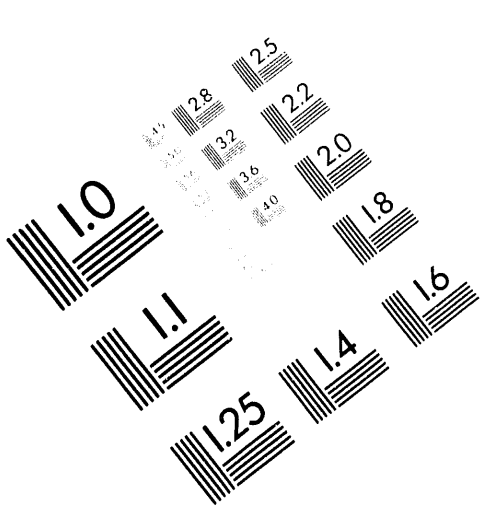

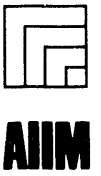

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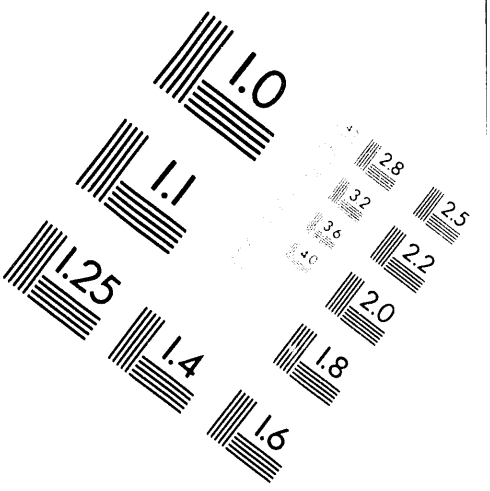

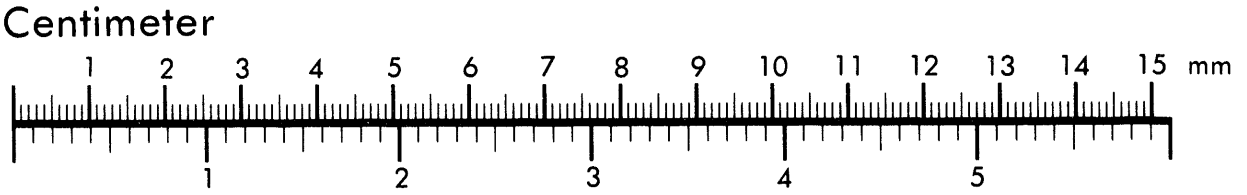

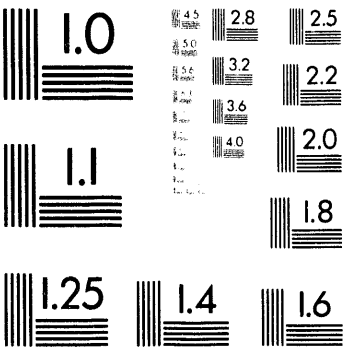

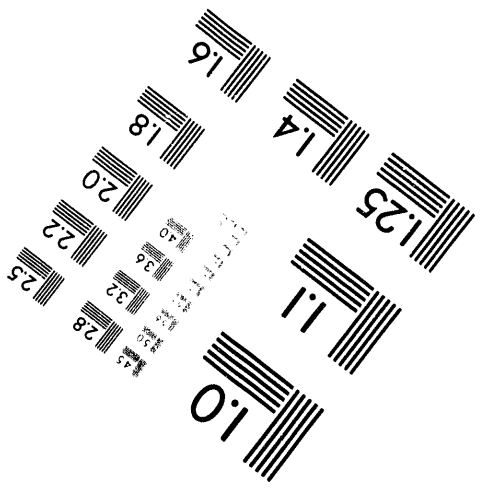

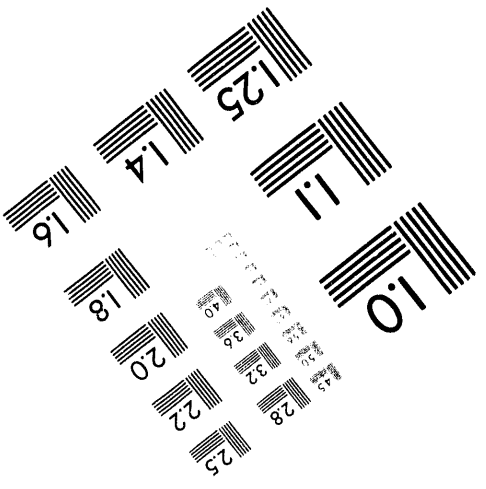

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EXPLOSIVES DEPARTMENT—TNX

May 17, 1945

To: Hood Worthington

From: C. P. Kidder

Turbidity Coagulant for Columbia River Water

In response to several inquiries as to why Ferrisul was selected in preference to alum as a coagulant for the 100 Area filter plants, we are listing pertinent reasons for the selection of Ferrisul.

During the initial phase of the CMX program at Hanford tests with and without a turbidity coagulant indicated that the natural turbidity in the Columbia River was frequently high enough to necessitate the use of some coagulant to minimize the passage through the filters of iron and fine turbidity, both of which were found to contribute to the formation of objectionable films. Initial tests were made with alum as the coagulant but it was found that film formation was accelerated when alum was used due to the introduction of aluminum, an objectionable film former, into the process water.

Since the choice of chemicals for use in the filter plant for coagulation of river turbidity is practically limited to a commercial grade salt of either iron or aluminum, an extensive laboratory program was conducted comparing alum [$Al_2(SO_4)_3 .18 H_2O$] and Ferrisul [$Fe_2(SO_4)_3$] to ascertain the respective iron and aluminum residuals resulting from the use of these coagulants.

The results indicated that both Ferrisul and alum can be expected to reduce the iron content of the water to a residual of no more than 0.02 ppm by proper pH control. Less than 0.01 ppm Al is found over the complete pH range when Ferrisul is used. On the other hand, when alum is used the minimum is somewhat higher, about 0.01 ppm Al, but this minimum is reached only if the pH is controlled within the limits 6.0 to 6.5. Outside of this pH range, the aluminum residuals rise rapidly. This latter conclusion has been confirmed more recently at the 200 Area filter plant where alum is used as a coagulant.

Since these laboratory results were confirmed later in the CMX plant tubes, Ferrisul was recommended as a filter plant coagulant in preference to alum for the following reasons:

1 - Ferrisul is equally as effective as alum in reducing the Fe content of process water.

2 - An aluminum film is more difficult to remove than iron film. The concentration of dissolved aluminum in the water should therefore be kept at a minimum. Ferrisul will keep the Al content of process water very low over the complete pH range encountered whereas alum effects low (.01 ppm) Al content water only in the pH range of 6.0 to 6.5.

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3 - Since Columbia River pH is normally about 8.0 it would be impossible to flocculate with alum at 6.0 to 6.5 pH with existing filter plant equipment and acid addition facilities would have to be provided.

4 - If flocculation was done at 6.0 to 6.5 pH it would be necessary to add lime or soda ash after filtration to raise the process water to about 7.5 pH to prevent dichromate decomposition. The additional amounts of certain elements so introduced such as Al from lime and sodium from soda ash might be objectionable.

The effect of pH on the iron and aluminum content of water coagulated with alum and with Ferrisul, in laboratory tests, is as follows:

	ALUM			FERRISUL		
pH	Al	Fe	Total	Al	Fe	Total
6.5	.01	.025	.035	<.01	.05	.05 +
7.0	.02	.02	.04	<.01	.03	.03 +
7.5	.06	.02	.08	<.01	.02	.02 +

Note: Initial laboratory and plant tests were conducted with Ferrisul. Later on, Ferrifloc was found to be an acceptable equivalent.

C. P. Kidder

C. P. Kidder, 100 Technical

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