15	f = 6-10

Stability of rock and ore: All the host rocks in zones of tectonic disturbances - are unstable. The ores are localized in all the varieties of species - are unstable. Contact steeply dipping faults and fracturing in the process is not lengthy defense of the workings of up to 10 days in the rocks with an intensive study of hydrothermal and weak adhesion of debris may form fell out of the roof and sides of the excavation. Outside the zones of tectonic disturbances and out of the ore zones, trachydacites, basalt, conglomerate rock high stability.

Significant water inflow into mine workings are not expected to block. Chance of drip water in zones of tectonic disturbances.

Rocks and ores because of the large predominance of clay minerals are prone to caking.

1.3 Eksplorazvedochnye work

In working out the boundaries of the planned unit 1-406 made a detailed mining and exploration drilling with the III and IV horizons. On the horizon were passed making of which was carried out drilling exploration wells. At the stage of detailed exploration were established shapes and sizes of the major ore bodies, their mining and geological conditions of occurrence. Past exploration work allow you to select a system of processing and to draft a training unit 1-406 and planning treatment works. As a result of exploration work was to establish the parameters of the ore bodies. The ore bodies have a complex structure, great length, with a high variability of the power circuit for the discontinuity of the ore strike and dip, it is not a uniform distribution of the useful component. Balance reserves are estimated according to the detailed investigation carried out by the expedition Sosnovskaya PGO Ministry of Geology and Geological Survey of Ugra further exploration. Proven reserves of category C_a fully engaged in the project outline mining blocks, so the balance recoverable reserves are equal and are presented in Table 3.

Table 3. The distribution of stocks in the estimation block

Estimation block	Reserves			Accumulation type
	Ore	Content	Uranus	
	tons	%	so	
402-C_1	14.6	0.201	29.3	PLAST
470-C_1	3.0	0.267	8.0	PLAST
482 $_{to}$ C-$_1$	1.5	0.073	1.1	PLAST
403-C_1	16.7	0.443	73.9	PLAST
422-C_2	6.0	0.093	5.6	PLAST
TOTAL	41.8	0.282	117.9	

Two. A special part of the

2.1 Selection of System Development

In the block there are two main types of mineralization - steeply dipping ore bodies are vein-like and lenticular shape, have a capacity of 1 to 10 meters, interrupted by a fall and along strike. The second type are sheet-like form of mineralization, bed thickness up to 6 meters.

The main reserves of uranium ore and concentrated in ore bodies, with vein-like and tabular form. Power of the ore bodies is variable intermittent in nature. Rocks and ore zones of tectonic joints is characterized mainly as an unstable, prone to intense exfoliation beads and pieces of the roof of mine workings.

One of the criteria for the selection of design preparation and testing is an index of stocks of complete extraction of the metal, which in turn depends on the

quality of the ore issued from the block.

Given the value of the ore and the requirements for maximum reduction of losses and dilution, as well as the location of ore bodies in zones of tectonic disturbances that best meets this requirement, system design, "The horizontal layers of hardening bookmark" option working out - "top-down."

Disadvantages of the system:

- Low productivity and unit labor downhole work;
- High cost of clean-up costs due to significant hardening bookmark, 25-30% of the total production costs for the mine;
- The possible delamination of tabs at the top of stope, which increases the dilution of ore and increases the risk of mining operations;
- Intensive ventilation of blind stope local ventilation fan connected with the provision of standard levels of pollution of the atmosphere on the specials. factors.

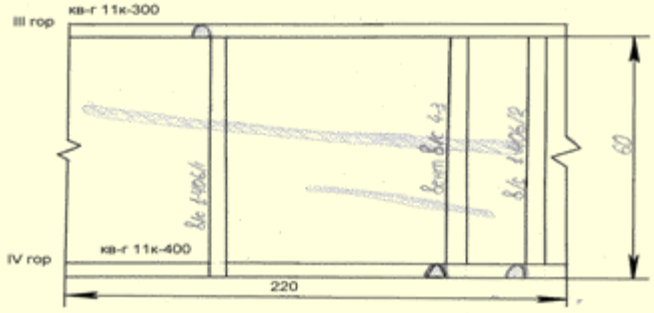
Value

- Ensuring a high degree of operational supplementary exploration of ore reserves in the block;
- Low loss and dilution of ore up to 3 ... 5%;
- Ensuring radiation safety by a bookmark out space and reduce radonovydeleniya.

Development System with the hardening of descending layers tab, though expensive, but allows you to develop ore bodies with a complex morphology with minimal losses and dilution of ore. At the same time solve the problem of underground voids with the redemption, the work of the miners is more secure.

Parameters of unit 1-406 (Fig. 1)

A. Length, m 220
Two. Width, m 150
Three. Height, m 60
4. The height of the working layer, m 3
Five. The angle of sewage stope, deg 3
6. The average length delivery on the layer, m 100



In Fig. A. Parameters of unit 1-406

2.2 Losses and Dilution

Loss and dilution on the block is justified in view of the accepted system development, technological capabilities used mining equipment, conditions of occurrence and morphological features of the ore bodies, the state of the rock mass.

To losses include:

- Does not involve stocks of metal in the ore and refinement;
- Leaving a broken ore and metal on the ground are working on the layer;
- Spillage of ore and metal in its transportation;
- In sorting ore at the RCC.

The overall standard of loss and dilution when mining stocks projected unit of the development system is assumed to be:

Losses:

- By grade - 5%;
- Metal - 4.6%;

Dilution - 36.7%.

In developing the unit standards for average loss and dilution on the excavation of the layers have to specify the block and approved in accordance with established procedure.

Calculation formula for determining the operational stocks blocks:

$$Q_{ЭКСП} = \frac{Q_{БАЛ}(1-П)}{(1-Р)}, тт$$

$$Me_{ЭКСП} = (Q_{ЭКСП} \times C_{тов})10, т$$

The reserves of ore and metal projected unit are presented in Table 4.

Table 4. The reserves of the block

Balance			Losses		dilution,%	Performance		
Ore t.t	Sod %	Me t	Ore %	Me %		Ore t.t	Sod. %	Me so
41.8	0.282	117.9	5	4.6	36.7	62.9	0.179	112.5

2.3 Mining and preparatory work and rifled

In connection with the accepted classification of mining and mine workings are preparatory to ensure opening of the ore bodies within the ore deposits (unit vectors, drifts, rising block, the transport slope, etc.).

Mining-preparatory work include: mining complex tunneling to ensure maintenance of sewage treatment works in a safe environment, the availability of emergency exits, ensuring the mining of fresh air stream, hardening, and bookmark locomotive haulage transport scheme. Based on this classification, the development of the project to the mining and preparation works (PGR) are: the horizontal mine workings haulage and ventilation horizons, transport slope, material, and rising sea vents, ore passes and chamber making, walkable within the planned unit.

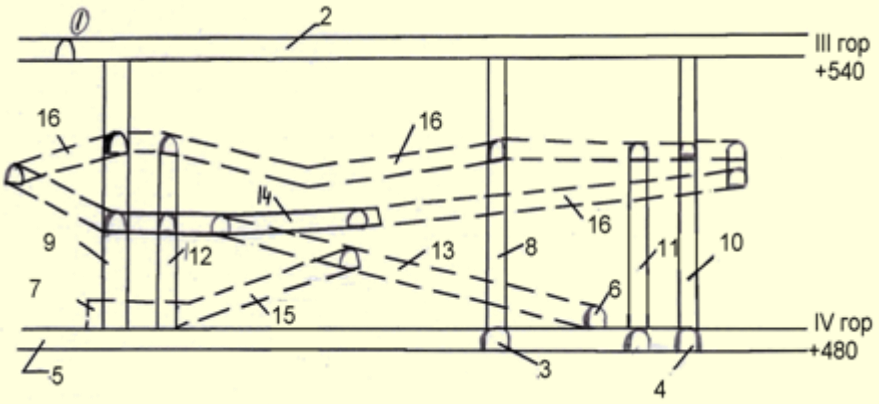
Block 1-406 prepared by the following generation (Fig. 2):

A. Horizontal:

- III horizon (540.0 m) - drifts and crosscuts 11K 1-301, 300;
- IV horizon (480.0 m) - 1-419 and 1-401 drifts, crosscuts 11K-400, number 1 ort haul, haulage unit vector of the number 2;
- Production chamber: lesokamera the camera for temporary storage of VM. 2. Vertical :
- Ventilation vosstayuschy 04.03;
- Material way vosstayuschy 1-406/1;
- Is rising 1-406 / $_2$;
- Ore passes 1-406 $_{1.2;}$

Three. Inclined :

- Transport slope number 1 with IV horizon (480.0 m) to substage (503.5 m);
- Exit haulage unit vector in the number 2;
- Transport slope number 2 with substage (503.5) to the ore beds.



In Fig. Two. PGR: **1** - drift 1-301, **2** - 11k crosscut-300 **3** - drift 1-40, **4** - drift 1-419, **5** - 11k crosscut-400 **6** - haulage unit vector number 2, **7** - haulage unit vector of the number 1 , **8** - ventilation V / s 4.3, **9** - the material in the way / s 1-406/1, **10**- V / s 1-406/2, **11** - P / s 1-406/2, **12** - P / 1 - 406/1, **13** - Transport slope № 1 (substage), **14** - substage, **15** - exit haulage unit vector in the number 1, **16** - Transport slope number 2

Fixing the preparatory workings, depending on the geological characteristics of the host rock conditions, carried out according to passport, valid at the mine and approved by the chief engineer of the mine. In the unstable rocks (in zones of tectonic joints and offshooting) - mounting frames SVP-22 with F / B tightening sides and roof openings and voids backing for attachment. In sredneustoychivyh

rocks (in the zone of tectonic joints and offshooting) - fixing the roof, stalipolimernymi anchors (with strips) and gunned the sides and roof of output.

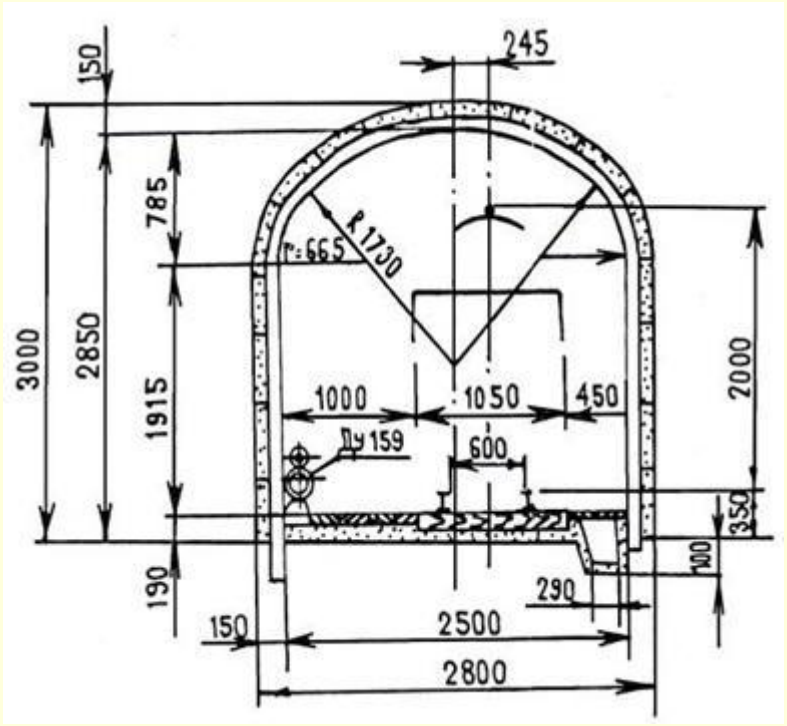
To ensure the intensity of the mining block layers 1-406 and effective use of self-propelled equipment transport project envisages the initiation of slope number 2. Kickoff of the layer and the delivery of technological equipment, produced with the slope of the transport number 2. Transport slope number 2 is passed to the substage (503.5 m) to the ore beds at an angle not exceeding 12^{0} connecting the vertical mine workings.

The slope of the excavation on the slope of straight sections - 6^{0} 12^{0}, not curved - 0^{0}. Turning radius on the curved sections of the transport bias - at least 6 meters on the slope during penetration, as well as tie layers used by workers ore passes 1-406 / $_{1.2}$, which are used to bypass the rock mass in the haulage horizon. Penetration of vertical mine workings in the floor of the III-IV horizons is performed by tunneling system CPV - 4, section 4.6 m^{2}, which are reinforced in accordance with passports PTO Ugra.

Ore passes are not equipped with vibrating feeders, due to the high caking of ores and rocks. In this connection, loading rock into trucks shall be effected by an overload of the ore passes at 1-406 / $_{1.2}$, with the help of machines TORO - 151D unit vectors for the transport number 1 and number 2 through the racks, which are located in the crosscut and drifts 11K -400 1 -419.

For delivery of materials and equipment for working layers block the project provides lesokamery through 1-302 drift in the area of the material - way rebelling 1-406 / $_{1}$. Ascent and descent of materials and equipment for working in a projected block layers are made of material navigating insurgent 1-406 / $_{1}$. The penetration of horizontal and inclined mine workings (trackless) is brown-blasting, the shipment is made of rock loading machine TORO - 151D.

The penetration of horizontal mine workings (rail) is machine-DPU 1C. Section of mining is shown in Figure 3.



In Fig. Three. The cross section of mine workings

To provide diesel vehicles with fuel and lubricants provide an additional amount of ODA to include construction of a fuel depot fueling point in the roadway 1-401 IV horizon crosscut by 11K-400, which serves to provide refueling and cargo - haul vehicles TORO-151D.

List of mining - development workings, sections and volumes of penetration are shown in Table 5.

Table 5. The volume of mining and development workings

Number p / p	Name of mine workings	Length, m	The cross section, m^{2}		The volume m^{3}
			in clear	in the rough	
III horizon (540.0 m) horizontal					

A	sboyka on the restoration. 1-406/2	5	-	7.8	39
IV horizon (480.0 m) horizontal					
2	drift 1-419	27	-	7.8	211
3	haulage unit vector number 1	40	AC	9.5	380
4	ort haul number 2	23	AC	9.5	219
5	drift 1-401	45	-	7.8	351
Inclined					
6	Transport number 1 on the slope of substage (503.5 m)	96	AC	9.5	912
7	Congress to roll back. ort number 2	49	AC	9.5	466
8	Transport slope number 2	395	AC	9.5	3754
vertical					
9	vosstayuschy 1-406/2	45		4.5	203
10	ore passes 1-406/2	29	4	4	116
11	ore passes 1-406/1	12	4	4	48
kubazhnye					
	lesokamera (2 pcs.)	-	-	-	24
	camera for temporary storage of VM	-	-	-	14
TOTAL:					
	horizontal	140	AC	AC	1200
	vertical	86	AC	AC	367
	Inclined	540	AC	9.5	5132
	kubazhnye	-	-	-	60
	TOTAL:	766	AC	AC	6759

In accordance with the classification of work relates to the rifle system of mine workings, which provides directly prepared ore bodies within the operating unit, their working out (layers, transport vectors, cameras, etc.)

Layers kickoff unit is designed in two phases:

Stage I - with substage (503, 5 m), traversed the transport slope number 2, which loses its vertical mine workings along the flanks of the block.

Stage II - a vehicle traversed the slope number 2 split unit vector (№ 1-10) employees to ensure maintenance of sewage treatment works hardening bookmark.

Transport slope number 2 and all the split unit vector are passed to the ore. The cross section of the transport and the slope of the cutting unit vector in Figure number 4.

slope of the unit vector

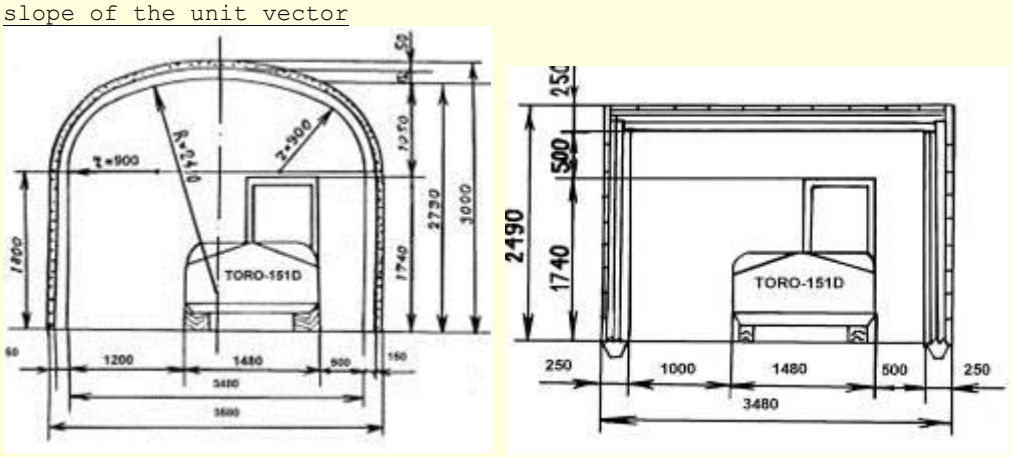


Figure 4. The cross section of the transport and the slope of the cutting unit vector

Natural roof openings rifled fixed taking into account the geological and mining conditions. For the unstable rocks and high stability - mounting frame NIR.

The minimum width of the split vectors with mounting frame NIR - 3.5 m, the minimum height of 2.5 m rough workings

The range of threaded openings for the preparation of recovery to the treatment

works includes the following production:
- Split the unit vector (c1, 10)
- Backfill the reservoir № № 1,2
- Backfill Dutschke № № 1,2
- The camera for repair of equipment and intra recreation people
- Lesokamery.

Drilling rig by means of a carriage Minibur 1F / E, as well as punches PP-54 with the drill column spacer LCR - 1U.

Rock mass is delivered Scooptrams TORO-151 D in the ore passes, equipped with the levels of each layer screens.

Table 6

Name of mine workings	Length, m	The cross section, m^2(rough)	Volume m^3
Split basis vector number 1	63	8.7	548
Split basis vector number 2	95	8.7	827
Split basis vector number 3	33	8.7	287
Split basis vector number 4	106	8.7	922
Split basis vector number 5	99	8.7	861
Split basis vector number 6	25	8.7	218
Split basis vector number 7	66	8.7	574
Split basis vector number 8	30	8.7	261
Split ort number 9	76	8.7	661
Split basis vector number 10	57	8.7	496
Camera intra rest and repair of equipment (1 pc. On - substage, 1 pc. - On a slope)	8	12	192
Lesokamera (2 pcs.)	6	4.5	54
Stowing number 1 drift	55	7.42	408
Stowing drift number 2	45	7.42	334
Stowing Dutschke number 1	3	4.6	137
Stowing Dutschke number 2	5	4.6	23
TOTAL:	786	AC	6680

2.4 Treatment of

System used to develop "horizontal layers tab hardening" treatment option - the "top - down."

Sewage treatment works in the block starts after the specified project preparatory work on the block, and threaded work on layers that ensure the availability of: at least two emergency exits in the haulage and ventilation horizons; stowing operations, haulage transport schemes and delivery unit in operation.

Prior to the start of treatment works on the layer must be equipped with camera equipment and repair of intra recreation.

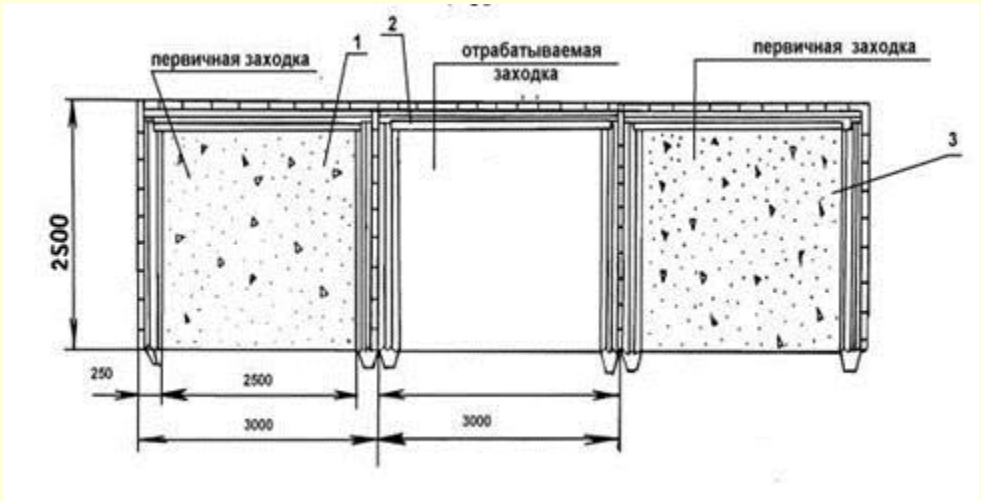
Sewage treatment works are carried out in layers on the following technological schemes: "single stope", "stope - rear sight," according to the standard STP O106-120-2000.

For the unstable ore and host rocks.

A. In the first place with a split unit vector traversed paired primary stope ore leaving the pillar between them (3-4 m).

Two. Paired primary stope laid hardening bookmark.

Three. Worked through a secondary stope. waste space, covered bridge, without a remote bookmarks, which is installed at the mouth of a secondary stope.



In Fig. Five. The technology for the extraction of unstable layers of ore and host rocks: 1, 3 - tab, 2-fixing stope

When mining seams more than 3, is paid as a primary as a secondary stope.

Adjacent (secondary) are processed in the stope stability hardening bookmarks primary stope 0.5 MPa. Sewage treatment works under the artificial roof is allowed to start filling mass for strength of 1.5 MPa. If the strength of the filling mass less than 1.5 MPa, the wastewater treatment seizure under it is on a special project approved by the chief engineer of the mine.

Parameters of treatment zahodok:

- The height of the layer zahodok treatment - 2.5-3 m (depending on the capacity of the reservoir);
- Width of treatment zahodok layer - 3.0 m;

angle zahodok - 3 ^{0}

Technological processes of wastewater treatment works include:

- Drilling of boreholes
- Loading and blasting shpurovyh charges (at the end of work shift);
- Of the working faces;
- Cleaning of a broken rock mass and its subsequent delivery to the ore passes;
- The fixing of cleaning space.

Breaking mass is shpurovymi mining explosives charges in accordance with the passport BSB. Method of blasting charges - electric system with SINV-III.

The area of permissible exposure in the management of wastewater treatment works in each layer in a block is determined by the safety factor.

Before starting treatment works in the block (layer) composed of passport control, and fixing the roof, BSB passport and ventilation. The artificial roof cleaning of the array must be attached with the reference (frame NIR), safety (signaling and hanging racks lining) attachment.

The autopsy nedozalivov in primary stope, it is necessary to consolidate the space unliquidated crib from secondary zahodok in passport fixing, approved by the chief engineer.

The design capacity of each layer of ore at full development of the sewage treatment works within the boundaries of the block is 5000 tons / month.

2.5 Calculation of cross sections

Dimensions of cross wastewater treatment stope determined graphically based on the size and dimensions of the equipment, subject to clearance, regulated, "Uniform security policies for the development - underground deposits." For these conditions apply machine TORO-151D

L - 1480 mm width of the car.

H - height of machine 1740 mm.

Based on these dimensions of width and height of the forward production. This development is not designed for the simultaneous passage of people and machines.

As HPB the width of those. clearance of 500 mm on both sides.

In the $_{North}$ - the width of output.

L - the width of the machine.

h - those. gap.

In $_{CB}$ = L +2 h = 1480 2 x 500 = 2480 mm, round and take the width of the light output in 2500 mm.

The cross section for production in the world.

The area of production in the world:

S_{CB} B = $_{CB}$ (H + 0.26B)

B_{CB} - production base (mm)

H - Height of machine (mm)

S_{CB} = 2.5 x (1.74 + 0.26 x 2.5) = 5.9 m^2, taking 6 m^2 .

The area of production in the rough:

$S_B = S_{CB}$ K x $_{WIDTH}$

To $_{WIDE}$ - 1,05-1,07 roughness coefficient

S_H = 6 x 1.06 = 6.36 m^2

Accepted treatment zahodok layer height - 2.5-3 m (depending on the capacity of the reservoir), the breadth of treatment zahodok layer - 3.0 m;

2.6 Calculation of ground pressure and strong elements of the lining

According to the hypothesis of Professor Protodjakonova in the rocks above the horizontal arch formed by the elaboration of the natural balance in the shape of a parabola, which takes pressure of the overlying rocks. Height of the arch is given by:

b = a / f

where a - half the width of the output in penetration, 1.5 m

f - coefficient of rock strength. 8

b = 1,5 / 8 = 0.18 m

The vertical rock pressure is equal to the mass of rock enclosed in a vault and is determined by the formula:

$$P = \frac{3}{4} \times a \times \frac{Y_K}{f}$$

Y_K - density of the rock roof of 2.4 t / m^3 .

$$P = \frac{3}{4} \times 1{,}5 \times \frac{2{,}4}{8} = 0{,}33 Па$$

The vertical component of production is determined by the formula:

$$Q_z = Y_K \times H$$

H - depth of the excavation.

Q_z = 2.4 x 250 = 600 N

Production of a mountain pass to the mount frame NIR.

2.7 Calculation of drilling and blasting operations

2.7.1 Selection of equipment

Applicable process equipment:

- Drilling : drilling carriage Minibur 1F / E, drilling holes by setting LCR-1U with a portable perforators PP-54.;
- Loading of rock: Scooptrams type TORO-151D;
- The fixing of cleaning space: non-motorized way to install roof support.

Minibur1F is a compact, versatile, electro - hydraulic unit with a single arrow, used for sinking mines, drilling anchor holes and carrying out cleaning work in the development of thin veins.

The unique target boom has a lot more coverage of optimal shape. Dual spinner allows the vertical positioning of both parties, and allows for drilling in close proximity to both the roof and soil excavation, so the right and left sides of the excavation.

The layout of the rig is as follows, which provides good visibility and balance. Powerful all-wheel articulated chassis provides quick and safe maneuvering in the workings of a small section.

High performance and reliable drilling system allows for high speed drilling at a significant savings boring tool.

Ergonomics of the operator and additional automatic features allow the operator to concentrate fully on the safe, fast and accurate drilling. All service points are well protected by the installation, and thus easily accessible.

Specification Minibur 1F / E.

- Installation of 1 x Minibur
- Drill 1 x HL300
- Bolt 1 x B 14 NV (800 mm telescope)
- Feeder 1 x telescopic NVTF
- Length 8470 mm
- The width of 1,200 mm

- Height 1850 mm down kazyrek
kazyrek up 2750 mm
- Turning radius 5100/3400 mm
- The speed of 3 km / h
- The maximum angle gradeability 30 ^{0}
- Noise level <98dB (A)
- Weight 8000 kg.

Drilling holes in the stope treatment also produced LCR-1U units with portable punches PP-54.

2.7.2 Calculation of the blasting

Size of treatment zahodok determine the technical capabilities of the equipment and the best technical and economic indices of zahodok width of stope - In_3 = 3000 mm, height of the stope - H_3 = 3000 mm, cross-sectional area - S_n = 9 m ^{2} . Mining is breaking mass shpurovymi charges of explosives, explosive take patronize - ammonal;

- The density p = 1100 kg / m ^{3} ,
- Detonation velocity - 4.2 km / sec.
- Performance-400-430 cm ^{3}
- Diameter of 32 mm ammo-
- Weight of the cartridge - 200g

Method of blasting charges - electric system with SINV-III. Average depth of holes - L_{wn} = 3 m

Calculation of the BSB to produce cleansing carried out in the stope pillar. Specific consumption of explosives used is calculated from the specific consumption of standard explosives (ammonite number 6ZHV). At f = 8, the reference flow BB is 0.8 kg / m ^{3} .

Specific consumption of explosives.

$$q = q_0 \cdot R_{зп} \cdot R_{сп} \cdot e = 0{,}8 \cdot 1{,}9 \cdot 1{,}1 \cdot 0{,}9 = 1{,}5 \text{ kg / m}^3$$

where q_0 - the specific consumption of standard explosives - 0.8 kg / m ^{3} ;
R_c - factor structure of the rocks of 1.1;

$$R_{зп} = \frac{3 \cdot l_{шп}}{\sqrt{S_п}} = \frac{3 \cdot 1{,}8}{\sqrt{8{,}1}} = 1{,}9$$

- Coefficient clip rocks;
E - the coefficient of relative performance. 0.9

The required amount of explosives to slaughter

$$Q_{зар} = q \cdot S_п \cdot l_{шп} \cdot \eta = 1{,}5 \cdot 9 \cdot 3 \cdot 0{,}9 = 36{,}45 \text{ kg}$$

where η - coefficient of the hole. 0.9

The average weight of the charge shpurovogo

$$q_{ср} = \frac{\pi \cdot d^2_п}{4} \cdot l_{шп} \cdot R_{зш} \cdot \rho = \frac{3{,}14 \cdot 0{,}032^2}{4} \cdot 3 \cdot 0{,}5 \cdot 1100 = 1{,}32 \text{ kg, 1.4 kg accept}$$

where d_n - diameter cartridge explosives, m - 32 mm;
R $_{sin}$ - the hole filling factor of 0.5;
ρ - Density of the explosive in a cartridge, kg / m ^{3} .

The number of holes on a face:

$$N_{шп} = \frac{Q_{зар}}{q_{ср}} = \frac{36{,}45}{1{,}4} = 26 \text{ pieces.}$$

Accepted vertical wedge type cut, as the most used in the manufacture of blasting operations at the company.

The number of holes in groups of:

- Coal-cutting 4 pcs.
- Fender 6 pcs.
- Contouring 16 pcs.

Determine the length of the holes in each group:

- Length of contouring blast holes $l_{он} = \frac{l_{шп}}{\sin 85°} = \frac{3}{0{,}996} = 3$ m
- Length of the fender holes $l_{отб} = l_{шп} = 3$ m

$$l_{ep} = \frac{l_{wn}}{\sin 75^\circ} = \frac{3}{0,9} = 3,3$$

- Length of cut hole m

Prodviganie bottom of the cycle (uhodka) is given by:

$$l_{yn} = l_{wn} \cdot \eta = 3 \cdot 0,9 = 2,7$$ m

The line of least resistance is determined by the formula

$$W = d \cdot \sqrt{\frac{0,785 \cdot R_{ww} \cdot \Delta}{m \cdot q}} = 0,042 \cdot \sqrt{\frac{0,785 \cdot 0,5 \cdot 1100}{0,8 \cdot 1,5}} = 0,79$$ m

where m - the coefficient of convergence of the hole, 0.8;
d - diameter of the hole, m

The distance between the trace:

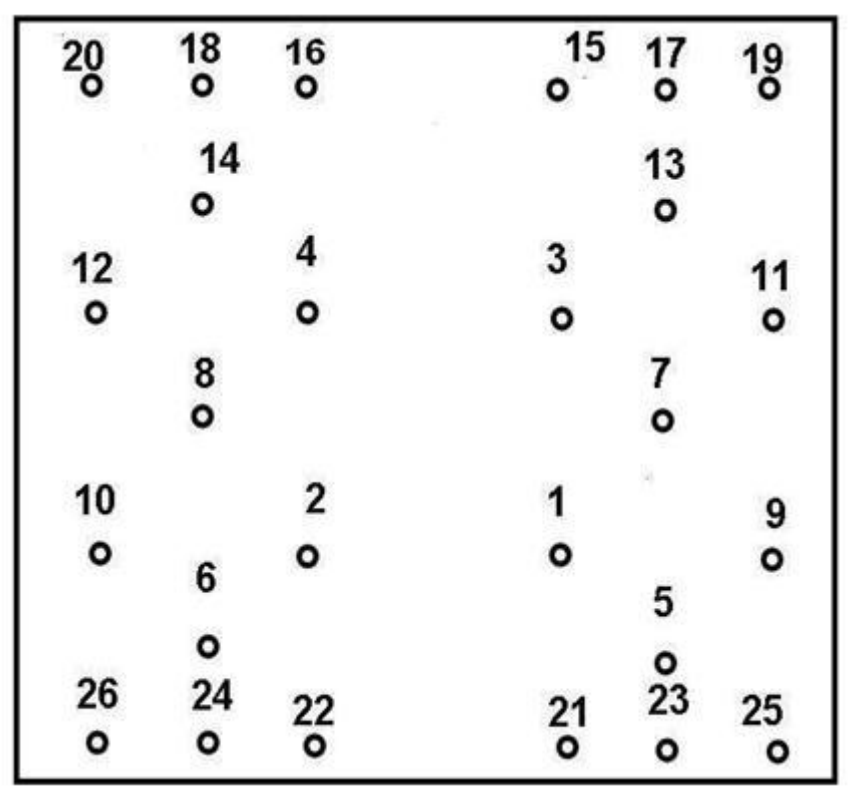
- Cutters $a_{ep} = 2 \cdot l_{ep} \cdot \cos\alpha + b = 2 \cdot 3 \cdot \cos 75^\circ + 0,2 = 1,7$ m

where b - the distance between the ends of the holes, m;

- Contouring $a_{ox} = 1,1 \cdot W = 1,1 \cdot 0,79 = 0,8$ m;

- Baffle $a_{omb} = W = 0,79$ m

The distance between pairs of coal-cutting holes d_n = 0.6 m
Arrangement of holes in the mine is shown in Fig. 6



In Fig. 6. Arrangement of holes in the mine: 1-4-cutters, 5-8, 13, 14 - Demolition, 9-12, 15-26-contouring

The volume of ore, the batter for a blast:

$$\overline{V} = S_n \cdot l_{wn} \cdot \eta = 9 \cdot 3 \cdot 0,9 = 24,3$$ m^3

The distribution of explosives in the hole :

- Cutters $q_{ep} = 1,1 \cdot q_{cp} = 1,1 \cdot 1,4 = 1,54$ kg.;

- Pneumatic $q_{omb} = q_{cp} = 1,4$ kg.;

- Contouring $q_{ок} = 0{,}9 \cdot q_{ср} = 0{,}9 \cdot 1{,}4 = 1{,}26$ kg.

The number of cartridges in boreholes:

$$n_{вр} = \frac{q_{вр}}{q_n} = \frac{1{,}54}{0{,}2} = 7$$

- In the coal-cutting piece.

$$n_{отб} = \frac{q_{отб}}{q_n} = \frac{1{,}4}{0{,}2} = 7$$

- In the fender piece.

$$n_{ок} = \frac{q_{ок}}{q_n} = \frac{1{,}26}{0{,}2} = 7$$

- In the contouring pcs.

where q_n - weight of the cartridge, kg.

The actual consumption of explosives in the blast:

$$Q_{ф.п} = q_n \cdot \left(n_{вр} \cdot N_{вр} + n_{отб} \cdot N_{отб} + n_{ок} \cdot N_{ок}\right),$$

$$Q_{ф.п} = 0{,}2 \cdot (7 \cdot 4 + 7 \cdot 6 + 7 \cdot 16) = 37{,}2 \text{ kg}$$

The total length of holes :

$$\sum l = l_{вр} \cdot N_{вр} + l_{отб} \cdot N_{отб} + l_{ок} \cdot N_{ок} = 3{,}3 \cdot 4 + 3 \cdot 6 + 3 \cdot 16 = 85{,}8 \text{ m}$$

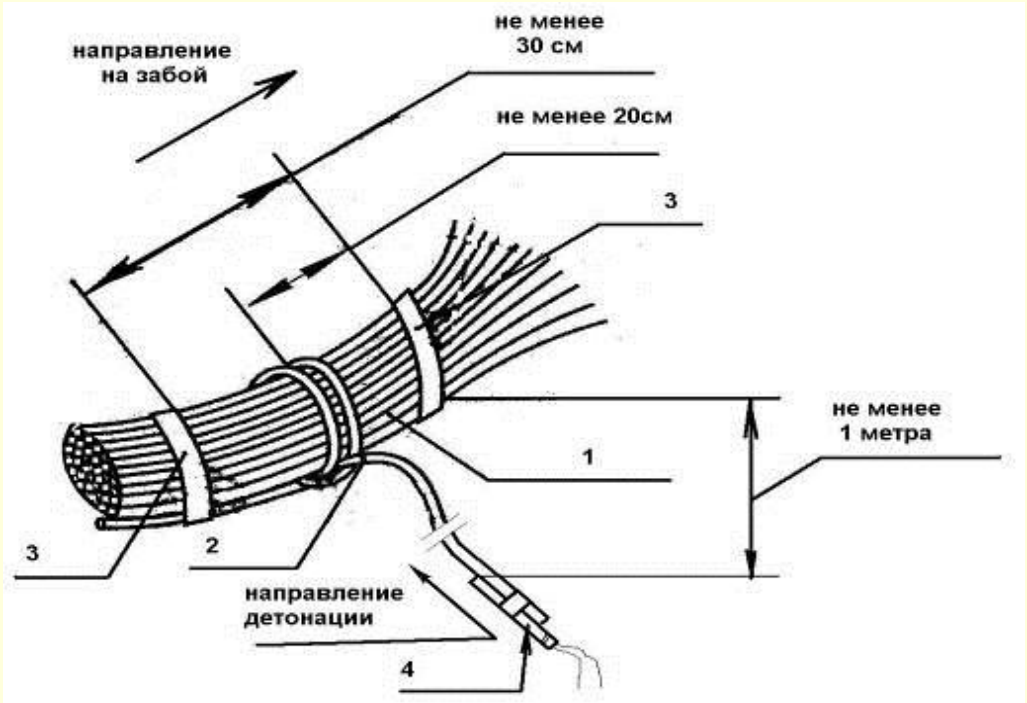
Specific consumption per 1 m of drilling three ore:

$$l_1 = \frac{\sum l}{S_п \cdot l_{шп} \cdot \eta} = \frac{85{,}8}{9 \cdot 3 \cdot 0{,}9} = 3{,}5 \text{ m / m}^3.$$

Specific consumption of explosives per 1 m ^{3} of ore:

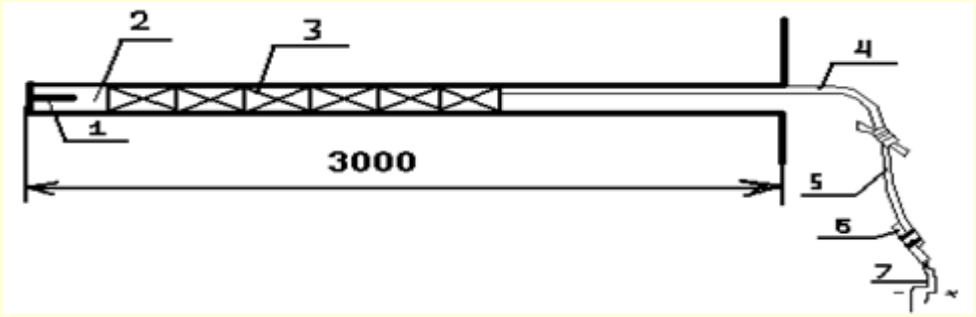
$$q_1 = \frac{Q_ф}{l_{шп} \cdot S_п \cdot \eta} = \frac{37{,}2}{3 \cdot 9 \cdot 0{,}9} = 1{,}53 \text{ kg / m}^3.$$

In the production of blasting explosives used method of electrical charges - with the use of SINV-III. The device triggers a slowdown shpurovye SINV-III, designed to delay the initiation of militants shpurovyh and borehole charges. SINV-III device has sensitivity to the initiating pulse, providing the undermining of the detonating cord LH-A according to the diagram in Fig. 7 (undermined by up to 20 devices, which are connected to waveguides with a bunch of wires or insulating tape)



In Fig. 7. Scheme initiating devices from DS: 1 - Waveguides-driven devices, 2 - LH-A, 3 - electrical tape or wire, 4 -, or an electric blasting cap

In the production of blasting is used to initiate reverse explosive charges. The design of the charge is shown in Fig. 8



In Fig. 8. Design charge: 1 - CD 2 - chuck-action 3 - BB bullets, 4 - waveguide, 5 - LH-A, 6 - ED 7 - end of the wire.

Priority blasting holes specified in Table 7.

Table 7. Priority blasting holes

Number of the hole	the name of the SINV-III-R (ms)	Weight of explosive charge, kg	The length of the hole, m
2.1	SINV-III-R-25	1.4	3.3
4.3	SINV-III-R-500	1.4	3.3
6.5	SINV-III-R-1000	1.4	3
7.8	SINV-III-R-2000	1.4	3
9.10	SINV-III-R-3000	1.4	3
12.11	SINV-III-R-4000	1.4	3
13-14	SINV-III-R-5000	1.4	3
15-16	SINV-III-R-6000	1.4	3

17-18	SINV-III-R-7000	1.4	3
19-20	SINV-III-R-8000	1.4	3
21-26	SINV-III-R-9000	1.4	3

To initiate electric detonators use a condenser explosive device KVP-1/100. Indicators of BSB are shown in Table 8

Table 8. Indicators of BSB

Number p / p	Names of indicators	Unit. rev.	Number of
A	The number of holes per cycle	pieces.	26
2	The diameter of the hole	mm	42
3	The total length of holes	m	85.8
4	The average length of the hole	m	3
5	Kish		0.9
6	Prodviganie bottom of the cycle	m	2.7
7	The volume of chipped rocks for the explosion	m^3	24.3
8	Consumption of N per cycle:		
	electric detonator	pieces.	2
	LH-A	m	5
	SINV-III	Pieces	26
9	The explosive device - KVP1/100	pieces.	A
10	Consumption of explosives on a cycle	kg	36.4
11	Specific consumption shpurometrov	m / m^3	3.5
12	Specific consumption of explosives	kg / m^3	1.53

2.7.3 Calculation of ventilation

Calculation of the ventilation is reduced to determining the necessary amount of air supplied to the fan face.

Determine the amount of air for removal of dust:

$$Q_B = V \times S$$

where V - the minimum rate of air flow, ensuring removal of the flying dust, 0.25 m / sec.

S - cross section generation.

$$Q_B = 0{,}25 \times 9 = 2{,}25 м^3 \ / сек$$

According to the number of people:

$$Q_B = 6 \times N \times Z$$

where N - number of people simultaneously working in the mine, take 3 people.

Z - Factor of 1.4 air

$$Q_B = 6 \times 3 \times 1{,}4 = 25{,}2 м^3 / мин . = 0{,}42 м^3 / сек$$

The consumption of explosives in the discharge mode:

$$Q = \frac{21.4}{t}\sqrt{A \times S \times L}$$

where t - the estimated time of 30 min of ventilation.

A - amount of explosives - 36.2 kg

S - cross section for production of 9 m^2 .

L - length output (max) - 100 meters

$$Q = \frac{21.4}{30}\sqrt{36{,}2 \times 9 \times 100} =$$

$$= 128{,}7 м^3 / мин = 2{,}14 м^3 / сек.$$

In addition, the calculation is designed to execute air-to-demand to reduce the concentration of harmful exhaust products from the work of self-propelled vehicles with internal combustion engines.

$$Q_{ДВС} = N \times q_{СН} =$$

$$= 98 \times 5 = 490 м^3 / мин = 8{,}1 м^3 / сек$$

where N = 98 hp - rated power of PDM TORO - 151D;

q_{CH} = 5 m^3 / min - the amount of fresh air in the block, providing the reduction in the concentration of harmful exhaust products in the mine atmosphere to sanitary standards.;

From these calculations is taken vozduhopotrebnost Q_{DIC} = 8.1 m^3 / sec. Select the fan is on this indicator. Select the VM fan - 6 m, the parameters of the fan shown in the table number 9.

Table 9. Parameters of the fan

Rate	Ed.izmer.	Parameters
Air Supply	m^3 / min	140 - 490
Pressure	Pas	24
Mah. expr section-ki	m^2	16
Mah. length of regex-ki.	m	600
Weight of fan	kg	350

08.02 Shipment of the rock mass

Shipment is made after the rock face ventilation, irrigation, blasting and stabbing frills. Shipment is made through the ore passes from the substage to haul the horizon.

2.9 The organization works in the mine

In carrying out horizontal drilling and blasting excavation method is applied cyclic organization of work. The duration of 6:00 shifts, the number of shifts per week 6. The composition of the cycle consists of the following manufacturing processes:

- Drilling holes in the mine produced rig Minibur 1F / E.
- Loading, assembling a network SINV-III and blasting
- Ventilation.
- Loading of rock TORO - 151
- Other operations. (Mounting, repairs, etc.)

In general, the expression for calculating the complexity of the manufacturing process (q_I) is as follows

$q_I = V_I / H^I_{you\ are\ p}$,

where V_I - the amount of work performed on the I - to the process;

$H^I_{you\ p}$ - the rate making process to execute (people shift.)

Duration of I - of the production process (t_I), h is determined by the expression:

$t_I\ q = _I \cdot T_{sm} / n_{Spanish.}$,

where T_{cm} - the length of shifts, hours;

$n_{Spanish}$ - the number of performers, people.

Calculates the complexity of operations:

A. Calculation of labor for loading rocks:

$q_{absorption} = V_I / H^n_{you\ p}$ = 24.3 / 18.6 = 1.3 pers. cm

Two. Calculation of labor to drill holes in the mine

$q_{bur} = V_I / H^{drill}_{you\ p}$ = 85.8 / 78 = 1.1 people. cm

Three. Calculation of labor in the loading and blasting holes

$q_{zar} = V_I / H^{dice}_{you\ are\ p}$ = 26/130 = 0.2 pers. see

4. Calculation of other operations

$q_{, PRODUCT}$ = 10% of Σq = 0,26

Five. The total volume of work involved in the cycle

$Σq\ q = _{absorption} + q_{bur} + q_{vzar} + q_{OFF,}$

Σq = 1.3 1.1 0.2 .26 = 2.86 people. see

By taking the integer part Σq recruiting factor = 2 people.

Coefficient of performance standards defined by the formula:

$k = Σq / N_{slave}$ = 2.86 / 2 = 1.43

We make the calculation time for tunneling operations:

A. Timing of loading rock

$t_{absorption} = (q_{absorption} \cdot T_{cm}) / (k \cdot N_{slave.})$ = (1.3 x 6) / (1,43 · 2) = 2.7 h

Two. The timing for drilling holes in the mine

$t_{drill} = (q_{bur} \cdot T_{cm}) / (k \cdot N_{Slave})$ = (1.1 · 6) / (1,43 · 2) = 2.3 h

Three. The calculation time for loading and blasting holes

$t_{zar} = (q_{zar} \cdot T_{cm}) / (k \cdot N_{Slave}) = (0.2 \times 6) / (1,43 \cdot 2) = 0.4$

4. The calculation time for other operations

$F = (q_{, etc.} \cdot T_{cm}) / (k \cdot N_{Slave}) = (0.26 \cdot 6) / (1,43 \cdot 2) = 0.5$ h

Total cycle time:

$\Sigma T = t_{absorption} + t_{drill} + t_{vzar} + t_{, etc.}$,

ΣT = 2.3 2.7 0.4 0.5 = 5.9 hours

Schedule of Works is presented in Table 10.

10.2 The monthly rate of penetration sewage stope

The monthly rate of penetration sewage stope is given by:

$$V_{мес} = l_{шп} \cdot \eta \cdot m \cdot n \cdot N_{ц} = 3 \cdot 0,9 \cdot 27 \cdot 3 \cdot 1 = 218,7$$ m / month.

Labour productivity thunderstorms:

P = V / (N · m · n · λ),

where V - ROP sewage stope, m / m

N - number of thunderstorms in the link;

m - number of working days per month;

n - the number of shifts per day;

λ - the coefficient of labor productivity;

P = 218.7 / (2 · 27 · 3 · 1,43) = 0,94 rm. / Person. cm or 8 m^3 / person. see

The monthly plan for a team = 1296 m^3 / month

The monthly rate of penetration sewage stope = 218.7 lm / m

2.11 Sequence diagram works

Table 10. Schedule of Works in the mine

	Name of process	Unit.rev.	Scope of work	The complexity, pers.shifts	Number of workers	The duration of an hour	Change, an hour						
							A	2	3	4	5	6	Break
A	Loading of the rock mass	m^3	24.3	1.3	2	2.7							
2	Other work (mounting, hanging vent hoses, etc.)	-	10% of Σq	0.26	2	0.5							
3	Gadding	m	85.8	1.1	2	2.3							
4	Loading and firing	m	26	0.2	2	0.4							
5	Ventilation					0.5							

Three. Environmental protection

3.1 The impact of underground mining on the environment

Mining of ore minerals as the open and underground mining operations causes significant changes in the environment defined by two groups of factors: violations of the surface areas of the exhaust and the formation of deposits in the area of mining waste dumps and heaps of discarded ore. All other factors are a consequence of these two main factors.

Mining underground, requiring much less land under the mining allotment, so does not cause significant changes in the landscape and infrastructure, such as open pit mining, but also it contributes to significant changes in the environment. These changes are associated primarily with the nature of displacement overlapping sets of rocks.

Undermined the land area for a long time excluded from agricultural use. The earth's surface, subjected to deformation, can be submerged and this will require drainage, disturbed by mining activities, water-bearing areas. Deformation of the rocks directly associated with mining operations may cause deformation of the earth's surface, just not subject to the influence of part-time work. At such sites, landslides, collapse, collapses, and even the plastic flow of huge rock masses that represent a great danger.

Underground mining can have a great influence on the hydrology of the surrounding territory. When removing large amounts of minerals in the area of displacement involved and aquifers, often over large areas. Slash water-carrier drain mine workings, resulting in a water area of mining operations will soon run out.

The second main factor causing undesirable changes in the landscape, connected with the necessity issued by dumping waste rock at the surface.

In addition, the production of the rock causes a number of smaller, but the unpleasant inconvenience for people, such as fumes, dust, dust generation, the mud on the roads of trucks, noise from blasting.

Thus, disruption of the environment in the process of mining production is predicted quite accurately. The current challenge is to develop efficient and reliable measures to prevent these abuses and restore the environment for future generations. Is sufficient awareness of the need for it is the indispensable element that can be used as the basis for all design decisions for new construction and reconstruction of existing mining operations.

One of the most important indicators of mining and processing facilities in the present conditions are the assessment of the ecological environment completeness of raw materials. Extraction and processing of uranium ore is composed of a set of processes, the passage is accompanied by the release into the atmosphere, hydrographic network, storage, and piles of hazardous chemicals.

3.2 Activities of land conservation

Under the influence of underground mining process of moving the work gradually spreads upward to the earth's surface, resulting in a trough subsidence.

To determine the boundaries of trough displacement angles are taken according to the classification VNIMI shown during the "Provisional Rules of structures and natural objects from the harmful effects of underground mining of ore deposits in unexplored process of displacement of rocks."

In assessing the impact of underground mining on the environment is taken into account the depth of a safe design. Under the safe depth of development refers to the depth at which the ground can not cause the development of protected objects destructive deformations, which lead to the termination of their operation and the danger to human life.

The greatest amount of solid waste at OAO PPGHO up refuse heaps. All off-balance ores are stored and processed by heap leaching. Solid waste GIZ, not suitable for the sanitary standards for recycling, place in a special shielded hvostohranilesche polyethylene film bottom.

3.3 Activities to protect water resources

The water in the mines is consumed for irrigation chipped rock and the drilling of boreholes and wells. On the surface complexes of the water consumed in the domestic needs, to cool the compressor and other equipment, preparation and transportation of backfill mixes and other purposes.

A special place among the sources of pollution of the environment occupied by various methods in-situ leaching.

At JSC PPGHO has two water systems: industrial and drinking water from artesian wells, and technology.

With the development of enterprises and increase the capacity of mining production increased inflow of water from underground workings. Commissioning of the plant for treatment of mine waters from natural radionuclides allowed to expand their scope.Purified water are currently not only for the needs of the uranium technology, but also for ancillary industries.

The company employs an operational system for monitoring the condition of the water consumption by industrial facilities. All the information about its emergency discharge and the various deviations from the established regime of water use goes to the union leadership, which allows to take timely measures to address the violations occurred.

3.4 Activities for the Protection of the atmosphere

The main harmful chemicals (VHV) released into the atmosphere - is spetsgazy mine ventilation system, sulfur dioxide, ammonia, nitrogen oxides and inorganic dust.

To solve the problem associated with a decrease in emissions of VHV, were calculated on a computer that takes into account the effect of each separate source of air pollution, as well as the cumulative effect of harmful emissions into the atmospheric boundary layer under adverse weather conditions.

Vent gases discharged from underground mines for the extraction of uranium ore, is now released without treatment. Their main harmful component - radon, which is

formed during the natural decay of radionuclides of uranium ore. In small quantities in ventilation gases present as oxides of carbon and nitrogen, occurring as a result of blasting.

Because of the low concentration of hazardous components in the vent gases discharged from the silo complexes of uranium mines, so far not established a sufficiently effective method of purification of gases.

The most promising method for reducing emissions of radon in the atmosphere is improving the technology of mining, including the scientific rationale for the choice of systems design and ventilation of mines schemes.

Application development system downstream from the layers tab hardening due to insulation surfaces emaniruschih out space allows multiple reduction of discharge of radon in mine workings and therefore its emissions to the atmosphere.

Problems of dust suppression in mines, in order to protect air quality require less attention, because, first, the dust in the workplace effectively suppressed by sprinklers, and secondly, most of the remaining dust in the mine atmosphere is deposited in the movement of air in the cells lining the horizontal workings and on the walls and valves ventilation shafts. In addition, vydachnye ventilation trunks are placed away from populated areas and have a sanitary zone. It also uses moisture on the surface of roads and landscaping areas adjacent to businesses.

4. The economic part of

4.1 Special Part

4.1.1 The organization of operational management

Operational control is performed through the dispatching service, which operates around the clock. Mountain masters at the beginning of the change brought to the attention of the Manager of attire on the team and at the end of its execution.

Organization and the effective application of Brigadier provide cost accounting - managers and professionals.

4.1.2 Information on the cost accounting

Improving the brigade forms of labor organization has become one of the main directions of work on scientific organization of labor, an important factor in improving efficiency and attracting workers to actively participate in enterprise management.

Brigadier-cost accounting - a system of planning, accounting and economic planning, contributing to an increase in production while reducing production costs.

4.1.3 Brigadier Streak

One form of cost accounting is a brigadier brigadier in a row - the organization of work on a full cost accounting system, or a treaty of obligatory term of works. Work on the team contract is organized according to the "Regulation on cross-cutting team contract."

Self-supporting team is the one team, which sets targets for product quality, labor and other production costs, and having the operational and production autonomy in decision-making to ensure fulfillment of the targets. Operative and productive autonomy is manifested in the rational conduct of the workflow, labor, equipment use, materials consumption, energy resources.

Payment is made to order - a task on a monthly basis for a contractual term actually executed volumes.

4.1.4 bonuses

Payments and incentives for workers to self-supporting teams provide a collective and personal interest in achieving high performance work, to improve its productivity and product quality, in the rational use of production resources.

Self-supporting teams flown in accordance with regulations on bonuses.

The award for saving materials, the workers are paid in excess of the marginal rates of premiums, the total amount of premiums for the cost of materials may not exceed one employee for 75% of the monthly flat rate per quarter. Just complete the brigade involved in the sinking of mines made of 100% premium rates will be 70% for each% fulfillment of the plan by 5%.

Premium position of MS and S - a 100% run performance bonus of 50% for every% decrease in the cost of 5% of the maximum 60% premium

4.2 Organization of the

4.2.1 Mode of operation

Working together in teams. Testing of the block is over the combined process flowsheet. Recruiting of thunderstorms on change of 2 (excluding ancillary workers). Working Week - Six-Day. With a 6-hour work shift. The working week 36 hours.

4.2.3 Calculation of the number of workers

When planning the number necessary to distinguish between recruiting and payroll of the workers.

Recruiting staff - a part of the workers who every day must be at work.

List structure - is the total of the workers, taking into account the fact that someone is on vacation, that is, absent from the workplace.

Payroll factor is determined.

$$K_{cc} = \frac{T_{H}}{T_{эф}}$$

where T_{EF} - an effective fund of working time, $T_{N} = T_{CAL} - T - T_{OUT}$

The average balance of working time with a 6-day week will be -147.1 hours per month.

$$K_{cc} = \frac{T_{к} - T_{вых}}{(T_{к} - T_{вых} - T_{бол} - T_{от})\times 0,96}$$

where T_{OUT} - number of output per year

T_{K} - calendar year

T_{BOL} - the days of sickness

T_{TNA} - releases.

$$K_{cc} = \frac{366 - 61}{(366 - 61 - 54)\times 0,96} = \frac{305}{241} = 1,26$$

Recruiting brigade

A. Thunderstorm-2 2. timberers - 2

Three. Fitter - 1

Recruiting staff - 5 people.

Payroll

$N_{SP} = N_{nuclear\ explosion} \times K_{SS} = 5 \times 1,26 = 6$ people.

In three shifts:

$N_{YaV} = 6 \times 3 = 18$ people.

4.2.4 Organization of work

Work on mining unit conducts a team of 5-6 people. The tasks performed by workers included dress-job targets in compliance with safety rules and profsanitarii at maximum economy of materials and energy.

Contents of work: cleaning rocks with bottom sweep, the erection of roof support (including all types of work), other works (capacity of the pipeline, etc.), preparation for drilling, drilling, loading, blasting, ventilation.

The task of MS and C includes: round the clock monitoring the implementation of the planned tasks, adherence to safety rules in this area, control the issuance of orders; etc.

4.3 Design of the

4.3.1 The wages of the workers. Workers wages fund

Based on the information filled in the order made by the volume. Scheduled of timesheets for the brigade. In the dress is calculated actual productivity and the actual salary for the team, which is distributed among team members according to the established categories. When the targets are paid premium, according to the current premium position.

Table 12. Hourly wage rates

Number p / p	Professions	Discharges			
		V	VI	VII	VIII
A	STORM Timber-man	25-545	26-863	28-502	
2	Mechanic	24-321	25-461	26-100	

3	Blaster		28-502	29-800	

Wages calculated according to the basic rate of premium surcharge at night and the local rate.

50% of the nightly rate at an average of 48 hours.

Calculation of the night:

T x 48 x 0.5 x 1.8;

Where T - the tariff for the category:

1.8 - Local ratio:

Example with VI - discharge

$$26{,}863 \times 48 \times 0{,}5 \times 1{,}8 = 1161 \quad руб$$

Payroll is shown in Table 13.

Table 13. Payroll per month

Number p / p	Profession	Discharge	Hourly wage rate	Tariff, Rub.	Award 70% of the tariff, Rub.	50% of the nightly rate, rubles.	N / board altogether, now.	The regional factor	The balance of working time	N / Board of
Wage of workers									147.1	
	STORM (Timber-man)	VI VII	26,863 28.502	4351.84 617.3	3046.23 232.1	1161 1231.2	85599080.7	7833.24 8312.2		16392.2 17392.8
	Timber-man (Thunderstorms)	VI VII	26,863 28.502	4351.84 617.3	3046.23 232.1	1161 1231.2	85599080.7	7833.24 8312.2		16392.2 17392.8
Salary electrician and shooter taken into account in "Workshop costs"										
	mechanic	VI	25,461	4124.6	2887.3	1099.9	8111.8	7424.3		15,536
	Blaster	VII	29.800	4827	3380	2059	10,266	8688		18,954
TOTAL:										102061

Payroll workers per year will be:

Wages fund 102061h = 12 x1, 26 = 1,543,162 - a change

Three shifts - wages fund $_{RAB}$ = 1543162h 3 = 4,629,487 rubles.

4.3.2 Wages MS and MS S. wages fund, and C

Wages PC and C is calculated according to the salaries, bonuses, prizes and local rate.

Salaries of RL and C plot displayed in Table 14.

The prize for the PC, and C at the site 60% of salary.

Table 14. Salaries of RL and C section

	Post	Number	Salary, £.
A	Site Manager	A	8000
2	Deputy. Head of section	A	7500
3	Electrician	A	5800
4	The underground mine foreman	A	5500
5	The underground mine foreman	A	5500
6	The underground mine foreman	A	5500
7	The underground mine foreman	A	5500
TOTAL:		7	43,300

Table 15. N / board PC and C (RR)

Number p / p	Post	Number of	Salary	Premium 60%	N / Fee In total	Local Coefficient of coefficient	N / Fee only
A	Site Manager	A	8000	4800	12,800	14,400	27,200
2	Deputy. Head of section	A	7500	4500	12,000	13,500	25,500
3	Electro Mechanical	A	5800	3480	9280	10,440	19,720
4	The underground mine foreman	4	5500	3300	8800	9900	18,700 x 4 = 74 800
TOTAL:		7					147 220

Payroll PC and C each year.
Wages fund MS and C = 147 220 x 12 = 1,766,640 rubles.
The total payroll
Wages fund $_{R}$ + wages fund $_{, \text{ and C RS}}$ = 4,629,487 1,766,640 = 6,396,126 rubles.

4.3.3 Costs of materials

Calculating the number of materials for the unit.
Purification of -50,508 m ^{3} / year
PGR - 6759 m ^{3}
Rifles of - 6680 m ^{3}
Table 16. The cost of materials

Number p / p	name	Unit.measurement	The rate per m ^{3}	Number - in the	Unit cost in €.	The total cost of rubles.
Purification of 50 508 m ^{3} / year						
A	forest	m ^{3}	0.018	1000	890.00	890 000
2	BB	kg	1.46	73,741	18	1327338
3	Drill Steel	kg	0.382	19,294	58.05	1120016
4	hard alloys	g	4.000	202 032	1.7	343 454
5	Vent.rukav	rm	0.06	3031	200	606 200
6	Tires	pieces.	0.004	202	1600	323 200
TOTAL:						4610208
Mining - sinking of 6759 m ^{3}						
A	forest	m ^{3}	0.02	136	890	121 040
2	BB	kg	1.7	11,490	18	206 820
3	Drill Steel	kg	0.58	3920	58.05	227 556
4	Hard alloys	g	7.1	47,988	1.7	81,581
5	Vent.rukav	rm	0.04	271	200	54,072
TOTAL:						692 000
Rifles of 6680 m ^{3}						
A	forest	m ^{3}	0.03	200	890	178 356
2	BB	kg	1.4	9252	18	168 336
3	Drill Steel	kg	0.44	2939	58.05	170 621
4	ventilation.sleeve	rm	0.04	268	200	53,600
TOTAL:						570 913
TOTAL:						5873121

Total amount of the cost of materials per year is 5873121 rubles.

4.3.4 Energy consumption

Energy used when developing unit, electricity and compressed air, the calculation is shown in Table 17.
Table 17. Energy consumption

Type of energy	Consumption rate	The volume per m^3 (50,508)	Price rub.	Amount. rub.
Electric power	128 kW m^3	6465024 KW	0.5	3232512
Compressed air	0.71 m^3 / m	35 861 m^3	90	3227462
Water Technology	0.46 m^3 / m	23 234 m^3	2.5	58,085
In total				6518059

Energy costs were 6518059 rubles.

4.3.5 Depreciation

The calculation of depreciation, we find the following formula:

$$A_P = \frac{Б_{СТ} \times Н_А}{100}$$

Where the BLS - the carrying amount of
On - the depreciation rate
Table 18. The calculation of depreciation

Name	number of	The carrying amount of rubles.		% Depreciation rate	Amortization
		Units	All		
TORO - 151D	2	9729000	19458000	38	7394040
Minibur 1F / E	A	16339000	16339000	38	6208820
BM -6 m	4	136 000	544 000	50	272 000
Hammers + column LKRu	4	13,766	55,064	60	33,038
PPN-1C	A	476 000	476 000	25	119 000
CPV - 4	A	540 000	540 000	20	108 000
TOTAL:					14134699

4.3.6 The guild costs

By the guild costs include the costs of spetspitanie, special clothing, repair, and washing clothes, the cost of labor protection.

The cost of special meals are calculated as follows: 56 rubles. - The value of a coupon for special meals a day for a group of underground workers. From the mining site in this category include the MS and C, thunderstorms, and repair of elektroslesarnaya, blasters.

Table 19. Calculation of the cost of shop

Name	Costs	The amount of cost now.
Wages RS and C	-	1766640
Charges on z / PC board uC	26.8%	.268 X 473,460 = 1,766,640
The cost of depreciation	-	14134699
Expenditures for maintenance and repair of equipment	10% of Amort.certified	14134699 x 0.1 = 1,413,470
Occupational safety and health	6-8% of the wages fund	6396126 x 0.06 = 383,767
Coupons spetspitaniya	56 rub. / Person.	56 x 25 = 427 000 h305
The costs of rationalization and invention	0.5 of the wages fund	6396126 x 0.005 = 31,981
Other expenses	10% of the wages fund	6396126 x 0.1 = 639 613
TOTAL:		19270630

4.3.7 Calculation of costing 1t of ore

Calculation of the calculation of production cost per 1 ton of ore at an annual productivity of 60,000 tons / year is shown in Table 20.

Table 20. Costing production of 1 ton of ore

Number p / p	Name of item cost	Amount of expenses	The cost of 1 ton	
			Rub	%
A	Energy consumption	6518059	108.6	17.3
2	Wages fund major service	4629487	77.1	12.3

3	Charges on z / pl key workers. 26.8%	= 0.268 h4629487 = 1,240,702.5	20.67	3.30
4	Materials	5873121	97.9	15.6
TOTAL:		18,261,369.5	304.27	48.6
5	Departmental expenses	19270630	321	51.36
TOTAL:		37531999	626	100

$$C_{ед} = \frac{37531999}{60000} = 626\,p/m$$

cost of 1 ton of ore is:

The complexity of the inverse index of product performance. It represents the cost of working time per unit of output:

$$R = \frac{T_{ПР}}{Q},$$

where Q - quantity of products

T_{PR} - labor costs incurred in the production of this product.

$$R = \frac{6396126}{60000} = 106,6$$

Energy intensity is defined as:

$$Э = \frac{З_{ЭН}}{Q} = \frac{6518059}{60000} = 108,6$$

Material costs will be:

$$М = \frac{З_{М}}{Q} = \frac{5873121}{60000} = 97,9$$

Lower production costs and increase profitability is achieved, above all, the strict regime of saving. Cost reduction is the increase in labor productivity, reduction of intangible costs, reduce maintenance costs of production and management, the elimination or reduction of non-productive resources, the introduction of scientific and technological progress and inventions, which contributes to the development of production.

When using the impact on cost of production of natural conditions and methods of mining are the following factors: changes in metal content in the ore, the volume and methods of mining and mineral processing, changing the rules of repayment of mining and preparation work in the revision of stocks of raw materials increased due to changes in the extraction of metals quality ores.

Conclusion

In the calculation of the degree project submitted to clean-up unit 1-406 number 4 mine with an annual production unit was 60 tons / year. When the diploma project addressed issues of improving the mining and development workings, made choice of system development. We use top-down system with a hardening layer tab. Development System with the hardening of descending layers tab, though expensive, but allows you to develop ore bodies with a complex morphology with minimal losses and dilution of ore. At the same time solve the problem of underground voids with the redemption, the work of the miners is more secure. Including in connection with the manifestation of rock pressure in the lower horizons of the field, under a system of descending layers of hardening the bookmark.

The applied system design has the following parameters: the height of the block - 60 m block length - 220 m, width of the block - 150 is equal to the capacity of the ore deposits, the layer height - 3 m, width zahodok - 3 m zahodok angle - 3 °.

Block work out horizontal layers, starting from the top under the protection of artificial roofs that for each of the next layer is formed from the hardening bookmark as excavation vyshelezhachego layer. Excavation of the first layer unit, as well as treatment zahodok other layers do not coincide with the contours of the ore bodies are working with the contours of the layer vyshelezhachego layer is a natural roof. Testing of stock layer is single or twin stope height of 3 m kickoff layer is carried out along the gradient. Sewage treatment works include the breaking of the ore of the array, cleaning of ore in ore passes, ventilation and cleaning attachment area, production and shipment of ore from the ore passes, installation of exhaust insulating jumper stope and fill out space hardening the bookmark. Testing of layered zahodok is brown-blasting, drilling holes installing

LCR-1U, as well as drilling coach Minibur 1F / E. Ventilation fans zahodok by local ventilation BM-6 pm For delivery of the rock mass in the blocks used Scooptrams TORO-151D. Mounting of purification of the space depending on the strength and structure of filling mass is frame NIR. Repayment of developed space in the block is hardening bookmark as mining layered zahodok. Bookmark zahodok produce sections, the length of the section for the rigid and stratified mixtures of 15 m (volume of the section 150 ... 200 m^3), sections are separated by insulating bridges. Repayment is required for all horizontal layers develop, the completeness of the bookmark-out space shall be not less than 85% by volume. Submission of hardening stowing the bookmark is a set of "The March" by the number 2 mine Concrete Delivery Truck transportation unit to backfill wells drilled from the surface. From stowing stowing mixture well served by pipelines in the stope waste layer.

Advantages:

- Ensuring a high degree of operational supplementary exploration of ore reserves in the block,
- Low loss and dilution of ore up to 3 ... 5%;
- Ensuring radiation safety by a bookmark out space and reduce radonovydeleniya.

In the spec. part of the project for the design of development with top-down layered groove and hardening a bookmark, the technology of sewage treatment works taking into account the manifestations of rock pressure. The proposed technology of sewage treatment works using modern pollution control equipment and optimize the parameters of BSB have improved the productivity of thunderstorms, reduce production cost of 1 ton of ore to provide the required output power while reducing time working off the block. The losses amounted to 5% of the ore, 36.7% dilution, the monthly performance of the layer 5000 tons / month, a monthly plan for a team = 1296 m^3 / month monthly sewage treatment rate of penetration stope = 218.7 lm / month.

As a result of calculating the parameters of BSB with explosives - ammonal, Kish has increased from 0.85 to 0.9. In the production of blasting explosives used method of electrical charges - with the use of SINV-III. The device triggers a slowdown shpurovye SINV-III, designed to delay the initiation of militants shpurovyh and borehole charges.

In the environment, described the impact of underground development on the environment.

In the economic part of the project calculated the costs and costing of production at the mine one ton of ore - 626 p / m

References

A. Uniform rules for safety in the mining of ore, non-metallic and placer deposits of minerals by underground mining. - Moscow GUP "STC on industrial safety Gosgortekhnadzor Russia," 2004 -261 sec.

Two. Uniform rates of output and time for underground waste disposal, tunneling and mining threaded. Part 1. - Moscow: Nedra, 1985. - 423 p.

Three. Common pravela security for blasting operations. - Moscow: Nedra, 2003.

4. Polyakov, I. Handbook of labor economics. - M: Economics, 1988, with the - 240.

Five. Grebenyuk VA Directory of mining. - M.: Nedra, 1983.-815 p.

6. Shekhurdin VK Book of problems for mining operations, holding and securing mining. - Moscow: Nedra, 1970.-455 p.

7. Pokrovsky NM. Designing complex workings of underground facilities. - Moscow: Nedra, 1986.-320 p.