

Case Study



The information in this case study is reprinted from the American Cyanamid AM-9 technical manual. AM-9 was American Cyanamid's acrylamide grout product. Avanti's AV-100 Chemical Grout matches the chemical formulation, usage and performance of AM-9.

Title: Constructing Grout Curtain for Dam

Location: Rocky Reach Dam, Columbia River, Washington, U.S.A.

Owner: Chelan County Public Utility District #1

Engineer: Stone & Webster Engineering Corporation

Grouting Contractor: Selby Drilling Corporation

PROBLEM:

The Columbia River Valley at the dam site is a wide canyon dividing the Columbia Plateau on the east from the Entiat Mountains on the west. At the Rocky Reach site, the Columbia is a shallow, swift river about 1300 feet wide, occupying a high bedrock shelf close to the west wall of the canyon. East of the present river channel, a broad terrace extends more than 3500 feet to the east canyon wall. Borings and seismic explorations made by the U.S. Army Corps of Engineers indicated that extensive granular deposits existed in the terrace areas. These erratic deposits, placed by the river in its previous courses, are often exposed on the current river banks above and below the dam site. Serious seepage problems could be expected.

SOLUTION:

After analysis of the results of the seismic and boring programs, and of field permeability tests, consideration was given to sheet piles, grout curtains, relief holes, and an up-stream impervious blanket as possible control measures. Field grouting tests were then conducted. These were successful and led to the selection of a grout curtain as the means of control.

APPLICATION:

A three-row pattern was selected for the full curtain length and enlarged to five rows adjacent to the dam structure. A construction trench was placed to facilitate the drilling and grouting operation. A total of 554 cement grout holes were treated first with a cement-clay grout followed by a cement-bentonite grout.

An average of 38 cubic feet of cement was placed per foot of cement grout hole for a total of over 1,068,000 cubic feet of cement grout. Continuous field testing indicated that residual permeability was still higher than the desired value at the conclusion of the cement grout program. AM-9 Chemical Grout selected for further field work because of its ability to penetrate the sand and silt zones which remained open after the cement grouting. Actual volumes of grout injected per hole were based on computations of percent voids filled by cement grout takes in the

same area. Gel times for AM-9 were primarily in the 15 to 45 minute range. Grouting was done in five-foot stages, by grouting as the drill hole progressed downward. A total of 527 chemical grout holes, primarily along the center row of the cement grout curtain, were treated with about two cubic feet of chemical grout per foot of hole. During a six-month period, 446,000 gallons of AM-9 Chemical Grout were placed.

RESULTS:

Field permeability tests and continuous records of piezometric levels before and after grouting indicate that initial permeabilities of 1 to 15 feet per minute were reduced by a factor of about 1,000, after the completion of cement and chemical grouting. The efficiency of cut-off has remained at this same high level, following several years of operation at full reservoir level.