DELAWARE RIVER BASIN

SWINGING BRIDGE DAM

SULLIVAN COUNTY, NEW YORK

INVENTORY NO. N.Y. 696

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

Swinging Bridge Dam (Inventory Number NY-696),
Delaware River Basin, Sullivan County,

APPROVED FOR PUBLIC RELEASE:
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CONTRACT NO. DACW-51-79-C-0041

George Koch
11-24 Sep 79

NEW YORK DISTRICT CORPS OF ENGINEERS

JUNE 1973

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DISCLAIMER NOTICE

THIS DOCUMENT IS BEST QUALITY PRACTICABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.
This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization. The examination of documents and visual inspection of Swinging Bridge Dam and appurtenant structures did not reveal conditions which constitute an immediate hazard to life or property. The dam, however, has a number of deficiencies which if not remedied, may have the potential for developing into hazardous conditions. These deficiencies are as follows:
1. Seepage at the toe and along the east abutment of the dam was evident. A depression was observed in the downstream slope above the original penstock near the center of the dam. Investigation of these conditions must be completed within 6 months of notification, and monitoring devices to measure flow and movement must be installed immediately with recording of information at weekly intervals until completion of the investigation.

2. Structural cracking of the gate tower (reportedly due to ice loading) and deterioration of the spillway slabs and flood gate supports was noted. Investigation of these conditions must be completed within 1 year of notification and repairs completed within the next construction season.

3. Removal of tree and vegetative growth observed in the spillway channel, on the spillway channel slopes, on the embankment slopes, at the abutment contacts and along the toe of the dam is required, and must be completed within this construction season.

4. Repair the depressions noted on the crest of the embankment (western end) and on the upstream slope near the watch tower during this construction season.

5. Initiate a program of periodic inspection and maintenance of the dam and appurtenances. Document this information for future reference and develop an operations manual.

The discharge capacity of the spillway and the adjacent bedrock channel at both ends of the spillway is adequate to pass the Probable Maximum Flood (PMF = 47,800 cfs), without overtopping of the embankment portion of the dam, which is located approximately 1,000 feet southeast of the spillway. The maximum reservoir level during the PMF will be nearly equal to the top of the embankment at elevation 1080. The actual spillway capacity is only 39% of the PMF. However, the adjacent non-erodable bedrock channel at the north and south ends of the spillway will provide the additional capacity necessary to discharge the outflow from the PMF.
This report is prepared under guidance contained in the 
Recommended Guidelines for Safety Inspection of Dams, for Phase I 
Investigations. Copies of these guidelines may be obtained from 
the Office of Chief of Engineers, Washington, D.C. 20314. The 
purpose of a Phase I Investigation is to identify expeditiously 
those dams which may pose hazards to human life or property. The 
assessment of the general condition of the dam is based upon 
available data and visual inspections. Detailed investigation, 
and analyses involving topographic mapping, subsurface investigations, 
testing, and detailed computational evaluations are beyond the scope 
of a Phase I Investigation; however, the investigation is intended 
to identify any need for such studies.

In reviewing this report, it should be realized that the 
reported condition of the dam is based on observations of field 
conditions at the time of inspection along with data available to 
the inspection team. In cases where the reservoir was lowered or 
drained prior to inspection, such action, while improving the 
stability and safety of the dam, removes the normal load on the 
structure and may obscure certain conditions which might otherwise 
be detectable if inspected under the normal operating environment 
of the structure.

It is important to note that the condition of a dam depends on 
numerous and constantly changing internal and external conditions, 
and is evolutionary in nature. It would be incorrect to assume that 
the present condition of the dam will continue to represent the 
condition of the dam at some point in the future. Only through 
frequent inspections can unsafe conditions be detected and only 
through continued care and maintenance can these conditions be 
prevented or corrected.

Phase I inspections are not intended to provide detailed 
hydrologic and hydraulic analyses. In accordance with the established 
Guidelines, the Spillway Test flood is based on the estimated 
"Probable Maximum Flood" for the region (greatest reasonably possible 
storm runoff), or fractions thereof. Because of the magnitude and 
rarity of such a storm event, a finding that a spillway will not 
pass the test flood should not be interpreted as necessarily posing 
a highly inadequate condition. The test flood provides a measure 
of relative spillway capacity and serves as an aide in determining 
the need for more detailed hydrologic and hydraulic studies, 
considering the size of the dam, its general condition and the 
downstream damage potential.
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PHASE 1 REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Swinging Bridge Dam (I.D. No. NY-696)
State Located: New York
County Located: Sullivan
Stream: Mongaup River (tributary of Delaware River)
Dates of Inspection: November 8, 1978 and April 20, 1979

ASSESSMENT

The examination of documents and visual inspection of Swinging Bridge Dam and appurtenant structures did not reveal conditions which constitute an immediate hazard to life or property. The dam, however, has a number of deficiencies which if not remedied, may have the potential for developing into hazardous conditions. These deficiencies are as follows:

1. Seepage at the toe and along the east abutment of the dam was evident. A depression was observed in the downstream slope above the original penstock near the center of the dam. Investigation of these conditions must be completed within 6 months of notification, and monitoring devices to measure flow and movement must be installed immediately with recording of information at weekly intervals until completion of the investigation.

2. Structural cracking of the gate tower (reportedly due to ice loading) and deterioration of the spillway slabs and flood gate supports was noted. Investigation of these conditions must be completed within 1 year of notification and repairs completed within the next construction season.

3. Removal of tree and vegetative growth observed in the spillway channel, on the spillway channel slopes, on the embankment slopes, at the abutment contacts and along the toe of the dam is required, and must be completed within this construction season.

4. Repair the depressions noted on the crest of the embankment (western end) and on the upstream slope near the watch tower during this construction season.

5. Initiate a program of periodic inspection and maintenance of the dam and appurtenances. Document this information for future reference and develop an operations manual.
The discharge capacity of the spillway and the adjacent bedrock channel at both ends of the spillway is adequate to pass the Probable Maximum Flood (PMF = 47,800 cfs), without overtopping of the embankment portion of the dam, which is located approximately 1,000 feet southeast of the spillway. The maximum reservoir level during the PMF will be nearly equal to the top of the embankment at elevation 1080. The actual spillway capacity is only 39% of the PMF. However, the adjacent non-erodable bedrock channel at the north and south ends of the spillway will provide the additional capacity necessary to discharge the outflow from the PMF.

George Koch
Chief, Dam Safety Section
New York State Department of Environmental Conservation
NY License No. 45937

Approved By:

Col. Clark H. Benn
New York District Engineer

Date: 24 Sept 79
SECTION 1: PROJECT INFORMATION

1.1 GENERAL

a. Authority
The Phase 1 inspection reported herein was authorized by the Department of the Army, New York District, Corps of Engineers, to fulfill the requirements of the National Dam Inspection Act, Public Law 92-367.

b. Purpose of Inspection
Evaluation of the existing conditions of the subject dam to identify deficiencies and hazardous conditions, determine if they constitute hazards to life and property and recommend remedial measures where necessary.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenant Structures
The Swinging Bridge Dam is a 975 feet long hydraulically placed earth dam with a spillway located approximately 1000 feet northwest of the dam. The maximum height of the dam is 135 feet. The upstream slope is 1 vertical on 3.5 horizontal, the downstream slope is 1:2.5 and the crest width is 25 feet. The dam is composed of a clay and fine sand core extending from the center of the crest with slopes of 1:1 to the original grade, a core trench with maximum dimensions of 50 feet wide, 10 feet deep (side slopes = 1:1), an outer zone of boulders, gravel and sand, and rockfill toes, the material of which was obtained from spillway excavation. All exposed surfaces of the embankment were riprapped.

An intake located at the toe of the upstream slope and a gate tower located in the upstream face of the dam control the flow through the 10 feet diameter penstock to the number 1 generator. Two 24 inch diameter pipes serve as reservoir drains and are located in the conduit below the penstock. A second penstock and intake was installed at a later date near the west abutment of the dam to provide flow to generator number 2. This penstock is 10 feet in diameter. Both generators are located at the toe of the dam. The spillway is founded on sandstone. Five electrically operated flood gates each 22.6 feet wide and 6 feet high control the flow thru the spillway. Flashboards located on the north end of the flood gates are 122 feet long and 6 feet high.

b. Location
Swinging Bridge Dam is located on the Mongaup River, a tributary of the Delaware River, about 2 miles northwest of the Village of Forestbury and 7 miles southwest of the City of Monticello.
c. **Size Classification**

The dam is 135 feet high and stores 36,800 acre-feet of water. It is classified as a "large" dam (in excess of 100 feet).

d. **Hazard Classification**

The dam is classified as high hazard because of its location, about 11 miles north of the Village of Mongaup and upstream of 2 other large dams.

e. **Ownership**

The dam is owned and operated by Orange and Rockland Utilities Inc., 1 Blue Hill Plaza, Pearl River, NY, 10965, Tel: (914) 627-2410 – r (914) 343-0621.

f. **Purpose of the Dam**

The dam provides storage for power development. Recreation is permitted except at the southern end of the reservoir where the dam and spillway are located.

g. **Design and Construction History**

The dam was designed in 1925 by Charles H. Tenny & Co., Engineers, 200 Devonshire Rd., Boston, Mass. for the Catskill Power Corporation, Middletown, NY. The dam was constructed in 1929 by Fred T. Ley Inc., Central Contractor, Boston, Mass. The second generating plant and penstock system was constructed in 1938.

h. **Normal Operating Procedures**

Water releases from the Swinging Bridge Reservoir are passed through either of the two penstock systems from intakes to the generating stations located at the toe of the dam. Generation discharges are intended to maximize power development and minimize spillage through the spillway section. The generating capacity of the Swinging Bridge Reservoir is supplemented from Toronto and Cliff Lake Reservoirs by use of conduits. (See Section 4 – Operation and Maintenance Procedure).

1.3 **PERTINENT DATA**

| a. **Drainage Area (sq. mi)** | 118 |
| **Height of dam (feet)**    | 135 |

| b. **Discharge at Dam Site (cfs)** |  
| **Maximum Known Flood** | 9,143 in August 1955 |
| **Spillway at Design Pool (El. 1073*)** | 23,600 |
| **Spillway at Maximum Pool (El. 1080*)** | – |
| **Maximum Capacity of Reservoir drains** | 2-24" 80 C.F.S. |
| **Total Discharge, Max. Pool** | – |
| **Average Daily Discharge** | Varies |
| **Maximum Capacity of Penstock** | 2 X 585 = 1170 |

| c. **Elevation (ft. above MSL-Datum)** |  
| **Top of Dam** | 1080 |
| **Design Pool** | 1073 |
| **Spillway Crest** | 1065 |
| **Tailrace Channel** | 938.5 |
| **Tailwater Elevation** | 945.5 |
| **Invert Reservoir Drain Inlet** | 951 |
| **Unit #1 Invert Penstock Inlet** | 964.5 |
| **Unit #2 Invert Penstock Inlet** | 1015 |
d. Reservoir
Length of maximum Pool, Miles  7
Length of Shoreline (Spillway Crest) miles  15.23
Surface area (Top of Flashboards (1070)) acres  1000

e. Storage, (Acre-feet)
Spillway Crest  27,350
Maximum Design Pool  34,700
Top of Dam  -

f. Dam
Type: Hydraulic Fill (Earth fill)
Length (ft.)  975
Uplstream slope  3.5:1
Downstream slope  2.5:1
Impervious Core  Clay and Fine Sand.
Crest elevation, ft.  1080
Crest Width, ft.  25
Crest Curtain  None

h. Spillway
Type: Comb. Flashboards & Gates (125' each)
Length, ft.  250'
Crest Elevation ft.  1065
Soastream Channel  Natural Rock
Downstream Channel  Natural Rock & Concrete

a. Regulating Outlet
Unit #2 - 10' diameter penstock, shape inverted "U";
Unit #1 - 10' diameter penstock.

l. Reservoir drain
2-24" pipe.
SECTION 2: ENGINEERING DATA

2.1 DESIGN

a. Geology
The Swinging Bridge Dam is located in the "Appalachian Uplands" physiographic province of New York State. This province (northern extreme of the Appalachian Plateau) was formed by dissection of the uplifted but flat lying sandstones and shales of the middle and upper Devonian Catskill Delta. Relief is high to moderate. Maximum dissection occurs in the Catskill Mountain area, where only the mountain peaks approximate the original plateau surface. Drainage is generally south or southwest toward the Delaware River system.

b. Subsurface Investigation
A subsurface investigation was conducted and this information has been included in Appendix F - Drawings #KK 3-16 and KK 3-18. In general, the borings indicate that the soils at this site are of glacial till origin (sand, clay and stone of varying mixtures), over shale and sandstone bedrock.

The "General Soil Map of New York State" prepared by Cornell University Agriculture Experiment Station indicates that the surficial soils are of the Lackawanna series. This soil series has poor internal drainage characteristics. Boulders are common and depth to bedrock is variable. Sandstone bedrock was observed outcropping in the excavated spillway channel.

c. Dam and Appurtenant Structures
The dam was designed by Charles H. Tenny, 200 Devonshire Rd. Boston, Mass. All drawings available have been included in Appendix F. The design of the dam includes a hydraulically placed core of clay and sand with adjacent zones of boulders, gravel and sand, and slopes protected by riprap. Rockfill toes using spillway excavation material was incorporated in the design. The dam has a core trench which extends to "impervious material", with maximum dimensions of 50 feet wide and 10 feet deep. The spillway is located approximately 1000 feet northwest of the dam and is founded on sandstone bedrock.

2.2 CONSTRUCTION RECORDS
No information regarding the construction of the dam was available other than the year of completion and the contractor, that being 1929 and Fred T. Ley Inc. A second generating system was completed in 1938.

2.3 OPERATION RECORD
All information concerning operation and maintenance of the dam is on file at the power house.

2.4 EVALUATION OF DATA
Some of the data presented in this report has been made available by representatives of Orange and Rockland Utilities Inc. This information has been invaluable in the preparation of this report. All information gathered appears to be adequate and reliable for Phase 1 Inspection purposes.
SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General
Visual inspection of Swinging Bridge Dam and the surrounding watershed was conducted on November 8, 1978 and April 20, 1979. The weather was clear and the temperature ranged in the fifties. The reservoir level at the time of inspection was 1064.5, 15.5 feet below the top of the dam.

b. Embankment
The earth embankment shows no signs of major distress. However, the following conditions were observed: A minor depression was evident on the crest near the west end of the embankment. No signs of active movement were observed and the alignment of the crest appeared good. A depression was observed on the downstream slope approximately one-third the slope length from the toe and above the penstock. This depression is approximately 10 feet in diameter with a maximum depth of 2 feet. No evidence of current movement was apparent. A third depression was observed on the upstream slope near the watch tower structure. This depression is approximately 10 feet by 15 feet with a maximum depth of 1 foot. No evidence of on-going movement was discovered. The cause of this depression is most likely wave action from the reservoir. Numerous small trees and vegetation were observed on the slopes, at the abutment contacts and along the toe of the dam. No erosion or seepage was discernible on the slopes or at the abutments of the dam. No evidence of subsidence, depressions, or movement was present in the downstream area below the dam. Numerous areas of seepage emerged in this area and are described in the following sub-section.

As a consequence of this seepage, the surficial soils in the vicinity were soft, particularly on the west side of generation station #1.

c. Seepage
Five zones of seepage were observed at and below the toe of the dam and along the original grade near the east abutment. Section 3-e of the "Visual Inspection Checklist" - Appendix C contains a sketch of these areas; the following numbers correspond to the numbers shown in the Appendix.

1) A catch basin north of generation station #1 between the access road and the toe of the dam was observed. Examination of this basin revealed flow at a rate of approximately 10 gallons per minute (gpm) entering the basin from a drain which extends eastward along the toe of the dam and partially up the east abutment. Flow from the catch basin is directed under the access road toward the generation building. No evidence of particle migration or sedimentation within the catch basin was observed.

2) Near the southwest corner of generation building #1, a 6 inch diameter pipe was placed to collect seepage water. This pipe was not taking the full flow and water was by-passing the pipe along the west side. This area was very wet and the soil very soft. Flow was estimated to be 10 gpm through the pipe and 10 gpm by-passing the pipe. The source of the seepage is unknown and no transportation of fine soil material was noted (Photo #10).
3) Approximately equidistant from the generation buildings and below the access road, a 4 inch diameter pipe was exiting from the slope. A metal container, presumable used to collect or measure flow, was placed beneath the outlet of this pipe. No flow was observed and its previous performance is uncertain. (Photo #9).

4) Seepage was noted exiting from and in the vicinity of two 15 inch diameter pipes located in a swale area (original grade) southeast of the toe of the dam below an abandoned camp. Flow is estimated to 10 gpm with no migration of soil particles. The two pipes appear to have provided control of run-off along the east abutment, but are now plugged with soil and vegetation (Photo #12 and 12).

5) A wet area was encountered near and beneath the northeast corner of the abandoned camp. No flow was observed exiting this level area (Photo #13).

Maintenance personnel reported observing the seepage as described above for their duration of employment at the site.

d. Spillway
Considerable concrete spalling and deterioration was observed on the flood gate supports and the spillway slabs. In certain areas, the spalling has progressed to the point where reinforcing bars are exposed. This spalling appears to be related to exposed surfaces where ice and water have initiated deterioration. Leaking of flashboards was also noted. Considerable tree growth was observed in the tailrace channel and along the channel slopes. The flood gate system was reported to be operational.

e. Regulating Outlets
All reservoir drains, power generation systems, and associated valves were reported operational. The gate tower located in the upstream face of the dam was examined, and structural cracking of the concrete was discovered 84.8 feet below the tower floor at Elevation 995.2. This cracking was reported to be a result of ice pressure from the reservoir. Steel straps, secured to the concrete on either side of the cracked areas, were installed to insure the integrity of the structure. Calcification was also apparent on the walls of the tower at various locations.

f. Downstream Channel
The downstream channel appears to be in good condition. Since the spillway and outlet channel foundations are sandstone bedrock, the condition of the downstream channel will probably not influence the performance of the spillway and appurtenances.

g. Reservoir
There are no visible signs of instability or sedimentation problems in the reservoir area.
3.2 EVALUATION OF OBSERVATIONS
Significant conditions were observed which require immediate inves-
tigation to determine the type of corrective action necessary to
insure the stability of the dam and appurtenances. The following is
a summary of the problem areas encountered, in order of importance.

1. The seepage observed at various locations at or near the
toe of the embankment and along the east abutment.

2. The depression observed on the downstream slope above the
penstock (10 feet in diameter, 2 feet deep maximum).

3. The cracking noted in the gate tower.

4. The deterioration of concrete located on the spillway slabs
and flood gate supports.

5. Tree and other vegetative growth noted in the spillway channel,
at the abutments and along the toe of the embankment.

These conditions do not represent any imminent danger, however, remedial
action must be undertaken to prevent the development of hazardous con-
ditions.
SECTION 4: OPERATION AND MAINTENANCE PROCEDURE

4.1 PROCEDURE
The Swinging Bridge Dam is a power generating dam for Orange and Rockland Utilities Inc. Two penstocks carry water from the reservoir to the two power plants located at the toe of the dam. Flow through the 10 feet diameter penstock to generating station #1 is controlled by an 8 feet diameter remote controlled electrically operated butterfly valve, located in the gate tower. Below this valve, two 24 inch diameter gate valves serve as reservoir drains. Flow through the 10 feet diameter penstock to generating station #2 is controlled by a remote controlled electrically operated butterfly valve located in the gate house at the northwest corner of the embankment. This penstock is connected to a surge tank. In addition, flow at the entrance to each generator can be controlled by wicket gates.

Five flood gates located on the south end of the spillway control the discharge not utilized for power generation. These gates are operated by electric motors placed on the bridge above the gates.

Two water supply conduits, one from Cliff Lake Reservoir and one from Toronto Reservoir, augment the storage capacity of Swinging Bridge Reservoir, so that during low flow conditions, power can still be generated.

All valves are remote controlled by the systems operator located on Dolson Avenue, Middletown, NY.

4.2 MAINTENANCE OF DAM
The operation and maintenance manual and records for the facility are on file in the generating building. Maintenance of the dam appears to be adequate with the exceptions noted in "Section 3: Visual Inspection". Maintenance of the spillway is inadequate in as much as deterioration of concrete surfaces is well advanced.

4.3 MAINTENANCE OF OPERATING FACILITIES
Maintenance of generating equipment and associated valves, conduits, etc., appear to be excellent.

All valves are reported to be operational. No operations manual is on file. A record of maintenance operations is on file with the maintenance staff.

4.4 WARNING SYSTEM IN EFFECT
An excellent warning system has been developed by the owner, in accordance with the Federal Energy Regulating Commission standards. This system was recently updated (Dec. 7, 1978) and is included in Appendix F.

4.5 EVALUATION
Certain remedial measures are required to provide the proper maintenance. Deterioration of concrete surfaces in the spillway system, and cracking in the gate tower are areas which need further maintenance. Vegetative growth in the spillway channel and at the dam must be removed.
SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 DRAINAGE AREA CHARACTERISTICS
The Swinging Bridge Dam is located on the Mongaup River, a tributary of the Delaware River. The drainage area at the dam site is 118 square miles. The topography is characterized by steep slopes interspersed by swamps, ponds and lakes.

5.2 ANALYSIS CRITERIA
Information on the Standard Project Flood (SPF) for the Swinging Bridge Dam and its watershed was obtained from the "Upper Delaware River Basin Hydrologic Flood Routing Model" prepared in 1976 by Water Resources Engineers, Inc. for the New York District of the U.S. Army Corps of Engineers. The rainfall-runoff mathematical model HEC-1 developed by the U.S. Army Corps of Engineers was used to reconstruct major floods and to simulate the SPF considered in the study. SPF is approximately one-half of Probable Maximum Flood (PMF).

The Swinging Bridge Dam watershed is located within the subbasin 50 of the Delaware River Basin. The inflow was routed through the reservoir and the peak outflow was determined to be 23,900 cfs for the SPF.

5.3 SPILLWAY CAPACITY
The spillway is 122 feet long and is topped by 6 feet high flashboards. There are 5 electrically operated floodgates, each 22.6 feet wide, located south of the spillway. The capacity of the spillway and floodgates is 18,600 cfs with the flashboards removed and gates completely opened.

5.4 RESERVOIR CAPACITY
The reservoir capacities at the crest of spillway, and at the top of the flashboards are 27,400 acre-feet (AF) and 34,100 AF respectively. The storage capacity curve is shown in Appendix D. The curve indicates a surcharge storage of 4,400 AF which is equivalent to a runoff depth of 0.70 inches over the drainage area.

5.5 FLOODS OF RECORD
Maximum flood recorded is 9100 cfs on August 1955.

5.6 OVERTOPPING POTENTIAL
The maximum combined capacity of the floodgates and spillway is 18,600 cfs compared to a SPF of 23,900 cfs. Hence, the floodgates and spillway can pass 78 percent of the SPF. Since the SPF is approximately one-half of PMF, the floodgates and the spillway are capable of passing only 39 percent of PMF (47,800 cfs). The adjacent non-erodable bedrock channel which extends to the north and south at the ends of the spillway will provide additional discharge capacity. This additional capacity will be such that the reservoir level will approximate the top of embankment (elevation 1080) during the PMF. Therefore, no overtopping of the dam will result.

5.7 EVALUATION
The spillway and adjacent bedrock channel is adequate to pass the PMF, and no overtopping of the earth embankment section, approximately 1000 feet southeast of the spillway, will result.
SECTION 6  STRUCTURAL STABILITY

6.1  EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations
The following visual observations indicate distress within the earth embankment, although these observations do not indicate conditions which pose an immediate hazard to human life or property:

1. Seepage at the toe and along the east abutment.
2. Depression on the downstream slope above the penstock (10' diam, 2' deep).

The following visual observations indicate deterioration or distress in the concrete elements of the dam, but do not pose an immediate hazard to life or property:

1. Cracking of the gate tower due to reservoir ice loading.
2. Deterioration of concrete at the spillway slabs and flood gate supports.

b. Design and Construction Data
No design computations or construction information regarding the structural stability of the dam are available.

c. Operating Records
No operational problems were reported which would influence the stability of the structure.

d. Post-Construction Changes
A second generating system was installed in 1938 with the intake at the western edge of the embankment. Steel straps, used to repair the cracking of the gate tower, were installed in 1971.

e. Seismic Stability
Seismic forces in this zone are not considered to be of significant magnitude to influence the stability of the structure.
SECTION 7: ASSESSMENT/RECOMMENDATIONS

7.1 ASSESSMENT

a. Safety
The Phase 1 Inspection of Swinging Bridge Dam did not indicate conditions which constitute an immediate hazard to human life or property. The embankment is not considered to be unstable. However, seepage along the toe of the dam and at the east abutment, and the depression on the downstream face above the original penstock, require investigation and observation at periodic intervals to prevent the development of hazardous conditions. In addition, deterioration of the spillway concrete and structural cracking of the gate tower must be investigated and repairs instituted.

b. Adequacy of Information
The information reviewed is adequate for Phase 1 Inspection purposes.

c. Urgency
Investigation of the observed seepage and depression must be completed within 6 months of notification to the owner. In addition, weirs should be immediately constructed and measurements taken to monitor the flow of the seepage at all locations. Investigation of the structural cracking in the gate tower and deterioration of concrete on the spillway slabs and flood gate supports must be completed within 1 year of notification and repairs completed within the next construction season. Tree and other vegetative growth noted in the spillway channel, at the abutments and along the toe of the embankment must be removed during this construction season.

d. Need for Additional Investigations
To prevent the development of potentially hazardous conditions, investigations are required in the following areas:

1. Seepage at toe and along east abutment of the dam.

2. Depression observed on the downstream face of the dam above the penstock.

3. Structural cracking of the gate tower and deterioration of concrete on the spillway slabs and flood gate supports.

7.2 RECOMMENDED MEASURES

a. Results of the aforementioned investigations will determine the type and extent of remedial measures required for the observed seepage, depression, structural cracking and concrete deterioration.

The following improvements can be accomplished by maintenance forces:

b. Remove the tree and vegetative growth observed in the spillway channel and on the spillway slopes, on the embankment slopes, at the abutment contacts, and along the toe of the dam.
c. Repair the depressions noted on the crest of the embankment (western end) and on the upstream slope near the watch tower.

d. Initiate a program of periodic inspection and maintenance of the dam and appurtenances. Document this information for future reference. Also develop an operations manual.
APPENDIX A

PHOTOGRAPHS
Upstream slope looking west
at Intake #2
Photo #2

Upstream slope looking east
note depression in riprap
Photo #3
Gate Tower for Intake #1
Photo #4

Downstream Channel
viewed from top of dam
Photo #5
Depression in Downstream Slope
above penstock #1
Photo #8

Seepage Collector (inactive)
Seepage point #3
Photo #9
Seepage Point #4
East Abutment Area
Photo #11

Seepage Point #4
Note seepage at 15" pipe
Photo #12
Seepage Point #5
Near abandoned camp
Photo #13
Spillway Flood Gate System
Looking north
Photo #16

Spillway Flood Gate
Note Deteriorated Concrete Slab
Photo #17
Spillway Flood Gate Supports
Note Deteriorated Concrete
Photo #18

Spillway - Deteriorated Concrete of South Abutment
Photo #19
APPENDIX B

ENGINEERING DATA CHECKLIST
<table>
<thead>
<tr>
<th>Item</th>
<th>Plans</th>
<th>Details</th>
<th>Typical Sections</th>
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<tr>
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<td></td>
</tr>
<tr>
<td>Spillway(s)</td>
<td>YES</td>
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<td></td>
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<tr>
<td>Outlet(s)</td>
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**Name of Dam**: Swingin'  
**I.D. #**: N.Y. 694

- **Design Reports**: NONE
- **Design Computations**: NONE
- **Discharge Rating Curves**: NONE
- **Dam Stability**: NONE
- **Seepage Studies**: NONE
- **Subsurface and Materials Investigations**: YES
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<td>Surveys, Modifications, Post-Construction Engineering Studies and Reports</td>
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<td>Accidents or Failure of Dam Description, Reports</td>
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<td>Operation and Maintenance Records Operation Manual</td>
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<td>OPERATION AND MAINTENANCE RECORDS ONLY.</td>
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<td>Emergency Action Plan (recently updated) 12/78</td>
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APPENDIX C

VISUAL INSPECTION CHECKLIST
VISUAL INSPECTION CHECKLIST

1) Basic Data
   a. General

      Name of Dam     SWINGING BRIDGE
      I.D. #          NY 696
      Location: Town  LUMBERLAND  County  SULLIVAN
      Stream Name     MONGAUP RIVER
      Tributary of    DELAWARE RIVER
      Longitude (W), Latitude (N)  74°47'00", 41°34'25"
      Hazard Category     C
      Date(s) of Inspection NOV. 8, 1978, APRIL 20, 1979
      Weather Conditions  50's, CLEAR, SUNNY

   b. Inspection Personnel
      ROBERT MCCARTY, MUHAMMAD ISLAM
      KENNETH FIELD, Robert Stuber, Edward Kienz, Joseph Cox

   c. Persons Contacted
      KENNETH FIELD, Tel 914-627-2410
      Robert Stuber, Tel 914-786-3310

   d. History:
      Date Constructed  APRIL 1929, 2nd generating plant constructed 1938
      Owner  ORANGE AND ROCKLAND UTILITIES, 1 BLUEHILL PLAZA
             PEARL RIVER, N.Y.
      Designer  CHARLES H. TENNYSON 200 DEVONSHIRE RD, BOSTON, MASS.
      Constructed by  FRED T. LEY INC. Central Contractor
                     Boston Mass.

2) Technical Data
   Type of Dam    HYDRAULIC FILL
   Drainage Area  117.6 SQUARE MILES
   Height          135 FEET  Length  975 FEET
   Upstream Slope  3.5:1  Downstream Slope  2.5:1
2) **Technical Data (Cont'd.)**

External Drains: on Downstream Face **NONE** @ Downstream Toe **ROCKFILL TOE**

Internal Components:

- **Impervious Core**: CLAY AND FINE SAND
- **Drains**: NONE
- **Cutoff Type**: CUTOFF TRENCH FILLED WITH CLAY AND FINE SAND
- **Grout Curtain**: NONE
3) **Embankment**

a. Crest

(1) **Vertical Alignment**
   - Generally good - 1 minor depression near the west end of the embankment - not considered to be a problem.

(2) **Horizontal Alignment**
   - Good

(3) **Surface Cracks**
   - None

(4) **Miscellaneous**

b. Slopes

(1) **Undesirable Growth or Debris, Animal Burrows**
   - Numerous small trees on slopes - numerous large trees at abutment contacts on along toe.

(2) **Sloughing, Subsidence or Depressions**
   - Depression on downstream slope approx 10' x 15' near watch tower on upstream face - probably related to wave action.

(3) **Slope Protection**
   - Both upstream & downstream slopes riprapped.

(4) **Surface Cracks or Movement at Toe**
   - None evident

(5) **Seepage**
   - None evident

(6) **Condition Around Outlet Structure**
   - Good condition except seepage as noted in "date"
c. Abutments

- Good condition - some trees along abutment contact

1. Erosion at Embankment and Abutment Contact: None

2. Seepage along Contact of Embankment and Abutment: None

3. Seepage at toe or along downstream face: See below

d. Downstream Area - below embankment

1. Subsidence, Depressions, etc.: None evident

2. Seepage, unusual growth: As described on next page

3. Evidence of surface movement beyond embankment toe: No evidence

4. Miscellaneous: Surface soil is soft on west side of generation station #1

e. Drainage System

- Drain at toe of embankment north of access road - pipe extends to abutment areas. Estimated flow 10 gpm. Drain west of generator #1 below access road, described on next page. Drain below access road approx. 4' away between generator #1 & #2. No flow observed.
(1) Condition of relief wells, drains, etc.  
Generally good condition

(2) Discharge from Drainage System (number system corresponds to areas on plan below)

1. About 10 gpm in front of generator #1 blowing from abutment areas to catch basin - no migration of fines
2. About 10 gpm thru 6" pipe & 10 gpm by-passing pipe all from the same general area west of generator #1 - origin unknown, no fines
3. Drain between generators #1 & #2 no flow observed from 4" pipe
4. Seepage in swale on slopes of original grade near east abutment blow at 10 gpm - this flow has been occurring as far back as they can remember at about the same rate - no particle migration - Th 2-15" pipes appear to have provided control for runoff but are now plugged w/soil
5. A wet area was observed beneath the contractors house - no flow was observed.

N

Zones of seepage designated by 1

generators designated
#1 - 1929
#2 - 1938
4) Instrumentation

<p>| | |</p>
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<td>(1) Monumentation/Surveys</td>
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<tr>
<td></td>
<td>reservoir water level gage on intake tower</td>
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<tr>
<td>(2) Observation Wells</td>
<td><strong>NONE</strong></td>
</tr>
<tr>
<td>(3) Weirs</td>
<td><strong>NONE</strong></td>
</tr>
<tr>
<td>(4) Piezometers</td>
<td><strong>NONE</strong></td>
</tr>
<tr>
<td>(5) Other</td>
<td><strong>NONE</strong></td>
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</table>

5) Reservoir

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Slopes</td>
<td><strong>OK</strong></td>
</tr>
<tr>
<td>b. Sedimentation</td>
<td><strong>NONE REPORTED OR OBSERVED</strong></td>
</tr>
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</table>
6) Spillway(s) (including tail race channel)

- 5 electrically operated flood gates each 22.6' wide & 6' high.
- Flood boards: 122' long & 6' high.
- North of flood gate - spillway NW of dam.

a. General
- The concrete spillway is founded on bedrock.
- The tailrace channel & downstream channel is bedrock formed or controlled.
- Concrete deterioration:
  - Flood gate supports: Some rebars are exposed.
  - Spillway slabs.

b. Principle Spillway

- 122' wide & 6' high collapsible flashboards during flood discharge.
- 1 foot overtopping (designed).
- Some minor leakage of flashboards.

2 inlets for power generation described in section 8.

c. Emergency or Auxiliary Spillway
- 5 Flood gates 22.6' wide & 6' high electrically operated from motor units above.

d. Condition of Tail race channel
- Bedrock - some rock debris with a few trees directly below the spillway.

e. Stability of Channel side/slopes
- Rock or ripraped channel
- No problems visible - however, trees on banks should be trimmed out.
7) **Downstream Channel**

- **Natural Channel**

- a. Condition (debris, etc.)
  
  Generally in good condition, used only during
  
  flooding, numerous trees

- b. Slopes
  
  Generally good

- c. Approximate number of homes
  
  8 homes - residents of Mongaup
  
  village

---

8) **Miscellaneous**

- Power generation system: 2 intakes, one for
  
  each generator. Generator #1 (1929) intake tower in reservoir.
  
  Flow from intake tower to the penstock is controlled by an
  
  electrically operated butterfly valve. The control is in the
  
  tower. Flow from the reservoir to the 2nd generator is also
  
  controlled by a butterfly valve (electrically controlled)

  and the control is located at the gate house at the north-west
  
  corner of the embankment. This penstock is connected to a
  
  surge tank. In addition, water supply at entrance
to each generator can be shut off by electrically operated

  valves located in each generator building. Each generator
  
  is started by a group of batteries.
9) **Structural**

a. Concrete Surfaces cracking and spalling of concrete surfaces in flood gate supports & spillway slabs
   concrete intake tower has some calcification

b. Structural Cracking cracking of intake tower due to ice loading metal straps have been used to stiffen this area

c. Movement - Horizontal & Vertical Alignment (Settlement) none observed

d. Junctions with Abutments or Embankments good condition


e. Drains - Foundation, Joint, Face see embankt section a 3

f. Water passages, conduits, sluices where observed good condition & operational

g. Seepage or Leakage none evident related to concrete deterioration
h. Joints - Construction, etc.  

Good condition

i. Foundation  

Spillway - rock foundation  

Intake systems - foundation unknown

j. Abutments  

No problems

k. Control Gates  

Operational electric motors  

For each of 5 flood gates  

Intake systems electrically operated

l. Approach & Outlet Channels  

Bedrock channels

m. Energy Dissipators (plunge pool, etc.)  

None

n. Intake Structures  

Generally good condition

o. Stability  

Appears good

p. Miscellaneous
APPENDIX D

HYDROLOGIC/HYDRAULIC

ENGINEERING DATA AND COMPUTATIONS
# Check List for Dams

Hydrologic and Hydraulic Engineering Data

## Area-Capacity Data:

<table>
<thead>
<tr>
<th>Elevation (ft.)</th>
<th>Surface Area (acres)</th>
<th>Storage Capacity (acre-ft.)</th>
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<tbody>
<tr>
<td>1080</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1073</td>
<td>38,500</td>
<td></td>
</tr>
<tr>
<td>1070</td>
<td>34,100</td>
<td></td>
</tr>
<tr>
<td>1065</td>
<td>1,100</td>
<td>27,400</td>
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## Discharges

<table>
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<th>Volume (cfs)</th>
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<tr>
<td>Unknown</td>
</tr>
<tr>
<td>Type</td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td>Width</td>
</tr>
<tr>
<td>Length</td>
</tr>
</tbody>
</table>

Spillover: In a cut section located at northwest of dam: length 122 feet. In addition 5 floodgates 22'6" wide (each).

Location: North-west of embankment and not connected to embankment.

**SPILLWAY:**

<table>
<thead>
<tr>
<th>PRINCIPAL</th>
<th>ELEVATION</th>
<th>EMERGENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1065</td>
<td>Elevation</td>
<td>NONE</td>
</tr>
</tbody>
</table>

Channel in a cut section.

Width: 122 feet; 5 floodgates each 22'6".

Type of Control

- Uncontrolled
- Controlled:

Type (Flashboards; gate)

Number

Size/Length

Invert Material

Anticipated Length of operating service

Chute Length

Height Between Spillway Crest & Approach Channel Invert (Weir Flow)
OUTLET STRUCTURES/EMERGENCY DRAWDOWN FACILITIES:

Type: Gate ___ Sluice ___ Conduit YES Penstock YES

Shape: INVERTED U SHAPED (UPPER CONDUIT)

Size: 10 FEET DIAMETER. ALSO 2 - 24" PIPE IN LOWER CONDUIT.

Elevations: Entrance Invert 959.50
Exit Invert 957.50
Tailrace Channel: Elevation 1665.0

HYDROMETEROLOGICAL GAGES:

Type: NONE

Location: 

Records:

Date - 
Max. Reading -

FLOOD WATER CONTROL SYSTEM:

Warning System: NONE, EMERGENCY ACTION PLAN UPDATED RECENTLY.

Method of Controlled Releases (mechanisms):

USUALLY THROUGH PENSTOCK. BUTTERFLY VALVE OF PENSTOCK IS OPERATED ELECTRICALLY. WATER CAN ALSO BE RELEASED THROUGH 2 - 24" VALVES IN LOWER CONDUIT.
DRAINAGE AREA: 117.6 SQUARE MILES

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: ___________________________

Terrain - Relief: ___________________________

Surface - Soil: ___________________________

Runoff Potential (existing or planned extensive alterations to existing (surface or subsurface conditions)

NONE

Potential Sedimentation problem areas (natural or man-made; present or future)

NONE

Potential Backwater problem areas for levels at maximum storage capacity including surcharge storage:

NONE

Dikes - Floodwalls (overflow & non-overflow) - Low reaches along the Reservoir perimeter:

Location: NONE

Elevation: ___________________________

Reservoir:

Length @ Maximum Pool 7 (Miles)

Length of Shoreline (@ Spillway Crest) 17.5 (Miles)
SWINGING BRIDGE DAM

Drainage area = 118 square miles.

From "Upper Delaware River Basin Hydrologic Flood Routing Model" study, subbasin 50 - pages 78 to 87:

Area of subbasin 50 = 118 square miles.

The entire subbasin 50 is the drainage area of Swinging Bridge Dam.

Modified Standard Project Flood (MSPF) = \frac{1}{2} \text{ Probable Max. Flood (PMF)}

MSPF = \frac{23,900 \text{ cfs}}{2} = 23,900 \text{ cfs}

PMF = 2 \times 23,900 = 47,800 \text{ cfs}
Swinging Bridge

Storage Capacity Curve

<table>
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<tr>
<th>Elevation (feet)</th>
<th>Storage (acre-feet)</th>
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<tbody>
<tr>
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<td>25691</td>
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<tr>
<td>1063.2</td>
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<td>33511</td>
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<td>38500</td>
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Capacity figures given above are based on zero storage at minimum operating pool level El. 1010.0
Design high water

Top of flashboards

Elevation in feet

1073
1072
1071
1070
1069
1068
1067
1066
1065
1064
1063

Swinging Bridge Dam

Storage in acre-feet

25 27 29 31 33 35 37 x 1000

Legend:
- Crest of Spillway
- Spillway
- 1065.0 Elevation
- 1073.0 Elevation

Scale: 10 x 10 to the right, 1 x 10 to the left, 10 x 10 to the bottom, 1 x 10 to the top.
### Swinging Bridge

**Spillway Rating Curve**

1. **Floodgates**
   - \( H = \text{Head} \), \( L = \text{Length} \), \( C = \text{Coefficient of discharge} \), \( Q = \text{Discharge} \)
   - 5 floodgates, each 22' wide. 6' high collapsible flashboards on spillway.
   - \( Q = CLH^{3/2} \)

<table>
<thead>
<tr>
<th>Elevation (feet)</th>
<th>( H ) (feet)</th>
<th>( C )</th>
<th>( L_1 ) (feet)</th>
<th>( Q_1 ) (cfs)</th>
<th>( H_2 ) (feet)</th>
<th>( C )</th>
<th>( L_2 ) (feet)</th>
<th>( Q_2 ) (cfs)</th>
<th>( Q_1+Q_2 ) (cfs)</th>
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<td>122</td>
<td>0</td>
<td>122</td>
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<tr>
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<td>403</td>
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<td>3.5</td>
<td>122</td>
<td>9662</td>
<td>122</td>
<td></td>
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Flashboards collapse with 2' of water over flashboards.

Values of \( C \) assumed for simplification.
OVERTOPPING

\[ Q = CH^{\frac{3}{2}} \quad \text{where} \quad Q = \text{discharge in cfs} \]
\[ C = \text{coefficient of discharge} \]
\[ L = \text{length of floodgate or spillway} \]
\[ H = \text{head} \]

For \( \frac{1}{2} \) PMF = SPF

\[ Q = 23,900 \text{ cfs}, \quad C = 3.5, \quad L = 235 \text{ ft.}, \quad H = ? \]

\[ 23,900 = 3.5 \times 235 \times H^{\frac{3}{2}} \]
\[ H = 9.5 \text{ feet} \]

Elevation at \( H = 9.5' \) is \( 1065.0 + 9.5 = 1074.5 \text{ ft.} \)

For PMF

\[ Q = 47,800 \text{ cfs}, \quad C = 3.5 \text{ ft.}, \quad L = 235 \text{ ft.}, \quad H = ? \]

\[ 47,800 = 3.5 \times 235 \times H^{\frac{3}{2}} \]
\[ H = 15 \text{ feet} \]

Elevation at \( H = 15 \text{ ft} \) is \( 1065.0 + 15 = 1080 \text{ ft.} \)

Top of dam
APPENDIX E

REFERENCES


APPENDIX F

DRAWINGS
December 7, 1970

Mr. James D. Hebson, Regional Engineer
New York Regional Office
Federal Energy Regulatory Commission
26 Federal Plaza
New York, New York 10007

Subject: Emergency Action Plan in the Event of Dam Failure at Project Nos. 2578, 2592 and 2605

Dear Mr. Hebson:

In accordance with your letter dated October 16, 1978, enclosed are three (3) copies of our revised "Monitoring and Emergency Action Plan, Mongaup River Hydroelectric Facilities." The plan provides a detailed procedure for notification of the proper authorities in the event of an emergency, including a list of telephone numbers of persons to be contacted. A contingency plan for alternate means of communication as well as documentation of correspondence with the New York State Police are also attached.

The Company Duty Officer changes each week and a copy of the Duty Officer schedule is provided to the System Operator's office. By copy of this letter the revised Emergency Action Plan is being transmitted to the Superintendent-Hydro Maintenance for immediate posting in his office. All subsequent revisions shall be likewise forwarded to him.

The revised plan includes a list of parties to be notified in the event of an emergency with the State Police having the primary responsibility and authority to effect any orderly evacuation of the areas of potential flooding. Since Orange and Rockland Utilities is the only operator of water-related facilities along the Mongaup River subject to potential flooding in the event of dam failure, the notification of other such operators is not applicable.

The Company's rigid inspection program, which is summarized in the Emergency Action Plan, affords us the opportunity to determine when repairs are required until it reaches the critical stage. Materials necessary to effect such repairs on a
timely basis are on hand or are readily available in the area. Therefore, we do not feel the necessity to stockpile additional materials for emergency repairs.

Coordination of flows based on weather forecasts is included in instructions to System Operators. This flow coordination is designed to reduce the risk and amount of potential flooding in the downstream areas.

If we can be of further assistance to you regarding this matter, please do not hesitate to contact us.

Very truly yours,

[Signature]

Frank E. Fischer
Atts.
Vice President

cc: B. Muthig, Capt. (NYS Police)

bcc: T. A. Griffin, Jr.
    K. B. Field
    B. Z. Baxter, Jr.
    F. J. Kiernan (4 copies for distribution)
    J. F. Kragh
    W. H. Smith
    J. O. Trudeau
    K. D. Archer
Inspection Procedures Used To Monitor Condition Of Dams

Swinging Bridge, Mongaup and Rio dams are inspected daily by attendant-operators.

Toronto, Cliff Lake and Lebanon dams are inspected on Monday, Wednesday and Friday of each week by Hydro Maintenance crew members.

Each dam will be inspected once a year by a licensed Civil Engineer.

All dams are inspected every five years by consulting engineers representing the Company Bond Holders.

Other Monitoring Procedures

Pond elevations at Swinging Bridge, Mongaup and Rio are recorded by operators at these plants and relayed to Orange and Rockland System Operators at least every 4 hours during normal working hours and 24 hours per day during times of severe floods. When the new Energy Control Center goes into service in mid-1979, these elevations will be monitored continuously and automatically logged hourly at the System Operator's office in Spring Valley, New York.

Instructions to System Operators and Superintendent-Hydro Maintenance

In case of major floods (over 4 inches of rain in 24 hours or 6 inches in 48 hours), or when the in-flow at Swinging Bridge exceeds 2,000 c.f.s., Superintendent-Hydro Maintenance is instructed to close Toronto reservoir gates (if open) and start opening Swinging Bridge
flood gates at a rate which will hold the Swinging Bridge pond elevation at Elev. 1070 or less.

If the Swinging Bridge pond water elevation rises to Elev. 1071, the top 1.2 feet of flashboards will release over the 125 foot length of boards. When this condition occurs the Superintendent-Hydro Maintenance shall notify the System Operator. The System Operator shall notify the New York State Police that a possible emergency condition is imminent and request that Police stand by, but take no action until further notice. If this release by the top 1.2 feet of flashboards does not cause a drop in the elevation of the Swinging Bridge pond, or if the pond again rises to Elev. 1071, the Superintendent-Hydro Maintenance shall notify the System Operator who will notify the State Police to evacuate the houses in Mongaup Village at the lower end of the Mongaup River. The System Operator shall notify the Company Duty Officer, Manager-Electric Production, and Security Manager of the emergency condition and the action taken. The System Operator shall notify the New York Regional Engineer of the Federal Energy Regulatory Commission or his alternate.

If Swinging Bridge pond level continues to rise to above Elev. 1072, the remaining 5.0 feet of flashboards will be released and the maximum spillway capacity will then be available. The sill of this spillway is at Elev. 1065.

The operation of the entire flashboard system with all gates wide open should control the Swinging Bridge pond level for any anticipated flood. If after the operation of the entire flashboard system the pond level does not drop below Elev. 1071, the Superintendent-Hydro Maintenance shall notify the System Operator who will notify the State Police to evacuate the remaining endangered properties located immediately down-
stream of the Mongaup dam and the Rio recreation area. Notification of the Duty Officer, Manager-Electric Production, Corporate Communications, and Security Manager shall also be accomplished.

In the event, during an emergency condition, the Superintendent-Hydro Maintenance cannot make telephone contact with the System Operator, he shall use the Company two-way radio system. If the System Operator cannot make telephone contact with the State Police, he shall request a messenger with a radio vehicle be immediately dispatched from the Company's Western Division Operations Center in Middletown, New York to go directly to the State Police headquarters, also located in Middletown, to notify them of the emergency condition. The messenger shall remain at police headquarters to maintain direct radio contact between the Superintendent-Hydro Maintenance, System Operator, and the State Police.
MONGAUP RIVER HYDROELECTRIC FACILITIES

EMERGENCY ACTION PLAN

NOTIFICATION LIST

New York State Police (914) 343-1424

Superintendent-Hydro Maintenance Office: (914) 856-2109
Joseph B. Case Home: (914) 754-8271

Manager-Electric Production Office: (914) 352-6000, X-441
Frank J. Kiernan Home: (914) 342-0521

Security Manager-Office: (914) 352-6000, X-558
John F. Kragh Home: (914) 496-4964

Corporate Communications Office: (914) 627-2473
John P. Murphy Home: (914) 942-0246

Federal Energy Regulatory Commission Office: (212) 264-3687
New York Regional Engineer Home: (201) 998-2845
James Hebson

Chief Civil Engineer (Alternate) Office: (212) 264-3687
Martin Inwald Home: (516) 285-5964

Operations Duty Officer (See Operations Duty Officer Schedule and Guidelines)

12/1/78
In answering this, please use the same subject heading as on this letter

Subject: Monitoring and Emergency Action Plan
To: FILE
From: B. Z. Baxter, Jr.
cc: Mr. F. E. Fischer
     Mr. J. Kragh
     Mr. K. B. Field

July 14, 1978

On July 7, 1978 a meeting was held at the New York State Police Headquarters, Troop F, in Middletown, New York to review our June 30, 1978 submittal of subject plan to the Federal Energy Regulatory Commission. Attendees were J. Kragh (O&R), B. Z. Baxter, Jr. (O&R), B. Muthig, Capt. (NYS Police) and J. McMahon, Lt. (NYS Police).

Since we had forwarded a copy of the plan to the NYS Police prior to the meeting, only a short discussion as to the purpose of the plan and the function of the State Police was required. We advised that they were the only group being asked to coordinate this Emergency Action Plan in the event implementation was necessary and we would forward them a list of residences not controlled by O&R that would be affected in the Mongaup Village area. The State Police felt that since there were few residences involved, notification would not be difficult.

They were informed that any changes in the Emergency Action Plan would be forwarded to them as they occurred.

The meeting was highly productive since we will be able to obtain their cooperation.

BZBjr/ct

B. Z. Baxter, Jr.
Blake Muthig, Captain
New York State Police
Troop F
Middletown, New York 10940

Subject: Monitoring and Emergency Action Plan
Mongaup River Hydroelectric Facilities

Dear Captain Muthig:

As agreed during our July 7, 1978 meeting, attached is a list of residences in the Mongaup Village area not controlled by Orange and Rockland which could be flooded due to upstream dam failure. We also attach a drawing showing location of the homes with respect to the expected area of flooding.

In the event of any changes in the Emergency Action Plan, you will be promptly notified.

Very truly yours,

BZBjr/ct
Atts.

B. Z. Baxter, Jr.
Assistant Vice President

cc: Mr. J. Kragh

bcc: Mr. F. E. Fischer
      Mr. K. B. Field
Mongaup Village Residences

Not Controlled By O&R

Donald A. Gregory 856-8324

Tri State Diesel
McKerrill's Garage 856-6646

Gilson No Phone Listed

Douglas Bachelder 856-5612

Stephen J. Roman 856-3179

John Roman 856-6439

Robert Thiele 856-7608

Joseph Roberty 856-5685
COMPANY OPERATIONS
DUTY OFFICER
GENERAL GUIDELINES

PURPOSE
To provide for the availability of a person of sufficient rank to act in the
capacity of Company spokesman and provide high level management direction,
if required in the event of an incident or accident within the Company which
would have a significant impact in terms of our customers, the general public,
regulatory agencies, news media and other interested publics. This is consis-
tent with our Company Policy of providing continuous service to our
customers in a safe and efficient manner.

To provide an equitable distribution of Operating Department responsibilities
during those periods outside of the normal business hours.

To provide the opportunity for the exposure of the Duty Officer to all facets
of operations, thereby developing understanding, appreciation and flexibility
of personnel within the Company.

GENERAL GUIDELINES

1. Copies of the Duty Officer Schedule for Company operations will be made
available to the Service Operator Supervisor and Service Operators to
facilitate contacting the appropriate person when an incident or
accident occurs which may have a significant impact on the Company.

2. Persons scheduled for duty may change with other parties on the Duty Officer
Schedule and will be obligated to inform the Service Operator Supervisor of
such change.

3. The availability of the Duty Officer will be required during the entire week
that the person is scheduled. Availability is not construed to mean that the
person must stay at home by the telephone. However, it does mean that the
person may be contacted in a timely fashion.

4. The person designated as Duty Officer for the week will act as the Company
spokesman concerning any incident or accident that occurs during that week,
until such time as another appropriate individual becomes available to act
as the Company spokesman.

5. The availability of a Duty Officer will not supersede or change established
procedures for emergency notification of functionally responsible Officers
or other personnel.
GENERAL GUIDELINES - (Continued)

6. The Duty Officer shall act as the liaison authority across all departments, such as Transportation, Stores, etc. during the period outside of normal business hours. Problems which may develop after the standard Operating Procedures have been exhausted at lower levels of management, concerning the coordination of support services will be resolved by the Duty Officer.

7. Included with the Duty Officer Schedule are Emergency Procedures that are to be followed either by the Standby Duty Supervisor and/or persons within the operating departments in compliance with established requirements. It shall be the responsibility of the Duty Officer to ensure that these requirements are accomplished in a timely manner.
# List of Drawings

Swinging Bridge Dam

<table>
<thead>
<tr>
<th>Description</th>
<th>Drawing Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developments on Mongaup River</td>
<td>1300-50</td>
</tr>
<tr>
<td>General Plan</td>
<td></td>
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<tr>
<td>Borings</td>
<td>KK3-16</td>
</tr>
<tr>
<td>Dam</td>
<td>KK3-17</td>
</tr>
<tr>
<td>Spillway</td>
<td>KK3-18</td>
</tr>
<tr>
<td>Intake</td>
<td>KK3-19</td>
</tr>
<tr>
<td>Gate Tower</td>
<td>KK3-21</td>
</tr>
<tr>
<td>Conduit</td>
<td>KK3-25</td>
</tr>
<tr>
<td>Conduit Outlet</td>
<td>KK3-27</td>
</tr>
<tr>
<td>Powerhouse - General Plan (Generator #1)</td>
<td>KK3-28</td>
</tr>
</tbody>
</table>
POWERHOUSE - 10,000 K.W.
UP FALLS POWERHOUSE - 4000 K.W.
THG BRIDGE POWERHOUSE NO.1 - 5000 K.W.
THG BRIDGE POWERHOUSE NO.2 - 5000 K.W. (FUTURE)
ROCKLAND LIGHT & POWER CO.
NYACK, N.Y.
DEVELOPMENTS ON MONGAUP RIVER
GENERAL PLAN

CHAUS. T. MAIN, INC., ENGINEERS
301 DEVONSHIRE ST.
BOSTON, MASS., U.S.A.

<table>
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<th>REVISIONS</th>
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<td>7-14-38 General Revisions</td>
</tr>
</tbody>
</table>

IN CHARGE: W. F. U.
DRAWN: Traced: CHECKED: R.A.K.
SCALE: 1" = 100 FT.
DATE: JULY 7, 1938

1300-50
THIS DRAWING IS THE PROPERTY OF CHARLES TENNEY & CO.
AND IS SUBJECT TO RETURN ON DEMAND.
## Catskill Power Corp. Middletown, N.Y.

**Swinging Bridge Development Boring**


<table>
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</tbody>
</table>

**Scales**

1" : 100', 1" : 20'

**Sept. 3, 1925**

**KK 3 16**
90% of core material to pass 200 mesh sieve, remaining 10% must pass 100 mesh sieve

Core trench in rock, 10 ft bottom width, side slopes 2:1, excavated to impervious material.

CROSS SECTION OF DAM AT STA 2+00

Scale 1\" : 50\" 

Note, This cross section is typical between Stations 0+00 and 2+40.
Top of Flashboards: Elev. 1070.

Riprap upstream Face

Rockfill Toe, Material from Spillway Channel

Area under dam to be stripped of all vegetable matter

Thin core within core limits to be excavated and made impervious material
CROSS SECTION OF DAM AT ST. 50

Scale 1:50

Note: This cross section is typical of Stations 2, 46 and 5,000.

Core trench in earth, 50 ft. bottom width remaining 10% must pass 100 mesh sieve.

90% of core material to pass 200 mesh sieve.

Slopes 1:2.

Embankment
core

Embankment

Crest of Dam
Elev. 1080

Rock-fill Toe Material
from Spillway Channel.

Rock-fill Toe Material

Boulders, gravel, sand
Clay and fine sand

Crest of Dam Top

Crest of Dam

Core trench 11 excavated from per

5
CROSS SECTION OF DAM AT STA. 7+00
Scale 1" = 50'

Note: This cross section is typical between Stas. 5+00 and 9+75.
For detail of trashboard, pin and socket see Sheet KK-3-23

Quantities:
- Excavation - Sand & Boulders: 83,000 cy.
- Excavation - Rock: 33,000 cy.
- Riprap: 1,600 sq.
- Concrete at Spillway: 200 cy.
Ripraped, leave 3' Bèrm above Riprap, all other side slopes in Sand & Gravel to be 1½: 1.

All rock surfaces shall be reasonably smooth and sound. Rough places shall be improved with concrete.
<table>
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<tbody>
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Swinging Bridge Development Spillway

Prepared by Charles H. Tenney & Co.
Engineers

Boston, Mass.

Scales

Sept. 1925

KK 3 18
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<tr>
<th>DESCRIPTION</th>
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<th>Size</th>
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<tr>
<td></td>
<td>A 99</td>
<td>8</td>
<td>½&quot; Ø</td>
<td>15' 6&quot;</td>
</tr>
<tr>
<td></td>
<td>A 100</td>
<td>4</td>
<td>½&quot; Ø</td>
<td>13' 0&quot;</td>
</tr>
<tr>
<td></td>
<td>A 101</td>
<td>32</td>
<td>½&quot; Ø</td>
<td>15' 0&quot;</td>
</tr>
<tr>
<td></td>
<td>A 102</td>
<td>2</td>
<td>¾&quot; Ø</td>
<td>26' 0&quot;</td>
</tr>
<tr>
<td></td>
<td>A108-109</td>
<td>14 (2 ea)</td>
<td>½&quot; Ø</td>
<td>16' 0&quot;</td>
</tr>
<tr>
<td></td>
<td>A108-110</td>
<td>36 (4 ea)</td>
<td>½&quot; Ø</td>
<td>19' 9 to 16' 0&quot;</td>
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<tr>
<td></td>
<td>A119-129</td>
<td>44 (4 ea)</td>
<td>½&quot; Ø</td>
<td>16' 0 to 16' 6&quot;</td>
</tr>
<tr>
<td></td>
<td>A130-137</td>
<td>16 (2 ea)</td>
<td>½&quot; Ø</td>
<td>20' 6 to 17' 9&quot;</td>
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<tr>
<td></td>
<td>A138-145</td>
<td>24 (4 ea)</td>
<td>½&quot; Ø</td>
<td>9' 0 to 10' 6&quot;</td>
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<tr>
<td></td>
<td>A144-147</td>
<td>16 (4 ea)</td>
<td>½&quot; Ø</td>
<td>20' 3 to 18' 6&quot;</td>
</tr>
<tr>
<td></td>
<td>A148</td>
<td>40</td>
<td>½&quot; Ø</td>
<td>17' 6&quot;</td>
</tr>
<tr>
<td></td>
<td>A149</td>
<td>44</td>
<td>½&quot; Ø</td>
<td>15' 0&quot;</td>
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<tr>
<td></td>
<td>A150</td>
<td>32</td>
<td>½&quot; Ø</td>
<td>33' 6&quot;</td>
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<td></td>
<td>A151</td>
<td>14</td>
<td>½&quot; Ø</td>
<td>26' 0&quot;</td>
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<tr>
<td></td>
<td>A152-159</td>
<td>16 (2 ea)</td>
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<td>22' 6 to 21' 6&quot;</td>
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<tr>
<td></td>
<td>A160-161</td>
<td>4 (2 ea)</td>
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<td>A162-166</td>
<td>20 (4 ea)</td>
<td>½&quot; Ø</td>
<td>17' 6 to 13' 5&quot;</td>
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<td></td>
<td>A177</td>
<td>12</td>
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<td>32' 0&quot;</td>
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<td></td>
<td>A178-179</td>
<td>22 (2 ea)</td>
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<td>14' 6 to 14' 5&quot;</td>
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<tr>
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<td>A179-183</td>
<td>11</td>
<td>½&quot; Ø</td>
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<td></td>
<td>A190</td>
<td>22</td>
<td>½&quot; Ø</td>
<td>11' 6&quot;</td>
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<tr>
<td></td>
<td>A191</td>
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<td></td>
<td>A192</td>
<td>10</td>
<td>½&quot; Ø</td>
<td>18' 0&quot;</td>
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</table>
All longitudinal conduit trenchment to be carried through center wall.
<table>
<thead>
<tr>
<th>Mark</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>Length</th>
<th>Mark</th>
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<td>23.3&quot;</td>
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<td>U-2</td>
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<td>19.3&quot;</td>
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<td>5.9</td>
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<td>23.9&quot;</td>
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<tr>
<td>U-3</td>
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<td>4.4</td>
<td>1.0</td>
<td>25.0&quot;</td>
<td>U-14</td>
<td>3.2</td>
<td>5.1</td>
<td>1.0</td>
<td>24.3&quot;</td>
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<td>U-4</td>
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<td>3.1</td>
<td>1.0</td>
<td>21.0&quot;</td>
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<td>4.5</td>
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<td>25.0&quot;</td>
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<td>U-5</td>
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<td>21.9&quot;</td>
<td>U-16</td>
<td>5.1</td>
<td>3.8</td>
<td>1.0</td>
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<td>U-6</td>
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<td>22.6&quot;</td>
<td>U-17</td>
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<td>25.9&quot;</td>
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<td>1.0</td>
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<td>1.0</td>
<td>26.3&quot;</td>
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<td>U-8</td>
<td>7.1</td>
<td>1.6</td>
<td>1.0</td>
<td>24.0&quot;</td>
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<td>1.7</td>
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<td>11.4</td>
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<td>U-10</td>
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<td>1.0</td>
<td>25.0&quot;</td>
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<td>0.0</td>
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</table>

*Cut bars to fit at Y
Use deformed bars

TYPICAL U-BAR FOR TOP OF INTAKE
Use 7/8" See Above Table

APPROVED:
CHAS. T. MAIN, CONSULTING ENGR.
Anchor Bolt Location Detail at Y
Notes:
Concrete Mix 1:2:4 (2008)
All Reinforcing Steel to be 3" from face of forms
For General Location & Connecting Structures
see drawings KK-3-17 & KK-3-26
For Trash Rack Steel, Details see draw 11
KK-3-24.

THIS DRAWING IS THE PROPERTY OF CHARLES H. TENNEY & CO.
AND IS SUBJECT TO RETURN ON DEMAND.
SKILL POWER CORP. - MIDDLETOWN, N.Y.

SWINGING BRIDGE DEVELOPMENT INTAKE

PREPARED BY: CHARLES H. TENNEY & CO.
ENGINEERS - BOSTON, MASS.

SCALE: 1/2" = 1'

OCT 1925

KK 3 19
<table>
<thead>
<tr>
<th>REVISIONS</th>
<th>CAVING BRIDGE DEVELOPMENT</th>
</tr>
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<tr>
<td>3</td>
<td>GATE POWER</td>
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Designed by CHAS. T. MAIN, TENNEY & CO.

ENGINEERS

BOSTON, MASS.
Spacers ¼" & Continuous 9" cc. top & bot.
top & bot slab
12 - ¾" Variable - 18 cc. A-50-61
top of bot slab
16 - 1½" Variable - 15 cc. A-62 71
1 1/4 Anchor Bolts 18° (g) With nut & washer

Approx. Present Grade

12" Porous Farm Drain Tile
# Reinforcement Schedule

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<th>Mark</th>
<th># Rein.</th>
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<td>1.0</td>
<td>1/4</td>
<td>2&quot;</td>
<td>6'</td>
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<td></td>
<td>1.0</td>
<td>1/2</td>
<td>4&quot;</td>
<td>6'</td>
</tr>
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<td>3/4</td>
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<td>8&quot;</td>
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<td>1-1/2</td>
<td>10&quot;</td>
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<td>1.0</td>
<td>2</td>
<td>12&quot;</td>
<td>6'</td>
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(Use deformed rebar.)
Carry longitudinal spacers 3-0" through construction joint.
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<th>Note</th>
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<td>Concrete Mix: 1:3:6 (1000)</td>
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<tr>
<td>All reinforcement to be 6&quot; from face of forms</td>
</tr>
<tr>
<td>For General Location &amp; Connecting Structures, see Drawings KK 3-17, KK 3-26, RK 3-26</td>
</tr>
</tbody>
</table>

**APPROVED:**

CHAS T. MAIN, CONSULTING PHAR
<table>
<thead>
<tr>
<th>Spacers</th>
<th>Continuous</th>
<th>18 ac.</th>
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*Caution:* Center wall.
DOWNSTREAM ELEVATION

THIS DRAWING IS THE PROPERTY OF CHARLES H. TENNEY & CO.
AND IS SUBJECT TO RETURN ON DEMAND.
### Table of Reinforcement

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HALF BOTTOM PLAN

NOTES

Concrete Mix - 1:2:4
Concrete to be poured continuously between construction joints.
All construction joints to be keyed, and cleaned and lined with 1:2 Portland cement before concrete is poured.
All longitudinal rods to be 2" with 3" to 4" eccentric shown.
Spacers not shown on drawings to be 2" used as required.

REFERENCE DRAWINGS
KK-3-21 Gate Tower
KK-3-22 Gate Tower - Temporary Gates
KK-3-23 Steel Details Sheet
KK-3-24
KK-3-26 Conduit Sheet

APPROVED:
CHAS. T. MAIN, Consulting Eng.
200 Devonshire St.
Boston, Mass.
HALF SECTION B-B

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PREPARED BY CHARLES TERRY & ASSOCIATES ENGINEERS  
BOSTON, MASS.

Scale 1:20  
Date 15 Oct 1925  

KK 3-25