Proposed Improvements
Irrigation Hydraulics Laboratory
Bellevue, Colo.
---Cooperating---
U.S. Dept. of Agri. Colo. Agri. Exp. Station
The Jackson Ditch Co.
Scale 3/4 inch to 1 foot
March 1925

Note: New weir crest to be made adjustable to 10 feet by insert plates.
Detail Bars
E-Countersunk 9@15
V0-Countersunk 2@8½'
VC - S. Verticals 20@5½'
VB - L. 24@7'
VA - L 7@8½'
VK = L 6@7'
F = Horiz. Bars 40@20'

40@20 = 800
4@17 = 68
12@15 = 180
12@14 = 168
10@11 = 110
\[ \text{Total} = 1326 \]
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<th>Brief Description</th>
<th>Serial or Factory No.</th>
<th>Req. No.</th>
<th>Date of Req.</th>
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<th>From Whom (Vendor)</th>
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**Notes:**
- Special bend 1/16" 1@16
- 10@11 12@14
- 3@17 40@20
- 18 inches extra to be cut from bar at laboratory
Proposed Improvements
Irrigation Hydraulics Laboratory
Bellevue, Colo.

Cooperating:
The Jackson Ditch Co.

Scale: 1 foot = 1 inch
March 1925

Note: New weir crest to be made adjustable to 10 feet by insert plates.
NOTE. Outside walls to be covered with sheeting, building paper, and drop siding.
North, South, and West inside walls and ceiling to be covered with wall board with battens over joints.
Floor and East inside wall to be covered with flooring.
Roof to be covered with sheeting and shingles.
Duplicate pages not scanned

See originals in folder
PROPOSED IMPROVEMENTS AT BELLVUE LABORATORY

During the early summer of 1919 it became apparent that improvements must be provided for the study of water measuring devices having capacities larger than could be investigated at the hydraulic laboratory at the college. A reconnaissance was made of likely locations along the river near Fort Collins, and the most feasible and practical condition was found at the headgates of the Jackson Ditch at Bellvue. There was at this place a concrete diversion dam with very substantial headgate and wasteway, with metal gates provided with rack and pinion regulation. (Fig. 1). Permission was obtained from the officials of the ditch company to construct, adjoining the wasteway, the first small field laboratory. This flume was built with a concrete floor 10 ft. wide and approximately 60 feet long. The sides of the flume were of wood of the usual flume-type construction with 2 by 4 inch cross ties. This original flume was constructed during August and September, 1919, primarily for the purpose of investigating the smaller size Venturi flumes which were beyond the capacity of the laboratory at the college. At the close of that season this work had been completed. The scope of the development of the Venturi flume has not yet been covered; this would include the calibration of the larger sized trapezoidal flumes.

To further add to the usefulness of the Bellvue laboratory, it was decided in 1920 to increase the width of the flume from 10 to 14 feet and to add directly below the structure a reinforced concrete weir box 7 1/2 ft. deep, 14 ft. wide and 24 ft. long, this box being provided at the lower end with a standard 10-ft. rectangular weir. (Figs. 2, 3, and 4). The new flume, now 14 feet wide, was built having the flume side next to the river in place and
moving the opposite side out the required distance. This enlargement, with a
capacity of approximately 100 second-feet, was made primarily to provide means
for the further study of the Venturi flume, and also to make certain studies
with current meters. (Figures 5, 6 and 7 show the present laboratory and weir
Figs. 8, 9, 10 show laboratory in action.
when discharging about 100 second-feet.

The present proposed improvements are necessary now because of the de-
terioration of the wooden sides of the present structure. Last season in the
study of the Herschel hollow crest weir, one side of the wooden flume gave way
which required some delay in the work to make repairs. It is thought that the
wooden flume will not last another season, and it is proposed to construct two
reinforced concrete walls taking the place of the wooden sides, these walls to
join at the lower end with the present reinforced concrete weir box, and at
the upper end to join on to the concrete structure of the wasteway—a part of
the ditch company's structure. This wall is to be approximately 6 ft. 3 inches
high from the inside floor line, with a thickness of 6 inches at the top, bat-
tered on the outside to a thickness of 12 inches at the floor line, and placed
on a 3-ft. footing with counterforts at intervals along the outside of the wall
to provide additional stability. Experience indicates that it is never possible
to absolutely close the supply gate of the flume, which means more or less water
on the floor. It is proposed that for a distance this floor be raised from 3
to 4 inches at a point immediately below the regulating gates in the flume, this
increase in elevation to provide dry working conditions for installing apparatus.
A structure of this nature must, of necessity, be flexible in its application,
and it is proposed that the Dayton Malleable Inserts be placed at various in-
tervals, both on the inside of the walls and on the floor, which will provide the
means of constructing bulkheads, anchorage or bracing. Along the top of the wall
will be placed a 3 by 6 inch wooden plate which may also be used for anchoring and bracing at any point. The accompanying blueprint gives the general plan of this new proposed construction.

Because of the interest shown by the Jackson Ditch Company in our investigational work, they have granted permission to cut one of their concrete walls and rebuild on a line which is very much to our advantage in the improvement of floor conditions in the flume. This new wall, set back on the flume line, will increase the section immediately below the supply gate, giving a more uniform distribution of the water as it approaches the measuring structures. The two regulating gates, as shown in the print, each having an opening of 2 by 2½ feet, provide for the regulation of the discharge thru the flume, sufficient and when completely opened are expected to discharge a quantity of water to minimize the deposit of sand and silt in the weir box and flume. The new work must be satisfactory to the ditch company in providing means to flush the deposit of sand immediately above the diversion dam. If, in the event the regulating gates are insufficient, we will be obliged to permit the ditch company to flush the sand thru the flume into the weir box and it would eventually fill the structure. However, this is not a serious matter because the weir box can be cleaned in a short time, and also the flume itself. The cleaning of the weir box is done by means of a temporary movable bulkhead so placed that the current of water is forced downward near the bottom which cuts and moves the sand deposit downward. Three men can completely clean the box in less than a day. The sand carried by the river only occurs during extreme high water period for a few days in June, and I have no reason to fear but what matters can be adjusted satisfactorily to the ditch company from the standpoint of sand accumulation.
There is to be placed a 6 inch pipe line for regulation, running parallel to the flume from some point in the regulating chamber and discharging into the river below the weir, this pipe line to be provided with a valve near the hookgates of the weir. The approximate amount through the flume is to be adjusted by the two regulating gates, and the finer adjustment by the use of the six valves.

Estimated Cost of Improvements at Bellvue Laboratory

The plan of doing the work is somewhat as follows:

The present wooden sides of the flume are to be removed from their foundation and used for forms with some slight modifications for casting the counterforts, and in addition it will be necessary to provide possibly another 12 inches in height. The wall on the river side will be cast first and the forms then moved to the opposite side and the work completed.

Arrangements are to be made with the College Farm for the use of a concrete mixer, cement to be purchased from the Farm at rates more favorable than can be secured from local merchants. Sand and gravel are available near the laboratory. Quotations on reinforcing steel have been obtained at about $4 per cwt., twisted bar, f. o. b. Denver. It is expected that our regular force will be engaged upon the work, and in addition two or three extra men will be necessary to push the work more effectively during the time the concrete is being poured. The item of cost of gravel is merely estimated, but as a usual thing sand and gravel can be obtained at about $1.50 per cubic yard.
The following gives some idea as to the extent of construction and estimated cost:

**Concrete**:
- Walls: 45 cu. yds.
- Counterforts: 2" "
- Floor: 4" thick: 6" "
- Total: 55 cu. yds.

**Materials**:
- Gravel, 55 cu. yds at $1.50: $82.50
- Cement, 250 sacks at $1.00: $250.00
- Steel, 800 lbs at $4.00: $3200.00
- Inserts and bolts: 5.00
- Additional lumber: 20.00
- Incidentals: 10.00
- Total: $399.50 or $400.00

**Regulating gates**:
- 2- 1½" stems, wheels and brackets: 27.00
- Lumber, bolts, angle iron, etc: 3.00
- Total: 30.00

**6" pipe for regulation**
- On hand 22 ft. of 6" pipe: 10.00
- 50 ft. 6" tile: 10.00
- Improvised valve for regulation: 10.00
- Second-hand material: 10.00
- Total: 30.00

**Additional labor**: 150.00

Total: $590.00

It is believed that the estimated cost of the materials necessary for the construction is approximately correct. The item of two regulating gates is estimated to be $40, of which $27 is required for the 2- 2½" stems, hand wheels and brackets. It is proposed that these gates be made of 2" lumber bolted together with cleats, angle iron gate seat with strap iron on face of gate. It is not intended that these gates shall be water-tight, and leakage is of no great importance. The 6" pipe and valve for regulation can be obtained at small cost. We have on hand one 22 ft. length of 6" pipe and
sufficient 6" tile to complete this regulation line along the outside of the flume. However, the valve has not yet been provided and it is thought that an old 5" second-hand valve might be bought at small cost, and in the event this cannot be secured plans are in mind for providing a suitable regulation at a cost not to exceed $10. It is thought that about 10 days will be required to do the construction and three or four men at $3.50 per day will cover possibly the amount of extra labor necessary. However, this item of labor is to include assistance given the ditch company in widening the river channel, which is not thought to be a great expense. This widening will consist in cleaning the channel of the present drift and logs, removing an old tree stump from the opposite bank, thus permitting the river at high stage to do its own cutting.

As a matter of distribution of costs I would propose the following:

The charge for labor, regulating gates, insert bolts and incidentals, amounting to approximately $200 to be charged to the Government account and the balance of about $400 to be charged to the Experiment Station.

Comments

The Bellevue laboratory can be reached from headquarters in about 25 minutes by auto. During the months of May, June, July and usually August there is always available at least 100 second-feet for our experimental work. However, during the season of 1922 the river was at extremely low stage, necessitating our abandoning work in early September. The proposed concrete work, together with the reinforced concrete weir box now in place, will make a very desirable field laboratory, and if, in the future, it should become necessary for a longer flume, conditions will permit a possible extension of 50 or 60 feet. Extreme high water in the river causes undesirable conditions round the flume, and the ditch company has proposed that the river channel be
widened opposite the flume, giving a more desirable condition for wasting
the sand and also added protection to our structure.

The Jackson Ditch Company have informed me that they are sole
owners and claimants of the area occupied by the laboratory. The company
does not feel inclined to grant a perpetual right of occupancy, but with
proper attention in the regulation of the ditch during working hours I have
been assured that the company have no objections whatever to our using their
conveniences in our experimental work. Because of the low stage of the river
about the last of March and first of April, it is thought that this is the
most desirable time to get at this new construction.

The use of this laboratory to date has justified the expense al-
ready incurred. Sufficient work is now awaiting attention which will require
the use of the laboratory for at least two seasons.

Fort Collins, Colorado

January 30, 1923
1. General view looking down stream at Bellvue Laboratory, showing present condition of flume. Approximately 100 second-feet passing over diversion dam.
Enlarging flume from 10 to 14 ft. Experimental Venturi flume as installed in 10-ft. flume is shown in middle foreground. During construction the small flow in river is by-passed around the work thru the Jackson ditch and wasted below, as shown in view. The work of widening the channel, as mentioned in text, will consist of taking out the tree and brush as shown to left, along bank of river channel. The ditch company has permitted the removal of the 12-inch concrete wall, see claw hammer, and rebuilding this on the line of the new proposed wall.
3- Enlarging flume from 10 to 14 ft. View looking up stream. To increase head in flume, a temporary 12-inch plank crest is placed in diversion dam. The logs shown in channel below dam are to be removed and the larger stones cast along the side of new flume for protection.
4- View of Bellevue laboratory. Looking up stream after concrete weir box was constructed and flume increased to 14 feet.
Ten ft. rectangular weir discharging about 100 second-feet. Current meter investigation.
6- Side view of nappe of weir when discharging about 100 sec.-ft.
7- General view of Bellvue laboratory looking up stream.
Rohrer and Lightburn making current meter studies at Bellevue laboratory.
9- Weir box showing the two hook gages. The regulating 6-inch pipe line to be placed along the outside of this with valve near hook gage for convenience.
10- Bellevue laboratory when investigating Herzogal hollow crest weir, 15-second-feet passing weir. Lumber for construction of apparatus or general use is left full length where possible as matter of economy.