# MODIFIED ROCKFALL CATCH FENCE
# MAYFLOWER CREEK - DETROIT DAM

Experimental Feature
Interim Report

OR 84-01

by

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MAYFLOWER CREEK - DETROIT DAM
NORTH SANTIAM HIGHWAY (#162)
MARION COUNTY
EXPERIMENTAL PROJECT NO. OR 84-01
JULY 2, 1986

# CONSTRUCTION REPORT

## INTRODUCTION and BACKGROUND

Many older rock cut slopes along the highways in Oregon are in need of repair. The rockfall from these slopes can create a hazard to the traveling public. Ditches are often inadequate to restrict rocks from rolling or bouncing onto the highway. In some cases widening the ditch can solve the problem, but where the slopes are high this is not economically feasible. In these areas the State has used chain link fence draped over the slope and catch fences at the bottom of high slopes. Catch fences consist of an impact section and a screened section. The impact section captures rocks rolling down the slope and channels them through the screened section into the ditch. These types of slope protection can be used if the site is accessible and the slope uniform.

This experimental features project is located on the North Santiam Highway (#162) between Mayflower Creek and Detroit Dam, approximately 40 miles east of Salem. Here access is limited and the slope is non-uniform. To deal with the problem of fallen rocks in this area the slopes were scaled, a catch fence and screen protection were installed, and particularly hazardous rocks were secured with rock bolts. These are all routine functions to secure rock fall areas. On this project however, the following three modifications were proposed to the standard catch fence design and accepted as experimental features:

1. A triple twist (Gabion [TM] type) wire mesh was used instead of chain link fabric for the catch fence.

2. The length of the wire mesh draped from the fence was as long as 50 feet instead of the standard 15 feet.

3. Rock bolts were used to anchor the fence posts.

The construction aspects of the experimental features were assessed using a "good, fair, poor" rating system. In the future the durability and performance of the wire mesh catch fence will be assessed. Durability will be judged by the fence's ability to withstand the climate and resist impact of falling rocks. Performance will be judged by the fence's

capability of controlling rocks and reducing maintenance cleanup costs. These factors will be evaluated for two years and reported in the final report.

## GABION TYPE WIRE MESH

The wire mesh fabric was used for the catch fence. The fabric had 6-sided openings and consisted of #11 gauge wire with 0.8 oz galvanizing per square foot. The fabric was flexible and conformed well with the slope. The triple twist feature allowed the fabric to be trimmed without ravelling. The contractor elected to use fabric in 20 foot widths which reduced the number of vertical laps required. The fabric was relatively easy to work with and was given an overall rating of good.

## LENGTH OF WIRE MESH

The cut slopes consist of up to 50 feet of dark grey andesite overlain by bouldery soil. The original highway cut in the andesite was constructed on about a 0.25H:1V slope with the overburden cut generally on a 1H:1V. To capture the rocks weathering out of the overburden, and to control the rocks falling from the andesite, the catch fence was located at the break in the slope. The catch fence (Figure 1) consisted of a 3/8-inch steel support cable with wound wire rope core passed through eye bolts in the top of the fence posts; the ends were anchored into the slope. The screening was attached by hog rings to the wire rope then draped down the slope. Additional cables ran from the top of the screen to the bottom for additional support. The screening was not secured to the slope but allowed to hang freely. Another cable was attached at the bottom of the screen. This cable will allow the fabric to be pulled away from the slope, permitting trapped rocks to fall to the ditch for removal. Had a more conventional slope screen been used, without the catch fence at the break, rocks would have collected at the break in the slope. This may have torn down the screen.

No construction problems were encountered. The overall rating of this feature is good.

## ROCK BOLT FENCE POSTS

The rock bolt fence post assembly is shown in Figure 2. The fence posts, as shown, were constructed in the field. First a hole was drilled into the rock and a continuously threaded rock bolt, 3/4" in diameter by 24" long, was grouted in place. Next a key hole plate and hex nut were put on the rock bolt.

The rock surface had been pre-leveled for the plate. The nut and plate were set so 1" of the rock bolt extended above the hex nut. A 2" stop type coupling was added and above that a 3/4" steel tie rod was installed. The length of the tie rod varied. A 4" O.D. steel fence post (minimum length six feet) slid over the tie rod. Longer fence posts were used where needed to maintain a level top fence line; the tie rod had to extend 1 inch above the fence post. To the top of the tie rod a 1/4" steel plate and a 1" eye bolt with a threaded 3/4" tap was installed and used to tighten the fence post in place.

The rock bolt anchoring system for the fence post assemblies was recommended for two reasons:

1. To speed installation time where jack hammering a standard 3' deep hole in rock would be too costly and difficult for the location.

2. To allow for quicker and easier post replacement if a post was damaged after construction.

There were a few construction problems with this feature. One problem was due to the contractor and his fabricator misinterpreting the plans. They understood the plans to call for the key hole plates to be welded to the bottom of the fence posts. This made tightening the hex nut and the stop type coupling impossible. This error was corrected in the field by cutting the plates off the posts and regalvanizing the steel. An expanded assembly sequence drawing included in the plans would have alleviated this problem.

Also the contractor had difficulty developing level surfaces for the key hole plates in the rock. The rock tended to spall along lines roughly parallel to the slope. In some cases the contractor had to construct level surfaces with grout. This problem may have been avoided if a little more care and effort had been taken.

In addition, the fence posts slipped along their key hole plates; although attention was given to properly tightening the threaded eye bolt on top of the post. Movement occurred when the fence support cable running from post to post was tightened to the prescribed amount. This caused no appreciable construction problems. In the future, by fabricating the key hole plates to include a 1-inch high sleeve welded in place, slightly smaller than the inside diameter of the fence post, this problem can be solved. The short sleeve will not hinder tightening the hex nut or stop type coupling, but will help to strengthen the system.

None of the above were significant problems. They can easily be avoided on future projects. The opinion of those involved

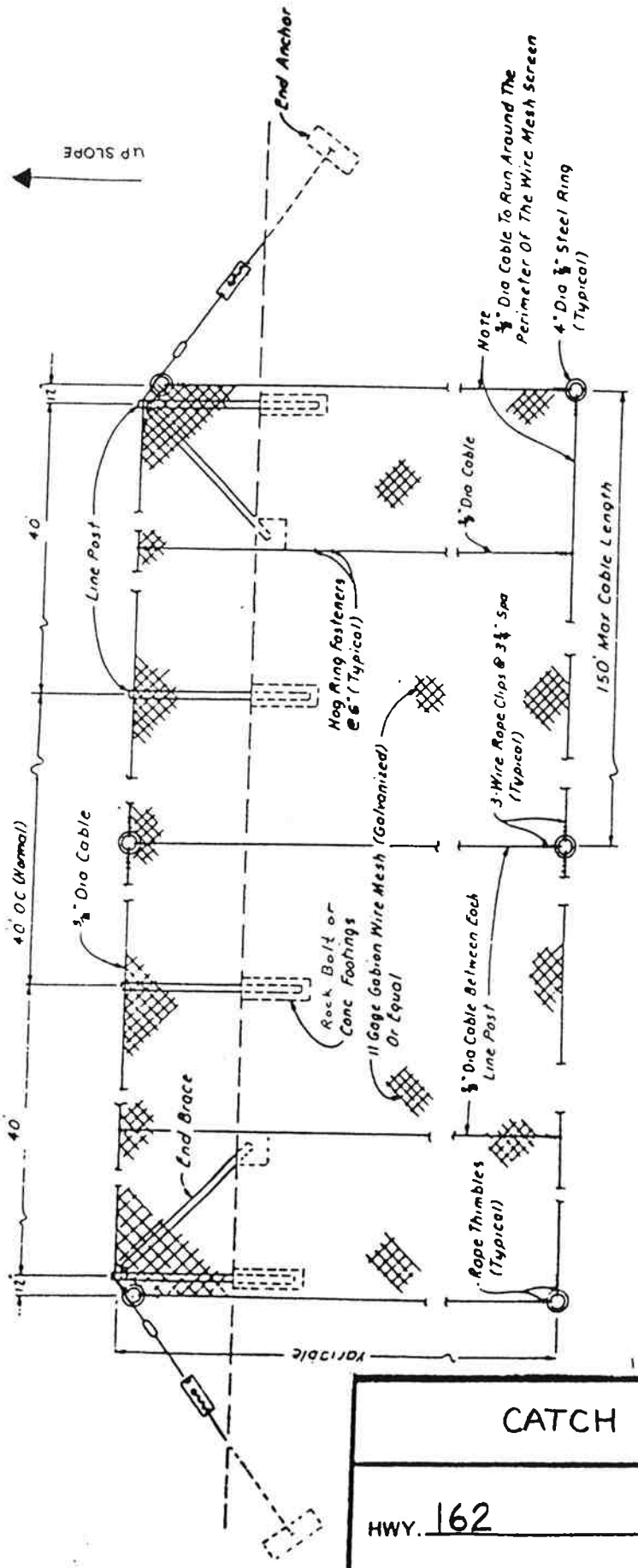
in constructing this experimental feature was one of satisfaction. The overall rating of the rock bolt fence posts is good.

## LINE POST ALIGNMENT

One item, not an experimental feature, but worth mentioning is the horizontal alignment of the line posts. The alignment can have an impact on the system. A straight fence line is preferred where possible. If not, the interior posts should be installed farther uphill in a semicircular fashion in order to maintain tension in the fence post tiebacks. The tiebacks are necessary to strengthen the fence posts so they can resist the impact and weight of falling rocks.

## FUTURE EVALUATIONS AND REPORTS

The performance and durability of the fence will be evaluated through 1987. At that time a final evaluation will be written.




# CATCH FENCE

HWY. 162 M.P. 41.82 - 42.94

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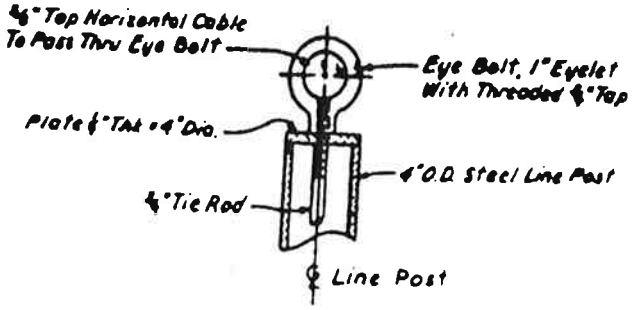
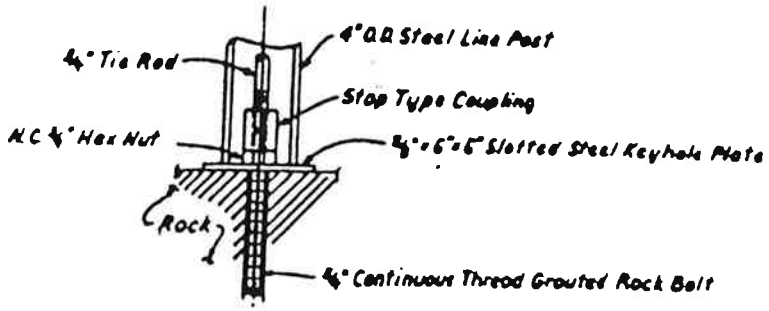
**FIGURE 1**




DETAIL "D"

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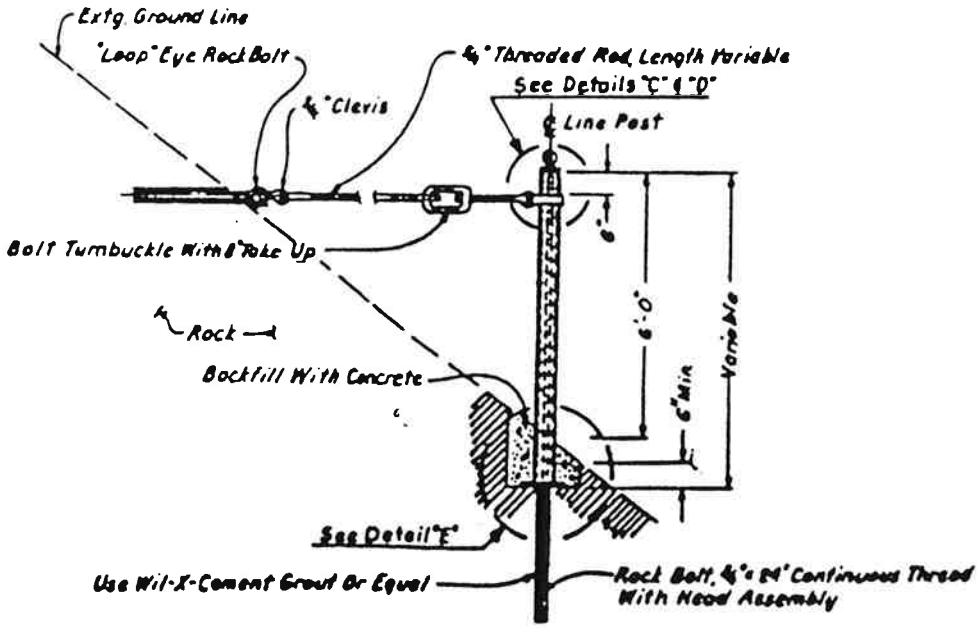


## LINE POST AND TIE BACK DETAILS
(INSTALLATION IN ROCK)

| ROCK BOLT FENCE POSTS | |
|---|---|
| HWY. 162 | M.P. 41.82 - 42.94 |
| GEOTECHNICAL GROUP OREGON STATE HIGHWAY DIVISION | FIGURE 2 |