

January 14, 1960

T.C. Heseigh

Adolph Zulian

Tunnels

The following additional information is furnished in connection with plans for our tunnels east of Idaho Springs:

1. We should indicate the approximate location of the pioneer bore on the cross-section for the main tunnel.
2. BPH letter of Jan 6, 1960 state that provision should be made for lighting these tunnels. Plans for the portal structure should be revised to show suitable conduit which would receive the power from public service lines and distribute some to a box in each tunnel ceiling.

The lighting installation could then continue with exposed conduit through the tunnels. It would be very difficult to imbed conduit through the tunnels. It would be very difficult to imbed conduit in the gunite (*shotcrete*) sections of the tunnel due to the irregular surface. An exposed conduit installation would probably never be noticed by the average motorist. This would also permit placement of the conduit in the exact position recommended for the type of lighting to be installed. I understand there was no problem in fastening the conduit to the tunnel which is presently lighted.

Comments and recommendations as to light intensity are request from District personnel. Mr. Miles has also suggested that outside identification lighting be included in the plan. It appears preferable to have the lighting installed under a separate contract after the tunnels are completed. We might also consider the feasibility of having Public Service Company make the lighting installation. District comments are requested.

3. My memo of December 14<sup>th</sup> (1959) stated we should specify 8-foot maximum length of hole during the tunnel boring operation. Actually our specification should include a maximum length of tunnel to be blasted as 8 feet. It is sometimes necessary that holes be 9 to 10 feet long in order to accomplish this.
4. The end of holes for the wedge-type rock bolts must be 1 3/8" diameter for a minimum distance of 12 inches in order to hold the edge end of the bolt properly. The balance of the hole from the surface may be of larger diameter to facilitate drilling.
5. We have had considerable discussion regarding the chain link fencing to be installed under the rock bolts. You have pointed out that this fence will sag between bolts and protrude beyond the gunite lining in many areas. This would be a very unsightly appearance.

After considerable discussion with the Bureau of Mines and the Bureau of Public Roads, I believe we can eliminate the chain link fencing inside the tunnel. It might be desirable to include a note

stating the Contractor could install chain link fencing at his expense in the sections which are to be lined. This would be in lieu of timber lagging until the concrete lining is placed.

6. Mr. Miles is somewhat in disagreement with the number of rock bolts recommended by the Bureau of Mines. We will probably not have their definite report until after January 16 (1960). A copy of Mr. Miles memo has been forwarded to you.

A lengthy discussion with BPR indicates that rock bolts at 4-foot spacing in the unlined part of the tunnel would appear excessive. It is suggested that you estimate the bolts on the basis of 8-foot spacing and specify that they are to be placed as determined necessary by field conditions. I believe we should withhold definite decision until the BM report is received.

It may be necessary, in some cases, to provide support between bolts by fastening a channel section under the bolts. This appears to be common practice and I believe there is some information regarding this in the BPR tunnel specifications which were sent you. It might be well to investigate this. If desirable to include this as a pay item, we should estimate a quantity. It appears advisable to retain the 4-foot bolt spacing on the pillar side of the tunnels. I believe probably two rows high on the north tunnel, and three rows high on the south tunnel would be sufficient if the balance has bolting at approximate 8-foot centers.

It also appears advisable to include an estimated number of bolts for bolting the flow (*flow or flow? unknown intention*) on the west end of the tunnel. Mr. Miles is not in agreement with this, but BPR feels it might be very desirable if pressure exists due to the foliation.

Bolts inside the tunnels normally should be placed at right angles to the general surface. This may vary during construction to meet actual field conditions. Mr. Rodriguez feels that best support will be obtained by the placement at right angles to the general surface.

7. BPR still feels we should require a maximum 6-inch overbreak on the pillar side of each tunnel. They feel this can be accomplished by drilling more holes along this area. It is suggested we specify maximum 6-inch overbreak up to 15 feet on the pillar side of the north tunnel and up to 20 feet on the pillar side of the south tunnel. The balance of the tunnels would require a maximum 12-inch overbreak.
8. We should also provide a quantity of drain pipe which would be installed as necessary to drain wet areas into the sub-drainage system.

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