IDAHO STATE HISTORICAL SOCIETY

REFERENCE SERIES

LODE MINING CULTURAL RESOURCES
Underground Mining Interpreted from Surface Observations

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With the constant decline of underground mining, there is a fading comprehension of the enormous excavations out of sight from all except those who were engaged in the work or the tourists who now visit a few open mines. Acquiring an understanding of the purpose and methods in underground operations should increase appreciation of this contribution to our culture. Although some records of operations in the more famous mines have been preserved, and those of less important mines may exist somewhere, the records, if any, of many others are irretrievable. Since old mines are usually caved and flooded, few are ever contained in geologists' reports; all that can ever be learned of these underground workings will result from the observations of people trained to interpret surface evidence. Hopefully, the following guidelines will assist in that endeavor. The guidelines should also be useful for the person with only a casual interest in such matters.

This outline does not attempt to point out what can be learned from the evidence of mills, ore bins, power plants, etc. These artifacts are important and should be studied carefully before greater deterioration takes place. Nor does the outline, in most respects, serve as a substitute for the excellent reports of geologists who have described many of the shafts, drifts, and crosscuts. For example, Alfred L. Anderson's 1947 report on the Boise Basin quartz mines contains this kind of information on more than twenty-five mines and prospects. Making interpretations from other kinds of surface evidence and different sources of information, geologists tend to pay less attention to shallow surface excavations.

Surface Excavations

Many years later, surface excavations at prospecting or mining sites often provide clues to vein location, structure, and the kind of workings that would be found at much greater depth. But to make these surface interpretations, it is necessary to understand what brought prospectors to the site. Brownish red or greenish stains in the loose or solid rock on the surface indicates the possibility of ore at some depth or distance along the cracks and fractures extending deeply into the solid rock

formation. The depth of these mineralized zones or veins may extend from less than ten feet to thousands of feet, the width from a few inches to more than a hundred feet, and the length from less than a hundred feet to several miles. It must be realized that much surface work, shaft sinking, and tunneling has been done on veins without finding any ore. A very deep shaft--indicated by waste dump size--or two or more tunnels on a hillside usually means at least some production.

The prospector's first concern was to determine value and dimensions of the vein. Surface excavations will show how the prospector went about this task. Fractures in any exposed mineralized rock or the location of stained loose rock may have suggested the probable direction or strike of the vein. Consequently a trench at right angles to the strike was dug to find width of vein. A trench along the strike was probably dug to find better values or the length of the ore deposit. A long deep cut or trench along the vein with little waste rock on either side indicates a strong probability that ore has been removed either from the surface or by mining upward from underground workings (miners usually work upward from a tunnel). With the later possibility in mind it is better to stay out of such excavations. Similarly any deep hole without waste piled near is dangerous. Trenches across the vein at intervals of a hundred feet or more--sometimes much less--indicate attempts to determine total length of the vein or any changes in strike. Unfortunately, erosion has removed most evidence of the very early shallow surface work.

Shafts

Having determined the width and length of the better portions of a vein as far as it had been convenient, the prospector's next concern was (or should have been) to determine depth of the deposit. The difficulty of driving long tunnels with black powder induced miners to follow the ore downward by sinking shafts. Miners used dynamite soon after 1867. Finding a shaft more than ten feet deep on a fairly steep hillside certainly indicates either the miners lack of confidence that his ore would go down very far, or the shaft was sunk in the black powder period. Finding excavations into the walls of the shaft indicates either ore removal or vein exploration. Sometimes this work can be seen from the surface. Shafts have many disadvantages including hoisting, pumping water in wet ground, and shoveling from a rough bottom.

In gently sloping or flat terrain, only shafts can attain depth on a deposit. Shafts are of two kinds: inclines following the vein downward (veins dip at various angles from nearly flat to nearly vertical, usually steeper than thirty degrees) and more often vertical shafts off to one side of the vein because mining from inclines has several disadvantages. From the vertical shaft tunnels are run to the vein at a number of levels, depending upon the depth of the vein. Observers on the surface can usually

determine whether the shaft is vertical or inclined even when the collar of the shaft is badly caved. Two workings on the surface less than a hundred yards apart, one with a small waste dump and the other much larger, indicates the smaller was the discovery site, the other a vertical shaft.

Tunnels

In mountainous country with steep hillsides, tunnels have definite advantages: they are cheaper and safer to drive, waste and ore are more easily removed, and water drains from the working above. If the strike of the vein has been determined from an examination of the upper surface workings, the observer can easily understand the purpose of hillside tunnels. Although hillside tunnels called adits provide access to ore bodies similar to those from vertical shafts, these tunnels often have another purpose as well. Whether vein strike is roughly parallel to the surface of the hillside or more at right angles to it is a matter of great importance, for it must be remembered that while ore bodies in a vein may only occur at intervals, the fracturing and other minerals can persist for great distances. If the vein strike is more at right angles to the hillside surface, the vein can frequently be traced down the slope where it outcrops. In this situation tunnels called drifts are driven from the surface along the vein at different levels, not only to gain depth on known ore bodies, but to explore the vein for other ore bodies that may not have reached the surface.

Now, consider the other situation where vein strike is somewhat parallel to the hillside surface though located deeply inside the hill or mountain. Known ore bodies can be found at depth only by driving tunnels called crosscuts at approximately right angles to the vein strike. When crosscuts reach a vein, drifts explore it in both directions. Crosscut tunnels occasionally encounter parallel veins not discovered on the surface. If no brownish red rock is found on the waste dump of a crosscut adit, it is fairly safe to conclude that workings above this level up to the next adit level are below the oxidized zone. This is a matter of great importance in gold bearing veins because gold is readily extracted from oxidized ore.

Sometimes observers can tell at a glance whether tunnels on a hillside are drifts or crosscuts. Tunnels are drifts if each one is noticeably offset in the same direction from the one above as would be required to stay on a vein substantially inclined. Situations exist where shafts were almost preferable to tunnels for opening mines because slope of the terrain required very long tunnels to reach ore. However, if the ore bodies were extensive and water a problem, long tunnels for haulage and drainage purposes were advisable. For various purposes these mines usually have tunnels at intermediate levels that never reach the surface. Special methods--but not open pits--used to mine very wide veins start at the top and work downward leaving little evidence of the methods except a great sunken area with sloughing

rock walls on both sides. Yet, this alone is evidence of a very wide ore body.

Changes in Methods

The years have brought many changes in the tools and equipment for prospecting and mining. Early prospectors confronted with heavy vegetation and earth cover resorted to deep holes and short tunnels in attempts to expose veins and ore bodies. In more recent times, until environmental concerns placed restrictions, heavy earth moving equipment has stripped away cover and made new discoveries, especially in zones of lower grade ores. At present, deep hole drilling accomplishes nearly all underground exploration and larger quantities of lower grade ores are mined from open pits instead of shafts and tunnels.

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(This information has not been edited.)