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**Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
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SUBJECT OR TITLE

ADA-DC-6 - DESIGN CRITERIA FOR REACTOR

WATER PLANT AT COYOTE RAPIDS SITE

Instruction Letter No. 1

19

FROM

O. R. P. 11-10-7

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- cc: 1. RK Patterson
2. RK Patterson
3. RH Beaton
4. WJ Dowis
→ 5. VD Nixon
6. OH Pilkey
7. WW McIntosh
8. JR Kelly
9. D & C File.
10. D & C File
11. D & C File
12. D & C File

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This document consists of
6 pages, No. [redacted]

January 10, 1952

Chas. T. Main, Inc.
141 Milk Street
Boston, Massachusetts

Attention: Mr. R. K. Patterson

Gentlemen:

Classification Cancelled and Changed To

DECLASSIFIED

By Authority of RM-100

CG-NMP-1, 6-27-94

By J. E. Savely 6-30-94

Verified By Jerry Maly 7-26-94

RDA DC-6 - DESIGN CRITERIA
FOR REACTOR WATER PLANT AT COYOTE RAPIDS SITE

Instruction Letter No. 1

I. NUMBER AND SIZE OF UNITS

The design will be based on one reactor with a potential capacity of 1300 megawatts. For the time being this reactor will be designated "X".

II. WATER PLANT CAPACITY AND TENTATIVE SCHEDULE FOR USE

The water plant will be designed to supply 100,000 gpm initially. The design shall provide, however, for the ultimate capacity of 140,000 gpm; i.e., underground process piping, space in river pump house, and other items which would be difficult to enlarge after initial construction, will be sized for the ultimate capacity and provision shall be made for future enlargement of filter plants, etc. to provide the required increase in capacity.

The following is the proposed schedule for operation of the water plant:

- a. The first four years of operation may be considered to be at 100,000 gpm to the pile with 400 psia pressure at the top of the risers.

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*① to lead is extent
of Main's work
to do - study
report.*

Chas. T. Main, Inc.

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- b. At the end of this period re-orificing will be done and operation will start at 122,000 gpm with 462 psia pressure at the top of the risers. Operation at this rate will continue for approximately two years.
- c. The final stage of operation will be at 140,000 gpm and 600 psia pressure at the top of the risers. For the purposes of economic studies this period may be considered to last approximately four years.

The above pressures are considered to be maximum with fouled tubes. A variation at top of riser pressure of 15 psi between the fouled tube and the cleaned tube condition is acceptable. The above flow rates are nominal and represent an average between clean and fouled tubes.

A tube inlet pressure build-up of 40 psi will be the criteria for initiating tube cleaning procedures.

During shutdown periods a minimum flow of approximately 10,000 gpm will be required. No pressure requirements other than those necessary to sustain flow exist during this period. Shutdown will account for about 25 hours time per month.

A pressure reduction at the top of the riser of 7 per cent of normal operating pressure will be tolerated under condition of process pump failure. If failure of one process pump does not cause a greater than 7 per cent pressure drop it will be possible to control power level within the reactor and restore normal operation without scrambling, provided rated pressure can be restored within approximately 15 minutes. Should the pressure drop due to pump failure exceed 7 per cent, it would be necessary to scram the unit and restart according to standard procedures.

Water flow requirements during the transition period immediately following emergency shutdown may be assumed to be identical to that shown on Chart No. 2, in HDC-2106, excepting that the vertical ordinate scale should be changed in the ratio of 385 over 525, 447 over 525, or 585 over 525, corresponding to the operating conditions given above under (a), (b), and (c) respectively.

III. LAYOUT OF AREA

The Coyote Rapids Site will be located in the area between 100-B and 100-D. The location of the reactor should be limited to the area which falls at a minimum distance of three miles from the

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reactors in B and D. The remainder of the water plant should be arranged for maximum economy of construction and operation.

No arbitrary limitation is set in regard to space between buildings beyond that required for efficient construction, except that a minimum distance of 150 feet is required between the reactor building and the isolation fence. In general, a compact arrangement is preferred.

The reactor building will be approximately 275 feet wide by 213 feet long in the direction of the axis of the center lines of the process water pipes entering the building. The process stack in the 115 Building will be located to the right of the reactor building when facing the reactor building in the direction of process water flow. The 115 Building will be approximately 2/3 of the existing 115 Buildings in floor area and of corresponding shape. The elevation of the process sewer leaving the 105 Building will be such as to provide a minimum earth cover of 5 feet.

Two elevated water tanks will be required. They shall be located in relation to other structures in a similar manner to the existing areas. The capacity shall be 500,000 gallons each.

Two railroad tracks will enter the reactor building on the opposite side from the stack. General arrangements of the tracks including passing facilities should be similar to that provided in "C". One track shall be provided for gas bottle handling to the 115 Building.

The river pump house should be located so that operations will be unaffected by floods at the 117 foot level (1894 flood) or for low waters down to the 375 foot level. McNary Dam Backwater will not extend to the location under consideration.

Raw and process water lines and sewers outside of buildings should be sufficiently dispersed so that damage to one line would not incapacitate another.

Two process sewers will be required. All outside process pipe should be sized for the ultimate capacity of the plant and for continuing operations with one line out of service for repairs.

Contour and utility maps and aerial photographs of the area are available. More detailed contour information will be obtained upon request.

No areas of contamination exist in the proposed site.

*there is no such
stack Does he mean
the multiple stack.*

*Radius of flood
clear 7105.*

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IV. WATER TREATMENT, RETENTION AND DISPOSAL

Present standards of water quality will be acceptable for this plant. Maximum allowable filter rate may be taken as 2.86 gpm, per square foot of filter area. This is a gross rate based on total water entering the filter plant divided by the total installed filter area.

The design of the sedimentation basins and other features of the plant should be such as to yield water of the required quality. Arrangements should be provided for water treatment with either ferric sulphate and lime or aluminum sulphate and activated sodium silicate. The batch system of applying chemicals is preferred over the continuous system. Consideration should be given for arrangements which provide an automatic backwash cycle with manual instigation. Storage should be provided for three months supply of chemicals based on an average rate of use. Provisions should also be made for the addition of potassium dichromate to the process water.

should this be sodium?

The consideration of types of filters need not be limited to the Roberts design. Questions of water treatment may be referred to S. T. Powell directly for consultation and advice. Three copies of all correspondence with S. T. Powell should be sent to J. R. Kelly, General Electric Administrator of the Powell consulting contract.

Process water storage upstream of the 190 Building should be 15.5 million gallons. This is based on provision of requirements for a 20 minute shutdown transition process and 24 hours operation at a shutdown flow of 10,000 gpm.

Retention basin design should be based on the following requirement: The size and efficiency of the basin must be such that the elapsed time between detection of excessive fission product contamination in the influent to the basin to the time of doubling of the normal fission product activity of the basin effluent shall not be less than one hour. Further information will be available on this item at a later date.

This will not help C.T. Main.

The filter pump house reservoir should be sized on the same basis as for C Area.

What are the requirements?

An outfall for the retention basin effluent shall be provided to a point near the middle of the river similar to those in the existing areas. It is not expected that a lift station will be required for the 105 Building in this area.

No consideration shall be given in this study to a recirculating process water system.

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In general, spare pumping units may be limited to one for each service. Combination spare units should be considered for the 183 pump room if practicable. Two spare units will be required for the 190 pump room.

is this necessary?

7 with what flow?

V. REQUIREMENTS OF THE 105 AND 115 BUILDINGS

*no spares or max. of 1 each
14,000 GPM*

Power requirements of the 105 Building will be 450 HP for ventilation. Other power requirements for 105 Building will be the same as for 105-C. Power requirements for 115 Building will be the same as that of 115-B plus 25 HP for ventilation. Steam requirements for heating will be 26,000 pounds per hour for 105 Building and 2,000 pounds per hour for 115 Building.

Filtered water requirements for other than process cooling in the 105 Building may be taken as 1-1/2 times the "C" requirements. Addition of dichromate to water used for auxiliary services in 105 does not appear to be objectionable except from the standpoint of the additional expense of the chemical.

VI. OUTSIDE UTILITIES

No provision will be made for exporting water from the Coyote Rapids area. A connection should be made to the export system, however, to supply this area with 10,000 gpm for emergency use.

Sufficient electric power will be available from the main distribution system for supply of this area.

VII. SPECIAL DESIGN FEATURES

Bomb blast protection should be given consideration. Class II construction as outlined in the Savannah River Plant Building Code should be provided for all buildings. Certain spaces within buildings may be required to be Class I. This matter will be more fully defined at a later date.

Remote control of water plant facilities from the 190 Building should be considered from the standpoint of operating economy.

The elimination of building structures by the use of outdoor equipment should be considered if over-all economies can be realized.

Comfort cooling and heating should be provided for offices and work spaces only. Heating should be provided in pump and machinery room, etc., as required to prevent freezing in either operating or shut-down conditions.

NO!

What are the requirements?

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Monitoring requirements at the retention area will be similar to "C".

VIII. SCHEDULE

The following is the proposed schedule for design and construction at the Coyote Rapids site. Detailed design start May 15, 1952. Construction start August 1, 1952. Construction complete May 1, 1954.

Very truly yours,

O. H. Pilkey

ENGINEERING DEPARTMENT

OH Pilkey:WMM:cs

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TENTATIVE PROGRAM FOR C. T. MAIN GROUP

Thursday, January 24, 1952

Field Trip

100-B & 100-DR

Material to be obtained for review - (from J. H. Snyder)

- (1) Coulee Disaster Report
- (2) HDC-21065 "Decay Curve"

Friday, January 25, 1952

Meeting _____ 8:30 AM

Patterson, Nixon, Wolcott, Snyder, McIntosh.

NIXON'S
OFFICE

Meeting on Background of Reactor Water Requirements, 10 AM

C. T. Main group, Roy, Locke, Fryar, McIntosh, Snyder,
Russ, Perkins, Langan.

} Conf. Room!

Saturday, January 26, 1952

Flight Over Coyote Rapids - 1:00 PM

Patterson and two other C. T. Main personnel,
Wolcott and Snyder.

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Monday, January 28, 1952

Meeting on Electric Power - 8:30 AM

Patterson and interested C. T. Main men
Peabody, Snyder and Russ.

} Conf. Room. V.

Meeting on Instrumentation - 1:00 PM

Patterson and interested C. T. Main men,
Day, Snyder, and Russ.

} Conf. Room! X

Tuesday, January 29, 1952

Meeting on Area Services and Operating Philosophy - 8:30 AM

Entire C. T. Main Group, Perkins, Langan, Snyder, Pilkey,
Russ.

} Conf. Room. X

Tuesday, January 29, 1952

Meeting on Form of Presentation of Criteria - Review "HX"
Criteria - 1:00 PM

Patterson, Dowis, Snyder, Russ

Dowis spec.

Wednesday, January 30, 1952

Meeting on Bomb Blast, River Levels, Emergency Power, etc.
8:30 AM

C. T. Main Group, Shadel, Peabody, Russ, Davis and Pilkey.

Meeting on Layout - R.R. Roads Export Line, etc., - 1:00 PM

C. T. Main Group, Fritchard, Goss, Shadel, Russ, Snyder.

Coy. Rom ✓

Thursday, January 31, 1952

C. T. Main will submit for G. E. Concurrence

- (1) Requirements of Design for operation.
- (2) List of documents, drawings and other material to be forwarded to Boston.

Friday, February 1, 1952

Meeting to Review Requirements and for Initial Agreement
as to Basis for Design - 8:30 AM

C. T. Main Group, Wolcott, Snyder, Peabody, Day, Shadel, Russ,
McIntosh.

Coy. Rom ✓

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NOTE: When names are mentioned above the listing is not intended to exclude others from the meeting who can contribute by attending.