Example 5 (1969) - Rockfill dam with a core of coarse gravel and bitumen

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<th>CATEGORY</th>
<th>MAIN OBJECTIVE</th>
<th>MAIN BENEFIT</th>
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<td>Construction control</td>
<td>Verify new design concept for impervious core</td>
<td>Design verified</td>
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BACKGROUND AND DESCRIPTION OF PROJECT
A 12 m high, 120 m long trial rockfill dam was constructed in 1969 with a unique central watertight membrane. This 0.5 m wide barrier was formed in 0.2 m thick layers by filling the voids of a matrix of prepacked rock aggregate with hot bitumen. A cross section of the dam is shown in Figure 1.

SCOPE OF INSTRUMENTATION
The instrumentation consisted of survey monuments, six special pressure transducers for measuring the fluid pressure in the bitumen, and extensometers at three levels to measure change in width of the membrane.

FACTORS THAT INFLUENCED THE DESIGN OF THE MONITORING PROGRAM
In order to prevent the impounded water from "fingering" through the bitumen membrane, the pressure in the bitumen must be higher than the water pressure at a corresponding level in the reservoir. To achieve this, the membrane extended above maximum pool elevation, thus creating an overpressure in the bitumen relative to the reservoir water pressure. The primary objective of the measurement program was to measure the distribution of bitumen pressure with depth so that it could be compared with the external water pressure. In addition it was considered important to monitor horizontal deformations of the membrane since it was constructed of a viscous material.

MOST SIGNIFICANT INFORMATION DERIVED FROM THE MONITORING PROGRAM
Measurements were continued on a regular basis for three years after completion of the dam. The measured change in width of the core was very small, of the order of millimeters. The distribution of bitumen pressure with depth was less than hydrostatic with respect to the top of the bitumen, but the pressure measured at the various levels was always slightly higher than the reservoir water pressure at the same depth.

- Satisfactory performance of the new type of membrane was verified.
- The measurements and experience obtained on this dam provided a basis for the design and construction of five other small dams of this type.

REFERENCE: Reference: Kjærnsli and Sande (1973)