

UNITED STATES DEPARTMENT OF THE INTERIOR

FISH AND WILDLIFE SERVICE

ANADROMOUS FISH PRODUCTION FACILITY STUDY

ON THE

NEZ PERCE INDIAN RESERVATION

R. Kahler Martinson

Regional Director

TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION.	1
STUDY CRITERIA. . . ,	1
HATCHERY SITE INVESTIGATIONS.	2
Surface Waters Investigated.	2
Spring Waters Investigated	2
WATER QUALITY ANALYSIS.	3
Water Quantity	3
SITE RECOMMENDATIONS.	5
FLOOD HAZARD.	5
CLIMATOLOGICAL DATA	5
SOILS	5
SITE DEVELOPMENT.	5
HATCHERY DEVELOPMENT.	6
Proposed Facilities.	7
Hatchery Production.	8
CONSTRUCTION COSTS.	9
OPERATIONS.	9
Operational and Maintenance Costs.10
Conclusion11

EXHIBITS

Exhibit 1	Location Map, Old Hatchery Springs Site
Exhibit 2A	Water Analysis, Old Hatchery Springs
2B	Water Analysis, Lapwai Creek
2c	Water Analysis, Big Cangon Creek
Exhibit 3A	Thermograph Chart Summary, Old Hatchery Springs
3B	Thermograph Chart Summary, Lapwai Creek
Exhibit 4	Climatological Data
Exhibit 5	Construction Cost Estimate
Exhibit 6	Construction Drawings
Exhibit 7	Construction Specifications

**ANADROMOUS FISH PRODUCTION STUDY
ON THE NEZ PERCE INDIAN RESERVATION**

INTRODUCTION

During FY 78 and FY 79, the Fisheries Assistance Office, Vancouver, of the U.S. Fish and Wildlife Service, conducted an Anadromous Fish Enhancement Study on the Nez Perce Indian Reservation on behalf of the Nez Perce Tribe of Idaho. Engineering for the study was provided by the Fish and Wildlife Service Engineering Branch in Portland, Oregon. This was a cooperative study with the Columbia River Inter-Tribal Fish Commission and was funded by the Bonneville Power Administration. The purpose of the study was to determine the feasibility of developing or enhancing the anadromous fish production on the Reservation.

The number of anadromous fish returning to the Columbia River has been drastically reduced in recent years, as a result of the combined impacts of construction and operation of mainstem dams, loss or degradation of spawning habitat and increasing sport and commercial fisheries. These reduced runs have had a severe social and economic impact on the Nez Perce Indian Tribe. The Tribe has placed high priority on restoration of runs to combat the declining trends and to re-establish some significant tribal fisheries.

Evaluation of data collected during the study indicated that one site for a fish production facility exists on the Nez Perce Indian Reservation.

STUDY CRITERIA

1. The site must have a dependable water supply of adequate quality, volume and temperature; and must not contain toxic materials or pollutants. The water supply transportation distance should be minimized to feasible costs limits. A gravity water supply is most economical, although pumping auxiliary surface or ground water to augment quantity or adjust quality is practical in some instances.
2. The site should have a dependable water avenue, downstream from its location, for the return of brood stock to assure a perpetual egg supply. The stream should be free of pollution and other obstacles which would hamper migration of adult salmon and steelhead trout to the hatchery.
3. The site must have sufficient acreage for construction of the physical facilities included in a hatchery development. The terrain and foundation material should be such that cost of site preparation is minimized; and the site, when developed, should be protected from flooding.
4. The site must have year-round vehicle access for delivery of fish food, supplies and transportation of personnel.

HATCHERY SITE INVESTIGATIONS

Preliminary investigations were made of the Clearwater Drainage starting in May 1978. The Clearwater River, the major stream flowing through the Nez Perce Reservation is made up of the South and Middle forks entering the Reservation at the southeast corner, and the North Fork entering the Reservation at the northeast corner. Twenty-six streams flow into the Clearwater River within the 85 miles of river transecting the Reservation. Of these, 13 are totally within the Reservation. All field investigations were confined to within the boundaries of the Nez Perce Indian Reservation.

Surface Waters Investigated

Only streams with perennial flows were investigated in detail. All the surface waters investigated within the study area were found to have characteristics making them inadequate for a perennial rearing program under the study criteria. The areas adjacent to most of the streams on the Reservation are comprised mainly of land used for dryland farming and cattle grazing. Surface runoff from these agricultural lands creates turbid conditions and large irregularities in stream flows. Cold winters cause water temperatures below acceptable limits and hot summers result in water temperatures above acceptable limits for anadromous fish rearing.

Lapwai Creek, Potlach River, Cottonwood Creek, Big Canyon Creek, Little Canyon Creek, Orofino Creek, Jim Ford Creek, Lawyer Creek, Maggie Creek and Lower Cottonwood Creek, all showed high summer temperatures, cold winter temperatures, intermittent extreme turbidity conditions and considerable agricultural land within their drainages. These streams were excluded from site consideration.

Iolo Creek was dropped from consideration since it lacks flat terrain for facility construction.

The Clearwater River shows similar conditions as its tributaries, though not as extreme in relation to climatic changes. The turbidity, low winter temperatures and the fact that pumping water to a facility would be required, excluded it from serious consideration as a water source for a perennial rearing facility. If water were pumped to a site and water treatment and heating provided, the river could be considered a water source for a major facility. Due to the high costs associated with pumping and water treatment, this water source was not considered at this time.

Spring Waters Investigated

Old Hatchery Springs was the only ground water found and investigated on the Reservation. These small springs are located near the Tribal Headquarters at Lapwai (Exhibit 1). The springs originate primarily in two locations, and form a small stream which flows approximately 1/4 mile prior to its confluence with Lapwai Creek at River Mile 4 (Figure 1). The site is located about 300 yards downstream from the spring

origins. At this site Idaho State Fish and Game Department began to construct a rearing facility in the 1960's. Completion of the facility was not accomplished and the facility was never operated. A concrete weir and one raceway (Figure 2) still exist at the site and are in fair condition.

WATER QUALITY ANALYSIS

Complete water chemistry analysis was conducted twice for Old Hatchery Springs (Exhibit 2a) and once at Lapwai Creek and Big Canyon Creek (Exhibits 2B and 2C).

The Water quality of Old Hatchery Springs displayed two parameters with values near the upper limits for anadromous fish rearing. These parameters are dissolved lead concentration and filterable residue. The high filterable residue value is due to the large abundance of vegetative growth in the spring channel. This problem could be avoided by piping the spring water from the source to the rearing facility. Piping the water would also lower the dissolved lead concentration. The close proximity of the springs to a major highway probably results in lead from automobile exhaust being absorbed by the water. The other water quality parameters are safe for anadromous fish rearing.

Temperatures of the combined springs at the Old Hatchery site are ideal for rearing anadromous fish (Exhibit 3A).

Lapwai Creek and Big Canyon Creek, although not recommended in this report, both showed acceptable water chemistry for rearing anadromous fish except for possible residue complications. The filterable residue factor in both creeks displayed values that unless decreased could create problems in artificial rearing situations. Temperatures of these two streams would prohibit their use for artificial rearing.

Water Quantity

Water quantity analysis was conducted throughout the year at the site by the use of a staff gauge and actual measurements. Below is the estimated water available by month for the site.

<u>Month</u>	<u>Available Flow-Cubic Feet/Sec.</u> <u>Old Hatchery Springs</u>
May	1.5
June	1.5
July	.9
August	.8
September	.5
October	.5
November	1.0
December	1.3
January	1.5
February	3.2
March	2.5
April	2.0

Figure 1. The main spring of Old Hatchery Springs

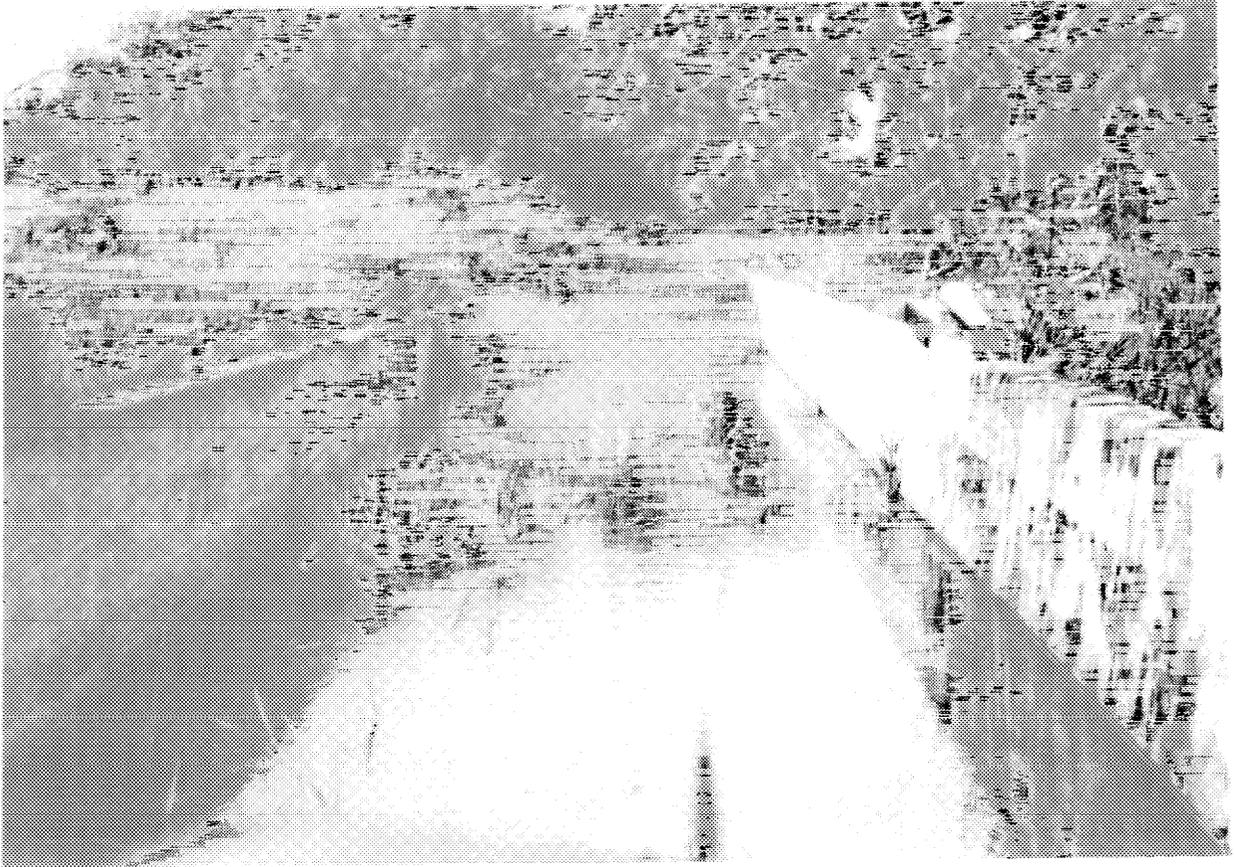


Figure 2. Existing raceway at hatchery site

SITE RECOMMENDATIONS

Evaluation of data collected during this study indicated that only one good site, Old Hatchery Springs, met the site criteria outlined earlier.

FLOOD HAZARD

In the past the site has been inundated during high spring runoff of Lapwai Creek. The flooding is not the result of overtopping of the banks adjacent to the site but from runoff of flooded areas upstream of the station. A dike must be constructed to direct the runoff back to the stream above the hatchery site.

CLIMATOLOGICAL DATA

Climatological information is presented in Exhibit 4 for Lewiston, Idaho, which is just 12 miles west of the site. The data should be representative of the conditions at the proposed site.

SOILS

No detailed subsurface investigations were made at the proposed site. By visual inspection of the surface and exposed banks of Lapwai Creek, a silty-sand and gravel layer is expected to extend several feet (more than four or five feet) below the top soil layer. The material is quite satisfactory for foundations of the planned structures.

SITE DEVELOPMENT

The Old Hatchery Springs Site is under Tribal ownership. It is located along the left bank of Lapwai Creek at River Mile 4 in Section 11 of Township 35N and Range 4W, and at a mean sea level elevation of 1,000 feet. Access to the site is by Highway 95, and the last 1/10th mile by graveled county road.

The existing concrete raceway can be utilized at the site. It will be necessary to clean it thoroughly and install stoplogs and screens at both ends. Considerable expense can be saved by using the old structure versus building a new one.

The operation of Tribal bath house located below the hatchery site will have to be curtailed or modified. The water standards immediately downstream from the facility will be below those acceptable for human usage after the facility is in operation, due to accumulation of fish wastes. The bath house and fish rearing facility could both be operated if the waters are kept separate. Water could be piped from above the hatchery at times when not needed for fish production and either used or stored for use at the bath house. A separate pool for bathing could be dug with an outlet pipe flowing back to the stream below the facility. A close control of the flow to the bath house would have to be maintained so that adequate flow is always maintained to the fish facility.

The limited hydraulic head available for the water supply at the site requires the use of large size pipes to carry the water with minimum pipe losses. The facility as planned will operate without pumping any of the rearing water. A contour map of the existing site is shown on the first sheet of Exhibit 6 and the proposed site development plan is on Sheet 2.

HATCHERY DEVELOPMENT

The plan presented identifies these separate phases of hatchery development to allow initial fish production. In Phase 1, it is recommended that the existing concrete raceway pond be utilized for fish rearing as well as holding returning adults. This is done to permit the rearing program to begin with a minimum cost. Although the existing pond will work, there are difficulties or disadvantages in its use that warrant planning for the future use of circular fiberglass tanks. These disadvantages are:

- a. Poorer water quality for fish in the lower sections of the raceway.
- b. Raceway ponds in series are more difficult to clean properly without serious effects on the fish.
- c. Disease problems cannot be readily isolated and will affect the entire station population.

Another factor to be considered is the possible augmentation of the water supply with well water. If this is done, it is much easier to add circular ponds to the facility than to further jeopardize the health of the fish by using more of the existing raceway. Since production levels using only spring water are small, we feel that the Tribe will want to expand the hatchery capacity and we have sized pipes, etc., to handle twice the amount of water presently available from the springs.

The Hatchery Building is not included in either of the first two phases of development. Since the station is less than a mile from BIA and Tribal facilities, it is feasible to use one of these facilities for the hatchery's storage needs. At this time, it doesn't appear practical to erect a new structure to house the one incubation trough. Placing the trough over the existing raceway during each incubation cycle will meet the requirements at minimum cost. Eventually, with additional water, two incubation troughs located in a hatchery building would be desirable.

The inclusion of future residential housing and restroom facilities in the Hatchery Building makes development of potable water and domestic sewage systems essential. The spring water flow would be suitable for potable use with the addition of a chlorinator, booster pump and contact tank since the required flow for domestic use would not exceed 400 gallons/day maximum. Sewage disposal by underground conventional septic tanks and drainfields is proposed.

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1. **Water collection, supply, distribution and drain system for Old Hatchery Springs.**
 2. **Well water and associated distribution system if Tribe elects to augment flow (no development cost or plans provided).**
 3. **Adult fish barrier with trap, and combination of adult holding pond and spawning facility.**

Criteria for adult holding and fish rearing facilities:

- a. **For adult holding, 10 cubic feet of water per adult chinook and 4 cubic feet for coho and steelhead will be required.**
 - b. **Minimum water depth for adult holding should be 4 feet, and 4 feet of water depth will also be required for fish rearing.**
 - c. **Three water changes per hour for adult holding and 1.6 water changes per hour for fish rearing will be required.**
 - d. **Suggested adult holding pond utilizes about 210' of existing raceway pond.**
4. **Two baffled incubation troughs 4' wide x 2' high and 20' long to be located inside the hatchery building.**
 5. **Three circular rearing ponds 24' diameter x 5' depth with external standpipes.**
 6. **On-site Feed Storage Facility 40,000 lb. capacity. Initially, fish food required for annual operation could be stored at the Tribal Headquarters or BIA facilities until construction is completed.**
 7. **Settlement pond (2-hour detention time) for pond cleaning wastes only. Earthen Pond 30' x 210' x 6' and water depth of 2'. Sized for five pond cleanings per week per pond and three ponds cleaned in an hour.**
 8. **Buildings**

Hatchery building which includes:

- a. **Fish Food Storage**
 - b. **Equipment and miscellaneous storage**
 - c. **Staff Room with lavatory**
 - d. **Space for incubation troughs**
9. **Other**
 1. **Gravel access road**
 2. **Vehicle Parking areas**
 3. **Domestic water**
 4. **Sewage Systems**
 5. **Storm Drainage**

6. Electrical Service
7. Telephone Service
8. Fencing
9. Miscellaneous equipment including freezer, tools and a small flatbed truck for transferring fish and fish food (with a removable fish distribution box.)

10. Optional Construction

1. Residential housing one trailer pad
2. Automatic feeders
3. Monitor and alarm systems for fish facility operations

Hatchery Production

The desired production levels are listed below based upon the entire available flow from Old Hatchery Springs, and a single-pass facility. Depending on the desired species, this fish hatchery will be capable of producing the salmonid outputs listed in the following table. Production figures are for a single species only and are not to be considered cumulative.

<u>Old Hatchery Site</u>	<u>Steelhead</u>	<u>Spring Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>
Number of adults required	98	22	19	54
Survival to spawn	80	80	95	80%
Number of adult spawning	78	18	18	20
Percent females	50	50%	50%	50%
Number females	39	9	9	15
Number eggs per female	4,000	4,000	5,000	3,000
Number of eggs	154,000	33,900	43,300	43,700
Survival, eggs to smolts	50	70%	70%	70%
Number of smolts liberated	77,000	23,700	30,300	30,600
Number per pound at liberation	8.2(7.0")	4.1(9.3")	9.8(6.9")	6.4(7.3")
Survival smolts to adults	2%	2%	.05%	1%
Number of returning adults	1,540	474	15	306
Approximate egg to date	April 1-30	Sept 1-30	Oct 1-31	Nov 1-30
Approximate months rearing	10	15	9	11
Approximate release date	April 30	April 1	Nov 30	March 1

CONSTRUCTION COSTS

Engineering construction cost estimates are detailed in Exhibit 5. The construction of the hatchery facility has been organized into a Phase 1, Phase 2, Phase 3 and Optional Future Construction categories to provide greater flexibility in fund allocations.

Phase 1 items are the "bare-bones" minimum with the completion of all items necessary before fish production can be started. Phase 2 items are those remaining things that are deemed essential to satisfactory continuous fish production at the level permitted by the quantity of water available from the springs. Plans and specifications have been prepared for both Phase 1 and Phase 2 items.

Phase 3 consists of items needed with an additional water supply to increase the hatchery production to a level about twice the amount possible with only spring water. The Optional Future items, though not essential to produce fish, may be deemed desirable in terms of security, convenience of employees, etc., should additional funds be available.

All costs have been prepared for construction during the remainder of 1980. For any items to be started next year, the estimated amounts should be increased by an additional 12%. Additional increases should be made for subsequent years to reflect expected inflation rates.

The grand total cost for development is:

Phase 1 and 2 completed together	\$400,200.00	
Phase 1 and 2 completed separately		\$412,300.00
Phase 3 and Optional	424,600.00	424,600.00
Equipment	<u>30,000.00</u>	<u>30,000.00</u>
	\$854,800.00	\$866,900.00

OPERATIONS

To operate the fish hatchery, one manager will be required full-time. The manager must have training in fish hatchery management. Temporary help may be required at distribution or spawning time. If qualified individuals are available, the positions should be filled by the Tribal members.

The objective of the hatchery will be to produce salmon or steelhead to partially fulfill the Nez Perce fishery management program for the Clearwater River System

Steelhead appear to be the best suited for this type of facility from a production standpoint, with spring chinook being second best. Both of these species would have the best survival rate back to Lapwai Creek. Fall chinook, on the other hand, would not be self-sufficient since fewer adults would return to the facility than needed for spawning. Coho are not recommended for consideration.

Initially, there would not be sufficient numbers of brood fish returning to furnish eggs for the hatchery program

Eggs could be obtained from mature fish trapped in Lapwai Creek or from other hatcheries. After the first full production cycle, it is expected the hatchery will be self-supporting.

The final decision as to what species would be raised at the hatchery will be determined by the Nez Perce Tribe. The production tables were calculated for the maximum poundage the facility can produce of each individual species based on available water. Due to the limited amount of water available and the relatively low production releases possible, the single species approach might be the most advantageous approach for the operator to undertake.

The production from this facility released into Lapwai Creek would benefit not only tribal fishermen on and off the reservation, but also all user groups in the Snake River and the main stem Columbia River.

Operational and Maintenance Costs

Steelhead were considered in estimating operation costs since production of this species would result in the greatest number of pounds of smolts released. Local conditions may require adjustment in the salaries paid in order to obtain and retain qualified personnel. The figures presented are based on expected increases in cost of living and are presented for the calendar year of 1981.

The following expenses should not vary appreciably once production has begun.

		Spring Water Program	Augmented Water Program
1.	Personnel: Manager	\$17,500.00	\$24,200.00
	Technician	0,000.00	17,500.00
	Clerical (part-time)	1,800.00	1,800.00
	Laborer (part-time)	8,000.00	8,000.00
	Fringe benefits	2,800.00	5,200.00
2.	Truck expenses: operation	2,500.00	2,500.00
	amortization	2,000.00	2,000.00
3.	Equipment Amortization	1,800.00	1,800.00
4.	Miscellaneous	300.00	300.00
	TOTAL	\$36,700.00	\$63,300.00

During the first year of operation with only Phase 1 and 2 facilities in place, the additional O&M costs would be:

1.	Fish feed	\$5,700.00
2.	Supplies	3,000.00
3.	Utilities: trash disposal	1,000.00
	TOTAL	\$9,700.00

For the second and subsequent years with Phase 1 and 2 facilities only, the additional O&M costs in 1981 dollars would be:

1.	Fish feed	\$5,700.00
2.	Facility Maintenance	2,000.00
3.	Supplies	3,000.00
4.	Utilities: Trash disposal	1,000.00
	TOTAL	\$11,700.00

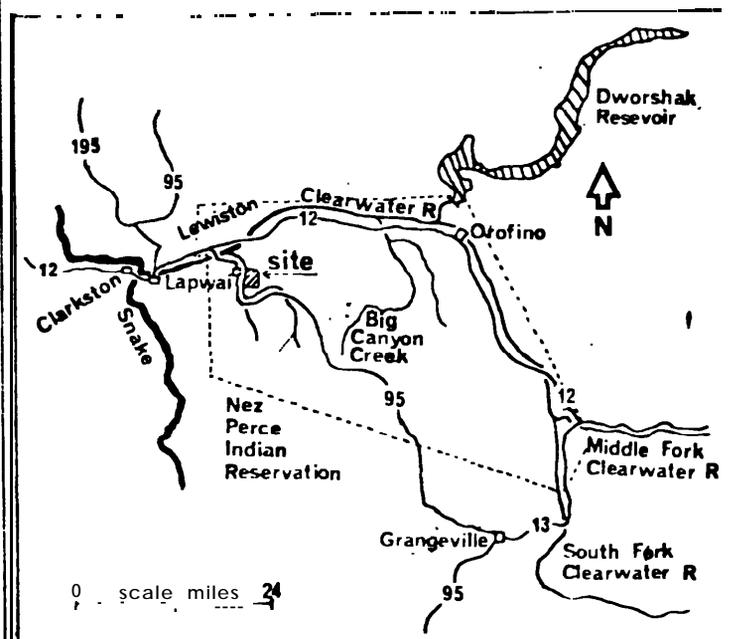
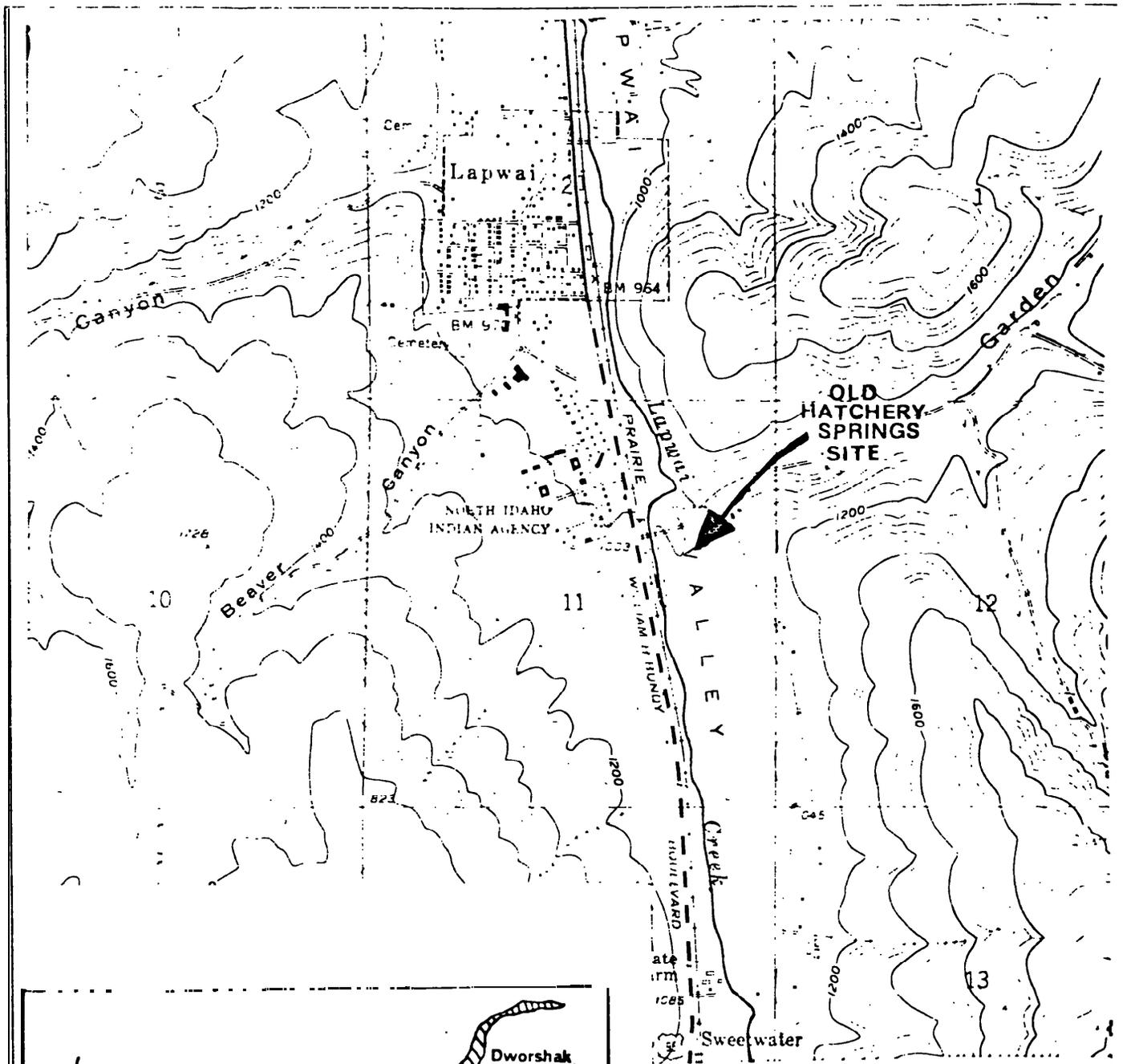
The additional O&M costs with all planned facilities in place will depend upon whether or not additional water supplies are provided. The following amounts (in 1981 dollars) would be anticipated:

<u>Item</u>	<u>Spring Water Program</u>	<u>Augmented Water Program</u>
1. Fish feed	\$5,700.00	\$11,100.00
2. Facility Maintenance	3,000.00	4,000.00
3. Supplies	3,000.00	4,000.00
4. Utilities: trash disposal	1,000.00	1,000.00
electricity	1,000.00	4,000.00
sewage	300.00	600.00
telephone	500.00	500.00
TOTAL	<u>14,500.00</u>	<u>\$25,200.00</u>

With just spring water available for fish rearing, the O&M cost is about 2-1/4 times as high as that for Federal hatcheries. With the provision of well water and doubling hatchery production, the multiple is substantially reduced to about 1-1/2 times Federal installation experience.

Conclusion

Of the sites examined on the Nez Perce Reservation for developing a fish hatchery under the criteria of this study, the Old Hatchery Springs site was found to be the only feasible location. It has the most reliable water source and allows fish production with the least development cost. Attached are detailed engineering designs and specifications which can be used for bid solicitation prior to construction (Exhibits 6 and 7).



VICINITY MAP

**PROPOSED
HATCHERY SITE
OLD HATCHERY SPRINGS.
NEZ PERCE RESERVATION
EXHIBIT J**

Water Analysis

OLD HATCHERY SPRINGS

CONCENTRATION
(parts per million except
where otherwise noted)

	9/18/78	1/22/79
1/TEMPERATURE (°F)	53	43
DISSOLVED O ₂	7	9
DISSOLVED CO ₂	5 - 10	0 - 5
DISSOLVED H ₂ S	< 0.1	< 0.1
TOTAL DISSOLVED GAS (%)	98.33	98.82
PH	7.5	7.6
2/RESIDUE, FILTRABLE	224.5	207.5
RESIDUE, NONFILTRABLE	0.5	4.5
TURBIDITY (N.T.U.)	1.5	3.0
TOTAL ALKALINITY (ph 4.5 as CaCO ₃)	151.9	130.3
HARDNESS (calculated as CaCO ₃)	121.1	123.1
NITROGEN, AMMONIA	< 0.05	< 0.05
NITROGEN, NITRITE	< 0.01	< 0.01
NITROGEN, NITRATE	2.28	1.7
DISSOLVED ORTHOPHOSPHATES	< 0.1	0.09
DISSOLVED CHLORIDE	3.8	3.9
CALCIUM	28.6	33.3
COBALT	< 0.08	< 0.0571
COPPER	0.0070	< 0.0044
IRON	< 0.0667	0.1293
MAGNESIUM	10.0	9.7
MANGANESE	< 0.0089	0.0140
MOLYBDENUM	< 0.00667	< 0.0727
SODIUM	14.8	13.3
ZINC	0.030	0.0140
3/CADMIUM (Parts Per Billion)	< 0.10	< 0.006
T LEAD (Parts Per Billion)	< 0.50	< 0.30

1/Analyses by U.S. Fish and Wildlife Service, Fisheries Assistance, Vancouver, Washington.

2/Analyses by U.S. Fish and Wildlife Service, Marrowstone Field Station, Nordland, Washington.

3/Analyses by U.S. Geological Survey, Central Laboratory, Denver, Colorado.

Water Analysis

LAPWAI CREEK

CONCENTRATION
(parts per million except
where otherwise noted)

	1/22/79
1/TEMPERATURE (°F)	32
DISSOLVED O ₂	11
DISSOLVED CO ₂	0 - 5
DISSOLVED H ₂ S	< 0.1
TOTAL DISSOLVED GAS (%)	99.82
PH	7.9
2/RESIDUE, FILTRABLE	172.0
RESIDUE, NONFILTRABLE	16.0
TURBIDITY (N.T.U.)	9.0
TOTAL ALKALINITY (ph 4.5 as CaCO ₃)	107.1
HARDNESS (calculated as CaCO ₃)	101.1
NITROGEN, AMMONIA	< 0.05
NITROGEN, NITRITE	0.01
NITROGEN, NITRATE	1.5
DISSOLVED ORTHOPHOSPHATES	0.08
DISSOLVED CHLORIDE	2.4
CALCIUM	27.3
COBALT	< 0.0571
COPPER	< 0.0044
IRON	< 0.0291
MAGNESIUM	7.7
MANGANESE	< 0.0040
MOLYBDENUM	< 0.0727
SODIUM	13.5
ZINC	0.0110
3/CADMIUM (Parts Per Billion)	0.006
T LEAD (Parts Per Billion)	< 0.30

1/Analyses by U.S. Fish and Wildlife Service, Fisheries Assistance, Vancouver, Washington.

2/Analyses by U.S. Fish and Wildlife Service, Marrowstone Field Station, Nordland, Washington.

3/Analyses by U.S. Geological Survey, Central Laboratory, Denver, Colorado.

Water Analysis

BIG CANYON CREEK

CONCENTRATION
(parts per million except
where otherwise noted)

	1/22/79
1/TEMPERATURE (°F)	32
DISSOLVED O ₂	12
DISSOLVED CO ₂	0 - 5
DISSOLVED H ₂ S	< 0.1
TOTAL DISSOLVED GAS (%)	99.2
pH	7.8
2/RESIDUE, FILTRABLE	154.5
RESIDUE, NONFILTRABLE	5.5
TURBIDITY (N.T.U.)	3.5
TOTAL ALKALINITY (ph 4.5 as CaCO ₃)	92.1
HARDNESS (calculated as CaCO ₃)	67.9
NITROGEN, AMMONIA	< 0.05
NITROGEN, NITRITE	< 0.01
NITROGEN, NITRATE	1.3
DISSOLVED ORTHOPHOSPHATES	0.16
DISSOLVED CHLORIDE	1.7
CALCIUM	17.3
COBALT	< 0.0571
COPPER	< 0.0044
IRON	0.0691
MAGNESIUM	6.0
MANGANESE	0.0056
MOLYBDENUM	< 0.0727
SODIUM	13.5
ZINC	0.0120
3/CADMIUM (Parts Per Billion)	< 0.006
LEAD (Parts Per Billion)	< 0.30

1/Analyses by U.S. Fish and Wildlife Service, Fisheries Assistance, Vancouver, Washington.

2/Analyses by U.S. Fish and Wildlife Service, Marrowstone Field Station, Nordland, Washington.

3/Analyses by U.S. Geological Survey, Central Laboratory, Denver, Colorado.

THERMOGRAPH CHART SUMMARY

----- Old Hatchery Springs -----

WATER TEMPERATURES F°

Date	High	Low	Mean	Date	High	Low	Mean	Date	High	Low	Mean	Date	High	Low	Mean
May 1978				June 1978				July 1978				Aug 1978			
12*	50	50	50	1	50	50	50	1	52	52	52	1	54	54	54
13	50	50	50	2	50	50	50	2	52	52	52	2	54	54	54
14	50	50	50	3	50	50	50	3	52	52	52	3	54	54	54
15	50	50	50	4	50	50	50	4	52	52	52	4	54	54	54
16	50	49	49	5	50	50	50	5	52	52	52	5	55	54	54
17	49	49	49	6	51	50	51	6	53	53	53	6	55	54	54
18	49	49	49	7	51	51	51	7	53	53	53	7	55	54	54
19	49	49	49	8	51	51	51	8	53	53	53	8	55	54	54
20	49	49	49	9	51	51	51	9	53	53	53	9	55	54	54
21	49	49	49	10	51	51	51	10	53	53	53	10	55	55	55
22	49	49	49	11	51	51	51	11	53	53	53	11	55	54	55
23	49	49	49	12	51	51	51	12	53	53	53	12	55	54	54
24	49	49	49	13	51	51	51	13	53	53	53	13	55	54	54
25	49	49	49	14	51	51	51	14	53	53	53	14	54	54	54
26	49	49	49	15	51	51	51	15	53	53	53	15	55	54	54
27	50	49	50	16	51	51	51	16	53	53	53	16	56	55	55
28	50	50	50	17	52	51	52	17	53	53	53	17	55	55	55
29	50	50	50	18	52	52	52	18	53	53	53	18	55	54	54
30	50	50	50	19	52	52	52	19	53	53	53	19	54	54	54
31	50	50	50	20	52	52	52	20	54	53	54	20	54	54	54
				21	52	52	52	21	54	54	54	21	54	54	54
				22	52	52	52	22	54	54	54	22	54	54	54
				23	52	52	52	23	54	54	54	23	54	54	54
				24	52	52	52	24	54	54	54	24	54	54	54
				25	52	51	52	25	54	54	54	25	54	54	54
				26	52	51	52	26	54	54	54	26	54	54	54
				27	52	52	52	27	54	54	54	27	54	53	54
				28	52	52	52	28	54	53	54	28	54	53	54
				29	52	52	52	29	54	54	54	29	54	53	54
				30	52	52	52	30	54	54	54	29	54	53	54
								31	54	54	54	30	54	54	54
												31	55	54	55

* Thermograph installed

THERMOGRAPH CHART SUMMARY

Old Hatchery Springs

WATER TEMPERATURES F°

Date	High	Low	Mean												
Sep 1978				Oct 1978				Nov 1978				Dec 1978			
1	55	55	55	1	53	51	51	1	57	50	50	1	50	50	50
2	55	55	55	2	51	51	51	2	51	50	50	2	50	50	50
3	55	55	55	3	52	51	51	3	50	49	50	3	50	50	50
4	56	56	56	4	52	51	51	4	49	48	48	4	50	50	50
5	56	56	56	5	51	51	51	5	50	48	49	5	50	50	50
6	56	56	56	6	51	52	52	6	50	49	50	6	53	51	52
7	56	56	56	7	52	52	52	7	50	49	49	7	53	53	53
a	56	55	55	a	52	52	52	a	48	47	48	8	54	53	53
9	55	55	55	9	52	52	52	9	49	47	48	9	53	53	53
10	55	55	55	10	53	52	53	10	51	48	49	10	53	53	53
11	55	55	55	11	53	51	52	11	52	50	51	11**			
12	55	54	55	12	52	51	51	12	52	50	51	12			
13	55	54	54	13	51	51	51	13	52	51	52	13			
14	54	54	54	14	51	51	51	14	53	51	52	14			
15	54	54	54	15	52	51	52	15	53	51	52	15			
16	54	54	54	16	52	52	52	16	52	50	51	16			
17	54	53	53	17	52	52	52	17	50	49	50	17			
18	53	53	53	18	52	52	52	18	49	49	49	18			
19	53	52	52	19	52	51	51	19	49	49	49	19			
20	52	52	52	20	52	52	52	20	50	50	50	20			
21	52	52	52	21	52	50	51	21	50	50	50	21			
22	52	52	52	22	50	50	50	22	50	50	50	22			
23	52	52	52	23	51	51	51	23	50	50	50	23			
24	53	52	53	24	52	52	52	24	50	50	50	24			
25	53	53	53	25	50	49	49	25	50	50	50	25			
26	54	53	54	26	50	49	49	26	50	50	50	26			
27	54	54	54	27	50	49	50	27	50	50	50	27			
28	53	52	52	28	50	49	49	28	50	50	50	28			
29	52	52	52	29	48	48	48	29	50	50	50	29			
30	53	52	53	30	49	48	48	30	50	50	50	30			
				31	50	49	49	31	50	50	50	31			

** Data gap - Thermograph malfunction

THERMOGRAPH CHART SUMMARY

----- Old Hatchery Springs -----

WATER TEMPERATURES F°

Date	High	Low	Mean												
Jan				Feb				Mar				Apr			
1979				1979				1979				1979			
1*				7	44	42	43	1	47	46	46	1	50	49	49
2				2	43	42	43	2	48	45	46	2	50	49	49
3				3	45	43	44	3	48	45	47	3	50	48	49
4				4	46	45	45	4	48	47	47	4	51	47	48
5				5	47	45	46	5	48	47	47	5	51	48	49
6				6	47	44	46	6	49	42	47	6	51	48	49
7				7	44	40	42	7	47	42	45	7	52	48	50
8				8	46	44	45	a	48	43	47	8	52	40	50
9				9	47	45	46	9	48	42	46	9	53	49	51
10				10	47	45	46	10	49	45	47	10	54	47	50
11				11	47	46	46	11	49	47	48	11	54	50	52
12				12	47	45	46	12	49	47	48	12	54	50	52
13				13	46	45	46	13	49	47	48	13	52	49	51
14				14	47	45	46	14	49	47	48	14	54	50	51
15				15	47	45	46	15	49	47	48	15	53	50	51
16				16	47	45	46	16	48	47	47	16	54	49	52
17				17	47	47	47	17	49	47	48	17	54	49	52
18				18	47	47	47	1a	49	47	48	18	54	49	52
19				19	47	46	46	19	50	47	48	19	54	49	52
20				20	47	45	46	20	49	47	48	20	54	49	52
21				21	47	47	47	21	50	47	48	21	54	49	52
22	46	43	44	22	48	47	47	22	49	47	48	22	54	49	52
23	45	43	44	23	48	47	47	23	50	48	49	23	54	49	52
24	46	45	45	24	48	47	47	24	49	48	48	24	54	49	52
25	45	45	45	25	48	47	47	25	49	48	48	25	54	49	52
26	45	45	45	26	38	47	47	26	49	48	48	26	54	49	52
27	46	45	45	27	47	47	47	27	49	48	48	27	54	49	52
28	45	42	43	28	48	47	47	28	49	48	48	28	54	49	52
29	43	42	42					29	49	48	48	29	54	49	52
30	43	42	43					30	49	48	48	30	54	49	52
								31	49	48	49				

* Data gap - Thermograph malfunction

THERMOGRAPH CHART SUMMARY

Old Hatchery Springs

WATER TEMPERATURES F°

Date	High	Low	Mean												
May															
1979															
1	53	49	51												
2	53	49	51												
3	53	49	51												
4	53	49	51												
5	53	49	51												
6	53	49	51												
7	53	49	51												
8	53	49	51												
9	53	49	51												
10	53	49	51												
11	53	49	51												
12	53	49	51												
13	53	49	51												
14	53	49	51												
15	53	49	51												
16	53	49	51												
17	53	49	51												
18	53	49	51												
19	53	49	51												
20	53	49	51												
21	53	49	51												
22*	53	49	51												
23															
24															
25															
26															
27															
28															
29															
30															
31															

*** Readings discontinued

THERMOGRAPH CHART SUMMARY

Lapwai Creek

WATER TEMPERATURES F°

Date	High	Low	Mean	Date	High	Low	Mean	Date	High	Low	Mean	Date	High	Low	Mean
May 1978				June 1978				July 1978							
12	56	46	51	1	63	52	58	1	70	62	66				
13	54	50	52	2	66	54	60	2	71	62	67				
14	54	51	52	3	68	55	61	3	62	62	62				
15	52	47	49	4	69	57	63	4	62	60	63				
16	50	44	47	5	70	58	64	5	68	59	68				
17	53	46	50	6	69	59	65	6	76	60	68				
18	57	46	51	7	72	59	66	7	72	64	69				
19	63	48	55	8	62	58	60	8	73	65	69				
20	62	50	56	9	61	56	59	9	77	64	70				
21	62	51	56	10	67	54	60	10	67	62	65				
22	56	49	53	11	59	55	57	11	67	57	63				
23	50	45	48	12	57	54	55	12	66	58	63				
24	53	46	50	13	62	54	58	13*							
25	55	45	50	14	64	54	59	14							
26	57	46	52	15	66	53	58	15							
27	56	49	53	16	72	57	65	16							
28	59	50	54	17	69	58	65	17							
29	57	49	63	18	71	56	65	18							
30	56	45	51	19	74	57	66	19							
31	56	45	51	20	73	59	64	20							
				21	75	61	67	21							
				22	77	64	69	22							
				23	66	62	64	23							
				24	60	58	59	24							
				25	72	56	63	25							
				26	74	60	67	26							
				27	78	62	70	27							
				28	74	65	69	28							
				29	70	65	68	29							
				30				30							
								31							

* Thermograph installed

** Readings discontinued

CLIMATOLOGICAL DATA

(NORMAL)

MONTH	TEMPERATURE			PRECIPITATION		WIND	
	Daily Max.	Daily Min.	Monthly	Normal Total	Mean Snow Fall	Mean Hourly Speed	Prevailing Direction
Jan.	37.9	24.4	31.2	1.27	26.1		
Feb.	46.0	30.1	38.1	0.85	14.9		
Mar.	52.9	32.9	42.9	0.96	9.7		
Apr.	62.0	38.6	50.3	1.13	1.1		
May	70.6	45.5	58.8	1.58	T		
June	77.9	52.1	65.0	1.83	0.0		
July	89.2	57.6	73.4	0.53	0.0		
Aug.	87.1	55.9	71.5	0.60	0.0		
Sept.	77.6	48.9	63.3	0.86	0.0		
Oct.	63	40.3	51.8	1.08	2.5		
Nov.	48.0	32.9	40.5	1.25	14.4		
Dec.	41.0	28.6	41.8	1.7	8.7		
Annual	62.3	40.6	51.7	13.2	26.1		

● AVERAGE RELATIVE HUMIDITY

<u>TIME</u>	
0400	75
1000	59
1600	48

Station:

LEWISTON, IDAHO

CLIMATOLOGICAL DATA

(NORMAL)

MONTH	TEMPERATURE			PRECIPITATION		WIND	
	Daily Max.	Daily Mn.	Monthly	Normal Total	Mean Snow Fall	Mean Hourly Speed	Prevailing Direction
Jan.	37.9	24.4	31.2	1.27	26.1		
Feb.	46.0	30.1	38.1	0.85	14.9		
Mar.	52.9	32.9	43.9	0.96	9.7		
Apr.	63.0	38.6	50.3	1.13	1.1		
May	70.6	45.5	58.8	1.58	T		
June	77.9	52.1	65.0	1.83	0.0		
July	89.2	57.6	73.4	0.53	0.0		
Aug.	87.1	55.9	71.5	0.60	0.0		
Sept.	77.6	48.9	63.3	0.86	0.0		
Oct.	63.2	40.3	51.8	1.08	2.5		
Nov.	48.0	32.9	40.5	1.25	14.4		
Dec.	41.1	28.6	34.8	1.0	18.7		
Annual	62.8	40.6	51.7	13.21	26.1		

AVERAGE RELATIVE HUMIDITY

<u>TIME</u>	
0400	75
1000	59
1600	48

Station:

LEWISTON, IDAHO

**OLD HATCHERY SPRINGS
NEZ PERCE**

CONSTRUCTION COST ESTIMATE

Item	Description	Estimated Cost
PHASE 1		
1.	Remove existing fence and concrete weir	\$ 3,000.00
2.	Site grading, base course areas to be gravel surfaced, entrance road culvert	32,100.00
3.	Intake Structure including dikes & riprap	40,200.00
4.	Rearing Pond Water Supply Piping	45,400.00
5.	Hatching Trough including supports and accessories	18,700.00
6.	Flood Control Dike	29,100.00
7.	Misc. Pond Accessories	9,200.00
	TOTAL	<u>\$177,700.00</u>
PHASE 2		
1.	Timber Fish Barrier and Trap	\$ 20,400.00
2.	Demolish 120 ft. existing pond and other misc. concrete	6,400.00
3.	Excavate Settling Pond & relocate Spring Creek	16,100.00
4.	Rearing Pond Water Supply	5,500.00
5.	Circular Rearing Ponds - 3 ea.	89,700.00
6.	Pond drains, Drain Control Structure w/piping to Holding & Settling Ponds	49,300.00
7.	Gravel Surfacing	21,400.00
a.	Chain link fencing and gates	25,800.00
	TOTAL	<u>\$234,600.00</u>
<p>If Phase 1 and 2 work is accomplished before any fish rearing is attempted, the cost can be reduced by \$12,100.00. The total cost for the combined work is: \$400,200.00</p>		
PHASE 3 (Future)		
1.	Spring Creek outfall improvements and Fish Trap	\$ 14,800.00
2.	Hatchery Building including additional hatching trough with accessories and piping	84,200.00
3.	3 circular rearing ponds	89,700.00
4.	Pond drain piping, Drain Control Structure w/piping to Holding and Settling ponds	24,200.00
5.	Rearing Pond Water supply piping	4,500.00
6.	Electric Service	7,400.00
	TOTAL	<u>\$224,800.00</u>

**OLD HATCHERY SPRINGS
NEZ PERCE**

CONSTRUCTION COST ESTIMATE

<u>Item</u>	<u>Description</u>	<u>Estimated Cost</u>
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OPTIONAL FUTURE CONSTRUCTION

1.	Complete Hatchery Building interior (electrical, plumbing, feed freezer, septic tank and drain field)	\$37,100.00
2.	Spawning facility lifts, anesthetic tank, piping, etc.	48,500.00
3.	Automatic feeders - 6 ponds	52,400.00
4.	Alarm and monitor system	12,000.00
5.	Telephone Service	900.00
6.	Residential Trailer Pad & Utilities	26,000.00
7.	Area lighting	22,900.00
	TOTAL	\$199,800.00

EQUIPMENT

1.	Truck	\$ 10,000.00
2.	Pumps - portable	5,000.00
3.	Nets, brushes, etc.	1,000.00
4.	Small tools, scales, buckets, etc.	3,000.00
5.	Desk, table, chairs & files	1,500.00
6.	Storage racks and work bench	1,500.00
7.	Fish Transport box	2,000.00
	TOTAL	\$ 30,000.00

TECHNICAL SPECIFICATIONS

DIVISION 1. GENERAL REQUIREMENTS

1A. SUMMARY OF WORK

1A.01 Description of Work

The work to be performed under this contract consists of furnishing all labor, equipment, materials and supplies required to construct rearing ponds, fish trap, fish rack, a water control structure, a water intake structure, effluent settling pond and supply and drain pipe.

1A.02 Location of Work

All work to be performed is at Old Hatchery Springs Hatchery on the Nez Perce Indian Reservation near Pendleton, Oregon.

1A.03 Inquiries

Questions regarding the work should be directed to _____

1A.04 Applicable Codes

In instances where these specifications do not state exact materials or methods of construction, the applicable minimum requirements of the Uniform Building Code, 1979 edition shall govern.

1A.05 Engineering Services

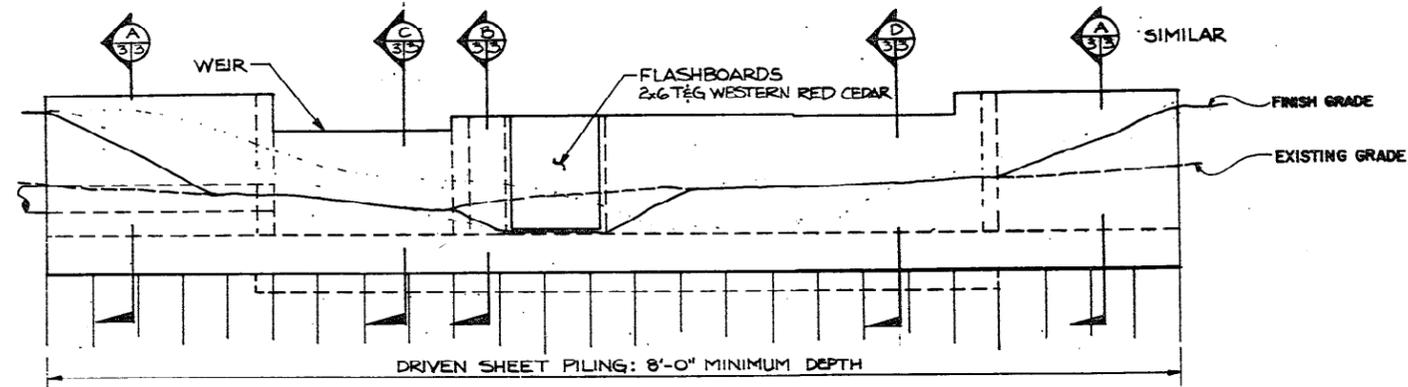
The Engineer will furnish the Contractor with all necessary information relating to elevations and control points. From these elevations and control points, the Contractor shall furnish and place all additional stakes, marks and templates required for the performance and completion of the work. If any Government-established reference point or bench mark is disturbed or destroyed, the Contractor shall replace it to the original line and grade at his own expense.

1B. CONTRACT DOCUMENTS

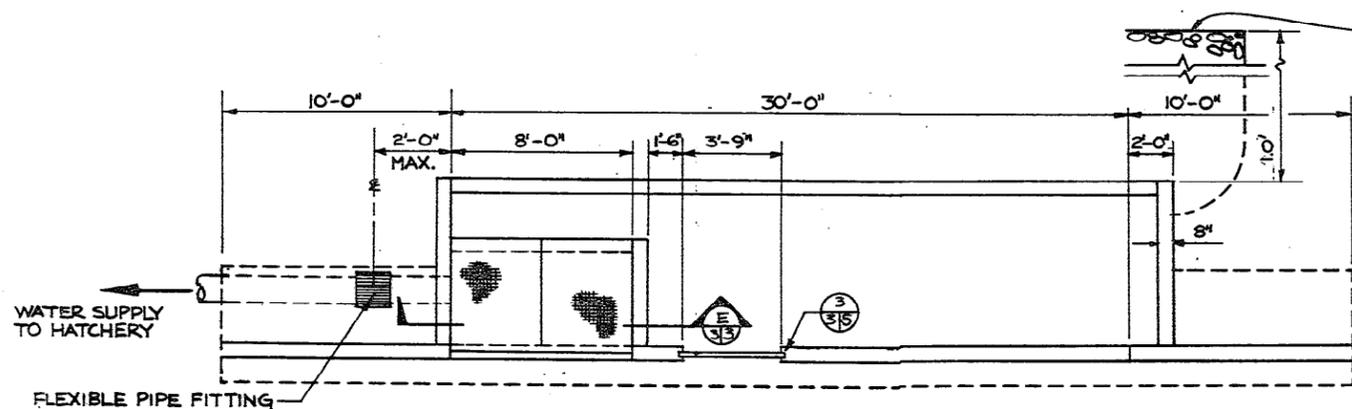
18.01 Drawings

The following drawings are hereby made a part of this invitation by reference:

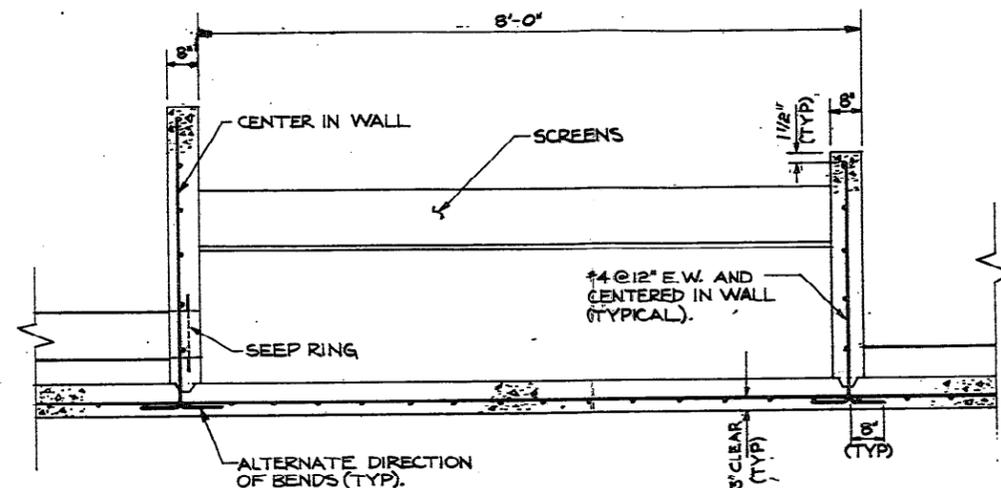
<u>Drawing No.</u>	<u>Title</u>	<u>Sheet Number</u>
1 F-MSC-250-1 .0	SITE MAPS	1 of 9
1F-MSC-250-2.0	PLOT PLAN	2 of 9
1F-MSC-250-3.0	INTAKE STRUCTURE	3 of 9
1F-MSC-250-4.0	WATER CONTROL STRUCTURE	4 of 9
1F-MSC-250-5.0	M SC METALS	5 of 9
1F-MSC-250-6.0	HATCHING TROUGH & DETAILS	6 of 9
1F-MSC-250-7.0	MISC. DETAILS	7 of 9
1F-MSC-250-8.0	FISH RACKS	8 of 9
1 F-MSC-250-9.0	FISH TRAP	9 of 9



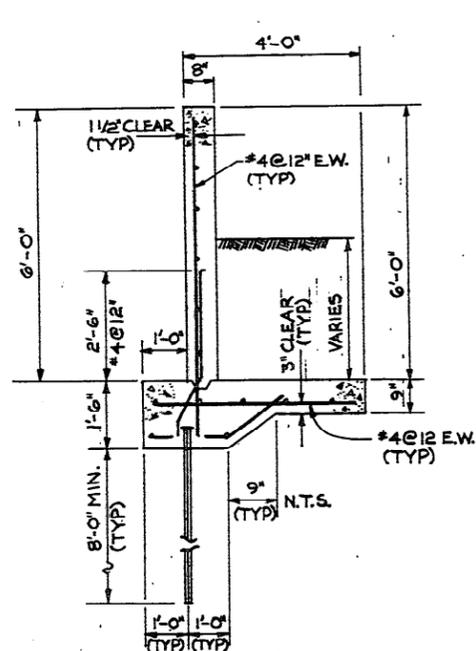
UPSTREAM ELEVATION
1/4" = 1'-0"



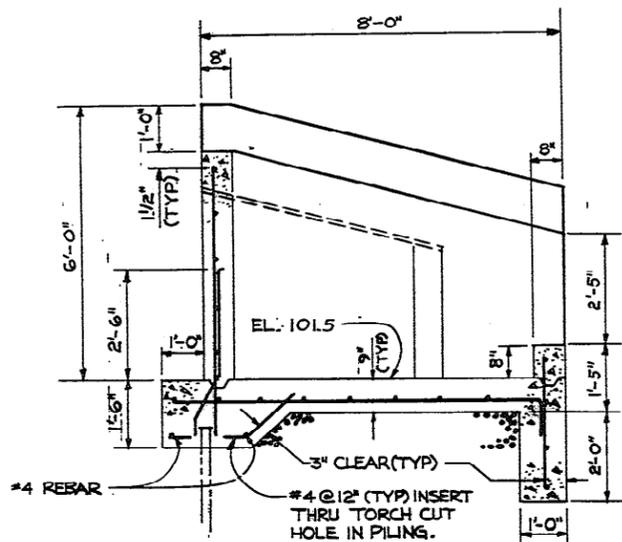
PLAN OF STRUCTURE
1/4" = 1'-0"



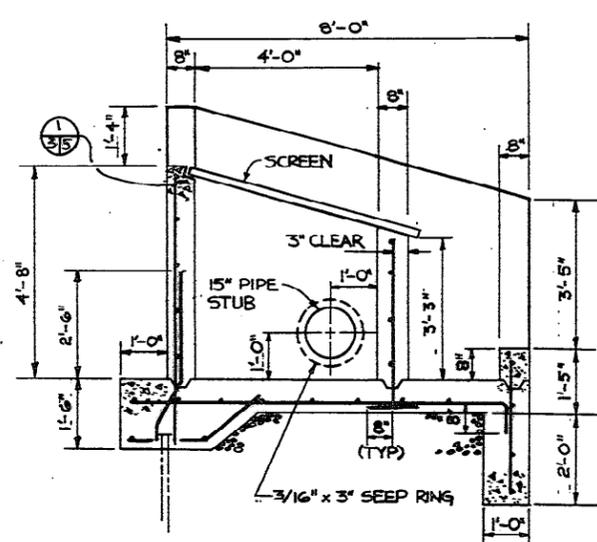
SECTION
1/2" = 1'-0"



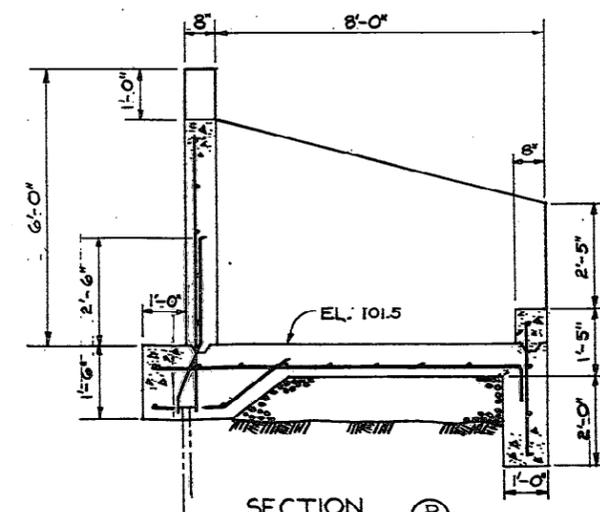
SECTION
1/2" = 1'-0"



SECTION
1/2" = 1'-0"

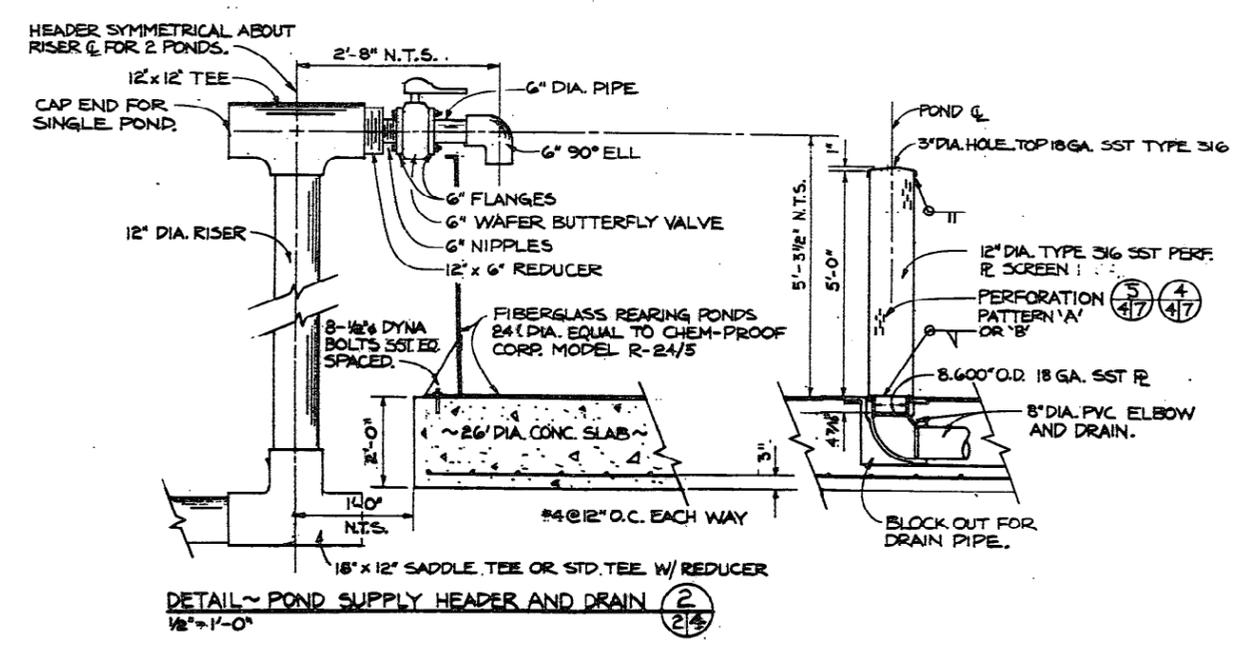
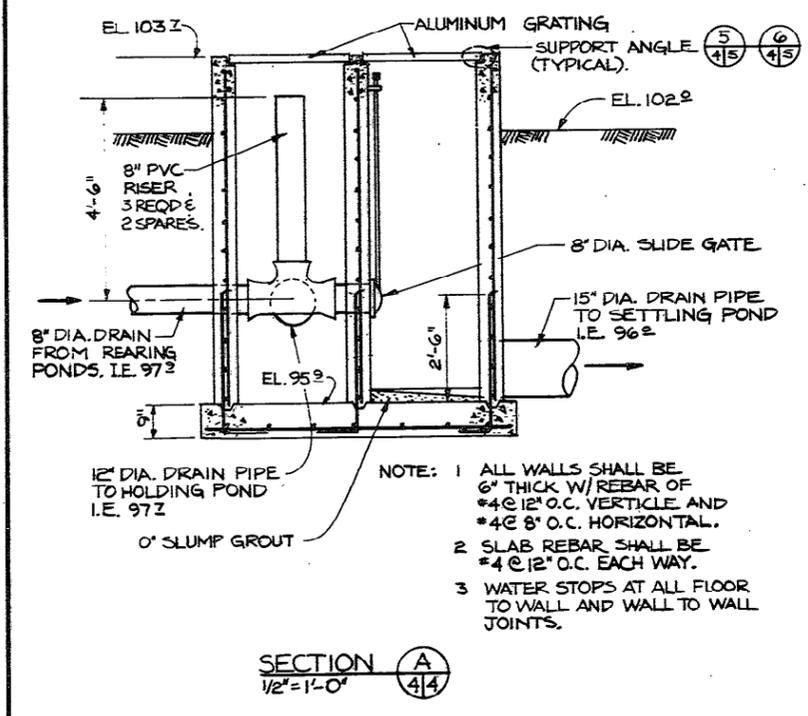
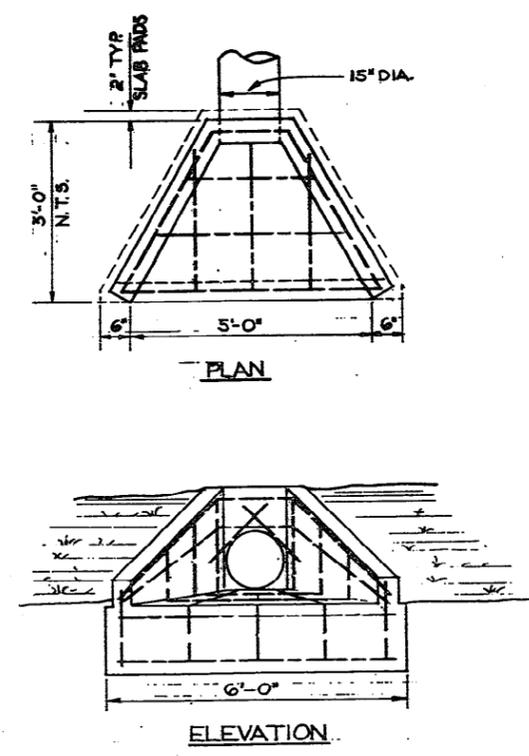
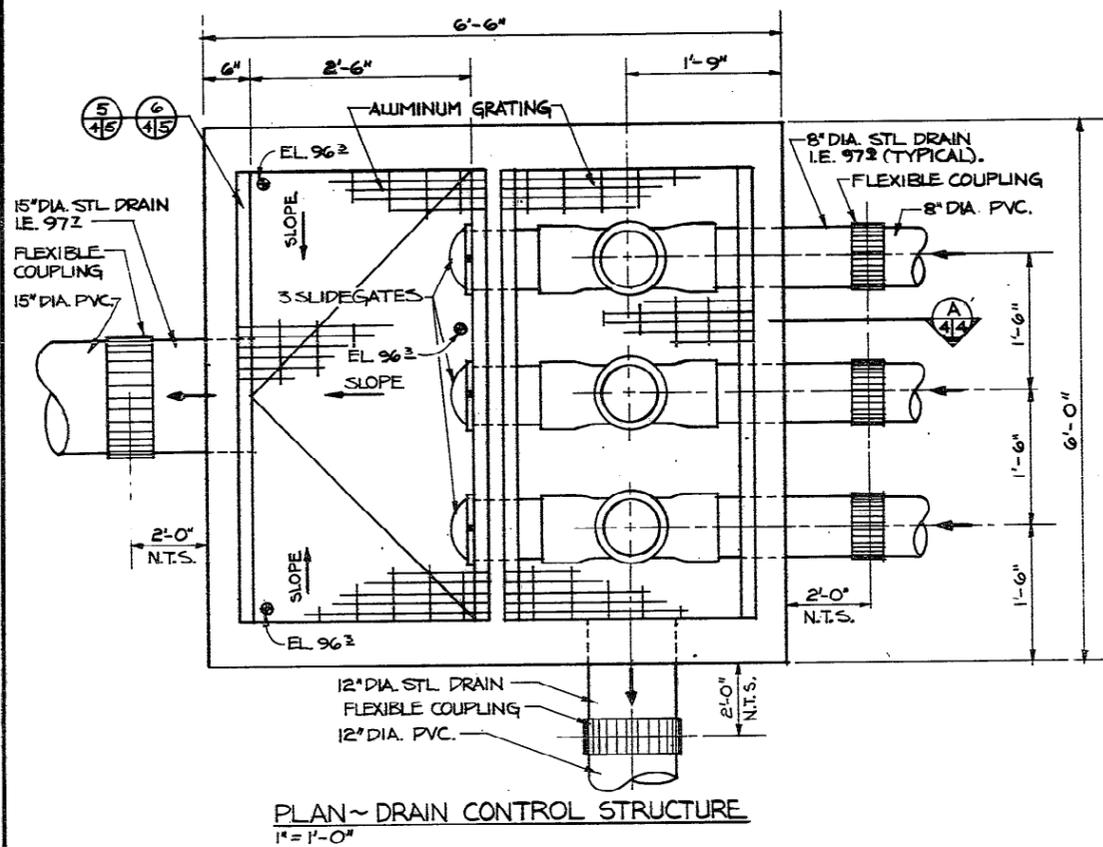


SECTION
1/2" = 1'-0"



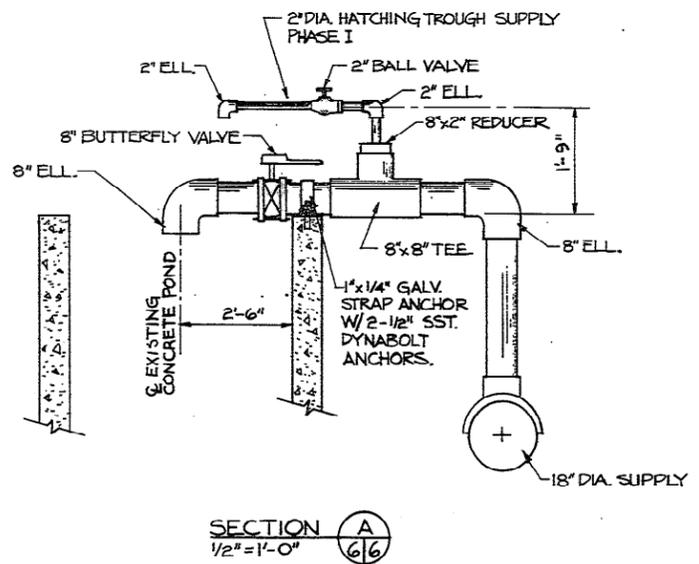
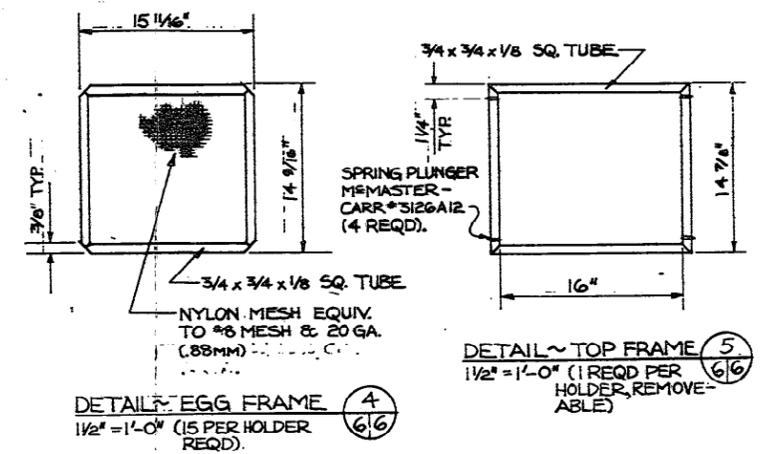
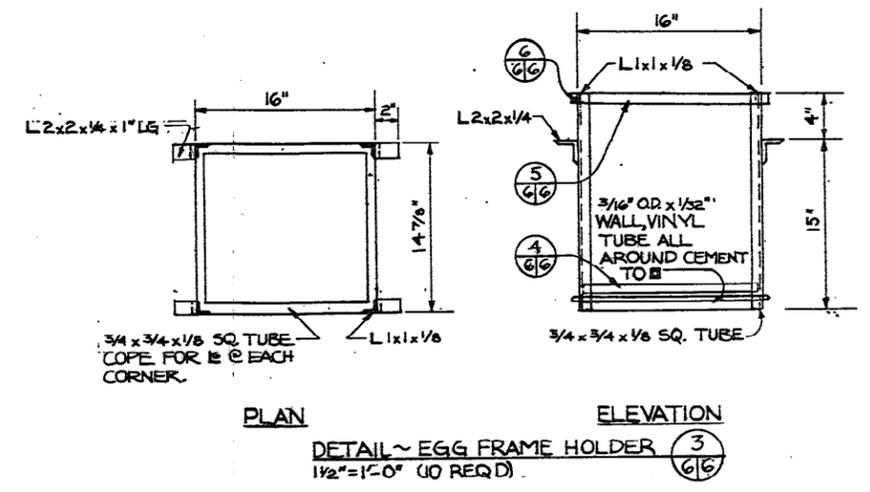
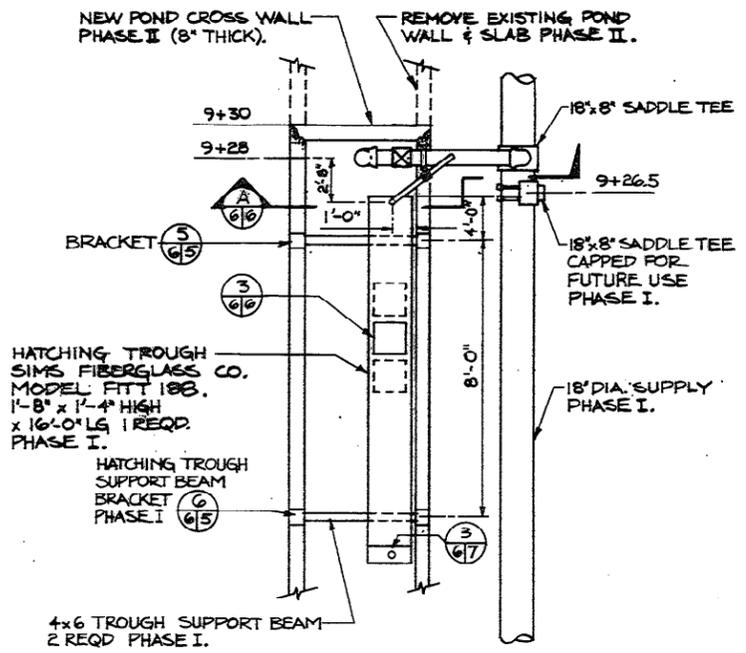
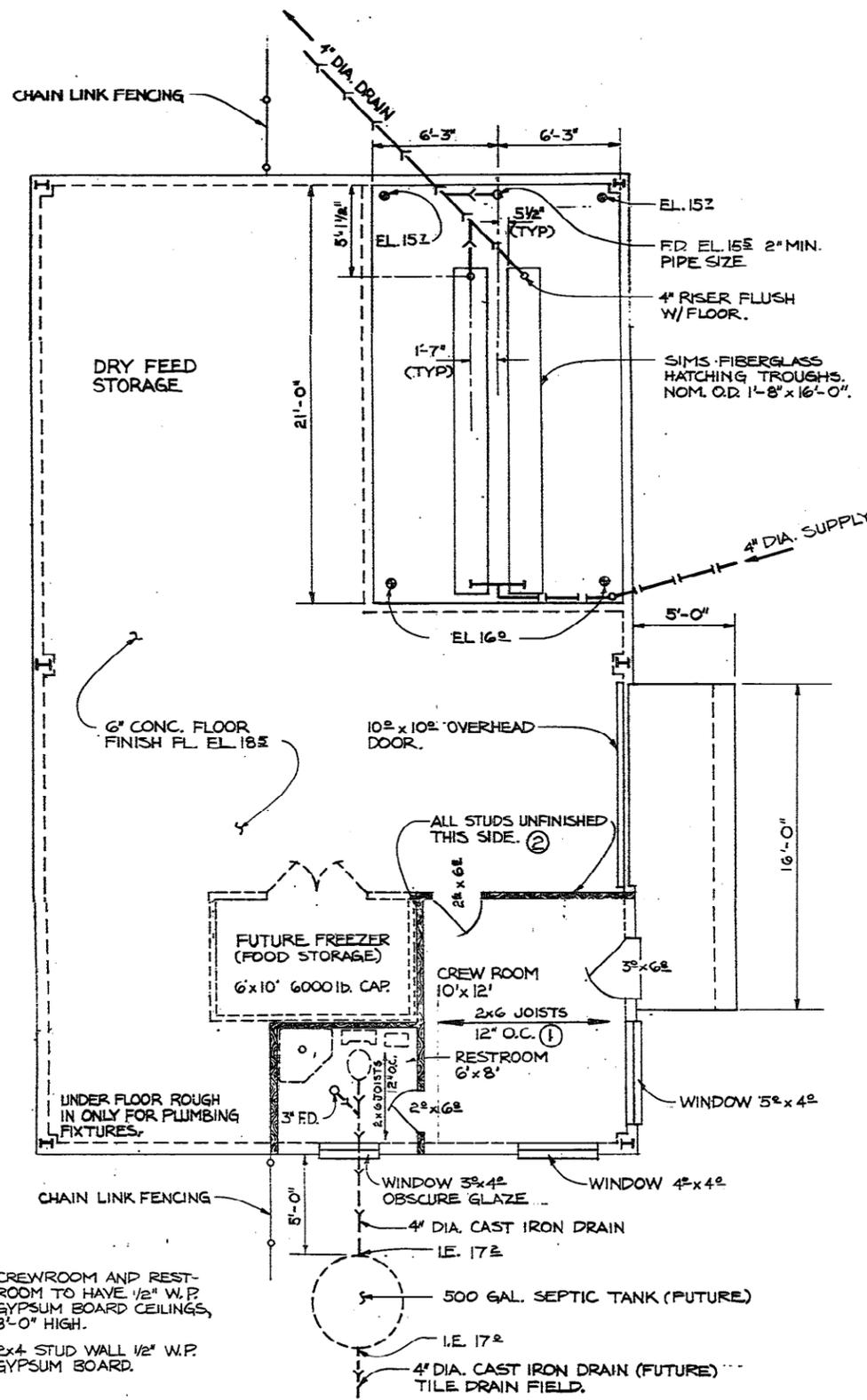
SECTION
1/2" = 1'-0"

NO.	DATE	DESCRIPTION	BY
NEZ PERCE INDIAN RESERVATION			
OLD HATCHERY SPRINGS HATCHERY INTAKE STRUCTURE			
JLC	BW	JUN 80	IF-MISC-250-30



NO.	DATE	DESCRIPTION	BY
1		NEZ PERCE INDIAN RESERVATION WATER CONTROL OLD HATCHERY SPRINGS HATCHERY STRUCTURE	
2			
3			
4			
5			

JUN 20 2000 250 20



NOTE: 1 8"x8" TEE AND ALL 2" PIPING @ STATION 9+28 ONLY.

2 PIPING - ALL 8" TYPICAL FOR STATION 9+88 AND 10+48.

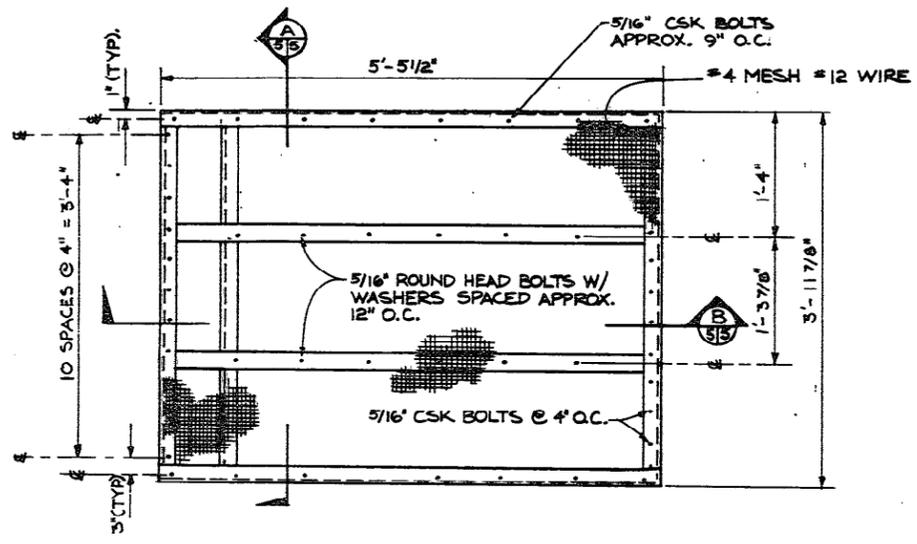
NOTE: HATCHERY BUILDING IS NOT IN THIS CONTRACT. THE BUILDING SHOWN IS ONE USED FOR A SIMILAR HATCHERY DEVELOPMENT. A BUILDING SUCH AS THIS IS CONTEMPLATED FOR THIS STATION AND IS PRESENTED FOR OWNER INFORMATION ONLY. TO BE SUITABLE, THE HATCHING TROUGHS SHOULD BE LOCATED IN THE LOWER RIGHT HAND CORNER & THE CREW FACILITIES IN THE UPPER RIGHT HAND CORNER.

MATERIAL	PER HOLDER
3/4 x 3/4 x 1/8	90 LFT
L 1x1x1/8	6 1/2 LFT
L 2x2x1/4	1/2 LFT
SOFT NEOPRENE TUBE	5 1/2 LFT
NYLON MESH	26 SF

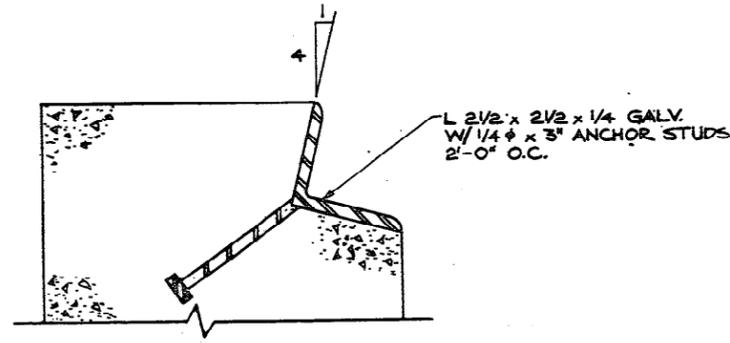
NOTE: ALL SHAPES SHALL BE FIBERGLASS, RESIN WELD ALL JOINTS.

MATERIALS PER HOLDER

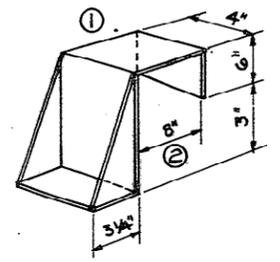
NO.	DATE	DESCRIPTION	BY
HATCHING TROUGH & DETAILS			
NEZ PERCE INDIAN RESERVATION			
OLD HATCHERY SPRINGS HATCHERY			
DATE	DRAWN	DATE	NO.
JLC	SW	JUN 80	IF - MISC-250-6.0



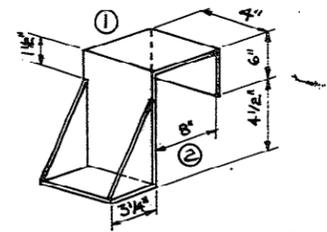
PLAN ~ INTAKE SCREEN
 1" = 1'-0"



DETAIL
 1/2" SCALE

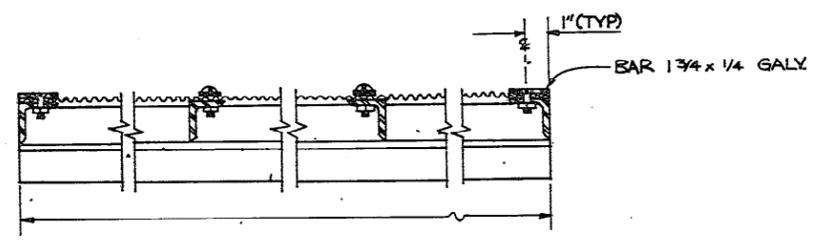


FRONT BEAM HANGER ⑤
 N.T.S. (2 REQ'D) ⑥/5

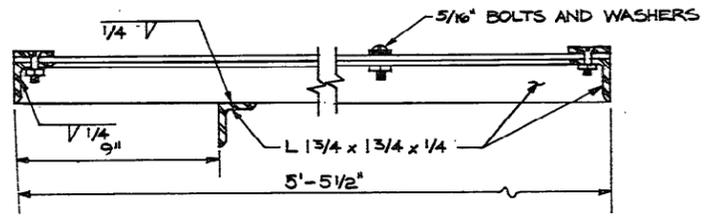


REAR BEAM HANGER ⑥
 N.T.S. (2 REQ'D) ⑥/5

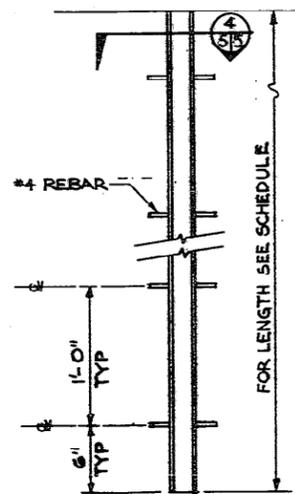
- NOTES:
 ① ALL PIECES FROM 1/4" R. COLD FORMED AND/OR WELDED - ALL WELDS CONTINUOUS. GALV. AFTER FAB.
 ② TO BE SAME AS EXISTING POND WALL THICKNESS (CONTRACTOR VERIFY).



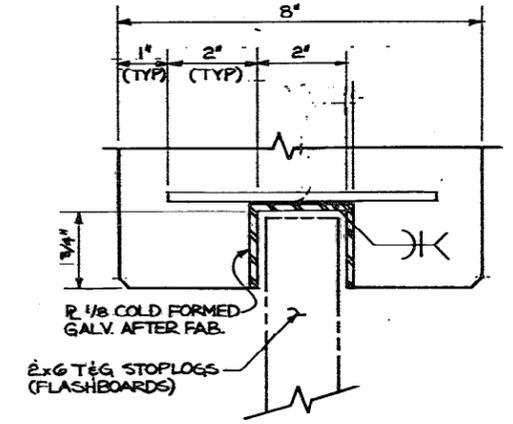
SECTION
 3" = 1'-0" ③/5



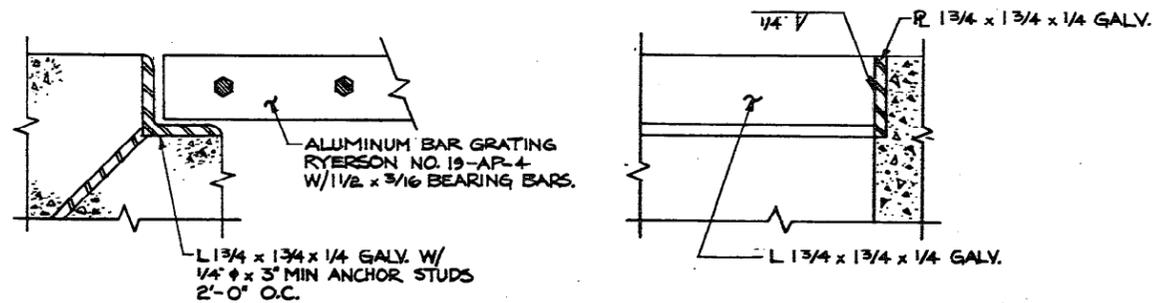
SECTION
 3" = 1'-0" ③/5



SH.	STRUCTURE	LENGTH	NO. REQ'D
3	SPRING INTAKE	5'-0"	1 PAIR



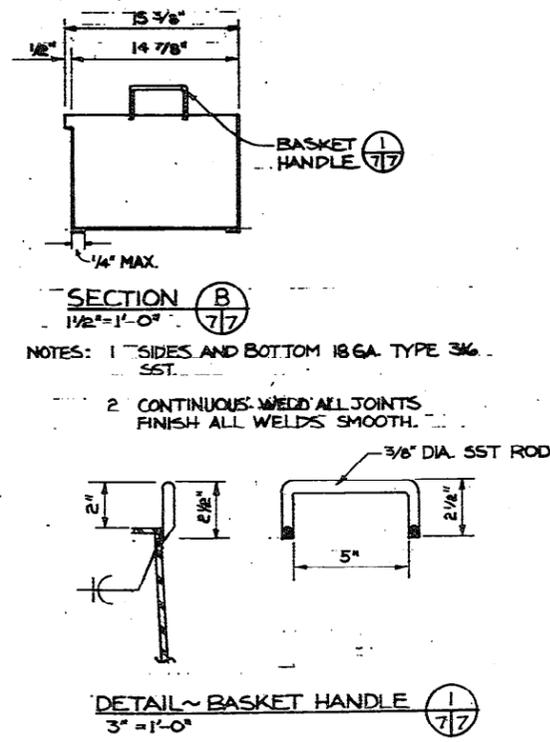
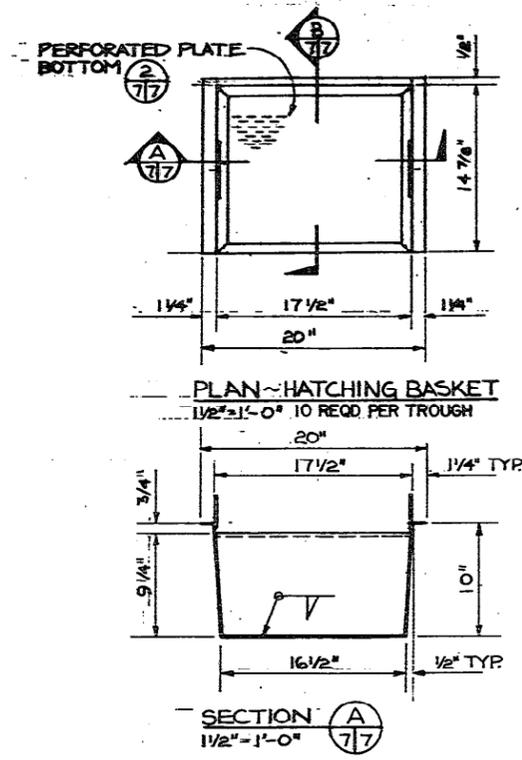
DETAIL ~ FLASHBOARD GUIDE ④
 1/2" = 1'-0" ③/5



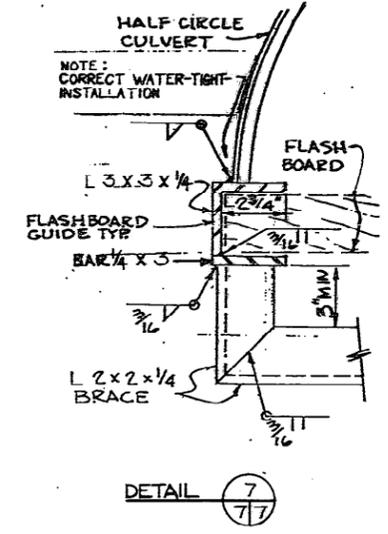
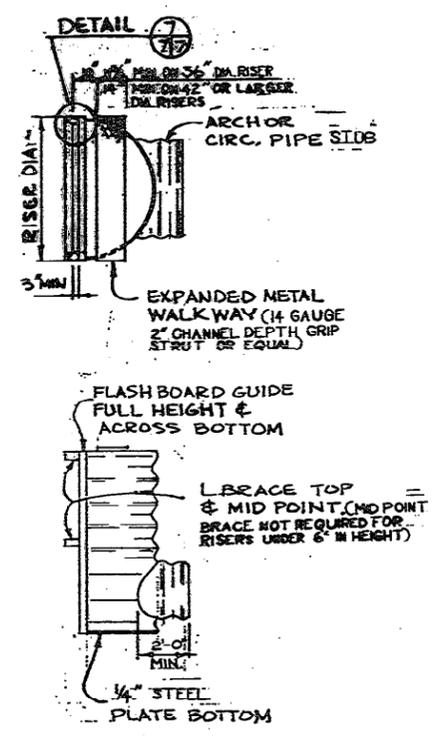
DETAIL
 1/2" SCALE ⑤/5

DETAIL
 1/2" SCALE ⑥/5

REVISION	DATE	DESCRIPTION	BY
NEZ PERCE INDIAN RESERVATION			
OLD HATCHERY SPRINGS HATCHERY MISC. METALS			
JLC	GW	JUN 80	IF-MISC-250-5,0

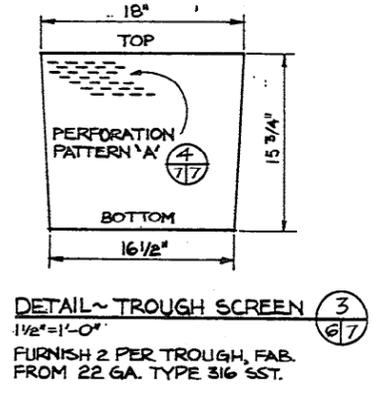
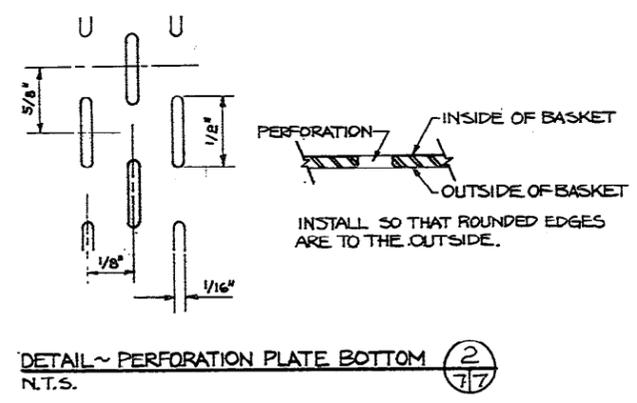


NOTES: 1 SIDES AND BOTTOM 18 GA. TYPE 316 SST.
2 CONTINUOUS WELDS ALL JOINTS FINISH ALL WELDS SMOOTH.

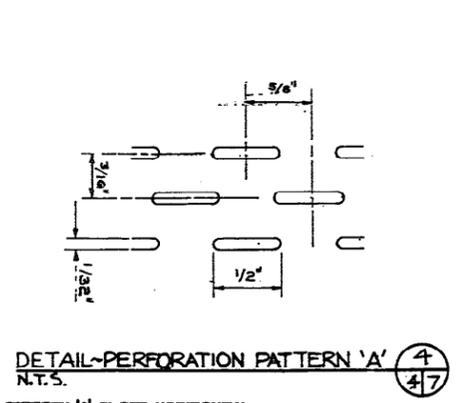
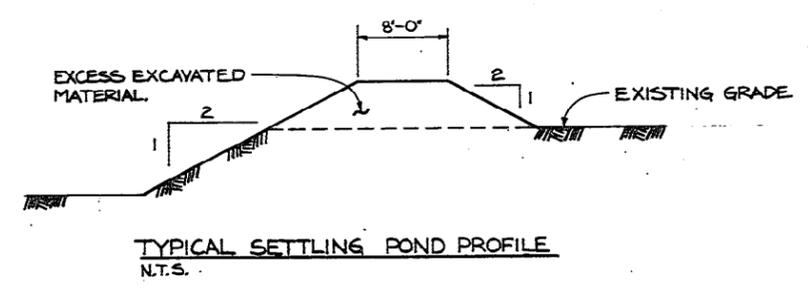


NOTE: CORRECT WATER-TIGHT INSTALLATION

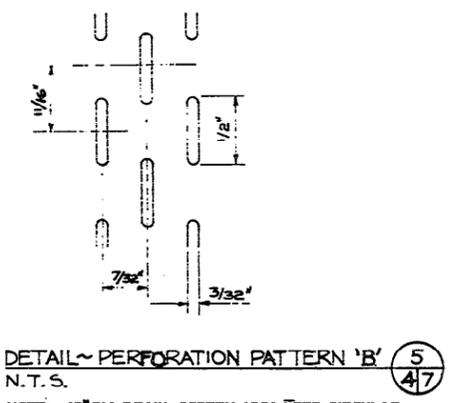
NOTES: 1 A FORMED 1/4" THICK CHANNEL MAY BE SUBSTITUTED FOR THE WELDED FLASHBOARD GUIDE SHOWN ABOVE.
2 FURNISH 3x6 T&G WESTERN RED CEDAR FLASHBOARDS FOR FULL HEIGHT OF GUIDE.



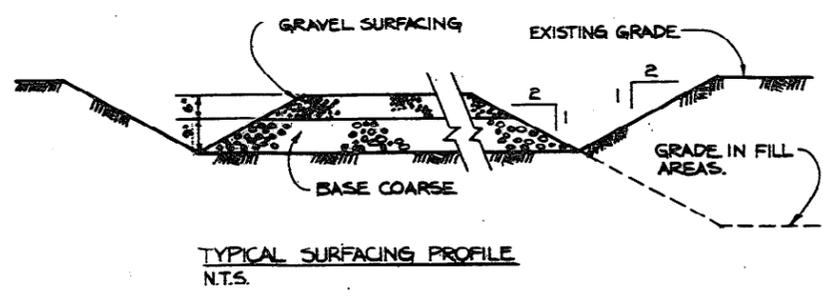
FURNISH 2 PER TROUGH, FAB. FROM 22 GA. TYPE 316 SST.



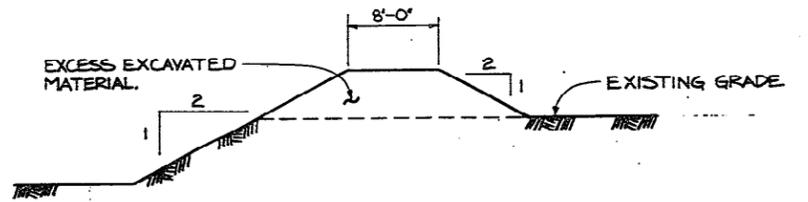
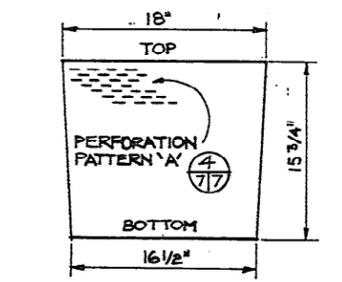
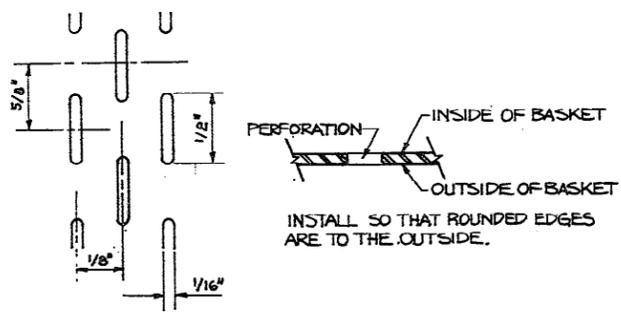
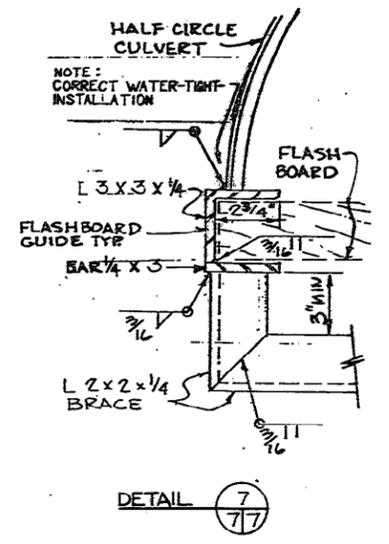
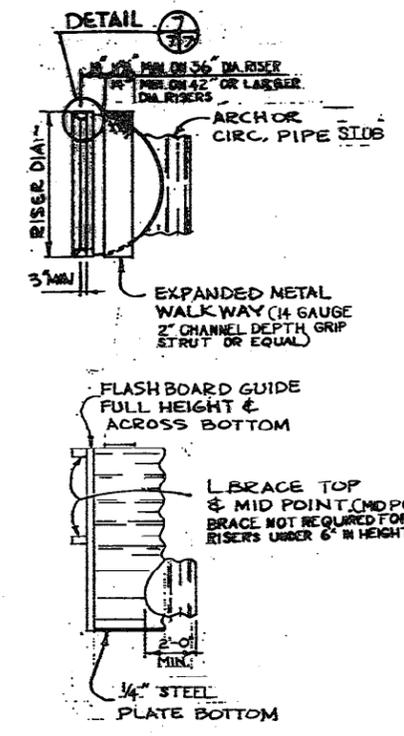
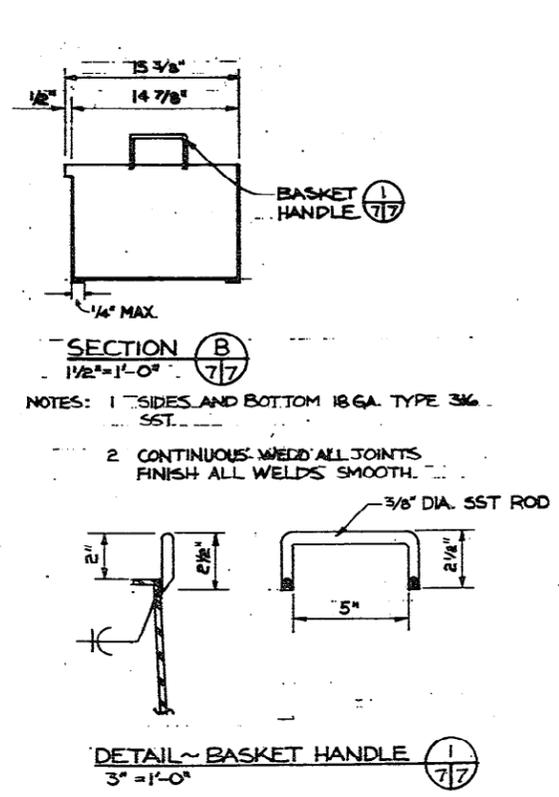
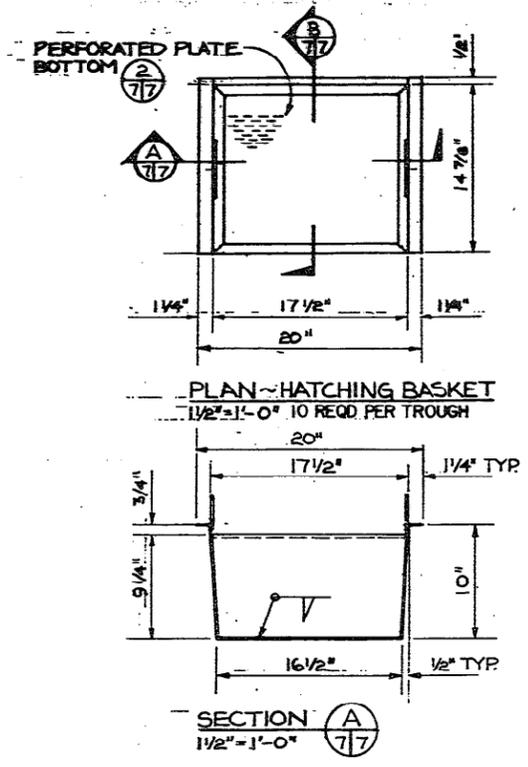
NOTES: 1 ALL PATTERN 'A' SLOTS HORIZONTAL.
2 FURNISH 1 ONLY PATTERN 'A' 12" DIA 22 GA DRAIN SCREEN.



NOTE: 12" DIA DRAIN SCREEN 18 GA TYP PER CIRCULAR POND W/SLOTS VERTICLE.



NO.	DATE	DESCRIPTION	BY
NEZ PERCE INDIAN RESERVATION			
OLD HATCHERY SPRINGS HATCHERY MISC. DETAILS			
JLC	EW	JUN 80	IF-MISC-250-7.0

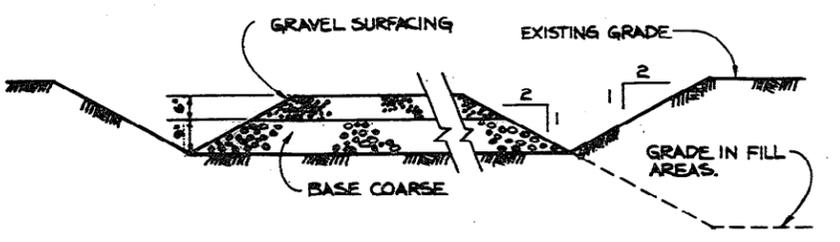
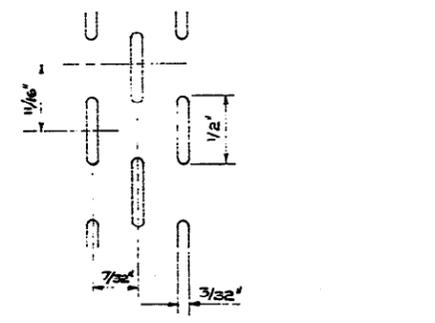
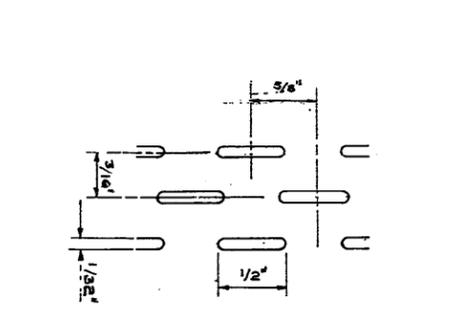


DETAIL ~ PERFORATION PLATE BOTTOM (2) N.T.S.

DETAIL ~ TROUGH SCREEN (3) 1 1/2" = 1'-0" FURNISH 2 PER TROUGH, FAB. FROM 22 GA. TYPE 316 SST.

PLAN, ELEVATION ~ FLASHBOARD RISER (6) N.T.S.

NOTES: 1 A FORMED 1/4" THICK CHANNEL MAY BE SUBSTITUTED FOR THE WELDED FLASHBOARD GUIDE SHOWN ABOVE. 2 FURNISH 3x6 T&G WESTERN RED CEDAR FLASHBOARDS FOR FULL HEIGHT OF GUIDE.



DETAIL ~ PERFORATION PATTERN 'A' (4) N.T.S.

DETAIL ~ PERFORATION PATTERN 'B' (5) N.T.S.

TYPICAL SURFACING PROFILE N.T.S.

NOTES: 1 ALL PATTERN 'A' SLOTS HORIZONTAL. 2 FURNISH 1 ONLY PATTERN 'A' 12" DIA 22 GA DRAIN SCREEN.

NOTE: 12" DIA DRAIN SCREEN 18GA TYP PER CIRCULAR POND W/SLOTS VERTICLE.

REVISION	DATE	DESCRIPTION	BY
NEZ PERCE INDIAN RESERVATION			
OLD MATCHERY SPRINGS MATCHERY MISC. DETAILS			
J.C.	BW	JUN 80	IF-MISC-250-70

1B.02 Coordination of Documents Governing the Work

- a. The standard Government forms, specifications, associated plans, general and supplemental provisions, and supplemental agreements, made a part of the contract are essential parts thereof and the requirements in one are as binding as though contained in all. They are intended to be mutually supplementary to describe and provide for a complete work.
- b. All discrepancies in the drawings shall be brought to the attention of the Engineer for resolution. Blueprints shall not be scaled to obtain missing or conflicting dimensions. The Contractor shall keep a check on dimensions and details as the work progresses and any errors or discrepancies discovered shall be promptly reported to the Engineer.
- c. In cases of conflict between plans, specifications, special provisions, supplemental agreements and provisions of Standard Government Forms, the provisions of Standard Government Forms shall govern. In all cases of dispute in respect to such conflict or as to what part or parts of the specifications apply to any given parts of the work, decisions shall be made by the Contracting Officer.

1B.03 Copies of Drawings and Specifications

- a. When reduced size drawings are furnished with the Invitation for Bids, 2 sets of full size prints will be furnished by the Contracting Officer at the request of Bidders.
- b. Full size prints shall be used for construction. The Contractor will be furnished with a reasonable number of additional copies of the drawings and specifications he may require to carry on the work in a satisfactory manner.

1c. SUBMITTALS

1C.01 Equipment, Materials and Components

- a. All equipment, materials and components furnished by the Contractor shall be stock models for which parts are readily available and shall be products which shall have performed satisfactorily in an installation independent of the manufacturer's facilities for a consecutive period of not less than 2 years as of the date of the bid opening.
- b. Any item which the Contractor proposes to furnish as equal to item specified shall be submitted for approval following the instructions below.

1C.02 Submittal Procedure

- a. All submittals shall be made utilizing the Government furnished Submittal Form RI-67 which shall be used as the document for approving or disapproving the material. Written approval must be obtained from the Government before items are installed. Submittals not in accordance with the plans and specifications shall be accompanied by a written statement indicating in detail all parts which deviate from the plans and specifications.
- b. All submittals shall be made to the Engineer by the Contractor Only. Submittals received by the Engineer without the Contractor's signature

shall be returned to the Contractor without action.

c. Literature, shop drawings, etc., fully describing the items which the Contractor proposes to install shall be submitted in 5 copies. Material or finish samples shall be submitted in 3 sets. Items submitted shall be plainly marked to indicate which options, models, etc. are proposed.

1C.03 Required Submittals

a. **Construction Schedule.** The Contractor shall furnish the Engineer his proposed work schedule within 15 days after award of contract. He shall also advise the Engineer of revisions of the schedule as modifications may become necessary, or as may be required after commencement of work. Such outlines and revisions shall be in sufficient detail to enable the Engineer to judge as to the adequacy of the Contractor's operations and to anticipate such conditions as may tend to impair or retard the progress and completion of the work.

b. The Contractor shall send submittals for the following items to the Regional Engineer for approval prior to installation:

Concrete Material	Misc. Metals
Piping Layout and Materials	Rearing Ponds
Embedded Metals Items	Rebar Schedule & Placement Drawing
Fencing	Hardware
Grating	Slide Gates
Incubators	
Valves	
Hatching Troughs	

1D. CONSTRUCTION SUPPORT

1D.01 Utility Services and Construction Support Facilities

The Contractor shall furnish all facilities and utilities needed for his operations under this contract, including all temporary heat, light, power, water, telephone, sanitary facilities and job offices and shops.

1D.02 Access to Site

Access to the work from existing roads shall be provided by the Contractor at his own expense. The Government assumes no responsibility for the condition or maintenance of any road or structure thereon that may be used by the Contractor in performing the work under these specifications or in traveling to and from the site of the work. No payment will be made to the Contractor by the Government for any work done in improving, repairing, or maintaining any road or structure thereon for use in the performance of the work under these specifications. Roads subject to interference by the work shall be kept open.

1D.03 Protection of Property

The Contractor shall not enter upon private property for any purpose without first obtaining permission from the owner or his duly authorized representative, shall be responsible for the preservation of all public and private property along and adjacent to work contemplated under the contract, and shall use every precaution necessary to prevent damage or

injury thereto. He shall exercise due care in preventing, and shall be responsible for damages to structures of all kinds, whether owned by the Government or privately, and shall protect from disturbance or damage all land monuments until they have been properly referenced by the Engineer.

1D.04 Rights of Way

The sites necessary for the installation of machinery, camp grounds, and works to be constructed, and for Government furnished borrow pits, required channels, ditches and spoil banks, will be provided by the Government. Days under which work is prevented by failure to furnish necessary right of way under the initial sentence of this paragraph will not be counted against the Contractor as delay in completion of the contract, and the time stipulated for completion of work will be increased by the number of calendar days of any delay so caused. In event of failure to obtain right of way for all or any portion of the work by the time construction has progressed thereto, the Contracting Officer shall have the right to omit such work or portion of such work.

1D.05 Operations and Storage Areas

All operations of the Contractor (including storage of materials) upon Government premises shall be confined to areas authorized or approved by the Contracting Officer. Government premises adjacent to the construction will be made available for use by the Contractor without cost whenever such use will not interfere with other Government uses or purposes. The Contractor shall be liable for any and all damages caused by him to such Government premises and shall at all times protect and preserve all materials, supplies, and equipment of every description and all work performed.

1D.06 Protection of Environment

- a. All contract operations shall be conducted within compliance of all federal, state and local environmental laws and regulations. This condition applies to, but is not limited to, laws and regulations governing noise levels and air and water quality standards.
- b. If the Contractor fails or refuses to promptly comply with the requirements of subparagraph above, the Contracting Officer or his authorized representative, shall notify the Contractor of any noncompliance and indicate to the Contractor the action to be taken. The Contractor shall, after receipt of such notice, immediately correct the conditions to which attention has been directed. Such notice, either oral or written, when served on the Contractor or his representative(s) at the site of the work, shall be deemed sufficient.
- c. In the event the Contractor fails or refuses to promptly comply with the compliance directive issued under subparagraph above, the Contracting Officer may issue an order to suspend all or any part of the work.
- d. When satisfactory corrective action is taken, an order to resume work will be issued. The Contractor shall not be entitled to any extension of time, nor to any claim for damage or to excess costs by reason of either the directive or the suspension order.

1D.07 Additional Safety Requirement

In addition to the Safety and Health requirements of the General Provisions, Clause 37, roll-over protection and seat belts required by 29 CFR 1926 shall be extended to include equipment regardless of year of manufacture.

1E. CONTRACT ADMINISTRATION

1E.01 Authority of the Engineer

- a. The Engineer, as the Contracting Officer's representative, shall decide any and all questions which may arise as to the quality and acceptability of materials furnished and work performed, the manner of performance and the rate of progress, interpretation of the plans and specifications, and acceptable fulfillment of the terms of the contract.
- b. The Engineer may suspend the work by written order only for such period or periods as are necessary because of extended unsuitable weather or for such other site conditions as may be unfavorable for the prosecution of the work. Upon suspension the work shall be put in satisfactory condition and properly protected, as directed by the Engineer. The work shall not be resumed until permitted by written order of the Engineer. Extensions of time will be allowed as provided in Clause 5(d) of the General Provisions of Standard Form 23A or 2(b) of Standard Form 19, whichever is applicable, however, no additional compensation or adjustment in contract price will be allowed by reason of this work suspension. This extension of time shall not release the Contractor and his sureties from their general obligations under the contract and performance bond.

1E.02 Authority of Inspectors

- a. Inspectors employed by the Government will assist the Engineer in making all necessary inspections and measurements and will enforce a strict compliance with the terms of the contract and the orders of the Engineer. No decisions or instructions of an Inspector will at any time relieve the Contractor from the responsibility of complying fully with all the requirements of the contract. In cases of difference arising between an Inspector and the Contractor or his agent, appeal shall be taken to the Engineer.
- b. Inspectors are not authorized to waive or alter in any respect any of the terms or requirements of the contract, to make additional requirements, to grant extensions of time or delays, or to waive forfeitures. The Contractor shall not be entitled to payment for any work improperly performed with or without an Inspector's approval.

1E.03 Performance of Work by Contractor

- a. The Contractor's procedure and methods of construction may, in general, be of his own choosing, provided they follow best general practice and are calculated to secure results which will satisfy the requirements of these specifications.
- b. The Contractor shall furnish the Engineer all reasonable facilities for obtaining such information as he may desire respecting the character of the materials and the progress of the work. The Contractor shall furnish information to include the number of men employed, their pay, the time they worked, and other elements of cost at the request of the Engineer.

1E.04 Payments

Payments for work performed by the Contractor shall be made in accordance with the provisions of Clause 7 of the General Provisions of Standard Form 23A or Clause 6 of Standard Form 19, whichever is applicable.

1E.05 Payments for Change Orders

a. Payments for work performed under any change order or extra work order issued pursuant to the provisions of Section 3 of the General Provisions, will be made on the basis of unit prices stated in the contract where applicable. Whenever the schedule of unit prices in the contract does not apply to any items authorized and directed in a change order such items of work shall be paid for at a price agreed upon in writing between the parties to the contract before such work is done, or, in the event of failure of the parties to agree, on the basis of force account in the following manner:

(1) For all labor, and foremen in direct charge of the specified operation, the Contractor shall receive the current local rate of wage and the cost of the employer's liability insurance, social security taxes, etc., to be agreed upon in writing before starting the work, to which shall be added an amount equal to 15 percent of the sum thereof. No allowance shall be made for general superintendence and the use of small tools and ordinary equipment.

(2) For all materials used, the Contractor shall receive the actual cost of such materials, including transportation charges, to which cost shall be added a sum equal to 15 percent thereof.

(3) For any machine-power tools or special equipment, including pertinent fuel and lubricants, which it may be deemed necessary or desirable to use, the Contracting Officer shall allow the Contractor a reasonable rental price, to be agreed upon in writing before any work is begun, for the time that such tools or equipment are in use on the work, and to which sum no percentage shall be added.

b. The compensation as herein provided shall be received by the Contractor as payment for work done on a force-account basis. The Contractor's representative and the Inspector shall compare records of work done on a force-account basis at the end of each day. Copies of these reports shall be made upon suitable forms provided for this purpose, and signed by both the Inspector and the Contractor's representative, one copy being forwarded to the Engineer and one to the Contractor. All claims for work done on a force-account basis shall be submitted to the Engineer by the Contractor upon certified statements, and such statements shall be filed not later than the tenth day of the month following that in which the work was actually performed.

F. CONTRACT COMPLETION

IF.01 Cleaning Up

a. Rubbish shall not be allowed to accumulate on the site and the Contractor shall collect and remove, from time to time, such rubbish and debris incident to the execution of the contract as, in the opinion of the Engineer may be undesirable or disfiguring on the premises.

b. Upon completion of the work, the Contractor shall remove from the vicinity thereof all plant, buildings, unused materials, concrete forms, rubbish, and other materials belonging to him or used under his direction during construction, sweep the floors broom clean, clean all window lights, etc., as may be required by the Engineer, and in case of his failure to do so, the same may be removed by the Government at the expense of the Contractor and the Contractor and his surety shall be liable therefor.

1F.02 Final Inspection

The Contractor shall notify the Engineer at least 10 days prior to the anticipated date of completion of all work specified in the contract. Upon completion of the work, the Engineer shall proceed with final inspection and shall complete such inspection as promptly as practicable. The time required for such inspection and the making of any corrections as a result thereof shall be included in the contract performance time.

1F.03 Acceptance and Final Payment-

Final acceptance is the allowance of final estimates by the Contracting Officer. The Engineer shall certify to the Contracting Officer that the contract is complete and include the amount of the final payment due the Contractor. All progress or partial payments made prior to the final payment are subject to correction in the final estimate and payment.

1F.04 Release of Claims

After completion of work, and prior to final payment, the Contractor shall furnish to the Contracting Officer a release of claims Form DI-137, properly executed by the Contractor, against the United States arising out of the contract, other than claims specifically excepted from the operation of the release.

1F.05 Termination of Responsibility of Contractor

The contract shall be considered as completed after all work contemplated therein has been accepted and final estimates therefore have been allowed and paid, and the Contractor shall be considered as released from all further obligations and responsibility thereunder except as to the conditions and requirements set forth in the performance bond and payment bond.

DIVISION 2. SITE WORK

2A. DEMOLITION AND REMOVAL OF EXISTING STRUCTURES

2A.01 General

Existing structures to be demolished and/or removed include a concrete weir, 170 ft. of barbed wire fence and 120 ft. of concrete rearing pond. All structures not designated to be removed shall remain and be protected by the Contractor. Any damage to the structures to remain shall be repaired by the Contractor at no additional cost to the Government. All materials resulting from demolition shall become the property of the Contractor and shall be removed from the site. Broken concrete may be used as riprap as specified in Division 2G or may be used as fill material as specified in Division 20.01.

2A.02 Limits of Removal

29.02a. BELOW ROADS AND PARKING AREAS

All concrete and timber to be removed which is not more than 2 ft. below subgrade elevation shall be removed. Subgrade elevation is defined as the bottom of the gravel surfacing.

2A.02b. BELOW LANDSCAPED AND UNSURFACED AREAS

All concrete and timber to be removed which is not more than 12 in. below finished grade shall be removed.

2A.02c. BELOW NEW STRUCTURES AND PIPELINES

All concrete and timber to be removed which is not more than 6 in. below the bottom surface of the structure or pipe shall be removed.

2A.02d. BESIDE NEW STRUCTURES AND PIPELINES

All concrete and timber to be removed which is within 2 ft. of the structure or pipe shall be removed.

2B. CLEARING AND GRUBBING

2B.01 General

All trees with trunk diameter 6 in. or more in diameter shall be saved unless specifically designated for removal. All debris resulting from clearing and grubbing shall be burned or disposed of off the site. Burying of the debris will not be allowed. All trees and shrubs outside the limits of clearing and grubbing designated below shall be protected from damage by the Contractor.

2B.02 Limits of Clearing and Grubbing

2B.02a. SURFACED AREAS

All areas to be surfaced and within 2 ft. of the surface edge shall be

cleared and grubbed of all trees, shrubs, stumps, roots and other perishable matter except sound undisturbed stumps and roots may remain as permitted in Division 2B.02b.

2B.02b. FILLED AREAS

All areas to receive more than 6 in. of fill shall be cleared and grubbed of all trees, shrubs, stumps, roots and other perishable matter except sound undisturbed stumps and roots that will be more than 3 ft. below the slope of embankments or subgrade may remain. Subgrade is defined as the bottom of the gravel base or concrete.

2B.02c. BUILDINGS AND STRUCTURES

All areas within 5 ft. of new buildings and structures shall be cleared and grubbed of all trees, shrubs, stumps, roots and other perishable matter except trees and shrubs designated to remain. Sound undisturbed stumps and roots may remain as permitted in Division 2B.02b.

2B.02d. PIPELINES

All areas within 2 ft. on either side of the outside of pipelines shall be cleared and grubbed of all trees, shrubs, stumps, roots and other perishable matter. Where pipelines are to be placed in filled areas, sound undisturbed stumps may remain as permitted in Division 2B.02b provided they are cut off 6 inches or more below the bottom of the pipe.

2c. EXCAVATION

2C.01 General

The Contractor shall perform all excavation, grading and compacting necessary for and properly incidental to the completion of the work.

The Contractor shall be responsible for dewatering work areas and no extra payment will be made for water encountered in any excavation or other work area. Water removed from the excavations and other work areas shall not be allowed to flow into the creek if it will increase the turbidity in the creek.

Material obtained from excavation which meets the fill and backfill specifications shall be used in the required fills and backfills. Excess and/or unsuitable material shall be removed from the site or disposed of in the areas designated by the Government.

2C.02 Structural Excavation

Structural excavations include excavations required for footings, slabs and manholes.

The bottom of excavations shall be within plus or minus 0.1 ft. of the elevations shown on the drawings.

The bottom of all structural excavations shall be cleaned to remove all rocks over 1 in. diameter and loosened soil. Cleaning shall be accomplished

immediately prior to placing gravel base or concrete. Gravel base where required shall be as specified for pipe bedding in Division 2D.02a.

Excavations carried below the required depths shall be refilled with gravel base material, placed and compacted all as specified for structural fill and backfill in Division 2D.03.

2C.03 Trench Excavation

This section is applicable to excavations required for the placement of all underground pipes, conduits and cables.

The trench shall be excavated to permit placement of the pipe, conduit, or cable to the alignment and grade shown on the drawings or specified. Excavation depth shall include an allowance for the required bedding and the trench bottom shall be cleaned of all loosened soil and rocks. The shape and dimension of the trench shall be as shown. Where not shown the shape and dimension of the trench shall afford at least 1 ft. on each side of pipes 3 in. to and including pipes 36 in. diameter, and 2 ft. total width of pipes smaller than 3 in., for doing all necessary work around and beneath the pipe, for inspection after laying and for thoroughly tamping the backfill without injury to the pipe or coating. If, without written authorization, the pipe trench is excavated below the required depth, it shall be backfilled at the Contractor's expense with bedding material specified in Division 2D.02a.

The Contractor shall provide shoring, signs, barricades, etc., in accordance with OSHA (Occupational Safety and Health Standards), and shall maintain traffic where trenches cross roads.

2c.04 Other Excavations-

Other excavations include all excavations required to construct roads, parking areas, ditches, etc. The bottom of these excavations shall be within plus 0.1 ft. of the elevations shown with an allowance for the required surfacing material.

2D. FILLING AND BACKFILLING

2D.01 General

References in these specifications to percentages of the maximum density are percentages of the maximum density as defined and determined by AASHTO T180, Method D. All materials requiring compaction to minimum densities expressed as a percentage of the relative maximum density shall be tested in accordance with AASHTO T180, Method D. Tests shall be run by an independent testing laboratory selected by the Contractor and approved by the Engineer. The Contractor shall pay all costs for testing.

All fill and backfill shall be placed only in the presence of the Inspector. Fill and backfill material shall be earth or gravelly material free of refuse, vegetable matter or roots over 1 in. in diameter and rocks over 6 in. in diameter except larger rocks will be permitted in the deep

fills when placed as specified below for broken concrete. All temporary planking, timber, etc., shall be removed as the backfill is placed. All fill and backfill (except Pipeline Backfill and Structural Fill and Backfill, found in Division 2D.02 and 20.03, respectively) shall be placed in layers not exceeding 12 in. loose depth. Before adding succeeding layers, each layer shall be compacted to a minimum density of 85% relative maximum density. Broken concrete shall have all rebars cut reasonably flush and shall be placed in the fill areas in a manner that will allow compaction of soil, around the concrete pieces. No broken concrete shall be placed within 12 in. of subgrade.

2D.02 Pipeline Backfill

2D.02a. GENERAL

The word pipeline shall include all underground pipes, conduits and cables.

Trenches shall not be backfilled until the Inspector has determined that installation and testing requirements have been met. Backfill shall be brought up evenly on both sides of the pipe to avoid lateral displacement of the pipe or damage to the joints. Insofar as permitted by Division 15D. TESTING, pipelines shall be backfilled on the same day the pipe is laid to prevent displacement.

All pipelines shall be bedded. Minimum thickness of the bedding layer under the pipelines shall be 6 in. Bedding material shall be furnished by the Contractor and shall meet the following gradation.

<u>Screen or Sieve Size</u>	<u>Percent Passing by Weight</u>
1-1/2 in.	100
1/2 in.	Not less than 40
No. 100	Not more than 10

In addition to meeting the above gradation, all bedding for plastic pipe, asbestos cement pipe (except perforated asbestos cement pipe), direct burial cable and coated and wrapped steel pipe shall pass a 1/4 in. sieve.

The Contractor may use excavated material for bedding if it meets the aforementioned gradation or he may at his option process excavated material to meet the required gradation.

Backfill shall be placed only in the presence of the Inspector. Compaction of pipeline backfill to 1 ft. over the top of the pipes shall be with hand-operated compaction equipment.

Material as specified for bedding shall be placed along both sides of the pipe in layers not exceeding 6 in. loose depth. Before placing succeeding layers, each layer shall be compacted to the minimum density of 85 relative maximum density. Backfilling and compacting in 6 in. layers shall continue until 1 ft. of cover has been placed over the top of the pipe. Remaining backfill may be placed in accordance with Division 2D.01. Backfilling with bedding material will be required to

1 ft. over the top of coated and wrapped steel pipes, plastic pipes, asbestos cement pipes and direct burial cables and to the springline for all other pipes. Backfill material from the springline to 1 ft. over the top of pipes other than plastic, coated and wrapped steel pipe, asbestos cement pipe and direct burial cable shall be granular material free of rocks over 2 in. in diameter.

2D.02b. PIPELINES UNDER CONCRETE SLABS

Material as specified for bedding in Division 2D.02a shall be placed along both sides of the pipe in layers not exceeding 6 in. Before placing succeeding layers, each layer shall be compacted to a minimum density of 90% relative maximum density. Backfilling with bedding material shall be extended to the top of the pipeline excavation.

2D.02c. PIPELINES PASSING BELOW OTHER PIPELINES

Pipelines passing below other pipelines shall be backfilled as specified for "Pipelines Under Concrete Slabs". Any backfill below a slope of 2:1 (horizontal to vertical), drawn from the top of the upper pipe, shall be considered as being below the upper pipe.

2D.02d. PIPELINES UNDER BLACKTOPPED AND GRAVEL SURFACED AREAS

Material as specified for bedding and backfill shall be placed and compacted as specified Division 2D.02a except that all backfill shall be placed and compacted to 90% relative maximum density. Placing and compacting shall be done in 6 in. layers.

2D.03 Structural Fill and Backfill

All fill and backfill within 3 ft. of all structures and buildings shall be defined as structural fill or backfill. Structural fill and backfill material shall be as specified in Division 2D.01. Structural fill and backfill shall be placed in layers not exceeding 6 in. loose depth. Before adding succeeding layers, each layer shall be compacted to the minimum density of 95% relative maximum density. Compaction of structural fill and backfill shall be with hand-operated compaction equipment.

Where backfill is to be placed against both sides of concrete walls, the backfill shall be brought up evenly on both sides of the wall.

No backfill shall be placed against one side of concrete walls until the concrete has developed sufficient strength to resist the loading imposed by the backfill. Any abutting concrete walls or beams shall also have attained sufficient strength. In any case, the backfill placement shall not exceed the following schedule:

<u>Age of Concrete</u>	<u>Backfill Depth</u>
72 hours	1/3 wall height
7 days	2/3 wall height
21 days	Full wall height

Any deviations from this schedule must be approved in writing by the Engineer,

2E. CULVERTS AND RISERS

2E.01 Materials

2E.01a. CORRUGATED METAL PIPE AND COUPLINGS

Corrugated metal pipes shall be size, gage and length shown on the drawings. Pipe shall be in accordance with AASHTO M 36 bituminous coated in accordance with AASHTO M 190, Type A. Bituminous coating is not required for couplings.

2E.01b. CORRUGATED STEEL FLASHBOARD RISERS

Zinc and bituminous coated Type II corrugated steel pipe flashboard riser with 1/2 in. by 2-1/4 in. to 2-3/4 in. annular corrugations, Class I, Series A, Shape 1, Coating A, conforming to Federal Specifications WW P-4058 dated June 14, 1974 with Amendment 1 dated May 8, 1976 complete with zinc and bituminous coated steel bottom plate, flashboard guides and braces, packaging and packing level C. Structural steel shall be galvanized or black painted with two coats of zinc dust - zinc oxide primer prior to application of the bituminous coating. The stub invert shall be a maximum of 3 in. above the bottom of the riser and flashboard guides. The bottom of the riser is to be capped with a 10 gauge flat plate. Flashboard guides to be full height and across the bottom as detailed, except that riser diameters greater than 48 in. shall also have a center flashboard guide. 2 in. x 2-1/4 in. angles shall be welded to the top and midpoint (midpoint brace not required for risers under 6 ft. in height) of the riser guides for bracing to provide approximately 3 in. clearance between the brace and the stop log guides.

2E.02 Installation

Excavation shall be in accordance with Division 2C and bedding, backfill and fill shall be in accordance with Division D.

2F. PILING

Sheet piling shall be lightweight 12 gage galvanized steel sheet piling with minimum section modulus of 1.7 in.³ per ft. of width equal to Armo Metric Sheeting.

Salvaged steel piling may be used provided it meets the following requirements: (1) pieces shall be straight; (2) interlocking joint edges shall be intact; (3) minimum thickness of sound uncorroded metal shall be 12 gauge (0.1046 in. measured at bottom of rust or pitting, bright metal and bright metal surfaces; (4) without holes, welded patches will be permitted; and (5) full length or welded splices only for driving depth required. Sheet piling may be furnished in more than one pattern provided interlocking edges are compatible.

Piling shall be driven with a drop hammer, pneumatic or steam pile driver by progressive driving taking care to protect the top. Misalignment of piling shall not exceed six inches from true line as shown on the drawings. Piling outside the alignment limits shall be withdrawn and redriven within alignment limits. Concrete slabs shall be enlarged

including the barbed wire). Shop drawings showing all material and installation details shall be submitted for approval before ordering any materials.

21.02 Materials

21.02a. CHAIN LINK FABRIC

Fabric shall be 9 gauge, 2 inch mesh galvanized coated steel per ASTM A-392 1.2 ounce coating. Tensile strength to be 80,000 psi minimum Top of fabric shall have twisted and barbed selvages.

21.02b. BARBED WIRE

Barbed wire shall be two strands of twisted 12-1/2 gauge steel with 4 point barbs on 5 inch centers. Coating .30 ounce aluminum or Class 3 Zinc per ASTM A-121.

21.02c. BOTTOM TENSION WIRE

Bottom tension wire shall be 7 gauge coil spring wire with Class 3 Zinc coating (.80 ounce per square feet of wire surface).

21.02d. TOP AND BRACE RAILS

Rails shall be 1-1/2 in. schedule 40 galvanized seamless steel pipe complying with ASTM A-120 or 1-5/8 in. by 1-1/4 in. roll formed section with minimum yeild stress of 45,000 psi and a minimum section modulus of .165 in.³. Rails to have 2 ounce zinc coating PSF of surface.

21.02e. LINE POSTS

Posts shall be 2 in. schedule 40 galvanized seamless steel pipe complying with ASTM A-120 or 1-7/8 in. by 1-5/8 in. roll formed "C" section with minimum yeild stress of 45,000 psi and a minimum section modulus of .395 in.³ perpendicular to fence lines. Posts to have a 2 ounce zinc coating PSF of surface.

21.02f. END, CORNER, AND PULL POSTS

Posts shall be 2-1/2 in. schedule 40 galvanized seamless steel pipe complying with ASTM A-120 or 3-1/2 in. by 3-1/2 in. roll formed section with minimum yeild stress of 35,000 psi and minimum section modulus of 1,000 in.³. Posts for swing gates shall be in accordance with the following gate leaf widths:

Up to 6' - 2-1/2 in. schedule 40 galvanized seamless steel pipe or 3-1/2 x 3-1/2 roll formed section as specified above.

Over 6' to 13' - 3-1/2 in. schedule 40 galvanized seamless steel pipe.

Over 13' to 18' - 6 in. schedule 40 galvanized seamless steel pipe.

Over 18' - 8 in. schedule 40 galvanized seamless steel pipe.

where necessary to provide minimum concrete thickness of 4 in. outside piling. In all cases, the piling shall be driven to the depth shown or deeper.

In lieu of sheet piling, 6 in. thick concrete cutoff walls may be placed at the Contractor's option. The wall shall be to the depths shown for piling, reinforced with No. 4 rebar 12 in. on center each way. Concrete shall be in accordance with Division 3. Concrete.

2G. RIPRAP

Riprap stone shall be hard and durable and shall weigh not less than 155 lbs. per cu. ft. (specific gravity not less than 2.5). Soft or disintegrated rock will not be allowed. Riprap shall consist of individual stones weighing more than 25 lbs. and at least 50% weighing not less than 100 lbs. each.

The Contractor may obtain riprap material from required excavations, or other approved source.

Riprap layer shall be to the thickness shown. Riprap shall be placed by dropping the rocks into place and shall be arranged so that rock sizes are intermixed using the small sizes to fill the spaces between the larger stones.

2H. GRADING AND SURFACING

2H 01 Grading

All areas to be filled or excavated shall be graded to the finished contours shown within a tolerance of 0.1 ft. and with an allowance for the thickness of the surfacing materials. Edges of graded areas shall be blended to adjacent contours. Disposal areas shall be graded smooth, sloped to drain and blended to adjacent contours.

2H 02 Surfacing

All disturbed areas with an existing gravel surface and all areas to receive new surfacing shall be surfaced with a 9 in. layer of Road Mix Aggregate. Aggregate shall be in accordance with Section 703.04 of Idaho Standard Specifications For Highway Construction. Aggregate shall be spread in two layers. Bottom layer shall be 9 in. thick, size 2 in. Top shall be 6 in. thick, size 1 in.

2I. CHAIN LINK FENCE

2I.01 General

Work in this division includes construction of approximately 1135 ft. of chain link fence with 2 gates 30 ft. wide, and 3 gates 3 ft. wide. Fence shall be equal to USS Cyclone Invincible, with 3 rows of barbed wire. Fence shall be 6 ft. high (not including the barbed wire). Shop drawings showing all material and installation details shall be submitted for approval before ordering any materials.

21.029. ACCESSORIES

All accessories except tie wires shall be galvanized to comply with ASTM A-153.

Post tops shall be pressed steel or malleable iron, designed as weather-tight closure caps and to permit the passage of top rail.

Stretcher bars shall be one piece lengths equal to full height of fence fabric with a minimum cross-section of 3/16 in. by 3/4 in. Provide one stretcher bar for each gate and end post and two for each corner or pull post. In lieu of stretcher bars posts may be equipped with integral lock loops formed in the post.

Stretcher bar bands shall be heavy pressed steel or malleable iron spaced not over 15 in. on center with no less than 6 bands per stretcher bar.

Wire ties for tying fabric to line posts and top rail shall be 9 gage aluminum or galvanized steel. Tie spacing shall be 14 in. on center for posts and 24 in. on center for top rail. For tying fabric to tension wire, use 11 gage galvanized hog rings spaced 24 in. on center.

21.02h. GATES

All gates more than 3 ft. wide shall be double leaf type. Gate frames shall be fabricated from 1-1/2 in. galvanized seamless steel pipe complying with ASTM A-120. Additional horizontal, vertical and diagonal members shall be provided to ensure proper gate operation, prevent sag and for attachment of fabric, hardware and accessories.

Gate fabric shall be same as fence fabric. Vertical edges shall be fastened to frame as specified for the fence posts. Top and bottom edges shall be fastened to frame as specified for top rail of fence.

Gate hardware shall be malleable iron or pressed steel galvanized in compliance with ASTM A-153. Hinges shall be non-lift-off-type offset to permit 180" opening. Stops shall be provided for all double leaf gates consisting of a flush plate with anchors set in concrete to engage the center drop rod or plunger bar. Provide a locking device with padlock eyes as an integral part of the latch. Padlock eyes on double leaf gates shall be designed to lock both leaves with one padlock. All gate leaves shall be equipped with keepers to hold the gates in the open position until manually released.

21.02i. CONCRETE

Concrete shall comply with Division 3 of these specifications.

21.03 Installation

Fence installation shall not begin until completion of all grading. Maximum post spacing shall be 10 ft. Post holes shall have minimum diameter of 9 inches and a minimum depth of 3-1/2 ft. with bottom of posts set 3 ft. below ground surface. Posts shall be set plumb and in

proper alignment and grade. Posts shall be held in position during placing and finishing of concrete. Place concrete around posts in a continuous pour and tamp for consolidation. Trowel finish tops of post footings and slope or dome to direct water away from posts. Extend concrete for gate posts to underside of bottom hinge. Set keepers, stops and other accessories into concrete as required.

Install fabric on outside of framing with approximately 2 inches between finish grade and bottom of selvage.

Fabric shall be stretched and anchored to framework so that fabric remains in tension after pulling force is released.

Gates shall be installed plumb and level with hardware adjusted for smooth operation and lubricated where necessary. Ground set items shall be set in concrete as recommended by the manufacturer and to a depth of 3-1/2 ft. below finish grade.

Bend ends of all wire ties to minimize hazard to persons or clothing.

Install nuts, tension band and hardware bolts on side of fence opposite fabric side.

DIVISION 3. CONCRETE WORK

3A. SCOPE

This section covers concrete materials, placement, finish and curing. For excavation and backfill requirements see Division 2. Vapor barrier shall be as specified in Division 7.

3B COMPOSITION

Concrete shall be composed of Portland cement, water, fine and coarse aggregate and an air entraining admixture. Concrete shall contain 5-1/2 sacks of cement per cu. yd. and shall be designed to achieve a minimum of 3,000 psi compressive strength at the age of 28 days. The Contractor shall submit for the Engineer's approval a concrete mixture design certified by an independent testing laboratory for all concrete to be used under this contract.

3c. MATERIALS

3c.01 Cement

Cement shall conform to Federal Specification SS-C-192, Type II, low alkali. Cement will be accepted on the basis of a manufacturer's mill certificate that the cement furnished meets the physical and chemical requirements of the foregoing specification.

3C.02 Water

Water shall be fresh, clean and free from injurious amounts of sewage, oils, solids, alkali, salt or organic matter. The water content of all cement mixtures shall be the minimum necessary to place the mixture being used. The maximum allowable concrete slump at time of concrete placement shall not exceed 4 in.

3c.03 Aggregates

a. Aggregates shall be clean, hard, tough, durable and shall conform to the requirements of Federal Specification SS-A-281. Aggregates will be rejected if the specific gravity is less than 2.60.

b. Fine aggregate shall consist of natural sand, manufactured sand, or a combination of natural and manufactured sand. It shall be uniformly graded from 0 to No. 4 sieve designation to provide a fineness modulus from 2.5 to 3.0. Fine aggregate will be rejected if: (1) deleterious substances such as shale, clay lumps, mica, loam and soft particles exceed 3% by weight; (2) the portion retained on a No. 50 screen shows a weighted average loss of more than 8% by weight when subjected to 5 cycles of Sodium Sulphate test for soundness or 12% loss when subjected to 5 cycles of Magnesium Sulphate; (3) portion passing a No. 100 sieve is 8% or more by weight; or (4) portion passing a No. 200 sieve is 2% or more by weight.

c. Coarse aggregate shall consist of gravel or crushed stone. It shall be uniformly graded from No. 4 to 1-1/2 in. sieve designation (square mesh opening). Coarse aggregate will be rejected if: (1) deleterious

substances such as shale, clay lumps, organic material, soft particles, and material passing No. 200 screen exceed 2% by weight; (2) the L. A. rattler test results in 10% weight loss at 100 revolutions or 40% weight loss at 500 revolutions; (3) the Sodium sulphate test for soundness results in an average weighted loss of more than 10% by weight when subjected to 5 cycles, or 15% loss when subjected to 5 cycles of Magnesium Sulphate; or (4) portion passing a No. 200 sieve is 0.5% or more by weight.

d. The Contractor shall furnish to the Government compliance certification and analysis from an independent testing laboratory for approval of the concrete aggregates to be used. Approval of a source of concrete aggregates is not to be construed as approval of all materials from that source. The right is reserved to reject materials from certain localized areas, zones, strata or channels, when such materials are unsuitable for concrete aggregates as determined by the Engineer.

3c. 04 Forms

See Paragraph 3F.01c for dimensional tolerance.

a. Forms shall be sheathed or lined with plywood or other approved material and shall be true to line and grade. Metal faced or metal pan forms will not be permitted. Form panels shall be clean, free of encrusted grout and coated with a non-staining form oil shortly before concrete is placed. Reinforcing steel and surfaces of construction joints shall be kept clean of form oil and, if necessary, protective coverings may be required during form oiling operations. All oil spots on reinforcing steel and construction joint surfaces shall be removed. Form panels shall be as large as practical to minimize seams and shall not be used when damaged or second ply is exposed on the plywood interior surface. The form shall be substantial and sufficiently tight to prevent leakage of mortar and sufficiently braced and tied so as to maintain specified position and shape.

b. Form ties shall be approved round design or as approved for type of forms used and free from devices that will leave holes or depressions larger than 1-1/4 in. diameter and of a type that when forms are removed they shall leave no metal within 1 in. of finished surfaces. Top row of ties shall be between 3 in. and 12 in. of grade.

c. All exposed exterior corners shall be chamfered 3/4 in. to 1 ft. below finish backfill grade.

d. Forms shall be removed after pouring as early as practical in a manner which will prevent injury to the concrete. Unless otherwise directed, forms, falsework and shoring supporting the weight of the concrete as under beams, slabs, large openings, etc., shall be removed within 7 days and all other form work shall be removed within 24 hours after concrete placement. The Engineer reserves the right to have supports and forms left in place up to 21 days under slabs and beams and up to 72 hours for other form work if weather and curing conditions so warrant. No forms or supports shall be left on the walls, under slabs or in the backfill.

3D. BATCHING AND MIXING

Ready-mixed concrete utilizing approved aggregate shall be used. When a truck mixer is used, each batch of concrete shall be mixed not less than 70 nor more than 100 revolutions at the rate of rotation designated by the manufacturer of the equipment as mixing speed. Mixing shall be performed in the presence of the Inspector at the job site. The air content shall be between 3 and 6 percent of the volume of the concrete.

3E. PLACING

- a. Concrete shall be placed only in the presence of the Inspector, and only when the air temperature is between 40° and 90°F. The Inspector shall be notified of intent to pour 24 hours before pour is to start. All forming shall be completed prior to inspection by the Inspector and before the concrete is ordered.
- b. Adequate cover during expected rainy periods shall be provided for concrete placement protection. Cover materials shall be set up at the job site, ready for installation before concreting is started and shall remain in place until the concrete has set sufficiently to resist any damage to the finish from rainfall.
- c. Concrete shall not be placed on a frozen sub-grade or against any surfaces having deposits of frost or ice. See paragraph 3G.04 for placing concrete on or against existing concrete.
- d. Water shall be removed from within forms and excavations before and during placement of concrete.
- e. Concrete shall be conveyed from mixer to forms as rapidly as possible and deposited as near final position as possible by methods which will prevent segregation or loss of ingredients. Freely dropping concrete vertically a distance of more than 5 ft. or depositing a large quantity at any point and running or working the concrete along the forms will not be permitted. Concrete shall be worked into the corners and angles of the forms and around all reinforcement and embedded items without permitting the materials to segregate. Once started, concrete placement shall be carried on as a continuous operation until the placing of the panel or section is completed. Concrete shall be placed within 30 minutes after the cement has been added if transported in nonagitating equipment, or 90 minutes if transported in agitators, unless otherwise authorized.
- f. Concrete shall be consolidated with the aid of mechanical vibrating equipment supplemented by hand spading and tamping. Vibrating equipment shall be of the internal type and shall at all times be adequate to properly consolidate all concrete.

3F. FINISHING AND CURING

3F.01 Finishing All Concrete

- a. Defective concrete, voids left by the removal of the tie rods, ridges, lips and local bulging on all concrete surfaces shall be repaired immediately after the removal of forms. Unless otherwise authorized by

the Engineer in writing all concrete finishing shall be completed within 48 hours of concrete placement. Voids left by the removal of the tie rods shall be reamed and completely filled with drypacking mortar. Defective concrete shall be repaired by cutting out the unsatisfactory material and replacing with new concrete which shall be secured with keys, dovetails or anchors. All unformed surfaces of concrete shall have a wood float finish, unless otherwise specified, without additional mortar and shall be true to elevation as shown on the drawings. All wall tops shall be steel troweled and edges finished with a 3/8-in. radius edging tool. Every precaution shall be taken by the Contractor to protect the finished surfaces from stains or abrasions. Failure to maintain the concrete finish schedule will be cause for suspension of concrete placement.

b. All concrete slabs and walkways shall be float finished and sloped to indicated grades. Floating may be performed by use of hand or power driven equipment. Floating shall be started as soon as the screeded surface has stiffened sufficiently to produce a uniform surface free from screed marks. Dry topping will not be allowed. A true plane surface shall be provided for a minimum width of 6 in. between all mating flashboard guides. Exposed edges of slabs shall be finished with a 3/8-in. radius edging tool. additional finishes may be required where noted on the drawings.

c. Irregularities of exposed surfaces shall not exceed 1/8 in. for gradual irregularities as measured by a 5 ft. template or 1/4 in. for gradual irregularities as measured by a 10 ft. template. Abrupt irregularities will not be permitted. Deviation from line and dimensions shall not exceed 1/4 in. for fishrearing and holding ponds and 1/2 in. for all other work unless noted otherwise on the drawings. However, the minimum thickness allowed for any structural slab or wall shall be 1/4 in. less than dimensioned.

3F.02 Special Finishes (Where noted on the drawings)

a. WALLS AND CURBS (Sack Finish)

Where indicated on the drawings the exposed surfaces shall be stoned or ground to expose air pockets and finished by applying cement mortar with a brush and sacked to give a smooth uniform finish immediately upon form removal. All finish shall extend 12 in. below backfill grade line.

b. SLABS AND WALLS

Troweled Finish - Slabs shall be steel troweled after float finishing as specified above and when concrete is sufficiently hard to prevent excessive amounts of fines and water from working to the surface.

Sufficient pressure shall be applied to the trowel to flatten and smooth the concrete and produce a dense, uniform surface free of blenishes, ripples and trowel marks.

Broom Finish - Slabs and wall tops shall be floated and troweled as specified above and then broomed immediately following steel troweling. The broom shall be of an approved type that will produce regular corrugations

not over 1/16 in. depth. Strokes of the broom shall be made square with the slab, slightly overlapping, continuous from edge to edge of the slab. The finished surface shall be free of porous spots, irregularities, depressions and small pockets.

3F.03 Curing

a. Immediately following the completion of the concrete finish requirements, all concrete surfaces shall be kept wet for a period of not less than 5 days after placing by covering with a water-saturated material or other approved methods.

b. Membrane curing will be permitted only where specifically noted on the drawings. A curing compound conforming to ASTM C-309, Type 2, white pigmented, may be used and shall be applied in two coats immediately following the completion of the concrete finish requirements. In preparation for the curing compound application, the concrete shall be thoroughly saturated with water. Curing compound shall be applied as soon as the surface water has disappeared. The concrete shall be protected from damage at all times. No curing compound will be permitted on surfaces against which concrete or other material will be bonded.

c. In lieu of water curing, an epoxy chlorinated rubber surface sealer and hardener equal to TRI-KOTE 18 may be used. Application rate shall be not less than one gallon for 250 sq. ft. of surface area. Application shall be immediately following finishing at a spray pressure of 30 to 40 p.s.i. Concrete surface shall be kept damp at all times until sealer is applied.

d. During the curing period when there is likelihood of freezing temperatures, suitable and sufficient measures must be provided to maintain all concrete surfaces at a temperature of not less than 55°F for a period of not less than 5 days after concrete placements. All necessary materials for covering or housing must be on the work site before concrete work is started and must be effectively applied or installed. Where artificial heat is employed, special care shall be taken to prevent the concrete from drying by maintaining the curing procedures. All concrete placed in the forms shall have a material temperature range between 40" and 90°F.

3G. EMBEDDED ITEMS (See also Division 5)

3G.01 General

Before placing concrete, care shall be taken to determine that all embedded items are properly positioned, firmly fastened and clean.

3G.02 Materials

a. Steel reinforcement shall conform to Federal Specification QQ-S-632 Type II, Class B-40 or B-60. Wire mesh shall conform to Federal Specification RR-W-375. Metal chairs shall be galvanized or plastic coated. Bars and/or wire mesh shall be cut, bent and installed in accordance with the American Concrete Institute Building Code requirements. The Contractor shall submit reinforcing steel shop drawings for review by the Engineer prior to steel fabrication. The Engineer's review will be for shape, size and spacing only.

b. All steel bars shall be furnished in full lengths where possible, except at the base of all concrete walls where 36-bar diameter splices are permitted. Other splices shall have a length of not less than 30 times the nominal diameter of the reinforcement unless otherwise shown and shall be well distributed or else located at points of low tensile stress. Sheets of wire mesh reinforcement shall overlap each other 12 in. and shall be securely fastened at the ends and edges. Size, spacing and quantity of reinforcing bars shall be as shown or noted on the drawings within the following tolerances:

1. Depth, d, in flexural members, walls, columns where d is 24 in. or less: + 1/4 in.
2. Depth, d in flexural members and columns where d is more than 24 in.: ± 1/2 in.
3. All other location dimensions: + 2 in., except that specified concrete cover at ends of members shall not be reduced.

Reinforcement shall be held securely by wire, mortar blocks or metal chairs during the pouring of the concrete. In general, all reinforcement shall be securely wired in proper position (alternate bar intersections minimum) and supported before concrete is poured in any section. Special precautions shall be taken to insure that the wire mesh is properly located at all times during the pouring of the concrete. Except as otherwise shown on the drawings, the thickness of concrete over reinforcing bars shall be as follows:

- Between main bars and surface of concrete deposited against earth without intervening forms 3 in.
- Between reinforcing bars more than 5/8 in. diameter and formed concrete surfaces 2 in.
- Between bars 5/8 in. or less in diameter and formed concrete surfaces 1 1/2 in.
- Between stirrups and ties and surface concrete 1 in.
- Between slab bars and top of slab , 1 1/2 in.
- Between slab bars and formed bottom of interior building slabs 1 in.

3G.03 Waterstop

Waterstop shall be installed only where indicated on the drawings and shall be equal to Serviced Durajoint Type 4 PVC Waterstop, as manufactured by W. R. Grace & Co. Waterstop in walls shall be spliced to waterstops in slabs. All splices and butt joints in the waterstop shall be heat fused as recommended by the waterstop manufacturer.

36.04 Concrete Joints

a. Construction of stop pour joints shall be located only as shown on the drawings and shall be formed with or without shear key and waterstop as detailed. Should the Contractor require other construction joints than shown on the plans, the Contractor shall submit requests for Engineer's approval prior to placing concrete forms. Contraction and expansion joints shall be constructed at the locations shown and to the dimensions as detailed. Reinforcing bars shall not extend through contraction or expansion joints. Premolded joint filler shall be equal to Homex 300 as manufactured by Homasote Co.

b. Concrete joint preparation for additional concrete lifts shall require the hardened concrete face to be roughened and cleaned to remove loosened aggregate particles or damaged concrete. Immediately prior to concrete placement the surface shall be again cleaned, thoroughly wetted and followed by flushing with a slurry of neat cement and water.

c. At joints with existing concrete or concrete over 30 days old the surface of hardened concrete shall be roughened and then cleaned to remove all dust, loose aggregate particles or damaged concrete. Immediately prior to placing new concrete, the hardened concrete surface shall be coated with an epoxy bonding adhesive equal to Adhesive Engineering Co. "Concresive =1 Long Pot Life" applied in accordance with manufacturer's recommendations.

3H DAMAGED OR DEFECTIVE CONCRETE

Concrete not conforming to the specifications or concrete damaged from any cause that is found defective shall be removed and replaced with acceptable concrete at no additional cost to the Government. Concrete test cylinders will be taken by the Government for the purpose of checking concrete quality of materials furnished. All concrete placed without approval by the Inspector shall be considered defective concrete and shall be subject to removal and replacement.

DIVISION 4. GROUT

4A. MATERIAL

Grout shall be a waterproof non-corrosive and non-shrink grout equal to EMBECO 636 Grout as manufactured by Master Builders.

4B. WORKMANSHIP

All grouting shall be accordance manufacturer's instructions.

DIVISION 5. MISCELLANEOUS METALS

5A. GENERAL

Steel shall be free from mill scale, flake rust or pitting. All Steel to be galvanized shall be hot-dipped galvanized in accordance with ASTM A-123. Galvanizing shall be after fabrication.

5B MATERIALS

5B.01 Structural Steel

Structural steel shapes, plates, and bars shall conform to Federal Specification QQ-S-741.

5B.02 Fasteners

All bolts, nuts and washers shall be galvanized, cadmium plated or stainless steel as noted. Cinch anchors shall be equal to Phillips Red-Head non-drilling flush anchors.

5B.03 Wire Mesh

Wire mesh for fish rack apron shall be galvanized welded wire fabric in accordance with ASTM A-82. Style shall be 2" x 2" -16/16. Wire mesh shall be furnished in one roll with minimum width of 4 ft. and minimum length of 100 ft.

Wire mesh for intake structure screen shall be 4 x 4 openings per inch with .105 in. steel double weave woven wire as manufactured by Western Wire Works. Screens panels shall be furnished full size with no splices.

5B.04 Bar Grating

Bar grating shall be aluminum equal to Ryerson =19-AP-4 with 1-1/2 x 3/16 in. bearing bars 1-3/16 on center and 5/16 in. cross bars 4 in. on center. Maximum panel width shall be 3 ft. and minimum panel width shall be 18 in.

5c FABRICATION

Field welds of galvanized steel components will not be allowed unless so indicated on the drawings and all such field welds shall be painted with Galvacon or equal.

The finished diameter of bolt holes shall not be more than 1/16 in. larger than the nominal diameter of the bolt unless otherwise shown.

On all exposed metal surfaces all cuts, drilling, welds, etc., shall be smooth free of burrs, scale, jagged edges, etc. All grating cuts shall be saw cuts.

All welds shall be continuous and to the full strength of components unless specifically noted otherwise.

All shop fabrication shall be to the shapes and dimensions shown within 1/16 in.

5D INSTALLATION

Embedded items shall be securely fastened in place to prevent displacement during placing and finishing. Tolerance in the finished work shall be 1/4 in. for horizontal location dimensions and 1/8 in. for elevations; however, all metal surfaces and edges shall be flush with adjacent concrete surfaces where applicable.

Movable items shall operate smoothly and easily without binding and fit the mating parts at all appropriate locations and orientations.

DIVISION 6. CARPENTRY

Lumber used for flashboards to be Western Red Cedar T & G, "Select Dex", size as noted on the drawings.

Lumber for fish racks and fish trap shall be S4S Hem-Fir No. 1 Structural Light Framing or better for 2 x 2s, 2 x 4s and 4 x 4s; No. 1 Structural Joist and Planks or better for 2 x 6s, 2 x 12s and 4 x 6s; No. 1 Structural Beams and Stringers or better for 6 x 12s; and No. 1 Structural Posts and Timbers or better for 8 x 8s.

All fasteners shall be hot galvanized in accordance with ASTM A-153. All nuts and bolt heads in contact with wood shall have washers.

DIVISIONS 7, 8, 9, 10, 11, 12, 13, and 14

These Divisions are not applicable to work under this contract.

DIVISION 15. MECHANICAL

15A. GENERAL

15A.01 Scope

Work covered by this section includes furnishing and installing all piping, valves, slide gates and testing of all systems.

15A.02 Codes and Abbreviations

ASTM American Society for Testing and Materials

AWWA: American Water Works Association

15B. PIPING

The work covered by this section includes furnishing and installing the piping systems shown on the drawings.

The types of material to be used in the piping systems are shown on the drawings. Specifications for each type of material are listed hereinafter. All piping systems shall be constructed from the materials shown and to the lines, grades and dimensions shown. Where not shown, the pipes shall be located to avoid interference with other features and sloped a minimum of 0.001 to drain.

All piping systems shall be plugged, tested and left ready for use.

15B.01 Materials

15B.01a PVC SUPPLY PIPE AND FITTINGS

Pipe and fittings shall be made from ASTM 01784, Type I, Grade 1 PVC.

Pipe shall comply with AWWA C900, Class 160, SDR 26 or ASTM D1785, Schedule 40.

Fittings shall be socket type complying with ASTM D2467. Solvent cement for socket joints shall comply with ASTM D2564 made especially for PVC piping.

15B.01b PVC DRAIN PIPE

Pipe and fittings shall be rubber gasketed complying with ASTM D3034, made from material complying with ASTM D1784, Type I, Grade I.

15B.01c STEEL PIPE AND FITTINGS

Steel pipe shall conform to ASTM A-53, with 3/16 in. minimum wall thickness. Steel pipe to be buried in the ground shall be coated and wrapped in accordance with AWWA C203 finished with a single wrap craft paper. The

minimum number of sections for each fabricated fitting shall be as follows:

0 through 22-1/2°	2 sections (1 miter)
over 22-1/2° through 45°	3 sections (2 miters)
over 45° through 67-1/2°	4 sections (3 miters)
over 67-1/2° through 90°	5 sections (4 miters)

The centerline length of each piece between miters shall not be less than 1/2 the nominal pipe diameter.

Steel pipe joints shall be flanged, welded, bell and spigot, or flexible coupling connected.

Pipe flanges shall conform to AWWA C207 Class D flanges except where noted as Class B flanges. Flanges to be welded or screwed on shall be shop or factory mounted and refaced after mounting. Gaskets for flanges shall be full facing rubber gaskets cut from 1/4 in. thick Buna N rubber sheet stock with Durometer rating 65/76 or shall be factory formed, 1/4 in. nominal thickness of equal quality material.

Welded joints shall be single butt weld type in conformance with AWWA C208, Table 1. Welded connections shall be coated in accordance with AWWA C203-73.

Bell and spigot ends shall be in accordance with AWWA C200-75 Section 3.7.7. spigot ends shall have groove for confining rubber gasket.

Flexible couplings for connecting steel pipe to steel pipe or for connecting steel pipe to PVC pressure pipe shall be equal to Smith Blair 411 with corrosion resistant nuts and bolts. Flexible couplings for connecting steel pipe to PVC drain pipe shall be Smith Blair 413 with corrosion resistant bolts.

Field procedure and coal tar enameling of couplings shall in accordance with AWWA C203.

15B.02 Pipe Handling and Transportation

During loading, transportation, unloading and laying or installation, every precaution shall be taken to prevent injury or damage to the pipes. Use strap slings for lifting coated pipes.

Coated and wrapped steel pipe shall be handled and transported in accordance with AWWA C203 Section 4.7.

Any section of pipe with a damaged end or barrel shall be repaired as directed if in the opinion of the Engineer a satisfactory repair can be made; otherwise, the damaged section shall be replaced with an undamaged section at the expense of the Contractor.

15B.03 Installation

15B.03a GENERAL

Buried pipe lines shall be installed only in the presence of the Inspector. Excavation and backfill shall be as specified in paragraph 2B.

Pipe trenches shall be kept free of water which might impair joining operations at all times when pipe is being placed.

In case defects are revealed by inspection, the Contractor shall replace the defective pieces and shall bear the expense. All pipe and fittings shall be carefully cleaned before laying. Precautions shall be taken to prevent foreign material from entering the pipe. Pipe shall be laid with bell ends facing in the direction of laying and generally on an uphill direction unless otherwise directed. Pipe shall be cut only to remove defective places or for closing pieces. Such cuts shall be made square.

Pipe shall be laid on a prepared bed of the specified depth and gradation. The bedding shall be placed in the excavated trench and shall be compacted. Depressions for pipe bells and couplings shall be hand excavated. After the bedding has been compacted, the top 1 in. shall be loosened to provide cushioning for uniform pipe support. To insure full bearing of the pipe on the bedding material, the pipe shall be lifted after initial placement to allow the Inspector to view the depression left by the pipe. If full bearing is not evident, the bedding surface shall be reshaped or additional bedding material added until full bearing is achieved.

All laying operations to provide water-tight pipe and pipe joints shall be the responsibility of the Contractor. If adjustment of the position of a length of pipe is required after it has been laid, it shall be removed and rejoined as for a new pipe. Prior to acceptance the inside of the pipe shall be cleaned and all debris removed.

The pipe units shall be fitted together and the joints shall be drawn together so that the bells and spigots are as nearly fully engaged as practicable. Care shall be exercised to secure true alignment. The rubber gaskets shall be fitted properly in place and lubricated as necessary, and the pipe shall be fitted together in a manner to avoid twisting or otherwise displacing or damaging the gaskets.

Thrust blocking shall be provided as required on all changes of direction in the pipe lines such as: opposite branch connections of tees or wyes, outside bends or elbows either horizontal or vertical, at reducing changes in diameter, at dead ends and any other places where forces due to pressure or flow of water may develop. Thrust blocking shall equal or exceed the pipe manufacturer's recommendations for applicable test pressures listed in the Test Schedule in Division 15D. and a soil bearing strength of 2000 lb. per sq. ft.

Exposed piping shall be run parallel and square with the lines of the structures unless otherwise indicated. Pipes shall be accurately cut to allow assembly without springing or forcing. Pipe to be embedded in concrete shall be secured in place to prevent displacement during

concrete placement. Do not weld embedded pipe to reinforcing steel. Embedded pipes without seep collars may at the Contractor's option be grouted into blockouts. Grouting shall be accordance with Division 4. All buried piping shall have a flexible joint or coupling within 2 ft. of the concrete surface whether shown on the drawings or not.

15B.03b PVC PIPE AND FITTINGS

Plastic pipe shall be installed in accordance with the manufacturer's instructions, except that bedding shall be in accordance with Division 2D.02a. Install electronically-detectable plastic tape 1 ft. below finished grade over all plastic pipe buried in the ground. Tape to be Allen "DETECTATAPE" 3 in. wide and imprinted continuously "BURIED WATER LINE BELOW" or other appropriate wording approved by the Engineer.

15B.03c. STEEL PIPE

Field welding of steel pipe shall be in accordance with AWWA C206. Galvanized piping shall not be field welded.

Flanged pipe shall be installed using full-facing rubber gaskets between each pair of mating flanges. Gaskets shall be cut from 1/4 in. thickness of Buna N rubber sheet stock with Durometer rating of 65/76 or shall be factory formed, 1/4 in. nominal thickness of equal quality material. All bolts shall be installed in flanged pipe but shall not be tightened until the complete run of piping has been installed and aligned. Bolts shall be tightened uniformly to a torque of 30 to 40 foot-pounds for 5/8 in. bolts, 50 to 65 foot-pounds for 3/4 in. bolts, 80 to 100 foot-pounds for 7/8 in. bolts and 120 to 150 foot-pounds for 1 in. bolts. Bolts threads and nut bearing surfaces shall be lubricated before tightening.

Threaded joints shall have a thread joint compound applied to a the male threads before making the joint.

Coated and wrapped steel pipe shall be handled and stored at the installation site in a manner that will prevent damage to the pipes, coatings and wrappings. Pipes shall be lowered into the trench by means of wide belt slings. Chains, cables, tongs or other equipment likely to damage the coating will not be permitted, nor will dragging or skidding the pipe. The Contractor shall allow the Inspector to examine the underside of the pipe. Any damaged areas shall be repaired before lowering the pipe into the trench. During installation, every precaution shall be used to prevent damage to the coating. No metal tools or heavy objects shall be permitted to come in contact with the coating. Workmen will not be permitted to walk on the pipe unless necessary and in case of such necessity, the workmen shall wear shoes with rubber or composition rubber heels. Any damage to the pipe or coating shall be repaired at the expense of the Contractor as directed by the Engineer. All field joints shall be by means of flexible couplings, bell and spigot ends, threaded couplings or flanges. No field welding will be permitted. Couplings and exposed pipe ends shall be reprimed in the field. When the primer is dry, these surfaces shall be coated with AWWA coal tar enamel recommended by the manufacturer of the coating used on the pipe. The coating shall be capable of conforming to the normal movement of the buried pipe without cracking.

15C. VALVES AND SLIDE GATES

15c.01 Slide Gates

Slide gates shall be Waterman C20 with minimum frame heights and rising stem extensions as shown or full frame heights. Frame parts, stem extensions, anchor bolts and assembly bolts shall be galvanized. Lift nuts shall be cast bronze. Tops of all stem extensions or tops of all full frames shall be fastened to adjacent concrete walls with galvanized pipe clamps Fee & Mason Fig. 366 or anchor bolts. Installation shall be as recommended by the manufacturer. Embedded parts shall be built into forms and embedded directly in cast-in-place concrete or grouted into blockouts. Grouting shall be as specified in Division 4.

15C.02 Butterfly Valves Larger Than 6 Inches

Butterfly valves shall be Pratt Goundhog line size Class 150 butterfly valves with buried service manual operators conforming to AWWA C504-74 with the following additional requirements.

1. Valve shafts material shall be stainless steel Type 302, 303, 304 316 or Mn1.
2. Rubber seat thickness shall be in accordance with Table 4 in AWWA c504-70.
3. Valve discs shall be alloy cast iron (conforming to ASTM A-436, Type 1 or 2, or ASTM A-439 Type D2, with a maximum lead content of 0.003 percent) or stainless steel ASTM A-276 Type 304 or 316.
4. Operators shall have adjustable internal stops.
5. Valves shafts shall be securely attached to the valve discs by means of keys, dowel pins, taper pins or any combination of the three. The connections between the shaft and disc shall be designed to transmit shaft torque equivalent to at least 75% of the torsional strength of the minimum required shaft diameters. Dowels and taper pins shall be mechanically secured.

Buried valves shall be equipped with cast iron slip-type valve boxes and covers, extension stems and Pratt Diviner ground level position indicator. Valve box shall have sufficient overlap to permit a top adjustment 6 in. higher than the present elevations.

Exposed butterfly valves shall be flanged and equipped with cast iron floor boxes and covers, extension stems and Pratt Diviner groundlevel position indicator. Top of floor boxes shall be fastened to adjacent concrete walls with offset pipe clamp equal to Fee & Mason Fig. 366.

15c.03 Butterfly Valves (6 Inches and Smaller)

Butterfly valves shall be PVC rubber seated butterfly valve as manufactured by Celanese Piping Systems with 316 stainless steel shaft, teflon coated top and bottom bearings, 0-ring shaft seals, steel lever and operator assembly. Shaft shall be square through the disc body. Lever and operator assembly shall be equipped with device for holding valve in open, closed or throttled positions. All PVC to be ASTM D1784 Type I, Grade 1 material ,

15c.04 Ball Valves

Ball valves shall be single union PVC ball valves as manufactured by Celanese Piping Systems with teflon ball seats, 0-ring seals on stems, 0-ring seals between end connectors and carriers, 0-ring seals between valve bodies and carriers. All PVC to be ASTM D1784 Type I, Grade 1 material.

15c.05 Gate Valves

Gate valves shall be equal to M&H NRS-Style 67 with bronze mounted cast iron body, cast iron discs with bronze seats, bronze stem, 2 in. square operating nut, double 0-ring stem seals, cast iron slip-type valve boxes and covers, extension stems to place 2 in. square operating nut 3 in. below the box covers. Valve box shall have sufficient overlap to permit top adjustments 6 in. higher than present elevations.

15C.06 Valve Wrenches

Valve wrenches (two required) shall be T handle socket wrench to fit 2 in. square nut as made by M & H Division of Dresser Manufacturing. Stems shall be 4 ft. long.

15D. TESTING

Flush all piping until clean. Test piping as a system or in sections.

Furnish all necessary pumps, valves, gauges, meters and labor for all testing. Notify inspector in writing 3 days in advance of test. Repair any leaks and re-test. Dispose of surplus water from testing. Tests of piping in the ground shall be made with the pipe backfilled to a depth of 12 in. with all joints and couplings left exposed for inspection. Concrete thrust blocks shall have cured for a minimum of 24 hours before testing. All tests shall be made for a minimum of 4 hours with water or as indicated. Allow a minimum of 24 hours after filling system for natural absorption before starting tests. Clean up after testing.

PIPING TEST SCHEDULE

<u>System</u>	<u>Test Pressure</u>	<u>Results</u>
Supply Pipes (Not buried)	25 psig	No loss in pressure or visible leaks.
Supply Pipes (buried)	25 psig	Leakage not to exceed 1-1/2 gal. per in. of diameter per 100 ft. in 24 hours. No visible leaks
*Drain Pipes	Fill to highest point	Leakage not to exceed 5 gals. per in. of diameter per 100 ft. in 24 hours. No visible leaks.

* In lieu of this method, the Air Test Method published by International Pipe and Ceramics (Interpace) in their bulletin "Procedure for Leak Locating With Low Pressure Air: may be used.