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Memorandum

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Hydraulic model tests on the moss-prevention devices for the Friant-Kern Canal

1. In August, 1947, the laboratory was requested to make studies on a box turnout on the Friant-Kern Canal to develop a device which would prevent or reduce the entry of floating or partially submerged debris into the turnout. Accordingly, a model was constructed which consisted of a head box which supplied water to a canal section about 20 feet long. About midway in the canal section was located a turnout on which the various devices were tested. Although the canal can operate at any discharge, the first tests were run with a canal discharge of 2,000 second-feet and a turnout capacity of 200 second-feet. Various devices were tested visually using floating material to determine the effectiveness of the device in preventing the material from entering the turnout. Many such devices were tested, and only those showing promise of further development were tested quantitatively.

2. Four schemes were tested in this manner. A quantity of wet sawdust was fed into the canal uniformly over a period of time. The wet sawdust distributed itself more or less uniformly in a vertical direction throughout the flow and was believed representative of the material which might pass through a prototype canal. Various concentrations of sawdust were tried and the results averaged. The amount passing through the turnout with the particular device in place was collected and weighed. The ratio of the weight placed in the canal to the weight collected in the turnout was computed in percent. The discharge passing into the turnout was set before the test at 200 second-feet; and if a reduction in flow below this figure resulted, it was due to the combined effect of the sawdust and the device being tested. The following table shows the results of these tests:

Canal discharge cfs	Turnout discharge cfs	Device designation	% Passed through turnout
2,000	200	none	11.4
	175	A	5.7
	189	B	1.9
	185	C	4.06
	184	D	3.71
1,500	200	none	14.9
	100	A	14.1
	191	B	6.7
	184	C	5.6
	183	D	5.8

3. It is apparent in the table that Device B provided the best operation for the 2,000 second-foot discharge in the canal. When the discharge was reduced to 1,500 second-feet, however, Devices C and D indicated better performance. The performance of Device B, however, was so nearly the same as C and D that on the basis of its better performance for 2,000 second-feet it was concluded that Device B was superior. No quantitative tests were made for other discharges, or other ratios of canal discharge to turnout discharge.

4. Enclosed in this memorandum are photographs showing the testing equipment and some of the devices described above. The captions on the photographs are self-explanatory. The enclosed drawings show the structure as tested, and the details of Device B which was recommended for field construction.

5. In the course of testing the mass prevention devices, many different ideas were investigated and only a few proved to have any merit whatsoever. The reason for this is that the problem, basically, proved to be extremely difficult to solve. To make a fully effective device, it is necessary to separate the debris from the water; and since the debris is of practically the same density as the water, it becomes next to impossible to introduce water into the turnout without introducing the debris as well.

6. Some of the devices which appeared promising on paper produced a back eddy in the vicinity of the intake. These devices concentrated the debris near the turnout entrance and proved to be worthless. Devices C and D made use of divider walls arranged so that the flow into the turnout was accomplished entirely through a narrow channel. Water entering the turnout caused a drop in the water surface in the narrow channel which accelerated the flow rapidly as it passed the turnout. It was hoped that the inertia of the debris would prevent its entry into the turnout. The idea could not be developed, however, to a satisfactory degree. In fact none of the schemes tested, including the most promising one, provided a satisfactory answer to the problem.

7. Although Device B, on the basis of the data submitted and on the opinion of those who saw the device operate, is considered superior, it is not in the opinion of the laboratory a satisfactory device, but it does provide the best answer obtainable at this time. It was agreed by all at the time of the tests that further investigations should be made. This was not done, however, because of a lack of workable ideas and a lack of a basic concept on how the problem should be attacked. Also, farther investigations should be coordinated with field tests on a small turnout where the action of weeds and moss can be studied. It is felt that laboratory materials approximate the field materials but do not give exact answers.

8. It is hoped that these tests may be resumed in the future when some workable ideas are found. At the time of this writing, however, no new ideas are forthcoming.

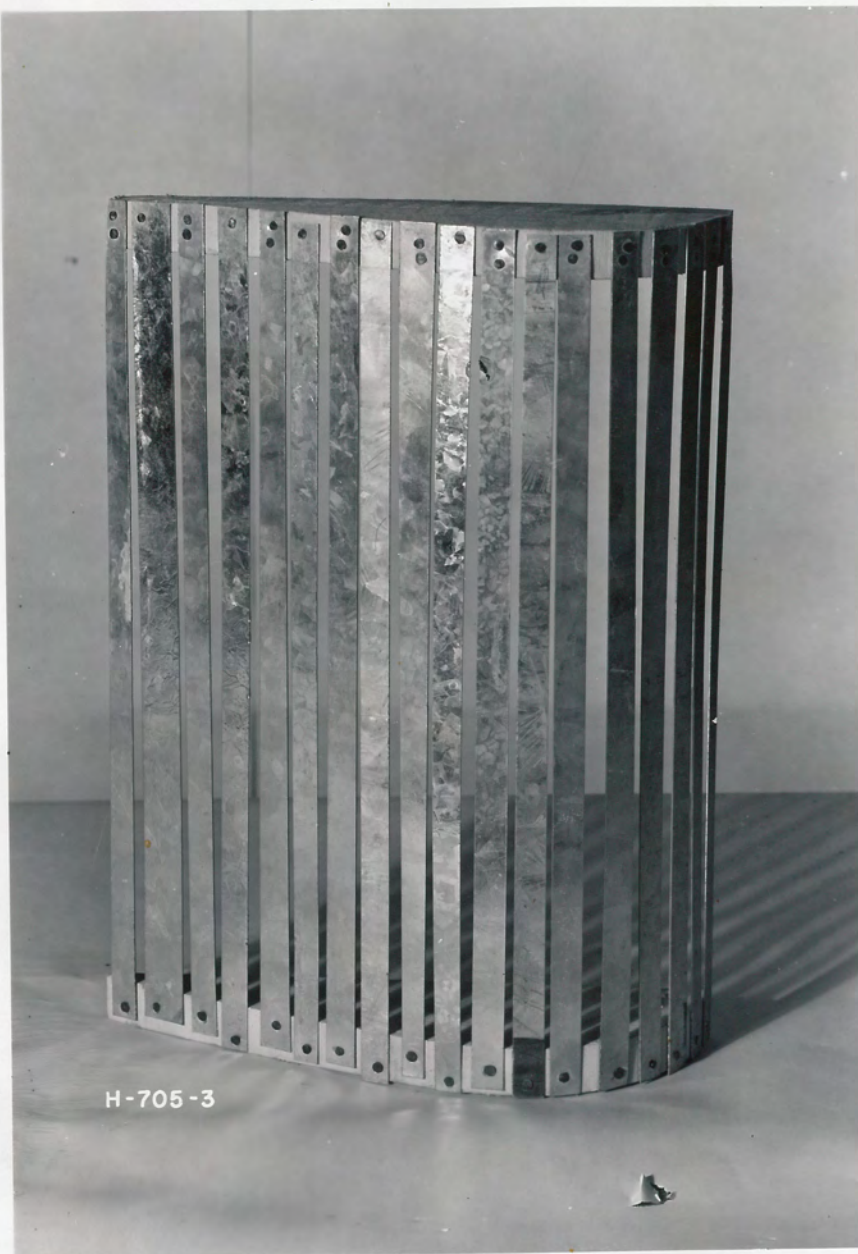
Enclosures



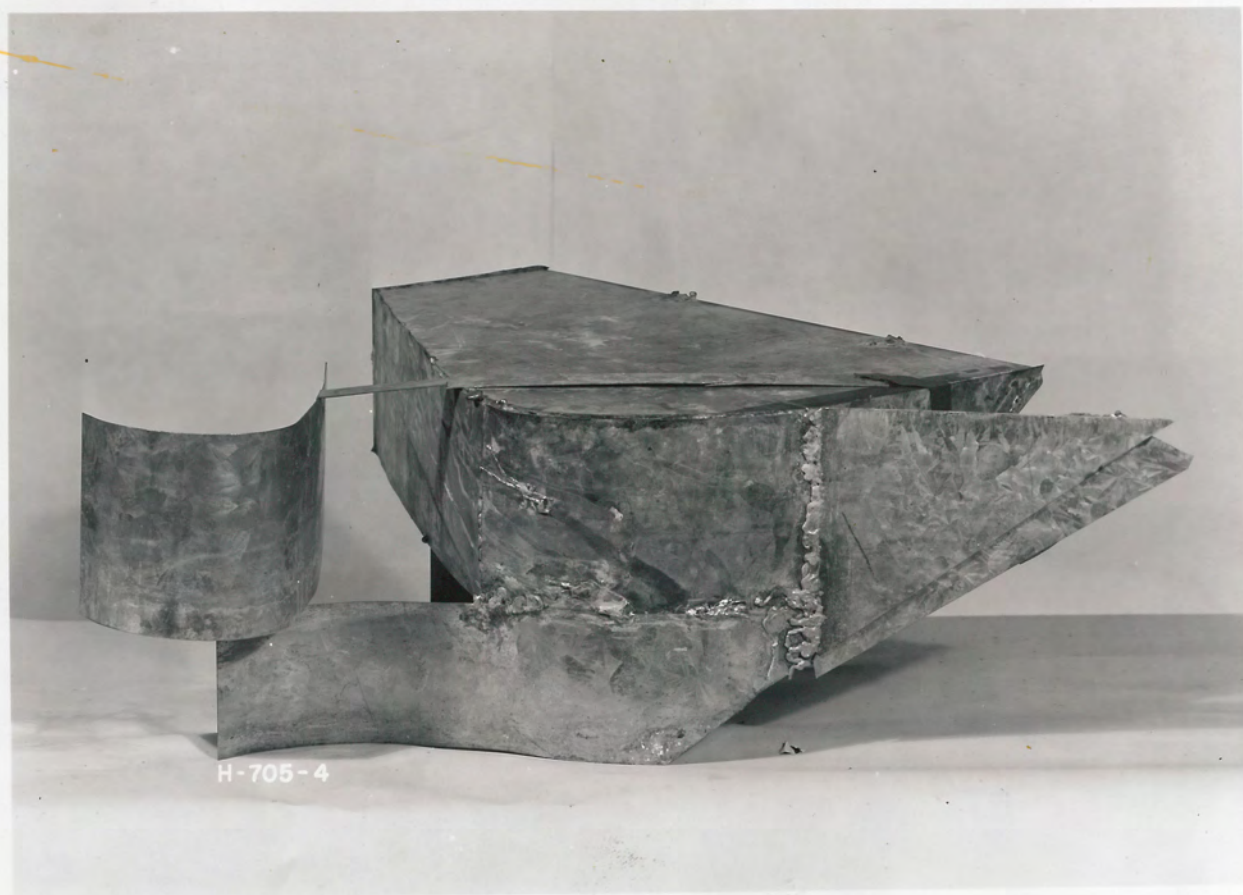
Device C in place and ready for testing. Flow is from right to left.



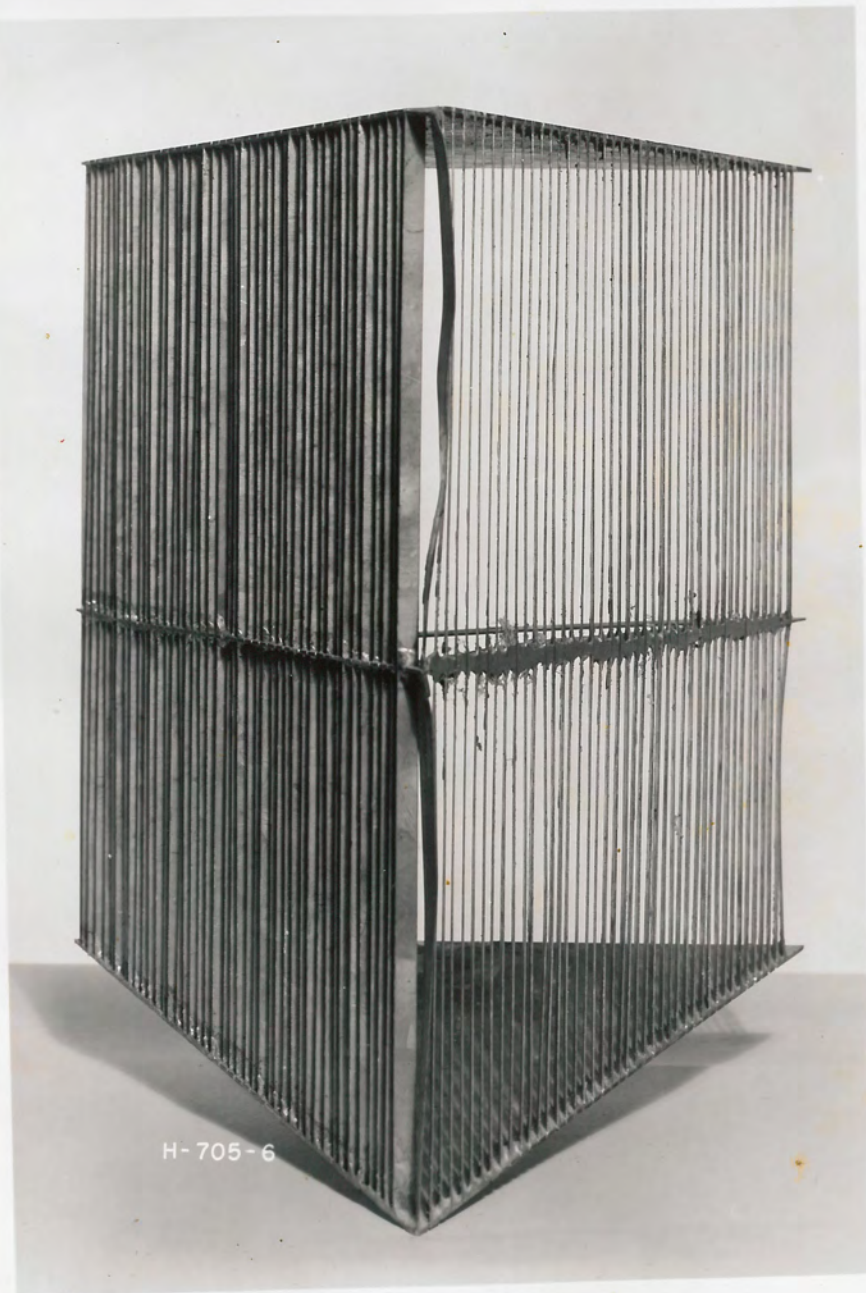
View of model canal showing box turnout.



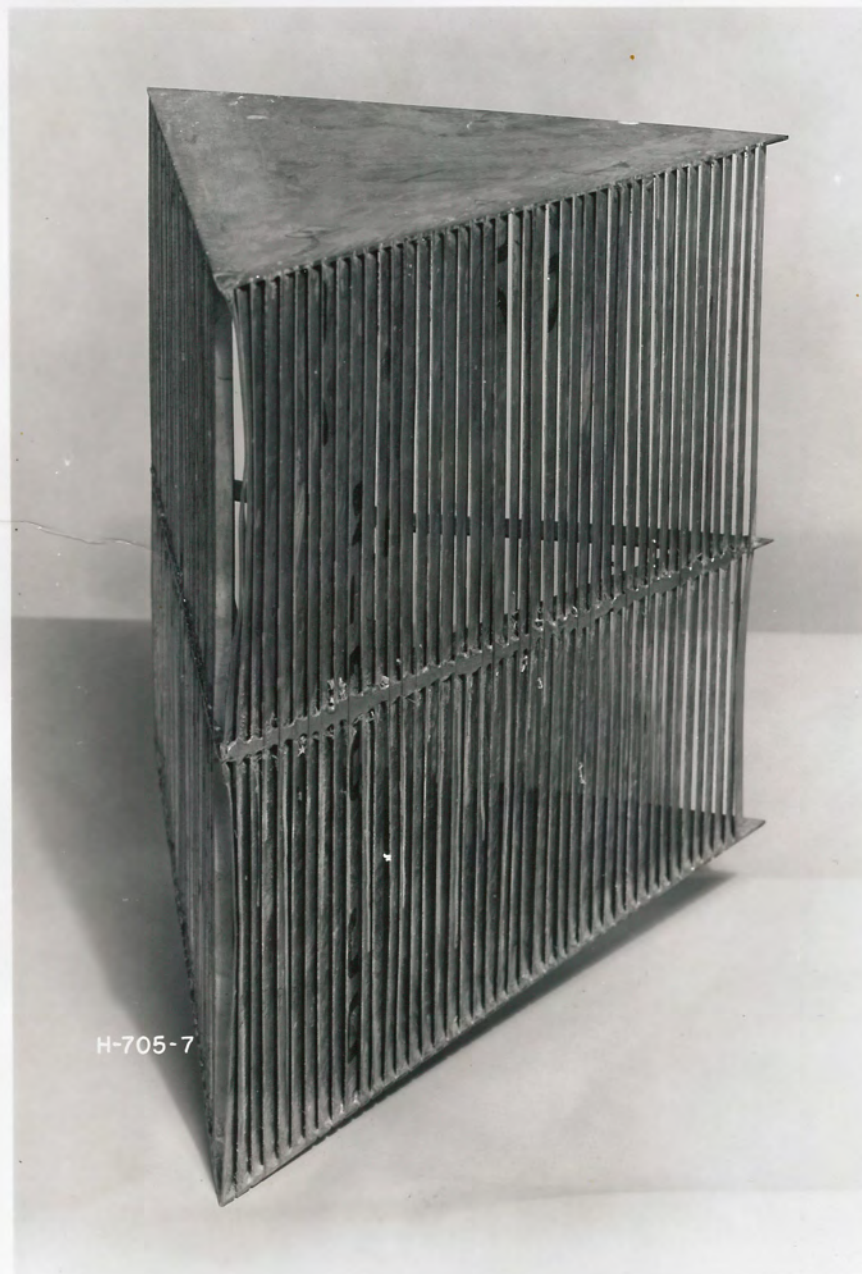
Device A was placed in front of the box turnout
with the sharp radius of curvature placed upstream.



Device C was tested with various modifications. The sloping edge of the metal on the right in the photograph was placed against the canal bank.



Device B which proved to be the best device tested.
The damaged zone in the nose occurred after the
tests.



Another view of Device B.

Figure 7 is a technical drawing showing the model layout of the Friant-Kern Canal. It includes three views: PLAN, SECTION A-A, and SECTION B-B.

PLAN View: Shows the top-down layout of the canal. Key features include a 12" supply pipe, a rock baffle, a dividing wall, a canal turnout, a 90° V-notch weir, a stilling pool, and a stop-log tail gate. Dimensions are provided for various sections and components.

SECTION A-A View: Shows a cross-section of the canal. Key features include a 12" supply pipe, a rock baffle, a dividing wall, a canal turnout, a 90° V-notch weir, a stilling pool, and a stop-log tail gate. Dimensions are provided for various sections and components.

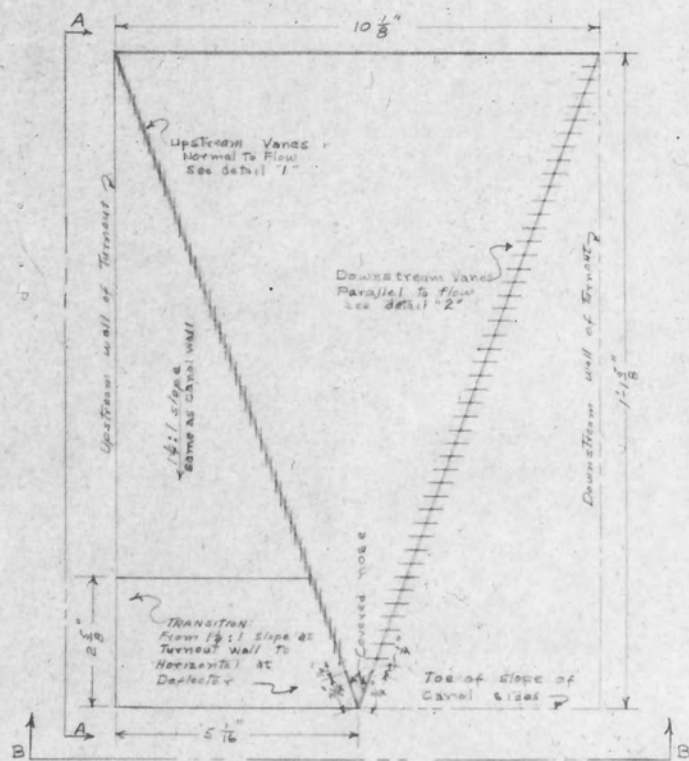
SECTION B-B View: Shows a cross-section of the canal. Key features include a radial gate, a stilling pool, and a 90° V-notch weir. Dimensions are provided for various sections and components.

MODEL LAYOUT
MOSS PREVENTION TESTS
FRIANT-KERN CANAL
1:24 SCALE MODEL

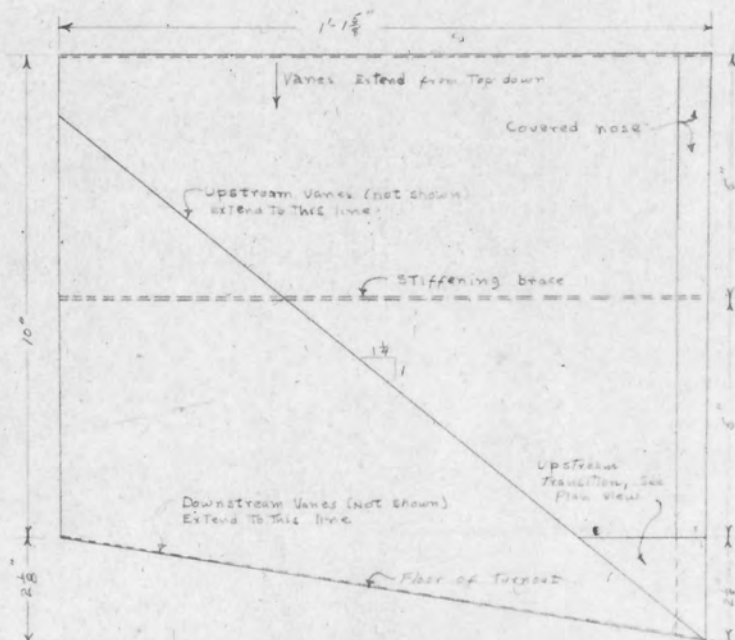
MOSS PREVENTION TESTS

FRIANT-KERN CANAL

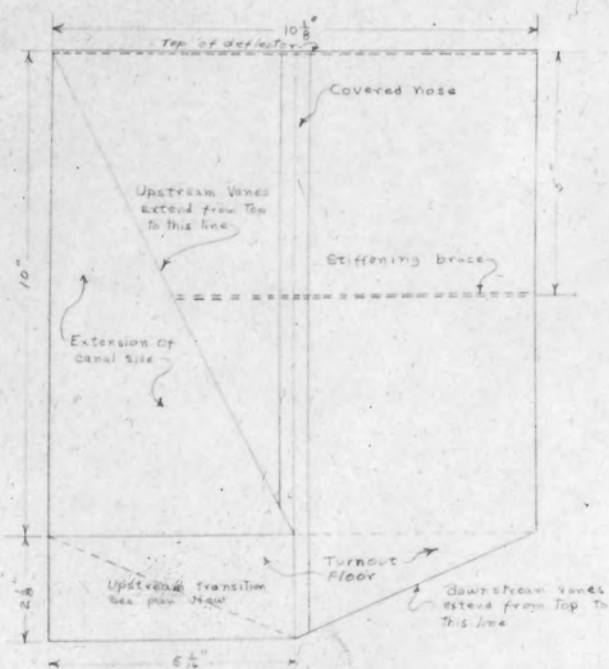
1:24 SCALE MODEL:



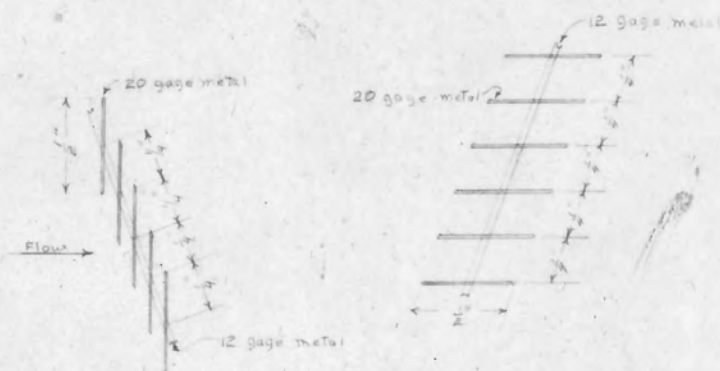
PLAN



ELEVATION A-A



ELEVATION B-B



DETAIL "1"
UPSTREAM VANES

DETAIL "2"
DOWNSTREAM VANES

MOSS DEFLECTOR DETAILS & INSTALLATION OF DESIGN B

MOSS PREVENTION TESTS
PRIANT-KERN CANAL
1:24 SCALE MODEL

