STOPE SURVEYING

Tape Triangulation :

- As the face advances, new stations are established nearer the face to facilities off setting.
- Suitable positions are selected near the face from which at least two stations in connection are visible.
- Direct measurements are made between survey pegs and selected stations.

Instrumental survey :

- It is same that tedious but required for check survey.
- Specially when the ore body is irregular from the station of the theodolite traverse are calculated and their positions are plotted on a horizontal projection which are converted to the plane of the ore body.
- Peg to peg distances are measured by still tape horizontal & vertical angle by theodolite.

Determine Stope face :

A 30 mt tape is held between two stope station with its 0 at the starting station near the face and right angle. Offset from the tape to the successive points at the face are measured and booke. If the offsets are less than 1.2 mt the graduated rod may be used instead of the 15 mt tape.

The tag line should be closer to the face. It may some times be necessary for convient to hold the tape with its 0 at the station peg & a mark on the face. The station thus omitted may be often by measuring and a check right angle measurement may be made in addition.

In order to often and average stope width a no. of measurement from the hanging wall to the foot wall are taken during the survey.

State preparation of stope Plane , plotting the stopes station & plotting of stope face to the mine plan.

In underground ore body mining, the mining method plays an important role in the stability of the stope structure and ground pressure control. However, with the gradual mining of ore body, the horizontal pillar with a thin plate structure may cause accidents due to instability. Therefore, the analysis and evaluation of mining methods of ore bodies can provide an improved reference for this type of mine.

Domestic and foreign researchers have conducted numerous studies on mining methods and the stability of stopes . At present, the mining methods of metal ore bodies include continuous mining technology, filling mining technology, VCR (Vertical Crater Retreat Method) technology, and caving mining technology . For example, T. M. Ermekovtakes mine engineering obtains the key parts of pillar instability in the goaf and then analyzes the goaf stability. Zhao et al., used FLAC3D numerical simulation technology on the basis of the optimization of the mining scheme in Dajishan Tungsten Mine. They obtained the alternative and one mining schemes, which are further conducive to stope stability and can improve the stope production capacity. Zuo et al., by studying the deformation and failure characteristics ofrock under different mining conditions, the transition of brittleness and ductility of surrounding

rock is closely related to the axial loading rate, which is related to the mining method of coal seam, and the more confining pressure Large, plastic features are more obvious. The present research selects the middle section (section 417) of a mine in Jiangxi as the content and combines on-site monitoring, theoretical discussion, and numerical simulation to analyze the stability of the stope structure under different mining methods to provide reference for complex ore body mining.

Find out the area of extraction by a planimeter and calculation of triangle thereof

The design of the stope structural parameters in room-pillar mining is mainly the size design of the room and pillar. In the design process, numerical simulation is generally used to perform comprehensive analysis, and the appropriate mining model is adopted to analyze the response of the surrounding rock and ore body in the design of different structural parameters, along with the structural and failure characteristics of the rock mass, the distribution of the 3D in-situ stress field, and the characteristics of the dominant structural plane of the stope. The rationality of the structural parameters is evaluated in accordance with the mechanical response of the rock mass.

Model parameters

The reasonable selection of parameters is a necessary condition for correct modeling. The samples used in laboratory tests are obtained in situ, which can further reflect the mechanical properties of the main occurrence lithology in the mining area. The sample integrity is high, and few evident cracks are observed. Meanwhile, the rock mass is a heterogeneous, nonlinear structure with weak structural planes, such as cracks . Therefore, the direct simulation of the mechanical parameters of a rock block may cause a large deviation and does not have a good simulation effect.

GPS AND TOTAL STATIONS

Explain the basic principle of Global positioning system and total station

The GPS system consists of three “segments” called the Control Segment, the SpaceSegment, and the User Segment. Proper operation of each of these three segments results in accurate, reliable operation of the entire system. The Control Segment is composed of the main control center located at Falcon Air Force Base, near Colorado Springs, Colorado, USA, and several monitoring and control stations located around the world. These stations monitor the satellites, report the results to the main control center, and relay the control signals generated in Colorado back to the satellites. The Control Segment stations are the only ones which transmit to the satellites. The information they send to the satellites provides for positioning the satellites in orbit, provides data to be broadcast in the satellites' navigation messages, and generally provides control of the satellite operation. Part of the satellite broadcast data includes a health status. The Control Segment is responsible for detecting satellites that are not broadcasting properly, or that are not in the proper orbit, and commanding the satellites to identify themselves as unhealthy when circumstances warrant. This allows the Control Segment to keep results obtained from using the system consistently within operating specifications. The Space Segment is composed of a constellation of satellites orbiting approximately 20,000 km (about 12,500 miles) above the Earth. The full constellation is defined as 24 satellites, but there may be more or fewer active at any one time. The satellites are arrayed in 6 separate orbits, each inclined about 55° with respect to the equator, with 4 slots per orbit designated to hold a satellite. The orbit is traversed in about 12 hours. With a full constellation, receivers located on most spots on the Earth can see at least 6, and sometimes as many as 12 of the satellites at any one time. The User Segment is the term given to all of the receivers listening to the satellites at any time. There is no organization to the User Segment, but for any user, it consists of the receiver currently in use and its associated antenna. User receivers are passive – they need only listen to the Space Segment and not broadcast anything, thus making the system accessible to any number of users at one time without users interfering with each other. While all three segments operate at one time, the typical user is basically unaware of the Control Segment, and only concerns himself with the operation of his own receiver and the satellites actually visible at his location during his time of use. Further, limitations in individual receivers may make the user aware of only some of the satellites visible at his location, since the receiver may only select a few of them to monitor.

Total Station

Total stations are the primary survey instrument used in mining surveying.

A total station is used to record the absolute location of the tunnel walls, ceilings (backs), and floors as the drifts of an underground mine are driven. The recorded data are then downloaded into a CAD program, and compared to the designed layout of the tunnel.

The survey party installs control stations at regular intervals. These are small steel plugs installed in pairs in holes drilled into walls or the back. For wall stations, two plugs are installed in opposite walls, forming a line perpendicular to the drift. For back stations, two plugs are installed in the back, forming a line parallel to the drift.

A set of plugs can be used to locate the total station set up in a drift or tunnel by processing measurements to the plugs by intersection and resection.

Introduction to DGPS

A Differential Global Positioning System (DGPS) is an enhancement to the Global Positioning System (GPS) which provides improved location accuracy, in the range of operations of each system, from the 15-meter nominal GPS accuracy to about 1-3 cm in case of the best implementations.

Each DGPS uses a network of fixed ground-based reference stations to broadcast the difference between the positions indicated by the GPS satellite system and known fixed positions. These stations broadcast the difference between the measured satellite pseudoranges and actual (internally computed) pseudoranges, and receiver stations may correct their pseudoranges by the same amount. The digital correction signal is typically broadcast locally over ground-based transmitters of shorter range.

The United States Coast Guard (USCG) and the Canadian Coast Guard (CCG) each run DGPSes in the United States and Canada on longwave radio frequencies between 285 kHz and 325 kHz near major waterways and harbors. The USCG's DGPS was named NDGPS (Nationwide DGPS) and was jointly administered by the Coast Guard and the U.S. Department of Defense's Army Corps of Engineers (USACE). It consisted of broadcast sites located throughout the inland and coastal portions of the United States including Alaska, Hawaii and Puerto Rico. Other countries have their own DGPS.

A similar system which transmits corrections from orbiting satellites instead of ground-based transmitters is called a Wide-Area DGPS (WADGPS) or Satellite Based Augmentation System.

When GPS was first being put into service, the US military was concerned about the possibility of enemy forces using the globally available GPS signals to guide their own weapon systems. Originally, the government thought the "coarse acquisition" (C/A) signal would give only about 100-meter accuracy, but with improved receiver designs, the actual accuracy was 20 to 30 meters. Starting in March 1990, to avoid providing such unexpected accuracy, the C/A signal transmitted on the L1 frequency (1575.42 MHz) was deliberately degraded by offsetting its clock signal by a random amount, equivalent to about 100 meters of distance. This technique, known as "Selective Availability", or SA for short, seriously degraded the usefulness of the GPS signal for non-military users. More accurate guidance was possible for users of dual-frequency GPS receivers which also received the L2 frequency (1227.6 MHz), but the L2 transmission, intended for military use, was encrypted and was available only to authorized users with the decryption keys.

This presented a problem for civilian users who relied upon ground-based radio navigation systems such as LORAN, VOR and NDB systems costing millions of dollars each year to maintain. The advent of a global navigation satellite system (GNSS) could provide greatly improved accuracy and performance at a fraction of the cost. The accuracy inherent in the S/A signal was however too poor to make this realistic. The military received multiple requests from the Federal Aviation Administration (FAA), United States Coast Guard (USCG) and United States Department of Transportation (DOT) to set S/A aside to enable civilian use of GNSS, but remained steadfast in its objection on grounds of security.

Through the early to mid 1980s, a number of agencies developed a solution to the SA "problem".[dubious – discuss] Since the SA signal was changed slowly, the effect of its offset on positioning was relatively fixed – that is, if the offset was "100 meters to the east", that offset would be true over a relatively wide area. This suggested that broadcasting this offset to local GPS receivers could eliminate the effects of SA, resulting in measurements closer to GPS's theoretical performance, around 15 meters. Additionally, another major source of errors in a GPS fix is due to transmission delays in the ionosphere, which could also be measured and corrected for in the broadcast. This offered an improvement to about 5 meters accuracy, more than enough for most civilian needs.

The US Coast Guard was one of the more aggressive proponents of the DGPS, experimenting with the system on an ever-wider basis through the late 1980s and early 1990s. These signals are broadcast on marine longwave frequencies, which could be received on existing radiotelephones[further explanation needed] and fed into suitably equipped GPS receivers. Almost all major GPS vendors offered units with DGPS inputs, not only for the USCG signals, but also aviation units on either VHF or commercial AM radio bands.

They started sending out "production quality" DGPS signals on a limited basis in 1996, and rapidly expanded the network to cover most US ports of call, as well as the Saint Lawrence Seaway in partnership with the Canadian Coast Guard. Plans were put into place to expand the system across the US, but this would not be easy. The quality of the DGPS corrections generally fell with distance, and large transmitters capable of covering large areas tend to cluster near cities. This meant that lower-population areas, notably in the midwest and Alaska, would have little coverage by ground-based GPS. As of November 2013 the USCG's national DGPS consisted of 85 broadcast sites which provide dual coverage to almost the entire US coastline and inland navigable waterways including Alaska, Hawaii, and Puerto Rico. In addition the system provided single or dual coverage to a majority of the inland portion of United States.[6] Instead, the FAA (and others) started studying broadcasting the signals across the entire hemisphere from communications satellites in geostationary orbit. This led to the Wide Area Augmentation System (WAAS) and similar systems, although these are generally not referred to as DGPS, or alternatively, "wide-area DGPS". WAAS offers accuracy similar to the USCG's ground-based DGPS networks, and there has been some argument that the latter will be turned off as WAAS becomes fully operational.

By the mid-1990s it was clear that the SA system was no longer useful in its intended role. DGPS would render it ineffective over the US, where it was considered most needed.

Additionally, during the Gulf War of 1990-1991 SA had been temporarily turned off because Allied troops were using commercial GPS receivers. This showed that leaving SA turned off could be useful to the United States. In 2000, an executive order by President Bill Clinton turned it off permanently in 2000.

Nevertheless, by this point DGPS had evolved into a system for providing more accuracy than even a non-SA GPS signal could provide on its own. There are several other sources of error which share the same characteristics as SA in that they are the same over large areas and for "reasonable" amounts of time. These include the ionospheric effects mentioned earlier, as well as errors in the satellite position ephemeris data and clock drift on the satellites. Depending on the amount of data being sent in the DGPS correction signal, correcting for these effects can reduce the error significantly, the best implementations offering accuracies of under 10 cm.

In addition to continued deployments of the USCG and FAA sponsored systems, a number of vendors have created commercial DGPS services, selling their signal (or receivers for it) to users who require better accuracy than the nominal 15 meters GPS offers. Almost all commercial GPS units, even hand-held units, now offer DGPS data inputs, and many also support WAAS directly. To some degree, a form of DGPS is now a natural part of most GPS operations.