

Inspection Report

**River Falls Hydroelectric Project
FERC Project No. P-10489**

**Junction Falls Dam
River Falls, Wisconsin**

Prepared for:

**River Falls Municipal Utilities
River Falls, Wisconsin**

December 2009

Inspection Report

**River Falls Hydroelectric Project
FERC Project No. P-10489**

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River Falls, Wisconsin**



Engineers/Architects/Scientists/Surveyors

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Ayres Associates Project No. 26-0570.00
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1.0 Project Description

1.1 Background

The Junction Falls Dam is located on the Kinnickinnic River within the city limits of River Falls, Wisconsin. The project is located in Section 1, Township 27 North, Range 19 West, Pierce County, Wisconsin. This hydropower project consists of two developments, Junction Falls Dam and Powell Falls Dam. Junction Falls Dam (also known as Upper Dam) is located about one-half mile upstream of the Powell Falls Dam. The dam is operated as a run-of-river facility. The dam is owned and operated by the City of River Falls.

From left to right looking downstream, the project consists of a left abutment and downstream retaining wall, an uncontrolled stepped spillway, and headworks consisting of a wasteway and penstock intake. Water from the headworks is conveyed through a penstock to the powerhouse which is located downstream of the dam. The total length of the spillway crest is approximately 114 feet.

Rehabilitation was performed in 1989 consisting of spillway stabilization by installing post-tensioned rock anchors, modifying the downstream spillway profile, headworks and abutment concrete repair, construction of downstream retaining walls and construction of upstream parapet walls.

The purpose of this inspection is to evaluate the concrete condition of the structures.

A location map is included as Figures 1 and 2. Structure drawings are included in Appendix A. Photographs are included in Appendix B.

1.2 Left Abutment and Downstream Retaining Wall

The left concrete abutment and downstream concrete retaining wall are located to the left of the spillway (Photos 10 to 12). The left abutment and downstream retaining wall appear to be founded on bedrock.

1.3 Spillway

The spillway (Photos 9 to 11, and 16) consists of an uncontrolled stepped concrete gravity structure. The spillway appears to be founded on bedrock. The spillway is bookended by concrete abutments. A portion of the right abutment is part of the headworks.

1.4 Headworks

The headworks (Photos 1 to 8, 13, 14, and 17) are concrete structures containing the wasteway and penstock intake. Sluice gates are located in the structure for flow regulation. A steel trashrack is located upstream of the intake. A concrete operating deck supports the sluice gate operators. A concrete parapet wall is located on the upstream edge of the deck. A downstream concrete retaining wall is located on the right bank and extends to the rock face (Photo 13). The headworks appear to be founded on bedrock.

1.5 Powerhouse

The concrete and brick powerhouse is located downstream of the dam (Photos 15, 18, and 20 to 23). The powerhouse appears to be founded on bedrock. A concrete training wall is located to the left of the powerhouse (Photos 15 and 19).

2.0 Field Inspection

2.1 General

The field inspection was conducted on December 1, 2009 by Todd Rudolph, PE and Ray Fandel of Ayres Associates. Mark Freeborn from the City of River Falls assisted in the inspection. An underwater inspection was not performed. The weather during the inspection was sunny with a temperature of 40 degrees Fahrenheit. Photographs from the field inspection are included in Appendix B.

2.2 Left Abutment and Downstream Retaining Wall

The left abutment is in good condition. The downstream retaining wall is in good condition with minor cracking and efflorescence (Photos 11 and 12). The paint system has failed in many areas. All the weep holes were functioning at the time of the inspection. There is moss growth (Photo 12) on the downstream retaining wall due to seepage through the rock face and vegetation build up on the top of the wall.

There is heavy vegetation growth behind the left abutment and downstream retaining wall (Photos 11 and 12).

2.3 Spillway

The spillway is in good condition with minor deterioration and missing caulk at the vertical joints. Moss growth limited inspection of all joints. There were no visible signs of structure undermining. Minor flow was observed from the weep holes.

2.4 Headworks

The parapet walls are in good condition with minor cracking (Photos 4, 7 and 8). The paint system has failed in many areas.

The operating deck is in fair condition with cracking and deterioration (Photo 5).

The right abutment is in fair condition with cracking and efflorescence (Photos 13 and 14). The paint system has failed in many areas.

There downstream face of the headworks near the wasteway is in good condition. It appears there is seepage through a joint above the wasteway exit, however, heavy vegetation growth near the joint makes an assessment difficult. Vegetation was hanging over the right downstream retaining wall and dripping water. Seepage around the sluice gate is unknown due to the standing water on the sill that may be caused by the dripping water (Photo 17).

The downstream retaining wall is in good condition. There is heavy vegetation growth in front of and behind the downstream retaining wall (Photo 13).

There is heavy vegetation growth on the right downstream bank (Photos 13 and 15).

2.5 Powerhouse

The powerhouse superstructure is generally in good condition. The concrete substructure is in fair condition with cracking, deterioration and efflorescence (Photos 18, 20 to 23). The deterioration is located near the waterline (Photos 21 to 23).

The downstream training wall is in good condition (Photo 19).

There is heavy vegetation growth around the powerhouse (Photos 15, 18 and 19).

3.0 Recommendations

3.1 Left Abutment and Downstream Retaining Wall

No visual observations from the inspection indicate that there is a threat to dam safety.

The brush and trees growing around the left abutment and downstream retaining wall should be removed within one year to facilitate inspection and to eliminate potential seepage paths and concrete damage due to the root systems.

3.2 Spillway

No visual observations from the inspection indicate that there is a threat to dam safety.

The missing caulk at the vertical joints should be repaired within two years.

3.3 Headworks

No visual observations from the inspection indicate that there is a threat to dam safety.

The brush and trees growing around the headworks should be removed within one year to facilitate inspection and to eliminate potential seepage paths and concrete damage due to the root systems

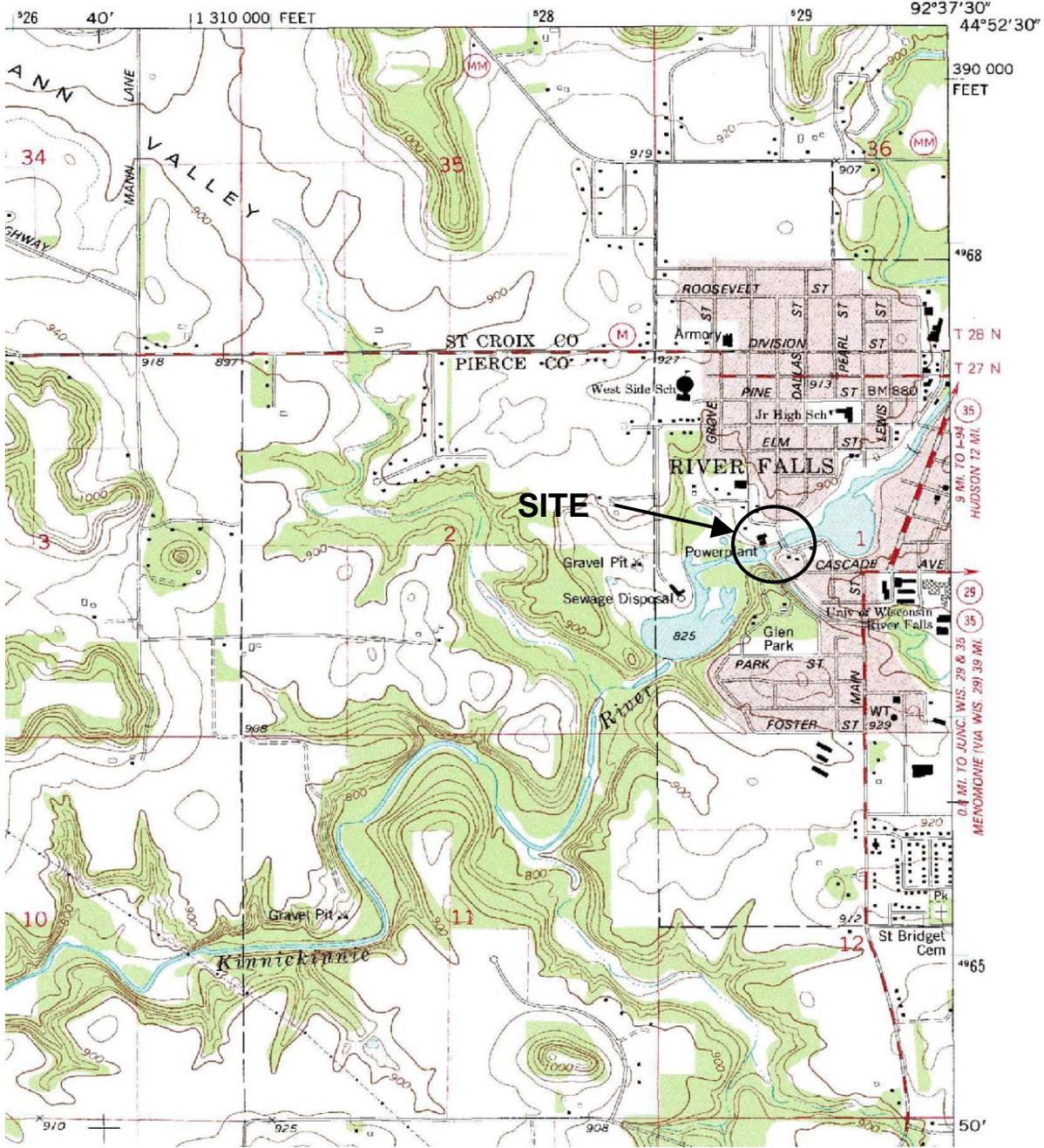
3.4 Powerhouse

No visual observations from the inspection indicate that there is a threat to dam safety.

The brush and trees growing around the powerhouse should be removed within one year to facilitate inspection and to eliminate potential seepage paths and concrete damage due to the root systems.

RIVER FALLS WEST QUADRANGLE
WISCONSIN
7.5 MINUTE SERIES (TOPOGRAPHIC)
SW/4 RIVER FALLS 15' QUADRANGLE.

2473 1/4 INE
(ROBERTS)



**Junction Falls Dam
Pierce County, WI
River Falls, WI**

**USGS 7.5' Quadrangle: River Falls West, WI
Section 1, T27N, R19W**

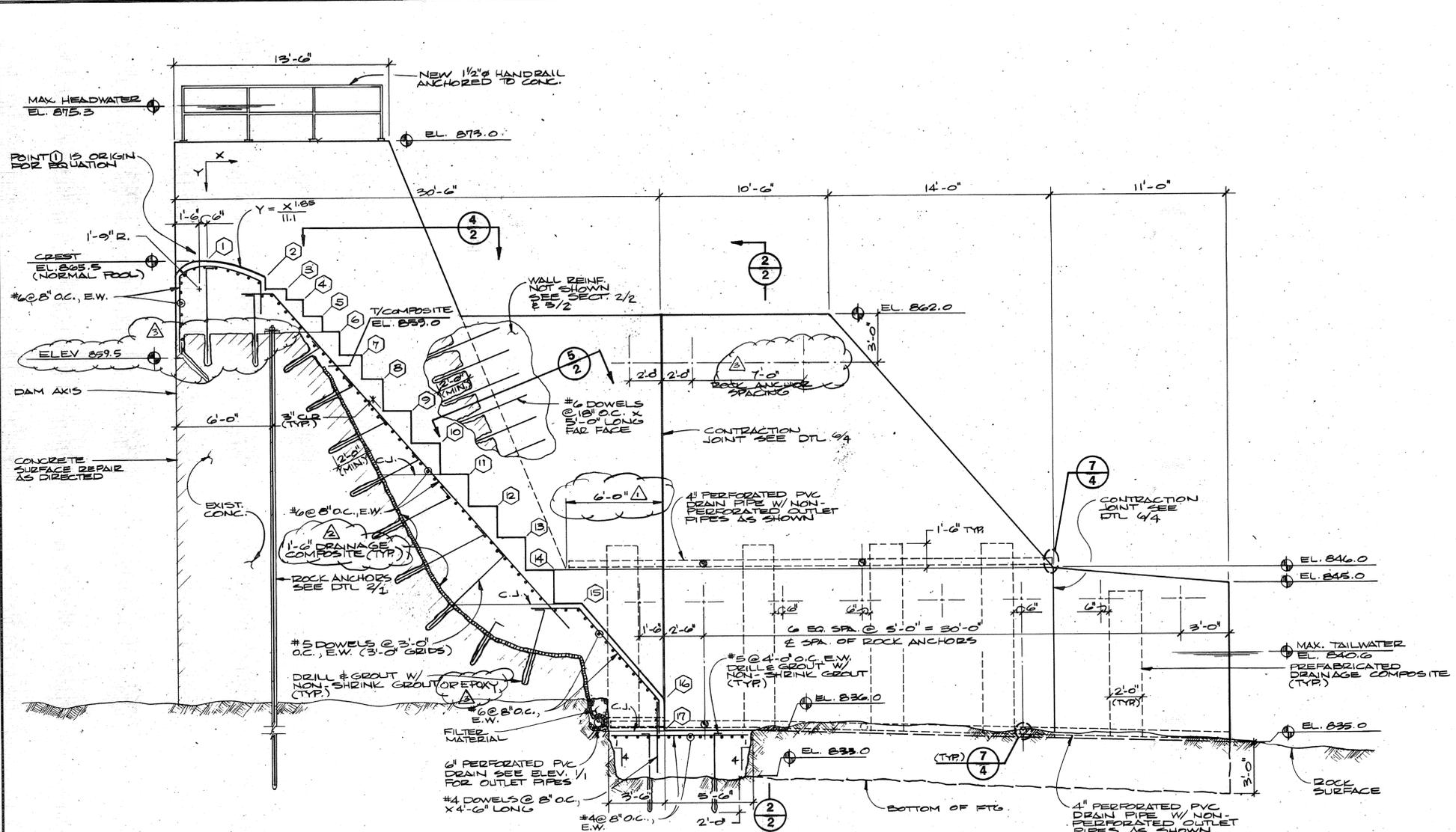
December 2009

Location Map

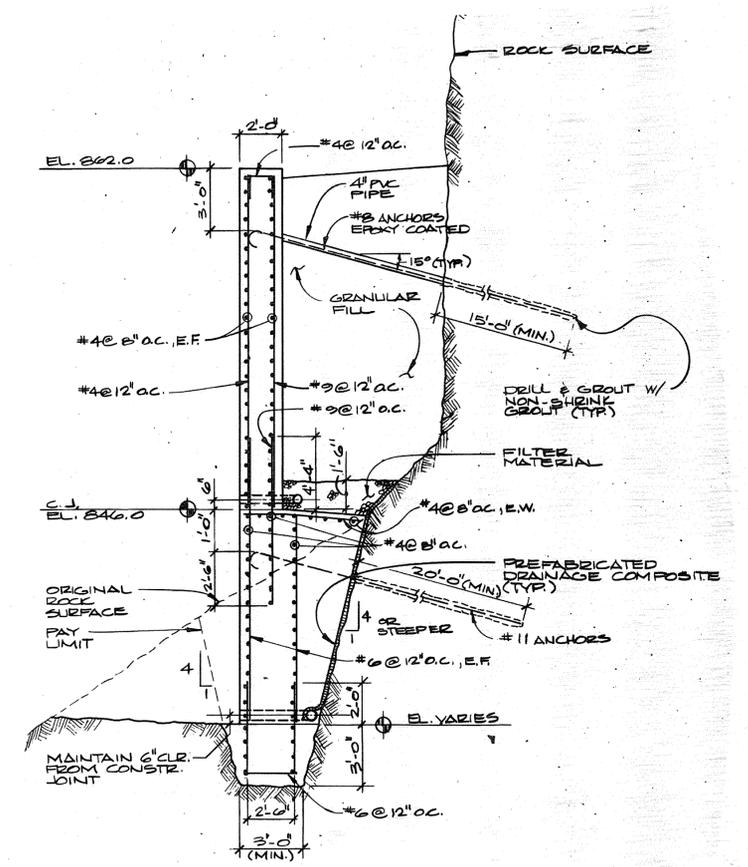
Figure 2

Appendix A

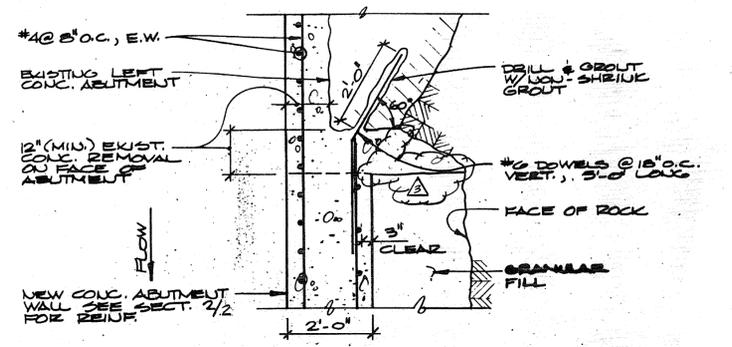
Drawings



SPILLWAY SECTION @ LT. ABUT.
1/4" = 1'-0"



LT. RETAINING WALL SECTION
1/4" = 1'-0"

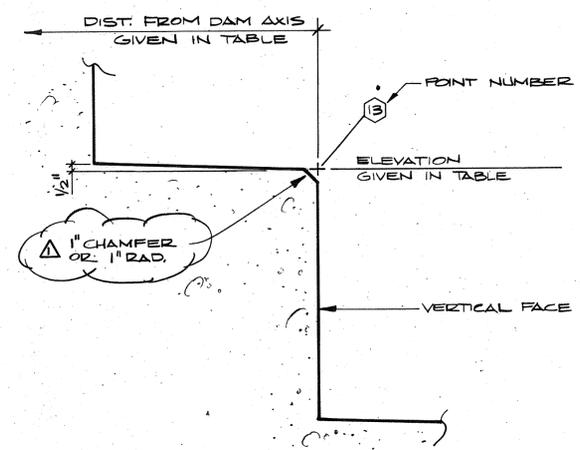


SECTIONAL PLAN

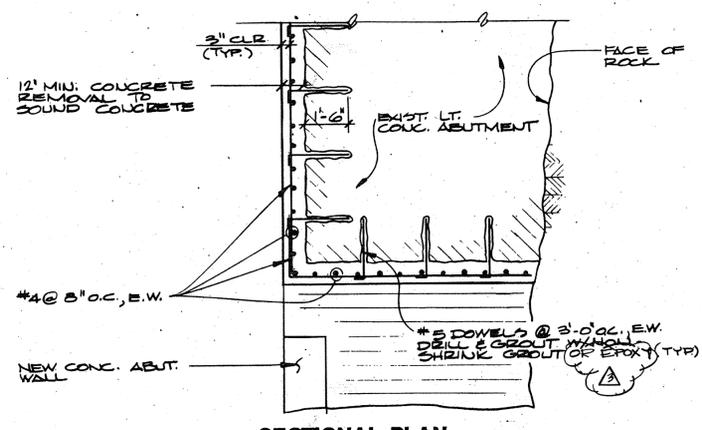
LEFT ABUTMENT WALL EXTENSION
1/2" = 1'-0"

TABLE OF SUMMARY CREST DIMENSIONS		
LOCATION	DISTANCE FROM DAM AXIS	ELEVATION
1	2'-0"	865.50
2	5'-8"	864.50
3	6'-11-1/2"	863.75
4	8'-0-1/2"	863.00
5	9'-2-3/4"	862.00
6	10'-3-1/2"	861.00
7	11'-8-1/4"	859.50
8	13'-0"	858.00
9	14'-9"	856.00
10	16'-6"	854.00
11	18'-3"	852.00
12	20'-0"	850.00
13	21'-9"	848.00
14	23'-6"	846.00
15	25'-3"	844.00
16	30'-6"	838.00
17	30'-6"	836.00

NOTE:
FOR POINT LOCATIONS
SEE DETAIL AT RIGHT



POINT LOCATION DETAIL
1/2" = 1'-0"



SECTIONAL PLAN

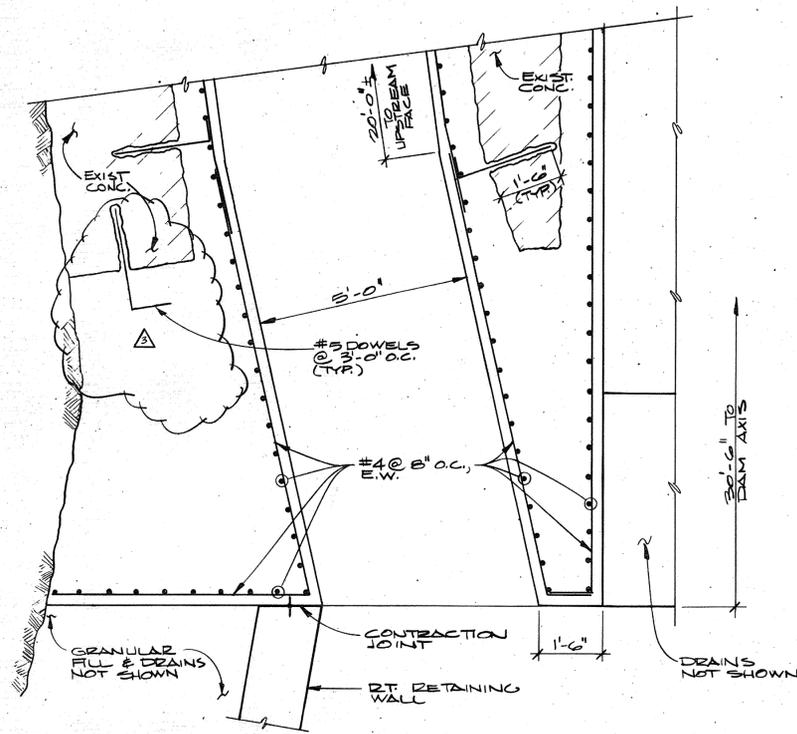
LEFT ABUTMENT CONCRETE OVERLAY
1/4" = 1'-0"

This drawing is a part of the application for license made by the undersigned
this 6 day of April, 1990.
By: *Jerry E. Wilkens*
Jerry E. Wilkens, Mayor
City of River Falls, Wisconsin

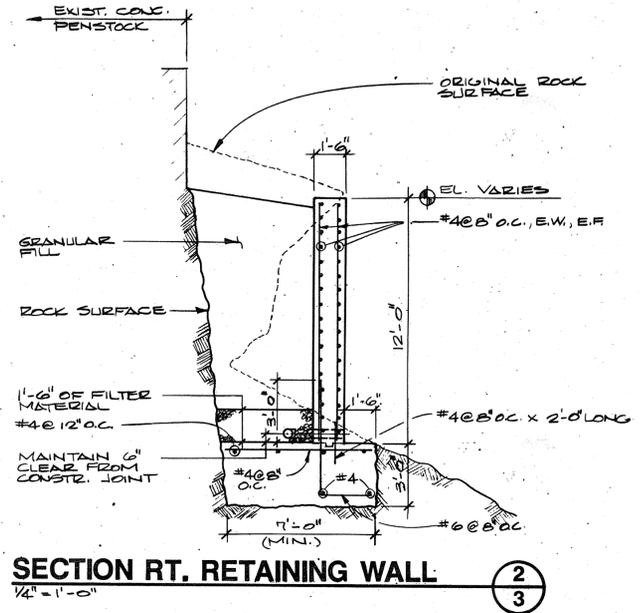
EXHIBIT F-11 PROJECT NO. 10489 SHEET 2 OF 5
RIVER FALLS MUNICIPAL HYDROELECTRIC FACILITIES
CITY OF RIVER FALLS, WISCONSIN
JUNCTION FALLS DAM
REHABILITATION
SPILLWAY & LEFT ABUTMENT
SCALE: AS SHOWN

REVISOR 1/16/90
REVISOR 9/14/89
REVISOR 2/8/89

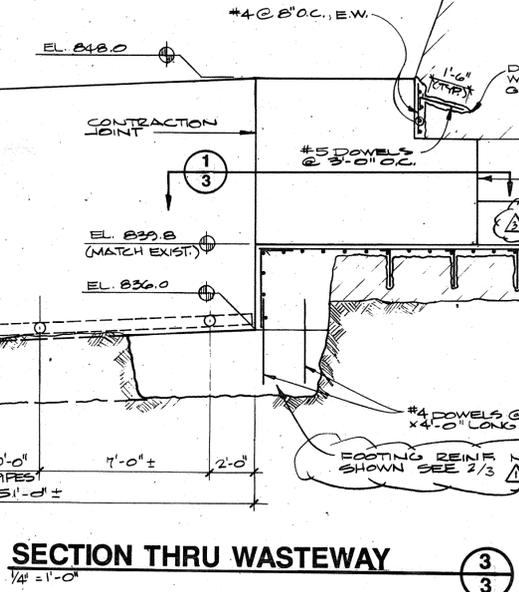
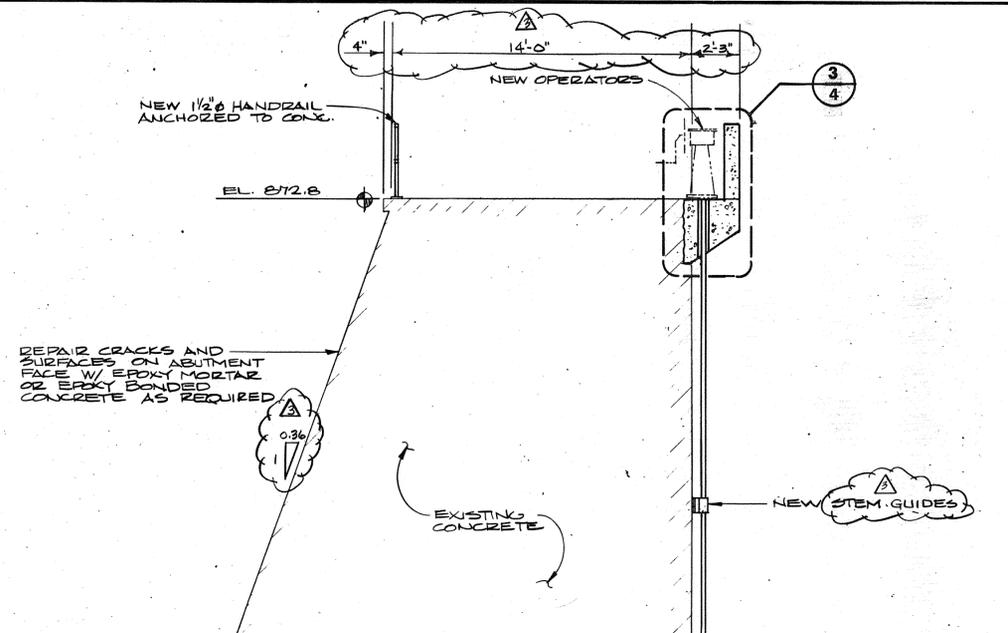
AYRES ASSOCIATES
Engineers / Architects
Planners / Surveyors
Owen Ayres & Associates Inc.
Eau Claire, Wisconsin



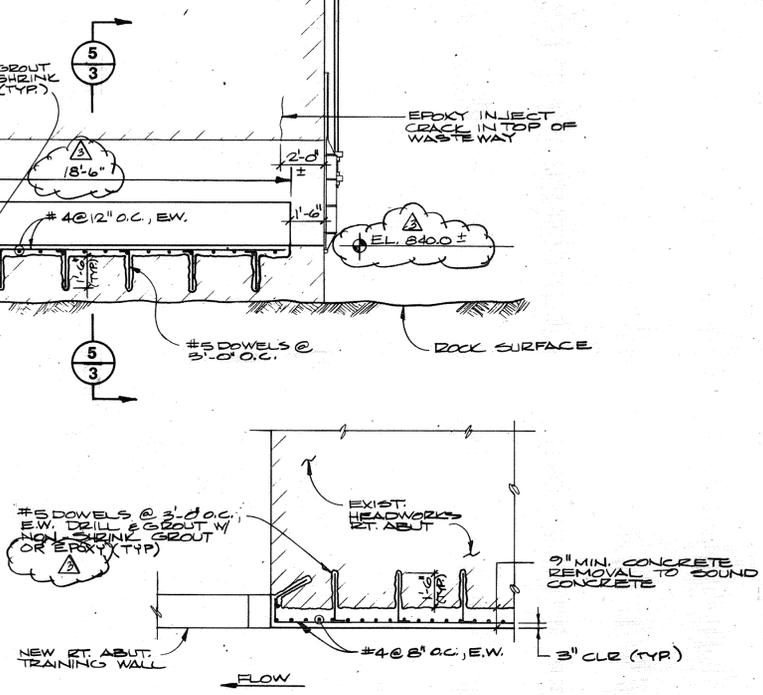
SECTIONAL PLAN @ WASTEWAY
1/2" = 1'-0" (1/3)



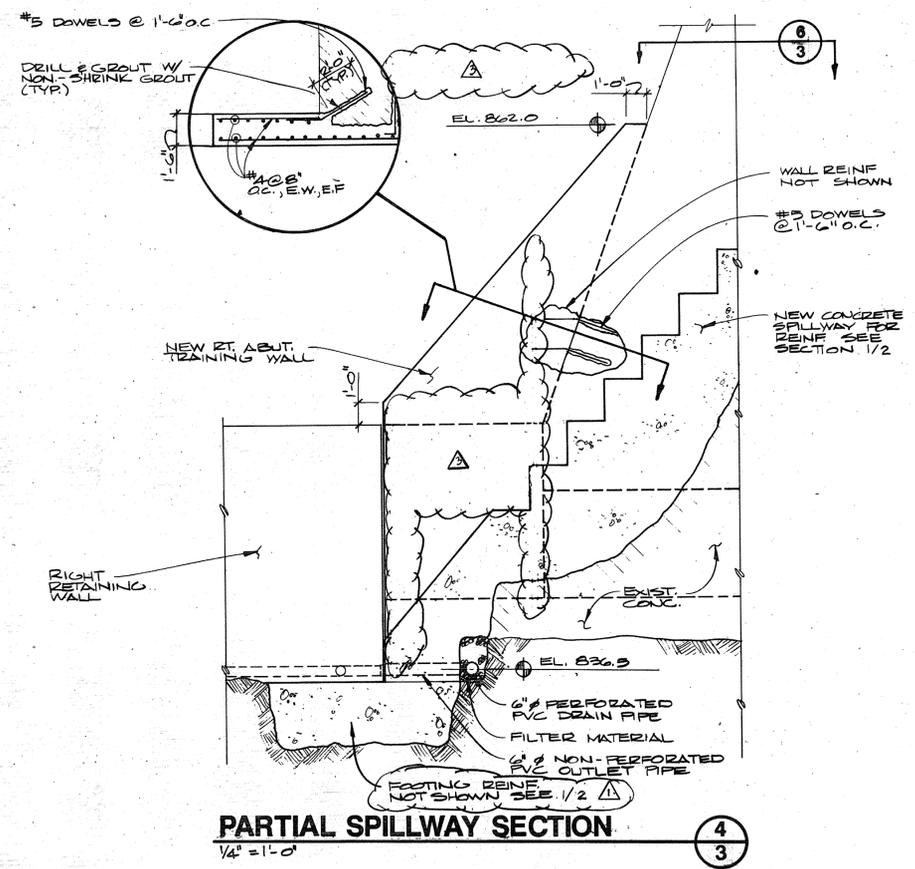
SECTION RT. RETAINING WALL
1/4" = 1'-0" (2/3)



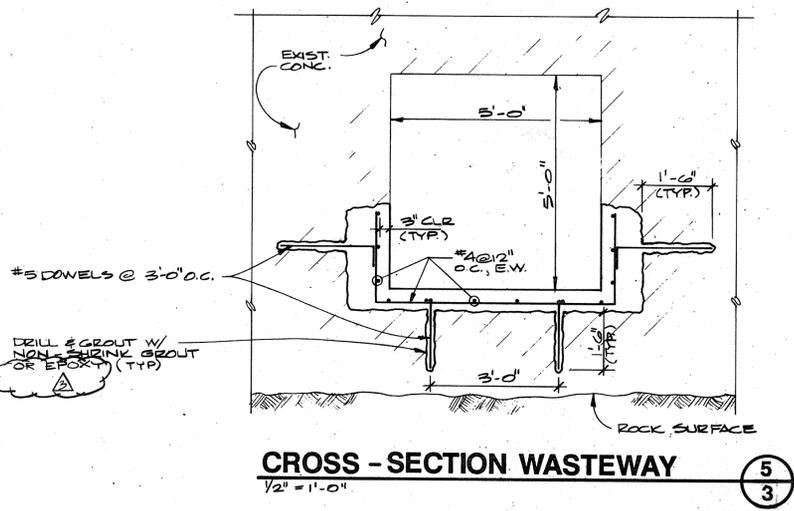
SECTION THRU WASTEWAY
1/4" = 1'-0" (3/3)



SECTIONAL PLAN
1/4" = 1'-0" (6/3)



PARTIAL SPILLWAY SECTION
1/4" = 1'-0" (4/3)



CROSS-SECTION WASTEWAY
1/2" = 1'-0" (5/3)

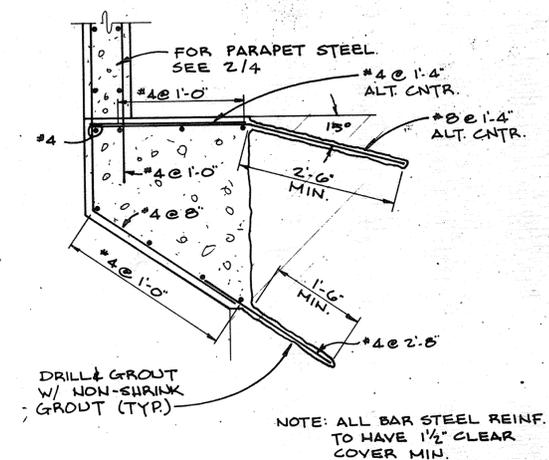
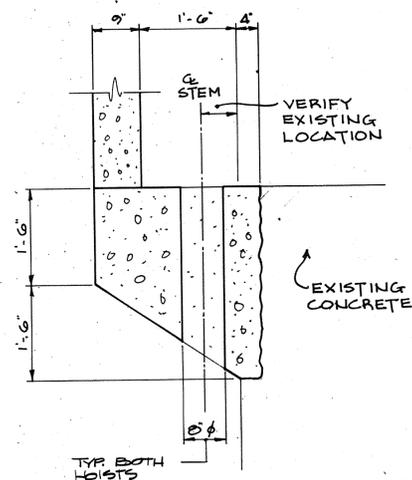
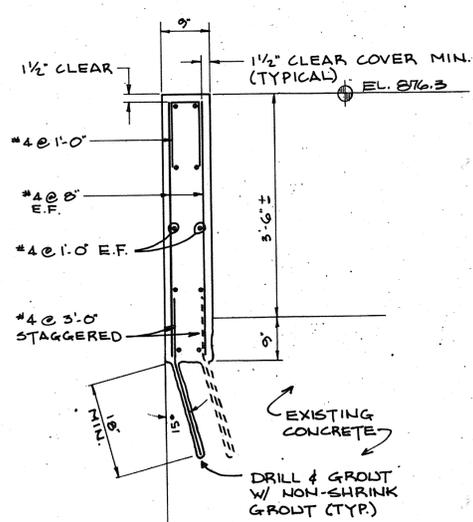
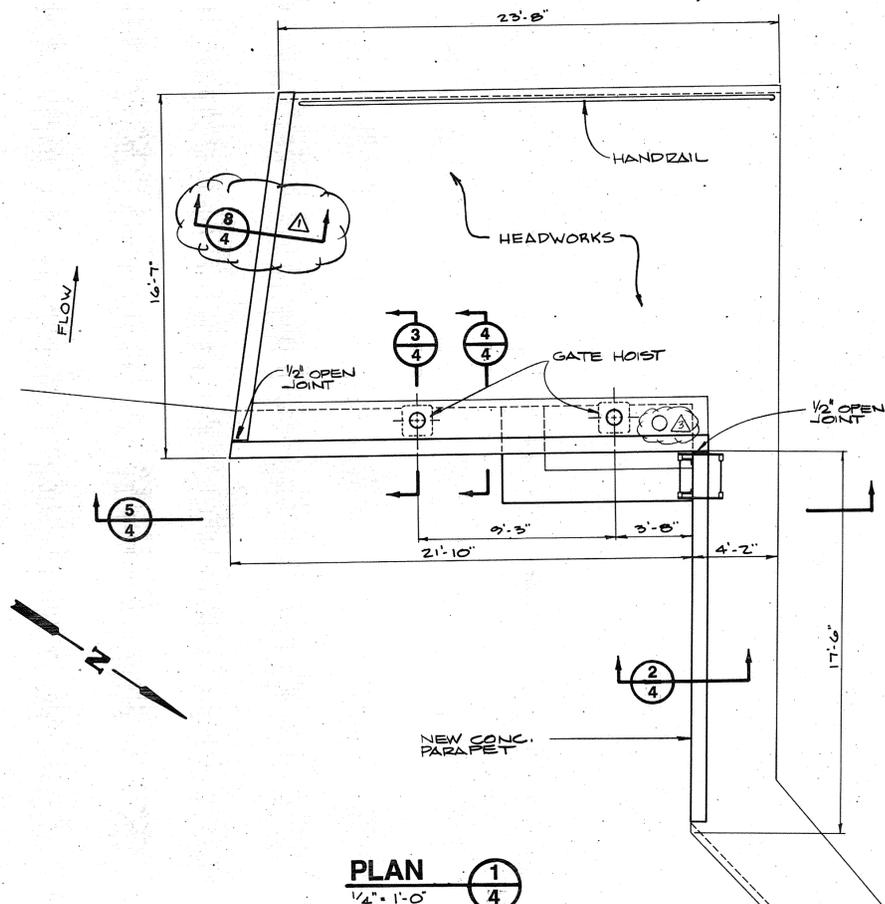
RIGHT ABUTMENT CONCRETE OVERLAY
1/4" = 1'-0" (6/3)

EXHIBIT F-12 PROJECT NO. 10489 SHEET 3 OF 5
RIVER FALLS MUNICIPAL HYDROELECTRIC FACILITIES
 CITY OF RIVER FALLS, WISCONSIN
JUNCTION FALLS DAM
 REHABILITATION
 WASTEWAY & RIGHT ABUTMENT
 SCALE: AS SHOWN

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 Jerry E. Wilkens, Mayor
 City of River Falls, Wisconsin

AVRES ASSOCIATES
 Engineers / Architects
 Planners / Surveyors
 Owen Ayres & Associates Inc
 Eau Claire, Wisconsin

REVISOR 1/16/90
 REVISOR 8/9/87



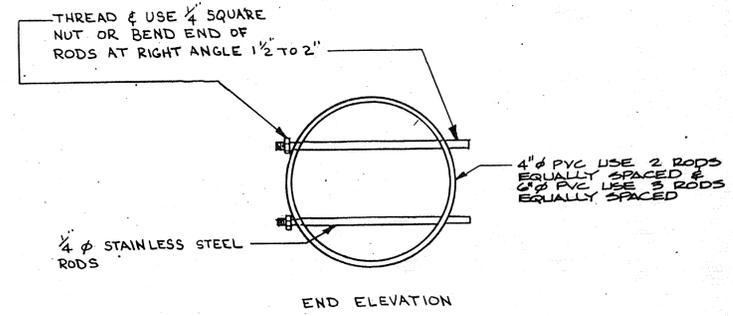
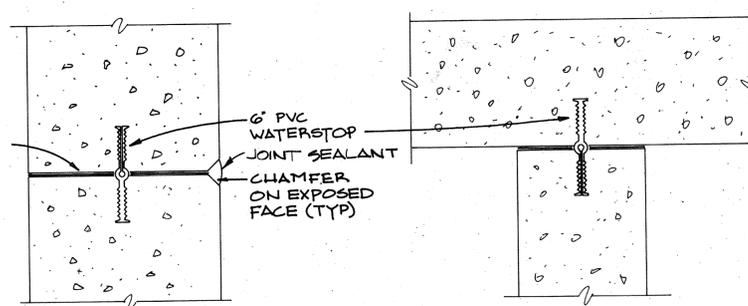
PLAN 1/4" = 1'-0" 1/4

SECTION 2 3/4" = 1'-0" 2/4

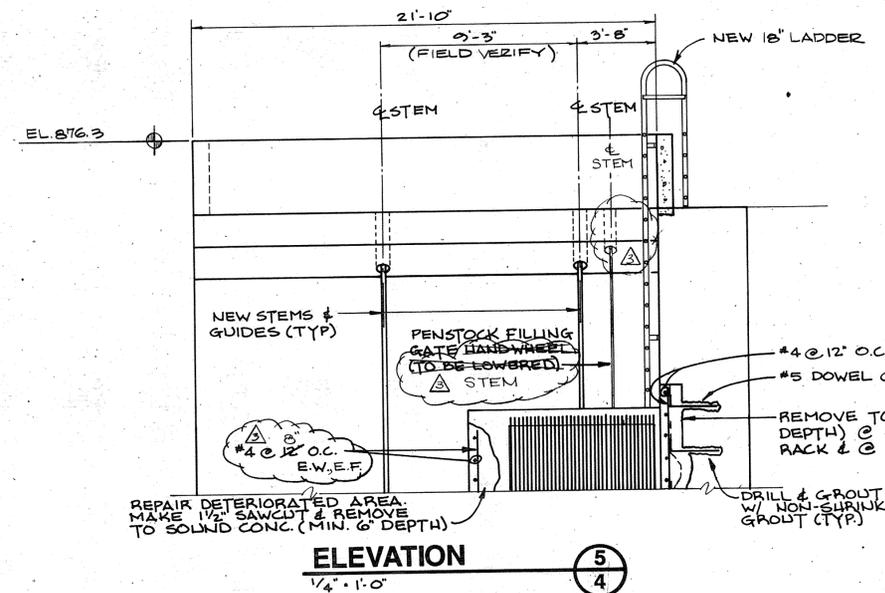
SECTION 3 3/4" = 1'-0" 3/4

SECTION 4 3/4" = 1'-0" 4/4

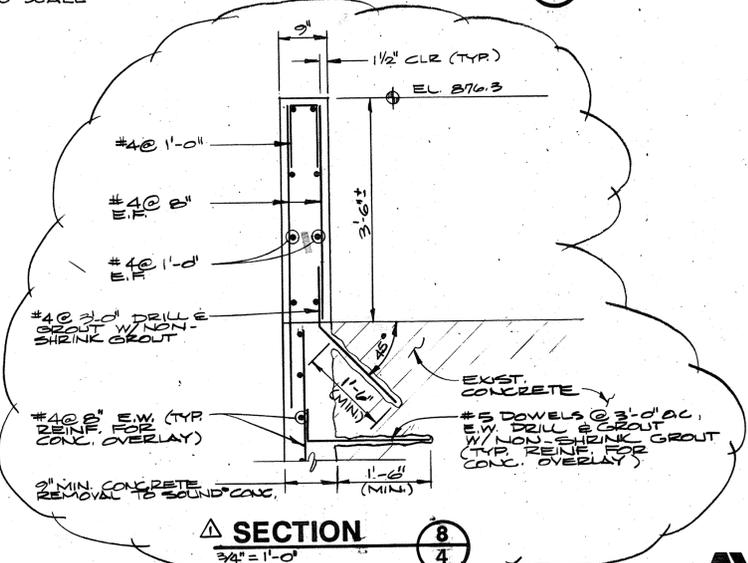
NO BOND ACROSS JOINT NOR REINFORCEMENT THROUGH JOINT



ANIMAL GUARD FOR DRAIN OUTLETS 7/4 NO SCALE



CONTRACTION JOINT DETAIL 6/4 NO SCALE



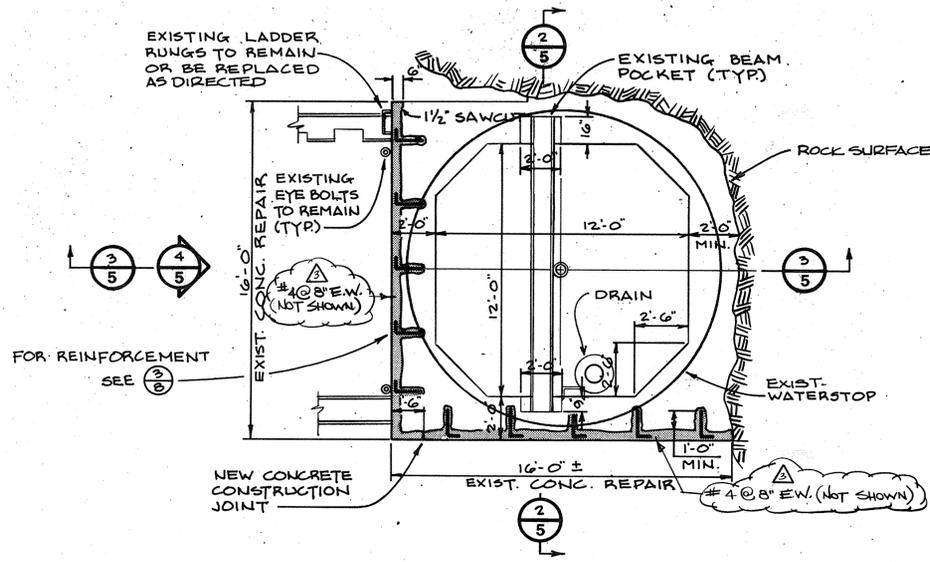
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By: Jerry E. Wilkens
 Jerry E. Wilkens, Mayor
 City of River Falls, Wisconsin

EXHIBIT F-13 PROJECT NO. 10489 SHEET 4 OF 5
 RIVER FALLS MUNICIPAL HYDROELECTRIC FACILITIES
 CITY OF RIVER FALLS, WISCONSIN
 JUNCTION FALLS DAM
 REHABILITATION
 HEADWORKS & MISCELLANEOUS DETAILS
 SCALE: AS SHOWN

REVIS 1/16/90
 REVIS 9/8/89

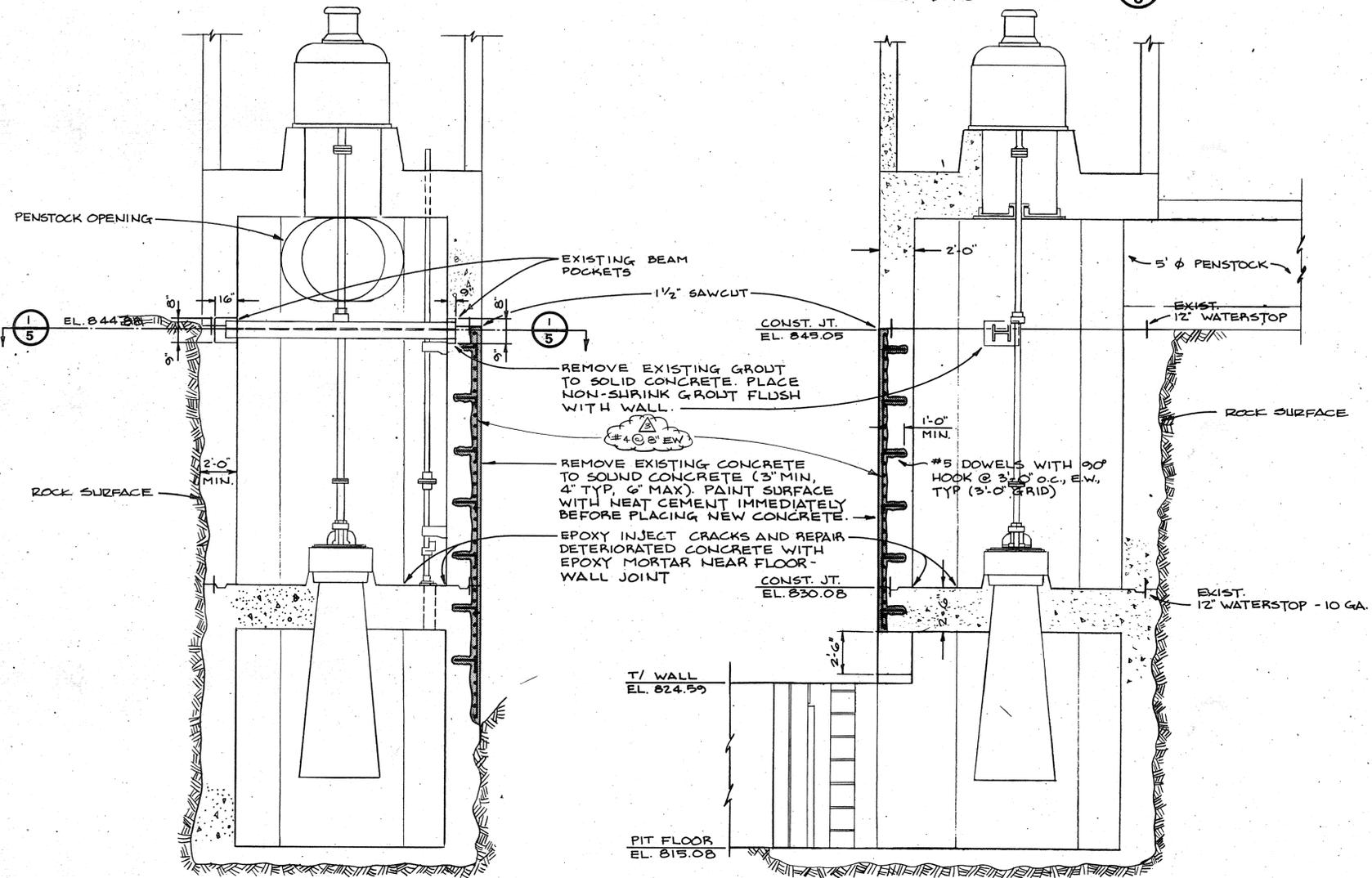
AYRES ASSOCIATES
 Engineers / Architects
 Planners / Surveyors
 Owen Ayres & Associates Inc
 Eau Claire, Wisconsin



SECTION 1-5
SCALE 1/4" = 1'-0"

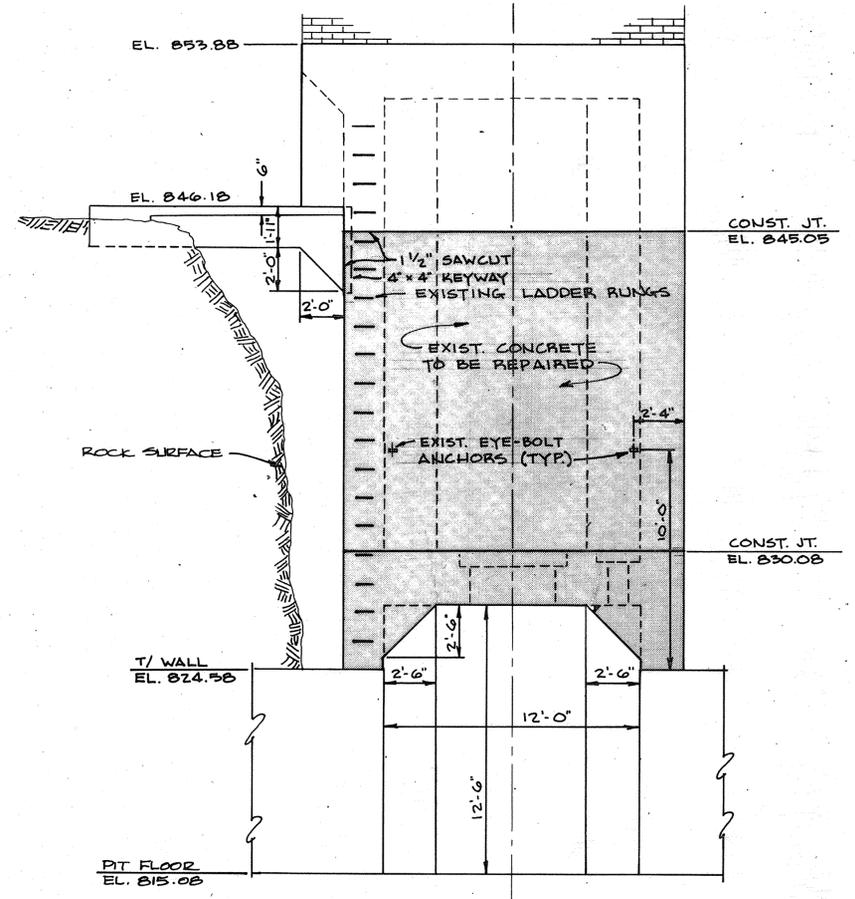
CONSTRUCTION NOTES:

- 1) CONTRACTOR TO REPAIR ONE SIDE OF POWERHOUSE BEFORE PROCEEDING WITH OTHER SIDE.
- 2) EXISTING CONCRETE REMOVAL NOT TO EXCEED A DEPTH OF 6"
- 3) REINFORCEMENT SHALL HAVE 2" CLEAR COVER
- 4) EXISTING REINFORCEMENT TO REMAIN OR BE REPLACED IN KIND USING SPLICES OR LAPS.
- 5) SHADED AREAS REPRESENT CONCRETE SURFACES TO BE REPAIRED.
- 6) EXISTING STRUCTURE DIMENSIONS DEVELOPED FROM DRAWINGS ENTITLED "UPPER HYDROELECTRIC IMPROVEMENTS, PLANS AND DETAILS," HERMAN T. NAGESTAD, CONSULTING ENGINEER, AUGUST 1946, 2 SHEETS. ADDITIONAL INFORMATION INCLUDING REINFORCEMENT DETAILS ARE SHOWN ON THESE DRAWINGS AND ARE AVAILABLE FOR THE CONTRACTOR'S USE. OWNER AND ENGINEER MAKE NO REPRESENTATION OR WARRANTY TO THE CONTRACTOR AS TO THE DRAWINGS ACCURACY OR THEIR USE BY THE CONTRACTOR.



SECTION 2-5
SCALE 1/4" = 1'-0"

SECTION 3-5
SCALE 1/4" = 1'-0"



ELEVATION 4-5
SCALE 1/4" = 1'-0"

REVISD 1/16/90

AVRES ASSOCIATES
Engineers / Architects
Planners / Surveyors
Owen Ayres & Associates Inc
Eau Claire, Wisconsin

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By: *Jerry E. Wilkens*
Jerry E. Wilkens, Mayor
City of River Falls, Wisconsin

EXHIBIT F-14 PROJECT NO. 10489 SHEET 5 OF 5
RIVER FALLS MUNICIPAL HYDROELECTRIC FACILITIES
CITY OF RIVER FALLS, WISCONSIN
JUNCTION FALLS DAM
REHABILITATION
POWERHOUSE

Appendix B
Inspection Photographs



1. Upstream parapet wall and operating deck



2. Upstream parapet wall



3. Upstream parapet wall



4. Typical upstream parapet wall cracking



5. Typical deck cracking



6. Intake

7. Upstream wall cracking



8. Previous spall repair and headwater gauge



9. Downstream view of spillway



10. Spillway, left abutment and left retaining wall



11. Spillway, left abutment and left downstream retaining wall



12. Left downstream retaining wall



13. Right downstream retaining wall and right spillway abutment



14. Cracking in right spillway abutment



15. Right bank looking downstream



16. Typical spillway and vertical joint



17. Downstream face of wasteway



18. Powerhouse



19. Downstream powerhouse training wall



20. Crack in powerhouse wall (see photo 18)



21. Tailrace



22. Tailrace interior



23. Tailrace and rock face