

PIONEERING WITH MEDIUM DIAMETER LIFTERS

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ABSTRACT

An unconventional drill pattern is used in an aggregate quarry to reduce pioneering costs.

The site is the Iron Mountain Quarry, Granite Falls, WA., an aggregate quarry with an annual production of in excess of 1,000,000 tons. The problem is to pioneer a forty acre addition of on top of Iron Mountain. The entire area had a vertical relief of fifty to one hundred feet with no level surfaces. How does one achieve the minimum cost?

The solution appeared to be to build an access road along a natural fifty foot face on the

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provided the rear dimension. It was decided to extend the leveling legs of the drill to their highest and drill a seventy foot horizontal hole. Subsequently fourteen holes were drilled on a fifteen foot spacing for the top row of holes. The next row of holes were collared in between the holes in the top row. The two front legs of the drill were then lowered so that the mast was at an angle of approximately nine degrees below horizontal. This placed the collars of the second row about four feet below the top row. Again, seventy foot holes were drilled intercepting the floor at the back of the shot. The drill was then positioned for the third row of holes. The front of the drill was lowered twelve degrees and the holes were collared six feet vertically below the top row holes. This third row of holes intercepted the floor approximately forty five feet from the face. A fourth row of holes was drilled at a down angle of about twelve degrees intercepting the floor twenty feet from the face. This completed the drilling with the big drill. The MS-4 finished the drilling by drilling a row of ten foot deep holes on six foot centers at floor level. The entire drilling program was completed in three weeks.

Explosives loading began three days later. The powder company showed up with their blend truck and a crew of five. Loading was started in the upper right hand corner of the shot. Seven holes were loaded to within twenty feet of the collar when it was decided that loading holes with bulk explosives was not practical. The problem was that the position of the loading hose could not be determined with relation to the bulk explosives column. It became apparent that gaps in the powder column were possible, even probable. The bulk truck was withdrawn and five inch diameter by thirty pound packaged product was ordered. Loading the packaged product commenced one week later. One pound cast boosters were used to prime with along with eighty foot nonelectric blasting caps for the deeper holes. A safety primer was placed on top of the powder column to insure initiation. Twenty five grain detonating cord was used to connect the top primer to the bottom primer. The loading proceeded at a slow pace as every bag had to be poled down the length of the borehole. A special tool was made to push the stemming down the hole. Fifteen bags were loaded in the longer holes. A corresponding lesser amount was loaded in the shorter holes. The loading process took ten days to complete. The weather held fair during most of the drilling and loading. Which is not typical of the Pacific Northwest.

The day of the shot the weather returned to normal. Low laying clouds from the Southeast intermittently obscured the blast area. Two seismographs were used. One was placed at the scale. The distance from the shot to the scale house is twenty six hundred feet or about eight hundred meters. This is done on all shots. And the other was placed on a different logging road about six hundred fifty feet or two hundred meters horizontally and two hundred feet or about eighty meters below the level of the shot. The shot was fired at two thirty PM on 06 February 1996. The nearest seismograph was triggered in the vertical. The values were: Transverse, PPV = 0.254 in/s, FREQ = 32 hz, TIME = 301 ms, ACCEL = 0.16 g; Vertical, PPV = 0.396, FREQ = 19 hz, TIME = 103 ms, ACCEL = 0.21 g; Longitudinal, PPV = 0.337 in/s, FREQ = 18 hz, TIME = 594 ms, ACCEL = 0.23 g; PK AIR~O/P = 135 db The peak air over pressure is due undoubtedly to the low overcast.

The results of the shot were far better than expected. Eighty percent of the muck pile was

minus three feet. The remaining twenty percent ranged from three feet to over twenty tons. Ten larger boulders were reduced by blockholing.

The total time involved in this shot from start to finish was six weeks. It would have been less than five weeks if the proper powder had been available.

How much did it cost? All labor, drill costs and powder costs came to Thirty Eight Thousand Dollars. Well worth the effort. A savings of Sixty Two Thousand dollars.